Implementation of

Florida's Numeric Nutrient Standard

for Streams

Division of Environmental Assessment and Restoration
Florida Department of Environmental Protection
(Effective Date)

~~**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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1.0 Floral Evaluation for Determining Achievement of Numeric Nutrient Criteria

Assessment of the numeric nutrient standard for streams pursuant to paragraph 62-302.531(2)(c), Florida Administrative Code (F.A.C.), involves the determination of whether chlorophyll *a* levels, algal mats or blooms, nuisance macrophyte growth, or changes in algal species composition indicate an imbalance in flora. During numeric nutrient criteria (NNC) development, the Department, in coordination with EPA, conducted a series of comprehensive statistical analyses to identify relationships between human disturbance (such as ~~including~~ nutrient enrichment) and ~~adverse~~ floral responses (such as adverse changes to ~~*e.g.*,~~ algal taxonomic composition, algal and vascular plant abundance, and 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/ ~~metrics and~~ impairment thresholds for streams associated with human disturbance or nutrient concentrations or loads. ~~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,~~

To establish floral health metrics and impairment thresholds, the Department decided to determine~~'s approach is to determine~~ whether measures of the algal and plant communities ~~the floral components~~ at a given stream ~~are~~ were 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~~ were within the ~~EPA~~ reference site distribution, it ~~is~~ was reasonable to ~~one may reasonably~~ conclude the presence of a balanced floral community.

Based on all potential floral outcomes associated with the conceptual nutrient enrichment ~~conceptual~~ model, 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 at stream sites, collected using Standard Operating Procedures as set forth in Rule 62-160.210, F.A.C.~~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 of these floral measures indicates an imbalance, then the Department would conclude that the stream site does not attain the numeric nutrient standard for streams ~~NNC~~. Floral measures alone can provide evidence that the nutrient standard ~~at~~ in paragraph ~~Rule~~ 62-302.531(2)(c), F.A.C., is not achieved, potentially leading to the waterbody being placed on the Florida Verified List of impaired waters and Clean Water Act Section 303(d) list~~.~~ if the Department identifies the causative pollutant(s) and the concentration of the pollutant(s) causing the impairment, pursuant to subsection 62-303.710(1), F.A.C. However, because invasive exotic or tolerant species can occur even in the absence of anthropogenic nutrient enrichment, streams that fail the LVS will be placed on the Study List of potentially impaired waters to evaluate whether nutrients contribute to the LVS failure.

If floral data (RPS, LVS, and chlorophyll a) are unavailable for a stream that exceeds the ~~Nutrient Thresholds, it~~ nutrient thresholds for TN or TP, the waterbody is placed on the Study List, indicating additional information needs to be collected. 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~~ additional information ~~is not collected during the assessment cycle (due to logistical considerations, etc.) and either the TN or TP thresholds are exceeded, the Department place 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.~~ before the next assessment of the waterbody.

~~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~~ For the RPS and LVS, one survey is insufficient 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~~ Therefore, at least two temporally independent (collected ≥ 90 days apart) bioassessment evaluations, are required to make a decision about floral health for a site. ~~Sample can further minimize Type 1 and Type 2 error~~.

For the RPS and LVS, greater weight will be given to the most recent samples because changes can occur rapidly in the primary producer communities in response to changes in nutrients or a mitigating factor (e.g. loss of canopy cover). If the two most recent samples (temporally independent) pass the RPS or LVS evidentiary thresholds described in the following sections, then there is no indication of floral imbalance at the site. If the two most recent samples fail the RPS or LVS evidentiary thresholds, there is evidence of floral imbalance at the site. If one "pass"

and one "fail" comprise the two most recent samples, then the next most recent assessment should be considered, and the assessment determination will be based on the results of this third assessment.

~~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 keys for each of the metrics to assist with decision-making.~~

1.1 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 RPS is a rapid assessment tool for evaluating streams' ecological condition based on the attached algae (periphyton). The RPS quantifies periphyton length and extent in a 100-meter stretch of a stream by assigning a rank category to the length of periphyton filaments. Ranks 4, 5 and 6 represent filament lengths of > 6 mm. If observations made during the physical/chemical characterization portion of the habitat assessment conducted per DEP SOP FT 3000 as set forth in Rule 62-160.210, F.A.C., indicate that algae smothering is "none" or "slight" and periphyton abundance is "not observed" or "rare," the RPS need not be conducted and the Department would conclude that there are no floral imbalances attributable to periphyton. Otherwise, the RPS shall be conducted and interpreted as described in this section.

In deriving the RPS threshold, the ~~The~~ Department compiled RPS results ~~from a stream to the RPS results compiled~~ from the population of ~~minimally disturbed~~ Benchmark 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 (reference) 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 SCI ~~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 Benchmark ~~EPA reference~~ sites would

be consistent with ~~the manner in which~~ how the nutrient thresholds were derived. Therefore, ~~if a stream exhibits a percent coverage for~~ the RPS evidentiary threshold was set at ~~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 a stream site exhibits a percent coverage of periphyton ranks 4-6 of 25% or less for two consecutive, temporally independent samples collected ≥90 days apart, the RPS results indicate evidence of a balanced periphyton community. If a stream site exceeds an RPS 4-6 coverage of 25% for two consecutive, temporally independent samples (≥90 days apart), the Department considers this as evidence that the numeric nutrient standard for streams is not achieved.

If the two most recent surveys ~~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~~ the third most recent survey will be used to make the assessment determination. If there are no additional survey results available, an additional, temporally independent RPS shall be conducted, and the results of the additional RPS will determine the assessment status of the site. ~~until two temporally independent samplings either attain, or do not attain, the evidentiary thresholds, , so a final decision can be made~~.

~~Where~~ When the RPS rank 4-6 coverage is ~~greater than~~ ≥ 20%, an evaluation of the algal species composition (identifying the five ~~most~~ dominant taxa) must ~~is~~ also be conducted to provide additional information on whether there is ~~no~~ an 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~~, Therefore, the algal species composition is presumed to be acceptable.

A complete RPS sample includes 99 observations, but sometimes site conditions prevent access to all 99 points. Samples with ≤ 90 observations are inconclusive unless the sampled points are sufficient to evaluate the evidentiary threshold (e.g., ≥ 25 points with rank 4-6 coverage among the ≤ 90 observations would indicate a floral imbalance).

~~***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 t 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.~~

1.2 Evaluating Dominant Algal ~~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.~~

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~~ with 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 and Florida occurrence data to determine if they ~~are indicative of~~ indicate nutrient enriched/imbalanced conditions.

~~For example, n~~Nutrient enriched Florida springs are typically characterized by an abundance of one or more of the following taxa: *Plectonema wollei* (formerly *Lyngbya wollei)*, *Vaucheria sp., Dichotomosiphon spp*, *Aphanothece spp., Caloglossa spp., Chaetomorpha spp., Cladophora spp., Compsopogon spp., Enteromorpha spp., Hydrodictyon spp., Lyngbya spp., Oscillatoria spp., Rhizoclonium hieroglyphicum, Spirogyra spp.* Information on potential toxin-producing taxa is located in the Department's Statewide Biological Database (SBIO) Florida Taxonomic Lists. Please contact the Florida DEP Laboratory for more information about specific taxa. The

dominance of such taxa at a stream site where the RPS rank 4-6 ≥ 20% would be evidence that the numeric nutrient standard is not achieved.

A stream is considered to have a balanced periphyton community if two consecutive temporally independent samples do not include dominance by taxa known to be nutrient enrichment indicators or to produce toxins. Streams are considered to have an imbalanced periphyton community if both assessments indicate dominance by taxa known to be nutrient enrichment indicators or to produce toxins. As was the case for the RPS ranks, a third bioassessment result, either from a previously conducted survey or a subsequent survey, will be used to make the assessment call if the results of the two most recent surveys are contradictory.

~~*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*).~~

~~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 should be accounted for 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.~~

1.2.1 RPS AND ALGAL SPECIES COMPOSITION DECISION KEY

1) Were the two most recent RPS assessment collected at least 90 days apart (temporally independent), and under representative conditions (*e.g.*, flow between 10th and 90th percentile of long-term discharge, light penetration/canopy cover characteristic of the system, sampling location representative of waterbody segment) for the system?

1a. Yes. Proceed to step 2.

1b. No. Evaluate previous RPS assessments, and either use previous RPS or conduct an additional RPS and collect algal taxonomic composition samples (if needed) at representative locations and during representative conditions and return to step 1.

2) Do both RPS assessments evaluated in step 1 attain the expectations for algal mat occurrence and taxonomic composition when applicable? To attain the expectations, conditions A **or** B must be met: A) RPS Rank 4-6 are < 20% **or** B) RPS Ranks 4-6 are ≥20 but ≤ 25%, and the dominant algal taxa are not nutrient enrichment indicators or potential toxin producers.

2a. Yes. The site attains the expectations for algal mat occurrence and taxonomic composition outlined in step 2. Stop.

2b. No. Proceed to step 3.

3) Do both RPS assessments evaluated in step 1 fail the expectations for algal mat occurrence and taxonomic composition? To fail the expectations, conditions C **or** D must be met: C) RPS ranks 4-6 > 25%, **or** D) RPS ranks 4-6 are ≥20 but ≤ 25%, and the dominant algal taxa are nutrient enrichment indicators or potential toxin producers.

3a. Yes. The site does not meet expectations for algal mat occurrence and taxonomic composition. Stop.

3b. No. The two RPS assessments evaluated in steps 2 and 3 have differing results (i.e., one "pass" and one "fail"). Either review results of the next most recent temporally independent RPS assessment or collect an additional temporally independent RPS assessment. Proceed to step 4.

4) Does the result of the next most recent temporally independent RPS assessment or the result of an additional temporally independent RPS assessment achieve the expectations for algal mat occurrence and taxonomic composition?

4a. Yes. The site attains the expectations for algal mat occurrence and taxonomic composition. Stop.

4b. No. The site does not meet expectations for algal mat occurrence and taxonomic composition. Stop.

~~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., sSee couplet 3.~~

~~3. Do dominant taxa[1] 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).~~

1.3 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 condition of streams based on vascular plants. Because many streams naturally have very little or no aquatic vegetation, ~~interpretation of~~ LVS data interpretation requires that a minimum of two square meters (2 m^2) of macrophyte coverage be present within ~~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 macrophytes ~~plants~~. To determine an LVS threshold for streams that would clearly support aquatic life, t~~T~~he Department evaluated LVS data from the ~~EPA reference~~ Benchmark streams. The Department ~~found~~ concluded that if a site's average Coefficient of Conservatism (C of C) score is greater than or equal to 2.5 (the 10th percentile of the distribution), the plant community composition is ~~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 Invasive Species ~~Exotic Plant Pest~~ Council (FISC ~~FLEPPC~~) exotics in the ~~EPA reference~~ Benchmark streams, and found that~~, due to the influence of a few streams at the 90th percentile~~, FISC ~~FLEPPC~~ exotics made up

~~[1] The Department will evaluate those dominant species that individually constitute approximately 10% or more of the community.~~

approximately 40% of the total plant occurrences at the 90th percentile. Considering the somewhat limited number of reference streams with > 2 m^2 of vascular plants (nineteen) and the variability in the data, the Department decided to set the FISC ~~FLEPPC~~ threshold at the 80th percentile of the distribution (25%) to be more protective of aquatic life. Therefore, if the frequency of occurrence of FISC ~~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 Coefficient of Conservatism (C of C) score is ≥ 2.5 and the frequency of occurrence of FLEPPC exotic taxa is ≤ 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.~~

Based on the analysis of the Benchmark streams described above, if a site's average C of C score is ~~>~~≥ 2.5 and the frequency of occurrence of FISC ~~FLEPPC~~ exotic taxa is ~~<~~≤ 25% of the total plant occurrences in the two most recent temporally independent samples, there is no imbalance of flora in the vascular plant community. If a site's C of C score is < 2.5 and the frequency of occurrence of FISC ~~FLEPPC~~ exotic taxa is > 25% of the total plant occurrence in the two most recent temporally independent samples, there is evidence of floral imbalance. If the two metrics have differing results (one passes, and one fails) in an individual sample, that sample is inconclusive. If there are additional LVS results available, the third most recent sample with conclusive results can be used to make the assessment determination. If there are no other LVS assessment results available, an additional, temporally independent sampling should be conducted. The results of the additional bioassessment, if conclusive, will determine the assessment status of the site.

Because invasive exotic or tolerant species can occur even in the absence of anthropogenic nutrient enrichment, streams with failing LVS scores shall be placed on the Study List for further evaluation to determine if LVS results can be linked to anthropogenic nutrient enrichment. If a stressor identification study is conducted and it is determined that nutrients are not the causative factor contributing to the LVS failure, the waterbody will be removed from the Study List.

1.3.1 *LVS DECISION KEY*

1) Were the two most recent LVS assessments collected at least 90 days apart (temporally independent) and under representative conditions (*e.g.*, flow between 10th and 90th percentile of long-term discharge, light penetration/canopy cover characteristic of the system, sampling location representative of waterbody segment) for the system?

1a. Yes. Proceed to step 2.
1b. No. Evaluate LVS assessments previous to the two most recent, and either use previous LVS or conduct an additional LVS at representative locations during representative conditions and return to step 1.

2) Do the two LVS assessments evaluated above in step 1 attain the expectations for stream macrophyte communities, with a mean C of C score > 2.5 AND a frequency of occurrence of FISC ~~FLEPPC~~ exotic taxa < 25%?
2a. Yes. The site attains the expectations for stream macrophyte communities outlined in step 2. Stop.
2b. No. Proceed to step 3.

3) Do both LVS assessments evaluated in step 1 fail to meet the expectations for stream macrophyte communities, with a mean C of C score < 2.5 AND a frequency of occurrence of FISC ~~FLEPPC~~ exotic taxa > 25%?
3a. Yes. Proceed to step 5.
3b. No. The two LVS assessments evaluated in steps 2 and 3 have differing results (i.e., one "pass" and one "fail"). Either review results of the next most recent temporally independent LVS assessment or collect an additional temporally independent LVS assessment. Proceed to step 4.
3c. No. One or both of the LVS assessments meets the expectation for one metric (i.e., mean C of C or occurrence of FISC ~~FLEPPC~~ taxa) but not the other. Either review results of the next most recent temporally independent LVS assessments or collect additional temporally independent LVS assessments until you find two samples for which the metrics either both meet or do not meet expectations for stream macrophyte communities. Return to step 1.

4) Do the results of the next most recent temporally independent LVS assessment or the results of an additional temporally independent LVS assessment attain the expectations for stream macrophyte communities?
4a. Yes. The site attains the expectations for stream macrophyte communities. Stop.
4b. No. Place the waterbody on the Study List for IWR assessment purposes, and proceed to step 5.

5) Based on a stressor ID study, is there evidence the LVS results can be linked to anthropogenic nutrient inputs?
5a. Yes. There is evidence that the waterbody does not attain the nuisance macrophyte growth component of floral measures. Stop.
5b. No. The LVS results are inconclusive, and the water should stay on the Study List for IWR assessment purposes.
5c. No. Stressor ID indicates the impairment is due to something other than nutrients. The waterbody should be removed from the Study List for the LVS for IWR assessment purposes.

~~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. 14 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 > 2.5 and the frequency of occurrence of FLEPPC exotic taxa is < 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*.~~

1.4 Evaluating Algal Blooms, Chlorophyll a, and Phytoplankton Taxonomic Data

A chlorophyll *a* ~~An~~ annual geometric mean (AGM) ~~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 chlorophyll *a* AGMs ~~annual geometric mean~~ ~~chlorophylls *a* values~~ 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~~

To develop a chlorophyll *a* threshold for streams, the Department ~~compares the chlorophyll *a* results from a stream to chlorophyll *a*~~ evaluated the chlorophyll *a* results compiled from the population of minimally disturbed and healthy sites the Department sampled as part of NNC development. If a stream exhibits chlorophyll *a* AGMs below the 90th percentile of values (3.2 µg/L), this is a clear indication of no imbalance of flora. ~~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. Iif 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 90th 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* AGM values up to 17 µg/L and 19 µg/L, respectively. Because the remaining distribution of observed ~~annual geometric mean~~ chlorophyll *a* AGMs ~~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 *a* impairment threshold.

~~Therefore,~~ Streams ~~streams~~ with chlorophyll *a* AGMs ~~annual average chlorophyll values between~~ that are greater than 3.2 µg/L and less than or equal to 20 µg/L are evaluated on a site specific basis by comparing the values to chlorophyll *a* values for similar reference streams in the region. Factors such as upstream sources of chlorophyll *a*, water residence time, flow, color, climatological conditions, and size of the stream/river (i.e., stream order) are considered when comparing the chlorophyll *a* values to values for reference streams in the region. If a site has chlorophyll a AGMs that are greater than 3.2 µg/L and less than or equal to 20 µg/L, the assessment is inconclusive until the Department documents a decision regarding whether chlorophyll *a* conditions reflect an 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 vice versa.~~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 a 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 vice 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.

1.4.1 Chlorophyll a/Algal Bloom Decision Key

1. Were there sufficient chlorophyll *a* data to calculate an AGM? Chlorophyll *a* AGMs require at least 4 samples with at least one sample collected between May 1 and September 30 and at least one sample collected during the other months of the calendar year. Were samples collected when environmental conditions were representative of typical conditions for the system? Typical conditions include flow between 10th and 90th percentile of long-term discharge, light penetration/canopy cover characteristic of the system and, use of sampling locations representative of the waterbody segment.
   - 1a. No. Collect additional chlorophyll *a* samples at representative locations and during representative conditions, and return to step 1.
   - 1b. Yes. Proceed to step 2.

2. Is the chlorophyll *a* AGM > 3.2 µg/L more than once in a three-year period?
   - 2a. No. There is evidence that the waterbody attains the chlorophyll *a*/algal bloom component of floral measures. Stop.
   - 2b. Yes. Proceed to step 3.

3. Is the chlorophyll *a* AGM > 20 ug/L more than once in a three-year period?
   - 3a. Yes. The narrative nutrient standard at paragraph 62-302.531(2)(c), F.A.C., is not attained. Stop
   - 3b. No, the chlorophyll *a* AGMs are > 3.2 and < 20 µg/L, proceed to step 4.

4. After considering site specific factors that affect chlorophyll *a* concentrations, such as system morphology, water residence time, whether the chlorophyll *a* levels are due to primary productivity in the stream or due to upstream sources, 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. There is evidence that the waterbody attains the chlorophyll *a*/algal bloom component of floral measures.

4b. No. There is evidence that the chlorophyll *a* component of the nutrient standard at paragraph 62-302.531(2)(c), F.A.C., is not attained.

4c. Inconclusive because of insufficient contemporaneous data from other functionally similar reference sites. Waterbody will be placed on the Study List.

~~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 < 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 >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.~~

1.5 Floral Measures Summary

As described previously ~~above~~, the Department derived the floral thresholds that are used ~~for~~ to interpret the numeric nutrient standard for streams ~~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 13** are ~~can be~~ used when developing evidence to support ~~supporting~~ a Department conclusion regarding the balance of the floral community. If all floral measures are achieved, a stream site 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 of these floral measures indicates an imbalance, then the stream site does not attain the Numeric Nutrient Standard ~~NNC~~. ~~Examples of this application of scientific reasoning are provided below~~.

Table 13. Floral community metric ~~measures~~ summary. These values were based on the distribution of a population of minimally disturbed Benchmark sites sampled by the Department as part of NNC ~~Numeric Nutrient Criteria~~ development (the same Benchmark ~~benchmark~~ sites EPA used for their criteria).

Floral Measure	Floral Metric	Evidentiary Threshold of No Imbalances
Macrophytes	LVS C of C	Site average ≥ 2.5
Macrophytes	LVS FISC ~~FLEPPC~~	Site average ≤~~<~~ 25%
Periphyton	RPS Rank	~~<~~≤ 25% rank 4-6 coverage ~~20 to 25 % rank 4-6 coverage, evaluate algal autoecological data~~
Periphyton	RPS Algal Community Composition (Autecology)	If 20 to 25 % rank 4-6 coverage, ~~then~~ ~~N~~no ~~adverse shifts in~~ dominant nuisance taxa
Phytoplankton	Chlorophyll *a*	~~< 20 u~~µg/L; ≥3.2 to 20 ~~u~~µg/L = site specific; ≤ 3.2 µg/L

2.0 BASIC INFORMATION NEEDS FOR DISTINGUISHING FLOWING WATERS UNDER RULE 62-302.200 ~~(36)~~, F.A.C.

The numeric nutrient standard for streams only applies to "flowing waters" meeting the stream definition in subsection 62-302.200(36), F.A.C. While the default assumption is that any flowing water meets this definition, permittees or other interested parties may want to provide the information necessary to demonstrate that a waterbody meets one of the exclusions in the definition for streams. Information can be submitted to the Department prior to or during the Watershed Assessment Cycle, or as a component of a permit application. The Department will review the submitted information, and all approved exclusions will be tracked by the Water Quality Standards Program including a GIS record of all stream exclusions.

The definition of stream in subsection ~~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(48)(b), F.A.C., ~~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 site specific bioassessment information or flow data indicate ~~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 reverse flows or 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 when ~~while implementing programs such as~~ assessing waterbodies for attainment of water quality standards under section 403.067, F.S., or implementing the NPDES permitting programs. When applying the nutrient standards adopted in subsection ~~Rule~~ 62-302.531(2), F.A.C., the Department will make clear whether the numeric nutrient standards for streams adopted in paragraph ~~Rule~~ 62-302.531(2)(c), F.A.C., apply ~~are applicable~~. ~~In implementing water quality standards and evaluating whether a particular waterbody meets the provisions of paragraph 62-302.200(36)(a) or (b) F.A.C.,~~ When preparing draft lists of impaired waters under the IWR, the Department provides ~~will provide~~ public notice of the draft lists and requests information relevant to ~~making the determination~~ determining whether a flowing water meets one of the exclusions in the streams definition ~~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 a stream exclusion ~~62-302.200(36)(b)1. F.A.C~~. The Department considers ~~will consider~~ all relevant information in implementing water quality standards and maintain the administrative records of such decisions, which will be ~~are~~ available to the public.

~~General Information~~

Until a Class I, I-Treated or III stream segment is identified as meeting one of the exclusions ~~the provisions~~ in paragraph ~~Rule~~ 62-302.200(36)(a) or (b), F.A.C., the criteria in paragraph ~~Rule~~ 62-302.531(2)(c), F.A.C., applies ~~will apply~~. Interested parties wishing to demonstrate that a stream segment qualifies for one of the exclusions ~~distinguish the characteristics of a waterbody with~~

~~respect to provisions~~ in subsection ~~Rule~~ 62-302.200(36), F.A.C., may provide the Department with the ~~applicable~~ information needed ~~set forth in the stream definition~~.

A clear delineation of the segment's geographic boundaries ~~of the segment~~ in question is necessary so that the Department knows exactly where the numeric nutrient standard for streams does not ~~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 one of the exclusions ~~the definition~~ of paragraph 62-302.200(36)(a) or (b), F.A.C., the narrative nutrient criteria will apply and the Department shall assess the stream using the nutrient impairment thresholds in subsection 62-303.351(4), F.A.C. (AGM chlorophyll a of 20 ug/L), subsection 62-303.351(3) (algal mats or blooms), and subsection (5) (increasing trends in nutrients or chlorophyll a), F.A.C. ~~and follow the Impaired Waters Rule at 62-303 F.A.C.~~

2.1 Non-Perennial Water Segments

The ~~stream~~ numeric nutrient standard for streams was ~~water quality standards adopted by the Department are~~ not designed to apply to wetlands, ~~or~~ uplands, or non-perennial streams. The duration and frequency of surface flow in streams must be understood to avoid confounding effects of natural drying events when assessing the ecological integrity of flowing waters. Some knowledge of flow permanence is critical and may be the key variable influencing the communities in many small streams in Florida. Different ecological expectations and sampling procedures are needed when assessing the condition of perennial versus temporary streams. The drying process causes changes in the physical and chemical conditions (e.g., loss of wetted habitat, reduced dissolved oxygen), which can exclude some species while allowing others to thrive. These effects are not related to nutrients and therefore need to be controlled for in nutrient evaluations. Geophysical, hydrological, and biological information may be used individually or in combination to make a demonstration whether a segment is non-perennial. Specific information to be included in a demonstration is discussed below.

There are two methods for demonstrating that a segment is non-perennial: 1) site specific gage and discharge data, 2) biological demonstration based on the resident flora or fauna. Either method can be used to independently establish non-perenniality. If both lines of evidence are available and the results conflict, the biological demonstration will take precedence. Demonstrations may be strengthened by employing multiple methods. Each method is described below.

~~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.

2.1.1 STREAM FLOW CHARACTERISTICS AS AN INDICATOR

Perenniality has been defined in several ways, including threshold-based definitions (such as 90% flow durations) and biologically-based criteria (such as 180 consecutive days of flow to support macroinvertebrate taxa). The terminology used here combines both elements. Perennial streams are defined for NNC purposes as those that have non-zero flow for at least 180 consecutive days (i.e., 6 months) in at least 90% of years in the available period of record. The period of record must consist of at least 5 years of flow data. Likely perennial steams have measurable flow for at least 180 consecutive days in greater than 50% of years. Seasonally perennial streams achieve 90-day (i.e., 3 months) flow spells in at least 75% of years, and non-perennial streams do not meet the flow thresholds for perennial, likely perennial, or seasonally perennial. Streams that are seasonally perennial or non-perennial fit the non-perennial exclusion for the stream numeric nutrient standard.

A demonstration that a stream is neither perennial or likely perennial, as defined above, can be made using pre-existing gage data or by deploying gages specifically for determining flow duration in the streams of interest. Stream flow statistics shall be calculated for a minimum of 360 days to capture seasonal variability. The demonstration shall include the mean annual flow, mean monthly flows, and 30-day low-flow frequencies. Longer periods of record will provide greater confidence that the mean, high, and low flow conditions have been adequately characterized. Streamflow statistics can be estimated using accepted regression equations for the region and site of interest and will be evaluated on a case-by-case basis for data sufficiency and accuracy.

2.1.2 BIOLOGICAL INFORMATION AS INDICATORS

Vascular plants

~~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. If available, vascular plant community composition will help distinguish ~~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 are 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~~ 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 (HA) or Linear Vegetation Survey (LVS) 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 extremely dry conditions, terrestrial taxa could also invade the channel bed of a non-perennial system.

Macroinvertebrates

If available, macroinvertebrates will also be used to distinguish perennial from non-perennial /wetland systems. Many rheophilic 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~~ if perennial streams reduce ~~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 the 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 taxa lists ~~of taxa~~ to distinguish ~~assist with distinguishing~~ perennial from non-perennial streams/wetland systems (**Tables 2~~8~~ and 3~~9~~**). Paragraph ~~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 (with a ~~and~~ corresponding reduction in obligate fluvial or lotic taxa) or to wetlands. Paragraph ~~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.

SCI ~~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 as set forth in Rule 62-160.210, F.A.C.) 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 2~~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 3~~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 as set forth in Rule 62-160.210, F.A.C.

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

Table 28. 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 (1990-2006). 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 rheophilic ~~rheophyllic~~ and long-lived taxa that are not commonly encountered in wetlands or non-perennial streams.

Taxa	# occurrences (n = 5309)
Hyalella Aazteca	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

Taxa	# occurrences (n = 5309)
Ancyronyx variegatus	1256
Rheotanytarsus pellucidus	1156
Chimarra	1149
Cryptochironomus	1139
Cambaridae	1131

Table 39. The most abundant invertebrate taxa found in wetland systems in Florida from 169 samples retrieved from SBIO (1999-2005). 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

Taxon	# of occurrences (n = 169)
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

2.1.3 USE OF GEOMORPHOLOGY TO IDENTIFY CANDIDATES SITES

Given the large number of potentially non-perennial streams, the Department plans to use GIS resources to help identify candidates for the collection of biological data or flow monitoring. Drainage area and dominant water source (surface versus groundwater), which rely on readily available GIS layers, provide insight into the typical flow regime and degree of flow permanence in a stream. Drainage area in this context refers only to the contributing area upstream of a sampling location. As drainage area increases, groundwater storage increases and approaches the streambed level, ensuring a more continuous flow. (Exceptions to this include springs and seepage streams where even the upper reaches sustain year-round surface flow.) Similarly, as groundwater's relative contribution versus surface water increases, so does the permanence of flow in a system.

Elements of the HydroBioGeomorphic (HBG) Classification System developed by John Kiefer and subsequently refined under DEP contract (AMEC, 2013; reference provided for informational purposes only) provides critical information that can be used to estimate the perenniality of a stream at a given location. The HBG system is a hierarchical, four-step process. The first step involves segregating streams based on broad differences in regional climate and geology (**Figure 1**). The second step divides streams into classes (karst, highlands, and flatwoods) based on the soils and dominant mode of water delivery in a watershed and is described in greater detail in a later paragraph (**Table 4**). The third step incorporates slope and valley configuration, and the fourth and final step, considers the dimensions and habitats of the channel and floodplain corridor (AMEC, 2013; reference provided for informational purposes only). For purposes of determining the likelihood of perenniality of a given system, the first two steps in the HBG classification process, identifying the hydrophysiographic region and mode of water delivery, are critical.

There are three regions for stream classification purposes: Northwest Florida Coastal Plain (NWFCP), Northeast Florida Coastal Plain (NEFCP), and Peninsula Florida Coastal Plain (PFCP). A fourth region, the South Florida Coastal Plain (SFCP) has been fundamentally

hydrologically altered and thus is not included in this discussion. The hydrophysiographic regions are illustrated in **Figure 1**. The NWFCP generally comprises the Florida panhandle west of and including the Ochlockonee River basin. The NEFCP lies to the east of the Ochlockonee River and north of an imaginary diagonal line running from the mouth of the Waccasassa River on the west (Gulf) coast to the mouth of the St Johns River on the east (Atlantic) coast. The PFCP region lies to the south of the same line as shown in **Figure 1**. It is important to note that sites near regional boundaries require more careful consideration and may exhibit characteristics that are intermediate between the bordering regions. If the system under evaluation crosses multiple regions, then each region should be evaluated. Department staff should be contacted if there is any uncertainty when conducting these determinations.

Florida's geology results in three distinctly different water delivery systems for Florida streams (karst, highlands, and flatwoods). Karst systems are those with abundant and steady groundwater discharged through limestone springs under pressure. The steady groundwater flow typical of karst systems exempts them from further non-perennial discussion. Highlands systems have unconfined lateral groundwater seepage through thick columns of sand through relict dunes, and flatwoods streams are dominated by surface water runoff seasonally coursing through and over combinations of flat, shallow, organic, and sandy soils. Accurately determining the dominant water source for highlands and flatwoods systems requires calculating the percentage of well-drained soils in the watershed of a given site. Surrogates for this information, such as the presence or absence of tannins in the water, *i.e.* color, is highly variable and not a reliable long-term indicator.

There are clear differences between the soil composition between the flashy, surface water dominated flatwoods systems and the steady, groundwater-dominated highlands systems among the three regions. Highlands generally have well-drained soils, low water tables, and rolling topography. Flatwoods generally have an abundance of poorly-drained soils, high water tables, and flat topography.

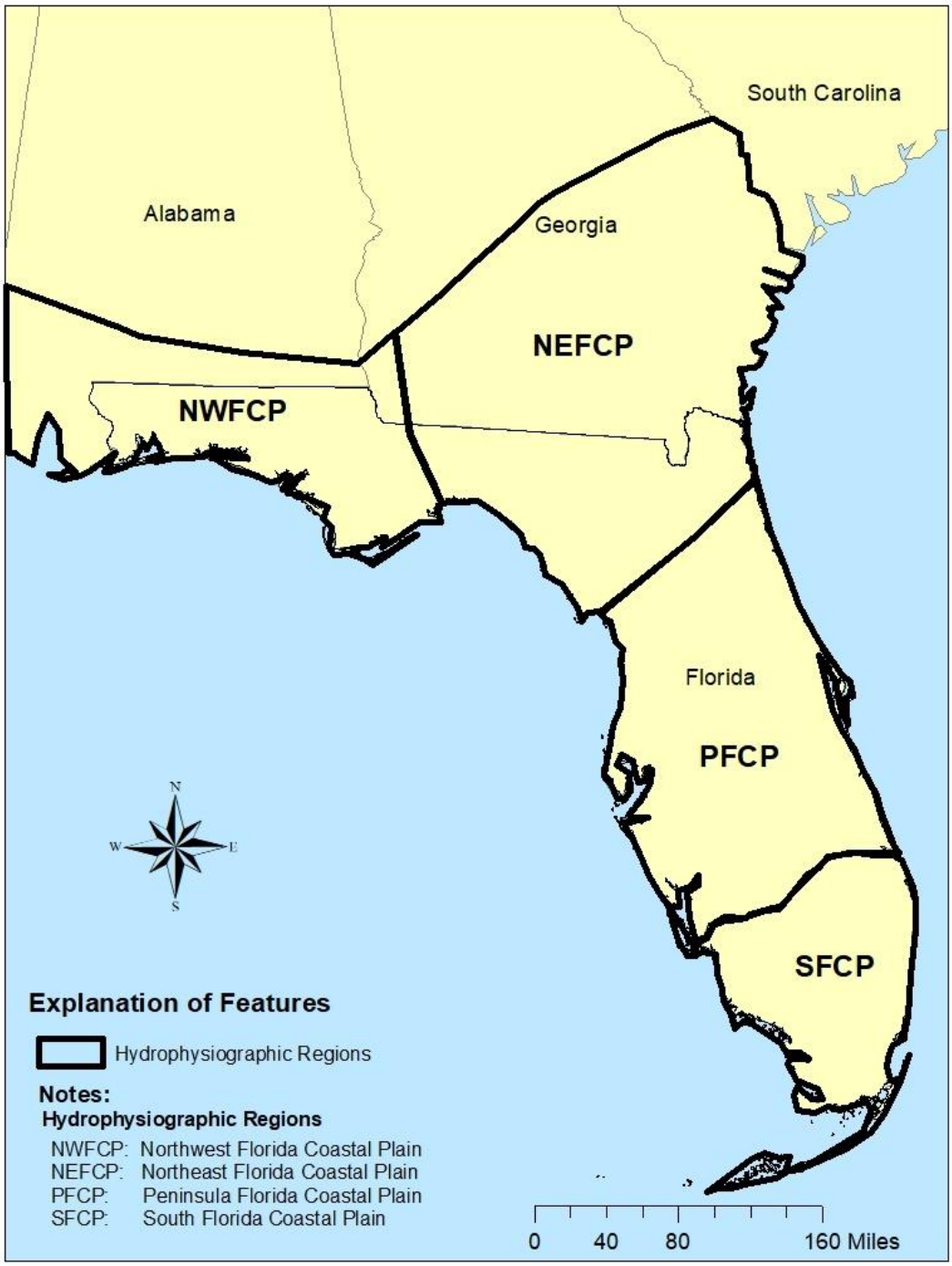

Figure 1. Hydro-physiographic regions versus FDEP Bioregions. This figure was adapted from AMEC (2013). For informational purposes only.

Soils are classified by the Natural Resource Conservation Service (NRCS) into four hydrologic soil groups based on the soil's runoff potential. The four hydrologic soil groups are A, B, C and

D. A-soils are the most well-drained and generally have the smallest runoff potential, and D soils are the poorest drained and have the greatest runoff potential. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the second letter should be used in the calculation. The first letter expresses the "potential" for a soil to be well-drained if drained or otherwise altered.

To determine the hydrologic soil groups in the drainage area of a given site, a Geographic Information System (GIS) layer (*e.g.* NRCS, SSURGO) with hydrologic soil content is required. The percent of hydric soils in the drainage area of interest should be calculated by adding up the soil types A and C in the PFCP region and the soil types A and B in the NEFCP and NWFCP regions. In GIS, this feature is typically designated as "HYDRGRP" or something similar in the attribute table of the soil layer. The percent thresholds in **Table 4** should be used to determine whether the site is highlands or flatwoods.

Table 4. Hydrologic soil thresholds for Flatwoods and Highlands stream by Hydrophysiographic Region.

Region	Flatwoods	Highlands
Peninsula (PFCP)	<40% A+C Soils	≥40% A+C Soils
Northeast (NEFCP)	<40% A+B Soils	≥40% A+B Soils
Northwest (NWFCP)	<40% A+B Soils	≥40% A+B Soils

2.1.3.1 Peninsula

The peninsula's distinct wet and dry seasons lead to the state's largest seasonal water deficits, which are most severe in April and May. The wet season typically starts in June and usually ends in November. The seasonal water stress creates the potential for a highly variable flow regime that is ameliorated in areas where the watershed's dominant soil characteristics consist of thick columns of unsaturated sands that allow for substantial infiltration consistent with the highland's physiography.

- Flatwoods Streams - Streams in the peninsular region with watersheds smaller than 5 sq. miles have highly variable hydroperiods and are inherently non-perennial. Streams with drainage areas above 5 square miles but less than 20 sq. miles are seasonally perennial. Peninsula flatwoods streams are likely perennial with drainage areas of at least 20 sq. miles and perennial above 50 square miles. Adequate flow volumes should not be an issue in these systems.

- Highlands Streams - In contrast to the flatwoods systems, highlands streams have a more consistent base flow and become perennial with much smaller drainage areas. Streams

smaller than 1 sq. mile are typically non-perennial, but those above this size are likely perennial.

Northeast

Streams in the northeast achieve perenniality in smaller basins than in the peninsula due to a more equitable distribution of rainfall throughout the year and lower evaporation potential.

- Flatwoods Streams - Northeast flatwoods streams with drainage areas less than 1 sq. mile are non-perennial. Systems between 1 and 5 sq. miles are seasonally perennial. Streams with drainage areas greater than 5 sq. miles are either seasonally perennial or perennial.

- Highlands Streams - There are very few highlands sites in the northeast region. Stream with drainage areas less than 3 sq. miles are likely to be non-perennial.

Northwest

Streams in the northwest region receive more rain than the peninsula or northeast regions, primarily in the winter and spring. With evapotranspiration potential the lowest and rainfall the highest, streams achieve perenniality in smaller basins when compared to the other regions.

- Flatwoods Streams – There are a limited number of these systems in the northwest region; most in this region tend to occur in or near the Apalachicola River basin. Given the climatic regime, it is likely that flatwoods sites become perennial when the drainage area exceeds 5 sq. miles.
- Highlands Streams – All sizes of highlands streams in northwest Florida are likely to be perennial.

A summary of the perenniality and associated NNC applicability based on region, water source, and drainage area is provided in **Table 5**. As noted in **Table 5**, peninsula flatwoods with a DA less than 5 square miles and peninsula highlands with a DA less than 1 square mile are expected to be nonperennial and therefore are candidates for further study. The nonperennial DA threshold for candidates in both Northeast and Northwest flatwoods is 1 square mile, while there is no DA threshold below which non-perenniality can be concluded for Northeast and Northwest highlands.

Table 5. Summary of NNC perenniality factors based on region, water source, and drainage area.

Region	Water Source	Drainage Area (DA) sq. miles	Perenniality	Candidate for Further Study
Peninsula	**Flatwoods**	DA <5	Non-perennial	Yes
Peninsula	**Flatwoods**	≥5 DA <20	Seasonally Perennial	Potential Candidate
Peninsula	**Flatwoods**	≥20 DA <50	Likely Perennial	No
Peninsula	**Flatwoods**	DA ≥50	Perennial	No
Peninsula	**Highlands**	DA <1	Non-perennial	Yes
Peninsula	**Highlands**	≥1 DA ≤5	Likely Perennial	No
Peninsula	**Highlands**	DA ≥ 5	Perennial	No
Northeast	**Flatwoods**	DA <1	Non-perennial	Yes
Northeast	**Flatwoods**	≥1 DA <5	Seasonally Perennial	Potential Candidate
Northeast	**Flatwoods**	≥5 DA <20	Likely Perennial	No
Northeast	**Flatwoods**	DA ≥20	Perennial	No
Northeast	**Highlands**	DA <3	Seasonally perennial	Potential Candidate
Northeast	**Highlands**	3 >DA ≥5	Likely Perennial	No
Northeast	**Highlands**	DA ≥5	Perennial	No
Northwest	**Flatwoods**	DA <1	Non-perennial	Yes
Northwest	**Flatwoods**	≥1 DA <5	Seasonally Perennial	Potential Candidate
Northwest	**Flatwoods**	≥5 DA <10	Likely Perennial	No
Northwest	**Flatwoods**	DA ≥10	Perennial	No
Northwest	**Highlands**	DA <1	Seasonally Perennial	Potential Candidate

Region	Water Source	Drainage Area (DA) sq. miles	Perenniality	Candidate for Further Study
Northwest	Highlands	≥1 DA <5	Likely Perennial	No
Northwest	Highlands	DA ≥5	Perennial	No

2.2 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 qualify for the exclusion ~~are applicable~~ under paragraph ~~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. If there are depth profile data, measurements for making this determination shall be taken within the bottom half of the water column.
>
> (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. If there are depth profile data, measurements for making this determination shall be taken within the bottom half of the water column.

This demonstration ~~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 facilities that discharges directly to tidally influenced segments of flowing waters with the reasonable potential to cause or contribute to nutrient impairments~~.

Tidally influenced segments also include those for which the direction of flow changes during the typical tidal cycle, such that the flow reverses during flood tide and resumes toward the coast during ebb tide or the water level increases during flood tide. Routine changes in the direction of flow or water level prevent consistent conditions required for the biological assessment tools included in the numeric nutrient standard.

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 paragraph ~~Rule~~ 62-302.200(36)(a), F.A.C., the ~~water quality standards~~ numeric nutrient standard for streams in paragraph ~~Rule~~ 62-302.531(2)(c), F.A.C., does not apply. Nutrient water quality based effluent limits (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 if as long as it continues to implement the standards at Rule 62-302.531(2), F.A.C.~~

2.3 Water Management Conveyances

The stream definition in paragraph ~~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 that qualify for the exclusion for conveyances ~~meeting the requirements~~ in paragraph ~~Rule~~ 62-302.200(36)(b), F.A.C.~~:~~

2.3.1 *Delineation*

Only those sections of the stream that meet the requirements in paragraph ~~Rule~~ 62-302.200(36)(b), F.A.C., are eligible for the exclusion ~~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.

2.3.2 *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 conveyance's 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 subparagraph ~~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 design 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 ~~d~~Department will apply the nutrient standards in subsection ~~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.

2.3.3 *Physical Alteration that Limits Habitat*

The exclusion ~~definition~~ at subparagraph ~~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 (SOPs) for conducting stream Habitat Assessments have been adopted by the Department in DEP SOP FT 3000 as set forth in Rule 62-160.210, F.A.C. ~~In order to~~ To qualify under subparagraph ~~Rule~~ 62-302.200(36)(b)2., F.A.C., the overall ~~Habitat Assessmen~~t HA score must ~~be score~~ either poor (0-40 points) or marginal ~~or poor~~(41-80 points), and the Substrate Diversity and Artificial Channelization metrics must score in the poor category (≤ 5 points). However, the exclusion may still apply when Substrate Diversity or Artificial Channelization scores are in the marginal range if it can be demonstrated that the higher scores are due to a lack of maintenance of the conveyance when the HA was completed. The Department will evaluate information related to ongoing maintenance programs and schedules to determine whether a lack of recent maintenance likely caused the scores to be within the marginal category, and to demonstrate that the conveyance is still being maintained primarily for water management purposes. If the overall HA score is other than poor or marginal, the conveyances do not meet the definition.

The HA ~~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's definition and components. An HA ~~system., and a Habitat Assessment~~ score must be completed by an individual with demonstrated proficiency (as per DEP SOP FT 3000 as set forth in Rule 62-160.210, F.A.C.,) 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 HA ~~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.~~

REFERENCES

[AMEC] Amec Environment and Infrastructure, Inc. 2013. Technical Support for Nutrient Concentration Sensitivities Associated with Different Types of Florida Freshwater Streams. Amec No. 14251.5. Prepared for Florida Department of Environmental Protection. February 2013. 191 pp. **For informational purposes only**.

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