

South Florida/Caribbean Network

National Park Service
Inventory and Monitoring Division



Periphyton Monitoring in Big Cypress National Preserve

Standard Operating Procedures—Version 1.0

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ON THE COVER

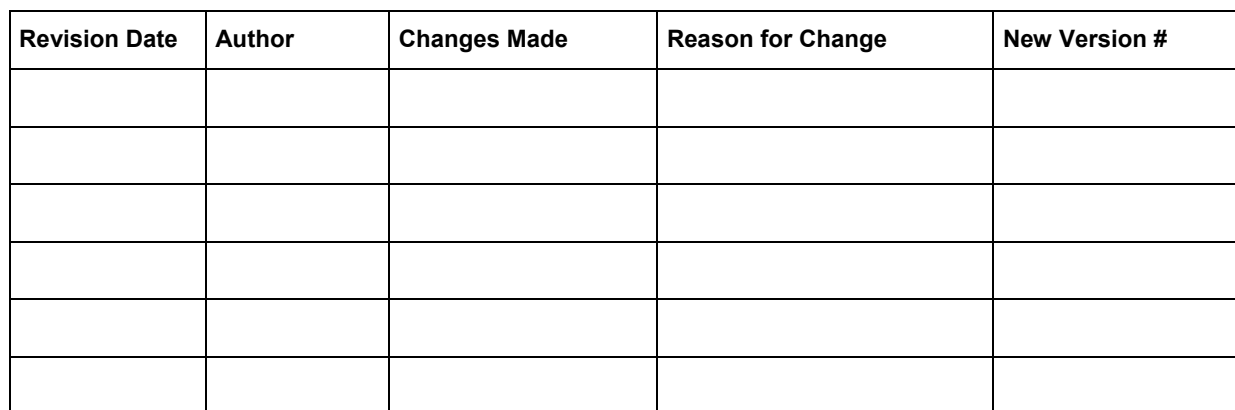
Calcareous periphyton mats in Fire Prairie unit, Big Cypress National Preserve.
Photographs courtesy of South Florida/Caribbean Network, National Park Service.

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National Park Service
Inventory and Monitoring Division



Overview

Field datasheets are created each year before the annual periphyton sampling event. Datasheets are created for each periphyton sampling site and include spaces for each of the parameters collected at a site as well as an aerial photograph of the site for guidance. This SOP describes the procedures used to produce the field datasheets.

Procedures

1. Open datasheet template project. For periphyton, the template is found at the following address: Z:\SFCN\Vital_Signs\Periphyton\documents\blank_datasheets\20180426_Periphyton_datasheet.mxd
2. Pull in Periphyton site shapefile to make datasheets from the mission prep folder: Z:\SFCN\Vital_Signs\Periphyton\spatial_info
3. If you do not see the Data Driven Pages toolbar click on Customize → Toolbars → Data Driven Pages (Figure SOP 1-1).

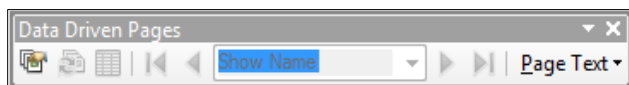


Figure SOP 1-1. The Data Driven Pages toolbar used to create field datasheets.

4. Click on the Data Driven Pages Setup icon (hand pointing to three sheets of paper).

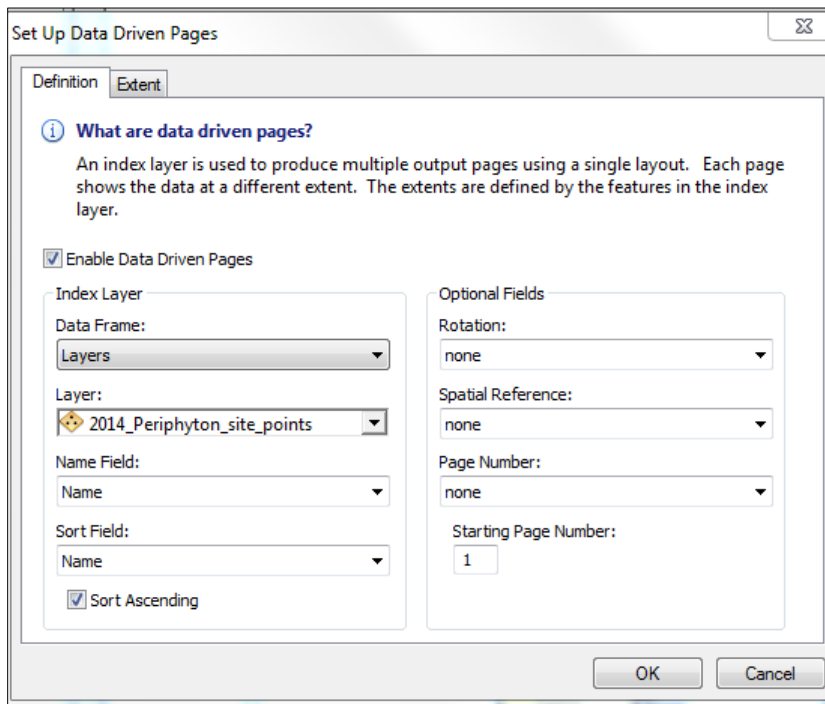


Figure SOP 1-2. Set up for Data Driven Pages when creating field datasheets.

5. Check the Enable Data Driven Pages checkbox (Figure SOP 1-2).
6. Choose the correct site layer from which to base your datasheets (Figure SOP 1-2).
7. Select the “Name” attribute as the Name Field and as the Sort Field.
8. Click OK. The final product should look like the example in Figure SOP 1-3.
9. Click File → Export Map.

Site: OK15		Hydro year: _____ Date: _____		Initials: _____																	
		Time start: _____ Time finish: _____		Field Check: ☐ _____																	
		Names: _____		Database Entry: ☐ _____																	
		Travel method: _____		Database Check: ☐ _____																	
		No. of photos: _____		GPS unit: _____																	
				GPS landing mark: _____																	
ORV activity ☐ Heavy ☐ Medium ☐ Low ☐ None		Sample collected? ☐ Yes ☐ No	Water present? ☐ Yes ☐ No	Water color ☐ Clear ☐ Slightly amber ☐ Amber	Water depths (cm): _____ _____ _____																
Transparent to bottom? ☐ Yes ☐ No		Transparency depth (cm): _____		Temp (°C): _____																	
pH: _____		Ambient cond (µS): _____																			
Substrate type ☐ Periphyton ☐ Soil ☐ Filamentous algae ☐ Plant		Substrate location ☐ 1 Floating ☐ 2 Sweaters ☐ 3 Ground ☐ 4 On Debris		Habitat type ☐ Broadleaf marsh ☐ Ecotone ☐ Graminoid marsh ☐ Cypress scrub ☐ Other _____																	
Overall Surface Cover and Vegetation - based on 5m plot radius																					
Surface Cover (Rel) %Vegetation: _____ %Periphyton: _____ %Open water: _____		Veg Breakdown <table border="1"> <thead> <tr> <th>Gen-spe</th> <th>% of veg</th> <th>Gen-spe</th> <th>% of veg</th> </tr> </thead> <tbody> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Gen-spe	% of veg	Gen-spe	% of veg	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____
Gen-spe	% of veg	Gen-spe	% of veg																		
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Figure SOP 1-3. Example of a datasheet ready for printing.

10. Navigate to the correct “Save in” location so that datasheets get stored with the field year in the following folder (you may need to create this folder):

Z:\SFCN\Vital_Signs\Periphyton\data\YYYYMM, where YYYY is the sampling year and MM is the month when sampling began.

11. Type a “File name:” with the date and the word “datasheets” (such as 20150811_datasheets).
12. Under “Save as type:” click PDF (*.pdf).

13. Move the “Quality” sliding bar to Normal or less.
14. Click Pages → All → Save.
15. Print out datasheets on waterproof paper.
16. Use three-hole punch and punch holes in datasheet along bottom of page.

Literature Cited

Urgelles, R., K.R.T. Whelan, R. Muxo, R.B. Shamblin, J. M. Patterson, and Andrea J. Atkinson.
2019. Protocol for periphyton monitoring in Big Cypress National Preserve: Protocol narrative.
Natural Resource Report NPS/SFCN/NRR—2019/1911. National Park Service, Fort Collins,
Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2260128> (last accessed
April 2019).

Standard Operating Procedure 2

Please cite this as:

Summary

Revision Log

[illegible]

Overview

A helicopter is an efficient method to fly South Florida/Caribbean Network personnel and their field equipment (datasheets, GPS, water quality meter, camera, sampling containers, and radio) to sites for sampling periphyton. Helicopters provide the most practical means as opposed to a motorized vehicle (truck, swamp buggy, or ATV/UTV). If feasible, ATVs or UTVs will be used for sites inaccessible by helicopter or if required to minimize expenses. A park service helicopter, versus a contracted helicopter, will be used whenever practical to reduce costs. Responsibilities for the helicopter crew, sample gathering, and data collection are delegated among the participating individuals at the start of each field season.

Helicopter Training and Pre-Field Procedures

Required training certifications (see below) must be obtained prior to any flights. The NPS procedures for flight operations are described in more detail in the Interagency Helicopter Operations Guide (IHOG), the Project Aviation Safety Plan, MPS 60, and DM 350-354. There is also a Job Hazard Analysis (Z:\SAFETY\SFCN_SOPs_with_JHAs\JHAs\Community Group JHA's\Job_Hazard_Analysis_Periphyton) pertaining to this monitoring effort which must be reviewed and signed by any South Florida/Caribbean Network team member flying in a helicopter for the periphyton sampling vital sign. An operational risk assessment analysis, hazardous materials checklist, and the South Florida/Caribbean Network Go/No Go list are completed for each mission.

All DOI personnel participating in helicopter flights for this monitoring project are required to complete the following helicopter training courses every three years:

- A107, Aviation Policy and Regulations I (on-line);
- A100, Basic Aviation Safety;
- S271, Helicopter Crewmember (at least one crew member); and
- S372, Resource Helicopter Manager (for the project lead).

All personnel must read and follow:

- Special Use Aircraft and Safety Plan Big Cypress Preserve: Big Cypress National Preserve, located on the South Florida/Caribbean Network server at:
Z:\Helicopter\Safety_plans\Periphyton; and
- Helicopter Job Hazard Analyses, located on the South Florida/Caribbean Network server at:
Z:\SAFETY\SFCN_SOPs_with_JHAs\JHAs\Community Group JHA's\
Job_Hazard_Analysis_Periphyton\.

Other pertinent forms are located in the Periphyton supplemental forms folder, found on the South Florida/Caribbean Network server at Z:\SFCN\Vital_Signs\Periphyton\documents\forms. It contains the following forms:

- SFCN_Float_Plan.doc.
- Flight_Request_Form_9400_blank_use_this.pdf.
- South Florida/Caribbean Network Helicopter Go No Go Checklist.
- Aviation_Risk_Assessment.docx.
- Hazardous_Materials_Manifest.docx.

These forms may be updated after publication and should only be seen as examples to help personnel locate the correct forms.

Weather conditions are an important consideration when deciding if the crew should proceed with a flight. Wind speed, wind gusts, temperature, visibility, precipitation, and local weather anomalies are all part of determining whether to proceed. Mission participants, ground support crew, and the pilot are all responsible for flight safety. The mission participants decide if the weather permits safely accomplishing the mission and obtaining good data.

1. Contact park personnel to ensure all landing sites are acceptable, e.g., not in a designated wilderness area or other restricted area.
2. Complete and submit required forms to access sites in restricted areas.
3. Submit Flight Request (9400).
4. Prepare GPS (SOP 8 *GPS Track and Waypoint Downloading and Archiving—Version 1.0*) and datasheets (SOP 1 *Field Mission Preparation: Creating Datasheets—Version 1.0*), and label and organize sample bottles for field use (SOP 4 *Periphyton Sample Collection Methods—Version 1.0*).
5. Confirm flight times and availability with pilot and flight following (air traffic control tracking).
6. Monitor weather.
7. Pack gear including personal protective equipment, personal locator beacon, park radio, food/drink, and camera.
8. Brief pilot on site locations and mission.
9. Weigh crew and gear prior to flight (to be added to the manifest).
10. Complete flight paperwork (manifest and load calculations).

11. Conduct flight safety briefing including procedures for “hot” egress and regress of the helicopter.

12. Secure all gear in helicopter.

Communication is essential before and during the mission. Flight following is maintained between the pilot and flight following personnel at Big Cypress National Preserve in accordance with the Office of Aviation Safety (OAS) described in the Project Aviation Special Use Plan for Periphyton Monitoring. Flight following communication requires verbal check-ins, which includes position and status update every 15 minutes as well as when the helicopter is landing and taking off. The South Florida/Caribbean Network crew carries a portable digital park radio for use when the helicopter has shut down or landed.

All considerations of aircraft performance with regard to load capacity, fitness for flight, flight duration, and ability to operate in current weather conditions are the primary responsibility of the pilot and flight crew. Any member of the crew has the ability to postpone a flight if conditions are not satisfactory (e.g., weather, gear, pilot, flight crew).

In all cases, the pilot and crew will be thoroughly familiar with the hazards within Big Cypress National Preserve and along flight routes. Flight following is conducted by Big Cypress National Preserve in accordance with Office of Aviation Safety (OAS) and NPS guidelines. All aircraft incidents or accidents will be reported in accordance with OAS, NPS, and FAA regulations.

Helicopter Field Procedures

Periphyton collection sites are pre-loaded onto a GPS chartplotter, which is secured on the dashboard of the helicopter. Once arriving at a site, the pilot and crew survey the area to find the safest place to land the helicopter including areas where vegetation is low-statured, water levels are not too high (less than 1 meter [3.2 ft]), and the ground is even and firm. The helicopter remains running with the rotors spinning during the collection of data and samples.

Upon landing, the project lead (navigating from the front seat) exits the helicopter first after approval from the pilot. The crew member (in the back seat of the helicopter) exits after direction from the project lead. The field crew then removes the field gear from the storage compartment. **Never walk beyond the helicopter storage compartment because of danger of coming in contact with the rear helicopter rotor (unseen when in motion).**

After gathering the field gear (be sure to hold field gear parallel to the ground to avoid contact with the main helicopter rotor above), the field crew walks toward the front of the helicopter in full view of the pilot and proceeds to the survey site. When sample collection is completed, return by approaching from the front of the helicopter in full view of the pilot, who will give a “thumbs-up” which signifies it is safe to return to the helicopter. The field crew stows their gear in the storage compartment, returns to their seats, and secures themselves before the helicopter lifts off the ground and proceeds to the next site.

All-Terrain Vehicle (ATV) Training and Pre-Field Procedures

All DOI personnel riding an ATV or UTV for this monitoring project are required to complete the ATV RiderCourse from the ATV Safety Institute every three years. There is also a Job Hazard Analysis (Z:\SAFETY\SFCN_SOPs_with_JHAs\JHAs\Community Group JHA's\Job_Hazard_Analysis_Periphyton) pertaining to this monitoring effort which must be reviewed and signed by any South Florida/Caribbean Network team member who will ride an ATV or UTV for the periphyton sampling vital sign. Other pertinent forms are located in the Periphyton supplemental forms folder which can be found on the South Florida/Caribbean Network server at: Z:\SFCN\Vital_Signs\Periphyton\documents\protocol\Latest_version\Supplemental_Material and Z:\SFCN\General_SOPs where the two following forms are located respectively:

- SFCN_Float_Plan.doc.
- SFCN ATV Go No Go Checklist

These forms may be updated after publication and thus should be seen only as examples to help personnel locate the correct forms.

Weather conditions are an important consideration when deciding if the crew should proceed with a mission. The mission participants decide if the weather permits safely accomplishing the goals and obtaining good data.

Standard Operating Procedure 3

Shamblin R. B. 2019. Initial Site Evaluation for Periphyton Sampling Sites—Version 1.0. South Florida/Caribbean Network Standard Operating Procedure. NPS/SFCN/SOP 3. South Florida/Caribbean Network, Palmetto Bay, Florida.

This standard operating procedure (SOP) is used by the South Florida/Caribbean Inventory and Monitoring Network (SFCN) of the National Park Service (NPS), for the evaluation of potential periphyton sampling sites. This task may need to be performed by both land and aerial observations. This evaluation takes place once, prior to the first sampling event. Sites should not have to be re-evaluated unless conditions at the site change and affect the landscape (possibly due to storm or long term vegetation growth).

[illegible]

Overview

The purpose of this SOP is to evaluate sites before sampling them. It serves as a time saving and safety measure. A set of potential sites can be evaluated in one or two flights where the pilot and crew members determine potential landing spots for accessing the sampling sites.

Procedures

This mission proceeds like any other flight, considering all planning and safety requirements, including an evaluation of current and expected weather conditions (see South Florida/Caribbean Network Safety Folder for appropriate safety requirements). The steps for an evaluation flight are as follows:

1. Make all necessary flight arrangements with Big Cypress National Preserve Aviation.
2. Download the preselected randomized points (both primary and secondary) onto a GPS unit.
3. Prepare and pack gear (personal protective equipment [PPE], GPS unit, and camera).
4. The project lead and possibly one other crew member (project team member) drive to Big Cypress National Preserve for the flight.
5. Brief pilot on mission objectives.
6. Fly predetermined course to evaluate sites and potential landing spots looking for any hazards and checking access to collection areas. Fill out a site evaluation form (Figure SOP 3-1) for each site and record any potential issues and concerns during the flight.
7. Debrief for pilot and crew on mission.
8. After returning to the South Florida/Caribbean Network office, decide which points were accepted for the project.

Sites are considered acceptable when the following conditions have been met:

1. The site contains the desired configuration of a central broadleaf wetland surrounded by a graminoid wetland that eventually grades into a shorter hydroperiod graminoid prairie. The areas of broadleaf and graminoid wetland may vary in size because of topography and there is no minimum area for either habitat (see also Figure 5a and 5b in protocol narrative; Urgelles et al. 2019).
2. There is adequate space of 300 feet (91.4 meters [m]) in length for a helicopter to take off from the site after sample collection.
3. Landing areas are 90 feet (27.4 m) in diameter for helicopter access. Desired landing areas include short-statured vegetation (1 meter [3.2 feet {ft}] or less), firm and even ground, and

areas of shallow water (1 meter [3.2 ft] or less). The landing area should be within 300 feet (91.4 m) of the randomly-selected point.

4. Site contains periphyton or filamentous green algae. Periphyton and filamentous green algae can be observed from the helicopter while hovering over the site.
5. Site is not disturbed. We look for areas where there are no signs of tire tracks, dirt roads, hiking trails, or airboat trails that may have altered the site.

SFCN Periphyton Monitoring Site Evaluation Form for BICY
Site ID _____ Date _____ Observer(s) _____
Evaluator's recommendation - approved/ denied (Circle) Signature
Pilot's recommendation - approved/ denied (Circle) Signature
Canopy Height Surrounding the Wetland (feet) Tree_____ Shrub_____ Herb_____
Plot Evaluation Checklist (Circle) Y / N Is the site free of helicopter hazards [towers, trees (> 100 Ft)]? Y / N Does the site has adequate space for helicopter to takeoff after landing? Y / N Does site contain desired wetland community? Y / N Does the site have safely accessible periphyton? Y / N Is the site > 50 m from cultural sites? Y / N Is the site > 50 m from visitor use areas?
Preferred Landing Area: GPS Unit _____ Mark #: _____
Comments / Sketches

Figure SOP 3-1. South Florida/Caribbean Network periphyton monitoring site evaluation form.

Use the following instructions to complete the South Florida/Caribbean Network Periphyton Monitoring Site Evaluation Form for Big Cypress National Preserve:

- Fill in the blank spaces on the top row: site ID, date of the evaluation, and who is performing the evaluation.
- The resource person performing the evaluation along with the pilot both need to approve or deny the site as acceptable to meet both resource and helicopter requirements. For the site to be considered acceptable, both people have to approve the site.
- Estimates of heights of the surrounding vegetation should be entered. Height estimates of the vegetation can be ascertained by using the altimeter on the helicopter and comparing to the height of the vegetation below. Purpose of estimating heights is to provide a coarse numeric estimate of canopy heights to back up the assessment of whether site will be safe to land a helicopter. Desired accuracy is Trees $\pm$ 2 meters (6.6 ft), Shrubs $\pm$ 1 meter (3.3 ft), Herbaceous $\pm$ 1 meter (3.3 ft).
- All the questions in the Plot Evaluation Checklist can be completed while hovering above the site in the helicopter. Hovering at different altitudes will allow the collection of the pertinent data. Purpose of the Yes or No questions is as follows:
 - Is the site free of helicopter hazards such as towers and trees greater than 100 feet (30.5 m) tall (Y/N)?
 - Purpose is to identify whether helicopter hazards exist at the site that either require dropping the site or must be part of pre-mission briefings.
 - Does the site have adequate space for helicopter to takeoff after landing (Y/N)?
 - Purpose is to determine whether site can be safely accessed by helicopter. Inability to take off will cause site to be excluded from sampling.
 - Does site contain desired wetland community (Y/N)?
 - Site must contain wetland habitat with an area of lower elevation and longer hydroperiod than the surrounding habitat, typically having broad leaf vegetation in the deepest areas. Sites dominated by dense cattails (90%) or by shrubs will be excluded.
 - Does the site have safely accessible periphyton (Y/N)?
 - Is there open water where light can reach the water column where periphyton should be present and that is accessible for sampling? Sites where vegetation is so thick that light cannot penetrate to the water (e.g., dense cattails) or where dense vegetation prevents safe access to the few areas of open water will be excluded.

- Is the site greater than 50 meters (164 ft) from a cultural site (Y/N)?
 - Although primarily screened during GIS assessment and unlikely to be found within marshes, not all cultural sites are known in the Preserve, thus this question is included out of an abundance of caution to prevent impacts on cultural sites.
- Is the site greater than 50 meters (164 ft) from visitor use areas (Y/N)?
 - Although primarily screened during GIS assessment, unmapped hunting camps and ATV trails do occur. This question is included out of an abundance of caution to document whether any sites are near areas of obvious visitor use and to determine whether localized human impacts (e.g., outhouse; hunter with gun) are of sufficient concern that dropping the site is warranted.
- Record which GPS was used and the numbers of the waypoint taken to record the “Preferred Landing Area.”
- Make any comments that may be useful to aid in why a site may have been selected or rejected. A sketch showing the location of a specific tree or landmark may also assist to reinforce decisions.

Standard Operating Procedure 4

Please cite this as:

Summary

Revision Log

[illegible]

Overview

The following procedures describe the process to properly collect periphyton samples and record pertinent and descriptive information about the site.

Equipment List

- Datasheets
- Datasheet holder
- Pencils
- Compass
- Garmin GPS60CSx or similar handheld unit
- Garmin GPSMAP 640 or similar
- YSI water-quality meter
- Olympus Stylus Tough waterproof camera
- Sample bottles (125mL plastic bottles) with pre-printed labels on the outside of each bottle including the site identification, and what the sample is being used for (total phosphorus or diatoms). Labels covered in clear packing tape to prevent waterlogging.
- Labels made from waterproof paper to be placed inside each bottle
- Formalin (stored in a hood at Everglades National Park)
- BK DPHX5102X Radio
- ACR ResQLink Personal Locator Beacon

Additional Equipment When Accessing Sites by Helicopter

- Nomex Flight Gloves
- Nomex Flight Suit
- Flight Helmet
- Flight Helmet Bag
- Leather Boots

Additional Equipment When Accessing Sites by ATV or UTV

- ATV

- ATV Trailer
- ATV Spare Tires
- ATV Helmet
- ATV Goggles
- ATV Gloves
- Leather Boots

Procedures

Sample and Data Collection

1. Fill in top of the datasheet, including the hydrologic year, visit date, names of those doing data collection, and travel mode. The hydrologic year is defined as May–April 30. If sampling between January and April, the hydrologic year will be the previous calendar year.
2. Arrive at location using handheld GPS unit (Garmin 60CSx, 62s, or similar). Sites have a 250-meter (820-foot [ft]) radius circular buffer, and periphyton samples can be collected anywhere in contiguous wetland within that buffer. In sequential sampling events, every attempt should be made to sample the same depressional marsh within the buffer as was previously sampled. However, safe landing of the aircraft takes precedence in any sampling activity. The two people sampling start at the access point and walk toward where the graminoid marsh to broadleaf marsh ecotone is located, looking for periphyton. The periphyton mat is generally in this ecotonal area, however periphyton may be collected anywhere there is an abundance of it along the way. If there is a lack of obvious periphyton within the circle after 15 minutes of searching, make that note in the comments section of the datasheet. It is impractical to spend all the time required to search the entire location. If periphyton cannot be located within 15 minutes of arrival to the site, move on to the next site. Since periphyton can exist in slightly different physical forms, the preferred order of collection is (1) floating mat, (2) algae on plants (sweaters), (3) algae on sediments (benthic mats), and (4) algae on woody debris. If the site is dry, a dry periphyton sample can be collected.
3. Once an area is found with available periphyton, take a GPS data collection waypoint and record the GPS unit number and the waypoint number on the datasheet. Also record the start time for the data collection.
4. To collect the periphyton samples, employ a grab sample method, using your hand to grab the sample. Prior to grabbing the sample, rinse your hands with water. This will help prevent the transfer of periphyton from the previous site. The goal of the grab sample collection is to collect approximately 120 milliliters (4 ounces [oz]) of periphyton (two 60 milliliters [2 oz] samples; one for periphyton composition and one sample for TP). Composite five grab

samples over the 5-meter (16.4-ft) radius sample area to get 120 milliliters (4 oz) of samples. Collect the easiest, most accessible periphyton available. If periphyton is not available you can substitute filamentous algae for the sample. Try to collect clean samples with few visible impurities (e.g., soil and vegetation). In order to have labs analyze for both total phosphorus and diatoms, two samples are collected. Each sample is squeezed slightly to remove excess water and placed in a 125 milliliter (4.2 oz) plastic bottle. Each bottle is filled approximately two-thirds by volume with periphyton. A sample should be collected even if it does not reach the recommended two-thirds by volume. It is better to collect what is available because it may turn out to be a viable sample. Sample bottles should already have pre-printed labels affixed to the outside of each bottle including the site identification and what the sample is being used for (total phosphorus or diatoms). Additional labels made from waterproof paper and written with pencil with the same information including the field date are placed inside each bottle, in case the outside label becomes compromised. The samples are placed in a cooler with ice for preservation. The community composition sample is fixed with a 3% buffered formalin solution upon returning from the field (SOP 17 *Use of Formalin in Field and Laboratory Settings—Version 1.0*). Record that a sample was taken on the datasheet and the number of grab samples included in the composite.

5. Take six mandatory photographs. Use a digital camera that can record 5 megapixel or greater photos. Use the autofocus mode with no flash and JPEG file format. The first photograph is of the datasheet (Figure SOP 4-1). This provides an easy way to separate the pictures by site back in the office. The second photograph is a downward facing, close-up photograph (from approximately three feet away) of the water surface or ground where the periphyton was collected (Figure SOP 4-2). Photos 3–6 are cardinal direction landscape photographs (north, east, south, and west) acquired using a compass for assistance. These photographs must have about 15–20% of the photo above the horizon to ensure they show the landscape and vegetation community surrounding the collection site (Figure SOP 4-3). Additional (optional) photos may include any plants you cannot identify, evidence of heavy off-road vehicle (ORV) activity, or field personnel at work. Record the number of photos taken at each site on the datasheet.
6. Fill in the “ORV activity” portion of the datasheet to describe the condition of the nearby (within the field of view) location, not just the specific collection site. Heavy ORV activity would indicate ORV’s use the area frequently and the terrain is currently roughed up (showing signs of destroyed vegetation and dug up terrain). Medium ORV use indicates previous ORV use in the area but the vegetation damage and terrain damage is less than severe. Medium use may also indicate an area that previously showed heavy use but shows signs of recovery. Low ORV use indicates light recent use (minimal vegetation damage and or terrain damage) or mostly recovered vegetation and terrain from previously use. If there are no signs of ORV check the “None” box.

7. Fill in the “Water present?” question on the datasheet. This should be marked as “Yes” when the periphyton was grabbed from standing water. This should be marked as “No” when the periphyton was grabbed from a dry substrate.
8. Fill in the “Water color” choices on the data sheet to provide an indication of the amount of tannins in the water. The “Clear” box is checked if there is no visible color in the water. The “Slightly Amber” box is checked if there is some color present but below the sample color threshold. Water color darker than the threshold constitutes “Amber” color. The threshold is determined by comparing to a preprinted standard taken into the field.



Figure SOP 4-1. After arriving at a periphyton sampling location, first take a photo of the datasheet to aid in identification of the pictures for each location.



Figure SOP 4-2. A downward facing photograph of the water surface showing algal substrate.



Figure SOP 4-3. After taking a picture of the location datasheet, take four landscape-style photos showing the vegetation community at each cardinal direction of the sampling location starting with the north picture, then east, south, and west.

9. Use a metal measuring stick to record water depth. Stand at the collection location and take three water depths around you (in centimeters [cm]). The first measurement is taken at the center of the periphyton collection location; the other measurements are taken perpendicular to the broadleaf marsh-graminoid marsh ecotone, one meter toward and one meter away from the ecotone (or on both sides of the ecotone if the first point is on the ecotone). Record these measurements on the datasheet. **Caution:** the metal measuring stick will sink if dropped. Use brightly colored flagging tape tied to it as a visual aid in case it is dropped into the marsh.
10. Determine and record the transparency depth of the water column. Find an area with little submerged aquatic vegetation or move existing vegetation aside without disturbing bottom sediments. Lower the meter stick vertically into the water until its end reaches the underlying substrate. If you can see the end at the bottom, the water column is transparent all the way through. If you cannot see the end when it is touching the bottom, slowly raise the measuring device until you can see the end, hold it in that position, and record the measurement at the surface. The measuring device is a stainless steel, Pittsburgh brand flat metal stick, 48 inches (122 cm) long and two inches (5.1 cm) wide. The increments are broken down to the centimeter and millimeter. The markings on the stick are printed in black providing good contrast against the metal finish. A hole in one end allows a piece of flagging to be tied to it.
11. Use a YSI ProPlus pH meter (or similar) to record water temperature (in °C), pH, and ambient conductivity (in μS). Refer to SOP 5 *Calibration, Operation, and Maintenance of YSI ProPlus Handheld Water Quality Meter—Version 1.0*. These readings are collected at the location where the periphyton was collected, or as close as possible with sufficient water if in dry conditions, and recorded on the datasheet.
12. Record the ‘Substrate type’, i.e. what is the dominant covering of the substrate at the sample collection location (Periphyton, Soil, Filamentous Algae, or Plant).
13. Record the ‘Substrate location’, i.e., location of the periphyton collected at the sample collection location (Floating, Ground, or Sweaters).
14. Record the ‘Habitat type’, i.e., dominant vegetation type at the sample collection location (Broadleaf marsh, Graminoid marsh, Cypress dome, Ecotone, or Other). Broadleaf Marsh is greater than 60% broadleaf vegetation, Graminoid marsh is greater than 60% graminoid vegetation, and Ecotone is where broadleaf and graminoid vegetation are both between 40–60% of the vegetation for the sample area. When sampling at the ecotone between two habitat types, the habitat will be defined as ‘Ecotone’ and cover of each habitat will be estimated.
15. Record the overall percentages for vegetation cover, periphyton, and open water for the 5-meter (16.4-ft) radius circle around where the periphyton sample was collected. The percent cover is estimated to the nearest 1% of each category. Cover estimates are made by looking at the 5-meter radius circle and recording the absolute percent cover of each category. Vegetation cover is the absolute percent area occupied by the vegetation regardless of

species. Periphyton cover is the absolute percent area occupied by periphyton. Periphyton occupying the benthic mat and covered with water is recorded as periphyton cover. “Open water/bare” cover is the absolute percent area occupied by open water (or bare ground in rare cases) in the absence of vegetation or periphyton (percent cover of water where there is no vegetation or periphyton). Typically this last percentage is small and percent vegetation cover and percent periphyton typically sum to approximately 100%. Even bare ground is usually covered by a periphyton crust.

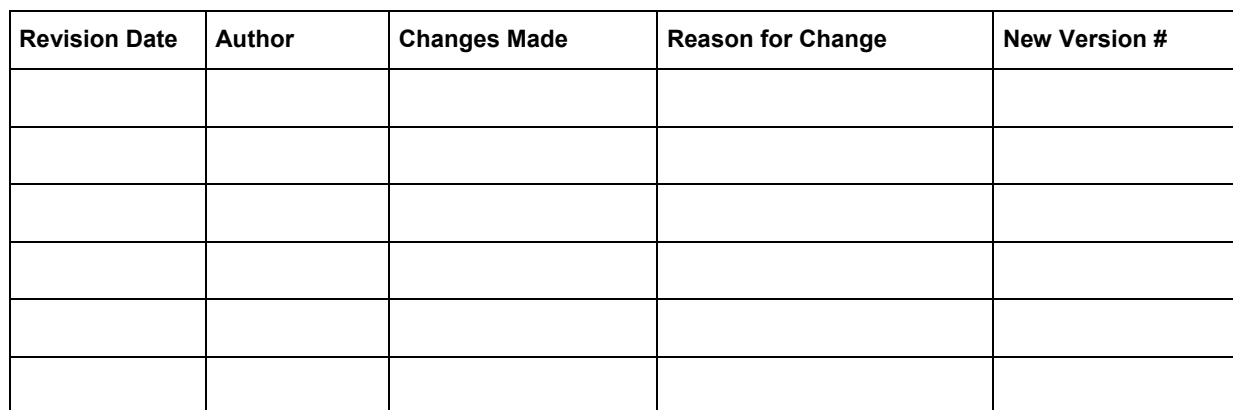
16. Within the vegetation “breakdown” section of the data sheet, record at least three, and up to six, dominant plant species that define the 5-meter (16.4-ft) radius circle where the periphyton sample is collected, and estimate the absolute percent cover to the nearest 1% for each species. These percentages may not add up to the total % vegetation or may be higher than the total % vegetation. Dominant species are identified as the most abundant plant species within the sample area based on cover. Percent cover is evaluated as the total cover of the species, ignoring the presence of other species.

17. Record the stop time for data collection.

To reduce the possibility of contamination across sites, if an all-terrain vehicle (ATV) was used to reach the site, prior to exiting the area, the riders must inspect the vehicles for invasive plant material that may be transported to the next area. Water at the site can be used to rinse off other unwanted debris. The South Florida/Caribbean Network will follow any guidance Big Cypress National Preserve may issue regarding limiting the spread of invasive species.

To ensure consistency at the start of each sampling season, all personnel participating will conduct sampling procedures on at least one training site together to ensure all understand the procedures and how to implement them. During this training sampling event, observers will separately collect and record field data so that sampling variability can be estimated. The team will discuss the results to determine how to eliminate discrepancies. Data sheets will be retained. Additionally, sample crews will always be comprised of at least one member who collected samples during the previous sampling event.

National Park Service
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Overview

The Yellow Springs Instrument (YSI) ProPlus is a rugged and waterproof micro-processor-based digital handheld meter with detachable probes for pH, DO, and conductivity. The following SOP outlines step-by-step procedures for operating the YSI Pro Plus in the field. This SOP provides South Florida/Caribbean Network technicians with standardized methods to ensure comparable data collection of water-quality parameters across time and space when using the YSI ProPlus handheld meter.



Figure SOP 5-1. YSI ProPlus Model handheld meter.

Procedures

Preparation and Calibration for Field Operation

1. Consult the YSI Pro Plus manual for step by step process for calibrating sensors. This manual can be found on the server at:
Z:\Property\Equipment\YSIs\YSI_ProPlus\YSI_Manual_ProPlus.pdf.

2. For the highest accuracy, calibrate or verify each sensor on the probe regularly. This must be done before taking measurements in the field. Calibration of the temperature sensor is not required. However, the temperature sensor should be verified annually when the instruments are sent in for maintenance.
3. Prior to calibrating the sensors, ensure the sensors are clean, the calibration solution is good (not expired), the calibration vessel is clean, and that you are entering the correct calibration value if entering manually. Proceed to calibrate the sensors according to the YSI Pro Plus manual.

Field Operation

1. Before departing for a periphyton sampling site, turn on the YSI Pro Plus instrument and let it run for approximately 10 minutes before use. Leave the instrument running while navigating to the sampling location. Turn the instrument off after sampling the location.
2. Carefully thread the metal cylinder over the sensors before use (Figure SOP 5-2).
3. At the site, submerge the probe completely in the water and allow readings to stabilize for five minutes (YSI Manual) before recording parameters. No calibration of the instrument is required on site. All calibrations are made in the office prior to field work.
4. Press “up or “down” arrows to toggle between parameters. Record readings for pH, temperature, and ambient conductivity.
5. Return the probe to plastic storage cylinder with the yellow sponge after use (make sure the sponge is damp; Figure SOP 5-3).
6. Use tap water to dampen the sponge. **Do not** use distilled water.

Post-Field Maintenance and Storage

- When not in use or during travel, the YSI Pro Plus should be stored in the yellow Pelican 1500 case.
- For long-term storage, the temperature and conductivity sensors can be stored dry or wet as long as solutions in contact with the thermistor are not corrosive (e.g., chlorine bleach).
- When storing pH sensors long term, make certain the sensor does not dry out. Sensors which dry out due to improper storage may be irreparably damaged by the dehydration. To store the sensor, remove it from the cable and seal the vacant port with a port plug. Fill the original shipping or storage vessel (plastic boot or bottle) with buffer 4 solution and then submerge the sensor in the solution. The sensor should remain submerged in the solution during the storage period. Seal the vessel to prevent evaporation and periodically check to ensure the sensor does not dry out. Be sure to note any time expiration on pH sensors and plan accordingly.



Figure SOP 5-2. Carefully thread the metal cylinder over the sensors before use.



Figure SOP 5-3. After use, return the probe to the plastic storage cylinder with the yellow sponge (make sure the sponge is damp).

Service Information

Follow the general maintenance procedures outlined in the YSI Professional Plus User Manual to ensure years of error-free operation. If the unit experiences technical problems that general maintenance and troubleshooting can't correct, YSI has authorized service centers throughout the United States and internationally. For the nearest service center information, visit <http://www.ysi.com> and click "Support," or contact YSI Technical Support directly at 800-897-4151.

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from <http://www.ysi.com> by clicking on the "Support" tab, then the "Product Return Form" button.

Technical Support Information

- Monday through Friday, 8:00 a.m. to 5:00 p.m. ET
- Phone: (937) 767-1058 (technical support)
- Email: environmental@ysi.com or proseries@ysi.com
- Internet: <http://www.ysi.com>
- Mail: YSI Incorporated, 1725 Brannum Lane, Yellow Springs, OH 45387 USA

When placing an order please have the following available:

1. YSI account number (if available);
2. Name and phone number;
3. Purchase order or credit card;
4. Model number or brief description; and
5. Billing and shipping addresses.

Standard Operating Procedure 6

Revision Date	Author	Changes Made	Reason for Change	New Version #

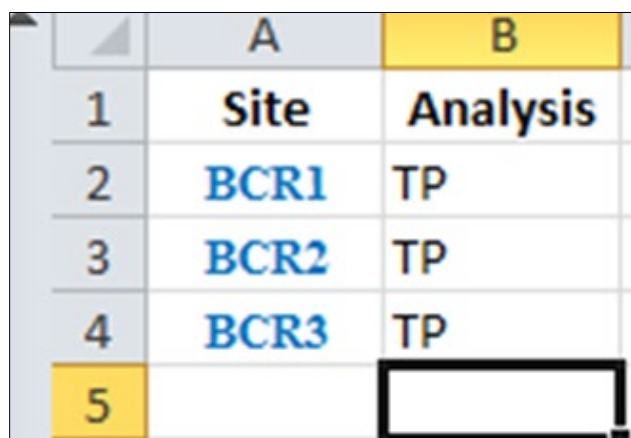
Overview

This SOP describes the process of handling and shipping samples for analysis after collection.

Procedures

Once the collected samples (two samples from each site collected in 125-milliliter [4.2-oz] plastic bottles) are returned to the South Florida/Caribbean Network office, they are sorted into two groups: one for total phosphorus (TP) analysis, sent to Florida International University (FIU); and the other for diatom analysis, sent to Michigan State University (MSU). The South Florida/Caribbean Network retains the ability to use a different qualified laboratory or laboratories for analysis if needed. Mention of business names is not an endorsement but for clarification of the activity as it relates to this SOP.

1. Labeling on samples is verified prior to shipment to ensure each institution receives the correct set of samples. Each 125-milliliter (4.2-oz) bottle should be labeled with the site ID, date of collection, and type of analysis to be performed (TP for total phosphorous analysis and D for diatom analysis).
2. Samples for Michigan State are shipped as soon as possible via FedEx or other common courier (see SOP 14 *Shipping of Formalin Solutions—Version 1.0*). A packing list (with the site ID and analysis to be performed for all sites sampled; Figure SOP 6-1) is sent electronically as a Microsoft Excel spreadsheet, as well as in paper form enclosed with the samples. Acknowledgment of receipt of the samples by Michigan State is sent to the network via email using the Microsoft Excel spreadsheet as a chain-of-custody (COC) form.



	A	B
1	Site	Analysis
2	BCR1	TP
3	BCR2	TP
4	BCR3	TP
5		

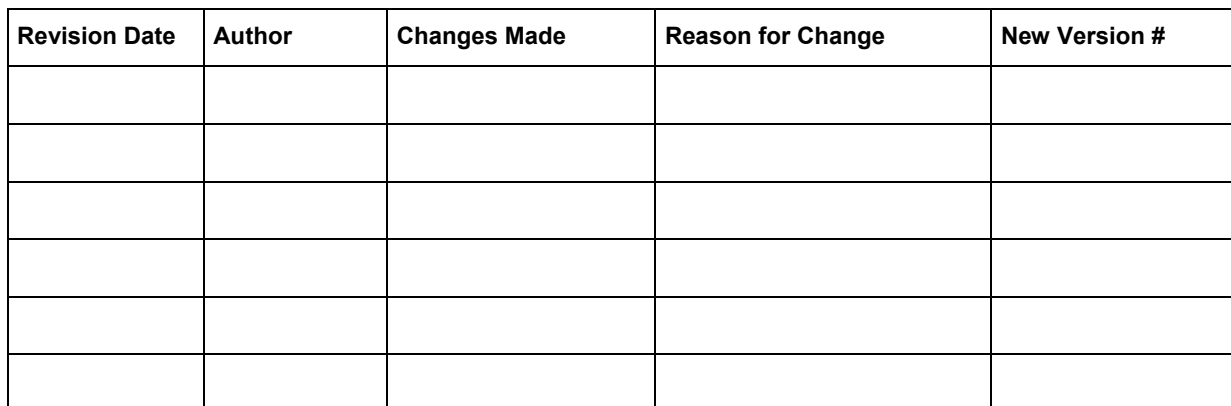
Figure SOP 6-1. Packing list example for total phosphorous (TP).

3. Samples for Florida International University are dropped off as soon as possible in an ice chest. As with the MSU samples, a packing list is sent via email as a Microsoft Excel spreadsheet and in paper form enclosed with the samples. The Periphyton Lab at Florida International University sends a confirmation email acknowledging receipt of the samples.

The Microsoft Excel spreadsheet containing the list of samples is attached to the confirmation email and used as a COC form thereafter. If sent to another facility where shipping is required, dry ice is used to preserve the samples during shipment.

4. The FIU samples are processed first in the Periphyton Lab where initial sorting (pre-processing) of samples eliminates unwanted vegetative debris. Once cleaned, samples are sent to the Southeast Environmental Research Center (SERC) lab for further processing and National Environmental Laboratory Accreditation Conference (NELAC) certified analysis.
5. The MSU samples are processed using EPA National Water-Quality Assessment (NAWQA) procedures for diatom identification. Taxonomic naming follows the diatom database supported and maintained by the US Geological Survey, BioData (<https://aquatic.biodata.usgs.gov/>). The South Florida/Caribbean Network will document the version used and will download a copy for reference upon receiving diatom data. To assist with documentation and harmonization, species that make up greater than 5% on the slide are photographed, named, and retained. Once processed, diatom data are sent to the South Florida Caribbean/Network in electronic form (Microsoft Excel file) along with the prepared microscope slides used for sample identifications. Diatom data are stored in the South Florida/Caribbean Network server (Z:\SFCN\Vital_Signs\Periphyton\data) in a subfolder labeled with year and month (YYYYMM) for data management to access and enter into the South Florida/Caribbean Network Periphyton Database (see SOP 9 *Data Entry and Quality Assurance—Version 1.0*). Slides produced from the samples (after receipt from the labs) are delivered to South Florida Collections Management Center (SFCMC), Everglades National Park for archiving and storage. South Florida/Caribbean Network personnel are responsible for delivery of the slides to South Florida Collections Management Center. An invoice of items delivered to the center is signed by SFCMC personnel and kept on file at the South Florida/Caribbean Network.
6. The FIU samples are analyzed for TP. Data and corresponding NELAC analysis certification are sent to the network in electronic form (Microsoft Excel spreadsheet) via email. As with diatom data, TP data are stored in the South Florida/Caribbean Network server (Z:\SFCN\Vital_Signs\Periphyton\data) for data management to access and enter into the South Florida/Caribbean Network Periphyton Database (see SOP 9 *Data Entry and Quality Assurance—Version 1.0*).
7. Upon completion of sample processing and receipt of data, payments are made to the corresponding institutions.

National Park Service
Inventory and Monitoring Division



Overview

Photographs are used in connection with observations to record the flora and surrounding conditions at each basin monitored in Big Cypress NP. With the use of photography and field observations, the South Florida Caribbean Network (SFCN) documents the general appearance and characteristics of the basins sampled.

Upon return from the field, follow the steps below to ensure the photographic data are properly processed.

Procedures

Downloading Photographs from the Olympus Stylus Tough-8000 camera

After returning from a field day, the photographs from the camera are downloaded before going back into the field. These steps describe the process for the Olympus Stylus Tough-8000 camera. If a different camera is used, refer to the instruction manual for that camera.

1. Connect the camera to the computer using the download cable and a USB port.
2. Once the camera is attached, it will come on and reveal a list of four choices on the camera screen: PC, Easy Print, Custom Print, and Exit. At the right of the PC box there is a right-facing arrow. To activate the arrow, hit the lightning bolt key on the camera menu. This takes you to a new screen with two choices, Storage and MTP. Hit the down button on the camera (on the menu buttons, it shows a clock on the button) to highlight the MTP choice.
3. Press the “OK” button on the camera. This brings up the Scanner and Camera Wizard (Figure SOP 7-1) on the computer. Click “Next.” This takes you to a new screen where you can choose pictures to copy. Pictures with a green arrow in the upper right hand corner are the ones to be copied (Figure SOP 7-2). Click “Next.”
4. A new screen will appear on the computer, the Picture Name and Destination page. In “Type a name for this group of pictures,” use the naming convention: “Year _Park.” For example, the periphyton project done in Big Cypress NP (BICY) in 2015 would be “2015_BICY.” Choose a place for the group of pictures to be saved. Since the project was done in 2015, a folder was made (BICY_2015) in the images section of the Periphyton Vital Sign folder. When choosing a place to save the group of pictures, choose the following destination: Z:\SFCN\Vital_Signs\Periphyton\images\BICY_2015. Within the BICY_2015 folder make separate subfolders for each site. Name these subfolders with the site name. For example, if you were working at the Fire Prairie basin, site 3, the subfolder would be named FP03. This will keep the pictures in order by place visited.
5. It is recommended that you delete the pictures from the camera after copying them. This can be done by clicking the box next to “Delete pictures from my device after copying them.” Click “Next.”

6. The pictures are copied to the specified destination. A new screen appears with other options. At this point you are finished downloading. Make sure the “Nothing. I’m finished working with these pictures,” is checked and hit “Next.” The pictures will be copied. Click “Finish.” You can now disconnect the camera from the computer.



Figure SOP 7-1. The Scanner and Camera Wizard will appear on the computer screen after highlighting and activating the MTP feature on the camera.

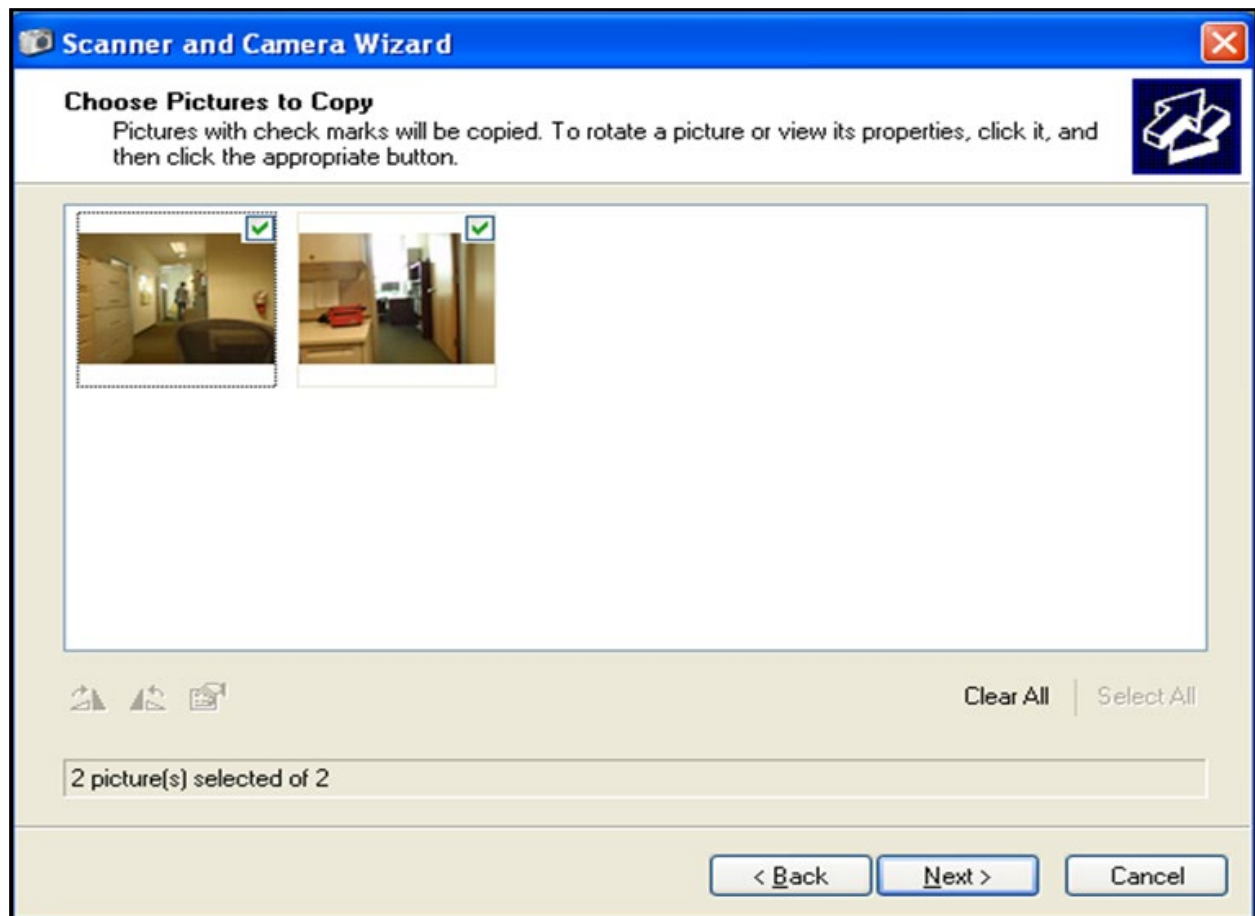


Figure SOP 7-2. When clicking Next on the Scanner and Camera Wizard, this new screen appears to allow pictures to be copied. Pictures with check marks will be copied.

Renaming Photographs Using Adobe Bridge CS4

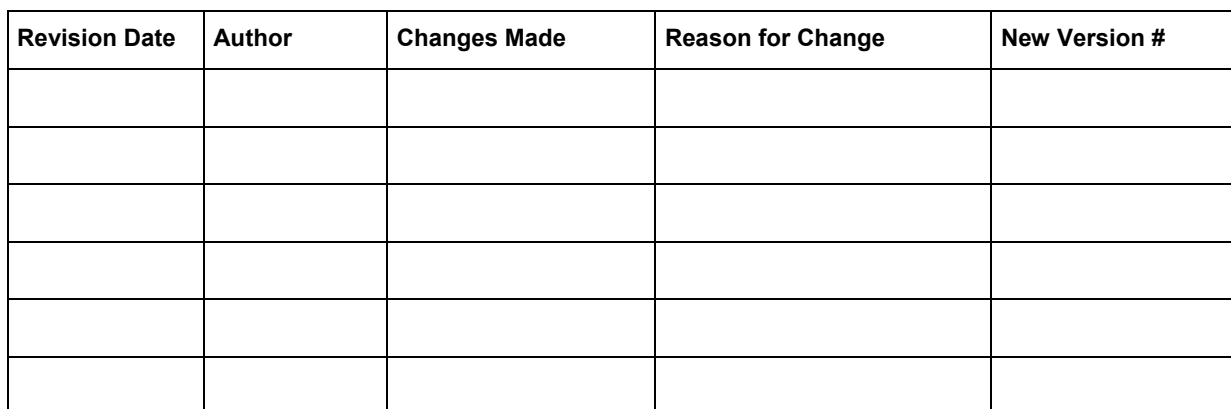
Use the following convention: shot date (YYYYMMDD)_PARK_site_two-digit number sequence beginning with the number 01 for the first photo taken in the series (Example:

20131119_BICY_OK01_01).

1. First make sure to select all photos by clicking inside the “Content” window where all the photos are located and clicking “Ctrl+A.” Then, from the “Tools” drop-down menu, select the “Batch Rename...” option.
2. From the “Batch Rename” dialogue box, select “Rename in same folder” under the “Destination Folder” section. From the “New Filenames section” select the appropriate options to rename the file the following way: YYYYMMDD_BICY_01. To do this, follow these steps:
 - a. On the first row, select “Date Time” on the first dropdown menu, then “Date Created” in the dropdown menu to the right, and “YYYYMMDD” from the next dropdown menu to the right.

- b. On the second row, select “Text” from the first dropdown menu and on the box to the right type in `_park code` (Example: `_BICY`).
 - c. On the third row, select “Text” from the first dropdown menu, and on the box to the right type in `_abbreviated project description_` (Example: `_site name_`).
 - d. On the fourth row, select “Sequence Number” from the first dropdown menu, type in 1 on the box to the right, and select “Two Digits” from the dropdown menu to the right.
 - e. Note that, as you make the changes above, under the “Preview” section on the bottom of this dialogue box, the sample “New filename” will change accordingly. When you are done, be sure the “New filename” displays correctly and according to convention. Ensure that it has no spaces and the appropriate underscores.
 - f. Click “Rename.”
3. Now add each basin code to the naming convention. Sites are differentiated by the basins they inhabit. Prior to sampling each site, a photograph of the datasheet is taken to identify and separate each site’s photographs from the next site. Adding the site code to the previously sequenced photos can be done the following way using Adobe Bridge:
 - a. First, make sure to select photos by each site. The sites can be distinguished from each other by using the datasheet photographs as mentioned above. Click on a specific photo to highlight that photo. To highlight a group of photos (e.g., a site photograph grouping), click on the first datasheet; then, hold the “Shift” key and click on the last photo site. Then, from the “Tools” drop-down menu, select the “Batch Rename...” option.
 - b. On the third row, select “Text” from the first dropdown menu and on the box to the right type in `_site name_` (Example: `_OK01`). Make sure to use the appropriate site code consisting of basin name and number.

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Overview

Tracklines and waypoints are used to record the spatial data associated with the collection of periphyton data as well as travel to and from data collection points for each basin monitored in Big Cypress NP. Follow the steps below immediately upon return from the field to ensure all spatial information is properly downloaded and archived.

Procedures

GPS Track Downloading Using DNR GPS:

1. Connect GPS unit to computer via USB cable and turn GPS device on.
2. Open DNR GPS program (version 5.4.1 or current appropriate software).
3. DNR GPS should automatically detect the GPS device (if device is on). DNR GPS window should show “Connected” in the lower left-hand corner. If GPS device is not automatically detected, select GPS from the menu bar, then select “Set Port,” and then “USB.”
4. The projection should read NAD83—UTM zone 17N. If this projection is correct, skip to step 6.
5. The projection may need to be set the first time a GPS unit is connected to the computer. A prompt will appear and provide the user with a projection. If the initial projection is not NAD83—UTM zone 17N, then select “No” and click on “ESRI” to select the correct projection. Click “Project” and then load the correct projection from your program files. The file path is: C:\Program Files\ArcGIS\Desktop10.1\Coordinate Systems\Projected Coordinate Systems\UTM\NAD 1983\NAD 1983 UTM Zone 17N.prj. Once this is done you may proceed.
6. Occasionally it is beneficial to return to a point using tracklines because that point may be more easily accessible from a specific direction. If downloading tracks, select “Track” from the menu bar and then select “Download” from that menu.
7. If you have a Garmin 60CSx GPS receiver, once the track records are successfully downloaded, a dialog window will appear informing you of how many records were collected. You will need to select “OK” in the window.
8. Select “File” from the menu bar, then select “Save To,” and then “File....”
9. Navigate to Z:\GIS\GPS\Garmin (model)\ (appropriate unit # as written on side of unit).
10. From the “Save as type”: drop-down menu, select “ArcView Shapefile (Projected).”
11. In the “File name”: box, name file according to convention. Example:
Garmin60Unit2_20110119_Tracklines.

Note: The date in the convention above is the date the data is being downloaded (usually the flight date).

12. Click “Save.”
13. DNR GPS will ask for an output shape: Point, Line, or Polygon. Tracks can be saved as either lines or points. **This type of track output (points) is necessary when a gpx file is not available.** However, saving a track file as lines is a faster process than saving it as points. Select “Line” and click “OK.”
14. A window should appear indicating that the file was written successfully and directing the user to the location of the file. Click “OK.”
15. If using a Garmin 60CSx (if using a Garmin 62S, skip to step 17) and you want to download waypoints, select “Waypoint” from the menu bar and then select “Download” from that menu. Repeat steps 8–10 for the waypoints.
16. A window should appear indicating that the file was written successfully and directing the user to the location of the file. Click “OK.”
17. If using a Garmin 62s and you want to download waypoints, select “File,” “Load From >” and “File...” and then navigate to “J:\Garmin\GPX” (J varies depending on the port you connected the unit to). From the “Files of Type” drop-down menu, select “GPS eXchange Format (*.gpx).”
 - a. You then need to select the appropriate file to load, the name of which should begin with the word “Waypoints,” and have the date the data were collected. Click on “Open.”
 - b. A box will pop up asking you to define the feature type. Click on “Waypoint” and “OK.”
 - c. A dialog window will appear informing you if the file loaded successfully. Click “OK.”
 - d. To save the file, follow steps 8-12 above.
 - e. A window should pop up indicating that the file was written successfully and directing the user to the location of the file. Click “OK.”
18. If downloading from a Garmin 60CSx or 62S, download the gpx file next. Turn off the DNR GPS software either by clicking on the “X” on the top right of the screen or selecting “File” and “Exit.” Next, proceed as follows, depending on the GPS model:
 - a. If using a Garmin 60CSx (if using a Garmin 62S, skip to step c) press the “Menu” key on the GPS unit twice, select the “Setup” icon, and press “Enter” key. Next,

select the “Interface” icon and press “Enter” key. Next, select the “USB Mass Storage” option at bottom of the screen and press “Enter” key.

- b. Your GPS device will now function as a removable USB Mass Storage drive. A new window should appear with all the GPX files on the unit. Select and “Copy” the desired GPX files and “Paste” into the appropriate folder, such as:
Z:\GIS\GPS\Garmin_60CSx\2\GPX.
 - c. If using a Garmin 62S, navigate from “My Computer” to “Garmin GPSMAP 62s” and then to “J:\Garmin\GPX” (J varies depending on the port you connected the unit to).
 - d. “Copy” the file or files with the appropriate date (when the data was collected) and “Paste” it into the appropriate folder, such as Z:\GIS\GPS\Garmin_62s\6\GPX. Then rename it according to the date the information was collected, using the YYYYMMDD convention.
 - e. When finished, safely remove the hardware from the computer.
19. Now make a copy of all the files you just downloaded to your working folder in “spatial_info”. Example: Z:\SFCN\Vital_Signs\Periphyton\spatial_info\2014_location_data.
- a. First, the shapefiles need to be cleaned up to remove data from other projects not related to the periphyton protocol. Open up ArcMap and drag in the tracklines shapefile or the waypoints shapefile.
 - b. Right-click on the shapefile you are editing and select Open Attribute Table.
 - c. Select/Highlight all the records by the date you flew, using the TIME field.
 - d. Right-click on the shapefile, select “Data,” then “Export Data.”
 - e. When the window pops up, navigate to your spatial_info folder. Example:
Z:\SFCN\Vital_Signs\Periphyton\spatial_info\2014_location_data.
 - f. Name your file by using the Garmin unit name and the field date. Example:
Garmin60Unit3_20140827_Tracklines. Select “Save.” Click “OK.”
 - g. When a window pops up prompting you to “add the exported data to the map as a layer?” select “Yes” and inspect your new shapefile.
 - h. Do the same for the waypoints shapefile if applicable.

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[illegible]

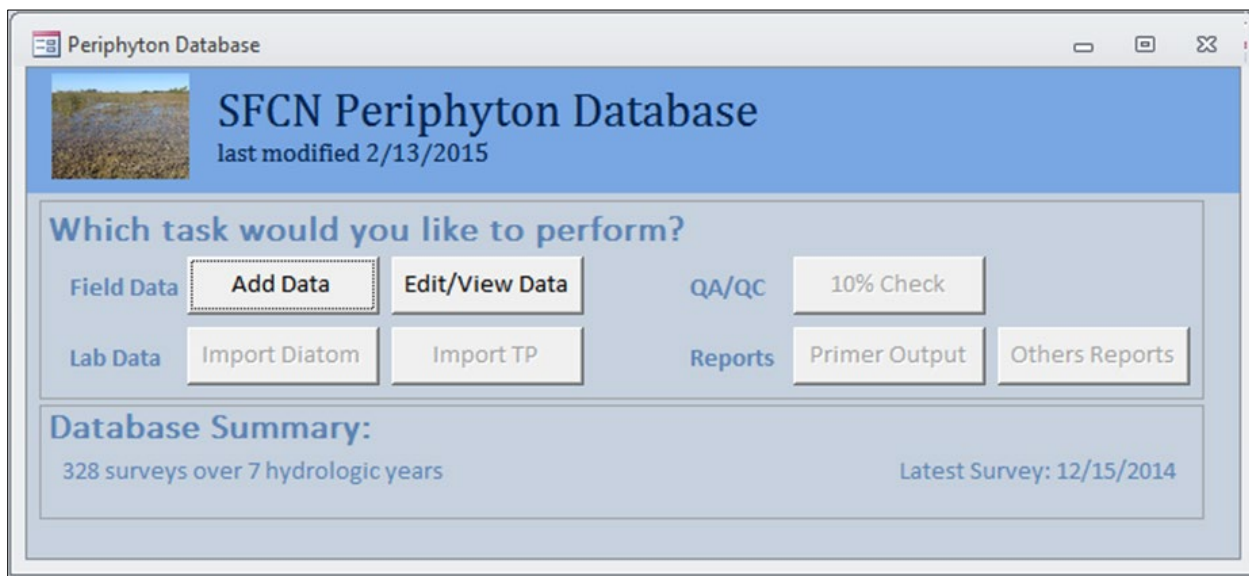
Overview

Field data from completed field datasheets must be entered into the Microsoft Access Database as soon as possible after returning from the field, while details are still vivid in the mind of the researchers. This database is located at:

Z:\SFCN\Vital_Signs\Periphyton\data\SFCN_Periphyton.mdb.

Procedures

When the Microsoft Access database is opened, it shows a startup form with buttons for common database tasks and a brief database summary (Figure SOP 9-1). Clicking one of these buttons allows for field data entry, data viewing and editing, report viewing, and producing outputs for analysis.



The screenshot shows a Microsoft Access startup form titled "Periphyton Database". The form has a blue header bar with a small image of a field on the left, the text "SFCN Periphyton Database" in the center, and "last modified 2/13/2015" on the right. Below the header is a section titled "Which task would you like to perform?". This section contains several buttons: "Add Data" and "Edit/View Data" under the "Field Data" label; "Import Diatom" and "Import TP" under the "Lab Data" label; "10% Check" under the "QA/QC" label; and "Primer Output" and "Others Reports" under the "Reports" label. At the bottom of the form is a "Database Summary" section. It displays "328 surveys over 7 hydrologic years" on the left and "Latest Survey: 12/15/2014" on the right.

Figure SOP 9-1. Startup form for the South Florida/Caribbean Network Periphyton Database.

Data Entry

Under the Field Data section clicking “Add Data” (Figure SOP 9-1) opens a form where all the information for a periphyton field survey is entered. This includes location, basin name, travel type, and substrate type (Figure SOP 9-2). The data entry form flows from top to bottom starting with the hydrology year, date, time, basin name and site, method of travel, the team members, the name of the GPS unit used, and the GPS mark.

The remainder of the form applies to observations or measurements made during the survey. Enter the substrate type and location, the ORV activity, if there was water present and if a sample was collected. The final step is to select your name from the “Data Entry Name” drop-down (Figure SOP 9-2) in order to track who entered the data.

Periphyton Data Entry [Close]

Site: KB1 Hydro Year: 2009 Add Date: 11/19/2009 Start Time: End Time:

Travel Type: Helicopter Observers: BS LA

Sample Collected? ☒ GPS Mark: 038

Photos: GPS Unit #: 4

ORV Activity: Water Present? ☒ Color: Clear Water Depths (cm): 13

Transparent to Bottom? ☒ T. Depth (cm): Temp (C): 27.89

DO (mg/L): pH: 8.34 Ambient Cond. (µS/cm):

Substrate Type: Periphyton Substrate Location: Floating Habitat Type:

Notes:

Overall Surface Cover (should add up to 100%)

% Vegetation: % Periphyton: % Open Water:

Veg Breakdown (should also add up to 100%)

Species Cod	% Total
clajam	30
panhem	20
baccar	50
*	

Data Entered By: Verified By:

Record: 1 of 336 Unfiltered Search

Figure SOP 9-2. South Florida/Caribbean Network Periphyton Data Entry form.

When all the data for a site have been entered, click the small arrow button near the bottom of the form (Figure SOP 9-3) to advance to a blank record where another site can be entered. The small backward/forward arrows allow for movement between the surveys.

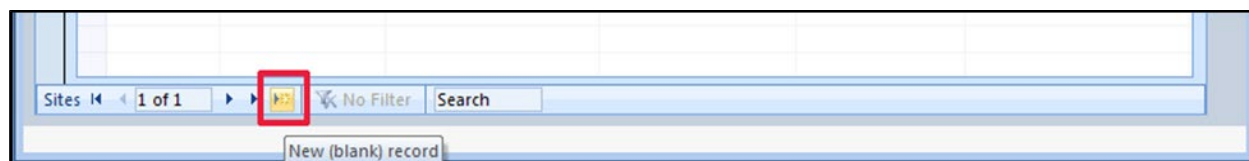


Figure SOP 9-3. Clicking the arrow inside the red box allows you to proceed to the next survey for data entry.

When done with data entry, click the “Close” button or the “X” in the upper-right of the form to return to the startup form. In Microsoft Access, all data are saved as they are typed into a form.

To edit a survey that has been previously entered (completely or partially), click the “Edit/View Data” button (Figure SOP 9-1) and it will show all the sites surveyed during a particular hydrologic year. Click on the drop-down box to choose the hydrologic year you wish to view surveys for (Figure SOP 9-4). When a site is highlighted, the “Edit This Survey” button in the bottom left corner appears. Edit the site by clicking this button. The standard data entry form will appear on screen prefilled with any existing data for that site.

Periphyton Database

View/Edit Survey

Close

Select a hydrologic year from the drop-down box and then click the box in front of the individual site that you would like to edit. Click the "Edit this Survey" button to make changes.

Hydrologic Year: 2014

Visit Date	Site ID	Basin	Verification
12/2/2014	E 2008	Bear Island	
12/2/2014	E 2009	Bear Island	
12/2/2014	E 2010	Bear Island	
12/2/2014	E 2011	Bear Island	
12/2/2014	F 2012	Fire Prairie	
12/2/2014	K 2013	Kissimmee Billy Strand	
12/2/2014	K 2014	Kissimmee Billy Strand	
12/2/2014	OK10	OK Slough	
12/2/2014	OK2	OK Slough	
12/2/2014	OK6	OK Slough	
12/2/2014	OK7	OK Slough	
12/2/2014	OK8	OK Slough	
12/3/2014	BI1	Bear Island	
12/3/2014	BI4	Bear Island	
12/3/2014	EC1	East Crossing Strand	
12/3/2014	EC2	East Crossing Strand	
12/3/2014	EC3	East Crossing Strand	
12/3/2014	EC4	East Crossing Strand	
12/3/2014	EH3	East Hinson Marsh	
12/3/2014	FP6	Fire Prairie	
12/3/2014	MN11	Monument	
12/4/2014	EC11	East Crossing Strand	
12/4/2014	EC5	East Crossing Strand	

Edit this survey

Figure SOP 9-4. This form is used to pick a previously entered survey by first selecting the appropriate hydrologic year.

Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) begins in the field with careful consideration of each component of monitoring, including training, well-designed datasheets, carefully recorded measurements, and checking data within an ecological context for outliers. Back in the office QA/QC continues by checking entered data and validating data.

Field Procedures

The crew must always use datasheets copied onto Rite-in-Rain paper. Datasheets contain designated labels for specific data elements, including general data such as date and collectors' names. After paper datasheets have been filled out in their entirety, a complete set of working copies will be made (see Data Stewardship section below). Most post-field collection data entry notes and remarks shall be made only on the copies, not to the original datasheets. Post-field collection remarks added to either the original (e.g., unknown species identifications) or copies of the datasheets must be written using a different colored pencil. Using the template at the top of the datasheet, all network staff members (including the crew) who make modifications to the datasheet indicate their identity (initials), date of modifications, purpose of their review, and the color used to provide comments or make changes.

- Datasheets are protected within an enclosed clipboard.
- All information added to a datasheet must be printed using pencil and clearly legible.
- While manually recording data, the crew member entering the data will verbally double check all field values for accuracy and completeness with the crew member collecting/announcing the data. All discrepancies will be corrected prior to moving to the next data field.
- Upon completing data collection at each site, original datasheets shall be reviewed and checked for legibility and completeness. The crew member responsible for completing this field verification must initial the datasheet.

Data Stewardship

Good data stewardship practices play a critical role in long-term data security and help prevent irretrievable loss of information.

Datasheets will be duplicated (via a copier) within one week of collection, and must be checked to ensure that all original data are present and legible. While all datasheet notes should be in the designated notes field, it is important to watch for stray comments written on the edges or back of a datasheet that could be missed when making copies. Once produced, photocopies of the datasheets will be affixed as coversheets to their corresponding originals and used for all computer data entry and verification procedures. All post-field corrections and remarks must be recorded on the copies. All post-field corrections and remarks must be annotated with the date and initials of the person making the changes.

Once the computerized data are verified as accurately reflecting the original field data and validation is complete, the paper field forms shall be delivered to the network data manager where they will be stored temporarily in the SFCN conference room. Ultimately all original datasheets will be stored in an approved DOI archive. The electronic version of the data is used for all subsequent data activities.

Data Entry and Data Verification

Following data entry into the database, the person who entered the data reviews 100% of their work to minimize errors of omission or transcription. The next step is to hand the original datasheets to a second person for a 100% quality assurance (QA) verification. Do not make notes or changes on the original datasheets. Instead, add to a copy of the datasheet made for this purpose.

Use the “View/Edit Data” button to browse each survey and review the values on the screen. Any discrepancies between the original datasheet and the database must be corrected. At the completion of each survey review, the box at the bottom of the data sheet must be filled with the verifier’s name (Figure SOP 9-2). This provides a way to follow the progress of data verification. Any errors found must be conveyed to the SFCN data manager or SFCN community ecologist who will determine whether the surveys for that particular hydrologic year must go through an additional 100% verification. For example, a spelling error in a comment field would not trigger a re-check but multiple errors in numbers entered would.

Additional Data Verification

After data entry and initial verification are complete, the community ecologist:

- Verifies field data are entered for all sites monitored.
- Reviews the 100% verification check of field data for multiple errors and determines if there is a systematic problem that must be addressed with training or re-entry of the data.
- Confirms laboratory data have been received for all sites and uploaded correctly.

Data Validation

Although data may be correctly transcribed from the original field forms, their values may not always be accurate or logical. Components of the data validation process have been built into the database (e.g., value range restrictions). Although many validation problems can be addressed by a well-designed database, the SFCN community ecologist must also review and validate the data after verification is complete. This will involve exporting to a .csv data set and creating graphs and various summaries to inspect for outliers and other suspect data. These steps include:

- Reviewing any “new” diatom species that are not included in the database lookup list that identifies species by Trophic Preference (Eutrophic, Mesotrophic, Mesotrophic – Eutrophic, Oligotrophic, Oligotrophic – Eutrophic, Oligotrophic – Mesotrophic, Unknown).
 - Resolve taxonomic discrepancies that include a species is identified to sub-species level but was only in lookup table at the species level or vice versa; a species has officially changed taxonomic names in the literature; or a species has a change in

taxonomic authority given that prevents an exact match. Work with the SFCN data manager to update the lookup table.

- Researching new names to determine if they can be identified by trophic preference, documenting any such determinations, and working with the SFCN data manager to update the lookup table. This is more important for species with six or more detections (greater than or equal to 1%). Species with single detections are unlikely to affect results.
- Comparing TP and diatom data with previous years and checking for suspicious data (unusual spikes or changes) in an ecological context that may have made it past the above checks. This will likely include conducting the analyses and graphs described in SOP 10 – Data Analysis Using PRIMER Software and SOP 11 *Data Analysis of Simplified Periphyton Indices—Version 1.0* for all categories including unknowns. Although with pre-labeled bottles, the likelihood of switching of bottles without discovery is unlikely, this could be detected with this process. Examples of problems that could be detected and be explainable might be documentation of a bird rookery at the site that is accompanied by a spike in total phosphorous and diatom community change.
- Identifying any data that is suspicious and entering comments into database. Such data would receive a flag identifying the data as reviewed but invalid and will not be changed to “Acceptable.”
- Switching the QA/QC level of data that passes inspection from “Raw” to “Acceptable” if a quality assurance plan is not in place or “Certified” if all requirements of a quality assurance plan have been met.

Estimation of within site variance of lab results

A total of 44 sites will be visited annually and two samples (one sample for diatom analysis and one sample for total phosphorous analysis) are collected at each site. This equates to 88 total samples (44 diatom samples and 44 total phosphorous samples). Each year five of the sites (10%) will be chosen to serve as quality control (QC) sites for TP. These extra samples will be collected at the same time as the typical field samples, but they will be labeled “Test X” (with X replaced with 1, 2, 3, 4, and 5) and recorded on the datasheet so that only the South Florida/Caribbean Network knows the identity of the sampled sites. The lab will be unaware of which sites these samples come from, providing the network with an opportunity to compare and understand the level of sampling variability at a single site. Duplicate periphyton sample will be sent from five sites labeled “Test X” for diatom analysis. After several years, these results will be used to estimate sampling variation of the TP and diatom data. After two years of this quality control practice we will assess if the quality control samples can be reduced.

Estimation of within site variance of field data

At the site used for training at the start of the field season, staff will each take measurements of field data separately and record them. These data will be used to estimate within site variance across observers.

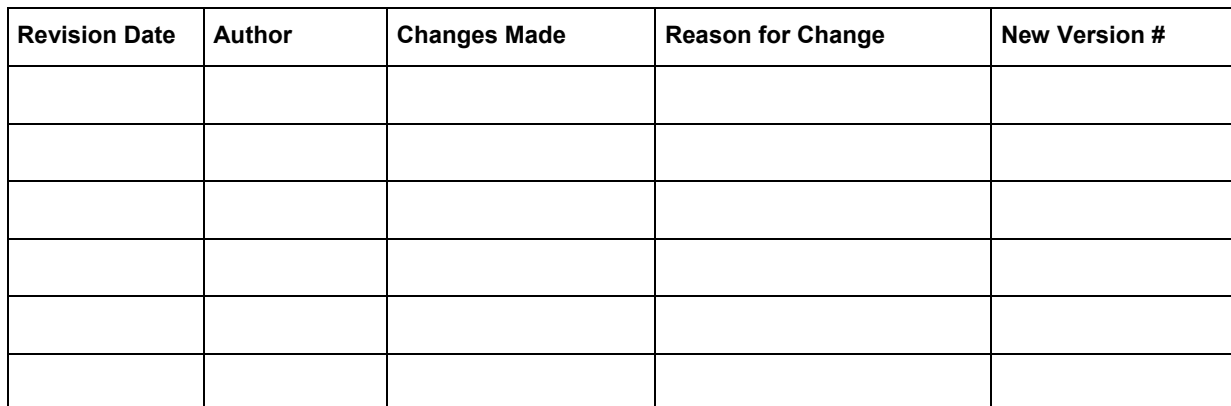
Datasheet Storage

The periphyton sampling effort produces photographs, field datasheets, and diatom/TP lab results.

The datasheets are scanned and stored on the server

(Z:\SFCN\Vital_Signs\Periphyton\data\scanned_datasheets\). The original datasheets are then placed in binders by hydrologic year. These binders are stored in the South Florida/Caribbean Network conference room, available for reference and review.

National Park Service
Inventory and Monitoring Division



Introduction

Data are analyzed to detect differences among the sites within a basin and among basins based on diatom assemblage composition and relative abundance. Descriptive statistics are used to illustrate the spatial extent of each species and to categorize the species according to their relative densities across sites and through time. Multivariate analyses, such as ordination, are the main methods used to investigate differences in diatom community structure. This SOP covers step-by-step procedures necessary to perform multivariate statistical tests using PRIMER v.6.1.16 (PRIMER-E Ltd., Plymouth, UK), a software program used for community analyses. The statistical analyses used and the interpretation of their results are based on the recommended procedures from the publications of Clarke and Warwick (2001) and Clarke and Gorley (2006). There are other programs such as R (R Foundation for Statistical Computing, Vienna, Austria, [R Project](#)) in which similar types of multivariate analysis can also be run. The graphs and steps provided in this SOP are for example purposes only.

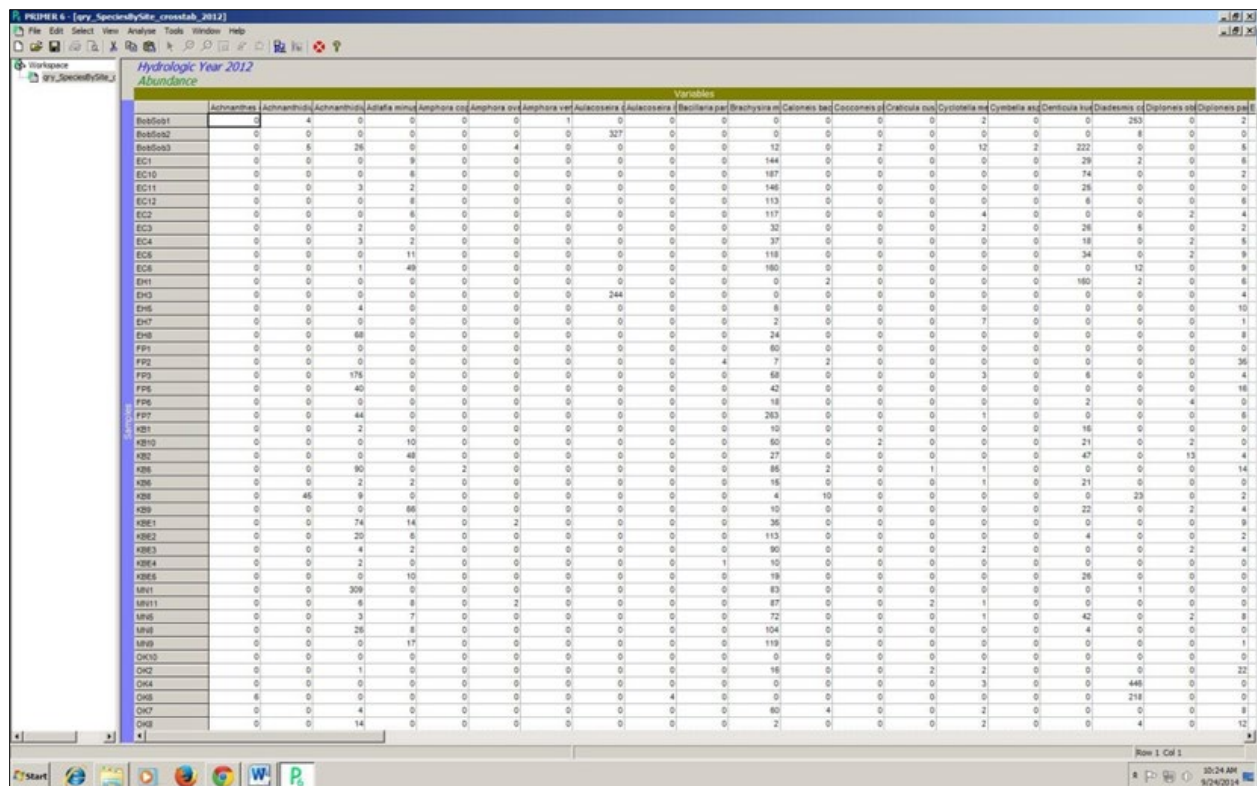
The goal of data analysis in PRIMER is to verify the relationship between periphyton mat total phosphorous level and diatom community structure by using an analysis of similarity (ANOSIM) with mat TP class as a factor. We can follow this analysis by using a SIMPER analysis to evaluate which diatom species abundances show the greatest differences due to mat TP level. The use of NMDS is to create a graphical representation of the relationships among the sites in ordination space based on species relative abundance.

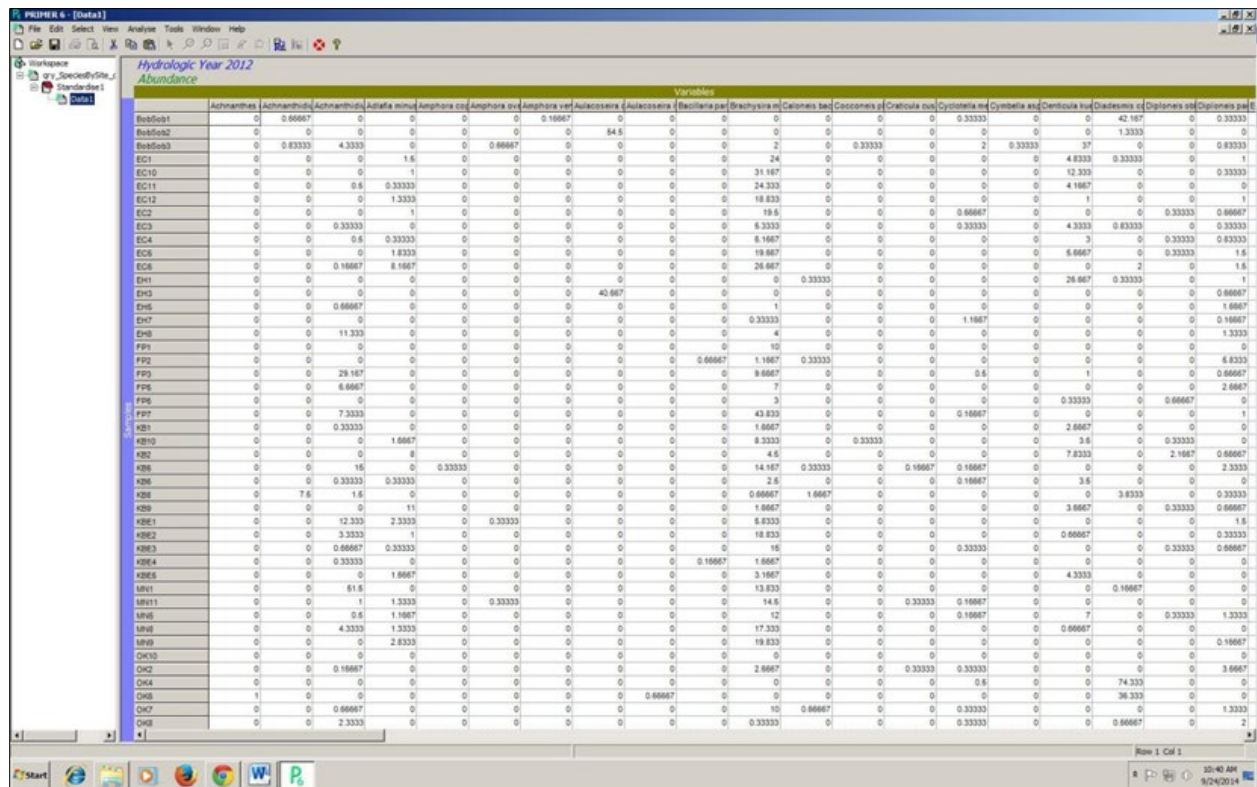
Non-metric Multi-Dimensional Scaling, Analysis of Similarities, and Similarity Percentages

Species-by-sample matrices are created by species count data (diatom valves) for each site per year and analyzed to identify latent patterns of community structure among the study sites. The matrices are generated through the Microsoft Access periphyton database and exported into and saved as a Microsoft Excel file (*.xls or *.xlsx) for subsequent use in PRIMER. The spreadsheet should show samples as rows and species as columns (conventional). Factors (e.g. “year”, “status”, or “basin name”) can be included in the Microsoft Excel spreadsheet or added later on in the PRIMER worksheet. If factors are included in the Microsoft Excel spreadsheet, they should be in column format (providing species are in column format) and at the end of all species counts, with one column separating the last species and the first factor. For the purposes of this SOP, all analyses shown are conducted for one hydrologic year.

- Double-click on the PRIMER 6 icon on your desktop to open and run the software.
- Click **File > Open**, a dialog window appears and allows you to select the Microsoft Excel file to open. Matrices in the form of comma-separated values files (*.csv) or text files (*.txt) can also be opened in PRIMER, as well as files of previous PRIMER versions. Select the desired file extension(s) from the drop-down menu located in the lower right corner of the dialog window. Click **Open**.

- A dialog window appears asking the user to select the worksheet where the data is located and the data type. Select the desired worksheet from the drop-down menu and select **Sample data** for **Data type**. Click **Next**.
- A second dialog window will appear with multiple selections. Check **Title** (if applicable) and **Row labels**, select **Samples as rows** for **Orientation**, select **Abundance** for **Data type**, and select **Missing value** for **Blank =**. Click **Finish**.
- A species-by-sample matrix appears showing the title and data type in the upper left corner, the samples as rows, species as columns, and counts as values (Figure SOP 10-1).





- Click **Analyze>Pre-treatment>Transform (overall)**. A dialog window appears prompting the user to select the type of transformation desired. For this example, select **Fourth root** from the drop-down menu and click **OK** (Figure SOP 10-3).

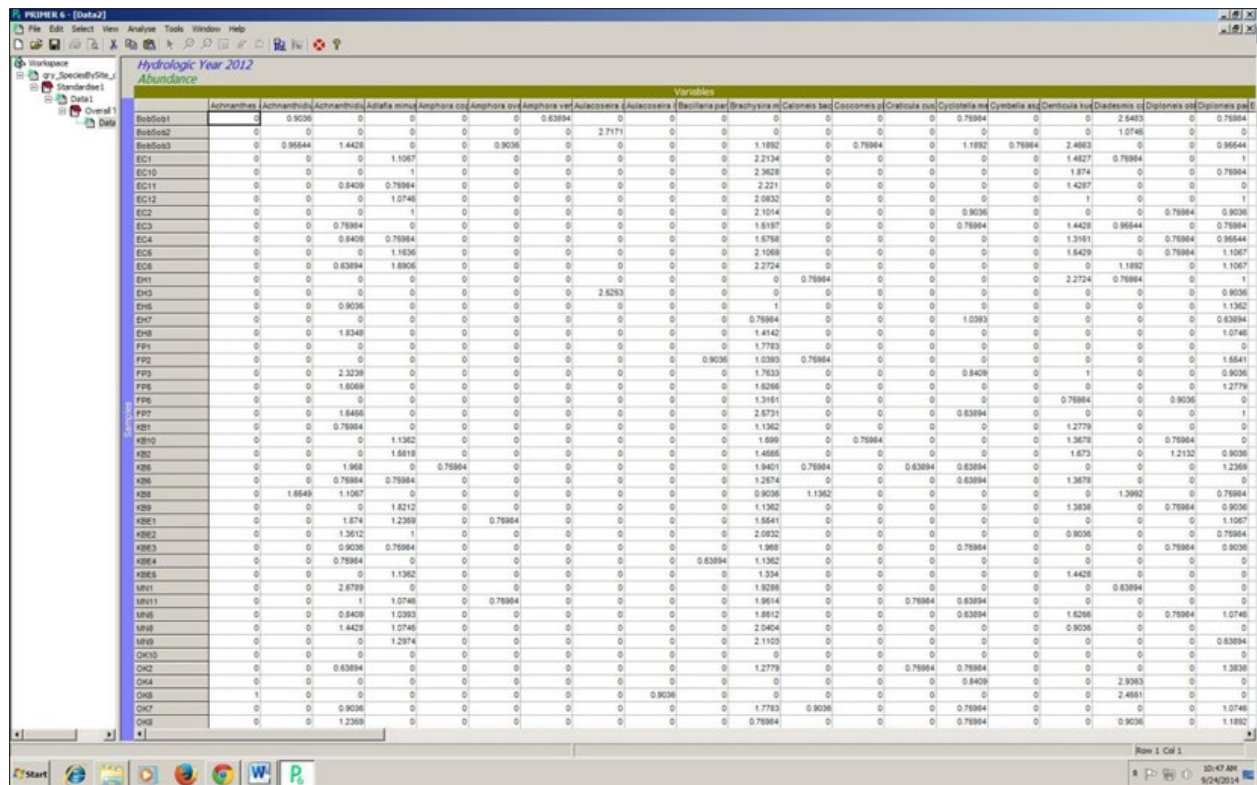


Figure SOP 10-3. A species-by-sample matrix will appear with the samples as rows, species as columns, and counts are Fourth root transformed values.

The standardized and transformed data are used to generate a sample dissimilarity matrix using a Bray-Curtis dissimilarity coefficient (δ), which produces values ranging from 0 (no dissimilarity) to 100 (total dissimilarity) between each pair of sites.

- Click **Analyze>Resemblance**. A dialog window with two tabs will appear prompting the user to select what to analyze between (samples or variables) and what measure of resemblance to use (Bray-Curtis similarity, Euclidean distance, or More). In the **Main** tab, select **Samples** for **Analyze between**, and select **Bray-Curtis similarity** for **Measure**. Do not select **Add dummy variable**. Ignore **More** tab. Click **OK**.
- A resemblance (similarity) matrix will be created. Click **Tools>Dissim**. A second resemblance (dissimilarity) matrix will be created (Figure SOP 10-4).

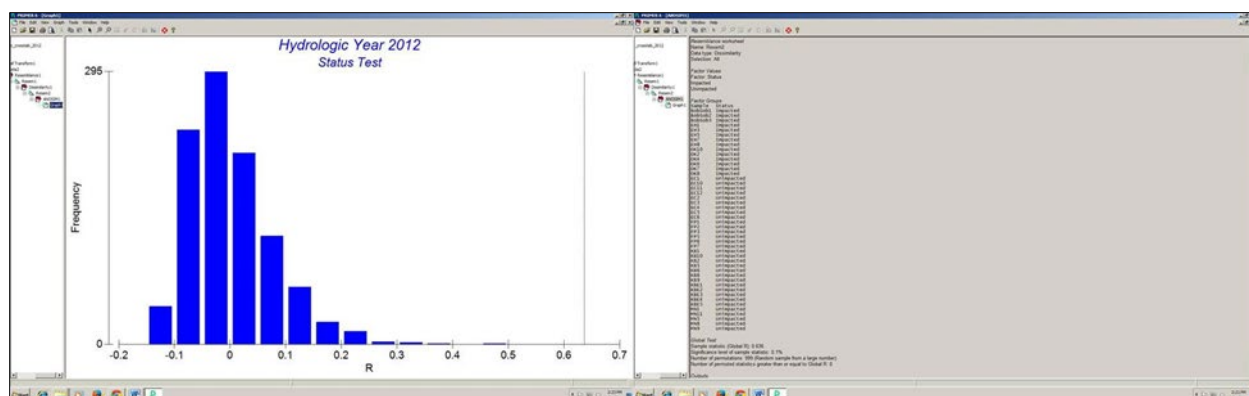


Figure SOP 10-5. A one-way analysis of similarities (ANOSIM) with histogram. The histogram shows a frequency distribution of the test statistic (R), obtained under the null hypothesis that there is no significant difference in diatom communities from all sites based on Status. For example purposes only.

Non-metric multi-dimensional scaling (NMDS) is used to create a graphical representation of the relationships among the sites (illustrated as points) in ordination space based on species relative abundance. The NMDS uses values in the site dissimilarity matrix and projects these as distances between points in a plot, where points that were close together represent sites that are more similar in species composition, and points that are far apart correspond to less similar communities. When creating an ordination, NMDS assumes an agreement between the rank-order of the dissimilarities in species composition among all pairs of sites and the rank-order of their corresponding distances. A measure of this rank-order agreement is shown as a stress value which increases with reduced dimensionality and with increasing quantity of data. Generally, NMDS can be considered to provide a good representation of the data when stress is less than 0.20, though higher values do not necessarily mean a bad representation.

- Return to the dissimilarity matrix and click **Analyze>MDS**.
- A dialog window appears. Make sure the **Number of restarts** is set at a minimum of **25** and that the **Minimum stress** is set at **0.01**. Check the **Shepard diagrams** box and leave the **Configuration plot** box checked. **Kruskal fit scheme** should be **1**. Click **OK**.
- NMDS graphs will be created in 2D and 3D with their respective non-parametric regressions (Figure SOP 10-6 and Figure SOP 10-7).

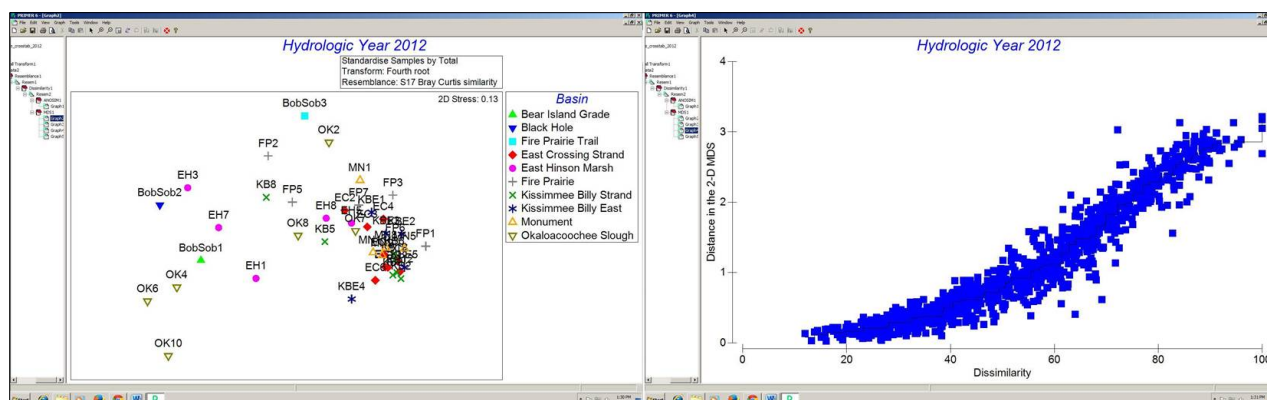


Figure SOP 10-6. Non-metric multi-dimensional scaling (NMDS) in 2 Dimensional space.

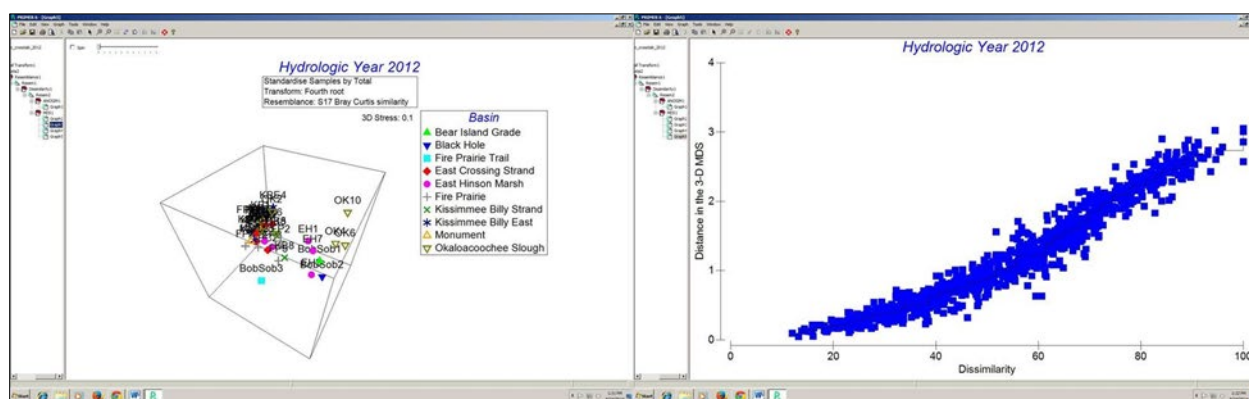


Figure SOP 10-7. Non-metric multi-dimensional scaling (NMDS) in 3 Dimensional space.

A similarity percentages (SIMPER) analysis is conducted for a factor grouping. SIMPER determines which diatom species contributes the most to each factor group and which species were responsible for the dissimilarities among the factor groups.

- Return to the standardized and transformed species-by-sample matrix and click **Analyze>SIMPER**.
- A dialog window appears prompting the user to select several options, including **Design** and **Measure**. Select **One way** for **Design**, and **Bray-Curtis similarity** for **Measure**. Select the desired factor from the **Factor A** drop-down menu. For this example we will choose **Status** (we could also have chosen **Basin**, **Site mat TP**, or **Year**). Boxes should be checked for listings of **higher-contributing variables** and **pair-wise resemblances**. **Cut-off percentage** should be at **90**. Click **OK**.
- The results for the SIMPER analysis will appear (Figure SOP 10-8).

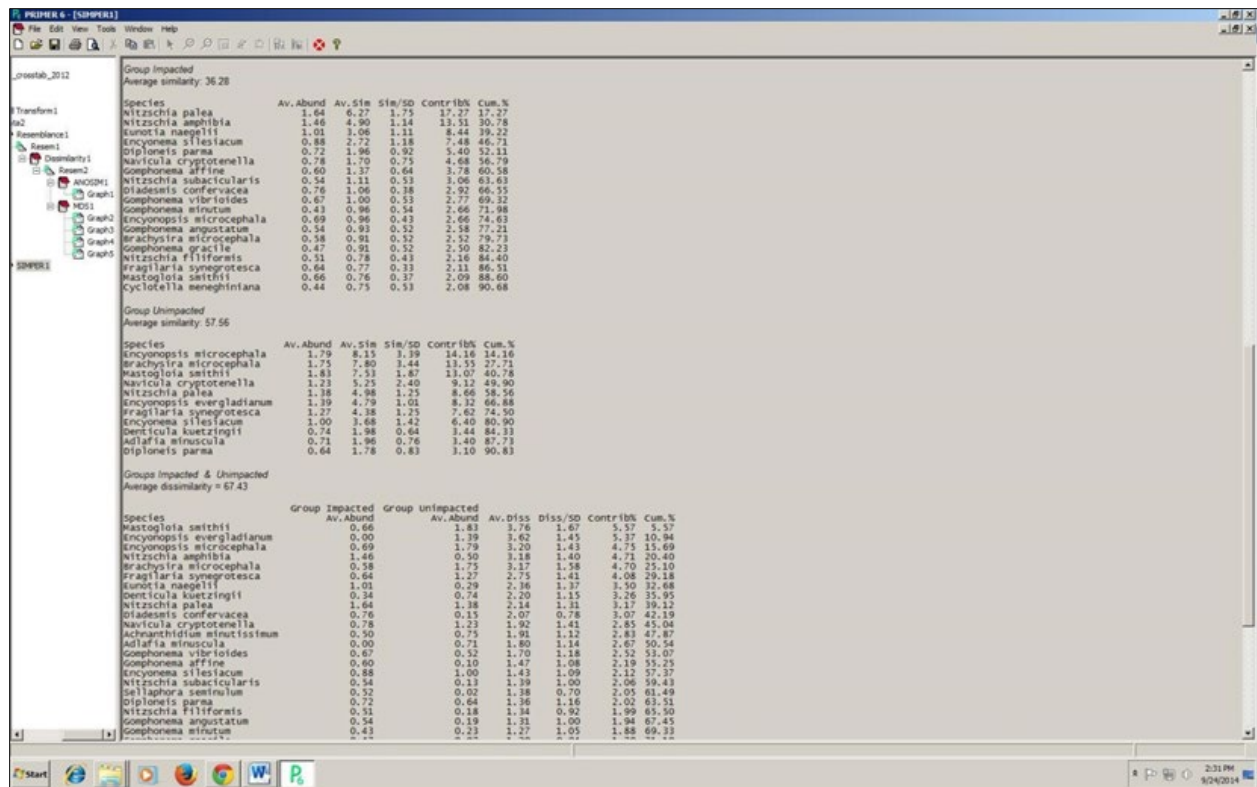


Figure SOP 10-8. Similarity percentages (SIMPER) analysis report.

Cluster Analysis

A cluster analysis is performed by applying the CLUSTER routine to the site dissimilarity matrix. This analysis uses group-average linking and creates a dendrogram (tree diagram) which further illustrates the hierarchical clustering among sites.

- Return to the dissimilarity matrix and click **Analyze > CLUSTER**.
- A dialog window with two tabs appears prompting the user to select the appropriate cluster mode.
- From the **Main** tab, select **Group average** for **Cluster mode**. Make sure the **Plot dendrogram** box is checked. Do not check the **SIMPROF test** box. Click **OK**.
- A dendrogram (tree diagram) will appear as well as the results for the CLUSTER analysis (Figure SOP 10-9).

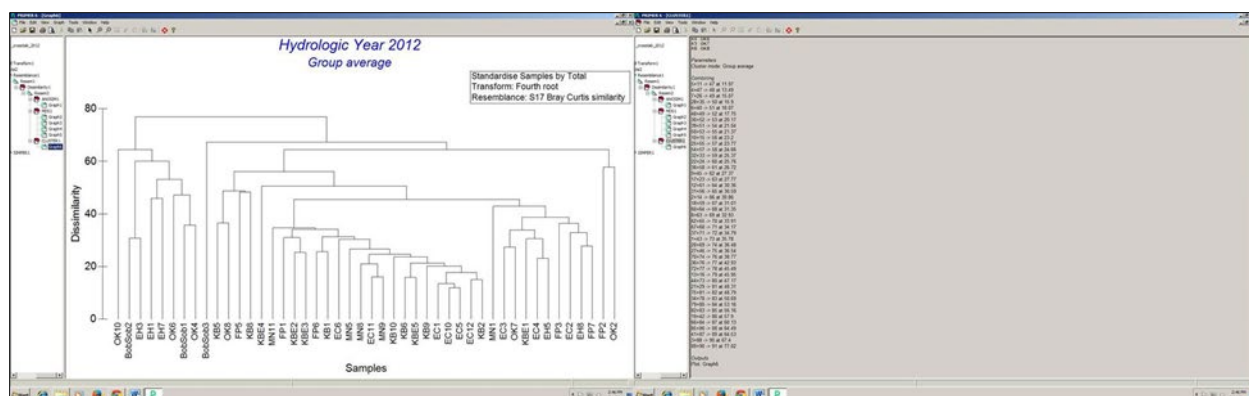


Figure SOP 10-9. Cluster dendrogram results.

Cluster delineation (circles) can be overlaid on the NMDS plot, showing similarity percentages and thus allowing the relationship between the groups to be displayed more informatively.

- Return to NMDS 2D graph and click **Graph > Special**. A dialog window appears with multiple configurations to select from. Check the **Overlay clusters** box in the **Clusters** section. Make sure the correct dendrogram plot is selected from the drop-down menu. Default **Resemblance levels** (20, 40, 60, 80) are preferred; however, these can be changed at the user's discretion. **Slack %** should read **100**. Click **OK**.
- Cluster delineation appears on the NMDS graph.
- Click **Graph>Data labels and symbols**. A dialog window appears with multiple tabs for graph options. Under the **Data labels and symbols** tab, check the **By factor** box under the **Symbols** section. Select the **Status** factor in the drop-down menu. Click **OK**. (Figure SOP 10-10).

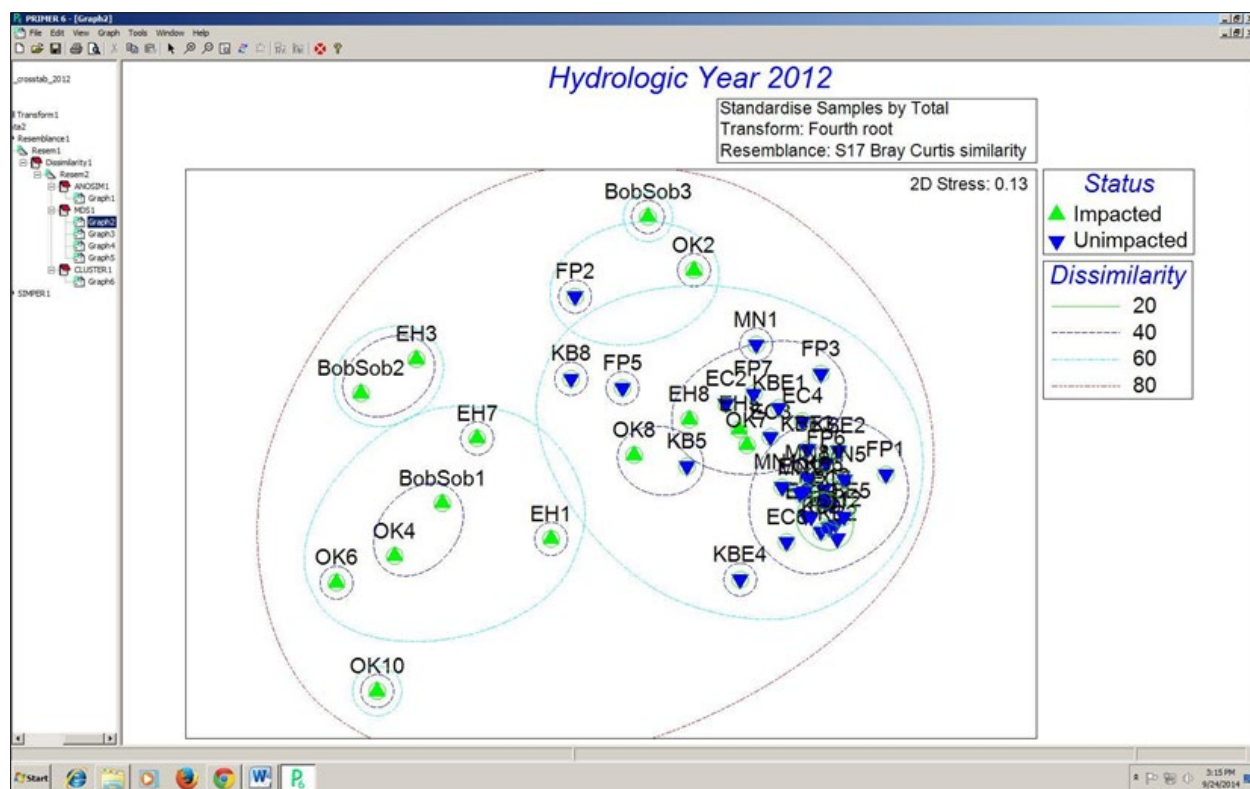
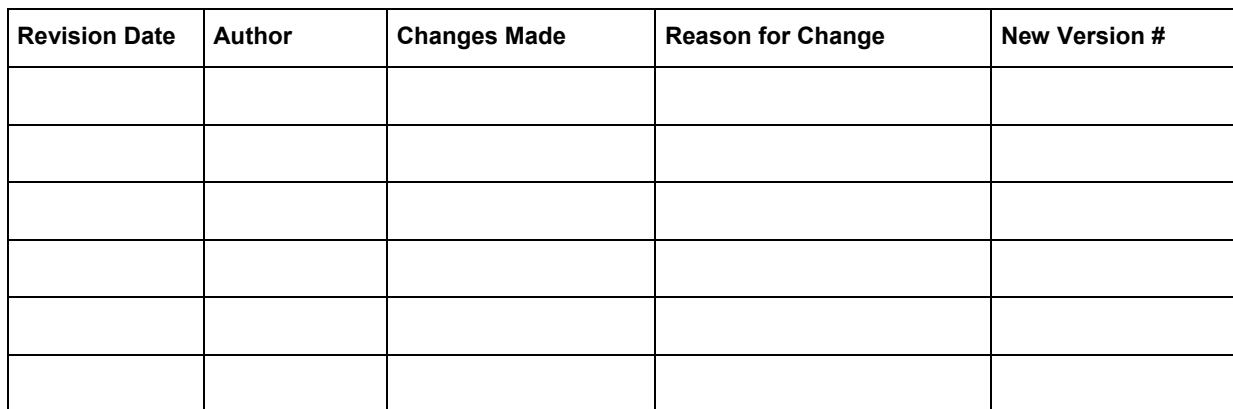


Figure SOP 10-10. Non-metric multi-dimensional scaling (NMDS) in 2 Dimensional space with cluster delineation (circles) overlaid.

Literature Cited

- Clarke, K. R., and R. M. Warwick. 2001. Change in marine communities: an approach to statistical analysis and interpretation, 2nd edition. PRIMER-E: Plymouth
- Clarke, K. R., and R. N. Gorley. 2006. PRIMER V6: User Manual-Tutorial. Plymouth Marine Laboratory.

National Park Service
Inventory and Monitoring Division



Introduction

This procedure provides general guidance for exporting, graphing, and analyzing the simple indicators for periphyton:

- Total phosphorous;
- Percent eutrophic diatoms, and
- Percent oligotrophic diatoms.

The primary hypotheses to be tested is whether differences are occurring:

- In space, i.e. between different basins, or
- Across time, i.e. are temporal trends occurring within and among basins?

Specific analysis code and graph and map templates will be developed at a later date.

Exporting the Data

1. The Query “Qry_DiatomByIndicator” is run in the Microsoft Access database and then exported as a Microsoft Excel spreadsheet for further analysis.

SFCN Periphyton Database

FILE HOME CREATE EXTERNAL DATA DATABASE TOOLS

View Paste Copy Cut Format Painter Filter Ascending Descending Remove Sort Toggle Filter Refresh Save Delete More Find Go To Select Replace Size to Switch Fit Form Windows Text Formatting

Queries

- qry_AppendDiatom
- qry_TP_Import_Append
- qry_SpeciesBySite_crosstab_2009
- qry_SpeciesBySite_crosstab_2009-2013
- qry_SpeciesBySite_crosstab_2010
- qry_SpeciesBySite_crosstab_2011
- qry_SpeciesBySite_crosstab_2011_and_2012
- qry_SpeciesBySite_crosstab_2012
- qry_SpeciesBySite_crosstab_AllYears
- qry_2013
- qry_2013_PackingList
- qry_2014_PackingList
- qry_AllDiatomSpecies_ByValveSum
- qry_AllTogether
- qry_Date_VisitMethod
- qry_Diatom_TotalValveSum_w_IndicatorSt...
- qry_Diatoms_ByIndicator
- qry_Distance
- qry_event_temp
- qry_MissingDiatomData
- qry_QAQC_DiatomsWithMissingIndicatorS...
- qry_QAQC_ValveCount

qry_Diatoms_ByIndicator

Hydrologic_Year	Flowway	Loc_Name	Sub_Locatio	Trophic Preference	SumOfValves	Percentage
2009	Fire Prairie	FP2		--	117	19.50%
2009	Fire Prairie	FP2		Eutrophic	402	67.00%
2009	Fire Prairie	FP2		Mesotrophic	2	0.33%
2009	Fire Prairie	FP2		Mesotrophic - Eutrophic	42	7.00%
2009	Fire Prairie	FP2		Oligotrophic	33	5.50%
2009	Fire Prairie	FP2		Oligotrophic - Eutrophic	2	0.33%
2009	Fire Prairie	FP2		Oligotrophic - Mesotrophic	2	0.33%
2009	Fire Prairie	FP3		--	6	1.00%
2009	Fire Prairie	FP3		Eutrophic	16	2.67%
2009	Fire Prairie	FP3		Mesotrophic - Eutrophic	8	1.33%
2009	Fire Prairie	FP3		Oligotrophic	502	83.67%
2009	Fire Prairie	FP3		Oligotrophic - Mesotrophic	68	11.33%
2009	Fire Prairie	FP4		--	77	12.83%
2009	Fire Prairie	FP4		Eutrophic	11	1.83%
2009	Fire Prairie	FP4		Mesotrophic	2	0.33%
2009	Fire Prairie	FP4		Mesotrophic - Eutrophic	30	5.00%
2009	Fire Prairie	FP4		Oligotrophic	354	59.00%
2009	Fire Prairie	FP4		Oligotrophic - Mesotrophic	126	21.00%
2009	Fire Prairie	FP5		--	117	19.50%
2009	Fire Prairie	FP5		Eutrophic	139	23.17%
2009	Fire Prairie	FP5		Mesotrophic	6	1.00%
2009	Fire Prairie	FP5		Mesotrophic - Eutrophic	54	9.00%
2009	Fire Prairie	FP5		Oligotrophic	226	37.67%
2009	Fire Prairie	FP5		Oligotrophic - Eutrophic	3	0.50%
2009	Fire Prairie	FP5		Oligotrophic - Mesotrophic	55	9.17%
2009	Fire Prairie	FP6		--	37	6.17%
2009	Fire Prairie	FP6		Eutrophic	6	1.00%
2009	Fire Prairie	FP6		Mesotrophic	1	0.17%
2009	Fire Prairie	FP6		Mesotrophic - Eutrophic	7	1.17%
2009	Fire Prairie	FP6		Oligotrophic	515	85.83%
2009	Fire Prairie	FP6		Oligotrophic - Mesotrophic	34	5.67%

Record: 281 of 1397

Figure SOP 11-1. Example of MS Access Query “qry DiatomByIndicator.”

Within the query, diatom data are summarized into seven indicator categories based upon lists (derived from research publications) provided by Dr. R. Jan Stevenson of Michigan State University and which have been supplemented with additional literature research on local species. Indices are calculated as 100 times the number of diatoms with a given trophic designation divided by the total number of diatoms identified to a trophic designation (i.e., the index excludes diatoms for which the trophic designation is unknown from calculations).

Table SOP 11-1. Diatom indicator categories and definitions.

Indicator category	Definition
Eutrophic	Diatoms only documented in eutrophic conditions
Mesotrophic–Eutrophic	Diatoms documented in range of mesotrophic to eutrophic conditions
Mesotrophic	Diatoms documented in mesotrophic conditions
Mesotrophic–Oligotrophic	Diatoms documented in range of mesotrophic to oligotrophic conditions
Oligotrophic	Diatoms only documented in oligotrophic conditions
Oligotrophic–Eutrophic	Found in all conditions
–	Diatom relationship as indicator of nutrient status unknown

The table can be exported as a *.csv file or directly cut and pasted into Microsoft Excel for graphing and other analyses.

2. The query “qry_TP_bySiteBasin” can be similarly run and exported to provide the Total Phosphorous data by site.

Graphs

3. The diatom data are first manipulated to ensure all categories have a value, i.e. 0’s are added for categories with no diatoms counted.
4. The mean, median, minimum, maximum, standard deviation, standard error for each basin are calculated.
5. Graphs are created showing comparisons of data within the current year (Figures SOP 11-2 to SOP 11-4) and eventually for data across years (Figure SOP 11-5).

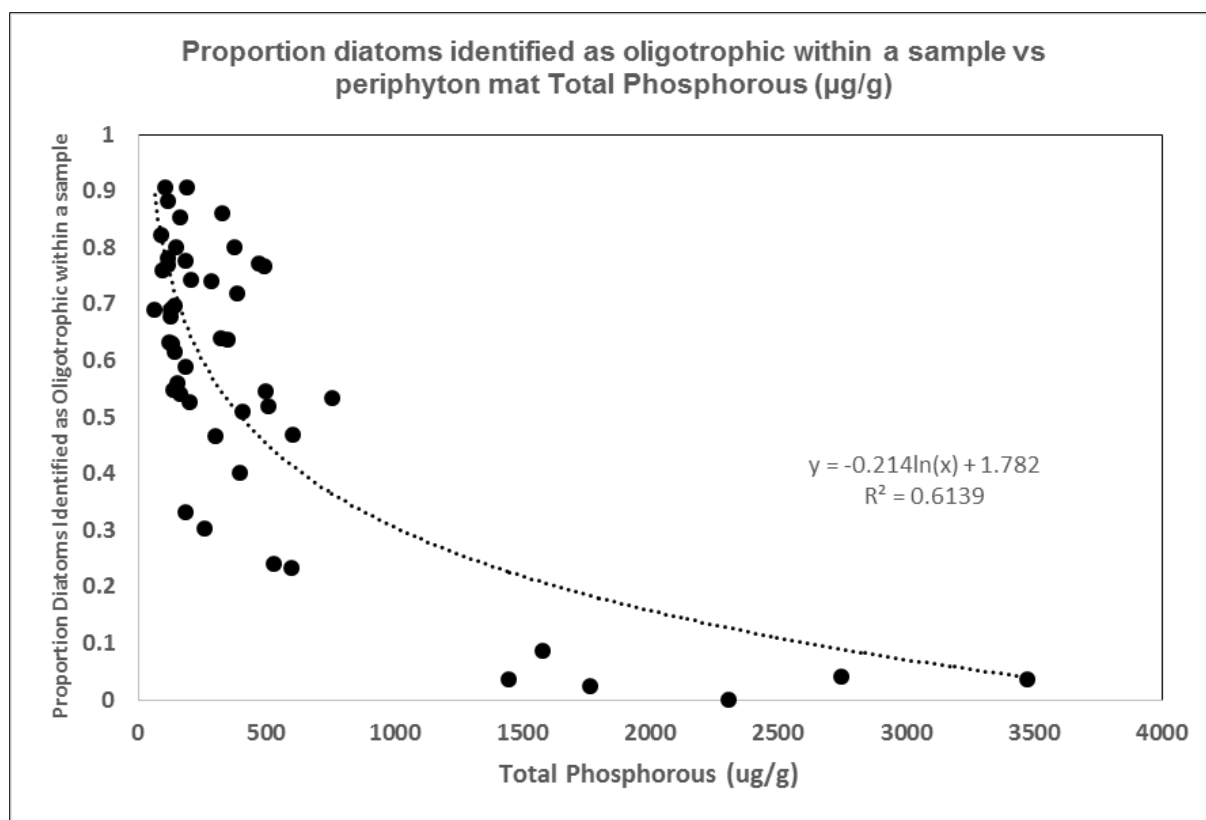


Figure SOP 11-2. Relationship between periphyton mat total phosphorous levels and periphyton mat percent oligotrophic diatoms. Data represents 2013 pilot data.

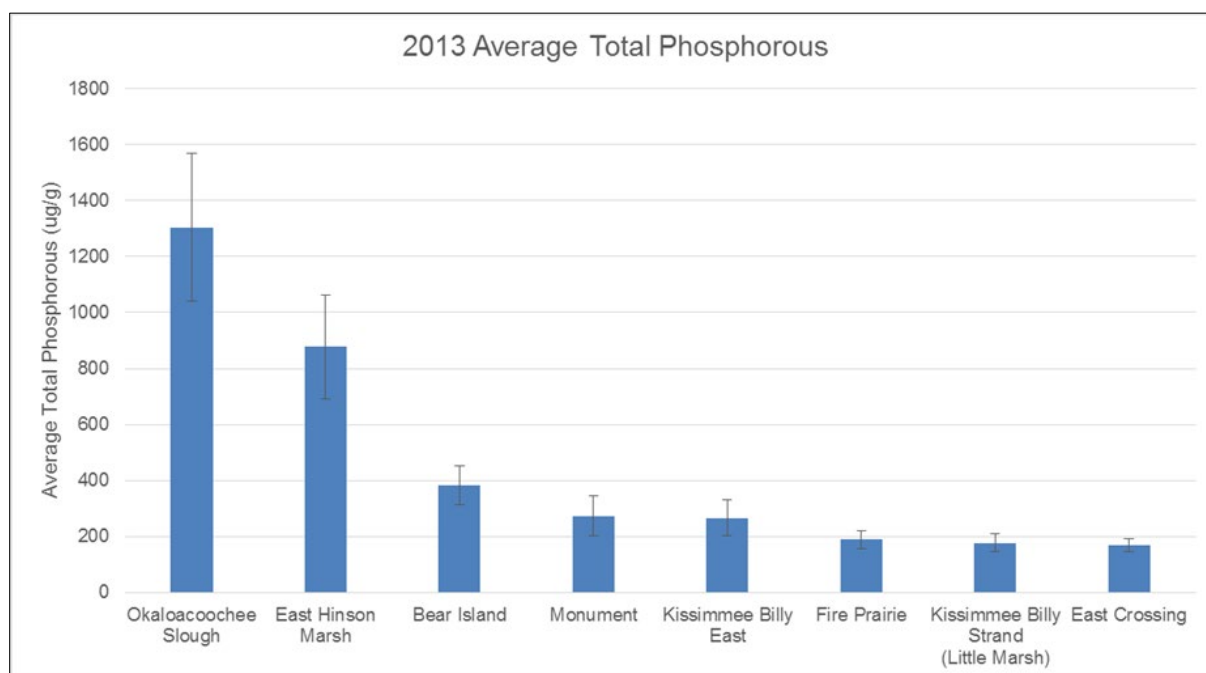


Figure SOP 11-3. Average periphyton mat total phosphorous (ug/g) by basin for 2013. Error bars are standard error.

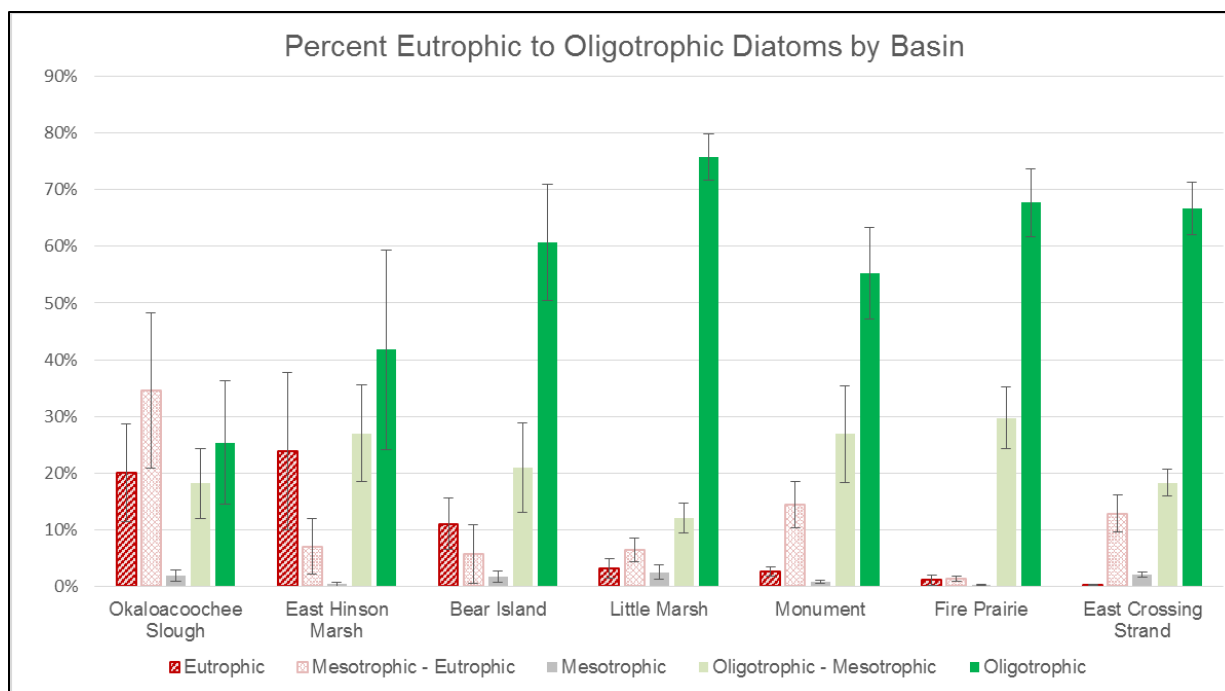


Figure SOP 11-4. Graphical display of average percent of diatoms classified into five indicator categories by basin: Eutrophic; Mesotrophic-Eutrophic; Mesotrophic; Oligotrophic-Mesotrophic; Oligotrophic. Data represent 2013 averages and standard errors by basin.

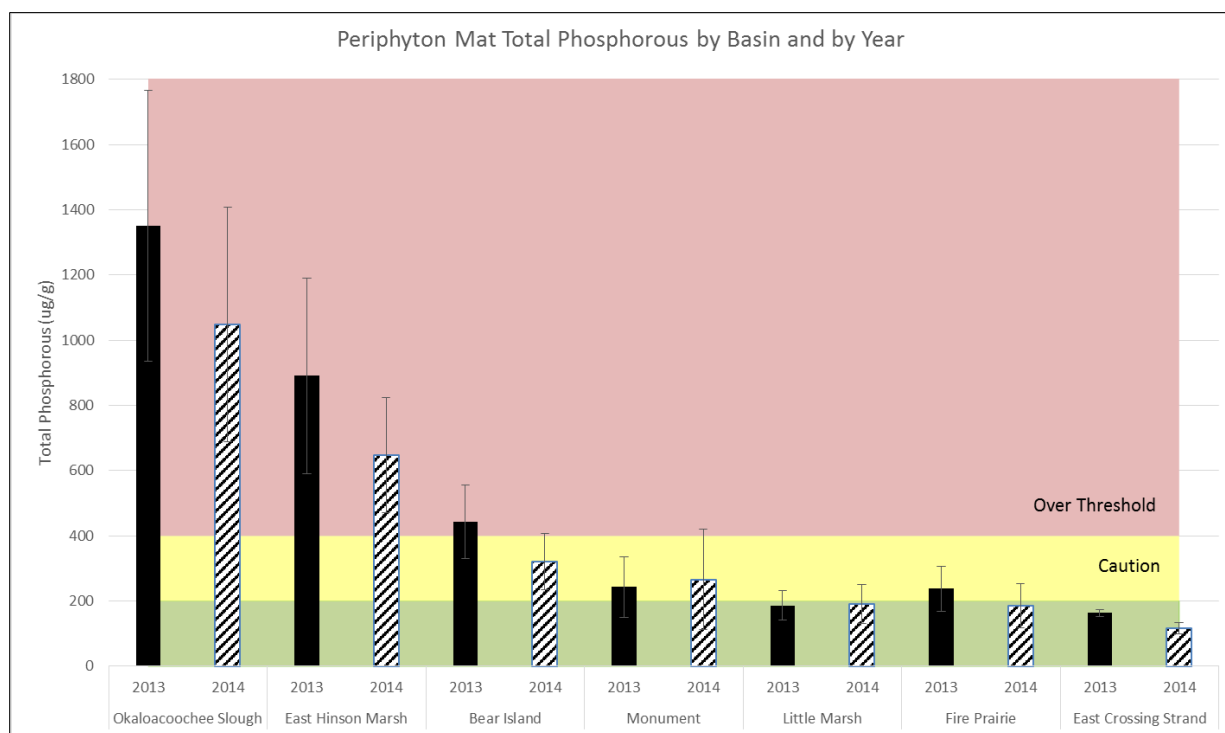


Figure SOP 11-5. Graphical display of average periphyton mat total phosphorous results by basin and year against background of three thresholds based upon published index for CERP periphyton monitoring program. (For illustration purposes only).

6. The indices can be analyzed using a mixed models analysis with basin and time as fixed effects and site as a random effect nested within basin. Time can either be a categorical or linear trend variable. A logistic link can be used to account for using proportion data.

If more than two sample events have been conducted, and significant factors are detected with the Analysis of Variance, then a Tukey-Kramer mean separation test can be used to determine which years are significantly different.

If trends appear to be linear, an Analysis of Covariance can be used in which time is treated as a linear regression variable. However if trends are non-linear, the Analysis of Variance procedure above or a non-parametric analysis are preferred.

Based upon the pilot data, the data will likely need to be transformed to meet the requirements of the test (square root, 4th root, arcsine, or $\log_{10}$ transformation) or a binomial distribution used.

As a backup to assist clarity of analysis if there is a Basin by Time interaction and an appropriate model structure cannot be found, or if using data transformations proves problematic, analyses of variance by basin may be conducted with percent oligotrophic diatoms, percent eutrophic diatoms and total phosphorous as the dependent variables and with Site and Time as category variables. For two sampling events, this is a paired t-test. Conducting the analysis by basin rather than including all basins in the analysis as a block variable is an alternative as pilot data shows the variance in different basins differs by an order of magnitude.

Trends can be analyzed by basin using a non-parametric analysis if basic transformations of the data still do not allow the assumptions of parametric tests to be met. A non-parametric equivalent of a paired t-test is the Wilcoxon paired-sample test or signed rank test (Zar 1999) which can be used within basins. The Sign test (Zar 1999) may be used to compare data at different time periods across all basins as it has the fewest assumptions about the underlying structure of the data and as the differences in variance in the different basins should not impact this test. However the sign test is considered less statistically powerful than the Wilcoxon paired-sample test (Zar 1999). A Kruskal-Wallis test which is a non-parametric equivalent of ANOVA can be programmed in both R and SAS.

7. Generate maps displays showing total phosphorous levels ($\mu\text{g/g}$), percent eutrophic diatoms, and percent oligotrophic diatoms across the sites (Figure 6).

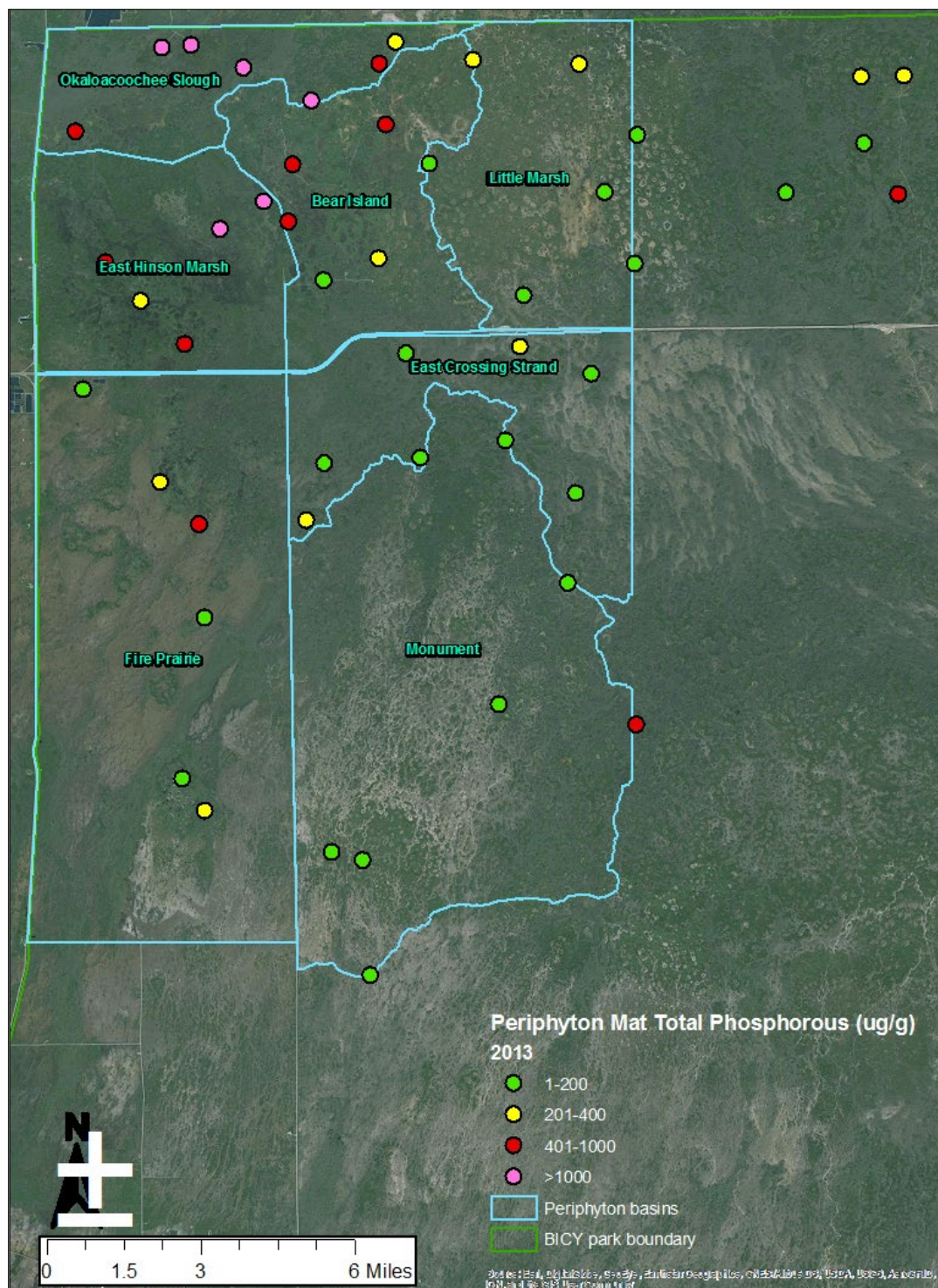


Figure SOP 11-4. Map of northwest portion of Big Cypress National Preserve showing all periphyton collection sites for November 2013. Sites are color-coded according to their total phosphorus content.

Literature Cited

Zar, J.H., 1999. Biostatistical analysis. Pearson Education India.

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Procedures

The protocol *Periphyton Monitoring in Big Cypress National Preserve* (Urgelles et al. 2019) can only be modified through the use of a versioning system with the following guidance. Changes will be designated as minor (e.g., software update or technology change) or major (e.g., modification of sample design, change in field methods, expansion to new areas of preserve).

1. Protocol edits and versioning are tracked in the Revision History Log attached to the narrative and each SOP. Major changes result in an update by whole numbers (e.g., version 1.0 to version 2.0) and minor changes by hundredths (e.g. version 1.01 to version 1.02). Record the new version number, date of revision, author of the revision, describe the change, and provide a rationale for the change. The version number used for the narrative and the SOPs will not stay synchronized because as some SOPs or the narrative and not others are updated, the version numbers will diverge.
2. All major changes must first be approved by appropriate network and park staff, including the network program manager and data manager, then sent to the regional program manager with a summary of changes. The regional program manager will determine if additional external scientific review is necessary. In general, minor changes to the protocol will only require in-house review by network staff (e.g., editing, formatting, switch to new software or comparable technology changes that do not affect sampling design, data quality, or data interpretation) followed by submission to the regional program manager for approval. Major changes in the protocol may require external review by subject matter experts (e.g., fundamental changes in sampling design, field methods).
3. Once approved for publication, the narrative, if revised, is submitted to the national I&M publication manager for formatting review and a new report number. The SOPs can be published to IRMA without obtaining a report number.
4. Inform the data manager about the changes to the protocol so new version numbers can be incorporated in the project database metadata and reports. The data manager may need to edit the database if the changes affect the database structure.
5. The new protocol version is posted on [SFCN website](#) and [NPS IRMA](#), the National Inventory and Monitoring Division protocol database is updated, and copies are forwarded to the parks and all people or organizations working with the previous version of the protocol.

Literature Cited

Urgelles, R., K.R.T. Whelan, R. Muxo, R.B. Shamblin, J. M. Patterson, and Andrea J. Atkinson. 2019. Protocol for periphyton monitoring in Big Cypress National Preserve: Protocol narrative. Natural Resource Report NPS/SFCN/NRR—2019/1911. National Park Service, Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2260128> (last accessed April 2019).

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Inventory and Monitoring Division

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Creating the Data Summary Report

A sample data summary report has been included in this document. It can be cut and pasted into a natural resource data summary (NRDS) template. In future years, simply edit the previous year's data summary report and update the tables and graphs. This will minimize formatting review changes. The wording of the introduction and methods section will require only changes to meet the specific monitoring of that year. For the first year, or if a new NRDS template has been released from the WASO office, the contents of the most recent data summary will need to be cut and pasted into the new template and updated.

1. Check to make sure no new data summary templates (NRDS) have been released by checking [NPS Inventory and Monitoring Report Templates](#). If the version of the latest template is after the version used in the most recent data summary, the contents will need to be shifted to the new format. This helps ensure the report meets all NPS requirements.
2. If there is no new template, save last year's report with a new name and update the report methods with specific sampling dates and specific changes in implementation of the protocol from that year.
3. Implement analyses described in SOP 10 *Data Analysis Using PRIMER Software* and SOP 11—*Data Analysis of Simplified Periphyton Indices—Version 1.0* and create graphs and maps as described.
4. Cut and paste the graphs and maps into the document. Summarize results and note changes from the current year compared to previous monitoring years that may be of interest to the park. However if there is any interpretation of the results that goes beyond what is covered in the protocol, the publication of the report will need to switch to the Natural Resource Report (NRR) series.
5. Summary reports are submitted for formatting review to the Southeast Region (SER) I&M editing department to ensure the publication meets Section 508 Accessibility Compliance requirements. Using the latest NRDS template and following the self-contained instructions will meet most of these requirements and speed up this review process. In addition:
 - a. Tables must be in Microsoft Word table format. They cannot be images of a table, or still in Microsoft Excel or SigmaPlot, or set-up using “typewriter techniques,” e.g., using spaces and tabs on a regular line of text to create “columns.”
 - b. Tables cannot be wider than the page margins.
 - c. Images must have alternate text.
 - d. Images, and text boxes must also stay within the existing page margins.

For additional details on adding alternate text or formatting tables, please see the guidance in: Z:\SFCN_Publications\ReportGuidelines\508_Compliance\IM_PDF_Accessibility_Using_M SWord.pdf

Or any more recent guidance on [NPS Inventory and Monitoring Report Templates](#).

6. Summary reports are submitted to the WASO office for a report number.
7. Data summary reports are published on [NPS Data Store](#) and made available on the [SFCN web page](#). Electronic copies (and hard copies if requested) will be delivered to park staff.

Archiving

The various types of data and reports associated with this protocol are stored on the SFCN server in Palmetto Bay, Florida. Each year these files will also be archived on NPS Data Store (Table SOP 13-1).

Table SOP 13-1. Data types and methods of archiving.

DATA TYPE	SFCN CONFERENCE ROOM	SFCN SERVER	IRMA
Datasheets	X	X	X (NPS Only)
Periphyton slides	X*	–	–
Laboratory results	–	X	X (NPS Only)
Database	–	X	X (NPS Only)
Exported flat files	–	X	X
Protocol	–	X	X
Analysis scripts	–	X	X
Data Summary Reports	–	X	X

* Periphyton slides are part of the BICY natural history collection and need to be properly accessioned. They will either be sent to the park or be loaned back to SFCN.

Example Data Summary Report

Introduction and Methods

Periphyton is a microbial mat community that forms the base of the aquatic food web in South Florida wetlands such as marshes in Everglades National Park (EVER) and Big Cypress National Preserve (BICY). It is a vital component of these wetlands, contributing to critical functions such as primary production, nutrient cycling, and soil production and stabilization. Periphyton is sensitive to slight changes in hydropattern (water quantity and duration) and water quality. Changes to these two ecosystem processes can quickly alter periphyton community structure (species composition and

relative abundance), which can create cascading effects on higher trophic levels. Periphyton is an early and integrative indicator of local and regional changes to hydrology.

The network conducts sampling for periphyton in the Big Cypress National Preserve (BICY). Of particular concern is northwest Big Cypress NP where water-quality stations have recorded high total-phosphorus (TP) concentrations in the water column. The network annually collects periphyton samples from basins in the northwest portion of the preserve (Figure SOP 13-2). Samples are processed to investigate diatom community composition and abundance (Tables SOP 13-2, 13-3, 13-4, and 13-5), as well as TP content (Table SOP 13-6). Diatom species from these sites are compared to indicator species from other studies and identified as eutrophic to oligotrophic indicators as appropriate. Diatom community structure is analyzed for spatial shifts (differences from site to site).

The overall goal of this monitoring is to assess water quality within the aquatic ecosystem in Big Cypress NP through diatom metrics. The network monitors the status and long-term trends in the community structure of periphyton mat diatoms and in the periphyton mat TP content within basins of the preserve to monitor changes in water quality that may impact ecological functioning within the preserve. The following objectives are addressed:

- Identify any basins in the northwest section of Big Cypress National Preserve where periphyton community structure and periphyton TP content are different from an oligotrophic (low-nutrient) and unimpacted community signal.
- Document any temporal and/or spatial trends in the periphyton community structure and periphyton TP content showing progression towards an oligotrophic, unimpacted condition or a eutrophic (high-nutrient), impacted condition.

Sampling and analyses are conducted in accordance with methods described in the *Protocol for Periphyton Monitoring in Big Cypress National Preserve: Protocol Narrative* (Urgelles et al. 2019) and associated standard operating procedures. In November 2013, the network conducted its sixth sampling for periphyton in Big Cypress NP. Periphyton samples were collected from 49 sites, 42 of which had been consecutively sampled for the past three years. Collection sites were accessed by helicopter and ATVs. Samples for diatom analysis were preserved in 3% formalin and sent to Dr. R. Jan Stevenson at Michigan State University (MSU). Samples for TP analysis were put on ice and sent to Dr. Evelyn Gaiser at Florida International University (FIU). Taxonomic naming follows the diatom database supported and maintained by the US Geological Survey, BioData (<https://aquatic.biodata.usgs.gov/>). Furthermore, to assist with documentation and harmonization, diatom species that make up greater than 5% on the slide are photographed, named, and retained.

Results and Discussion

Diatom community composition abundance data for November 2013 are provided in Tables SOP 13-2, 13-3, 13-4, and 13-5. For display purposes the taxonomic name is sometimes shortened (author source is removed) and synonyms are removed but are retained in the database. The most abundant species was *Mastogloia smithii* Thwaites (7,381 count) an indicator of oligotrophic systems present in 39 of the 49 samples. The lowest count of *M. smithii* was 8 at site Kissimmee Billy 8 (KB8) and

the highest count of 416 at East Crossing 6 (EC6) site (See Figure SOP 13-2 for location). Two more oligotrophic indicator species *Encyonopsis evergladianum* Krammer and *Encyonopsis microcephala* (Grunow) Krammer are the next most abundant diatoms (3,687 and 3,545, respectively) in the samples.

Diatoms were collectively categorized by their indicator status into eutrophic, eutrophic-mesotrophic, mesotrophic, mesotrophic-oligotrophic, and oligotrophic categories and each category's percentage of the total diatoms were calculated. Results from 2013 were averaged by basin and graphed in Figure SOP 13-3. A SAS NPAR1WAY non-parametric analysis of variance test was performed on the November 2013 data. Significant differences were found among basins for both percent eutrophic diatoms ($p=0.0074$) and percent oligotrophic diatoms ($p=0.0332$). Average total phosphorous also showed significant differences by basin ($p=0.0009$; Figures SOP 13-1 and SOP 13-3).

Multivariate ordination analyses were performed on the November 2013 periphyton samples using diatom community composition and total phosphorus content data from all sites (data per site is given in Tables SOP 13-1–SOP 13-5 or alternatively cite database posted to [NPS Data Store](#)). Analysis of Similarity (ANOSIM) found a significant difference in the diatom communities among basins (Global $R = 0.298$, $P = 0.001$). Non-metric Multi-Dimensional Scaling (NMDS), a graphical representation of this analysis, corroborates the results (Figure SOP 13-4) with marked separation between impacted and unimpacted sites. This separation is driven by a change in relative abundance of diatom species. In the Non-metric Multi-Simensional Scaling we can see that in general the impacted and unimpacted sites separate and the Bear Island sites typically have diatom composition more similar to the impacted collection locations than the unimpacted (Figure SOP 13-4).

Both Analysis of Similarity and Non-metric Multi-Dimensional Scaling indicated the Bear Island basin diatom communities are most similar to those found in East Hinson Marsh and Okaloacoochee Slough, which are located next to each other and closest to the canal inputs (Figure SOP 13-2 and Figure SOP 13-4).

Literature Cited

Urgelles, R., K.R.T. Whelan, R. Muxo, R.B. Shamblin, J. M. Patterson and A. J. Atkinson. 2019. Protocol for periphyton monitoring in Big Cypress National Preserve: protocol narrative. Natural Resource Report NPS/SFCN/NRR—2019/1911. National Park Service, Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2260128> (last accessed April 2019).

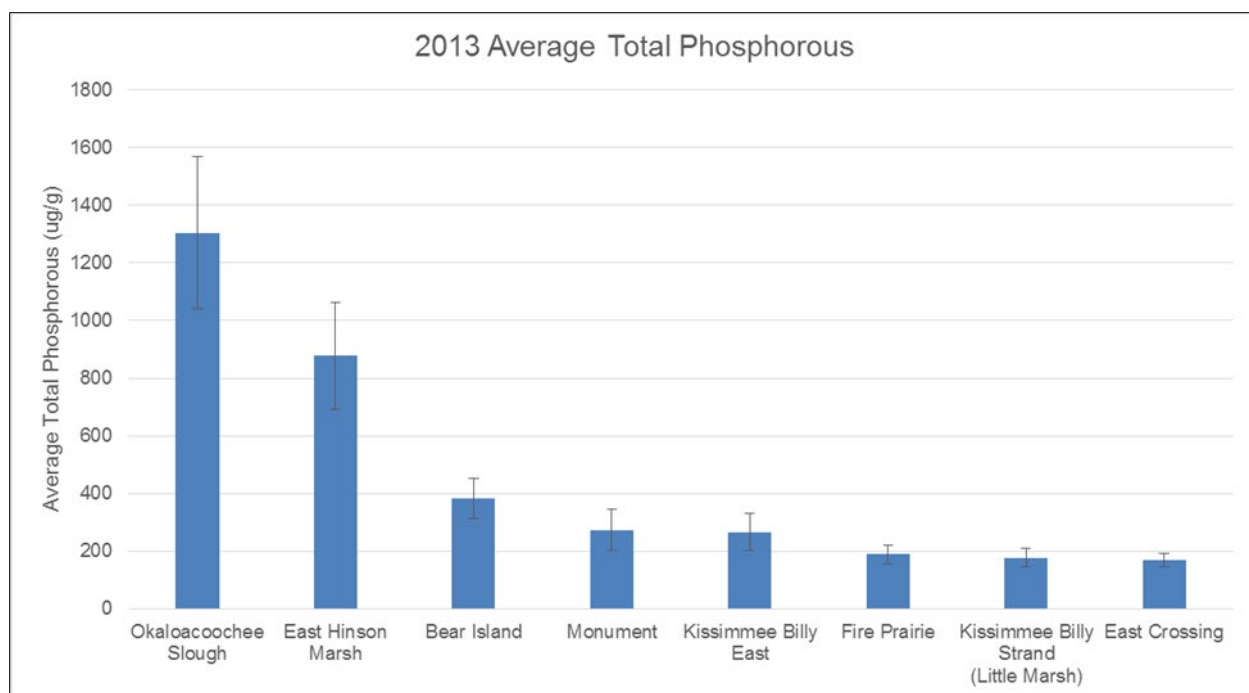


Figure SOP 13-1. Sample Figure 1. Average periphyton mat total phosphorous ($\mu\text{g/g}$) by basin for 2013. Error bars are standard error.

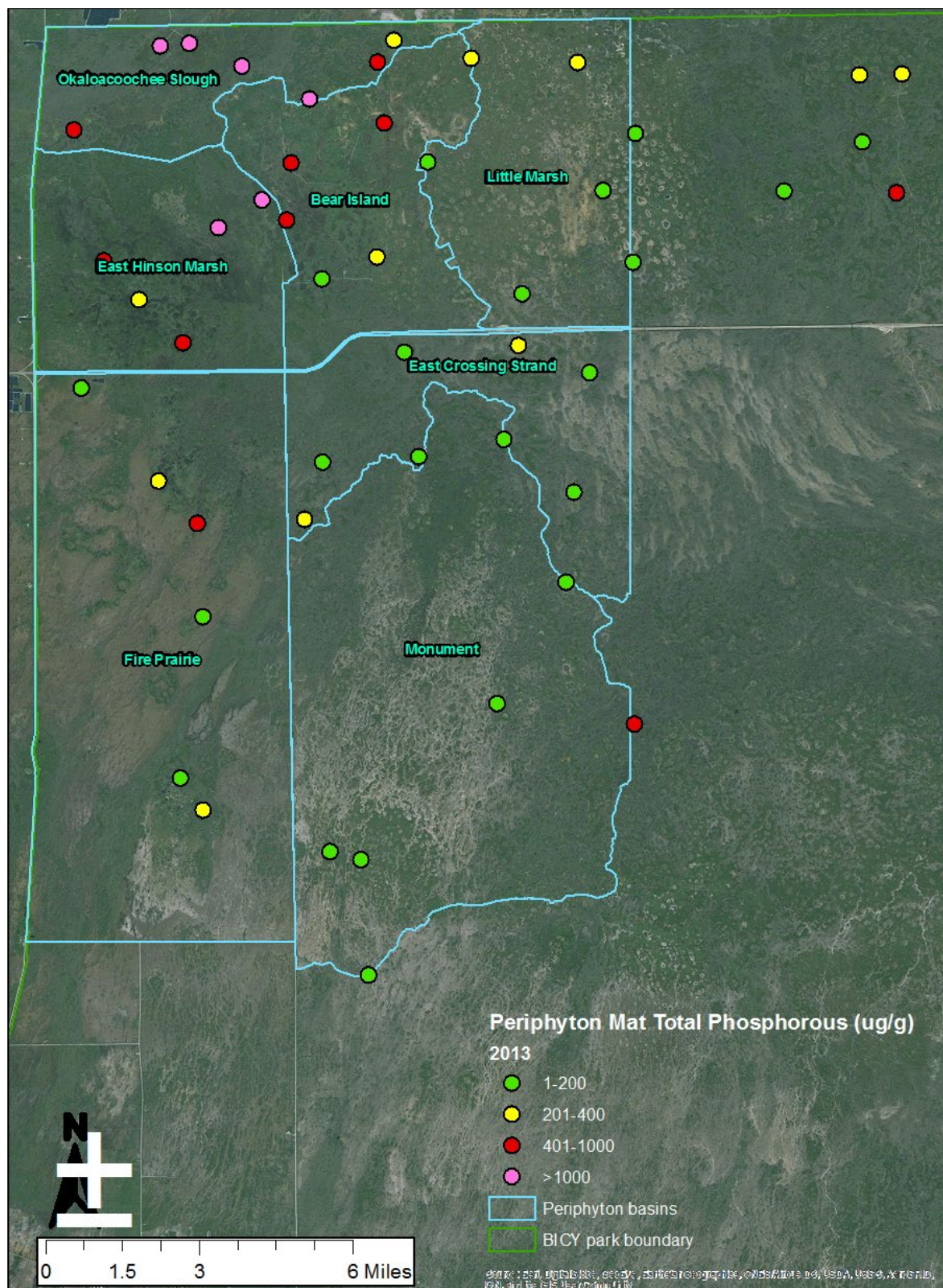


Figure SOP 13-2. Sample Figure 2. Map of northwest portion of Big Cypress National Preserve showing all periphyton collection sites for November 2013. Sites are color-coded according to their total phosphorus content.

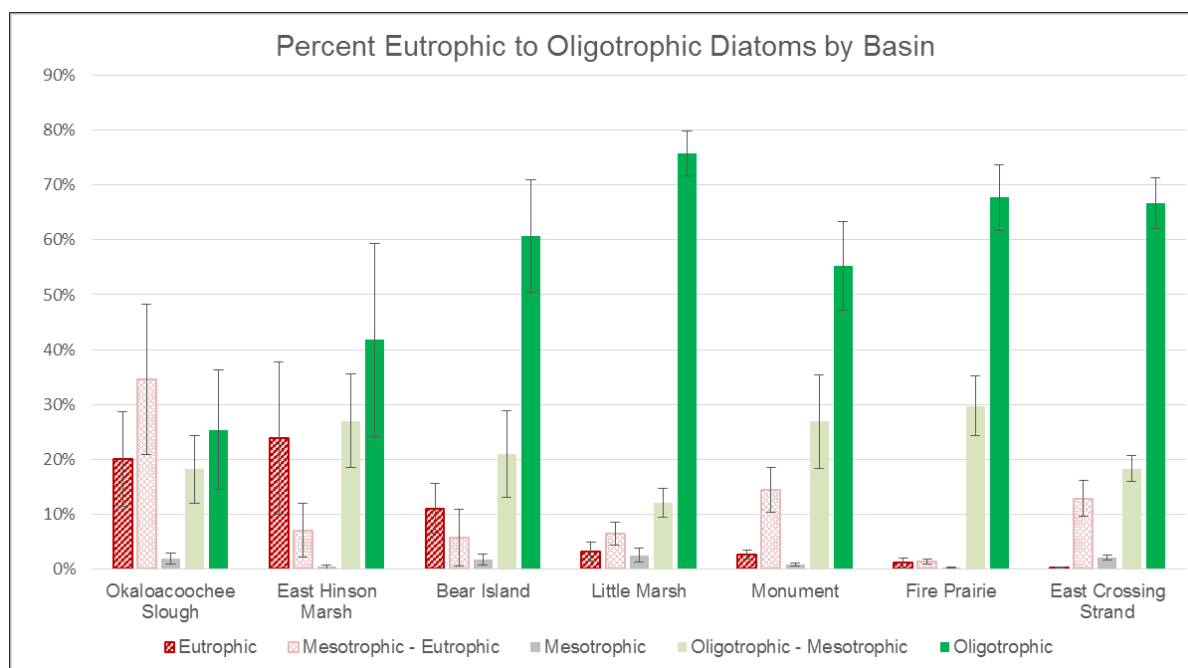


Figure SOP 13-3. Sample Figure 3. Graphical display of average percent of diatoms classified into five indicator categories by basin: Eutrophic; Mesotrophic-Eutrophic; Mesotrophic; Oligotrophic-Mesotrophic; Oligotrophic. Data represent 2013 averages and standard errors by basin.

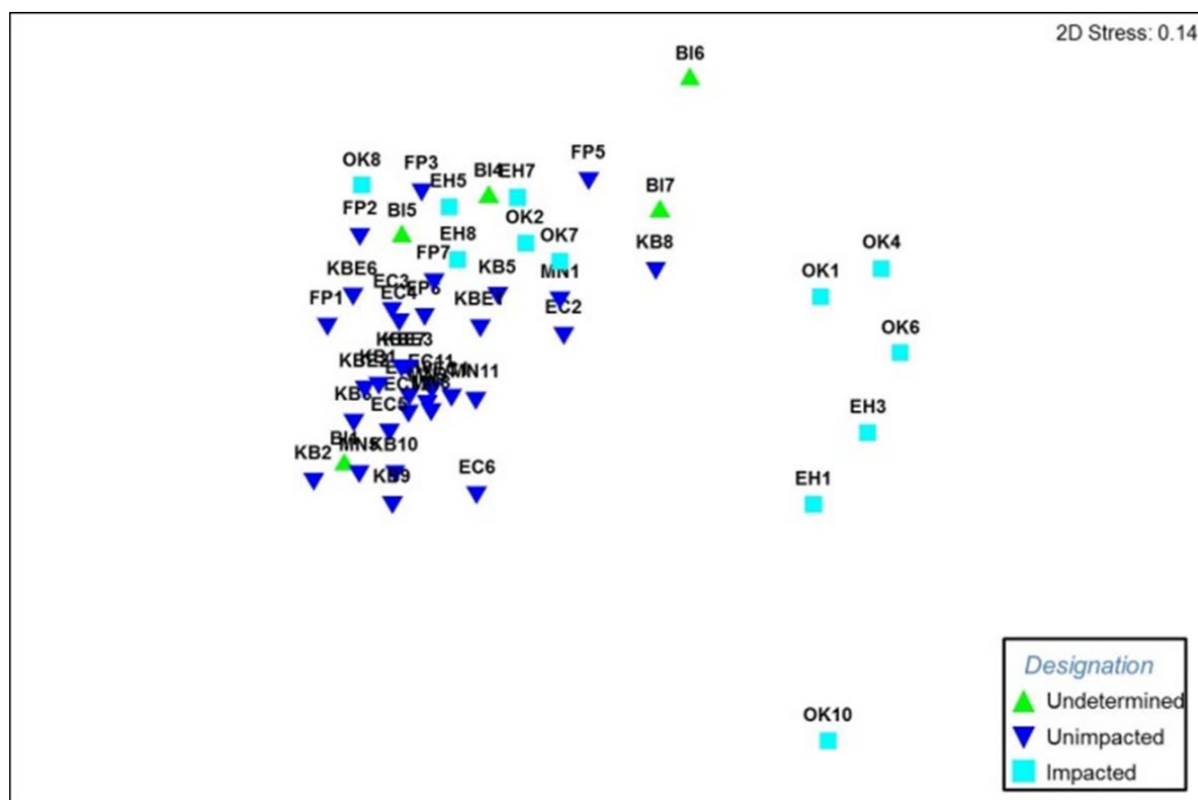


Figure SOP 13-4. Sample Figure 4. Non-metric Multi-Dimensional Scaling of all collection sites using relative abundance of diatom species.

Table SOP 13-2. Sample Table 1. List of Diatom species detected and abundance numbers counted on subsamples from periphyton samples collected in 2013. BI= Bear Island and EC= East Crossing Strand. (May be replaced by database or data output citation in IRMA.nps.gov).

Diatom species	BI1	BI4	BI5	BI6	BI7	EC1	EC10	EC11	EC12	EC2	EC3	EC4	EC5	EC6
<i>Achnantheidium exiguum</i> (Grunow) Czarnecki	—	—	—	—	—	—	—	—	—	—	—	—	—	4
<i>Achnantheidium minutissimum</i> (Kützing) Czarnecki	—	56	17	2	36	—	—	—	—	10	6	4	2	—
<i>Achnantheidium</i> spp.	—	—	—	—	—	—	4	—	—	1	—	—	—	—
<i>Amphora copulata</i> (Kützing) Schoeman et Archibald	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Amphora ovalis</i> (Kützing) Kützing	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Amphora</i> spp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Aulacoseira granulata</i> (Ehrenberg) Simonsen	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Aulacoseira italica</i> (Ehrenberg) Simonsen	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Brachysira microcephala</i> (Kützing) Compère	5	10	20	36	10	88	33	36	78	81	28	48	65	87
<i>Caloneis bacillum</i> (Grunow) Cleve	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Craticula cuspidata</i> (Kützing) Mann	—	4	—	—	—	—	—	—	—	—	—	—	—	—
<i>Cyclotella meneghiniana</i> Kützing	—	—	—	—	4	—	—	—	—	4	—	—	—	—
<i>Diadesmis confervacea</i> Kützing	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Diadesmis contenta</i> (Grunow ex Van Heurck) Mann	—	—	—	—	—	—	—	—	—	—	—	—	—	—
<i>Diploneis oblongella</i> (Naegeli ex Kützing) Ross	—	—	—	—	—	—	—	2	—	7	2	—	—	—

Diatom species	BI1	BI4	BI5	BI6	BI7	EC1	EC10	EC11	EC12	EC2	EC3	EC4	EC5	EC6
<i>Diploneis ovalis</i> (Hilse) Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Diploneis parma</i> Cleve	–	–	–	–	2	–	2	–	–	–	–	2	–	2
<i>Diploneis subovalis</i> Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Encyonema auerswaldii</i> Rabenhorst	12	–	–	–	–	–	–	–	4	–	–	–	–	–
<i>Encyonema minutum</i> (Hilse) Mann	–	2	–	–	–	–	–	–	–	–	–	–	–	–
<i>Encyonema neomesianum</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Encyonema silesiacum</i> (Bleisch) Mann	2	115	2	268	84	8	17	12	4	22	10	13	–	67
<i>Encyonopsis evergladianum</i> Krammer	263	4	2	–	–	139	121	125	297	2	4	18	174	181
<i>Encyonopsis microcephala</i> (Grunow) Krammer	10	25	35	6	208	42	35	128	62	18	86	42	37	111
<i>Epithemia</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia bilunaris</i> (Ehrenberg) Souza	–	–	–	2	–	–	–	–	–	–	–	–	–	–
<i>Eunotia camelus</i> Ehrenberg	–	–	63	4	–	–	–	–	–	2	–	–	–	–
<i>Eunotia flexuosa</i> Brébisson. ex Kützing	–	–	–	2	–	–	–	–	–	4	–	–	–	–
<i>Eunotia formica</i> Ehr.	–	–	–	–	2	–	–	–	–	–	–	–	–	–
<i>Eunotia monodon</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia nymanniana</i> Grunow	–	24	8	12	17	2	–	–	–	67	2	2	–	–
<i>Eunotia parallela</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	BI1	BI4	BI5	BI6	BI7	EC1	EC10	EC11	EC12	EC2	EC3	EC4	EC5	EC6
<i>Eunotia</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Fragilaria synegrotesca</i> Lange-Bertalot	–	–	40	–	–	26	12	11	9	11	5	123	2	–
<i>Fragilaria tenera</i> (Smith) Lange-Bertalot	–	28	–	–	24	–	–	–	–	–	–	–	–	–
<i>Gomphonema acuminatum</i> Ehrenberg	–	14	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema affine</i> Kützing	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema angustatum</i> (Kützing) Rabenhorst	–	–	–	–	2	–	–	–	–	–	–	–	–	–
<i>Gomphonema contraturris</i> Lange-Bertalot et Reichardt	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema gracile</i> Ehrenberg	–	–	–	22	23	–	4	4	–	–	–	–	–	–
<i>Gomphonema minutum</i> (Agardh) Agardh	–	–	–	–	10	–	–	–	–	–	–	–	–	–
<i>Gomphonema parvulum</i> (Kützing) Kützing	–	–	–	–	1	–	–	–	–	–	–	–	–	–
<i>Gomphonema pumilum</i> (Grunow) Reichardt and Lange-Bertalot	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema vibrioides</i> Reichardt et Lange-Bertalot	–	18	2	–	12	4	–	2	3	12	–	12	1	–
<i>Gyrosigma acuminatum</i> (Kützing) Rabenhorst	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Hippodonta capitata</i> (Ehrenberg) Lange-Bertalot, Metzeltin and Witkowski	---	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	BI1	BI4	BI5	BI6	BI7	EC1	EC10	EC11	EC12	EC2	EC3	EC4	EC5	EC6
<i>Kobayasiella subtilissima</i> (Cleve) Lange-Bertalot	–	–	–	–	–	10	–	16	15	6	6	–	23	9
<i>Luticola naviculoides</i> Johansen	–	–	36	–	–	–	–	–	–	–	–	–	–	–
<i>Mastogloia smithii</i> Thwaites	134	271	363	–	10	144	193	126	17	121	416	328	81	–
<i>Navicula cryptocephala</i> Kützinger	–	–	–	–	2	4	–	–	–	2	–	–	–	–
<i>Navicula cryptotenella</i> Lange- Bertalot	6	23	8	107	52	21	10	24	20	149	22	2	11	33
<i>Navicula exilis</i> Kützinger	–	–	–	1	–	–	–	–	–	–	–	–	–	–
<i>Navicula</i> spp.	–	–	–	–	–	–	–	4	–	26	–	–	–	–
<i>Navicula wallacei</i> Reimer	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Neidium iridis</i> (Ehrenberg) Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia acicularis</i> (Kützinger) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia amphibia</i> Grunow	–	2	4	–	41	–	–	–	–	15	2	–	–	–
<i>Nitzschia filiformis</i> (Smith) Van Heurck	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia gracilis</i> Hantzsch	–	–	–	66	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia lacuum</i> Lange-Bertalot	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia linearis</i> (Agardh ex Smith) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia nana</i> Grunow	–	–	–	21	4	–	–	–	–	10	–	–	–	–
<i>Nitzschia palea</i> (Kützinger) Smith	156	2	–	3	2	73	83	91	87	18	–	–	172	104
<i>Nitzschia perminuta</i> (Grunow) Peragallo	–	–	–	28	16	–	–	–	–	–	–	–	–	–

Diatom species	BI1	BI4	BI5	BI6	BI7	EC1	EC10	EC11	EC12	EC2	EC3	EC4	EC5	EC6
<i>Nitzschia serpentiraphe</i>	10	–	–	–	–	27	84	19	–	–	11	6	26	–
<i>Nitzschia subacicularis</i> Hustedt	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Pinnularia acrosphaeria</i> (Brébisson) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Pinnularia microstauron</i> (Ehrenberg) Cleve	2	–	–	–	–	–	–	–	–	–	–	–	2	2
<i>Pinnularia</i> spp.	–	–	–	–	–	2	–	–	–	6	–	–	–	–
<i>Pinnularia subcapitata</i> Gregory	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Pinnularia viridis</i> (Nitzsch) Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	2	–
<i>Psammothidium marginulatum</i> (Grunow) Bukhtiyarova and Round	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Rhopalodia gibba</i> (Ehrenberg) Müller	–	–	–	–	16	–	–	–	–	6	–	–	–	–
<i>Sellaphora pupula</i> (Kützinger) Mereschkowsky	–	–	–	2	–	–	–	–	–	–	–	–	–	–
<i>Sellaphora seminulum</i> (Grunow) Mann	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Sellaphora stroemii</i> (Hustedt) Kobayasi	–	–	–	–	–	10	2	–	4	–	–	–	2	–
<i>Stauroneis anceps</i> Ehrenberg	–	–	–	4	–	–	–	–	–	–	–	–	–	–
<i>Stauroneis obtusa</i> Lagerstedt	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Stauroneis phoenicenteron</i> (Nitzsch) Ehrenberg	–	2	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	BI1	BI4	BI5	BI6	BI7	EC1	EC10	EC11	EC12	EC2	EC3	EC4	EC5	EC6
<i>Stenopterobia curvula</i> (Smith) Krammer	–	–	–	14	–	–	–	–	–	–	–	–	–	–
<i>Synedra acus</i> Kützing	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Synedra delicatissima</i> var. <i>angustissima</i> Grunow	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Synedra ulna</i> (Nitzsch) Ehrenberg	–	–	–	–	22	–	–	–	–	–	–	–	–	–
Grand Total	600	600	600	600	600	600	600	600	600	600	600	600	600	600

Table SOP 13-3. Sample Table 2. List of Diatom species detected and abundance numbers counted on subsamples from periphyton samples collected in 2013. EH= East Hinson Marsh, FP= Fire Prairie, and KB= Kissimmee Billy Strand.

Diatom species	EH1	EH3	EH5	EH7	EH8	FP1	FP2	FP3	FP5	FP6	FP7	KB1	KB10	KB2
<i>Achnantheidium exiguum</i> (Grunow) Czarnecki	–	–	–	–	7	–	–	–	–	–	–	–	–	–
<i>Achnantheidium minutissimum</i> (Kützing) Czarnecki	–	–	–	23	18	–	–	2	30	2	21	4	–	–
<i>Achnantheidium</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Amphora copulata</i> (Kützing) Schoeman et Archibald	–	–	–	–	–	–	4	4	–	–	–	–	–	–
<i>Amphora ovalis</i> (Kützing) Kützing	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Amphora</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Aulacoseira granulata</i> (Ehrenberg) Simonsen	–	2	–	–	–	–	–	–	–	–	–	–	–	–
<i>Aulacoseira italica</i> (Ehrenberg) Simonsen	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Brachysira microcephala</i> (Kützing) Compère	–	–	77	25	157	16	20	13	40	142	43	37	81	8
<i>Caloneis bacillum</i> (Grunow) Cleve	–	2	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	EH1	EH3	EH5	EH7	EH8	FP1	FP2	FP3	FP5	FP6	FP7	KB1	KB10	KB2
<i>Craticula cuspidata</i> (Kützing) Mann	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Cyclotella meneghiniana</i> Kützing	–	10	1	1	–	–	–	5	–	–	–	4	–	–
<i>Diadesmis confervacea</i> Kützing	–	28	–	–	–	–	–	–	–	–	–	–	–	–
<i>Diadesmis contenta</i> (Grunow ex Van Heurck) Mann	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Diploneis oblongella</i> (Naegeli ex Kützing) Ross	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Diploneis ovalis</i> (Hilse) Cleve	–	–	–	–	–	2	–	2	–	–	–	–	–	–
<i>Diploneis parma</i> Cleve	–	6	–	–	–	–	–	–	–	–	–	–	–	–
<i>Diploneis subovalis</i> Cleve	–	–	–	–	–	–	–	–	–	–	–	–	2	–
<i>Encyonema auerswaldii</i> Rabenhorst	–	–	–	–	–	–	–	–	–	2	–	2	10	35
<i>Encyonema minutum</i> (Hilse) Mann	–	–	–	–	–	–	–	–	–	–	–	–	2	2
<i>Encyonema neomesianum</i>	–	–	64	–	–	–	–	–	2	–	–	–	–	–
<i>Encyonema silesiacum</i> (Bleisch) Mann	8	10	–	139	6	9	15	8	89	85	15	–	2	–
<i>Encyonopsis evergladianum</i> Krammer	–	–	–	–	–	117	–	–	–	2	–	204	271	271
<i>Encyonopsis microcephala</i> (Grunow) Krammer	–	–	78	186	37	177	207	168	197	95	103	38	42	14
<i>Epithemia</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia bilunaris</i> (Ehrenberg) Souza	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia camelus</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia flexuosa</i> Brébisson. ex Kützing	–	–	–	–	–	2	–	–	4	–	–	–	–	–
<i>Eunotia formica</i> Ehr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia monodon</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	EH1	EH3	EH5	EH7	EH8	FP1	FP2	FP3	FP5	FP6	FP7	KB1	KB10	KB2
<i>Eunotia nymanniana</i> Grunow	67	5	14	9	11	–	–	–	40	–	–	–	–	–
<i>Eunotia parallela</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Fragilaria synegrotesca</i> Lange-Bertalot	–	–	106	67	83	30	–	21	4	22	23	40	18	2
<i>Fragilaria tenera</i> (Smith) Lange-Bertalot	9	–	8	–	–	–	–	2	2	–	–	–	–	–
<i>Gomphonema acuminatum</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema affine</i> Kützing	–	1	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema angustatum</i> (Kützing) Rabenhorst	4	2	–	–	–	–	–	–	–	–	–	–	2	–
<i>Gomphonema contraturris</i> Lange-Bertalot et Reichart	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema gracile</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	1	–	–
<i>Gomphonema minutum</i> (Agardh) Agardh	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema parvulum</i> (Kützing) Kützing	–	4	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema pumilum</i> (Grunow) Reichardt and Lange-Bertalot	–	2	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema vibrioides</i> Reichardt et Lange-Bertalot	2	2	3	6	3	–	12	–	29	30	2	–	–	–
<i>Gyrosigma acuminatum</i> (Kützing) Rabenhorst	–	–	–	–	–	–	–	2	–	–	–	–	–	–
<i>Hippodonta capitata</i> (Ehrenberg) Lange-Bertalot, Metzeltin and Witkowski	–	–	–	–	–	–	–	2	–	–	–	–	–	–
<i>Kobayasiella subtilissima</i> (Cleve) Lange-Bertalot	–	2	–	–	–	–	–	–	–	–	–	–	10	2
<i>Luticola naviculoides</i> Johansen	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	EH1	EH3	EH5	EH7	EH8	FP1	FP2	FP3	FP5	FP6	FP7	KB1	KB10	KB2
<i>Mastogloia smithii</i> Thwaites	–	–	192	–	256	235	318	256	–	186	361	179	73	214
<i>Navicula cryptocephala</i> Kützinger	–	8	–	–	–	–	–	–	–	–	–	–	18	–
<i>Navicula cryptotenella</i> Lange-Bertalot	2	1	42	140	8	12	18	90	108	18	20	10	–	–
<i>Navicula exilis</i> Kützinger	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Navicula</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Navicula wallacei</i> Reimer	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Neidium iridis</i> (Ehrenberg) Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia acicularis</i> (Kützinger) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia amphibia</i> Grunow	28	263	–	2	2	–	–	6	20	–	–	–	–	–
<i>Nitzschia filiformis</i> (Smith) Van Heurck	–	–	–	–	2	–	–	–	4	–	–	–	–	–
<i>Nitzschia gracilis</i> Hantzsch	71	28	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia lacuum</i> Lange-Bertalot	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia linearis</i> (Agardh ex Smith) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia nana</i> Grunow	180	1	3	–	–	–	–	–	–	–	2	–	–	–
<i>Nitzschia palea</i> (Kützinger) Smith	138	35	10	2	4	–	4	6	16	16	8	49	61	23
<i>Nitzschia perminuta</i> (Grunow) Peragallo	–	3	–	–	–	–	–	–	5	–	–	–	–	–
<i>Nitzschia serpentiraphe</i>	81	169	–	–	–	–	–	–	–	–	–	32	8	27
<i>Nitzschia subacicularis</i> Hustedt	–	–	–	–	–	–	–	–	8	–	–	–	–	–
<i>Pinnularia acrosphaeria</i> (Brébisson) Smith	6	–	–	–	–	–	–	–	2	–	–	–	–	–
<i>Pinnularia microstauron</i> (Ehrenberg) Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	2
<i>Pinnularia</i> spp.	4	2	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	EH1	EH3	EH5	EH7	EH8	FP1	FP2	FP3	FP5	FP6	FP7	KB1	KB10	KB2
<i>Pinnularia subcapitata</i> Gregory	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Pinnularia viridis</i> (Nitzsch) Ehrenberg	–	2	–	–	–	–	–	–	–	–	–	–	–	–
<i>Psammothidium marginulatum</i> (Grunow) Bukhtiyarova and Round	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Rhopalodia gibba</i> (Ehrenberg) Müller	–	4	2	–	4	–	–	4	–	–	–	–	–	–
<i>Sellaphora pupula</i> (Kützinger) Mereschkowsky	–	2	–	–	–	–	–	2	–	–	2	–	–	–
<i>Sellaphora seminulum</i> (Grunow) Mann	–	6	–	–	–	–	–	–	–	–	–	–	–	–
<i>Sellaphora stroemii</i> (Hustedt) Kobayasi	–	–	–	–	2	–	–	2	–	–	–	–	–	–
<i>Stauroneis anceps</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Stauroneis obtusa</i> Lagerstedt	–	–	–	–	–	–	2	5	–	–	–	–	–	–
<i>Stauroneis phoenicenteron</i> (Nitzsch) Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Stenopterobia curvula</i> (Smith) Krammer	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Synedra acus</i> Kützinger	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Synedra delicatissima</i> var. <i>angustissima</i> Grunow	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Synedra ulna</i> (Nitzsch) Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Grand Total	600	600	600	600	600	600	600	600	600	600	600	600	600	600

Table SOP 13-4. Sample Table 3. List of Diatom species detected and abundance numbers counted on subsamples from periphyton samples collected in 2013. KB= Kissimmee Billy Strand, KBE= Kissimmee Billy East, and MN= Monument.

Diatom species	KB5	KB6	KB8	KB9	KBE1	KBE2	KBE3	KBE6	KBE7	MN1	MN11	MN5	MN8	MN9
<i>Achnantheidium exiguum</i> (Grunow) Czarnecki	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Achnantheidium minutissimum</i> (Kützing) Czarnecki	89	2	40	–	87	4	4	22	8	112	80	–	8	4
<i>Achnantheidium</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Amphora copulata</i> (Kützing) Schoeman et Archibald	–	–	–	–	–	–	–	–	–	–	2	–	–	–
<i>Amphora ovalis</i> (Kützing) Kützing	–	–	–	–	–	1	–	–	–	–	–	–	–	–
<i>Amphora</i> spp.	1	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Aulacoseira granulata</i> (Ehrenberg) Simonsen	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Aulacoseira italica</i> (Ehrenberg) Simonsen	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Brachysira microcephala</i> (Kützing) Compère	130	24	241	14	24	2	26	12	17	39	28	67	22	40
<i>Caloneis bacillum</i> (Grunow) Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Craticula cuspidata</i> (Kützing) Mann	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Cyclotella meneghiniana</i> Kützing	3	2	5	–	–	–	–	–	–	–	1	–	–	–
<i>Diadesmis confervacea</i> Kützing	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Diadesmis contenta</i> (Grunow ex Van Heurck) Mann	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	KB5	KB6	KB8	KB9	KBE1	KBE2	KBE3	KBE6	KBE7	MN1	MN11	MN5	MN8	MN9
<i>Diploneis oblongella</i> (Naegeli ex Kützing) Ross	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Diploneis ovalis</i> (Hilse) Cleve	–	–	–	–	–	–	–	2	–	–	–	–	–	–
<i>Diploneis parva</i> Cleve	2	–	–	–	–	–	–	–	1	4	–	–	–	2
<i>Diploneis subovalis</i> Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Encyonema auerswaldii</i> Rabenhorst	–	17	–	16	–	1	2	3	22	–	2	6	–	–
<i>Encyonema minutum</i> (Hilse) Mann	–	–	6	–	–	–	–	–	–	–	–	–	–	–
<i>Encyonema neomesianum</i>	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Encyonema silesiacum</i> (Bleisch) Mann	22	–	18	–	16	12	2	14	6	56	28	2	14	6
<i>Encyonopsis evergladianum</i> Krammer	2	247	–	229	9	191	75	4	172	–	54	187	182	140
<i>Encyonopsis microcephala</i> (Grunow) Krammer	42	6	46	34	138	71	16	73	46	76	236	–	44	107
<i>Epithemia</i> spp.	–	–	2	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia bilunaris</i> (Ehrenberg) Souza	–	–	2	–	–	–	–	–	–	2	–	–	–	–
<i>Eunotia camelus</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia flexuosa</i> Brébisson. ex Kützing	–	–	–	–	–	–	–	–	–	7	–	–	–	–
<i>Eunotia formica</i> Ehr.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia monodon</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia nymanniana</i> Grunow	8	–	2	–	3	–	–	–	–	29	–	–	–	–

Diatom species	KB5	KB6	KB8	KB9	KBE1	KBE2	KBE3	KBE6	KBE7	MN1	MN11	MN5	MN8	MN9
<i>Eunotia parallela</i> Ehrenberg	8	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Eunotia</i> spp.	–	–	2	–	–	–	–	–	–	–	–	–	–	–
<i>Fragilaria synegrotesca</i> Lange-Bertalot	156	21	100	4	70	22	46	40	62	48	11	8	5	35
<i>Fragilaria tenera</i> (Smith) Lange-Bertalot	–	–	6	–	–	–	–	–	–	15	–	–	–	–
<i>Gomphonema acuminatum</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema affine</i> Kützing	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema angustatum</i> (Kützing) Rabenhorst	3	1	6	4	1	–	2	–	–	2	–	–	–	–
<i>Gomphonema contraturris</i> Lange-Bertalot et Reichart	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema gracile</i> Ehrenberg	–	–	42	–	1	–	–	–	–	4	1	–	1	–
<i>Gomphonema minutum</i> (Agardh) Agardh	–	–	4	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema parvulum</i> (Kützing) Kützing	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema pumilum</i> (Grunow) Reichardt and Lange-Bertalot	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Gomphonema vibrioides</i> Reichardt et Lange-Bertalot	6	–	–	–	–	2	7	–	–	1	4	4	2	2
<i>Gyrosigma acuminatum</i> (Kützing) Rabenhorst	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	KB5	KB6	KB8	KB9	KBE1	KBE2	KBE3	KBE6	KBE7	MN1	MN11	MN5	MN8	MN9
<i>Hippodonta capitata</i> (Ehrenberg) Lange-Bertalot, Metzeltin and Witkowski	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Kobayasiella subtilissima</i> (Cleve) Lange-Bertalot	–	2	–	43	6	2	–	84	2	–	7	–	2	4
<i>Luticola naviculoides</i> Johansen	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Mastogloia smithii</i> Thwaites	103	235	8	119	204	250	355	204	172	109	72	221	128	104
<i>Navicula cryptocephala</i> Kützing	–	–	24	10	28	14	–	124	–	–	27	2	18	6
<i>Navicula cryptotenella</i> Lange- Bertalot	15	2	–	–	2	–	3	–	14	37	–	–	–	–
<i>Navicula exilis</i> Kützing	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Navicula</i> spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Navicula wallacei</i> Reimer	–	2	–	–	–	–	–	–	–	–	–	–	–	–
<i>Neidium iridis</i> (Ehrenberg) Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia acicularis</i> (Kützing) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia amphibia</i> Grunow	4	–	32	–	–	–	–	4	–	2	–	–	–	–
<i>Nitzschia filiformis</i> (Smith) Van Heurck	–	–	–	–	2	–	–	2	1	2	–	–	–	–
<i>Nitzschia gracilis</i> Hantzsch	–	–	–	–	–	–	–	–	–	2	–	–	–	–
<i>Nitzschia lacuum</i> Lange-Bertalot	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia linearis</i> (Agardh ex Smith) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia nana</i> Grunow	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	KB5	KB6	KB8	KB9	KBE1	KBE2	KBE3	KBE6	KBE7	MN1	MN11	MN5	MN8	MN9
<i>Nitzschia palea</i> (Kützing) Smith	6	26	4	94	2	3	54	3	77	37	42	48	149	144
<i>Nitzschia perminuta</i> (Grunow) Peragallo	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Nitzschia serpentiraphe</i>	–	13	–	31	–	25	8	–	–	2	–	55	25	2
<i>Nitzschia subacicularis</i> Hustedt	–	–	–	–	4	–	–	2	–	–	–	–	–	–
<i>Pinnularia acrosphaeria</i> (Brébisson) Smith	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Pinnularia microstauron</i> (Ehrenberg) Cleve	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Pinnularia</i> spp.	–	–	2	2	–	–	–	–	–	–	2	–	–	–
<i>Pinnularia subcapitata</i> Gregory	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Pinnularia viridis</i> (Nitzsch) Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Psammothidium marginulatum</i> (Grunow) Bukhtiyarova and Round	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Rhopalodia gibba</i> (Ehrenberg) Müller	–	–	5	–	–	–	–	1	–	–	–	–	–	–
<i>Sellaphora pupula</i> (Kützing) Meresckowsky	–	–	–	–	1	–	–	–	–	–	–	–	–	–
<i>Sellaphora seminulum</i> (Grunow) Mann	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Sellaphora stroemii</i> (Hustedt) Kobayasi	–	–	–	–	2	–	–	6	–	–	2	–	–	4
<i>Stauroneis anceps</i> Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Stauroneis obtusa</i> Lagerstedt	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Diatom species	KB5	KB6	KB8	KB9	KBE1	KBE2	KBE3	KBE6	KBE7	MN1	MN11	MN5	MN8	MN9
<i>Stauroneis phoenicenteron</i> (Nitzsch) Ehrenberg	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Stenopterobia curvula</i> (Smith) Krammer	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Synedra acus</i> Kützing	–	–	–	–	–	–	–	–	–	14	–	–	–	–
<i>Synedra delicatissima</i> var. <i>angustissima</i> Grunow	–	–	–	–	–	–	–	–	–	–	1	–	–	–
<i>Synedra ulna</i> (Nitzsch) Ehrenberg	–	–	3	–	–	–	–	–	–	–	–	–	–	–
Grand Total	600	600	600	600	600	600	600	600	600	600	600	600	600	600

Table SOP 13-5. Sample Table 4. List of Diatom species detected and abundance numbers counted on subsamples from periphyton samples collected in 2013. OK=Okaloacoochee Slough.

Diatom species	OK1	OK10	OK2	OK4	OK6	OK7	OK8	Grand Total
<i>Achnanthyidium exiguum</i> (Grunow) Czarnecki	–	–	–	–	–	–	–	11
<i>Achnanthyidium minutissimum</i> (Kützing) Czarnecki	4	–	1	2	–	–	2	702
<i>Achnanthyidium</i> spp.	–	–	–	–	–	–	1	6
<i>Amphora copulata</i> (Kützing) Schoeman et Archibald	–	–	–	–	–	–	–	10
<i>Amphora ovalis</i> (Kützing) Kützing	–	–	–	–	–	–	–	1
<i>Amphora</i> spp.	–	–	–	–	–	–	–	1
<i>Aulacoseira granulata</i> (Ehrenberg) Simonsen	–	–	–	–	–	–	–	2
<i>Aulacoseira italica</i> (Ehrenberg) Simonsen	–	–	–	–	3	–	–	3
<i>Brachysira microcephala</i> (Kützing) Compère	–	–	6	–	–	18	2	1996
<i>Caloneis bacillum</i> (Grunow) Cleve	–	–	–	2	2	–	–	6

Diatom species	OK1	OK10	OK2	OK4	OK6	OK7	OK8	Grand Total
<i>Craticula cuspidata</i> (Kützing) Mann	–	–	2	–	–	–	–	6
<i>Cyclotella meneghiniana</i> Kützing	16	–	2	16	–	–	–	74
<i>Diadesmis confervacea</i> Kützing	–	–	–	4	37	–	–	69
<i>Diadesmis contenta</i> (Grunow ex Van Heurck) Mann	2	–	–	–	–	–	–	2
<i>Diploneis oblongella</i> (Naegeli ex Kützing) Ross	–	–	–	–	–	–	–	11
<i>Diploneis ovalis</i> (Hilse) Cleve	–	–	–	–	–	–	–	6
<i>Diploneis parva</i> Cleve	4	–	2	20	2	–	–	51
<i>Diploneis subovalis</i> Cleve	–	–	–	–	–	–	–	2
<i>Encyonema auerswaldii</i> Rabenhorst	2	–	–	–	–	–	–	136
<i>Encyonema minutum</i> (Hilse) Mann	–	–	–	4	4	–	–	20
<i>Encyonema neomesianum</i>	–	–	–	–	–	–	–	66
<i>Encyonema silesiacum</i> (Bleisch) Mann	16	–	74	19	13	51	–	1379
<i>Encyonopsis evergladianum</i> Krammer	–	–	–	–	–	–	–	3687
<i>Encyonopsis microcephala</i> (Grunow) Krammer	–	–	77	–	–	195	151	3545
<i>Epithemia</i> spp.	–	–	–	–	–	–	–	2
<i>Eunotia bilunaris</i> (Ehrenberg) Souza	–	–	–	41	4	6	–	57
<i>Eunotia camelus</i> Ehrenberg	–	–	49	4	–	10	–	132
<i>Eunotia flexuosa</i> Brébisson. ex Kützing	8	–	–	–	–	–	–	27
<i>Eunotia formica</i> Ehr.	–	6	–	–	–	–	–	8
<i>Eunotia monodon</i> Ehrenberg	–	–	–	–	1	–	–	1
<i>Eunotia nymanniana</i> Grunow	66	442	---	27	2	15	–	874

Diatom species	OK1	OK10	OK2	OK4	OK6	OK7	OK8	Grand Total
<i>Eunotia parallela</i> Ehrenberg	–	–	–	–	–	–	–	8
<i>Eunotia</i> spp.	6	–	3	–	–	–	–	11
<i>Fragilaria synegrotesca</i> Lange-Bertalot	2	–	21	–	–	15	2	1323
<i>Fragilaria tenera</i> (Smith) Lange-Bertalot	–	–	–	18	–	2	–	114
<i>Gomphonema acuminatum</i> Ehrenberg	–	–	–	–	–	–	–	14
<i>Gomphonema affine</i> Kützing	–	–	–	–	–	–	–	1
<i>Gomphonema angustatum</i> (Kützing) Rabenhorst	7	4	–	9	8	2	–	59
<i>Gomphonema contraturris</i> Lange-Bertalot et Reichart	2	–	–	2	–	–	–	4
<i>Gomphonema gracile</i> Ehrenberg	10	–	4	8	7	4	–	136
<i>Gomphonema minutum</i> (Agardh) Agardh	–	–	–	–	2	–	–	16
<i>Gomphonema parvulum</i> (Kützing) Kützing	4	–	–	–	43	–	–	52
<i>Gomphonema pumilum</i> (Grunow) Reichardt and Lange-Bertalot	–	–	–	–	–	–	–	2
<i>Gomphonema vibrioides</i> Reichardt et Lange-Bertalot	2	–	–	6	4	3	–	198
<i>Gyrosigma acuminatum</i> (Kützing) Rabenhorst	–	–	–	–	–	–	–	2
<i>Hippodonta capitata</i> (Ehrenberg) Lange-Bertalot, Metzeltin and Witkowski	–	–	–	–	–	–	–	2
<i>Kobayasiella subtilissima</i> (Cleve) Lange-Bertalot	1	–	–	–	2	–	–	254
<i>Luticola naviculoides</i> Johansen	–	–	–	–	–	–	–	36
<i>Mastogloia smithii</i> Thwaites	–	–	38	–	–	208	377	7381
<i>Navicula cryptocephala</i> Kützing	8	–	–	19	15	–	–	329
<i>Navicula cryptotenella</i> Lange-Bertalot	62	–	28	29	23	22	50	1244
<i>Navicula exilis</i> Kützing	–	–	–	–	–	–	–	1

Diatom species	OK1	OK10	OK2	OK4	OK6	OK7	OK8	Grand Total
<i>Navicula</i> spp.	–	–	–	–	–	–	–	30
<i>Navicula wallacei</i> Reimer	–	–	–	–	–	–	–	2
<i>Neidium iridis</i> (Ehrenberg) Cleve	–	–	–	4	–	–	–	4
<i>Nitzschia acicularis</i> (Kützinger) Smith	–	–	–	–	2	–	–	2
<i>Nitzschia amphibia</i> Grunow	63	–	–	79	207	10	8	794
<i>Nitzschia filiformis</i> (Smith) Van Heurck	92	–	2	31	2	–	2	142
<i>Nitzschia gracilis</i> Hantzsch	28	–	–	10	2	–	–	207
<i>Nitzschia lacuum</i> Lange-Bertalot	–	–	–	–	–	–	2	2
<i>Nitzschia linearis</i> (Agardh ex Smith) Smith	–	–	–	–	7	–	–	7
<i>Nitzschia nana</i> Grunow	–	–	–	–	–	–	–	221
<i>Nitzschia palea</i> (Kützinger) Smith	121	101	287	170	162	11	2	2706
<i>Nitzschia perminuta</i> (Grunow) Peragallo	–	–	–	2	–	–	–	54
<i>Nitzschia serpentiraphe</i>	–	–	–	–	–	–	–	661
<i>Nitzschia subacicularis</i> Hustedt	26	–	–	6	2	11	–	59
<i>Pinnularia acrosphaeria</i> (Brébisson) Smith	–	–	–	–	–	–	–	8
<i>Pinnularia microstauron</i> (Ehrenberg) Cleve	–	–	–	8	–	2	–	18
<i>Pinnularia</i> spp.	–	47	–	10	2	–	–	79
<i>Pinnularia subcapitata</i> Gregory	–	–	–	4	2	–	–	6
<i>Pinnularia viridis</i> (Nitzsch) Ehrenberg	–	–	–	7	–	–	–	11
<i>Psammothidium marginulatum</i> (Grunow) Bukhtiyarova and Round	–	–	–	–	1	–	–	1
<i>Rhopalodia gibba</i> (Ehrenberg) Müller	–	–	–	–	–	10	1	53

Diatom species	OK1	OK10	OK2	OK4	OK6	OK7	OK8	Grand Total
<i>Sellaphora pupula</i> (Kützinger) Mereschkowsky	2	–	2	10	–	–	–	23
<i>Sellaphora seminulum</i> (Grunow) Mann	2	–	–	7	33	–	–	48
<i>Sellaphora stroemii</i> (Hustedt) Kobayasi	–	–	–	–	–	–	–	36
<i>Stauroneis anceps</i> Ehrenberg	–	–	–	2	–	–	–	6
<i>Stauroneis obtusa</i> Lagerstedt	–	–	–	–	–	–	–	7
<i>Stauroneis phoenicenteron</i> (Nitzsch) Ehrenberg	–	–	2	–	–	–	–	4
<i>Stenopterobia curvula</i> (Smith) Krammer	–	–	–	–	–	–	–	14
<i>Synedra acus</i> Kützinger	14	–	–	4	4	–	–	36
<i>Synedra delicatissima</i> var. <i>angustissima</i> Grunow	–	–	–	–	–	–	–	1
<i>Synedra ulna</i> (Nitzsch) Ehrenberg	30	–	–	16	2	5	–	78
Grand Total	600	600	600	600	600	600	600	29400

Table SOP 13-6. Sample Table 5. Periphyton mat Total Phosphorous TP µg/g after picking out large plant fragments and invertebrates. BI=Bear Island, EC=East Crossing Strand, EH=East Hinson Marsh, FP=Fire Prarie, KB=Kissimmee Billy Strand, KBE=Kissimmee Billy East, MN=Monument, and OK=Okaloacoochee Slough.

Site ID	Date	TP µg/g
BI1	11/20/2013	64
BI4	11/20/2013	382
BI5	11/20/2013	477
BI6	11/20/2013	760
BI7	11/20/2013	535
EC1	11/5/2013	144
EC10	11/5/2013	123
EC11	11/20/2013	204
EC12	11/5/2013	131
EC2	11/21/2013	374
EC3	11/20/2013	188
EC4	11/21/2013	194
EC5	11/20/2013	167
EC6	11/20/2013	158.
EH1	11/5/2013	1,451
EH3	11/19/2013	1769
EH5	11/5/2013	498
EH7	11/5/2013	401
EH8	11/5/2013	333
FP1	11/5/2013	132
FP2	11/5/2013	147
FP3	11/5/2013	410
FP5	11/5/2013	264
FP6	11/19/2013	121
FP7	11/5/2013	289
KB1	11/5/2013	121

Site ID	Date	TP µg/g
KB10	11/5/2013	99
KB2	11/5/2013	117
KB5	11/5/2013	392
KB6	11/5/2013	109
KB8	11/5/2013	328
KB9	11/5/2013	136
KBE1	11/21/2013	500
KBE2	11/21/2013	149
KBE3	11/21/2013	166
KBE6	11/21/2013	305
KBE7	11/21/2013	210
MN1	11/20/2013	607
MN11	11/20/2013	186
MN5	11/5/2013	93
MN8	11/21/2013	188
MN9	11/21/2013	141
OK1	11/19/2013	2,751
OK10	11/19/2013	2,309
OK2	11/19/2013	604
OK4	11/19/2013	1,582
OK6	11/19/2013	3,478
OK7	11/19/2013	511
OK8	11/19/2013	352

National Park Service
Inventory and Monitoring Division

Revision Date	Author	Changes Made	Reason for Change	New Version #

Procedures

South Florida/Caribbean Network personnel must wear personal protective equipment (PPE) when handling bottles containing formalin. The handling and packaging of these samples must be performed in a well ventilated, open area, or under a hood. Personal protective equipment consists of eye protection and gloves.

Packaging

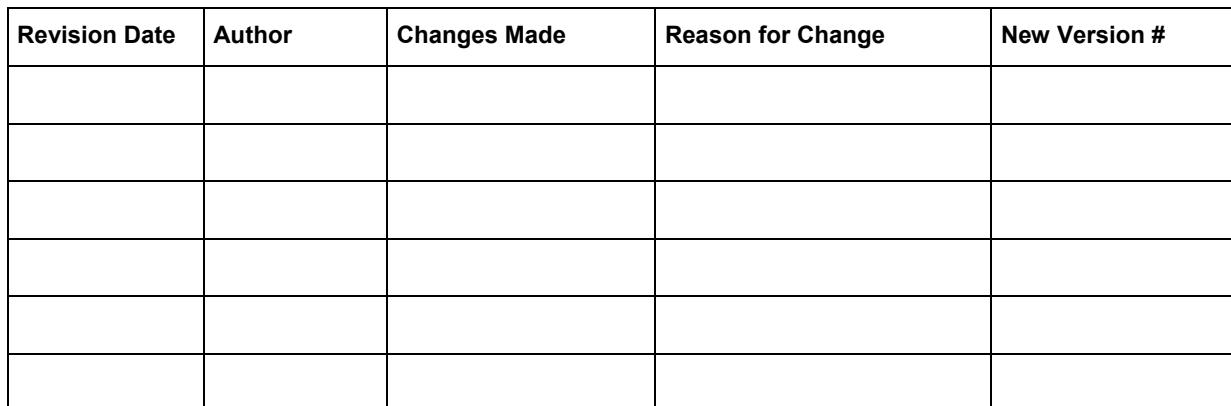
To minimize the possibilities of leakage during transportation, proper packaging is essential. Packaging will consist of three components:

- a. **Inner (primary) packaging**, including a bottle or tube jar. Do not completely fill inner packaging. Allow 10% head space for liquid expansion. Liquids must not completely fill inner packaging at a temperature of 55 °C (131 °F). Closures of inner packaging must be held in place with tape, wire, crimps, or other positive means.
- b. **Intermediate (secondary) packaging**, such as a Ziploc or other plastic bag. Use food quality bags that are well sealed. Intermediate packaging must contain enough absorbent material (e.g. PIG® Absorbent Mat Pads) to absorb all contents and must not react with the formaldehyde. Use two plastic bags. Put the absorbent and the inner container(s) in the first bag and seal it well with tape. Then seal this bag in another bag for added protection.
- c. **Outer Packaging**, such as a cardboard box. Formalin solutions may not be shipped in envelopes, Tyvek R sleeves, or other non-rigid mailers.

Literature Cited

Federal Aviation Administration. Pack Safe, Formaldehyde solutions, less than 10 percent, Available at: <https://www.faa.gov/hazmat/packsafe/> then in the search window type formaldehyde and page appears (last accessed April 2019).

National Park Service
Inventory and Monitoring Division



Overview

Samples collected in the field are sent to lab facilities for analysis. When the labs complete their work they return both total phosphorus and diatom species identification data sets as Microsoft Excel spreadsheets. This SOP describes the procedures used to import these laboratory results into the SFCN database. This SOP assumes all field data have been entered prior to these steps.

Procedures for Importing Total Phosphorus Data

1. Open the total phosphorus data Microsoft Excel spreadsheet obtained from the lab that did the analysis. Review the spreadsheet to determine if the data fields are compatible with the ones found in tbl_Lab_Data_TotalPhosphorus in the SFCN Periphyton database. The spreadsheet should contain the following fields at a minimum: Site ID, Bottle Weight (g), Sample wet weight (g), TP ($\mu\text{g/L}$), and Plant weight (g).
 - a. In particular, make sure the units of these fields are correct in the spreadsheet to avoid importing mixed units. Total phosphorus (TP) is collected in micrograms per liter ($\mu\text{g/L}$).
2. If it exists, the field “Sample (wet weight) + bottle weight (g)” should be removed from the spreadsheet. However, before doing this the column containing the field “Sample wet weight (g)” needs to be copied and pasted into a new column.
 - a. Insert a new column to the right of the one containing the field “Sample wet weight (g).”
 - b. Copy the column containing the values for the field “Sample wet weight (g)” and paste it into the newly inserted column. Make sure that when pasting it displays “Paste Options: Values (V).”
 - c. The column containing the field “Sample (wet weight) + bottle weight (g)” can be deleted. Once this happens, the original column displaying the field “Sample wet weight (g)” will show “#REF!” for each record. This column can also be deleted. The original numerical values were preserved when copied and pasted to the newly inserted column mentioned previously.
 - d. Save the modified spreadsheet with an appropriate, descriptive name using the “Save As” option.
3. Import the new spreadsheet into the SFCN_Periphyton database.
 - a. Open the SFCN_Periphyton database and click on the “External Data” tab and click on the “Import Excel spreadsheet” option.
 - b. A new window will appear that is labeled “Get External Data – Excel Spreadsheet.” To provide the file name that will source the data, browse to where the newly saved

spreadsheet is located and select it. Select the button that states “Import the source data into a new table in the current database.” Click ‘OK.’

- c. The Import Spreadsheet Wizard window appears. The wizard will prompt you to select the worksheet that contains the data to be imported because the spreadsheet was previously saved as a Microsoft Excel workbook. The modified spreadsheet saved in Step 2 contains only one worksheet. Selecting Sheet 1 in the wizard will display a sample of the data it contains. Select ‘Sheet 1’ and click ‘Next.’
 - d. On the next page of the wizard click the check box that reads “First Row Contains Column Headings” if it was not already checked. Click ‘Next.’
 - e. The next page allows the Field Options to be modified. Click ‘Next.’
 - f. On this page of the wizard the primary key gets defined for the table that will receive the imported data. Select the button that says “Let Access add primary key.”
 - g. The last page of the Import Spreadsheet Wizard window allows you to name the table in the database that will have the data from the spreadsheet imported into it. Name this table by giving it the hydrologic year for which the data was surveyed/collected followed by an underscore and the letters TP. For example, if data corresponds to the hydrologic year of 2014, then the table should be named “2014_TP.”
 - h. Click ‘Finish.’ A new window will appear asking to save the import steps. Click ‘Close.’
4. Open the new table with imported data in the SFCN Periphyton database. It will display in a Datasheet View. On the Microsoft Access ribbon select the Design View icon under the Views section. The table will now appear in Design View.
 - a. Click on the Date field. In the Field Properties section of the table, the General tab should be selected. In Format, change the current entry to “mm-dd-yyyy.”
 - b. Select the whole row that contains the Date field in the Field Properties section. Right-click the row and select Insert Rows. A new empty row will now appear above the Date field.
 - c. Name the field for the inserted empty row as “Event_ID.” Under Data Type, click on the drop down box and select Number. Now go to the Field Properties and under the general tab in the Field Size section, change the current entry/attribute to “Replication ID”.
 - d. On the Microsoft Access ribbon select the Datasheet View icon under the Views section. A small window will appear prompting that the table first be saved. Click ‘Yes.’ The table will now appear in Datasheet View.

5. An update query needs to be used to populate the EventID values for the new table that contains the imported total phosphorus data. On the Microsoft Access ribbon click the Create tab and select the Query Design.
 - a. The Show Table window will appear. This window allows you to choose the tables and queries that will construct the update query. In the Show table window select the '20XX_TP' table and 'qry_import_EventID' query. Click 'Add' and then click 'Close' on the Show table window.
 - b. The table and query should appear on the Design View page. Click on the Site ID field in the table 20XX_TP and drag it to the field Loc_Name found in qry_import_EventID. A line connecting the table and query will appear. This line represents a relationship between the two objects. In this case it is a one-to-one relationship. Double-click the connecting line. The Join Properties window should appear. Ensure that the first option is selected. The first option reads "Only include rows where the joined fields from both tables are equal."
 - c. On the Microsoft Access ribbon click on the Design tab which should say "Query Tools" highlighted above the tab. Then navigate on the Microsoft Ribbon to the Update icon in the Query Type section. Click the 'Update' icon.
 - d. On the bottom half of the query's Design View, fill in the update query properties with the following:
 - i. Field: Event_ID
 - ii. Table: 20XX_TP
 - iii. Update to: [qry_import_EventID].[Event_ID]
 - e. On the Microsoft Access ribbon click on the Run icon in the Results section. The icon is displayed by a red exclamation mark. A window will appear with a message that reads "You are about to update X row(s)." Click 'Yes.' Close the update query and do not save changes. This query will be recreated during each import.
 - f. The 20XX_TP table should now have the Event_ID field updated with values. Open the table to verify result of the update query.
6. Another query, an append query, needs to be created to append the total phosphorus data from a specific hydrologic year into the master table containing all total phosphorus data. On the Microsoft Access ribbon click the Create tab and select the Query Design.
 - a. The Show Table window will appear. This window will allow you to choose the tables and or queries that will construct the append query. In the Show table window select the following table: 20XX_TP (this is the table with the imported total

phosphorus data for the corresponding hydrologic year). Click 'Add' and then Click 'Close.'

- b. The fields from the 20XX_TP table that will build the append query must now be selected. Double-click the following fields from the 20XX_TP table in the order provided: Event_ID, Site ID, Bottle weight (g), Plant weight (g), Sample wet weight (g), and TP µg/L. These six fields will now appear on columns in the bottom half of the new query's Design View page.
- c. On the Microsoft Access ribbon click on the Design tab which should say "Query Tools" highlighted above the tab. Then navigate on the Microsoft Ribbon to the Append icon in the Query Type section. Click the Append icon. The Append window should appear. For the Table Name dropdown box, select the table tbl_Lab_Data_TotalPhosphorus. This is the table that will receive the imported total phosphorus data. Click 'OK.'
- d. In the bottom half of the Design View for the append query, fill in the append query's "Append To" property for the six listed fields/columns with the following:
 - i. Append To: Event_ID, for the Event_ID field/column
 - ii. Append To: Site_ID, for the Site ID field/column
 - iii. Append To: Bottle_Weight, for the Bottle weight (g) field/column
 - iv. Append To: Plant_Weight, for the Plant weight (g) field/column
 - v. Append To: Sample_Wet_Weight, for the Sample wet weight (g) field/column
 - vi. Append To: Total_Phosphorus, for the TP µg/L field/column
- e. On the Microsoft Access ribbon click on the Run icon in the Results section (the icon shows a red exclamation mark). A window will appear with a message that reads "You are about to update X row(s)." Click 'Yes.' Close the append query and do not save changes. This query will be recreated during future imports.

Procedures for Importing Diatom Community Data

1. Review the Excel spreadsheet and prepare for editing.
 - a. Open the diatom data Microsoft Excel spreadsheet obtained from the lab.
 - b. Review the spreadsheet to ensure that the data fields are compatible with those found in the table named 'tbl_Lab_Data_Diatom' in the SFCN Periphyton database. The spreadsheet must contain the following fields at a minimum: Sample ID, Hydrologic Year, Lump Level 1 Name, Scientific Name, Sum of Valves, and Taxonomist. In

particular, make sure that the scientific name field is a clean binomial name (genus and species) without intraspecific labels and authorities to allow a join to the diatom lookup list.

- c. Create a new column in the Microsoft Excel spreadsheet and give it a header name of 'Year_Location.' Set the formula for the first data row in this column to '=A2 & " " & B2' where A1 is replaced by the column letter for the Hydrologic Year and B1 is replaced by the column letter for the Sample ID (also known as the site).
 - d. Fill this formula down the column to create a concatenated label for all data rows. This can be accomplished several ways, such as dragging the lower-right corner of the cell from the original formula to the bottom of the column.
2. Import the new spreadsheet into the SFCN_Periphyton database:
- a. Open the SFCN_Periphyton database and click on the "External Data" tab and click on the "Import Excel spreadsheet" option.
 - b. A new window will appear that is labeled "Get External Data – Excel Spreadsheet." To provide the file name that will source the data, browse to where the newly saved spreadsheet is located and select it. Select the button that states "Import the source data into a new table in the current database." Click 'OK.'
 - c. The Import Spreadsheet Wizard window appears. The wizard will prompt you to select the worksheet that contains the data to be imported because the spreadsheet was previously saved as a Microsoft Excel workbook. Select the appropriate sheet, which will generally be the first and only sheet in the document. Click 'Next.'
 - d. On the next page of the wizard click the check box that reads "First Row Contains Column Headings" if it was not already checked. Click 'Next.'
 - e. The next page allows the Field Options to be modified to ensure that the imported data types are correct. Generally the defaults are appropriate. Click 'Next.'
 - f. On this page of the wizard the primary key gets defined for the table that will receive the imported data. Select the button that says "Let Access add primary key."
 - g. The last page of the Import Spreadsheet Wizard window allows you to name the table in the database that will have the data from the spreadsheet imported into it. Name this table by giving it the hydrologic year for which the data was surveyed/collected followed by an underscore and the word "diatom". For example, if data corresponds to the hydrologic year of 2014, then the table should be named "2014_diatom."
 - h. Click 'Finish.' A new window will appear asking to save the import steps. Click 'Close.'

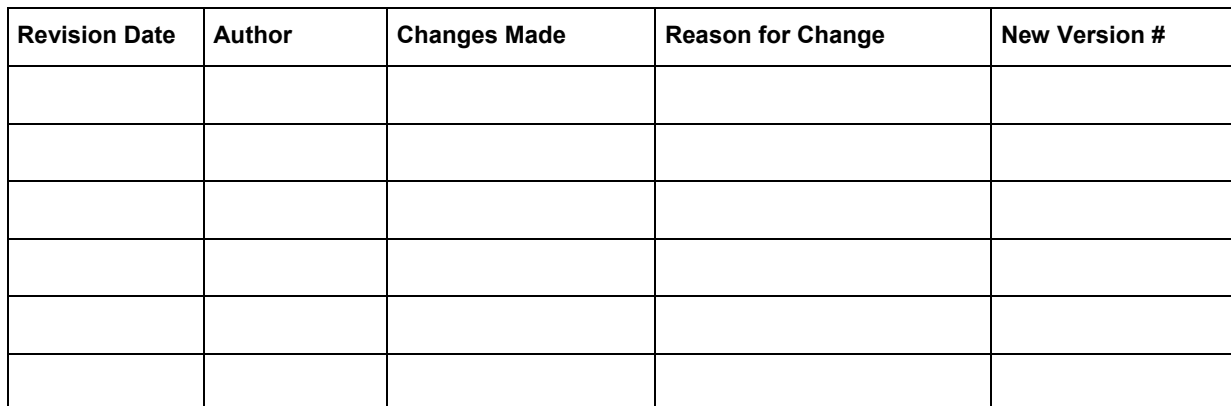
3. Add a blank 'Event_ID' field to the newly imported table:
 - a. Open the newly created table by double-clicking the name you set in step 2g. The table will initially display in a Datasheet View. On the ribbon at the top of the screen select the Design View option under the Views section to switch to Design View.
 - b. Go to an empty row in the Field Name column and insert a new row and enter a name of 'Event_ID'. Set the Data Type to Number. Now go to the Field Properties and under the general tab in the Field Size section, change the current entry/attribute to 'Replication ID'.
 - c. Press the 'Ctrl' and 'S' keys simultaneously to save the edits to the table, and then close the table.
4. The next steps utilize an existing query 'qry_import_EventID' which displays each visit made to a periphyton sampling location and the corresponding, unique Event_ID. These Event_ID's are generated automatically when field sheets are entered into the database. Before proceeding please confirm that data entry for the hydrologic year in question has been completed:
 - a. Find 'qry_import_EventID' in the list and double-click it to view the contents.
 - b. If 'Year_Location' and 'Event_ID' columns include appropriate values that match the diatom file that is being imported, it is safe to proceed. If not, ensure that data entry of the field sheets is completed first.
5. Create a new query and assign the appropriate relationship:
 - a. From the ribbon at the top of the screen, choose the 'Create' tab and select 'Query Design'.
 - b. From the Tables tab double-click the imported data table you created in step 2 (e.g. 20XX_TP).
 - c. Switch to the Queries tab and double-click the qry_import_EventID query.
 - d. Click and drag the 'Hydrologic Year' from the imported data table to the 'Hydrologic_Year' field in qry_import_EventID to establish a relationship between these two fields.
 - e. Create a second relationship by clicking and dragging the 'Samp_ID' field from the imported data table to the 'Loc_Name' field in qry_import_EventID.
 - f. Add the Event_ID field from the 20XX_diatom table by double-clicking this field. It should appear down below the related tables.

- g. Run the query by clicking the Run icon (an exclamation point) in the upper ribbon to see the results of the query.
 - h. Make note of the record count shown at the bottom and compare this to the number of records in the imported diatom data table. The two record counts should match. If the newly created query has fewer records, then there is a mismatch. More than likely one or more site visits were not entered into the database, or the lab made an error recording the sampling ID. Research these issues before proceeding to the next step.
6. If the record counts match then change the query to an update query and run:
- a. Return to design view for the query by clicking the 'View' icon in the upper ribbon.
 - b. Change the query to an update query by selecting the 'Update' icon in the upper ribbon.
 - c. Look under the 'Event_ID' at the bottom of the query builder and click in the 'Update To:' box and type '[qry_import_EventID].[Event_ID].'
 - d. Click the 'Run' button in the upper ribbon and Microsoft Access should show a warning that 'You are about to update X row(s).' Double-check in the query design view that the field being updated is in the 20XX_diatom table. If it is, click 'Yes.'
 - e. Review that the Event_ID has been filled in for all rows in the '20XX_diatom' table.
 - f. Close this query and do not save. This query will need to be recreated during each import.
7. Create an append query to finalize the import of diatom data:
- a. Click the Create tab on the upper ribbon and then click on the 'Query Design' to open up a new query.
 - b. Add table '20XX_diatom' by double-clicking it from the list. Click Close.
 - c. Change to an append query by choose the 'Append' icon from the upper ribbon. When prompted to choose a destination table, choose 'tbl_Lab_Data_Diatom.'
 - d. Add each field from the 20XX_diatom table (except for ID and SumOfRelative_abundance) to the query by double-clicking the field names.
 - e. Notice that if field names match between the source (20XX_diatom) and destination (tbl_Lab_Data_Diatom) tables then the 'Append To' property fills in with the matching name. Manually fill in the remaining properties by clicking the 'Append To' box and selecting the field that should receive the data during the append. In most cases the appropriate match should be straight forward (e.g. Hydrologic Year →

Hydrologic_Year) but a few may require manual review of the underlying data. The list below is a guide based on the data import from 2014:

- i. Hydrologic Year → Hydrologic_Year
 - ii. Samp_ID → Samp_ID
 - iii. LumpLevel1Name → Taxon_original
 - iv. Scientific_Name → Scientific_Name
 - v. SumOfValves → Valves
 - vi. Taxonomist → Taxonomist
 - vii. Event_ID → Event_ID
- f. Click the Run icon on the upper ribbon and click 'Yes' when prompted with the warning prompt indicates the number of records to be appended.
- g. Close the query without saving. This query will need to be recreated during each import.
- h. This import may have brought in new species, so an additional check needs to be run to compare tlu_Diatoms to tbl_Lab_Data_Diatom to ensure that all species are present in the lookup table.
- i. Open qry_NewDiatomSearch to look for mismatches. Any species listed is missing from tlu_Diatoms and needs to be researched so that the appropriate Indicator Status and References can be added.

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Procedures

1. Introduce the Western Big Cypress Vegetation Map feature class and the BICY Periphyton Basins feature class from the SFCN Periphyton geodatabase into an ArcMap project.
2. Open the attribute table for the Western Big Cypress Vegetation Map feature class. Select features that represent a Graminoid Freshwater Marsh, Broadleaf Freshwater Marsh, and Open Marsh. These features contain a “MFG”, “MFB”, and “MFO” in the Annotation field. The features selected in this process contained the following annotations:

- MFB
- MFB, MFGtD
- MFB, MFGtS
- MFB, P
- MFBa
- MFBp
- MFBt
- MFBt, MFGtS
- MFG
- MFG, EeS
- MFG, MFGtD
- MFG, MFGtS
- MFG, P
- MFGa
- MFGc
- MFGc, MFGtD
- MFGc, MFGtS
- MFGcS
- MFGe
- MFGe, MFGtD
- MFGe, MFGtS
- MFGh
- MFGh, MFGtS
- MFGj
- MFGtS
- MFGz
- MFO
- MFO, EeS
- MFO, EpiD
- MFO, MFGtS
- MFO, P

Once the selection process is complete, use the “Create layer from Selected Features” function to create a temporary layer file of the selected features. Then export the temporary layer as a shapefile. Name that output shapefile appropriately (e.g. BICY_MFB_MFG_MFO_cells) and save it in an appropriate place.

3. Apply the “Select By Attributes” tool to select one of seven basin features from the BICY Periphyton Basins feature class (e.g. Bear Island).
4. Apply the “Clip” tool function to the BICY_MFB_MFG_MFO_cells shapefile. The “Clip” function will be used to extract the BICY_MFB_MFG_MFO_cells features that overlay with the selected feature from the BICY Periphyton Basins feature class. The input feature will be the BICY_MFB_MFG_MFO_cells shapefile. The clip feature will be the BICY Periphyton Basins feature class with the selected feature mentioned in Step 3. The “Clip” function produces a new output feature class therefore, make sure to name the output shapefile appropriately (e.g. BearIsland_MFB_MFG_MFO_cells) and save it in an appropriate place.
5. Repeat Steps 3 and 4 for the six remaining BICY Periphyton Basins features (East Crossing Strand, East Hinson Marsh, Fire Prairie, Kissimmee Billy Strand, Monument, and Okaloacoochee Slough).
6. Apply the “Feature to Point” tool to create centroids for each of the resulting shapefiles created in Step 4. For each of the seven basins, the MFB, MFG, MFO cells within each basin will be given a centroid. The “Feature to Point” function produces a new output feature class therefore, make sure to name the output shapefile appropriately (e.g. BearIsland_MFB_MFG_MFO_centroids) and save it in an appropriate place.
7. Apply the “Create Random Sampling Points” tool from XTools Pro for each of the resulting point shapefiles created in Step 6. The reference layers to be used are the centroid shapefiles for each of the seven basins mentioned in the previous step. The “Number of Points” to be created for each basin will be 28, except for East Hinson Marsh and Okaloacoochee Slough. For these, they will have 35 random points created for them. The “Create Random Sampling Points” function produces a new output feature class therefore, make sure to name the output shapefile appropriately (e.g. BearIsland_MFB_MFG_MFO_randompoints) and save it in an appropriate place.
8. For each of the new random sampling points shapefiles created in the previous step, new fields must be added to the attribute tables.
 - a. Add a field called “Basins.” Set the Field Type as Text. To populate the “Basins” field, right-click on the header of the field and select “Field Calculator.” In the Field Calculator window that opens up type in corresponding basin name in the text box that appears on the bottom half of the window (e.g. Bear Island for BearIsland_MFB_MFG_MFO_randompoints). Click OK. The “Basins” field will now be filled in.

- b. Add a field called “Draw_Order.” Set the Field Type as Short Integer. The “Draw_Order” field depicts the order by which the random sampling points were generated. To populate the “Draw_Order” field for each of the attribute tables, right-click on the header of the field and select “Field Calculator.” In the Field Calculator window that opens up type in “[FID] +1” in the text box that appears on the bottom half of the window. Click OK. The “Draw_Order” field will now be filled in.
 - c. Add a field called “Accepted.” Set the Field Type as Text. This field will remain blank for now.
 - d. Add a field called “Name.” Set the Field Type as Text. This field will remain blank for now.
 - e. Add a field called “Long.” Set the Field Type as Double. This field will contain the longitude coordinate for each record in the attribute table. To populate the “Long” field, right-click on the header of the field and select “Calculate Geometry.” In the Calculate geometry window that opens up, ensure the following:
 - i. Property: X Coordinate of Point
 - ii. Coordinate system: PCS: NAD 1983 UTM Zone 17N
 - iii. Units: Decimal DegreesClick OK. In the next window that appears click OK again. The “Long” field will now be filled in.
 - f. Add a field called “Lat.” Set the Field Type as Double. This field will contain the latitude coordinate for each record in the attribute table. To populate the “Long” field, right-click on the header of the field and select “Calculate Geometry.” In the Calculate Geometry window that opens up, ensure the following:
 - i. Property: Y Coordinate of Point
 - ii. Coordinate system: PCS: NAD 1983 UTM Zone 17N
 - iii. Units: Decimal DegreesClick OK. In the next window that appears click OK again. The “Lat” field will now be filled in.
9. Apply the “Merge” tool to combine all of the random sampling points shapefiles created in Step 7 into one singular point shapefile. The “Merge” tool produces a new output feature class therefore, make sure to name the output shapefile appropriately (i.e. BICY_Periphyton_MFB_MFG_MFO_randompoints) and save it in an appropriate place.

10. Apply the “Spatial Join” tool to the new point shapefile created in Step 9 (i.e. BICY_Periphyton_MFB_MFG_MFO_randompoints). In this step the new point shapefile will have an attribute from the Western Big Cypress Vegetation Map feature class joined to it based on a spatial relationship. In the Spatial Join window that opens up, ensure the following:
 - a. Target Features: the new point shapefile created in Step 9 (i.e. BICY_Periphyton_MFB_MFG_MFO_randompoints)
 - b. Join Features: the Western Big Cypress Vegetation Map feature class

Output Feature Class: provide an appropriate name for the new shapefile that will result from this process (i.e. BICY_Periphyton_MFB_MFG_MFO_randompoints_join)
 - c. Join Operation (optional): JOIN_ONE_TO_ONE
 - d. Keep All Target Features: check box off
 - e. Field Map of Join Features (optional): ANNOTATION (remove all other fields).
 - f. Match Option (optional): COMPLETELY WITHIN

Click OK. When the Spatial join completes its run, a new feature class (with the name provided in iii.) will be added to the table of contents in the ArcMap document.
11. For the new feature class created from the Spatial Join in the previous step, new fields must be added to the attribute table.
 - a. Add a field called “Wild_y_n.” Set the Field Type to Text. This field will show if an attribute (random sampling point) is within Wilderness Area. This field will remain blank for now.
 - b. Add a field called “Select_y_n.” Set the Field Type to Text. This field will show if an attribute (random sampling point) is selected, not selected or serve as an alternate for site visitation. This field will remain blank for now.
 - c. Add a field called “NearTrail.” Set the Field Type to Text. This field will show if an attribute (random sampling point) is near a trail. This field will remain blank for now.
 - d. Add a field called “Comment.” Set the Field Type to Text. This field will remain blank for now.

12. The Wild_y_n field will need to get populated for the attributes of the new feature class created from the Spatial Join in Step 10. Run the “Select By Location” function and ensure the following:

- a. Selection method: select features from
- b. Target layer(s): new feature class derived by Spatial Join in Step 10 (i.e. BICY_Periphyton_MFB_MFG_MFO_randompoints_join)
- c. Source Layer: Big Cypress National Preserve Wilderness Area feature class
- d. Spatial selection method for target layer feature(s): intersect the source layer feature

Click OK. The attribute table for the feature class the selection was run for will have the attributes highlighted that intersect with Wilderness Area in Big Cypress National Preserve.

13. Populate the “Wild_y_n” field for each of the selected attributes by right-clicking on the header of the field and select “Field Calculator.” In the Field Calculator window that opens up type in “Yes” (include the quotations) in the text box that appears on the bottom half of the window. Click OK. Now, click the first icon/tab near the top of the attribute table. From the dropdown list that appears, click “Switch Selection.” The attribute table will now have the attributes highlighted that do not intersect with Wilderness Area in Big Cypress National Preserve. Populate the “Wild_y_n” field for each of the selected attributes by right-clicking on the header of the field and select “Field Calculator.” In the Field Calculator window that opens up type in “No” (include the quotations) in the text box that appears on the bottom half of the window. Click OK.

14. The NearTrail field will need to get populated for the attributes of the new feature class created from the Spatial Join in Step 10. Run the “Select By Location” function and ensure the following:

- a. Selection method: select features from
- b. Target layer(s): new feature class derived by Spatial Join in Step 10 (i.e. BICY_Periphyton_MFB_MFG_MFO_randompoints_join)
- c. Source Layer: Big Cypress National Preserve Roads and Trails feature class
- d. Spatial selection method for target layer feature(s): are within a distance of the source layer feature
- e. Apply a search distance: 100 Meters (328 feet [ft])

Click OK. The attribute table for the feature class the selection was run for will have the attributes highlighted that are within 100 meters of a road or trail in Big Cypress National Preserve.

15. Populate the “NearTrail” field for each of the selected attributes by right-clicking on the header of the field and select “Field Calculator.” In the Field Calculator window that opens up type in “Yes” (include the quotations) in the text box that appears on the bottom half of the window. Click OK. Now, click the first icon/tab near the top of the attribute table. From the dropdown list that appears, click “Switch Selection.” The attribute table will now have the attributes highlighted that are not within 100 meters of a road or trail. Populate the “NearTrail” field for each of the selected attributes by right-clicking on the header of the field and select “Field Calculator.” In the Field Calculator window that opens up type in “No” (include the quotations) in the text box that appears on the bottom half of the window. Click OK. Note: it may be necessary to use aerial imagery layers in ArcMap to check for the attributes’ proximity from roads and trails that are not recorded/displayed in the Big Cypress National Preserve Road and Trails feature class. If the aerial imagery shows that an attribute needs to have its NearTrail entry changed go to the Editor Toolbar and start an Editing session to change the attribute’s entry under the NearTrail field. (e.g. changing Yes to No).
16. In order for the attributes to become a selected site to be sampled the attributes need to meet further criteria that will be verified using aerial imagery in ArcMap:
- Sites must have the freshwater broadleaf marsh habitat within 250 meters (820 ft) radius of the initial randomly chosen point.
 - Centroid (random selection point) must be 1,000 meters (0.62 miles [mi]) or more from other sites within the same basin. The distance is increased to 3 kilometers (1.8 mi) in Fire Prairie and Monument as these areas are more than double the size of other basins.
 - Random selection point must be safely accessible by helicopter (meeting IHOG safety guidelines such as 300 feet [91.4 meters {m}] and areas with water depth less than 0.75 meters [2.4 ft; Big Cypress National Preserve Aviation guidance]) or accessible by road (100–500 meters [328–1,640 ft] from road or trail). Within the 250-meter (820-ft) radius from the original randomly selected centroid there needs to be a place to land a helicopter safely or which can be walked to.
 - Sites dominated by cattail monoculture (covering more than 90% of wetland area of the 50 × 50 meter [164 × 164 ft] grid cell mapped) will be excluded.
 - Sites showing obvious human disturbance within the 250 meter (820 ft) radius, such as used oil pads, are excluded.

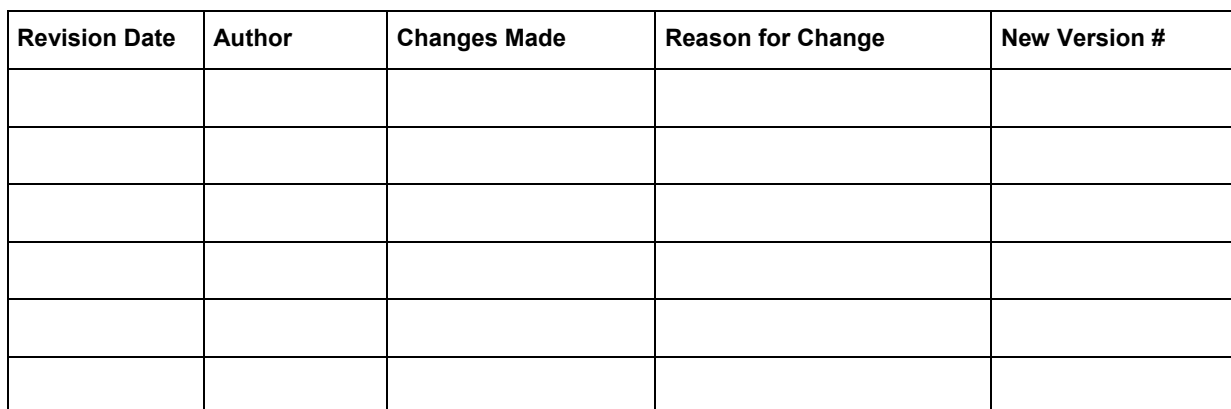
When going through the list of randomly selected points (a total of 209), make sure to edit the Comment field in the attribute table by inputting important notes (i.e. site too close to road or no helicopter room).

17. Each basin will have six sites selected, except for Okaloacoochee Slough and East Hinson Marsh (seven sites selected). In addition, each basin will have a set of alternate sites to be

visited when a selected site cannot be sampled on the day of site visitation due to unforeseen circumstances. When finding that a randomly selected point meets all the necessary criteria and should be selected, edit the Select_y_n field in the attribute table by inputting “Yes.” Also, edit the Name field by inputting the appropriate name for the selected point based on the naming convention used for the SFCN Periphyton Pilot Sites (e.g. Okaloacoochee Slough had 14 pilot studies therefore, the first selected site in that basin should be named OK15). When determining that a randomly selected point does not meet a criterion, edit the Select_y_n field in the attribute table by inputting “No.”

18. When you are finished determining and labeling the sites to be selected for sampling, continue evaluating the remaining randomly selected points for each basin to see if they can serve as alternates. It is important to evaluate these randomly selected points in the order they appear in the attribute table. If the randomly selected point meets the necessary criteria, edit the Select_y_n field in the attribute table by inputting “Alt.” Also, edit the Name field by inputting the appropriate name for the selected point (e.g., the first alternate site for Okaloacoochee Slough selected site basin should be named OKAlt1 and so on). Each basin should have as many alternate sites identified as possible. When determining a randomly selected point does not meet a criterion, edit the Select_y_n field in the attribute table by inputting “No.” Sites are included in the selection as alternates if they were only rejected based upon being too close to one other site. This must be specified in the Comment field, i.e., “Site EHAlt2 is 800m from site EH6”, and the alternative site is labeled according to where it originally appeared in the random selection order. In the field, sites (regardless of whether designated as alternate) are visited in initial selection order and staff must read the comment to determine if that alternative site may be used based upon which already evaluated sites have met field criteria. For example, if Site EH6 did not meet criteria when visited in the field and was dropped, alternate site EHAlt2 may now be greater than 1,000 meters (3,280 ft) from other sites and will be visited in the random selection order.

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Overview

In its purest form, formaldehyde (HCHO) is a pungent, colorless, highly-toxic gas with a distinctive smell. It is commonly found in an aqueous form called formalin—a solution of 37% formaldehyde by weight. Formalin is often used as a fixative of biological samples and is the method of preservation used for periphyton mat samples collected in the Big Cypress National Preserve. For the purposes of this SOP, a solution of 37% formaldehyde by weight will be referred to as 100% formalin.

Periphyton mat grab samples are preserved using a buffered 3% formalin solution with a pH at or close to 7.4 (neutral). Fixing samples with unbuffered formalin or with a concentration greater than 3% may damage the structure of the diatoms in the sample. This SOP addresses the methods and safety procedures associated with the dilution of a 100% or 10% formalin solution to a 3% formalin solution and with the application of 3% formalin to samples in a field setting.

Formaldehyde is a known carcinogen and because of the serious potential hazards for researchers and workers who may be exposed to formaldehyde as part of their work with formaldehyde-containing chemicals, precautions must be taken to eliminate or reduce the potential for exposure as much as possible.

Pre-Field Sampling Activities

A chemical fume hood located in Everglades National Park is used when diluting formalin of 10% (or greater) solution.

- The fume hood prevents inhalation of harmful vapors during transfer. Make sure fume hood is in proper working condition and assessments are up-to-date.
- Pour higher-concentration (10% or 100% formalin) solution into a secondary container appropriately labeled for 3% formalin. Fill to graduated mark (labeled formalin) with solution (fill mark location differs if the concentration being poured is 100% or 10% formalin) and then fill with regular tap water (do not use deionized water) to corresponding graduated mark. Polypropylene Nalgene® jars are used to contain the 3% formalin solution and are preferred for transport since they will not break upon impact.
- In case of accidental inhalation, remove the victim from the exposure area and get them fresh air. Seek immediate medical attention.
- Wear chemical-resistant gloves when handling formalin containers of any concentration to avoid contact with skin. Wear closed-toe shoes, long-sleeved shirts, and pants to minimize contact with skin.
- In case of accidental contact with skin, wash affected area thoroughly with water and soap or mild detergent for approximately 15–20 minutes or until no evidence of the chemical remains.

- Wear face shield (safety glasses or goggles are sufficient if working with a fume hood) to avoid contact with eyes as a result of splashing. Lower the fume hood glass door to minimize risk associated with splashing.
- In case of accidental contact with eyes, immediately flush eyes with water from emergency eye wash for at least 15–20 minutes. Seek immediate medical attention.
- Jars containing formalin are properly labeled to avoid accidental ingestion. No food or drink is allowed in the vicinity of formalin jars and fume hood.
- In case of accidental ingestion, **immediately** seek medical attention. **Do not** induce vomiting.
- Make sure the location of the spill response kit is known and the kit is in proper working condition.
- In case of a small spill, soak up formalin with absorbent material and place material in sealed and properly-labeled container(s).
- In case of a large spill, vacate the premises **immediately** and contact local HAZMAT team.
- Buffered 10% formalin contains methyl alcohol, which is extremely flammable. Keep any igniting sources away from work area when working with formalin.
- Formalin is a carcinogen. Minimize the amount of time exposed to formalin by not leaving jars opened longer than is necessary when transferring solution between containers.
- Formalin should be kept in glass jars for long-term storage, as plastic tends to deteriorate over time and may lead to leaks. Store all formalin jars and corresponding Safety Data Sheets (SDS) inside a large, labeled plastic container, such as a Rubbermaid Actionpacker® or Sterilite®, for secondary containment and store that container inside the chemical storage trailer in Everglades National Park.
- The chemical storage trailer is located outside of the Daniel Beard Center (main building), well away from where employees work or gather, and has the appropriate warning signs posted for hazardous chemical storage. Formalin is stored away from any ignition sources, alkalis, acids, and phenols.

Field Sampling Activities

Once in 3% solution, formalin can be applied to the periphyton mat samples collected in Big Cypress National Preserve.

- At 3% concentration, a chemical fume hood is not required when handling the formalin solution. However, application must take place in a well-ventilated area. Therefore, at the end of the field-work day, the collected samples are “fixed” with 3% formalin in an outdoor setting.

- Chemical-resistant gloves must always be worn during the fixing of periphyton samples.
- Safety glasses or goggles or face shield must always be worn during the fixing of periphyton samples.
- No food or drink is allowed near the work area during the fixing of periphyton samples.
- Spills must be treated in the same manner as in the section above (Pre-Field Sampling Activities). It is permitted to carry 3% formalin solution in a 1,000 milliliter (33.8 ounces [oz]) polypropylene container, such as a Nalgene® jar, since this action is intended for field use and not long-term storage. Transport of 3% formalin in polypropylene jars also minimizes the risk of exposure since this material does not usually break.
- Keep any igniting sources away from work area when fixing the periphyton samples.
- Minimize the amount of time exposed to formalin by closing the periphyton sample containers immediately after they are fixed and the formalin jars in between each fixing process.

Post- Field Sampling Activities

- Periphyton samples are packaged and shipped to processing facility shortly after collection.
- Guidelines for sending the samples to the processing facility are available in the SFCN protocol *Periphyton Monitoring in Big Cypress National Preserve* (Urgelles et al. 2019) under SOP 14 *Shipping of Formalin Solutions—Version 1.0*. This SOP addresses the safety actions and procedures to minimize exposure and leaks during packaging.
- Keep any igniting sources away from work area when packaging the periphyton samples.
- There is no waste formalin generated from this process as all the samples are shipped to the processing facility. The processing facility disposes of the waste formalin appropriately.

Required Training and Reading

There is no required training at this time. All SFCN personnel using formalin must become familiar with the following materials:

- Material Safety Data Sheets (MSDS) for Formaldehyde 37% solution and Formalin 10% buffered solution
- NPS Occupational Safety and Health Program, Reference Manual 50B, Section 4 Occupational Health

- OSHA Formaldehyde Standard 29 CFR, Occupational Safety and Health Standards - 1910, Toxic and Hazardous Substances - 1910.1048, Formaldehyde—Appendices A, B, C, D, and E
- SFCN Job Hazard Analysis (JHA) “Use of formalin for the preservation of periphyton mat samples”

Literature Cited

Urgelles, R., K.R.T. Whelan, R. Muxo, R.B. Shamblin, J. M. Patterson, and Andrea J. Atkinson. 2019. Protocol for periphyton monitoring in Big Cypress National Preserve: Protocol narrative. Natural Resource Report NPS/SFCN/NRR—2019/1911. National Park Service, Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2260128> (last accessed April 2019).