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CONSERVATION ISSUES

Assessing the Conservation Significance of a State Park System, New York, USA

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ABSTRACT: Bunnell et al. (2009) introduced the concept of Stewardship Responsibility (SR) rankings as a tool for conservation planning, using global rankings of rare species in British Columbia. I applied a version of their tool to assess biodiversity distributions in New York State Parks, using records collected by the N.Y. Natural Heritage Program. Comprehensive surveys were conducted among 150 parks over a decade, leading to a database of 1074 records for 312 rare species and 98 significant ecological communities. I applied SR ranks in a nested design – agency-wide – among regions within the agency and across the state (comparisons with other management entities). Subsets of parks and regions ranked more highly than others, but most parks contain at least one rare species and significant ecological community, indicating a broad distribution of important biological resources. Statewide, the agency maintains a very high SR rank profile in proportion to its land area (< 1% of the state), with 43% of all New York rare species found in at least one State Park, and 30 species fully or primarily dependent on the agency for their protection. Taking this information a step further, I developed a set of park-by-park Natural Heritage Biodiversity Profiles, which emphasize unique contributions of each park in ways designed to inform the general public. Although many state and provincial park systems emphasize their recreational features, probably all make critical contributions to biodiversity conservation, and tools like these can be used to illustrate and enhance those contributions.

Index terms: biodiversity distributions, Natural Heritage Program, New York State, state parks, stewardship responsibility

INTRODUCTION

Rarity, representation, and stewardship

Global biodiversity conservation depends on arrays of parks, preserves, and other protected areas, owned and managed by diverse groups of public and private agencies and organizations. Thus, even the rarest ecosystems and species are often distributed among multiple conservation entities. They are further distributed within the hierarchical structures of the responsible entities; for example, many individual national parks operate with a high level of autonomy. This form of management redundancy may be beneficial for conservation, because no single style of management is likely to offer an iron-clad guarantee of long-term persistence of protected organisms and ecosystems. However, when management responsibilities are diffuse, stewardship can be uneven, particularly when critical information is not available and shared.

Bunnell et al. (2009) introduced the concept of a Stewardship Responsibility (SR) matrix. With this approach, species are ranked according to their geographic rarity, with endemic species given the highest SR ranking, and widespread species the lowest. In addition, rarity is judged at different scales – in this case, global and provincial (British Columbia). Other criteria can then be applied to establish conservation priorities. For example, feasibility of protection is weighed against rarity at multiple scales to indicate where the highest SR candidates intersect with the highest feasibilities (Bunnell et al. 2009). I applied the SR concept to the study of how one agency contributes to a diffuse conservation network, viewed at multiple scales. The subject was the New York State Park system and its representation in a statewide biodiversity database.

State parks and biodiversity conservation

Each of the 50 states in the United States has its own park system with dozens to hundreds of individual parks per state. Cumulative areas range from 8000 ha (Delaware) to 1.4 million ha (Alaska), managed by agencies that are either stand-alone (18 states) or subsidiary to larger natural resource and environmental protection agencies (32 states). Perhaps their most striking shared feature is the overall level of visitation, with an estimated 725 million individual visitors to state parks per year, using over 64,000 km of trails and over 200,000 campsites (NASPD 2010). A recent economic analysis indicates that U.S. state parks account for one-third of all nature-based outdoor activity in the country, with an estimated annual recreation service value of U.S. $14 billion (Siikamäki 2011). However, despite their emphasis

on recreation, stewardship for biological conservation is generally embedded in state park missions, either explicitly or implicitly. Furthermore, they sample a wide range of natural habitats, due in part to their broad geographic dispersion and in part to the fact that many were designed to incorporate scenic and otherwise unusual landscapes. Also, in contrast to a general bias in the distribution of conservation lands toward more remote and less productive areas (Margules and Pressey 2000), many state and provincial parks tend to protect some of the last remaining wildlands embedded in otherwise modified landscapes.

State park systems appear to have received less attention from conservation scientists than other categories of protected areas in the United States. In some cases, high volumes of use may make a park an unattractive subject for research or otherwise limit attention to stewardship; in most cases, resources to support inventory and monitoring are scarce. However, most states keep records of rare species, often developed and maintained by Natural Heritage Programs that operate across North America (Groves et al. 1995, Stein et al. 2000) in coordination with an international system of standards for record collection and management (NatureServe 2009). For example, the N.Y. Natural Heritage Program (NY NHP) manages a database of over 7000 known occurrences of rare plants and animals and over 3500 historic records awaiting confirmation. In addition, the program tracks significant (rare or exemplary) occurrences of ecological communities, with over 1700 records in this category (NY NHP 2005a). State parks in New York and elsewhere get included in rare species surveys, in part because they are fully accessible public lands and in part because their plans and projects are subject to environmental reviews that include inventories for protected species.

The first objective of this paper was to prepare, using the SR rank framework, an agency-wide SR rank profile analysis for a state park system and to test how it compares with other conservation entities. New York State Parks are organized under an independent agency (the Office of Parks, Recreation, and Historic Preservation) (OPRHP), with an Environmental Management Bureau that supervises stewardship of biological resources (NYS OPRHP 1993, 2010). During the period 1999 – 2004, NY NHP surveyed the Office of Parks, Recreation, and Historic Preservation holdings under a State Lands Assessment contract supported by the N.Y. State Biodiversity Research Institute (NY NHP 2005b). The program has continued to maintain and update the information, including additions of new records through subsequent field surveys. The resulting dataset is amenable to SR rank analysis, because the underlying work was coordinated with standardized methodology and reviewed by staff experts, and because most parks were found to contain species and communities of conservation interest. Furthermore, in its organization and nomenclature, the survey is fully consistent with larger, statewide datasets, so SR ranks can be applied at larger scales of analysis.

The second objective of this paper was to develop a means to promote and deliver biodiversity distribution information in ways that are more broadly useful. This second objective has two groups as targets – agency professionals and the general public. The first group tends to operate in relatively small milieus, such as individual parks or groups of parks. SR rankings can offer a broader context for interpreting biodiversity distributions. For example, knowing that a rare species is limited to a small, but widely-distributed subset of parks, reinforces local management responsibility while suggesting opportunities to collaborate on management strategies. The second group is unlikely to be interested in specific rankings, and in any case, it should not be privy to details on rare species locations. However, one impetus for biological conservation is preserving a public good, and many in the general public would be interested in how state parks contribute. In this latter case, modified SR profiles of individual parks can be tailored to convey the significance of those contributions in interesting ways.

METHODS

Background

NY NHP scientists began with a list of 218 State Parks and Historic Sites, and 191 appeared to have the potential to harbor significant biological resources. These were investigated using historic records, remote imagery, and ground surveys (NY NHP 2005b). In 150 parks, at least one "Element Occurrence" was identified and characterized by field scientists, who recorded 312 different species and 98 different significant ecological communities. An Element Occurrence is a confirmed record of location for a species or community with associated metadata. Significant ecological communities are designated on the basis of rarity in New York State, or on their status as outstanding examples of the more common natural communities, due to their size and condition (NY NHP 2005a). In some cases, more than one occurrence was recorded for the same species or community in a given park, and I collapsed this information to a maximum of one report per park per species or community type. In all analyses, only confirmed records were used, setting aside historic occurrences that have not been validated.

The full N.Y. State dataset of Element Occurrences contains records for 723 rare species, characterized as vascular plants, nonvascular plants, vertebrate animals, and invertebrate animals. In addition, 163 different significant ecological community kinds are recognized (Edinger et al. 2002). I divided the statewide records into five management categories: (1) the state parks, (2) the Adirondack Park, (3) the Catskill Park, (4) other preserves, and (5) unidentified ownership. The latter category applies to records with unnamed land owners, including private lands where Element Occurrences were detected in the course of an environmental assessment. Other preserves are managed by public and private conservation organizations, including state and federal wildlife management areas, municipal and county preserves, and land trust holdings. The 2.5 million ha Adirondack Park is managed by the N.Y. State Department of Environmental Con-

servation (NYS DEC) and administered by the Adirondack Park Agency (APA 2001). The 285,000 ha Catskill Park is managed and administered by NYS DEC (2008). NY NHP recently completed a State Lands Assessment of forests managed by NYS DEC, on behalf of the NYS Biodiversity Research Institute, and records from this survey are in the statewide database used for this paper. Although the intensity of this latter survey did not match that of NY NHP's State Parks assessments (the Catskill Park alone covers over twice the area of all State Parks combined), its 5-year duration and total expenditure was equivalent to the core State Park survey (NY NHP 2005b).

Bunnell et al. (2009) applied a 7-category ranking system to all taxa on provincial and global scales. Here, the largest scale was New York State, so I applied a reduced, 5-category ranking system (Table 1). In contrast to Bunnell et al. (2009), who use global and regional endemicity as top-ranked categories, too few species in the NY NHP dataset qualify – only four of 723 species receive a top global (G1) ranking, two of which occur in state parks. Biodiversity inventory databases are not static, so it is necessary to report their vintage; the datasets I used were last updated in September, 2009. Data were organized and manipulated using SQL-based software (Microsoft Visual FoxPro™ 9.0), and statistical analyses were performed using SYSTAT™ 11.

Table 1. Stewardship Rank categories applied to N.Y. Natural Heritage Program records. Ranks are applied to rare species and significant ecological communities. Sources of location records vary according to each analysis: 150 N.Y. State Parks, 11 N.Y. State Park regions, or all statewide occurrences.

SR rank	Criterion
1	Found in 1-2 locations
2	Found in 3-5 locations
3	Found in 6-9 locations
4	Found in 10-14 locations
5	Found in >14 locations

Rare species and significant community rankings

SR ranks (Table 1) were applied at three scales of analysis: (1) agency-wide for 150 state parks, (2) comparisons among 11 state park regions, and (3) statewide comparisons among the five management categories. (OPRHP operates in 12 regions, but one contains no state parks, only historic sites and other holdings, so it was not included.) The subset of rare species that are listed as Endangered in N.Y. State, its highest level of legal protection (NY NHP 2010), are also reported in summary tables.

Significant ecological communities do not carry legal protection, but they are useful for comparative studies for several reasons. Most are recognizable year-round; most do not fluctuate in size or composition at the higher rates associated with changes in densities of natural populations; and most can accommodate some level of exposure to visitors, so they can be useful analogues of finer levels of diversity distributions. Among New York state parks, they are positively correlated with records of rare species (Figure 1).

Park-by-park NHP Biodiversity Profiles

A compendium of profiles was extracted for 150 parks, consisting of a full list of all significant ecological communities and rare species with information on: (1) number of other state parks where similar occurrences are located; (2) total other locations in all of N.Y. State, for each significant ecological community; (3) the percent of its total State Park acreage located in the park; (4) the percent of its total N.Y. State acreage located in the park, for each rare species; (5) its estimated condition in the park; and (6) its average estimated condition across N.Y. State. Details of this latter information are for internal use by OPRHP and not for public distribution, but they provide the basis for a more open form of fact sharing.

Information on rare species can be given circumspectly, without identities or locations; and for most parks, biodiversity of rare species can be summarized in ways that emphasize their significance without compromising their protection. In contrast to rare species, communities tend to be

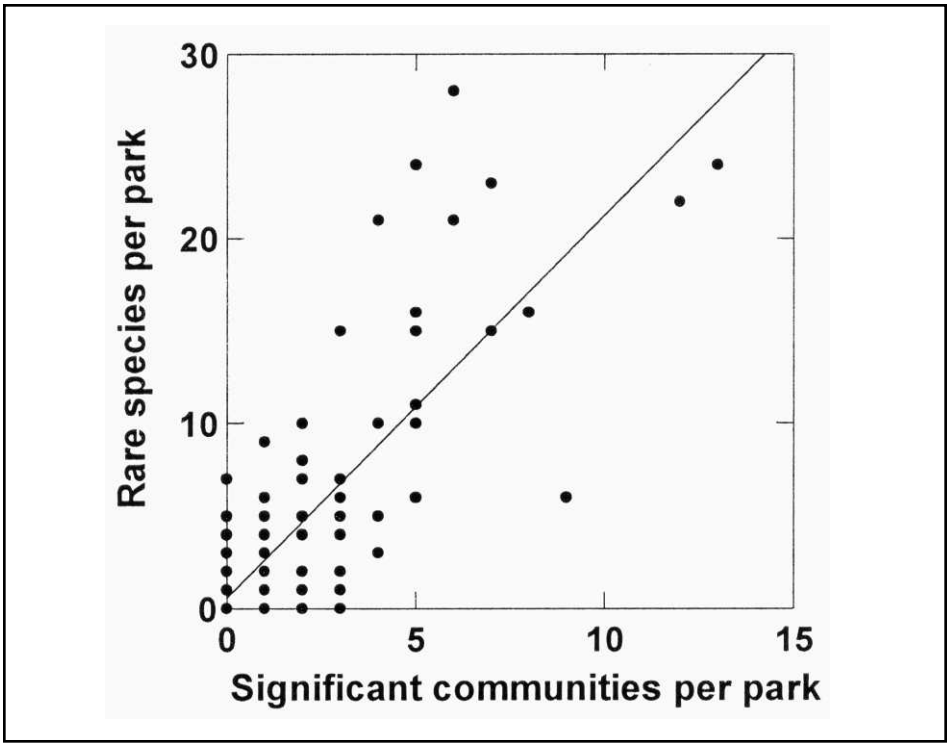

Figure 1. Correlation between rare species and significant ecological communities among 150 NY State Parks (rank-ordered Pearson R2 = .548; figure includes multiple overlapping data points).

more durable, so their locations and descriptions may not need protection. In many parks, significant ecological communities are special features (found in only a few parks and a limited number of statewide locations) that can be featured in education, research, planning, and management, without concern over increased vulnerability. Summary data on both species and communities is added to other information of ecological interest to give each park a unique profile. Three examples are given below in Results.

RESULTS

Distributions of rare species

Among parks, most rare species (mean = 3.57 per park) fall into the two highest Stewardship Ranks, and over half of those are N.Y. State Endangered species (Table 2). At the regional level, although a few regions dominate the spectrum, all contribute to the higher ranks (Table 3), with most species found in only 1 – 2 regions. At the full statewide level, although state parks represent less than 12% of all records, they protect 42.5% (312/723) of rare species (Table 4). Within species categories, this includes 43.4% (191/440) of the vascular plants, 38.1% (16/42) of the nonvascular plants, 57.3% (59/102) of the vertebrates, and 32.4% (45/139) of the invertebrates.

With the much larger statewide pool, species-by-species stewardship profiles for state parks shifts toward a more Gaussian distribution, similar to most of the other management categories (Figure 2). The main exception is the Catskill Park, which has relatively few records of rare species. After removing data from the Catskill Park, Stewardship Rank frequency distributions are statistically indistinguishable (Pearson Chi Square = 13.49, df = 12, p = .33).

Table 3. Summary Stewardship Responsibility rank distributions for 312 rare species among the 11 N.Y. State Park Regions. Total rare species per region are the sums of all ranks. Ranks: SR1 = found in 1-2 regions; SR2 = found in 3-5 regions; SR3 = found in 6-9 regions; SR4 = found in 10-11 regions. Values in parentheses: number of parks represented; land area represented (ha).

	Species per SR Rank			
Region	SR1	SR2	SR3	SR4
Niagara Frontier (12;1,524)	11	2	2	1
Allegany (3;27,411)	16	2	0	0
Genesee (6;7,622)	22	4	2	3
Finger Lakes (17;4,353)	17	5	2	1
Central (16;4,713)	16	6	1	2
Taconic (11;10,351)	16	14	2	2
Palisades (18;38,962)	68	17	4	2
Long Island (29;10,300)	87	22	4	3
Thousand Islands (25;6,455)	14	5	0	2
Saratoga-Capital District (10;4,726)	9	4	0	2
New York City (2;105)	9	2	0	0

Distributions of significant ecological communities

Significant ecological communities, although fewer per park (mean = 2.65), are distributed in a pattern similar to that for rare species. Within the agency, most community types are in the two highest SR categories (Table 5). At the regional level, the same few regions dominate the spectrum, but all regions contribute to the higher ranks (Table 6), and SR frequency distributions are statistically indistinguishable. At the full statewide level, although the state park system represents less than 12% of all records, it contains 43.2% (312/723) of rare species (Table 7).

At the full statewide level, although the state park system represents only 18.4% of all records, it contains 60.1.5% (98/163) of all community types. With the much larger statewide pool, SR profiles for state parks skew toward the lowest (most abundant) rank, similar to most of the other management categories (Figure 3). As with rare species, the Catskill Park is an outlier, with no community records in the top ranks. After removing data from the Catskill Park, SR rank frequencies are not distinguishable (Pearson Chi Square = 7.68, df = 12, p = .81).

Park-by-park Natural Heritage Biodiversity Profiles

As evident in the disproportionate number of species and communities in the highest SR ranks, most of the parks, and all of the regions, make unique contributions to the protection of biological diversity of N.Y. State. The goal of this next exercise was to put that information in less formal

Table 2. Summary Stewardship Responsibility rank distributions for records of 312 rare species among 150 N.Y. State Parks. Ranks: SR1 = found in 1-2 parks; SR2 = found in 3-5 parks; SR3 = found in 6-9 parks; SR4 = found in 10-14 parks; SR5 = found in 15 or more parks. Endangered species are the subset of rare species in the most protected category for the state (NY NHP 2010).

	Species per SR rank				
Category	SR1	SR2	SR3	SR4	SR5
Rare species	224	64	16	3	5
Endangered species	124	37	6	11	0
Park records	324	78	42	45	14

Table 4. Summary of records for distributions of 723 rare species among five management categories, based on all NY NHP statewide records. Unique rare species are found in only one of the five management categories, or are shared between management categories in a single location. Values in parentheses are for the subset of species listed as Endangered in N.Y. State.

Management category	Records	Species	Unique
State Parks	799 (222)	312 (113)	30 (11)
Unidentified	2991 (878)	533 (202)	110 (52)
Other preserves	2079 (453)	454 (168)	65 (31)
Catskill Park	76 (12)	20 (6)	2 (0)
Adirondack Park	850 (223)	154 (69)	50 (35)
Total statewide	6785 (1788)	723 (303)	247 (129)

terms for the benefit of park administrators, other state officials, and the general public. Figure 4 offers three examples emphasizing the significance of individual parks, representing three different ecoregions (NYS DEC 2010a) and watersheds (NYS DEC 2010b) and ranging over three orders of magnitude in area.

DISCUSSION

NHP biodiversity distributions among N.Y. state parks exhibit very high levels of beta diversity (Whittaker 1975), with large geographic variation in species and community composition. A variety of ecological measurements of beta diversity are available, ranging from indices designed to partition diversity components, to tests of community similarity (Magurran 2004). However, most work best with lognormal abundance distributions, or are otherwise overwhelmed by large numbers of rare species. The SR ranking technique focuses directly on rarity, and allows comparisons across different scales of analysis. Although the technique was introduced for global-scale conservation planning (Bunnell et al. 2009), it seems to work well as a tool for evaluating conservation portfolios at regional scales. In addition, it can be used to portray not only stewardship responsibility, but also stewardship success. I believe that this is an important distinction, because agencies, like state park systems, may have limited resources for conservation management. Responsibility may imply a burden, but it should be viewed as an outcome of successful management, as well.

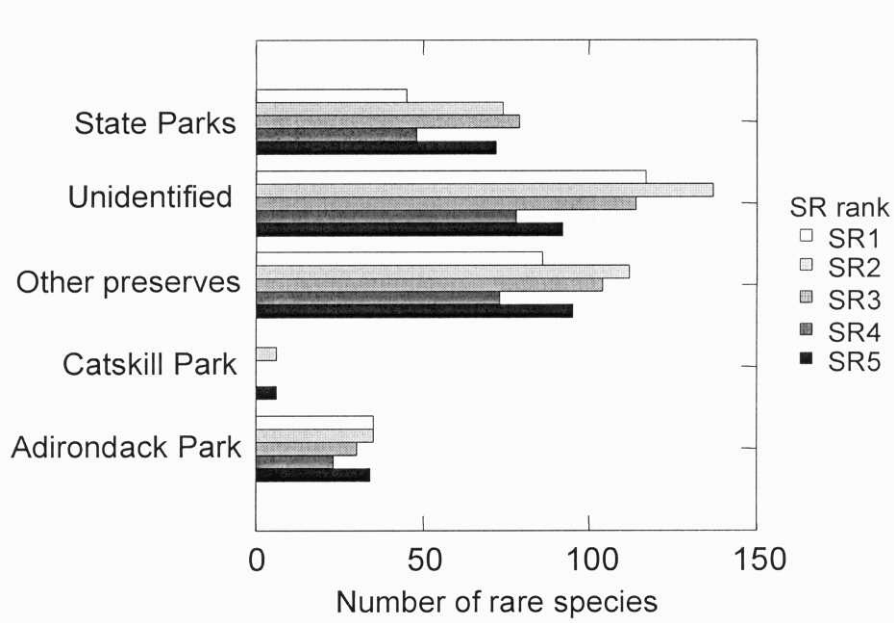

Figure 2. Summary Stewardship Responsibility rank distributions of 723 rare species among five management categories based on all NY NHP statewide records. Ranks: SR1 = found in 1-2 locations; SR2 = found in 3-5 locations; SR3 = found in 6-9 locations; SR4 = found in 10-14 locations; SR5 = found in 15 or more locations.

SR ranks indicate that most N.Y. state parks are somewhat distinct in their contributions to biological conservation; and that, as a group, they contribute significantly and (on the basis of land area) disproportionately to statewide diversity. Part of this result may be attributed to the simple fact that they have been more comprehensively surveyed than other land-holding and management entities in the state. However, there are other reasons to expect this outcome – first and perhaps foremost, their widespread geographic distributions. State parks occur in most of the available ecological settings in New York State. For example, they are found in six of seven N.Y. State ecoregions (NYS DEC 2010a), 16 of 17 N.Y. State watersheds (NYS DEC 2010b), all nine U.S. Level 3 ecoregions (US EPA 2009), and 29 of 42 U.S. Level 4 ecoregions (Bryce et al. 2010). Furthermore, almost half of the parks are spread among coastal zones (Great Lakes, Atlantic maritime, and Hudson River Estuary) where they protect some of the few remaining natural areas.

The Catskill and Adirondack Parks, which have been targets of surveys by NY NHP in its State Lands Assessment project, make for an interesting comparison. Combined, they are over 20 times larger than the land area of all state parks, but another important difference is that they are each situated in the same U.S. level 3 ecoregion (Northern Highlands), within which they occupy one and six Level 4 ecoregions, respectively (Bryce et al. 2010). Thus, despite their massive sizes, they are more restricted in their physical settings. It seems interesting that their record numbers for rare species are comparable to those of state parks (Table 4) but that they protect half as many individual species. On the other hand, the Adirondack Park has more unique species,

Table 5. Summary Stewardship Responsibility rank distributions for records of 98 significant ecological communities in 150 N.Y. State Parks. Ranks: SR1 = found in 1-2 parks; SR2 = found in 3-5 parks; SR3 = found in 6-9 parks; SR4 = found in 10-14 parks; SR5 = found in 15 or more parks.

	Communities per SR rank				
	SR1	SR2	SR3	SR4	SR5
Community types	65	23	5	3	0
Park records	89	88	31	38	0

and this may be due in part to its inclusion of the state's only alpine zones, as well as other unique features.

Total areas for the two remaining statewide management categories were not available. However, in the category of Other Preserves, there are 473 different named locations, and that may help explain why they account for nearly three times as many NY NHP records and over 100 more rare species as the 150 state parks. Regardless of their combined area, they probably sample a larger geographic area, and at undoubtedly higher densities. Most are small in size, but smaller parks and preserves are often recognized for their unique conservation values (e.g., Hayes et al. 1987; Shafer 1995; Falkner and Stohlgren 1997). Above all, it is clear that no single management category will suffice to protect the full complement of rare species and significant communities for the state and that state parks are critical and irreplaceable stewards of its biological resources.

The fact that state parks are major stewards of biodiversity is a message worth delivering within the agency, across state government, and as part of every visitor's experience. The Natural Heritage Biodiversity Profiles were constructed as examples of how to deliver it without the more cumbersome and sensitive details of the full NY NHP database. My inclusion of significant ecological communities seems important here; because, for the most part, they can be accessible to visitors. They are interesting and recognizable, and their unique properties can be featured in outreach and education.

Table 6. Summary Stewardship Responsibility rank distributions for 98 significant ecological communities among 11 N.Y. State Park Regions. Total significant communities per region are the sums of all ranks. Ranks: SR1 = found in 1-2 regions; SR2 = found in 3-5 regions; SR3 = found in 6-9 regions; SR4 = found in 10-11 regions.

	Communities per SR Rank			
Region	SR1	SR2	SR3	SR4
Niagara Frontier	2	2	0	0
Allegany	5	1	1	1
Genesee	3	1	3	1
Finger Lakes	4	2	4	1
Central	5	2	1	0
Taconic	4	2	5	1
Palisades	15	5	4	1
Long Island	23	11	1	0
Thousand Islands	6	2	5	1
Saratoga-Capital District	5	4	2	1
New York City	2	1	0	0

Few park or preserve systems have been surveyed as comprehensively as New York state parks, but it seems likely that comparable results would be realized for other state and provincial park systems that take similar steps. In many cases, some forms of SR rankings and NHP Biodiversity Profiles can probably be developed with available information. Across North America, most states and provinces have Natural Heritage Programs that survey public and private lands (Grove et al. 1996; Stein et al. 2000). Furthermore, although the ecological community classifications used here are unique to the state (Edinger et al. 2002), they are designed to conform to standards used in other states and provinces (NatureServe 2009). The critical components are standardized methodologies and centralized record keeping, in addition to resources to support skilled field scientists. These are modest requirements, but likely to compete with other management needs. However, Leopold's oft-quoted remark applies here, that the first rule of conservation is, "to save all the pieces" (Leopold 1949) – and prior to that those pieces need to be found and counted.

CONCLUSIONS

Two underlying principles of scientifically-guided conservation are representativeness and redundancy, but when viewed as components of conservation networks, not all protected lands may meet these standards (Fuller et al. 2010). However, at regional and statewide scales, the New York state park system clearly qualifies, serving as one of the principle protectors (in some cases the only protector) for many rare species and significant communities. With this realization comes a responsibility to ensure long-term persistence of biological resources, even in the face of global change (Olson et al. 2009; Lawler et al. 2010). With it also comes a large measure of credit for gathering and sustaining an irreplaceable array of the public's biological heritage. It seems highly likely that other state and provincial park systems carry similar levels of responsibility and deserve similar credit.

Table 7. Summary of records in the NY NHP database for significant ecological communities, according to responsible management entity. Unique communities are found in only one of the five management categories.

Management category	Records	Communities	Unique
NY State Parks	274	98	6
Unidentified	714	105	7
Other preserves	631	122	9
Catskill Park	40	16	0
Adirondack Park	329	82	6
Total statewide	1788	163	28

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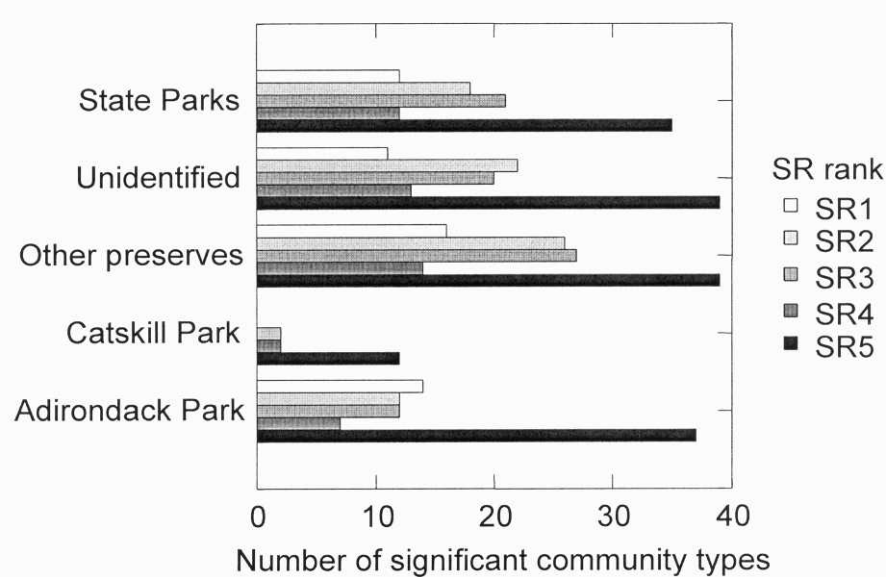

Figure 3. Summary Stewardship Responsibility rank distributions of 163 significant ecological community types among five management categories, based on all NY NHP statewide records. Ranks: SR1 = found in 1-2 locations; SR2 = found in 3-5 locations; SR3 = found in 6-9 locations; SR4 = found in 10-14 locations; SR5 = found in 15 or more locations.

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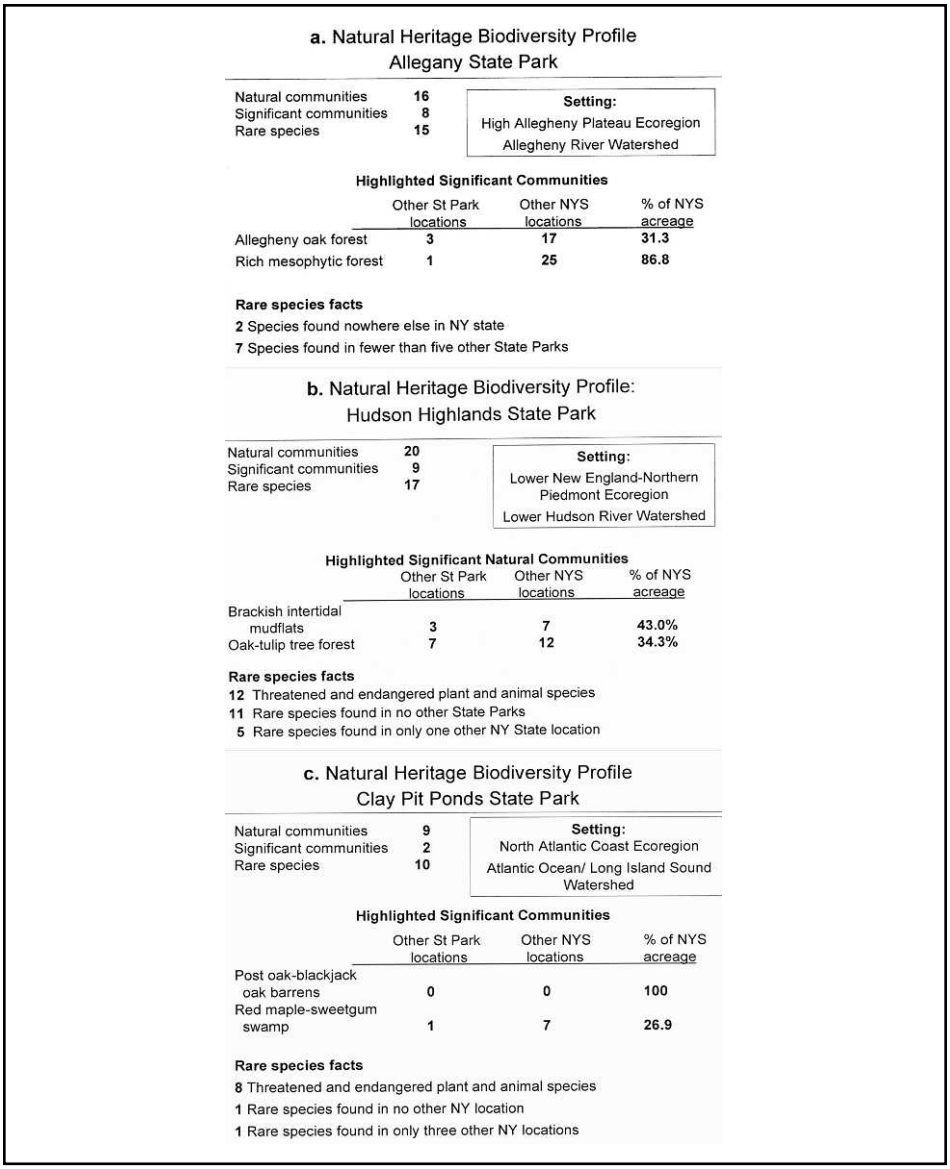

a. Natural Heritage Biodiversity Profile
Allegany State Park

Natural communities	16
Significant communities	8
Rare species	15

Setting:
High Allegheny Plateau Ecoregion
Allegheny River Watershed

Highlighted Significant Communities

	Other St Park locations	Other NYS locations	% of NYS acreage
Allegheny oak forest	3	17	31.3
Rich mesophytic forest	1	25	86.8

Rare species facts
2 Species found nowhere else in NY state
7 Species found in fewer than five other State Parks

b. Natural Heritage Biodiversity Profile:
Hudson Highlands State Park

Natural communities	20
Significant communities	9
Rare species	17

Setting:
Lower New England-Northern Piedmont Ecoregion
Lower Hudson River Watershed

Highlighted Significant Natural Communities

	Other St Park locations	Other NYS locations	% of NYS acreage
Brackish intertidal mudflats	3	7	43.0%
Oak-tulip tree forest	7	12	34.3%

Rare species facts
12 Threatened and endangered plant and animal species
11 Rare species found in no other State Parks
5 Rare species found in only one other NY State location

c. Natural Heritage Biodiversity Profile
Clay Pit Ponds State Park

Natural communities	9
Significant communities	2
Rare species	10

Setting:
North Atlantic Coast Ecoregion
Atlantic Ocean/ Long Island Sound Watershed

Highlighted Significant Communities

	Other St Park locations	Other NYS locations	% of NYS acreage
Post oak-blackjack oak barrens	0	0	100
Red maple-sweetgum swamp	1	7	26.9

Rare species facts
8 Threatened and endangered plant and animal species
1 Rare species found in no other NY location
1 Rare species found in only three other NY locations

Figure 4. Three examples of Natural Heritage Biodiversity Profiles for NY State Parks. (a) Allegany State Park, the largest in the system (27,300 ha) and the only park in the Mississippi River basin; (b) Hudson Highlands State Park, 1670 ha, within 30 miles of the New York City metropolitan area, and (c) Clay Pit Ponds State Park, 100 ha, on Staten Island.

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