Implementation of

Florida's Numeric Nutrient Standards

Document Submitted to EPA in Support of the Department of Environmental Protection's Adopted Nutrient Standards for Streams, Spring Vents, Lakes, and Selected Estuaries

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PURPOSE OF DOCUMENT

This document describes how numeric nutrient standards in Chapters 62-302 (Water Quality Standards) and 62-303 (Identification of Impaired Surface Waters), Florida Administrative Code (F.A.C.), are implemented by the Department of Environmental Protection (Department). The major topics include the hierarchical approach used to interpret the narrative nutrient criterion (NNC) on a site-specific basis; a summary of the criteria for lakes, spring vents, streams and estuaries; floral measures and the weight of evidence approach in streams; example scenarios for how the criteria will be implemented in the 303(d) assessment process; and a description of how the Water Quality Based Effluent Limitation (WQBEL) process is used to implement the nutrient standards in wastewater permitting. Finally, because of the complexity associated with assessing nutrient enrichment effects in streams, a summary of the weight-of-evidence evaluation involving flora, fauna, and Nutrient Thresholds is provided.

BACKGROUND

Nutrients are naturally present in aquatic systems and are necessary for the proper functioning of biological communities. Nutrient effects on aquatic ecosystems are moderated in how they are expressed by many natural factors (*e.g.*, light penetration, hydraulic residence time, presence of herbivore grazers and other food web interactions, and habitat considerations). As a result, determining the appropriate protective nutrient regime is largely a site-specific undertaking, requiring information about ecologically relevant responses.

THE HIERARCHICAL APPROACH

The NNC in paragraph 62-302.530(47)(b), F.A.C., states that "in no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna." The method for numerically interpreting this NNC, on a site-specific basis, is provided in Rule 62-302.531, F.A.C, using a hierarchical process (**Figure 1**). This hierarchical scheme specifies a prioritization for determining the numeric nutrient criteria that apply to a given waterbody.

The Rule's hierarchical approach gives preference to site-specific analyses that result in a numeric interpretation of the NNC. Site specific interpretations are generally deemed superior to more broadly applicable interpretations of the NNC because of the many natural factors affecting the expression of nutrient loadings on a given waterbody. Beginning at the top of **Figure 1,** if there is a site specific interpretation of the narrative, such as a Total Maximum Daily Load (TMDL), Site Specific Alternative Criterion (SSAC), Water Quality Based Effluent Limitation (WQBEL), or other Department-approved action that numerically interprets the narrative criterion (*e.g.*, Reasonable Assurance derived values), that numeric interpretation is the applicable nutrient criterion[1]. These numeric interpretations of the narrative criterion must establish the total allowable load or ambient concentration for at least one nutrient that represents achievement of a healthy, well balanced aquatic community. Each nutrient (TP

[1] Consistent with the Clean Water Act, these site-specific interpretations will be submitted to EPA for review.

and TN) is interpreted independently using this hierarchical approach; if the site-specific interpretation only addresses one nutrient, then the generally applicable numeric interpretations in subsections 62-302.531(2) and (3), F.A.C., will apply for the other nutrient**.**

If a hierarchy 1 interpretation is not available, the Rule's hierarchical approach then gives preference to numeric nutrient values based on quantifiable stressor-response relationships between nutrients and biological response (*i.e*., **springs and lakes**). If no quantifiable stressor-response relationship has been established, such as is the case for Florida **streams**, reference-based Nutrient Thresholds, *in conjunction with biological information*, are used to determine the applicable interpretation of the NNC. For those waters without a numeric interpretation under any of these approaches, the NNC continues to apply to the waterbody.

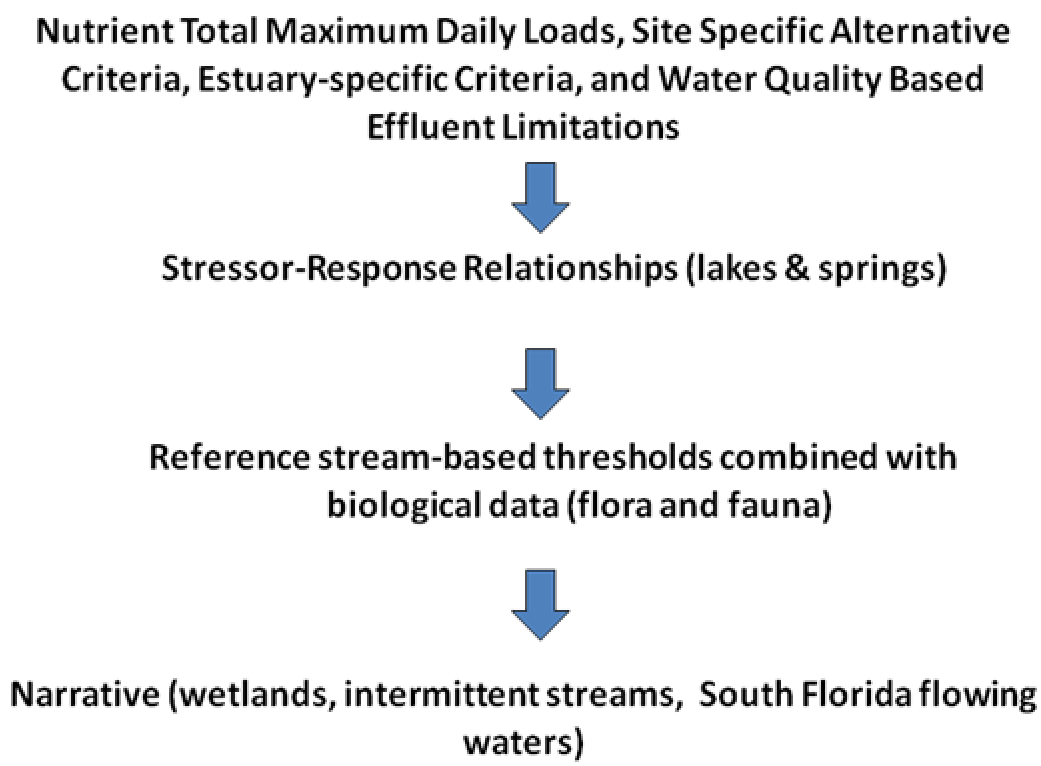

Figure 1. The hierarchy for numerically interpreting the NNC.

Nutrient Criteria for Lakes

The lakes criteria were based on a strong stressor-response relationship between nutrients (TN and TP) and phytoplankton response (chlorophyll *a*). The lakes chlorophyll criteria were derived using multiple lines of evidence, and result in maintaining naturally low nutrient lakes in an oligotrophic state and lakes with naturally moderate nutrient levels in a mesotrophic state. Naturally eutrophic lakes are addressed on a site-specific basis. A “lake” is defined, for purposes of interpreting the NNC in paragraph 62-302.530(47)(b), F.A.C., as a lentic fresh waterbody with a relatively long water residence time and an open water area that is free from emergent vegetation under typical hydrologic and climatic conditions. Aquatic plants, as defined in subsection 62-340.200(1), F.A.C., may be present in the open water. Lakes do not include springs, wetlands, or streams (except portions of streams that exhibit lake-like characteristics, such as long water residence time, increased width, or predominance of biological taxa typically found in non-flowing conditions). Note that while lakes are typically characterized by a fringe of emergent vegetation, the presence of an open water area, where emergent vegetation is absent, distinguishes lakes from wetlands. Floating or submersed vegetation may be present in this open water area, and the system would still be defined as a lake, and numeric nutrient criteria would apply.

For lakes, the applicable numeric interpretations of the NNC in paragraph 62-302.530(47)(b), F.A.C., for chlorophyll *a* are shown in **Table 1**. The Department allows for an acceptable range of annual geometric means of TN and TP, up to the values shown in the “maximum calculated numeric interpretation” column, as long as the applicable chlorophyll *a* criterion is achieved in that same year. These numeric interpretations for TN, TP, and chlorophyll *a* cannot be exceeded more than once in any consecutive calendar three year period and apply statewide.

Table 1. Lakes chlorophyll *a*, TN, and TP criteria.

Long Term Geometric Mean Lake Color and Alkalinity	Annual Geometric Mean Chlorophyll *a*	Minimum calculated numeric interpretation		Maximum calculated numeric interpretation	
		Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen	Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen
> 40 Platinum Cobalt Units	**20 μg/L**	**0.05 mg/L**	**1.27 mg/L**	**0.16 mg/L**[1]	**2.23 mg/L**
≤ 40 Platinum Cobalt Units and > 20 mg/L $CaCO_3$	**20 μg/L**	**0.03 mg/L**	**1.05 mg/L**	**0.09 mg/L**	**1.91 mg/L**
≤ 40 Platinum Cobalt Units and ≤ 20 mg/L $CaCO_3$	**6 μg/L**	**0.01 mg/L**	**0.51 mg/L**	**0.03 mg/L**	**0.93 mg/L**

[1] For lakes with color > 40 PCU in the West Central Nutrient Watershed Region, the maximum TP limit is 0.49 mg/L, which is the TP streams threshold for the region.

If there are insufficient data to calculate the annual geometric mean chlorophyll *a* for a given year or the annual geometric mean chlorophyll *a* exceeds the values in **Table 1** for the lake type, then the applicable numeric interpretations for TN and TP are the minimum values in the table. If there are sufficient data to calculate the annual geometric mean chlorophyll *a* and the mean **does not** exceed the chlorophyll *a* value for the lake type in Table 1, then the TN and TP numeric interpretations for that calendar year are the annual geometric means of ambient TN and TP samples for that lake, subject to the minimum and maximum TN and TP limits in the table.

If a lake is influenced by an upstream NPDES discharger, the Water Quality Based Effluent Limitation (WQBEL) evaluation for that discharge would determine the specific TN and TP levels (again subject to the upper nutrient values for TN and TP) that would maintain the appropriate chlorophyll *a* target for the lake (6 or 20 µg/L) during **all** years, including years representing critical conditions. This evaluation would involve water quality modeling set to achieve a “never to exceed” chlorophyll target scenario. The Department evaluated the inter-annual variability in lake chlorophyll *a* levels and found that inter-annual standard deviation (natural log-transformed) typically ranges from 0.305 to 0.533. Given this level of variability, the long-term geometric chlorophyll *a* concentration in a colored or alkaline clear lake would need to be between 12.8 and 15.5 µg/L to be consistently found in compliance with the chlorophyll *a* standard of 20 µg/L. Consequently, the numeric nutrient permit limits for a point source discharger that influences a downstream lake would need to be adjusted to ensure attainment of chlorophyll *a* targets in this lower range during all years, with the precise permit limits being dependent upon site specific factors. If this demonstration of attainment cannot be made, the discharger could pursue other options, which include effluent nutrient reductions, discharge re-location (*e.g.,* land application), or a Site Specific Alternative Criterion (establish alternate chlorophyll and nutrient targets that are fully protective of designated uses).

Note that for lakes with color > 40 PCU in the West Central Nutrient Watershed Region, the relationship between chlorophyll *a* and TP is sufficiently variable such that the maximum allowable TP based on the upper prediction interval would be higher than the TP nutrient threshold for streams. To ensure protection of downstream streams, the maximum TP limit was set at 0.49 mg/L, which is the TP streams threshold for the region.

Nitrate-Nitrite Criterion for Spring Vents

The spring vent nitrate-nitrite criterion is based on a strong stressor-response relationship between nitrate-nitrite and the presence of nuisance algal mats, with the criterion established at a concentration that would prevent nuisance mats from occurring (compared with natural background levels). A “spring vent” is defined as a location where groundwater flows out of a natural, discernible opening in the ground onto the land surface or into a predominantly fresh surface water.

For spring vents, the applicable numeric interpretation of the NNC in paragraph 62-302.530(47)(b), F.A.C., is **0.35 mg/L** of nitrate-nitrite ($NO_3 + NO_2$) as an annual geometric mean, not to be exceeded more than once in any three consecutive calendar year period.

Using Measures of Flora and Fauna and Regional Nutrient Thresholds in Streams

Despite an exhaustive effort to develop stressor-response relationships between nutrients and biological responses in streams, insufficient responses were observed to develop numeric nutrient criteria. Therefore, to assess whether a stream attains the NNC in paragraph 62-302.530(47)(b), F.A.C., pursuant to the provisions in paragraph 62-302.531(2)(c), F.A.C. , an evaluation of water chemistry, biological data (flora and fauna), and physical information is used to determine if a stream's nutrient concentrations are protective of balanced flora and fauna. Because of the complexity associated with nutrient enrichment effects, no single assessment tool is adequate to evaluate all potential impacts, and instead, a weight-of-evidence evaluation must be conducted, as described in Section 2.7 of *Sampling and Use of the Stream Condition Index (SCI) for Assessing Flowing Waters: A Primer* (DEP-SAS-001/11), which was incorporated by reference in the rule. The final result allows a scenario in which the TN and/or TP thresholds are exceeded, but because the floral and faunal measures are met, the streams are found to be healthy and well balanced. In those occasions, the Department will provide information to the public on the TN and TP levels that would be associated with the well-balanced aquatic community.

Stream Definition

For purposes of interpreting the NNC in paragraph 62-302.530(47)(b), F.A.C., under paragraph 62-302.531(2)(c), F.A.C., a "stream" is defined as a predominantly fresh surface waterbody with perennial flow in a defined channel with banks during typical climatic and hydrologic conditions for its region within the state. During periods of drought, portions of a stream channel may exhibit a dry bed, but wetted pools are typically still present during these conditions. Streams do not include: (a) non-perennial water segments where fluctuating hydrologic conditions, including periods of desiccation, typically result in the dominance of wetland and/or terrestrial taxa (and corresponding reduction in obligate fluvial or lotic taxa), wetlands, or portions of streams that exhibit lake characteristics *(e.g.,* long water residence time, increased width, or predominance of biological taxa typically found in non-flowing conditions), or tidally influenced segments that fluctuate between predominantly marine and predominantly fresh waters during typical climatic and hydrologic conditions; or (b) ditches, canals and other conveyances, or segments of conveyances, that are man-made, or predominantly channelized or predominantly physically altered; and 1) are primarily used for water management purposes, such as flood protection, stormwater management, irrigation, or water supply; and 2) have marginal or poor stream habitat or habitat components, such as a lack of habitat or substrate that is biologically limited, because the conveyance has cross sections that are predominantly trapezoidal, has armored banks, or is maintained primarily for water conveyance.

This stream definition applies only to the numeric nutrient criteria for streams adopted at paragraph 62-302.531(2)(c), F.A.C. (hereafter referred to as paragraph (2)(c)). The definition does not apply to any other water quality criteria adopted within Florida rules except those that specifically reference paragraph (2)(c). Rule 62-302.531(1), F.A.C., states that the NNC continues to apply for those waters without numeric nutrient criterion.

The stream definition in Rule 62-302.200(36), F.A.C., was carefully crafted to ensure consistency with the scientific procedures and methods used to establish the numeric nutrient standards expressed in paragraph (2)(c). Neither canals nor non-perennial streams were used in the derivation of the nutrient thresholds in paragraph (2)(c). Furthermore, the physical and hydrologic alterations within a canal would almost always result in the failure of the SCI component of the standards in paragraph (2)(c), regardless of nutrient levels. This limits the utility of the SCI for determining the affects of nutrients in canals.

Implementation of NNC in Streams

To evaluate ecosystem health in streams, it is important to acknowledge that adverse nutrient enrichment effects follow a conceptual ecological model (**Figure 2**). When anthropogenic nutrient loading or concentrations exceed a system's assimilative capacity, the primary response consists of changes to the primary producer communities (periphyton, phytoplankton, or vascular plants), and excess production of plant biomass. In turn, this enhanced floral biomass can lead to habitat loss (*e.g.*, from excess periphyton smothering or nuisance plant biomass accumulation), food web alterations (*e.g.*, dominance of taxa that thrive in nutrient/organic matter enriched conditions), and/or low dissolved oxygen (DO) from decomposition of plant biomass or respiration. This chain of events is ultimately reflected in meaningful biological endpoints, such as excessive algal mats, excess water column chlorophyll *a*, excess nuisance vascular plant growth, and/or failing Stream Condition Index (SCI) scores. These adverse biological endpoints constitute imbalances of aquatic flora and/or fauna.

Conversely, if data show that biological health is fully supported in an aquatic system (no adverse responses consistent with the ecological model), one may conclude that the associated nutrient regime is inherently protective of the waterbody, and the NNC is achieved.

For streams, if a site specific interpretation pursuant to paragraph 62-302.531(2)(a), F.A.C. (TMDL, SSAC, Level II WQBEL or RA Plan) has not been established, Nutrient Thresholds are used to interpret the NNC in combination with biological information. The NNC in paragraph 62-302.530(47)(b), F.A.C., shall be interpreted as being achieved in a stream segment if:

- *Information on chlorophyll a levels, algal mats or blooms, nuisance macrophyte growth, and changes in algal species composition do not indicate an imbalance in flora or fauna; AND EITHER*
- *The average score of at least two temporally independent SCIs performed at representative locations and times is 40 or higher, with neither of the two most recent SCI scores less than 35 (i.e., no faunal imbalances), OR*
- *The Nutrient Thresholds (expressed as annual geometric means) in **Table 2** are not exceeded more than once in a three year period (see **Figure 3** for regions).*

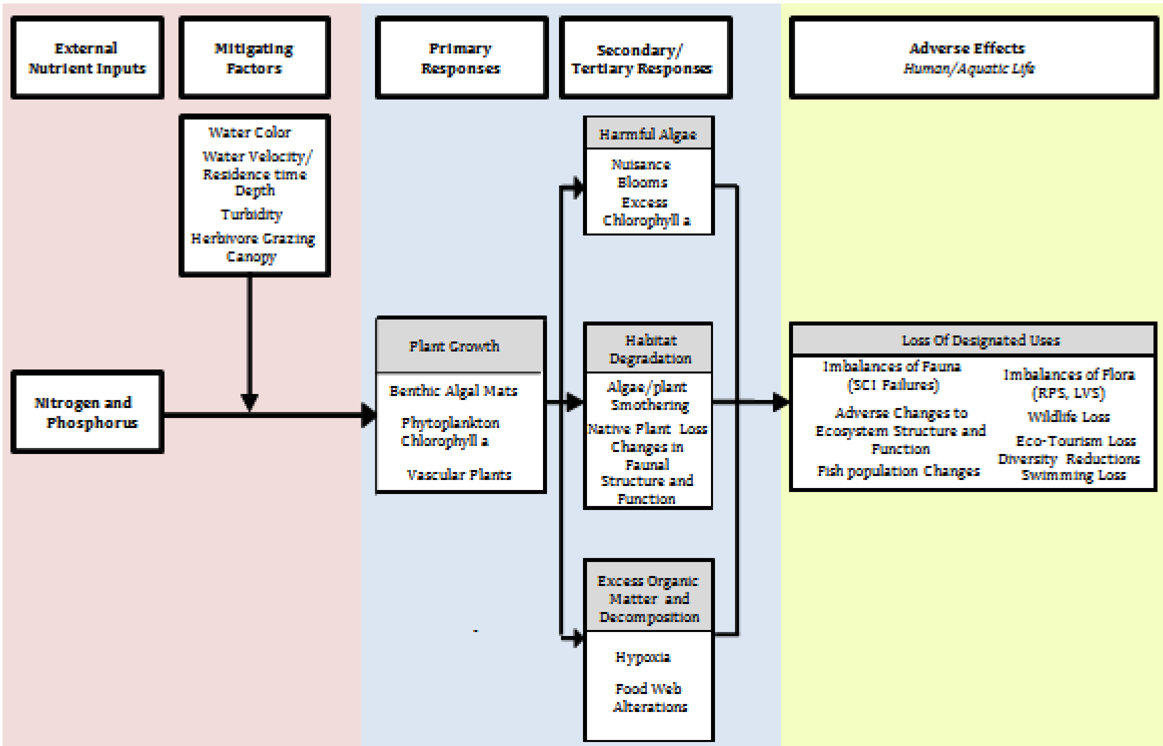

Figure 2. Simplified nutrient enrichment conceptual model used to assess potential adverse effects of nutrients on aquatic life and human uses in streams. Relationships between nutrients and biological responses are highly influenced by site-specific and mitigating factors.

Table 2. Reference stream-based nutrient thresholds.

Nutrient Region	Total Phosphorus Threshold	Total Nitrogen Threshold
Panhandle West	0.06 mg/L	0.67 mg/L
Panhandle East	0.18 mg/L	1.03 mg/L
North Central	0.30 mg/L	1.87 mg/L
Peninsula	0.12 mg/L	1.54 mg/L
West Central	0.49 mg/L	1.65 mg/L
South Florida	No numeric nutrient threshold. The narrative criterion in paragraph 62-302.530(47)(b), F.A.C., applies.[2]	

[2] Chlorophyll *a* impairment thresholds in the IWR will continue to be used to assess South Florida flowing waters.

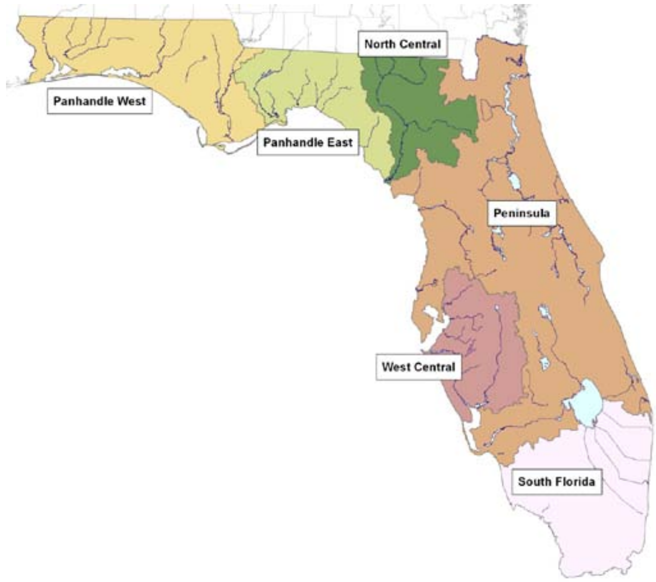

Figure 3. Map of stream nutrient regions.

FLORAL EVALUATION FOR DETERMINING ACHIEVEMENT OF NNC

During numeric nutrient criteria development, the Department, in coordination with EPA, conducted a series of comprehensive statistical analyses to identify relationships between human disturbance (including nutrient enrichment) and adverse floral responses (*e.g.,* algal taxonomic composition, algal and vascular plant abundance, chlorophyll *a*, etc.) using an extensive data set collected in Florida streams. The relationships were statistically weak, and neither the Department nor EPA could identify floral health/impairment thresholds associated with human disturbance or nutrient concentrations/load. The Department will continue these investigations, and if a relationship is eventually found, then stream floral measures would be strong candidates for Biocriteria, similar to the Stream Condition Index and Lake Condition Index. Until these Biocriteria are developed, the Department's approach is to determine whether the floral components at a given stream are consistent with the floral measures found within the EPA reference stream distribution (generally the 90th percentile, as was used to develop the nutrient thresholds). If all floral measures are within the EPA reference site distribution, one may reasonably conclude the presence of a balanced floral community. Based on all potential floral outcomes associated with the conceptual model in **Figure 2**, the Department evaluates the Rapid Periphyton Survey (RPS), community composition (autecological) information associated with dominant algal taxa, Linear Vegetation Survey (LVS), and chlorophyll *a* data using a weight of evidence approach, as described below. These assessments were chosen because they:

- *Represent the entire range of potential floral responses to nutrients, consistent with the nutrient enrichment conceptual model in* ***Figure 2****;*
- *May routinely be conducted by Department staff, who have been extensively trained in the associated Standard Operating Procedures (SOPs); and*

- *Comprise the most advanced floral assessment tools currently available for the State of Florida.*

In addition to comparing water quality data to the stream nutrient thresholds in **Table 2 and evaluating available SCI data**, the Department evaluates the floral components, described below, to determine if the stream exhibits balanced flora. Although a weight of evidence approach is used (generally using floral thresholds established at the 90th or 10th percentile of the EPA reference stream distribution, depending on the metric), if any one these floral measures indicates an imbalance, then the Department would conclude that the stream does not attain the NNC. Floral measures alone can provide evidence that the nutrient standard at Rule 62-302.531(2)(c) is not achieved, leading to the waterbody being placed on the Florida Verified List and Clean Water Act 303(d) list.

If floral data are unavailable for a stream that exceeds the Nutrient Thresholds, it is the Department's intent to collect the information during the Watershed Management Assessment Cycle associated with the Impaired Waters Rule. If the necessary information is not collected during the assessment cycle (due to logistical considerations, etc.) and either the TN or TP thresholds are exceeded, the Department places such waters on the Study List, which is submitted to EPA as part of the 303(d) list of impaired waters, until conclusions can be made.

To conduct a conclusive biological evaluation of the floral community, it is necessary to conduct two floral evaluations using the metrics described below to address the temporal persistence. One evaluation is not sufficient to document a stream's long term floral health because natural climate-related circumstances during any given time period can cause shifts in the vascular plant and algal communities. Collecting a temporally independent sample can further minimize Type 1 and Type 2 error.

When evaluating the floral evidentiary thresholds described below, comparisons to contemporaneous floral data from minimally disturbed reference streams (with minimal disturbance being based on the same criteria employed by EPA during nutrient threshold development) is an important component of the process. The expression of nutrient responses is very complex, and could be related to many natural factors, such as extended low flow periods (increased residence time), natural variation in grazer populations, changes in light penetration, and system morphology. For this reason, it is important to assess how floral metrics fluctuate at reference sites that are sampled under environmental and climatological conditions similar to any test site being evaluated. The RPS, LVS, algal species composition, and chlorophyll data from reference streams located proximally to any stream under evaluation should be considered as part of the evidentiary process. Algal evaluations are complex and should be considered with regard to all the variables described above; however, the Department has provided a decision key for each of the metrics to assist with decision making.

Evaluating Algal Mats

The RPS is used to quantify the extent (coverage) and abundance (thickness) of attached algae (periphyton) and is an *effective tool to quantify abundance of nuisance or problematic algal growth*. The Department compares RPS results from a stream to the RPS results compiled from the population of minimally disturbed and healthy sites that was sampled by the Department as part of NNC development. RPS rank 4-6 coverage (Rank 4-6 represent epiphyte lengths of > 6 mm) at Nutrient Benchmark streams ranged from 0% to 66%, with a mean value of 6% and a 90th percentile value of 25%. RPS rank 4-6 coverage at all biologically healthy sites (as indicated by Stream Condition Index scores > 40), ranged from 0% to 91%, with a mean value of 8% and a 90th percentile value of 32%. Although these RPS distributions are fairly similar, the Department concluded that use of an RPS evidentiary threshold based on the 90th percentile of the EPA reference sites would be consistent with the manner in which the nutrient thresholds were derived. Therefore, if a stream exhibits a percent coverage for RPS ranks 4-6 of 25% or less in both samples, the RPS results indicate evidence of no imbalance of flora. If a stream segment exceeds an RPS 4-6 coverage of >25% during two consecutive, temporally independent samplings (> 3 months apart), the Department considers this as evidence that the NNC is not achieved.

If the two samples have differing results in relation to the evidentiary threshold, then the preliminary analysis of this metric alone is inconclusive. Reviewing other data, information, or water quality/biology variables can help inform the reasons behind the differing results. Additional sampling should be conducted until two temporally independent samplings either attain, or do not attain, the evidentiary thresholds, so a final decision can be made.

Where the RPS 4-6 coverage is greater than 20%, an evaluation of the algal species composition (identifying the five most dominant taxa) is also conducted to provide additional information whether there is no imbalance of flora. Where RPS 4-6 coverage is <20%, there is no need to collect samples for algal species composition because the stream is clearly within the reference site distribution, and therefore, the algal species composition is presumed to be acceptable.

RPS Decision Key

1. Were environmental conditions associated with the RPS samples representative of the typical conditions of the system? (*e.g.*, flow between 10th and 90th percentile of long term discharge, light penetration characteristic of system, sampling location representative of waterbody segment, etc).
   1a. Yes, proceed to couplet 2.
   1b. No. Collect additional RPS samples at representative locations and during representative conditions, and return to couplet 1.

2. Results of two temporally independent RPS samplings show that RPS rank 4-6 is 25% or less?
   2a. Yes. Evidence that the waterbody *achieves the algal mat component of floral measures* (other components must still be evaluated). If RPS rank 4-6 results are between 20% to 25%,

then algal species composition will also be evaluated (see algal species composition decision key).

2b. No, evidence that the *nutrient standard at 62-302.531(2)(c) is not achieved*.

EVALUATING CHANGES IN SPECIES COMPOSITION

Changes in algal species composition (through an analysis of autecological information) are also evaluated using the latest scientific references for algal species. The Department maintains a list of the scientific references used in this evaluation. While many references are for studies conducted in other States and other countries, they still provide valuable information concerning nutrient enrichment in Florida because many of the indicator algal species are distributed worldwide and have been shown to have consistent sensitivity to nutrients wherever found. For example, analyses in the Florida Everglades using algal autecological information derived from the prevailing literature showed distinct responses to TP enrichment, analogous to the signal generated through site=specific TP dosing studies (http://www.dep.state.fl.us/water/wqssp/everglades/pctsd.htm)

Although the Department conducted a comprehensive study of stream periphyton in Florida in an attempt to formulate a multi-metric index for assessing human disturbance (including nutrient effects), the statewide data indicated that that the periphyton community composition was more highly correlated with pH (and conductivity) than to nutrients or measures of human disturbance. Additionally, common metrics that typically decrease in response to human disturbance in invertebrate communities, such as taxa richness and diversity, often increase in algal communities when comparing oligotrophic to eutrophic streams, meaning such metrics are not useful for assessing anthropogenic nutrient inputs. Given these constraints, the Department assesses the environmental information associated with dominant algal taxa qualitatively using the scientific literature to determine if they are indicative of nutrient enriched/imbalanced conditions.

For example, nutrient enriched Florida springs are typically characterized by an abundance of one or more of the following taxa: *Lyngbya wollei, Oscillatoria* sp*., Aphanothece* sp., *Phormidium* sp., *Vaucheria* sp., *Spirogyra* sp., *Cladophora sp., Rhizoclonium* sp*., Dichotomosiphon* sp., *Hydrodiction* sp., *Enteromorpha* sp., and *Chaetomorpha* sp. Other algal indicators of nutrient enrichment from the literature include: *Anabaena* sp., *Euglena* sp., *Chlamydomonas* sp., *Scenedesmus* sp., *Chlorella* sp., *Rhopalodia* spp., *Gomphonema* spp., *Cosmarium* sp., *Nitzschia* spp., *Navicula* spp., *and Stigeoclonium* sp. Dominance of such taxa at a stream where the RPS rank 4-6 >20% would be evidence that the NNC is not achieved.

As another example of this approach, the Everglades TP criterion was largely based on observed shifts in the dominant algal taxa from those characteristic of reference conditions (*e.g*., *Scytonema* sp., *Schizothrix* sp.) to taxa indicative of nutrient enriched conditions (*e.g*., *Gomphonema parvulum, Navicula minima*, *Nitzschia amphibia*, *Nitzschia palea, Oscillatoria* sp*., Rhopalodia gibba, Scenedesmus* sp*., Anabaena* sp*., Cosmarium* sp*.,* and *Lyngbya wollei).* As mentioned earlier, this change in algal species composition due to nutrient enrichment was supported by using the general (worldwide) autecological references.

Because a statewide analysis of algal community metrics (including the percentage of pollution sensitive and pollution tolerant taxa) failed to correlate well ($r^2 < 0.1$) with human disturbance, this evaluation of algal community composition in streams must be conducted on a site-specific basis, using the latest scientific references. During this assessment, the natural ionic regime (pH, conductivity) should be taken into account because past studies indicate that pH and conductivity significantly influence the algal community composition. Because of the variability associated with algal species composition, site-specific responses are emphasized as part of the weight of evidence approach. Additional sampling should be conducted until two temporally independent samplings either attain, or do not attain, the evidentiary thresholds, so a final decision can be made.

Algal Species Composition Decision Key

1. Were environmental conditions associated with the RPS samples and algal taxonomic collections representative of the typical conditions of the system? (*e.g.*, flow between 10th and 90th percentile of long term discharge, light penetration characteristic of system, sampling location representative of waterbody segment, etc.).
   1a. No. Collect additional RPS samples and algal taxonomic composition samples at representative locations and during representative conditions, and return to couplet 1.
   1b. If Yes, see couplet 2.

2. Results of two temporally independent RPS samplings show that RPS rank 4-6 is 20% or less?
   2a. Yes. Evidence that the waterbody *achieves the algal species composition component of floral measures* (other components must still be evaluated).
   2b. If No, see couplet 3.

3. Do dominant taxa[3] of algal community include taxa known to be nutrient enrichment indicators? (see list above and references in Appendix).
   3 a. Yes. Evidence that the *nutrient standard at Rule 62-302.531(2)(c) is not achieved*.
   3b. No. This is evidence that the waterbody *achieves the algal species composition component of floral measures* (other components must still be evaluated).

EVALUATING THE PRESENCE OR ABSENCE OF NUISANCE MACROPHYTE GROWTH

Another line of evidence to determine if streams are healthy is determining the relative lack of nuisance macrophyte growth by certain vascular plant taxa that may interfere with designated uses of a waterbody. The Linear Vegetation Survey (LVS) is a rapid assessment tool for evaluating the ecological

[3] The Department will evaluate those dominant species that individually constitute approximately 10% or more of the community.

condition of streams based on vascular plants. Because many streams naturally have very little or no vegetation, interpretation of LVS data requires that a minimum of two square meters (2 m^2) of macrophyte coverage be present throughout a 100 meter stream reach. If there is <2 m^2 of vascular plant coverage present in a 100 m stream reach, there are no floral imbalances attributable to aquatic plants. LVS results from a stream are compared with LVS results compiled from the population of EPA reference streams sampled by the Department as part of NNC development. The Department evaluated LVS data from the EPA reference streams and found that if a site's average C of C score is greater than or equal to 2.5 (the 10th percentile of the distribution), the plant community composition may be considered to be part of the reference site distribution. Based on the Department's experience in minimally disturbed streams and the types of plants associated with C of C scores greater than or equal to 2.5, this threshold was determined to be reasonable and protective.

The Department also analyzed the frequency of occurrence of Florida Exotic Plant Pest Council (FLEPPC) exotics in the EPA reference streams, and found that, due to the influence of a few streams at the 90th percentile, FLEPPC exotics made up approximately 40% of the total plant occurrences. Considering the somewhat limited number of reference streams with vascular plants (nineteen) and the variability in the data, the Department decided to set the FLEPPC threshold at the 80th percentile of the distribution. Therefore, if the frequency of occurrence of FLEPPC exotics at a site is less than or equal to 25% of the total plant occurrences (the 80th percentile of the distribution), the site may be considered to be part of the reference site distribution.

Therefore, if a site's average C of C score is $\geq$ 2.5 and the frequency of occurrence of FLEPPC exotic taxa is $\leq$ 25% of the total plant occurrences in two independent samples, this would indicate no imbalance of flora. Because of the inherent temporal variability in aquatic plant communities, two temporally independent LVS assessments should be conducted. If a stream segment's C of C score is < 2.5 and the frequency of occurrence of FLEPPC exotic taxa is > 25% during two consecutive, temporally independent samplings, the Department considers this as evidence that the NNC is not achieved. While variability of LVS sampling is typically low, if the two samples have differing results in relation to the evidentiary threshold, then the preliminary analysis of this metric alone is inconclusive. Reviewing other data, information, or water quality/biology variables can help inform the reasons behind the differing results. Additional sampling should be conducted until two temporally independent samplings either attain, or do not attain, the evidentiary thresholds, so a final decision can be made.

LVS Decision Key

1. Were environmental conditions associated with the LVS samples representative of the typical conditions of the system (*e.g.*, flow between 10th and 90th percentile of long term discharge, light penetration characteristic of system, sampling location representative of waterbody segment, etc.).
   1a. No. Collect additional LVS samples at representative locations and during representative conditions, and return to couplet 1.
   1b. Yes, proceed to couplet 2.

2. Given that invasive exotic species can occur even in the absence of nutrient impacts and that aquatic plant management practices can also affect LVS results, is there evidence the LVS results can be linked to anthropogenic nutrient inputs?
   2a. Yes, proceed to couplet 3.
   2b. No. The LVS results are inconclusive and other lines of floral evidence should be used.

3. Results of two temporally independent LVS samplings show that C of C score is $\geq$ 2.5 and the frequency of occurrence of FLEPPC exotic taxa is $\leq$ 25%?
   3a. Yes. Evidence that the waterbody *achieves the nuisance macrophyte growth component of floral measures* (other components must still be evaluated).
   3b. No. Evidence that the *nutrient standard at 62-302.531(2)(c) is not achieved*.

EVALUATING ALGAL BLOOMS, CHLOROPHYLL A, AND PHYTOPLANKTON TAXONOMIC DATA

An annual geometric mean chlorophyll value of >20 µg/L is used as an impairment threshold for both lakes and streams in Chapter 62-303, F.A.C. However, it is commonly understood that healthy lakes in Florida may be characterized by annual geometric mean chlorophylls up to 20 µg/L, while most healthy streams would be expected to have significantly lower chlorophyll *a* levels. While this impairment threshold for streams was supported by an expert panel of Florida scientists that helped the Department develop the Impaired Waters Rule (IWR), neither the expert panel nor a review of stream chlorophyll *a* literature was able to identify a stream chlorophyll *a* value below 20 µg/L that definitively did, or did not, support aquatic life uses.

The range in "healthy" stream chlorophyll *a* values is due to a variety of site specific factors, such as system morphology, water residence time, and presence of lentic taxa may indicate a healthy aquatic stream in a natural transition from a lotic to lentic system during the time period studied. While the Department compares the chlorophyll *a* results from a stream to chlorophyll *a* results compiled from the population of minimally disturbed and healthy sites that was sampled by the Department as part of NNC development, these site specific factors must also be taken into account. If a stream exhibits annual geometric mean chlorophyll *a* concentrations between the mean observed at these minimally disturbed and healthy sites (2.0-2.1 µg/L) and the associated 90^{th} percentile values (3.2-3.5 µg/L), this is a clear indication of no imbalance of flora. However, some Nutrient Benchmark streams and biologically healthy streams also exhibit annual geometric mean chlorophyll *a* values up to 17 µg/L and 19 µg/L, respectively. Because the remaining distribution of observed annual geometric mean chlorophyll *a* values includes values approaching the IWR impairment threshold (and higher percentiles of the distribution actually exceeded it), the Department chose to continue to utilize 20 µg/L as a chlorophyll impairment threshold. Therefore, streams with annual average chlorophyll values between 3.2 µg/L and 20 µg/L are evaluated on a site specific basis, and factors such as water residence time, flow, color, climatological conditions, and size of the stream/river (*i.e.*, stream order) are considered when chlorophyll *a* values are within this range. If a site has chlorophyll values within the 3.2 µg/L to 20 µg/L range, the assessment is inconclusive until the Department documents a decision regarding whether chlorophyll *a* conditions reflect and imbalance in flora or not. When the Department determines that the values indicate enrichment (*e.g.*, are higher than functionally similar reference streams in the region), the Department considers this evidence of imbalances in flora, and vise versa.

The Department also assesses trends in chlorophyll *a* using a temporal trend test (a Mann's one-sided, upper-tail test for trend, with a 95% confidence interval) in conjunction with the chlorophyll *a* impairment threshold. The observation of a statistically significant increase in chlorophyll *a* in a stream is another line of evidence used by the Department to determine floral imbalances.

The Department also uses the presence of phytoplankton blooms as an indicator of floral imbalances. An unacceptable phytoplankton bloom would consist of a situation where an algal species, whose noxious characteristics or presence in sufficient number, biomass, or areal extent, may reasonably be expected to prevent, or unreasonably interfere with, the designated use of a waterbody. The Department evaluates the autecological information for the dominant bloom species, in conjunction with the associated chlorophyll *a* when assessing imbalances of flora.

Chlorophyll/Algal Bloom Decision Key

1. Were environmental conditions associated with the chlorophyll samples representative of typical conditions for the system? (*e.g.*, flow between 10th and 90th percentile of long term discharge, light penetration characteristic of system, sampling location representative of waterbody segment, etc.).
   - 1a. No. Collect additional chlorophyll samples at representative locations and during representative conditions, and return to couplet 1.
   - 1b. If Yes, see couplet 2.

2. Annual geometric mean chlorophyll $\leq$ 3.2 ug/L?
   - 2a. Yes. Evidence that the waterbody *achieves the chlorophyll a/algal bloom component of floral measures* (other components must still be evaluated).
   - 2b. If No, see couplet 3.

3. Annual geometric mean chlorophyll $\geq$20 ug/L more than once in a three year period?
   - 3a. Yes. The *narrative nutrient standard at 62-302.531(2)(c) is not achieved*.
   - 3b. No, annual geometric mean chlorophyll is between 3.2 and 20 ug/L, see couplet 4.

4. After considering site specific factors that affect chlorophyll concentrations, such as system morphology, water residence time, or consistency with other functionally similar reference sites, can it be documented that the chlorophyll *a* values represent a healthy well balanced phytoplankton community?
   - 4a. Yes. Evidence that the waterbody *achieves the chlorophyll a/algal bloom component of floral measures.*
   - 4b. No.

Evidence that the *nutrient standard at 62-302.531(2)(c) is not achieved.*

4c. Inconclusive because of insufficient contemporaneous data from other functionally similar reference sites. Waterbody will be placed on the Study List if either of the TN or TP thresholds were exceeded.

Floral Measures Summary

As described above, the Department derived the floral thresholds that are used for this "weight of evidence evaluation" using a distribution of a population of minimally disturbed Benchmark streams (the same streams used by EPA for their criteria development). The thresholds summarized in **Table 3** can be used when developing evidence supporting a Department conclusion regarding the balance of the floral community. If all floral measures are achieved, a stream meets the floral component of a healthy, well balanced aquatic system, because it is within the minimally disturbed Benchmark stream condition. However, if any one these floral measures indicates an imbalance, then the stream does not attain the NNC. Examples of this application of scientific reasoning are provided below.

Table 3. Floral measures summary. These values were based on the distribution of a population of minimally disturbed Benchmark sites sampled by the Department as part of Numeric Nutrient Criteria development (the same benchmark sites EPA used for their criteria).

Floral Metric	Evidentiary Threshold of No Imbalances
LVS C of C	Site average ≥ 2.5
LVS FLEPPC	Site average < 25%
RPS	< 25% rank 4-6 coverage 20 to 25 % rank 4-6 coverage, evaluate algal autoecological data
Chlorophyll	< 20 ug/L; 3.2 to 20 ug/L = site specific
Algal Community Composition (Autecology)	No adverse shifts in dominant taxa

Faunal Evaluation for Determining Achievement of NNC

Paragraph (2)(c) requires a demonstration that a stream has well-balanced populations of flora and either attains the Nutrient Thresholds or has healthy, well balanced fauna. The presence of healthy fauna can be shown through the Stream Condition Index (SCI).

The SCI is a biological assessment procedure that measures the degree to which flowing fresh waters support a healthy, well-balanced biological community, as indicated by benthic macroinvertebrates. The Department and EPA have concluded that a balanced faunal community is achieved if the average score of at least two temporally independent SCIs, performed at representative locations and times, is 40 or higher, with neither of the two most recent SCI scores less than 35. To qualify as temporally independent samples, each SCI must be conducted at least three months apart. SCIs collected at the same location less than three months apart will be considered one sample, with the mean value used to represent the sampling period.

Attainment of the SCI threshold is an indication that the faunal community of the stream is not being adversely affected by nutrients to the extent that there is a loss in designated use. However, failure of the SCI does not necessarily mean that the stressor causing the loss of designated use is nutrients. Evaluation of other factors, as indicated by the nutrient enrichment model in **Figure 2** (including nutrient concentrations and floral communities) is useful information that could indicate nutrients are a factor. While the stressor may not be known, a failed SCI does indicate that fauna is not well-balanced.

Alternatively, if the benchmark Nutrient Thresholds in the Table in paragraph (2)(c) are attained, then the faunal community of the stream is presumed healthy with respect to nutrients, because the benchmark thresholds were derived using nutrient levels in high quality, minimally disturbed streams. However, regardless of attainment of benchmark thresholds, if SCI results are available and a stressor identification study demonstrate that the faunal community is not healthy as a result of nutrients, then the stream will be listed as impaired for nutrients.

In summary, where the Nutrient Thresholds are exceeded but there are no imbalances in either aquatic flora (phytoplankton, periphyton, or vascular plants) or fauna (invertebrate community), the NNC is achieved.

EXAMPLES OF A WEIGHT-OF-EVIDENCE APPROACH FOR DETERMINING ACHIEVEMENT OF NUTRIENT CRITERIA

To evaluate whether a stream achieves the NNC, the investigator must compile water chemistry data (*e.g.*, Total Nitrogen [TN], Total Phosphorus [TP], chlorophyll *a*, and ancillary parameters such as color, turbidity, DO, pH, conductivity, and temperature, nitrate, etc.) and a minimum of two samples of each of the following: RPS, LVS, HA, and SCI. Taken together, these data are used as multiple lines of evidence to decide whether a stream is healthy, with acceptable levels of nutrients. Supporting parameters, such as color and nitrate, are used to help determine nutrient sources (*e.g.*, high colored swamps have naturally elevated TN; very clear groundwater-fed systems may have elevated nitrate). Examples of how the Department evaluates these multiple lines of evidence are provided in **Table 4** and discussed below.

In Stream 1, although the RPS data showed a pulse of periphyton (which consisted of the generally non-problematic alga, *Oedogonium*), it was not persistent, meaning the RPS results were acceptable. Because no plants were found in the water, the LVS results indicated no imbalances. However, an increasing trend was observed in annual chlorophyll *a* (using a Mann's one-sided, upper-tail test for trend, with a 95% confidence interval), and the chlorophyll values exceeded those typically observed in healthy streams. Although the SCI score was currently acceptable and habitat was not limiting, the Department concluded that the chlorophyll issue, following the conceptual model in **Figure 2**, was sufficient to judge that this stream has impaired flora. It is likely that the increased organic matter enrichment associated with the excess phytoplankton (as indicated by the chlorophyll) would eventually lead to faunal imbalances.

Stream 2 was characterized by significant algal smothering, as demonstrated through the RPS results. Taxonomic identification showed the algae community to be dominated by *Lyngbya*, a known nuisance species. Although the vascular plant community, as assessed using the LVS, was within the range of reference streams, and chlorophyll *a* was non-problematic, the algal growth resulted in aquatic habitat smothering (a component of the HA), which likely led to the failing SCI score. The Department concluded that the RPS results, coupled with a poor habitat smothering score, was evidence that stream 2 has impaired flora, which in turn caused impaired fauna. These responses are consistent with the nutrient enrichment model.

Although periphyton and chlorophyll *a* were not issues in stream 3, the HA and LVS results showed that the invasive exotic vascular plant, *Hydrilla,* was excessively abundant, leading to imbalances of flora. An increase in *Hydrilla* abundance was associated with reduced substrate diversity and failing SCI scores, meaning the elevated nutrient levels were associated with imbalances in flora and fauna, consistent with the nutrient enrichment model. This situation is complicated because invasive exotic plants can be observed even without nutrient enrichment. It is important to review other information, including the levels of nutrients in the waterbody that could contribute to species proliferation. In this circumstance, the Department concluded that excess anthropogenic nutrients exacerbated the floral community imbalances as evidenced by the LVS results.

Stream 4 is a minimally disturbed Benchmark stream with TN and TP levels at the upper 98^{th} percentile of the data distribution used to establish the regional Nutrient Threshold. The RPS and SCI indicated normal, healthy conditions. No plants were observed in the water, meaning the LVS was acceptable. However, an annual chlorophyll *a* value of 10.5 µg/L was observed in one year, which is between the 3.5 to 20 µg/L range, and site specific information was subsequently evaluated. In this case, a drought year was associated with the moderately elevated chlorophyll, and other nearby reference streams also exhibited similar increases in chlorophyll. The algae associated with the elevated chlorophyll included the diatoms, *Achnanthes exiguum*, *Anomoeneis vitrea*, and *Cymbella minuta*, which are normally found in reference streams. The Department concluded that the drought conditions were associated with the chlorophyll value, and that this level was within the variability of the reference site data. Because the SCI was healthy and there were no other indicators of nutrient issues, the Department concluded that nutrient levels associated with Stream 4 are acceptable and the NNC is achieved.

Table 4. Examples of RPS, LVS, chlorophyll *a*, HA, and SCI data used to illustrate a multiple lines-of-evidence approach used by the Department for determining whether or not a stream exhibits imbalances of flora or fauna. In these examples, TP, TN, or both nutrients **exceed the regional Nutrient Threshold values**.

Measure		Sample #	Stream[1]					
			1	2	3	4	5	6
RPS (% Rank 4-6)		1	21	45	4	8	3	26
		2	2	65	7	15	0	37
LVS	Avg. C of C	1	No vegetation	2.6	1.9	No vegetation	3.5	1.8
		2	No vegetation	3.2	0.5	No vegetation	4.2	2.4
	FLEPPC %	1	No vegetation	12	45	No vegetation	0	31
		2	No vegetation	4	74	No vegetation	0	26
Chlorophyll (µg/L as annual geometric mean)		Year 1	17.2	1.1	Non-Detect	10.5	3.5	1.3
		Year 2	22.1	2.1	Non-Detect	1.2	4.1	1.1
Increasing Chlorophyll Trend			Yes	No	No	No	No	No
Habitat Assessment		1	121	109	105	133	81	110
		2	113	102	98	126	77	107
SCI		1	45	44	39	67	22	42
		2	39	33	29	58	31	39

[1] In these examples, TP, TN, or both nutrients exceed the regional Nutrient Threshold values. **No vegetation** = No plants in water, therefore, LVS results indicate no imbalance**.**

Floral measures at stream 5 were non-problematic, despite nutrient concentrations that exceeded the regional threshold values. No primary or secondary nutrient responses, as described by the nutrient enrichment model, were observed, but the SCI indicated impaired fauna. The SCI results, combined with higher levels of nutrients, lead to the conclusion that the NNC is not achieved. In this case however, habitat assessment results indicated artificial channelization, poor substrate diversity and availability, and a compromised riparian buffer zone. Observations also indicated extensive hydrologic modifications in the drainage basin. These habitat and hydrologic factors were evaluated as part of a TMDL process, prior to initiating a TMDL. After an evaluation of all stressors (through a stressor identification study), habitat and hydrologic improvements were found to be the stressors affecting stream health, and not nutrient concentrations. The Department would then evaluate this stream under a site specific structure described in Rule 62-302.531, F.A.C.

In stream 6, both the RPS and LVS results suggested early warnings of nutrient enrichment, with persistent periphyton coverage and changes in the vascular plant community, even though chlorophyll *a* and SCI results were acceptable. The periphyton community was dominated by *Vaucheria*, a known nuisance species, while the vascular plants, *Alternanthera philoxeroides* and *Panicum repens* (two FLEPPC exotics), were moderately abundant. Habitat assessment results indicated moderate smothering by the periphyton and a reduction in substrate diversity associated with the exotic plant growth. The Department concluded that this was sufficient evidence of floral imbalances, which if allowed to continue without intervention, would also result in faunal imbalances, as predicted by the nutrient enrichment model.

STREAM SAMPLING LOCATIONS AND OTHER ENVIRONMENTAL CONSIDERATIONS

When conducting nutrient studies, it is important to confirm that sampling locations and other environmental conditions (canopy cover, habitat, water depth and flow, etc.) are representative of the system and that water quality data are collected in the same homogeneous waterbody segment as the biological monitoring stations. Establishing spatial relationships between the water quality data and biological health data is dependent upon the homogeneity of the stream or stream segment. In stream segments that have homogeneous nutrient concentrations, at least one biological station (for floral and faunal measures) should be sampled during two temporally independent time periods. If a stream is not homogeneous with regard to nutrients, the stream should be divided into homogeneous units (segments), and the biological evaluation conducted for each segment.

The following elements should be addressed when sampling to evaluate attainment of the NNC in paragraph 62-302.530(47)(b), F.A.C., and to affirmatively demonstrate that nutrients are not adversely affecting flora and fauna:

1. Biological sampling locations should be selected to reduce or eliminate the effects of confounding variables. Sampling should be conducted in areas where other physical factors, especially habitat and hydrology, do not limit biological expectations. Efforts should be taken to establish sites in stream reaches (where possible) with minimal hydrological modifications and optimal habitat, including adequate substrate diversity and availability, intact stream

morphology (minimal or no artificial channelization), adequate velocity and flow, and optimal riparian buffer zones (see the Department's SOP FS 3000 for Habitat Assessment procedures). Sites should also be selected where light penetration through the tree canopy is representative of the stream segment (*i.e.*, avoid bridge or powerline crossings where the canopy has been artificially changed in a relatively small area). While care should be taken to minimize confounding factors, sampling locations should be sited within stream segments that are representative of typical conditions. Additional information on controlling for the effects of confounding factors is presented in the SCI Primer.

2. All biological sampling should be conducted consistent with the Department's Standard Operating Procedures (SOPs) and SCI Primer.

3. Water quality stations should be located where there is a clear relationship between the nutrient regime and the system's biological health, as assessed using either the floral or faunal measures. For streams, this means that site-specific information should be relied upon to ensure that the biological sampling site(s) provide response information representative of potential effects caused by nutrients in the system. Therefore, site-specific confounding factors and the potential for downstream expression of nutrients should be considered when determining sampling locations. For example, if a discharge or tributary significantly influences the nutrient concentrations in an area associated with the biological collection site, then data from stations located upstream of that discharge should not be used for establishing the ambient values associated with the biological data.

4. Unless a very large data set has been established, sampling during extreme climatic or hydrologic conditions, such as floods, droughts, or hurricanes, should be avoided.

Nutrient Criteria in Estuaries

Rule 62-302.532, F.A.C., contains estuary-specific numeric interpretations of the NNC in paragraph 62-302.530(47)(b), F.A.C., for estuaries along the Southwest Coast (roughly from Tampa Bay to Miami and the Florida Keys). These criteria were developed individually for each estuary segment to protect recreation and a healthy, well-balanced population of fish and wildlife, and are hierarchy 1 interpretations pursuant to paragraph 62-302.531(2)(a), F.A.C. The concentration-based estuary interpretations are open water, area-wide averages.

Decision Matrix and Examples for Implementing the Hierarchical Process

The Department has developed a decision matrix for assessing the stream nutrient thresholds in Rule 62-302.531(2)(c), F.A.C. (**Table 5)** and examples that illustrate how Florida's numeric nutrient criteria are assessed using the hierarchical framework. For both the matrix and the examples, the following assessment categories[4], were used:

- 1 - Attaining all designated uses;
- 2 - Attaining some designated uses and insufficient or no information or data are present to determine if remaining uses are attained;
- 3A - No data and information are present to determine if any designated use is attained;
- 3B- Some data and information are present but not enough to determine if any designated use is attained;
- 3C - Potentially impaired, exceedances meet the requirements of the Impaired Waters Rule for placement on the Planning List;
- 4A - TMDL developed, additional sampling would be used to gauge success of TMDL;
- 4B - Impaired but TMDL not needed (Reasonable Assurance activities underway);
- 4C - Fails criteria but due to natural condition. In this case, the generic criteria are inappropriate, and development of a "natural background" (Type I) SSAC may be warranted;
- 4D - Fails criteria but causative pollutant has not been determined, therefore, a pollutant cause-effect study is needed;
- 4E - Impaired, but restoration ongoing; and
- 5 - Impaired. Fails criteria and causative pollutant identified.

[4] The assessment categories are the same as those in the Department's Integrated Report.

Table 5. Decision matrix for assessment of stream nutrient thresholds in Rule 62-302.531(2)(c), F.A.C. Reasonable Assurance is demonstrated for near-field effects when the receiving streams is shown to "Attain .531(2)(c)". This table does not address increasing trends in nutrient concentrations, and increasing trends in nutrient causal or response variables can result in placement of waterbodies on the Study List or Verified List [303(d) List] independent of the conclusion articulated in this table. Assessing Stream Biological Health using the SCI pursuant to the biological health assessment provisions of the IWR is conducted concurrently to the Nutrient Assessments described in this table as follows: If only 1 SCI is available and it is <35, the water is placed on the Planning List, Cat. 3c for biology; If only 1 SCI is available and it is >35, the water is placed in Cat. 3b for biology; If the 2 most recent SCIs have 1 sample <35 or the average is <40, the water is placed on the Study List, Cat. 4d for biology to conduct a Stressor Identification (SI) study to determine causative pollutant(s). If the SI study determines a pollutant is responsible for the biological impairment, the water is placed on the Verified List, Cat. 5. If the SI study determines nutrients are responsible (even if nutrient thresholds are attained), then 62-302.531(2)(c) is Not Attained, and the water is placed on the Verified List, Cat. 5. If the 2 most recent SCIs average 40 or higher, and neither is <35, then the water is placed in Cat. 2.

	Attains Nutrient Thresholds for Both TN and TP (3 Years of Data)			**Nutrient Threshold Attainment Inconclusive for Either TN or TP (< 3 Years of Data)**			**At Least One Nutrient Threshold Not Attained (3 Years of Data)**		
	SCI Attains (2 Samples)	**SCI Inconclusive (<2 Samples)**	**SCI Not Attained (1 or 2 Samples)**	**SCI Attains**	**SCI Inconclusive**	**SCI Not Attained**	**SCI Attains**	**SCI Inconclusive**	**SCI Not Attained**
Attains Floral Measures (2 Sampling Events)	Attains .531(2)(c) Cat. 2	Attains .531(2)(c) Cat. 2	Attains .531(2)(c) Cat. 2	Attains .531(2)(c) Cat. 2	Cannot Conclude .531(2)(c) Assessment Cat. 3b	Cannot Conclude .531(2)(c) Assessment Cat. 3b	Attains .531(2)(c) Cat. 2	Cannot Conclude .531(2)(c) Assessment Cat. 4d (Study & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)
Floral Measures Inconclusive (<2 Sampling Events)	Cannot Conclude .531(2)(c) Assessment Cat. 3b or 3c(Planning List)	Cannot Conclude .531(2)(c) Assessment Cat. 3b or 3c(Planning List)	Cannot Conclude .531(2)(c) Assessment Cat. 3b or 3c(Planning List)	Cannot Conclude .531(2)(c) Assessment Cat. 3b or 3c(Planning List)	Cannot Conclude .531(2)(c) Assessment Cat. 3b or 3c(Planning List)	Cannot Conclude .531(2)(c) Assessment Cat. 4d (Study & 303(d) List)	Cannot Conclude- .531(2)(c) Assessment Cat. 4d (Study & 303(d) List)	Cannot Conclude .531(2)(c) Assessment Cat. 4d (Study & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)
Any One Floral Measure Not Attained (2 Sampling Events)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat/ 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)	.531(2)(c) Not Attained Cat. 5 (Verified & 303(d) List)

Hierarchies 1 and 2

Examples of Hierarchy 1

Hierarchy 1 – TMDLs, nutrient SSACs, Level II WQBELs and other Department approved actions such as RA plans are the applicable numeric interpretation of the narrative nutrient criteria, subject to EPA review.

- *Freshwater Portions of the Lower St. Johns River*
    - *Status*: Has a nutrient TMDL for TN and TP.
    - *Action required*: Assessed as category 4a. No additional action required. Implement TMDL and BMAP as planned.
- *Marine Portion of the Lower St. Johns River*
    - *Status:* Has a TMDL for TN.
    - *Action required*: Assessed as category 4a. Implement TN TMDL and BMAP as planned. Continue to implement the narrative for TP until applicable NNC adopted.

Examples of Hierarchy 2

Hierarchy 2 – Numeric interpretation of the narrative criterion based on an established, quantifiable understanding of the stressor-response relationship between nutrient concentrations and biological imbalance. Currently this relationship has been determined only for freshwater springs and lakes.

- *Lithia Springs*
    - *Status*: Has no site specific interpretation, but exceeds the springs-specific stressor-response based nitrate criterion of 0.35 mg/L.
    - *Action required*: List the spring as Verified Impaired (category 5) and take action to achieve the 0.35 mg/L nitrate criterion. A Basin Management Action Plan (BMAP) will be developed that addresses sources of nitrogen in the springshed.
- *Silver Springs*
    - *Status*: Has no site specific interpretation, but exceeds the springs-specific stressor-response based nitrate criterion of 0.35 mg/L.
    - *Action required*: List the spring as Verified Impaired (category 5) and take action to achieve the 0.35 mg/L limit as nutrient criterion. Silver Springs has a TMDL scheduled to be complete in 2012, which will move it to Hierarchy 1. A BMAP will be developed that addresses sources of nitrogen in the springshed.

- *Lake Harney*
  - *Status*: Has no site specific interpretation. Meets the lakes nutrient and chlorophyll *a* criteria and Lake Vegetation Index results indicate a healthy plant community.
  - *Action required*: Not impaired (category 2), and no additional action required.
- *Lake Gibson*
  - *Status*: Has no site specific interpretation. Meets the lakes chlorophyll *a* criteria, but exceeds the upper range of the TP criterion.
  - *Action required*: List the lake as Verified Impaired (category 5) and develop nutrient TMDL, which will serve as primary site specific nutrient interpretation. May also be a candidate for a SSAC since the chlorophyll *a* criteria is met (provided vascular plant community, as measured by the LVI, is also healthy).
- *Lake Istokpoga*
  - *Status*: Has no site specific interpretation. Exceeds the lakes chlorophyll *a* criterion more than once in a three year period.
  - *Action required*: Place on Verified List (category 5) for nutrient impairment and develop nutrient TMDL, which will serve as primary site specific nutrient interpretation.

Hierarchy 3

Hierarchy 3 – As described in Table 5, the numeric interpretation of the narrative criterion is based on a combination of reference-based nutrient thresholds and biological information (currently limited to streams, excluding intermittent systems, canals/ditches, and South Florida region)[5]. Streams can fall into the following main categories at the end of the Phase 2 assessment of the Watershed Management Cycle:

a. Waters that meet the nutrient thresholds and have sufficient data to document they have healthy flora. These waters are deemed to attain the NNC (category 2).

b. Waters that exceed the nutrient thresholds, but are biologically healthy (both flora and fauna). These waters are deemed to attain the NNC (category 2).

c. Waters that exceed the nutrient thresholds, but there is insufficient information to fully assess the biological health of the stream. These waters are placed on the Study List (category 4d).

[5] Streams are also independently assessed using the nutrient impairment thresholds in the IWR (20 ug/L chlorophyll *a*, for example).

d. Waters that meet the nutrient thresholds, but there is insufficient information to assess the floral community. These waters will be placed on the Planning List for additional study (category 3c).

e. Waters that meet the nutrient thresholds, but are not biologically healthy. These waters will be placed on the Study List to determine the causative pollutant (category 4d). If the causative pollutant is determined to be a nutrient, the waterbody will be listed on the Verified List (category 5) for nutrient impairment even if the nutrient thresholds are attained.

f. Waters that exhibit an imbalance of flora, or exceed the nutrient thresholds and are not biologically healthy (fauna). These waters are placed on the Verified List (category 5).

For category "f" waters above where nutrients are identified to be a causative pollutant, the Department will develop a site specific response (such as a TMDL), at which point the waterbody would fall under "Hierarchy 1" after formal Department action (with subsequent EPA approval).

Examples of Hierarchy 3

✓ Waters achieving the nutrient thresholds that are also biologically healthy.

- *Little Manatee River*
    - *Status*: Has no primary site specific interpretation, but satisfies reference-based nutrient thresholds and is determined to have healthy biology (both flora and fauna).
    - *Action required*: No additional action required. Place assessed condition in category 2 of the Integrated Report.

✓ Waters that exceed the nutrient thresholds, but are biologically healthy.

- *Econfina River*
    - *Status*: Has no primary site specific interpretation. Exceeds reference-based nutrient thresholds due to natural swamp inputs, but has sufficient floral and faunal information to determine that it is biologically healthy.
    - *Action required*: Achieves NNC. No additional action required. Place assessed condition in category 2 of the integrated report.
- *Aucilla River*
    - *Status*: Has no primary site specific interpretation. Exceeds reference-based nutrient thresholds due to natural swamp inputs, has evidence of healthy fauna (SCI), but requires further study to gather additional required floral information.
    - *Action required*: Place on Study List to gather sufficient floral data to make final determination. Place in Category 4d.

- ✓ Waters that meet the nutrient thresholds, but are not biologically healthy based on either failing SCIs or floral measures. Waters with failing SCIs are placed on the Study List to identify stressor/causative factor(s), or are placed directly on the Verified List if stressor/causative information is available. Waters with evidence of imbalance based on floral measures are placed directly on the Verified List.

  - *Weeki Wachee River*

    - *Status*: Has no primary site specific interpretation. Achieves reference-based nutrient thresholds, but is determined not to be biologically healthy due to failing SCI and excess algal mats.

    - *Action required:* Because floral information is available, bypass Study List and place on Verified List for nutrient impairment (due to excess algal mats) and develop nutrient TMDL, which can serve as primary and independent site specific nutrient interpretation. The Department will provide documentation for the record to demonstrate how the biological data indicate an imbalance in flora and/or fauna. Place assessed condition in category 5 of the Integrated Report.

  - *Huckleberry Creek*

    - *Status*: Has no primary site specific interpretation. Achieves reference-based nutrient thresholds, but is determined not to be biologically healthy due to excess nuisance plant growth.

    - *Action required:* Because floral information is available, bypass Study List and place on Verified List for nutrient impairment (due to excess nuisance plant growth) and develop nutrient TMDL, which will serve as primary site specific nutrient interpretation. The Department will provide documentation for the record to demonstrate how the biological data indicate an imbalance in flora and/or fauna. Place assessed condition in category 5 of the Integrated Report.

- ✓ Waters that meet the nutrient thresholds, but do not have biological data (floral measures).

  - *Halls Branch*

    - *Status*: Has no primary site specific interpretation. Achieves reference-based nutrient thresholds, but no biological data are available.
    - *Action required:* Place on Planning List to gather sufficient floral data to make final determination. Place in Category 3b.

- ✓ Waters that exceed the nutrient thresholds and are not biologically healthy.

  - *New River*

    - *Status*: Has no primary site specific interpretation. Exceeds reference-based total phosphorus threshold and is not biologically healthy based on most recent SCI results.

Action required: Place on Verified List for nutrient impairment and develop nutrient TMDL, which will serve as primary site specific nutrient interpretation. The water could be delisted for nutrients if a Stressor Identification Study determines that factors other than nutrients are responsible for the degradation. Place assessed condition in category 5 of the Integrated Report.

Waterbody Types and Cases with Insufficient Information

In types of aquatic systems where the Department does not have sufficient information to accurately develop generally applicable NNC, such as Class III wetlands. The Department will continue to rely on existing assessment provisions contained in the Impaired Waters Rule to list these waterbodies. The Department will numerically interpret the narrative criterion as the information is developed.

Other Components of NNC

- *Attainment of the narrative criterion is assessed over a spatial area consistent with its derivation. For Tier 1 numeric interpretations based on paragraph 62-302.531(2)(a), F.A.C., the spatial application of the numeric interpretation is as defined in the associated order or rule. For lakes, the numeric interpretation shall be applied as a lake-wide or lake segment-wide average. Except for extremely large lakes (e.g., Lake Okeechobee, which has been subdivided), the lakes criteria apply to lakewide averages. For spring vents, the numeric interpretation shall be applied in the surface water at or above the spring vent. For streams, the spatial application of the numeric interpretation shall be determined by relative stream homogeneity and shall be applied to waterbody segments or aggregations of segments as determined by the site-specific considerations. The stream nutrient thresholds were derived though a distributional analysis of data from homogeneous reference stream segments, with the spatial extent of each stream segment typically measuring approximately five linear miles. Two or more stream segments may be combined if the nutrient data are homogeneous, which is evaluated through routine statistical tests, such as Analysis of Variance or Student's t-test, and if the results show that the segments are not significantly different at the 90 percent confidence level. Data will be transformed (e.g., log) prior to statistical analysis if the data are not normally distributed.*
- *Except for data used to establish historic chlorophyll a levels, chlorophyll a data shall be measured according to the Department document titled "Applicability of Chlorophyll a Methods" (DEP-SAS-002/10), and be corrected for, or free from, the interference of phaeophytin.*
- *If there is more than one hierarchy 1 interpretation for a given waterbody, the most recently adopted interpretation controls.*

NNC and Protection of Downstream Waters

Protection of downstream waters is required in the new nutrient standards by the statement, "The loading of nutrients from a waterbody shall be limited as necessary to provide for the attainment and maintenance of water quality standards in downstream waters." This provision is implemented by the Department by:

- *Using models to allocate to upstream watersheds when establishing the TMDL for the downstream waterbody;*
- *Requiring dischargers, at the time of permit issuance, to provide reasonable assurance that their effluent does not cause or contribute to nutrient impairments in the receiving waterbody and downstream waterbodies; and*
- *Identifying trends in nutrient concentrations in all waters, including downstream waters, during the assessment cycle.*

Water Quality Modeling

A watershed model, such as WASP or LSPC, can be applied to ensure that the narrative downstream water quality standard is achieved when developing and allocating TMDLs and when developing nutrient SSACs. The model can be used to ensure that "loading of nutrients from a waterbody shall be limited as necessary to provide for the attainment and maintenance of water quality standards in downstream waters."

Issuance of NPDES Permits

An upstream regulatory decision, such as a permit issuance, might be executed by evaluating the nutrient conditions of near-field and downstream waterbodies. Evaluating near-field conditions was described earlier. Downstream evaluations can be conducted similarly. For example, if a downstream lake is currently attaining its nutrient standards, then current conditions in the upstream waters provide for that attainment condition (*i.e.*, loading of nutrients from the waterbody would be limited at current conditions to provide for the continued attainment and maintenance of water quality standards in downstream waters). However, a Level II WQBEL will be needed to evaluate the impacts on downstream waters if the facility requests an increase in their permitted load.

If a downstream waterbody is not attaining nutrient standards, the permit could not be issued until reasonable assurance was provided that the facility's discharge was not contributing to the impairment. This can be done in response to a Department adopted TMDL, or through independent modeling conducted in the watershed. Once modeling is conducted, the results of that modeling can be used to ensure that loading of nutrients from the upstream waterbody is limited as necessary to provide for the attainment and maintenance of the water quality standards of downstream waters.

EVALUATION OF TRENDS

Even if both upstream and downstream waters are currently attaining nutrient standards or in situations where information for downstream waters is not available, the Department's nutrient standards include an evaluation of trends to ensure that conditions are not increased in a manner that could result in impairment downstream. Pursuant to Chapter 62-303, F.A.C., the Department assesses whether there is an adverse trend in nutrients (nitrate-nitrite, TN or TP) or a nutrient response variable (chlorophyll *a*) and if the waterbody is expected to become impaired. If statistically significant adverse trends are present in causal variables, then the waterbody will initially be placed on the Planning List[6] of potentially impaired waters so that a more rigorous statistical analysis can be conducted. If statistically significant adverse trends are present in causal variables after controlling for confounding variables and the waterbody is expected to become impaired within 10 years, then the waterbody will be placed on the Study List and the Department will develop a site specific interpretation of the NNC for the waterbody. This interpretation would likely be a nutrient SSAC, and would be implemented and applied to upstream waters feeding the waterbody including in NPDES permits for upstream dischargers as described in the section titled "WQBEL Procedures for Each Tier of the Hierarchy."

If statistically significant adverse trends are present in response variables (after controlling for confounding variables) and the waterbody is expected to become impaired within 5 years, then the waterbody will be placed on the Verified List for nutrient impairment, pursuant to subsection 62-303.450(4), F.A.C., and a TMDL will be developed, which will be a site-specific interpretation of the NNC and set levels/allocations to upstream waterbodies. The TMDL, which would include wasteload allocations for point sources and load allocations for nonpoint sources, would be implemented in NPDES permits for upstream dischargers as described in the section titled "WQBEL Procedures for Each Tier of the Hierarchy", and any needed reductions in nonpoint sources would be implemented via the BMAP for the TMDL, which is enforceable for nonpoint sources.

When evaluating changes over time, confounding, or exogenous variables, such as natural random phenomena (*e.g*., rainfall, flow, and temperature) often have considerable influence on the response variable in question (*e.g*., nutrient concentration or chlorophyll). By statistically accounting for exogenous influences, the background variability is reduced so that any trend present can be better observed. This process involves standard statistical modeling, such as least squares regression or LOcally WEighted Scatterplot Smoothing (LOWESS) analysis, with a subsequent analysis for increasing trend in the residuals. To be considered statistically significant, the *p* value associated with the residuals trend analysis shall be less than 0.05. If the slope of the projected trend line is expected to exceed either a nutrient or nutrient response variable endpoint within 10 or 5 years (and if there is evidence of anthropogenic nutrient enrichment), the waterbody shall be placed on the Study or Verified List, respectively.

This process involves two steps. First, if an increasing trend is determined for nutrients, the Department analyzes the statistical relationship between nutrients and the associated nutrient response variable to

[6] See the Section titled "Implementing the NNC Revisions to the Impaired Water Rule (Chapter 62-303, F.A.C)" for a full description of the Planning, Study and Verified Lists.

determine the level of nutrients at which imbalance would occur. Next, the Department would analyze the slope of the trend to determine if the response variable would exceed the level associated with imbalance within 5 or 10 years, given the trend observed in nutrients.

To illustrate this concept, data were analyzed from Station 3566 in the Weeki Wachee River. Based on flow adjusted residuals analysis, the Weeki Wachee River exhibits a statistically significant nitrate-nitrite trend. Although there is an apparent trend in the raw data (**Figure 4**), the influence of flow (**Figure 5**) was taken into account to determine the statistical validity of the trend. Note that the residuals plot (**Figure 6**) shows a more striking trend over time, and that the results are significant (p-value is < 0.001) with an increasing slope of 0.03 mg/L per month.

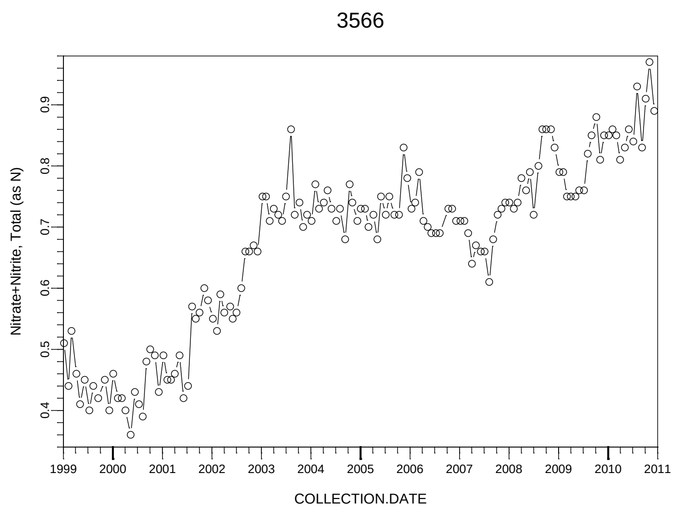

Figure 4. Nitrate concentrations in Weeki Wachee River over time.

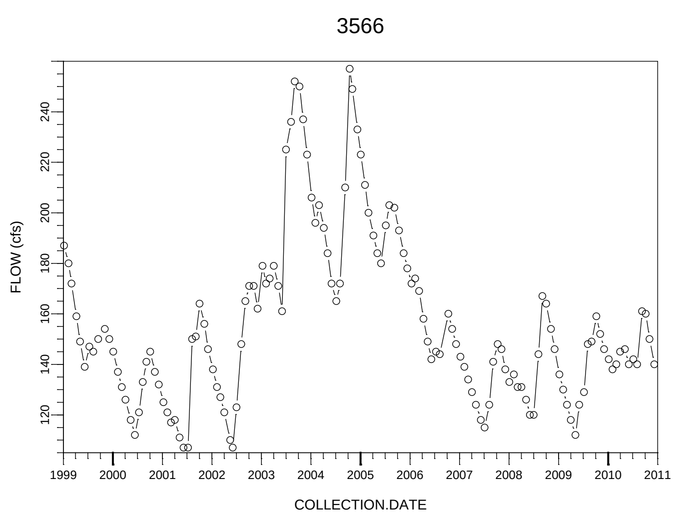

Figure 5. Weeki Wachee river flow (CFS) from 1999 to 2011.

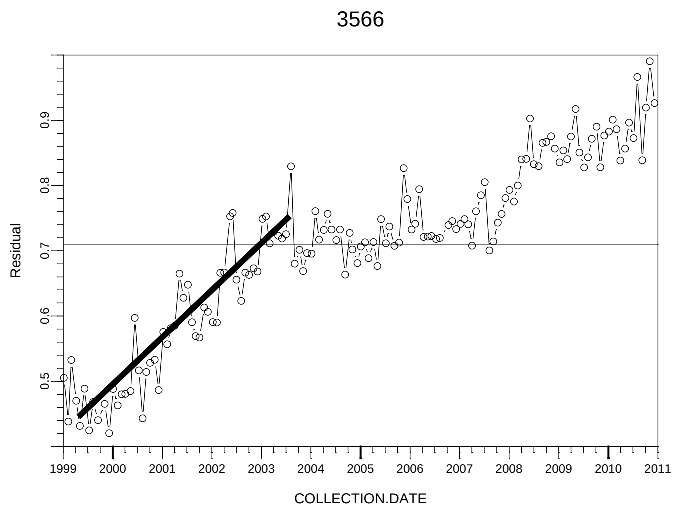

Figure 6. Weeki Wachee River residuals over time (derived from the flow vs. nitrate regression), highlighting the trend during the years from 1999 to 2003.

These data may be used to demonstrate how the Department would implement the adverse trend test, which is designed to determine if the water will be impaired within 5 years (for the Verified List), taking into consideration the current concentrations of nutrients or nutrient response variables and the slope of the trend. For example purposes, suppose the Department had adopted the adverse trend test prior to 1999, and suppose that site-specific algal responses in the Weeki Wachee River had led to the conclusion that a nitrate level of 0.71 would lead to failures of the Rapid Periphyton Survey. Based on the significant trend in the residuals plot, the Department would have estimated that this concentration of nitrate (0.71 mg/L) would be exceeded in 2003, allowing the Department to place the water on the verified list in 1999 and take action to reduce nitrate levels prior to the actual impairment occurring.

While this example focuses on the trends in nutrients in the Weeki Wachee River, it is important to note that downstream waters would also be assessed for trends. Any TMDL developed to address the increasing trend in nitrate levels would, in addition to protecting the Weeki Wachee River, have the added benefit of protecting downstream waters even if there were no observable increases in nutrients or nutrient response variable in the downstream waters.

TREND TEST SUMMARY

Because the trend test applies to lakes and estuaries, as well as the streams that feed them, it provides an enhanced method to assure that downstream waters are fully protected. In addition to the above example, if an adverse trend in TP were observed in a downstream lake or estuary, a site specific criterion would be developed for the waterbody prior to it becoming impaired, and this action would establish TP expectations for upstream waters at a level that would prevent the lake or estuary from exceeding the applicable nutrient criteria. The adverse trend test, which is linked to the numeric criteria necessary to protect recreation and healthy, well balanced aquatic communities, allows for Hierarchy 1 site-specific and highly accurate downstream protection values to be developed prior to the downstream waters from becoming impaired.

Discussion of TMDLs as NNC

- *Only State-adopted nutrient TMDLs are eligible as site-specific interpretations of the NNC.*
- *To be eligible, the nutrient TMDLs must be based upon prevention of imbalances of flora or fauna (paragraph 62-302.530 (47)(b), F.A.C.). Nutrient TMDLs that address dissolved oxygen (DO) impairment (paragraph 62-302.530 (47)(a), F.A.C.) would also be eligible if nutrients were identified as a causative pollutant and the TMDL demonstrated that it would also prevent an imbalance of natural populations of flora and fauna. As an example, surplus anthropogenic nutrients could be shown to generate excess plant biomass (periphyton, phytoplankton, or vascular plants), which could by themselves constitute an imbalance in flora or result in habitat smothering (e.g., excess periphyton accumulation), food web alteration (e.g., dominance of taxa that thrive in nutrient enriched conditions), or low DO (from decomposition or respiration of excess plant biomass), etc., that results in imbalances in fauna, as reflected by failing SCI scores or another meaningful biological endpoint (e.g., decline in seagrass coverage, reduced transparency, etc.). If the TMDL is written to prevent this cycle and then achieve DO, it could be eligible as the numeric interpretation of paragraph 62-302.530 (47)(b), F.A.C. Standard statistical tests, such as regression or other appropriate empirical or deterministic models, are used to demonstrate a "predictable and measurable" DO response to nutrients. The p value associated with the regression or other statistical model should be less than 0.05 and the variability in DO explained by nutrients should be sufficient (e.g., $r^2 \geq 0.25$) to expect that nutrient reductions would lead to improvements in DO and maintain or restore a healthy, well balanced biological community.*
- *Many TMDLs are expressed as loads instead of concentrations, but the loads do not have to be translated into concentrations to be deemed the numeric interpretation of the NNC.*
- *TMDLs may be modified based on new data, new science, or different targeted endpoints (such as DO). When TMDLs are modified and re-adopted, they become the new interpretation of the NNC.*
- *Future TMDL rules may include a response target (chlorophyll a, for example) designed to implement the NNC. Scientific information relating to the response target and the basis for existing TMDLs is presented in the TMDL reports; and this information can be used to establish a site-specific listing threshold for nutrient impairment pursuant to Rule 62-303.450, F.A.C.*

- *TMDLs may be written to achieve numeric nutrient values established in Chapter 62-302, F.A.C., (lakes or springs), or alternatively, to achieve conditions necessary to protect the NNC. If written to achieve the NNC, the site-specific thresholds used for the TMDL would become the numeric interpretation of the narrative pursuant to “1” of the hierarchy.*
- *After Rule 62-302.531, F.A.C., becomes effective, subsequently adopted hierarchy 1 nutrient TMDLs must be publically noticed as new numeric interpretations of the narrative criterion and as changes to state water quality standards. Consistent with the CWA, these site-specific interpretations will be submitted to EPA for review.*

Discussion of Site Specific Alternative Criteria as NNC

- *The restriction on establishing a Type II SSAC for nutrients pursuant to subsection 62-303.800(2), F.A.C., was eliminated in the revised rule adopted in December 2011.*
- *A new SSAC provision for a “Type III SSAC” was also adopted to allow a predictable approach to developing nutrient SSACs. The rule language provides clear expectations on the water quality and biological data needed to characterize existing nutrient concentrations and aquatic health, but the specific number of stations required for assessment will be determined on a site specific basis.*
- *Since numeric nutrient criteria are intended to protect healthy, well-balanced natural populations of flora and fauna, the existing nutrient concentrations are deemed protective if the biology is found to be healthy and protection of downstream waters is demonstrated pursuant to subparagraph 62-302.800(3)(a)3. The nutrient SSAC will need to address the natural variability in nutrient concentrations and must demonstrate that the designated uses are being protected in the waters covered by the SSAC and in downstream waters.*
- *As part of Type III SSAC development, aquatic life use support must be demonstrated. The phytoplankton, periphyton, vascular plant community, and benthic macroinvertebrates responses are used as primary evidence to demonstrate systems are meeting their designated use (as described above).*
- *Streams that do not exhibit excess algal growth or nuisance aquatic plants and where the average of two temporally independent Stream Condition Index (SCI) results is greater than 40 are biologically healthy, and the associated nutrient regime is demonstrated to be protective.*

IMPLEMENTING THE NNC REVISIONS TO THE IMPAIRED WATERS RULE (CHAPTER 62-303, F.A.C.)

The Impaired Waters Rule (IWR, Chapter 62-303, F.A.C.) provides a process to determine if waterbodies (or waterbody segments) should be placed on the Verified List of impaired waterbodies for subsequent TMDL development. The listings are made in accordance with evaluation thresholds, data sufficiency and data quality requirements in the IWR. The results of the assessment are used to identify waters in each basin for which TMDLs will be developed.

The process for determining impairment in individual waterbodies has been incorporated into the Department's Watershed Management approach. Under this approach, which is based on a 5-year basin rotation, Florida's 52 Hydrologic Unit Code (HUC) basins (51 HUCs plus the Florida Keys) have been distributed among 29 basin groups. These basin groups are located within the Department's six (6) statewide districts, with 5 basin groups in each of the Northwest, Central, Southwest, South, and Southeast Districts, and 4 basin groups in the Northeast District. One basin group in each district is assessed each year (except for the Northeast). **Table 6** lists the basin groups for each of the Department's districts that are included in each year of the basin rotation

Implementation of the TMDL Program (monitoring, assessment, identification of impaired waters, development of TMDLs, and implementation) under the rotating Watershed Management approach includes five distinct phases (**Table 7**). Development of the Planning, Study, and Verified Lists occur in the first two phases of the cycle. As described in greater detail below, there are approximately two years between the initial Phase 1 assessment and the final adoption of the Verified Lists [including the 303(d) list] at the end of Phase 2.

Table 6. Basin groups for implementing the watershed management cycle, by Department district..

- = No basin assessed

Dept. District	Group 1 Basins	Group 2 Basins	Group 3 Basins	Group 4 Basins	Group 5 Basins
Northwest	Ochlockonee–St. Marks	Apalachicola–Chipola	Choctawhatchee– St. Andrew	Pensacola	Perdido
Northeast	Suwannee	Lower St. Johns	-	Nassau–St. Marys	Upper East Coast
Central	Ocklawaha	Middle St. Johns	Upper St. Johns	Kissimmee River	Indian River Lagoon
Southwest	Tampa Bay	Tampa Bay Tributaries	Sarasota Bay–Peace–Myakka	Withlacoochee	Springs Coast
South	Everglades West Coast	Charlotte Harbor	Caloosahatchee	Fisheating Creek	Florida Keys
Southeast	Lake Okeechobee	St. Lucie–Loxahatchee	Lake Worth Lagoon–Palm Beach Coast	Southeast Coast–Biscayne Bay	Everglades

Table 7. Phases of the basin management cycle.

Phase	Schedule	Activities
Phase 1: Preliminary Basin Evaluation	Year 1	• Identify stakeholders/participants • Obtain data and enter into Florida STORET • Conduct public meeting to introduce cycle • **Primary Products:** **– Develop Planning List of potentially impaired waters to identify those waters that need more information to complete a full attainment decision.** **–Develop Strategic Monitoring Plan for information collection to complete a full attainment decision. (A full attainment decision allows the Department to place waters on the verified list if needed).**
Phase 2: Strategic Monitoring and Verified List Development	Years 2–3	• Carry out strategic monitoring to collect additional data identified in Phase 1 • Acquire additional data and enter into Florida STORET • Evaluate new data and incorporate findings into draft versions of Verified List of Impaired Waters and Delist List • Distribute draft Verified List of Impaired Waters and Delist List for review • Conduct public meetings and solicit comments from stakeholders on draft version of Verified List of Impaired Waters and Delist List • **Primary Products:** **–Finalize Verified List of Impaired Waters, Study List, and Delist List for Secretarial adoption** **–Adopt Verified List of Impaired Waters and Delist List by Secretarial Order** **–Submit finalized Verified List of Impaired Waters, Study List, and Delist List to EPA as update to 303(d) list**
Phase 3: TMDL Development	Years 2–4	• Complete TMDLs for verified impaired waters according to prioritization

Phase	Schedule	Activities
Phase 4: Development of BMAPs	Year 4	• Finalize management goals/objectives • Develop draft BMAP, including TMDL allocation • Identify monitoring and management partnerships, needed rule changes and legislative action, and funding opportunities • Develop Monitoring and Evaluation Plans • Seek funding • Obtain participant commitment to implement plans
Phase 5: Implementation	Year 5+	• Implement BMAPs • Carry out rule development/legislative action

In the first phase of the basin cycle, which lasts approximately six months (from July through December), the Department evaluates all readily available water quality data for the basin group using the methodology prescribed in the IWR to identify any potentially impaired waters or other waters that need additional data to determine the restoration actions needed. For the nutrient assessment, key provisions of the IWR include Sections 62-303.350 (Planning List), 62-303.390 (Study List), and 62-303.450 (Verified List), F.A.C. The Planning List provisions in the IWR for streams (Rule 62-303.351, F.A.C.) include two references to the numeric nutrient thresholds for streams (subsection 62-302.531(2), F.A.C.). Under subsection 62-303.351(1), F.A.C., streams can be placed on the Planning List for nutrient impairment if they do not attain the numeric interpretation of the NNC, which requires a combination of both nutrient and biological data to be fully assessed. Under subsection 62-303.351(2), F.A.C., streams can also be placed on the Planning List[7] if they exceed the numeric thresholds in subparagraph 62-302.531(2)(c)3, F.A.C., even if there is insufficient biological information to fully assess achievement of subsection 62-302.531(2), F.A.C..

Waters found to be potentially impaired are included on a *Planning List* for further assessment, and a Strategic Monitoring Plan (SMP) is prepared to ensure that the necessary monitoring is conducted during the second phase of the cycle. While the focus of the initial assessment is on the identification of potentially impaired waters, the assessment is comprehensive, and waters with sufficient information to qualify for the Study List or the Verified List will also be identified. Waters found to be impaired and the cause is known to be a pollutant are placed in category 3d to indicate that no additional data are needed to place the water on the Verified List in Phase 2. Waters that qualify for the Verified List are generally not prioritized for monitoring because sufficient data have already been collected; however, there may be cases where the Department may conduct additional monitoring (for example, to confirm the causative pollutant or to confirm suspect data). Regardless of whether additional data are collected, the waters will not be adopted on the Verified List until the end of Phase II of the cycle.

The SMP will also address sampling of waters that were placed on the Study List during the previous Watershed Management cycle. It should be noted that some of the waters on the Planning List will also qualify for the Study List during Phase 1. These waters will not be placed on the official Study List submitted to EPA for 303(d) list approval until the conclusion of Phase II and only in those circumstances

[7] These waters would also be eligible for the "Study List" if sufficient biological data are not collected during the Strategic Monitoring phase.

where the needed data or information is not collected during the strategic monitoring phase (due to drought, for example).

The second phase of the Watershed Management cycle includes two distinct activities: completion of the SMP and re-assessment of the basin's waterbodies using the new data. The strategic monitoring phase, which lasts a full calendar year, is focused on those waters that were placed on the Planning List during the first phase of the basin rotation or the Study List during the previous cycle, with the goal of ensuring that sufficient data and/or ancillary information are available to determine (*i.e.*, to "verify")—using the methodology described in the IWR—whether a waterbody segment is impaired and if the impairment is caused by a pollutant.

After the monitoring is completed, all of the waterbodies in the basin are re-assessed, taking into account the new data collected by the Department and any other new information from other data providers. This re-assessment process typically lasts another full calendar year, with draft assessments conducted in the spring and presented to the public in June, revised assessments conducted in the summer and presented to the public in the fall, and final lists adopted by the Secretary at the end of the year.

Waters are re-assessed for nutrient impairment pursuant to Rule 62-303.450, F.A.C. There has been some confusion expressed about the meaning of the text in Rule 62-303.450(3), F.A.C., which states that waters shall be placed on the Verified List "upon confirming the imbalance in flora or fauna based on the last 7.5 years of data." The only confirmation required is that the nutrient criteria have been exceeded within the last 7.5 years, and no additional biological information is required for waters listed on the Planning List under the referenced rule provisions. However, Rule 62-303.450(3), F.A.C., does not reference the Planning List rule provision that lists streams on the Planning List based on exceedances of the nutrient stream thresholds without sufficient biological information (Rule 62-303.351(2), F.A.C.). These waters will be targeted during the SMP so that they can be fully assessed against the numeric interpretation of the NNC for streams.

Waterbody segments identified and verified as impaired are placed on the state's Verified List of impaired waters, and those waterbody segments determined to be no longer impaired or in need of a TMDL are placed on the Delist List. After the additional year of data collection, surface waters or segments that do not attain surface water quality standards, but the cause of nonattainment is still unknown, or waters where there is still insufficient information to fully assess the water quality standard are placed on the *Study List* so that additional monitoring can be conducted to identify the cause of impairment or fully implement the water quality standard.

For waterbodies on the Planning List due to adverse trends in a nutrient or nutrient response variable, the Department will conduct additional trend analysis during Phase 2 to determine the appropriate listing category for the waterbody. Because it is well known that nutrient loads in natural watersheds may fluctuate according to climatologic, hydrologic, and/or seasonal patterns, it is important to control for these confounding factors when performing the trend analyses. The Department is confident that any increasing trends in anthropogenic nutrient loading will be observed using valid statistical approaches (*e.g*., regression and subsequent residuals analyses), because removal of confounding influences improves the ability to detect an anthropogenic signal. One of the following actions can occur related to trend assessments at the end of the Phase 2 analysis:

1. If the Department determines there is not a statistically significant increasing trend in TN, TP, or a nutrient response variable after controlling for confounding variables, then the waterbody will be removed from the Planning List for nutrients.

2. If the Department determines there is a statistically significant increasing trend in TN, TP, or a nutrient response variable after controlling for confounding variables and the waterbody is expected to become impaired within 6 - 10 years, then it will be placed on the Study List, pursuant to paragraph 62-303.390(2)(a), F.A.C.

   The waterbody will be removed from the Study List when a site specific interpretation (a SSAC in this case) of the NNC is established. If a site-specific interpretation of the narrative has already been established, then the waterbody will be re-evaluated to ensure the attainment and maintenance of water quality standards in downstream waterbodies.

3. If there is a significant adverse trend in a nutrient response variable and the waterbody is expected to become impaired within 5 years, then the waterbody will be placed on the Verified List for nutrient impairment, pursuant to subsection 62-303.450(4), F.A.C.

Both the Verified List and Delist Lists are adopted by Secretarial Order in accordance with the Florida Watershed Restoration Act (FWRA). Once adopted, the Verified, Delist and Study lists are submitted to the EPA for approval as an update to the state's Section 303(d) list of impaired waters.

As demonstrated through this process, a waterbody may be placed directly on the Verified List if sufficient data are available even if it was not previously identified as potentially impaired in Phase 1 of the Watershed Management cycle. Furthermore, there is no requirement that waters be placed on either the Planning List or Study List before they can be placed on the Verified List.

If a waterbody is placed on the Study List, it is the Department's goal to complete the needed monitoring/analysis during either the same or the next Watershed Management cycle. Because waters on the Study List will be included on the State's 303(d) list, there will be significant pressure by both the environmental and regulated communities to complete the needed studies in a timely manner. If resources allow, the Department will include a second strategic monitoring phase in the Watershed Management cycle (likely concurrent with Phase 3, TMDL Development). However, the Department may need to wait until the Strategic Monitoring phase of the next watershed cycle. As a result, the studies should be completed and the waterbody moved to the Verified or Delist List (as appropriate) within six years of placement on the Study List.

Assessment of Estuaries

As noted previously, the Department has adopted estuary-specific numeric interpretations of the NNC in paragraph 62-302.530(47)(b), F.A.C., for estuaries along the Southwest Coast (roughly from Tampa Bay to Miami and the Florida Keys). With the exception of the criteria developed for Tampa Bay, which are expressed as delivery ratios (addressed in next section), assessment of the estuary-specific numeric interpretations is straightforward because the listing thresholds for both the Planning and Verified Lists are directly based on exceedances of the adopted numeric interpretations of the NNC [see Subsections 62-303.353(1), and 62-303.450(3), F.A.C.] For this assessment, the only added review elements under the IWR include the time frame (10 years for Planning List and 7 years for the Verified List) and an evaluation of whether the data were collected under extreme climatic conditions (the Department will not list waters as impaired based solely on extreme climatic conditions or changes in the monitoring network).

For estuarine systems without adopted estuary-specific numeric interpretations of the NNC, the Department will continue to assess the NNC pursuant to Subsection 62-303.353(3), F.A.C. (Planning List) and Subsection 62-303.450(2), F.A.C. (Verified List), and assess the 11 ug/l chlorophyll *a* impairment threshold for estuaries pursuant to Subsection 62-303.353(2) (Planning List) and Subsection 62-303.450(1), F.A.C. (Verified List).

Assessment of Waterbodies with Interpretations of the NNC Expressed as Loads or Delivery Ratios

For waters with nutrient TMDLs expressed as a load, attainment of the allowable loads will be evaluated as part of the BMAP reporting process, and nonattainment will be assumed until information is provided to prove attainment (a combination of model estimated loads of nonpoint sources and measured loads from point sources). Waters should only be deemed to be in attainment if they meet the loads (or concentrations) and targets (*e.g.,* chlorophyll) and a demonstration is made that nutrients are no longer causing biological imbalances. If the waterbody attains the allowable loading but there is site-specific information indicating an imbalance in flora or fauna, the TMDL would be revisited and revised as needed.

For the Tampa Bay estuarine system where nutrient standards are expressed as a delivery ratio, the Tampa Bay Estuary Program has agreed, pursuant to their binding Reasonable Assurance agreement, to provide the hydrologic and loading information (for both point and nonpoint sources) needed to calculate and assess annual delivery ratios on at least a five year frequency, which is consistent with DEPs watershed assessment cycle. However, TBEP has agreed to evaluate chlorophyll *a* targets on an annual basis, and will provide the Department with the needed information more frequently if chlorophyll *a* targets are exceeded for two consecutive years.

IMPAIRED WATERS RULE ASSESSMENT SUMMARY

- *The IWR was revised to be consistent with the revisions to Chapter 62-302, F.A.C., including provisions to implement the NNC for lakes, springs, and streams.*
- *Streams that exceed reference-based nutrient thresholds will be placed on the Study List unless there are bioassessment data (flora and fauna) indicating the stream is healthy. Streams that exceed reference-based nutrient thresholds and have information that indicate imbalances of flora are placed directly on the Verified List. Waters on the Study List will receive a site-specific physical, chemical, and biological investigation to determine if aquatic life use support goals are attained (if there were no bioassessment data available), and if aquatic life use support is not attained, to determine the causative pollutant(s). This process constitutes a "stressor identification" study. If the stream is determined to be impaired due to nutrients (at least in part), the water will be listed on the Verified List for TMDL development, which will determine the reductions needed. This approach places waters on the Study List if there is a nonattainment condition based on the current numeric interpretation of the narrative criterion outlined above, and places waters on the IWR Verified List for nutrients if they need a reduction in a nutrient loading to attain the NNC or otherwise restore the waterbody's designated use.*

SURFACE WATER DISCHARGE WASTEWATER PERMITS

This chapter describes how the site-specific interpretations of the NNC in Rules 62-302.531 and 62-302.532, F.A.C., are implemented in surface water discharge domestic and industrial wastewater permits with reasonable potential (excluding municipal separate storm sewer system permits)(see **Figure 7**), including:

- *The permit application process;*
- *The expectations for providing reasonable assurance and for calculating Water Quality Based Effluent Limitations for nutrients; and*
- *How permits will be reviewed with respect to meeting numeric nutrient standards both in near-field receiving waterbodies as well as downstream waterbodies.*

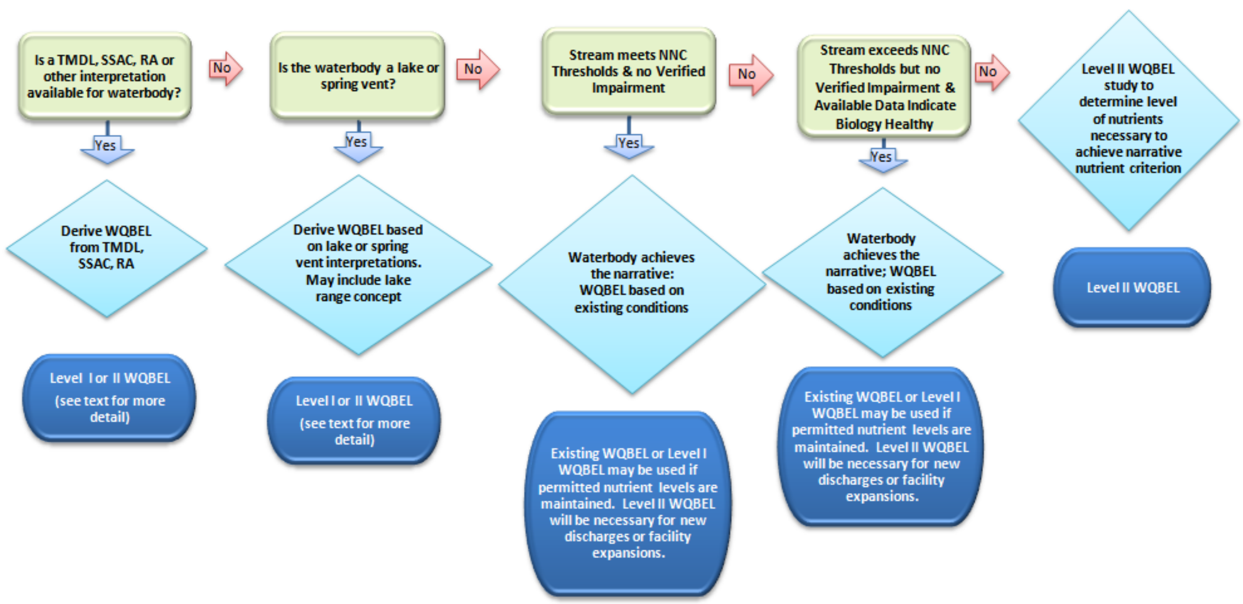

Figure 7. Flow chart illustrating the process by which NNC will be implemented in surface water discharge wastewater permits.

Although it is ultimately the Department's responsibility to assure that adequate documentation is in the administrative record for permitting decisions, Florida's permitting process puts the burden on the applicant to provide all of the necessary documentation for permit issuance. Rule 62-620.320, F.A.C., (Standards for Issuing or Denying Permits) requires that:

> "(1) A permit shall be issued only if the applicant affirmatively provides the Department with reasonable assurance, based on a preliminary design report, plans, test results, installation of pollution control equipment, or other information, that the construction, modification, or operation of the wastewater facility or activity will not discharge or cause pollution in contravention of chapter 403, F.S., and applicable Department rules.

(2) If, after review of the application and any pertinent information, the Department determines that the applicant has not provided reasonable assurance that the construction, modification, or operation of the wastewater facility or activity will be in accordance with applicable statutes or rules, including rules of approved local programs under 403.182, F.S., the Department shall deny the permit, shall notify the applicant, and specify the reasons for the denial."

These information requirements are spelled out in the Department's "Guide to Permitting Wastewater Facilities or Activities Under Chapter 62-620, F.A.C." The guide reiterates the rule requirement that the applicant has the burden to submit documentation with the application providing reasonable assurances that the criteria in Chapter 62-302, F.A.C., and other applicable Department rules shall be met. If other Department orders or rules have established discharge limits that explicitly protect the narrative standard (in-stream, upstream, and downstream) in this type of segment, that limit is sufficient to implement numeric nutrient criteria as long as it continues to implement the standards at Rule 62-302.531(2), F.A.C.

The WQBEL process, pursuant to Chapter 62-650, F.A.C., is the mechanism for determining the levels of nutrients in a point source discharge (*i.e.*, effluent nutrient limits) that attain the NNC in paragraph 62-302.530(47)(b), F.A.C. Derivation of a level II nutrient WQBEL is a site-specific, hierarchy 1 interpretation of the NNC and the WQBEL derivation is based on the worst-case scenario (permitted flows) and the associated nutrient loads from a discharge. If downstream waters are anticipated to be potentially affected by the discharge of nutrients from an upstream facility, the potential impact must be assessed, regardless of distance (see section on "NNC and Protection of Downstream Waters").

Revisions to a WQBEL for existing discharges are implemented through the permit renewal process and compliance schedules may be used to give permittees time to come into compliance with any new requirements pursuant to the provisions of subsection 403.088(2)(e) and (f), F.S., and subsections 62-620.610(12) and 62-620.620(6), F.A.C. New or expanded discharges are subject to the antidegradation review, and if the discharge contains nutrients, it will need to have a WQBEL established and provide reasonable assurance at the time the permit is issued that the WQBEL will be met. Existing WQBELs are reviewed at the time of permit renewal (every five years), and if the factors associated with the derivation of the WQBEL have not substantively changed during the five year period, the WQBEL can be considered valid for another five year period.

WQBEL Procedures for Each Tier of the Hierarchy

1. In accordance with paragraph 62-302.531(2)(a), F.A.C., where a site specific numeric interpretation of paragraph 62-302.530(47)(b), F.A.C., has been established by the Department, that interpretation is the applicable interpretation. Such interpretations include Total Maximum Daily Loads (TMDLs), site specific alternative criteria (SSAC) for nutrients, Reasonable Assurance (RA) demonstrations, or other site-specific interpretations that are formally established by rule or final order of the Department. The applicable interpretations, if available, include both nutrient [*e.g.*, total nitrogen (TN) or total phosphorus (TP)] and response variables (*e.g.,* chlorophyll *a*). Where multiple interpretations have been made for a waterbody, the most recent is the applicable interpretation. If only one nutrient (*e.g.*, TP) has a numeric interpretation established in accordance with paragraph

62-302.531(2)(a), F.A.C., the numeric interpretation of the narrative nutrient criteria for the other nutrient (*e.g.*, TN) follows the hierarchy described in paragraph 62-302.531(2), F.A.C. The Department will maintain a listing of the site-interpretations established to date available on the Department website.

Site-specific interpretations are used to establish WQBELs as follows:

- *TMDLs – Where a TMDL[8] is the applicable interpretation, a WQBEL is derived in accordance with the Wasteload Allocation provided in the TMDL. In accordance with subsection 62-302.531(8), F.A.C., if the Wasteload Allocation is expressed as a load, the WQBEL can be expressed as a load[9] (i.e., there is no requirement to "translate" the load to a concentration for the WQBEL).*
- *SSAC – Where a SSAC is the applicable interpretation, a WQBEL is derived to ensure that the discharge does not cause or contribute to an exceedance of the SSAC within the spatial area to which the SSAC is applicable (e.g., if a SSAC for a stream segment has been established as an annual geometric mean of 40 µg/L total phosphorus, the WQBEL is calculated to ensure that the discharge does not cause or contribute to the stream segment exceeding an annual geometric mean of 40 µg/L), in all years. If the waterbody currently achieves the SSAC value, the Level I WQBEL process can be used to establish effluent limits consistent with permitted nutrient levels, but only if the permit applicant is not expanding its discharge above currently permitted levels and will not increase its nutrient concentrations over the permit cycle. However, if the waterbody does not achieve the SSAC or if the permit is for a new or expanded discharge, the Level II WQBEL process is more appropriate.*
- *Reasonable Assurance (RA) Demonstration – Where the Department has approved an RA demonstration pursuant to the subsection 62-303.100(5), F.A.C., related to nutrient impairment, the nutrient-related target in the RA demonstration can serve as the applicable numeric interpretation of the narrative nutrient standard. The WQBEL would then be calculated to ensure attainment of that numeric interpretation in the same manner as the TMDL or SSAC procedures, depending on how the RA demonstration was crafted. For example, if the RA demonstration included an allocation to a permitted facility, that allocation can be treated as the Wasteload Allocation similar to those contained in a TMDL.*

For the examples above that include a Wasteload Allocation, the WQBEL is established using the Level I process at Rule 62-650.400, F.A.C., to implement the site-specific interpretation of the narrative. If the Department determined that a facility will not cause or contribute to nutrient impairment and did not establish a Wasteload Allocation for the facility, permit limits are not required, pursuant to the TMDL; however, such a facility would not be allowed to increase its

[8] TMDL means a TMDL adopted under Chapter 62-304, F.A.C., that interprets the narrative water quality criterion for nutrients in paragraph 62-302.530(47)(b), F.A.C., for one or more nutrients or nutrient response variables.
[9] Note – permit load (mass) limits are generally expressed as a rolling annual load.

nutrient loading and permit limits may be needed if increased discharge is being sought. Where a TMDL, SSAC or RA Demonstration does not exist, a WQBEL is recognized as the applicable interpretation of the narrative nutrient criteria if:

a) The documentation for the WQBEL includes a site specific numeric interpretation of the narrative criterion at paragraph 62-302.530(47)(b), F.A.C., for the waterbody;
b) The WQBEL is established pursuant to the Level II Process contained at Rule 62-650.500, F.A.C.; and
c) The public notice for the WQBEL specifically states that the Level II WQBEL includes a site specific interpretation of the narrative for the receiving waterbody.

Where a Level II WQBEL has previously been established for discharge of nutrients to a waterbody and a TMDL, SSAC, or RA does not exist for the waterbody, the existing WQBEL remains in effect until revised by a Final Order that establishes a site specific interpretation of the narrative. Revisions to the WQBEL to reflect the site-specific interpretation will generally be implemented through the permit renewal process, and compliance schedules may be used to give permittees time to come into compliance. In certain cases permits may need to be re-opened prior to permit renewal to include revised WQBELs based on priority of restoration needs, time remaining before permit renewal, and workload considerations.

2. If there is no site-specific interpretation in effect as described in the preceding paragraph that is applicable to the receiving waters, but there is an established, quantifiable stressor response relationship between one or more nutrients and nutrient response variables for those waters, then the values set forth in paragraph 62-302.531(2)(b), F.A.C., are the applicable numeric interpretation of paragraph 62-302.530(47)(b), F.A.C. Such an interpretation has only been made at this time for lakes and spring vents. There are currently no discharges directly to spring vents and it is unlikely that such discharges will be proposed in the future. Effluent limits for discharges to ground waters in the springshed are developed through the standard process for groundwater discharges (see separate document on discharges to groundwater) or through the TMDL/Basin Management Action Plan process for that spring where sufficient information exists.

   For lakes, the WQBEL may be derived to ensure that the discharge does not cause or contribute to exceedances of the numeric interpretation for the waterbody segment, which is expressed as a lake average. As stated previously, Florida's wastewater permitting process puts the burden on the applicant to provide all of the necessary documentation for permit issuance, including demonstrating that their discharge will not cause violations of the water quality standards applicable to the lake. Depending on the circumstances of the lake, either a Level I or Level II WQBEL is established that implements this numeric interpretation of the narrative criteria. This is accomplished as follows:

- *If the discharge can meet the applicable numeric interpretation, a Level I WQBEL is calculated to ensure the discharge does not exceed the Total Nitrogen and Total Phosphorus values contained in sub-subparagraph 62-302.531(2)(b)1.a., F.A.C.; or*

- *For existing discharges, a Level I WQBEL can be established at permitted nutrient loads if the receiving lake attains the numeric interpretation of the narrative expressed at sub-subparagraph 62-302.531(2)(b)1.a., F.A.C.; or*
- *For new or expanded discharges to a lake that attains the applicable criteria, a Level II WQBEL must be established that ensures the lake will continue to attain the numeric interpretation of the narrative; or*
- *If the lake does not attain the baseline TN or TP values in sub-subparagraph 62-302.531(2)(b)1.a., F.A.C., but attains the applicable chlorophyll a value in sub-subparagraph 62-302.531(2)(b)1.a., F.A.C., a Level II WQBEL must ensure attainment of the applicable chlorophyll a value in all years. The Level II WQBEL must also ensure that ambient lake nutrient conditions do not exceed the upper end of the range Total Nitrogen and Total Phosphorus limits in sub-subparagraph 62-302.531(2)(b)1.b., F.A.C.*

In any case, a new or expanded discharge would need to conduct water quality modeling during critical conditions to provide the reasonable assurance that the discharge will not cause a violation of lake water quality standards during critical conditions. Note that the WQBEL is subject to change upon permit renewal if a site specific interpretation is established pursuant to paragraph 62-302.531(2)(a), F.A.C.

3. For streams in which an applicable interpretation (*i.e.*, TMDL, SSAC, RA) has not been made as described in paragraph 1, the provisions set forth in paragraph 62-302.531(2)(c), F.A.C., are the applicable numeric interpretation of paragraph 62-302.530(47)(b), F.A.C. A continuous discharge facility that has effluent nutrient concentrations greater than the applicable numeric nutrient thresholds adopted at Subparagraph 62-302.531(2)(c)2, F.A.C., will require that effluent limits be established as necessary to meet the nutrient standards in Chapter 62-302, F.A.C. In that case, a WQBEL that implements the numeric interpretation of the narrative criteria is derived as follows:

    - *If the stream receiving an existing discharge has evidence of balanced flora based on available information on chlorophyll a levels, algal mats or blooms, nuisance macrophyte growth, and changes in algal species composition and either is achieving the reference thresholds at subparagraph 62-302.531(2)(c)2., F.A.C., or there is evidence of balanced fauna based on available Stream Condition Index (SCI) scores[10], the waterbody will be deemed to have attained the standard at paragraph 62-302.531(2)(c), F.A.C., and the narrative criterion of paragraph 62-302.530(47)(b), F.A.C. In that case, the Level I WQBEL process is used to establish effluent limits consistent with permitted nutrient loads if the permit applicant is not expanding its discharge above currently permitted levels and will not increase their nutrient concentrations over the permit cycle. However, if a facility is discharging significantly below its permitted capacity, the Department will review the WQBEL that was the basis for the current*

[10] See Section 2.7 of the SCI Primer for details on the floral assessment.

permit limits to ensure that it is still a valid interpretation of the NNC. The Level II WQBEL process is available for new discharges or facility expansions that result in increased nutrient loads[11]*. A WQBEL for a new or expanded nutrient discharge must ensure that a healthy, well balanced floral community will be attained at the proposed discharge, and that either the nutrient thresholds will be achieved in the receiving stream (averaged over appropriate stream segments with homogeneous water quality) or that the waterbody has healthy fauna (SCI). If SCI measurements indicate that the waterbody is not biologically healthy AND a stressor identification study indicates that nutrients are the cause, the WQBEL that prevents nutrients from impacting stream fauna would need to be calculated.*

If insufficient biological data are available[12] *to determine if the stream is healthy, pursuant to paragraph 62-302.531(2)(c), F.A.C., the applicant may collect additional biological data to provide reasonable assurances. If the additional biological data indicate that the stream is not healthy, the following scenario will apply.*

- *If the stream receiving an existing discharge has evidence of imbalance in flora based on available information on chlorophyll a levels, algal mats or blooms, nuisance macrophyte growth, then the waterbody is not achieving the narrative criterion of paragraph 62-302.530(47)(b), F.A.C., regardless of whether the reference thresholds at paragraph 62-302.531(2)(c), F.A.C. or the SCI thresholds are met. If the flora are determined to be healthy, but neither the reference thresholds at subparagraph 62-302.531(2)(c)2., F.A.C., nor the SCI thresholds are met, then the waterbody is also not achieving the narrative criterion of paragraph 62-302.530(47)(b), F.A.C. In that case, the discharge to that waterbody is not allowed unless a level II WQBEL is developed or other administrative process is implemented that ensures the discharge does not cause or contribute to nonattainment of subparagraph 62-302.531(2)(c)2., F.A.C. or the narrative criterion of paragraph 62-302.530(47)(b), F.A.C. In the circumstance where flora are balanced, but the SCI fails, a stressor identification study would likely be needed as part of the Level II WQBEL evaluation. Stressor identification studies evaluate and identify causes of biological impairment, including both pollutant and hydrologic/habitat related stressors.*

  Where a stream is verified as impaired for nutrients pursuant to the impaired waters rule, a site-specific interpretation of the narrative nutrient standard will be developed as part of the TMDL process, which will include Wasteload Allocations for discharges to the stream. The subsequent WQBEL would be consistent with the Wasteload Allocation. As noted previously, the WQBEL is

[11] Since paragraph 62-302.532(7)(d), F.A.C., specifies that the spatial application of the numeric interpretation shall be determined by relative stream homogeneity and shall be applied to waterbody segments or aggregations of segments as determined by the site-specific considerations, mixing zones are not applicable.

[12] Biological data are available to the applicant through the Department's website at http://ca.dep.state.fl.us/mapdirect/?focus=waterdatacentral

subject to change upon permit renewal if a site specific interpretation is established pursuant to paragraph 62-302.531(2)(a), F.A.C.

WQBELs established by all of the above methods must prevent discharges from causing or contributing to a violation of the NNC in paragraph 62-302.530(47)(b), F.A.C. Also, in accordance with Subsection 62-302.531(4), F.A.C., WQBELs cannot allow the loading of nutrients from a waterbody to cause or contribute to an exceedance of water quality standards in a downstream waterbody. The reasonable assurance demonstration that the construction, modification, or operation of the wastewater facility or activity will meet this requirement may include information that: a) water quality standards of downstream waters are being attained with the existing discharge, b) the existing or future discharge does or will not affect downstream waters, or c) the discharge is in compliance with downstream TMDLs.

Finally, a permittee has the option of pursuing relief from any of the above site-specific interpretations through the establishment of Site Specific Alternative Criteria under Rule 62-302.800, F.A.C., a variance under the provisions of 403.201, F.S., or a designated use modification under Rule 62-302.400, F.A.C.

BASIC Information Needs for Distinguishing Flowing Waters under 62-302.200(36) F.A.C.

The definition of stream in Rule 62-302.200(36), F.A.C., states:

> (36) “Stream” shall mean, for purposes of interpreting the narrative nutrient criterion in paragraph 62-302.530(47)(b), F.A.C., under paragraph 62-302.531(2)(c), F.A.C., a predominantly fresh surface waterbody with perennial flow in a defined channel with banks during typical climatic and hydrologic conditions for its region within the state. During periods of drought, portions of a stream channel may exhibit a dry bed, but wetted pools are typically still present during these conditions. Streams do not include:
>
> (a) Non-perennial water segments where fluctuating hydrologic conditions, including periods of desiccation, typically result in the dominance of wetland and/or terrestrial taxa (and corresponding reduction in obligate fluvial or lotic taxa), wetlands, portions of streams that exhibit lake characteristics (*e.g*., long water residence time, increased width, or predominance of biological taxa typically found in non-flowing conditions), or tidally influenced segments that fluctuate between predominantly marine and predominantly fresh waters during typical climatic and hydrologic conditions; or
>
> (b) Ditches, canals and other conveyances, or segments of conveyances, that are man-made, or predominantly channelized or predominantly physically altered; and
>
> 1. Are primarily used for water management purposes, such as flood protection, stormwater management, irrigation, or water supply; and
>
> 2. Have marginal or poor stream habitat or habitat components, such as a lack of habitat or substrate that is biologically limited, because the conveyance has cross sections that are predominantly trapezoidal, has armored banks, or is maintained primarily for water conveyance.

The Department applies relevant water quality standards while implementing programs such as assessing waterbodies for attainment of water quality standards under 403.067, F.S., or implementing the NPDES permitting programs. When applying the nutrient standards adopted in Rule 62-302.531(2), F.A.C., the Department will make clear whether the standards for streams adopted in Rule 62-302.531(2)(c), F.A.C., are applicable. In implementing water quality standards and evaluating whether a particular waterbody meets the provisions of 62-302.200(36)(a) or (b) F.A.C., the Department will provide public notice and request information relevant to the application of water quality standards, including the purpose of the waterbody such as flood protection, stormwater management, irrigation, water supply, navigation, boat access to an adjacent waterbody, or frequent recreational use relevant to 62-302.200(36)(b)1. F.A.C. The Department will consider all relevant information in implementing water quality standards and maintain the administrative records of such decisions, which are available to the public.

General Information

Until a Class I or III stream segment is identified as meeting the provisions in Rule 62-302.200(36)(a) or (b), F.A.C., the criteria in Rule 62-302.531(2)(c), F.A.C., will apply. Interested parties wishing to distinguish the characteristics of a waterbody with respect to provisions in Rule 62-302.200(36), F.A.C., may provide the Department with the applicable information set forth in the stream definition.

A clear delineation of the geographic boundaries of the segment in question is necessary so that the Department knows exactly where applicable criteria apply. Delineation of segment boundaries can include physical, biological, and chemical information, such as intersections of tributaries into a segment, control structures, the interface of wetlands, or other factors that indicate that the homogeneous physical, biological, or chemical condition of the segment would change at the boundary.

For waters that meet the definition of 62-302.200(36)(a) or (b) F.A.C., the Department shall follow the Impaired Waters Rule at 62-303 F.A.C.

Non-Perennial Water Segments

The stream nutrient water quality standards adopted by the Department are not designed to apply to wetlands or uplands. The method for identifying non-perennial water segments is fundamentally based on the use of biological information to indicate the long term hydrologic condition of the water segment. Specific biological taxa can indicate where a perennial stream segment transitions to a system more characteristic of wetland or upland conditions.

To identify whether a segment is a non-perennial water segment, the biological information identified below will be evaluated by the Department. Other methods that provide this demonstration with similar accuracy will be accepted by the Department if they are a means to predicting the resulting biological conditions discussed below.

Vascular Plants as Indicators

Many plants and animals are adapted to survive in a specific hydrologic regime. The Department has long relied on lists of vascular plants (including obligate wetland indicators, facultative wetland indicators, and facultative (neutral indicators) as one component of the method used to identify and delineate wetland boundaries, as defined in Chapter 62-340, F.A.C. Vascular plant community composition may be used to assist in distinguishing streams from non-perennial water segments. Often, both of these types of systems contain few or no rooted herbaceous plants in the stream channel, because natural turbidity, canopy cover, and color reduce the light available for photosynthesis. If there are herbaceous plants present, perennial and non-perennial systems often share many taxa, particularly in areas where they transition to adjacent floodplains. However, the presence of certain facultative or facultative-wetland herbaceous species within the stream bed can be a valid indication that the stream is non-perennial, as these taxa may require moist or saturated conditions to germinate and grow, but would **not tolerate** the inundation of a perennially flowing stream. Examples of these taxa include, grasses such as *Chasmanthium latifolium* and *Tripsacum dactyloides*, sedges such as *Cyperus esculentus* and *Cyperus retrorsus*, forbs such as *Cuphea cartagenensis*, *Bidens pilosa*, and *Sphagneticola trilobata*, and ferns such as *Woodwardia virginica* and *Thelypteris* spp. (see complete lists of obligate wetland, facultative wetland and facultative taxa in Chapter 62-340, F.A.C.). During a habitat assessment or Linear Vegetation Survey conducted during a site visit, the presence of facultative and facultative wetland herbaceous vascular plant taxa in the channel bed would be an indicator that the system is non-perennial. Many plants within a permanently wetted channel are aquatic plants, which are defined but not listed in Chapter 62-340, F.A.C. Under extreme dry conditions, terrestrial taxa could also invade the channel bed of a non-perennial system.

MACROINVERTEBRATES AS INDICATORS

Macroinvertebrates may be used to distinguish perennial from non-perennial /wetland systems. Many invertebrates (rheophyllic taxa) require relatively consistent inundation and water velocity to complete their life cycle, although they have mechanisms to survive extreme drought conditions, when perennial streams may be reduced to a series of pools. Other (mostly wetland) taxa are adapted to survive the frequent (generally annual) periods of desiccation associated with non-perennial streams or wetlands. Some invertebrate species could be classified as facultative, able to occupy both perennial and non-perennial streams. This similarity in fauna is due in part to colonization of non-perennial streams by movement of invertebrates from nearby perennial waters, especially those with adaptations that allow them to survive in temporary environments, such as a multivoltine life cycle, highly mobile adults, and rapid growth during the wet season. Some rarely inundated non-perennial streams may be either completely lacking in aquatic invertebrates (terrestrial animals may be present), or have a limited number of facultative species that can complete their life cycles rapidly before the stream dries.

The Department has compiled lists of taxa to assist with distinguishing perennial from non-perennial streams/wetland systems (**Tables 8 and 9**). Rule 62-302.531(2)(c), F.A.C., **does not** apply to non-perennial water segments where there is a dominance of wetland and/or terrestrial taxa (and corresponding reduction in obligate fluvial or lotic taxa) or to wetlands. Rule 62-302.531(2)(c), F.A.C., **does apply** to perennial streams where drought conditions result in portions of a stream channel temporarily exhibiting a dry bed, but where wetted pools are still present.

Stream Condition Index ("SCI") sampling, the method normally used to collect stream invertebrate taxa, requires certain hydrologic conditions to distinguish the effects of natural drought from water quality issues. SCI sampling (following DEP Standard Operating Procedure SCI 1000) is conducted during periods when water velocity has been 0.05 m/sec or greater for at least 28 days or after a 6 month period if the site has gone completely dry. Following these SOPs ensures that perennial streams are typically dominated by taxa from **Table 8**, while non-perennial systems (which tend to transition into linear wetland strands) either would usually not be sampled for SCI or would typically be dominated by taxa in **Table 9**. The presence of long-lived aquatic species (benthic macroinvertebrates that require water for their entire life cycle) is another reliable method to determine if a stream is more characterized by perennial flow or wetland/terrestrial conditions. A list of long-lived taxa is included in DEP SOP SCI 2100.

For purposes of establishing segments that are excluded from the stream definition, the Department shall evaluate the taxa that occur in the segment, as well as the vascular plant information described above.

Table 8. The most commonly encountered invertebrate taxa in flowing streams in Florida. Taxa information was retrieved from the Florida Statewide Biological DataBase ("SBIO") and represents 5,309 perennial stream samples collected over the entire state. Some of the organisms are ubiquitous (*e.g., Chironomidae*) and are found in several system types, however, in flowing systems there are a large number of rheophyllic and long-lived taxa that are not commonly encountered in wetlands or non-perennial streams.

Taxa	# occurrences (n = 5309)
Hyalella azteca	3918
Stenelmis	3715
Cheumatopsyche	3515
Caenis (except C. diminuta)	3162
Rheotanytarsus exiguus grp.	3028
Microcylloepus pusillus	2913
Stenochironomus	2769
Dubiraphia vittata	2588
Polypedilum flavum	2575
Simulium	2503
Ablabesmyia mallochi	2402
Polypedilum scalaenum grp.	2222
Tubificidae	2056
Argia (except A. sedula)	2022
Oecetis	1992
Hydroptila	1990
Pentaneura inconspicua	1889
Palpomyia/bezzia grp.	1821
Tanytarsus sp. c epler	1780
Hemerodromia	1752
Corbicula fluminea	1696
Tanytarsus sp. l epler	1641
Hydrobiidae	1639
Enallagma	1590
Hydropsyche	1587
Baetidae	1533
Tricorythodes albilineatus	1516
Tanytarsus	1510
Caecidotea	1490
Micromenetus	1428
Sphaeriidae(mollusca)	1367
Neotrichia	1362
Thienemannimyia grp.	1347
Triaenodes	1315

Limnodrilus hoffmeisteri	1311
Pseudochironomus	1288
Heptageniidae (except Stenacron interpunctatum)	1286
Palaemonetes	1274
Ancyronyx variegatus	1256
Rheotanytarsus pellucidus	1156
Chimarra	1149
Cryptochironomus	1139
Cambaridae	1131

Table 9. The most abundant invertebrate taxa found in wetland systems in Florida from 169 samples retrieved from SBIO. The organisms are dominated by oligochaetes (*e.g.*, represented by the genera *Dero*, *Bratislavia* and others), midges (*e.g., Polypedilum* and *Goeldichironomus*), and damselflies and dragonflies (*e.g., Coenagrionidae* and *Libellulidae*).

Taxon	# of occurrences (n = 169)
Chironomus	105
Dero digitata complex	98
Polypedilum trigonum	96
Kiefferulus	80
Polypedilum tritum	67
Chaoborus	65
Libellulidae	65
Culicidae	60
Hydrocanthus	59
Enchytraeidae	58
Monopelopia boliekae	58
Goeldichironomus holoprasinus	56
Berosus	56
Dero	55
Dero vaga	51
Goeldichironomus	49
Dero pectinata	47
Bratislavia unidentata	46
Odonata	42
Dytiscidae	42
Dero lodeni	39
Oribatei	39
Aeshnidae (except Boyeria and Nasiaeschna)	38
Haemonais waldvogeli	36
Goeldichironomus natans	35
Belostoma	35
Uranotaenia	34

Pristinella longisoma	32
Callibaetis	32
Larsia berneri	31
Gastropoda	31
Pachydiplax longipennis	31
Arrenurus	30
Curculionidae	30
Pristina leidyi	28
Hydrovatus	28
Crangonyx	26
Pristina aequiseta	26
Buenoa	26
Anopheles	26
Callibaetis floridanus	25
Atrichopogon	25
Larsia	25
Corixidae	25
Pristina	25

Tidally Influenced Segments

Tidally influenced segments are those that fluctuate (daily, weekly, or seasonally) between predominantly marine and predominantly fresh waters during typical climactic and hydrologic conditions. The delineation of the segment is important as only portions of segments that are demonstrated to fluctuate between marine and fresh conditions are applicable under Rule 62-302.200(36)(a), F.A.C. The definitions of predominantly fresh and predominantly marine waters in Rule 62-302.200, F.A.C., are as follows:

> (29) "Predominantly fresh waters" shall mean surface waters in which the chloride concentration is less than 1,500 milligrams per liter or specific conductance is less than 4,580 µmhos/cm.
>
> (30) "Predominantly marine waters" shall mean surface waters in which the chloride concentration is greater than or equal to 1,500 milligrams per liter or specific conductance is greater than or equal to 4,580 µmhos/cm.

This distinction can be made with chloride or specific conductance data that were collected during typical hydrologic conditions, taking into account tidal cycles and seasonal and climatic variability. The presence of typical hydrologic conditions may be shown by tide and flow data that are temporally coupled with the water quality sampling events. The information (continuous or frequent grab sampling data) that demonstrates changing salinity conditions during a typical tidal cycle is necessary for the Department to differentiate the streams coverage under Rule 62-302.200(36), F.A.C.

Typical hydrologic conditions exclude periods of high rainfall or drought that would create flow conditions well outside of average annual flow conditions.

Domestic and industrial wastewater discharges with reasonable potential to discharge nitrogen and phosphorus in concentrations that can cause or contribute to nutrient impairments will receive water quality based effluent limits (WQBELs) consistent with Chapter 62-650, F.A.C., for total nitrogen and total phosphorus that implement State water quality standards related to nutrients (narrative and numeric). Florida has approximately 40 domestic and industrial discharges directly to tidally influenced segments of flowing waters with the reasonable potential to cause or contribute to nutrient impairments.

As part of the NPDES permitting process for domestic and industrial discharges, existing Florida law requires that such dischargers need to provide reasonable assurance that nutrient water quality standards will not be violated as a result of their discharge. For those waters that qualify as tidally influenced segments under Rule 62-302.200(36)(a), F.A.C., the water quality standards in Rule 62-302.531(2)(c), F.A.C., do not apply. WQBELs for NPDES permitted domestic and industrial wastewater discharges into such tidal segments will be based on the applicable numeric nutrient standards in waters both downstream (estuaries) and upstream (if tidally influenced), as well as the narrative nutrient water quality standard at the point of discharge. The establishment of numeric nutrient water quality standards in downstream and upstream waterbodies will expedite the derivation of WQBELs for discharges to these tidal segments. If other Department orders or rules have established discharge limits that explicitly protect the narrative standard (in-stream, upstream, and downstream) in this type of segment, that limit is sufficient to implement numeric nutrient criteria as long as it continues to implement the standards at Rule 62-302.531(2), F.A.C.

Water Management Conveyances

The stream definition in Rule 62-302.200(36)(b), F.A.C., excludes the following: Ditches, canals and other conveyances, or segments of conveyances, (hereafter referred to collectively as "conveyances"), that are man-made, or predominantly channelized or predominantly physically altered; and

1. Are primarily used for water management purposes, such as flood protection, stormwater management, irrigation, or water supply; and

2. Have marginal or poor stream habitat or habitat components, such as a lack of habitat or substrate that is biologically limited, because the conveyance has cross sections that are predominantly trapezoidal, has armored banks, or is maintained primarily for water conveyance.

The phrase "primarily used for" in the definition of stream does not modify the definition of "designated use" in Rule 62-302.200, F.A.C. The designated use continues to be defined by the classification system in Rule 62-302.400, F.A.C.

The following information will be used in identifying segments meeting the requirements in Rule 62-302.200(36)(b):

DELINEATION

Only those sections that meet the requirements in Rule 62-302.200(36)(b), F.A.C., are eligible to retain the narrative nutrient criteria. A map of the applicable areas for review must clearly delineate the upstream and downstream extent of the artificial conveyance.

PRIMARY WATER MANAGEMENT PURPOSE

Information must show that the current purpose of the man-made or physically altered conveyance is primarily water management such as flood protection, stormwater management, irrigation, or water supply. Relevant documentation can include photographic evidence, funding authorizations, operational protocols, local agreements, permits, memoranda of understanding, contracts, or other records that indicate how the conveyance is operated and maintained, and must verify that the design or maintenance of the conveyance allows the conveyance to currently function in a manner consistent with the primary water management purpose.

The phrase “primarily used for water management purposes” in Rule 62-302.200(36)(b)1., F.A.C., does not include use for navigation or boat access to an adjacent waterbody, or frequent recreational activities. The purpose of the design of the conveyance in conjunction with the purpose of any subsequent alterations or maintenance is evaluated to help differentiate whether its primary function is navigation, boat access to adjacent waterbodies, or frequent recreational activities; versus flood protection, stormwater management, irrigation, or water supply. If available information provided by the public, in response to public notice and request for information, or otherwise known by the Department, demonstrates that the segment is commonly used for navigation, boat access, or other frequent recreational activities such as swimming or boating, then the primary purpose is not water management and the department will apply the nutrient standards in Rule 62-302.531(2) F.A.C. Freshwater finger canals dug during the construction of neighborhoods designed to create homes with boat access to waterbodies are an example of a navigation or access as a primary purpose.

PHYSICAL ALTERATION THAT LIMITS HABITAT

The definition at Rule 62-302.200(36)(b)2., F.A.C., outlines that the conveyance must have marginal or poor stream habitat or habitat components that limit biological function because the conveyance has cross sections that are predominantly trapezoidal, has armored banks, or is maintained primarily for water conveyance. Photographic evidence of these limitations can demonstrate the habitat condition of the conveyance. Also, Standard Operating Procedures for conducting stream Habitat Assessments have been adopted by the Department in DEP SOP FT 3000. In order to qualify under Rule 62-302.200(36)(b)2., F.A.C., the overall Habitat Assessment score must score either marginal or poor.

The Habitat Assessment procedures include long-established criteria that can be used to demonstrate physical alterations in a system, and can provide information verifying that ongoing maintenance activities are associated with perpetuating those physical alterations. The lack of substrate and degree of artificial channelization are part of the definition and components of the Habitat Assessment scoring system, and a Habitat Assessment score must be completed by an individual with demonstrated proficiency (as per DEP SOP 3000) to indicate that the definition related to the segment’s modification is met. If there are different segments within the conveyance that exhibit different features, a Habitat Assessment is needed for each segment. The Department will conduct a Habitat Assessment if one was not previously conducted.

To ensure adequate water volume delivery, routine maintenance activities associated with conveyances used for water management purposes often involve removal of aquatic substrate (*e.g*., woody debris, aquatic and wetland vegetation), dredging of sediments, and/or removal of riparian trees. If the Substrate Diversity and Availability and Artificial Channelization metrics in the Habitat Assessment score in the Poor category, then one can conclude that the conveyance is predominantly altered and is being maintained in a manner to serve the primary purpose for water management. The overall habitat assessment may not rank as Poor due to other factors, but a primary factor being considered in the definition is the alteration and the maintenance of the conveyance. If the Substrate Diversity and Availability or Artificial Channelization scores are currently in the marginal range due to lack of maintenance of the conveyance at the time the assessment was completed, the Department will evaluate whether there is a maintenance program with a schedule to demonstrate that the conveyance is still being maintained for its primary water management purpose. If the overall Habitat Assessment score is other than poor or marginal, the conveyances would not meet the definition.

Appendix A. Minimally Disturbed and Healthy Streams

Table A-1. List of healthy streams (passing SCI) used to inform RPS expectations.

STORET ID	Station Description	RPS Average Percent 4 to 6 Scores	Mean SCI 2007 Score	SCI 2007 (n)
3497	Fisheating Creek @ Cr 27	0.0%	54	1
3509	ANCLOTE RIVER MOUTH AT S.R. 54	0.0%	47	1
3513	Withlacoochee River @ Stokes Ferry	40.4%	43	3
3531	S321 Econfina Creek	0.0%	73	1
3535	SUW010 Suwannee River	83.8%	61	1
3536	S418 Alaqua Creek	4.0%	90	1
3542	S250 Perdido River	9.1%	57	1
3545	S360 Blackwater River @ Hwy 4	4.0%	58	2
3546	S365 Yellow River @ Hwy 2	0.0%	79	1
3549	S377 Escambia River @ HWY 4 Bridge	0.0%	51	1
3554	FLO 57 162 0 Alafia River	28.8%	70	2
3555	Little Manatee River at HWY 301	2.5%	63	2
3569	Little Econlockhatchee River	5.1%	46	1
14264	SJB-LR-1006 BLACK CREEK	2.0%	73	1
21179	Spruce Creek	0.0%	45	1
21200	Rice Creek at SR100	4.0%	69	1
21201	Moultrie Creek	11.1%	63	1
21202	Orange Creek	1.0%	73	2
21460	Wrights Creek at CR 177A	4.0%	76	1
21461	BIG COLDWATER CR @ CR 191	1.0%	76	1
36366	Z2-LR-3010 Suwannee River	0.0%	57	1
36631	Z3-SS-3009 unnamed small stream	1.0%	83	1
36634	Z3-SS-3014 Trout River	2.0%	57	2
36636	Z3-SS-3038 Two mile Creek	1.0%	43	2
36639	Z2-SS-3003 Roaring Creek	0.0%	46	1
36641	Z2-SS-3016 unnamed small stream	31.8%	73	2
36642	Z2-SS-3030 unnamed small stream	0.0%	51	2
36646	Z2-SS-3068 unnamed small stream	1.0%	79	2
36648	Z2-SS-3075 unnamed small stream	0.0%	66	2
36998	Z4-LR-3004 Alafia River	21.7%	41	2
37003	Z4-LR-3022 Peace River	7.1%	48	2
37006	Z4-LR-3032 Anclote River	27.3%	43	2
37108	Z5-LR-3012 Lake Marion Creek	0.0%	45	1
37111	Z5-LR-3016 Boggy Creek	38.4%	47	2

STORET ID	Station Description	RPS Average Percent 4 to 6 Scores	Mean SCI 2007 Score	SCI 2007 (n)
37506	Z1-LR-3008 Big Water Coldwater	0.0%	82	2
37508	Z1-LR-3011 Holmes Creek	7.6%	64	2
37539	Z1-SS-3006 Alaqua Creek	0.5%	90	2
37540	Z1-SS-3007 Williams Creek	0.0%	67	2
37542	Z1-SS-3010 unnamed stream	2.5%	62	2
37543	Z1-SS-3012 unnamed stream	0.0%	60	2
37544	Z1-SS-3013 unnamed stream	0.0%	72	2
37545	Z1-SS-3022 titi creek	1.5%	76	2
37546	Z1-SS-3025 Alaqua Creek	1.0%	79	2
37547	Z1-SS-3026 Horsehead Creek	0.0%	46	1
37548	Z1-SS-3027 unnamed stream	4.0%	59	2
38195	Z3-SS-3049 South prong St. Mary's River	6.1%	93	1
38441	Z2-LR-4004 Withlacoochee River	0.0%	52	2
38442	Z2-LR-4005 Suwannee River	0.0%	50	2
38444	Z2-LR-4008 Aucilla River	0.0%	49	2
38445	Z2-LR-4009 Suwannee River	0.0%	41	2
38448	Z2-LR-4012 Aucilla River	11.1%	55	2
38450	Z4-LR-4002 Peace River	0.0%	52	2
38451	Z4-LR-4003 Braden River	8.1%	51	2
38453	Z4-LR-4005 Pithlachascottee River	0.0%	74	2
38454	Z4-LR-4006 Horse Creek	16.2%	58	2
38455	Z4-LR-4009 Withlacoochee River	24.2%	42	1
38458	Z4-LR-4012 N. Prong Alafia River	1.0%	62	2
38479	Z1-LR-4001 Ochlockonee River	0.5%	45	2
38480	Z1-LR-4002 Chipola River	0.0%	59	2
38481	Z1-LR-4003 Choctawhatchee River	4.0%	66	2
38482	Z1-LR-4004 East Fork Creek	20.2%	64	2
38484	Z1-LR-4006 Ochlockonee River	0.0%	58	2
38485	Z1-LR-4007 Chipola River	16.2%	58	2
38486	Z1-LR-4008 Yellow River	1.0%	66	2
38488	Z1-LR-4011 Yellow River	0.0%	67	2
38502	Z5-LR-4004 Boggy Creek	0.0%	57	1
38504	Z5-LR-4009 Fisheating Creek	35.4%	60	1
38520	Z3-SS-4008 Gee Creek	0.5%	48	2
38521	Z3-SS-4010 Simms Creek	0.0%	90	1
38525	Z3-SS-4023 Two Mile Creek	0.5%	47	2
38529	Z3-SS-4051 unnamed stream	2.0%	77	1

STORET ID	Station Description	RPS Average Percent 4 to 6 Scores	Mean SCI 2007 Score	SCI 2007 (n)
38559	Z1-SS-4003 unknown stream	4.5%	60	2
38560	Z1-SS-4006 unknown stream	0.0%	68	2
38561	Z1-SS-4009 unknown stream	0.0%	77	2
38562	Z1-SS-4013 unknown stream	0.0%	93	2
38563	Z1-SS-4015 unknown stream	0.0%	47	1
38564	Z1-SS-4017 unknown stream	5.1%	62	2
38565	Z1-SS-4018 unknown stream	0.0%	81	2
38566	Z1-SS-4022 unknown stream	0.0%	68	2
38568	Z1-SS-4027 unknown stream	0.0%	70	2
38570	Z5-SS-4008 Telegraph Creek	0.0%	54	1
38571	Z5-SS-4022 unnamed small stream	0.0%	58	1
38572	Z5-SS-4034 Gore Branch	7.1%	44	1
38573	Z5-SS-4041 Arbuckle Creek	0.0%	45	1
38574	Z5-SS-4056 Bedman Creek	0.0%	51	1
38580	Z6-SS-4010 Mosquito Creek	2.0%	57	1
38603	Z2-SS-4029 Water Oak Creek	0.0%	64	1
38605	Z2-SS-4033 unnamed Stream	0.0%	67	1
38607	Z2-SS-4040 Mitchell Creek	0.0%	62	1
38609	Z4-SS-4002 Oak Creek	33.3%	52	1
38610	Z4-SS-4004 Gator Creek	0.0%	52	2
38612	Z4-SS-4020 Blackwater Creek	14.1%	64	1
38614	Z4-SS-4024 unnamed stream	33.3%	59	1
19010006	ST MARYS RIVER AT SR #2	0.0%	103	1
19010041	St Mary's River at CR 125	0.0%	78	1
19010076	Calkins Creek at Turner Cemetery Road	0.0%	76	2
19020052	Alligator Ck east of US301 & SR115	0.0%	63	1
20010204	Lt Wekiva R, 100 yd dwnstr of Altamonte Spgs STP	38.9%	53	2
20010333	Robert's brnch @ curryville rd	20.7%	65	2
20010431	WEKIVA R. UPSTRM OF ROCK SPRINGS	65.7%	56	2
20010438	WEKIVA R UPSTR OF BLACKWATER CR	49.5%	82	1
20020317	SILVER RUN AT CONFLUENCE WITH BOAT RAMP CANAL	33.3%	57	1
20030388	PETERS CREEK #2 CULVERT SR 315	0.0%	86	1
20030481	South Fork Black Creek @ SR 21	0.0%	83	1
20030920	Mormon Branch upstream of SR 19 in Ocala NF	25.3%	69	3
21010008	ALAPAHA RIVER 1 SR 150 HAMILTON	9.1%	59	1

STORET ID	Station Description	RPS Average Percent 4 to 6 Scores	Mean SCI 2007 Score	SCI 2007 (n)
21010018	Falling Creek @ CR 131, above falls Suwannee R.	0.0%	54	2
21010033	Little Creek @ US 441	0.0%	89	1
21010040	Suwannee River above White Springs WWTP	3.0%	69	1
21010054	PCS Phosphate FYI5, test site 1	0.0%	52	1
21020001	SUWANNEE R U/S FR CONFL SWIFT CR	0.5%	58	2
21020062	SUWANNEE R ~ 150M D/S SWIFT CREEK	0.0%	52	2
21020098	Bethel Creek S Frk at SR 53	0.0%	76	1
21020124	LITTLE CR. ~ 300 M UPSTREAM SUWANNEE R	0.0%	73	2
21030011	SANTA FE R #6 AT SR 47	90.9%	49	1
21030049	NEW RIVER AT SR 18	0.0%	76	1
22020093	Quincy Creek above SR267 bridge	0.0%	57	1
22040004	AUCILLA R AT US 90	0.0%	61	1
22040009	WASCISSA R #1 AT BIG BLUE SPRING	65.7%	40	1
22040041	Wacissa River Bio Site 2	4.0%	65	1
22050083	Steinhatchee @ Canal Road	34.3%	52	2
23010444	WITHLACOOCHEE R@CANOE LAUNCH IN LACOOCHEE PARK	29.3%	52	1
23010464	Withlacoochee R @ county park off Auton Rd (TP3)	5.6%	43	2
23020001	Waccasassa R at US 19	20.2%	66	2
23020020	Waccasassa River @ WMA	0.0%	80	2
23020021	Waccasassa River @ OB Road #3	0.0%	82	2
24010002	Manatee R 20 m below SR64 bridge (TP1)	41.4%	64	1
24010063	Gamble Crk, East on Golf Course Rd.	2.0%	43	2
24020080	Alafia Rv- TP 80	8.6%	55	2
24020361	Alafia River S Prong @ Bethlehem Road	0.0%	67	1
24030044	Hillsborough R in Hills River State Park (TP5)	3.5%	66	2
24030081	Itchepackasassa Ck @ CR 582	0.0%	58	2
24040072	Anclote River @ Green Brooks Estates	0.0%	45	2
25020013	BOWLEGS CREEK MT PISGAH RD	0.0%	60	1
25020015	PEACE R AT SR64 ZOLFO SPRINGS	18.2%	43	1
25020111	Horse Creek @ SR 72 Bridge	41.9%	70	2
25020291	Troublesome Creek at Dansby Road	0.0%	59	1
25020292	Joshua Creek at airport road	37.4%	47	1
25020293	Peace River @ 664A	16.2%	48	1

STORET ID	Station Description	RPS Average Percent 4 to 6 Scores	Mean SCI 2007 Score	SCI 2007 (n)
25020294	Charlie creek at Sweetwater Road	6.1%	61	1
25020295	Paynes creek at State Park	12.1%	63	2
25020296	Paynes Creek at Hobbs Road	0.0%	61	1
25020300	Hawthorne Creek at Reynolds	12.1%	59	1
25020423	HORSE CREEK AT SR70	56.6%	57	1
25020427	HORSE CRK AT SR 665 BRDG	8.1%	48	1
25020548	Little Charley Bowlegs Ck, Highlands Hammock SP	0.0%	46	1
25020550	HOG BAY at CR 763 (S of Arcadia)	12.1%	53	1
25020553	Myrtle Slough- East Brch Punta G. Ref site	0.0%	56	2
25022977	Charlie Cr upstream of US27. Horse Cr short term study	19.2%	71	1
25022983	Horse Cr,located on Royal Park Estates, south of US72. Horse Cr short term study	18.2%	60	2
25030009	MYAKKA RIVER ABOVE SR 70 BRIDGE	0.0%	59	1
26010430	Fort Drum Creek @ US441	0.5%	49	2
26010614	Carter Creek @ Riverdale Rd	0.0%	72	1
27010050	Moses Creek @ US 1	0.0%	60	1
27010070	STEVENS BR OFF CR 204 SOUTH OF PELICER CEMETARY	13.1%	76	1
27010337	Horse Creek at Croton Road, Eau Gallie	4.5%	40	2
27010579	Tomoka River @ Eleventh Street Bridge	6.1%	56	3
28010081	LOX R AT TURNPIKE. W OF JUPITER	0.0%	44	2
28020147	HICKEY CREEK 1 MI SOUTH OF SR80	0.0%	52	2
28020155	Bedman Creek at Betts house	0.0%	46	2
31020012	CHIPOLA R HWY 274 CROSS CHIPOLA	0.0%	42	1
32008102	SFTRIB_ARSP	0.5%	53	2
32010066	SHAW STILL BRANCH E COLLEGE DR. TALL. BASE LINE	18.2%	45	2
32010121	Mill Creek Eglin AFB Golf Course below 17th HoleJAX GRD stream restoration proj.	3.0%	59	2
32010268	Turkey Creek (Bolton) East of Niceville	55.1%	55	2
32020258	Holmes Creek at 276A	0.0%	56	1
32030023	ECONFINA CREEK AT SCOTT RD	1.0%	82	1
33010112	Coffee Cr 1800Ft N of Stiller Lake Rd	0.0%	63	1
33030003	BIG COLDWATER CR E FORK HWY 4	2.0%	72	1
283430821152	Little Withlacoochee River at River Junction recreation area	0.0%	79	1

STORET ID	Station Description	RPS Average Percent 4 to 6 Scores	Mean SCI 2007 Score	SCI 2007 (n)
27051558216422	Deer Prairie Slough, on land acquired by Sarasota County	2.0%	74	1
27422738148581	Whidden Cr at Unnamed Rd off of Rt 17/35	1.0%	52	1
27514908208136	N.Prong Alafia at Alderman Ford Park	0.0%	77	1
28152268239035	Pithlachascotee River at Starkey Blvd, upstream of bridge	0.0%	48	2
273116508208152	East Fork Manatee R. S of US62 on Duette Park. Myakka DOSSAC study	0.0%	71	1
28020299FTM	BEE BRANCH SITE 2	0.0%	49	1
3598-B	Sampson River	1.0%	65	1
BAK208GS	St. Mary's River - BAK208GS	0.0%	50	1
CHA627GS	Alligator Creek - CHA627GS	0.0%	45	2
CLA243LV	Ates Creek - CLA243LV	0.0%	91	1
CLA246GS	Peters Creek - CLA246GS	0.0%	83	2
CLA254LR	Black Creek - CLA254LR	0.0%	91	1
DEP010C1	Deep Creek @441	0.0%	80	1
FAL020C1	Falling Creek @C-131	0.0%	55	1
GAD106GS	Yon Creek - GAD106GS	0.0%	81	1
GLA630GS	Cypress Branch - GLA630GS	0.0%	63	1
HAR610GS	Oak Creek - HAR610GS	1.3%	57	3
LAF176GS	Bethel Creek - LAF176GS	0.0%	61	1
LIB104LV	Mule Creek - LIB104LV	0.0%	67	1
LOCBCC	Little Orange Creek below Cabbage	0.0%	89	1
MPS	St. Mary's River middle prong	0.0%	71	1
MRN504LR	Rainbow River - MRN504LR	42.4%	62	2
NUTREF001	Telogia Creek at CR 1641	0.0%	78	1
OSC686LV	Crabgrass Creek	0.0%	62	1
PUT308GS	Little Orange Creek - PUT308GS	0.0%	75	1
ROB01C1	Robinson Branch @C-246	0.0%	81	1
S231	Attapulgus Creek @ 159	0.0%	65	1
S232	Swamp Creek @ 159	0.0%	51	1
SFR030C1	Santa Fe River @ 18 Worthington Springs	0.0%	64	1
SPRINGS006	Wakiwa (Wekiva) R. ab. Rock Spgs run	45.5%	41	1
SSR	Silver River above confluence of Oklawaha River	32.3%	46	1
UNI234LV	Olustee Creek - UNI234LV	0.0%	44	1
WAK168LR	St. Marks River - WAK168LR	15.2%	45	1

Table A-2. List of benchmark streams used to establish RPS and LVS expectations.

STORET ID	Station Description	WBID	RPS Average Percent 4 to 6 Scores
3531	S321 Econfina Creek	553	0.0%
3545	S360 Blackwater River @ Hwy 4	24C	4.0%
3546	S365 Yellow River @ Hwy 2	30	0.0%
3549	S377 Escambia River @ HWY 4 Bridge	10C	0.0%
3554	FLO 57 162 0 Alafia River	1621B	28.8%
21201	Moultrie Creek	2493	11.1%
38482	Z1-LR-4004 East Fork Creek	18A	20.2%
38486	Z1-LR-4008 Yellow River	30B	1.0%
38570	Z5-SS-4008 Telegraph Creek	3236A	0.0%
19010006	ST MARYS RIVER AT SR #2	2097K	0.0%
19010041	St Mary's River at CR 125	2211	0.0%
19010076	Calkins Creek at Turner Cemetary Road	2264	0.0%
20030388	PETERS CREEK #2 CULVERT SR 315	2444	0.0%
20030481	South Fork Black Creek @ SR 21	2415E	0.0%
20030920	Mormon Branch upstream of SR 19 in Ocala NF	2905	25.3%
21010008	ALAPAHA RIVER 1 SR 150 HAMILTON	3324	9.1%
22020093	Quincy Creek above SR267 bridge	1303	0.0%
22040009	WASCISSA R #1 AT BIG BLUE SPRING	3424	65.7%
22040041	Wacissa River Bio Site 2	3424	4.0%
22050083	Steinhatchee @ Canal Road	3573A	34.3%
24010002	Manatee R 20 m below SR64 bridge (TP1)	1807C	41.4%
24030044	Hillsborough R in Hills River State Park (TP5)	1443D	3.5%
25030009	MYAKKA RIVER ABOVE SR 70 BRIDGE	1877A	0.0%
26010430	Fort Drum Creek @ US441	3164	0.5%
32030023	ECONFINA CREEK AT SCOTT RD	553	1.0%
33030003	BIG COLDWATER CR E FORK HWY 4	18A	2.0%
27051558216422	Deer Prairie Slough, on land acquired by Sarasota County	1978	2.0%
28020299FTM	BEE BRANCH SITE 2	3235E	0.0%
BAK208GS	St. Mary's River - BAK208GS	2097K	0.0%
CLA243LV	Ates Creek - CLA243LV	2498	0.0%
CLA246GS	Peters Creek - CLA246GS	2444	0.0%
DEP010C1	Deep Creek @441	3388	0.0%
GLA630GS	Cypress Branch - GLA630GS	3235G	0.0%
HAR610GS	Oak Creek - HAR610GS	1897	1.3%
LIB104LV	Mule Creek - LIB104LV	684	0.0%

STORET ID	Station Description	WBID	RPS Average Percent 4 to 6 Scores
LOCBCC	Little Orange Creek below Cabbage	2713	0.0%
MPS	St. Mary's River middle prong	2211	0.0%
NUTREF001	Telogia Creek at CR 1641	1300	0.0%
PUT308GS	Little Orange Creek - PUT308GS	2713	0.0%
ROB01C1	Robinson Branch @C-246	3448	0.0%
SFR030C1	Santa Fe River @ 18 Worthington Springs	3605D	0.0%

Table A-3. List of healthy streams (passing SCI) used to inform stream chlorophyll a expectations.

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
4	BRUSHY CREEK	2006	2.2	64
4	BRUSHY CREEK	2007	2.1	64
4	BRUSHY CREEK	2008	1.3	64
4	BRUSHY CREEK	2009	1.1	64
4	BRUSHY CREEK	2010	1.1	64
18	BIG COLDWATER CREEK	2006	3.1	76
18	BIG COLDWATER CREEK	2007	3.2	76
18	BIG COLDWATER CREEK	2008	1.0	76
18	BIG COLDWATER CREEK	2009	1.0	76
18	BIG COLDWATER CREEK	2010	1.0	76
18	BIG COLDWATER CREEK	2011	1.0	76
19	BIG JUNIPER CREEK	2007	3.8	70
24	BLACKWATER RIVER	2009	1.0	68
30	YELLOW RIVER	2006	2.1	70
30	YELLOW RIVER	2007	2.0	70
30	YELLOW RIVER	2008	1.3	70
30	YELLOW RIVER	2009	1.6	70
30	YELLOW RIVER	2010	1.3	70
35	POND CREEK	2007	3.6	78
36	BRAY MILL CREEK	2009	1.0	48
52	COWARTS CREEK	2006	1.0	59
52	COWARTS CREEK	2007	1.0	59
52	COWARTS CREEK	2008	1.0	59
52	COWARTS CREEK	2009	1.3	59
52	COWARTS CREEK	2010	1.2	59

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
54	WRIGHTS CREEK	2006	1.0	67
54	WRIGHTS CREEK	2007	1.0	67
54	WRIGHTS CREEK	2008	1.0	67
54	WRIGHTS CREEK	2009	1.0	67
54	WRIGHTS CREEK	2010	1.0	67
59	HOLMES CREEK	2006	1.0	59
59	HOLMES CREEK	2009	1.0	59
72	PERDIDO RIVER (MIDDLE B)	2006	1.8	59
72	PERDIDO RIVER (MIDDLE B)	2007	2.2	59
72	PERDIDO RIVER (MIDDLE B)	2008	1.1	59
72	PERDIDO RIVER (MIDDLE B)	2009	1.1	59
72	PERDIDO RIVER (MIDDLE B)	2010	1.2	59
72	PERDIDO RIVER (MIDDLE B)	2011	1.1	59
87	LITTLE PINE BARREN CREEK	2009	3.2	71
88	MARE CREEK	2009	1.1	73
107	MURDER CREEK	2009	1.2	64
127	MANNING CREEK	2009	1.1	67
149	MCDAVID CREEK	2006	5.6	73
149	MCDAVID CREEK	2010	1.4	73
176	POND CREEK	2007	4.7	81
291	JACKS BRANCH	2010	1.8	42
316	CROOKED CREEK	2009	1.0	44
351	ALAQUA CREEK	2006	1.1	82
351	ALAQUA CREEK	2007	1.0	82
351	ALAQUA CREEK	2008	1.0	82
351	ALAQUA CREEK	2009	1.1	82
351	ALAQUA CREEK	2010	1.0	82
553	ECONFINA CREEK	2006	1.0	75
553	ECONFINA CREEK	2007	1.0	75
553	ECONFINA CREEK	2008	1.0	75
553	ECONFINA CREEK	2009	1.0	75
553	ECONFINA CREEK	2010	1.0	75
684	MULE CREEK	2006	1.9	73
716	CANEY BRANCH	2006	1.9	49
757	BEAR CREEK	2006	2.6	72
896	POLK CREEK	2010	1.0	55
921	HARVEY CREEK	2006	1.9	61

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
921	HARVEY CREEK	2010	1.0	61
998	SOPCHOPPY RIVER	2006	2.1	49
1024	BLACK CREEK	2010	1.0	85
1028	MCBRIDE SLOUGH	2006	1.7	57
1300	TELOGIA CREEK	2006	2.1	70
1300	TELOGIA CREEK	2007	1.1	70
1300	TELOGIA CREEK	2008	1.6	70
1300	TELOGIA CREEK	2009	1.0	70
1300	TELOGIA CREEK	2010	1.0	70
1381	LITTLE WITHLACOOCHEE	2008	3.5	56
1381	LITTLE WITHLACOOCHEE	2009	1.8	56
1409	PITHLACHASCOTEE RIVER	2008	4.0	58
1409	PITHLACHASCOTEE RIVER	2010	1.2	58
1431	GATOR CREEK	2008	4.5	54
1431	GATOR CREEK	2009	1.7	54
1431	GATOR CREEK	2010	1.9	54
1436	HORSE (HORSESHOE) CREEK	2009	2.0	60
1436	HORSE (HORSESHOE) CREEK	2010	3.3	60
1482	BLACKWATER CREEK	2010	9.4	64
1583	POLEY CREEK	2008	3.5	44
1639	THIRTYMILE CREEK	2006	1.5	53
1639	THIRTYMILE CREEK	2007	1.3	53
1639	THIRTYMILE CREEK	2008	2.4	53
1688	LITTLE BULLFROG CREEK	2006	1.5	42
1688	LITTLE BULLFROG CREEK	2007	1.3	42
1688	LITTLE BULLFROG CREEK	2009	1.8	42
1790	LITTLE MANATEE RIVER (SOUTH FORK)	2009	1.1	51
1811	MANATEE RIVER (EAST FORK)	2007	1.7	64
1813	CARTER CREEK	2006	8.7	65
1978	DEER PRAIRIE CREEK	2008	2.3	67
1978	DEER PRAIRIE CREEK	2010	1.2	67
1997	HAWTHORNE CREEK	2008	1.9	59
2001	HOG BAY	2007	1.8	50
2001	HOG BAY	2008	2.6	50
2074	ALLIGATOR CREEK	2007	1.4	44
2074	ALLIGATOR CREEK	2008	4.0	44
2196	DEEP CREEK	2008	1.4	49

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
2211	MIDDLE PRONG ST MARYS RIVER	2006	1.6	70
2211	MIDDLE PRONG ST MARYS RIVER	2007	1.3	70
2211	MIDDLE PRONG ST MARYS RIVER	2008	1.0	70
2211	MIDDLE PRONG ST MARYS RIVER	2009	1.0	70
2264	CALKINS CREEK	2008	2.6	76
2444	PETERS CREEK	2008	1.4	86
2444	PETERS CREEK	2009	1.5	86
2478	GREENS CREEK	2007	1.3	66
2493	MOULTRIE CREEK	2006	1.3	56
2493	MOULTRIE CREEK	2007	1.3	56
2493	MOULTRIE CREEK	2008	1.1	56
2493	MOULTRIE CREEK	2009	1.0	56
2493	MOULTRIE CREEK	2010	1.2	56
2634	TOMOKA RIVER	2006	1.1	47
2634	TOMOKA RIVER	2007	1.3	47
2634	TOMOKA RIVER	2008	4.2	47
2634	TOMOKA RIVER	2009	2.8	47
2634	TOMOKA RIVER	2010	2.0	47
2634	TOMOKA RIVER	2011	1.3	47
2641	UNNAMED BRANCH	2010	1.5	51
2646	LITTLE TOMOKA RIVER	2010	4.0	50
2673	UNNAMED DRAIN	2010	1.7	47
2675	SAND CREEK	2010	2.8	57
2679	UNNAMED DRAIN	2010	1.0	59
2695	LITTLE HATCHET CREEK	2006	2.2	56
2698	HOGTOWN CREEK	2006	1.3	49
2713	LITTLE ORANGE CREEK	2006	1.5	77
2730	DEEP CREEK RODMAN RESERVOIR	2011	1.1	60
2747	ORANGE CREEK	2006	1.2	78
2747	ORANGE CREEK	2007	1.1	78
2747	ORANGE CREEK	2008	1.0	78
2747	ORANGE CREEK	2009	1.1	78
2747	ORANGE CREEK	2010	1.0	78
2756	MILL CREEK	2010	1.2	65
2987	LITTLE WEKIVA RIVER	2006	2.7	56
2987	LITTLE WEKIVA RIVER	2007	3.9	56
2987	LITTLE WEKIVA RIVER	2009	3.4	56

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
2987	LITTLE WEKIVA RIVER	2010	1.5	56
2991	ECONLOCKHATCHEE RIVER	2006	1.1	62
2991	ECONLOCKHATCHEE RIVER	2007	1.2	62
2991	ECONLOCKHATCHEE RIVER	2008	1.1	62
2997	HOWELL CREEK BELOW LAKE HOWELL	2009	6.2	55
2999	BEAR CREEK	2009	1.8	52
3073	CRABGRASS CREEK	2007	1.5	62
3081	HORSE CREEK	2006	2.4	42
3081	HORSE CREEK	2007	2.5	42
3081	HORSE CREEK	2008	3.1	42
3164	FORT DRUM CREEK	2008	17.2	48
3324	ALAPAHA RIVER	2006	1.2	54
3324	ALAPAHA RIVER	2007	1.6	54
3324	ALAPAHA RIVER	2008	1.6	54
3324	ALAPAHA RIVER	2009	1.1	54
3324	ALAPAHA RIVER	2010	1.3	54
3325	ALLIGATOR CREEK	2006	1.3	69
3330	LITTLE ALAPAHA RIVER	2006	1.3	44
3351	ROCKY CREEK NEAR BENTON	2006	1.1	59
3351	ROCKY CREEK NEAR BENTON	2007	2.3	59
3351	ROCKY CREEK NEAR BENTON	2010	1.0	59
3388	DEEP CREEK	2006	1.5	78
3401	CAMP BRANCH	2010	3.2	55
3402	ECONFINA RIVER	2006	1.1	51
3402	ECONFINA RIVER	2007	2.4	51
3402	ECONFINA RIVER	2008	1.4	51
3402	ECONFINA RIVER	2009	1.0	51
3402	ECONFINA RIVER	2010	1.0	51
3422	SUWANNEE RIVER (LOWER SEGMENT)	2006	1.2	48
3448	ROBINSON CREEK	2006	1.4	81
3480	BETHEL CREEK	2006	1.0	54
3506	NEW RIVER	2010	2.2	73
3598	SAMPSON RIVER	2010	1.7	69
3649	COW CREEK	2006	2.6	69
3649	COW CREEK	2007	1.9	69
3649	COW CREEK	2010	1.4	69

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
3699	WACCASASSA RIVER	2007	3.0	75
3699	WACCASASSA RIVER	2008	2.6	75
3699	WACCASASSA RIVER	2009	2.1	75
3731	WEKIVA RIVER	2009	1.0	71
1320B	RAINBOW SPRINGS GROUP RUN	2006	1.0	58
1320B	RAINBOW SPRINGS GROUP RUN	2007	1.0	58
1320B	RAINBOW SPRINGS GROUP RUN	2008	1.0	58
1320B	RAINBOW SPRINGS GROUP RUN	2009	1.0	58
1320B	RAINBOW SPRINGS GROUP RUN	2010	1.0	58
1351A	OUTLET RIVER	2010	11.8	43
1443D	HILLSBOROUGH RIVER	2008	2.2	61
1443D	HILLSBOROUGH RIVER	2009	1.2	61
1495A	ITCHEPACKESASSA CREEK	2007	1.9	49
1495A	ITCHEPACKESASSA CREEK	2008	9.8	49
1495B	ITCHEPACKESASSA CREEK	2008	3.1	58
1573D	WEOHYAKAPKA CREEK	2010	6.2	56
1592C	MUSTANG RANCH CREEK	2010	2.6	59
160B	SHOAL RIVER	2007	2.9	84
1621A	ALAFIA RIVER ABOVE HILLSBOROUGH BAY	2009	3.5	41
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2006	2.1	57
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2007	2.0	57
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2008	1.7	57
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2009	3.2	57
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2010	3.5	57
1621D	ALAFIA RIVER (NORTH PRONG) LOWER SEGMENT	2008	1.6	63
1621D	ALAFIA RIVER (NORTH PRONG) LOWER SEGMENT	2009	1.6	63
1685B	LIVINGSTON CREEK	2006	19.0	65
1685B	LIVINGSTON CREEK	2007	6.4	65
1685B	LIVINGSTON CREEK	2008	11.8	65
1685B	LIVINGSTON CREEK	2009	4.4	65
1685B	LIVINGSTON CREEK	2010	3.3	65
1742B	LITTLE MANATEE RIVER (NORTH FORK)	2006	1.5	46
1757A	PAYNE CREEK (LOWER SEGMENT)	2008	1.1	59
1757A	PAYNE CREEK (LOWER SEGMENT)	2009	2.8	59

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
1757B	PAYNE CREEK (UPPER SEGMENT)	2007	1.3	62
1757B	PAYNE CREEK (UPPER SEGMENT)	2008	1.1	62
1787B	HORSE CREEK ABOVE BUSHY CREEK	2007	1.0	66
1807C	MANATEE RIVER	2007	1.4	72
1877A	MYAKKA RIVER (UPPER SEGMENT)	2006	1.2	43
1877A	MYAKKA RIVER (UPPER SEGMENT)	2007	1.4	43
1877A	MYAKKA RIVER (UPPER SEGMENT)	2008	1.5	43
1877A	MYAKKA RIVER (UPPER SEGMENT)	2010	1.8	43
18A	EAST FORK	2007	3.0	70
18A	EAST FORK	2009	1.1	70
2097H	ST MARYS RIVER	2007	2.3	55
2097K	ST MARYS RIVER (NORTH PRONG)	2006	1.2	57
2097K	ST MARYS RIVER (NORTH PRONG)	2007	1.2	57
2097K	ST MARYS RIVER (NORTH PRONG)	2008	1.3	57
2386A	BLACK CREEK (NORTH FORK)	2006	1.7	56
2386A	BLACK CREEK (NORTH FORK)	2007	1.4	56
2386A	BLACK CREEK (NORTH FORK)	2008	1.1	56
2386A	BLACK CREEK (NORTH FORK)	2009	1.3	56
2386A	BLACK CREEK (NORTH FORK)	2010	1.4	56
2415C	BLACK CREEK (SOUTH FORK)	2008	1.2	91
24D	BLACKWATER RIVER	2007	1.6	65
2535B	MOSES CREEK (FRESHWATER SEGMENT)	2008	1.2	63
2740C	OCKLAWAHA RIVER ABOVE LAKE OCKLAWAHA	2006	1.5	63
2740C	OCKLAWAHA RIVER ABOVE LAKE OCKLAWAHA	2007	1.6	63
2740C	OCKLAWAHA RIVER ABOVE LAKE OCKLAWAHA	2008	1.2	63
2740C	OCKLAWAHA RIVER ABOVE LAKE OCKLAWAHA	2009	1.2	63
2740C	OCKLAWAHA RIVER ABOVE LAKE OCKLAWAHA	2010	1.4	63
2740C	OCKLAWAHA RIVER ABOVE LAKE OCKLAWAHA	2011	1.2	63
2772D	SILVER RIVER (LOWER)	2006	1.8	54
2772D	SILVER RIVER (LOWER)	2007	1.1	54
2772D	SILVER RIVER (LOWER)	2008	1.0	54
2772D	SILVER RIVER (LOWER)	2009	1.1	54

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
2929A	BLACK WATER CREEK	2006	1.1	54
2929A	BLACK WATER CREEK	2007	1.4	54
2929A	BLACK WATER CREEK	2008	1.2	54
2929A	BLACK WATER CREEK	2009	1.3	54
2929A	BLACK WATER CREEK	2010	1.2	54
2987B	LITTLE WEKIVA (WEST)	2008	5.8	46
2991A	ECONLOCKHATCHEE RIVER	2007	1.6	50
2991A	ECONLOCKHATCHEE RIVER	2009	1.0	50
2991A	ECONLOCKHATCHEE RIVER	2010	1.1	50
30A	YELLOW RIVER	2007	1.6	54
30A	YELLOW RIVER	2008	1.2	54
3169A	SHINGLE CREEK	2007	1.2	50
3169A	SHINGLE CREEK	2008	1.1	50
3169A	SHINGLE CREEK	2009	1.6	50
3170D2	BONNET CREEK SOUTH	2009	7.8	44
3224C	CYPRESS CREEK	2011	2.3	44
3235E	BEE BRANCH	2008	2.8	49
3235H	HICKEY CREEK	2006	2.5	50
3235H	HICKEY CREEK	2007	3.6	50
3235H	HICKEY CREEK	2008	4.2	50
3235H	HICKEY CREEK	2009	1.7	50
3235I	BEDMAN CREEK	2006	1.7	49
3235I	BEDMAN CREEK	2007	2.1	49
3235I	BEDMAN CREEK	2008	1.6	49
3235I	BEDMAN CREEK	2009	1.3	49
3235I	BEDMAN CREEK	2010	1.1	49
3236A	TELEGRAPH CREEK	2006	2.0	59
3236A	TELEGRAPH CREEK	2007	2.0	59
3236A	TELEGRAPH CREEK	2008	3.0	59
3236A	TELEGRAPH CREEK	2009	2.9	59
3236A	TELEGRAPH CREEK	2010	1.8	59
3240F	DAUGHTREY CREEK	2006	2.0	55
3240F	DAUGHTREY CREEK	2007	5.2	55
3240F	DAUGHTREY CREEK	2008	4.1	55
3240F	DAUGHTREY CREEK	2009	2.4	55
3240F	DAUGHTREY CREEK	2010	2.4	55
3240F	DAUGHTREY CREEK	2011	3.3	55

WBID	Basin	Year	Geometric mean Chl-a (µg/L)	Mean SCI 2007
3240K	ORANGE RIVER	2006	2.0	41
3341A	SUWANNEE RIVER (UPPER SEGMENT)	2008	1.7	58
3341C	SUWANNEE RIVER (UPPER SEGMENT)	2006	1.3	48
3422P	MEARSON SPRING	2006	1.5	54
3504A	OLUSTEE CREEK	2006	2.2	53
3504A	OLUSTEE CREEK	2007	5.0	53
3504A	OLUSTEE CREEK	2010	1.2	53
3598C	ALLIGATOR CREEK	2006	1.1	41
49F	CHOCTAWHATCHEE RIVER	2006	1.2	57
49F	CHOCTAWHATCHEE RIVER	2007	1.6	57
49F	CHOCTAWHATCHEE RIVER	2008	1.5	57
49F	CHOCTAWHATCHEE RIVER	2009	1.6	57
49F	CHOCTAWHATCHEE RIVER	2010	2.2	57
72D	PERDIDO RIVER (MIDDLE A)	2008	1.1	56
791L	LAKE MICCOSUKEE OUTLET	2010	2.6	52

Table A-4. List of benchmark streams used to establish stream chlorophyll a expectations.

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
24	BLACKWATER RIVER	1998	5.0
24	BLACKWATER RIVER	2009	1.0
30	YELLOW RIVER	2000	1.2
30	YELLOW RIVER	2001	1.1
30	YELLOW RIVER	2002	1.0
30	YELLOW RIVER	2003	1.6
30	YELLOW RIVER	2004	1.9
30	YELLOW RIVER	2005	2.5
30	YELLOW RIVER	2006	2.1
30	YELLOW RIVER	2007	2.0
30	YELLOW RIVER	2008	1.3
30	YELLOW RIVER	2009	1.6
30	YELLOW RIVER	2010	1.3
30	YELLOW RIVER	2010	1.4

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
149	MCDAVID CREEK	2005	3.5
149	MCDAVID CREEK	2006	5.6
149	MCDAVID CREEK	2010	1.4
279	DRY CREEK	2005	1.2
279	DRY CREEK	2007	1.2
397	UNNAMED RUN	2005	2.2
504	CROOKED CREEK	2005	1.4
553	ECONFINA CREEK	2000	1.0
553	ECONFINA CREEK	2001	1.0
553	ECONFINA CREEK	2002	1.0
553	ECONFINA CREEK	2003	1.0
553	ECONFINA CREEK	2004	1.0
553	ECONFINA CREEK	2005	1.0
553	ECONFINA CREEK	2006	1.0
553	ECONFINA CREEK	2007	1.0
553	ECONFINA CREEK	2008	1.0
553	ECONFINA CREEK	2009	1.0
553	ECONFINA CREEK	2009	1.0
553	ECONFINA CREEK	2010	1.0
569	TENMILE CREEK	2002	1.1
569	TENMILE CREEK	2007	1.1
679	BLACK CREEK	2008	1.7
684	MULE CREEK	2005	1.2
684	MULE CREEK	2006	1.9
718	FOURMILE CREEK	2002	1.0
718	FOURMILE CREEK	2007	1.1
749	JUNIPER CREEK	2007	1.4
889	MOORE LAKE DRAIN	2008	1.6
889	MOORE LAKE DRAIN	2010	1.0
998	SOPCHOPPY RIVER	2004	1.0
998	SOPCHOPPY RIVER	2005	1.2
998	SOPCHOPPY RIVER	2006	2.1
1240	FORT GADSDEN CREEK	2007	2.7
1300	TELOGIA CREEK	1999	1.0
1300	TELOGIA CREEK	2000	1.6
1300	TELOGIA CREEK	2001	1.1
1300	TELOGIA CREEK	2002	1.0
1300	TELOGIA CREEK	2003	1.0

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
1300	TELOGIA CREEK	2004	1.1
1300	TELOGIA CREEK	2005	1.1
1300	TELOGIA CREEK	2006	2.1
1300	TELOGIA CREEK	2007	1.1
1300	TELOGIA CREEK	2008	1.6
1300	TELOGIA CREEK	2009	1.0
1300	TELOGIA CREEK	2010	1.0
1303	QUINCY CREEK (POTABLE PORTION)	2005	3.0
1303	QUINCY CREEK (POTABLE PORTION)	2006	2.5
1454	FISH HATCHERY DRAIN	2007	1.3
1658	FISHHAWK CREEK	2005	2.0
1658	FISHHAWK CREEK	2006	1.6
1658	FISHHAWK CREEK	2007	3.4
1658	FISHHAWK CREEK	2008	1.7
1658	FISHHAWK CREEK	2009	1.6
1658	FISHHAWK CREEK	2010	4.4
1666	BULLFROG CREEK	1998	2.9
1666	BULLFROG CREEK	1999	1.8
1666	BULLFROG CREEK	2000	2.3
1666	BULLFROG CREEK	2001	3.8
1666	BULLFROG CREEK	2002	2.2
1666	BULLFROG CREEK	2003	1.3
1666	BULLFROG CREEK	2004	1.6
1666	BULLFROG CREEK	2005	2.0
1666	BULLFROG CREEK	2006	2.0
1666	BULLFROG CREEK	2007	1.8
1666	BULLFROG CREEK	2008	1.7
1666	BULLFROG CREEK	2009	1.8
1666	BULLFROG CREEK	2010	2.7
1686	UNNAMED CREEK	2006	4.3
1897	OAK CREEK	2005	1.5
1978	DEER PRAIRIE CREEK	1998	2.8
1978	DEER PRAIRIE CREEK	1999	2.2
1978	DEER PRAIRIE CREEK	2000	2.0
1978	DEER PRAIRIE CREEK	2001	1.7
1978	DEER PRAIRIE CREEK	2002	4.9
1978	DEER PRAIRIE CREEK	2003	1.7
1978	DEER PRAIRIE CREEK	2004	2.2

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
1978	DEER PRAIRIE CREEK	2005	1.3
1978	DEER PRAIRIE CREEK	2006	1.4
1978	DEER PRAIRIE CREEK	2007	2.4
1978	DEER PRAIRIE CREEK	2008	2.3
1978	DEER PRAIRIE CREEK	2010	1.2
2105	PIGEON CREEK	2008	1.4
2161	THOMAS CREEK	2001	1.0
2161	THOMAS CREEK	2008	1.5
2196	DEEP CREEK	2008	1.4
2211	MIDDLE PRONG ST MARYS RIVER	1996	1.3
2211	MIDDLE PRONG ST MARYS RIVER	1997	1.3
2211	MIDDLE PRONG ST MARYS RIVER	1998	1.0
2211	MIDDLE PRONG ST MARYS RIVER	1999	1.4
2211	MIDDLE PRONG ST MARYS RIVER	2000	1.3
2211	MIDDLE PRONG ST MARYS RIVER	2001	1.3
2211	MIDDLE PRONG ST MARYS RIVER	2002	1.3
2211	MIDDLE PRONG ST MARYS RIVER	2003	1.1
2211	MIDDLE PRONG ST MARYS RIVER	2004	1.2
2211	MIDDLE PRONG ST MARYS RIVER	2005	1.0
2211	MIDDLE PRONG ST MARYS RIVER	2006	1.6
2211	MIDDLE PRONG ST MARYS RIVER	2007	1.3
2211	MIDDLE PRONG ST MARYS RIVER	2008	1.0
2211	MIDDLE PRONG ST MARYS RIVER	2009	1.0
2264	CALKINS CREEK	2008	2.6
2407	GROG BRANCH	2007	1.1
2444	PETERS CREEK	1996	2.8
2444	PETERS CREEK	1997	3.1
2444	PETERS CREEK	1998	2.6
2444	PETERS CREEK	1999	2.7
2444	PETERS CREEK	2000	2.4
2444	PETERS CREEK	2001	3.2
2444	PETERS CREEK	2002	2.7
2444	PETERS CREEK	2003	2.3
2444	PETERS CREEK	2004	2.2
2444	PETERS CREEK	2005	1.5
2444	PETERS CREEK	2006	2.4
2444	PETERS CREEK	2007	1.4
2444	PETERS CREEK	2008	1.4

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
2444	PETERS CREEK	2009	1.5
2444	PETERS CREEK	2010	1.7
2444	PETERS CREEK	2011	2.3
2478	GREENS CREEK	2004	1.0
2478	GREENS CREEK	2007	1.3
2493	MOULTRIE CREEK	1996	1.2
2493	MOULTRIE CREEK	1997	0.8
2493	MOULTRIE CREEK	1998	0.7
2493	MOULTRIE CREEK	1999	1.5
2493	MOULTRIE CREEK	2000	2.2
2493	MOULTRIE CREEK	2001	1.4
2493	MOULTRIE CREEK	2002	1.1
2493	MOULTRIE CREEK	2003	1.0
2493	MOULTRIE CREEK	2004	1.1
2493	MOULTRIE CREEK	2005	1.4
2493	MOULTRIE CREEK	2006	1.3
2493	MOULTRIE CREEK	2007	1.3
2493	MOULTRIE CREEK	2008	1.1
2493	MOULTRIE CREEK	2009	1.0
2493	MOULTRIE CREEK	2010	1.2
2498	ATES CREEK	2005	1.0
2500	UNNAMED BRANCH	2002	1.0
2713	LITTLE ORANGE CREEK	1997	1.0
2713	LITTLE ORANGE CREEK	1998	1.0
2713	LITTLE ORANGE CREEK	2000	1.0
2713	LITTLE ORANGE CREEK	2005	1.1
2713	LITTLE ORANGE CREEK	2006	1.5
2905	JUNIPER CREEK	2005	1.2
2905	JUNIPER CREEK	2008	0.7
2905	JUNIPER CREEK	2009	0.7
2905	JUNIPER CREEK	2010	0.9
3035	TOOTOOSAHATCHEE CREEK	2005	1.0
3035	TOOTOOSAHATCHEE CREEK	2008	1.9
3042	JIM CREEK	2008	1.4
3086	CRABGRASS CREEK (WEST BRANCH)	2003	3.3
3086	CRABGRASS CREEK (WEST BRANCH)	2008	1.0
3164	FORT DRUM CREEK	2008	17.2
3324	ALAPAHA RIVER	2000	1.0

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
3324	ALAPAHA RIVER	2001	1.0
3324	ALAPAHA RIVER	2002	1.1
3324	ALAPAHA RIVER	2003	1.2
3324	ALAPAHA RIVER	2004	1.2
3324	ALAPAHA RIVER	2005	1.3
3324	ALAPAHA RIVER	2006	1.2
3324	ALAPAHA RIVER	2007	1.6
3324	ALAPAHA RIVER	2008	1.6
3324	ALAPAHA RIVER	2009	1.1
3324	ALAPAHA RIVER	2010	1.3
3351	ROCKY CREEK NEAR BENTON	2006	1.1
3351	ROCKY CREEK NEAR BENTON	2007	2.3
3351	ROCKY CREEK NEAR BENTON	2010	1.0
3388	DEEP CREEK	1998	1.6
3388	DEEP CREEK	2006	1.5
3448	ROBINSON CREEK	2006	1.4
3480	BETHEL CREEK	2006	1.0
3605	SANTA FE RIVER	2010	1.0
10C	ESCAMBIA RIVER	2000	1.0
10C	ESCAMBIA RIVER	2001	1.1
10C	ESCAMBIA RIVER	2002	1.1
10C	ESCAMBIA RIVER	2003	1.6
10C	ESCAMBIA RIVER	2004	1.3
10C	ESCAMBIA RIVER	2005	2.2
10C	ESCAMBIA RIVER	2006	1.8
10C	ESCAMBIA RIVER	2007	2.2
10C	ESCAMBIA RIVER	2008	1.9
10C	ESCAMBIA RIVER	2009	1.8
10C	ESCAMBIA RIVER	2010	2.0
1329D	WITHLACOOCHEE RIVER	2000	2.1
1329D	WITHLACOOCHEE RIVER	2001	2.1
1329D	WITHLACOOCHEE RIVER	2002	4.0
1329D	WITHLACOOCHEE RIVER	2003	2.5
1329D	WITHLACOOCHEE RIVER	2004	3.9
1329D	WITHLACOOCHEE RIVER	2005	5.2
1329D	WITHLACOOCHEE RIVER	2006	4.7
1329D	WITHLACOOCHEE RIVER	2007	6.5
1329D	WITHLACOOCHEE RIVER	2008	7.5

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
1329D	WITHLACOOCHEE RIVER	2009	11.5
1329E	WITHLACOOCHEE RIVER	2000	4.2
1329E	WITHLACOOCHEE RIVER	2001	3.0
1329E	WITHLACOOCHEE RIVER	2002	3.7
1329E	WITHLACOOCHEE RIVER	2003	2.1
1329E	WITHLACOOCHEE RIVER	2004	4.0
1329E	WITHLACOOCHEE RIVER	2005	2.3
1329E	WITHLACOOCHEE RIVER	2006	4.3
1329E	WITHLACOOCHEE RIVER	2007	9.0
1329E	WITHLACOOCHEE RIVER	2008	7.7
1329E	WITHLACOOCHEE RIVER	2009	7.3
1351A	OUTLET RIVER	2001	3.1
1351A	OUTLET RIVER	2002	5.5
1351A	OUTLET RIVER	2003	15.6
1351A	OUTLET RIVER	2004	7.1
1443D	HILLSBOROUGH RIVER	2005	1.2
1443D	HILLSBOROUGH RIVER	2006	1.0
1443D	HILLSBOROUGH RIVER	2007	1.4
1443D	HILLSBOROUGH RIVER	2008	2.2
1443D	HILLSBOROUGH RIVER	2009	1.2
1495A	ITCHEPACKESASSA CREEK	2007	1.9
1495A	ITCHEPACKESASSA CREEK	2008	9.8
160B	SHOAL RIVER	2005	2.5
160B	SHOAL RIVER	2006	5.0
160B	SHOAL RIVER	2007	2.9
160B	SHOAL RIVER	2009	1.6
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2000	1.0
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2001	1.2
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2002	1.2
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2003	1.2
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2004	1.0
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2005	2.6
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2006	2.1
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2007	2.0
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2008	1.7
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2009	3.2
1621B	ALAFIA RIVER ABOVE FLINT HAWK	2010	3.5
1742B	LITTLE MANATEE RIVER (NORTH	2005	1.8

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
	FORK)		
1742B	LITTLE MANATEE RIVER (NORTH FORK)	2006	1.5
1742B	LITTLE MANATEE RIVER (NORTH FORK)	2007	1.2
1742B	LITTLE MANATEE RIVER (NORTH FORK)	2008	1.8
1742B	LITTLE MANATEE RIVER (NORTH FORK)	2009	1.4
1807C	MANATEE RIVER	2007	1.4
1869C	MYAKKA RIVER (UPPER SEGMENT)	1999	2.4
1877A	MYAKKA RIVER (UPPER SEGMENT)	1998	3.2
1877A	MYAKKA RIVER (UPPER SEGMENT)	1999	1.6
1877A	MYAKKA RIVER (UPPER SEGMENT)	2000	1.2
1877A	MYAKKA RIVER (UPPER SEGMENT)	2001	1.0
1877A	MYAKKA RIVER (UPPER SEGMENT)	2002	1.8
1877A	MYAKKA RIVER (UPPER SEGMENT)	2003	1.3
1877A	MYAKKA RIVER (UPPER SEGMENT)	2004	1.2
1877A	MYAKKA RIVER (UPPER SEGMENT)	2005	1.4
1877A	MYAKKA RIVER (UPPER SEGMENT)	2006	1.2
1877A	MYAKKA RIVER (UPPER SEGMENT)	2007	1.4
1877A	MYAKKA RIVER (UPPER SEGMENT)	2008	1.5
1877A	MYAKKA RIVER (UPPER SEGMENT)	2010	1.8
18A	EAST FORK	2005	5.0
18A	EAST FORK	2006	5.0
18A	EAST FORK	2007	3.0
18A	EAST FORK	2009	1.1
2097K	ST MARYS RIVER (NORTH PRONG)	1996	1.2
2097K	ST MARYS RIVER (NORTH PRONG)	1997	1.9
2097K	ST MARYS RIVER (NORTH PRONG)	1998	1.1
2097K	ST MARYS RIVER (NORTH PRONG)	1999	3.2
2097K	ST MARYS RIVER (NORTH PRONG)	2000	1.3
2097K	ST MARYS RIVER (NORTH PRONG)	2001	1.1
2097K	ST MARYS RIVER (NORTH PRONG)	2002	1.6
2097K	ST MARYS RIVER (NORTH PRONG)	2003	1.0
2097K	ST MARYS RIVER (NORTH PRONG)	2004	1.5
2097K	ST MARYS RIVER (NORTH PRONG)	2005	1.0
2097K	ST MARYS RIVER (NORTH PRONG)	2006	1.2
2097K	ST MARYS RIVER (NORTH PRONG)	2007	1.2

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
2097K	ST MARYS RIVER (NORTH PRONG)	2008	1.3
2097K	ST MARYS RIVER (NORTH PRONG)	2009	1.0
2120B	MILLS CREEK	2008	1.8
2415E	BLACK CREEK (SOUTH FORK)	2005	1.0
24C	BLACKWATER RIVER	2000	1.0
24C	BLACKWATER RIVER	2001	1.1
24C	BLACKWATER RIVER	2002	1.1
24C	BLACKWATER RIVER	2003	1.0
24C	BLACKWATER RIVER	2004	1.1
24C	BLACKWATER RIVER	2005	1.1
24C	BLACKWATER RIVER	2006	1.0
24C	BLACKWATER RIVER	2007	1.1
24C	BLACKWATER RIVER	2008	1.1
24C	BLACKWATER RIVER	2009	1.1
24C	BLACKWATER RIVER	2010	1.1
2551A	LAKE TRIPLET DRAIN	2005	1.2
2929A	BLACK WATER CREEK	1996	1.3
2929A	BLACK WATER CREEK	1997	1.1
2929A	BLACK WATER CREEK	1998	0.2
2929A	BLACK WATER CREEK	1999	1.1
2929A	BLACK WATER CREEK	2000	1.0
2929A	BLACK WATER CREEK	2001	1.2
2929A	BLACK WATER CREEK	2002	1.0
2929A	BLACK WATER CREEK	2003	1.0
2929A	BLACK WATER CREEK	2004	1.9
2929A	BLACK WATER CREEK	2005	1.3
2929A	BLACK WATER CREEK	2006	1.1
2929A	BLACK WATER CREEK	2007	1.4
2929A	BLACK WATER CREEK	2008	1.2
2929A	BLACK WATER CREEK	2009	1.3
2929A	BLACK WATER CREEK	2010	1.2
2929A	BLACK WATER CREEK	2011	1.0
30B	YELLOW RIVER	2003	1.0
3235E	BEE BRANCH	2005	1.3
3235E	BEE BRANCH	2008	2.8
3235G	CYPRESS BRANCH	2005	3.2
3236A	TELEGRAPH CREEK	1999	1.2
3236A	TELEGRAPH CREEK	2000	3.3

WBID	Basin	Year	Geometric mean Chl-a (µg/L)
3236A	TELEGRAPH CREEK	2001	1.4
3236A	TELEGRAPH CREEK	2002	1.4
3236A	TELEGRAPH CREEK	2003	1.6
3236A	TELEGRAPH CREEK	2004	1.9
3236A	TELEGRAPH CREEK	2005	2.3
3236A	TELEGRAPH CREEK	2006	2.0
3236A	TELEGRAPH CREEK	2007	2.0
3236A	TELEGRAPH CREEK	2008	3.0
3236A	TELEGRAPH CREEK	2009	2.9
3236A	TELEGRAPH CREEK	2010	1.8
3236A	TELEGRAPH CREEK	2011	2.1
3310Z	NUTALL RISE SPRING	2006	1.7
3310Z	NUTALL RISE SPRING	2007	1.0
3506B	NEW RIVER	2010	2.0
3506B	NEW RIVER	2011	1.5
3573A	STEINHATCHEE RIVER	2002	1.0
3573A	STEINHATCHEE RIVER	2006	1.6
3573A	STEINHATCHEE RIVER	2011	1.0
3605D	SANTA FE RIVER	2001	1.6
375G	APALACHICOLA RIVER	2001	1.2
375G	APALACHICOLA RIVER	2005	3.7
375G	APALACHICOLA RIVER	2007	1.4
793Z	HORN SPRING	2006	1.6
793Z	HORN SPRING	2007	1.0