

SOP 14: Recording Species Nomenclature and Data Field Descriptions

Version 1.31 (August 2020)

Overview

A high quality plot record is based on a high level of confidence in the species list **as a whole**, particularly for the dominant or most common species. We recognize that it is not possible to identify every plant to species with high confidence for all plots, so we have developed a system for documenting the species name as well as the confidence we have in that species name. First of all, every plant needs to have a name, even if it is simply a descriptive name. For hard to identify taxa, use ad hoc names such as “*Carex* fuzzy red base” and “*Carex* green base”. This method is more useful than lumping them together into simply “*Carex* spp”. By identifying species in this way, we can better estimate overall species diversity numbers on each plot.

Recording Species Nomenclature

Whenever a species name is written on a field form, the presumption is that you are reasonably certain of the name. For each species, use the 7-8 letter code that corresponds to the full scientific name for that species (see full list of all species for CUPN parks for more information on the codes). The code consists of the first 4 letters of genus and first 3 letters of species for the genus and species of that plant plus an extra fourth letter or number as a “tiebreaker” where two species have similar names. When in doubt or in a hurry, write the full scientific name with no abbreviations. No other variations will be accepted. **Use neat block letters**. If the person doing data entry cannot read your writing, then the data quality is undermined and the work is wasted.

If the team leader is not comfortable with the use of 7 letter codes, then always spell out the entire genus and species name. If the genus begins “*Poly...*” it is a good idea to spell out the entire genus and species names. Subspecies are **not** required for this project, and can actually be confusing when data entry time comes. Your team leader may provide additional guidance on this.

Confidence in the identification is often related to the level of taxonomic specificity. You could be very confident in a plant identified only to family, (e.g. Species = Orchidaceae; Confidence = C) because you are sure that it is in that family, but have no idea which genus it is. Similarly, you could be very unsure of a genus or species level call (e.g. Species = *Dryopteris* sp.; Confidence = U), especially if the specimen is obscure, small, or somehow uncollectable (table 14.1).

Table 14.1. List of species identification confidence level codes.

Certain	The person(s) making the taxon interpretation has a high confidence in the accuracy of the field or herbarium identification.	C
Probable	The person(s) making the taxon interpretation has a moderately high confidence in the accuracy of the field or herbarium identification, but uncertainly is typically recorded as “cf” or “?” (e.g., taxon is most likely the species named; occasionally another taxa may be listed as a possibility—it can be named in a comments field).	P
Uncertain	The person(s) making the taxon interpretation has only moderate confidence in the accuracy of the field or herbarium identification, as shown by “??” or other comments about uncertainty. For example, taxon may be one of two or more species and although one name is chosen, it could as easily be another.	U

Also include indicators of uncertainty in how you write the species name:

Simply record “CORNFOE” or “*Cornus foemina*” if species level is certain, and “*Cornus* sp.” if only genus level is certain. If you’re not certain of the species identification, give some indication of your uncertainty using the confidence level codes:

If the specimen might be one of two or a few species, record the two or three that it might be. Indicate, if possible, which one is most likely. If you’re not sure, indicate that as well. For example, *Viola* spp. (*conspersa* or *rostrata*)

If there are several distinct species within a genus, and you are uncertain of their name, but you can clearly see they are distinct, do use ad hoc names to separate them, such as “*Carex*- fuzzy red base” vs. “*Carex* - green base”. They will be entered as *Carex* sp. 1 and *Carex* sp. 2 along with your description.

If you don’t know the genus or species, record family if known. Beyond family, simply use broad growth forms, such as *tree sp.*, *shrub sp.*, *herb sp.*, *aquatic sp.*, *moss sp.*, *lichen sp.*, *algae sp.*, or *vine sp.* Record some additional note characterizing the plant. *Shrub sp* (opp lv).

If the specimen consists of only cotyledons or is so small (less than 5 cm) as to be difficult to identify with any certainty, you may ignore the specimen and move on without recording anything on the datasheet.

Where there is uncertainty noted with the species identification, as indicated by “cf.” or “?” in the species names, or by other comments, use the **Confidence Level** field to record that the identification is **Probable**.

Where there is greater uncertainty indicated, e.g., multiple species are listed, even though one is designated as the primary name, record the identification as **Uncertain**. Field crews should always indicate which name is primary, if more than one is listed.

Follow a Nomenclature Standard

With the important discussions surrounding data quality standards and initial efforts to develop Quality Assurance Plans (QAP), nomenclature standards have received renewed attention within the NPS Inventory and Monitoring Division (IMD). While its importance is understood, implementing a taxonomic standard that all parties can agree upon can be a challenge, particularly in the area of vascular plants! Botanists vary in their agreement as to the validity of particular taxonomic concepts. In addition, many species can only be reliably identified during particular times of the year. With that said the decision was made to adopt Weakley (2019) as this protocol's taxonomic standard for identification and reporting purposes whenever possible. However, the plot botanist or field subject matter expert is the ultimate authority, which is why to date CUPN has utilized professionally trained botanists.

At the end of the field day, or later in the office, be sure to review your list and make the nomenclature and levels of certainty as clear as possible. In addition, we ask that you note on the plot sheet the field guide/guides used for your work on that plot. This will vary depending upon the park in which you work and which field guide is most appropriate to use. Field guides can be obtained through the network program manager if you do not possess them or you can bring your own based on input from the network program manager as to which field guides are best to use in the park where you will work.

Datasheet Field Descriptions (April 5, 2018)

Field Name	Field Description
SOP 3: Site Selection and Plot Establishment	
Plot ID	Four letter (Sub) Park acronym + three digit GRTS order # (e.g., CUGA010). This field will be pre-populated on revisit forms.
Start Date	The date that data collection starts in mm/dd/yyyy format (e.g., 05/17/2011).
Reviewed by	Initials of individual who reviewed completed data sheet for SOP 3 elements. Ideally this should be someone other than individual who completed this portion of datasheet.
Park	For new plots, 4-letter park acronym (i.e., ABLI, CHCH, etc.)
(Sub) Park	For new plots. In most cases this will be same as Park acronym. However, exceptions include BIRT & KNOB at ABLI; LOOK & CHIC at CHCH; & DONE & HEIM at FODO
GRTS Order	For new plots, three digit plot number or id assigned to plot via the generalized random-tessellation stratified (GRTS) sampling methodology (e.g., 123, 001, 022)
QA/QC	Is this a "repeat" data collection effort, as designated by the GIS specialist for quality control purposes? Circle Yes or No.
Start Time	The time of arrival to the plot using local time.
Total Time	Total time needed to complete plot, rounded to nearest quarter hour (e.g., 2 hours and 45 minutes would be 2.75 hours)
Crew	Full name of all involved in the field data collection. Circle the name of the field crew leader (botanist).
GPS file name	For new plots (or revisit plots whose coordinates are incorrect), file name created by field observer in the hand held GPS (i.e., what did you name the point in the GPS device when you saved it?). Naming convention should be subpark acronym><3 digit GRTS order>. (e.g., STRI079).
GPS model	For new plots (or revisit plots whose coordinates are incorrect), the model of the GPS unit used in the field to acquire coordinates for the plot (e.g., Map 76cs).
GPS Unit ID	For new plots (or revisit plots whose coordinates are incorrect), unique identifier assigned to the GPS unit used in the field (e.g., CUPN1, 465, 470, ...). May also use the last 3 digits of the serial number.
Field UTM X	For new plots (or revisit plots whose coordinates are incorrect), the 6-digit latitude of the plot center, also known as easting, as recorded (and saved) in the field with the GPS. (e.g., 579129).
Field UTM Y	For new plots (or revisit plots whose coordinates are incorrect), the 7-digit longitude of the plot center, also known as northing, as recorded (and saved) in the field with the GPS. (e.g., 4116209).
Zone	The UTM zone is 17 for CARL, COWP, CUGA, GUCO, KIMO, and NISI. The zone is 16 for ABLI, CHCH, FODO, LIRI, MACA, RUCA, SHIL, and STRI.
# times waypoint averaged/confidence	For new plots (or revisit plots whose coordinates are incorrect), utilizing the averaging function on the GPS unit, the number of iterations or times the point is averaged/confidence in percent. Although not always possible it is recommended to allow unit to complete 100 iterations/100% confidence.
GPS Error	For new plots (or revisit plots whose coordinates are incorrect), record the horizontal error estimate from the GPS (in meters).
Elevation (m)	For new plots (or revisit plots whose coordinates are incorrect), elevation recorded from GPS unit in meters.
WAAS enabled	Are you picking up WAAS when recording GPS coordinates? Will need to look at the satellite screen on the hand help GPS device. On some units, if

	you are receiving a WAAS signal, there will be a "D" on the bottom of one or more bars. Circle Yes or No.
Directions to Plot	Starting from a road, known trail head, etc. provide <u>detailed</u> directions to aid another crew in returning to the plot. Ideally include GPS coordinates for where your vehicle was parked or where you accessed the area. This field will be pre-populated on revisit forms, correct/update if necessary.
Travel Time from Vehicle	Length of time taken to travel from vehicle to plot, recorded in minutes. This field will be pre-populated on revisit forms, correct/update if necessary.
Permanent Plot Established	For new plots, circle Yes or No; If no, provide criteria/justification for not establishing plot (e.g., on private land, within mowed field, etc.) Use criteria found in SOP 3.
Compass declination	Record the compass declination adjustment setting used on the compass utilized for plot establishment.
Tag #	Number on tag attached to "tag tree" for plot. Ideally these trees (two per plot) should be fairly large and distinctive and within 5m of centroid of plot.
Tag Color	Color of tag attached to tag tree.
Tag Tree Species	Record the 7-character species code of tag tree (e.g., LIRITUL for Tulip Tree, QUERALB for white oak, etc.). This field will be pre-populated on revisit forms, correct if necessary.
DBH of Tag Tree	DBH of tag tree (rounded to nearest cm).
Direction Tag is Facing	Compass bearing (1-360°) the tag is actually facing. This is determined by standing with tag at your back and compass held out directly in front of you. This field will be pre-populated on revisit forms, correct if necessary.
Direction from Tag Tree to Plot Center.	Compass bearing (1-360°) from tag tree to plot center. Typically plot center marked by rebar stake. Stand with back to tag tree aiming compass at center conduit. This field will be pre-populated on revisit forms, correct if necessary.
Distance from Tag Tree to conduit	Measured distance from tag tree to plot center. Typically plot center marked by rebar stake. Measure to nearest tenth meter. Don't guess use tape. This field will be pre-populated on revisit forms, correct if necessary.
Taxonomic Standard and Guide book used.	Taxonomic standard refers to source of taxonomic names. In almost all cases this will be NPSpecies. Guidebook used refers to primary key used for plant identification.
Plot Layout Notes	Record any unusual plot features or problems encountered during plot setup. Note any problem or irregularities inserting plot markers. This field will be pre-populated on revisit forms, correct/update if necessary.
Plot Dimension X and Y	Record plot dimensions in meters along X (east-west) and Y (north-south) lengths. A typical 20 x 20 plot would obviously be 20 in both instances. This field will be pre-populated on revisit forms.
Plot Diagram	Diagram which is used to add any notes about particularly important plot features such as rock outcrops, trails, etc. Plot conduit locations, tag tree numbers and location of plot photo points. Update/correct if necessary on revisit plots and check "updated" box.
Slope (degrees)	Predominant slope of plot measured with compass/clinometer. This field will be pre-populated on revisit forms, correct if necessary.
Aspect (degrees)	Predominant aspect of plot measured with compass. This field will be pre-populated on revisit forms, correct if necessary.
Landform	Circle landform that best characterizes the location of the plot. This field will be pre-populated on revisit forms, correct if necessary.
McNab indices: Terrain Shape Index	Using clinometers, while standing at plot center, record slope in degrees at aspect and then at 45 degree increments around the plot going in clock-

	wise fashion. This field will be pre-populated on revisit forms, correct if necessary.
Topographic position	Best estimate of topographic position. This field will be pre-populated on revisit forms, correct if necessary.
Indicators of Disturbance	Check all that apply in terms of disturbance indicators. For "Other Indicators", describe indicator.
Notes (related to landform, terrain, position, or disturbance)	Use this box to further describe selections chosen above on datasheet. Do not use this space for plot layout notes.
SOP 4: Plot Photopoints	
Photographer Initials	Record initials of photographer.
Reviewed by	Initials of individual who reviewed completed data sheet for SOP 4 elements. Ideally this should be someone other than individual who completed this portion of datasheet.
Camera	Text name of camera and/or make/model of camera (e.g., Nikon coolpix S6100).
Mark Photo Point	Is the photo point location, number and direction clearly marked on plot diagram (page 2 of datasheet), Yes or No.
Photo Sign	Was a photo of sign (designating photographer, date, plot id, photo point number and direction) taken with camera before taking plot photo?
Photo Notes	Include photo name (file name) from camera. Will likely be a generic number such as sd001, etc. Also, include other notes about photo point such as whether moved from standard position, etc.
Other Photo Notes	To be used if other photos documenting something related to plot were taken. This may include additional reference photos to aid future teams in realigning plot or photos of potential forest pest evidence.
SOP 5: Canopy Closure and Stand Height Measures	
Data Taker Initials	Initials of individual collecting the data. In some cases will have one person calling out data, while another records. Data taker initials should be individual who is primarily making decisions on what is written on the datasheet.
Reviewed by	Initials of individual who reviewed completed data sheet for SOP 5 elements. Ideally this should be someone other than individual who recorded data on this portion of datasheet.
Stand Height	Height of three co-dominant canopy trees either on or just off-plot, averaged for plot stand height. Use laser rangefinder or clinometer/meter tape.
Spherical Densiometer Tally	From module center, record the number of shaded dots (0-96) covered by canopy in each of the four cardinal directions (i.e., N, S, E, and W) for each of the four modules for a total of 16 counts.
Canopy Cover – alternative quick estimate	Should only be used in the absence of a spherical densiometer. Standing in the middle of each module, the most experienced crew member should estimate % cover (note this includes cover from shrub layer).
Cover Notes	Record any notes related to collection of cover values.
SOP 6: Tree Measurements	
Data Taker Initials	Initials of individual collecting the data. In some cases will have one person calling out data, while another records. Data taker initials should be the one with greatest knowledge and experience in tree identification, condition codes. etc.

Reviewed by	Initials of individual who reviewed completed data sheet for SOP 6 elements. Ideally this should be someone other than individual who recorded data on this portion of datasheet.
Module	Module (1,2,3, or 4) where tree occurs. For revisit plots, a pre-populated tree list will be provided. Update/correct as necessary.
Tree #	Recorded sequentially beginning with 1 until completed. For revisit plots, a pre-populated tree list will be provided. Update/correct as necessary.
Species	Seven or in some cases eight letter species code, typically comprised of first four letters of genus and first three letters of species. Refer to park species list to determine which species require the eight letter tie breaker codes. In instances where a species does not occur on the species list (i.e., no known species code), write out the entire scientific name. Ask field crew leader for assistance on spelling. For revisit plots, a pre-populated tree list will be provided. Update/correct as necessary.
DBH	Record DBH of measured tree, rounding to nearest centimeter. Tree must measure 10.0 cm before it should be recorded (i.e., don't round up to 10). For revisit plots, previous DBH will be provided as well.
Tree Status	Record tree status where 0=No status, previously tallied tree no longer in sample, 1=Live tree, 2=Standing tree, 3=Removed, 4=Fallen dead tree. For revisit plots, previous tree status will be provided as well.
Crown Class	For all live trees only – record crown class where 1=Open-grown, 2=Dominant, 3=Co-dominant, 4=Intermediate, and 5=Overtopped.
Tree Vigor	For all live trees only – record tree vigor where 1=Healthy, 2=Light decline, 3=Moderate decline, 4=Severe decline, and 5=Functionally dead.
Tree Dieback	For applicable live trees only – record tree dieback where 1=1-10%, 2=10-25%, 3=25-50%, 4=50-75%, and 5=75-100%.
Tree Condition/ Damage Codes	For applicable live trees only – record one or more of the 4-letter tree condition codes, as appropriate, from the provided list.
Foliage Condition	For applicable live trees only – record up to three foliage condition codes where C=chlorosis, N=necrosis, H=holes, S=small leaves, W=wilting, L=leaf loss, and O=other. Describe other in tree notes section.
Foliage %	For applicable live trees only – record foliage percentage affected by each of the previously listed foliage condition codes.
Decay Class	For dead trees only – record snag decay class (1-5) based on provided table and associated descriptions.
Snag Height	For dead trees only – record estimated snag height to nearest meter.
Tree ID confidence	In cases where tree identification is not certain record tree number and ID confidence where P=probable and U=uncertain.
Tree Notes	Record any noteworthy information, as well as use this area as overflow to record additional damage codes, etc. Tree notes from previous survey will be carried over for revisit plots-update/correct/cross out as needed.
Tree Diagram	Plot out all recorded trees with a status of 1 or 2 on the diagram, as well as smaller trees on edge of plot lines to aid in future plot layout. Update/correct if necessary on revisit plots and check “updated” box.
SOP 7: Herbaceous Plant and Seedling/Sapling Measurements	
Data Taker Initials	Initials of individual collecting the data. In most cases will have one person identifying species (field crew leader), while another records. Data taker initials should be the field crew leader, who is responsible for correct species ID.
Reviewed by	Initials of individual who reviewed completed data sheet for SOP 7 elements. In most situations this should be someone other than individual who recorded data on this portion of datasheet. Field crew leader can conduct this review while recording cover values.

# Corners Sampled	Default value should be eight. However, if less than eight are sampled record this number. Be sure to record justification in corner notes.
Corner Notes	If less than eight corners sampled or if different from default corners sampled, record information in this block. Be sure to include the identification of all corners that were sampled (e.g., 1-3, 2-4, etc.)
Species Code	Seven or in some cases eight letter species code, typically comprised of first four letters of genus and first three letters of species. Refer to park species list to determine which species require the eight letter tie breaker codes. In instances where a species does not occur on the species list (i.e., no known species code), write out the entire scientific name. Field crew leader should confirm spelling. For revisit plots, a pre-populated species list will be provided. Update/correct as necessary.
Note #	Refer to species-specific note written out at the end of the species list.
ID Confidence	In cases where species identification is not certain record confidence level as either C=certain, P=probable, or U=uncertain
Collect	Place a check mark in this column if field crew leader collects plant specimen for later identification and/or to make a species voucher.
Module 1-2, 1-4, ... 4-3	For <u>each</u> corner, record the level at which a species is first recorded where 3=1m x1m subplot and 2=3.16 x 3.16m subplot. If a species is not recorded in either corner but is detected in the module, record it as a 1 in either the first or second corner for that module
Cover Class (20m x 20m)	Field crew leader should record a cover class for each species for the overall plot where 1=trace, 2=0.1-1%, 3=1-2%, 4=2-5%, 5=5-10%, 6=1-25%, 7=25-50%, 8=50-75%, 9=75-95%, and 10=>95%.
Notes (optional):	Write out note for a specific species where mentioned in Note # column.
Seedling/sapling only:	
Module & Corner	Record the module and corner combination where the seedling or sapling species is found.
Species Code	Seven or in some cases eight letter species code, typically comprised of first four letters of genus and first three letters of species. Refer to park species list to determine which species require the eight letter tie breaker codes. In instances where a species does not occur on the species list (i.e., no known species code), write out the entire scientific name. Field crew leader should confirm spelling.
Seedling Height Classes (cm): 5-15cm 15-30cm 30-50cm 50-137cm	Within the 1m x1m nested subplot (i.e., level 3), using tally method (outlined on top or bottom of datasheet) record the number of individuals within each height category for the species in question within the specified corner.
Tree Sapling by DBH (cm): 0-1 cm DBH 1-2.5cm DBH 2.5-5cm DBH 5-10cm DBH	Within the 3m x 3m nested subplot (i.e., level 2, which includes the level 3 nested subplot), using tally method (outlined on top or bottom of datasheet) record the DBH of tree species which are at least 137 cm (i.e., DBH height) tall and less than 10cm DBH into the appropriate size category. Note, all trees 10cm DBH or above will be recorded on the tree data sheet (SOP 6).
SOP 8: Coarse Woody Debris	
Data Taker Initials	Initials of individual collecting the data. In some cases will have one person calling out data, while another records. Data taker initials should be the one with greatest knowledge and experience overseeing the calls being made.

Reviewed by	Initials of individual who reviewed completed data sheet for SOP 8 elements. Ideally this should be someone other than individual who recorded data on this portion of datasheet.
Transect X length and Transect Y length	Default length is 40m. However in some instances a transect may be shortened if it intersects a restricted area such as a road or regularly mowed or if it hits the park boundary. This field will be pre-populated on revisit forms, correct/update if necessary.
Transect	Circle X or Y, where X is the tape measure running east/west and Y is the tape measure running north/south.
Diameter	Measure diameter of CWD with aid of Biltmore stick or DBH tape (in cm).
Decay Class	Assign the piece to one of the five decay class categories listed on the bottom of the datasheet.
Hollow	If the log is hollow and could provide cover or habitat for a small mammal then record it as hollow by writing yes on the datasheet, otherwise no.
Notes	Record anything unusual about the transect placement or the pieces of CWD. If the tree species of the CWD can be easily identified, record that information in this space. Use this space to identify which pieces of CWD are connected to each other, or which diameters were measured from the same piece of CWD, if the same piece crosses a transect more than once.
SOP 9: U. S. National Vegetation Classification Measure	
Reviewed by	Initials of individual who reviewed completed data sheet for SOP 9 elements. Ideally this should be someone other than individual who recorded data on this portion of datasheet.
US NVC association (first call)	Four-digit vegetation community code representing the dominant vegetation type of the point as determined with aid of park's vegetation key.
Fit (first call)	Fit is simply how well the community "keys out". If it keyed out without any assumptions or problems clearly to one community type, then it is high fit. If there were some small issues where you had some doubt about a particular couplet but ultimately feel good about the keyed community type, then it gets a medium. If you feel that the community could not key without making large assumptions or it did not fit at all into the key, then it would be considered a low fit.
Confidence (first call)	This is distinguished from fit in that it is a determination of how confident you are that the veg association selected is the correct community type for the point. This is independent of the key. For instance, you might have a low fit on the key because the community did not key well, but you may be very confident in the determination because you read the full description and the full description matches the community type on the ground perfectly. Or perhaps you are a very experienced ecologist that has seen this same community dozens of times so you feel very confident assigning it to a community.
Classifier initials (first call)	Initials of ecologist who made final determination for the team. In almost all circumstances this should be the field crew leader.
US NVC Notes	Record any notes related to selection of association codes, such as "key indicates association should be dominated by white oak, however QuerAlb < 50%", etc.
<i>Association, fit, confidence and classifier initials may be repeated for a second and sometimes a third call if there is some question in the field regarding the team's first call.</i>	

Revision History

Version numbers are incremented by decimals where minor grammatical changes or textual clarifications are incremented by hundredths (e.g., 1.01, 1.02, 1.03, ..., etc.) and moderate

changes, such as equipment updates or changes in methodology that do not impact analysis are incremented by tenths (e.g., 1.1, 1.2, 1.3, etc.). Whole number increments (e.g., 1.0, 2.0, 3.0, ..., etc.) are reserved for major revisions. Of course, differentiating between what is moderate vs. major may not always be clear, but it is anticipated that with a little “common sense” and discussion protocol leads can adequately document and track revisions through time to the benefit of future data users. It should be noted that prior to 2020 all revisions were incremented by tenths.

Revision History Log

Version #	Date	Revised by	Changes
1.1	01/15/12	B. Moore and R. White	Note some revisions made 10/4/12 but not assigned a new version number - Added some good rules to follow when collecting specimens - Added need to include field guides or keys used on the plot to aid in accurate field identification - Added statement that it was understood that not all species could be identified with high confidence (10/4/12) - Every plant should be assigned a unique name. Descriptive qualifiers are ok (e.g., <i>Carex</i> sp. red base) as it aids in more accurately tracking diversity (10/4/12)
1.2	4/5/2018	C. Bledsoe	- Added field datasheet field descriptions to this SOP (previously part of Appendix D) - Removed good rules to follow when collecting specimens - Made updates to datasheet field descriptions, reflecting changes made to datasheet including revisit forms - Changed SOP title
1.3	3/31/2020	B. Moore	- Updated taxonomic standard from ITIS to Weakley (2019), <i>Note this standard was used in the field in the 2019 field season</i> - Moved Revision History to end of SOP and added more detailed list of changes made to date
1.31	8/10/2020	B. Moore	- Address grammatical changes and clarifying comments made by IMD regional program manager