BIODIVERSITY

New York State

Biodiversity Project

Needs Assessment

March 2001

NEW YORK STATE BIODIVERSITY PROJECT NEEDS ASSESSMENT

prepared by the

Environmental Law Institute

March 2001

The New York State Biodiversity Project is a partnership of the American Museum of Natural History's Center for Biodiversity and Conservation, Environmental Law Institute, New York State Biodiversity Research Institute, New York State Department of Environmental Conservation, The Nature Conservancy of New York, and New York Natural Heritage Program. Support for this publication was provided by the Center for Biodiversity and Conservation with a grant from Surdna Foundation, Inc.

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EXECUTIVE SUMMARY

INTRODUCTION

Biodiversity is the variety of life and its processes, which includes the abundances of living organisms, their genetic diversity, and the communities and ecosystems in which they occur.[1] Maintaining biodiversity is critical for it provides essential food, fiber, fuel, and other products, and ecological services such as photosynthesis, water purification, and flood control. However, such biodiversity maintenance depends on healthy ecosystems, which are being degraded and threatened in New York, as elsewhere. More than 50 percent of New York State's natural vegetation has been lost or altered due to land conversion to developed areas or farmlands.[2] Concurrently, associated species, such as the piping plover (*Charadrius melodus*), Karner blue butterfly (*Lycaeides melissa samuelis*), tiger salamander (*Ambystoma tigrinum*), and the sand-plain gerardia (*Agalinus acuta*) have been or are being lost and/or threatened. Due to the severity of New York's habitat loss, the overall risk to the state's ecosystems and species is high.[3]

The loss of New York's natural heritage is caused, in part, by direct threats which include ill-planned development, land use and land management. Thus, decision makers – from state and local government, private industry, and conservation organizations – must become better informed on how to incorporate biodiversity information into their activities and how to assess the potential effects of their decisions on biodiversity in the State. Without such biodiversity knowledge, decisions cannot effectively protect the State's natural resources even where a decision maker desires to do so. And where such knowledge exists, to be effective, it must be accessible, available, and known to potential users.

This study examines the extent and adequacy of biodiversity information currently being generated in New York from the point of view of representative decision makers. It also identifies impediments to the use of such information and suggests ways to design formats for biodiversity information to increase their accessibility to decision makers.

The Environmental Law Institute conducted 57 phone interviews with key decision makers in New York between June and August 2000. The interviews targeted representatives from state, federal, and regional management agencies; land acquisition, planning, environmental, and state education organizations; business and industry; and research institutions. Respondents were selected and interview questions were developed with guidance from the New York State Biodiversity Project Steering Committee (*see* Appendix A). Given the selective and small sample, this assessment was designed to reveal general, non-statistical trends among respondents and related sectors.

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[1] The Keystone Center. 1991. *Keystone Dialogue on Biological Diversity on Federal Lands*.
[2] Stein, B., L. Kutner, and J. Adams. 2000. *Precious Heritage: The Status of Biodiversity in the United States.* Oxford University Press. p. 229.
[3] Noss, R. and R. Peters. 1995 (December). *Endangered Ecosystems: A Status Report on America's Vanishing Habitat and Wildlife.* Defenders of Wildlife, Washington, D.C.

FINDINGS

Most respondents indicated that they consult biodiversity information directly when making decisions or indirectly for education or advocacy purposes. The small percentage that rarely consulted such information indicated it was due to a lack of biodiversity focus on the part of their organization or agency or lack of interest by their constituents.

Rare and endangered species data were the type of information accessed most often by survey respondents. The most referred-to source is the New York Natural Heritage Program. Decision makers turn secondarily to state agencies, federal agencies, and their own employees to supply additional information needed for development, land use planning and acquisition, and land management decisions.

In combination with federal laws requiring biodiversity conservation, New York State has a broad range of laws – from wetland protection requirements, State Environmental Quality Review Act, Fish and Wildlife Law, to the state's Biological Diversity Act – that require some consultation of biodiversity information. The majority of respondents were aware of their requirements, under state and federal law, yet had rather narrow interpretations of which state and federal laws and policies hold requirements to assess the impacts of their decisions on biodiversity.

Respondents believed they are not able to adequately use biodiversity information because of limitations of data access, coverage, and consistency. Users also wanted to know how to apply the data. Other impediments related to issues of limited capacity or lack of clear biodiversity objective within the organization or agency seeking information.

Almost 90 percent of decision makers indicated they would use additional biodiversity information if provided in a manner that would serve their needs. Information organized by natural communities was considered most useful over information based on taxa, physiographic regions, or watersheds. However, site specific information on the county scale and even smaller was requested to ensure its consideration in local land use decision making. Respondents also indicated a strong preference for graphical information – particularly standardized maps revealing hot spots or areas of conservation priority – in electronic form compatible with Geographic Information Systems (GIS). The Internet was found to be a key mechanism for disseminating this information to state decision makers.

RECOMMENDATIONS

The development of a *comprehensive biodiversity conservation strategy* for New York State cannot succeed without scientifically-based information that is usable and accessible by state decision makers. The following recommendations address this need.

- ***Develop a Statewide Biodiversity Inventory and Assessment Program***

New York should develop a statewide biodiversity inventory and assessment program that draws from existing sources of biological data as well as from data collected through the environmental review process and by private institutions and individual

researchers. This system should address the need for site-specific locality data that would be accessible and relevant to local governments and planning boards. Since larger, coarser scale data is already available, the focus should now be on compiling more fine scale data that is usable and accurate at county and local levels.

The system should cover as many species as possible (focusing on indicator and keystone species) as well as ecological processes statewide. In addition, more landscape-scale analyses using information on aquatic resources, soils, landforms, exotic species, ecosystem processes, as well as socioeconomic attributes should be included in the inventory. Not only should this scientific data be compiled into one system but also analyzed and translated into clear management guidelines. Accordingly, this system must establish a standardized protocol for documenting biodiversity, and be committed to ongoing monitoring to track biological change over space and time.

On the level of policy, there should be a clear and direct link between biodiversity information and resource policy-making in the state. A concerted effort should be made to identify critical areas to target incentive programs, management of natural resources, acquisition funding, and restoration activities. Overall, New York State should begin to foster a more integrated, multi-species and ecosystem approach because this affords perhaps the best hope for biodiversity conservation at any biological level.

- ***Develop a Central Clearinghouse for State Biodiversity Information***

To facilitate the use of biological information, there should be a central clearinghouse of data sources and existing programs where decision makers can readily access state biodiversity information. The establishment of a central directory would help guide decision makers toward the most appropriate biodiversity data available for the state. This role is appropriately filled by the New York State Biodiversity Research Institute (BRI), which was created in 1993 for this exact purpose. BRI should also be a leader in the development of an inventory and assessment model, as described above. However, BRI will not be able to fill this role unless it has the necessary support, both financially and politically.

- ***Develop a Statewide Biodiversity Education and Outreach Program***

Education and outreach efforts to educate all sectors about the importance of biodiversity conservation in New York are essential. This will require educational materials for targeted groups and a mechanism for both initial training and ongoing support of state decision makers, land managers and planners, educators, local officials, and the business community on accessing and using biodiversity information. Biodiversity education in the classroom is also critical. Organizations such as the American Museum of Natural History and the New York State Biodiversity Research Institute, which offer educational materials and programs for various audiences, should expand their existing efforts. A program should be developed to provide the necessary training and technical support (particularly related to GIS application) to state and local decision makers.

- ***Enhance the Effectiveness of New York's Biodiversity Laws and Policies***

This research found that a broad range of laws and policies were used by respondents to integrate biodiversity information into decisions. However, there were a number of laws that were not cited such as the state's Biological Diversity Act and Fish and Wildlife Law that could also promote the use of biodiversity information. New York State should provide expanded outreach and guidance regarding existing laws and policies. A comprehensive assessment of such legal and policy mechanisms will reveal whether they offer adequate opportunities for integrating biodiversity information. This assessment should examine whether additional measures should be taken to better protect New York's natural heritage and could be used as the basis for a comprehensive state biodiversity strategy.

INTRODUCTION

BACKGROUND

From the Great Lakes to the Hudson Valley, from the Adirondacks to the estuarine and marine systems of Long Island, New York is a state rich in plants, animals, and diverse ecosystems. However, between 2.5-5 percent of the state's mammals, 5-10 percent of the fish, and 15-20 percent of its reptiles are considered at risk.[4] More than 50 percent of New York State's natural vegetation has been lost or altered due to land conversion to developed areas or farmlands.[5] Between the 1780s and 1980s, New York lost 60 percent of its wetlands. In addition, as much as 90 percent of coastal plain Atlantic white cedar swamps, oak openings, and nearly 70 percent of the Long Island Pine Barrens have been lost. Due to the severity of New York's habitat loss, the overall risk to the state's ecosystems is high.[6]

The loss of New York's natural heritage is caused, in part, by direct threats such as ill-planned development, land use, and land management. Thus, decision makers – from state and local government, private industry, and conservation organizations – must become better informed on how to incorporate biodiversity information into their activities and how to assess the potential effects of their decisions on biodiversity in the State. Without such biodiversity knowledge, decisions cannot effectively protect the State's natural resources even where a decision maker desires to do so. And where such knowledge exists, to be effective, it must be accessible, available, and known to potential users.

This study examines the extent and adequacy of biodiversity information currently being generated in New York from the point of view of representative decision makers. It also identifies impediments to the use of such information and suggests ways to design formats for biodiversity information to increase their accessibility to decision makers.

THE NEW YORK STATE BIODIVERSITY PROJECT

In late 1999, the American Museum of Natural History's Center for Biodiversity and Conservation, in partnership with The Nature Conservancy of New York, New York Natural Heritage Program, New York State Museum's Biodiversity Research Institute, New York State Department of Environmental Conservation, and the Environmental Law Institute, launched the New York State Biodiversity Project (NYSBP) (*see* Appendix A for Steering Committee Members).

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[4] Stein, B., L. Kutner, and J. Adams. 2000. *Precious Heritage: The Status of Biodiversity in the United States.* Oxford University Press. pp. 139, 151, 155

[5] Stein, B., L. Kutner, and J. Adams. 2000. *Precious Heritage: The Status of Biodiversity in the United States.* Oxford University Press. p. 229.

[6] Noss, R. and R. Peters. 1995 (December). *Endangered Ecosystems: A Status Report on America's Vanishing Habitat and Wildlife.* Defenders of Wildlife, Washington, D.C.

The project seeks to:

- Assess current knowledge of New York State's biodiversity—from a genetic level to entire ecosystems—and to identify information gaps, conservation threats, and research needs;

- Compile and organize available information about biodiversity and to make it meaningful and accessible to a broad array of users;

- Foster collaborative strategies that will allow policy-makers, planners, business and industry leaders, educators, and others to make informed decisions on issues critical to the state's biodiversity; and

- Prioritize future conservation and systematic work.

The first task of the New York State Biodiversity Project was to conduct a needs assessment of representative users of biodiversity information, including policy-makers, land managers, planners, business and industry representatives, and educators statewide. This report, prepared by the Environmental Law Institute (ELI), describes the results of this assessment, which will guide subsequent phases of the Project.

Working with state scientists, the NYSBP Steering Committee is gathering current taxonomic information about New York State's species. They will also produce a summary publication about New York State's biodiversity. This book will highlight currently known information about biodiversity in New York, unique and special aspects of its natural heritage, critical threats to biodiversity, possible solutions, and recommendations for future research and conservation. The Project also seeks to establish a central repository featuring information about New York State's biodiversity, to be housed on the New York State Museum's Biodiversity Research Institute website.

Lastly, the Steering Committee will host a workshop to be attended by a broad array of actual and potential users of biodiversity information, with a purpose of increasing knowledge of New York's biodiversity and enhancing an understanding of how to use scientific information in decision making.

STATE BIODIVERSITY PROGRAMS

State-level biodiversity programs are an important tool to biodiversity conservation efforts in the United States. New York is one of at least 23 states with projects or programs underway to assess their biodiversity and to develop statewide strategies.[7] Since 1994, ELI has also operated an on-going collaborative program devoted to the protection of biological diversity at the state level.[8]

[7] Environmental Law Institute. 2001 (January). Status of the States: Innovative State Strategies for Biodiversity Conservation Conference Packet. Environmental Law Institute, Washington D.C.

[8] The objective of ELI's State Biodiversity Program is to improve biodiversity protection by identifying both obstacles to and opportunities for the conservation of biological diversity on the state and local level. The

In the process of working on these diverse state biodiversity efforts, ELI has identified several critical issues that affect whether biodiversity conservation is effectively incorporated into the fabric of laws, policies, institutions, and every-day decision making. One of these issues is the quality, quantity, and type of biodiversity information that is available to decision makers in the state, and how this information is made available. State agencies, non-profit organizations, research institutions, or other sources can generate biological information. How this information is provided to local decision makers, in both the public and private sectors, will greatly influence whether biodiversity is considered when decisions are made that affect a state's natural resources.

It is crucial that biodiversity information be provided to decision makers in a format that is timely, readily accessible, and understandable. Although much information is available, few efforts have been made in New York and other states to identify the types of biological diversity information decision makers actually use, what they would use were it available, what formats would be most useful to them, and how they would most like to access this information. The need for this critical information led to the development and implementation of the New York State Biodiversity Project Needs Assessment by the Environmental Law Institute.

OBJECTIVES OF NEEDS ASSESSMENT

As part of the New York State Biodiversity Project, ELI conducted an assessment of biodiversity information needs in New York State. This assessment was designed to:

- Identify the current biodiversity information used by state decision makers;
- Determine what additional information decision makers would find useful; and
- Determine in what form decision makers would most likely use this information.

METHODS

To determine the adequacy of biodiversity information from the perspective of intended users, ELI conducted personal interviews with key decision makers in New York. Decision makers were broadly defined as people whose decisions affect the status of biodiversity in the state. Representatives from state, federal, and regional management agencies; land acquisition, planning, environmental, and state education organizations; business and industry; and research institutions were targeted. Fifty-seven phone interviews were conducted between June and August 2000 with representatives from 56 different agencies or organizations (*see* Appendix B for agency/organization list).

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program has worked for six years to help catalyze and inform individual state strategies around the country, such as in Indiana, Ohio, New Mexico, Delaware, and recently in New Hampshire.

The list of respondents was compiled by recommendations by the Steering Committee, thus representing a carefully but somewhat narrowly selected population. Due to the small sampling size and its non-random selection, this study lends itself to a qualitative assessment. This assessment was designed to reveal general, non-statistical trends among respondents and related sectors. It is important to keep in mind that the sector with greatest representation was state agencies, comprising 13 agency contacts. We interviewed seven people each from environmental organizations, business and industry, and science/research community; six people from planning organizations; five people from regional management agencies; and four people each from land acquisition organizations, state education organizations, and federal agencies.

Interviews were structured, consisting of predominantly open-ended questions, which were reviewed by the New York State Biodiversity Project Steering Committee (*see* Appendix C for interview questions). The interviews were administered by Environmental Law Institute staff and lasted anywhere from twenty minutes up to two hours.

Because the word "biodiversity" has different meanings, a definition was provided during the interview. For the purposes of this assessment, biodiversity was defined as the "variety of life and its processes," which includes "the variety of living organisms, the genetic differences among them, and the communities and ecosystems in which they occur."[9] This definition was provided to ensure a consistent definition and use of this term among all respondents.

FINDINGS

CURRENT USE OF BIODIVERSITY INFORMATION IN NEW YORK STATE

Fundamental objectives of this needs assessment included determining whether decision makers in New York State use biodiversity information, what types of information are being used, and how the information is used.

IS BIODIVERSITY INFORMATION BEING USED?

The majority of respondents indicated that they consult – either directly or indirectly – biodiversity information when making decisions. Of the 57 respondents, 60 percent responded that they directly use biodiversity information in decision making, whereas 24 percent stated that they use it indirectly for education or advocacy purposes.[10]

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[9] The Keystone Center. 1991. *Keystone Dialogue on Biological Diversity on Federal Lands.*

[10] For specific numbers and percentages for interviewee responses, please refer to Appendix F. This appendix reflects the total responses of all 57 respondents, and does not break it down according to the nine sectors as described in Appendix B (e.g., state agencies, research institutions, business/industry, etc.).

A small percentage of respondents, 16 percent, indicated that they rarely or never use biodiversity information. These individuals all explained that this was driven by their particular organization's focus on recreational or aesthetic values of land use rather than biological resources or by the lack of demand for such information on the part of the organization's members or constituents. Most of those who indicated this viewpoint were from business or industry; however, some representatives from federal, state, land acquisition, and planning agencies echoed this sentiment. Such responses indicate that the *use of biodiversity information hinges in large part on the values and mission of the organization and the considerations and needs of the public and local constituents* (further described in Section III).

THE TYPE OF INFORMATION BEING USED

Decision makers stated that they primarily utilize species inventory data; 60 percent of respondents indicated they use data on locations of species, particularly rare and endangered species, for decision making. Secondarily, natural community distribution and abundance data are consulted (as indicated by 16 respondents). Such use is likely attributed to the regular collection and dissemination of data on rare and endangered species and significant communities by the New York Natural Heritage Program (NYNHP) (described later). As well, it may be because the collection of species occurrence data has become a well-accepted and/or well-adopted practice among land managers and biologists.

A handful of respondents indicated that they also use information on rankings associated with the level of rarity of species and natural communities, as well as on habitat, ecology, and life history of species. *Information on ecosystem processes, landscape features such as topography and soils, and socioeconomic factors such as land stewardship and human densities was cited by very few decision makers.*

BIODIVERSITY INFORMATION SOURCES FOR DECISION MAKERS

New York has many sources of scientific data upon which researchers, land managers, legislators, planners, and public interest groups can draw in their decision making. State decision makers are generally familiar with biodiversity resources and often use them (*see* Appendix D for further descriptions of biodiversity sources cited by respondents).

Interviews, however, revealed one overriding fact – that there is no one source to which decision makers turn for biological data (Appendix F). The most common source decision makers turn to is the New York Natural Heritage Program (NYNHP). Sixty percent commented that they relied on Heritage Data during their decision-making process. Over forty percent of respondents commented that they received biological data from New York State agencies, particularly divisions within the Department of Environmental Conservation (DEC), and thirty percent indicated federal agencies, particularly the U.S. Fish and Wildlife Service (USFWS). About the same percentage (35 percent) indicated that their organization or agency had to rely on their own employees or researchers to collect the necessary data to make management decisions. This may indicate either an inadequacy of currently available data to address decision-making needs, or a failure of existing data-gathering organizations to reach decision makers, or both.

New York Natural Heritage Program

Most respondents were familiar with the New York Natural Heritage Program (NYNHP) and cited it as the most frequently used source for state biodiversity information. NYNHP was established in 1985, as a joint effort between the Department of Environmental Conservation (DEC) and The Nature Conservancy (TNC). It is currently housed in the Bureau of Wildlife in Latham, New York.

New York Natural Heritage scientists conduct biological surveys throughout New York to locate populations of rare or unique plant and animal species and significant ecological communities. Information on ranking (the level of rarity based on the number of species occurrences), as well as the quality of a community is collected. Data from other agencies and organizations, such as the Endangered Species Unit within DEC and the New York State Museum, are also incorporated into the Heritage Data System, which is a computer- and map-based storage system that is regularly updated. The Natural Heritage Data System is the state's most comprehensive, centralized source of information on rare plants, animals, and natural communities.

NYNHP publishes several regularly updated reports, as well as project-specific studies. Every year, the NYNHP updates its rare native plant list. This list is broken down into two sections: the priority rare species list (species that are extremely rare in the state and in need of immediate protection efforts) and the watchlist (species that are not currently of conservation concern in the state, but still worthy of monitoring). In March 1990, New York Heritage Program published *Ecological Communities of New York State*, which defined and described the ecological communities found in New York State (*see* Appendix D). This book was cited by a handful of respondents as an important environmental resource – one referred to it as the "bible" for the environmental community in New York State. However, two main criticisms by respondents were that this resource is out of date and falls short by not providing a map of the known ranges of the communities. The Heritage staff recognizes that the community information needs to be updated. This is being done iteratively as new information on tax and community classifications becomes available, and NYNHP intends to make this information available online in the near future. A map showing taxonomic community distributions is a long-term goal of the Heritage Program. This need may be met to some extent at a coarser scale[11] with the recently unveiled land cover map by the New York Gap Analysis, which will likely be publicly available this coming winter through the U.S. Geological Survey (USGS).

New York Gap Analysis

A few interviews identified New York Gap Analysis as a source of biodiversity information. Gap Analysis is a state-level effort, part of a larger national initiative, to complete landscape-level mapping. It is coordinated by the USGS's Biological Resource Division, in conjunction with Cornell University and other state and non-profit cooperators. Gap is a geographic information system (GIS)-based mapping project that overlays

[11] Gap Analysis' New York landcover map identifies 40 natural communities, where as New York Natural Heritage Program identifies over 200 natural communities at a finer scale.

computer data of vegetation type and known and predicted vertebrate species distributions with land ownership. Data are obtained from Heritage, DEC, New York State Museum, among other sources. The resulting maps can help scientists and decision makers identify "gaps" in the protection of biological diversity at the state, regional, and national levels.

Gap Analysis addresses species distribution, habitat issues, management activities, and institutional arrangements. Once completed, this information could be utilized in conjunction with Natural Heritage data and other science-based information to guide state and private land acquisition, management, and regulatory decision making in New York. The Project was completed in the fall of 2000, and the resulting reports and associated maps will be available to the public through USGS in the next three to nine months.

New York State Biodiversity Research Institute (BRI)

Although no respondents identified the New York State Museum's Biodiversity Research Institute (BRI) as a source of biodiversity information, the Institute has the potential to serve as a central source for New York decision makers. Created by the Biological Diversity Identification, Research and Conservation Act (N.Y. CLS EDUC. § 235-A, 235-B), enacted in 1993, New York State Biodiversity Research Institute was established to coordinate state and private efforts to identify and understand the state's plants, animals, and ecosystems.[12] BRI aims to become a key biological resource and clearinghouse for information on the status of biodiversity in New York State.[13] Established goals for this program include "advising government entities on state biodiversity matters, fostering and sponsoring biological and ecological research, increasing biodiversity understanding by establishing and reporting what is known in the state, and recommending priority activities to be funded in the state."[14]

Unfortunately, BRI has not yet realized its potential as the prime biodiversity resource for New York decision makers. The two comments received in this study with respect to BRI (related to the laws and policies rather than to sources of biodiversity information) confirm decision makers' disappointment that the proposed scope of BRI has not been achieved or approached. Specifically, the Executive Committee – to be appointed by the governor and legislature and charged to run BRI – has not yet been formed. The formation of this committee is crucial to furthering the Institute's progress, as it is charged to elect a scientific committee to develop a strategic plan for BRI's role in state biodiversity issues. Even the formation of these two committees will not guarantee BRI's ability to fulfill its statutory charge if the necessary resources are not amassed. A few interviewees noted that the Institute is both under-staffed and under-funded.

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[12] 1993 Sess. Law News of N.Y. Ch. 554 (S. 5072-B) (McKinney's) (codified at N.Y. CLS Educ. Law § 235-a, 235-b; N.Y. Envtl. Conserv. Law §§ 3-0302, 9-0105, 11-0305, 11-0539, 45-0101, 45-0105, 45-0117; N.Y. Parks Rec. & Hist. Preserv. Law §§ 3.09, 20.01, 20.02; and N.Y. State Fin. § 97-00).

[13] BRI as a clearinghouse would provide links to websites or data sources, such as the NY Natural Heritage Program or the NY Gap Analysis, such that potential users could easily find and access biological data, but BRI does not aim to be a database for which such information is stored.

[14] *As cited in* Defenders of Wildlife. 1996. *Saving Biodiversity: A Status Report on State Laws, Policies and Programs.* Washington, D.C. p. 12.

HOW BIODIVERSITY INFORMATION IS USED

Only a small subset of respondents from each sector actually indicated *how* they were using biodiversity information. The most commonly cited use of biological information, particularly Heritage Data, is during the environmental review process – a process in which all projects or activities directly undertaken or supported (via funding, permitting, leasing, etc.) by state and local government agencies are subject to evaluation with regard to potential environmental impacts. This is a perfect example of how a law, in this case the State Environmental Quality Review Act (SEQR), can act as the catalyst for the integration of biological information into state planning (*see* Appendix E for a description of the law). Biological data, such as occurrences of threatened, endangered, or significant species and communities, are to be presented by agencies during the first stage of the review process (*e.g.*, when completing an environmental assessment to determine the significance of an action on the environment).[15] SEQR was developed with the hope that regulatory decisions would be made to better protect species and/or natural communities. From this small sample, it appears that natural resource managers within the state have interpreted this law to require consultation with Natural Heritage Data.

Over twenty percent of respondents cited that they referred to biological information for decisions regarding land management (*e.g.*, park development plans, right of way management, and timber management) and restoration (*e.g.*, streams and wetlands protection), as well as land acquisition and protection. Education and outreach, as well as ecoregional or large-scale planning, were also cited as areas in which decision makers consult biodiversity information.

SUMMARY OF THE CURRENT USE OF BIODIVERSITY INFORMATION IN NEW YORK STATE

The majority of respondents indicated that they consult biodiversity information directly when making decisions or indirectly for education or advocacy purposes. The small percentage that rarely consulted such information indicated it was due to a lack of biodiversity focus on the part of their organization or agency or lack of interest by their constituents.

Certain types of biodiversity information appear widely used by New York State decision makers, which include data on the locations of rare and endangered species and, to a lesser extent, on natural communities. These data are commonly used during the environmental review process. Information on ecological processes, landscape attributes (*e.g.*, topography and soils), and socio-economic factors (*e.g.*, land ownership and use and human densities), however, are rarely considered during state decision making. To obtain biodiversity information, decision makers consult not one but many sources; however, the most referred-to source is the New York Natural Heritage Program. Decision makers turn secondarily to state agencies, federal agencies, and their own employees to supply additional

[15] New York State Department of Environmental Conservation. 1998. (October 13). "SEQR." <www.dec.state.ny.us/website/dcs/EP_SEQR/seqr_1.html> (08 November 2000).

information needed for development, land use planning and acquisition, and land management decisions.

CATALYSTS FOR THE USE OF BIODIVERSITY INFORMATION: LAWS AND POLICIES

Providing decision makers in New York State with adequate information on biodiversity is key to promoting sound judgments on actions that affect the status of the state's plants, animals, and ecosystems. Unless the need to consult with this information is built into the state's laws, policies, regulations, and programs, biodiversity data will not be consistently and effectively used.

There are three central issues that determine whether, and the extent to which, biodiversity information is used by decision makers, and therefore how it influences decisions. The first determinant is whether or not state and federal laws and policies *require* the use of biodiversity information or assessment of a decision's impacts on biodiversity. The second determinant relates to how these laws are interpreted and carried out over time. Very often there are existing state laws and policies that, with the political will and interest, *can* be interpreted to require consultation with biodiversity information. Finally, it is important that individual decision makers fully *understand* the extent of their authority under the laws and policies, know how to access and interpret relevant biodiversity information, and grasp the fundamental principles of conservation biology. Only when all three determinants are met can we say that biodiversity is adequately considered in decision making.

The ensuing analysis draws on respondents' perceptions of their requirements to consult biodiversity information. However, it is not an exhaustive evaluation of actual legal and jurisdictional requirements (*see* Appendix E for descriptions of provisions). This assessment highlights the current *perceived influence* of laws and suggests the need for a more thorough assessment of actual requirements and ways to assure decision-maker awareness.

Respondents referred to several laws as the guiding forces behind their use of biodiversity information. These laws include (in order of mention), the State Environmental Quality Review Act (SEQR), endangered species laws (both the federal Endangered Species Act and the New York Endangered Species Law), state wetlands laws (the State Freshwater Wetlands Act and Tidal Wetlands Act), State Water Resources Law, State Bird Conservation Area Program, and Adirondack Park Agency Act (*see* Appendix E). Additional New York statutes noted primarily pertained to specific laws under an individual's purview and mentioned only once or twice. These included local regulations, the Sole Source Aquifer Protection Act, Long Island Pine Barrens Maritime Reserve Act, Agricultural Protection Programs, Agricultural Districts Program, requirements for permitting Concentrated Animal Feeding Operations, forestry planning requirements, and education curriculum development.

Federal laws that were mentioned (in addition to the federal Endangered Species Act) more than once included the Coastal Zone Management Act, the Clean Water Act (Sections 401, 402, and 404), and the National Environmental Policy Act. Additional laws

were only mentioned once. These included Superfund (CERCLA), Executive Orders on floodplains and invasive species, Rivers and Harbors Appropriation Act, Magnuson-Stevens Fishery Conservation and Management Act, federal cost-share and incentive programs, the National Forest Management Act, the Migratory Bird Treaty Act, and the National Historic Preservation Act.

Of those individuals who stated that they are not required under existing laws or policies to assess the impacts of their decisions on biodiversity, the vast majority worked for non-regulatory private organizations, such as private land trusts, environmental organizations, business and industry groups, and research institutions. Although these organizations' decisions are not dictated by state legal requirements for utilizing biodiversity information, many of them do consult this information regularly.

New York State has many laws and policies in place that clearly require the use of biodiversity information. As previously described, SEQR requires most public agencies, through a prescribed process, to prepare an environmental impact statement for "any action they propose or approve which may have a significant effect on the environment."[16] Based on responses, interviewees had an understanding of their legal requirements under SEQR and the majority of those who are involved in SEQR review utilize the services of the New York Natural Heritage Program and the Department of Environmental Conservation's Master Habitat Database (*see* How Biodiversity Information Is Used).

Of the individuals interviewed from state and federal agencies, three felt that they were not required under existing law to assess the impact of their decisions on biodiversity. Two of these individuals work within the Division of Fish, Wildlife, and Marine Resources. Although these natural resource managers did not express a requirement to address the impacts of their decisions on biodiversity, the New York State Fish and Wildlife Law[17] directs the Department of Environmental Conservation to manage the fish and wildlife resources of the state and to take into consideration ecological factors, such as "the need for restoration and improvement of natural habitat and the importance of ecological balance in maintaining natural resources."[18] In addition, the Biological Diversity Act requires the Department of Environmental Conservation[19] and the Office of Parks, Recreation, and Historic Preservation[20] to conduct regular inventories to identify the existence of rare plants, animals, and communities on the lands under their control.[21] Once identified, these agencies must take "special efforts to conserve and manage these rare biological resources."[22]

Although the consultation of biodiversity information will likely improve given its incorporation into state law and policy – such as in New York's Biological Diversity Act[23] – it is important to realize that even without the force of law, such consultation can emerge as

[16] N.Y. Envtl. Conserv. Law § 8-0109(2).
[17] N.Y. Envtl. Conserv. Law § 11
[18] Id. § 11-0303.
[19] N.Y. Envtl. Conserv. Law (Review of State-Owned Lands) § 3-0302
[20] Parks, Recreation, and Historic Preservation Law § 3.09(18)
[21] Neither N.Y. Envtl. Conserv. Law § 3-0302 nor N.Y. Parks Rec. & Hist. Preserv. Law § 3.09 were cited by any respondents.
[22] N.Y. CLS Educ. § 235-a, 235-b
[23] Id § 235-a, 235-b

common practice through a commitment from state agencies and natural resources organizations.

SUMMARY OF BIODIVERSITY LAWS AND POLICIES

In combination with federal laws requiring biodiversity conservation, New York State has a broad range of laws – from wetland protection requirements and SEQR to the state's Biological Diversity Act – that require some consultation of biodiversity information. This assessment found that the majority of respondents were aware of their requirements, under state and federal law, to analyze the effects of their decisions on biodiversity. Yet, respondents had rather narrow interpretations of which state and federal laws and policies hold requirements to assess the impacts of their decisions on biodiversity. Clearly, SEQR, state and federal endangered species statutes, and wetlands requirements came to mind. However, only two respondents cited the state's Biological Diversity Act and the State Open Space Conservation Plan, and none mentioned the state Fish and Wildlife Law as catalysts for analyzing the impacts of state decisions on biodiversity. As a result, New York State would be well served to undertake a detailed analysis of the potential of its laws and policies to require biodiversity conservation and consultation of biological information. This analysis could then be used to educate an array of decision makers about the full range of their authorities under state law. As mentioned above, it is also important that decision makers understand basic principles of conservation biology. This analysis did not set out to determine the extent to which decision makers are aware of these principles, and as a result, how well they are able to interpret and apply information about biodiversity.

IMPEDIMENTS TO INCORPORATING BIODIVERSITY INFORMATION INTO STATE DECISION MAKING

In addition to identifying how biodiversity information is used in New York State, the needs assessment aimed to determine what additional information decision makers would find useful and in what format. To do so, we investigated how decision makers currently regard available information.

ADEQUACY OF BIODIVERSITY INFORMATION

Although 60 percent of decision makers indicated that they consulted biodiversity information, the majority felt that the available data were inadequate. Over 50 percent of respondents were partially satisfied[24] with available biodiversity information, while almost one third (32 percent) felt completely unsatisfied[25] with the type, format, and presentation of this data, among other elements. Only twelve percent of respondents felt that biological

[24] Partially satisfied means that an interviewee found the information partially adequate, however, would prefer having additional and/or different data (see Appendix F, Section III for scale).
[25] Unsatisfied indicated that the respondent felt that available data were entirely inadequate.

data currently available was entirely adequate for their needs.[26] Satisfaction rates varied among the different sectors. Research institutions, environmental organizations, and regional management and federal agencies were among the least satisfied, with the environmental sector indicating the highest rate of dissatisfaction.

Dissatisfaction stemmed from both external and internal impediments. *External impediments* were defined as a lack or inadequacy of current biodiversity information itself, while *internal impediments* related to issues of limited capacity or scope within the organization seeking such information.

Five broad categories of external impediments were defined, including inadequacy in specific content areas, geographic areas, data aspects, data accessibility, and data applications. Among these categories, inaccessibility of current information, including the fact that information may not be shared with the public, was the most frequently cited impediment. Dissatisfaction with information in specific content areas – such as individual species, habitats, and landscape processes – was second, identified by 43 percent of respondents. Respondents also identified inadequacy in various aspects of available data, including what they perceived as inaccuracy and inconsistency. They noted the lack of information on data applications – or guidance on how to translate primarily scientific data for use in "real life" policy and management decisions. Although such policy guidance was requested, interviewees did not distinguish which agency or entity should bear such responsibility. To a lesser extent, they noted problems with geographic coverage, such as the lack of coverage of private and rural areas.

Internal impediments were identified as frequently as several categories of external impediments. A majority of respondents, 63 percent, identified both lack of capacity and lack of a clear biodiversity objective within their organizations as impediments to incorporating biodiversity information into institutional planning and management (*see* Appendix F for a detailed breakdown of both external and internal impediments, highlighting associated percentages and numbers of individuals and comments).

EXTERNAL IMPEDIMENTS

Biological Content

Among current inadequacies in biodiversity information, the lack of attention to specific subject areas was a primary concern. Forty-three percent of respondents, particularly within state agencies and the scientific community, identified gaps in four primary areas: a lack of information on *habitats*, *species*, *landscape-level and ecological processes*, and *socio-economic status and trends*. In addition, respondents commonly expressed a need for more biodiversity information in general.

[26] The remaining four percent felt that biodiversity information was not applicable in their decisions and therefore had no judgement of its adequacy. The four percent consisted of one individual from the planning sector and another from the business sector.

Ten respondents identified a lack of information on *habitats*, both rare and common alike, as an impediment to their ability to make sound management and policy decisions. Decision makers, particularly within state agencies, requested information detailing the location and range of specific natural communities – with grasslands and wetlands most frequently mentioned – and more extensive ground surveys of vegetative species. An additional gap in biological information was the lack of information on aquatic ecosystems (and associated invertebrates). Despite this perception of a lack of habitat information, a representative from the New York Natural Heritage Program indicated that such data could be made available through this program.

Beyond habitats, respondents indicated a need for information on both common and rare *species*, including life history and distribution information. For example, decision makers were interested in the amount of area needed to support viable populations of certain species. Respondents displayed strong convictions in their preferences for information on either common or rare species. Arguing for more information on common species, one scientist explained, "There is too much focus on the 'critically ill' patients…focusing instead on 'well system care' would benefit endangered and common species alike." Other decision makers stressed the need for further data on the most critically endangered species, because they require urgent action or conservation. Several respondents suggested that the focus by state agencies on game species (*e.g.,* for hunting and fishing) may have hindered the monitoring, research, and collection of biological information on non-game species, leading to an additional informational gap.

Twelve percent of comments made by respondents regarding gaps in content related to a lack of information on *landscape-level processes*. Land acquisition and state agency representatives emphasized this gap. Decision makers indicated a lack of information on the functions and locations of wetlands and watersheds, as well as a lack of understanding of landscape connectivity. Determining the significance of small parcels of land, relationships among them, and the presence of migration corridors could enhance protection of a variety of species (*i.e.,* bobcat) and ecosystems. Neither New York Gap Analysis nor NYNHP provide information to decision makers on ecological processes such as disturbance patterns of fire, hydrology, and climate that affect the distribution and abundance of species and communities. This type of information needs to be incorporated into current information systems to help managers understand these processes and the interrelationships between ecosystem function and patterns of biological diversity.

A fourth general area that decision makers found inadequate was related to *socio-economic factors*, such as economic conditions and pressures within regions, land ownership distribution, zoning patterns, as well as legal information that affects the status and conservation of biodiversity in the state.

Respondents indicated that, as decision makers, they need concrete, comprehensive, and easily digestible information on how biodiversity is faring both regionally and statewide to motivate action and capture "the big picture." Representatives from land acquisition, and regional biodiversity and local planning organizations were most likely to cite this as an inadequacy.

Geographic Coverage

Beyond inadequacies in content, a lack of geographic information has hindered decision making (as cited by 21 percent of respondents). Geographic gaps are largely an artifact of land ownership, organizational mandates, funding opportunities, and legal jurisdiction, among other factors. A larger proportion of biological inventories and scientific studies have been conducted on publicly owned and managed lands as opposed to private lands. Natural Heritage information was described by decision makers as "spotty," meaning that, after plotting wetlands and locations of heritage elements, there are "geographic white spaces" where no biological or historical information exists. This is in part due to the funding vehicles for Natural Heritage. About half of the program's financial support comes from the DEC and the other half from small subsidiary contracts from private or governmental sources, directly influencing the type of lands surveyed by the Heritage Program. Under the DEC contract, NYNHP is to focus its surveying on globally and locally (state) rare and exemplary species and natural communities. Other types of contracts request geographically based surveys such as inventories on state park lands.

Respondents also noted that historical biological information is concentrated in areas close to research institutions and universities and adjacent to development. These trends may also be influenced by legal requirements. For example, in requiring an assessment of impacts to plants and animals, SEQR tends to promote the collection of biological information near developing areas.

The geographic "gaps," according to respondents, were related to common natural communities. Thirty-six percent of interviewees suggested that such common areas have been under-surveyed and under-researched in the state. Respondents emphasized that without an in-depth understanding of common systems, they will not be adequately managed and conserved. Without more information on the components and functionality of these common habitats, decision makers were concerned that these communities will be mismanaged, degraded, and permanently altered.

Data Aspects: Scale, Accuracy, and Consistency

Even in cases where biological information exists, many New York decision makers are unable or limited in using it due to inadequacies related to format or design of the data. Common complaints among 35 percent of respondents were that biological information is often not presented at an appropriate scale, or is inaccurate and out of date, or inconsistent.

Data presented at an inappropriate *scale* was the most commonly cited inadequacy related to data format. A consistent theme, particularly among state agencies and land acquisition and planning organizations, is that information needs to be available at a *landscape* scale. As research and development projects tend to focus on small parcels, they often fail to consider the cumulative impacts of habitat fragmentation and degradation on a larger, more regional basis. At the same time, state and regional management agencies and land acquisition groups need more "*site-specific information,*" particularly for threatened and endangered species and communities. Respondents expressed frustration that Heritage often provides approximate locations of species too imprecise for local planning purposes

(*see* further discussion in Section IV). This likely relates to historic data not based on more rigorous field surveys meeting current survey standards and/or for species whose exact locations are not widely disseminated due to vulnerability to harvesting or exploitation.

Beyond limitations in scale, biodiversity information is considered by many to be *inaccurate* or *out of date*. One interviewee complained that he received information that was over 60 years old. Individuals within the research and science community in particular were concerned with the lack of scientific rigor of data, and that assessments for plant communities are based on anecdotal information from cursory surveys. This suggests that several potential users of biological information elect not to use data out of fear of their inaccuracy.[27] Several respondents emphasized the need not only for current data but also *trend data* (data gathered over a sufficient time span to reveal both spatial and temporal patterns in population growth). It was recommended that state agencies be more committed to conducting long-term monitoring of population abundances and distributions for non-game species (as has been historically done for harvested species).

Decision makers were concerned about conflicting sources of information and research biases. Data *inconsistency* was the third cited impediment. One fundamental issue is the inconsistent definition of the term biodiversity. State resource managers, land planners, and policy makers suggested that a common definition be established within the state to better promote the understanding and conservation of biodiversity. Respondents further noted that state decision makers often rely on local experts to establish conservation priorities, and that such experts might introduce their own research bias. Consistent data gathering and presentation of research products could help alleviate this problem.

Data Applications

Beyond inadequacies in existing information, many New York decision makers, from business and industry, planning organizations, and state agencies in particular, emphasized that they do not know how to use biodiversity information once they receive it. What may come in the form of raw scientific data often needs to be quickly translated into concrete management and policy decisions. Those making decisions often lack the scientific or technical background to interpret the data, thus, need to have access to resources and support to do so. The lack of information on data applications was cited by 35 percent of respondents as an impediment. The need for biological data translated into management and policy guidance and educational materials and for identifying conservation priorities or biodiversity "hot spots" (areas with particularly dense or unique concentrations of rare or important species and communities) was emphasized.

Decision makers wanted to know how different species and habitats respond to specific management techniques. For example, how should one manage, maintain, and perpetuate certain habitats, such as the Rome Sand Plains, for the benefit of threatened and endangered species? One researcher recommended that interdisciplinary specialists translate

[27] New York Natural Heritage Program provides the best available data for a site. However, often historic data are only available for certain locations. All data are provided with source information so that the user can determine their accuracy for his/her purpose.

life history, population, and ecological process data into policy and management guidelines. In addition, respondents requested information assessing how human use and impacts affect biodiversity. This type of information, for instance, would aid decision makers in evaluating the best ways to preserve open space for recreational purposes or to practice farming, forestry, and fishing to benefit biodiversity while serving human purposes.

Not only should biological data be translated into management and policy tools but also educational tools. Educators and environmentalists in particular stressed the need for improved educational materials on biological diversity. Beyond use in schools, such materials could serve the public, decision makers, and politicians to promote a better understanding of biodiversity conservation. Several respondents readily admitted they were intimidated by or ignorant about the use of biodiversity information. Other interviews indicated that some decision makers were unaware of currently available tools such as the Heritage Database or Gap Analysis.

Another clear trend identified by respondents, from state and federal agencies, planning and regional management groups in particular, is the need for information to identify conservation priorities. The information most requested by interviewees were data *ranking communities and species*, as well as *delineating biodiversity "hot spots"* (*see* Appendix F, Section IV). Respondents were interested in data that revealed the biological significance, rarity, or value of communities in New York State to help prioritize land acquisition and management. According to these decision makers, this type of information would help them decide how and where to concentrate conservation efforts, particularly if presented at the county level – the level at which decisions are often made. The New Jersey Landscape Project was recommended by a couple of interviewees as an excellent model because of its focus identifying key wildlife areas at the county scale (*see* Appendix D for a description of the Project). This argument was clearly captured by one respondent who suggested that an "annual list of biodiversity targets and priorities per county would be used by [state agencies] to help make decisions."

Although respondents preferred biological data to be molded into more clear cut policy and management applications (*e.g.*, presented as a map of biodiversity hot spots or conservation priority lists), this is not always feasible or desirable. The complex nature of biology and associated processes does not often lend themselves to a straightforward prescription for conservation. There is a risk that such a simplified depiction of biological diversity would lead to the neglect of more common communities and of important landscape connections (such as habitat and metapopulation connectivity, dispersal corridors, ecological gradients, and cross-boundary disturbance regimes). However, conserving certain habitats, such as wetlands (including swamps, rivers, and lakes), and montane environments, has been argued to conserve a substantial percentage of species, particularly those that are rare and threatened.[28] Although this type of focus is not without its downside, it may be what decision makers need to garner much-needed support for biodiversity conservation.

[28] Meffe, G. and Carroll, C., eds. 1994. *Principles of Conservation Biology*. Sinauer Associates, Inc., Sunderland, Massachusetts.

Data Accessibility

As mentioned previously, the inaccessibility of existing data was the most commonly noted concern among New York decision makers pertaining to biodiversity information, as cited by nearly three-quarters (73 percent) of respondents.

Although much biological information is theoretically available, it may not be accessible due to poor publicity, restrictions, or overly burdensome requirements. On ten separate occasions, respondents commented that biodiversity information was not well publicized or "marketed" to key decision makers. In addition, the same number of comments was made that restrictions on data dissemination obstructed use, particularly in relation to Heritage data. A person's or organization's right to obtain Heritage data relates to their "need to know." According to Heritage policy developed with the DEC, "governmental agencies (federal, state and local), consulting and engineering firms or individuals who are planning or participating in the analysis of proposed projects or other activities which may impact ecologically sensitive areas are considered to have a valid 'need to know'."[29] These limitations could preclude an environmental watchdog, like the Sierra Club, from obtaining Heritage information even if it were to use it for biodiversity conservation. One environmental activist expressed frustration that it is challenging for his organization to "verify if a landowner is using information [on rare and endangered species] in a misleading manner. It is difficult to verify because the landowner has access to the Heritage data where as a public entity does not."

Not only is accessibility limited by restrictions on who can obtain data but also by restrictions on the type of available data. In certain instances, NYNHP is required by contract with DEC to maintain data on sensitive species (species that are highly vulnerable to collection or disturbance) confidential in an effort to protect them from being located and harmed. However, interviews indicated that such protection may ultimately hurt conservation goals by withholding vital information from people or organizations that will use it for beneficial means. One researcher asserted, "the damage done by keeping information from the public far exceeds the benefit gained by keeping locations of threatened and endangered species confidential." However, others conceded to the necessity of such a protection measure.

Land acquisition organizations, federal agencies, and environmental groups were most likely to note secrecy of data as a primary problem. State agency representatives were less likely, perhaps because many, such as DEC, have partnerships with Heritage that allow them increased access to information. However, even among those who use Heritage data, many noted that the process for obtaining data is often lengthy and burdensome. Thus, providing data in a timely manner seemed to affect whether information was accessible to potential users.

The many disparate sources of information on biodiversity create an additional obstacle for decision makers. There is currently no mechanism for incorporating data from multiple sources, other than NYNHP and associated state agencies, into a central database.

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[29] New York Natural Heritage Program. 2000. "The New York Natural Heritage Program." <www.heritage.tnc.org/nhp/us/ny> (20 July 2000).

Thus, data from surveys conducted by local agencies, environmental consulting firms, private researchers and institutions are not widely known. As discussed previously, interviews suggest that decision makers across interest groups need one unified source – *a central database or index of sources available over the Internet* – to make attaining biodiversity information faster and easier. Respondents suggested that such a database might include the needs and general locations of threatened and endangered species and habitats; maps displaying vegetation communities and ecosystem types; wildlife occurrences by county; and hyperlinks to sites with more detailed information on life history and management information for individual species.

Secondary concerns relating to accessibility were whether information was available at an appropriate level and in a compatible format. According to respondents, biological information should be presented at a level of sophistication suited to those who use it. If information is too technical, members of the public or in political positions may be intimidated or unprepared to use it. However, if information is presented at too elementary a level or in an informal manner, biologists, engineers, and planners may find it insufficient for their purposes or may lack confidence in its accuracy. Most respondents who expressed dissatisfaction with current levels of biodiversity information felt the level was too sophisticated or esoteric, often requiring an extensive biological or technical background. Still others felt the information was either too informal or based on anecdotal evidence. These respondents emphasized that information needs to be quantitative, legally-defensible, and technically stringent. As the levels of sophistication and capacity vary, it will be a future challenge for providers of biodiversity information to cater biological data to different decision-making groups simultaneously.

INTERNAL IMPEDIMENTS

Perhaps as troubling to decision makers as the gaps or inadequacies in existing biodiversity information are internal impediments which prevent the full use of existing resources. Almost two-thirds of respondents found that impediments, such as a lack of organizational capacity, lack of an internal mission, or the existence of political and economic factors, were obstacles to incorporating biodiversity information into institutional decision making.

A lack of knowledgeable staff, adequate funding, and resources were commonly cited internal impediments. Many respondents indicated a desire to better incorporate biodiversity information into decision making but lacked the means to do so. Contributing to this problem is that a high proportion of organizations, which typically rely on biological data, are nonprofit groups or state agencies that are often limited in personnel and funding.

By contrast, those in the business and industry sector – many of whom have the capacity and resources to devote to biodiversity conservation – may not place ecological issues as a high priority. Respondents cited that a lack of understanding and appreciation of biodiversity by employees or their constituents were as much an impediment as a lack of organizational capacity. Some respondents speaking either for themselves or on behalf of their constituents expressed a clear aversion to the topic of biodiversity altogether because of

its threat to private property rights and its potential for causing increased regulations and restrictions on development.

It became quite clear that groups often lack an internal mission guiding them to consider or address long-term biodiversity impacts. One respondent explained that "planning officials often think in terms of one to five years down the road", and "most politicians do not feel that they can or need to address biodiversity during their short term in office." Such short-sighted thinking impedes the development of ecological understanding and environmental problem solving within companies or institutions; natural evolutionary processes driving our planetary systems and human-induced impacts on associated ecological processes, such as fire regimes or hydrologic cycles, often take decades to centuries to detect and even longer to mediate.

The lack of a biodiversity agenda goes beyond business, industry, and planning groups. "DEC may be highly attuned to biodiversity information, but other agencies don't even have it on their radar screens. For example, the water and power authorities have greatly altered the landscape without assessing or realizing it," explained one respondent.

Compounding this problem, decisions affecting the state's natural resources are often based on or influenced by political agendas or economic incentives in lieu of scientific information. Representatives from different sides – conservationists and developers alike – felt that politics and economics were leading factors in the interpretation of biodiversity information, or lack thereof. Since politics and economics often drive forces in state decision making, over and above science, instilling an understanding and appreciation on behalf of policy makers and an accounting system for biodiversity in New York will be a future challenge.

SUMMARY OF THE ADEQUACY OF BIODIVERSITY INFORMATION

The majority of decision makers interviewed were not satisfied with current biodiversity information. Both external and internal impediments were causes of respondent dissatisfaction. External impediments were generally more common and diverse and included, in order of significance, limitations in data accessibility, gaps in specific content areas, inadequacies in data aspects and applications, and gaps in geographic coverage. Inaccessibility of current information, including the fact that information may not be shared with the public, was the most frequently cited impediment. Dissatisfaction with information in specific content areas – such as individual species, habitats, and landscape processes – was second, identified by 43 percent of respondents. Respondents also identified inadequacy in various aspects of available data – including what they perceived as inaccuracy and inconsistency. They noted the lack of information on data applications – or guidance on how to translate primarily scientific data for use in "real life" policy and management decisions. To a lesser extent, they noted problems with geographic coverage, such as the lack of coverage of private and rural areas.

Internal impediments related to issues of limited capacity or scope within the organization/agency seeking biodiversity information, which were identified as frequently as several categories of external impediments. A majority of respondents, 63 percent, identified

both lack of capacity and lack of a clear biodiversity objective within their organizations as roadblocks to incorporating biodiversity information into institutional planning and management, and to a lesser extent political or economic factors that unduly influence decision making.

Although current biological information is deemed inadequate in certain respects, this should not be reason for inaction. Inaction is a decision in itself and often leads to poor environmental management. Because of what is at stake, it is often more desirable to move forward using best available information and adjust accordingly as additional information arises. Because ecosystems are dynamic and our knowledge base is incomplete and subject to change, management must be *adaptive*, in which there is on-going feedback and continual revisions based on new research and data.[30]

DESIGNING BIODIVERSITY INFORMATION TO MEET THE NEEDS OF DECISION MAKERS

For biological data to be used and incorporated into policy, management, and planning decisions at the state and local levels, it needs to be in a format that decision makers can use and interpret. Availability of data alone will not ensure its use. Rather, data must be tailored to meet the needs of its potential and intended users. If existing science-based assessment programs are not providing information in an appropriate format for those whose decisions affect biodiversity, valuable data will fail to have significant on-the-ground effects.

There is both an interest in and demand for biodiversity information by New York State decision makers. Eighty-seven percent of respondents indicated they would consult biodiversity information if it were accessible and in a usable format. Only two respondents, both from the industry and business community, directly responded that they would not use biodiversity information because economics, politics, or factors other than science dictate their organizations' decisions. Despite minority dissension, respondents indicated a clear need for biological information that better addresses their needs.

The ways in which data are collected, organized, presented, and disseminated will be significant determinants of their value to and use by decision makers. Respondents provided insight into how biological data could be tailored to be more effectively incorporated into decision making in New York State.

ORGANIZATION OF BIOLOGICAL DATA

Since long before, but accentuated by, the passage of the Endangered Species Act (ESA) in 1973, species have been a focus of conservation efforts. Species loss is more tangible to humans than the less obvious and less quantifiable loss of genetic diversity or

[30] Christensen, N., et. al. 1996. The Report of the Ecological Society of America Committee on the Scientific Basis For Ecosystem Management. Ecological Applications 6(3):665-691.

ecosystem processes and functions. Thus, natural resource agencies and conservation groups have a longer history of and are more accustomed to collecting data on abundances and distributions of species. However, there has been a recent paradigm shift to an ecosystem-level approach.[31] Scientists and managers have come to realize that conservation of individual species is difficult given the destruction and degradation of many habitats. By shifting to conservation and management of natural ecosystems, there is the hope that the ecological drivers and processes of a system, such as fire, hydrology, and soil regimes, as well inter-population dynamics like source-sink relations, will also be captured.

This paradigm shift was reflected in this needs assessment. The majority of New York State decision makers requested information organized by *natural communities* as opposed to species or taxa.[32] Respondents also indicated a preference for natural community information over information organized by physiographic regions and watersheds (*see* Appendix F). The majority of state and regional management agencies, land acquisition groups, and environmental organizations clearly indicated this ecosystem preference. Natural community information was cited as more accurate and reliable because species occurrence data becomes quickly outdated and often inappropriate for landscape planning (*e.g.*, developing a fire-management plan). Given current biological data, decision makers felt ill-equipped to manage whole ecosystems, protect and manage vital corridors, assess cumulative impacts of development on biodiversity, and consequently, develop adequate regional management plans.

An adoption to an ecosystem approach presents a challenge on how to delineate natural communities. Respondents were most familiar and accustomed to the classification presented by NYNHP in the *Ecological Communities of New York State*.[33] This level of detail was considered adequate by several decision makers, planners, and managers, and is based on the National Vegetation Classification System (NVCS), also used by NY's Gap Analysis Program.[34] Adoption of such national standards for classifying vegetation cover and associated information would promote data consistency and transference.

Despite the need for natural community and landscape information, *species data* will continue to be vital in biodiversity conservation. Natural resource managers will often need a "fine filter" approach to provide direct management attention to endangered and rare species that may not be conserved solely by protecting habitats. As well, information on species-area relationships and life history requirements of particular species (particularly indicator and keystone species) will play a key role in conservation decision making. This need was recognized by federal agency representatives who requested taxa or species

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[31] Imperial, M. 1999. Institutional analysis and ecosystem-based management: the institutional analysis and development framework. Environmental Management 24(4):449-465.

[32] The *Ecological Communities of New York* served as a reference to distinguish natural communities and physiographic regions. For example, natural communities were defined as forests versus wetlands, streams/rivers, estuarine/marine systems, etc. where as physiographic regions as the Adirondacks, Mohawk Valley, Applachian Plateau, etc.

[33] Reischke, C. 1990. *Ecological Communities of New York State.* New York Natural Heritage Program, Latham, NY.

[34] The National Vegetation Classification System (NVCS) is scale-independent. It has been applied by the New York Natural Heritage Program at finer physiognomic and floristic levels, hence a smaller biological scale than by the New York Gap Analysis.

information over and above other categories – which is a likely artifact of their mandate to implement and enforce the ESA.

Not surprisingly, many respondents indicated a desire to receive data at *multiple levels*. Providing information at both the fine "scale" (species) and the coarse "scale" (natural communities, physiographic regions) would capture species, as well as their habitats and associated processes (as practiced by The Nature Conservancy, the New York Natural Heritage Program, among other research organizations). A need for multi-tiered data – at the levels of taxa, natural communities, and physiographic regions – was emphasized by education entities, business and industry, and research institutions.

SCALE OF BIOLOGICAL DATA

As highlighted above, scale is a fundamental issue in ecology. The spatial domain of a study or research project determines the level of biological detail captured, thus, invariably affects how decisions are made in regard to critical species and habitats. Not surprisingly, a common criticism among New York decision makers was that biological information is not available at the appropriate scale. A consistent theme, particularly among state and regional management agencies and land acquisition groups, was that more "*site specific information*" is needed, particularly for threatened and endangered species and communities. Of the 43 respondents, over half emphasized the need for data at the county level or smaller (on the order of a few acres) since planning, development, and management decisions often occur at this fine scale.

All sectors indicated this small-scale preference; however, state agency representatives and researchers espoused the need for multiple levels of data for counties, regions, and the state.[35] Because state decisions are made on multiple scales – from site specific (*e.g.*, planning for park trails) to large scale (*e.g.*, planning for highway infrastructure) – there is a need for *multi-scaled data*. Large scale, regional data allow for the detection of landscape patterns and statewide trends. However, smaller-scale information is needed for local and county-level planning decisions.

Site-specific information is regularly collected by contractors, consulting firms, and local agencies when preparing Environmental Assessment and Environmental Impact Statements or during other planning efforts. As previously indicated, such information is not systematically compiled or incorporated into a larger state database like the New York Natural Heritage Database. An impediment to such a compilation is that data are collected by various sources and, thus, do not follow an accepted scientific standard. Adopting a common approach, accompanied with professional training, would benefit not only state programs like Heritage (by augmenting existing databases) but also local decision makers (by utilizing and presenting locally relevant data).

Standardization of data is clearly a concern. Twelve respondents within state agencies, regional management agencies, environmental organizations, and federal agencies

[35] Small scale refers to one that has fine resolution (*e.g.*, 1:24,000 ft) as opposed to a large scale with coarser resolution, covering a larger area (e.g., 1:100,000,000 ft).

recommended that biological data be compiled and presented at the U.S. Geological Survey scale of 1:24,000 ft as is currently done with Heritage data. Adhering to such an institutionalized methodology would promote data uniformity, which is essential for inter-organizational coordination and data sharing. However, the question still remains if this scale is exact enough for local decision makers.

DATA PRESENTATION AND MEDIUM

Not only do aspects like data organization and scale affect the utility of biological information, but so does presentation. Decision makers clearly preferred *graphical information*, such as maps, tables, and charts, over narrative forms: 74 percent (40 out of 54 respondents). The resounding demand was for standardized maps of species and natural community locations as well as maps revealing biodiversity hot spots and areas of conservation priorities. Maps were cited as important tools for communicating to developers, planners, and politicians. A handful of decision makers remarked that county maps showing the distribution and abundance of species and communities would greatly assist planning and management decisions at the local level.

About 60 percent of respondents indicated a preference for data to be in electronic form, such as on CD-ROM or Internet in particular, as opposed to hardcopy, because they can be more easily updated and queried. In addition, a common theme was that current and future biodiversity information be in formats compatible with common biological tools, such as GIS and U.S. Geological Survey topography maps. The use of GIS was emphasized, rather than having disconnected data sources, reflecting the trend of GIS-based environmental planning.

However, providers of electronic and technologically advanced information should be aware that a minority of users may have difficulty accessing such information. Two respondents cited technical obstacles as preventing their use of current information. One of these individuals, from a federal agency, indicated on-line information might not be downloadable or accessible to those in government agencies which are slow to upgrade technical equipment.

Given these potential shortcomings, biodiversity information in hard-copy form was recognized as useful – *particularly for a state overview of biodiversity status and trends* – since some county planners and local groups, as well as local governmental agencies, do not have access to or familiarity with GIS technology or the Internet. In fact one grassroots organization felt that this technological gap should be formally addressed by the establishment of an organization or state agency that would provide GIS support to local governments and non-profit groups.

WAYS TO ACCESS INFORMATION

Seventy-two percent of respondents requested biological information be made available over the *Internet* as opposed to phone, fax, or e-mail. However, 25 of the decision makers (44 percent) felt that having access to *expert consultation*, such as over the phone, was

vital because they often have questions regarding data interpretation and evaluation for management and would like to be able to personally contact the data provider. In particular, fifteen decision makers requested basic guidance on how to assess and use biodiversity information for management and policy decisions. Organizations within the research and business sectors emphasized this need, but it was also mentioned by land acquisition, planning, and state agencies.

SUMMARY OF DESIGNING BIODIVERSITY INFORMATION

Almost 90 percent of decision makers indicated they would use additional biodiversity information if provided in a manner that would serve their needs. Information organized by natural communities was considered most useful. However, site specific information – on the county scale and even smaller – was requested for all levels of biodiversity to ensure its consideration in local land-use decision making. Respondents also indicated a strong preference for graphical information – particularly standardized maps revealing hot spots or areas of conservation priority – in electronic form compatible with GIS. A hard copy version, however, was recognized as useful for county planners, local groups, and other sectors that are less technologically advanced. The second most frequent request was for basic guidance on how to interpret and use biodiversity information for management and policy decisions. The Internet was found to be a key mechanism for disseminating this information to state decision makers.

RECOMMENDATIONS

The development of a *comprehensive biodiversity conservation strategy* for New York State cannot succeed without scientifically-based information that is usable and accessible by state decision makers. The following recommendations address this need.

DEVELOP A STATEWIDE BIODIVERSITY INVENTORY AND ASSESSMENT PROGRAM

New York should develop a statewide biodiversity inventory and assessment program that draws from existing sources of biological data, particularly from Natural Heritage, Gap Analysis, Department of Environmental Conservation, New York State Museum, American Museum of Natural History, and local universities, as well as from data collected through the environmental review process. Currently, New York lacks this type of coordinated assessment system.

First, this system must establish a standardized protocol for documenting biodiversity. In particular, a consistent voucher specimen[36] methodology, which could

[36] A voucher is a specimen providing evidence for the existence of a particular species at a particular locality. Having a specimen eliminates inaccuracies in the identification process and serves to make inventories and distributional data credible. A specimen can be the whole plant or animal or any diagnostic part of the plant

include photo documentation, must be followed so that the quality of the data can be checked as needed.

This program should also address the need for site specific local data that would be accessible and relevant to local governments and planning boards. Since larger, more coarse scale data are available through federal agencies like the U.S. Geological Survey (land cover maps, digital elevation models, hydrology) and Gap Analysis (managed areas, vertebrate species ranges, land cover maps), the focus should now be on producing and compiling more fine scale data collected on the ground, as done by Heritage, which is usable and accurate at county and local levels.

This program should cover as many taxa as possible (focusing on indicator and keystone species) as well as ecological processes statewide. State decision makers need information on how biodiversity is faring both regionally and statewide to motivate action.

Providing more information on New York's natural communities – their distribution, abundance, threats, and management – will complement species specific information currently collected by various governmental agencies. Natural Heritage has already collected some of these data, and should continue to do so on a wider, more comprehensive scale. In addition, more landscape-scale analyses using information on aquatic resources, soils, landforms, exotic species, ecosystem processes, as well as socioeconomic attributes need to be better incorporated into state decision making and planning.

There needs to be a programmatic and financial commitment by state organizations and agencies, within both the public and private sector, to ongoing monitoring to track biological change over space and time. Adaptive management needs to emerge as a new way of conducting and improving business. This must occur for decision makers to begin to tackle the more elusive yet important management questions, such as how to assess cumulative impacts of development, protect vital habitat corridors, and manage for ecosystem processes.

A clear and direct link should be established between biodiversity information and resource policy making in the state. A concerted effort should be made to identify critical areas to target incentive programs, management of natural resources, acquisition funding, and restoration activities, as has been done in states like New Jersey, Oregon, and Florida.[37] Overall, New York State should begin to foster a more integrated, multi-species and ecosystem approach because this affords perhaps the best hope for biodiversity conservation at any biological level.

(*e.g.*, leaves, fruit, flower) or animal (*e.g.*, voice recording). Occasionally, a photograph can serve as a voucher although the best specimen is the actual organism itself.

[37] Hoctor, T., M. Carr, and P. Zwick. 2000. Identifying a linked reserve system using a regional landscape approach: the Florida ecological network. *Conservation Biology* 14(4):984-1000.
Bennett, J. 1998 (July/August). State biodiversity planning. *The Environmental Forum* 15(4):19-27.
Defenders of Wildlife. 1998. *Oregon's Living Landscape: Strategies and Opportunities to Conserve Biodiversity*.

DEVELOP A CENTRAL CLEARINGHOUSE FOR STATE BIODIVERSITY INFORMATION

To facilitate the use of biological information, there should be a central clearinghouse of data sources and existing programs where decision makers can readily access state biodiversity information. The establishment of a central directory would help guide decision makers toward the most appropriate biodiversity data available for the state. This role is appropriately filled by the New York State Biodiversity Research Institute (BRI), which was created in 1993 for this exact purpose. BRI should also be a leader in the development of an inventory and assessment model, as described above.

BRI should act as a coordinating entity to promote the application of biodiversity information among the various sectors. It has the advantage of not being locked into a narrow programmatic or management focus. Enhancing cooperation and communication among state and federal agencies, research institutions, local townships, environmental groups, and other state entities would enhance the power of existing and future information. This study found that coordination between the New York State agencies, organizations, and institutions that are conducting biodiversity research could be improved. BRI could act as a vehicle for supporting and addressing key state biodiversity issues. *However, BRI will not be able to fill this role unless it has the necessary support, both financially and politically.*

DEVELOP A STATEWIDE BIODIVERSITY EDUCATION AND OUTREACH PROGRAM

The creation of biodiversity information tailored to meet the needs of, and accessible to, local managers, planners, and policy-makers does not guarantee improved state decision making. Neglect of biological information in large part stems from a lack of awareness and appreciation of biodiversity conservation by business, the development community, town officials, and the general public. To improve state planning and land management, an outreach program needs to be established to educate all sectors about the importance of biodiversity conservation in New York. This program should develop educational materials for targeted groups and establish a mechanism by which to train state decision makers, land managers and planners, educators, local officials, and business community on how to access and use biodiversity information. BRI could potentially act as the central coordinating agency for such biodiversity education efforts.

On-going education on state biodiversity issues is needed for all sectors, particularly those that experience high turnover rates in leadership (*e.g.*, municipal and county officials, and planning commissioners). An education program that breeds a sustained commitment to state biodiversity conservation and that outlives political turnover is critical. In addition, biodiversity awareness and understanding have an important role in the classroom. Programs to inform educators about the importance and relevance of biodiversity, curricula that address conservation issues while satisfying state and national performance standards, and partnerships between scientists and the school districts to support biodiversity education are key. Organizations, such as the American Museum of Natural History, the New York State Biodiversity Institute, and the Institute of Ecosystem Studies which offer education

materials and programs for various audiences, should expand existing efforts (*see* Appendix D). The challenge will be to motivate and enable teachers to incorporate this new material.

Along with education, an important component of outreach is providing on-going technical training and support. The study revealed that state decision makers are often intimidated by or ignorant about the use of biological information. Without adequate guidance, biodiversity information may fail to be incorporated into decision making or may be interpreted inappropriately. Several respondents contended that state DEC employees, who are mandated to use New York Natural Heritage data during the environmental review process and for their own land management purposes, are often ill-equipped and ill-informed of proper use. A program should be developed to provide the necessary training and technical support (particularly related to GIS application) to state and local decision makers. This service could potentially be provided by the NYNHP (with additional funding earmarked) but done so in a manner that does not detract from their primary task of building and maintaining a biological database.

ENHANCE THE EFFECTIVENESS OF NEW YORK'S BIODIVERSITY LAWS AND POLICIES

This research revealed that a broad range of laws and policies were used by respondents to integrate biodiversity information into decisions. However, there were a number of laws that were not cited, such as the state's Biological Diversity Act and Fish and Wildlife Law, which could also promote the use of biodiversity information. New York State should provide expanded outreach and guidance regarding existing laws and policies. A comprehensive assessment of existing legal and policy mechanisms should be conducted to determine whether they provide adequate opportunities for integrating biodiversity information. This assessment should highlight the full range of authorities available to local, state, and federal agencies; conservation organizations; and the private sector to conserve biodiversity. Such a report could be used to educate New York decision makers about existing authorities and to highlight the availability and applicability of biodiversity information. Finally, it could help identify shortcomings in existing state laws and policies for protecting and restoring biodiversity and requiring consultation of biodiversity information. This assessment should examine whether additional measures should be taken to better protect New York's natural heritage and could be used as the basis for a comprehensive state biodiversity strategy.

APPENDIX A
NEW YORK STATE BIODIVERSITY PROJECT STEERING COMMITTEE

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APPENDIX B
LIST OF ORGANIZATIONS INTERVIEWED

Organizations and their representatives were selected by the New York State Biodiversity Project Steering Committee. Selected interviewees were key leaders and decision makers within their organizations and in a position to affect the status of biodiversity in New York State.

State Agencies

1. Adirondack Park Agency
2. Allegheny State Park
3. Palisades Interstate Parks Commission
4. Department of Agriculture and Markets, Division of Agriculture Protection and Development Services
5. Department of Environmental Conservation (DEC), Bureau of Wildlife
6. DEC Bureau of Habitat Protection (Wetlands)
7. DEC Division of Environmental Permits
8. DEC Division of Fish, Wildlife, and Marine Resources
9. DEC Division of Lands and Forests
10. DEC Non-game and Habitat Unit
11. Department of State, Division of Coastal Resources
12. Environmental Management Bureau, Office of Parks, Recreation, and Historic Preservation
13. Public Service Commission

Federal Entities (using state information)

1. Natural Resources Conservation Service
2. U.S. Army Corps of Engineers (regional office)
3. U.S. Department of the Army
4. U.S. Fish and Wildlife Service, Partners for Fish and Wildlife Program

Regional Biodiversity Initiatives or Management Agencies

1. Hudson River Estuary Program
2. Long Island Pine Barrens Commission
3. New York City Parks
4. New York State Tug Hill Commission
5. Suffolk County Parks

Land Acquisition Groups

1. Finger Lakes Land Trust
2. Land Trust Alliance
3. The Nature Conservancy, New York Chapter
4. Open Space Institute (regional land trust in the Hudson Valley)

Planning Organizations / Agencies

1. American Planning Association, Upstate New York Chapter
2. Capital District Regional Planning Commission
3. New York Planning Federation
4. Regional Planning Association
5. Saratoga Springs Open Space Project
6. Yorktown Town Hall

Environmental Organizations

1. Adirondack Park Council
2. American Farmland Trust
3. Great Lakes United
4. National Audubon Society of New York State (two interviews)
5. Scenic Hudson
6. Sierra Club, Atlantic Chapter

State Educational Organizations

1. Farnsworth Middle School
2. Kingston School District
3. New York State Department of Education
4. Public Education Program, Kanaskis Field Station, University of Calgary

Business and Industry

1. Empire State Forest Products Association
2. Lawler, Matusky, & Skelly Engineers, LLP (science and engineering consulting firm)
3. Malcolm Pirnie (environmental consulting firm)
4. New York Builders Association
5. New York Business Council
6. New York Farm Bureau
7. New York Power Authority

Research Institutions and Science Interests

1. Brooklyn Botanical Gardens
2. Institute of Ecosystem Studies
3. Invasive Plant Council of New York
4. Mashantucket Pequot Museum and Research Center
5. New York State Gap Analysis Project at Cornell University
6. New York State Museum
7. Wildlife Conservation Society, Metropolitan Conservation Alliance

APPENDIX C
INTERVIEW QUESTIONS

- Do you currently use biodiversity information in your decision-making?
    - If no, why not?
    - If so, what information do you use?
        - How do you obtain this information?
        - Is the information adequate? If not, why?

- Are you currently required to assess the impacts of your decisions on biodiversity (the status of native plants, animals, or ecosystems)?
    - If so, under what laws or policies?

- Has knowledge about biodiversity affected the decisions you make or projects you work on?
    - If so, can you give an example?

- If you had access to additional information on the status of biodiversity in New York, would you consult this information when making decisions?
    - If no, why not?
    - If yes, what format would be most useful to you?
        - Information organized by by natural communities (e.g, forests, wetlands, streams/rivers, pine barrens, estuarine/marine systems); physiographic regions (e.g., Adirondacks, Mohawk Valley, Appalachian Plateau); and/or type of organism (taxa)?
            - For both natural communities and physiographic regions, what scale is most useful?
        - Information presented graphically (e.g. on a map, table, or chart) or narratively?
        - Information in a book format?
        - Information upon request by phone, fax, or e-mail, or through the Internet?
        - Expert consultation?

    - What impediments are there to you incorporating biodiversity information into your decision-making (e.g., lack of capacity, staff, information, support)?

    - Do you think biodiversity information is effectively incorporated into decision-making in the state?
        - If yes, can you give some examples?

    - If not, how do you think information on biodiversity could be more effectively incorporated into decision-making in the state?
        - Can you give some examples?

    - Is there anything I failed to ask that you would like to emphasize with regard to how you use or would like to use biodiversity information?

APPENDIX D
BIODIVERSITY SOURCES CITED BY INTERVIEWEES

Sources for biodiversity information mentioned by respondents are summarized below (in alphabetical order). A few additional resources that were not mentioned by interviewees (marked by asterisks *) are included.

American Museum of Natural History
Center for Biodiversity and Conservation*

Since its founding in 1869, the American Museum of Natural History has advanced its global mission to discover, interpret, and disseminate information about human cultures, the natural world, and the universe through a wide-reaching program of scientific research, education and exhibitions. In 1993, the Museum launched the cross-disciplinary Center for Biodiversity and Conservation (CBC) to address environmental threats to the Earth's biological systems. The Center strives to develop viable science based solutions to biodiversity conservation problems and to disseminate these findings widely. Working in partnership with national and international organizations CBC develops field research projects, training programs, symposia, and publications, creating a wealth of data and resource materials for scientists and governmental agencies around the world. The Museum's Education Department has developed "Biodiversity Counts", an inquiry-based middle school curriculum used in many New York City schools and in schools elsewhere in the country. It also offers institutions and workshops for New York State teachers.

Contact: Center for Biodiversity and Conservation, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024; phone: (212) 769-5742; http://research.amnh.org/biodiversity/.

Atlas of Breeding Birds in New York State
By Robert F. Andrle and Janet R. Carroll. January 1988, Cornell University Press.

The first of its kind, this breeding bird atlas for New York State serves as a key biological resource by providing population and distribution information on New York's various bird species. A second Breeding Bird Atlas is currently underway to provide updated information about the state's bird populations. The project is a collaborative effort by The Federation of New York State Bird Clubs, New York State Department of Environmental Conservation, Cornell's Department of Natural Resources, and the Lab of Ornithology.

Contact: Breeding Bird Atlas Project Coordinator, Wildlife Resources Center, 108 Game Farm Road, Delmar, New York, 12054.

BirdSource

A collaborative effort between the Cornell Lab of Ornithology and the National Audubon Society, BirdSource collects data from all over the country, recording and charting the density and location of bird populations. BirdSource makes use of citizen observation in its efforts to map bird populations, habitats, and migration routes. Participants increase their scientific knowledge, vocabulary and literacy in two annual bird counts – Backyard Bird Count and Christmas Bird Count – while providing scientists and conservationists with valuable biological information.

Contact: Cornell Lab of Ornithology, 159 Sapsucker Woods Rd., Ithaca, NY 14850; http://birdsource.cornell.edu.

Cornell University

Cornell Lab of Ornithology

A nonprofit membership organization dedicated to the study and protection of birds. Since its founding in 1915, the Cornell Lab of Ornithology has been recognized for its contributions to bird research and for encouraging citizen contributions to birding. One of its many research projects, the lab conducts the Golden-Winged Warbler Atlas Project (GOWAP) that studies this neotropical bird whose population numbers have been declining significantly in recent years. Results will be used to develop maps that will aid in indicating areas of particular conservation importance.

Contact: Cornell Lab of Ornithology, 159 Sapsucker Woods Rd., Ithaca, NY 14850, Phone: (607) 254-2473; http://birds.cornell.edu.

Cornell University Geospatial Information Repository (CUGIR)

CUGIR is a centralized location for geospatial data for New York State. Emphasis is placed on natural features relevant to agriculture, ecology, natural resources, and human-environment interactions. Subjects such as landforms and topography, soils, hydrology, environmental hazards, agricultural activities, wildlife and natural resource management are all included.

Contact: Philip Herold, Albert R. Mann Library, Cornell University, Ithaca, NY 14853; phone: (607) 255-7959; fax: (607) 255-0318; e-mail: ph31@cornell.edu; http://cugir.mannlib.cornell.edu/.

Cornell Environmental Inquiry

The mission of Environmental Inquiry is to support education in the environmental sciences via teacher education, curriculum development, and scientific inquiry by students and teachers in grades 7-12. Environmental Inquiry modules are currently being developed in watershed dynamics, the ecological effects of alien species, and several other environmental topics. Three levels of inquiry are provided for, including protocol labs, explorations, and interactive research.

For more information: http://www.ei.cornell.edu.

Ecological Communities of New York State

By Carol Reschke, March 1990. New York Natural Heritage Program and New York State Department of Environmental Conservation.

This report classifies and describes ecological communities representing the full array of biological diversity of New York State in an effort to help assess and protect it. Marine, estuarine, lacustrine, palustrine, riverine, terrestrial, and subterranean systems are described.

Contact: New York Natural Heritage Program, N.Y.S. Department of Environmental Conservation, 700 Troy Schenectady Road, Latham, N.Y. 12110-2400; http://www.dec.state.ny.us/website/dfwmr/heritage.

Enature.com*

A new resource that provides free local field guides online based on zip code. Visitors can enter their zip code and receive a customized photographic guide to the wildlife in their area. Local guides to birds, mammals, reptiles and amphibians are currently available and local guides to butterflies, trees, and wildflowers will be released by the fall. Enature naturalists have developed species lists for all of the more than 42,000 zip codes in the continental United States and Alaska. Each local guide is complete with color photographs and descriptions from the National Audubon Society Field Guide series.

For more information: http://www.enature.com/press/press.

Gap Analysis Program (GAP)

Directed by the Biological Resources Division (BRD) of the U.S. Geological Survey, GAP is a nation-wide, multi-disciplinary effort aimed at integrating information about land stewardship, land cover, and vertebrate distribution. The project uses GIS and other tools to inventory, categorize, and plot plant and animal species. This blend of information allows regional decision makers to make well-informed choices regarding biodiversity protection by identifying "gaps" in land ownership as compared to natural community and vertebrate animal concentrations. GAP is currently underway in all 50 states. The New York Gap Analysis Project (NYGAP) is located in Cornell's Department of Natural Resources, with the Cooperative Fish and Wildlife Research Unit and New York State Department of Environmental Control (NYSDEC) serving as lead agencies. Other partners include the Adirondack Park Agency, Environmental Protection Agency, New York Natural Heritage Program, and New York State Museum. An extensive GAP report is due to be released for distribution in early 2001.

Contact: Mr. Kevin Gergely (national GAP program), Interim Leader, USGS/BRD/Gap Analysis Program, 530 S. Asbury St., Suite 1, Moscow, ID 83843; phone: (208) 885-3565, fax: (208) 885-3618; e-mail: gergely@uidaho.edu; http://www.gap.udiaho.edu. OR Mike Richmond (New York GAP), New York Cooperative Fish and Wildlife Research Unit, Cornell University, 202 Fernow Hall, Ithaca, NY 14853; phone: (607) 255-2151; e-mail: mer6@cornell.edu; http://www.dnr.cornell.edu/gap/gap.htm.

Herpetological Atlas Project for New York State

The Herpetological ("Herp") Atlas Project was a ten-year survey (1990-1999) that documented over 70 species of amphibians and reptiles in New York State. Their website provides fact sheets and maps based on data collected for the atlas.

Contact: New York State Herp Atlas Project, NYSDEC, Wildlife Resources Center, 108 Game Farm Road, Delmar, NY 12054;
http://www.dec.state.ny.us/website/dfwmr/wildlife/herp/snakliza.html.

Hudsonia

Since its beginning in 1981, Hudsonia has worked to protect the unique landscape and habitats of the Hudson River Valley through education, research, training and technical assistance. Their publications are varied, but frequently aim to help local government officials, developers, and citizens with an interest in biodiversity to manage land in an effective, conservation-oriented

manner. They are currently producing a review manual for citizens and local government officials on factoring biodiversity into land use planning.

Contact: Hudsonia, Ltd., Bard College # 1273, P.O. Box 5000, Annandale, NY 12504-5000; phone: (914) 758-7053/ 7273/ 7274; e-mail: decker@bard.edu; http://www.hudsonia.org.

Important Bird Areas

The Important Bird Areas program was developed in the mid-1980's by the National Audubon Society. The purpose of this organization is to use species and habitat data to identify key geographical areas for birds. An important bird area (IBA) is considered to be a place that provides essential habitat for one or more species of bird, whether in breeding season, winter, or during migration. As of October 1998, more than 1200 sites in the United States were identified as qualifying as IBAs, including more than 290 at the national level, more than 300 at the continental level and more than 620 at the global level of importance.

Contact: Chip Chipley, American Bird Conservancy, P.O. Box 249, Plains, VA 20198; phone: 540-253-5780; e-mail: rchipley@aol.com; http://www.audubon.org/bird/iba.

Institute for Ecosystem Studies (IES)

The Institute for Ecosystem Studies (IES) was founded in 1983 by ecologist Dr. Gene E. Likens to foster ecological literacy in students, teachers, young scientists, professionals, decision makers and the general public. It is one of the largest ecological programs in the world and publishes scientific books and articles and develops curricula for educators and scientists. IES serves as an essential resource for New York teachers by offering programs supporting local K-12 science curriculum. Institute educators also disseminate the successful approaches they develop by working with professional ecologists and educators nationwide through conferences and workshops. IES has developed teaching materials that cover the flow of matter in ecosystems and specific topics such as pond ecology, forest ecology and groundwater ecology, among others.

Contact: Institute of Ecosystem Studies Education Program, Box R, Millbrook NY 12545-0178; phone: 914-677-5359; http://www.ecostudies.org.

National Audubon Society

Founded in 1905, the mission of the National Audubon Society is to conserve and restore natural ecosystems, focusing on birds and other wildlife for the benefit of humanity and the earth's biological diversity. Among its top priorities are preserving wetlands, promoting a responsible U.S. population policy, and preserving America's endangered forests. With over half a million members and one hundred Audubon Sanctuaries and nature centers nationwide, Audubon serves as a key resource on biological information. Audubon's efforts include partnerships in programs such as BirdSource and the Important Bird Areas (IBA) program (discussed above).

Contact: National Audubon Society; 700 Broadway; New York, NY 10003; phone: (212) 979-3000; http://www.audubon.org.

Natural Heritage Program

Conceived in the early 1970's by The Nature Conservancy and currently restructured and integrated into a new organization called Association for Biodiversity Information, the Natural Heritage Program works to gather as much accurate information about plant and animal species as

possible to provide reliable data to decision makers. The Natural Heritage Program collects data on distributions, abundances, and quality of rare and exemplary species and natural communities. Natural Heritage Programs can be found in all fifty states, as well as in other areas of the world, such as Canada, South America, Central America and the Caribbean. The New York branch of the Natural Heritage Program (NYNHP) manages an integrated and centralized system of statewide conservation databases that help facilitate management and planning of natural resources throughout New York State. This program, which began in 1985, is a joint effort of the Department of Environmental Conservation (DEC) and The Nature Conservancy (TNC).

Contact: Association for Biodiversity Information (national program), 1101 Wilson Boulevard, 15th floor, Arlington, VA 22209; phone: (703) 908-1800; http://www.abi.org. OR New York Natural Heritage Program, Wildlife Resources Center, 700 Troy-Schenectady Road, Latham, New York 12110-2400; phone: (518) 783-3932; http://www.dec.state.ny.us/website/dfwmr/heritage. For more general information on Natural Heritage Programs nationwide: http://www.heritage.tnc.org.

New Jersey Landscape Project

Adopted in 1994 by New Jersey Division of Fish, Game and Wildlife's Endangered and Nongame Species Program, this landscape level approach to protect rare wildlife species and important habitats has been a success in New Jersey. Focusing on the county level, the Landscape Project identifies critical wildlife habitats within large landscapes to be targeted for protection. The program provides users with scientifically sound information that is easily accessible and can be integrated with planning and protection programs at various levels of government. Specifically, maps and overlays provide for proactive planning such as the development of local habitat protection ordinances, zoning to protect critical habitat, management guidelines for rare wildlife species protection on public and private lands, and land acquisition projects.

Contact: New Jersey Fish and Wildlife; phone: (609) 292-2965; http://www.state.nj.us/dep/fgw/lndscpe.htm.

New York Metropolitan Flora: Preliminary Atlas of Woody Plants
By Steven E. Clemants and Steven D. Glenn.

This book serves as a key biological resource by providing geographical distribution of woody plants in the New York Metropolitan Area. It is part of a larger initiative by the Brooklyn Botanical Gardens (BBG) to identify and catalog plants in the New York metropolitan region.

Contact: Brooklyn Botanical Gardens, Brooklyn, NY (book numberQK177/.C625 1994); http://www.bbg.org/nymf

New York State Department of Environmental Conservation (DEC)

With 15 divisions covering the gamut of environmental issues from environmental remediation to water quality, the New York DEC serves the state as a key biodiversity resource to scientists, developers and planners alike. This agency is also a key partner in several biological inventories and projects, including a current inventory of biodiversity resources in the Hudson Valley by their Estuary Program with multiple partners including The Nature Conservancy, Wildlife Conservation Society, and Cornell University.

For information: http://www.dec.state.ny.us.

New York State Historic Preservation Office (SHPO)

The New York State Historic Preservation Office maintains a website with information regarding sites in New York state that are of particular historical significance. Knowledge of these sites provides decision makers with another viewpoint from which to look at land use and management decisions. New York State Office of Parks, Recreation and Historic Preservation welcomes 65 million visitors a year to its parks, historic sites and recreation areas. The agency operates 152 state parks, 35 state historic sites, and 76 developed beaches, among several other developed and natural areas.

Contact: Mrs. Bernadette Castro, State Historic Preservation Officer, Office of Parks, Recreation and Historic Preservation, Empire State Plaza, Agency Building 1, 20th Floor, Albany, New York 12238; phone: (518) 474-0443; http://nysparks.state.ny.us/hist.

New York State Office of Technology and the New York State Library

This organization runs the New York State Geographic Information Systems (GIS) Clearinghouse, providing information about New York's GIS Coordination program, as well as access to the state's GIS Metadata and Data Repository. In this way, local, state and regional governmental agencies can share information about GIS data sets. The Clearinghouse site also lists links for education and training opportunities relating to GIS.

For information: http://www.nysgis.state.ny.us/welcome.htm.

New York State Museum's Biodiversity Research Institute (BRI)

The New York State Museum – a program of the University of the State of New York and the New York State Education Department's Office of Cultural Education – serves as a unique and multi-faceted resource for biodiversity research, education and information. In addition to including information on anthropological, historical, geological, and biological research and outreach, the Museum hosts the New York Biodiversity Research Institute (BRI). Founded in 1993, the Institute includes a number of collaborators, including the Department of Environmental Conservation, the New York Natural Heritage Program, and the Office of Parks, Recreation and Historic Preservation. Current projects focus on biodiversity stewardship, biodiversity education and biodiversity research to assess environmental quality and change. BRI aims to promote cooperative scientific and educational efforts to increase knowledge and awareness of biodiversity within New York State and to develop a comprehensive and readily accessible database on the status of biodiversity within New York State, among other goals.

Contact: NYS Biodiversity Research Institute, New York State Museum, Cultural Education Center, Room 3140, Albany, New York 12230; phone: (518) 486-4845 or (518) 486-2028; http://www.nysm.nysed.gov.

The Nature Conservancy (TNC)

With the mission of preserving plants, animals and natural communities that represent the diversity of life on Earth, and a special focus on science-based conservation, The Nature Conservancy is simultaneously a leading protector of nature and resource for biodiversity information. The organization founded the Natural Heritage Database in the early 70s, which has served as the primary source for information on plants and animals nationwide since its foundation

(discussed above). In addition, TNC's webpage provides links to a science library, conservancy publications, and conservation science newsletters, among other scientific resources.

Contact: The Nature Conservancy, 4245 North Fairfax Drive, Suite 100, Arlington, VA 22203-1606; phone: (800) 628-6860; http://www.tnc.org.

Partners In Flight

Partners In Flight was launched in 1990, in response to growing concerns about declines in the populations of many land bird species, to emphasize the conservation of birds not covered by existing conservation initiatives. A cooperative effort involving partnerships among government, academia, conservation groups, industry, and private individuals, the central premise has been that the resources of public and private organizations in North and South America must be combined, coordinated, and increased in order to achieve success in conserving bird populations in this hemisphere. While the initial focus was on species that breed in the Nearctic (North America) and winter in the Neotropics (Central and South America), the focus has spread to include most landbirds and other species requiring terrestrial habitats.

For more information: http://www.partnersinflight.org.

Pine Barrens Reference Library

The Central Pine Barrens is a natural region of over 100,000 acres in New York's south-easternmost county, Suffolk County. The Central Pine Barrens Commission maintains a reference library for citizens, students, researchers, government and private sector staff, teachers, historians, and any individual interested in Long Island's Central Pine Barrens. Promotion of research, citizen involvement, and access to information are goals of the Library.

Contact: Pine Barrens Reference Library, 3525 Sunrise Highway, 2nd Floor, Great River, NY 11739; phone: 516-563-0385; http://pb.state.ny.us/ref_lib.htm.

Regionally Significant Habitats and Habitat Complexes of the New York Bight Watershed
By the U.S. Fish and Wildlife Service, 1999.

This study is an in-depth resource that identifies and describes essential habitats of key marine, coastal, and terrestrial species inhabiting the New York Bight watershed. The project aims to help guide informed and ecologically sound land use decisions and land protection efforts.

Contact: U.S. Fish and Wildlife Service, Southern New England, New York Bight Coastal Ecosystems Program, P.O. Box 307, Charlestown, RI. 02813; phone: (401) 364-9124.

U.S. Census Bureau

The Census Bureau, although it does not produce maps that focus on physical geography, has a wealth of information on human population distribution throughout the United States. The census bureau creates digital cartographic data files that include hydrography data (TIGER/Line '98). For more information, visit the TIGER (Topologically Integrated Geographic Encoding and Referencing) web site at http://www.census.gov/geo/www/tiger.

Contact: U.S. Census Bureau; phone: (301) 457-4100; e-mail: comments@census.gov; http://www.census.gov.

U.S. Geological Survey (USGS)

The United States Geological Survey (USGS) is a governmental organization under the jurisdiction of the Department of the Interior. By collecting and interpreting scientific data, USGS strives to provide a better understanding of earth systems. This information is used to increase the efficiency of natural resource management, as well as minimize damage from natural disasters. USGS provides detailed mapping services, including maps featuring climate, elevation, digital line graphs, geology, hydrology, land cover, aerial photography and satellite images (see http://edc.usgs.gov/webglis/). Global Information Systems (GIS) maps are available for purchase from state run distribution centers, USGS Earth Science Information regional offices, or by calling a national toll-free number. Maps can also be downloaded for free at http://www.nwi.fws.gov.

Contact: The New York State Distribution Center, Cornell –IRIS, 302 Rice Hall, Ithaca, NY, 14853-5601; phone: (607) 255-4868; http://www.usgs.gov.

Wildlife Conservation Society

Founded in 1895, the Wildlife Conservation Society has focused on wildlife and habitat conservation for over a century. The Society manages over 300 field conservation projects in over 50 countries, and has a number of wildlife parks in the U.S., including the Bronx Zoo, the New York Aquarium, and the Wildlife Centers at Central Park, Queens and Prospect Park. The Society provides information to the public about wildlife and its habitat and ways to protect it, and is noted for having developed environmental curricula adopted both nationally and abroad. Metropolitan Conservation Alliance (MCA) is a WCS program working to provide biological information that integrates science into planning practices at selected sites in the New York metropolitan region.

Contact: Wildlife Conservation Society's Metropolitan Conservation Alliance, 68 Purchase Street, Rye, New York 10580; phone: (914) 925-9175; http:// www.wcs.org.

Woodrow Wilson National Fellowship Foundation (WWNFF)

The Woodrow Wilson National Fellowship Foundation is an independent, nonprofit organization that attempts to maximize human potential through education. One of the Foundation's areas of concern is promoting teachers as intellectual leaders. They offer a broad range of classes and programs designed to empower teachers with various tools, including conservation tools. In the summer of 1999, the Institute provided *1999 Summer Biology Institute*, an educational program designed to promote an understanding and appreciation of biodiversity.

Contact: Woodrow Wilson National Fellowship Foundation, CN 5281, Princeton NJ 08543-5281; phone: (609) 452-7007; fax: (609) 452-0066; http://webmaster@woodrow.org.

APPENDIX E
LAWS AND POLICIES MENTIONED BY NEW YORK DECISION MAKERS

Federal and state laws and policies mentioned by respondents as affecting biodiversity information use are summarized below (in order of mention). In some instances, an interviewee may have mentioned more than one law or policy, while some did not reference any. A few additional resources that were not mentioned by interviewees (marked by asterisks *) are included due to their importance. This list, however, does not include all available laws affecting biodiversity in New York State.

FEDERAL LAWS & POLICIES

Endangered Species Act (ESA)
16 U.S.C. §§ 1531-1544
(Mentioned 10 times)

The primary purpose of the ESA is "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved," and "to provide a program for the conservation of such endangered species and threatened species."[1] Species are listed as either threatened or endangered if there is "habitat destruction, over utilization, disease or predation, the inadequacy of existing regulatory mechanisms, or other factors."[2] One way the ESA protects these species is by making it "unlawful to import, export, take, or trade any endangered species of fish or wildlife."[3] The term "take" is broadly defined to include "harassing, harming, hunting, killing, capturing, and collecting."[4] Another way in which species are protected is by designating and listing critical habitat, which is "the ecosystems upon which endangered species and threatened species depend."[5] According to the ESA, destroying the critical habitat is legally equivalent to destroying the species itself. However, the ESA provides no systematic ecosystem-level protection and the term "critical habitat" refers only to localized, short-term survival requirements.[6]

The statute governs all federal departments and agencies and requires them to consult with the Secretary of the Interior to ensure that actions "authorized, funded, or carried out by the agency" are "not likely to jeopardize the continued existence of any endangered or threatened species, or adversely modify a critical habitat."[7] The ESA also directs all federal departments and agencies to "cooperate to the maximum extent practicable with states."[8]

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[1] 16 U.S.C. § 1531(b); ESA § 2(b).
[2] Envtl. L. Inst., Environmental Statutes Outline 89 (2d ed. 2000); See also 16 U.S.C. § 1533(a)(1); ESA § 4(a)(1).
[3] Envtl. L. Inst., Environmental Statutes Outline 90 (2d ed. 2000); See also 16 U.S.C. § 1538(a); ESA § 9(a).
[4] Envtl. L. Inst., Environmental Statutes Outline 90 (2d ed. 2000); See also 16 U.S.C. § 1538(a); ESA § 9(a).
[5] Gary K. Meffe and C. Ronald Carroll, Principles of Conservation Biology 67 (1994).
[6] Id. at 68.
[7] Envtl. L. Inst., Environmental Statutes Outline 90 (2d ed. 2000); See also 16 U.S.C. § 1536(a)(2); ESA § 7(a)(2).
[8] Envtl. L. Inst., Environmental Statutes Outline 89 (2d ed. 2000).

National Environmental Policy Act (NEPA)
42 U.S.C. §§ 4321-4370(d)
(Mentioned 4 times)

NEPA creates a national environmental policy for the federal government.[9] This broadly worded statute "encompasses all environmental values,"[10] including a directive to "preserve … natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity."[11] In achieving its goals, NEPA prescribes "two basic and related objectives: Preventing environmental damage and ensuring that agency decision makers take environmental factors into account."[12] One way this is accomplished is through requiring the federal government to prepare an environmental impact statement for "all major federal actions significantly affecting the quality of the human environment," including issuance of federal permits for private activities or federal funding.[13]

Clean Water Act (CWA) (Federal Water Pollution Control Act)
33 U.S.C. §§ 1251-1387 (especially §§ 1341, 1342 & 1344)
(Mentioned 4 times)

The purpose of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[14] In developing comprehensive programs for water pollution control, priority is given to "the improvements which are necessary to conserve such waters for the protection and propagation of fish and aquatic life and wildlife, recreational purposes, and the withdrawal of such waters for public water supply, agricultural, industrial, and other purposes."[15]

Section 401 provides that federal license or permit applicants must obtain *state certification* that any authorized discharge into navigable waters "will comply with the applicable effluent limitations, water quality standards, new source performance standards, and toxic and pretreatment requirements."[16] This provides an opportunity to assure that the health of the aquatic system is protected. Section 402 of the act further authorizes states to issue discharge permits (SPDES permits) to point source dischargers of pollutants.[17] This requires assurance that in-stream water quality standards will be met. Section 404 protects wetlands and water dependent species by having the Army Corps of Engineers control the issuance of permits for "the discharge of dredged or fill material into navigable waters at specified sites."[18]

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[9] 42 U.S.C. § 4321; NEPA § 2.
[10] Nicholas C. Yost, NEPA Deskbook 5 (Envtl. L. Rep. 2d ed. 1995).
[11] 42 U.S.C. § 4331(b)(4); NEPA § 101(b)(4).
[12] Yost, supra note 8, at 5.
[13] Envtl. L. Inst., Environmental Statutes Outline 11 (2d ed. 2000) (citing 42 U.S.C. § 4332(2)(C) and NEPA § 102(2)(C)).
[14] 33 U.S.C. § 1251(a); FWPCA § 101(a).
[15] 33 U.S.C. § 1252(a); FWPCA § 102(a).
[16] Envtl. L. Inst., Environmental Statutes Outline 78 (2d ed. 2000); See also 33 U.S.C. § 1341; FWPCA § 401.
[17] 33 U.S.C. § 1342; FWPCA § 402.
[18] Envtl. L. Inst., Environmental Statutes Outline 78 (2d ed. 2000); See also 33 U.S.C. § 1344; FWPCA § 404.

Coastal Zone Management Act (CZMA)
16 U.S.C. §§ 1451-1465
(Mentioned 3 times)

The general purpose of the CZMA is "to preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations."[19] The act achieves its goals by assisting the states in developing and implementing coastal management programs (CMPs), which, for example, study the state's coastal habitats, manage coastal development, and protect natural resources such as "wetlands, … coral reefs, and fish and wildlife and their habitat."[20] Any federal agency activity that affects a coastal zone must conform with the approved state CMP "to the maximum extent practicable."[21]

Federal Superfund Law (Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA))
42 U.S.C. §§ 9601-9675
(Mentioned 1 time)

CERCLA authorizes the President to "protect the public health or welfare or the environment" whenever any hazardous substance, pollutant, or contaminant is released or threatens to be released which "may present an imminent and substantial danger to the public health or welfare."[22] This includes holding a person liable for "injury to, destruction of, or loss of natural resources."[23] CERCLA results in natural resource damage assessments and programs to remedy destruction and impairment of such resources.

Magnuson-Stevens Fishery Conservation and Management Act
16 U.S.C. § 1801 *et seq.*
(Mentioned 1 time)

This act was passed to provide for the conservation and management of fisheries. It aims, in part, to promote conservation and management within U.S. coastal fishery resources, domestic commercial and recreational fishing, and highly migratory species.[24] It also promotes "the protection of essential fish habitat in the review of projects conducted under Federal permits, licenses, or other authorities."[25]

[19] 16 U.S.C. § 1452(1); CZMA § 303(1).
[20] 16 U.S.C. § 1452(2); CZMA § 303(2).
[21] Envtl. L. Inst., Environmental Statutes Outline 31 (2d ed. 2000); See also 16 U.S.C. § 1456(c)(1); CZMA § 307(c)(1).
[22] 42 U.S.C. § 9604(a)(1); CERCLA § 104(a)(1).
[23] 42 U.S.C. § 9607(a)(C), 9607(f); CERCLA § 107(a)(C), 107(f).
[24] 16 U.S.C. § 1801(b).
[25] Id. § 1801(b)(7).

Migratory Bird Treaty Act
16 U.S.C. §§ 703-712
(Mentioned 1 time)

The Protection of Migratory Game and Insectivorous Birds Migratory Bird Treaty Act prohibits the taking, killing, or possessing of certain migratory birds or their nests or eggs, except as provided for by the act.[26] The type of migratory birds encompassed by the act is determined by the respective conventions between the United States and Great Britain, Mexico, Japan, and the former Soviet Union.[27] Enforcement of the act is through criminal penalties, including the possibility of being convicted of a felony.[28]

National Forest Management Act (NFMA)

16 U.S.C. §§ 1600-1687
(Mentioned 1 time)

The NFMA directs the federal government to better manage renewable resources, such as timber products. Accordingly, the Secretary of Agriculture is to prepare and maintain a Renewable Resource Assessment and Renewable Resource Program.[29] The NFMA also establishes procedures for the sale of national forest timber.[30] One reason cited for protecting trees and forests is their importance in providing wildlife habitat.[31]

National Historic Preservation Act (NHPA)

16 U.S.C. §§ 470 *et seq.*
(Mentioned 1 time)

The NHPA directs the federal government to assist and promote historic preservation programs, including the protection of archeological sites and historical sites (which when successfully preserved can also protect the natural resources surrounding the sites).[32]

Rivers and Harbors Appropriation Act of 1899

§§ 10, 13, 33 U.S.C. §§ 403, 407
(Mentioned 1 time)

Section 10 of the act prohibits the modification or obstruction of any navigable water without authorization from the Corps of Engineers.[33] This includes excavating, filling, or altering of the condition of any of these waters.[34] Section 13 of the act prohibits discharges or deposits of

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[26] 16 U.S.C. § 703.
[27] Id.
[28] Id. § 707.
[29] Envtl. L. Inst., Environmental Statutes Outline 56 (2d ed. 2000); See also 16 U.S.C. §§ 1601(a), 1602; NFMA §§ 3(a), 4.
[30] 16 U.S.C. § 1611; NFMA § 13.
[31] 16 U.S.C. § 1671; RREA § 2.
[32] 16 U.S.C. § 470.
[33] RHA § 10, reprinted in Wetlands Deskbook 185 (Envtl. L. Rep. 2d ed. 1997).
[34] Id.

refuse into any navigable waters or any water or bank from which it may be washed into a navigable water.[35]

Executive Order No. 11988 on Floodplain Management
3 C.F.R. 117 (1978), as amended by Executive Order No. 12148, 3 C.F.R. 412 (1980)
(Mentioned 1 time)

Executive Order No. 11988 directs all federal agencies "to avoid … adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative."[36] Part of the purpose of the order is "to reduce the risk of flood loss, … and to restore and preserve the natural and beneficial values served by floodplains."[37]

Executive Order No. 13112 on Invasive Species
Feb. 3, 1999, 64 Fed. Reg. 6183
(Mentioned 1 time)

Executive Order Number 13112 on Invasive Species has two primary purposes: "to prevent the introduction of invasive species;" and to "provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause."[38] The order regulates all federal agencies "whose actions may affect the status of invasive species" and directs them to "not authorize, fund, or carry out actions" that may contravene the purposes of the order.[39] The executive order also creates a National Invasive Species Council to support federal planning, identify international policy options, and prepare a National Invasive Species Management Plan.

Land Conservation, Preservation, and Infrastructure Improvement Program
Conservation and Reinvestment Act (CARA)
(S. 25 & H.R. 701)
(Mentioned 1 time)

The Conservation and Reinvestment Act (CARA) of the 106th congress intended "[t]o provide Outer Continental Shelf Impact Assistance to State and local governments, … to establish a fund to meet the outdoor conservation and recreation needs of the American people, and for other purposes."[40] However, the initial bill, which would have provided $44 billion over 15 years for state and local conservation programs, became a highly contentious issue in the senate and failed to pass as originally proposed.

A final version of the bill, written into an $18.8 billion spending bill for the Department of Interior, establishes a six-year fund totaling $12 billion for state and federal land acquisition. The new Lands Legacy Initiative/Land Conservation, Preservation, and Infrastructure Improvement Program serves as a compromise between the President's Lands Legacy Proposal and the CARA legislation. The 2001 program includes a new category of funding that provides $1.6 billion for a

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[35] Id. § 13.
[36] Exec. Order No. 11988, reprinted in Wetlands Deskbook 315 (Envtl. L. Rep. 2d ed. 1997).
[37] Id. § 1.
[38] 64 Fed. Reg. 6183.
[39] 64 Fed. Reg. 6183 § 2(a).
[40] H.R. 701, 106th Cong. (2000).

variety of state and federal land conservation programs. Specifically, $1.2 billion is directed to the Interior and Forest Service programs, including additional funding for Federal and State Land and Water Conservation Fund (LWCF) funding, State and other conservation programs, and urban and historic preservation. The remaining $400 million is for coastal programs in NOAA that will be funded under the Commerce, Justice, State Appropriations bill.[41]

National Invasive Species Act of 1996 (NISPA)
(Pub.L. 104-332, Oct. 26, 1996, 110 Stat. 4073)
Up for reauthorization in 2001
(Mentioned 1 time)

The National Invasive Species Act of 1996 (NISPA) reauthorized the original Non-indigenous Aquatic Nuisance Prevention of Control Act of 1990 (NANPCA) that aimed to prevent the introduction and spread of aquatic nuisance species into the Great Lakes area. The original Act established the Aquatic Nuisance Task Force to address these issues and directed the coast guard to address the issue of ballast water as a means for exotic species introduction. The reauthorized act of 1996 further addressed the issues raised by NANPCA, requiring a ballast water management program to demonstrate technologies and practices to further prevent nonindigenous species from being introduced into the Great Lakes ecosystem. The Act is up for reauthorization this year (2001), and faces more advanced specifications. The reauthorized bill may include direction for "No Ballast on Board" which would more securely limit the transfer of ballast material between ports.

Fish and Wildlife Coordination Act*
16 U.S.C. § 661-666c:

The Fish and Wildlife Coordination Act seeks to promote "wildlife conservation and rehabilitation," and to coordinate such efforts with "other features of water-resource development programs."[42] In achieving the "equal consideration" and coordination of wildlife conservation with other programs, the Act authorizes the Secretary of the Interior to assist federal, state, public, and private agencies or organizations in developing and protecting "all species of wildlife, … and their habitat."[43]

STATE LAWS & POLICIES

State Environmental Quality Review Act (SEQR)
N.Y. Envtl. Conserv. Law § 8
(Mentioned 1 time)

SEQR expands upon the federal National Environmental Policy Act by broadening the impact statement preparation process and imposing "more explicit environmental responsibilities on [state] agencies that approve actions which are subject to the preparation of an impact statement."[44]

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[41] Department of the Interior. 2001 (January). "Summary: Conference Action on the Fiscal Year 2001 Interior and Related Agencies Appropriations Bill." < http://www.doi.gov/budget/2001/01conf/cnfmain.html> (19 Jan. 2001).
[42] 16 U.S.C. § 661.
[43] Id.
[44] Daniel R. Mandelker, NEPA Law and Litigation § 12.02[3] (2d ed. 1999).

SEQR requires all state agencies to prepare an environmental impact statement for "any action they propose or approve which may have a significant effect on the environment."[45] The purpose of the act is to "encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and enhance human and community resources; and to enrich the understanding of the ecological systems, natural, human and community resources important to the people of the state."[46]

State Freshwater Wetlands Act
N.Y. Envtl. Conserv. Law § 24 *et seq.*
(Mentioned 10 times)

The Freshwater Wetlands Act sets forth a policy to "preserve, protect and conserve freshwater wetlands and the benefits derived therefrom."[47] Freshwater wetlands encompass all lands enclosed by or supporting certain "aquatic or semi-aquatic vegetation," and the water "overlying the areas."[48] The act directs that any land qualifying as a freshwater wetland and being 12.4 acres or larger in size is to be inventoried and mapped.[49] Any person desiring to conduct certain regulated activities, such as draining, dredging, or excavation, on a freshwater wetland must obtain a permit as provided for in Title 7 of Article 24 of the New York Environmental Conservation Law.[50]

State Endangered Species Law
N.Y. Envtl. Conserv. Law § 11-0535
(Mentioned 5 times)

New York's Endangered Species Law is broader, protecting more species, than the federal Endangered Species Act. The law calls for the protection of "wild animals, plants and significant habitats."[51] Species are listed on the basis of scientific criteria, although the general practice is to ask citizens for comment before species are listed. The law does not require recovery plans, critical habitat designation or agency consultation.[52] Violators of the law can face fines of up to $1,000 and up to 15 days in jail.[53] Recently, the New York Supreme Court Appellate Division issued an important decision rejecting a takings challenge by Sour Mountain Reality, Inc., which held that the modification of a protected species' habitat may constitute a taking under the State ESA. The case (State of New York v. Sour Mountain Realty, Inc.) arose from a state order requiring a land owner to remove a snake-proof fence constructed to keep endangered timber rattlesnakes off the landowner's property (No. 1999-03232, N.Y. App. Div. Oct. 2, 2000).

[45] N.Y. Envtl. Conserv. Law § 8-0109(2).
[46] Id. § 8-0101.
[47] Id. § 24-0103.
[48] Id. § 24-0107(1).
[49] Id. § 24-0301.
[50] Id. §§ 24-0701, 24-0703.
[51] Defenders of Wildlife, Saving Biodiversity: A Status Report on State Laws, Policies and Programs 150 (1996).
[52] Id.
[53] Id.

Water Resources Law
N.Y. Envtl. Conserv. Law § 15 *et seq.* (Stream Protection)
(Mentioned 4 times)

The Water Resources Law declares that it is the duty of the state "to conserve and control its water resources for the benefit of all inhabitants of the state," including setting water quality standards for the purpose of "the propagation and protection of fish and wildlife, including birds, mammals and other terrestrial and aquatic life."[54] The definition of "waters" is broadly construed to include all "bodies of surface or underground water, natural or artificial, inland or coastal, fresh or salt, public or private."[55] In protecting the waters of New York, permit provisions exist for the protection of streams, water bodies, and navigable waters.[56] The Department of Environmental Conservation is to review all permit applications for its "probable effect on the health, safety and welfare of the people of the state, and the effect on the natural resources of the state."[57]

Living Environment Core Curriculum
(available at <http://www.emsc.nysed.gov/ciai/mst/sci.html>)
(Mentioned 4 times)

The Living Environment Core Curriculum is a component of the New York State Learning Standards for Mathematics, Science, and Technology. The New York State Education Department developed the Living Environment Core Curriculum to assists teachers and supervisors in the preparation of K-12 curriculum, instruction, and assessment designed "to prepare students to explain … the most important ideas about our living environment."[58] There are separate core curriculum for the elementary, intermediate, and high school levels. Included as important living environment concepts in the high school version of the core curriculum is explaining "how diversity of population within ecosystems relates to the stability of ecosystems,"[59] and "the importance of preserving diversity of species and habitats."[60]

Tidal Wetlands Act
N.Y. Envtl. Conserv. Law § 25 *et seq.* (Marine Wetlands)
(Mentioned 3 times)

The Tidal Wetlands Act is "to preserve and protect tidal wetlands, and to prevent their despoliation and destruction."[61] After an inventory of tidal wetlands is completed, the act directs land-use regulations to be adopted for these lands that will further the goals of the act and protect "the present and potential value of the particular wetland for marine food production, as a wildlife habitat, as an element of flood and storm control, and as a source of recreation, education and

[54] N.Y. Envtl. Conserv. Law § 15-0105.
[55] Id. § 15-0107(4).
[56] Id. §§ 15-0501, 15-0503, 15-0505.
[57] Id. § 15-0503; See also id. §§ 15-0501, 15-0505.
[58] Univ. of State of New York & State Educ. Dep't, The Living Environment Core Curriculum 3 (available at <http://www.emsc.nysed.gov/ciai/mst/sci.html>).
[59] Id. at 9.
[60] Id. at 18.
[61] Id. § 25-0102.

research."[62] Any person wishing to conduct a regulated activity on any inventoried tidal wetland must obtain a permit from the Commissioner.[63]

State Bird Conservation Area Program
N.Y. Envtl. Conserv. Law § 11-2001 *et seq.*
(Mentioned 3 times)

The Bird Conservation Area Program was created to "safeguard and enhance populations of wild birds native to New York state and the habitats therein that birds are dependent upon for breeding, migration, shelter, and sustenance."[64] To meet these goals, any site is eligible to be designated as an "important bird area" if it meets one of the listed criteria, such as a "waterfowl concentration site" or a "migratory concentration site."[65]

Adirondack Park Agency Act
N.Y. Exec. Law § 800 *et seq.*
(Mentioned 3 times)

The Adirondack Park Agency Act governs all actions and decisions of the Adirondack Park Agency. Consistent with constitutional safeguards for "wild forest lands,"[66] the act is "to insure optimum overall conservation, protection, preservation, development and use of the unique scenic, aesthetic, wildlife, recreational, open space, historic, ecological and natural resources of the Adirondack Park."[67] To meet these purposes, the act adopts an Adirondack Park Land Use and Development Plan and provides for its implementation.[68]

Biological Diversity – Identification, Research and Conservation Act
N.Y. CLS Educ. § 235-a, 235-b[69]
(Mentioned 2 times)

This bill, enacted into law in 1993, created the Biodiversity Research Institute within the New York State Museum. The institute acts as a clearinghouse for biodiversity information, sponsoring and pursuing "inventories and scientific studies of the state's biological resources."[70] The bill also establishes the New York Natural Heritage Program and provides for better biodiversity identification and management of state-owned lands.[71]

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[62] Id. § 25-0302.
[63] Id. §§ 25-0401, 25-0402.
[64] Id. § 11-2001(1).
[65] Id. § 11-2001(3).
[66] N.Y. Const. art. XIV, § 1.
[67] N.Y. Exec. Law § 801.
[68] Id. § 805.
[69] 1993 Sess. Law News of N.Y. Ch. 554 (S. 5072-B) (McKinney's) (codified at N.Y. CLS Educ. Law § 235-a, 235-b; N.Y. Envtl. Conserv. Law §§ 3-0302, 9-0105, 11-0305, 11-0539, 45-0101, 45-0105, 45-0117; N.Y. Parks Rec. and Hist. Preserv. Law §§ 3.09, 20.01, 20.02; and N.Y. State Fin. § 97-00).
[70] 1993 Sess. Law News of N.Y. Ch. 554 (S. 5072-B) (McKinney's); See also N.Y. Educ. Law § 235-b.
[71] 1993 Sess. Law News of N.Y. Ch. 554 (S. 5072-B) (McKinney's).

New York State Open Space Conservation Plan
(Mentioned 2 times)

The Open Space Conservation Plan authorizes the state to acquire lands in order to conserve a diversity of open space resources. Governor Pataki approved the most recent version of the plan in 1998, which includes a listing of 131 priority projects.[72] The goals of the plan include "protecting water quality … to support fish and plant life," and "protecting habitat for the diversity of plants and animals needed to sustain the state's ecosystems."[73] Under this plan, a priority rating system for land acquisition considers biodiversity as a factor. However, this policy falls short by not requiring the state to consider environmental quality or value when making decisions regarding the exchange or selling of state lands and does not provide funding to manage lands after they are acquired.[74]

Hudson River Estuary Management Act
N.Y. Environmental Conservation Law § 11-0306
(Mentioned 1 time)

The act establishes a Hudson River estuarine district and management program with the goal of "preservation, protection, restoration and enhancement of the Hudson River estuarine district and associated shorelands including but not limited to its natural resources, its fish and wildlife and the habitats within it."[75] The act also creates a Hudson River estuarine sanctuary to protect "areas of special ecological significance" within the district.[76] The sanctuary is to be used as a research and education laboratory to study the Hudson River ecosystem.[77]

State Conservation (Protection of Natural and Man-made Beauty)
N.Y. Envtl. Conserv. Law § 49
(Mentioned 1 time)

Article 49 of the Environmental Conservation Law calls for the development and promotion of "policies and programs to preserve and enhance the natural and man-made beauty of the state."[78] Under this law the Department of Environmental Conservation is to conduct studies, surveys, and inventories of natural resources and serve as a clearinghouse for such information.[79] Article 49 also provides for state land acquisition and conservation easements. Conservation easements are to be established in order to implement a broad state policy, which includes "conserving, preserving and protecting its environmental assets and natural and man-made resources, the preservation of open spaces, the preservation, development and improvement of agricultural and forest lands, [and] the

[72] Peter S. Duncan, New York State's Open Space Conservation Program, 4 Alb. L. Envtl. Outlook 18 (1999).
[73] Id. at 18-19 (1999).
[74] Defenders of Wildlife, Saving Biodiversity: A Status Report on State Laws, Policies and Programs 150 (1996).
[75] N.Y. Envtl. Conserv. Law § 11-0306.
[76] Id. § 11-0306(5).
[77] Id.
[78] Id. § 49-0103(1).
[79] Id. § 49-0103(3), (6).

preservation of areas which are significant because of their scenic or natural beauty or wetland, shoreline, geological or ecological character."[80]

State Environmental Protection Act
N.Y. Envtl. Conserv. Law § 54
(Mentioned 1 time)

The act is a declaration of the state's commitment to the environment. It affirms that one of the "government's most fundamental obligations" is "the preservation, enhancement, restoration, improvement and stewardship of the state's environment."[81] To fulfill this obligation the act authorizes state assistance to be given to state agencies, local governmental bodies, and public entities to perform various waste management and conservation efforts.[82]

Clean Water/Clean Air Bond Act of 1996
N.Y. Envtl. Conserv. Law § 56
(Mentioned 1 time)

The Clean Water/Clean Air Bond Act of 1996 provides funds for five environmental programs.[83] The act allocates $355 million for Safe Drinking Water Projects, which primarily finances "drinking water infrastructure projects."[84] The largest portion of monies raised by the act, $510 million, is available for Clean Water Projects, including assistance to municipalities for water quality improvement projects and dam safety projects.[85] The Clean Water Projects also encompass open space land conservation projects that are to "develop, expand or enhance water quality protection or public access to water bodies, including but not limited to coastlines, aquifers, watersheds, lakes, rivers and streams."[86] Another program funded by the act is Environmental Restoration Projects; $200 million of state assistance is to be given to projects meeting a list of criteria, including benefit to the environment and public recreation potential.[87] Lastly, the act allocates $50 million for Solid Waste Projects,[88] and $230 million for Air Quality Projects.[89]

Sole Source Aquifer Protection Act (informally called Special Groundwater Protection Area Law)
N.Y. Envtl. Conserv. Law § 55
(Mentioned 1 time)

The Sole Source Aquifer Protection Act allocates funds "for the preparation and implementation of groundwater watershed protection plans" designed to protect water quality in certain areas and further control nonpoint pollution sources.[90] One purpose in protecting

[80] Id. § 49-0301.
[81] N.Y. CLS Envtl. Conserv. Law prec. § 54-0101.
[82] Id.
[83] N.Y. Envtl. Conserv. Law § 56-0103.
[84] Id. § 56-0201.
[85] Id. § 56-0301.
[86] Id. § 56-0307.
[87] Id. § 56-0501.
[88] Id. § 56-0401.
[89] Id. § 56-0601.
[90] Id. § 55-0101.

groundwater quality is to "maintain natural vegetative and hydrogeologic conditions."[91] The act designated nine areas as the first "special groundwater protection areas," and outlined procedures for adding additional areas.[92]

Long Island Pine Barrens Protection Act
N.Y. Envtl. Conserv. Law § 57
(Mentioned 1 time)

This act establishes a reserve "to protect and manage the Pine Barrens-Peconic Bay system,"[93] in part, because the area "contains one of the greatest concentrations and diversities of endangered, threatened and special concern species of plants and animals to be found in the state."[94] In addition to the reserve, the act calls for the creation of a comprehensive management plan "to preserve, protect and enhance the natural, recreational, economic and educational values of the region."[95] The plan is to be designed by a council consisting of governmental and private participants, and implemented by a commission comprised of state and local government officials.[96]

Long Island South Shore Estuary Reserve Act
N.Y. Exec. Law § 960
(Mentioned 1 time)

The Long Island South Shore Estuary Reserve Act creates a "single integrated estuary" to "protect and manage the South Shore Estuary System."[97] The reserve is governed by a council of governmental and private individuals, who are to "prepare a comprehensive management plan and make recommendations to preserve, protect and enhance … the reserve."[98] A primary reason for protecting the reserve is its importance in sustaining "biological productivity" because the system **"**contains and supports many unique marine habitats and locally significant populations and a diversity of rare, threatened and endangered species of plants and animals."[99]

Concentrated Animal Feeding Operations (CAFOs)
(Mentioned 1 time)

The Department of Environmental Conservation (DEC) is developing a SPDES (State pollutant discharge elimination system) permit that will cover CAFOs.[100] Previously, CAFOs were not covered under SPDES permits because they were not allowed to discharge.[101] The new permit

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[91] Id. § 55-0103.
[92] Id. § 55-0113.
[93] Id. § 57-0103.
[94] Id. § 57-0105.
[95] Id. § 57-0103.
[96] Id.; See also id. § 54-1301.
[97] Id. § 961.
[98] Id.
[99] Id. § 961-a.
[100] Envtl. L. Inst., Research Report, Locating Livestock: How Water Pollution Control Efforts Can Use Information From State Regulatory Programs 141 (1999).
[101] Id.

will require farms to develop an Agricultural Waste Management Plan and abide by established Best Management Practices.[102]

Agricultural Protections Programs:

Agricultural Districts
N.Y. Agric. & Mkts. Law § 300 *et seq.* (Article 25-AA)
(Mentioned 1 time)

The Agricultural Districts Program directs the state to promote local initiatives in agricultural protection policy. In addition to preserving land for food production, the act aims "to conserve and protect agricultural lands as valued natural and ecological resources which provide needed open spaces for clean air sheds."[103]

Agricultural and Farmland Protection Programs
N.Y. Agric. & Mkts. Law § 321 *et seq.* (Article 25-AAA)
(Mentioned 1 time)

This act was passed to expand upon the Agricultural Districts Program. The program seeks to increase state assistance for the promotion of local initiatives for agricultural and farmland protection.[104]

Fish and Wildlife Law*
N.Y. Envtl. Conserv. Law § 11

The Fish and Wildlife Law establishes regulations for the hunting, fishing, and trapping of fish and wildlife in New York. Except as permitted by the law, it is illegal to "pursue, take, wound or kill in any manner, number or quantity, any fish protected by law, game, protected wildlife, shellfish, harbor seals, crustacea protected by law, or protected insects."[105] The law also directs the Department of Environmental Conservation to efficiently manage the fish and wildlife resources of the state, including taking into consideration ecological factors, such as "the need for restoration and improvement of natural habitat and the importance of ecological balance in maintaining natural resources."[106]

Parks, Recreation, and Historic Preservation Law*
N.Y. Parks Rec.& Hist. Preserv. Law § 3.01 *et seq.*

The Parks, Recreation, and Historic Preservation Law mandates that the Office of Parks, Recreation and Historic Preservation "shall operate and maintain the state park, recreation, and historic site system to conserve, protect, and enhance the natural, ecological, historic, cultural and recreational resources contained therein and to provide for the public enjoyment of and access to

[102] Id.
[103] N.Y. Agric. & Mkts. Law § 300.
[104] Id. § 321.
[105] N.Y. Envtl. Conserv. Law § 11-0107.
[106] Id. § 11-0303.

these resources in a manner which will protect them for future generations."[107] The Office is also required to "identify, protect, manage, and conserve important ecological and natural areas, including plants, animals, and ecological communities that are rare in New York State, located on state parks, parkways, historic sites, recreational facilities, and other lands under [its] jurisdiction."[108]

Review of State-Owned Lands (Ecosystem Management Policy)*
N.Y. Envtl. Conserv. Law § 3-0302

The Department of Environmental Conservation is required to conduct an annual review of state-owned lands "to identify lands and waters that harbor plants, animals, and ecological communities that are rare in New York state."[109]

[107] N.Y. Parks Rec. & Hist. Preserv. Law § 3.02.
[108] Id. § 3.18.
[109] Id. § 3-0302.

APPENDIX F
DATA RESULTS FROM INTERVIEWS

SECTION I. CURRENT USE OF BIODIVERSITY INFORMATION IN NEW YORK STATE

Do Decision Makers Use Biodiversity Information? (percent out of 57 respondents)	
YES (uses information DIRECTY for decision-making):	60%
YES (uses information INDIRECTLY for education or advocacy):	24%
RARELY or NEVER:	15%

Types of Biodiversity Information Being Used

In order of mention; (n) = number of comments

- Species locations and/or inventories (34)
- Habitat locations and/or inventories (16)
- Ecosystem or habitat information (7)
- Species rankings (level of rarity) (6)
- Species life history information (5)
- Community ranking, priority locations, hot spots (5)
- Hydrology, water quality, stream information (5)
- Locations of historical or archeological sites (3)
- Aerial photography (3)
- Landscape measures or data on ecosystem functions and processes (2)
- Satellite imagery data (2)
- Development information on impacts to species and/or habitats (2)
- Land stewardship information (2)
- Topography and elevation information (1)
- Soil types/information (1)
- Trails/roads locations (1)
- Human census data (1)

Biodiversity Information Sources

(n) = number of comments
(italics indicates a book)

- NY Natural Heritage Program (including *Ecological Communities of New York State*) (34)
- State agencies (including Department of Environmental Control and State Library and Office of Technology, and State Historic Preservation Office, in order of mention) (25)

- Employees from within the agency/organization interviewed (20)
- Federal agencies (including U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, U.S. Geological Survey, U.S. Forest Service, U.S. Army Corps of Engineers, and Census Bureau, in order of mention) (17)
- *The Breeding Bird Atlas* (9)
- Cornell University (including Lab of Ornithology and Environmental Inquiry Program) (9)
- "Local experts" (8)
- New York State Museum (7)
- Universities (including state (SUNY) schools) (6)
- National wetland inventory maps (6)
- Private consultants (6)
- *The Herpetological Atlas* (5)
- The Nature Conservancy (4)
- Scientific literature searches (4)
- Environmental non-governmental organizations (including The Adirondack Council) (4)
- National Audubon Society (including Important Bird Areas and Christmas Bird Counts) (4)
- Gap Analysis Program (3)
- Wildlife Conservation Society (including Metropolitan Conservation Alliance) (3)
- Private landowners (including forest product companies) (3)
- World Wildlife Fund (3)
- Environmental Impact Statements (2)
- Hudsonia (2)
- Pine Barrens Commission (1)
- Bird Source Program (1)
- Sea Grant Program (1)
- International Joint Commission documents (1)
- Local libraries (1)
- New Jersey Landscape Project (1)
- National Homebuilders Association, Endangered Species Subdivision (1)

How Biodiversity Information Is Used

In order of mention; (n) = number of comments

- To evaluate development plans (EISs, EASs) and to evaluate human-induced impacts for planning and recreational purposes (20)
- To manage and restore habitats and species (15)
- To prioritize land acquisition and/or protection (13)
- For education purposes (9)
- For land use and ecoregional planning (8)
- For research purposes (3)
- To protect human land rights (e.g., for Native Americans) (1)

SECTION II. LAWS AND POLICIES

Refer to Appendix E for the list of laws and policies mentioned by respondents, as well as the number of comments.

SECTION III. IMPEDIMENTS TO INCORPORATING BIODIVERSITY INFORMATION

Is Current Biodiversity Information Adequate?
(percent out of 57 respondents)

Satisfied: Information is entirely adequate (12%)
Partially Satisfied: Information is partially adequate but would like more or different (53%)
Unsatisfied: Information entirely inadequate (32%)
Biodiversity information not applicable (4%)

External Impediments

Gaps in Biological Content

(25 individuals or 43% of respondents provided 42 comments on "Gaps in Biological Content")
(n) = number of comments

- Lack of information on habitats (rare/critical and common types) (10)
- Too much focus on threatened and endangered species in lieu of common species (6)
- Lack of information on landscape and ecological processes (5)
- Lack of information on invertebrates (4)
- Lack of population biology information (viability, life history traits) (3)
- Lack of information on aquatic species and systems (3)
- Over-emphasis on game species by state agencies (2)
- Lack of socio-economic information (2)
- Other (7)

Gaps in Geographic Coverage

(12 individuals or 21% of respondents provided 14 comments on "Geographic Gaps")
(n) = number of comments

- Bias toward rare species and communities (5)
- Lack of information on private lands and rural areas (4)
- Emphasis on areas near development and academic institutions (2)
- Other geographic factors (e.g., related to specific areas) (3)

Inadequacies in Data Aspects

(20 individuals or 35% of respondents provided 33 comments on "Inadequacies in Data Aspects")
(n) = number of comments

- Inappropriate scale (especially, lack of site specific information) (9)

- Lack of up to date information (8)
- Inaccurate data (7)
- Conflicting sources and data tainted by research biases (4)
- Lack of trend/time series data (3)
- Inadequate resolution (e.g., lack if accurate delineations of species/community locations) (1)
- Lack of a consistent definition of biodiversity (1)

Inadequacies in Data Applications

(20 individuals or 35% of respondents provided 27 comments on "Data Applications")
(n) = number of comments

- Lack of guidance for management and policy decisions (9)
- Lack of quantifiable data on human use/impacts and development on biodiversity (7)
- Lack of educational tools (for schools, decision-makers, politicians, and general public) (6)
- Lack of ranking of communities and species and hot spot information (5)

Limitations of Data Accessibility

(42 individuals or 73% of respondents provided 47 comments on "Data Accessibility")
(n) = number of comments

<u>Availability of Data</u>

- Not well publicized (lack of awareness on how/where to find data) (10)
- Inadequately shared with the public (10)
- Lack of central database (8)
- Not available in timely manner (7)

<u>Understandable, Usable, Compatible Format of Data</u>

- Presented at an inappropriate level (too technical or simplistic) (6)
- Not quantifiable (3)
- Technical obstacles (downloading from the Internet) (2)
- Not legally defensible (not well documented and too anecdotal) (1)
- Incompatible (with GIS; Heritage; USGS topo maps) (1)
- Lack of standardized materials and maps (1)

Internal Impediments

(36 individuals or 63% of respondents provided 43 comments on "Internal Roadblocks")
(n) = number of comments

- Lack of capacity (lack of staff, funding, time, expertise, and/or resources) (16)
- Lack of understanding and appreciation of biodiversity by employees or constituents (16)
- Lack of clear biodiversity objective within organization (6)
- Decisions governed by political agendas or economics and not science-driven (5)

Additional Information Requested by Decision Makers

Not cited under a separate section in the report. The following numbers reflect specific requests made by respondents for additional biodiversity information that they felt was currently lacking.
(n) = number to times mentioned by the 57 respondents

- Ranking of natural communities and delineation of biodiversity hotspots/priority areas (16)
- Management and conservation tools (e.g., basic guidance on how to use biodiversity information for land management and planning, such as how to link science with policy decisions (15)
- Site specific information for threatened/endangered species/significant communities (15)
- Information on critical habitats and species (11)
- Information on common habitats and species (11)
- Population biology and species life history information (9)
- Information on urbanization, human use, and impacts of development (9)
- Educational materials for private landowners, town officials, and students (6)
- Information on landscape and ecological processes (5)

SECTION IV. DESIGNING BIODIVERSITY INFORMATION FOR DECISION-MAKERS

Will Decision Makers Use Additional Biodiversity Information?
(percent out of 57 respondents)

Yes:	87%
Not Sure:	9% (depends on scale, source, and reliability of data)
No:	4% (all from Business/Industry)

What Type of Information Do Decision Makers Prefer?

Organization of Biological Data
(percent out of 61 comments)
- Natural communities (44%)
- Physiographic regions (20%)
- Taxa (using keystone/indicator species) (18%)
- Communities, physiographic regions, and taxa (16%)
- Watersheds (2%)

Scale of Biological Data
(percent out of 43 comments)
- Small scale; fine resolution (56%) (on the order of few acres; site specific; county/municipality level; particularly for on the ground management)
  - Natural communities delineated to scale of New York's Natural Heritage classification (2 comments or 10% of small scale comments)
  - Physiographic subregions defined by New York's Natural Heritage classification (4 comments or 20% of small scale comments)
- U.S.Geological Survey scale (1:24,000 ft.) (18.5%)
- Large scale; coarse resolution (to detect regional/statewide trends) (7%)
- Multiple scales (county, region, and state) (18.5%)

Data Presentation
(percent out of 54 comments)

- Graphically (map w/supplemental text) (74%)
- Narrative (2%)
- Both graphically and narrative (24%)

Data Medium
(percent out of 49 comments)

- Hardcopy (book) (as state overview or fact sheets) (33%)
- Electronic (CD-ROM or Internet) (compatible with GIS) (59%)
- Both hardcopy and electronic forms (8%)

Ways to Access Information
(percent out of 60 comments)

- Phone (particularly to verify or interpret data) (8%)
- E-mail (7%)
- Fax (0%)
- Internet (72%)
- Phone, e-mail, fax, and Internet (12%)
- Biodiversity workshops (1%)

<u>Access to Expert Consultation</u>
(for evaluation and interpretation of data and management implications)
(percent out of 57 people) (44%)