

# Classifying Massachusetts' Natural Communities:

where we are and where we may go

Patricia Swain, Natural Community Ecologist



I'm going to talk about the Massachusetts classification of natural communities, how it's set up, how it came to be as it is, what we're doing with it, and what improvements /revisions we've been thinking about for the next iteration.

But before that, some background: The Natural Heritage & Endangered Species Program has been in the Mass Division of Fisheries & Wildlife since 1983. Natural Heritage programs were started by the Nature Conservancy to identify, inventory, and map, rare species and natural communities. NHESP has the additional mandate to actively protect rare species and their habitats, which include natural communities.

## NHESP NC classification goal

- protecting biodiversity
- coarse filter approach



NHESP's goal in creating a classification of natural communities was to define all the community types in order to capture all aspects of biodiversity. Using natural communities involves a "Coarse filter approach" to conservation, where "fine filter" involves identifying and protecting rare species.

We thought it was important to define all types, then determine the uncommon and then make sure examples of each are protected.

The classification is then one of the tools for biodiversity protection.

Photos: Calcareous slopping fen with Showy Lady's slipper (SC)

**Classification of the  
Natural Communities  
of  
Massachusetts**

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and Jennifer B. Kearsley**

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Massachusetts Division of Fisheries and Wildlife  
Westborough, MA

**DRAFT**

2001 – (Version 1.3)

Where we are

Can download type  
descriptions from  
[www.nhesp.org](http://www.nhesp.org)

(<http://www.mass.gov/dfwele/dfw/nhesp/nhclass.htm>)

This is the current version of the classification of natural communities. There have been essentially no content revisions since the original: some typos have been fixed, and a few other small format changes made. Jen Kearsley wrote the Palustrine section and designed the original format. She then went to medical school and is now a doctor in medical residency. One hopes that classifying communities doesn't always send the perpetrators off to new fields.

The classification is available on line, by entire sections, or by individual types.

# Classification Set-up

- Hierarchical
  - Terrestrial, Palustrine, Estuarine
  - Within first Terrestrial and Palustrine
    - Forested, not forested
    - if not forest, shrub, herbaceous, or open (sparse vegetation)



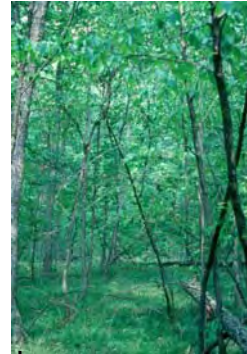
The classification is set up to be hierarchical: with Terrestrial, Palustrine, and Estuarine sections, NOT Aquatic.

Then, Forested, or not. If forest, coniferous or deciduous. If not, is it shrubby or herbaceous dominated (or in a few cases, sparsely vegetated).

Photos to demonstrate types, in these cases palustrine: forest if trees are dominant even if shrubs or herbaceous present; shrub if shrubs dominate even if a few trees, and if herbaceous present and herbaceous, even with a few scattered shrub layer things. AWCS Westboro Cedar Swamp, Hockomock shrubs and Hockomock herbaceous. Then different community types are described.

## Original Assumptions Community type

- has a recognizable group of species
- that recur together
- usually in particular environmental conditions



Hickory Hop-Hornbeam Forest/woodland

One original and continuing assumption is that each NC type has a recognizable group of species (with dominants, characteristic spp, and indicator spp.) that recur together (in similar structures and proportions) usually in particular environmental conditions (moisture, temperature, chemistry, soils, slopes, geology...).

Lines between types may be artificial, arbitrary in the worst cases, clear in others. There are gradients between (among) many types.

On the ground differences between neighboring community occurrences is also an issue, sometimes clear, often not.

Land use history is a wild card with homogenization, and a remix of species as they recolonize an area, creating hardships for classifiers.

While there are artificial separations in a classification (NC types in gradients), it is useful to categorize, and a good classification reflects reality.

Community Name: LEVEL BOG  
 Community ELCODE: CP:BOC1000  
 SRANK: S3



# Page example

**Concept:** Acidic dwarf ericaceous shrub peatlands, generally with pronounced hummock-hollow topography. Level bogs are the most acidic and nutrient-poor of Massachusetts' peatland communities.

**Environmental setting:** Level bog communities receive little or no streamflow and they are isolated from the water table, making them the most acidic and nutrient-poor of peatland communities. The pH of level bogs is in the range of 3 to 4. Level bogs develop along pond margins, at the headwaters of streams, or in isolated valley bottoms without inlet or outlet streams.

**Vegetation Description:** Level bogs are characterized by a mixture of tall and short shrubs that are predominantly ericaceous (i.e. members of the Heath family). Lowland (Chamaedaphne calyculata) is dominant. Other typical ericaceous shrubs include thicket (Rhododendron canadense), sharp leaved (Lobelia angustifolia), bog laurel (Lobelia polyfolia), bog rosemary (Andromeda polifolia var. glaucophylla), Labrador tea (Lobelia spicata), and low-growing large and small cranberry (Vaccinium macrocarpon and V. oxycoccos). Scattered, stunted coniferous trees, primarily hemlock (Larix laricina) and black spruce (Picea mariana), occur throughout. A mixture of specialized bog plants grow on the hummocky Sphagnum surface, including carnivorous pitcher plants (Sarracenia purpurea) and sundews (Drosera rotundifolia and D. intermedia).

**Associations:** Five associations have been described in Massachusetts. They are: 1. Vaccinium corymbosum-Rhododendron vaccinum tall shrub bog and bog heath association [TYPE A in Kearsley, 1999c]; 2. Vaccinium corymbosum-Rhododendron canadense-Lobelia polyfolia tall shrub bog association [TYPE B in Kearsley, 1999c]; 3. A Chamaedaphne calyculata-Lobelia polyfolia-Entodonium polyfolium dwarf ericaceous shrub bog association [TYPE C in Kearsley, 1999c]; 4. Chamaedaphne calyculata dwarf ericaceous shrub bog association [TYPE D]; and 5. Vaccinium oxycoccos-Rhynchospora alba-Utricularia cornuta open Sphagnum lawn association [TYPE E].

**Habitat values for Associated Fauna:** The high acidity and low oxygen content of the water make level bogs inhospitable to many reptiles, fish, and amphibians. However, several of the state's protected rare animal species are found in level bogs. Meads or pools associated with level bogs can provide important amphibian breeding habitat and refugia at vernal pools if they have two to three months of pooling and lack fish.

**Associated rare plants:**

ARCEUTHOBUM FUSILLUM	DWARF MISTLETOE	S3
CAREX LIMOSA	MUD SEDGE	-W1
SCHUCHZERIA PALUSTRIS	POD-GRASS	T
XYRIS MONTANA	NORTHERN YELLOW-EYED GRASS	-W1

From: Swain, P.C. & J.B. Kearsley. 2001. Classification of the Natural Communities of Massachusetts. Version 1.3. Natural Heritage & Endangered Species Program, Division of Fisheries & Wildlife, Westborough, MA.



In the classification as written, we cover those original assumptions, including information on the recurrent species groups and the environmental setting.

Page set up with name, code, and state rank (not regulatory), some rarer types are than others, distribution, brief concept, environmental setting, Vegetation description (key), any splitting we've done, Habitat for animals, rare species associated with the community type.

**Associated rare animals:**

AESHNA MUTATA	SPATTERDOCK DARNER	E
AMBYSTOMA JEFFERSONIANUM	JEFFERSON SALAMANDER	SC
AMBYSTOMA LATERALE	BLUE-SPOTTED SALAMANDER	SC
LITHOPHANE VIRIDIPALLENS	PALE GREEN PINION MOTH	SC
METARRANTHIS PILOSARIA	COASTAL SWAMP METARRANTHIS MOTH	SC
PAPAIPEMA APPASSIONATA	PITCHER PLANT BORER MOTH	SC
WILLIAMSONIA FLETCHERI	EBONY BOGHAUNTER	E
WILLIAMSONIA LINTNERI	RINGED BOGHAUNTER	E

Example  
2<sup>nd</sup> page

**Examples with Public Access:** Ponkapoag Bog Reservation MDC, Canton; Poutwater Pond, MDC, Sterling.

**Threats:** Hydrologic alteration and nutrient enrichment from road and lawn runoff. Trampling from humans affects peat mat integrity.

**Management needs:** Public should be encouraged to visit only those sites with established boardwalks. Signs need to be posted along boardwalks encouraging visitors to stay off the peat mat. Monitor the impact of salt and other nutrient runoff into bogs, and work to minimize runoff. Remove phragmites where it has become established.

**Synonyms**

**USNVC/TNC:** Includes *Vaccinium corymbosum*/Sphagnum spp. Shrubland ; *Picea mariana*/*Kalmia angustifolia*/Sphagnum spp. Forest; *Picea mariana*/Sphagnum spp. (Lower New England /Northern Piedmont, North Atlantic Coast) Woodland ; *Kalmia angustifolia*-*Chamaedaphne calyculata* (*Picea mariana*)/*Cladonia* dwarf-shrubland.

**MA [old name]:** SNE Level Bog [CP2C2A0000].

**ME:** Includes and related to: 2001 – Sheep Laurel Dwarf Shrub Bog and Bog Moss Lawn. 1991 - Dwarf shrub bog community.

**VT:** Dwarf shrub bog.

**NH:** similar to Coastal/southern dwarf shrub bog and to Boreal/transitional dwarf shrub bog.

**NY:** Dwarf shrub bog.

**CT:** *Chamaedaphne calyculata* dwarf shrubland s.

**RI:** Dwarf shrub bog.

**Golet & Larson, 1974:**

**Other:**

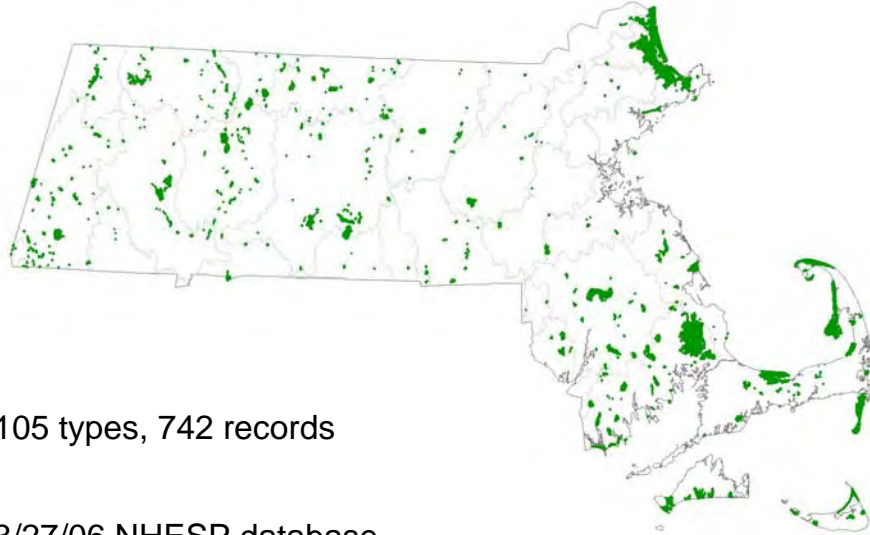
**Author:** J. Kearsley

**Date:** 7/21/99



Rare animals associated with the NC type, examples with public access, threats, management needs, and synonyms of NatureServe's National Vegetation Classification (was TNC's) and surrounding states, and important other relevant classifications.

# NHESP Natural Communities



Of the 105 types in the Mass classification, 72 are considered uncommon (common types are less split, but cover more of the state). Most of our records are of the uncommon types, only exemplary, “A” ranked, occurrences for the most common types are included in the database. For types determined to be less common we accept lower quality examples for the database. Draft criteria of occurrence quality exist for most types, and will be included in future iterations of the classification.

The background lines are watersheds, green areas are natural community locations from the NHESP database, 3/27/06.

# Original Assumptions/Intentions

- Conservation focus
  - Coarse filter
    - “Last of the Least, Best of the Rest”



A similar site identified for its bog-ness (in July) turns out to contain a great population of rare orchid, *Arethusa* (T) found in a later June



Thanks to Tom Rawinski for the example and reminder

To write the classification, we made some assumptions and had intentions for it. In conservation there are multiple approaches to protecting biodiversity. Fine filter approach is species specific, focusing on rare species.

Coarse filters are intended to catch species & habitats missed otherwise. Also catch common species and their habitats, unknown taxa, and a variety of physical conditions.

Does the coarse filter work? Tom Rawinski recently reminded us of a situation where it did work. He reported a bog that went into our database as a good community. He was there in July and didn't see any rare species. Some years later someone else was there in June and discovered a very large population of a state listed species, visible in June, but not in July.

## Original Assumptions/Intentions

- Conservation focus
  - Identify range of variations



Intent to identify the state's range of variations of types and situations, and then variations within types. Want to be sure that something of everything is protected.

NHESP is not out to produce a vegetation map of the state, our focus is on the rare and uncommon. But to know the rare, we've tried to describe all the types. The result is a classification that splits out the unusual for description and naming.

Photos: Salt marsh on Boston Harbor Islands and old growth forest in Mohawk Trail SF, a Northern Hardwoods Hemlock community.

## Original Assumptions/Intentions

- User friendly
  - A bog =



Original intent was for users NOT to have to collect plot data for a lab analysis to know what type of community they had been in. Unfortunately, this approach creates name issues, since there are multiple associations within “bogs”, and people use “bog” more broadly than our intention. So maybe not as user friendly as we intended.

## Original Assumptions/Intentions

- Provide a Common reference
  - A Kettlehole Level Bog =



We wanted the classification to define types sufficiently that when a type name is used, it is clear what species and conditions are present.

# Original models

## Classifications from region's Natural Heritage Programs

- Particularly New York as pioneer model, 1990

## New England Regional Classification TNC 1987



When we began writing the classification, we looked at classifications from the surrounding and other states, and at TNC's early regional classification, and borrowed heavily from them.

Roble picture early May, Rhodora in flower in a bog.

# Original information sources

## Site descriptions

- NHESP natural community descriptions
  - (previous classifications)
- Rare species associates, habitat descriptions
- Site inventory records
- Published and 'grey' literature



and other states' Natural Community Classifications and the USNVC (TNC/ABI/NatureServe)



The information that we based the types in the classification on came from: previous ecologists at NHESP (Christine Reid and Henry Woolsey), nc descriptions from field forms, rare plant site descriptions; Bruce Sorrie, Rawinski, Motzkin, Weatherbee (Berk), Dunwiddie-Nant, Reid in the SE, LeBlond, and many others.

Photos are Hickory Hop hornbeam site on Bear Mountain and rare oxalis that occurs in the natural community-type. Rare plant records helped locate some of the ncs, and information from the rare plant records helped inform the nc descriptions.

Federal agencies (NPS ex.) are required to use USNVC

## Original Data

- A few plot studies with analysis
  - Atlantic White Cedar Swamps, Motzkin
  - Floodplain forests, Kearsley
  - Bogs, Kearsley (incomplete)
  - Calcareous Fens, Motzkin, others since



Our original descriptions had plot data for some limited numbers of community types. Good sets of plot data are hard to come by: the Floodplain work included preliminary fall field work, a winter planning, a very intense field season. Bogs same thing. We had focused grants for those types, and extremely good ecologists. These were mostly EPA grants that are no longer available to us, which were wetlands focused.

## Content changes to come

- **New types** - such as Aspen Depressions (thanks to Cavanagh & Ciaranca)



Other new types: leatherleaf shrub peatlands, no open water – question here of degree of splitting that is useful, maybe an association within the bog type? More work with formal analysis would help! They do occur alone.

Riparian forests, need work, same for Riparian shrublands.

## Content changes to come

- Oak Forest Continuum of types to be addressed
  - Many sites visited, data and descriptions collected
  - Many plots now (including 400 from Harvard Forest)
  - May not be any clearer at the end!



Photos show a variety of oak and oak pine community occurrences. There are differences at extremes of conditions, but changes are mostly gradual geographically. Naming of obvious different types leaves a great mass of undifferentiated oak and oak pine forest. May well stay that way, keeping a named general type with named splits when discernable or worth doing. Land use history issues are probably important in this continuum.

## Content changes needed

- Refine existing types
- Set naming conventions
- Clarify hierarchy
- Split large types
  - Ex. Shrub Swamp
  - Ex. Emergent Marshes, deep and shallow



And A Key, of course



Having named different types, we need to see what needs refining or clarifying. Find what is special in broadly defined types. We are a conservation organization, have focused on uncommon. If subtypes always occur together, it may not be important to split, but if sometimes separate, not so clear. Might have hierarchy of types, as suggested in previous slide.

For example, In successional mosaic, having names for stages would be useful for total picture.

Split large types as appropriate and useful.

Some name changes, too. Spruce Fir “boreal” swamp, remove boreal Names, problem of implied chemistry and Problem of using commonly used words technically.

Photos, emergent marshes along Charles River.

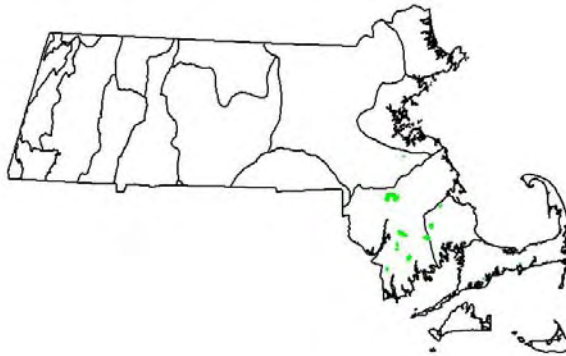
And, we need to have a key to the types!

## Format changes to come

Distribution maps - USFS/DFW ecoregions

– Better coastal differentiation

Map known distributions from database



We plan to refine the distribution maps for the next version of the classification.

DFW/USFS ecoregions have better coastal representation than the EPA ecoregions and smaller Worcester Co, AND retains Marble Valleys as Land Type Associations although split into different Ecoregions.

NHESP will have GIS locations of known and mapped occurrences put into distribution maps, which will alert to needs of further inventory where they are not known but expected, or found where not expected.

Shown is Coastal AWCS.

## Sources of improvements

- Input from reviewers
- Input from users
- DATA
- and more DATA



For the next iteration of the classification, we expect to revise content, and tighten up nc descriptions based on data where it is available.

Reviewers and users (often the same people) have comments on format, descriptions, distributions, and the need for a key. Continued input is useful.

## **New or additional data Reports and inventories**

- Coastal Plain Pond Shores, Sneddon (TNC, NatureServe, USNVC)
- Rich Mesic Forests, Bellemare
- Regional re-interpretation of AWCS, Floodplain forests data (New Hampshire)
- MassWildlife forestry project  
    Bioinventory/Allowable harvest work
- Location information: Janice Stone's MassGIS Priority Vegetation Communities polygons

Inventories directed at particular types of natural communities are the most useful source of data for classifying. Property inventories where NCs are explicitly studied are also quite informative, and hit the more common types: Appalachian Trail for example. Some property reports from a variety of people and organizations such as TTOR have provided us with real descriptions from real places. Sometimes not data, but location information is still useful

Nancy Putnam will discuss the BioInventory work at symposium later.

The MassGIS Priority Vegetation Communities data layer is very useful for locations of various types of priority communities and community groups such as riparian communities, AWCS, peatlands, coastal communities, and others in the regions in eastern Massachusetts in which Janice had a chance to do her ace aerial interpretations.

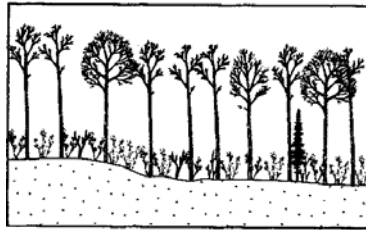
# Additional improvements

## A key, of course

Identification of variants of named types

Appendix with  
Site ranking specification,  
Cross-walks  
Associated Rare species

Pictures - diagnostic



From Sims, RA et al. 1997. Field guide, Ontario.

Additional improvements include tightening Site rank specifications, making them specific to Massachusetts, and including them in a technical version (if separate) or appendix.

Identification of variants of named types, useful for protecting entire suite of types. Ex. Coastal Plain Pond Shores

Ontario, outline drawings are a great model for diagnostic illustrations.

Drawing From Sims, RA et al. 1997. Field guide to the forest ecosystem classification for northwestern Ontario. Ont. Min. Natur. Resources, Northwest Sci & Technol. Thunder Bay, Ont. Field guide FG-03. 176 pp.

# Perennial issues

Succession, what gets named

Human made and maintained communities

especially if habitat for rare or interesting species

i.e. grasslands, hayfields

Mosaics



Perennial classification issues include what to do with or about:  
Successional mosaics, what gets named, what gets mapped?

Mosaics, identification of types within them, especially if they move around,  
such as in successional mosaics,

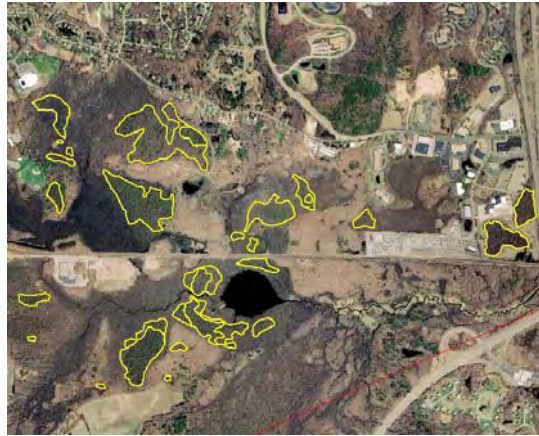
and mapping them (as in wetlands with different types among  
differences in wetness, water movement, chemistry, oxygenation,...)

What to do with human made and maintained communities that would  
change if not maintained? What about natural succession stages that require  
management, but would occur naturally if we allowed disturbances and had  
more land?

Photo is Clinton Nashua River floodplain grassland with aspen, recent fire, (2  
years ago now).

## NHESP Natural Community Polygons on MassGIS

NHESP NC datalayer  
to MassGIS by May 1,  
then on web.



Westborough Cedar Swamp

Polygon fixes from Janice Stone (MassGIS)

NHESP GIS layer of Natural Communities in our database is all but done (May 2006), (finish correction some overlarge polygons by incorporating Janice Stone's AWC polygons for existing NHESP records and apply attributes that were written for each NC occurrence last year) to MassGIS by May 1, then on web.

Contains most natural community occurrence polygons in our database with abbreviated attributes – several sentence descriptions of types and local information.

All our sites have been visited and descriptions made and/or data collected, none are only noted from aerials, although certainly can be informed by them, and boundaries drawn from them.

## Last thoughts

### NHESP NC classification goal

- protecting biodiversity
- coarse filter approach



Again,

Goal to define all the types in order to capture all the aspects of biodiversity.  
Coarse filter approach

Define all types to determine the uncommon and then make sure examples are protected.

Part of total approach for protecting biodiversity.

Calcareous sloping fen, Shrubby Cinqufoil with flowers of Grass of Parnassus

## A protected area, chosen for NC



Coastal Plain Pondshore,  
Grassy Pond, Plymouth



DFW property in Plymouth purchased to protect coastal plain ponds and the pondshore community. One use of the classification is to identify uncommon natural communities, which can then be included in conservation planning (or less obliquely, for buying or otherwise acquiring land id'd as containing unusual natural communities).