

# **Classification of the Natural Communities of Massachusetts**

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**D R A F T**

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The data organization and availability reflect the effective management by several data managers and hoards of interns, work-study students, and volunteers over more than 20 years. Preliminary conceptual design and organization was accomplished through meetings of the authors, Julie Lundgren, Henry Woolsey, and Vicki Frey. Vicki Frey and Jean Collins developed the Access database. Jean wrote and enabled the clever 'macro' that italicized the scientific names. David Szczebak and Laura Chaskelson produced the sub-core region distribution maps.

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Note on reprinting the draft Classification of Natural Communities of Massachusetts  
2001 version 1.3

The draft of the *Natural Communities of Massachusetts* being printed and reposted on the NHESP web site in June 2004, is substantially the same as the previous print and web versions, dated 2000 and 2001 respectively. Typographic errors were corrected as they were identified. Three fields have been removed from each community write up: the Tracked and Inventory Needs and Inventory Comments fields. During NHESP's BioMap project (2000-2001) the tracking protocols were changed to depend on an interaction between the quality of individual occurrences and the overall state rank. Therefore, it is possible to have occurrences of any type of natural community in the database. A review of all the community descriptions and of the occurrence ranks is planned that will clarify how decisions are made and what is included in the conservation database. The BioMap project also resulted in a large increase in the number of records of natural communities in the NHESP database, and greatly changed the perceived inventory needs. In preparing this copy of reprinting, I felt that the old inventory information was now misleading, and could be easily removed.

The contents are mostly the same. Pitch Pine - Oak Forest is now Pitch Pine - Oak Forest / Woodland (which was always the intent). There are slight changes in the write-up on the Spruce - Fir Boreal Swamp, based on a fact sheet Nancy Putnam wrote in 2001. The basic description was not changed. Putnam recognized three associations, which were added. *Linnaea borealis* was added to the list of Associated Rare Plants, Examples with Public Access were added, and Threats and Management Needs were elaborated on. We have also removed any references to "Data Sensitive" species that occur in the community types. The Synonyms have not been updated, but it is worth noting that the USNVC (United States National Vegetation Classification) is now being developed by NatureServe, rather than TNC (The Nature Conservancy), with information available on the NatureServe web site ([www.natureserve.org](http://www.natureserve.org)).

The Appendices are different. The previous summary of Inventory Needs has been removed. Instead, two different lists of the community types are included with their state ranks: one alphabetical within the Terrestrial, Palustrine and Estuarine groups, and the other grouped by rank.

Pat Swain, June 22, 2004

## Introduction

The main purpose of this classification is to provide a useful framework for describing, inventorying, and tracking natural communities in Massachusetts. This natural community classification is designed to describe vegetation at a scale that is meaningful for conservation and land protection. A classification provides a convenient mechanism for reducing the complexity of natural vegetation to a relatively small number -- 105 in this case -- of somewhat homogeneous and relatively easily understood, but abstract and artificial, groups. Any classification requires somewhat arbitrary categories and lines between types and classifications differ on where the lines are drawn. Part of the reason for disseminating a draft is to encourage input into the categories and their delineations. Vegetation classifications are influenced by their intended use -- the use of this one is for conservation, and indeed focuses on the uncommon.

To protect the components of biodiversity, their patterns of distribution and their current patterns of conservation need to be evaluated and tracked. One aspect of this is to evaluate the conditions and distribution of natural communities across the state. Tracking natural communities requires having knowledge of what they are. A beginning of knowing natural communities is to name and describe what is known and give a common parlance for discussing the communities. Such a framework also allows identification of what isn't as well known, and encourages focus on gathering that information.

Our intent is to describe communities that can be identified in the field and to accurately (if arbitrarily) divide the vegetation of Massachusetts into identifiable and useful categories. Terrestrial, Palustrine, and Estuarine communities are included; Aquatic communities have **NOT** been addressed in this classification. In this classification of natural communities, attempts have been made to use community names that are recognizable and meaningful to a broad conservation audience including writers of town open space plans, land managers, environmental reviewers and consultants, and ecologists doing field studies.

In defining the composition and structure of the community types, we have begun identifying variations within those community-types; further information on the variations may lead to further splitting or lumping of the identified types in later versions of the classification. In particular, there is a complex of communities dominated by oak trees and another group (inter-related) dominated by red maple. Increased data may lead to splitting these groups differently than they are now divided. Comments on this public draft should lead to refinements and improved descriptions of the community types. Suggestions on other community types that could be split or consolidated would be considered. Descriptions of types of cultural communities (plant communities planted and maintained by humans for direct use by humans or domesticated animals such as forest plantations, orchards, and pastures) could be expanded, but most are not of conservation focus, so will probably continue to be lumped into a few groups.

Many communities occur with others in mosaics that share conditions and processes, such as water flowing through a wetland complex with no one community-type independent of the others or the unifying conditions. Communities are most effective as units of conservation when the controlling ecological processes can be maintained or restored. Putting communities into the functional systems of which they are a part will be another step in the classification. For now, some of those ideas are addressed in the part of each community description under the header Environmental Conditions. Such functional systems are not actually the same as the hierarchy of a key - that is a rock cliff face may be found in a key under non-forested, open communities, but is found on the ground surrounded by forest.

The communities described here are in exemplary condition, the type communities: not all real communities meet the criteria of the abstract, but still qualify as that community type. Many actual communities are disturbed by nature or humans, some are in climatic, topographic, or geological conditions different from the idealized, and others occupy some middle ground between described communities. Because communities are made up of plant species that have individual responses to environmental variables, the communities described grade into other community-types. In addition, the role of land use history is very important in the location and definitions of natural communities in Massachusetts. Three hundred years of intense use of the land in the state appears to have had a homogenizing effect that overrides some of the

influences of climate and landscape position (for example, see Foster et al. 1998, and other papers from the Harvard Forest). Some of this homogenization of communities is reflected in the difficulty of defining distinct community types and in the prevalence of mid-successional species in many of the community descriptions, and in the actual community occurrences.

The community-types that are described here are parts of the habitat for the animal species that use them. Birds may nest in one type of community, feed in another, and then leave entirely. Other animals also move between community types for different needs. Generalist species might have individuals occurring in a variety of different community types.

Despite the problems of classification, we do find recurrent groupings of plant species, and associated animals, that do share responses to environmental conditions. Species that have restricted ranges and particular environmental requirements are often used as indicators of the communities in which they occur. Other species are found in a range of conditions and are occur in a variety of community-types, so are less useful as indicators, although they may be characteristically present in a given community type. These natural groupings of species, or natural communities, tend to vary simultaneously in response to soil moisture gradients, temperature gradients, and nutrient gradients, in a multidimensional, rather than linear, way. Thus, there are southern and northern versions of dry to wet gradients, acidic to less acidic, and nutrient poor to nutrient rich communities, and all the other interactions as well. While not all the possible variations result in distinctly different communities, there is a lot of variation in the real world.

### **Relationship to other classifications**

This classification focuses on the natural communities of Massachusetts, but they are closely related to the natural communities of the region and particularly the surrounding states. The Massachusetts community descriptions include lists of synonyms for the surrounding states, all of which have developed individual classifications for their natural communities. The Nature Conservancy (TNC) with the Association for Biodiversity Information (ABI), has been developing a classification for the region within the United States National Vegetation Classification (USNVC) system. We've included the USNVC/TNC synonyms for those who want more finely divided community-types – the TNC Associations. The accuracy of the cross-walk to the synonyms is variable in this draft. Synonymy with other state's classifications are, of course, confounded by geographic differences in species distributions in the states, as well as issues of different levels of definitions. Clarification of these is one goal for the more final version of the classification. We also include synonymy with the previously used names in Massachusetts, some of which are more broadly defined than in the current classification. Many of the cross-walks to the old Massachusetts classification (Rawinski 1984), especially for the northern forest types, lack precision. That is at least partially a result of the lack of clear boundaries between types.

### **Organization of the classification**

This draft classification divides natural community **types** into three major sections: Terrestrial, Palustrine and Estuarine. The Tables of Contents of each section double as keys, but are not dichotomous. Within the sections, the structural dominance – growth form or physiognomy such as forest, shrubland, herbaceous, and open or sparsely vegetated – is used as a division of types. The forested categories in the terrestrial and palustrine sections are subdivided into evergreen, deciduous and mixed.

We used a significant presence of water to define what was palustrine, and the presence of water with some salinity or tide for inclusion in the estuarine category. All tidally influenced communities are in the estuarine category whether the tidal water is saline or fresh. Salt spray communities not influenced by tides are treated as terrestrial.

**Terrestrial:** The vegetation of terrestrial communities is not significantly influenced by standing or moving water. The forested community types have more than about 25% tree canopy (50% in the palustrine section), which includes woodlands of USNVC/TNC and other classifications. If mature trees are absent, and if shrubs are present forming more than about a 25% shrub layer cover overall, the community is considered to be a shrubland. Herbaceous communities are relatively open communities with neither forest nor shrub

canopies and have more than about a 25% vegetated cover. Open or sparsely vegetated communities are divided by their substrate type, rock or sand for convenience.

**Palustrine:** The palustrine section of the Massachusetts natural community classification includes all freshwater, non-tidal wetlands dominated by trees, shrubs, or persistent emergents, including mosses and lichens. This definition is slightly different from Cowardin (1979) who also included small, shallow aquatic beds with submersed and floating-leaved aquatics, and tidal wetlands where salinity due to ocean-derived salts was less than 0.5%. In this draft Massachusetts' classification, submersed and floating-leaved aquatics will be included in an as yet unwritten aquatic section, and all tidal wetlands are included in the estuarine section. The palustrine section does include riverside communities that receive annual or semi-annual overbank flooding, e.g. floodplain forests. High-terrace floodplain forests (although technically terrestrial communities) are included in the palustrine section in order to group them with other floodplain forest communities.

**Estuarine:** Estuarine communities are subject to varying salinity, tidal actions, and wind. Estuaries include tidal habitats and adjacent tidal wetlands in which ocean water is at least occasionally diluted by freshwater from the land. Estuarine areas extend landward and up streams to where oceanic salts (formally defined as above 0.5 ppt (parts per thousand) salinity in an annual average low flow period) or tides (including freshwater tidal areas) have an influence on the vegetation. Hyper salinity (compared to the ocean) may occur temporarily in some areas from evaporation (such as in salt ponds). The estuarine area extends off-shore to areas with freshwater influence on the seawater, called subtidal communities in this classification.

### **Species Nomenclature**

The scientific and common names of organisms are intended to be consistent with the following:

Vascular plants:

Sorrie, Bruce A. and Paul Somers. 1999. The vascular plants of Massachusetts: a County Checklist, Massachusetts Division of Fisheries and Wildlife, Natural Heritage & Endangered Species Program. Westborough, MA.

Mammals:

Cardoza, James E. and Gwilym S. Jones. 1999. MassWildlife's State Mammal List. 4<sup>th</sup> Edition. Available only from <http://www.state.ma.us/dfwele/dfw/dfwmam.htm>

Birds:

Blodget, B.G. 1998. Checklist of the birds of Massachusetts. Massachusetts Division of Fisheries and Wildlife. Westborough, MA.

Reptiles and Amphibians:

Cardoza, James E. and Peter G. Mirick. 1999. List of the reptiles and amphibians of Massachusetts, 3<sup>rd</sup> edition. Massachusetts Division of Fisheries and Wildlife, Fauna of Massachusetts Series No. 3. Westborough, MA.

### **Request for information**

This classification identifies example sites where the community-types can be found, on lands with public access in Massachusetts. Our database does include sites on less accessible land. We are in the process of building our database to include good occurrences of all community-types, with the most common being tracked only by exemplary occurrences (definitions of exemplary are being developed for each community type), and the rarest being tracked by all known occurrences, with a sliding scale of rarity and quality between. We would like to ultimately know what types are on protected - conservation - land, and what types need further protection. Then, with the management and restoration knowledge also being developed and collected, we will be in a better position to continue to protect the biodiversity of Massachusetts. We are asking for examples of additional locations, or better locations of community types; this will not necessarily result in those locations becoming published information. See Appendix A for a list of estimated inventory needs by community type.

Management needs of communities are seldom well known. In the descriptions we have included some of the management issues identified by field biologists who have been to occurrences of the communities

described. We hope to encourage further discussions of the management needs of the described communities by raising the management issues for each type.

**Refinement of described community types**

This draft of the classification of the natural communities of Massachusetts was written in order to provide a basis for discussing and conserving diversity of the types of vegetation in the state. The primary aim is to describe natural communities of conservation interest in Massachusetts, while including all the vegetation of the state. The overall tendency in this classification is to lump rather than to split. However, communities that have been well-studied (e.g. floodplain forests, acidic peatlands, Atlantic white cedar swamps) are usually more finely divided. Mostly, though, the many vegetation associations occurring within broadly defined communities are not described separately. Instead, the variation in vegetation is included within the vegetation description field and referred to as Associations when known and considered subtypes. As more data are accumulated, more divisions and reorganization will undoubtedly occur.

This classification represents the best of our knowledge about Massachusetts' communities from the field data and literature that we have compiled to date. It is by no means complete or absolute. Instead, it should be regarded as a framework that can be field-tested and revised. Communities can be added, deleted, divided, or combined as we expand our knowledge of Massachusetts' natural communities. There are inconsistencies, some fields are incomplete, some community descriptions overlap. Any assistance with refining those issues would be helpful.

The plan is to collect data, have discussions with ecologists state-wide, and consider comments on this draft -- and to produce a more definitive classification. All comments, feedback, and community information are welcome and appreciated. Your help will greatly improve the result.

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<b>Community Name:</b>	Name used to describe the community in Massachusetts
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<b>SRANK:</b>	Community state rank (SRANK) that reflects the community's rarity and threat within Massachusetts, with regard to its regional rarity and threat. The SRank system was developed for Natural Heritage programs by The Nature Conservancy. The SRANKs are as follows: <b>S1=</b> Typically 5 or fewer occurrences, very few remaining acres or miles of stream, or especially vulnerable to extirpation in Massachusetts for other reasons. <b>S2=</b> Typically 6-20 occurrences, few remaining acres or miles of stream, or very vulnerable to extirpation in Massachusetts for other reasons. <b>S3=</b> Typically 21-100 occurrences, limited acreage or miles of stream in Massachusetts. <b>S4=</b> Apparently secure in Massachusetts. <b>S5=</b> Demonstrably secure in Massachusetts. <b>SU=</b> Status unknown in Massachusetts.

NHESP tracks examples of communities that are ranked S1-S3, that is we maintain records of known occurrences in our database and actively search for new occurrences. Communities that are ranked S4 or S5 generally are not tracked, except for exemplary occurrences. Definitions of quality of occurrences are being developed.

### Map of the ecoregions and sub-ecoregions of Massachusetts:

Ecoregions (or ecological regions) are areas of relatively homogeneous ecological systems, including vegetation, soils, climate, geology, and patterns of human uses. Ecoregion boundaries have been developed for the United States to provide an ecological framework for inventorying and assessing environmental resources. Massachusetts falls within two ecoregions of the United States—the **Northeastern Highlands** and the **Northeastern Coastal Zone**. Sub-ecoregions of Massachusetts have been delineated (Figure 1; Griffith et al. 1994), and they are particularly useful for statewide ecological inventory and assessment activities, including vegetation classification.

There are thirteen sub-ecoregions in Massachusetts. Complete descriptions are given in Griffith et al. (1994), but a brief synopsis of their descriptions is given below:

#### **Northeastern Highlands:**

The **Taconic Mountains** sub-ecoregion is a hilly and mountainous region of western Massachusetts that includes Mt. Greylock, the highest elevation in the state (3491 feet). Streams are generally small and high-gradient, and there are few lakes. The vegetation is primarily northern hardwoods (maple-beech-birch) with spruce-fir at higher elevations. The **Western New England Marble Valleys**, also known as the Berkshire Valley, consists of calcitic and dolomitic marbles and limestones bedrock. Surface water alkalinity values in the area are the highest in Massachusetts (>1000 µeq/L; Griffith et al. 1994) due to the underlying limestone and marble. Alkaline groundwater results in mineral-rich and species-rich wetlands in the region, particularly calcareous fens. The Hoosic and Housatonic Rivers are the major drainages. The **Green Mountains/Berkshire Highlands** includes the southern extent of the Green Mountains and the Berkshire Hills; elevations range from 1000 to 2500 feet. Northern hardwoods and spruce-fir characterize the forested uplands. The Deerfield and upper Westfield Rivers are the main river basins. The **Lower Berkshire Hills** is similar to the Green Mountains/Berkshire Highlands sub-ecoregion except that it has an overall lower elevation, generally 1000 to 1700 feet. Spruce-fir is generally lacking, and northern hardwoods are mixed with transition hardwoods (maple-beech-birch, oak-hickory). Lakes and ponds are abundant compared to the rest of western Massachusetts. The **Berkshire Transition** ranges in elevation from 400-1400 feet, and forest types are transition hardwoods and northern hardwoods. Surface waters drain to the Westfield and Connecticut River basins. The **Vermont Piedmont** has a similar elevation range as the Berkshire Transition, but underlying limestone and marble result in surface waters with higher alkalinity (500-1000 µeq/L). Surface waters drain into the Deerfield and Connecticut River basins. The **Worcester/Monadnock Plateau** contains the most hilly and mountainous area of Massachusetts' central upland. Elevations range from 500 to 1400 feet with some peaks above 1800 feet (Mt. Watatic and Mt. Wachusett). Transition hardwoods are common, but

northern hardwoods also occur. Forested wetlands are common, and forested and non-forested peatlands are abundant. Surface waters are acidic with alkalinity values less than 50 µeq/L.

**Northeastern Coastal Zone:**

The *Connecticut Valley* is characterized by thick outwash, alluvial, and lake bottom deposits overlaying sedimentary bedrock. Surface water alkalinity values are generally above 500 µeq/L. Central hardwoods (oak-hickory) and transition hardwoods are the major forest types. The *Lower Worcester Plateau/Eastern Connecticut Upland* ranges in elevation from 500 to 1200 feet. The soils of the area developed primarily on glacial till in the uplands, and on stratified sand, gravel, and silt deposits in the valleys. Surface waters are acidic and drain primarily into the Chicopee and Quinebaug River systems. The *Southern New England Coastal Plains and Hills* is the largest sub-ecoregion in southern New England and is variable in its topography and bedrock. Bedrock types are mostly granites, schist and gneiss. Surface water alkalinity values are generally lower than in the Connecticut Valley, ranging from less than 50 to 500 µeq/L. Central hardwoods are dominant. The *Boston Basin* has low, rolling topography that is dominated by urban and suburban land. The *Narragansett Bristol Lowlands* are similar to the Coastal Plains and Hills, but bedrock outcrops are uncommon, and thick glacial till and outwash deposits cover the area. The lowlands are flat to gently rolling with elevations less than 200 feet. Surface water alkalinity values are generally between 100 to 300 µeq/L, but several areas have values less than 50 µeq/L. The vegetation is mostly central hardwoods. The *Cape Cod/Long Island* sub-ecoregion is characterized by terminal moraines and outwash plains left by the glaciers, and by coastal deposits. The landscape is influenced by wind and water. Elevations are less than 200 feet. There is a moderate maritime climate, and stunted oak and pine forests are typical. Surface water alkalinity values are low (less than 50 µeq/L).

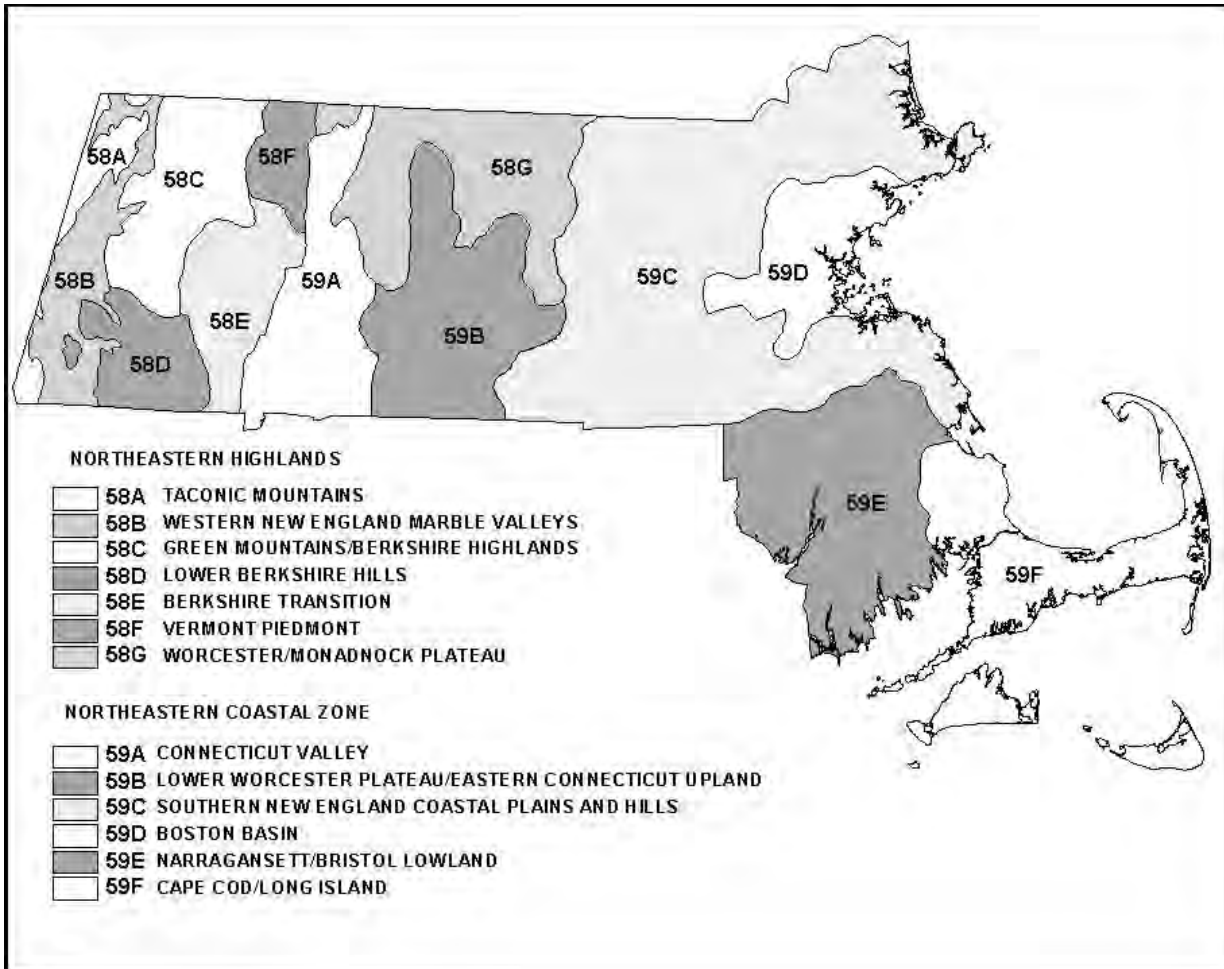


Figure 1. Ecoregions and sub-ecoregions of Massachusetts (Griffith et al. 1994)

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In the vegetation classification, each community description is accompanied by a sub-ecoregion line map showing the sub-ecoregion boundaries. Sub-ecoregions in which the community type is known to occur (i.e., NHESP has field data for the community including vegetation descriptions and/or plot data) are shaded in dark gray, and the sub-ecoregions with probable occurrences (i.e., field data are currently lacking but the community has been observed in the sub-ecoregion or the sub-ecoregion is known to have the appropriate physical conditions) are shaded in light gray. If the community is not believed to occur in a certain sub-ecoregion, then that sub-ecoregion is left white.

The community sub-ecoregion maps are intended to give the user an idea of where s/he may encounter a certain community type and also to identify sub-ecoregions for which community data are needed. Readers are encouraged to look in sub-ecoregions identified as having probable occurrences of the community (light gray). All new data and distribution information is welcome and much appreciated.

<b>Concept:</b>	Brief general description or word-picture of the community.
<b>Environmental setting:</b>	Detailed description of the landscape setting, soils, water chemistry, and other physical characteristics of the community.
<b>Vegetation Description:</b>	Detailed description of the vegetation structure and characteristic plant species of the community.
<b>Associations:</b>	List of the vegetation associations that have been described in Massachusetts that are either equivalent to the community or included within the community. For example, Motzkin (1991) described six Atlantic white cedar (AWC) associations in Massachusetts. Coastal AWC Swamps are equivalent to his Coastal AWC type, while Inland AWC swamps include both his Mixed hemlock-AWC-red maple-yellow birch type and his Spruce-hemlock-AWC type.
<b>Habitat values for: Associated Fauna</b>	Description of the habitat that the community provides for animals, including birds, small mammals, amphibians, invertebrates, etc.
<b>Associated rare plants:</b>	A list of rare plants that are known to occur in the community type. Rare plants include those that are state-protected under the Massachusetts Endangered Species Act and those that are on the state watch list. Plants on the watch list are not legally protected, but they are believed to be uncommon or rare. They are species for which information is lacking on number of sites and severity of population decline, or species that have been delisted.

Plant Latin name

Plant common name

Plant state status

E= State Endangered

T= State Threatened

SC= State Special Concern

WL= State Watch List

H= State Historic

<b>Associated rare animals:</b>	A list of rare animals that are known to occur in the community type. Rare animals include those that are state-protected under the Massachusetts Endangered Species Act (birds on the bird watch list are also included). Format and abbreviations follow those used for Associated rare plants (see above).
<b>Examples: OR Examples with Public Access:</b>	List of representative examples of the community in areas with public access. For particularly sensitive communities, specific examples are not listed.
<b>Threats:</b>	A description of known threats to the community.
<b>Management needs:</b>	A description of management activities that may be necessary to maintain community occurrences and the quality of those occurrences.
<b>Synonyms</b>	Names used for the Massachusetts community in other natural community classifications. If a synonym is listed without any modifier, then the Massachusetts community is basically equivalent to the synonym. Sometimes the following modifiers are used: "includes" means that the Massachusetts community includes the communities listed, "included within" means that the Massachusetts community is included within the community listed, "similar to" means that the Massachusetts community is similar but not equivalent to the communities listed, and "not

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described” is used when the Massachusetts community has no synonym in that classification. Question marks indicate uncertainty about synonyms.

**USNVC/TNC:**

Synonyms in the National Vegetation Classification. Sneddon, L., M. Anderson, and J. Lundgren eds. 1998. International classification of ecological communities: terrestrial vegetation of the Northeastern United States (July 1998 working draft). The Nature Conservancy, Eastern Conservation Science and Natural Heritage Programs of the northeastern U.S. Boston, MA. [Association codes are written in brackets.] and subsequent descriptions added by NatureServe.

**MA (old name):**

Old name used by the Massachusetts Natural Heritage Program. Rawinski, T.J. 1984. New England natural community classification. The Nature Conservancy, Eastern Regional Office, Boston, MA. [old EOCODES are written in brackets].

**ME:**

Synonyms in the Maine vegetation classification.  
Gawler, Susan C. 2001. Natural Community Profiles, Open (non-forested) types. Maine Natural Areas Program, Department of Conservation, Augusta, Maine.  
Maine Natural Heritage Program. 1991. Natural Landscapes of Maine: A Classification of Ecosystems and Natural Communities. Department of Economic and Community Development, State House Station 130, Augusta, ME.

**VT:**

Synonyms in the Vermont vegetation classification.  
Thompson, E. 1995. Natural Communities of Vermont: Uplands and Wetlands. Vermont Nongame and Natural Heritage Program, Department of Fish and Wildlife, Agency of Natural Resources. Waterbury, VT.

**NH:**

Synonyms in the New Hampshire vegetation classification.  
Sperduto, D.D. 1994. A Classification of the Natural Communities of New Hampshire. New Hampshire Natural Heritage Inventory, Dept. of Resources and Economic Development. Concord, NH. (used for palustrine) AND  
Sperduto, D.D. 1997. The Natural Communities of New Hampshire: A Guide and Classification. Draft. November 21, 1997. New Hampshire Natural Heritage Inventory, Dept. of Resources and Economic Development. Concord, NH.

**NY:**

Synonyms in the New York vegetation classification.  
Reschke, C. 1990. Ecological Communities of New York State. New York Natural Heritage Program, N.Y.S. Dept. of Environmental Conservation. Latham, NY.  
and subsequent descriptions by NY Natural Heritage Program, since 1990.

**CT:**

Synonyms in the Connecticut vegetation classification.  
Metzler, K.J. & J.P. Barrett. 1996. Vegetation classification for Connecticut, Organized into the modified UNESCO hierarchy. Draft report, Connecticut Natural Diversity Database. Hartford, CT.

**RI:**

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Enser, R. 1995. Natural Communities of Rhode Island. Rhode Island Natural Heritage Program, Providence, RI.

**Golet & Larson, 1974:**

Synonyms in Golet, F.C. and J.S. Larson. 1974. Classification of freshwater wetlands in the glaciated Northeast. US Fish and Wildlife Service Resource Publication 116, Washington D.C. [Used in Palustrine section.]

**Weatherbee:**

Synonyms in Weatherbee, P.B. 1996. Flora of Berkshire County. The Berkshire Museum, The Studley Press, Inc. Dalton, MA. 123 pp. [Used in Terrestrial section.]

**Other:**

Synonyms in other miscellaneous vegetation classifications.

**Author:** Person responsible for writing community description. **Date:** Date last revised.

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