

Standard Operating Procedure FVM10

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Summary

Revision Log

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SOP Source and How It Was Modified

This SOP is an adaptation of SOP 11 *Data Quality Assurance and Quality Control—Version 1.2* of the *Cumberland Piedmont Network Vegetation Monitoring Protocol* (White et al. 2011), with minor edits to match South Florida/Caribbean Network (SFCN) staffing and server locations. Additionally, this SOP used *SOP 2.4.05 Data management, Quality Assurance and Quality Control—Version 1* of the *Terrestrial Vegetation Monitoring in Southeast Coast Network Parks* (Boyle and Capece 2019) as a guide for the observer bias section. For a general explanation of how the South Florida/Caribbean Network modified the Cumberland Piedmont Network (CUPN) protocol and its SOPs, see the *South Florida/Caribbean Network Forest Vegetation Monitoring: Protocol Implementation Plan* (Whelan et al. 2020).

Overview

Careful, accurate data collection and stewardship are critical to the success of the vegetation monitoring program. This SOP describes data quality assurance and quality control (QA/QC) procedures for the vegetation monitoring protocol. Ensuring data quality must be a priority during training, and throughout the data collection, entry, verification, and validation process.

Field teams will typically consist of a field crew leader (who is the lead for that field-sampling mission), botanical authority or “botanist” (who may or may not be the field crew leader), and one or two additional crew members. Ideally, all members of the field team will have read all protocol SOPs and attended annual training at the beginning of each field season. However, the South Florida/Caribbean Network invites and encourages park personnel to participate in field data collection as much or as little as their schedule allows. This assistance and interaction in the field is always appreciated.

The crew leader will:

- collect data according to established methods
- understand how to correctly complete data forms in the field
- oversee all activities of crew members
- possess adequate plant identification skills for completing assigned tasks (may be supplemented by park unit staff or other “botanist”).

Crew members will:

- correctly and legibly record all data values on the data sheets
- complete all tasks assigned by the crew leader
- adhere to any additional instruction provided by the crew leader in the field
- when in doubt, about plant identification or methods, ask questions

Data Collection

Field data are collected by entering data onto a series of paper datasheets (see corresponding SOPs for specific data forms). Field data may in the future be collected using handheld devices or field laptops.

Regardless of the data collection method, all data values shall be called out by the “measurer” and repeated by the recorder when one crew member is measuring and one crew member is recording. The measurer shall clearly call out the value record. The recorder shall clearly repeat the value aloud as it is recorded, to ensure that the value was heard and recorded accurately. If the measurer does not hear a response from the recorder, the measurer shall repeat calling out the measurement until a response is obtained. If the measurer hears a different value from the value measured, the measurer must immediately correct the value.

Datasheets

Carry datasheets within an enclosed clipboard to keep them clean, dry and secure in one location.

Print legibly all information on datasheets using pencil and limit writing excessive information on the datasheet margins. These edges are often difficult to read on scans and there is often confusion on how they should be entered in the database.

Once data collection is complete and before leaving the plot, crew members must review all sections of the paper datasheets to ensure all fields are complete and no obvious errors exist. Each data sheet should be reviewed by someone other than the person who originally recorded the data on that sheet. Once it has been determined that the data sheet is complete, the reviewer will sign their initials in the “Reviewed by” box in the header for each SOP on the field data sheets. Common data omissions to keep an eye out for include:

- Decay Class for standing snags on the Tree sheet
- Incomplete plot diagram
- Any data associated with the last few trees or herbaceous plants in the plot
- Failure to map all trees greater than or equal to 5 centimeters (2 inches) diameter breast height (DBH)
- Coarse woody debris data for all three transects
- Lack of marks indicating which species were photographed
- Incomplete plot establishment information including detailed directions to plot and total time on plot
- Failure to record a tree species in the species diversity SOP after having recorded it in the tree or seedling data

Field data forms will be maintained by the South Florida/Caribbean Network. Once any unknown species have been identified, the original datasheets will be updated.

Database

The SFCN forest monitoring database will be modified from the CUPN database, which is a customized Microsoft Access relational database application used for storage and manipulation of project data. This database was developed using the Natural Resource Database Template (NRDT; NPS 2007), but will be modified to keep up with the latest IMD database standards.

Data Entry

The goal of data entry is to transcribe field observations into a computer database with 100% accuracy. Recognizing that errors are unavoidable, a number of verification steps are followed for data entry:

- To the extent possible and practicable, data entry will be automated.
- Data will be entered as soon as reasonably possible following collection, and not more than one month after the field visit.
- Data entry will be completed by someone familiar with data collection.
- Data will be entered into pre-designed database forms that resemble field sheets and maximize error control.

When the person doing data entry is uncertain about writing on a datasheet, they will highlight that information and follow-up with the original data collection team to get clarification on what they intended.

Currently data will be entered into the Forest Monitoring Database from the paper field forms. **A user manual will be developed for the database and should be reviewed before attempting data entry. In addition, the data manager must be contacted prior to initiating data entry to ensure database versions and plant lists are up to date and to determine what level of data entry training is in order.**

The database incorporates many functions and utilities to help reduce data entry errors such as look-up fields and appropriate upper and lower bounds for fields. However, care must be taken to avoid any potential entry errors. If there are any uncertainties about an entry (e.g., data are illegible or inconsistent with the database), do not guess. Instead, mark the data sheet with a Post-it Note. Describe the illegible or inconsistent entry on the Post-it Note with an arrow pointing to the questionable item. In addition, utilize the data entry notes fields in the database, as these will be reviewed during the data validation process.

After each plot is entered, the person entering the data will print their initials and date in the lower right corner of the field data sheets.

Data Verification

Following data entry, network staff will implement procedures to ensure data are accurately and completely entered into the database. The data entry for each section is 100% reviewed against the original datasheets. After each section of data is verified, the person doing the verification will add their initials and date in the lower right corner of the field datasheets. If data verification finds significant problems with the data entry for a particular plot or park, this will trigger a full review of all data entered for that plot or park. In addition, procedures will be reviewed by the data manager and/or project leader to correct deficiencies and avoid a repeat of future errors.

Data Validation

Following data verification, summarize and review the data to identify any potential mistakes. This process includes:

- Running summary queries, and tallies on the data
- Identifying out-of-range values, including new species and checking that tree/sapling/seedling data are also present in the species diversity list
- Evaluating outliers
- Comparing plot location coordinates in the database with the coordinates recorded by GPS units.

Data Storage and Product Distribution

Data will be stored locally on the SFCN server where it will be included in routine SFCN onsite and offsite backups. Each year after verification/validation and certification are completed a new cumulative version of the database will be uploaded to the National Parks Service's Integrated Resource Management Applications portal (IRMA).

Observer Bias

The SFCN has chosen to follow the guidance from *SOP 2.4.05 Data Management, Quality Assurance and Quality Control—Version 1* of the *Terrestrial Vegetation Monitoring in Southeast Coast Network Parks* (Boyle and Capece 2019) to determine observer bias. To determine whether the plots are being measured consistently by field crews, randomly selected plots will be re-sampled during each field season. Before the beginning of each field season, the assistant data manager will randomly choose two plots (approximately 5%) of all plots sampled in any given year to be re-sampled that field season. Points that are difficult to access—requiring more than two hours of travel time to reach—can be excluded from the 5% that are chosen; otherwise, plots will be selected randomly. Field quality control occurs as close as possible to (but not before) the original sample date of the plot to reduce seasonal variability. Although logistical and budgetary constraints may necessitate using most of the same crew for the original and quality control revisits to sampling points, the network must use different staff members for field work tasks and post-field identifications. If the same team members are used for both an initial sampling visit and a quality control revisit, the tasks they perform must be switched (e.g., data recorder becomes the person who

measures). To minimize trampling impacts, resampling should not occur at plots that are particularly sensitive, and no plot should be sampled more than five times in twenty years. The quality control team samples the plot as it was left from the previous sampling, using the same plot markers, and perceived locations of tree DBH measurements.

All quality control data are collected without viewing the data collection event from earlier in the season. Outside botanists can be obtained from network parks, from local universities, or professionals with south Florida or U.S. Virgin Islands botanical expertise. The outside botanist's primary role is to confirm species identification. The rest of the plot sampling will be accomplished by personnel familiar with the methodology (attended pre sampling training and have sampled a number of plots). The list of resampled plots will be given to the network program manager, so logistics can be arranged separately from the regular plot work and so the primary field crew is unaware of which plots will be quality control plots until after they sample them. Plot delineation and the location of tree DBH measurements will not be changed. If the quality control team detects a potential issue with the data, it will be recorded in the notes. The protocol lead later compares the original data and data from the QA/QC revisit. If significant discrepancies are noted between the two visits to the same plot, a re-evaluation of sampling techniques and training will be undertaken and adjustments will be made in future years to try to address the discrepancy.

If consistent observer biases are identified, there are a few solutions to consider. These include:

- Mid-season training if the problems are caught early
- Renewed focus on training for the measures that were off in future years
- “Disqualification” of some data if it is inconsistent between observers

Literature Cited

- Boyle, M. F., and P. I. Capece. 2019. Data management, quality assurance and quality control—Version 1.0. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—2.4.05. Southeast Coast Network, Athens, Georgia. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2260356> (last accessed December 2019).
- National Park Service (NPS). 2007. Natural resource database template version 3.2 documentation. Natural Resource Program Center, Office of Inventory, Monitoring, and Evaluation, Fort Collins, Colorado. 201 pp.
- Whelan, K. R. T., R. B. Shamblin, M. Prats, J. M. Patterson, M. Londoño, and R. Muxo 2020. South Florida/Caribbean Network forest vegetation monitoring: Protocol implementation plan. Natural Resource Report NPS/SFCN/NRR—2020/2064. National Park Service, Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2271719> (last accessed February 2020).
- White, R., C. Nordman, L. Smart, T. Leibfreid, B. Moore, R. Smyth, and T. Govus. 2011. Vegetation monitoring protocol for the Cumberland Piedmont Network, Version 1. Natural Resource Report NPS/CUPN/NRR—2011/XXX. National Park Service. Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2192468> (last accessed December 2019).