

## **Protocols for Conducting Surveys for Plant Species of Special Concern**

### **Part 2 of 4 – Conducting the Botanical Survey**

#### **Introduction**

The Department of Conservation and Natural Resources (DCNR) may request a botanical survey or habitat assessment be performed to investigate proposed project sites for PA Plant Species of Special Concern. This will be used to help DCNR determine whether or not a proposed project will remove or impact a Species of Special Concern (SOSC), evaluate the level of impact to the species of special concern habitat, and identify approaches to avoiding or minimizing project-related impacts to Species of Special Concern and their habitats.

The following protocols have been provided by DCNR as a means to enhance the quality of botanical surveys conducted, as well as to standardize the way in which project areas are surveyed and findings are documented and reported to DCNR for further review. DCNR has issued that the following protocols so they may be used to guide surveyors in the field and clearly indicate the expectations of DCNR in relation to survey result reporting. The following protocols are split into four sections: 1) recommended preparation in advance of a Survey, 2) field protocols for conducting a Survey, 3) guidelines for documenting field results and report writing, and 4) Voucher specimen collection protocols.

Please also note that as of January 2011, DCNR is recommending that a Wild Plant Management Permit be obtained before conducting botanical surveys for PA Plant Species of Special Concern. Permit information and application can be found on the Wild Plant Management Program Website at: <https://www.dcnr.pa.gov/Conservation/WildPlants/Pages/default.aspx> and on the PNDI Environmental Review Homepage at: <https://conservationexplorer.dcnr.pa.gov/>.

## **Surveying Protocols**

- I. **Survey Limits of Disturbance:** Unless instructed otherwise by the Survey Request Letter, surveyors should completely search the project area within all limits of disturbance and adjacent areas subject to indirect impacts, this includes all related secondary infrastructure (including but not limited to: access roads, pipelines, transfer stations, tower support wire anchor points, skid trails, haul roads, topsoil stockpile locations, staging areas, etc.)
  
- II. **Sampling Procedures and Protocols:** Sampling procedures and protocols should be carefully determined in order to accurately describe all habitat types and locations within the project area.
  - A. Any wetlands, springs, seeps, creeks or other water bodies should be carefully surveyed regardless of the sampling process or protocol chosen for the entire project area.
  - B. Any ecotones or transition areas where habitat types change should be carefully surveyed for regardless of the sampling process or protocol chosen for the entire project area.
  - C. For smaller projects, less than 5 acres in size, the entire project area should be surveyed for any SOSC. If the surveyor deviates from this recommendation, please provide justification.
  - D. For projects larger than 5 acres in size, DCNR recommends a meander-style survey that is tailored to optimize investigation based on site characteristics and species' habitat requirements. The surveyor should provide justification for the sampling rationale in their report.
  
- III. **Plant Species Lists:** During the survey, surveyors should keep a reasonably complete inventory list of all woody and non-woody plants found within the project area.
  - A. Every attempt should be made to identify all woody and non-woody plants present on site during the time of the year of the survey to the **species level**.
    1. Identifying plants found to the genus level (e.g. *Carex* spp. or *Cuscuta* spp.) is rarely sufficient (especially if the target species are of the same genus). If you are presenting findings only to the genus level, please explain why the plants could not be further identified.
    2. If species can only be identified to the genus level, DCNR recommends collecting voucher specimens, when appropriate, and/or contacting other botanists or institutions to aid in identification. Please see Voucher Specimen guidelines included with these protocols.
    3. If the level of identification is insufficient to determine whether the species is a SOSC, a follow-up site visit with DCNR or other PA Natural Heritage Program personnel may be required.

- B. Other information regarding plant species (non SOSC) found during the survey should include:
1. Strata. (Epiphyte/liana, Non-vascular, Herbaceous, Short shrub (<1m), Tall shrub (>1m), Emergent tree, Tree sub-canopy, Tree canopy)
  2. Height
  3. Relative % Cover of dominant species (if it can be reasonably estimated)
  4. Relative distribution across site
- IV. **Site Habitat Characteristics:** DCNR also recommends keeping detailed notes regarding the following ecological and habitat characteristics during the survey. These notes should correspond with information on the “Botanical Field Survey Form” which is included with these protocols.
- A. General habitat description (e.g. *Alluvial floodplain areas along Rattling Creek which are seasonally inundated by flooding. Site is mostly colonized by herbaceous species, in a mixed oak forest opening with dry-mesic soils.*)
  - B. Substrate/soil type. DCNR encourages any information regarding geological and soil conditions on site. Please provide as much information as your background in these areas permits (i.e., soil horizons, geology, soil types, soil hydrology, etc.)
  - C. Dominant plant species within each unique habitat type within the project area.
  - D. Any other observations that the surveyors feels are important to help the reviewer gain a better understanding of the site and how it will be impacted by the proposed project.
  - E. Color photographs of the areas surveyed are also particularly helpful.
- V. **Target Species Data Collection:** When recording information regarding PA Plant Species of Special Concern (SOSC) found on site, please make observations regarding:
- A. Location information. This includes: specific directions to the site, name of site owner (and leasee if applicable), and GPS coordinates (if possible, please provide both decimal degrees and degrees/minutes/seconds).
    1. For small populations, GPS center point and radius necessary to enclose entire population is sufficient. If the radius is greater than 6.25 meters, a polygon is preferred.
    2. For large populations GPS multiple points around the population perimeter so that a polygon for the population can be drawn.
    3. Include a hand-drawn map showing the limits of the population. This is important if unable to obtain GPS data. Include features that are likely to serve as permanent landmarks to facilitate relocation of the population.

- B. Observations regarding the condition of the surrounding habitat. Consider the specificity of the plant's requirements as well as the rarity of the element when deciding detailed a description is appropriate.
1. Associated Species
    - a. Only include plants and trees that are growing near the element and in the same habitat. A good rule of thumb is herbaceous plants within 1 meter, and woody plants within 5 meters, excluding other habitats. However, unless you are involved in a quantitative study (in which case you should probably be recording data in a different format), this usefulness of this data will be related only to the extent to which it helps to describe the habitat of the element at this location. (If you are in a fen that is dominated by *Carex interior*, but the nearest stem of that species is just over a meter away, you should probably include it as an associate unless you have some reason to think the *C. interior* is excluded from the immediate vicinity of the element because of habitat differences).
    - b. Animal species should be included if interaction with the plant element is known or suspected. Such interaction can be indirect, such as an animal that is significantly defoliating a dominant species in the habitat.
  2. Relative age or Successional stage
  3. Topographical features including aspect, slope, elevation and topographic position (ridge, steep slope, floodplain, etc.)
  4. Light conditions. This may include observations regarding canopy cover and shading.
  5. Moisture conditions. This would also include hydrologic conditions or proximity to any water sources.
  6. Any known or inferred land use (present and past)
  7. Any other anthropogenic or unnatural disturbance
  8. Integrity/Fragmentation of the plant community
  9. Presence of any invasive species (or native vegetation acting aggressively) occurring on site
  10. Any threats on-site (routine mowing, succession, invasive plant colonization, etc.) or off-site (development, mining, climate change, etc)
  11. Other members of the genus that occur on site, please also note any evidence of hybridization. If hybridization is common in the genus, express your level of confidence regarding the presence of hybrids in the

area. If any other species in the genus are present that might plausibly hybridize with the element, list them.

- C. Substrate/soil type. DCNR encourages any information regarding geological and soil conditions on site. Please provide as much information as your background in these areas permits.
  - 1. Indicate the depth or depths at which you observed the soil. If your understanding of soils permits, express this in terms of soil horizons.
  - 2. Geology and soils types can be determined from maps geology or soil survey maps as well as from direct observation, both with inherent limitations on accuracy. Specify which. Of course, it is best to have both, but this is not always necessary.
  - 3. Please also indicate any observations relating to soil hydrology.
- E. Estimates of additional area of potential habitat for the SOSC. DCNR is interested in notations concerning areas of potential habitat where SOSC are not currently found, but provide the appropriate conditions for possible colonization in the future. Please keep careful notes so that potential habitat can be discussed in your report and these delineated areas can be included with other maps.
- F. SOSC biology and population information
  - 1. Phenology (e.g., in leaf? In bud? In flower? Immature or mature Fruit? Seed dispersing?).
    - a. If a population exhibits more than one phenological state, please note all that apply (include percentages if relevant to assessing the age or health of the population).
    - b. If flowering, please indicate whether the plant may have flowered earlier or later than normal. Please make careful observations that relate to how well a population is reproducing and the long-term viability of the population.
    - c. For bryophytes and pteridophytes, indicate appropriate phenology. This consists of leaf vs. states of sporangia, but it could also include gametophyte phenologies, which are important and often overlooked. Always look for gametophytes when assessing an occurrence of a pteridophyte.
    - d. Note if vegetative propagules, such as gemmae, turions, bulbils, or adventitious deciduous shoots are present.
  - 2. Size of Element Occurrence (EO) of SOSC
    - a. Definitions

- i. Genet: “*A unit or group derived by asexual reproduction from a single original zygote, such as a seedling or a clone*” (Lincoln, et Al, 1998). A genet can consist of a single stem or a clone of many stems that are essentially genetically identical.
  - ii. Ramet: “*A member of modular unit of a clone, that may follow an independent existence if separated from the parent organism*” (Lincoln, et Al, 1998). This is a useful concept for evaluating the size of occurrences because determining the number of genets in the field for an asexually reproducing species is often not possible, and the number of stems or clumps (ramets) can be a better indicator of viability than the number of genets.
- b. Counting
- i. It is inadvisable to estimate the number of plants without counting a portion first. There is a tendency to significantly underestimate occurrence size.
  - ii. Count a reasonable number of plants (25 or 50) and to gain a sense of what this many plants looks like. If this is small relative to the whole occurrence, visually extrapolate to estimate what 100 plants looks like. While mentally adjusting for differences in density, use this basic unit as a template, and walk around the occurrence adding up the number of units to obtain an estimate. **Please include exact numbers whenever possible.**
  - iii. Counting a clonal species
    - a). A large portion of our native plant species are clonal by rhizomes. If possible, estimate both the number of genets and the number of ramets.
    - b). Estimating number of genets. Plants that produce multiple or branched rhizomes tend to form more or less circular clones. As these clones age, they may merge, making it difficult to determine how many genetically unique plants are present.
      - Look for somewhat circular patterns in the distribution of stems.
      - Look for slight differences in color (especially in the fall) or phenology; individual plants show unique characteristics as one would expect from animals, although typically the differences are more subtle.

- Document how you obtained your estimate. An estimate based partly on speculation can be useful if (and only if) the nature of the speculation is known.
- c). Estimating number of ramets.
- A plant ramet is usually either a stem or a clump. Clumps can also be genets though, and field workers do not always have the resources at hand to make this determination.
  - Count clumps if it is reasonably clear what constitutes a clump. This is the most useful way to keep track of the size of an occurrence whether or not the clumps are connected by rhizomes.
  - If you are counting clumps, it can be useful to estimate the average number of stems in a clump. This is especially important for loosely tufted species, when what constitutes a clump can be subjective.
- c. It is important to distinguish between ramets and genets by estimating occurrence size in a repeatable way and clearly documenting your method. **Make sure it is clear what was counted as a ramet or a genet.** In this way, someone can later deduce whether the occurrence is declining, stable, or increasing by reproducing your method.
3. Estimate of population area. Surveyors should be sure to have carefully delineated the furthest extent of a population and all **additional potential habitat** that exists in the vicinity of the population. This should include areas inside and outside of the project area when possible.
4. Age structure. This may be ignored for annual species. When using “mature” be sure that you are referring to reproductive maturity.
- a. Age structure observations should help assess how well the population is regenerating (e.g. % seedlings, % immature, % 1<sup>st</sup> year, % mature, % senescent)
- b. If you are documenting a perennial species and can find few or no juveniles, this is important to note; and you should then consider whether there might be any disruptions in the life cycle such as:
- i. Absence of obligate pollinators
  - ii. Absence of male or female plants (for dioecious species).

- iii. Lack of multiple genets (for partially or completely self-incompatible species).
      - iv. Excessive herbivory on reproductive parts.
    - 5. Vigor of population (e.g. very feeble, feeble, normal, vigorous, exceptionally vigorous). If you don't have the experience to provide the appropriate evaluation, please note this before omitting these observations.
    - 6. Look for evidence of animal pollinators (if applicable) and dispersers. Pollination biology is often a significant gap in the understanding of the ecological requirements of rare plant species.
    - 7. Evidence of Disease, Predation or Injury (if present)
    - 8. Any other observations of note, including any insights into how well or poorly the species may be reproducing.
  - G. An explanation of any identification problems and any references used to aid in identification, if identifying this species during non-peak time, a methodical explanation of how a species was taxonomically identified should be included.
  - H. SOSC population size relative to other occurrences you have observed (if any)
- VI. In addition to target species, any and all PA Plant Species of Special Concern found within the project area must be reported to DCNR. This includes all PA Watch List or "Special Concern Populations" (SP) species.
- VII. Voucher Specimens. Voucher specimens can be valuable as a way to confirm plant identification after a study has been completed. In order to collect a voucher specimen, the collector **MUST** have a Wild Plant Management Permit. In addition, decisions regarding when to collect a Voucher Specimen of a PA SOSC and how to collect these plants are outlined in the "Policy on Voucher Specimens" included with this protocol. Surveyors must also note where voucher specimens were sent. A list of PA herbaria locations is also included with the "Policy on Voucher Specimens."
- VIII. If SOSC **were not found** please prepare detailed notes that reflect the following
- A. How the proportion of the project area surveyed (if not surveyed in its entirety) was sufficient to have found the SOSC had it existed on site.
  - B. Disturbances that could have effected a previously present population
  - C. Any areas of unsuitable habitat for SOSC
  - D. Plant competition (notably invasive exotics)
- XI. Surveyors are also encouraged to make observations and compile notes that may be relevant to the specific type of project proposed and any other insights or observations not captured above.



## Literature Cited

Lincoln, Roger, Geoff Boxshall, and Paul Clark. 1998. *A Dictionary of Ecology, Evolution and Systematics*, 2<sup>nd</sup> ed. Cambridge University Press).

Portions of this protocol were taken from: Grund, S. 2004. *Documenting Plant Element Occurrences for the Pennsylvania Natural Heritage Program*.