

National Park Service
U.S. Department of the Interior
Appalachian National Scenic Trail



A VOLUNTEER GUIDE FOR

Rare Plant Monitoring on the Appalachian Trail



ON THE COVER: Gray's Lily on Round Bald, Roan Highlands, East Tennessee. Jon Erickson photo.

The Appalachian National Scenic Trail (AT) is a treasured national icon. Since 1937, it has been a footpath through the wilderness that traverses more than 2,170 miles across the highest ridge lines of the Appalachian Mountains, from Springer Mountain in Georgia to Mount Katahdin in Maine. The Trail, a unit of the National Park System, provides a unique and rich opportunity for outdoor enjoyment and appreciation of natural and cultural resources. Along the way, it crosses through 14 states, 8 National Forests, 6 other National Park units, one National Wildlife Refuge, three Tennessee Valley Authority properties, a Smithsonian Institute property, 6 National Park Service (NPS) Inventory and Monitoring Program networks, and 287 local jurisdictions. It is managed cooperatively by the NPS Appalachian Trail Park Office (ATPO), the Appalachian Trail Conservancy (ATC), more than 30 local trail clubs (who contribute nearly 200,000 hours by more than 5,000 volunteers), the US Forest Service (USFS), and the 14 states through which it passes. These groups are committed to conserve unimpaired the natural and cultural resources of the Appalachian Trail and its surroundings, as directed by federal legislation.



The Appalachian National Scenic Trail from Maine to Georgia.

Rare species are an important Trail resource. As a first step in fulfilling the obligation to conserve rare species, surveys were undertaken in cooperation with state Natural Heritage offices to inventory rare, threatened or endangered (RTE) species within the AT corridor. Between 1989 and 2001, inventories were conducted in each of the 14 Trail states. These inventories documented more than 1,700 occurrences of globally or regionally rare species and rare or exemplary communities in more than 500 Natural Heritage Sites within the AT corridor. Most of these are rare plants. Notable hotspots of rare species occur in the Presidential Range of the White Mountains of NH, the Mt. Rogers-Whitetop area of southwest VA, and the Roan Mountain area along the border of NC and TN.

The Natural Heritage inventories included a description of threats and management recommendations for each site or occurrence. The threats most frequently observed were trampling, trail maintenance activities, invasive exotic plants, and exotic insect pests. Additional threats noted include erosion, all-terrain-vehicles (ATVs), and plant competition or succession.

The stated goals of the AT Natural Heritage Program are to:

- Contribute to the protection of RTE species on AT corridor lands;
- Improve natural resources management and stewardship capacity by providing essential information in a timely fashion to land managers and decision-makers;
- Develop an appreciation for rare plants and animals in the AT community through volunteer involvement; and
- Raise public awareness of the AT as a protected refuge for significant biodiversity.

In 1989, the ATPO and ATC began a program to monitor Natural Heritage sites in order to track the size and condition of rare plant occurrences, as well as to identify and track threats. Actual numbers of sites and species monitored fluctuates from year-to-year, but about one quarter of the documented Natural Heritage sites have been included in the monitoring program. The program focuses monitoring efforts on sites within the AT corridor, defined as land within 500 feet on either side of the Trail, and any adjacent land acquired by the ATPO. Financial and staff resources available to this program are modest, but the program draws upon a large cadre of committed Trail volunteers who serve as monitors. Regional or state monitoring coordinators oversee monitoring activities and serve as the contact person for volunteers in their area.

The specific objectives of the monitoring program are to:

- Determine long-term trends and variability in number and life-stage distribution for selected occurrences of RTE plant species at priority sites;
- Determine long-term trends and variability in spatial extent of selected occurrences of RTE plant species at priority sites;
- Identify threats to selected occurrences of RTE plant species at priority sites.

A specific and detailed protocol has been adopted to ensure that monitoring procedures do not vary unintentionally among regions or over time, and so that real trends may be detected. It is essential to the success of this program that monitors carefully follow these established procedures. The protocol was designed to be implemented by trained volunteer monitors. It includes a combination of straightforward measurements and observations designed to track the size and condition of known rare plant occurrences, the spatial extent of the occurrence, important site variables, and visible threats. The protocol can be used for monitoring a wide variety of plant lifeforms, including grasses, herbs, trees, and shrubs, with methods varying slightly among different lifeforms. The protocol is relatively simple and requires only a few basic pieces of equipment. The use of GPS and digital cameras are both strongly encouraged but not required.

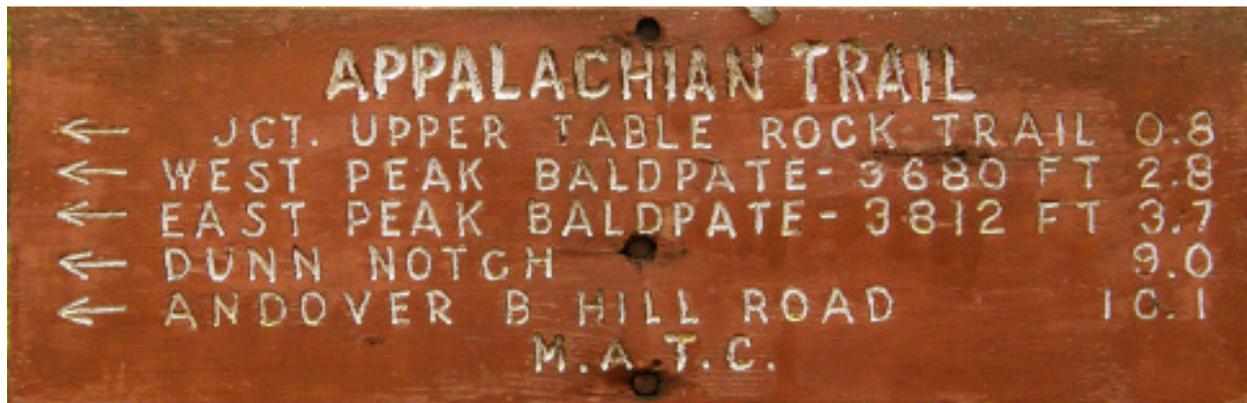
Rare plant occurrences will be monitored using a census technique, in which all plants are counted (for smaller occurrences) or estimated (for larger occurrences). Any new occurrences found should be reported to your monitoring coordinator so they may be evaluated for inclusion in the monitoring program.

Frequency of monitoring may vary based on the site location, vulnerability of the occurrence, and management activity, in addition to the significance and rarity of the species. In general, sampling will occur each year for occurrences that are undergoing management activity, or are considered vulnerable due to threats or problems noted by previous monitoring. For occurrences that appear stable, are without obvious risk, and are not subject to management activity, staff may relax monitoring frequency to every second or third year, particularly for remote sites.

The protocol incorporates several measures to ensure high quality data is collected, including the use of a well-documented methodology, pre-printed dataforms, careful training, and the use of photographs to confirm plant identification and other data. It uses quantitative and objective methods wherever possible in order to reduce variation by subjective assessment. Detailed, step-by-step descriptions of each measurement are provided in the standard operating procedures (SOPs). Each year, program staff will analyze, summarize and report monitoring data, and provide feedback to volunteer monitors.

Unintended trampling of rare plant occurrences by volunteers during monitoring is an unfortunate but real hazard of the program. Please do all you can to avoid trampling these rare species and the site in general, as further described in the SOPs and during training.

Volunteers are the heart and soul of this program. Thank you for your participation!



Equipment List

The following is a list of equipment needed to monitor rare plant occurrences on Appalachian National Scenic Trail (ANST) lands. Monitoring coordinators will supply recent monitoring reports, rare species descriptions, the USDA guide, and blank dataforms in paper or pdf format. Monitoring coordinators may also have GPS units and/or digital cameras to lend to volunteers. Tally counters may be available from monitoring coordinators or can be purchased for about \$5-10 at an office supply store, online, or a forestry supplier.

Monitoring equipment:

- Recent monitoring report with species occurrence map
- Rare species description with photographs or illustrations
- Invasive Species Identification Guide (USDA)
- Blank dataforms (1 per occurrence)
- Clipboard and pencils
- Tally counter
- Small flags
- Measuring tape
- Watch
- Compass
- GPS unit (optional, but strongly encouraged)
- Digital camera (optional, but strongly encouraged)
- Cell phone (optional, for safety)



Species Measurements Standard Operating Procedure

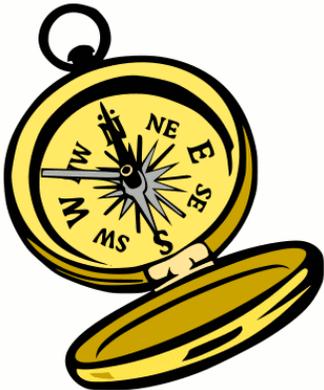
This SOP describes how to monitor rare plant occurrences within the AT corridor. Please take care to follow these step-by-step instructions closely, in order to collect high quality data that is comparable over years and among sites.

Procedure

A training session will provide personal instruction in these monitoring methods and identification of your assigned species, and will allow you the opportunity to ask questions. During training, you will receive a monitoring report for this rare species, including a map of the area covered by rare plants. Please bring this report and map with you when visiting the site. The report contains valuable information and the map will help you locate the rare species occurrence. You will also receive a description of the rare species including pictures or illustrations that will help you identify the rare plants.

It is best to visit when the plant is at or near peak reproduction (that is, flowering and fruiting). If the last visit occurred when many plants were flowering or fruiting, please visit this year within 10 calendar days of the former visit date, or as otherwise directed by your monitoring coordinator.

It is useful to use a GPS to verify the location and a digital camera to take photographs. If you do not have a GPS unit or digital camera, try to borrow one from your monitoring coordinator. The coordinators have been provided with several of each. If you are unable to obtain a GPS or digital camera, please complete the rest of the data form.



Pack the tools and materials listed in the attached equipment list. Using a GPS or compass navigate to the area shown in your rare species occurrence map. Search the whole area delineated on the map as part of the rare species occurrence. The area occupied by rare species may shift over time, and it is important to document this area during each visit. Search only within the AT corridor which is “broadly” defined to be 500 feet on either side of the Trail, unless otherwise instructed by your Monitoring Coordinator. This may be the case on steep terrain (where a narrower boundary may be used) or where the ATPO owns more land in which case a wider boundary may apply (e.g., portions of Maine). If you see additional nearby areas containing plants of this rare species, please note the location in the comment section of your monitoring form.

All data should be recorded on data forms provided by your coordinator. Please complete a separate data form for each occurrence you monitor. Try your best to respond to each question. If a measurement does not apply, reply “NA” (not applicable). If you don’t know the correct response, record “Unsure,” take a photograph if possible, and ask your monitoring coordinator for assistance. Some information may be pre-printed on your datasheet. If any pre-printed information is incorrect, please make a correction.

It is very important to do all you can to avoid trampling rare species and the site in general. When you leave established trails to approach your site, please take a slightly different route each time to avoid creating a new “social trail.” At the monitoring site, try to remain as still as possible, limiting your movement to only what is needed to collect information. Please do not bring pets to the site with you, or more than one companion, unless first discussing this with your monitoring coordinator.

Once you have located and identified the rare plant occurrence, try to place temporary flags around the perimeter to help mark the whole occurrence as you collect data. For large occurrences, this may not be feasible. **Take care to remove and pack out all flags before leaving.**

Please submit completed data forms, any sketches you have drawn, and digital photographs to your monitoring coordinator within 3 weeks of visiting your site. If any problems arise, please contact your monitoring coordinator as soon as possible to get assistance. **If you see an urgent threat to the rare plant occurrence, please contact your monitoring coordinator immediately.**

See page 10 for an example of a filled out data form.

SECTION 1 : BASIC INFORMATION

Monitor name

Record your name.

Email or phone

Record contact information for your preferred method of communication, either your telephone number or email address.

Visit date

Record the date of your visit as month/date/year.

Site name and number.

Record the site name and number provided to you.

Common name

Record the common name of the monitored species.

Scientific name

Record the scientific name of the monitored species.

Found?

Did you find the rare plant occurrence? If you are unsure whether you found the correct occurrence, please record the reason. If possible, take a close-up photograph of a flowering or mature plant in this occurrence for your monitoring coordinator. Whether or not you found the occurrence, please record information in sections 1 and 3 to document where you searched and the condition of the site.

Sketch

If you were unable to bring a GPS unit, please sketch, on your species occurrence map, the approximate area covered by rare plants this year, or if not found, please sketch the area searched. Your monitoring coordinator has several GPS units available to lend.

NPS GPS unit

Please record the NPS unit number of the GPS, if borrowed from your coordinator.

Coordinate system/datum

We prefer decimal degrees referenced to NAD-83 recorded to four places for accuracy (for example, 42.4910°, -76.4584°). If you have borrowed an NPS GPS unit, it will be preset to that coordinate system and datum. If you are using your own GPS, please set the coordinate system to decimal degrees and the datum to NAD-83, and circle the default on your data form. If you must use a different coordinate system or datum, specify which on your data form.

GPS coordinates - small occurrence

For occurrences smaller than about 1,000 ft² (100 m²) - that is, smaller than a square about 32 feet (10 m) on each side, or smaller than a circle with a radius of about 18 feet (5.5 m). Record the GPS coordinates near the center of this occurrence, taking care not to trample the occurrence.

GPS coordinates - larger occurrence

For occurrences larger than 1,000 ft² (100 m²), as described above, or longer than 50 feet (15 m), record GPS coordinates to define the edges. To define a long, skinny occurrence, record GPS coordinates at either end. For other large occurrences, record GPS coordinates at the plants that are furthest North, South, East and West from the center.

GPS Accuracy

Record the positional accuracy in feet or meters for these coordinates from your GPS unit.

Area covered by rare species - small occurrence

For occurrences smaller than about 1,000 ft² (100 m²), as described above, measure area as follows. Mark the edges of the occurrence with temporary flags and visualize a square that contains the entire occurrence. Use a measuring tape to measure the longest distance (length) and perpendicular distance (width) within this square. Record length and width distance and circle units (feet or meters) used.

SECTION 2 : RARE PLANT DATA

Occurrence photo

A digital photograph will provide an enduring visual record of plant condition. To take the photo, stand near the center of the occurrence, taking care not to trample or damage individual plants. Look in all directions to find a good example of a group of plants in flower and fruit, if possible, visible from your location. Allow the camera to automatically select the appropriate aperture for the given light conditions. Capture a digital photograph of the scene. Display the image to check the photo for obvious blurring, and capture a better image if needed.

Count unit

Record the count unit used as either 1) stems (for trees, many herbs, and some shrubs); 2) clumps (for some grasses, sedges, shrubs); or 3) rosettes (for some herbs). Use the same counting unit recorded on the form from most recent observations, unless your monitoring coordinator has given other instructions. A stem is a single stalk emerging from the ground that is separate from other stems (for example, a tree). A clump is a group of stalks emerging together (for example, many grasses and shrubs). A rosette has a dense cluster of basal leaves, from which a flowering stem will emerge when the plant matures (for example, a dandelion).

Plant count

For occurrences comprised of less than or equal to approximately 250 stems, clumps or rosettes, count using a tally counter and record the number of plants. When counting plants, it is easy to overlook small or juvenile plants, especially in dense cover. Search as thoroughly as possible, without trampling the rare plants. As you count, take stock of about what portion of the rare plants are vegetative, flowering, fruiting, and senescent (see definitions below). For non-vascular plants (mosses or lichens) or densely matted plants (some grasses and shrubs), omit this measurement. Percent cover will be measured instead (below).

Count time

How long did you count? Record approximately how many minutes you spent searching for and counting plants.

Plant estimate

For occurrences of more than 250 stems, clumps or rosettes, estimate as 251-500, 501-1000, or >1000. For non-vascular plants (mosses or lichens) or densely matted plants (some grasses and shrubs), omit this measurement. Percent cover will be measured instead (below).

% Cover non-vascular or matted plants

For non-vascular plants (mosses or lichens) or densely matted plants (some grasses and shrubs), record the average % ground covered by this species within the occurrence area using these classes: 0, 1-5, 6-25, 26-50, 51-100%.

Life-stage classes - % vegetative, % flowering, % fruiting, % senescent



While you are counting (above), examine the plants for flowers and fruits. Keep in mind that a single plant may have both flowers and fruits at the same time. Plants that have not yet produced flowers or fruits will be classed 'vegetative.' Plants that are withering or drying up and show no evidence of flowers or fruits are classed 'senescent,' Estimate the % of plants within each of these categories (vegetative, flower, fruit, senescent) using these classes: 0, 1-5, 6-25, 26-50, 51-100%.

Seedlings or immature present?

Can you see seedlings or immature plants? These provide evidence that the plant is successfully reproducing. It may take time and careful looking to determine if there are small, vegetative plants with the same leaf characteristics as the adult plants. Carefully move aside other vegetation to look near the ground. If you are not sure, record "Unsure". Please try to take a digital photo of a seedling or immature plant.

What is the condition of this rare plant occurrence?

In your opinion, what is the condition of this rare plant occurrence compared to others you have seen? Describe as excellent, average, or poor based on evidence of herbivory or disease, leaf color or retention, plant or flower size, number of leaves or flowers, or evidence of disturbance, as appropriate. Please note the characteristic(s) considered and what you observed. For example, "Excellent condition, no problems seen and many leaves/flowers" or "Poor condition, leaves with many insect holes, and few flowers." If you are unsure, circle unsure.

SECTION 3 : ASSOCIATED SITE CONDITIONS

Water on site

Observe how wet or dry the soil is beneath this occurrence. Record as Flooded (standing water present), Wet (saturated but no standing water), Moist (feels moist but water does not emerge when soil is squeezed), or Dry.

Sunlight

Observe the amount of sun affecting most of the plants in this occurrence. Record as >95% sun, 51-95% sun, 5-50% sun, or <5% sun.

Common species

Dominant species exert a strong influence on the site, and site conditions affecting rare species can change substantially as these species change due to succession or other processes. Please list the most common plants of other species growing together with and near this occurrence within 10 feet (3 meters). Record up to 3 trees, 3 shrubs and 5 understory plant species in order of declining abundance. Use scientific names if known, otherwise use common names. If you do not know a plant, collect a twig (if plant is a tree or shrub) or a photograph (if plant is not woody) of a mature individual (preferably flowering) for your monitoring coordinator. If the most common species are the same as previously recorded, circle "Same as previous".

Invasive exotic species

Record the scientific or common name of any invasive exotic species growing intermingled with or nearby (within sight) of this occurrence. For each species, note the degree of infestation as low (only a few individuals seen), medium, or high (invasive species dominates the site).

Disturbance

Look for evidence that these common disturbances may be affecting this rare plant occurrence. Record threats which are obvious as you visually survey the site. Do not trample rare plants by making an exhaustive search.

Trampling. Look for trampled vegetation within sight of this occurrence. Estimate how many plants in this occurrence are affected as None, Trace, Some or Most. Do not include any trampling that may have occurred during your visit.

Browsing. Look for stems that have been browsed, and estimate how many plants in this occurrence are affected as None, Trace, Some or Most.

Insect damage or disease. Look for and record evidence of disease or insect damage including damage to leaves, twigs, stem, buds or other plant parts. If possible, take a photograph. If you recognize the disease or insect, write it down. Estimate how many plants in this occurrence are affected as None, Trace, Some or Most.

Competition/succession. Look for evidence that other plant species are hurting this occurrence due to competition or due to shading associated with plant succession (that is, change in the plant community, often progressing from shorter to taller species). Estimate how many plants in this occurrence are affected as None, Trace, Some or Most.

Drought. Do you see wilted rare plants or extremely dry soil that may indicate drought stress?

Erosion. Do you see tracks of bare soil on the ground occupied by rare plants indicating erosion?

Trail maintenance. Do you see evidence that trail maintenance (including mowing and clipping of vegetation) has affected this occurrence?

ATV tracks. Do you see ATV tracks within or nearby (within sight) of this occurrence?

Social trails. Are there unofficial “social trails” leading to or through this occurrence?

Campsite. Do you see a campsite nearby? How far away is the site?

Plant collection. Do you see evidence of digging that may indicate plants from this occurrence have been collected?

New development. Do you see evidence that new development nearby may be affecting this occurrence? How far away is the development?

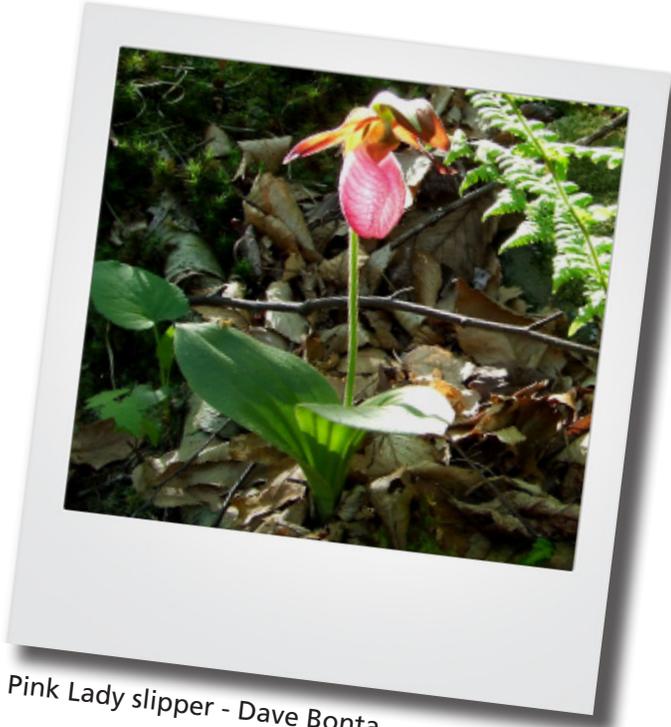
Other disturbance. (please describe) and disturbance specific comments, if any. Describe evidence of any other disturbance you see that may be affecting this plant occurrence. If possible, take a photograph. Record specific comments describing any disturbance noted above.

Comments, suggestions and/or management actions that may benefit the rare plants.

In your opinion, what management action, if any, may benefit this rare plant occurrence? Record any other useful observations about this rare plant occurrence.

Photo log

While at the site, record each photograph in this log. Include a description of what feature was photographed, and the location and direction in which the photo was taken.



Pink Lady slipper - Dave Bonta

Time spent

Record the time spent a) monitoring this occurrence, b) traveling to the trailhead, and c) hiking to the occurrence.

APPALACHIAN TRAIL Rare Plant Monitoring Dataform, Version 1.00

Please avoid trampling rare plants and the site in general. Remain as still as possible and step carefully. During your visit, refer to the monitoring report and rare species occurrence map given to you during training. Fill out this form as directed in the AT Rare Plant Standard Operating Protocol (SOP) also given to you during training. If you see an urgent threat or disturbance to the rare plants, please contact your coordinator immediately!

Monitor name: Laird Granger **Visit date:** 7/12/11
Email or phone: Laird@gmail.com **Site name:** _____
Common name: _____ **Site number:** _____
Scientific name: _____
Found? Yes No Unsure
Why unsure if found? _____

If you were unable to bring a GPS unit, please **sketch**, on the rare species occurrence map provided to you, the approximate area covered by rare plants this year, or if not found, please sketch the area searched.

NPS GPS Unit: # _____ **Coordinate system/Datum:** _____ **Decimal degrees/ NAD83** **OR**

For small occurrences (<1000 ft² or < 50 ft long):

For larger occurrences:

GPS coordinates: X Y	GPS N or top: X Y
GPS accuracy: _____ ft or m	GPS E: X Y
Area covered by rare species	GPS S or bottom: X Y
	GPS W: X Y
Length: _____ ft or m	GPS accuracy: _____ ft or m
Width: _____ ft or m	

Rare Plant Info

Count unit: stem OR clump OR rosette	% Vegetative: 0 1-5 6-25 26-50 51-100
Plant count: _____	% Flowering: 0 1-5 6-25 26-50 51-100
Count time: _____ minutes	% Fruiting: 0 1-5 6-25 26-50 51-100
OR Estimate: 251-500 501-1000 >1000	% Senescent: 0 1-5 6-25 26-50 51-100
OR %Cover: 0 1-5 6-25 26-50 51-100	Seedlings or Immature present? Yes No Unsure

What is the condition of this rare plant occurrence?

Please note the characteristic(s) considered and what you observed:

Excellent
Average
Poor
Unsure

Associated Site Condition (Circle one)

(Estimate amount of light reaching rare plants)

Water on site: Flooded Wet Moist Dry **Sunlight:** >95% sun 51-95 % sun 5-50% sun <5% sun

