DRAFT

# Ecological Communities of New York State

## Second Edition

A revised and expanded
edition of Carol Reschke's
*Ecological Communities*
*of New York State*

*Edited by*

Gregory J. Edinger, Ecologist
D. J. Evans, Associate Ecologist
Shane Gebauer, Associate Ecologist
Timothy G. Howard, Associate Ecologist
David M. Hunt, Associate Ecologist
Adele M. Olivero, Associate Ecologist

**New York Natural Heritage Program**
N.Y.S. Department of Environmental Conservation
625 Broadway, 5th Floor
Albany, NY 12233-4757

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# PREFACE

The first edition of *Ecological Communities of New York State* by Carol Reschke was published in 1990 and quickly became the primary source for community classification in the state. Its success and acceptance by a wide range of users was driven by its lofty goal to be an all-inclusive classification intending to fulfill a long-standing need. From communities as large as Lake Ontario to a room-sized vernal pool, from a 50,000 acre beech-maple mesic forest to a 40-acre maritime beech forest, from the highest alpine meadow to the deepest terrestrial cave, the original, and continued, goal of this classification is to include *all* ecological communities of the state, even those created by humans. Since the first edition, several neighboring states and Canadian provinces have published community classifications including Pennsylvania (Fike 1999), Massachusetts (Swain and Kearsly 2000), Vermont (Thompson and Sorenson 2001), New Hampshire (Sperduto 1997, 2000), Maine (Gawler 2000), and Ontario (Chambers et al. 1997, Harris et al. 1996). During that same time, The Nature Conservancy and the Heritage Network have made significant progress toward the publication of a national community classification over the last decade (Grossman et al. 1998, Sneddon et al. 1998). Most of these classifications have benefitted from *Ecological Communities of New York State*, a few are modeled after it, and nearly all of them refer to Reschke (1990). While all of these classifications are impressive works in their own right, and are referred to in this publication, none are intended to be as all inclusive as this classification is for New York State. Some classifications exclude aquatic communities (e.g., riverine and lacustrine), and some exclude subterranean communities. Others may focus on one system, such as wetlands or forests while excluding other systems. Most of the other classifications exclude fauna from their descriptions. And despite the prevalence of human land use in the northeast, *Ecological Communities of New York State* remains the only classification that includes a comprehensive treatment of cultural communities along with the natural types. This allows users of this classification to describe and map nearly any ecological community encountered in the state.

Although this edition includes over two dozen new communities (see Table 1), and revised descriptions for most of the remainder, it is impressive to see how much of the first edition remains unchanged. This attests to the fact that *Ecological Communities of New York State* was thoroughly researched and ahead of its time. The New York Natural Heritage Program was very fortunate to have a published classification to build upon, and to collect data on individual occurrences. In 1989 there were only 480 community occurrences covering less than 100,000 acres in the NY Natural Heritage database, today there are nearly 1,500 occurrences totaling 1,000,000 acres! In that same time the ecology staff grew from one ecologist (Carol Reschke) to six ecologists. Together with our partners we continue to amass data to further refine our classification and describe new communities. As stated in the first edition, "this classification is our current working hypothesis; it will be refined as new data obtained from field surveys and literature review become available." We have reached a time when the amount of additions and changes to the 1990 classification warranted the publication of this second edition. This edition retains much of the content and format of the original, and although there are a few noticeable changes, we have decided not to do a complete overhaul of the classification. Excellent ideas for improvement, such as the inclusion of photographs, distribution maps, and cross-walks to other classifications will likely be included in future editions.

The next edition of this classification will likely be even more comprehensive and designed to be readily accessible via the Internet. The NY Natural Heritage Program plans to have both editions of *Ecological Communities of New York State* posted on the worldwide web. Check the NYNHP web page for the latest information about the program and our classification (http://www.nynhp.org). In addition, we have plans to produce more informative community "fact pages" on the web, that will likely include digital photographs, statewide distribution maps, vegetation coverage data, cross-walks to other classifications, and more. Please send suggestions for improvement of this classification and ideas on what to include in the future to the NY Natural Heritage Program ecologist. No matter what technological means are used to present the information in the future, the descriptions and the classification will be based on the strong foundations of these earlier editions and the network of dedicated ecologists, botanists, and zoologists.

Lastly, this classification system has proven to be a very valuable tool to a wide array of conservation practitioners and land managers in New York. By using this classification to identify locations of high quality natural communities across the state we have raised awareness of their biodiversity significance. In addition, many of the occurrences identified by the NY Natural Heritage Program, and our partners, have resulted in their protection ensuring that a good portion of New York's natural heritage will persist for future generations to enjoy, study, and appreciate.

Greg Edinger, Ecologist
NY Natural Heritage Program

**Table 1. Summary of new communities and name changes.**

| System | Subsystem | New Name | Old Name (Reschke 1990) | Comments |
|---|---|---|---|---|
| Estuarine | Estuarine intertidal | brackish interdunal swales | coast salt pond (in part) | new community differentiated from maritime freshwater interdunal swales |
| Estuarine | Estuarine cultural | estuarine submerged structure/reef | marine submerged structure/reef (in part) | new community, now recognize estuarine variant |
| Riverine | Natural streams | confined river | midreach and main channel stream (in part) | reflects current trend in river classification |
| Riverine | Natural stream | unconfined river | midreach and main channel stream (in part) | reflects current trend in river classification |
| Riverine | Natural stream | deepwater river | main channel stream | reflects current trend in river classification |
| Riverine | Natural stream | spring | none | springs were split as ne community from various stream communities |
| Riverine | Riverine cultural | riverine submerged structure | none | new community, now recognize riverine variant |
| Lacustrine | Lacustrine cultural | lacustrine submerged structure | none | new community, now recognize lacustrine variant |
| Palustrine | Open mineral soil | maritime freshwater interdunal swales | maritime interdunal swales | name change, added “freshwater” to split from brackish interdunal swales |
| Palustrine | Open peatlands | sliding fen | inland poor fen (in part) | new community, split from inland poor fen |
| Palustrine | Open peatlands | sea level fen | none | new community, freshwater peatland at upper margins of high salt marsh |
| Palustrine | Forested mineral soil wetlands | red maple-black gum swamp | red maple-hardwood swamp (in part) | new community split from red maple-hardwood swamp, black gum co-dominant |
| Palustrine | Forested mineral soil wetlands | red maple-sweetgum swamp | red maple-hardwood swamp (in part) | new community split from red maple-hardwood swamp, sweetgum co-dominant |
| Terrestrial | Open uplands | alvar shrubland | calcareous pavement barrens (in part) | reflects current classification of alvar communities |
| Terrestrial | Open uplands | alvar pavement-grassland | calcareous pavement barrens (in part) | reflects current classification of alvar communities |
| Terrestrial | Open uplands | erosional slope/bluff | cliff community (in part) | new community, now recognize unconsolidated substrate variant of cliff community |
| Terrestrial | Open uplands | successional northern sandplain grassland | successional old field (in part) | new community recognized as grassland bird habitat with sandy substrate and not in maritime setting |
| Terrestrial | Barrens and woodlands | maritime pitch pine dune woodland | none | new community |
| Terrestrial | Barrens and woodlands | alvar woodland | limestone woodland (in part) | reflects current classification of alvar communities |
| Terrestrial | Barrens and woodlands | red pine rocky summit | pitch pine-oak-heath summit (in part) | new community |
| Terrestrial | Forested uplands | maritime post oak forest | maritime oak forest | name change, added “post” oak to name, now more narrowly defined |
| Terrestrial | Forested uplands | maritime beech forest | none | new community |

| | | | | |
|---|---|---|---|---|
| Terrestrial | Forested uplands | maritime holly forest | maritime oak-holly forest (in part) | name change and more narrowly defined, split holly dominated variant in maritime setting, compare to coastal oak-holly forest |
| Terrestrial | Forested uplands | coastal oak-heath forest | pitch pine-oak forest (in part) maritime oak forest (in part) | new community, heath shrubs abundant |
| Terrestrial | Forested uplands | coastal oak-hickory forest | Appalachian oak-hickory forest (in part), maritime oak forest (in part) | new community, hickory co-dominant |
| Terrestrial | Forested uplands | coastal oak-beech forest | beech-maple mesic forest (in part) maritime oak forest (in part) | new community, beech co-dominant, compare to maritime beech forest |
| Terrestrial | Forested uplands | coastal oak-laurel forest | maritime oak forest (in part) | new community mountain laurel abundant |
| Terrestrial | Forested uplands | coastal oak-holly forest | maritime oak-holly forest (in part) | new community, recognize mixed oak-holly variant in non-maritime setting, compare to maritime holly forest |
| Terrestrial | Terrestrial cultural | railroad | unpaved/road path (in part) | new community, now separately defined |

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This classification has been developed in part from data collected by numerous field biologists. Some of these contributors have worked under contract to the Natural Heritage Program, including Caryl DeVries, Brian Fitzgerald, Jerry Jenkins, Al Schotz, Edith Schrot, Paul Sherwood, Nancy Slack, Dan Smith, Gordon Tucker, and F. Robert Wesley. Present and former Heritage staff who have contributed a significant portion of field data include Peter Zika, Robert E. Zaremba, Lauren Lyons-Swift, Steven Clemants, and the author. Chris Nadareski helped compile long species lists for many communities by entering data from field survey forms into computer files. Robert E. Zaremba provided preliminary draft descriptions of several estuarine intertidal and open upland communities; Raymond Curran provided a draft description of boreal heath barrens. John Ozard provided reliable assistance in resolving computer problems during the preparation of this manuscript, and he produced the county map. The staff of the New York State Museum's Biological Survey has been very helpful in identifying specimens of plants and animals collected during field surveys.

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# INTRODUCTION

## OBJECTIVES

The primary objective of this report is to classify and describe ecological communities representing the full array of biological diversity of New York State. An ecological community is a variable assemblage of interacting plant and animal populations that share a common environment. As part of the New York Natural Heritage Program inventory, this classification has been developed to help assess and protect the biological diversity of the state. The Natural Heritage Program inventory work allows us to maintain a regularly updated database of information on rare animals, rare plants, and significant natural communities of New York State. This inventory also provides a ranking system for determining priorities for conservation and management of New York State's significant natural areas.

### The Coarse Filter/Fine Filter Approach

Heritage inventory methodology works by focusing on the identification, documentation, and mapping of all occurrences of rare species and significant ecological communities. A "coarse filter/fine filter" approach is used to identify and prioritize the protection of these significant biological resources. Ecological communities represent a "coarse filter," an analysis of biodiversity at a larger scale than the species level. Their identification and documentation can be used to describe whole assemblages of plant and animal species, both common and rare. The conservation of high quality examples of the natural communities assures the protection of most of the species that make up the biological diversity of the state. Rare animals and plants often have narrow or unusual habitat requirements. These species may "fall through" the coarse filter, and sometimes not protected in the representative communities. Identifying and documenting viable populations of each of the rare species serves as the "fine filter" for protectecting the state's biological diversity. This coarse filter/fine filter approach to a natural resources inventory is an efficient means of identifying the most sensitive animals, plants, and communities of an area.

Developing and refining a classification of communities is an essential step in the Heritage inventory process. The inventory requires a classification of discrete community types because these types are used as mapping units, and because the types are assigned ranks that establish priorities for conducting the inventory. This second edition represents the first major revision to Carol Reschke's *Ecological Communities of New York State* published in 1990.

## APPLICATIONS

In addition to serving as the framework for the Natural Heritage Program inventory of significant natural communities in New York State, this community classification is designed to meet a variety of needs. The classification provides natural resource managers with a standard set of terms and concepts to describe wildlife habitats, and it also provides mapping units to use in plans for managing public and private natural areas such as forest preserves, wildlife management areas, parks, and nature preserves. The classification can be used to identify ecological communities for environmental impact statements and other forms of environmental review. In combination with the Heritage ranking system, the classification can be used to establish priorities for land acquisition by public agencies and private conservation organizations. Programs for long-term monitoring of environmental change can use the classification to guide the selection of monitoring sites. The classification and community descriptions provide a general survey useful to students of the natural history of New York State.

## COMMUNITY CONCEPTS

In this classification a community is defined as a variable assemblage of interacting plant and animal populations that share a common environment. Most communities occur repeatedly in the landscape. The plants and animals in a community occupy a habitat, often modifying the habitat. For example, the canopy trees in a hemlock-northern hardwood forest shade the ground and keep the forest floor cool and dark, a large deer population can modify the structure of a forest community by browsing the understory shrubs and saplings, and beavers can modify a stream corridor by damming the stream and flooding the surrounding habitats.

No two examples of a community are identical in composition or environment, however they are similar within a given range of variability. The range of variability of each community (or the percent similarity between different examples of a community) is not defined quantitatively in this classification. Some communities are narrowly defined. Different examples of a narrowly defined community, such as alpine krummholz, will be very similar. Other communities are more broadly defined, such as shrub swamp. The more broadly defined community types provide a catch-all category for communities that are quite variable.

Ecological communities form a complex mosaic in the landscape; they change through time, and they intergrade spatially and temporally. This classification is an attempt to establish a set of discrete categories into which units of the intergrading landscape mosaic

can be sorted and organized. The classification is an artificial construct, and the community types are intended to be conceptually discrete, non-overlapping entities. For the purpose of organizing an inventory of ecological communities, artificial boundaries between communities have been drawn across the continuous ecological gradients that occur in the real landscape. For example, near the summits of the Adirondack Mountains there is a continuous change in communities along an elevation gradient. On many mountains at an elevation of 3000 feet there is a mountain fir forest, a forest dominated by balsam fir trees. At higher elevations the trees become stunted and deformed, and they form dense thickets; this community, at an elevation of 4000 feet, is alpine krummholz. On the summits of the highest peaks, at elevations above timberline (about 4900 feet), is an alpine meadow community. The change from mountain fir forest to alpine krummholz to alpine meadow is a gradual transition on the mountain slopes. In order to conduct an inventory and map occurrences, artificial boundaries between these communities are defined, with the recognition that in the landscape the transitions are often not so distinct.

Communities can be described at many scales, ranging from a fine scale "microcosm" (such as the plankton in a drop of pond water) to a large scale "biome" (such as the eastern deciduous forest). An important consideration in the development of this classification has been to distinguish communities at a scale that is appropriate for statewide inventory work, yet compatible with community classifications developed by other Heritage programs in the eastern U.S.

### Community Patch Size

Communities can also be classified by their patch size in the landscape as follows:

*Matrix* communities form extensive cover, often blanketing 80% of the undeveloped land, and covering 100 to 1 million contiguous acres. Important for wide ranging fauna such as large herbivores, predators, forest interior, and migratory birds. May include small and large patch communities.

*Large Patch* communities may form extensive cover, up to 1000 acres in some places, but usually their boundaries are correlated with single dominant local process such as hydrology or fire regime. Often have a set of characteristic fauna. Nested within matrix communities.

*Small patch* communities may range from less than one acre up to 50 -100 acres. They occur where a number of local conditions come together in a precise way. Serve as refuges for many rare species. Can be nested within large patch or matrix communities.

*Linear* communities are usually small patch communities that are many times longer than wide (e.g., shoreline outcrop, maritime beach, etc.).

To some extent the classification reflects the amount of information available to the Heritage Program. Therefore, communities that the Heritage Program has studied in detail (such as open uplands and open peatlands) may be divided more finely than communities we have studied only briefly (such as riverine and lacustrine communities).

## ORGANIZATION

The classification is organized by "systems", and each system is composed of two to five "subsystems". Within each subsystem are many community types. System, subsystem, and community descriptions are included in the text. There are seven systems: marine, estuarine, riverine, lacustrine, palustrine, terrestrial, and subterranean. Marine and estuarine systems are divided into subtidal and intertidal subsystems. The palustrine system is divided into open mineral soil wetlands, forested mineral soil wetlands, open peatlands, and forested peatlands. The terrestrial system is divided into open uplands, barrens and woodlands, and forested uplands. An additional subsystem, cultural, is included in each system. Definitions of the systems and subsystems are adapted from the U.S. Fish and Wildlife Service wetland classification (Cowardin et al. 1979), and a U.S. Department of Agriculture ecological land classification (Driscoll et al. 1984).

The communities classified as cultural are created or maintained by human activities, or they are modified by human influence to such a degree that the physical conformation of the land or the biological composition of the resident community is significantly different from the character of the land or community prior to modern human influence. Most, if not all, "natural" communities are to some degree exposed to the influence of civilization in the form of acid rain deposition, air and groundwater pollution, logging, fire suppression and ignition, road construction, and so forth. There is a continuous gradient of human-influenced disturbances between "natural" and "cultural" communities. The decision to classify an intermediate community as cultural is based on its biological composition (such as presence of exotic species) and its lack of similarity to communities less disturbed by human activities. Rather than emphasizing land use in the classification of cultural communities, the intention is to emphasize biological composition and environmental features. The Heritage Program does very little field work on cultural communities, and occurrences are not mapped or documented in the Heritage database.

The communities in this classification are intended to include all the resident organisms, including everything from earthworms, bacteria, and fungi to shrubs and trees in a forest, or everything from

plankton to fishes and aquatic macrophytes in aquatic systems. In each system, certain groups of organisms and environmental features are used as an index to habitat conditions. The primary group of organisms and the main environmental characteristics used to describe and distinguish communities within each system are listed below.

**Table 2.** Organisms and environmental characteristics used to describe communities within systems.

| System | Group of organisms | Environmental characteristics |
|---|---|---|
| marine | fauna (fishes, invertebrates) | tidal regime, substrate |
| estuarine | vegetation | tidal regime, salinity, substrate |
| riverine | fauna (fishes) | watershed position, stream flow |
| lacustrine | fauna (fishes, invertebrates) | trophic state, stratification, morphometry, water chemistry |
| palustrine | vegetation | substrate, hydrologic regime |
| terrestrial | vegetation | substrate, disturbance regime |
| subterranean | fauna (bats, invertebrates) | hydrology, geological structure |

The communities in this classification are distinguished by physiognomy, composition of resident organisms, and ecological processes. The descriptions include *dominant* species (species with the greatest abundance or percent cover), *codominant* species (species with relatively high abundance or percent cover), and *characteristic* species (species that are commonly found in the community, although not necessarily abundant). The community descriptions are derived from a review of literature sources, species lists compiled from both qualitative and quantitative field surveys conducted by Heritage Program biologists, and in some cases, either from interviews with biologists studying communities or from reviewers' comments. The species lists are presented as a representative sample. An individual occurrence of a community may not include all the species listed in the description, and the description includes only a very small proportion of the all the species present in a community. Some descriptions also include a brief discussion of ecologically important environmental characteristics (geology, soils, hydrology) and disturbance patterns (e.g., flood regime, fire regime) that distinguish the community. For certain communities a more detailed description is provided than for other communities. In most cases, the communities with more detailed descriptions have been the focus of Heritage inventory work; in some cases these communities are not well-documented in the literature or are described from New York State for the first time. Comments in the descriptions about variability of communities and relationships between communities are qualitative observations; evaluation of these observations will require quantitative sampling and analysis.

Following each community description is a brief summary of the distribution of the community in New York State, and the state rank and estimated global rank currently assigned by the Heritage Program. The statewide distribution of each community is described in terms of "ecozones" or ecological zones of New York State as described by Dickinson (1979) and Will et al. (1979). A map of these ecozones is provided on the inside of the back cover.

**Community Rarity and Vulnerability (Global Rank and State Rank)**

The New York Natural Heritage Program statewide inventory efforts revolve around lists of rare species and all types of natural communities known to occur, or to have historically occurred, in the state. These lists are based on a variety of sources including museum collections, scientific literature, information from state and local government agencies, regional and local experts and data from neighboring states.

Each natural community is assigned a rank based on its rarity and vulnerability. Like all state heritage programs, the New York Natural Heritage Program ranking system assesses rarity at two geographic scales. Each community is assigned a global rank and a state rank. The global rank reflects the rarity of the community throughout its range, whereas the state rank indicates its rarity within New York State. Both of these ranks are usually based on the range of the community, the number of occurrences, the viability of the occurrences, and the vulnerability of the community around the globe or across the state. As new data become available, the ranks may be revised to reflect the most current information. See Appendix A for definitions of global and state ranks used in classification.

**Community Occurrence Quality**

Community occurrences are assigned ranks based on quality and are evaluated within the context of the known or hypothesized distribution of that particular community. Several ecological and spatial factors must

be considered when determining the element occurrence rank of a community. These include the occurrence size, maturity, evidence and degree of unnatural disturbance, continued existence of important ecological processes, overall landscape context, and existing and potential threats. A-ranked community occurrences are among the largest and highest quality of their type. These community occurrences should be large enough to provide reasonable assurance for long-term viability of component ecological processes. They are essentially undisturbed by humans or have nearly recovered from past human disturbance, typically exhibiting little or no unnatural fragmentation. Exotic or particularly invasive native species are usually lacking in high quality community occurrences, or, if present, are observed at very low levels.

There are three rank factors, each reflecting what is currently known (in an ideal situation) about an occurrence: size, condition, and landscape context. These factors are used as a basis for estimating the viability of an occurrence (i.e., its element occurrence rank. Thus:

Size + Condition + Landscape Context =>
Estimated Viability = EO Rank

Occurrence **size** varies as a function of both natural and anthropogenic factors. Larger occurrences are generally presumed to be more valuable for conservation purposes, all other rank factors being equal. Larger occurrences are typically less influenced by edge effects, and less susceptible to degradation or extirpation by stochastic events. Larger occurrences are generally more stable and resilient.

**Condition** is an integrated measure of the quality of biotic and abiotic factors, structures, and processes *within* the occurrence, and the degree to which they affect the continued existence of the occurrence.

**Landscape context** is an integrated measure of the quality of biotic and abiotic factors, structures, and processes *surrounding* the occurrence, and the degree to which they affect the continued existence of the occurrence.

These factor help determine an element occurrence rank which range from "A" for an outstanding or pristine example to "D" for a poor quality or degraded example.

**Table 3**. Explanation of element occurrence quality ranks used Natural Heritage database reports.

| | |
|---|---|
| A | EXCELLENT |
| B | GOOD |
| C | MARGINAL |
| D | POOR |
| E | EXTANT |
| F | FAILED TO FIND. Not found at the previously documented site, or more thorough searching needed. |
| H | HISTORICAL. No recent field information. |
| X | EXTIRPATED. Believed to longer exist. |

**Significant Natural Community Occurrences**

"Significant" natural communities are determined using occurrence quality ranks in conjunction with global and state rarity ranks (Table 3). In this way, communities are documented and mapped in the Heritage Program databases if they are either rare in New York State or are an outstanding example of a more common natural community. For example, all known occurrences of alvar grassland (a rare community), and only the best occurrences, such as an old-growth forest, of beech-maple mesic forest (a common community) are documented as significant natural areas. Cultural communities are not considered significant and are therefore not tracked by the Heritage Program.

**Table 4.** Criteria used by Heritage programs to determine significant communities.

| Element Rarity Rank | Element Occurrence Rank |
|---|---|
| G1, G2 or S1 | all occurrences ranked A-D |
| G3 or S2 | all occurrences ranked A-C |
| G3G4 or S3 | all occurrences ranked A-BC |
| G4, G5 or S4, S5 | all occurrences ranked A-B |

For most communities, examples are provided and sources of data are listed. Examples are selected from sites documented either in the Heritage database or in the listed sources. Each example is given as a site and county in which a good example of the community is present; a map of the counties of New York State is provided following the Index. A single site may include examples of several different communities. Sources are either literature cited in References, or unpublished data collected by the Natural Heritage Program (NYNHP) or the Significant Habitat Unit (both programs are housed in the N.Y.S. Department of Environmental Conservation's Bureau of Wildlife). These unpublished data sources are cited as either "NYNHP field surveys" or "Significant Habitat Unit files."

Community names simply provide a label for each community type; the names are not intended to identify all of the dominant or characteristic species, or all the

significant environmental qualities. Number codes could be used instead of names, but codes are not as easy to remember nor as meaningful. In some cases the community name includes dominant species (such as black spruce-tamarack bog). Some names include physiographic provinces to which the community is more or less restricted (such as coastal plain pond shore). Some names include adjectives denoting floristic affinities of the characteristic species (such as alpine meadow or boreal heath barrens).

In a few cases the term "Appalachian" is used in this classification to refer to a community with floristic affinities to the so-called "Alleghenian floristic element" (Curtis 1959, Eaton and Schrot 1987), which refers to a group of species centered in the Cumberland and Great Smoky Mountains of the southern Appalachians. The term "Allegheny" is here reserved for the unglaciated portion of the Appalachian Plateau in Cattaraugus County in and around Allegany State Park and the Allegheny River (note the two different spellings). This area is within the "Allegany Hills" ecozone. The terms "Appalachian" and "Allegheny" are used by different authors to refer to the same geographic area. In this classification "Appalachian" is used in a broad sense to refer to the Appalachian highlands that extend from Quebec to Georgia. "Allegheny" is used in a narrow sense to refer to a specific portion of the Appalachian Plateau.

Plant nomenclature used in the community descriptions follows Mitchell and Tucker (1997) for vascular plants; Andrus (1980) for *Sphagnum*, and Ketchledge (1980) for other mosses. Animal nomenclature follows C. L. Smith (1985) for fishes; American Ornithologist's Union (1983) for birds; Collins et al. (1982) for reptiles; Frost (1985) for amphibians; Honacki et al. (1982) for mammals; Miller and Brown (1981) for butterflies; and Hodges et al. (1983) for moths. Nomenclature for any other species in a community description is taken from one of the references listed under "Sources" for that community.

**HOW TO USE THIS CLASSIFICATION**

This classification is designed to be used by biologists to identify communities in the field. It can also be used to identify communities from written descriptions of a site, if enough information on composition and structure is provided in the description. The first step in identifying an unknown community is to determine the system and subsystem. A dichotomous key to systems and sybsystems is provided in Appendix C, with instructions on how to use the key to determine system and subsystem. For an explanation of unfamiliar terms, a glossary is provided in Appendix B. Once the system and subsystem are known, then the descriptions in the appropriate section of the text can be reviewed. As a shortcut, you can review the communities listed in the Contents under the appropriate subsystem, and select a few communities that seem most closely related to the site you are trying to identify. The order of the communities in each subsystem reflects environmental and geographical gradients, so that similar communities within a subsystem are usually grouped in the list. Finally, read the descriptions to determine which community type best fits the unknown community. In some cases a site will be equally similar to two different community types; these sites are best described as intermediate between the two most similar community types.

The classification can be used in combination with the Heritage ranking system to help make natural resource management decisions. As an example, consider the process of making decisions regarding wildlife management in a natural area. The interactions between wildlife and their habitat can have both positive and negative effects on communities. For example, beaver flooding may increase waterfowl habitat, while at the same time decreasing adjacent wetland or upland habitats for other species. Some types of rare peatlands are vulnerable to flooding by beavers. The costs and benefits of these kinds of modifications need to be weighed in making management decisions. The manager may wish to consider the rarity or significance of a community in the process of evaluating the effects of wildlife on an ecosystem.

This classification of ecological communities is flexible and open to future modifications. New communities can be added as they are discovered, and previously described or designated communities can be changed, divided, or combined as new information becomes available. This classification is our current working hypothesis; it will be refined as new data obtained from field surveys and literature review become available. The Heritage Program welcomes feedback from users of this classification; please send comments or data to the attention of the ecologist at the following address:

New York Natural Heritage Program
N.Y.S. Department of Environmental Conservation
625 Broadway, 5th Floor
Albany, NY12233-4757.

http://www.nynhp.org

New York State Department of Environmental Conservation
George Pataki, *Governor* Erin Crotty, *Commissioner*

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COVER PHOTOGRAPHS (TO BE UPDATED)

*Front cover:*
Pines reflected in the glassy surface of Lowery Pond, a meromictic lake that is one of the Junius Ponds, Seneca County.

*Back cover, top left:*
A small patch of alpine krummholz in the alpine meadow near the summit of Algonquin Peak, Essex County.

*Back cover, top right:*
Deep emergent marsh in the foreground and red maple-hardwood swamp in the background, at Lake Alice Wildlife Management Area, Clinton County.

*Back cover, bottom left:*
A spruce-northern hardwood forest bordering Jordan Lake, Kildare Forest, St. Lawrence County.

*Back cover, bottom center:*
An alvar grassland at Chaumont Barrens, Jefferson County.

*Back cover, bottom right:*
Calcareous pavement barrens near Three Mile Creek Road, Jefferson County.

All photographs by Carol Reschke.