

A.T. Natural Heritage Monitoring Program

-Evaluation-



Gray's Lily, *Lilium grayi*

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A.T. Natural Heritage Monitoring Program Evaluation

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History and Background

The Appalachian Trail (A.T.) natural heritage monitoring program is based on a series of natural heritage inventories that were conducted on lands within all 14 states through which the A.T., more officially known as the Appalachian National Scenic Trail (ANST), passes. These inventories, conducted from 1989 to 2001, documented rare, threatened and endangered (RTE) species and rare or exemplary natural communities within the A.T. corridor. Documentation of RTE vertebrates has varied from state to state, and only a few heritage inventories include non-vascular plants and invertebrates.

The state natural heritage inventories documented approximately 2,050 occurrences of rare, threatened or endangered species and rare or exemplary natural communities within 515 natural heritage sites along the ANST corridor. The number of RTE occurrences within the Appalachian National Scenic Trail corridor is believed to be the greatest of any National Park Service unit.

In accordance with the National Park Service's mission statement (1916), the Appalachian National Scenic Trail Park Office (ATPO or A.T. Park Office) and its managing partners are obligated to "preserve unimpaired [the park's] natural and cultural resources and values [...] for the enjoyment, education, and inspiration of this and future generations." This obligation translates first and foremost into a responsibility that the A.T. Park Office, the Appalachian Trail Conservancy (ATC) and all its maintaining clubs, and other managing partners do no harm to the Trail's natural heritage.

The ATPO and ATC's natural heritage monitoring program is a first step towards fulfilling this obligation. By tracking the status of RTE occurrences, the A.T. managing partners can ensure that A.T. related activities and management decisions are not adversely affecting these natural resources. More specifically, monitoring and communicating results to the relevant partners can help to prevent inadvertent harm to species and critical resources during trail maintenance activities, and can direct rapid proactive responses to trail-related impacts including trail relocations away from sensitive locations.

Each of the 14 natural heritage inventories resulted in recommendations for specific species and sites to be monitored on a regular basis, based on their location and classification. Because of the large number of occurrences identified by the inventories, and the range in status observed (i.e. from globally rare to state endangered), the documented RTE occurrences were prioritized in 2002 and 2003 by National Park Service staff to allow management actions to first address the rarest and most threatened species and sites.

Of the 515 currently known natural heritage sites, 131 are currently included in the monitoring program. In 2006, 56% (74 of 131) of those designated sites were monitored, which amounts to approximately 14% of the total sites.

Now that the program has been running for over 10 years, it is appropriate to review the results it has yielded so far and evaluate whether the program is meeting its objectives. The review is intended to comprehensively assess the existing monitoring program and recommend ways that the program can be improved including, but not limited to: trail-wide coordination; coordination with relevant organizations; communication of monitoring results to trail managers; volunteer training and retention; and improvements in monitoring procedures and methods.

Purpose

This evaluation aims to ensure that the Appalachian Trail natural heritage program meets the management and reporting objectives and needs of the Appalachian Trail Park Office, the National Park Service Inventory and Monitoring Northeast Temperate Network, and the Appalachian Trail Conservancy.

Committee:

The committee that conducted the evaluation was composed of:

Caroline Dufour – Evaluation Project Manager (Appalachian Trail Conservancy)

Geraldine Tierney (SUNY, NETN Collaborator)

David Field (Maine Appalachian Trail Club)

Robert Pickett (Botanist/Naturalist, Potomac Appalachian Trail Club)

Chris Mattrick (Forest Botanist, White Mountain National Forest)

Diane Pavek (Research and Endangered Species Coordinator for the National Capital Region)

Nora Murdock (NPS Appalachian Highlands Network)

Ted Elliman (Botanical Consultant/NEWFS Vegetation Management Coordinator/IPANE Volunteer Coordinator)

Wendy Cass (Botanist at Shenandoah National Park)

Carolyn Wells (US Fish and Wildlife Service, NC field office)

Objectives:

The evaluation's objectives were to:

- Clearly state the existing program's goals and objectives
- Evaluate whether the program's methods and procedures are sufficient to meet program goals and objectives
- Evaluate current process and criteria for regularly reviewing monitoring priorities
- Evaluate the current program's ability to coordinate with relevant organizations
- Evaluate the process, schedule and criteria for periodic program review (after-action review) aimed at evaluating existing programmatic procedures, including: data collection; reporting and data integration; volunteer recruitment, training and retention; and, program management
- Make recommendations aimed at improving the previous aspects as appropriate

I. Program Goals and Objectives

Program Goals:

The program's goals are based on 1) the NPS Appalachian National Scenic Trail's responsibilities as a Park Unit to provide for the protection of rare, threatened and endangered species, 2) the need identified by both the NPS ATPO and the ATC to raise awareness of rare, threatened and endangered species within the Trail constituency and with the general public and to garner more support and appreciation for the A.T. and its managing agencies, and 3) the need to remain true to the core value of volunteerism that is intrinsic to the Appalachian National Scenic Trail.

Program goals are to:

- Contribute to the protection of rare, threatened and endangered species and communities on Appalachian National Scenic Trail 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 A.T. community through volunteer involvement
- Raise public awareness of the A.T. as a protected refuge for significant biodiversity

These goals are consistent with the goals historically associated with the Program since its inception (refer to the program history section).

Program Objectives:

To contribute to the protection of rare, threatened and endangered species on Appalachian National Scenic Trail lands, Program partners will:

- Identify trends such as decline, stability or increase in populations or occurrences of priority RTE species
Identifying trends over time is the first step towards detecting problems and taking action to protect these populations and occurrences, as well as to accumulate enough information to make larger-scale inferences on the status of RTE species in the future. The amount of time needed for a trend to be detectable depends on the species.
- Identify and track threats to priority element occurrences of RTE species, populations and rare communities, anthropogenic or otherwise, and react as is appropriate and possible with available resources
Trends indicating a decline in populations or occurrences may be correlated with threat information, potentially enabling managers to identify the threat causing the decline, and to mitigate that threat if appropriate.

- Prevent damage to RTE species element occurrences by A.T.-related recreational use or maintenance by using and distributing element occurrences information in all planning and implementation of operations and maintenance by relevant organizations and individuals
The first responsibility of both ATPO and ATC is to do no harm: monitoring RTE occurrences, populations and/or communities and communicating the results will give managers the ability to proactively prevent damage caused by A.T. recreational use or maintenance such as hiking, overnight site use and maintenance, trail work (relocations, rock work, etc.), shelter building and maintenance, etc.
- Actively protect priority RTE species on ATPO lands; provide information and encourage the protection of RTE species on lands owned by other agencies
The Appalachian National Scenic Trail Park Office can only take management action on lands held by the Park Service. On NPS lands, ATC and ATPO can coordinate to take appropriate action to protect priority RTE occurrences, populations or communities, such as removing exotic plants or mowing open areas. However, on lands that are part of the Appalachian National Scenic Trail corridor but held by other agencies (US Forest Service, State agencies, or even other National Parks), the ATC and ATPO do not necessarily have authority to undertake management actions. In those cases, ATC and ATPO must communicate with the responsible agencies and work with them towards protecting RTE occurrences, populations or communities as appropriate.
- Evaluate the effectiveness of management actions; implement adaptive management
Documenting management actions (what was planned and what was actually done) and analyzing monitoring data before and after a management intervention will enable management agencies to evaluate the effectiveness of management actions, and adapt interventions accordingly.

To develop an appreciation for rare plants and animals in the A.T. community, and to raise public awareness of the A.T. as a protected refuge for significant biodiversity, Program partners will:

- Engage Trail Club and ATC memberships in RTE monitoring activities
Trail club and ATC memberships are core supporters: they are already invested with the A.T. and most are familiar with the volunteer ethic. Involving them with monitoring is a way to show them an additional facet of the A.T. through a medium with which they are familiar (volunteering), in a hands-on, experiential way. It is also a way to get the manpower needed to fulfill the previous objectives.
- Regularly share program updates and results with ATC clubs, membership and volunteers

It is vital that the volunteers involved with the Program have access to results, in a format that is both manageable and acceptable to management agencies: this access will act as feedback, which is necessary for volunteer retention.

There will also be club and ATC members and others in the A.T. community who may not be interested in volunteering for the RTE program, but may have an interest in program results and may gain greater appreciation for the Trail by having access to such information. Finally, the clubs, ATC's membership and all volunteers may be more supportive of the program and of the broader goal of protecting RTE species if they are informed.

- Showcase program results and updates for the public through ATC's website and other public interfaces as feasible.

ATC, ATPO and other A.T. management partners agree that it is important to reach beyond the A.T.'s core community to the general public and increase awareness of the A.T. as an important biodiversity resource as well as a recreational asset. Reaching a wider public and increasing support for and appreciation of the A.T. will be crucial to its continued protection. Showcasing program results and updates through broad-reaching media such as the ATC's website is one means by which broader public interest and support can be attained.

II. Primary RTE Monitoring Program Responsibilities

At the current time, primary program responsibilities are described as follows:

ATPO Natural Resources Specialist

- Overall program coordination
- Reviewing reports and assessing priorities for monitoring and management
- Training

State monitoring coordinators (ATC field staff and club volunteers)

- State-level coordination including volunteer recruitment and gathering of monitoring reports

Volunteers

- Field data collection
- Database input

ATPO Physical Scientist

- Database and GIS data management
- Supervision of database input
- Supplementary mapping

Specific aspects such as analyzing the data, sharing results with volunteers and with the wider constituency, coordinating with the clubs regarding maintenance activities, and other such elements have not been clearly delineated and assigned. The recommendations in the following sections aim to address this issue.

In addition, the NPS Inventory and Monitoring Program's Northeast Temperate Network has recently established a new position, the A.T. Environmental Monitoring Coordinator. The I&M Network is charged with helping the parks improve and support their environmental monitoring programs and make sure these programs are scientifically sound and manage their data well. The I&M Network has significant scientific and technical expertise in data management.

Recommendations:

1. The I&M NETN A.T. Monitoring Coordinator should lead and oversee the follow-up to this report and the implementation of the recommendations, with ATPO and ATC staff cooperation. Additional expertise can be brought in on a contractual or volunteer basis.
2. Unless the program is restructured, program responsibilities should remain fundamentally unchanged: the following recommendations will help to further define and clarify these responsibilities.

III. Monitoring Priorities

Currently, the sites identified for monitoring are largely the sites that were recommended after the initial natural heritage inventories. Key staff from the State Natural Heritage Offices, ATC and ATPO were involved in making the original selection of sites to be included in the program. There were a variety of valid reasons to include sites within the A.T. natural heritage monitoring program, including: the rarity and status of the species present; the interest of the state natural heritage office in having the site monitored; the ease by which volunteers could monitor a species; and, the threat to the site or species occurrence.

Decisions on which species and sites to place into the A.T. monitoring program generally occurred at the completion of each state's A.T. natural heritage inventory. The inventories were completed from 1989 to 2001. The decision-making process as well as the people involved varied by state: there were no trail-wide guidelines or criteria, although the basic considerations seem to have been similar. Most sites identified and recommended by the inventories were included in the monitoring program although some of the sites or occurrences that were deemed dangerous, too remote or too difficult to identify for volunteers were not included. The A.T. natural heritage monitoring sites currently include G1, G2, G3, S1, S2 and S3 species, as well as some rare communities. Monitors are assigned to sites as opposed to Element Occurrences.

There is no mechanism in place to review the sites included in the program nor to get data and evaluate newly discovered occurrences/sites for possible inclusion in the program. Because there is no systematic, regular review of the sites included in the Program, changes in species rarity status or rank are not necessarily reflected in the monitoring site list. Changes are sometimes made upon the requests of volunteers or coordinators, such as removing sites when species are no longer considered rare, or if a population can no longer be found. There is also no prioritizing or differentiation between

different sites or occurrences as far as monitoring goes: all sites are scheduled to be monitored once a year, regardless of the threat level or type of species present.

Recommendations:

1. ATC's natural heritage monitoring efforts should be directed at rare species occurrences and sites within (or at least partly within) the A.T. corridor where it is clearly defined and surveyed (i.e. ATPO lands), or within 500 feet either side of the trail in areas where the trail corridor is not clearly defined in the field (i.e. Forest lands and State lands). Natural heritage sites identified during preparation of each state's AT natural heritage inventory but lying outside of these areas should be designated "NON-A.T. SITE" and should not be included in the AT natural heritage monitoring program. Such sites should be pointed out to the appropriate management agency if the land is held by a public entity.

Verifying locations and removing sites from the program list should be the responsibility and jurisdiction of ATC field staff, with the understanding that they may need GIS and database assistance from the ATPO Physical Scientist. This should be done prior to the 2008 monitoring season if possible.

2. Monitoring efforts should be directed towards:

S1 and S2 species and/or those designated State Endangered or State Threatened Federally designated Endangered or Threatened Species G1, G2, or G3 (globally rare or globally uncommon) species.

S3 (State uncommon) species, although included in the inventories, should be a focus of concern only if there is an extraordinary population worthy of occasional monitoring (perhaps every 5 or 10 years) or if trail work is likely to damage a significant part of a population unless precautions are taken to protect it.

Any site with S1, S2, G1, G2 or G3 species, as well as federally-listed endangered or threatened species should therefore remain on the monitoring list. The frequency of monitoring may be adjusted (see point 4). Sites with only S3 or other rank/status species should be removed from the list or put in a separate category addressed as time and volunteers allow, unless specific anthropogenic trail threats must be tracked. Within priority sites, non-priority occurrences (S3 or other lower rank or status) can be monitored at a lower frequency or not at all.

Updating listing information in the database as well as updating the list of sites and occurrences to be monitored based on the statuses should be the responsibility of ATPO staff: the Natural Resource Specialist and Physical Scientist should collaborate. NPSpecies, the park species database of the NPS I&M Program, regularly updates this information and may be useful in keeping the A.T. list current. ATC field staff may recommend specific sites or occurrences of S3 or

other lower rank/status species for monitoring based on their field knowledge of hiker traffic, proximity to the Trail and other potential causes for concern.

In addition to considering the ranks and statuses as described above, input from regional experts should be sought to refine the list of species to be monitored. Global ranks are not always updated fast enough to reflect actual population tendencies, and certain states are more liberal than others in designating S1 and S2 species. Regional experts can help focus attention on species most at risk. Any decision based on regional expertise should be documented.

3. Only 14% of the total number of current AT natural heritage sites were monitored in 2006, representing 56% of sites included in the monitoring program. This seems like a low proportion. Sites previously not included in the program may need to be re-evaluated, and the reasons for their inclusion or rejection documented.
4. A glossary of terms and definitions should be put together, clarifying the meaning of S1, S2, S3, G1, G2, G3 terms, as well as the federal designations, and any other terms of relevance to program managers.
5. The state, federal and global listings should be updated into the database every three years, or as the states update their lists (for example, Maryland updates its list approximately every 5 years while Virginia does it annually), and the list of monitoring sites reviewed and updated consequently. As mentioned above, NPSpecies, the park species database of the NPS I&M Program, regularly updates this information and may be useful in keeping the A.T. list current. Consultation with regional experts should follow. Data on new occurrences or sites discovered within the A.T. corridor should also be collected from the State Natural Heritage Offices at least every three years if not annually and included in the update. These updates should be completed at the end of every monitoring season, in time to be taken into account during the monitoring season.

Obtaining the updated listings, updating the database and the list of monitoring sites on schedule and sharing it with regional offices should be the responsibility of ATPO staff. Consulting with regional experts to refine the list and communicating this list back to the ATPO office should be the responsibility of club coordinators and ATC regional staff.

6. The frequency of monitoring should be adjusted based on the location of a site or occurrence, its vulnerability to damage and degree of threat, as well as the trends that have been detected.

For example, a site that is under no current threat and is not near sources of disturbance (Trail, shelter, etc.) and that has shown steady or improving

conditions for several years may not need to be monitored on a yearly basis. Longer intervals may be sufficient depending on the species.

Conversely, a site that was on a three or even five year monitoring schedule but whose latest monitoring results show a threat or symptoms of decline should be followed more closely and brought back to an annual schedule.

Any site that was the focus of a management intervention should be monitored annually or even more frequently if appropriate, to determine the impacts and efficiency of the management intervention.

The ATPO Natural Resources Specialist and ATC staff should determine appropriate frequencies of monitoring jointly, and consult other experts as needed.

7. There may be populations of species on the Trail that are so significant, sensitive and/or difficult to identify and monitor that engaging professional help to monitor these populations is warranted. It may also be possible to find professional-level help by contacting botanical societies and other expert organizations. The list of A.T. sites to be monitored should be reviewed with this option in mind.
8. Monitoring and management of federally-listed Endangered and Threatened species has to be conducted in accordance with the requirements for Federal agencies listed in the Federal Endangered Species Act. These requirements should be researched, listed and explained in a document and communicated with ATPO and ATC staff involved with the program.

IV. Coordination with relevant organizations

Coordination with other land managing agencies concerned with the A.T. corridor as well as with A.T. maintaining clubs is interlaced with the program objectives. Coordination with other types of organizations is not a goal or an objective of the Program but may be a means to achieving some of the objectives.

State Natural Heritage Offices

As outlined in the Monitoring Priorities section, one of the most important points of collaboration and coordination with the State Natural Heritage Offices may be to get regular updates from them on state listings and rankings of species, as well as on new occurrences and sites that may have been identified on A.T. lands.

At present, coordination with State Natural Heritage Offices is inconsistent. At the beginning of the program, ATPO and ATC staff created a monitoring form that would be used for the entire Trail, which enables ATPO and ATC to enter, track, manage, compile and compare data much more effectively. It does however mean that A.T. data is not collected following State Natural Heritage Program formats, and although some of the

information collected is similar there are in some cases fundamental differences that makes A.T. information unusable to the State Natural Heritage Programs.

In December 2006, NatureServe submitted a report to the National Park Service Northeast Temperate Network on data sharing between the NatureServe Network and the NPS A.T. Natural Heritage Monitoring Program (see Appendix 1- NatureServe 2006 Report). Although the report concluded that data sharing was possible and potentially valuable, it also highlighted potential difficulties. NatureServe collected the Natural Heritage monitoring forms of the 14 states that the Trail crosses, compared them for cross-cutting fields, and also submitted a survey on data sharing. The form comparison showed that although the type of information collected is often similar, the states use different terminology and the forms vary widely in their degree of complexity and the amount of information gathered.

Twelve data sharing surveys were received in time to be included in NatureServe's report. These surveys showed that the States have widely differing criteria for accepting external information. Most of the state programs are primarily interested in receiving information about "tracked" species only, generally meaning state-listed species, but the specifics of what they include as "tracked" species change slightly (for example, a few include watch-list species, most do not). The minimum fields to be filled for information to be accepted also differ significantly: most include the date when the observation was made and a map, several require GPS coordinates, and some require their entire form to be filled out.

NatureServe did not distinguish between new occurrence data and updates when crafting their survey questions, but several respondents did make this distinction when answering the questions and indicated that updates are of far lesser priority than new data. In response to a question about the speed with which external information would be entered by the Heritage Office, eleven of the twelve surveys responded that it takes months if not years for the data to be entered. The twelfth survey responded that data was entered in weeks or months, however the answers seem to indicate that the responder was only thinking of new occurrence data.

While all State Natural Heritage Offices expressed willingness to receive external data, only a few expressed a desire to receive it. ATPO has an agreement with the Virginia State Natural Heritage Office and sends them hard copies of the monitoring forms every year. Aside from that exception, neither ATC nor ATPO have obligations towards any other State program, and it is up to ATC regional offices to share the information if they choose.

Originally, when the A.T. Natural Heritage Inventories were completed, the State programs were involved in selecting which sites to monitor. The results of the data sharing survey show that the State programs are interested in receiving information about occurrences based on certain criteria (state listed, new as opposed to updates, etc.), so that if data sharing was to occur and be useful, ATC and ATPO would have to be flexible and

create data sets to send to the Offices based on their current criteria and needs and not on the original inventories.

Finally, in certain cases, the Park Service may be prevented by Director's Order #66 from sharing location-specific data with State Programs: for states with sunshine laws or their equivalent, sharing information with the states is tantamount to public release.

Recommendations:

1. In the short to medium term, the program should focus on getting updates from the Natural Heritage programs, and addressing other issues and recommendations. This may change of Natural Heritage Programs request A.T. data in return for providing updates.
2. In the medium term, the program may be able to coordinate with State Natural Heritage Programs. Collaborating directly with the state programs would require meeting with State Heritage Program staff in each state to explore common ground. Coordination with State Natural Heritage Programs may require determining the different states' criteria for receiving information, keeping these updated, requiring the volunteers to gather any state-required information not included in the ATC form, having the capacity to enter this in the database and send it to the Heritage Programs in electronic format (this would cut down on handling time and increase the likelihood of the information being used by the State Programs) according to their specifications. All of this has to be done with regard for Director's order #66 as explained above.
3. Another option would be to collaborate with the State Natural Heritage Programs through NatureServe: NatureServe coordinate the State Natural Heritage Programs and would be an ideal intermediary and facilitator in trying to synch the A.T. program with State Natural Heritage programs. Even then, some of the changes described above would still have to be implemented for the collaboration to be possible.

NatureServe

There is no formal collaboration with NatureServe at present. NatureServe's 2006 report outlines potential avenues, challenges and advantages of collaboration for the A.T. Natural Heritage Program, and dealing directly with NatureServe would most likely be the most efficient way to deal with the needs and requirements of 14 different State Natural Heritage programs.

Recommendations:

1. Collaboration with NatureServe is not a priority for the Program at this point, similarly to full collaboration with State Natural Heritage programs: the evaluation committee suggests improving other aspects of the program including SOPs for data gathering, data management and volunteer management before tackling data sharing with NatureServe and the State Natural Heritage Programs.

It may become advantageous in the future to collaborate with NatureServe, once their software is implemented and if their turnaround time on gathering updates and redistributing them out to their network improves.

Other land managing agencies

At present, collaboration with other land managing agencies such as individual National Forests and Parks as well as state management agencies is at the discretion of ATC regional staff or ATPO staff. There are no guidelines or procedures in place to share data with these managing partners, nor to coordinate with them with regards to management responses.

Recommendations:

1. Collaboration with other National Parks, National Forests and state agencies should be increased. These public land owners should be contacted to verify whether they are also monitoring RTE species, which species they are monitoring, whether they wish to receive data, whether they could lend assistance, etc. Contacting these land owners, maintaining and building relationships and sharing information should be the responsibility of ATPO staff.
2. Data sharing agreements with other public landowners relevant to the program could be considered.

Other environmental monitoring organizations

As with other land managing agencies, collaboration with other non-governmental organizations is presently at the discretion of ATC staff. There are no guidelines indicating whether this is desirable or not and under what conditions. In New England, the New England Wild Flower Society and the New England Plant Conservation Program (NEPCoP) have had some overlap with the A.T. Natural Heritage Program, and in the south the Southern Appalachian Highlands Conservancy has expressed interest in coordinating with regards to monitoring in our common area of interest. SAHC currently coordinates with a group which includes US Fish and Wildlife Service, US Forest Service, NC Natural Heritage Program and others in the Roan Highlands area, and ATC SORO staff has been coordinating with this group for the last 10-15 years.

Recommendations:

1. ATC staff and club coordinators who have been involved in collaborative efforts could form a committee and use their experience to create guidelines for collaboration with other organizations conducting environmental monitoring, including the role that ATC and others should play in such partnerships and what ATC hopes to gain from other partners (more volunteers, expertise, etc.). These guidelines can be used to help ATC develop partnerships Trail-wide that help achieve program objectives while keeping some consistency.

2. Coordinating with regional partners should be handled by the club coordinators and the ATC field staff. An obvious goal of coordinating should be to prevent duplication of effort.

Trail Clubs

Appalachian Trail Clubs are one of the audiences of this program as well as essential participants, and there is already a degree of collaboration in that most of them are involved with the program either through the participation of some of their members as volunteer monitors, or through some of their staff or members helping to coordinate the program in their states (see section VII).

One of the objectives of the program is to “prevent damage to RTE species element occurrences by A.T.-related recreational use or maintenance” (see the Objectives section). This has led to the creation of Rare Plant Identification Sheets showing RTE sites and species identification information for occurrences that have been judged to be near enough to the Trail (within about 3 feet) that they warranted caution by the maintainers (see examples in Appendix 2). Although the sheets enable maintainers to recognize most rare plants, the rare plants ID sheets do not tell the maintainers what to do if they do encounter those plants in their section. Some of these rare plants would benefit from having other vegetation cut around them, others not, etc. In 2001, a letter accompanying the sheets sent to club presidents had instructions on what to do and not do around rare species.

Some rare species, including some known to be in the immediate vicinity of the Trail, are very difficult to identify for amateurs, even with rare plant ID sheets.

The rare plant ID sheets are not regularly updated: at present many do not have updated contact information. They are also not regularly systematically distributed to the maintainers. The last systematic distribution was in 2001, when the sheets were given to all trail club leaders. The ATPO Natural Resources Specialist sends these sheets out upon request, usually to club presidents, and relies on ATC regional staff to relay information from the clubs about their need for more sheets. Clubs sometimes contact The ATPO Natural Resources Specialist directly. ATC regional staff has been largely unable to keep track and be proactive about these sheets because of time constraints. The sheets are currently only available in hard copy.

Recommendations:

1. The Rare Plant Identification Sheets should be updated with correct ATC contact information, GIS mapping, and better indications to maintainers of what they should do if they encounter the rare plant or what they have to be careful of. This should be under the responsibility of the ATPO Physical Scientist, who can draw

- on ATC field staff and the ATPO Natural Resource Specialist for information. These sheets should be reviewed each year to ensure that they are up to date.
2. The Rare Plant Identification Sheets should be created and saved in electronic format.
 3. The Rare Plant Identification Sheets should be distributed in electronic format to the appropriate ATC regional offices and to the club presidents and other appropriate club officers (club coordinators, maintainer coordinators, etc.). The ATPO Natural Resources Specialist should make sure that the forms get distributed to the maintainers, and ensure that the club has enough laminated copies for their use.
 4. The Natural Resources Specialist should contact the club presidents and appropriate trail officers yearly and make sure they have sufficient amounts of laminated copies for their maintainers.
 5. The Natural Resource Specialist may coordinate with the club presidents and appropriate club officers to offer workshops with maintainers and other club members to sensitize them to RTE species, invasive species, and demonstrate the usefulness of and need for the Rare Plant Identification Sheets. These events could be held like recreational presentations on A.T. RTE species: guest speakers, regional staff and other experts should be invited to present. However effectiveness should not be sacrificed for entertainment value: for maintainers to avoid doing damage is essential. Events should be tailored to regional circumstances and the clubs' interests.
 6. The list of rare species and their location for the A.T. should be reviewed with an eye to identifying potential populations of rare species that are near the Trail and are difficult to identify (and thus are likely to be unrecognizable to maintainers). These populations should receive special attention and potentially be monitored by professionals to ensure that they are not suffering from their proximity to the Trail.

V. Data collection, reporting, management and sharing

Data collection

At the beginning of the program a trail-wide data collection form was created, inspired by the State Natural Heritage Program forms of the first states to be inventoried. Over time, ATPO and ATC staff made changes to the Trail-wide form based on experience as well as to integrate some of the data that other State Natural Heritage Programs collected. The form has seen minor updates every 2 or 3 years since its creation. The latest version of the form is included in Appendix 3. Despite the efforts of the regional staff to distribute the new form and to ask volunteers not to use the old ones, some volunteers still use previous versions.

Every year before monitoring season, monitoring coordinators send monitoring forms out to Natural Heritage volunteers. The forms are sent out in hard copy, or in electronic format for those who request it, and any additional instructions are at the discretion of the coordinators. Most coordinators usually include a letter or e-mails asking the volunteers

to monitor their sites and thanking them for their participation. The ATPO Natural Resources Specialist has asked the coordinators to include a request to the volunteers to fill out the forms completely.

Reporting - Monitoring form

The form currently includes an identification section which allows ATC and ATPO to know which volunteers participated, which sites were monitored and on what dates, as well as a data section which provides information on the species monitored. This means that several forms can be turned in for one site if that site has more than one species identified for monitoring.

Data gathered includes both quantitative and qualitative estimates.

Volunteers are asked to estimate the proportion of the population found at the different development stages (i.e. flowering, in fruit/seed, or vegetation only), to count or estimate the number of individual plants found (either by counting stems or clumps), and to estimate the area covered by the rare species.

Qualitative data includes an assessment of the “vigor of the species” where a scale from “excellent” to “struggling” is provided, a comparison of the current size and vigor of the population with what was observed at the last visit based on a scale from “Improved” to “Declining”, and an assessment of specific threats present on the site. There is also a section reserved for management recommendations from volunteers, and a question as to whether they can implement their recommendation themselves or would need help.

Some fields are optional, such as GPS locations and photographs. GPS locations are seldom submitted, photographs are more frequent. Some of the mandatory fields are also often left blank, especially the fields requiring quantitative estimates (area, % flowering, vegetative or in seed).

Recommendations:

1. Notation of whether volunteer has timed the visit correctly and certainty of ID are both useful.
2. Photographs should be encouraged, and made mandatory when volunteers are not certain of their identification. Photographs help the Natural Resource Specialist to verify the identification of plants. Photographs can also help verify plant condition and reproductive or developmental stage.
3. Change the question “how confident are you on your species identification” to “what characteristics did you use to identify the species”, or include both questions.
4. Photos showing site conditions should also be taken. Appropriate means for determining and marking photo points should be considered to provide some continuity and comparability for the photos. GPS as well as compass bearings and inconspicuous markers could all be considered.

5. Written protocols and instructions on how to gather data and fill out the monitoring form should be included with the monitoring form and distributed to volunteers (Standard Operating Procedures). SOPs will help standardize methodology across regions, volunteers and time. The SOPs should include the items in the following recommendations, as well as instructions on who to contact if the monitor sees a need for urgent intervention at their site.
6. Vigor of species measurement: getting a measurement of vigor is important, but the current measure is not quantitative enough and too subjective. Sets of quantitative criteria and measurements for judging vigor could be developed for the different life forms of rare species monitored, and the feasibility of having volunteers use these quantitative measurements could be evaluated. Photos can also help to confirm vigor assessments.
7. Because vigor changes through plants' life cycles, volunteers should be given species-specific time frames within which to visit their sites, and the importance of visiting during this period should be highlighted. For sites with multiple species, more than one volunteer can be assigned so as to reduce the number of visits necessary per volunteer.
8. Measure of number of individuals in a population: this is a useful measure to have, however more direction and clarity is needed on how to count individuals of different species. Methods and standards for counting plants could be developed for different life forms. Plant count should be a discrete count up to a manageable number, then estimate by intervals (this is currently the case in the form.). Indicating a minimum search time for counting plants may increase accuracy.
9. % of plants in flower and in fruit/seed is useful. Volunteers should be asked to visit within a 2 week window if time when the plant to be monitored is expected to be reproductive. Noting the % of plants that are seedlings or senescent would also be useful.
10. Area covered: this is a useful measure, however more direction and clarity is needed on how to measure this. Some species growth patterns and habitat require different measurements: for example, species that only grow right on stream edges should be measured in the length of a strip of a certain width. Categories (linear feet of a certain width, square feet, acres) should be listed for people to select, and size classes should also be listed (similarly to the number of individual classes). The larger the areas are, the more inaccurate estimates become, so that for large areas choosing a size class (i.e. between 5 and 10 acres, more than 10 acres...) is more accurate than a discrete number.
11. It may be useful to provide a standard method for estimating areas covered by occurrence via pacing, tape measure, GPS or laser rangefinders. Data collection within a few standard size categories (< 1 sq. yard, 1-5, 5-100, 100 sq yards - 2 acres, > 2 acres) may be easier for volunteers to collect.
12. Eliminate the question **"How does the size and vigor of the population compare with your last visit?"** This information is too subjective. This question should be replaced by analysis and comparison of quantitative measurements over several years.
13. Add a question on whether the population/occurrence extends beyond the area monitored (either 500' feet line or surveyed corridor boundary) that monitors take

- into account. If so monitors should note that the population is larger than the quantified data.
14. In the section evaluating threats, the question should be changed from **“Were there any other threats to the site?”** to something less value-laden and more inclusive referring to site conditions (“were there other changes in site conditions”). Changes in site conditions such as defoliation of canopy by insects or other changes may not be perceived as threats, but they are relevant.
 15. Reports of changing conditions and/or threats should include comments on how close these changes are to the species monitored and whether they are thought to directly impact the species. Appropriate wording for this should be developed.
 16. Change the question on management action from **“In your opinion, what action, if any, is necessary to protect the sensitive species?”** to “ is there any action you would suggest taking to protect the species?”
 17. Remove the question on whether they could undertake the management action themselves. This kind of follow-up can be done directly with the volunteer after the situation has been evaluated and the need for management action has been confirmed. Furthermore, instances of unsupervised management action by volunteers should be an exception, not the rule.
 18. GPS locations for occurrences should be encouraged, although accuracy can be an issue and should be recorded whenever possible: these would enable more accurate mapping of occurrences as well as field verification when necessary.
 19. Some site characteristics may be useful to collect, such as light regime (open, filtered light, shade) and moisture (inundated, wet, moist, dry)
 20. ATC field offices could consider developing procedures for lending GPS equipment to volunteers who do not have their own.
 21. The ATPO Physical Scientist should develop basic instructions and standards for volunteers to take and submit GPS information (datum, etc.): these instructions should be kept as simple as possible and included in the SOPs.

Management and Sharing- Natural Heritage Database

After volunteers have monitored their site(s), they send in their forms to their Regional Offices or State coordinators who send them on to the ATPO Natural Resources Specialist. ATPO has a Natural Heritage database that was set up specifically for the A.T. Natural Heritage monitoring program, however that database is only minimally used at present. Any data entry is done by volunteers, so that it can take several years before someone is available to enter the data. Furthermore, the database is only available to ATPO: none of the ATC offices have direct access to it. At present, ATC offices can receive copies of the database, which are not linked to the original residing on ATPO's servers. This presents a versioning challenge in keeping those different copies current and synced with each other and with the central database at ATPO.

The Natural Resources Specialist does not usually use the database. Every year the Natural Resources Specialist collates the monitoring results by hand and produces several summaries of results. In 2007, the Natural Resources Specialist pointed out that since

data had not been entered in the database since 2004, he could not use it to produce reports on 2004 through 2007 data.

One of the summaries produced yearly by the Natural Resources Specialist is a state-by-state list of the sites for which monitoring reports were received and not received, with a calculation of the proportion of sites for which reports were received vs. not received. Another summary is a site by site rundown of vigor, vigor changes and threats. These 2006 summaries are included in Appendix 4.

The Natural Resource Specialist uses the volunteers' qualitative assessments of the vigor and changes in the populations to determine whether management action is necessary. If a volunteer reports that a population is declining in size or vigor, and identifies a threat, the Natural Resources Specialist may bring the site to the attention of the ATC regional staff and recommend a course of action. For more information on management response and prioritizing, see section VI.

What the database contains: The database holds all the information gathered on the monitoring forms, as well as information on Natural Heritage monitors and on global, federal and state species ranks and statuses.

The chart in Appendix 5 shows the different tables within the database, as well as the fields in each of those tables and the relationships between the different tables.

The Monitoring Table contains all the information gathered on the monitoring forms, for all years, including qualitative and quantitative data, identified threats, suggested management responses and comments. A current report exists to show all monitoring visits per site, per state, for 2001 and 2002: the report shows the dates of the monitoring visits as well as the monitor names.

The Natural Diversity Table (see screen capture in Appendix 6) holds location information for the different sites (nearest quad, nearest trail segment, state, county, township) as well as management information (land managing agency/owner, Trail Club, specific management objectives and threats). The threats field seems to be redundant to the threats entry in the Monitoring Table. Furthermore, the Natural Diversity Table does not accumulate data for several years: there is a field for "date changed" which means that this table only shows the most current threats data. Finally, neither this Table nor the Monitoring Table have fields to enter and track data on management actions taken.

The Element Priorities Table (see screen capture in Appendix 6) shows all the relevant ranks and statuses (global, federal and state levels) for each species at each site, and calculates species and site priority rankings. For more information on the use of the rankings see Section VI- Management Priorities.

Several tables list global and state ranks and federal and state status of species. Currently, no mechanisms are in place to update the Element priorities Table which makes the ranking calculations based on these rank and status tables.

The Volunteer Monitor Table (see screen capture in Appendix 6) holds contact information, including phone numbers and addresses, as well as the date the record was last updated and an option to mark individual volunteers as inactive.

Views, Reports and Queries: Views are queries or reports that display certain sets of data for the user. Several views are currently set up but the code for several seems to be corrupted.

No reports or queries exist to treat and present the quantitative monitoring data itself, including quantitative measures such as number of individuals of specific species per site for different years, or qualitative assessments of existing threats.

It's also not clear how new sites or occurrences could be added to the database.

Overall, although some effort was made to construct an interface and forms for data entry, the database is still not user friendly, and because the interface is incomplete and several of the forms seem to be corrupted, users would be forced to interact directly with the tables. This is not only un-user-friendly, but also inadvisable because of higher risks of data entry errors and data corruption.

The architecture of the database does not seem to have been constructed following a specific plan and reporting requirements, but instead seems to have grown out of a collection of Excel sheets. In reality this database is the successor to a previous database (TREAD) that operated on Macs and was used by both ATC and ATPO: when the change was made to PCs, data was exported from TREAD and different databases were constructed to host these data sets. TREAD contained data on natural heritage but also on trail facilities and construction, and a host of other variables, which made the transfer somewhat messy. At this moment, very little of the actual capacity and functionality of a database is being used and the basic design is flawed (repetition of data in different tables, architecture not set up to facilitate useful calculations and reports, etc.).

System limitations: MSAccess databases do not allow multiple users to access the same records at the same time. Multiple users attempting to access a record simultaneously will lock the record being used and sometimes related/adjacent records from use until the first user is finished. MSAccess is also not well suited to interacting with the web, which is one of the main options for multi-user and multi-location database access. As noted above, the database currently can be shared with the different offices by making copies and distributing them, but this causes a versioning problem.

Recommendations:

1. Improving data management and sharing should be a particular focus of the I&M NETN A.T. Monitoring Coordinator.
2. As part of a USGS grant to the National Biological Information Infrastructure, a web entry tool is being developed for the natural heritage field data. This tool

should be linked directly to a database and the club coordinators and ATC field staff should enter the data. On a case-by-case basis other volunteers could help to enter the data. Regardless of the means, monitoring data should be entered into a database immediately following the monitoring season, whether or not a volunteer is available to do it. Ease of access and use should be a primary consideration in the design of the web data entry interface. The interface must also be cognizant of data security issues.

3. Database: one option is to create a master database and distribute copies out to the ATC regional offices. Web entry forms should link in to the master database. If any data entry occurs at the regional offices, the copies have to be sent back and synched with the master database on a regular basis. In addition, Access 2007 may have some improvements in web-like features, including potential integration with “SharePoint” and the possibility of having volunteers or staff enter data on html forms embedded in e-mails. SQL Server is also much better suited to web sharing and has all the functionality of Access.

Whatever the platform and sharing means, a new database should be constructed based on careful analysis and design meant to meet program goals and objectives. This will be more effective and yield better results than trying to adapt and fix the current database which has basic architectural flaws. Other options for hosting the database could be considered, including I&M NETN and NBII.

This process should be led by the I&M NETN A.T. Monitoring Coordinator, with collaboration from relevant ATC staff including I.T. staff, and ATPO staff including the Physical Scientist. Additional expertise should be brought in if necessary.

A functional and complete database should be in place by the end of 2008.

4. All of the needed reports, summaries and compilations of monitoring data can and should be done by querying the database. The main function of a database is to treat and present data in different forms to help decision-making, not simply to store it. Using the database will save large amounts of time and allow the publication and distribution of results to be timely.

ATC staff and the I&M NETN A.T. Environmental Monitoring Coordinator should work with the ATPO Natural Resources Specialist to make a list of reports that should be produced every year, for site and occurrence management purposes, for volunteer communications purposes, and for program assessment purposes. Reports, queries or other tools should then be created accordingly so that these reports can be created by anyone every year using the database.

Reports could include:

- a) Listing the sites by state and showing which sites have been monitored, who monitored them, calculating the proportion of sites monitored vs not monitored; listing the sites state by state and showing reports of threats (the two reports that the ATPO Natural Resources Specialist currently compiles without using the database)
- b) The list of sites where threats have been identified by volunteer monitoring, showing the land ownership of the sites, adding up the total number of such sites (this overall number can be communicated to volunteers).
- c) The list of sites where management actions have been taken, broken down by type of management action, such as exotics removal, mowing, trail relocation or trail work, or awareness-raising activities, adding up the total number of sites per category and overall (those numbers can be communicated to volunteers).
- d) Per occurrence, graphing the estimated # of individuals for the last 5 to 7 years as well as other quantitative variables (area covered, proportion flowering, etc.) to show trends - increasing, staying stable or decreasing. The number of occurrences that seem to be increasing, remaining stable or decreasing can be compiled: these total numbers can be communicated to volunteers.

Data QA/QC verification

There is currently little verification of the volunteer monitors' data in the field. Some verification is provided when volunteers turn in photographs with their monitoring reports. In some cases, volunteers turn in reports of being unable to locate or identify their target species and do not always receive assistance. Efforts are made to have a botanist (ATPO Natural Resource Specialist, ATC staff, state coordinator or contracting botanist) accompany the volunteer monitor to their site, however several ATC regional staff and club coordinators are not botanists and would not be qualified to confirm a species' identification or to help a volunteer who is unsure of identification, and the ATPO Natural Resources Specialist has been unable to respond to all the requests. There is however a mechanism to verify field data before management action is taken. Both USFS and NPS generally require some type of Environmental Assessment before management actions are taken, and for Federally listed species, the Endangered Species Act requires formal consultation with the US Fish and Wildlife Service for any action that might result in adverse impacts to the listed species.

Recommendations:

1. As noted in the monitoring form section, photographs should be encouraged. These are greatly useful in verifying that the identification was successful. GPS could also be used to take better measures of area covered by specific populations: tracklogs around the perimeter of populations could be useful.
2. Requests for help by volunteers should be a priority and should always be met. Appropriate resources to meet these requests should be identified and secured.

3. Staff or contractors could be used to revisit a small proportion of the monitored sites each year to provide some quality assessment and control of the data being provided. This method is used by the NPS Inventory and Monitoring Program for quality assessment and control. If this method is not used, some other QA/QC method should be developed and implemented.

Volunteer data- the human side

The only centralized volunteer database for the Natural Heritage monitoring program is within the Natural Heritage database. As noted above, only ATPO staff has direct access to this database at the moment which means that ATC staff and volunteer coordinators cannot update the database with new volunteers nor access the database to run reports that would generate mailing lists and other useful tools.

State and Trail Club coordinators keep lists of the volunteers involved in their program in whatever format they find most useful for their outreach and tracking activities (often Excel).

Recommendations:

1. The new database should retain the capacity to track volunteer information, including contact information, which sites are assigned to each volunteer and a history of contacts (trainings and other presentations attended, etc.). As noted above, this database should be made available and used by ATC regional offices.
2. The possibility of developing a web or e-mail-based tool by which state coordinators can submit new volunteer information should be investigated. Keeping a central and current list of volunteers with their contact information is crucial to being able to provide these volunteers with feedback.
3. Means for enabling the state coordinators to access the database and create volunteer mailing lists should be investigated. The alternative is for state coordinators to continue to use their own tracking system to keep in touch with their volunteers.
4. The database should accumulate volunteer information over the years, in a form that allows reporting on volunteer retention and turn-over for specified periods of time.

VI. Management priorities

In addition to the list of monitoring sites to be included in the Program, the NPS Endangered Species Coordinator and the ATPO Natural Resources Specialist established an A.T. Priority Ranking System in 2002. The ranking system was intended to prioritize the sites and species already included in the natural heritage monitoring program for management intervention, however all sites and all species are given a rank.

The ranking system is based on four elements: global rarity rank, federal status, state rarity rank, and state status. The highest priority was given to global ranking (a maximum of 8 points), federal status (a maximum of 6 points), state ranking (a maximum of 3 points), and state status (a maximum of 3 points). The total number of points that an RTE species on the AT can receive is 20 points: that total number of points is the species' rank. The higher the rank, the more significant the species. The priority rank for a site is the total of all the species' ranks present on the site. Again, the higher the rank for a site, the more significant the site.

This is a summary of the ranking system; a complete description is available in Appendix 7. There is no schedule for regularly updating the ranking system with changes in rarity ranks and status: the Natural Resources Specialist estimates that such updates occur every two to five years.

Note that sites can vary widely in size, from 2 miles along the Trail, with volunteers monitoring what is within sight from the Trail, to one plant occurrence within 50 square feet.

In theory, management action is considered on a site if volunteer monitors report a decline or a threat (see section V for a discussion of the data gathered by volunteer monitors), and sites receive attention based on their ranking. Management needs are discussed on a yearly conference call attended by ATPO's Natural Resources Specialist and ATC regional staff involved with the A.T. Natural Heritage Program. ATC Regional staff receives a list of sites needing management attention from the ATPO Natural Resources Specialist in the spring, before the start of the growing season, so that management can be planned.

In practice, although ATC regional field staff find the ranking helpful, they do not adhere to it strictly in terms of guiding management actions. Management responses are not only based on the "rarity" ranks of the sites but also on the nature and urgency of the threat as well as the feasibility of solving the problem, taking budgetary constraints and available manpower into account. In other words, if a site is reported to be under an immediate threat (i.e. hiker trampling) that is easily and quickly mitigated (signs and fencing), it may get management attention before another site with a higher ranking that is subject to a more diffuse threat (exotic plants moving in) that takes more research, planning and manpower to address.

Recommendations:

1. Request photos of threats for verification purposes.
2. Sites where threats are found should see some response within two years, even if the response is to verify the situation in the field and plan the management action. Threats should immediately be communicated to the land management

agency/owner and their assistance requested. This is the responsibility of the ATPO Natural Resources Specialist.

3. Although the ranking system provides a useful indication of priorities, it is appropriate for qualified ATC field staff and local coordinators to continue to consider the nature and urgency of the threat in responding. For the ranking summary to be completely valid, each species would have had to be given equal consideration at each level, however some species do not have federal or state ranks because they have not yet been evaluated. Therefore the ranking system should be considered indicative only.
4. A natural heritage botanist should be consulted when the situation calls for dealing with rare species that have not been ranked.
5. The rankings should be recalculated and updated in the database when new state, federal or global rank and status information is entered – this should be an automated database function.
6. As indicated in earlier sections, management actions should be recorded in the database and future monitoring results used to assess whether management was successful. For each site, it should be possible to retrieve records of all management actions undertaken through the years.
7. Submitting ranked lists of sites where threats have been reported to the ATC regional offices and contacting the appropriate land management partners is the responsibility of the ATPO Natural Resources Specialist. The Specialist should be using the database to produce these lists.
8. Management should make greater use of mapping, and share the results with program partners whenever possible, including Trail clubs and ATC regional offices. RTE sites and even occurrences should be mapped in GIS and color-coded by rank and status. This will clearly show hotspots. Threats should also be mapped by category. Mapping will enable bigger picture planning, prioritizing and management. The ATPO Physical Scientist should lead the mapping project with the aim of making it a sustainable and adaptive tool for management, and draw on ATC staff as necessary.

VII. Volunteer Coordination, Recruitment, Training, Retention and Support

Coordination

Many of the volunteers for the A.T. Natural Heritage monitoring program are members of the maintaining clubs, which is consistent with one of the goals and several of the objectives. Several of the clubs have monitoring coordinators that oversee the natural heritage program for their sections, handle recruitment within their clubs, and work directly with the ATPO Natural Resources Specialist or with ATC regional staff to schedule training workshops. Several of the coordinators are ATC regional staff.

In addition to helping with recruitment and setting up workshops, the coordinators are responsible for all communications with volunteers, including sending them the monitoring forms, sending them reminders to visit their sites, thanking them for their efforts and making sure the forms get sent back. The only schedule and expectations are

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for the distribution and collection of the monitoring forms. The coordinators are also responsible for forwarding the monitoring forms on to their regional offices or directly to the ATPO Natural Resources Specialist. In some instances, the coordinators have the botanical knowledge to provide support to the volunteers when they have trouble identifying their sites and species in the field.

The GA volunteer coordinator sends reports directly to ATPO but copies SORO regional staff; the volunteer coordinator for the PATC sections of VA, WV and MD, and the NYNJTC coordinator send reports directly to ATPO and do not copy the regional offices; and all New England coordinators send their reports to the NE regional office which then forwards them to ATPO.

See table 1 for a list of coordinators by state. Some of the volunteers are not club members but are affiliated with other organizations (universities, other non-profits): this is especially true in sections coordinated by ATC staff.

Table 1. State by state summary of natural heritage sites and volunteer totals.

Data on # volunteers involved and # reports missing are based on 2006 field results (see Appendix 4A. The coordinator list is current as of August 2007.

State	A.T. Miles	# Sites	# Volunteers (2006)	# Unallocated sites (2006)	# Reports missing (2006)	Latest monitoring workshop	Coordinator
GA	83.6	13	16	1	7	2006	Ginny Smith (GATC)
NC	234	19	29	1	7	2007	Julie Judkins (staff)
TN	73.2	12	8	2	10	2007	Julie Judkins (staff)
VA	543.2	19	18	0	6	North- 2000 South- 2003	Bob Pickett (PATC) Laura B. & Alice D. (staff)
WV	29.4	1	1	0	1	2002	Bob Pickett (PATC)
MD	37	3	2	0	0	2002	Bob Pickett (PATC)
PA	229.8	6	6	0	5	2002	Michele Miller (staff) Bob Pickett (PATC)
NJ	73.6	7	7	1	6	2007	Glenn Butcher (NYNJTC)
NY	90.9	7	7	0	6	2007	Glenn Butcher (NYNJTC)
CT	46.7	6	4	0	0	2006	Paul Palmer (AMC)
MA	89	12	12	0	8	2006	Adam Brown (AMC)
VT	145.5	11	9	3	4	2006	Matt Stevens (staff)
NH	157.7	7	5	2	4	2006	Matt Stevens/AMC
ME	274.6	8	10	0	3	2006	Dave Field (MATC)
Total	2,108	131		10	67		

Recruitment

The coordinators are generally responsible for recruiting volunteers to cover the RTE sites within their section/state. In most instances, recruitment coincides with training: coordinators generally use a combination of press releases and advertisements to local media outlets, club newsletter announcements and web site postings to publicize the training workshops through which newcomers can become monitors.

The frequency at which training workshops are held varies widely, as can be seen in the table above.

Both SORO staff and NERO staff have implemented a yearly training schedule that serves not only as a recruitment tool but also as a refresher and reward for current monitors. Both SORO and NERO staff have worked to make the workshops interesting and rewarding events for the volunteers, inviting known botanists as speakers and giving awards to recognize the volunteers. In addition to publicizing the workshops, they also send invitations to existing volunteers.

The latest workshop for TN and NC was held at the Roan Stewardship Rally, which gave the volunteers the opportunity to participate in the wider event and exposed a wider audience to the A.T. natural heritage program.

In southern Virginia, the latest training workshop was held in 2003. Since then VARO staff has filled any vacancies by reaching out to existing volunteers or asking the clubs to select appropriate individuals. These new volunteers then get personalized training, often in conjunction with other events such as Ecoweeek or Trail Crew training weeks. There is therefore no mass recruitment or training at this point.

The situation is similar in northern Virginia, West Virginia and Maryland. Bob Pickett has been recruiting to fill specific vacancies and trains the new volunteers individually in the field. He estimates having to find and train one new volunteer per season to cover turn over.

Based on 2006 results as well as anecdotal evidence from the ATPO Natural Resources Specialist and state coordinators, it seems that recruitment is not a substantial issue. There are relatively few unallocated sites trail wide, compared to the number of missing reports. It follows that most of the missing reports are due to volunteers either not monitoring their sites or not turning in their reports.

Training

Training varies from state to state. In New England states, Alice Schori who was a botanist and a part-time ATC staff worked with the coordinators and conducted many of the training sessions herself. In Connecticut, NERO staff had made the decision to hire a botanist to give the training sessions: the training did not take place in 2007 because of Alice's departure.

In NC, TN and GA, the ATPO Natural Resources Specialist relies on the coordinators to organize and recruit for the training sessions and sometimes travels to provide the training on site. Training workshops such as these are generally not organized unless several vacancies exist and new monitors need to be trained. In the last couple of years, regional staff have decided to organize yearly events in TN and NC.

In VA, WV and MD, training has occurred more informally over the last several years, as was described above in the Recruitment section. It has generally been conducted in the field with only one or two new monitors at a time.

Despite the differences in frequency, training personnel and style of training, there are materials available which are widely used by the staff and contractors. At the minimum, new volunteers who sign up for a site receive a list of species they should monitor on their site, a site location map and directions, copies of the monitoring form and background on the program. The site location map is usually taken from the original Inventory site report (see the maps at the back of maintainer sheets in Appendix 2): in certain cases where the Trail has moved or the original map presents some other challenges, the maps have been redone using GIS layers (see example in Appendix 8).

The most important and challenging part of the training is to enable the volunteers to identify the plants they are seeking. At ATPO-led workshops, the ATPO Natural Resources Specialist includes photocopies of relevant pages from identification guides, including pages explaining the different botanical identification terms, color photographs of the plants that volunteers will have to deal with, and line drawings as well as botanical descriptions (see Appendix 9). Sometimes herbarium specimens of some of the plants to be monitored are brought to the workshops as well.

These workshops generally include a half-day in the classroom and a half-day in the field. The classroom portion includes powerpoint presentations on the RTE species found along the entire A.T. and background on the monitoring program; explanations of botanical identification procedures and terms; and detailed information on the species to be monitored by those present in the room. The field portion consists of a visit to at least one of the natural heritage sites where as many RTE species are pointed out and identified as possible, and completion of the monitoring form is discussed.

Where sites are difficult to access (for example in Maine), a full day is needed for the field portion and no time is spent in the classroom.

The coordinators that have chosen to train monitors individually usually take the volunteers to their assigned site to train them, and point out the species they will have to monitor. Apart from the monitoring forms and site maps, any documentation they hand out to the volunteers is at their discretion.

Enabling the volunteers to find their site(s) is also crucial: the southern Virginia office staff have experimented with lending GPS units to their volunteers so that precise site

locations may be recorded and re-used. This has so far proved to be successful in providing additional and accurate location data that is verifiable in the field.

Anecdotal evidence seems to show that many volunteers that have attended a training workshop do not follow through and monitor their site(s). A 2005 survey of volunteer monitors that had not visited their sites yielded the following as primary reasons for not going in the field: too busy, bad weather, health reasons, and moving out of the area. ATC regional staff have indicated concern that something in the training does not give them the motivation and/or confidence to follow through, find their site in the field and do the data gathering. There is however no firm data collected or analyzed to confirm this.

Recommendations:

1. An approach combining yearly awareness-raising and recognition events with more personalized and specialized field training sessions should be made available trail-wide. Coordinators should be consulted regularly about the need for events and trainings.
2. Many of the state coordinators are also volunteers, and they should be recognized as well.
3. The ATPO Natural Resource Specialist should contact the state coordinators every year at the beginning of the season, thank them for their participation and efforts, remind them to reach out to their volunteers, and ensure that they have all the materials and information needed.
4. There is value in a somewhat uniform approach in reporting along the entire trail: if volunteer coordinators are reporting directly to ATPO, regional offices should be kept informed, and they should have access to collated results for their region.
5. Volunteers should be recruited/selected by the state coordinators on an individual basis to fill vacancies, they should be accompanied to their site at least once and trained to recognize the species that they should monitor (in cases where volunteers are highly skilled and familiar with the area and terrain this may not be necessary: coordinators may make this determination). They should also be trained in the estimation methods for quantitative parameters, and in filling out the monitoring form. The way that the data will be used and the importance of the quantitative data should be explained. Class time and general background should be allowed for when the coordinators feel it is appropriate, but the emphasis should be on field time. General awareness-raising events for the clubs can give information about RTEs on the trail and program background.
6. If volunteers find a site onerous, coordinators can split the species to be monitored and attribute more than one volunteer to a site.
7. ATPO and its Natural Resources Specialist are responsible for making sure that state coordinators have sufficient resources available, including access to appropriate expertise, to train the volunteers and respond to their queries.
8. If volunteers are interested in taking GPS locations for occurrences, they should receive basic training and support on the method and specs to use to get the data

for it to be useful to the program. ATPO's physical scientist could be charged with responding to these requests.

9. Materials- Volunteers should be provided with a map of their site, a list of the species to be monitored, and pictures and identification features for the species. The ATPO Natural Resources Specialist is responsible for ensuring that state coordinators receive these materials.
10. Yearly events should be made available in every region, combining recognition activities for volunteers with awareness-raising presentations on rare species and exotic species and on the monitoring program. Volunteers can be recruited to help with these events and to present on RTE species and exotic species on the Trail.

Support

There are very few feedback mechanisms for the volunteers at this point. In some specific instances the state coordinators have started to organize events that include existing volunteers and incorporate elements like awards and other tokens of appreciation, but this is not consistent across the program. The last trail-wide feedback effort to volunteers was a letter co-signed by Pam Underhill and Dave Startzell in 2005.

Results are also not shared with volunteers at this point. They neither directly receive nor have access to feedback demonstrating the usefulness of their monitoring or showing them what ATC and ATPO accomplish with the information they provide.

Finally, on the level of individual support, volunteers experiencing difficulties with their field monitoring duties sometimes receive inadequate support. Several volunteers have complained that no one was available to address their request and accompany them in the field to verify their identification or help them find their site. Some ATC regional staff have also expressed that this was a concern. The situation is more of a challenge in areas where ATC field staff and/or club coordinators are not well-versed in botany and are unable to provide support. This was mentioned in the Data Verification portion of Section V in this report.

Recommendations:

1. See previous section: volunteers should receive feedback and thanks, possibly at yearly ATC events. A committee could be formed of ATC staff and volunteer coordinators from different regions to share lessons learned on these events and help design appropriate events for the different regions. These events can also be used to promote other environmental monitoring programs besides RTE species (i.e. consolidated outreach for A.T. MEGA-Transect activities).
2. Every year, following the monitoring and management season, the ATPO Natural Resources Specialist should ensure that database reports are run (see data management section), and distribute the results to state coordinators, ATC field staff and ATC headquarters conservation staff, along with an updated list of volunteers and their contact information.

3. Volunteers should be surveyed regularly, possibly in conjunction with the distribution of results, about their thoughts and degree of satisfaction with the program. ATC's volunteer coordinator should be involved in the design of survey questions and the selection of survey means.
4. A trail-wide response should be sent every year to all volunteers involved with the program sharing program results and thanking them for their contributions.
5. Program results should also be posted on ATC's website and updated yearly.
6. Regarding individual support, having the initial training be more tailored to the individual and include a visit to the site they are assigned may cut down on support needs. Regardless, responding to volunteer requests for help or questions should be a priority. State coordinators and ATC field staff should be the first to receive and try to respond to volunteer queries: if they are unable to do so, they should contact the ATPO Natural Resources Specialist. The Natural Resources Specialist is responsible for making sure that appropriate expertise is provided to answer volunteer queries. State Natural Heritage Programs may also be capable of providing some field support.
7. Volunteer coordinators should follow up in a timely manner when volunteers do not turn in their reports, and survey the volunteers on reasons for not turning in reports. ATC regional staff are responsible for supporting the volunteer coordinators in this function.
8. Having a mechanism to allow volunteers to change sites every couple of years could be considered, to make monitoring more interesting. For this to work the monitoring information gathered must not be dependent on having the same volunteer make the observations from year to year.
9. Every site could have a backup monitor in case of illness or other problem with the primary monitor. Backup monitors could be the primary monitors for other nearby sites, so that they already received the training and get to use it regularly.

Retention and Turnover

As was mentioned above, turn-over does not seem to be unacceptably high, however even if volunteers do not officially leave the program, they may not be turning in their reports or even visiting their sites. According to table 1, there was a high incidence in 2006 of volunteers not turning in their reports. A recommendation was made in the Data Management section to build the database to allow for tracking and analysis of volunteer retention and turn-over.

Recommendations:

1. Turn-over as well as degree of participation are potentially indicative of a volunteer or work force's satisfaction. Low turn-over rates as well as high participation rates are usually an indication of satisfaction. The volunteer turn-over rate for the whole trail and per state should be calculated yearly and monitored.

VIII. Implementation

Finance

Additional resources and expertise will need to be secured to enable the creation of the database, as well as for the design of methods, protocols and SOPs as recommended in section V.

Additional capacity will also be needed to ensure adequate volunteer support and communication from ATC offices and volunteer coordinators such as events, personalized training, responding to volunteer queries, ensuring data entry, sharing results, posting results on the web, coordinating with partner agencies and organizations, etc.

In 2007, the Appalachian Trail Conservancy spent approximately \$7,300 in regional staff time on running the Natural Heritage Program, as well as \$5200 in contractual services with botanists and other needed experts for field and training assistance. Most of the contractual work was done in the southern region. This amounts to approximately \$1,825 spent in staff time per region on average, which amounts to an average of 90 hours of staff time per region on ATC's part. This does not allow for sufficient time to coordinate with other partners, assist in training and supporting volunteers, as well as coordinate activities and communications with ATPO, Headquarters and volunteers to the degree necessary.

Current capacity at ATPO should be assessed against these recommendations, particularly the ability to ensure data analysis and communication of results for both monitoring activity and management needs. Additional capacity may be needed to ensure these functions. This additional capacity could potentially reside either with ATPO or with I&M NETN.

The evaluation committee suggests that two full-time positions are needed to run this program: one for natural resources management and data analysis, and one for coordination, communication and volunteer management.

Grants should be sought for the start-up phase of implementation, including database creation and SOPs. An assessment of maintenance costs should be made to ensure that sufficient resources are available in the long-term to support program objectives.

Suggested priorities

As has already been mentioned in previous sections, the reviewing team suggests the following broad prioritization scheme in implementing changes to the program:

1. Improve data management and analysis by developing a fully functional shared database, and committing staff and resources to maintaining it and using it

2. Reduce the subjectivity of data collection through SOPs and more standardized and updated training materials and methods
3. Improve volunteer support and communications, as well as communications with the general public
4. Improve communication and coordination with other organizations, including State Natural Heritage Programs.

IX. Future Assessments

Schedule and benchmarks

The program should undergo regular assessment and evaluation to verify that it is meeting goals and objectives and consider possible improvements.

Progress achieved on implementing recommendations should be assessed in the fall of 2009.

Subsequently the program should be assessed every 5 years against the following quantitative objectives:

Monitoring:

- 100% of priority sites monitored (100% of reports received)
- 100% data entry completed yearly

Management:

- Data is analyzed for 100% of monitored sites every year to determine trends
- 100% of threat reports and declining sites receive a response within two years
- 100% of management actions recorded in the database yearly

Communications and Volunteer Support:

- 100% of volunteer queries and requests for help receive a response
- 1 trail-wide results and recognition communication per year

The overall program goals and objectives should also be considered in future program evaluations.