

Cumberland Piedmont Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure 2

Pre-Sampling—Version 2.0

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Summary

This standard operating procedure (SOP) describes tasks to be performed prior to site visits. This SOP gives procedures for:

- Training overview for ozone foliar injury identification and quantification
- Sampling in addition to the established sampling rotation (i.e., episodic monitoring)
- General Site Visit Preparation

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
May 2020	Johnathan Jernigan	Added revised training procedures, introduced possibility of episodic monitoring, and refined language from previous version.	Training sources have changed since previous version and episodic monitoring is now being allowed where it wasn't in previous version.	2.0

Procedures

The NPS requires research or collecting permits be obtained before any fieldwork can commence. For each park being sampled that year, the project lead must submit an application through the [NPS Research Permit and Reporting System](https://irma.nps.gov/RPRS/) (<https://irma.nps.gov/RPRS/>). At Mammoth Cave National Park, ozone foliar injury permits are multi-year permits and only need to be renewed in years when the permit has expired.

A travel authorization must also be completed and approved prior to departure for any non-local fieldwork (i.e., greater than 50 miles from the duty station).

Training for Foliar Injury Assessment

Each crew has one person who must be especially knowledgeable in the assessment of foliar injury. For this reason, any member of the crew who will be identifying or quantifying foliar injury (usually the crew leader and the QA/QC observer) must review practice materials that are posted to the CUPN server. These materials help the observer correctly identify and quantify ozone foliar injury. Crew members who are assisting the observers are also encouraged (but not required) to review these practice materials. Having non-observers capable of identifying injury is advantageous to help increase the probability of detection. However, the crew leader and QA/QC observer (if there is a QA/QC observer for a given site) will be designated ahead of time and they will make the final determination on the status of each plant examined. It is strongly recommended that a short meeting between crew leaders and any QA/QC observers (or other interested crew members) be held to refresh themselves on the identification and quantification of ozone foliar injury. This meeting is conducted prior to any fieldwork. Specific instructions for training of personnel are found in SOP 1 *Training of Field Personnel—Version 2.0* (CUPN 2024a).

Each crew member must also be familiar with any safety risks that are associated with foliar injury assessments. The protocol has a Job Hazard Analysis (JHA) document associated with it. The JHA is in the training materials folder discussed in SOP 1 (CUPN 2024a). All crew members must read and sign the JHA annually before any fieldwork is conducted. Any questions about the JHA should be addressed to the protocol lead.

Episodic Monitoring

The goal of this protocol is to detect ozone-caused foliar injury that is occurring in Cumberland Piedmont Network (CUPN) parks. During a given year, foliar injury may occur on plants in parks not scheduled to be sampled that year. Factors such as weather patterns and ozone dosing throughout the season can lead to the suspicion that injury may be occurring. If the network or a park determines that such injury is likely and the network is not scheduled to sample at that park during that year, then sampling may occur if time and resources are available to complete the sampling. If this supplemental sampling is undertaken, then procedures for normal scheduled sampling should be followed.

A project plan for the episodic sampling event is required. This plan can be short, but must cover the rationale for episodic sampling, the design of the sampling (including park, sites, and timing), the

methods (e.g., according to this protocol and a description of any modifications), and plans for reporting the results (e.g., according to this protocol).

Field QA/QC sampling will not be required for supplemental sampling. If injury is found at a site, voucher specimens should be collected, as with scheduled sampling, and examined by the regional expert. Lastly, because permitting will not have been completed, the project lead must work with park staff to insure that permitting is completed (if required by any given park for its own staff conducting field activities) on an accelerated timeline in order to have the permit in place for sampling to commence.

General Site Visit Preparation

1. All crew members must read and sign the ozone foliar injury Job Hazard Analysis (JHA) document each year. Prior to field sampling, the project lead will forward, via email, a digital copy of the JHA to each person who will participate in field sampling. Each field sampler will digitally sign (preferably digitally) and then return to the project lead.
2. Acquire an NPS research or collecting permit for each park scheduled for sampling that year. Permit applications are submitted to the parks no later than April 30 of the sampling year to allow adequate time for park staff to review the permit application. The crew carries a photocopy of the permit while in the field.
3. Obtain travel authorization for all non-local travel. This applies to all NPS crew members traveling more than 50 miles away. Also, make lodging arrangements if needed.
4. Well in advance of the sampling visits, review the list of supplies needed (see List of Equipment and Supplies) to determine any supplies that will need to be ordered. Order those supplies as needed.
5. The crew leader reviews copies of field data forms from recent sampling events (available as scanned documents on the network's server) to identify any unique events or hazards that may be encountered.
6. The crew leader and QA/QC observer review previous sampling paths at each site that will be sampled. Those sampling paths are indicated on site sketches. Paper copies of those site maps can be taken into the field as necessary. Samplers should attempt to replicate, approximately, those sampling paths.
7. The crew leader and QA/QC observer review the list of ozone sensitive species at each park where each of them is sampling that year (sensitive species list by park is found in the supplemental materials directory for this protocol). They must review previous scans of field forms (available on the CUPN server) for each site that will be sampled and be familiar with what species will likely be observed. Also, they must know which species are being identified at the genus level. Proper assessment requires that samplers be able to identify the species of interest. Review of the USFS training materials, as referenced in SOP 1 (CUPN 2024a), or other plant guide with plates is helpful.

8. Complete foliar injury refresher training as detailed in the previous section of this SOP and in SOP 1 (CUPN 2024a).
9. Schedule the site visit. Site visits are scheduled with host parks regardless of whether the crew needs an escort to the site (though it is sometimes necessary to have personnel from the host park accompany and assist the site crew to the site). As a courtesy, a host park is always notified of an upcoming site visit and scheduling of the visit is coordinated with park staff. The project lead or designated field crew lead will file a trip plan with a CUPN contact (i.e., someone in the office during the trip) and the park before the trip. The project lead will also discuss with park staff the status of each site's accessibility or suitability for monitoring.
10. Print copies of the foliar injury, biosite characteristics, site mapping and voucher specimen field forms. Blank versions of these forms are stored on the CUPN server. Each form has a header that will need to have the year updated. Also print a couple of sheets of petiole labels. Each label will need the year updated.
11. Know how to navigate to the destination park and know the location of sampling sites, the coordinates for which are available through an in-house document associated with this protocol or through the GIS specialist. While the list of site coordinates is available for quick and easy access to a complete list of foliar injury sites, the official coordinates are those stored in the CUPN ozone foliar injury database. To locate a particular site at the park, it may be sufficient to arrange for personnel at the host park to accompany the crew to the site. Also, six years elapse between site visits to most of the sites. Large changes to the sites can occur in that time (e.g., a site becoming inaccessible, tree species becoming much taller). The crew leader for a trip to any given site will work with park personnel to determine if the site is still suitable for sampling prior to the field season. If a site becomes unsuitable, the project leader will work with park staff to find a replacement site that meets the criteria outlined in SOP 3 *Establishment and Location of Sampling Sites—Version 2.0* (CUPN 2024b).
12. Obtain or request that personnel at the host park obtain any keys necessary to access sites.
13. Gather equipment and supplies. All equipment is examined to be sure that it is functioning properly. Supplies are inventoried and, as necessary, purchased. A list of equipment and supplies is given below.
14. Depart for the field site or host park.

List of Equipment and Supplies:

- ☐ Plant press
- ☐ Petiole labels for voucher leaf samples (we ordinarily print 60 labels at the beginning of the sampling season)
- ☐ Field forms

- For each site and observer, four each foliar injury data and voucher leaf samples sheets
 - Two biosite characteristics sheets
 - Two map of biosite sheets
- ☐ For QA/QC site, list of randomly generated distances at which sensitive species should be located
- ☐ Handheld GPS
- ☐ 10X hand lens
- ☐ Digital camera
- ☐ Field guides or reference samples and sensitive species list, which may include those files contained in the supplemental materials directory for this protocol
- ☐ Optional: copies of USFS training materials, located in training materials directory
- ☐ Printout of the JHA, located in training materials directory
- ☐ Plant guides including trees, shrubs, herbs of interest
- ☐ Compass
- ☐ Rangefinder or tape measure (for QA/QC plots)
- ☐ Flagging (for QA/QC plots)
- ☐ Two forms of communication (cell phones, park radios, or satellite communicators)
- ☐ Park Plant List and Ozone Sensitive Species List
- ☐ Replacement batteries
- ☐ Snake stick (for pulling high branches into view)
- ☐ Snake gaiters
- ☐ Tick repellent and bug spray
- ☐ Sunblock
- ☐ Hat with bill to block sun (optional)
- ☐ Hand clippers (for collecting small branch/leaves)

Literature Cited

Cumberland Piedmont Network. 2024a. Training of field personnel—Version 2.0. Standard Operating Procedure. NPS/CUPN/SOP—1. Cumberland Piedmont Network, Mammoth Cave, Kentucky. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2301993> (last accessed January 2024).

Cumberland Piedmont Network. 2024b. Ozone and Foliar Injury Monitoring. Establishment and location of sampling sites—Version 2.0. Standard Operating Procedure. NPS/CUPN/SOP—3. Cumberland Piedmont Network, Mammoth Cave, Kentucky. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2302027> (last accessed January 2024).