Henry Street Canal

STREAM HABITAT ASSESSMENT, STREAM CONDITIONS INDEX, LINEAR VEGETATION SURVEY, RAPID PERIPHYTON SURVEY AND WATER QUALITY

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Methods

STUDY AREA ANALYISIS

The watershed containing the stream being assessed was analyzed using ESRI ArcGIS 10.2. Using this software with 2016 Hillsborough County aerial, 2014 Land Use/ Land Cover (LULC) and Watershed boundary (WBID) layers courtesy of the Florida Department of Environmental Protection. The Landscape Development Intensity Index (LDI) was calculated for the WBID containing the stream. From FDEP "The Landscape Development Intensity index (LDI) is an estimate of how much humans have altered an area of interest around a waterbody. Various land use types (low density residential, row crops, industrial and natural) are assigned coefficients of land use intensity based on estimates of the amount of human energy that is put into those land use types.

The LDI is calculated by multiplying each land use coefficient by the percentage of the area of interest occupied by that land use, and then summing the results. The Florida Department of Environmental Protection (DEP) uses the LDI as a tool to estimate potential land use impacts on streams, lakes, and wetlands. LDI values less than two (≤ 2) can be considered minimally disturbed." In the Florida framework, the maximum LDI index score is approximately 42.

HABITAT AND VEGETATION ASSESSMENT

For small streams that are not easily navigated by Jonboat for bathymetric mapping and vegetation analysis, Hillsborough County requested the implementation of the Florida Department of Environmental Protection methods for Stream and River Habitat Assessment (FT 3100) (http://www.dep.state.fl.us/water/sas/sop/sops.htm) using forms FD 9000-3, FD 9000-4 and FD 9000-5, Rapid Periphyton Survey (FS 7230) using form FD 9000-25 and Linear Stream Vegetation Survey (FS 7320) using form FD 9000-32. These methods were utilized on two sampling locations on each stream, typically near access points along roadways.

Stream and River Habitat Assessment per FT3100 receives a score calculated in Form FD 9000-5. This score results from the ranking of the primary habitat components (substrate diversity, substrate availability, water velocity and habitat smothering) and secondary habitat components (Artificial channelization, bank stability, riparian buffer zone width and riparian zone vegetation quality). The maximum score possible in this method is a 160.

Two metrics are utilized in the Linear Vegetation Survey. The Mean Coefficient of Conservatism (CoC) applies a score of 0-10 to each species based on its ecological tolerances and fidelity to pre-settlement conditions. Species with higher scores show a high fidelity to native, undisturbed habitats and are typically sensitive to alterations. Available CoC scores can be obtained from LT 7000 from the Florida Department of Environmental Protection at: http://www.dep.state.fl.us/water/sas/sop/sops.htm. The Percent Florida Exotic Pest Plant Council (% FLEPPC) metric calculates the percent invasive exotics as the number of occurrences of FLEPPC Category I or II in the 100 m reach divided by the total number of taxa occurrences in the 100 m reach. The FLEPPC list can be found at: http://www.fleppc.org/list/11list.html

STREAM CONDITION INDEX ASSESSMENT

The Stream Condition Index (SCI) was sampled per DEP SOP FS7420 and calculated per DEP SOP LT7200. The SCI consists of collecting macroinvertebrates via 20 D-frame dipnet sweeps (0.5 m in length) in the most productive habitats in a 100 m reach of stream. The organisms are sub-sampled, and identified to the lowest practical taxonomic level. The SCI is composed of ten metrics, eight of which decrease in response to human disturbance, with two metrics (% very tolerant and % dominant) increasing in response to human disturbance. According to DEP SOP LT 7000, the SCI score ranges and categories are: (68-100) Exceptional; (35-67) Healthy; and (0-34) Impaired. Proposed biological health assessment criteria state that a site is considered to meet designated uses if the average of the two most recent SCI scores is 40 or higher and neither of those scores is less than 35.

WATER QUALITY ASSESSMENT

Physical water quality samples were taken using a Eureka Manta Sub-2 multiprobe pre and post calibrated daily. Measurements taken with this device include: depth, conductivity, pH, Dissolved Oxygen (mg/l and % Saturation) and salinity. Chemical water parameters were collected and preserved on ice by USF Water Institute staff and analyzed at the Environmental Protection Commission of Hillsborough County Laboratory. Analysis include; Chlorophyll (a, b, c, t and corrected), Alkalinity, Color, E. Coli, Enterococci, Ammonia, Nitrates/Nitrites, Total Phosphorous, Kjeldahl Nitrogen and Total Nitrogen.

Study Area

Henry Street Canal is located in north central Hillsborough County. Its headwaters are located in Egypt Lake and the outfall of Henry Street Canal is in Sweetwater Creek. The assessment of Henry Street Canal was conducted on January 22, 2019. At the time of the assessment, the water levels were normal for the dry season. The Henry Street Canal WBID covers 8.31 square miles and is dominated by residential (32.2%), transportation (20.6%), commercial (17.2%), industry (11.8%) and natural (8.7%) land uses. The resulting calculated landscape development intensity index score was 7.45.

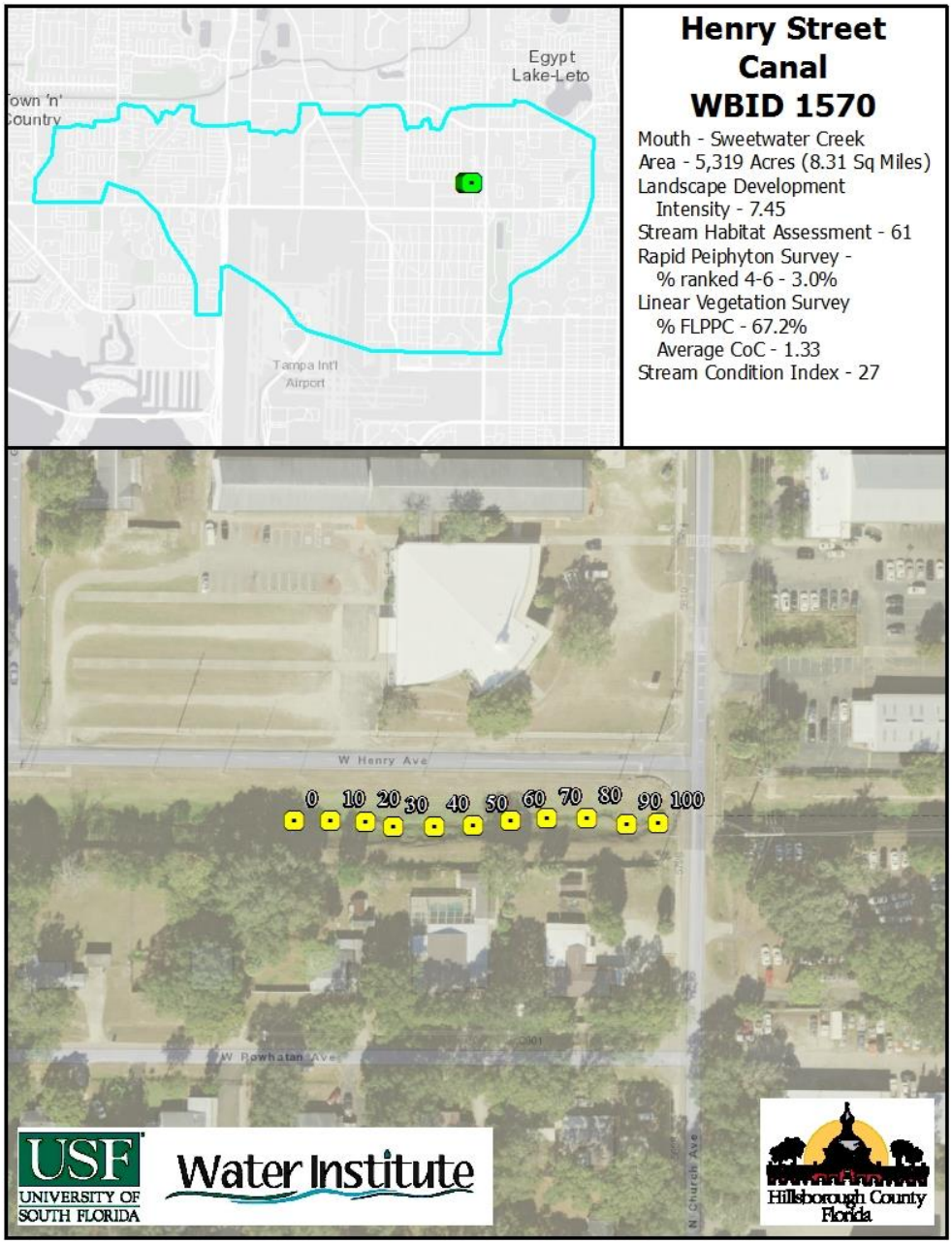

Figure 1 2019 Henry Street Canal Study Area Map

Habitat and Vegetation Assessment

The region of Henry Street Canal where the assessment was conducted is in a mixture of residential and commercial land use in an urban area. The region was heavily maintained and open with a mean canopy cover measurement of 0%. Henry Street Canal averaged 0.5 meters in depth, approximately 1.5 meters wide with a flow of 0.36 m/s.

The primary habitat components of the FDEP Habitat Assessment focus on in-water habitat. The primary habitat components score in the optimal category for Water Velocity. Marginal scores were achieved for Substrate Diversity (Presence of two major productive habitats (snags, aquatic macrophytes)), Substrate Availability (8.9% of total stream area) and Habitat Smothering (Many of the productive habitats were affected by sand smothering and the pools were unstable). Minor habitats included rock, leaf, sand and silt deposits. The total score for the primary habitat components was a 40 out of 80.

The secondary habitat components of the FDEP Habitat Assessment focus on the surrounding features of the stream. At the water level at the time of assessment, Henry Street Canal was low on its banks revealing the eroded banks from the wet season. The secondary

habitat components scored in the suboptimal category for Bank Stability for the left bank. Artificial Channelization and Bank Stability for the right bank scored in the marginal category. Riparian Buffer Zone Width and Riparian Zone Vegetation Quality were poor in the region of Henry Street Canal. There were several areas of raw eroded banks where the sand bank had collapsed on the right bank. The riparian buffer zone surrounding the stream has been effectively removed by constant maintenance. This has removed the source of substrates used by macroinvertebrates including leaf packs and snags. Twelve species were identified during the vegetation assessment. The vegetation in the stream itself was dominated by mostly native species with 5 non-native invasive species. The secondary habitat components received a score of 21 out of 80. The resulting FDEP Habitat Assessment score was a 61, in the marginal category.

Periphyton was encountered during 3 of the 99 samples taken during the Rapid Periphyton Survey. The tree canopy in the assessment area averaged 0% allowing available sunlight for macrophytes and algae.

The FDEP Linear Vegetation Survey encountered 12 herbaceous species in Henry Street Canal, seven of which are native. Alternanthera philoxeroides, Hygrophila polysperma, *Colocasia esculenta, Urochloa mutica* and *Ludwigia peruviana* are non-native invasive species. *Hygrophila* was dominant in 7 regions and Co-dominant with *Urochloa* in one region. The vegetation community had a mean coefficient of conservatism of 1.33 and a % FLPPC of 67.16%, both below the standards set by FDEP indicating disruption to the plant community.

Table 1 Linear Vegetation Survey Results – Henry Street Canal

Taxa Name	C of C Score	Sample Site										Total Occurrences
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	
Alternanthera philoxeroides	0	1	1	1	1	1	1	1	1	1	1	10
Commelina diffusa	2.02	1	1	1	1	1	1	1	1	1	1	10
Hygrophila polysperma	0	D	C	D	D	D	D	1	D	D	1	10
Urochloa mutica	0	1	C	1	1	1	1	1	1	1	1	9
Polygonum hydropiperoides	2.5	1	1	1	1	1	1	1	1			8
Pontederia cordata	5.38	1	1			1	1	1				5
Hydrocotyle umbellata	1.92	1			1	1				1		4
Ludwigia peruviana	0	1		1						1		3
Colocasia esculenta	0		1		1							2
Ludwigia leptocarpa	3						1				1	2
Rumex verticillatus	3.17				1					1		2
Mikania scandens	1.95									1		1
Mean coefficient of Conservatism	1.33											
% FLEPPC	67.16%											

Stream Condition Index

The analysis of the SCI sample involves splitting the sample into 2 aliquots for analysis. The SCI metrics are then calculated on each separately. The final SCI score is an average of the two scores. The SCI score for Henry Street Canal was 27 out of a possible 100 points, corresponding with an “Impaired” designation, with the expected community of a healthy stream.

High scores were achieved for the % Tanytarsini metrics in both samples. Neither subsamples contained a sensitive taxa, Total Clingers or Total Trichoptera. A single Long-lived taxa was identified in sample B. Both subsamples contained low numbers of total taxa. The full results of the SCI sampling are shown in Table 3 (Sample A) and Table 4 (Sample B) for Henry Street Canal.

Table 2 SCI metric summaries for Henry Street Canal

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	12.00	-1.25	0.00
Total Ephemeroptera	1.00	2.00	2.00
Total Trichoptera	0.00	0.00	0.00
% Filter Feeders	13.55	2.99	2.99
Total Clingers	0.00	0.00	0.00
Total Long-lived Taxa	1.00	3.33	3.33
% Dominance	39.35	4.93	4.93
% Tanytarsini	27.10	9.81	9.81
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	45.16	2.17	2.17
SCI Sum	25.23		
Final SCI score	28.03		

SCI Metric	Raw Totals	SCI scores	Adjusted SCI scores
Total Taxa	11.00	-1.67	0.00
Total Ephemeroptera	1.00	2.00	2.00
Total Trichoptera	0.00	0.00	0.00
% Filter Feeders	12.41	2.72	2.72
Total Clingers	0.00	0.00	0.00
Total Long-lived Taxa	0.00	0.00	0.00
% Dominance	32.41	6.32	6.32
% Tanytarsini	22.07	9.23	9.23
Total Sensitive Taxa	0.00	0.00	0.00
% Very Tolerant Individuals	40.69	2.42	2.42
SCI Sum	22.70		
Final SCI score	25.22		

Table 3 SCI full results for Sample A

Stream Condition Index Results for Henry Street Canal SCIA

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant Individuals	Specimen Notes
Annelida		Clitellata	Oligochaeta	Lumbriculida	Lumbriculidae	*Lumbriculus* cf. *variegatus*	1	1	1	0	0	0	0	0	0		0	0	1	
Mollusca		Gastropoda	Caenogastropo	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	5	5	1	0	0	0	0	0	0		0	0	5	
Arthropoda	Crustacea	Malacostra	Eumalacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp. complex	33	33	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Crustacea	Malacostra	Eumalacostraca	Decapoda	Cambaridae	Cambaridae spp.	1	1	1	0	0	0	0	0	1		0	0	0	Immature
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	*Caenis* spp.	1		0	0	0	0	0	0	0		0	0	0	Damaged
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	*Caenis diminuta*	4	5	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera		Diptera spp.	2		0	0	0	0	0	0	0		0	0	0	pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	7		0	0	0	0	0	0	0		0	0	0	pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus buckleyi*	1	1	1	0	0	0.5	0	0	0		1	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus* sp. F	1	1	1	0	0	0.5	0	0	0		1	0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum illinoense* group	56	61	1	0	0	0	0	0	0		0	0	61	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum beckae*	2	2	1	0	0	0	0	0	0		0	0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Paratanytarsus* spp.	36	40	1	0	0	20	0	0	0		40	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Cricotopus* or *Orthocladius*	4	4	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Immature larva

Table 4 SCI full results for Sample B

Stream Condition Index Results for Henry Street Canal SCIB

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Abundance	Collapsed Abundance	Taxa Presence	Ephemeroptera	Trichoptera Taxa	50% Filterer	100% Filterer	Clinger Taxa	Long-lived Taxa	Dominant Taxa	Tanytarsini	Sensitive Taxa	Very Tolerant	Specimen Notes
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1	1	1	0	0	0	0	0	0		0	0	0	Damaged and/or immature
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	*Nais pardalis*	5	5	1	0	0	0	0	0	0		0	0	5	
Mollusca		Gastropoda	Caenogastropo	Littorinimorpha	Hydrobiidae	*Pyrgophorus platyrachis*	5	5	1	0	0	0	0	0	0		0	0	5	
Mollusca		Bivalvia	Heterodonta	Veneroida	Sphaeriidae	Sphaeriidae spp.	2	2	1	0	0	0	2	0	0		0	0	0	Damaged and/or immature
Arthropoda	Crustacea	Malacostra	Eumalacostraca	Amphipoda	Dogielinotidae	*Hyalella azteca* sp. complex	37	37	1	0	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	*Caenis diminuta*	4	4	1	1	0	0	0	0	0		0	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	5		0	0	0	0	0	0	0		0	0	0	pupae
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Tanytarsus buckleyi*	2	2	1	0	0	1	0	0	0		2	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum illinoense*	45	47	1	0	0	0	0	0	0		0	0	47	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Polypedilum beckae*	2	2	1	0	0	0	0	0	0		0	0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Paratanytarsus* spp.	28	30	1	0	0	15	0	0	0		30	0	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	*Cricotopus* or *Orthocladius*	9	10	1	0	0	0	0	0	0		0	0	0	

Water Quality Assessment

Limited long-term water quality data is available for Henry Street Canal. The data that is available was collected by the Hillsborough County Stormwater Department. Values for the physical water parameters begin in 2018 and continue through present. Values for the laboratory water parameters begin in 2018 through present including the sample taken along with this assessment. The 2019 USF Water Institute Assessment fall within the range of the previous data collections. Table 5 provides a summary of the Physical/Chemical conditions recorded at the site.

Table 5 Henry Street Canal Physical Water Quality (Field)

Henry Street Canal								
Date	**Depth (m)**	**Temp (°C)**	**pH**	**DO (mg/L)**	**DO (% Sat)**	**Cond (UMHO/cm**	**Salinity (PPT)**	**Secchi Depth (m)**
1/30/19	0.26	15.19	7.32	5.54	54.2	246.8	0.11	0.5 VOB
Mean POR		25.85	6.97	1.96	24.12	273.3	0.13	

The chemical water quality analysis for Henry Street Canal is shown in Table 6 along with mean values for the period of record for available parameters. Period of record mean and the sample for this assessment for Total Phosphorous values were below the nutrient region threshold developed by FDEP of 0.49 mg/L with a mean value of 0.088 mg/L (2018-2019). Total Phosphorous values for the sample from this assessment were 0.059 mg/L. Total Nitrogen values were below the nutrient region threshold developed by FDEP of 1.65 mg/L with a mean value of 0.826 mg/L (2018-2019). The Total Nitrogen value from the assessment was below the threshold with a concentration of 0.945 mg/L. Chlorophyll-a corrected values fall within the site specific evaluation range of 3.2 µg/l to 20 µg/l for the period of record (5.90 µg/l 2018-2019). For sites with Chlorophyll-a values in this range, the assessment is inconclusive of conditions reflecting an imbalance in flora. Elevated biomass of the bacterial parameters was observed in the long term dataset with E. Coli having a geomean of 647 colonies/100 ml, 1,349/100 ml for Enterococci.

Table 6 Henry Street Canal Water Quality (Laboratory)

Parameter	Henry Street Canal	POR Mean	Units
Alkalinity	88.0		mg/LCaCO3
Nitrates/Nitrites	0.199	0.162	mg/L
E. Coli	420	647	#/100 ml
Enterococci	500	1,348	#/100 ml
Chlorophyll a	9.6	6.02	ug/L
Chlorophyll b	0.5	0.58	ug/L
Chlorophyll c	0.6	0.60	ug/L
Chlorophyll t	10.7	6.94	ug/L
Chlorophylla Corr	8.7	5.90	ug/L
Chlorophyll-pheo	5.4	5.80	ug/L
Ammonia	0.032	0.045	mg/L
Kjeldahl Nitrogen	0.746	0.655	mg/L
Total Nitrogen	0.945	0.826	mg/L
Total Phosphorus	0.059	0.088	mg/L
Color(345)F.45	22.6		Pt/Co

Conclusion

Henry Street Canal at Church St. is located in a residential area near an commercial area. The stream itself showed signs of past alteration in the region assessed. At the time of the habitat assessment, the water levels were low, corresponding to the middle of the dry season, however sufficient habitat for macroinvertebrates was observed. Due to these factors, the Habit Assessment resulted in a marginal score of 61. Disruption to the vegetation community was observed in the results of the Linear Vegetation Survey with Henry Street Canal not meeting the metric for Average Coefficient of Conservatism or the Percent FLEPPC. Henry Street Canal did meet standards for the rapid periphyton survey with 3% of samples being ranked between 4 and 6. The limited historical water quality record for Henry Street Canal showed acceptable concentrations of Total Phosphorous and Total Nitrogen. The results of the SCI sampling indicate that the stream is "impaired" based on the macroinvertebrate community. The limited long term data indicates high levels of bacterial contamination. Table 7 summarizes the results of the nutrient sampling, floristic sampling, habitat assessment and SCI.

Table 7 Summary of Water Quality, Floristic Surveys and Habitat Assessments

Measure		Henry Street Canal	Mean POR	Threshold
Total Phosphorous (mg/l)		0.059	0.088	< 0.49
Total Nitrogen (mg/l)		0.945	0.826	< 1.65
RPS (% Rank 4-6)		3.00%		< 25%
LVS	Avg C of C	1.33		≥ 2.5
	FLEPPC %	67.16%		< 25%
Chlorophyll (µg/l)		8.7	5.9	< 20 µg/l
Habitat Assessment		61		> 34
SCI		27		> 34