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FDEP Standards and Assessment

Biological Health Thresholds

Clean Water Act Objective

- Restore and maintain the chemical, physical, and biological integrity of the Nation's waters
- Biological assessment measures are valuable for making use attainment decisions
- Must establish appropriate biological threshold indicating attainment/non-attainment of the designated use

Establishing Expectations for Aquatic Life Use – Stream Condition Index

- ⦿ Reference Site Approach
- ⦿ Biological Condition Gradient Approach
- ⦿ Evaluation of the Reference Site
Approach Coupled with Biological
Condition Gradient

Reference Site Approach

- ⦿ EPA recommended that Florida examine the lower distribution of reference sites as the principal line of evidence for establishing aquatic life use support thresholds
- ⦿ Reference site selection process is critical

FDEP Reference Site Selection Process

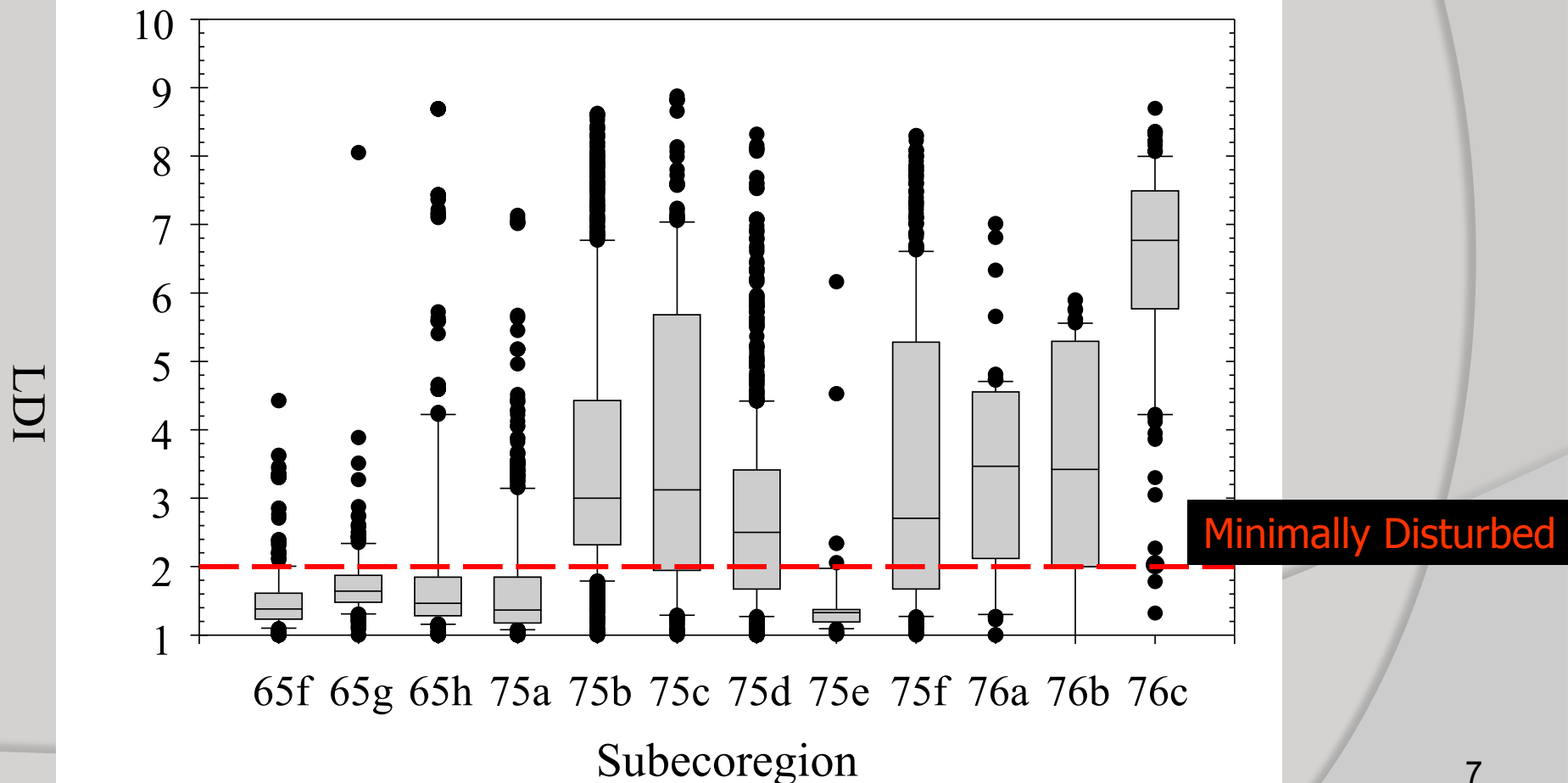
FDEP used an extensive, multi-step selection process to demonstrate minimally disturbed conditions (very small amounts human disturbance)

- Landscape Development Intensity Index (LDI) as initial screening
- Review of Planning and Verified TMDL Lists
- BPJ Input from District Biologists

FDEP Reference Site Process

- Examination of recent aerial photos
- Field verification, including watershed assessment and application of BPJ
- Demonstration that sites support valued ecologic attributes (good habitat and minimal algae growth)

Summary of Stream LDI Results by Subcoregion (n=5570 stations)



Black Creek @ SR 16

Parameter	Value
Habitat Assessment	133
Hydrologic Score	2
LDI Score	1.21
SCI Score	91 A
Total Phosphorus Geometric Mean (mg/L)	0.116
Total Nitrogen Geometric Mean (mg/L)	0.55



Reference Site Statistics: Balancing Type I and II Errors

- Conducted interval and equivalence tests with SCI data from 55 reference streams (predominantly consisting of the recently verified nutrient benchmark sites with additional data from the Fore *et al.* 2007 analysis)
- This statistical analysis was performed to determine the lower bounds of the reference site distribution of SCI scores while balancing type I errors (falsely calling a reference site impaired) and type II errors (failing to detect that a site is truly impaired)

Selecting a Lower Distribution

- ◎ Florida's reference site selection approach more rigorous than other States
 - Objectively demonstrates the “minimally disturbed” (limited human influence) nature of Florida's reference sites.
- ◎ Florida's reference site selection process significantly reduces Type II errors (*i.e.*, classifying impaired sites as healthy).
- ◎ This increased confidence also allows for establishing the impairment threshold at a low level of the reference site distribution
 - Minimizes Type I errors (classifying healthy sites as impaired).

Interval and Equivalence Test Results (Based on the Average of 2 SCIs)

Impairment threshold (description)	Ref site mean	Impairment threshold (numeric)	Impaired	Unde termi ned	Reference
2.5 th percentile of reference	65	40	<35	35– 44	>44
5 th percentile of reference	65	44	<39	39– 47	>47

SCI Reference Site Conclusions

- In the proposed water quality standard for the SCI, impairment will be determined by the average of two site visits
- An impairment threshold of 40 would result in approximately 2.5 % of reference sites (known to be minimally disturbed) to be deemed impaired.

Biological Condition Gradient Approach

- The BCG is a conceptual model that assigns the relative health of aquatic communities into one of six categories, from natural to severely changed
- It is based in fundamental ecological principles and has been extensively verified by aquatic biologists throughout the U.S.

EPA Biological Condition Gradient Conceptual Model

Natural structural, functional, and taxonomic integrity is preserved.

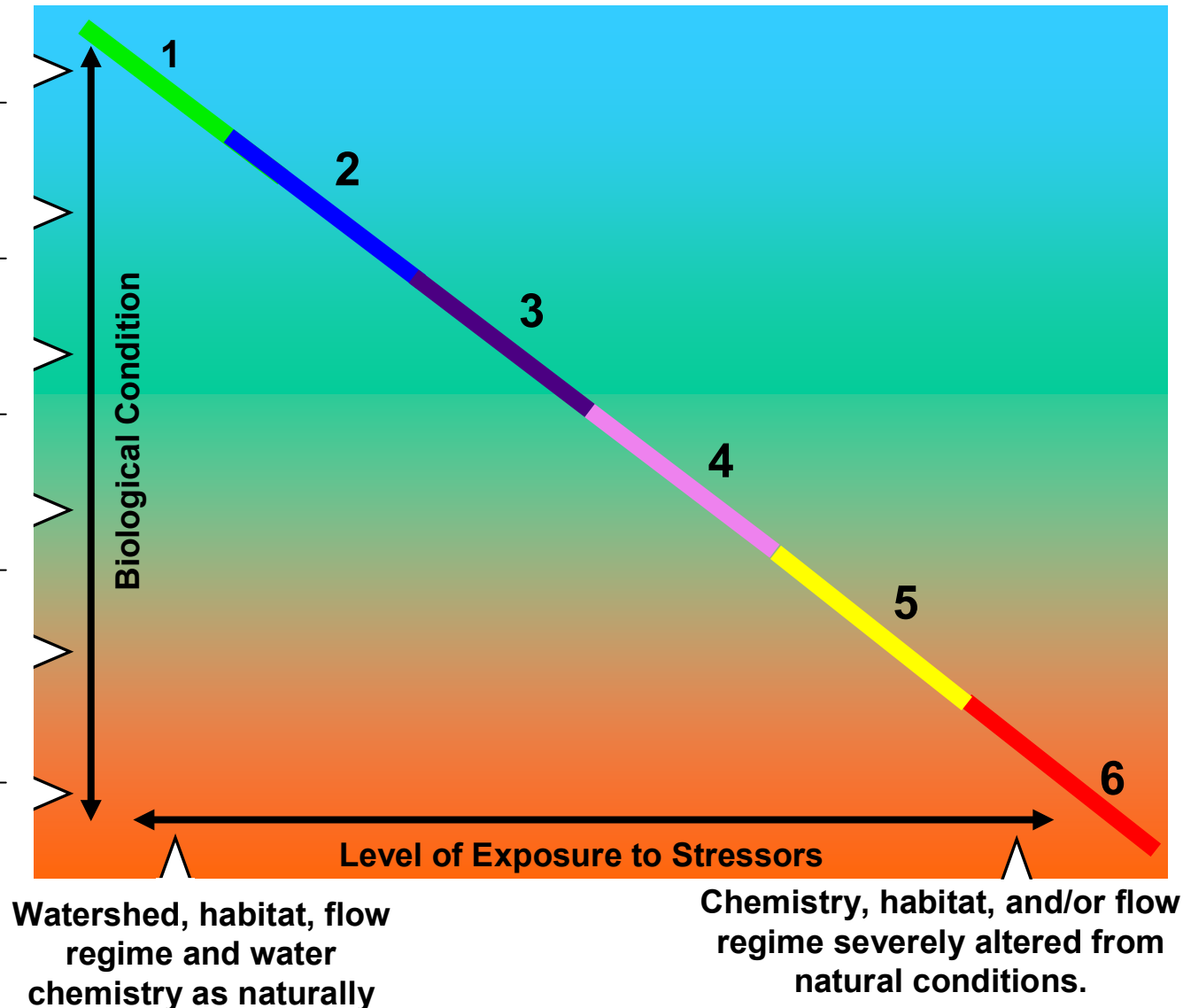
Structure & function similar to natural community with some additional taxa & biomass; ecosystem level functions are fully maintained.

Evident changes in structure due to loss of some rare native taxa; shifts in relative abundance; ecosystem level functions fully maintained.

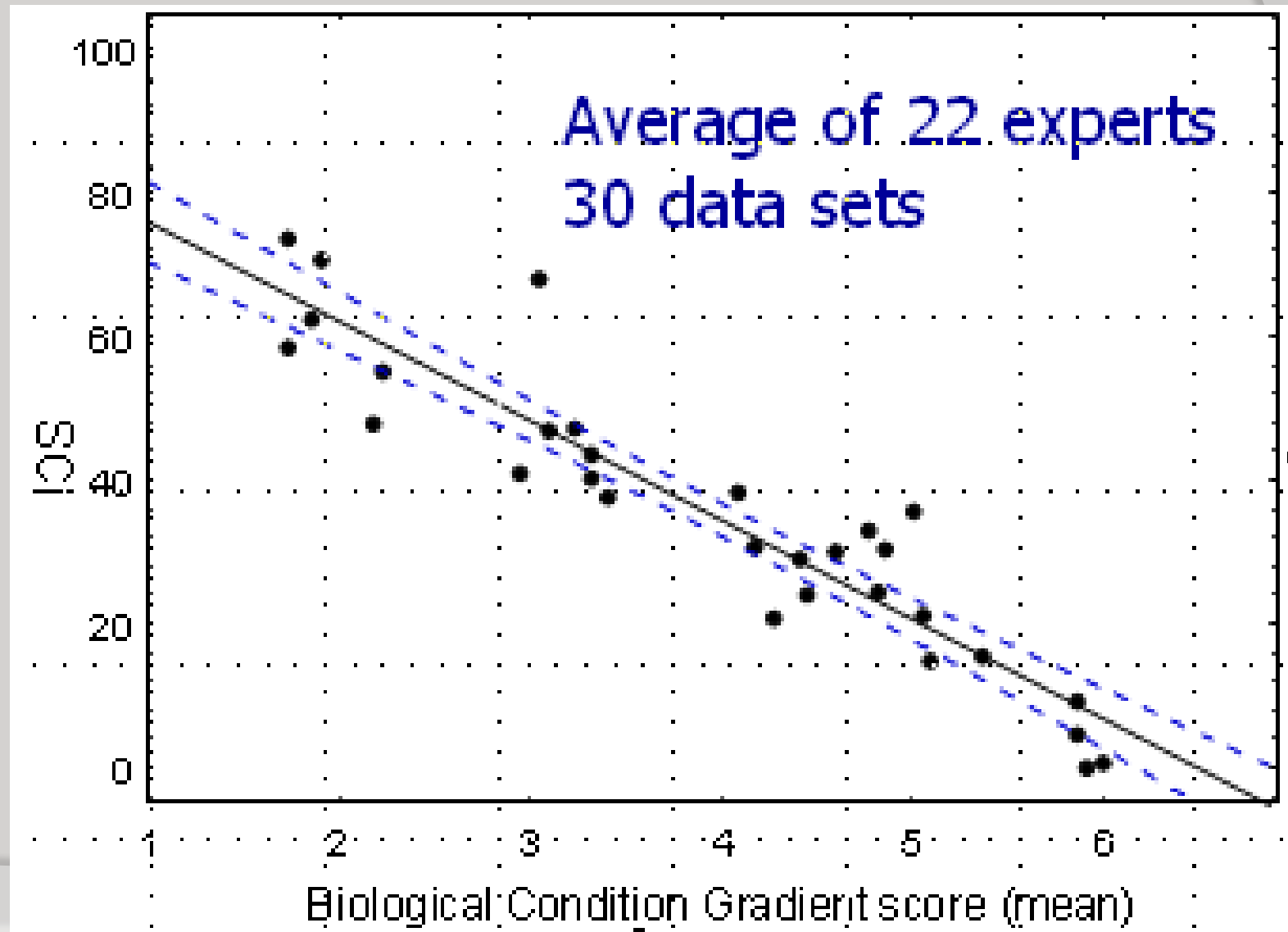
Moderate changes in structure due to replacement of sensitive ubiquitous taxa by more tolerant taxa; ecosystem functions largely maintained.

Sensitive taxa markedly diminished; conspicuously unbalanced distribution of major taxonomic groups; ecosystem function shows reduced complexity & redundancy.

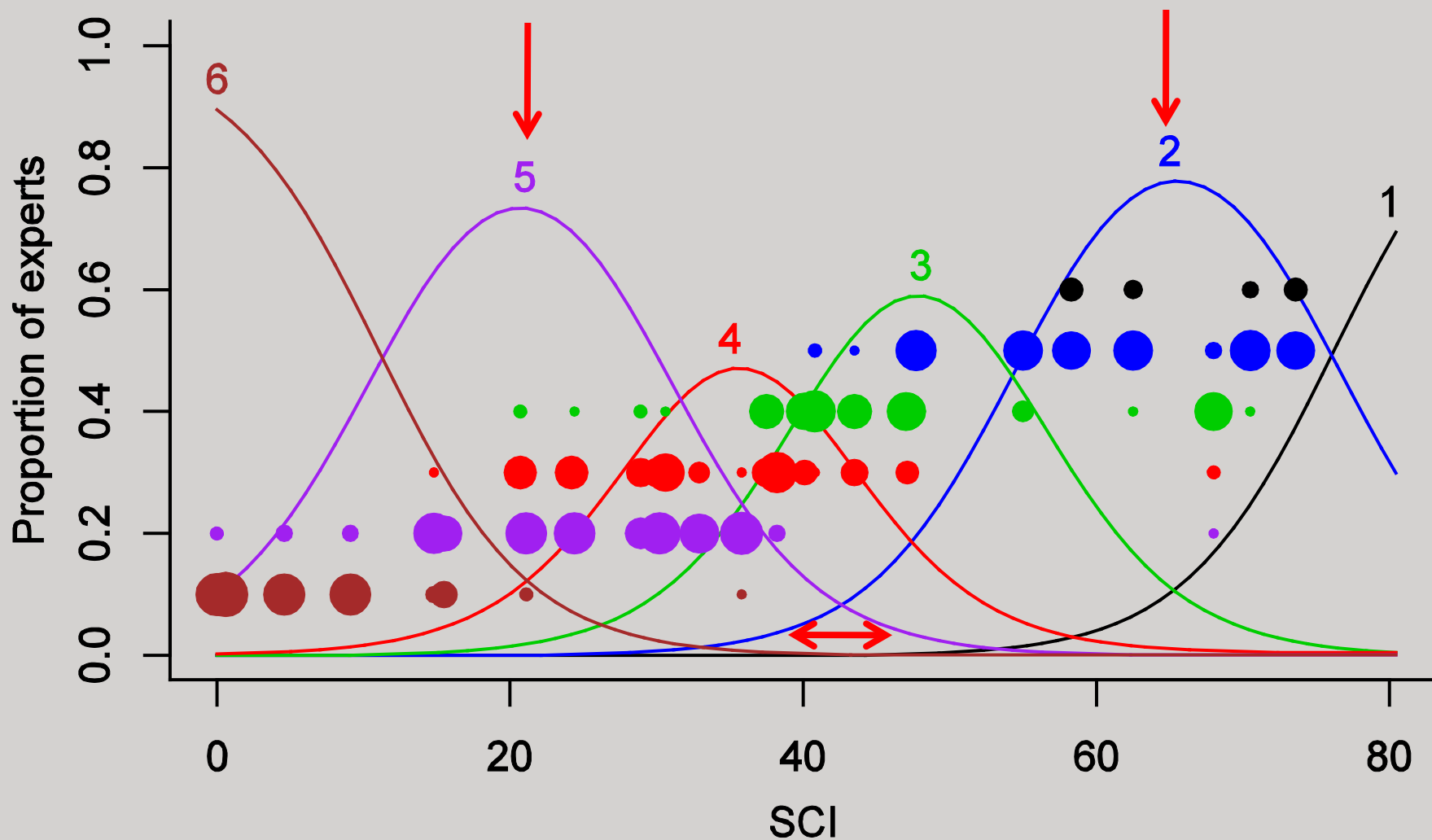
Extreme changes in structure and ecosystem function; wholesale changes in taxonomic composition; extreme alterations from normal densities.



SCI BCG Linear Regression Results



SCI Proportional Odds Analysis



SCI Threshold Conclusions

- SCI score of 40 indicates that the designated use is being met, and a score of 39 is impaired.
- This impairment threshold is supported by the distribution of benchmark site scores and corresponds with a BCG category midway between Tiers 3 and 4.
- The proportional odds analysis provides assurance that stream communities deemed exceptional (BCG category 2) will not be considered impaired at a threshold of 40.
- Exceptional SCIs will be based on the mean category 2 score (64 and above).

Lake Vegetation Index

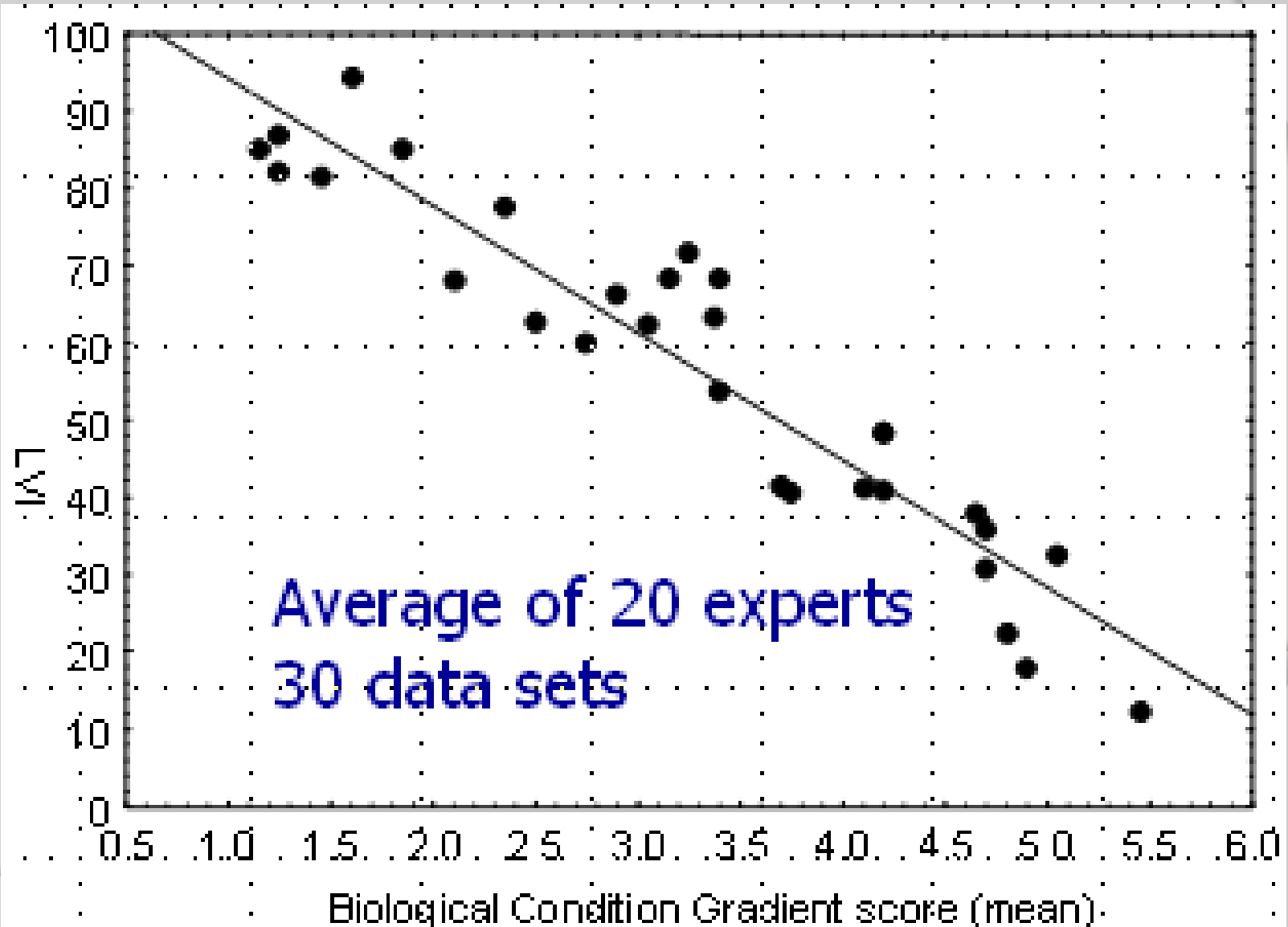
- Followed analysis path analogous to that of SCI for determining LVI thresholds:
- Reference Site approach
- BCG approach

Interval and Equivalence Test Results

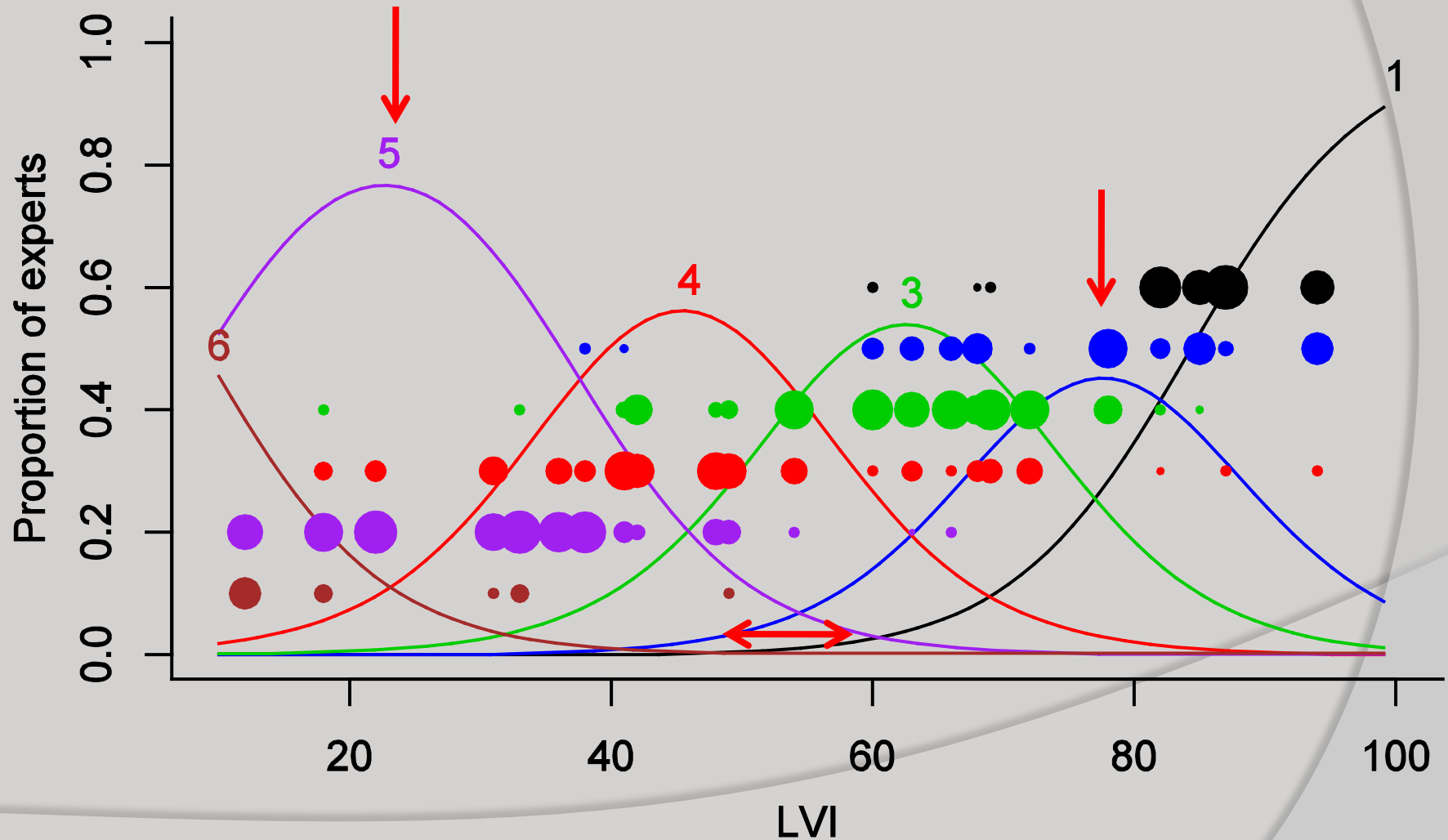
(Based on the Average of 2 LVIs)

Impairment threshold (description)	Impairment threshold (numeric)	Impaired	Undete rmined	Reference
2.5 th percentile of reference	46	<31	31–53	>53
5 th percentile of reference	50	<37	37–57	>57

LVI BCG Linear Regression



LVI Proportional Odds Results



LVI Threshold Conclusions

- LVI score of 46 indicates that the designated use is being met, and a score of 45 is impaired.
- This impairment threshold is supported by the distribution of benchmark site scores and corresponds with a BCG category between Tiers 3 and 4.
- The proportional odds analysis provides assurance that lake communities deemed exceptional (BCG category 2) will not be considered impaired at a threshold of 46.
- Exceptional LVIs will be based on the mean category 2 score (78 and above).

Conclusions

- DEP is currently proposing SCI, BioRecon, and LVI as methods to determine attainment of designated use in 62-302 and 62-303
- DEP is proposing that Type III Nutrient Site Specific Alternative Criteria may be developed using the Biological Health assessments

SCI Objectives and QA

- ◎ SCI Primer document discusses factors that affect SCI
 - Hydrology, habitat, water quality, etc.
- ◎ Make sure that conditions are appropriate for sampling
- ◎ Steinhatchee reference site example

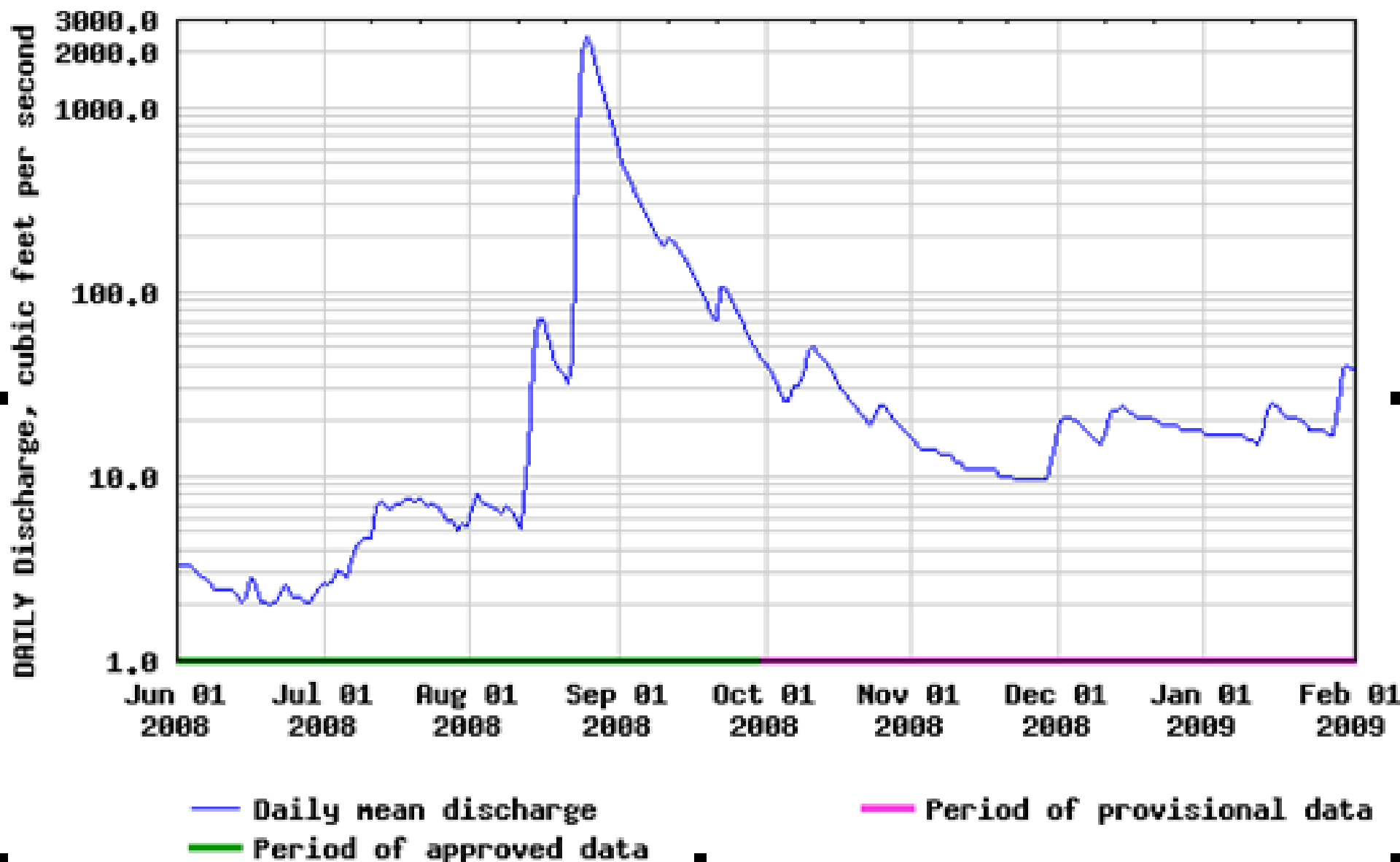
Steinhatchee River, August 2008, SCI Score= 20



Steinhatchee River, January 2009, SCI Score= 53



USGS 02324000 STEINHATCHEE RIVER NEAR CROSS CITY, FLA.



Exceptional Sites and SCI

Minimum Detectable Difference

- New Designated Use Classification Proposed
 - Sites where SCI scores above 64 potentially may be placed in AL1 category
- Please sample 6-8 sites that may exceed 64
- On 2-3 of these, perform duplicate sampling (same day, same site, different sampler) to get data for determining updated MDD
- Joy will provide analyte list

Proposed Aquatic Life Use

- ⦿ Aquatic Life Use I Propagation and maintenance of exceptional quality aquatic communities, exhibiting biological community structure and function that approximate natural background.
- ⦿ Aquatic Life Use II Propagation and maintenance of healthy, well-balanced aquatic communities, with small changes in biological community structure relative to natural background and ecosystem functions fully maintained.
- ⦿ Aquatic Life Use III Protection of a limited aquatic community, characterized by reductions in major taxonomic groups, presence of predominantly tolerant taxa, and reduced complexity of system function relative to natural background.
- ⦿ Aquatic Life Use IV: Protection of a severely limited aquatic community, characterized by substantial changes in biological structure and function relative to natural background.