Natural Heritage Programs: public–private partnerships for biodiversity conservation

Craig R. Groves, Mary L. Klein, and Thomas F. Breden

Here is an excellent opportunity to learn what 2 decades of conservation partnering has developed among The Nature Conservancy and many other natural resource interests.

Roots of the Partnership

Since its formation in 1951, The Nature Conservancy's (TNC) primary mission has been to conserve biological diversity. Throughout much of its history, TNC has attempted to accomplish this mission through establishing nature reserves. As the Conservancy matured, it became increasingly clear that better information on the status and distribution of biological diversity was needed to make the most effective and efficient use of limited resources. Natural Heritage Programs were borne out of this need to gather and organize scientific information as the basis for sound conservation decisions. From their inception, Heritage Programs were intended to meet the Conservancy's needs and those of the broader and growing public constituency interested in conserving biological diversity.

In 1974 the South Carolina Department of Wildlife and Marine Resources and The Nature Conservancy cooperated in launching the first of what are now referred to as state Natural Heritage Programs (NHP's) domestically and Conservation Data Centers (CDC's) internationally (Jenkins 1988). Since 1974, the network of NHP's and CDC's has grown to some 85 programs, including 50 U.S. states and the District of Columbia, 5 Canadian provinces, 12 countries of Latin America and the Caribbean, and a host of other programs situated in federal agencies (e.g., Great Smoky Mountains Heritage Program), native American nations (e.g., Navajo NHP), and other institutions (Fig. 1). The majority of these programs are cooperative ventures between agencies of state or federal government and the Conservancy—a unique public–private partnership collectively known as the Natural Heritage Network.

How Natural Heritage Programs work

Natural Heritage Programs use a standardized information management system to track important biological data including taxonomy, distribution, population trends, habitat requirements, relative abundance, quality, condition, and viability. Examples of critical non-biological information tracked are landownership type, land-use and management, distribution of protected areas, and threats to species or their habitat. The information management system has 3 major components: (1) structured paper files, (2) geographic files (maps and computerized geographical information systems), and (3) a computerized database that integrates the biological and non-biological information.

The Biological and Conservation Data (BCD) system is computer software designed specifically for use by NHP's and CDC's. Developed by TNC over 20 years

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Fig. 1. Distribution of Natural Heritage Programs and Conservation Data Centers in the Western Hemisphere, 1995 (shaded areas).

of testing and refinement by staff of The Nature Conservancy in cooperation with NHP's and CDC's, BCD is a fully relational database management system containing 36 files and more than 2,000 fields for linking essential information. Use of standard methods and software allows exchange of information among programs and the aggregation and analysis of data across administrative and geopolitical boundaries.

Elements of biodiversity (animal and plant species and natural communities) are the primary functional unit of Natural Heritage methodology (Noss 1987, Jenkins 1988, Noss and Cooperrider 1994). By ranking, mapping and digitizing, and developing databases on these elements of biodiversity, sites can be compared for their relative contribution to biodiversity at state, regional, national, or global scales. An essential feature of this process is ranking by priority each element of biodiversity based on the number and quality of occurrences of that element, population size and trends, threats to the element, and other factors. These ranks are assigned at 3 levels of distribution: state and global (rangewide) in the U.S., and national in other countries. Through this ranking process, NHP's and CDC's can concentrate their data collection and management on the rarest, most threatened species and natural communities. Further, the best examples of common natural communities are targeted for data collection. This is a coarse filter–fine filter approach to conservation priority setting. Further details on the element ranking system are provided in Master (1991), Noss and Cooperrider (1994) and discussion in LaRoe et al. (1995:399–400).

Natural Heritage Programs have 3 broad functions: (1) to collect information on the status and distribution of species and natural communities from as many sources as possible (e.g., museums and herbaria, species experts, field inventories, published and unpublished literature); (2) to manage this information in a standard way; and (3) to disseminate this information to a wide array of users. Typical program staff may include a director, zoologist, botanist, ecologist, and information manager.

Role of The Nature Conservancy

The Nature Conservancy plays a critical role in this public-private partnership through the establishment, development, and ongoing support of the Natural Heritage Network. The Conservancy maintains the centralized databases with information on flora, fauna, and vegetation communities in the Western Hemisphere that are integral to the operation of the Network. Regular computerized data-exchanges between the NHP's and these central databases helps the Network maintain consistent biodiversity status information across an immense geographic area.

The Conservancy strengthens the Network through training and technical support in standard methodology, database management, GIS (geographic information system) and related technologies, vegetation classification, and program administration. Continued development and documentation of standard methods including software applications is a key role for the Conservancy that helps keep the Network at the forefront of biodiversity information technology. The Conservancy also finances and administers selected programs.

Because of its international character, the Conservancy is well positioned to facilitate projects that involve multiple NHP's. Recently, the Conservancy coordinated regional and national-level data requests and multi-jurisdictional projects such as the Great Plains Initiative (Chaplin et al. 1995), and published Network newsletters and products such as a report to the U.S. Congress on the status of federally listed threatened and endangered species on federal lands (Natural Heritage Data Center Network 1993, LaRoe et al. 1995:398–401). Finally, the Conservancy plays an integral role in establishing new CDC's in cooperation with governmental agencies or conservation organizations.

Status of the Natural Heritage Network

In 1994, the Conservancy evaluated the status of NHP's and CDC's through a detailed questionnaire that contained 100 questions covering 6 major areas: (1) staff expertise and technical capability, (2) fiscal, staff, and institutional support, (3) database standards and methodology, (4) information availability (how current and comprehensive), (5) services and products, and (6) data security. We report some of the key findings of this survey for North America (50 state NHP's, 5 Canadian CDC's, Tennessee Valley Authority NHP, Navajo NHP, and Greater Yellowstone CDC).

In North America, the NHP's and CDC's employ more than 590 full-time staff scientists and managers with a combined budget in fiscal year 1995 of $31.7 million including appropriated (by state and provincial agencies) and contractual funds. Individual program budgets range from $70,000 to nearly $3 million. About 10% of the Network's staff have doctorates in the natural sciences and over 40% have master's degrees. Individual Programs started 6–21 years ago (average 13.5 years); average tenure of staff in these programs is approximately 6 years.

In the U.S., most NHP's reside institutionally in state natural resource departments or fish and wildlife agencies where the majority of staff are employed by state governments, not The Nature Conservancy (Fig. 2). For 27% of North American NHP's and CDC's, there is state or provincial legislation (Fig. 3) that mandates all aspects of the program; another 27% have legislation that covers at least part of the program's activities.

In addition, most U.S. NHP's have formal partnerships through cooperative agreements and memoranda of understanding (MOU) with other state and federal natural resource agencies (Fig. 4). These partnerships usually involve data-sharing agreements or cooperative projects related to the inventory, monitoring, management, or research on priority species or natural communities. At the federal level, over half of these partnerships are with the U.S. Forest Service and the U.S. Fish and Wildlife Service. At the state level, more MOU's and agreements are with fish and wildlife agencies than any other category. Natural Heritage Programs are also directly involved in or contribute information to >80% of the National Biological Service's individual projects that have subsequently developed in the Gap Analysis Programs described by Scott et al. (1993). In Canada, most provincial CDC partnerships are with the Canadian Wildlife Service.

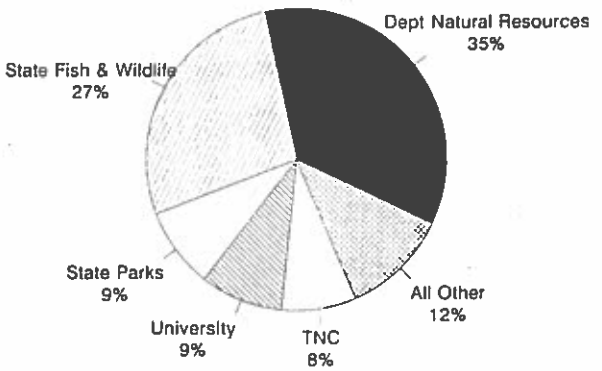

Fig. 2. Type of institution or agency in which Natural Heritage Programs are established in each state in the U.S. (from a 1994 survey).

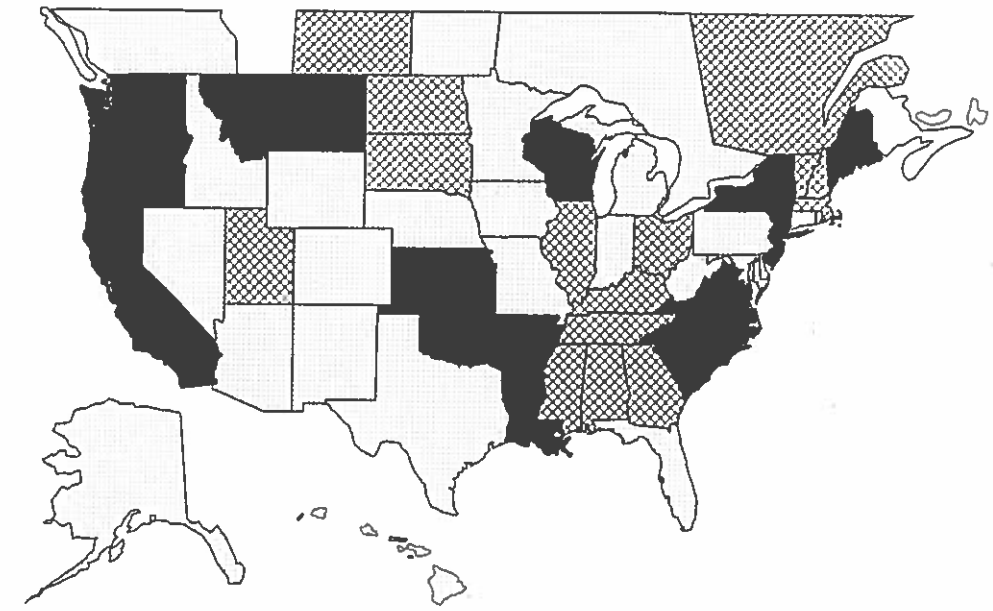

Fig. 3. Extent to which enabling legislation mandates a Natural Heritage Program or Conservation Data Center within state or provincial government in North America.

The Natural Heritage Network has amassed site-specific information on >400,000 individual occurrences of plants, animals, and natural communities. Nearly half of these data are botanical, over a third are zoological, and about a tenth are specific to plant communities (Fig. 5). Although there are limited human resources to regularly reconfirm known occurrences, 33% of the NHP's have current data (1991 or later) for the majority of animal occurrences, 53% of the NHP's have current data (1984 or later) for the majority of plant occurrences, and 60% of the NHP's have very current data for the majority of natural community occurrences in their databases.

In 1994, there were 65,000 requests to the Natural Heritage Network for information on plant, animal, and natural community occurrences and other data (Fig. 6) ranging from of 85/year to 7,200/year. The private sector (consultants, corporations, private landowners) comprised the single largest category of data requestor. Nearly half of the requests were from state or provincial and federal agencies. In addition to these data requests, many thousands more were handled internally or through data distribution programs with partners (e.g., contribution of NHP's data sets to state geographic information systems). This information is also used to set priorities for biodiversity protection at meetings held annually (or more frequently) by 80% of the U.S. NHP's with their local Conservancy office and other interested parties.

Biodiversity information available from NHP's and CDC's was used for many purposes (Fig. 7). The most frequently cited uses were: environmental impact assessment, listing package and recovery plans for Threatened and Endangered Species, and selection and design of nature reserves. Data were also commonly used for scientific research, regulatory permit review (e.g., Section 404 permits under the Clean Water Act [13 U.S.C. 1251–1376 and amendments]), transportation and utility routing, land management planning, and wetlands jurisdiction issues.

Projects on the horizon

Despite the austere times facing state and federal natural resource agencies, there are bright spots on the Network's horizon. A few promising projects focus on use, dissemination, and collection of information as described below.

Association for Biodiversity Information. Just as the International Association of Fish and Wildlife Agencies supports and represents state fish and wildlife agencies, NHP's and CDC's have formed an organization to represent their interests. The Association for Biodiversity Information (ABI) was established to unify, support, and represent the network of NHP's and CDC's in the mission of collecting, interpreting, and disseminating ecological information critical to the conservation of the world's biological diversity. ABI's 4 organizational goals for the Natural Heritage Network are: (1) to help slow the loss of the world's biodiversity; (2) to be a leader in the collection, management, and analysis of biodiversity data; (3) to have strong staffing and funding for Network

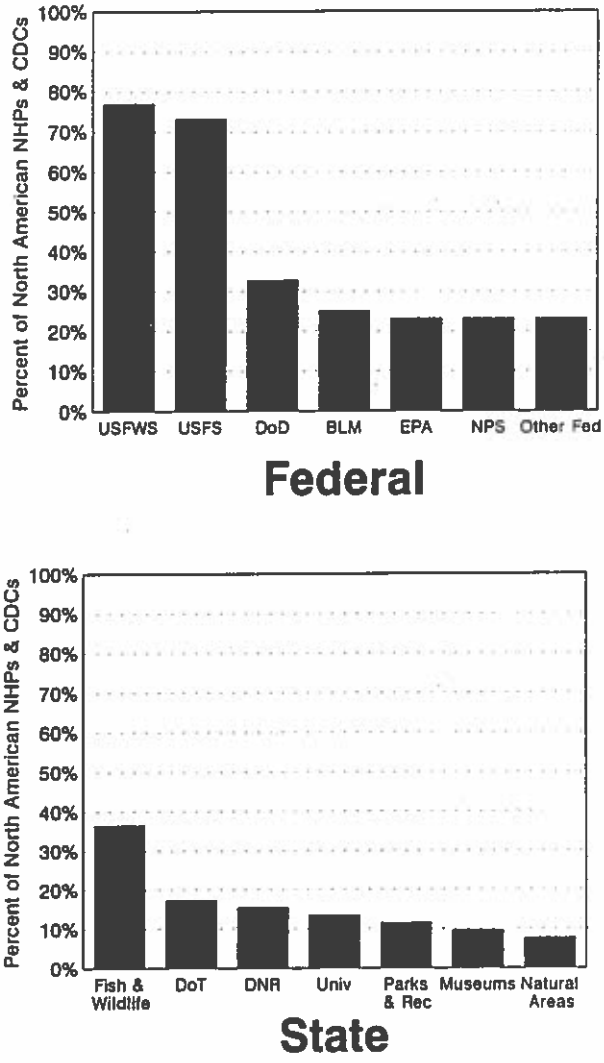

Fig. 4. Percent of Natural Heritage Programs in the U.S. that have memoranda of understanding and cooperative agreements with federal agencies, state agencies, and other institutions, from a 1994 survey. Abbreviations: BLM, Bureau of Land Management; DNR, Department of Natural Resources; DoD, Department of Defense; DoT, Department of Transportation; EPA, Environmental Protection Agency; NPS, National Park Service; USFS, U.S. Forest Service; USFWS, U.S. Fish and Wildlife Service.

programs that will result in superior information products and services; and (4) to play a central role in conservation decision-making worldwide.

Book about status of biodiversity in the U.S. The Natural Heritage Network, in partnership with the Conservancy, is currently undertaking its most important and ambitious product to date: a book and CD-ROM slated for publication in 1996 that will consolidate, analyze, and distill the information of the Network for a wide audience. This publication will detail the importance and sources of biodiversity information, the status of biodiversity in the U.S., reasons for imperilment of those elements at risk, current levels of biodiversity protection, and future directions for the conservation of biodiversity. The CD-ROM will present detailed distribution maps for each for the 4,500 most imperiled species and vegetation communities in the U.S., information not presently available from any other source.

Conservation information engineering. The Conservancy is spearheading an effort to establish a center for the evaluation, design, documentation, and dissemination of scientific standards and methods for the collection and management of biodiversity information. This endeavor will be a strong partnership with ABI, the Natural Heritage Network, and other agency partners. The Network will have broad geographic and programmatic representation on design committees that will develop future standards and methods, and will guide the design of evolving information systems.

Vegetation classification. For over a decade, the Conservancy and its partners in NHP's and CDC's have been developing a national classification for terrestrial vegetation communities. This standardized classification is hierarchical; its upper levels are based on vegetation structure largely derived from the UNESCO (United Nations Educational, Scientific, and Cultural Organization) format (Driscoll et al. 1984), and its lower levels are floristic. Like species, communities are assigned conservation status ranks. The classification is based on existing vegetation and its 2 lowest levels, the Alliance and Community Element (equivalent to plant association), are identified by diagnostic species found within and among occurrences of community elements.

A preliminary vegetation classification of the western United States has been completed (Bourgeron and Engelking 1995), and a first iteration of a national classification is slated for publication in 1996. The classification has been embraced by sev-

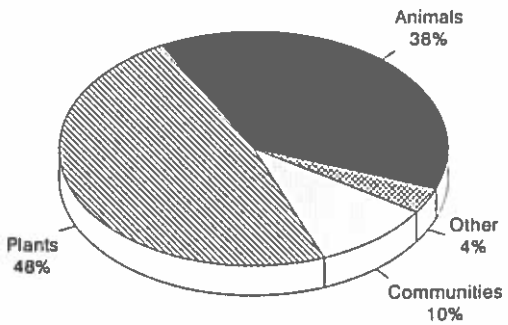

Fig. 5. Percent of element occurrences maintained by all NHP's and CDC's by element type in North America.

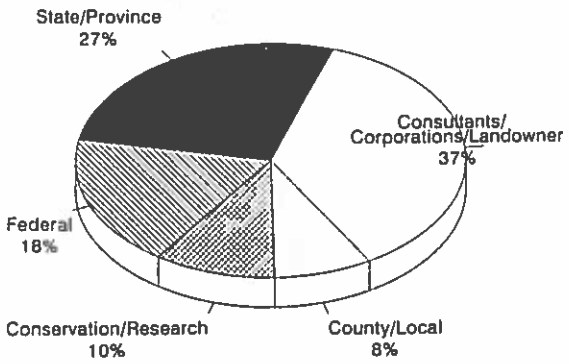

Fig. 6. Percent of total annual data requests to Natural Heritage Programs and Conservation Data Centers in 1994 in North America by type of organization submitting the request.

eral federal agencies including the U.S. Fish and Wildlife Service and the National Biological Service's Gap Analysis Program, which supported projects detailing rare plant communities of the United States (Grossman et al. 1994). The Vegetation Subcommittee of the Federal Geographic Data Committee recently endorsed the Conservancy-Natural Heritage vegetation classification for use as a federal standard (D. Grossman, The Nature Conservancy, Arlington, Va., pers. commun. 1995). Work is underway by the Conservancy and the Network to develop companion classifications for freshwater and marine systems.

Future of the partnerships

Natural Heritage Programs and their methodology have evolved for more than 20 years. They represent exceptional information on the biological diversity of regions, states, provinces, and countries. Only recently has the value of these programs working together as a true network been realized through the sharing and aggregation of information across program boundaries for regional initiatives and national assessments. The strength and success of this Network can be traced to the roots of its early partnerships between The Nature Conservancy and state government and an ever-expanding number of partners in local, state, and federal governments and the private sector. Its future success will continue to depend on strong partnerships and on the ability of the Network, its individual components, and Natural Heritage methodology to continue to adapt and evolve to meet tomorrow's biodiversity information needs.

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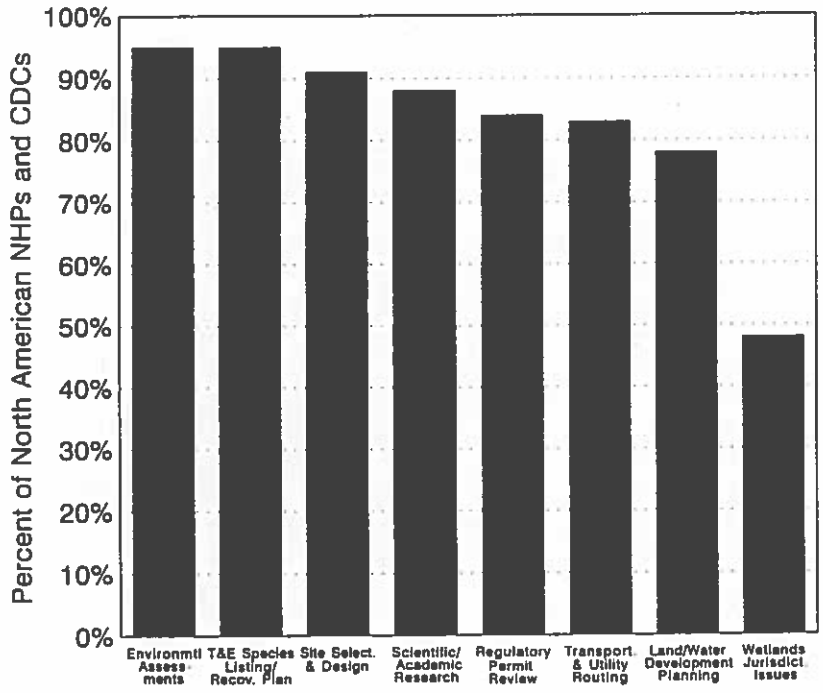

Fig. 7. Percent of Natural Heritage Programs and Conservation Data Centers in North America reporting data use or application in 8 different categories from a 1994 survey.

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