



Stream Condition Index Stressor ID Process

DEP Aquatic Ecology and QA Section
November 5, 2019

SCI Stressor Identification

62-303.430 – Biological Impairment.

Required to determine a causative pollutant when SCI has a verified failure.

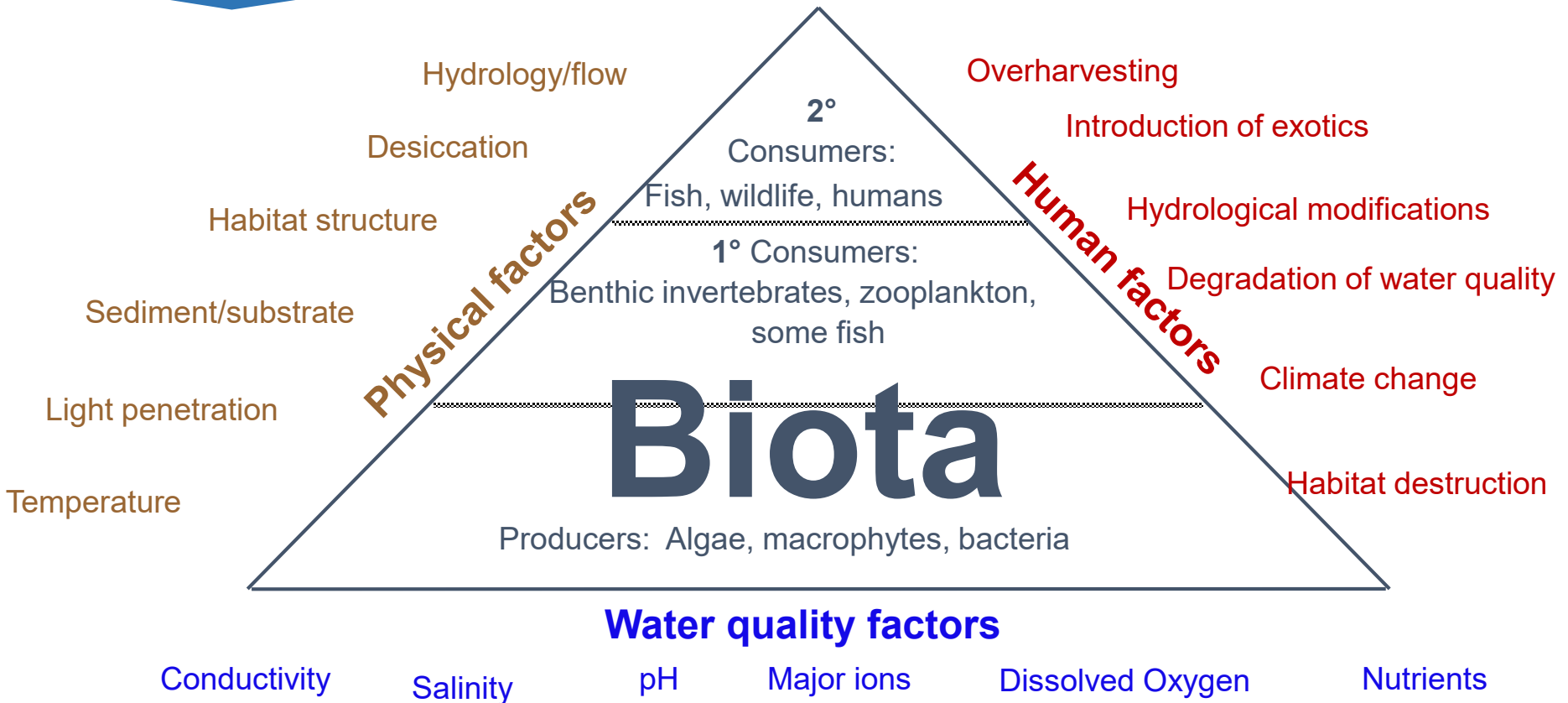
Study List - verified biological impairment, no causative pollutant identified

Verified List - water quality data reasonably demonstrating particular pollutant are causing the impairment or

if NNC are exceeded, then nutrients shall be identified as the causative pollutant unless a stressor identification study links other factors



SCI Stressors





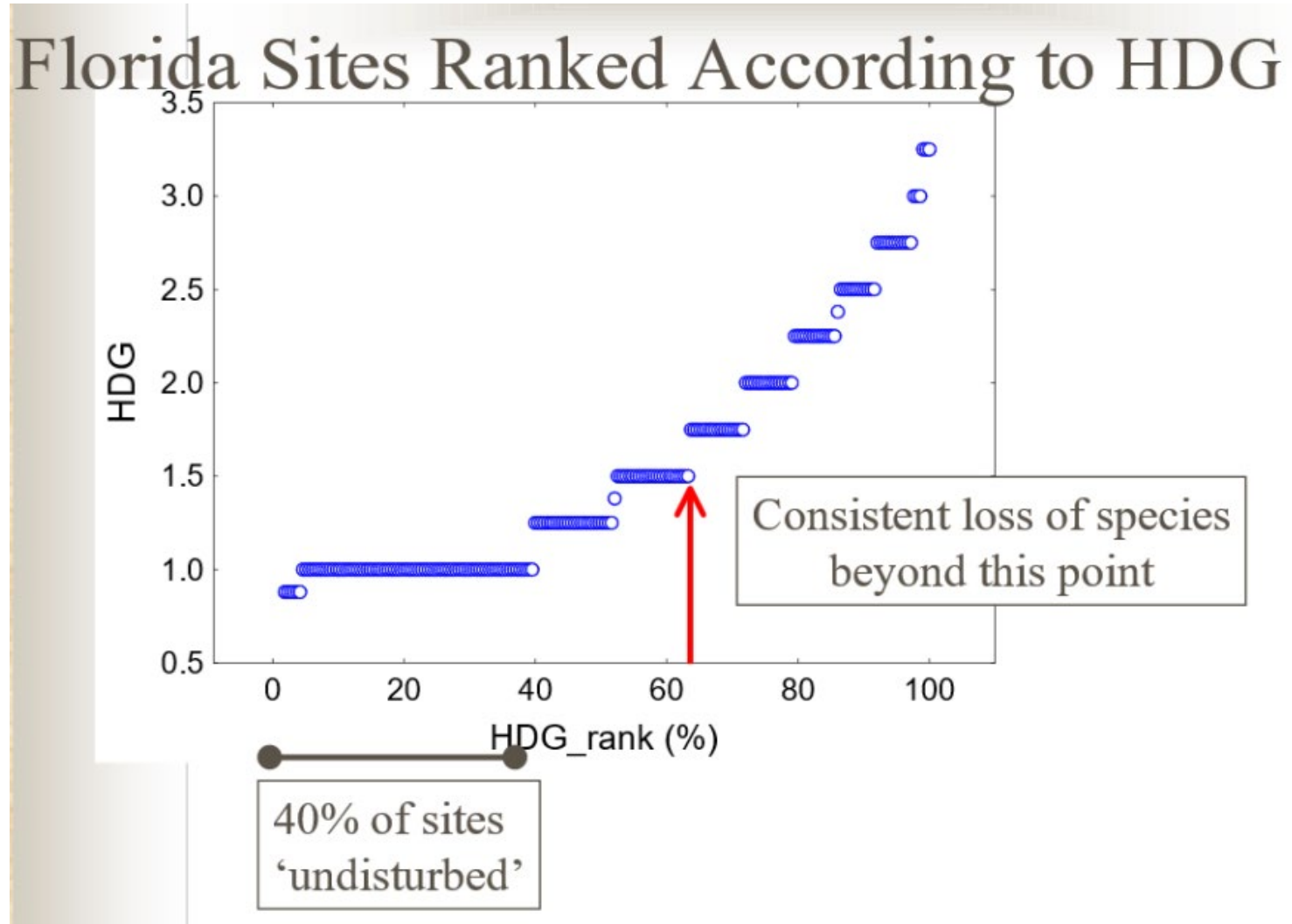
DEP Efforts

(2005-2012)

- DEP recalibrated the SCI with a human disturbance gradient including habitat assessment, hydrologic modification score, ammonia, and Landscape Development Intensity Index
- Specific conductance analyses (2005, 2008)
- Dissolved oxygen criteria revision (2013)
- SCI SOP and Primer sampling guidance, emphasizes hydrologic impacts (2008, 2012)

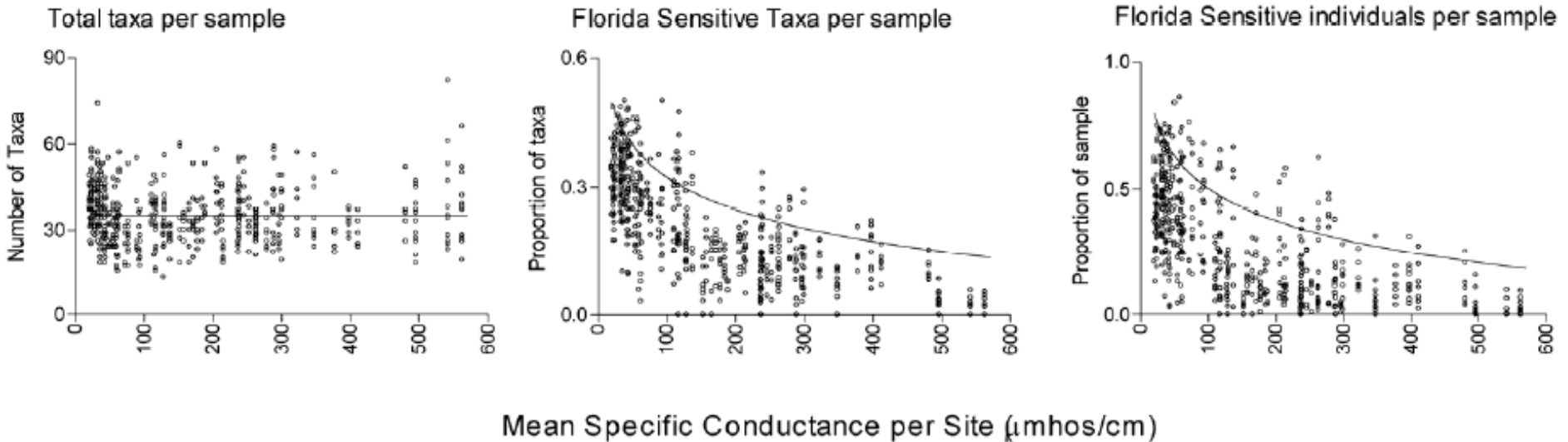


Human Disturbance Gradient





Specific Conductance

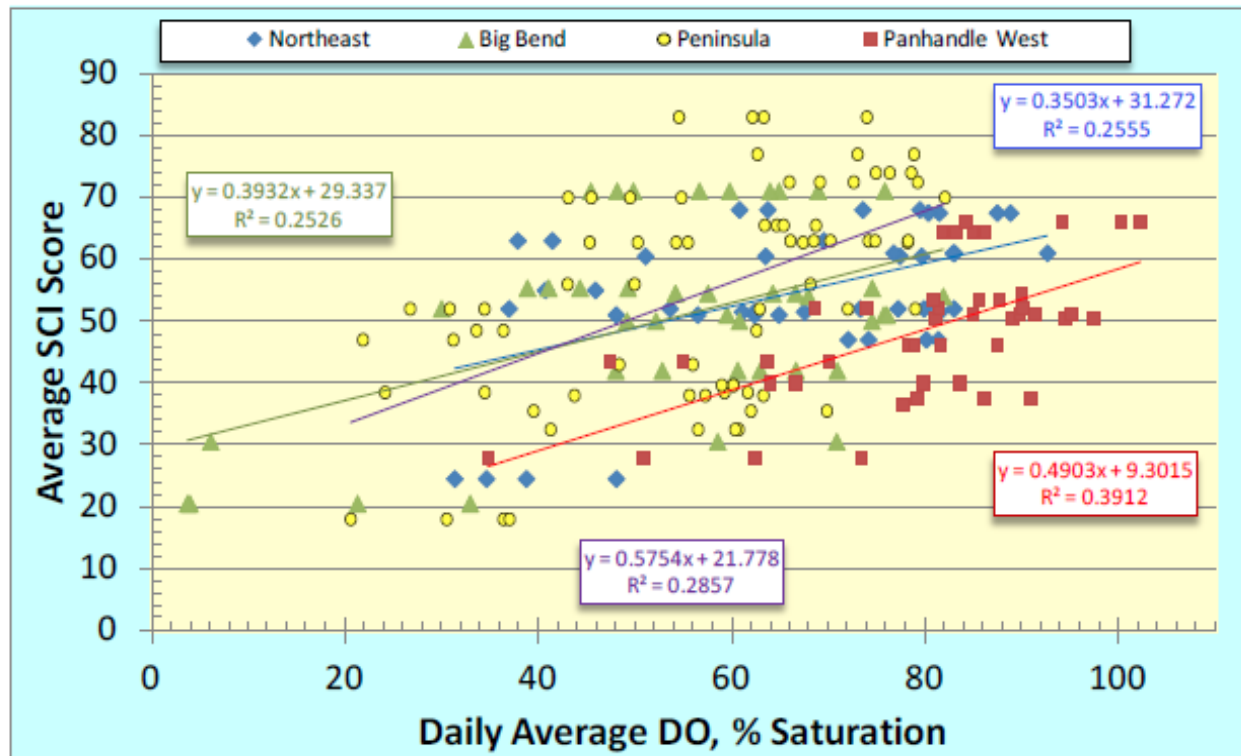


Distribution of Florida sensitive taxa at least disturbed sites with respect to specific conductance (internal DEP analyses).





Dissolved Oxygen



Regional relationships between SCI and daily DO percent saturation for the Panhandle West, Big Bend, Northeast, and Peninsula bioregions (from DO criteria TSD).



SCI Primer-Hydrologic Impacts



Lake-like river with very little flow



Tidal portion of river



Wetland slough with very little flow⁸

SCI Primer - Hydrologic Impacts



6/10/2014



6/24/2014

Should they sample on 6/24?



Consultants' Efforts

(2009-2013)

- Curt Pollman, PhD. SCI Stressor ID model development
- John Kiefer, PhD. Stream Classification System and an evaluations of stream perenniality



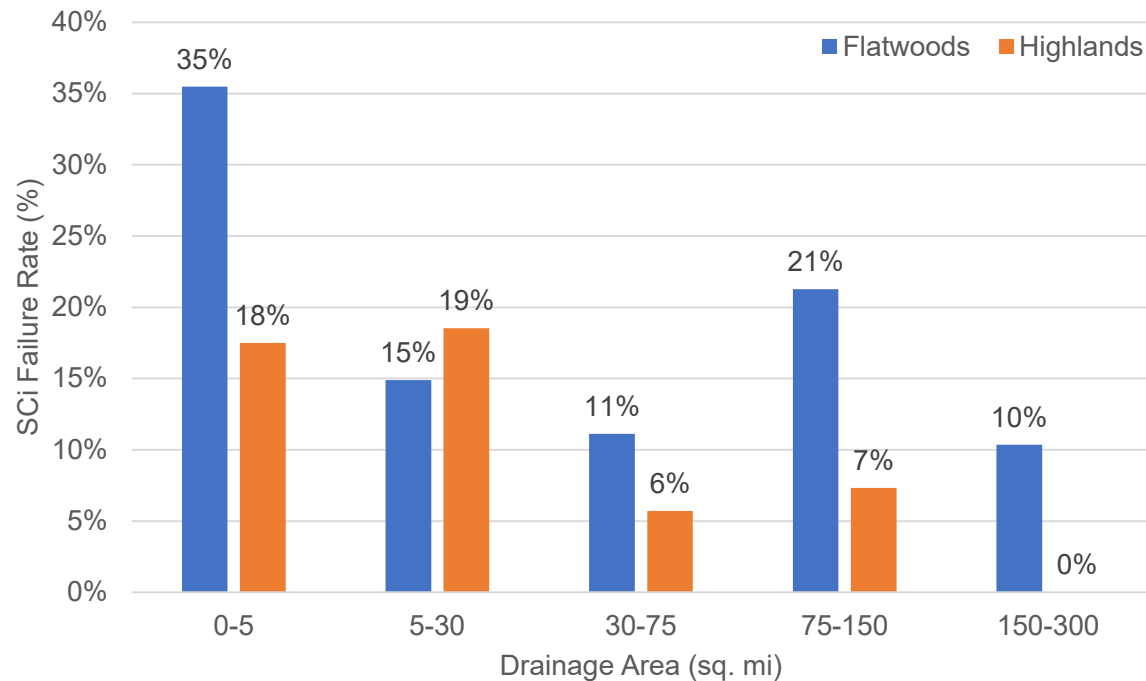
DEP Efforts (2016-2019)

Applying the concepts of the stream classification system to small, first order flatwoods streams fail more often than other classes or sizes

Stream Order	Mean SCI Flatwoods	Mean SCI Highlands	Mean SCI Karst	Mean SCI by Stream Order
1	25	62	38	49
2	54	64	52	57
3	62	66	52	66
4	57	68	58	65
5	58	66	-	63
6	42	59	-	55
7	49	48	-	48
8	47	48	-	49
Overall Mean	53	61	43	59



Kiefer provided guidance on perenniality of streams based on drainage area. We applied those thresholds to SCI scores to see if the relationship held.

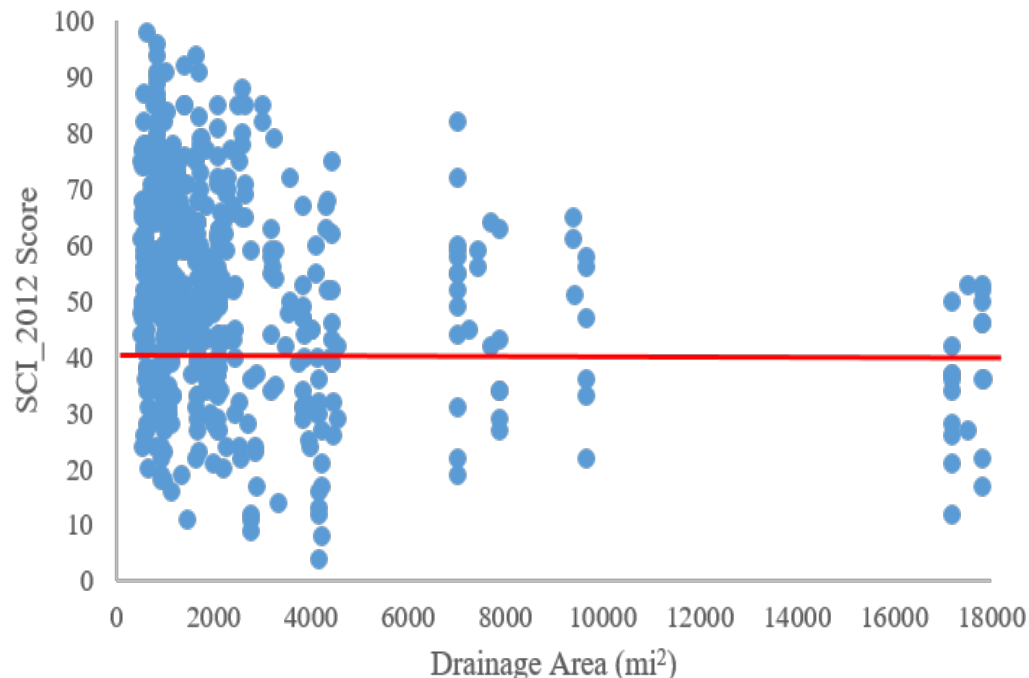


***No systems >300 sq. miles were included in this analysis.**



We analyzed large rivers similarly and found significantly more fail with increasing size.

SCI score versus drainage area (mi²) for all samples with drainage area >500 mi²



(218 sites, 528 samples), $R^2=0.06$. 152 samples fail the SCI for an overall SCI failure rate of 29%.



SCI Stressor ID Process

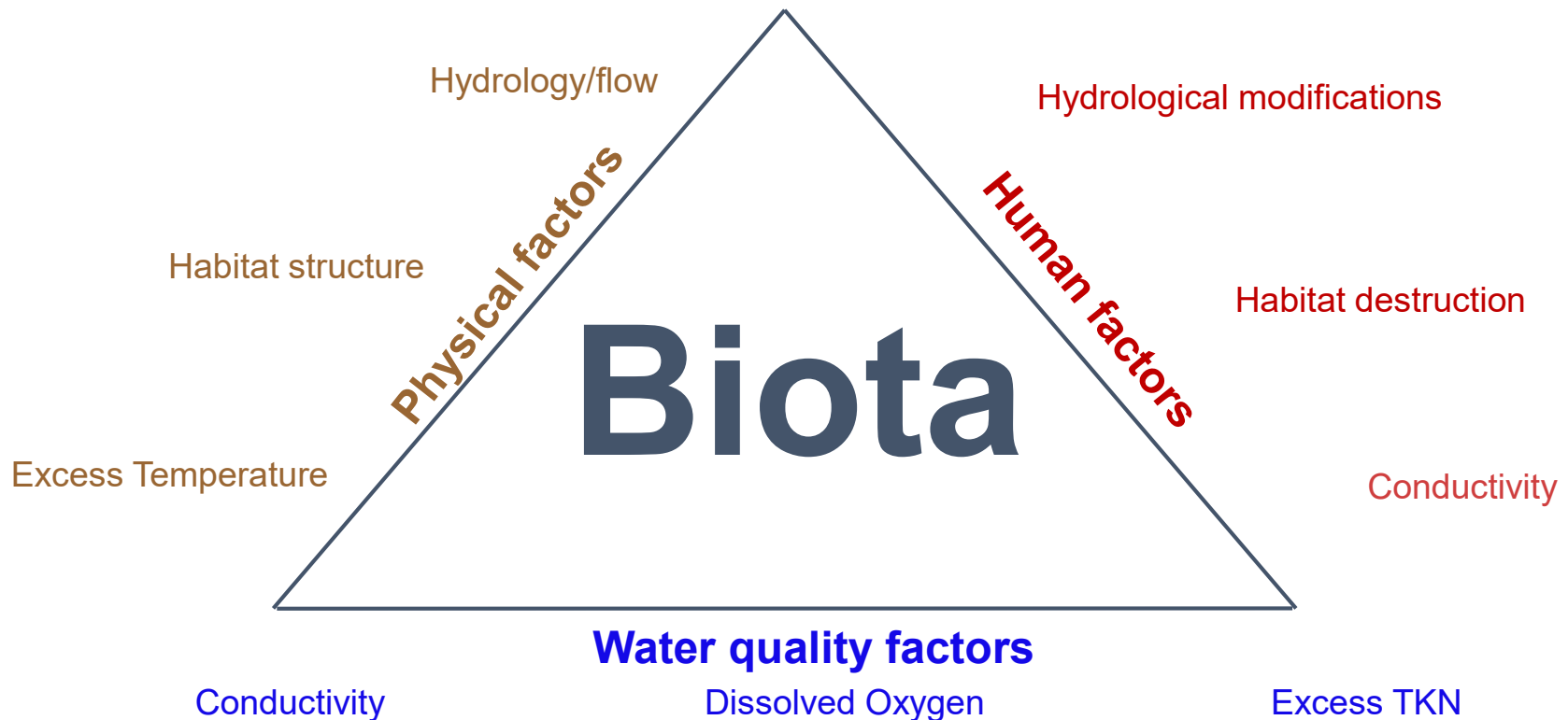
Evaluate instream information

- Habitat assessment
 - Total score ≤ 80 likely to fail SCI
 - Channelization score < 10 likely to fail SCI
 - Velocity < 0.05 m/s – likely to fail
- Water quality
 - Specific conductance $> 380 > 600$ likely to score poorly
 - DO – Are criteria met? Evaluate all data from site.



SCI Stressor ID Process

Stressors included in the Pollman Stressor ID Model



Region	Water Source	Drainage Area (DA) sq. miles	Perenniality	SCI Sampling Guidance
Peninsula	Flatwoods	DA <5	Non-perennial	SCI not appropriate.
		≥5 DA <20	Seasonally Perennial	Use caution after prolonged drought or onset of rainy season.
		≥20 DA <50	Likely Perennial	Follow SCI primer. No additional restrictions.
		DA ≥50	Perennial	Follow SCI primer. No additional restrictions.
	Highlands	DA <1	Non-perennial	SCI not appropriate.
		≥1 DA ≤5	Likely Perennial	Follow SCI primer. No additional restrictions.
		DA ≥ 5	Perennial	Follow SCI primer. No additional restrictions.
Northeast	Flatwoods	DA <1	Non-perennial	SCI not appropriate.
		≥1 DA <5	Seasonally Perennial	Use caution after prolonged drought or onset of rainy season.
		≥5 DA <20	Likely Perennial	Follow SCI primer. No additional restrictions.
		DA ≥20	Perennial	Follow SCI primer. No additional restrictions.
	Highlands	DA <3	Seasonally perennial	Use caution after prolonged drought or onset of rainy season.
		3 ≥DA ≥5	Likely Perennial	Follow SCI primer. No additional restrictions.
		DA ≥5	Perennial	Follow SCI primer. No additional restrictions.
Northwest	Flatwoods	DA <1	Non-perennial	SCI not appropriate.
		≥1 DA <5	Seasonally Perennial	Use caution after prolonged drought or onset of rainy season.
		≥5 DA <10	Likely Perennial	Follow SCI primer. No additional restrictions.
		DA ≥10	Perennial	Follow SCI primer. No additional restrictions.
	Highlands	DA <1	Seasonally Perennial	Use caution after prolonged drought or onset of rainy season.
		≥1 DA <5	Likely Perennial	Follow SCI primer. No additional restrictions.
		DA ≥5	Perennial	Follow SCI primer. No additional restrictions.

	Drainage Area (mi ²)	Initial Recommendations for SCI
All	512-1662 1666-3179 >3218	OK Case-by-case Not appropriate
Flatwoods	550-2094 >2167	Case-by-case Not appropriate
Highlands	512-1662 1706-3179 >3218	OK Case-by-case Not appropriate
NEFCP	552-665 771-2770 >7031	OK Case-by-case Not appropriate
Flatwoods	575-2770 >2771	OK Case-by-case
Highlands	552-631 831-912 >979	OK Case-by-case Not appropriate
NWFCP	512-1314 >1726	OK Not appropriate
Flatwoods	500-1314 >1930	Case-by-case Not appropriate
Highlands	512-3179 >3218	OK No appropriate
PFCP	520-2006 >2167	Case-by-case Not appropriate
Flatwoods	550-1647 >1666	Case-by-case Not appropriate
Highlands	>520	Case-by-case



SCI Stressor ID Process

- Step 1.** Obtain site level information.
- Step 2.** Obtain watershed information.
- Step 3.** Determine whether the stream is highlands, flatwoods, or karst, and its perenniality.
- Step 4.** Retrieve macroinvertebrate community attributes.
- Step 5.** Compile the water chemistry data for entry into the Statewide SI Model.
- Step 6.** Enter the habitat assessment components.
- Step 7.** Test the suspected stressors individually and combined until the predicted SCI score is similar to the actual score.
 - A.** If the predicted SCI score is similar to the actual SCI score, then the stressor is being defined by the model. Adjusted factors likely to be the most influential based on all of the information gathered to see what is required to obtain a passing SCI.
 - B.** If the predicted SCI score is lower than the actual score, there may be mitigating conditions for some of the stressors.
 - C.** If the predicted SCI score is greater than the actual score, then an additional stressor not included in the model is likely the cause of the SCI failure (e.g. altered hydrology) and can be surmised from the other information that was compiled.
 - D.** Test by deploying long-term monitoring devices in the stream of interest. Ideally, during conditions similar to those that created the failing SCI scores.



SITE INFORMATION		(Source - SBIO)	Potential stressors are high LDIs and a small drainage area. Even though the site is Highlands, it is at the lower end of the size range making it more susceptible to widely fluctuating hydroperiods given the amount of development immediately adjacent to the stream and in the watershed. Check hydrographs, photos, and habitat assessment for evidence of flashy hydroperiod.
	WATERBODY	Mizners Branch	
	STORET	27010068	
	NICKNAME	MIZNERBR	
	LIMS EVENT ID	CEN-DIST-2015-11-04-02	
	BIOREGION	PENINSULA	
	LATITUDE	29.26696	
	LONGITUDE	-81.08756	
	WBID	2645	
WATERSHED COMPONENTS		(Source - GIS)	The lack of sensitive taxa and so few long-lived taxa suggest a combination of factors causing the failing scores, e.g. low dissolved oxygen as a result of excess nutrients and lack of continuous flow. A high percent of a single, tolerant, grazer suggests low flow, low DO conditions.
	SITE LDI (100m buffer)	8 (estimated)	
	WATERSHED LDI	7 (estimated)	
	WATERSHED SIZE	1.5	
	STREAM ORDER	2	
	NEAREST GAGE	Tomoka near Daytona	
	WATER SOURCE	Highlands	
SAMPLE INFORMATION		(Source - SBIO)	
	SAMPLE 1	SAMPLE 2	
SAMPLE DATE	2/16/2010	11/3/2015	
VISIT ID	67853	75041	
SCI SCORE	26	38	
# SENSITIVE TAXA	0	0	
# LONG-LIVED	1	0	
% DOMINANT TAXON	52	20	
DOMINANT TAXON (NAME)	Gammarus	Gammarus/Hyalella	
WATER CHEMISTRY		(Source - LIMS, IWR, WIN)	Conductivity is slightly high as are some of the nutrients - may be acting as a secondary stressors.
COLOR	120	97	
SP COND Source: SBIO & LIMS	392	407	
TKN	0.97	0.78	
DISSOLVED OXYGEN (MG/L)	8.7	6.1	
TEMP	14.7	25.3	
DISSOLVED OXYGEN (%)	-	74	
PH	7.7	6.4	
NITRATE	0.31	0.2	
CHL-A	1.8	0.55 U	
HABITAT COMPONENTS		(Source - SBIO)	The secondary HA components are low which supports the idea that hydrology is being impacted by development immediately adjacent to the streams and in the watershed.
SUBSTRATE DIVERSITY	13	16	
SUBSTRATE AVAILABILITY	7	15	
WATER VELOCITY	15	12	
SMOTHERING	17	10	
CHANNELIZATION	10	10	
AVG. BANK STABILITY	3.5	6	
AVG. BUFFER WIDTH	5	4	
AVG. BUFFER QUALITY	4.5	4.5	
TOTAL HA SCORE	88	92	
STRESSOR MODEL OUTPUT		(Source - Stressor ID Model)	The results of the in situ variables do not adequately capture stressors. Lowering the DO improves model prediction.
Expected SCI with in situ values	52	48	
Expected SCI with lower DO values	39	36	

