Sharing Data Between the NatureServe Network and the NPS: Requirements and Data Management Solutions

Prepared for:

National Park Service – Northeast Temperate Network

Submitted by:

NatureServe

Final Report
December 2006

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1 Introduction

The key to creating interoperability among the more than 75 local database nodes that comprise the NatureServe network of member programs is the use of a rigorous set of biological inventory and data management standards and protocols. These standards and protocols are known collectively as natural heritage methodology, and serve as a common language for all participants in the network.

In the 32-year history of the network, there have been eight generations of technologies for the management of biodiversity data. The current data management system is called Biotics 4 and at present has been implemented by approximately 60 network programs, including centrally at NatureServe. Biotics 4 is a stand-alone automated software tool for the collection, storage, and management of biodiversity data using natural heritage methodology. Built on a sophisticated relational data model implemented in industry-standard technologies such as Oracle and ESRI's ArcView, the system incorporates custom applications for spatial data management, tabular data management, data import/export and reconciliation, reporting, and extension of the data model to meet local needs, while allowing for the aggregation of the data at regional and national scales.

Biotics 4 is a capable and reliable tool, but having been developed in the late 1990's and the early part of this decade, the system is in mid-lifecycle and efforts are underway at NatureServe to design the Next Generation Data Management System (NGDMS). This initiative will entail a top-to-bottom redesign of the Biotics 4 architecture and is intended to respond to the business needs of our growing client base and retain the elements of high-quality biodiversity data management techniques required by the network.

A key objective of the NGDMS is to streamline the current system for users in a way that will permit simplified activity-specific data views or modules. Unlike Biotics 4, the NGDMS will also be a web-based system that will utilize XML-based web services for the exchange of information between individual user interfaces. This will allow for greater flexibility as far as where the system is physically "hosted", and will make it easier for external clients such as NPS to utilize and interact with the NGDMS even with their own data systems via a custom interface.

The first "module" of the NGDMS – an observations data management tool – is currently under development through a grant from the Moore Foundation and in partnership with Parks Canada, and is scheduled for release in March 2007. This observations tool may be an effective and cost-efficient option for the NPS to maintain their own observations data and easily share it with the network as well, and will be discussed in more detail below.

At a minimum, regardless of what data management systems are in place, in order for the Appalachian Trail Park Office (ATPO) and the Northeast Temperate Network (NETN) of the NPS to be able to effectively and efficiently exchange data with the

NatureServe network, it will be necessary for ATPO and NETN to incorporate some natural heritage methodology, in whole or in part, into their existing data model(s) and data inventory/monitoring efforts. At the most basic level this would involve the adoption of standard field data collection forms Trail-wide that would meet the minimum requirements of natural heritage methodology. At the highest level this would involve the creation of at least a simple database or spreadsheet where the field data would be aggregated and could be exported in a format specified by the network programs.

One of the goals of this project was to identify potential strategies to keep the natural heritage data that the NETN has acquired current as well as a mechanism for the Park Service to submit recent observations to NatureServe's member programs. This is intended to ensure that data acquired by either NatureServe, the member programs, or the National Park Service NETN is shared, and that the datasets held by either organization contain the most current available information for the Appalachian Trail (and potentially other parks in the NETN jurisdiction). NatureServe will present the requirements, potential costs, and the advantages and disadvantages of implementing these strategies in this report.

Input was solicited from the NPS-NETN, the NPS Biological Resources Management Division in Fort Collins, CO, the Colorado Natural Heritage Program, NatureServe member programs in the Appalachian Trail states, Parks Canada, and NatureServe staff (see Section 8 and Appendix 3 for contact information). This input was gathered through on-site meetings, e-mail surveys, and telephone interviews.

2 NatureServe and its Network of Member Programs

NatureServe is a non-profit conservation organization that provides the scientific information and tools needed to help guide effective conservation action. NatureServe represents an international network of biological inventories—known as natural heritage programs (U.S.) or conservation data centers (outside the U.S.)—operating in all 50 U.S. states, Canada, Latin America and the Caribbean. Together we not only collect and manage detailed local information on plants, animals, and ecosystems, but develop information products, data management tools, and conservation services to help meet local, national, and global conservation needs. Objective scientific information about species and ecosystems developed by NatureServe is used by all sectors of society—conservation groups, government agencies, corporations, academia, and the public—to make informed decisions about managing natural resources.

NatureServe, which was established in 1994 and was originally known as the Association for Biodiversity Information, carries on the legacy of conservation work that began when The Nature Conservancy helped to establish the first state natural heritage program in 1974 and set a foundation for the "Network of Member Programs" that exists today. Over the next two decades, The Nature Conservancy in cooperation with a number of public and private partners worked together to build the network of state centered natural heritage programs that collect and manage data about the status and distribution of species and ecosystems of conservation concern.

As the network of member programs expanded to include Canada and Latin America, natural heritage programs and conservation data centers became the recognized source for the most complete and detailed information on rare and endangered species and threatened ecosystems relied upon by government agencies, corporations, and the conservation community. Today the NatureServe network includes 74 independent natural heritage programs and conservation data centers throughout the Western Hemisphere, with some 800 dedicated scientists and a collective annual budget of more than $45 million.

By 2001 NatureServe and the network of member programs had grown and evolved into its present form. At this point, The Nature Conservancy, which had provided scientific and technical support to the network since the 1970s, transferred this role to NatureServe along with professional staff, databases, and responsibility for the scientific standards and procedures under which the network operates. NatureServe is headquartered in Arlington, Virginia, with regional field offices in four U.S. locations and in Canada.

3 Natural Heritage Data Management

NatureServe and the natural heritage member programs have developed standardized methods for gathering, managing, and analyzing biological and ecological data, referred to collectively as natural heritage methodology. As mentioned above, this is key to creating interoperability and facilitating data exchange among the more than 75 local database nodes that make up the network, and this allows for the most consistent and standardized dataset of its kind in the Western Hemisphere.

3.1 Standard Methodology

The defining characteristic of the NatureServe network is the use of natural heritage methodology. By specifying standard procedures for gathering, organizing, and managing information on biodiversity, natural heritage methodology unites the efforts of hundreds of individuals and dozens of institutions on two continents working to advance the knowledge needed to effectively conserve biodiversity. Over the past quarter-century, natural heritage methodology has evolved to keep pace with the growth in scientific knowledge about the natural world and advances in information technologies. Nevertheless, the underlying continuity of the methodology over time has permitted the network to accumulate knowledge and make available vast amounts of scientifically authoritative data. Natural heritage methodology provides a rigorous set of procedures for identifying, inventorying, and mapping species and ecosystems of conservation concern; for gathering related information on conservation sites and managed areas; and for setting conservation priorities.

Natural heritage methodology has several basic characteristics:

- It is designed to support a decentralized database network that respects the principle of local custodianship of data.
- It supports the collection and management of data at multiple geographic scales, allowing decisions to be made based on detailed local information, yet within a global context.
- It encompasses both spatial and attribute data, but emphasizes the type of fine-scale mapping required to inform on-the-ground decisions.
- It includes multiple quality control and quality assurance steps to ensure that data products have the reliability needed to inform planning and regulatory actions.
- It incorporates explicit estimates of uncertainty and targets additional inventory work to reduce levels of uncertainty.
- It integrates multiple data types, including: species and ecological communities; collections and other forms of observational data; biological and non-biological data.

Because biodiversity encompasses the variety of life at all levels, not just species, natural heritage methodology is designed to deal with both species and ecological communities, referred to collectively as "elements of biodiversity." The NatureServe

network has gathered and organized data on over 84,000 such elements of biodiversity, including animals, plants, fungi, and terrestrial and freshwater communities. Scientific names, local and global conservation status, basic biological and ecological characteristics, management requirements, and the location and condition of species populations and community occurrences are among the types of data collected. The information is housed in customized databases that employ sophisticated geographic information systems.

Each part of the network has distinct roles and responsibilities. "Global" (range-wide) information on each element is developed and managed centrally by NatureServe, while detailed local data is developed and managed by member programs. Annual data exchanges between NatureServe and its member programs ensure that up-to-date range wide data is available to all local databases, and that detailed local data can be shared and aggregated across the network.

At the core of the methodology is the concept of the Element Occurrence, the spatial representation of a species or ecological community at a specific location. An Element Occurrence generally delineates a species population or ecological community stand, and represents the geo-referenced biological feature that is of conservation or management interest. Element Occurrences are documented by voucher specimens (where appropriate) or other forms of observations. A single Element Occurrence may be documented by multiple specimens or observations taken from different parts of the same population, or from the same population over multiple years. At present more than 500,000 Element Occurrence records are managed across the network, representing several million observations or specimens.

3.1.1 Basic Steps in Natural Heritage Methodology

In the broadest sense, natural heritage methodology answers four key questions: What species and ecosystems exist in a region (the elements of biodiversity)? How are they doing (their condition and status)? Which are priorities for conservation? Where precisely are they found (documenting and mapping Element Occurrences)?

To answer these questions, network programs carry out a series of repeated steps. Each time the steps are repeated, the data are refined to give a better picture of biodiversity and of problems and progress in its conservation. The basic steps employed are:

- Develop a list of the elements of biodiversity in a given jurisdiction, focusing on better-known species groups (e.g., vertebrate animals, vascular plants, butterflies, bivalve molluscs), and on the ecological communities present.
- Assess the relative risk of extirpation or extinction of the elements to determine conservation status and set initial priorities for detailed inventory and protection.
- Gather information from all available sources for priority elements, focusing on known locations, possible locations, and ecological and management requirements.

- Conduct field inventories for these elements and collect data about their location, condition, and conservation needs.
- Process and manage all the data collected, using standard procedures that will allow compilation and comparison of data across jurisdictional boundaries.
- Analyze the data with a view toward refining previous conclusions about element rarity and risk, location, management needs, and other issues.
- Provide access to data and information products to interested parties so that it can be used to guide conservation, management planning, and other natural resource decision-making.

3.1.2 To Learn More About Natural Heritage Methodology

Additional detailed discussion of specific aspects of natural heritage methodology is provided in the "About the Data" section of our NatureServe Explorer website (www.natureserve.org/explorer). For technical documentation of key standards and protocols that are part of natural heritage methodology, see the links below.

- *Element Occurrence Data Standard:* standards for documenting and mapping species and community Element Occurrences (http://www.natureserve.org/prodServices/eodata.jsp).
- *Element Occurrence Specification standards:* species-specific criteria used to define Element Occurrences (please contact NatureServe about obtaining this documentation – this information is stored in the Biotics 4.0 software).
- *NatureServe Biodiversity Data Model:* technical architecture and data dictionary for Biotics, NatureServe's core data management system (http://www.natureserve.org/prodServices/biotics/HDMS-DataModel.shtml)
- *Element Occurrence Specifications for Plants:* A habitat-based strategy for delimiting Element Occurrences of plants (http://www.natureserve.org/library/deliminting_plant_eos_Oct_2004.pdf). View decision-tree here: http://www.natureserve.org/explorer/decision_tree.htm.
- *FGDC-Compliant Metadata as of September 2004* http://www.natureserve.org/prodServices/biotics/HDMSDoc/hdms_dx/NatureServe_EO_Metadata_09-2004.html
- *Benchmark Data Content Standards* (http://www.natureserve.org/library/bdcs_2004_ver2.doc) and *Element Global Fields* (http://www.natureserve.org/library/BDCS_2004_ver2.0_fields.xls): These standards provide guidance to members of the NatureServe network regarding the development and quality control of core data elements. The standards focus on those data that are shared across the network and are necessary for providing regional, national, and international data products and services. Specifically, these standards establish: 1) content goals for element and Element Occurrence records; 2) spatial data (GIS) standards to facilitate the aggregation of these data; and 3) metadata documentation. Benchmark Data Content Standards also serve as a metric against which to measure the currency and completeness of NatureServe data.

3.2 Element Occurrence Data

All of NatureServe's member programs are actively collecting and maintaining data on Elements. An observation is the documentation or measurement of an occurrence or circumstance of an Element, which can be:

- attribute data on Elements, such as location, abundance, distribution, reproductive status/phenology, ecological associations
- plots data (including NPS and VegBank Plots data, as well as general plots data), and
- monitoring data.

An Element Occurrence (EO) is defined as "an area of land and/or water in which a species or natural community is, or was present", and an EO is created from one or more observations of an Element. There are several reasons for creating EOs from observation data, and these include:

- focuses on population or natural community as primary unit of conservation interest,
- enables viability/integrity estimates, represented as ranks over time,
- place-based,
- permits unbiased comparison of areas of interest, and
- knowing location of significant areas of interest will help in targeting them for protection.

3.2.1 How Element Occurrences are Created

First, observation data that is collected in the field for an Element are evaluated using EO specifications in the following way:

- observation(s) are mapped,
- data are evaluated according to EO criteria,
- EO(s) are delineated using separation distances,
    - Species: restrict movement or dispersal
    - Communities: limit or alter function
- and tabular data are recorded.

EO specifications, as depicted in Figure 3-1 below, establish the minimum criteria for determining valid EOs, the separation distances for area between EOs, and barriers that separate EOs.

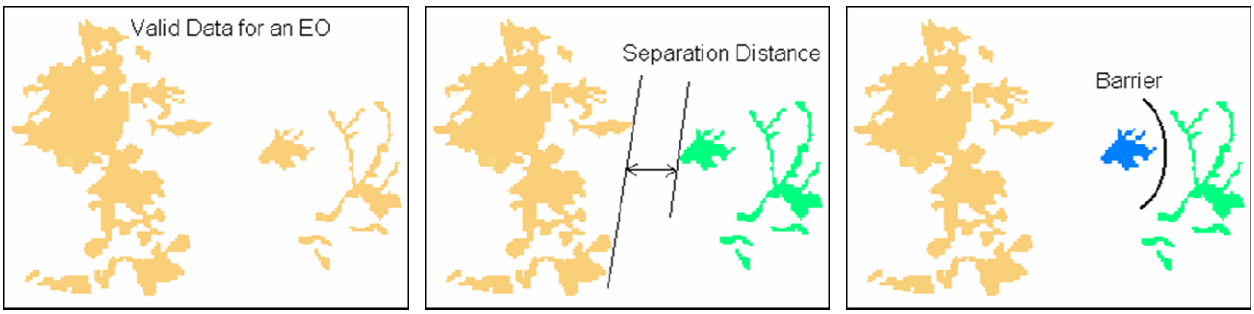


Figure 3-1 – based on EO specifications, field data is determined to comprise three separate records.

Next, EO polygon representations are created for valid observation data that incorporate spatial uncertainty, and can be based on multiple features, through the following process:

- Observations are mapped as points, lines, and polygons
- Spatial uncertainty is incorporated (based on confidence that mapped location is actual location).
- Representation accuracy is assigned;
    - Indicates relative area of feature occupied by Element, e.g., high accuracy = minimal area added for uncertainty.
- Features are developed into polygons (some require procedural buffer).
- Polygons are grouped into EOs using separation distances defined in the EO specifications for that species or species group.

3.3 Data Management Systems and Data Model

3.3.1 Biotics 4

As mentioned in the Introduction, the data management system that is currently used by NatureServe and the vast majority of member programs, including all programs in the Appalachian Trail corridor, is called Biotics 4. This database system incorporates several components that offer a fully integrated suite of data management products. They are: Biotics Mapper (custom ArcView GIS interface for spatial data management); Biotics Tracker (user interface for tabular data management); Biotics Exchanger (utilities for data import/export and bi-directional data exchange); and Biotics Administrator (interface for managing security, system options, and extensibility). The spatial component of the system is a custom GIS application that supports basic digital mapping, spatial analyses, and data visualization. Figure 3-2 below illustrates the basic conceptual model of Biotics 4.0. The full detailed Biotics 4.0 data model can be accessed at the following website:
http://www.natureserve.org/prodServices/biotics/HDMS-DataModel.shtml

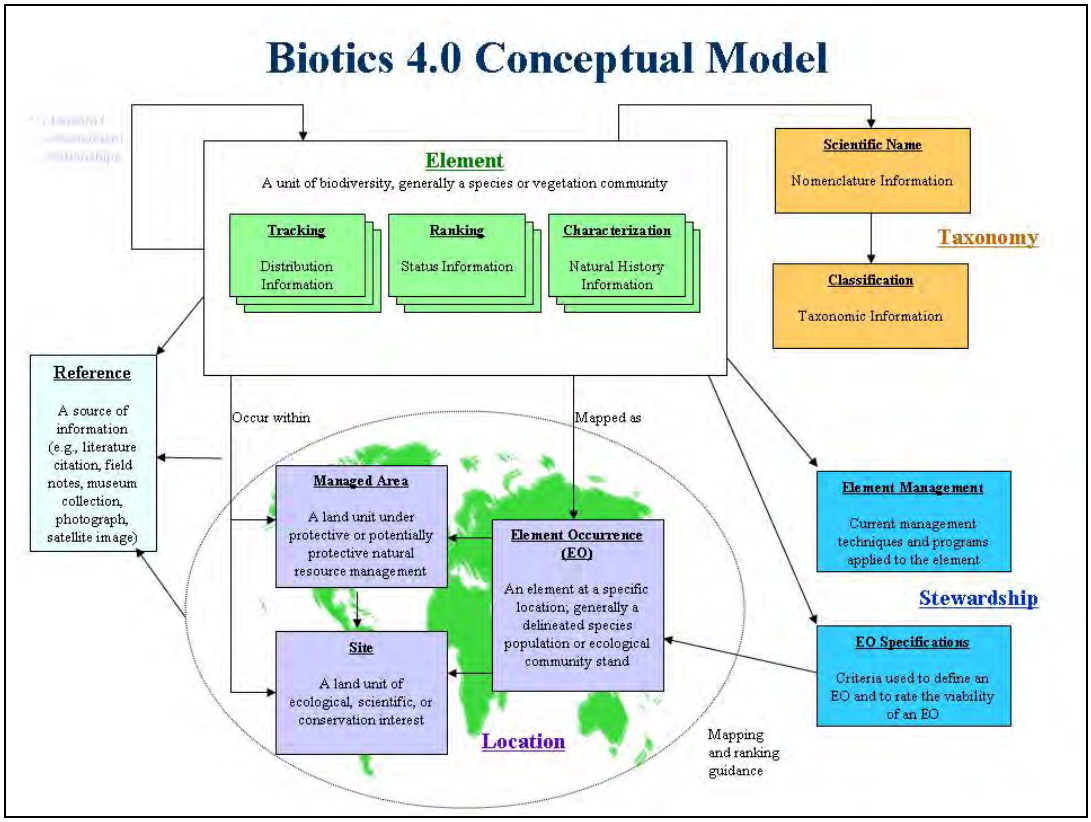


Figure 3-2

3.3.1.1 Network Data Flow Under the Biotics 4 Data Model

Figure 3-3 below illustrates the lifecycle of an EO at a typical network program, from the collection of observation data on the ground, to the exchange of the resulting EO data with NatureServe, and its subsequent use in data products.

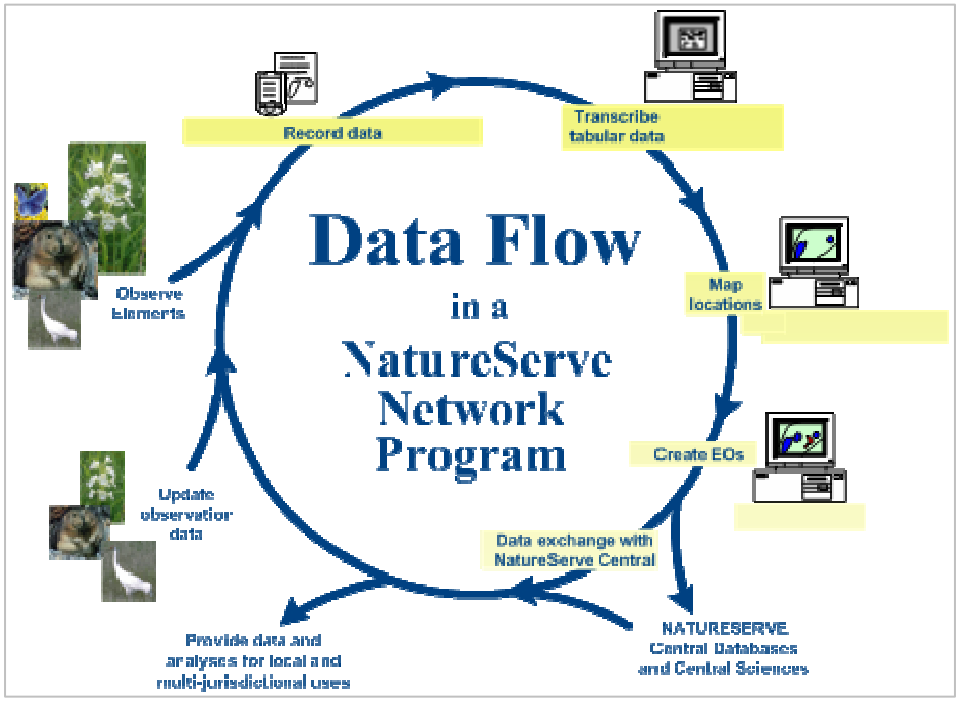


Figure 3-3

NatureServe performs a data exchange with each member program in North America (64 in total) approximately once every 12 to 18 months. This is a continuous process where approximately 4 to 6 data exchanges are performed in any given month throughout the year.

During this process the NatureServe central database gets updated with any new state/province-level information (i.e. state ranks and status, species added or deleted, updated Element Occurrence information, etc.) that a program has created or changed since the last data exchange, and the program's local database gets updated with any new Global or National-level data that NatureServe maintains. Also, each program's data goes through a process of taxonomic reconciliation with NatureServe's standard taxonomic references. This ensures that when providing multi-jurisdictional datasets, all information for a species will be included from each state or province where it occurs, regardless if at the local level different programs might follow different taxonomic standards for what NatureServe recognizes as the same species.

As a result of the data exchange schedule, data in NatureServe's central databases for any given member program could be anywhere from 1 month to 18 months in age compared to the data housed in that program's local database. The advantage of

getting data through NatureServe for multi-jurisdictional projects however is that data for multiple areas can be provided through a single point of contact and the data that is provided has been taxonomically reconciled across jurisdictions and is provided in a single format.

3.3.1.2 Advantages of Biotics 4

In providing a mechanism for aggregating and sharing biodiversity information within the network, there are several key reasons why Biotics 4.0 is advantageous (Oliver, 2004).

Taxonomy

Biotics 4 provides standard, current taxonomy (and a team keeping that taxonomy up to date), the ability to track changes to taxonomy, and data standards for taxonomy. And NatureServe is working towards similar standard classifications for natural communities and ecosystems. NatureServe is a partner in the Integrated Taxonomic Information System (ITIS --- see www.itis.usda.gov for more information).

Methodology

Biotics 4 provides a Western Hemispheric standard, science-based natural heritage methodology, including data standards and metadata for basic biodiversity data. This methodology generates a public view of natural heritage information from raw observations using a standard scientific process.

The scientific view of natural heritage data involves detailed observations on the ground, made by competent observers and verified by professional, experienced natural heritage staff.

Application of the standard methodology to the verified observations generates Element Occurrences (EOs) for each rare species. The public view of rare species involves these EOs --- each showing roughly (but not exactly) where that species is currently found (and not found).

Thus the methodology supported directly by Biotics provides an important foundation for communicating scientific information about the natural heritage of a particular area or region with the public.

Automation

Biotics 4 is an automated software tool for the collection, storage, and management of biodiversity data, providing good automated support for the NatureServe natural heritage methodology, and built on an industry-standard Information Technology platform (i.e. ESRI, Oracle, Windows, XML).

Biotics 4 provides multi-user, Internet-based access to much of the data it captures and manages.

Biotics 4 offers "buy rather than build" cost-effectiveness. Biotics was created by NatureServe, and the burden of maintaining and upgrading Biotics rests with NatureServe. At the same time, Biotics users have the ability to influence the future development of Biotics (and/or the equivalent NGDMS discussed below), without having that burden of maintenance.

3.3.1.3 Limitations of Biotics 4

Despite the advantages above, in this world of ever changing technology and data management needs, Biotics 4 does have a number of limitations including the following (Oliver 2004):

- Biotics 4 is a traditional relational database application, usable either in a desktop or local area network setting, and offers relatively limited GIS functionality for managing the spatial components of the data.
- Configuration flexibility is somewhat constrained, as it was engineered to exclusively use the Oracle database management platform.
- It embodies a relational data model comprising hundreds of tables and more than 5,000 individual data fields. While the data model conforms to best practices in architectural design, it is often perceived as being overly complicated for use in ad-hoc queries and adjunct applications.
- The software can be difficult and expensive for external clients to implement due to system requirements, the complexity of the data model, the ongoing need for support, and the need for a thorough knowledge of natural heritage methodology in order to be able to take advantage of the full capability of the system.

3.3.2 Next Generation Data Management System

In order to address the limitations of the current system, NatureServe is initiating a major reengineering of Biotics 4 that will result in a Next Generation Data Management System (NGDMS). The NGDMS will replace the network's existing stand-alone Biotics 4 system installations with a web-based architecture that provides a framework for full integration of the data holdings of Network data centers and collaborators, streamlines the process of creating new biodiversity applications, and reduces costs associated with managing biodiversity data resources.

NatureServe's NGDMS will take full advantage of XML web services and service oriented architecture to enable multi-jurisdictional integration of datasets across the Network. The web-based framework will provide a "metadatabase" capability that will enable real-time query and aggregation of multiple data centers' information resources.

It is envisioned that the current Biotics 4 user interface and data structure will be replaced with an array of application modules, each with a limited subject area focus. Individual modules will be dedicated to the purpose of dealing with data about a particular Biotics content area, such as taxonomy, species characterization and status, population occurrences, etc., thus handling the current system's subject areas in more easily "digestible" parcels. As mentioned in Section 1, NatureServe has received dedicated funding to develop an observations data management tool (ODMT), which will be compatible with the existing Biotics system, and will serve as the first module of the Next Generation Data Management System.

3.3.2.1 Observations Data Management Tool – "Kestrel"

NatureServe has identified a clear and striking expression of need for tools to manage observational data across the breadth of the biodiversity and conservation communities. Working in partnership with the Center for International Earth Science Information Network (CIESIN) at Columbia University, a global survey was conducted in 2005. NatureServe asked nearly 1,000 researchers, data managers, operations managers and others from research institutes, government agencies and not-for-profit organizations to identify their most critical bioinformatics tool needs. More than 250 individuals chose to participate in the survey that identified over 20 needed capabilities and tools to support their work. The number one identified need was for better tools to manage observational data.

Because individual research projects and field surveys have their own unique requirements, according to the species targeted, the location, sampling techniques, etc., it is obvious that a "one size fits all" solution will not suffice. NatureServe proposes to respond to this by building web hosted tools and a suite of services that allow a researcher or observations tool developer to design an observations data model "template" from a data object library that can be extended to create data templates unique to the survey protocol needed. The data templates can be stored, shared with others and modified as needed and then contributed to the template library to once again be shared with others. A key design goal for the observations application will be to equip it with flexibility and extensibility by enabling a user-driven database schema, and a library interface for cataloging user-defined database fields and surveys constructed with the application. The intent will be to enable the design of new surveys whenever they are needed, and to facilitate re-use of the customized survey templates where appropriate. While the end result for the researcher produces an application to enter and manage data, it does it from a managed database perspective.

"Kestrel", as the system has been named, will be made available to researchers in the form of a web portal that presents an array of web based applications. The system will be built upon a web based service oriented architecture (SOA) platform and will be deployable as either a local instance within a using organization, or as a shared resource available from one or more hosting organizations; deployments of the latter type would serve multiple remote users over the web. In each deployment scenario,

datasets from across the user community could be aggregated regardless of their physical location; the system will incorporate XML messaging and directories of web services and data content in order to enable the discovery and consumption of observations data from disparate instances of the system. Users who are able to take advantage of the hosted deployment scenario will experience significant cost savings because there will be no need to acquire expensive database and GIS software licenses, and the need for local technical staff will be minimized.

3.3.2.2 The Kestrel Portal

The central Kestrel portal will provide a comprehensive feature set to enable researchers to construct surveys, securely manage their data, and expose data for consumption by the public or by a specified class of users. The portal will include powerful query, reporting, and web based mapping tools for searching the collective observational datasets that Kestrel users have opted to expose for external consumption. Other capabilities will include functions for aiding field work by enabling generation of paper survey forms and by enabling the downloading of data entry forms and databases for use with compatible handheld field collection units. The central Kestrel portal will also include a suite of community support functions, such as a comprehensive User Guide, discussion forums, a bug tracking feature, a knowledge base, and a facility for downloading copies of the Kestrel software itself for installation elsewhere. Figure 3-4 illustrates the array of features envisioned for the Kestrel portal site on the web.

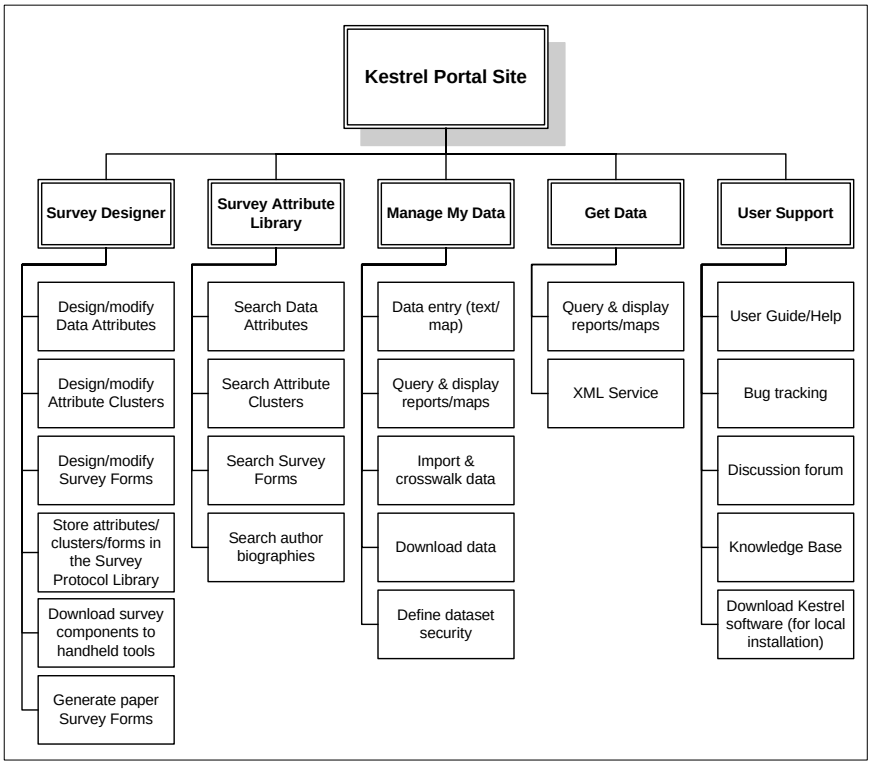


Figure 3-4: Kestrel central portal structure

The principle challenges to the aggregation of observation data, as described above, are associated with the heterogeneity among data sets as engendered by the varying needs of disparate surveys. The core schema for Kestrel's observations data will adhere to the provisional Taxonomic Databases Working Group (TDWG) Observation Data Standard (http://www.tdwg.org), and will thus ensure a measure of data compatibility for surveys developed in conjunction with this tool. While the provisional standard provides for a field survey's fundamental data content (e.g. what was observed, where and when the observation occurred, and by whom), the informational details of individual surveys often involve the collection of additional data attributes particular to an investigation. The solution that NatureServe proposes is to equip Kestrel with a community driven, needs-based process for extending the utility beyond attributes defined in the provisional standard.

Using a web-based tool set, observation datasets for new field surveys will be designed by combining the core data attributes from the Provisional Observations Standard (see http://www.natureserve.org/prodServices/obsStandard.jsp) with any number of extension data attributes. In this conception, an extension data attribute will consist of a full qualified name plus metadata, including description, purpose of the attribute, author, data type, validation rules, help text (in multiple languages, indexed by culture), and error messages (associated with validation rules, indexed by culture). Researchers who author extension data attributes will have the option of storing them permanently in Kestrel's shared Survey Attribute Library; extension data attributes that are placed in the library then become publicly available for reuse in subsequent surveys.

By defining and combining a set of extension data attributes a researcher will create an Attribute Cluster to handle the data needs for a particular survey project. Attribute Clusters will in themselves be managed in a collection in the shared Survey Attribute Library, and will provide subsequent field surveys with a starting point for reusing a survey's data structure in another data collection effort. Attribute Clusters obtained from the library may be used in a new survey design either in part or in full, and may be combined either with other Attribute Clusters, or with single, standalone extension data attributes (which can either be obtained from the library or defined anew). Attribute Clusters will consist of a fully qualified name plus specification information, including description and purpose, author, the ordered list of data attributes at the survey level, the ordered list of data attributes at the observation level, additional validation rules, help text (in multiple languages as needed, indexed by culture), and error messages (associated with validation rules, indexed by culture). The data attributes (both core and extended) may be grouped to improve usability. Once defined, an Attribute Cluster can be optionally stored in the survey Attribute Library for later reuse. Attribute Clusters, coupled with procedural guidelines for their use, will constitute survey protocols.

Figure 3-5 illustrates the reuse of data attributes found in the Survey Attribute Library in two survey projects, with data from the disparate surveys being aggregated through a single query. This is made possible because of the surveys' sharing of common data attributes.

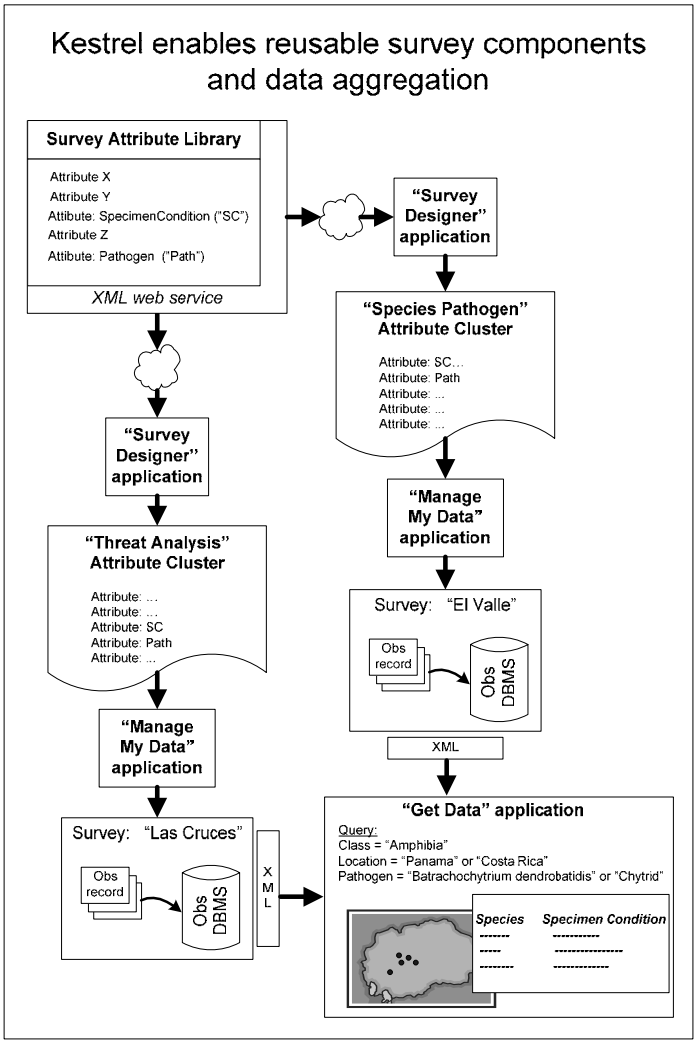


Figure 3-5

The Kestrel portal will provide access to a web based Data Management System (DMS) application for runtime operation of surveys that are created with the Survey Designer. With the survey components operating in the DMS application, the user will experience an interface that provides for both form based and map based data entry and database query. The DMS will be equipped with reporting and mapping tools for filtering and presenting both core and extended attributes. Core and extended data attributes will be indistinguishable in the runtime environment; there will be equally rich user interface support for both.

For the purpose of bringing preexisting data into conformance with the Provisional Observations Data Standard (and simultaneously addressing the recognized need for preserving older datasets), the DMS application will provide features for import and conversion of external data. These will include import adapters that will crosswalk Excel column headers to data attributes and perform the import process. The user will optionally be able to save a crosswalk specification for future use.

The DMS application will also include user authentication procedures for controlling access (on the basis of user restrictions defined in the Survey Designer application) to authorized surveys for viewing or data modification.

3.3.2.3 Protecting Data Ownership

Although Kestrel is a web based system that will make data available to many researchers, survey authors will have complete control over the visibility of their data. For instance, a researcher may decide that none but herself have access to her dataset until an associated research paper has been published, and thereafter only specific individuals or individuals in specific organizations may view the details of her study. The Survey Designer application will provide access to Kestrel's security features, and will give the researcher complete control over the decision of who will be given access to their datasets. Such decisions will be easily revised over time. In this way, the visibility of datasets is explicit and dynamically controlled by the author and not an artifact of inherent inaccessibility and/or data incompatibility. The hope is that by providing this security, more data holders will be more inclined to share their data. Additionally, agreements could be formulated between NatureServe and the National Park Service that would grant access to data and establish rules for use of the information.

3.3.2.4 Development Plan

NatureServe is in the process of developing a first-generation prototype version of Kestrel for Parks Canada, which is scheduled for release in March 2007. This effort is being funded entirely by Parks Canada, though additional funding may be contributed by the Canadian Wildlife Service.

This first-generation tool will be a simplified version of NatureServe's fully-capable vision of Kestrel described above. It will contain the minimum required core data fields from NatureServe's Observation Data Standard (see http://www.natureserve.org/prodServices/obsStandard.jsp) and will be linked to the Source Feature data model in the current Biotics 4 system. An interface will allow Parks Canada to export data from the observations tool in a format that is compatible and easily importable into the Canadian network programs' Biotics 4 systems, allowing for easy exchange of data that will adhere to natural heritage methodology. This first-generation tool however will completely lack the ability for users to define custom extension data attributes as described in Section 3.3.2.2 above.

The fully-capable version of Kestrel that will eventually be developed will expand upon this first-generation version that is currently being developed for Parks Canada. The timeline for developing and releasing it is roughly estimated at three years, but will largely be dependent on the availability of dedicated sources of funding.

4 Minimum Requirements for Exchanging Data with the Network

As described in Section 3.2, Element Occurrences are based on one or many individual observations, and because of that, any data that is collected in the field (including data that would be collected and shared by NPS) would initially be treated as observation data that would need to be validated before either being incorporated with existing EO records, or processed into new EO representations by member programs.

In accordance with natural heritage methodology there is a core set of fields that are required in order to be able to process field observation data into high-quality Element Occurrences. While each member program may include a slightly different suite of fields on their field reporting forms (see Appendix 1), some more inclusive some less so, they all are designed to capture the basic information in Section 4.1 below. In order to promote data exchange and maximize efficiency and effectiveness, NPS-NETN/ATPO should adopt a standard field form that includes the basic fields in addition to any fields the NPS requires for their own databases. This form would be used Trail-wide.

4.1 Field Data Collection

Observation data, associated with the following categories, should be collected[1]:

- Location use class – used to indicate use by seasonally disjunct migrants
  - Breeding, nonbreeding, staging area, hibernaculum, maternity colony, bachelor colony, nesting area
- Location, recorded as precisely as possible
  - Ideally, the location of the observation will be represented as a GIS feature (point, line, or polygon). However, recognizing that historical observational data sometimes lack precise geographic information (e.g., a plant observation with only a county name), and that some users of this proposed standard may not use GIS, the relationship between an observation record and a GIS feature is optional. Instead, location can either be mapped in a GIS or described as precisely as possible by using coordinates and datum and/or by filling out one or more fields in the Country – State/Province – County hierarchy and/or by filling out the Location Description text field. Therefore, a valid observation record must be mappable in the broad sense but does not necessarily have to be mapped. In the example mentioned above of a plant with only a county as the location, the observation could be mapped as a polygon whose boundaries coincide with the county in which the plant was recorded, but it may not be desirable to map it as a

[1] The NatureServe network has extensive training expertise in collecting, managing, and analyzing data about species and ecosystems. NatureServe could work with NPS-NETN to develop a training program to teach standard survey methods to staff and volunteers for the Appalachian Trail that would meet both agency needs and the requirements of Natural Heritage Methodology outlined in this report.

large polygon in a GIS. In this case, the county name would be put in the County field, and the state and country names would also need to be entered.

- Area / length
- Size
- Area of occupancy, abundance, density
- Condition – within Element observation
  - Reproduction, ecological processes, species composition and structure, abiotic factors
- Landscape context – surrounding area
- Fragmentation / connectivity, condition

An example field form designed by NatureServe that includes all of this information can be found at the following link, along with some examples of field forms that network programs are using: http://www.natureserve.org/prodServices/biotics/Biotics-FieldForms.shtml. Also, Appendix 1 of this report contains copies of field forms that all of the network programs along the Appalachian Trail are currently using.

The example NatureServe form is highly inclusive in comparison to some of the member program forms. As part of this report, NatureServe also conducted a survey of the programs along the Appalachian Trail about how they typically handle external data, which is presented in Section 4.2 below. Questions 5 and 6 of the survey asked specifically what data fields each state requires in order to be able to process observation data into EOs, and which fields may be optional but desired. As an example, the responses from four of the states who responded are provided here in Table 4-1. As can be seen from this table, while the number and names of the fields across states vary, the types of information are very similar and generally fit into the categories listed above.

CT	GA	NY	WV
Required Fields			
Taxon Name	Taxon Name	Taxon Name	Taxon Name
Date	Date	Date	Data Source (person)
Site Name	Data Source (person)	Data Source (person)	Date
Town	Map*	Site Name	Map*
Map*		Directions	Population Size
Population Size		County	Habitat Description
Population Area (plants)		Town	Condition of Habitat
Phenology (plants)		Number of individuals	
Breeding Evidence (animals)		Population Size	
Behavior Observed (animals)		Habitat Description	
Method of Observation		Sketch of Observation	
General Habitat Description		Landscape Condition	
Optional but Desired Fields			
Threats	General Description	GPS Coordinates	Threats
Management Needs	Managed Area Name	Level of accuracy of GPS	Surrounding Landscape
Land Ownership	Management Needs	Indication of Accuracy	Associated Species
Photographs	Land Ownership		Presence of Non-natives
Directions to Site	Land Ownership Comments		
Best Access Points	Survey Site		
Landmarks	General Comments		
	Method of Observation		
	Weight (animals)		

CT	GA	NY	WV
	Sex (animals)		
	Behavior (animals)		

Table 4-1

Once a standard field data form has been designed and implemented by NPS-NETN/ATPO that meets these basic requirements, NatureServe recommends that NPS transfer the data that is collected on these forms during field surveys into an electronic database. NPS should also track the state where the data was collected and/or a unique primary key should be assigned to the records in the database that contains a state code, so that NPS can subset and export data sets for exchange with individual state programs. In the short term, as long as required fields are being tracked, NPS-NETN can track this information in any database or spreadsheet program of their choosing. In the long-term however, the NPS-NETN/ATPO may want to consider managing and exchanging data by either implementing Kestrel to manage observation data and/or taking advantage of NatureServe's web services by accessing data through NatureServe Explorer or developing a custom interface for their own database system(s) that would allow it to interact directly with NatureServe's data systems. These options are discussed further in Section 5.0.

4.2 Sharing the Electronic Data

Once field data collection protocols have been established, the next step for NPS-NETN is to establish protocols for the exchange of the field data itself with the member programs. As mentioned earlier, only the member programs develop and maintain Element Occurrence data; NatureServe receives and aggregates this information during data exchange, but does not develop any EO data. Thus, the data flow between NPS, the member programs, and NatureServe would need to follow one of the basic models in Figure 4-1 below. A more detailed data flow diagram is presented in Section 4.2.2.

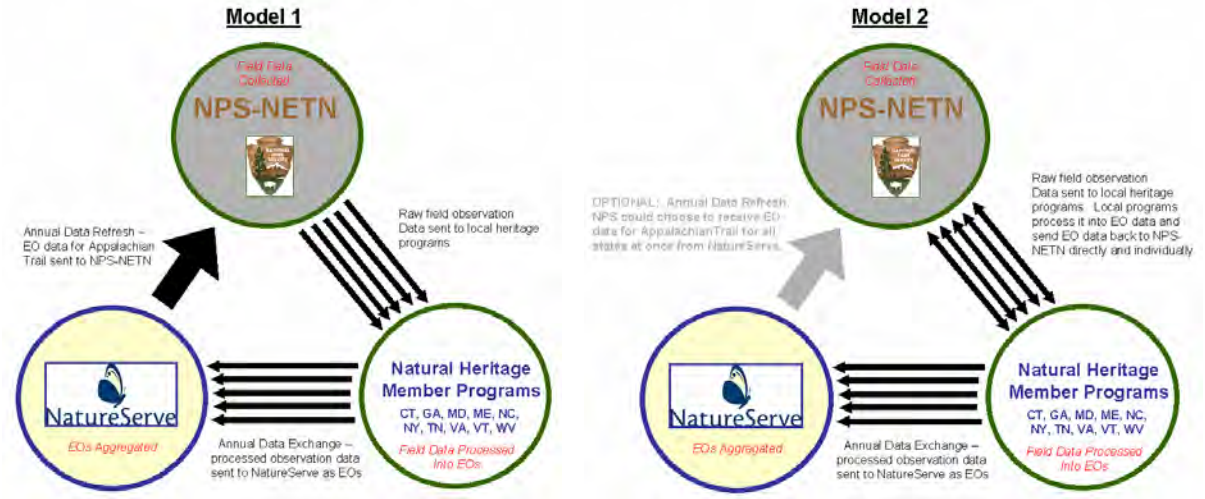


Figure 4-1 – two models of potential data flow between NPS-NETN, NatureServe, and the network programs.

Under the Model 1 scenario, the NPS-NETN would provide raw field observation data to the network programs, the network programs would process the data into new or existing EOs, the new information would be aggregated by NatureServe during the annual data exchange cycle, and NatureServe would provide the processed EO data back to NPS-NETN through an annual or other periodic data refresh. The advantage to following this model is that NPS-NETN would be receiving EO data for all states through NatureServe that has been taxonomically reconciled, is exported in a single format, and any global or national level data fields that are included (which are maintained by NatureServe) would be as current as possible. The disadvantage to following this model is that due to the data exchange cycle there would likely be a lag of one to two years before NPS-NETN would receive processed EO data back from NatureServe after submitting it to the network programs (depending on their capacity to process it). Also, depending on the time of last data exchange for a state and the frequency of data refreshes being sent to NPS-NETN, some state level data fields provided through NatureServe may not be as current as possible.

Under the Model 2 scenario, the NPS-NETN would provide raw field observation data to the network programs, the network programs would process the data into new or existing EOs and send it back to NPS-NETN directly (on an agreed upon schedule), and NatureServe would receive a copy of any new EO data during the annual data exchange cycle (as permitted by NPS-NETN). NPS-NETN would also have the option, if desired, of getting a data-dump for all of the states through NatureServe (taking into account the lag time due to the data exchange cycle). The advantage of following this model is that NPS-NETN would be receiving the processed EO data from the states as quickly as possible, and any state level data fields would be as current as possible. The disadvantage to following this model is that NPS-NETN would be receiving a separate data set from each state that may not necessarily be in the same exact format, that will not have been taxonomically reconciled against NatureServe's taxonomic standards, and that may contain global or national level data fields that are not as current as possible.

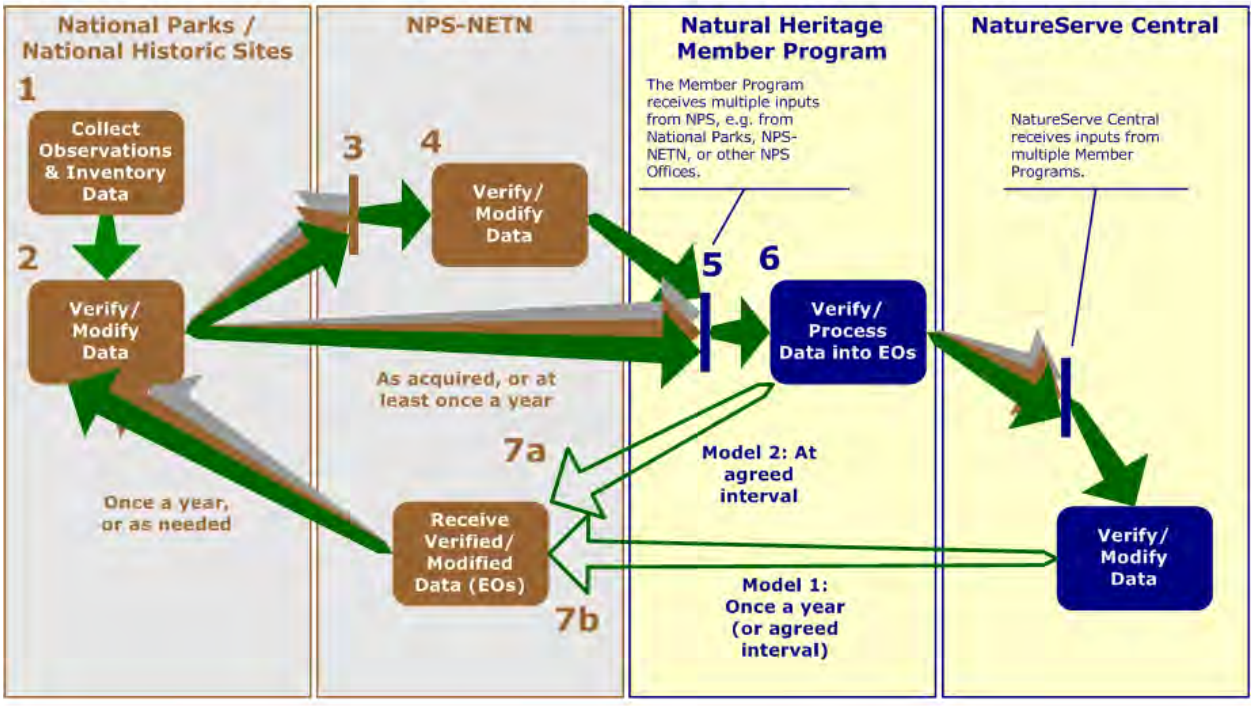
4.2.1 Data Sharing Agreements

Data Sharing Agreements (DSAs) will be important to enable the sharing of data between NPS-NETN, the Natural Heritage Member Programs, and NatureServe. These agreements will serve to benefit and protect the interests of all parties by establishing ownership of data, identifying and defining restrictions on the use of sensitive data, setting limitations on the distribution of data to third parties, defining appropriate and/or inappropriate uses of the data, and establishing a frequency at which data will be exchanged and refreshed, to name several examples. These DSAs could either be developed directly between NPS-NETN and each individual program, or they could be facilitated through NatureServe.

4.2.2 Data Flow: Processing Steps and Network Capacity

As described above, the general data flow is that NPS-NETN/ATPO would collect the field observation data and send it to the network programs, who would then process it into new or existing EOs. The updated EO information would either be aggregated by NatureServe during data exchange, and provided to NPS-NETN on an annual (or other agreed upon interval) basis (Model 1 above) or NPS-NETN could receive regular updates of the EO data as it gets processed directly from the individual network programs on an agreed upon schedule (Model 2 above). Figure 4-2 below shows how the data flow would occur for each model in greater detail.

Figure 4-2: NatureServe – National Park Service Detailed Data Flow Diagram



Notes

Dataflow timing: The exchange cycle from NatureServe (Model 1) or the network (Model 2) to NPS-NETN will operate on an annual basis or agreed upon intervals; in special cases where Parks will need detailed data from a Member Program, NatureServe and NPS-NETN recognize that dataflow may vary. Regarding Step 5 – while the focus of this report is on the premise that data will be aggregated from ATPO and/or other parks and provided to the Member Programs by NPS-NETN, NatureServe recognizes that there may be cases where a Park provides data directly to a Member Program.

Verification/modification: Each Park will verify and modify detailed data where appropriate; each Member Program will have to verify and modify/process the data into Element Occurrences (EOs); NatureServe will have to verify and modify the data before the exchange does one full cycle (following Model 1 only).

Data sensitivity training (DST): NatureServe certified data sensitivity training will be strongly recommended for NPS staff that will have access to Element Occurrence Data. This can be arranged even if NPS-NETN chooses to receive data directly from the programs (Model 2).

Data to be shared: general element data (e.g. taxonomic data) and detailed geographic element data; minimum data standards for both are based on Biotics 4/ Natural Heritage Methodology common data model elements.

The conditions and capacity for each individual network member program to be able to accept and process data from external sources, including NPS-NETN, may be somewhat different depending on the size of the program, the amount of data being exchanged, and the quality and format of the data itself. As part of this report, NatureServe conducted a short survey of the programs along the Appalachian Trail to

get a general idea of their capacity and protocols for processing external data that included the following seven questions:

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

2) If so, then generally speaking, how is this information processed or incorporated into your database (observations are processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to species that are G1/G2, state rare, state protected, federally protected, etc., etc.?)

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

A sample of the survey results for questions 5 and 6 is presented above in Table 4-1 (see Appendix 2 for complete survey results for programs that responded in time for this report). The overall message is that while the requirements for programs to be able to accept and process data are generally the same, there may be some individual preferences, limitations, or concerns for some programs that NPS-NETN will need to take into consideration when working to provide data to them. It is possible to negotiate and establish protocols in the Data Sharing Agreements between NPS and the programs (discussed in Section 4.2.1) that will address these considerations and best allow the programs to accept and process data in as efficient a manner as possible for all parties.

5 Long Term Strategies for Managing and Sharing Data with the Network

While collecting and managing data in a manner that satisfies some minimum requirements of natural heritage methodology (as described in Section 4.0), will immediately allow NPS-NETN to begin sharing data with the network programs with relative ease in the short term, there are some long-term options for managing and exchanging this data that NPS-NETN may want to consider as well. These options include implementing Biotics 4, implementing the Kestrel observation data system, and exchanging data through web-services using NatureServe Explorer or NPS-NETN's own database system(s).

5.1 Implementation of Biotics 4

Due to the age of this system, the costs to implement it, and the time investment required to learn this complex data model, this is probably the least feasible of the three options presented in this section. However, because it is a possibility, and because Biotics 4 will continue to be the primary data management system of the network for at least several more years, it is given a mention here.

Implementing NatureServe's current Biotics 4.0 data management system would allow NPS-NETN to track species and/or community data for the region in exactly the same manner as NatureServe and the member programs. Biotics 4 includes tools for exchanging data, and would also potentially allow NPS-NETN to quickly become an active member of the network if so desired. The network currently has three active non-state/provincial programs including the Tennessee Valley Authority Regional Natural Heritage Program, the Navajo Nation Natural Heritage Program, and Parks Canada. Additionally, Great Smokies National Park and the NPS Center for Urban Ecology in Washington D.C. used NatureServe's data management systems in the past and functioned in the capacity of network programs, so this is not a new idea.

Unless there is a strong desire on behalf of NPS-NETN to become an active member of the network in the near future however, it is probably not advisable to pursue this option. For one, there would likely be a cost of several thousand to over 10,000 dollars for NPS-NETN to purchase the system and have NatureServe install and support it, depending on circumstances. Because the "off-the-shelf" version of Biotics 4 is designed to work within a single jurisdiction (i.e. state/province), a custom installation has to be implemented for non-state/provincial entities that cover more than one state/provincial jurisdiction, which is more expensive than a standard installation. This is the case with Tennessee Valley Authority and Parks Canada, and would be the case with NPS-NETN and/or the Appalachian Trail itself as well, both being regional entities. Being an Oracle and ArcView based product, this also requires users to have the appropriate licenses, infrastructure, and internal support to operate the system which can be expensive if these are not already in place.

Lastly, and perhaps most importantly, NatureServe has already begun work on designing the NGDMS that will eventually, in modular fashion, replace Biotics 4. The first module, the Kestrel observation data system, is perhaps the most relevant piece of the NGDMS related to NPS-NETNs management of inventory and monitoring data, and the prototype of this module is already funded and is scheduled for release in less than a year.

5.2 Implementation of the Observation Data Module of NatureServe's NGDMS

Since NatureServe already has received dedicated funding and has begun work developing a prototype of the Kestrel system described in Section 3.3.2 (and is actively pursuing additional funding for developing the finished product), NPS-NETN may want to consider implementing these modules, both of which would be more cost effective than pursuing Biotics 4. Being the first module of the network's NGDMS, this option would also put NPS-NETN in a good position to implement additional modules in the future if so desired.

5.2.1 Implementation of the Kestrel Prototype

As mentioned earlier, Parks Canada has funded the development of the prototype of the Kestrel observation data management tool (see Sections 3.3.2.1-3.3.2.4 for details). This prototype is scheduled to be completed in March 2007 and it will be used by Parks Canada to manage observation data that is collected in their parks and exchange it easily with the Canadian network programs (and ultimately NatureServe) agency-wide.

This prototype will be a secure web-based system that will most likely be hosted by NatureServe. This means that neither Parks Canada as an agency nor their individual park units will need to implement or support the tool on their local or regional systems. Parks Canada staff wishing to have access to the system will only need an internet connection to be able to enter, edit, and download observation data for their own park or for multiple parks. Data Sharing Agreements will be established, and security authorization and authentication tools will be developed to manage and enforce who has access to different types of data and at what scale. Furthermore, the tool will be designed with an interface that will cross-walk the observation data to the Biotics 4 data model, and allow Parks Canada to export data into a common file format (.txt, .dbf, Excel, etc.) that the Canadian network programs can easily incorporate into their Biotics 4 systems for processing into Source Features for new or existing EO records. NatureServe has also worked with Parks Canada to cross-walk these core Observations Standard fields to their own agency-specific fields to ensure that the tool will satisfy their own data needs.

While this prototype will be a simplified version without all of the functionality and flexibility of the proposed fully-operational version, it will still be a web-based system containing the core fields of the Observation Data Standard (see http://www.natureserve.org/prodServices/obsStandard.jsp) and will be the starting point from which subsequent versions will be based. Thus, if NPS-NETN were interested in implementing this prototype version of the module for its own use, NatureServe would be pleased to work with NPS-NETN to scope out the requirements and cost of doing so.

The advantage of pursuing this option is that, being web-based, the system is extremely flexible. It could be designed so that a single office such as NatureServe or NPS-NETN would host the system and the individual parks would access it through a secure web portal, or each park could host its own instance of the system, or it could be a mix of the two. As with Parks Canada, NatureServe could work with NPS-NETN to crosswalk the core Observations Standard fields (see http://www.natureserve.org/prodServices/obsStandard.jsp) to agency-specific fields NPS-NETN needs to track, and the export tool that will already be built for the module will export fields that network programs need to process the data into Source Features and EOs.

This option would also be cheaper than implementing Biotics 4 in both time and money, and, being the first module of the NGDMS, it would allow the NPS-NETN to easily exchange data with the network programs and would be compatible with future modules of the NGDMS that NPS-NETN may wish to pursue.

It should be noted that for this option NatureServe would prefer to implement this tool as-is, and not customize it with NPS-specific fields for anything that could not be cross-walked to the Observation Data Standard (see http://www.natureserve.org/prodServices/obsStandard.jsp). The reason is that our goal is not to create customized versions of the initial prototype, but to expand it so that subsequent versions will incorporate the additional functionalities envisioned for the final product, which ultimately will satisfy any user-specific needs.

5.2.2 Implementation of the Fully-Operational Kestrel Module

If implementing the Kestrel observation data module prototype would not satisfy NPS-NETN's inventory and monitoring data needs, NPS-NETN may want to consider adopting the measures described in Section 4 and waiting for the final fully-operational version of Kestrel to be developed and released. As described in detail in Sections 3.3.2.1 through 3.3.2.4, this will be an extremely powerful and flexible tool that will allow users both inside and outside of the network to design their own custom observation data templates that will satisfy any research or project specific needs, while still allowing easy aggregation and sharing of data and data collection templates from multiple sources. Given current funding levels, NatureServe estimates that the final version of Kestrel will be released in approximately three years though additional funding could help shorten this timeline.

5.3 Utilizing Web-Services to Acquire Network Data

NatureServe is implementing web services for our central database node to improve access to the network's vast biodiversity data resources, using established XML-based web services protocols. These web services will provide direct access to these data from a user's desktop by confederating the existing distributed network of biodiversity databases held by the natural heritage programs in each of the 50 states. Although in practice it will take some time for all network participants to become web services-enabled, the long-term vision is to employ this web services framework for all NatureServe network nodes.

Through this distributed database architecture, each data provider (i.e. network program) would continue to host the data locally and respond directly to data requests from the central node or from other compatible third-party applications. This means that eventually a user such as NPS-NETN, with a web services enabled system, will be able access network data directly from the programs through a central node "on demand". These services will feature security authorization and authentication systems to protect sensitive data, and can be set up so that a particular user could actually download data, or they could only view but still interact with the data in their own systems.

Until all network programs are web services-enabled, the data that will be available will be through NatureServe's central database, and the currentness of that data will still be limited by our annual data exchange cycle with the network. However, NatureServe is also designing web services that will be used to automate and increase the frequency of our data exchanges with the network, which will improve the currency of the central database through time.

One initial disadvantage of both web services options below is that they would only enable NPS-NETN to download network data, but not provide updates of their own data to the programs through the same channel. Thus, NPS-NETN would be able to receive updates of EO data as it becomes available either through NatureServe Explorer or their own system, but would still have to track their own observation data in their own system according to the requirements in Section 4, and send individual updates of that data separately to the states. However, NatureServe's goal is to eventually design web services that will automate our data exchange process with the programs (a true distributed database architecture), and it will be possible to modify these services to allow exchange directly between programs and third parties in the long run.

A fact sheet about web services can be accessed at the following link: http://services.natureserve.org/docs/general_info/factsheet%20internet%20data%20delivery.pdf.

5.3.1 Accessing Data Through the NatureServe Explorer Website

The first round of web services are going to be available through the NatureServe Explorer (www.natureserve.org/explorer) website in a matter of months. Here, users will be able to set up a secure account, query the data they want, and based on their access level, download the data they are permitted to have in a specified format. Initially, the data that will be made available will be non-sensitive in nature and will not require the creation of an account, but eventually, users will be able to access and download precise location data from the site once they have requested and been granted access to it from the network programs. Once precise location data is available through NatureServe Explorer, NPS-NETN can contact NatureServe to request access to it for their area of interest for a specified period of time, and once granted, they will be able to download it and refresh it as they wish from the site. (Note: there will still be fees for accessing precise data, but details of how that will be handled are still being worked out.)

5.3.2 Accessing Data Through a Web Services-Enabled NPS System

Instead of accessing data through NatureServe Explorer, a second option would be for NatureServe to work with NPS-NETN to design a new, or modify an existing database system, that would be web services-enabled and would be able to connect to and pull data directly from NatureServe's central database in XML format. In this scenario, it could be as simple as designing an Access database that can connect to NatureServe's system and import data whenever needed, or as complex as modifying NPSpecies or designing a GIS-based system that could access, query, and interact with the data spatially. This option may be more desirable in the case where NPS-NETN would prefer to access and refresh network data directly in their own systems without the extra step of having to download the data from NatureServe Explorer first. If interested, NatureServe can work with NPS-NETN to scope out the requirements, costs, and timeline of getting such a system up and running.

6 Conclusion

NatureServe and the network natural heritage member programs have developed standardized methods for gathering, managing, and analyzing biological and ecological data, referred to collectively as natural heritage methodology. This is key to creating interoperability and facilitating data exchange among the more than 75 local database nodes that make up the network, and this allows for the most consistent and standardized dataset of its kind in the Western Hemisphere.

One of the goals of this project was to identify potential strategies to keep the natural heritage data that the NETN has acquired current, as well as a mechanism for the Park Service to submit recent observations to NatureServe's member programs. This is intended to ensure that data acquired by either NatureServe, the member programs, or the National Park Service NETN is shared, and that the datasets held by either organization contain the most current available information for the Appalachian Trail (and potentially other parks in the NETN jurisdiction).

In order for the Appalachian Trail Park Office (ATPO) and the Northeast Temperate Network (NETN) of the NPS to be able to effectively and efficiently exchange data with the NatureServe network, it will be necessary for ATPO and NETN to incorporate some natural heritage methodology, in whole or in part, into their existing data model(s) and data inventory/monitoring efforts. At the most basic level this would involve the adoption of standard field data collection forms Trail-wide that would meet the minimum requirements of natural heritage methodology. At the highest level this would involve the creation of at least a simple database or spreadsheet where field data would be aggregated and could be exported in a format specified by the network programs.

While collecting and managing data in a manner that satisfies these requirements will immediately allow NPS-NETN to begin sharing data with the network programs in the near term, there are some long-term options for managing and exchanging this data that NPS-NETN may want to consider as well. These options include implementing Biotics 4, implementing the Kestrel observation data system, and exchanging data through web-services using NatureServe Explorer or NPS-NETN's own database system(s).

If the NPS is interested in pursuing any of the options and recommendations that are put forth in this report, NatureServe would be pleased to arrange a meeting to scope out requirements in more detail and answer any questions that NPS may have. NatureServe could also provide demonstrations of our data management systems and methodology, and could accommodate NPS staff that may not be able to attend in person over the internet via the WebEx online meeting service. Contact information for NatureServe staff is provided in Appendix 3.

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Fred Dieffenbach - Biologist / Data Manager, Northeast Temperate Network
Beth Johnson - Northeast Regional I&M Coordinator
Greg Shriver – (Former) Network Coordinator, Northeast Temperate Network
Brian Mitchell – Network Coordinator, Northeast Temperate Network

Mark Wotawa - Biological Inventories Program Manager, Biological Resources Management Division

NatureServe Contributing Staff and Reviewers:

Nancy Benton – Project Manager, Arlington, VA Office
Keith Carr – (Former) Database Systems Program Manager, Arlington, VA Office
Leslie Honey - Director of Information Products & Services, Arlington, VA Office
Lynn Kutner - Data Management Coordinator, Boulder, CO Office
Jason McNees – Conservation Data Analyst, Arlington, VA Office
Lori Scott – Project Director, Arlington, VA Office
Rob Solomon - Software Support Program Manager, Arlington, VA Office

Cover Photo: Section of Appalachian Trail in Bigelow Preserve, Maine. Photo provided courtesy of the NPS Northeast Temperate Network, Woodstock, VT.

APPENDIX 1
Network Program Field Data Forms

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_____**New** _____ **Update**
_____ **Entire Known EO**
_____ **SubEO[s] only**

CT Department of Environmental Protection
Natural Diversity Data Base
Element Occurrence (EO)
SPECIAL PLANT SURVEY FORM

Reporter: _____
Adrs. & Tel: _____
_____
_____

Species Name: _____ Element Code: _____ Occ.#: _____

Site: _____ Survey Date: _____ Source Code: _____
Quad Name(s): _____ Survey Date: _____ Source Code: _____
Town(s):_____ Survey Date: _____
Full extent of EO known and mapped by reporter? ____Yes ____No Other:_____

Directions to EO:

Mapping Details:
__ Location mapped within 6.25m (corrected GPS or precisely bounded area) GPS Coordinates (Optional) Preferred Datum: NAD 83

Add buffer, if needed, to indicated location for uncertainty: Model: _____

None 25 100 1000 (radius, meters) Accuracy: _____

50 500 1500 Custom: _____ GPS data post processed?: Y / N

Explain boundaries: (If the observed area is known to be somewhere within a bounded area on the map, please draw the boundary with dashed lines, describe features.)

BIOLOGY

Population Area
Lenth (units)
_____
Width (units)
_____
Area (units)
_____
Comments on above:

Population Size
Ramets Genets
____ Actual # _____
or
____ Estimated _____
(or range)

Phenology
__%In leaf
__%In bud
__%In flower
__%Immature fruit
__%Mature fruit
__%Seed dispersing
__ %Dormant

Age Structure
__% Seedlings
__% Immature
__% 1st year
__% Mature
(established)
__% Senescent
__Age structure
unknown

Vigor
__Very feeble
__Feeble
__Normal
__Vigorous
__Exceptionally
vigorous

Evidence of disease, predation or injury? ___Yes ___No Explain: _____

HABITAT

Aspect
___N ___NE
___E ___NW
___S ___SE
___W ___SW
___Flat
___° re true N
___° re mag N

Slope
___ 0-3%
___ 3-8%
___ 8-15%
___ 15-35%
___ 35%-vertical
___ measured (° or %)
___ Horizontal shape (as for next item)
___ Vertical shape (i.e. convex, concave, straight, variable)

Light
___Open
___Partial
___Filtered
___Shade

Topographic position
___Crest
___Upper Slope
___Mid-Slope
___Lower-Slope
___Bottom
Other _____

Moisture
___Permanently Inundated
___ Seasonally Inundated/Exposed
___ Tidally Inundated/Exposed
___ Saturated (Hydric)
___ Moist (Mesic)
___ Dry-Mesic
___ Dry (Xeric)
Other: _____

Elevation: _____ ft to _____ft NGVD
Evidence of disturbance: ____fire ____logging ____disease ____insect damage ____windthrow _____ invasives
Comments: _____

Cross section of topography / habitat (include scale, direction, element position, description, and suboccurrence ID[s], if needed):

Associated natural/plant community(ies):

Associated plant species (separate strata e.g. tree, shrub, herb layers.):

Soil/substrate name/description(give source):_____

Estimated # of acres of potential habitat in the immediate area: _____

IDENTIFICATION

Photograph taken? ___Yes ___No Photo ID:_____

Specimen taken* ___Yes ___No If yes, give collector, collection # and repository: _____

Identification problems? ___Yes ___No Explain: _____

_____

*****DEP Scientific Collection Permit is needed to collect specimens.

CONSERVATION

Owner info: _____

Owner aware of EO? _____ Yes _____ No _____ Unknown Owner protecting EO? _____ Yes _____ No _____ Unknown

Threats to EO:_____

Conservation/management needs: _____

_____

Research needs: _____

_____

SUMMARY

For each category assign a letter rank as follows: A-Excellent B-Good C-Marginal D-Poor E-Unable to assess

EO Size: (Compare area of occupancy, population abundance, density and fluctuation, with other occurrences in the region.)
Rank:_____ Comments:_____

EO Condition: (Reproduction and health, species composition and biological structure, ecological processes, abiotic physical/chemical factors)
Rank: _____ Comments: _____

Landscape Context: (Landscape structure and extent, and condition of the surrounding landscape)
Rank: _____ Comments: _____

EO Rank: (ie, A summary of all factors listed above.) A B C D E
Comments: _____

Attachments:

____ Sketch map (showing finer detail than topo or aerial photo)
____Aerial photo base EO location map
____USGS quad base EO location map
____Prints ___ Slides ___ Field notes ___Route of survey map

Return completed form to:
DEP, BNR-Wildlife Division
79 Elm Street, 6th Floor
Hartford, CT 06106-5127

Georgia Natural Heritage Program
2117 US Hwy 278 SE
Social Circle, GA 30025
Phone: (770) 918-6411

SPECIAL CONCERN ANIMAL OBSERVATION/ COLLECTION DATA SHEET

Species Scientific Name: _____

Date Observed / Collected: _____ County: _____

Method of Observation/Capture: _____

_____

Observer / Collector: _____

Affiliation / Address: _____

Field Collection Number: _____

Museum & Accession Number: _____

Site Name: _____Topographic Quad: _____

Directions To Site From Known Landmark: _____

_____

_____

General Description of Habitat: _____

_____

_____

Specimen Data: _____

_____

_____

Weight: _____ Sex: _____

Additional Notes (e.g. behavior, condition): _____

_____

_____

_____

*****Attach a photocopy from a 7.5-minute U.S.G.S. topographic map showing the location of the observation/collection site. Please mark the precise location of the site.*****

Send to: Greg Krakow, Data Manager
Georgia Department of Natural Resources
Wildlife Resources Division
Georgia Natural Heritage Program
2117 U.S. Hwy. 278, SE
Social Circle, Georgia 30025-4714

Georgia Natural Heritage Program
2117 US Hwy 278 SE
Social Circle, GA 30025
Phone: (770) 918-6411

SPECIAL CONCERN PLANT DATA SHEET

Species Scientific Name: _____

Date Observed / Collected: _____ County: _____

Observer / Collector: _____

Affiliation / Address: _____

Was a Voucher Specimen Collected? Yes _____ No _____

Where Will specimen Be Deposited? _____

Was a Photo Taken? Yes _____ No _____

Where Will Photo Be Located?

Was live material collected? Yes _____ No _____

Where will specimen be grown? _____

Site Name: _____ Topographic Quad: _____

Directions To Site From Known Landmark: _____

_____

_____

General Description of Habitat: _____

_____

_____

Landowner information: _____

Additional Notes (size of population, vigor, flowering, fruiting, etc.): _____

_____

_____

_____

_____

*****Attach a photocopy from a 7.5-minute U.S.G.S. topographic map showing the location of the observation/collection site. Please mark the precise location of the site.*****

Send to: Greg Krakow, Data Manager
Georgia Department of Natural Resources
Wildlife Resources Division
Georgia Natural Heritage Program
2117 U.S. Hwy. 278, SE
Social Circle, Georgia 30025-4714

Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife

Please submit field forms, a copy of a USGS map, and all supporting documentation to:
Data Manager
Natural Heritage and Endangered Species Program
Massachusetts Division of Fisheries and Wildlife
Route 135, Westborough MA 01581
(508) 792-7270 Ext. 200

Rare Animal Observation Form

Species name (scientific or common): _____

Date and time of observation: _____

Amount of time spent surveying area: _____

Location Information

Town: _____ County: _____ Waterbody: _____

Please attach a photocopy of the appropriate section of a USGS topo map (or similar map if a topo map is unavailable). **Please carefully mark the site where you observed this rare species**. Topo Name: _____

Describe how to get to the site of the observation using obvious permanent landmarks such as a road intersection (measuring to at least the nearest 1/10 mile): _____

_____

_____

_____

Population Information

Number, age and sex of animals observed: _____

_____

_____

Evidence (if any) of breeding activity at this site (e.g. eggs, nests, carrying food to young, copulation): _____

_____

_____

Behavioral notes (e.g. crossing road, basking): _____

Have you observed this species at this site in previous years? If yes, please give details: _____

_____

_____

Species Identification

Description of the specific characteristics upon which the ID was based (including how age and sex were determined):

_____

_____

Photographs or slides taken (Y / N)? If yes, please submit a clear photograph or slide of the animal. Please label the back of the photograph with the date it was taken, the location, and your signature.

Specimen taken (Y / N)? If yes, where will the specimen be deposited? _____

Site Information

Description of habitat at site where the species was observed. List dominant vegetation, size of habitat, and information on the physical environment such as substrate type, hydrology, moisture regime, slope, and aspect. If possible, provide information on the surrounding land use: _____

_____

_____

_____

Associated species: _____

_____

Alteration of ecological processes (e.g. damming, logging, rip-rapping of stream)? If yes, describe: _____

_____

_____

Observed or potential threats to the species or its habitat at this site (e.g. land clearing, development project)? If yes, describe:_____

_____

_____

Landowner's name and address, if known: _____

_____

Additional comments: _____

_____

Observer Information

Observer: Name: _____ Phone Number:_____

Address: _____

Email Address: _____

Affiliation/Qualifications: _____

Form filled out by: Name: _____ Phone Number:_____

(if different from above) Address: _____

Affiliation/Qualifications: _____

Briefly explain your previous field experience with this species: _____

_____

List names and qualifications of other observers (if any): _____

_____

Certification

I hereby certify under pains and penalties of perjury that the information contained in this report is true and complete to the best of my knowledge.

Signature: _____Date: _____

Thank you for contributing to the Natural Heritage & Endangered Species Program database. Your efforts are valuable and appreciated.

Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife

Please submit field forms, a copy of a USGS map, and all supporting documentation to:

Data Manager
Natural Heritage and Endangered Species Program
Massachusetts Division of Fisheries and Wildlife
Route 135, Westborough MA 01581
(508) 792-7270 Ext. 200

RARE PLANT OBSERVATION FORM

SPECIES SCIENTIFIC NAME: **Element Occurrence No., if known:**

Observation Date: **Today's Date:** **Population Found?** ☐ Yes ☐ No

Observed By: **Other Observers:**

Observer's Address:

Observer's Email Address: **Telephone:**

Photograph Taken? ☐ Yes ☐ No (if yes, please attach, and label back with your name, date taken, and the location)

Specimen Collected? ☐Yes ☐No Collection # Repository:

Site Name (informal)**:** **USGS Topo Name:**

County: **Town:**

Directions to the rare plant population (if found), or search area (if not found). **Mark the location on a copy of the USGS topo map.**

GPS Coordinates: System used (check one): ☐ UTM ☐ Lat-Long ☐ Mass. State Plane Datum:

At, or near, the center of the population:

or:

Least-rectangle (i.e., the coordinates delimiting the north, east, south, and west corners of the population):

North East South West

Has the full extent of the population been determined? (check one) ☐ yes; ☐ no ; ☐ uncertain whether full extent is known
Identification Problems? ☐ Yes ☐ No **Explain:**
Diagnostic Characters used: **Reference used:**
Do other members of the genus or look-alike plants occur at this site? ☐ Yes ☐ No
Explain:

Population Data

Approximate Area Occupied by the Population (check appropriate unit): ☐sq. m ☐ ha ☐ sq. ft ☐ sq. yds ☐acres

Population Size:

Total number of "genets" (i.e., genetically distinct, or clearly separate individuals): (☐ Precise count *or* ☐ estimate?)

and/or

Total number of "ramets" (e.g., stems or shoots arising from clones): (☐ Precise count *or* ☐ estimate?)

Population Structure (check all that apply)**:**

Age Classes Present	Reproductive Condition of the Population on this Date	
☐ Seedlings	☐ Vegetative (in leaf)	☐ Mature fruit
☐ Immature plants	☐ In bud	☐ Seed dispersing
☐ Mature plants	☐ In flower	☐ Senescent
☐ Plants of unknown age	☐ Immature fruit	☐ Dormant

How would you characterize the vigor of this population? ☐ Excellent ☐ Good ☐ Fair ☐ Poor

Evidence of Disease, Predation, or Injury? **Pollinators:**

Environmental Setting

Describe the plant community and list the associated species:

List any exotic plant species present and discuss their possible impacts:

Describe evidence of natural or human-caused disturbance (including changes in ecological processes) **and effects on population:**

Surrounding Land Use:

Elevation: ☐ft. or ☐m? **Soil Type(s):**

Surficial Geology: **Bedrock Geology:**

Check Appropriate Habitat Descriptors:

Landform/Topography	Aspect °	Slope %	Light	Soil Moisture Regime	Important Ecological Processes
☐summit/crest	☐N ☐NE	☐flat	☐open	☐xeric	☐seasonal or regular flooding
☐upper slope	☐E ☐SE	☐gentle	☐filtered	☐dry	☐groundwater seepage
☐mid slope	☐S ☐SW	☐average	☐shade	☐mesic	☐colluvial processes
☐lower slope	☐W ☐NW	☐rather steep		☐wet	☐alluvial processes
☐rolling terrain/plain	☐flat/variable	☐steep		☐inundated	☐wind/salt spray
☐flood plain/terrace		☐very steep			☐erosion
☐wetland		☐abrupt			☐fire
☐shore/pond/lake/stream					☐none apparent

Describe Microhabitat Conditions:

Conservation Information

Land Owned/Managed by:

Name(s) Address Telephone

Managed Area Name: **Contact Person:**

Owner Comments:

What additional factors might potentially threaten the population (e.g. land clearing, development project) If yes, describe?

What are your recommendations for future inventory, monitoring, research, and/or management?

What are your protection recommendations?

Additional Comments:

Signature: _____ **Date:** _____

For office use only: *Relative Size: _____ Relative Condition: _____ Relative Landscape Context: _____ MA EO Rank: _____*

MA EO Rank Comments: _____

Global EO Rank: _____ Global EO Rank Comments: _____

Sketch:

Use this space to draw or diagram useful information about the rare plant occurrence, such as its location relative to landmarks and habitat features. Consider depicting, for instance, a vertical cross section of a population's position on a ledge or slope, or how a population is distributed in clumped patches in the habitat relative to boulders, stone walls, brooks, trees, etc.

Please:

Don't forget to attach a copy of a USGS topo map indicating the location of the rare plants or the search area!

Mark the location of the rare plants as precisely as possible, and label with the map source, date and species name.

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RARE SPECIES REPORTING FORM

Maryland DNR, Wildlife and Heritage Division

Species name: _____

Date(s) species was located: _____

County name: _____ Directions to the site: _____

_____

_____

Habitat description: _____

_____

_____

Data on species (for example; number seen, age or maturity, breeding behavior, nature of observation - song, tracks, sight record, etc..):

_____

_____

_____

Photograph taken? _____ Yes _____ No Specimen taken? _____ Yes _____ No

if yes, give collection # and repository: _____

_____

Identification problems? _____ Yes ____No; explain: _____

_____

Other comments (for example; other people who observed this species, known threats/management needs for species or habitat, land ownership, etc..):

_____

_____

Reporter's name: _____

Address & phone number: _____

_____

PLEASE ATTACH A LOCATION MAP TO THIS FORM
(e.g., photocopy of ADC book map or USGS quadrangle map with species' location marked.)

Return to: Lynn Davidson
MD Wildlife and Heritage Division
Tawes State Office Bldg, E-1
Annapolis, MD 21401

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MAINE NATURAL AREAS PROGRAM
SPECIAL PLANT SURVEY FORM

Site name: | Survey site:

Quad name: | Quad code:

County: | Town:

Date: | Surveyor(s): | Sourcecode: F

Plant Name:	New ☐ Update ☐	Occurrence #:

GPS data:

Directions:

Number of individuals:

Population structure:

____ % Vegetative

____ % Reproductive

Phenology:
- ☐ In leaf
- ☐ In bud
- ☐ In flower
- ☐ Immature fruit
- ☐ Mature fruit
- ☐ Seed dispersing
- ☐ Dormant

Population area:
- ☐ 1 square yard
- ☐ 1 - 5 square yards
- ☐ 5-100 square yards
- ☐ 100 square yards to 2 acres
- ☐ 2 acres+

____ Est. area of **potential** habitat

Vigor:
- ☐ Very feeble
- ☐ Feeble
- ☐ Normal
- ☐ Vigorous
- ☐ Exceptionally vigorous

Comments:

Type of reproduction: ☐ sexual ☐ asexual	Explain:
Evidence of disease, predation, etc. ☐ yes ☐ no	Explain:

Aspect
- ☐ N ☐ NE
- ☐ E ☐ NW
- ☐ S ☐ SE
- ☐ W ☐ SW
- ☐ Flat or n/a

% Slope
- ☐ Flat
- ☐ 0-10
- ☐ 10-35
- ☐ 35+
- ☐ Vertical

Light
- ☐ Open
- ☐ Partial
- ☐ Filtered
- ☐ Shade

Topographic position
- ☐ Crest
- ☐ Upper slope
- ☐ Mid-slope
- ☐ Lower-slope
- ☐ Bottom

Moisture
- ☐ Inundated
- ☐ Saturated (wet-mesic)
- ☐ Moist (mesic)
- ☐ Dry-mesic
- ☐ Dry (xeric)

Elevation: minimum ____ft maximum ____ft

Associated natural community/plant community:

Associated plant species:

Substrate/soil type:

Threats to population:	

Conservation / management / research needs:	

Photograph taken? ☐ yes ☐ no

Specimen collected? ☐ yes ☐ no Collection #: _____ Repository: _____

Other species occurring at the site:

Do other members of this genus occur at this site? ☐ yes ☐ no

If yes, please complete below:

Hybridization? ☐ yes ☐ no

Identification questions? ☐ yes ☐ no

Explain:

RANKING

1. SIZE / QUALITY:

How large is this population relative to typical populations of the species? Does it appear to be viable, i.e. capable of maintaining itself if its habitat remains basically intact?

- **Size / Quality Rank:** **A** excellent **B** good **C** fair **D** poor

2. CURRENT CONDITION of the plant habitat:

Is the habitat supporting the EO pristine or degraded? Note any natural and anthropogenic disturbance within the plant habitat (check off, then describe extent and how recent below):

- ❑ Logging – most recently c. _____ yrs ago
- ❑ Agriculture / pasture
- ❑ Fire
- ❑ Wind or ice damage
- ❑ Impoundment
- ❑ Exotic plants
- ❑ Animal effects (insect outbreaks, browsing)
- ❑ Erosion
- ❑ Dumping or Mining
- ❑ ORV / vehicle disturbance
- ❑ Trails / roads
- ❑ other

Describe the disturbance(s): to what degree have these altered natural ecological processes, or do they appear to have any negative or positive effects on the population?

- **Condition Rank:**

1 No apparent signs of human disturbance (human use may have occurred, but long enough ago that effects are no longer visible or are extremely minor).

2 Some signs of human disturbance or degradation, but habitat generally intact.

3 Highly disturbed.

3. LANDSCAPE CONTEXT of the area surrounding the plant habitat:

- What land uses and/or natural communities surround the observed area? To what degree can the population be protected from effects of adjacent land uses?

- **Landscape Rank:**

1 Population surrounded by >= 1000 acres of undisturbed landscape.

2 Population surrounded by fairly intact landscape, though there may be cuts nearby.

3 Population surrounded by fragmented forest or rural landscape.

4 Surrounding area developed.

4. OVERALL RANK for plant EO based on your experience: **A** excellent **B** good **C** fair **D** poor

5. MNAP reviewed/verified rank: **A** excellent **B** good **C** fair **D** poor

Describe rationale (EO rank specs in MNAP element files; general EO rank spec considerations, etc.):

Landowner name/address for the entire population:	Landowner phone:
	Lot number (if known):
	Tax map (if known):
	Landowner aware of plant? ☐ yes ☐ no
	Landowner protecting plant? ☐ yes ☐ no
	Landowner comments:

Cross section of topography (habitat). Include scale, direction, element position.

Feature Map: It is very important to include a map indicating the precise location and extent of the feature. Please follow these instructions carefully when attaching your feature map.

1. Attach a photocopy of the appropriate part of a USGS topographic map (1:24,000 scale if available) and write the map scale on the map. Please do NOT enlarge or reduce the map.
2. Indicate on the map the exact location of the observed feature(s):
   a. When the observed feature is ***no larger than a pen point*** on the map (i.e. extremely small patches), place small points on the map indicating the location(s) of the patches, and label each point with an arrow so they are easily seen.
   b. When the observed feature is ***larger than a pen point*** on the map:
   (1) Draw a **thin solid boundary line showing the extent of the observed area** of the feature.
   (2) Indicate disjunct patches (polygons) by drawing the boundary for each patch separately.
   (3) If the boundary follows the edge of a lake, stream, road, marsh or other feature, draw the boundary precisely in the edge of the feature.
   (4) Where needed, add notes to the map with instructions on where the boundary line is located or if the boundary is shared with other observations.

Note: One Feature Map may be submitted for multiple features (communities and plants), providing the map is clear and easy to read. If necessary, please attach multiple feature maps to ensure clarity.

Locational Uncertainty is a measure of how the location of an observed area on a map varies from its actual location on the ground.

1. Is your depiction of the observed area on the map within 6.25 meters (approximately 20 ft) of its actual location on the ground? **Yes** **No**
   a. If no, estimate the uncertainty distance based on landmarks, elevation, etc. The location of the observed area on the map is accurate to within _____ meters kilometers feet miles of the actual location on the ground.
   b. Is the observed area known to be located within some feature(s) on the map (e.g. wetland boundary, lake, road, trail, highway, contour lines)? **Yes** **No**
   (1)If yes, indicate the boundary within which the observed area is known to be located on the map with a **dashed lin**e, and if applicable, identify the feature.

Confidence Extent is a measure of how confident you are that the observed area represents the full extent of the feature.

Indicate whether there is confidence that the observed area represents the full extent of the feature at that location. **Yes** **No** **?**
Y = Confident that the full extent is known **N** = Confident that the full extent is NOT known **?** = Uncertain whether the full extent is known

Shaded areas are to be filled out by Maine Natural Areas Program staff.

Please mail the completed field form and appropriate map to **Data Manager, Maine Natural Areas Program, 93 State House Station, Augusta, ME 04333**. Thank you!

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NORTH CAROLINA NATURAL HERITAGE PROGRAM
SPECIAL ANIMAL SURVEY FORM

Scientific Name:

Common Name:

Observer(s):

Date(s) of Observation:

County: 7.5' Quad Map:

Exact Location (**be specific! - attach copy of map with site marked**):

Number of Animals (**include age and sex, if known**):

Type of Observation (**sight record, vocal record, specimen, photograph, etc.**):

Behavior of Animals (**singing, foraging, at nest, etc.**):

Habitat (**use NC NHP natural community name if known; describe dominant vegetation, maturity of vegetation, slope, aspect, etc.**):

Owner(s) of Land, if known:

Other Comments (**significance of record, disturbance to habitat, etc.**):

Person making this report: Date:
Address: Phone:

Return form to: N.C. Natural Heritage Program;
1601 MSC; Raleigh, NC 27699-1601

North Carolina Natural Heritage Program - Endangered And Rare Plant Field Survey Form
Return form to: N.C. Natural Heritage Program, 1601 MSC, Raleigh, NC 27699-1601. Visit www.ncnhp.org.

Species: Common name: **Survey date**:

EO Number (if updating existing EO): **County**: 7.5' Quad Map:

Latitude/Longitude (if known): Elevation:
If Latitude/Longitude given, what coordinate system was used (State Plane 1927 or 1983, UTM, etc):

Site Name (if this is within previously identified site):
Site location and directions: (attach copy of map with site marked or use back of form to draw a sketch of the site):

Number of individuals: Define individual (stem, clump, etc.):

Size of area in which population occurs:

Estimate whether the entire population was surveyed, or only a portion:

Estimated Population Viability (circle one): Excellent Good Fair Poor Unknown Failed to find
Population Viability Comments:

Phenology (include % or # in each stage): vegetative bud flower

Evidence of reproduction: fruit seedlings clonal/vegetative

Reproduction Comments:

Habitat (NC NHP natural community name and description, if known; include quality, soils, geology, etc.):

Associated species:

Invasive species noted & degree of threat from invasive species:

Area of apparently suitable habitat (suitable for, but not necessarily occupied by the species):

If the population is within a Right-of-Way, does suitable habitat exist outside Right-of-Way?

Topographic position (examples: crest, mid slope, alluvial, etc):

Moisture regime (examples: inundated, dry, seasonally wet, etc):

Light (examples: open, woodland, closed canopy, etc):

Other information:

Protection / management needs and opportunities:

Landowner(s), if known:

Person making this report, Address, & Phone:

Other observers:

Specimens collected? Collection #: Repository:
(**permits are required for federal or state listed species**)

Draw sketch below or attach map.

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New Hampshire Natural Heritage Bureau
Rare Species Occurrence Record

Please fill out this form to report the location of a rare plant or animal species to the New Hampshire Natural Heritage Bureau. Required information is indicated by an asterisk; other items are desirable but not required. Rare species lists are at: www.dred.state.nh.us/divisions/forestandlands/bureaus/naturalheritage/listsforms.htm. Call (603) 271-2214 with any questions. Thank you!

If sent to NHB as a Word document, use the naming convention "Name Town Mon dd", where "Name" = what was seen (common or scientific) and town, month & day are where & when it was seen, e.g., "Loon Squam Aug 12" or "Scirpus longii Derry Sep 12".

What and When

* Scientific Name:	
Common Name:	
* Date(s) Observed:	
* Who Observed It:	Phone # or email:

Location

Town Name:
* Map. Attach a map with the location marked. Ideally, use a USGS topographic map. If you hand-sketch the map, be sure to include a north arrow, scale, and landmarks such as roads and major water bodies. If you provide GPS coordinates, please tell us the model of the unit and the datum (e.g., WGS 84 or NAD 83).
Directions. Write this as if you are telling someone how to get back to the exact site:

Taxonomy

* How did you identify the species? What traits helped you decide that you had seen this species? What similar species did you consider and how did you exclude them? Photos showing **key characteristics** are welcome. A specimen is usually required to document a new plant population, however, an entire plant should never be collected if there are < 20 plants present.
* Certainty of ID (1=dubious, 5=absolutely positive):
If a specimen was collected, collector, collection number, and where the specimen is stored:

Send to: Data Manager, DRED / NHNHI, P.O. Box 1856, Concord, NH 03302-1856 (scairns@dred.state.nh.us)

Biology

* How many? If there are a few, count them. If there are a lot, estimate (e.g. 50-100)

Plants: how are they distributed, in how large an area? For example: "In a tight clump about 2 feet square" or "Scattered over a 30 x 60 foot area"

Evidence of reproduction? Plants: flowers/fruit/seed. Animals: nests/youngsters... etc.

Local surroundings: what do you see when you look around the area? Is it a steep slope or the middle of a swamp? What are the most common plants?

Conservation Status (if known):

* Land ownership: name of owner (private) or area (if public).

Phone number of owner (if known):

Is the landowner aware that you are reporting this find to NH Heritage? Y / N

Factors that indicate how secure the occurrence is (e.g. evidence of disturbance / owner is interested in protecting it...)

Send to: Data Manager, DRED / NHNHI, P.O. Box 1856, Concord, NH 03302-1856 (scairns@dred.state.nh.us)

New Jersey Natural Heritage Rare Species Reporting Form

This form is used to report a personal field sighting of a rare species tracked by the Natural Heritage Database. It may also be used to summarize locational information from a published or unpublished report. Species tracked include those appearing on the Special Plants of New Jersey List and the Special Animals of New Jersey List. The Office of Natural Lands Management can provide copies of the lists upon request. Note: For anadromous fish species, only reports of spawning areas are requested. For most bird species, only breeding reports are requested. Consult the Endangered and Nongame Species Program to determine if a non-breeding report of a bird species is desired.

In order for this form to be processed, the sections preceded by an asterisk (*) must be completed.

Send completed form to : DEP - Division of Parks and Forestry, Office of Natural Lands Management, Natural Heritage Program, PO Box 404, Trenton, NJ 08625-0404. Forms for endangered and nongame wildlife will be forwarded to the Endangered and Nongame Species Program for review.

Common Name_____

***Scientific Name**_____

Today's Date_____

Location:

***Location Map:** A mapped location of the occurrence must accompany this form. The ideal format is to locate the site on a photocopied section of a USGS 7.5 minute topo map, and to also sketch a second map showing finer details. Be sure to provide the name of the USGS map.

***Directions to Site:** Describe how to get to the site from a readily relocated permanent landmark such as a road intersection.

_____

_____

_____

_____

Biology / Habitat:

*Date and Approximate Time of the Observation:

_____

Weather Conditions (animal reports):

clear ____overcast ____calm ____windy____

Describe temperature, precipitation, and other significant weather factors:

_____

_____

_____

Identification: How was the species identification made? Was it based on a sighting, tracks, call, or road kill? Name the identification manuals used or the experts consulted. Were there identification problems?

_____

_____

_____

***Number of Individuals Observed:**

1-10 ____ 11-50 ____ 51-100 ____ 101-1000 ____ 1001-10,000 ____ >10,000____

If possible, provide the exact number of individuals. For rhizomatous plants such as grasses and sedges, what was counted as an individual - separate culms or entire clumps or patches?

_____

_____

_____

Life Stages Present: Check off life stages observed or provide an estimate of the numbers of individuals for each life stage.

For plants:

vegetative ____ in bud ____ flower ____ fruit____

seed dispersing ____ seedling ____ dormant ____

For animals:

eggs ____ larvae ____ immature _____ adult female ____

adult male _____ adult, sex unknown ____

Associated Species: List any associated species such as predators, prey, food plants, parasites, host species, and additional rare species observed at the site.

_____

_____

_____

_____

***Additional Biological Data:** What else was observed? Provide information on the general condition or vigor of the individuals and viability of the population, and animal behavior such as mating or nesting behavior.

_____

_____

_____

_____

_____

Habitat Data: Describe the general area where the occurrence is located. List natural community types, dominant vegetation, and information on the physical environment such as substrate type, hydrology, moisture regime, slope, and aspect. Also, if possible, provide information on the surrounding land use.

_____

_____

_____

_____

_____

Conservation: Are there natural or man made threats to this occurrence? Please describe.

_____

_____

_____

_____

_____

Ownership: If known, please provide landowner name, address, phone #.

_____

_____

_____

Information Source:*Name and Address and Phone # (of person filing report):

_____

_____

_____

*Does this information come directly from a field visit ____, or a published or unpublished report?____
Citation: For information taken from a published or unpublished report, please provide a copy of the cover page and the pertinent portions of the report. If a copy can not be provided, list below the author, date, title, publisher, and page numbers.

_____

_____

_____

_____

_____

Voucher: Was the observation vouchered with a photograph?____ a specimen?____ If possible, attach a copy of the photograph. If specimen voucher, please provide the name of the repository:

_____

_____

Confirmation: Would you accompany a biologist to the site if needed? ____yes ____no.
Additional Comments: (use extra sheets if needed)

_____

_____

_____

Revised 9/98

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OFFICE USE ONLY

SURVEYSITE: _____

FILE QUADCODE: __ __ __ __ __ __ __

FILE QUADNAME: _____

Date received: _____ (yyyy-mm-dd)

Sourcecode: U __ __ __ __ __ __ __ NYUS

EOR transcribed/updated by: __ __ __ (initials) _____ (date)

rev. 7/24/2001

NATURAL HERITAGE REPORTING FORM

New York Natural Heritage Program
New York State Dept. of Environmental Conservation
625 Broadway, 5th Floor
Albany, NY 12233-4757 (518) 402-8935

We Need Your Help. *If you have information on the location of a rare plant, rare animal or ecological community and would like to help us build the Natural Heritage inventory, please complete the form below. - Thank you!*

INSTRUCTIONS:

1. Complete this form for **first hand field observations only**. Please mail fully completed form to the above address.
2. **DO NOT COMPLETE THIS FORM** if the source of your information is a report, letter, conversation or other document. Send us the documentation.
3. Rare birds: complete this form only for observations during the breeding season or at large concentration areas during migration or in winter.
4. Attach a copy of a map (USGS 1:24,000 topographic map preferred) and mark the location of the rare species or community & its boundary (if known).
   Note, you may print copies of topo maps from the Internet at http://www.topozone.com. Please use 1:24,000 or 1:25,000 scale only.

SOURCE OF YOUR INFORMATION: (check one of the following)

__ Firsthand field observation Does the identification need to be confirmed? __ yes __ no

__ Other: Please do not complete this form; send us a copy of the documentation instead. If source is a conversation with someone, send us a note.

FORM COMPLETED BY: Date: phone:

IDENTIFICATION

Complete **only one form per rare plant, animal or ecological community per site**. If you need a list of rare species/communities we are tracking, contact our office.

Name of the rare plant, animal or ecological community:

Last Date Observed: First Date Observed: month:

Observer (name, phone# and address if known) :

LOCATION:

Site name (local or place name):

Directions (describe in detail the precise location of the species or community; include nearby landmarks, street names and mileages):

County: Town: Name of USGS 7.5' topo (if known):

OBSERVATION DATA:

Animals: Indicate the number of adults, juveniles, nests, etc.

Plants: Indicate 1) the number of flowering plants and/or sterile stems and 2) the number of separate plant groups

Ecological communities: Indicate 1) the percent cover of tree, shrub and herb layers and 2) the percent cover of dominant plants in each layer.

SIZE: Please indicate the estimated size of the area occupied by the animal, plant or community): _____acres or _____sq. meters

If the area occupied is long, narrow and less than 12.5 meters wide, please indicate: Length:_____(meters) Width: _____(meters)

HABITAT DESCRIPTION: Write a word picture of the habitat where the species or community is found. Include ecological communities, dominants, associated species, substrates, soils, aspect, slope, hydrology, etc.

LANDOWNER (name, addresses and phone numbers if available):

LANDSCAPE (describe the current landscape surrounding the plant, animal or community (i.e., farmland, residential, pristine forest, etc.)

CURRENT AND POTENTIAL THREATS:

MANAGEMENT NEEDS:

SPECIMEN: Was a specimen taken? ___yes ___no. If yes, indicate the collection # and repository: _____
PHOTOGRAPH: Was a photo taken? ___yes ___no. If yes: ___slide ___print ___digital. If possible, please send us a copy of the photo.
Is a copy included with the form? ___yes ___no
COMMENTS:

HABITAT MAP: Please draw a sketch of the site and habitat showing the location of the species or ecological community which are not apparent on the topo map. Show nearby landmarks, the route taken, streets, landmarks, disturbances, scale, and north. Use an additional sheet of paper if needed.

PENNSYLVANIA NATURAL HERITAGE PROGRAM
PLANT & ANIMAL SPECIES OF SPECIAL CONCERN REPORT
(PLEASE INCLUDE A MAP – SEE MAPPING INSTRUCTIONS)

SPECIES NAME:	**SURVEYOR(S):** (*Please include your address & phone #)*
DATE OF VISIT:	**TIME SPENT AT SITE:**
USGS QUADRANGLE:	
SITE NAME AND DIRECTIONS TO SITE:	**GPS Coordinates**: Latitude:_____ Longitude:_____ **DATUM** (e.g. NAD27, NAD83)_____

OWNER INFORMATION:
- **Public Land:** give tract name:_____
- **Private Land:** Please fill out landowner info below. **NOTE**: We cannot accept data collected on private land if you didn't have permission!

Landowner Name:	Address:
Phone Number:	City / State / Zipcode:

- Landowner aware of the species of special concern? **YES____ NO____**
- Landowner aware that data are submitted to PA Natural Diversity Inventory? **YES____ NO____**
- Landowners are welcome to call the PNDI-East office in Middletown at (717) 948-3962 for more information.
- **IF A SPECIMEN WAS COLLECTED**: Please ask for the landowner's signature **for permission to save the specimen in a museum**:
  Landowner Signature:_____ Date:_____
- WHERE IS THE SPECIMEN BEING HELD_____

HABITAT DESCRIPTION: Give a general description of the site. You might include other plant/animal species at site, substrate/soils, topography, land use, weather, etc. If revisiting a site, indicate any obvious changes to the habitat.

DISTURBANCES/THREATS: Include human and/or natural disturbances and threats to the species at this site.

SPECIES DATA: Fill out as much of the following as you can - include anything else you feel is of importance.

♣Give general description of what you saw (*i.e.: found scat, heard song, animal crossing road, found plant in bog.*.)

♣Count or estimate the number of plants / animals you observed & estimate the size of the area they occupy.

♣Age and condition of individual(s) (*i.e.: fresh adult butterfly; healthy mature plants - 50% flowering and with immature fruit...*)
♣Behavior (*animals*) (*i.e.: nectaring insect, breeding birds, turtle basking...*)
♣If revisiting this site, compare the heath and size of the population to previous visits.
♣Confidence level on Identification: ID Positive ID Somewhat Uncertain ID Unknown
♣Voucher specimen or photo taken? (*Please include if possible*)
♣Additional information:

Mapping Locations of Species of Special Concern

- Maps made from USGS quadrangle maps are ideal, but a good topographical or gazetteer map will do.
- Draw with a thin red or other bright-colored pen so your lines are easy to see.
- Draw the location of the 'found' species as accurately as you possibly can. We encourage you to draw a precise polygon of the area the species occupies, rather than a vague circle or arrow pointed at the site. If you only find a few plants or one animal, a polygon would be impossible to draw at 1-24:000 map scale (our standard map scale), so a dot would suffice.
- Estimate the size of the area the species is occupying.

Do not include in your polygon the 'suitable' habitat surrounding the location of the species IF:

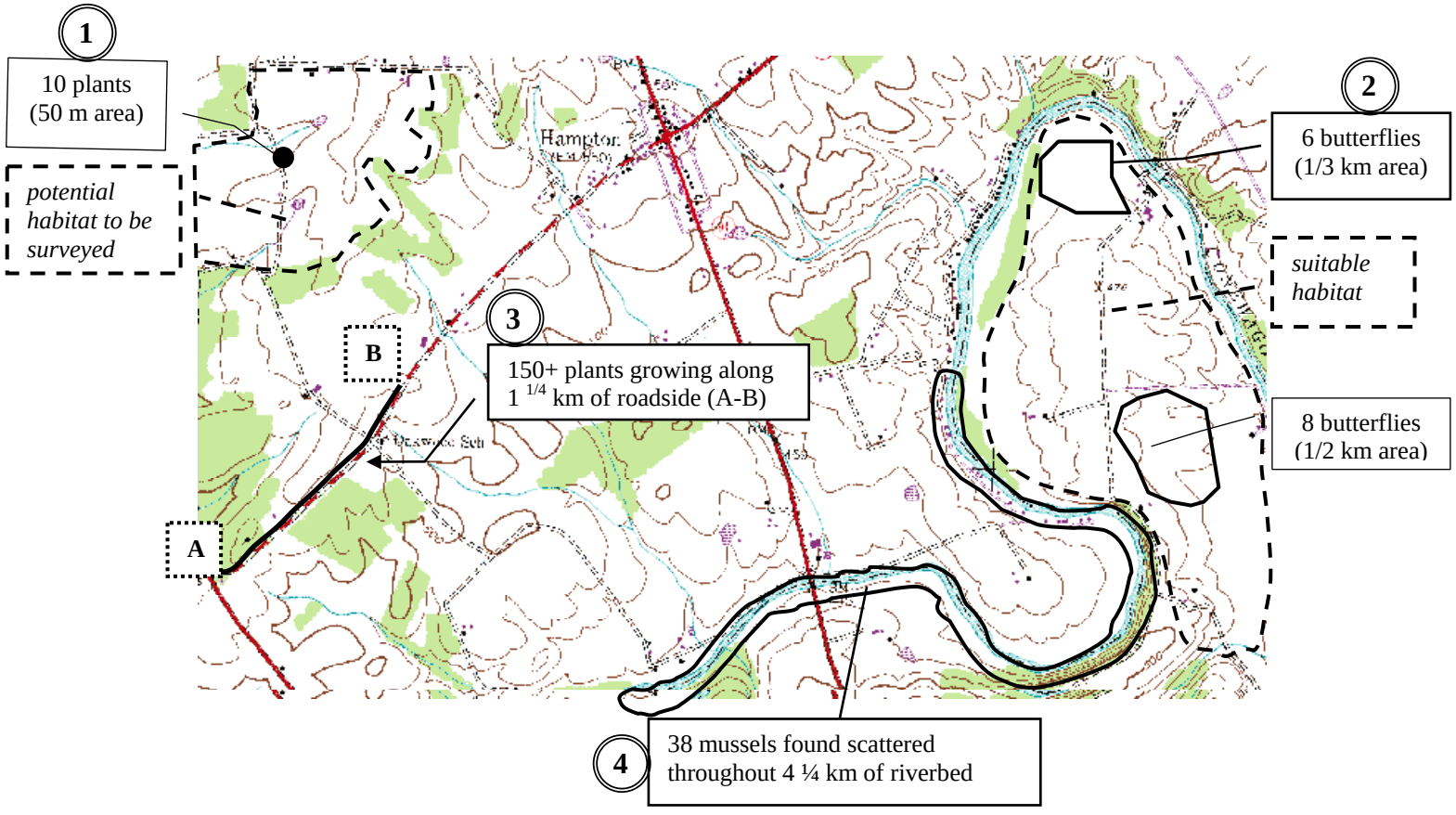
- You <u>did not survey</u> the surrounding area.
- You <u>searched but did not find</u> the species in the surrounding area.

To further complicate things, we <u>do</u> want potential / suitable habitat information if you can provide it. But it must not be confused with the area where you KNOW FOR CERTAIN the species is found.

- To indicate suitable habitat (but not yet known for certain to be occupied), draw a dotted line around the area and label it as 'suitable' or 'potential' habitat.

Examples:

1. Small dot indicates the exact location of a plant population of 10 plants. The dotted polygon represents additional potential habitat for the plant that should be surveyed in the future.
2. The solid-line polygons are two sections of a large meadow where butterflies were found nectaring. The dotted-line polygon shows the perimeter of the meadow. Your report might explain that the entire meadow appears suitable for the butterflies, though the butterflies were only seen in two areas of the meadow during this particular survey.
3. Solid line indicates plants were growing along a narrow strip of roadside.
4. Solid-line polygon around section of river shows where mussels were found throughout the riverbed.



PNHP Employees Only

(Office use only)

Employee who received this field form:

Date form was received:

New EO or update to an existing one?

Survey Site (Site Name):

EO Rank:

EO Rank Comments:

Data Sensitivity: _____Yes _____No
Reason for Data Sensitivity:

Managed Areas Element is in (if any):

Management Comments (if any):

Are any Additional Surveys Needed?

Comments:

Rare Species Survey

State of Tennessee
Department of Environment and Conservation
Natural Heritage Program

Species Name: _____
Species Type: ☐ Flora ☐ Fauna **Survey Date:** _____ **County Name:** _____
Quadname: _____ **Physiographic Province:** _____
Latitude: _____ **Longitude:** _____ **Elevation:** _____

(Note: If possible, attach a copy of the USGS 7.5' quadrangle with the location indicated)

Name of Area: _____
Survey Site Name (if different from above): _____
Unmanaged: ☐ **Managed:** ☐ **If managed, by whom?:** _____
Owner Name: _____
Contact Name: _____ **Phone:** (____) _____
Directions to Survey Site: _____

Threats or Evidence of Disturbance: _____

Habitat Description: _____

Associated Species: _____

Population Data: _____

Photograph and/or Specimen Collection Number and Methodology (if applicable): _____

Name: _____ **Address:** _____
Phone: Work (____) _____
Home (____) _____

Mail to: Division of Natural Heritage, 7th Floor L&C Tower, 401 Church Street, Nashville, Tennessee, 37243-0447
Phone (615) 532-0431; FAX (615) 532-0046

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RARE SPECIES OBSERVATION FORM

Mail to: TVA Natural Heritage Project
Tennessee Valley Authority
400 W. Summit Hill Drive
Knoxville, TN 37902

Fax to: 865-632-4223

If available, please include pictures of the occurrence.
Please specify as to whether they need to be returned.

Fill in any and all information that is known. Please be as precise as possible.
Feel free to include extra sheets of paper if necessary. Thank you for your help!

Do the provided pictures need to be returned (please provide return address below)?
YES NO

Observer or collector information:

Name: _____

Address: _____

_____

Title or position: _____

Organization or company affiliation:

_____

_____

Species common name: _____

Scientific name: _____

State: ____ County: _____

Quadrangle name (7 _ Min.):

_____

Latitude: _____ Longitude: _____

Directions:

_____

_____

_____

_____

_____

General data (What? When? How many?):

General description of the area:

Elevation (feet or meters):

Managed area(s):

Were specimens deposited in any collections. If so, where? Is there a catalogue number?

Additional comments:

Rare Species Sighting Form

Please print this form and mail it to:

J. Christopher Ludwig
Virginia Department of Conservation and Recreation
Division of Natural Heritage
217 Governor St.
Richmond, VA 23219

Species Name (please include a photograph(s) if available):
_____

Date Observed: _____

County(ies):_____
__

USGS Quadrangle Name(s) (if known):
_____

Location: (Provide a detailed description. Include a copy of a USGS topographic map showing the location

or sketch a map on the back of this form)

Habitat Description: (Include associated species, elevation, natural features,

natural community type, etc.)

Population Data: (Include data such as number of individuals, age, size, spatial

distribution, evidence of reproduction)

Property Owner (name, address, phone if known):
_____

Threats or evidence of Disturbance:

Protection Information: (Under present conditions, will this population maintain itself

over a long period of time? Why or why not?)

Contact Information:

Reported By: _____

Address:

Phone:

E-Mail:

Date:

Go to online information page

Return to the Virginia Natural Heritage Program *home page*

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Nongame and Natural Heritage Program
Vermont Department of Fish and Wildlife
Rare Animal Form

SPECIES NAME:
EO# (if known):
Are there any questions about the identification or taxonomy of the animal? If so, describe:
Was a specimen taken?: **Collection #**: **Repository**: **Photos taken?**:

Survey site (or project name):
Surveyor(s): **Report by**:
Survey date(s):

Fill in below or note 'See Site Summary' for the following.
Town: **County**: **State**:
USGS Quad: **Quad Code**:
Attach map (showing survey route and rare species location; optional attach sketch map)
Location of or directions to the rare species:
Show the survey route (including compartments and stands if applicable):
Ownership (include specific EO owner) and Managed Area Name(s) (address and telephone number; how owner was contacted and their response; and other owner comments (or fill in owner forms)):
Are there any unusual data sensitivity issues? Please explain.
List the following: source of lead, prior site reports, and knowledgeable individuals:
Reason for visit:

In what format have you provided the location? (insert X or provide information)
Paper Map Attached (label scale if reduced or enlarged):
Electronic File Name/Location (e.g. of GIS coverage or jpeg):
GPS: **Model**:
Latitude: **Longitude**:
Other (Northing, Easting):
Differential Correction (Yes/No):
Accuracy (PDOP x base accuracy):

Indicate Base Map used to map the occurrence:
1:24,000 USGS Quad:
1:25,000 USGS Quad:
1:5,000 Ortho Photo:
GPS (indicate accuracy):
Other:

If this occurrence was mapped as a point or line, not a polygon, how accurately is the location mapped (in meters)? (insert X or provide additional information)
<6.25 (requires GPS data with <6.25 meter accuracy or measured distance from a known, mapped location): >6.25 - 25: >25 - 50: >50 - 100: >100 - 200: >200 - 400:
>400 - 800: >800 - 1500: >1500 - 4000: other:

Area OR length of linear area where animals were ACTUALLY OBSERVED, with unit:
Area: or **Length** (for linear areas less than 6.25 meters wide):
Was this area (insert X) **Measured?**: or **Estimated?**:

If this occurrence was mapped as a polygon, is it based on GPS data with accuracy (PDOP x base accuracy) of 6.25 meters or better? OR was it mapped based on the best interpretation of orthophotos, topo maps, etc.?
(Please X one. If the occurrence was not mapped by either of these methods, please consider remapping more accurately, or provide further information. Note that ONLY THE LOCATION OF THE OBSERVATION(S), not presumed habitat, SHOULD BE MAPPED.)
If applicable, estimate the percentage of the mapped polygon occupied by this community (insert X):
>95%: >80-95%: >20-80%: 0-20%: Unknown:

Confidence Extent (insert X):

Confident that the full extent is known:

Full extent is not known:

Uncertain if full extent is known:

Comments:

Additional inventory needed? Comments:

General description and range of variability of site (Give a word picture of site):

Number of individuals (eg., adults (male, female, sex unknown), juveniles (male, female, sex unknown): and/or size of the occurrence (square feet, acres, or length of a stream or river stretch in feet or miles in which animals actually observed): Evidence of reproduction (eg., eggs, nests, carrying food to young, copulation observed, etc.):

Behavioral notes and other comments:

How much potential habitat in the area?

Quality of occurrence -A comparative evaluation of this occurrence with others in the state or rangewide. Use ranking specifications if available. (**Indicate whether State Rank: or Global Rank:**). A excellent estimated viability; B good estimated viability; C fair estimated viability; D poor estimated viability; E verified extant (viability not assessed); H historical; F failed to find; X extirpated – a range of ranks may be used (E.g. AB):

Is the habitat natural and likely to persist?:

Is the animal likely to persist at the site?:

Discuss threats:

Conservation and management needs:

Return form to Mark Ferguson mark.ferguson@state.vt.us, Nongame and Natural Heritage Program, Vermont Dept. of Fish and Wildlife, 103 South Main St., Waterbury, VT 05671-0501 (802) 241-3700

Nongame and Natural Heritage Program (NNHP)
Vermont Department of Fish and Wildlife
Rare Plant Form

SPECIES NAME:
EO# (if known):

Are there any questions about the identification or taxonomy of the plant? If so, describe:
Was a specimen taken? Collection #: **Repository**: **Photos taken?**

Survey site (or project name):
Surveyor(s): **Report by**:
Survey date(s):
Fill in below or note 'See Site Summary' for the following.
Town: **County**: **State**: VT
USGS Quad: **Quad Code**:
Attach map (showing survey route and rare species location; optional attach sketch map)
Location of or directions to the rare plant:
Show the survey route (including compartments and stands if applicable):
Ownership (include specific owner where rare plant observed) and Managed Area Name(s) (address and telephone number; how owner was contacted and their response; and other owner comments):
Are there any unusual data sensitivity issues? Please explain.
List the following: source of lead, prior site reports, and knowledgeable individuals:
Reason for visit:

In what format have you provided the location? (insert X or provide information)
Paper Map Attached (label scale if reduced or enlarged):
Electronic File Name/Location (e.g. of GIS coverage or jpeg):
GPS: **Model**:
Latitude: **Longitude**:
Other (Northing, Easting):
Differential Correction (Yes/No):
Accuracy (PDOP x base accuracy):

Indicate Base Map used to map the occurrence:
1:24,000 USGS Quad:
1:25,000 USGS Quad:
1:5,000 Ortho Photo:
GPS (indicate accuracy):
Other:

If this occurrence was mapped as a point or line, not a polygon, how accurately is the location mapped (in meters)? (insert X or provide additional information)
<6.25 (requires GPS data with <6.25 meter accuracy or measured distance from a known, mapped location): >6.25 - 25: >25 - 50: >50 - 100: >100 - 200: >200 - 400: >400 - 800: >800 - 1500: >1500 - 4000: other:

Area OR length of linear area where plants were ACTUALLY OBSERVED, with unit:
Area: or **Length** (for linear areas less than 6.25 meters wide):
Was this area (insert X) **Measured?**: or **Estimated?**:

If this occurrence was mapped as a polygon, is it based on GPS data with accuracy (PDOP x base accuracy) of 6.25 meters or better? OR was it mapped based on the best interpretation of orthophotos, topo maps, etc.?
(Please X one. If the occurrence was not mapped by either of these methods, please consider remapping more accurately, or provide further information. Note that ONLY THE LOCATION OF THE OBSERVATION(S), not presumed habitat, SHOULD BE MAPPED.)
If applicable, estimate the percentage of the mapped polygon occupied by this species (insert X):
>95%: >80-95%: >20-80%: 0-20%: Unknown:

Confidence Extent (insert X):

Confident that the full extent is known:

Full extent is not known:

Uncertain if full extent is known: **Comments**:

Additional inventory needed? Comments:

General description and range of variability of site (Give a word picture of site):

Phenology (in leaf, in bud, in flower, immature fruit, mature fruit, dispersing, dormant):

Approximate # of individuals:

- ramets (individuals connected by roots or stem):

- **genets (individuals not connected by roots or stem)**:
- **Age Structure**:

- % seedlings: **% immature**: **% 1st year**: **% mature**: **% senescent**:

Vigor (feeble, normal, vigorous (explain)):

Verbal synopsis of biological data and evidence of reproduction:

Discuss the following features associated with the rare plant (natural community type, substrate, topographic position, aspect, slope, light, moisture):

Elevation, with units (if this doesn't agree with what's marked on the USGS map why not?)

minimum elevation: **maximum elevation**:

Associated plant species:

How much potential habitat in the area?

Quality of occurrence -A comparative evaluation of this occurrence with others in the state or rangewide**. (Indicate whether State Rank: or Global Rank:).** Several factors should be used in this evaluation including quality, size, condition, viability, and defensibility). A excellent estimated viability; B good estimated viability; C fair estimated viability; D poor estimated viability; E verified extant (viability not assessed); H historical; F failed to find; X extirpated – a range of ranks may be used (E.g. AB):

Is the habitat natural and likely to persist?

Is the plant likely to persist at the site?

Discuss threats:

Conservation and management needs:

Monitoring needs comments:

WEST VIRGINIA SPECIES FIELD SURVEY FORM

SURVEY INFORMATION

Survey date _____ - _____ - _____ (YYYY MM DD) | Time: from _____ am pm to _____ am pm | Weather conditions _____

Surveyor(s) (first & last name[s], principal surveyor listed first) _____

_____

Revisit needed? Y N if Y, explain _____

Previously sought at this location? Y N if Y, date of last survey _____ Previously found at this location? Y N if Y, date last observed _____

IDENTIFICATION

Scientific name _____ Occ # (if known) _____

Common name _____

Identification problems? Y N if Y, explain _____

Photo/slide taken? Y N Where has photo/slide been deposited? _____

Specimen/voucher collected? Y N Collection # _____ Repository _____

LOCATIONAL INFORMATION

DIRECTIONS: Provide detailed directions to the observation (rather than the survey site). Include landmarks, roads, towns, distances, compass directions.

_____

_____

_____

_____

_____

Landowner _____ Landowner comments _____

Site name _____ Managed area _____

County(ies):	USGS quadrangle name(s), and code(s), if known:	If using a GPS unit:
_____	_____ _____	Latitude _____
_____	_____ _____	Longitude _____
_____	_____ _____	Type of unit _____
		File name _____

UTM Zone _____	Elevation: Minimum _____ m / ft	Notes:
Northing _____	Maximum _____ m / ft	
Easting _____		

TOPOGRAPHIC MAP -- MANDATORY

1. Attach a photocopy of the appropriate part of a USGS topographic map (1:24,000 scale if available) and write the map scale on the photocopy. Please do NOT enlarge or reduce the map.
2. Indicate on the map the exact location of the observation(s):
   a. When the observed area is ***no larger than a pen point*** on the map (i.e., only a small number of individuals or extremely small patches), place small points on the map indicating the location(s) of the individuals or patches, and label each point with an arrow so they are more easily seen.
   b. When the observed area is ***larger than a pen point*** on the map, (e.g., a population of plants, foraging birds):
      (1) Draw a thin solid boundary line showing the extent of the observed area occupied by the individuals.
      (2) Indicate disjunct patches (polygons) by drawing the boundary for each patch separately.
      (3) If the boundary follows the edge of a lake, stream, road, marsh or other feature, draw the boundary precisely on the edge of the feature.
      (4) Where needed, add notes to the map with instructions on where the boundary line is located or if the boundary is shared with other observations.
3. A hand drawn sketch may be included for finer details.

LOCATIONAL CERTAINTY

Is your depiction of the observed area on the map within 6.25 m (approximately 20ft) of its actual location on the ground? Y N
If **N,** complete the following:

a. Estimate of uncertainty distance: based on landmarks, elevation, etc., the location of the observed area on the map is accurate to within _____ meters kilometers feet miles of its actual location on the ground.

b. Is the observed area known to be located within some feature(s) on the map (e.g., wetland boundary, lake, road, trail, highway, contour lines)? Y N
If Y, indicate the boundary within which the observed area is known to be located on the map with a dashed line, and if applicable, identify the feature _____ (e.g., marsh).

FIELD DATA FOR THE ELEMENT

CONFIDENCE EXTENT

Indicate whether there is confidence that the observed area represents the full extent of occupied habitat or area for the Element at that location.
Y N ? (Y = confidence that the full extent is known; N = confidence that the full extent is not known; ? = uncertainty whether full extent is known)

Animals

AGE STRUCTURE

by type of individuals observed, if known
(e.g., pair, adult, male, female, juvenile, chick, nest, hatchling):

observation type	*actual # observed*	*# estimated*

Census technique _____

_____

Basis for estimate_____

_____

_____

Kind of observation: sight song/vocalization road kill trapped
other (explain)_____

Location use class, if appropriate (e.g., breeding, nonbreeding)

_____

Site use (e.g., foraging, roosting) _____

Feature label (e.g., den, tracks) _____

Plants

PHENOLOGY

indicate # (or use checkmark to indicate presence if # unknown)

in leaf _____
in bud _____
in flower _____
immature fruit _____
mature fruit _____
seed dispersing _____
dormant _____
seedling _____

Color of flowers (if observed) _____

Do other members of this genus or look-alike plants co-occur at this survey site? Y N if yes, explain

_____

_____

Animal pollinators_____

_____

Density description (e.g., scattered, dense clumps, evenly distributed)

_____

_____

Feature label (e.g., deme)_____

SIZE - a quantitative measure of the area and/or abundance of the Element at the observed location. Components of size are 1) area of occupancy, 2) population abundance, 3) population density and 4) population fluctuation.

Observed area / area of occupancy _____ sq. meters hectares sq. feet sq. yards acres sq. miles *Type of measurement:* precise estimate

Observed length _____ meters kilometers feet miles *Type of measurement:* precise estimate

Animals	Plants
Abundance: total # of individuals _____ precise count estimate	Abundance (total size of the observation): # ramets (total # of individuals) _____ precise count estimate # genets (total # of groups) _____ precise count estimate

Census technique_____

Basis for estimate_____

Population density (if practical): #_____ per unit: sq. meters hectares sq. feet acres sq. miles

Does population fluctuate? (may be particularly relevant to invertebrates and seed banking plants) Y N ? Explain_____

_____

_____

CONDITION - an integrated measure of the quality of biotic and abiotic factors, structures and processes within the observed area, and the degree to which they may affect the continued existence of the Element at that location. Components of condition for species are: 1) reproduction and health, 2) species composition and biological structure, 3) ecological processes, and 4) abiotic physical/chemical factors. Factors to consider include evidence of regular successful reproduction, richness/distribution of species, presence of exotic species, degree of disturbance, changes to ecological processes, stability of substrate, and water quality.

Evidence of reproduction? Y N if Y, describe_____

_____

_____

Evidence of disease, predation, injury? Y N if Y, describe_____

_____

_____

List associated taxa, species, and plant communities within the observed area _____

_____

Comment on evenness of species distribution within the observed area_____

_____

List any exotics present within the observed area and describe resulting impacts_____

_____

Comment on evidence of existing disturbance (either natural or caused by humans) and changes to ecological processes (e.g., hydrologic and fire regimes) within the observed area

_____

_____

_____

General Habitat: Information on abiotic physical/chemical factors of specific habitat or micro habitat within the observed area. (circle all that apply)

Slope:	Aspect:	Moisture:	Light:	Topographic position:
flat	N NE	hydric (inundated)	open	crest
0-10	E NW	wet-mesic (saturated)	partial	upper slope
10-35	S SE	mesic (moist)	filtered	mid slope
35+	W SW	dry-mesic	shade	lower slope
vertical		xeric (dry)		bottom

Describe other abiotic factors within the observed area, including land forms, aquatic features, soils/substrate, geological formations, and water quality.

_____

_____

_____

_____

LANDSCAPE CONTEXT - an integrated measure of the quality of biotic and abiotic factors, structures and processes surrounding the observed area, and the degree to which they may affect the continued existence of the Element at that location. Components of landscape context for species are: 1) landscape structure and extent, 2) condition of the surrounding landscape (i.e., community development/maturity, species composition and biological structure, ecological processes, and abiotic physical/chemical factors.) Factors to consider include connectivity, fragmentation/patchiness, stability/old growth of communities, richness/distribution of species, presence of exotic species, degree of disturbance, changes to ecological processes, stability of substrate, and water quality.

Comment on connectivity of the observation with other surrounding occurrences of the Element, including relative fragmentation/patchiness

_____

_____

_____

LANDSCAPE CONTEXT (continued)

List taxa, species, and plant communities in area surrounding the observation_____

_____

Comment on stability/old growth of communities in area surrounding the observation _____

_____

Comment on evenness of species distribution in area surrounding the observation _____

_____

List any exotics present in area surrounding the observation _____

_____

Comment on evidence of existing disturbance (either natural or caused by humans) and changes to ecological processes (e.g., hydrologic and fire regimes) in area surrounding the observation

_____

_____

_____

_____

Slope:	Aspect:	Moisture:	Light:	Topographic position:
flat	N NE	hydric (inundated)	open	crest
0-10	E NW	wet-mesic (saturated)	partial	upper slope
10-35	S SE	mesic (moist)	filtered	mid slope
35+	W SW	dry-mesic	shade	lower slope
vertical		xeric (dry)		bottom

Describe other abiotic factors in area surrounding the observation, including land forms, aquatic features, soils/substrate, geological formations, water quality.

_____

_____

_____

_____

_____

_____

MISCELLANEOUS DATA

PAST IMPACTS on the Element, both within and surrounding the observed area (e.g., grazing, logging, mining, plantations, ATVs, dumping)

_____

_____

MANAGEMENT, MONITORING and RESEARCH NEEDS for the Element at this location (e.g., burn periodically, open the canopy, ensure water quality, control exotics, ban ATVs, study effects of browsing)

_____

_____

_____

PROTECTION NEEDS for the Element at this location (e.g., protect the entire marsh, the slope and crest of slope)_____

_____

_____

ADDITIONAL COMMENTS: _____

_____

_____

Data sensitive? Y N Sourcecode _____ Best reference _____

APPENDIX 2*
Natural Heritage Program Data Sharing Survey Results**

** A tabular version of this appendix is also included with the electronic version of the report*
*** Responses to the survey were not received in time from the New Jersey Natural Heritage Program, the Tennessee Valley Authority Regional Natural Heritage Program, and the Virginia Division of Natural Heritage to be included with this report.*

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Connecticut Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes, most of our data is from outside sources. We get hard copy field forms, some by email and some digital data in limited cases.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

If it is a credible observation with good documentation it becomes a full EO.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

Our priority is state listed/protected species. We also take copies of reports from BIOBlitz Projects and other "inventory projects". They get filed in GMF.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

Data takes months to years to process. Bad data (no maps and weird forms, etc) take longer. New records get processed faster than updates.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Minimum requirements: date, site name, town, detailed map (topo or orthophotoquad, GPS points if available), population size, plants--population area (length, width, area), phenology (fl, fr, veg) OR animals--breeding evidence, behavior observed, method of observation, and general habitat description.

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

Threats, management needs, ownership info, photographs, directions, best access points and landmarks. (if this is an on-going monitoring project these are not needed).

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

Most sites do not need to be visited every year. **This data, if received may be filed but just generally updated in the database. Specimens should not be taken for monitoring (this would require a state permit).**

Georgia Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

A copy of the data is placed in our paper file and it is placed in the queue to add to the database.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We would like to receive data relating to our tracked or watched taxa.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

Data is entered as we receive it, which could be immediately or several years later, depending on staff time, importance of taxa (federal/state status, rank), or many other factors.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

EO taxon name (either sname, gname, common name, etc.), EO location (either: paper or electronic map, directions, survey site, county, geographic coordinates, etc.), source of data (who identified it) and when it was seen (last observation date).

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

More detail on any of #5 as well as: general description, managed area name, management comments, ownership (NPS?), ownership comments, general comments, and survey site. For animals, data concerning method of observation/capture, weight, sex and behavior would be nice.

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

The standard possibility of FOIA (Freedom of Information Act) issues should always be addressed. Site-specific information should be protected for use only for internal management purposes unless both parties agree to other uses.

Maine Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes, they must complete and submit our site survey, special plant survey and natural community field forms. Ranking information is verified by our biologists. In some cases, we request they submit the specimen for proper identification.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

This information is processed in Biotics just as our biologist's information is processed. We create source features and then link it as an EO rep. Again, the forms are verified by our biologists prior to processing. The information is stored in our files with other information gathered on that specific quad.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We accept data for species being tracked/listed as endangered on our current plant list.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

It may take months depending on current processing needs. Data is processed two staff-persons, so it really depends on work load.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Survey site, town, county, directions, feature name, map of polygon/point depicting area, date of visit, EO rank (verified by MNAP), number of individuals

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

We like our survey forms to be completed as thoroughly as possible, to include threats to the population, recent disturbances, landscape context, current condition, general description, site survey description

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

Send forms to attention of Raquel Ross, Information Manager. This will ensure they are designated to the correct person.

Maryland Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

YES

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

DEPENDS ON FORMAT OF DATA, BUT GENERALLY THEY ARE REVIEWED BY OUR STAFF AND THEN PROCESSED INTO SOURCE FEATURES, ASSUMING STAFF FOUND NO REASON TO QUESTION THE DATA.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

PREFER DATA TO BE LIMITED TO OUR TRACKED ELEMENTS (NOT WATCHLIST SPECIES OR ANYTHING CONSIDERED MORE COMMON).

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

MONTHS OR YEARS GENERALLY, BUT THAT IS NO DIFFERENT FROM DATA RECEIVED FROM INTERNAL STAFF.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

VERY SKELETAL RECORDS NEED TO HAVE: SPECIES NAME, LASTOBS DATE, REFERENCE, DIRECTIONS (PREFER TO HAVE MAP INCLUDED).

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

MANY ADDITIONAL FIELDS WOULD BE NICE TO HAVE: EODATA, FIRSTOBS DATE, SURVEY DATE, GENERAL DESCRIPTION, THREATS, PROTECTION COMMENTS, INVENTORY NEEDS, SPECIMEN COLLECTION DATA, ETC.....

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

Massachusetts Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes, but they must be approved by staff biologists. They should have proper documentation, i.e. voucher, photo, etc.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

They are processed into source features, made into EOs, and data entered into [Biotics] Tracker.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We only put state protected species, natural communities, and some other species of interest (not an official designation) into our database.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

Depends on our backlog – no different than data from staff biologists.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Varies

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

Sending maps (or GPS coordinates) as well as information so we can verify ID is crucial. Using our field forms is very helpful (and usually means we don't have to contact the observer for more information).

New Hampshire Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

First: evaluated to see if the identification is well-documented and believed. If there are issues, enter it into a "leads" GIS layer for other field workers to check out. If meet our criteria, then entered into Biotics (either update existing, or as a new EO). For wildlife reports, there's an external observations database that's populated when the person reporting the observation(s) enters the data into a web-based reporting form. Then we mine that data for what Biotics needs..

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a “bio-blitz” approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We would only want to process data on the species we track (state rare or special concern). NH Fish & Game might be interested in wildlife reports for common species.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

We have a backlog of data entry, so could take months or years. On the other hand, we just got a new staff member so the process should speed up considerably.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Element name
How identified/certainty of ID
Date observed
Who observed it
A map (Directions)
How many seen
For birds: evidence of reproduction

Same for plants and animals, except for the bird/reproduction part.

6) Are there additional fields that would be nice to have, but wouldn’t be critical as far as being able to process and use the data?

For plants: distribution, population area
For all species (not just birds): evidence of reproduction
Local surroundings (General area)
Landowner name (a bit borderline whether this is required or optional)
Threats comments if based on site-specific observations (e.g., 'close to bootleg trail').

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

Volunteers need to know what is required to *document* identifications (use of keys, writing down key characteristics observed, photographs).

It could be well worthwhile for NPS to invest in developing a web tool for data entry. Volunteers could access one form from multiple locations, fairly extensive help could be readily available at the time of data entry, some fields could be constrained to only accept certain values or formats, and the end result would be digital data rather than hard-copy forms. If observation locations could be mapped online that would really be the icing on the cake. NH Fish & Game and GRANIT (the NH state GIS repository) developed such a system for statewide wildlife observations, and it has worked well. It doesn't have the mapping feature, but digital photos (or map jpg files generated elsewhere) can be submitted to the web site.

New York Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

For species, the field form is reviewed and assessed by our scientists to determine if the identification of the element is reliable and if what was observed meets the definition of an EO for that element. If the identification is not reliable or confirmed, and/or the available information indicates it doesn't qualify as an EO, or is insufficient to determine that it's an EO (e.g., no evidence of breeding observed when EO's require evidence of breeding), then we don't process any further without additional information. If the submitted info is complete enough for transcribing or updating an EO, then the locational information is used to create or modify a source feature in Mapper, and the other information is used to populate fields in Tracker, including our observation data extensible field.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

If possible, we would prefer data limited to species of conservation concern in New York, as defined by the criteria you list plus a few other state lists/designations, such as Special Concern species.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

For state-listed animals, our contract with our host agency requires that any new locations be processed and entered into Biotics within 30 days of our Program receiving the information about it. For plants and for non-listed animals, there is no deadline, but our target is to process new locations as soon as we can, and that happens usually in within the year. Updates to already known locations, for all species, are of lower priority and sometimes they wait a little longer to get processed, since data collected under funded grants and contracts gets higher priority.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Our minimum fields are pretty much what is on our species reporting form, available at http://www.dec.state.ny.us/website/dfwmr/heritage/NHRepForm.pdf : information on the observer, name of element, date, site name and directions, county, town, numbers, size of EO, habitat description and sketch, landscape condition, and accompanied by a map with the location marked. (landowner, threats, and management needs would be optional). More important is the level of detail provided in those fields; e.g., vague directions and a vague map vs. detailed directions and a map with a precise location marked; or, a habitat description that says "woods" vs. a habitat description that includes the dominant and common species and details on condition and physical description of the habitat. While

the less detailed information doesn't preclude processing the data into an EO, obviously we would direct contributors to provide as many details as possible.

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

It would be nice to have the contributor use GPS and provide coordinates of the EO's location and the level of accuracy of the reading; or, to indicate on the map not just his best estimate of the EO's location, but give an indication of how far off he may be (e.g., "EO was within 500 m of this spot").

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

North Carolina Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

Any species we track are entered as element occurrences. We also keep paper files for species on our watchlist. No information is maintained on common species.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We would only be interested in species we track or that are on our watchlist.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

It could take several months to process records

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Scientific or Common Name
Date Observed
Observer Name and Contact Information
Directions to Occurrence Location
Occurrence Data (number seen, quality, etc.)

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

Habitat Description
Owner Name and Comments
Protection Comments
Management Comments

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

It would be especially nice to have accurate locations for occurrences, e.g., GPS coordinates.

Pennsylvania Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes, we accept data from external parties.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

If the required information is provided (descriptive eo data, location), we process it into a complete EO Representation.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We limit data to tracked species.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

Usually within weeks or months, depending on in-house priorities and the species.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

GPS Coordinates (or shapefiles) must have projection info and include DATUM.

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

Shapefiles (with projection info and DATUM).

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

We request that contributors be as specific as possible, and include information about GPS coordinates such as error, accuracy, etc.

Tennessee Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes. Through our field forms posted online and through the state parks/state natural areas collection permitting process, we regularly receive data from outside sources. Also, we have relationships with botanists and zoologists from other agencies and at times they report data back to us. This is done through field forms, e-mails, spreadsheets, etc.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

First a reference file is created so each EO has a reference (formerly known as the Source Abstract in the BCD days). We require this for all records. We then enter sources and create reps and populate as much data as possible based upon the data we receive. If there are multiple sources for one rep, then we may add data to the sources in tracker. However, most of the data on species numbers is simply added to the EO data field for EOs.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

There is no harm is acquiring data for all species. However, we will only map data which we track. This can be found on our rare plant and animal lists. For collection permit reports, we simply go through the data and map those records for species we track. For non-tracked species sometimes simply a list of what has been documented for a particular area is fine (e.g. floristic surveys) and we create a reference file and add the report to our hardcopy site files. When we map a record we hope to have more info like precise date, and locational information.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

It could take months. For small projects with just a few records we will try and get the data in quickly. For other data, we may wait until after our field season to even begin to process of mapping the records.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Taxon name
Survey and last obs date
Locational information (GPS preferred).
Reference (this can be the form itself), but often this is collection numbers, reports, publication, etc.
Surveyors

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

We can map with just the above. However, the data fields on our field form are preferred (e.g. habitat, eo data fields, good directions, associated species, etc.). Other fields of use are Survey site (we can often add that based on directions and location), ownership information, specimens and museum info (if any), managed area name (again we can determine this).

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

We welcome this process to receive data from NPS and will do our best to map the records accurately. As long as there is good locational information dates, we can map the records. The biggest pitfall could be accurate identification depending on the expertise of the volunteers.

One thing to keep in mind is that for working with animals, researchers may need a permit from the Tennessee Wildlife Resources Agency, regardless if working on NPS land or not. Also, if plant collections are to be made in Tennessee, it would be nice (but not required) that the specimens or duplicates be deposited at the University of Tennessee Herbarium (TENN).

Vermont Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes, we do, however, there is a backlog and we are currently only entering Element Occurrence (EO) data.

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

We incorporate EO data into [Biotics] Mapper and [Biotics] Tracker. We are considering developing observational database; however, it is not a high priority.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We plan on modifying our plots database so we can record species lists from an observation site.

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

It depends on the priority based on funding and staff levels. Some information is processed in a few weeks and other information takes years.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Species Name:
Survey site:
Surveyor(s):
Survey date(s):
Town:
State:
Ownership:
Data sensitivity issues:
Format of data (paper or digital):
Indicate Base Map used to map the occurrence:
Digital geographic data:
    Specify format of data:
Datum of data:
GPS accuracy:
Locational uncertainty:
General Description of the site:
Approximate # of individuals (for plants and animals):
Condition of the occurrence:

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

Yes, see the [Vermont] field forms for the element in question.

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

No, although the NPS should be aware we may be required to share data with the public not related to threatened and endangered species.

West Virginia Data Sharing Survey

1) Do you currently accept, or do you have the capacity to accept, data provided by external parties (federal/state agencies, universities, local volunteers, etc.)?

Yes

2) If so, then generally speaking, how is this information processed or incorporated into your database (processed into source features, entered into source feature / observation extensible tables, entered into an external observations database, other)? In other words, what is the life-cycle of data that comes in from a field form at your program?

If we accept the data as "good data" then it will be entered into Biotics as a source feature and then made into an EO if it is something we track.

3) Do you accept data for any and all species, or do you limit the data you accept to a subset of species? (In other words, NPS may sometimes take a "bio-blitz" approach and do inventory efforts that record anything and everything that is encountered. Would you want data from NPS about common species in your state, or would you prefer to limit it to G1/G2, state rare, state protected, federally protected, etc., etc.?)

We would like to have all data because we get numerous requests for county-level species lists, and we have very little general (none-rare species) data to provide. Plus we are always talking about county inventories. However, at the same time we are under-staffed...

4) How quickly is information received from outside parties processed? Is it handled immediately, or could it take months or years before it makes it into your database?

Info on T&E species is entered ASAP, but most other data could take months to years. We have a large back-log.

5) What are the minimum fields you require to be filled out in order to be able to accept outside data and process it? Are these different for plants and animals? Please list them below.

Pretty much the same for plants and animals...who, what, where, when, habitat, and how many...and we really, really like to have a map or coordinates.

6) Are there additional fields that would be nice to have, but wouldn't be critical as far as being able to process and use the data?

Threats, surrounding landscape, associated species, presence of non-native species.

7) Do you have any specific recommendations, preferences, or pitfalls to avoid that NPS should keep in mind in order to be able to share their data with you? Any additional comments?

None.

APPENDIX 3
Primary Contact Information for the NatureServe Network

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NatureServe Contact Information:

Mailing Address:

NatureServe
1101 Wilson Blvd, 15th Floor
Arlington, VA 22209

General and Data Related Questions:

Jason McNees – Conservation Data Analyst
703-908-1849
jason_mcnees@natureserve.org

Leslie Honey – Director of Heritage Data Services
703-908-1858
leslie_honey@natureserve.org

NGDMS and Kestrel System Development:

Larry Sugarbaker - Vice President of Conservation Information Systems
703-908-1870
larry_sugarbaker@natureserve.org

Rob Solomon – Software Support Program Manager
703-908-1873
rob_solomon@natureserve.org

Web Services Development:

Leslie Honey – Director of Heritage Data Services
703-908-1858
leslie_honey@natureserve.org

NatureServe Explorer:

Leslie Honey – Director of Heritage Data Services
703-908-1858
leslie_honey@natureserve.org

Natural Heritage Program Contact Information:

http://whiteoak.natureserve.org/HSDS/search/index.cfm (searchable all-staff directory)

http://www.natureserve.org/visitLocal/index.jsp (natural heritage program website directory)

Connecticut Natural Diversity Database
Environmental & Geographic Information Center
Department of Environmental Protection
79 Elm Street, Store Level
Hartford , CT , 06106-5127
860-424-3540
http://dep.state.ct.us/cgnhs/nddb/nddb2.htm

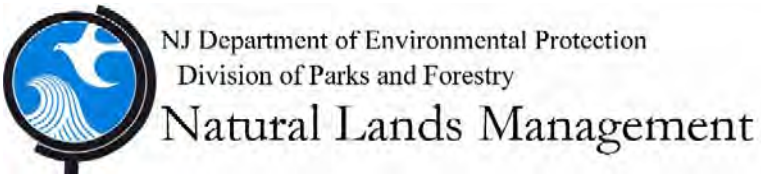
Georgia Natural Heritage Program
Wildlife Resources Division
Georgia Department of Natural Resources
2117 U.S. Highway 278 S.E.
Social Circle , GA , 30025
706-557-3032
http://www.georgiawildlife.com/content/displaycontent.asp?txtDocument=87

Maryland Natural Heritage Program
Maryland Wildlife and Heritage Service
Department of Natural Resources
Tawes State Office Building, E-1
Annapolis , MD , 21401
410-260-8540
http://www.dnr.state.md.us/wildlife/

Maine Natural Areas Program
Natural Areas Division
Department of Conservation
93 State House Station
Augusta , 04333-0093
207-287-8044
http://www.mainenaturalareas.org/index.php

Massachusetts Natural Heritage and Endangered Species Program
Division of Fisheries & Wildlife
Route 135
Westborough , 01581
508-792-7270
http://www.mass.gov/dfwele/dfw/nhesp/nhesp.htm

New Hampshire Natural Heritage Bureau
Department of Resources & Economic Development
172 Pembroke Street
P.O. Box 1856
Concord , 03302-1856
603-271-3623
http://www.dred.state.nh.us/divisions/forestandlands/bureaus/naturalheritage/index.htm



New Jersey Natural Heritage Program
Office of Natural Lands Management
Division of Parks and Forestry
Department of Environmental Protection
P.O. Box 404
Trenton, New Jersey 08625
(609) 984-1339
http://www.state.nj.us/dep/parksandforests/natural/heritage/index.html

North Carolina Natural Heritage Program
NC Department of Environment & Natural Resources
Office of Conservation and Community Affairs
1601 MSC
Raleigh , NC , 27699-1601
919-715-4195
http://www.ncnhp.org/

New York Natural Heritage Program
625 Broadway, 5th Floor
Albany , 12233-4757 , USA
518-402-8935
http://www.nynhp.org

PNHP
Pennsylvania Natural Heritage Program

Pennsylvania Natural Heritage Program
Department of Conservation and Natural Resources
Bureau of Forestry
PO Box 8552
Harrisburg, PA 17105-8552
(717) 787-3444
http://www.naturalheritage.state.pa.us/

DIVISION OF NATURAL AREAS
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Tennessee Division of Natural Areas
Department of Environment & Conservation
7th Floor, L & C Tower
401 Church Street
Nashville , 37243-0447
615-532-0431
http://www.state.tn.us/environment/na/nhp.shtml

Tennessee Valley Authority Regional Natural Heritage
Natural Heritage Project
Tennessee Valley Authority
WT11C-K; 400 West Summit Hill Drive
Knoxville , TN , 37902-1401 , USA
865-632-2418
http://www.tva.com/environment/land/habitat.htm

Virginia Division of Natural Heritage
Department of Conservation & Recreation
217 Governor St.
Richmond , VA , 23219
804-786-7951
http://www.dcr.state.va.us/dnh/

Vermont Nongame and Natural Heritage Program
Vermont Fish & Wildlife Department
5 Perry Street, Suite 40
Barre , 05641-4266 , USA
802-476-0127
http://www.vtfishandwildlife.com/wildlife_nongame.cfm

West Virginia Natural Heritage Program
Division of Natural Resources
Ward Rd., P.O. Box 67
Elkins , 26241
304-637-0245
http://www.wvdnr.gov/wildlife/wdpintro.shtm