Field Key to the Ecological Systems of Map Zones 63, 64, 65, and 66: Finger Lakes, Northeastern Highlands, Connecticut River Basin and Highlands, and The North Woods (United States)

NatureServe
Terrestrial Ecology Department
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Acadian-Appalachian Subalpine Woodland and Heath-Krummholz, Borestone Mountain, Maine
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Contents

Introduction

The following keys to NatureServe ecological systems cover the areas found in MRLC map zones[1] 63 (Finger Lakes), 64 (Northeastern Highlands), 65 (Connecticut River Basin and Highlands), and 66 (The North Woods) (Figure 1). The systems included in these keys are the basis for the legend that LANDFIRE is using to map existing vegetation. In addition, the keys include types that characteristically occur at small spatial scales (generally <2 ha in size), are not included in the LANDFIRE legend, and hence may not be mappable at the scale used in the LANDFIRE project. We have chosen to be inclusive in the keys, so that the user will have information on these system types for comparison purposes; systems that are not part of the legend are so indicated. In some cases these small-patch systems may be important for modeling fire condition class and, given their relative distinctiveness on the landscape, they may in some cases be mappable.

Plant names are almost always in Latin and follow the nomenclature of Kartesz (1999). In limited cases, we have included synonyms and/or common names for some taxa.

The keys are dichotomous, which means the user is given paired choices (the pair is termed a 'couplet') and makes a choice between the two options given for the couplet. The user should carefully read both choices in the couplet and only then choose the option that best fits the data or field situation. A choice leads the user to either the next couplet to be followed in the keying process, via a number at the far right, or else leads to a final result (an ecological system type or LANDFIRE legend unit).

[1] Multi-Resolution Land Characteristics Consortium zones; see http://www.mrlc.gov

System names start with a Biogeographic region (e.g. “Atlantic Coastal Plain” or “Central Appalachian”), and may include plant common names (e.g. Pine, Oak). The number in parentheses after the system name is the EVT (Existing Vegetation Type) code assigned by LANDFIRE to the system. System names that are not followed by an EVT code are not part of the LANDFIRE legend, and fall into one of two classes. Those marked with a single asterisk have been aggregated into composite units for LANDFIRE mapping (e.g. “Gulf and Atlantic Coastal Plain Swamp Systems”); the system name in those cases is followed by the LANDFIRE legend unit (with its EVT code and a double asterisk). Systems marked with a triple asterisk are small-patch types not being addressed comprehensively by LANDFIRE and therefore not in the national legend.

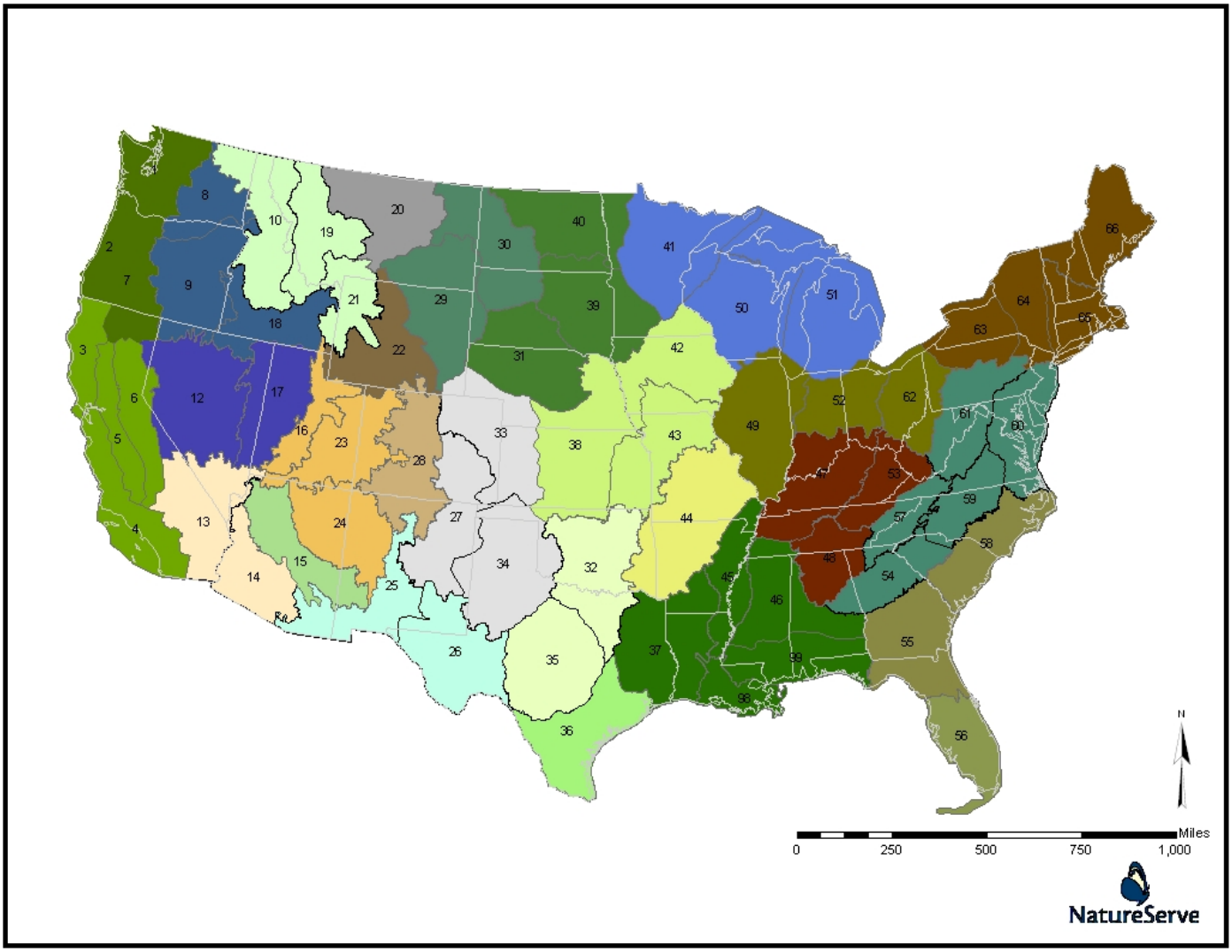

Figure 1. LANDFIRE map zone clusters with keys to ecological systems.

The keys to ecological systems use a variety of different variables, which are applied in various sequences, depending on the relative significance of the variable. Variables that are less ambiguous in their application will typically be used earlier or “higher” in the key. The principal

variables that help provide the upper structure for the key include broad physiognomy (e.g. forested vs. non-forested, or woody canopy vs. primarily herbaceous canopy), broad biogeography (map zones, TNC ecoregions, USFS Sections, Ecological Divisions), and general hydrology (e.g. upland and wetland). Common terms are preferred over technical language where possible, but some technical terms are required for clarity. For example, in our usage, "wetland" vegetation is that "whose composition is affected by flooding or saturated soil conditions." The term is not used in the sense of a "jurisdictional wetland", which is a more limited as well as a legal meaning of the term.

A preliminary key guides the user to one of several individual keys for (1) Wooded Uplands, (2) Wooded Wetlands, (3) Open Uplands and (4) Open Wetlands.

Some portions of a key may follow a different logic from one another, depending on what ecological or biogeographic variable is best suited to the types included in the key. A given system may occur in the key in several places, if it has a variety of manifestations on the landscape. In more detailed (or "lower") places in the key, dominance within vegetation strata may play a role. Tree cover is generally considered first, then that of shrubs, then the herbaceous component. Codominant species within a given stratum are important as well: in some cases a system type is described as having two or more codominant species, which may or may not be present in all stands.

Some terminology on spatial characteristics is employed throughout the keys to distinguish common patterns in which systems occur on the landscape. For example 'matrix' types of vegetation are dominant across the majority of a given landscape, while 'large patch' types tend to occur as distinctive patches, which represent specific environments within the larger 'matrix.' 'Small patch' types, most of which are not being mapped by LANDFIRE, occur in very specific environments and are at most a few hectares in size, often less than one hectare. Elevation, soil or substrate characteristics, and vegetation physiognomy are often important. These and other variables provide the framework for the key.

Ideally, the users of the key will be able to locate themselves in relation to The Nature Conservancy ecoregions (Figure 2) or the US Forest Service ECOMAP sections or subsections (Figure 3). [EPA Level III Ecoregions (Figure 4) have been used in other mapzone group keys, but because they are not complete to Level IV for these mapzones we have not used them in this key.] NatureServe's Ecological Divisions are sometimes referenced: these are sub-continental units based on broad climate and biogeographic patterns. Each ecological system is tagged to one Ecological Divison as central to its distribution, although a system's range may cover multiple Divisions. This group of mapzones intersects Divisions 201 (Laurentian – Acadian), 202 (Central Interior and Appalachian), and 203 (Gulf and Atlantic Coastal Plain) (Figure 5). In some cases, an ecoregion, section, or division line may be the determining factor between two otherwise similar systems. Given the continuous nature of ecological variation, however, transitional areas may occur near an ecoregional boundary, so the lines should be considered as general guides.

Further details on TNC ecoregions and the USFS ECOMAP Sections and subsections, and Ecological Divisions can be found via http://www.natureserve.org/explorer/eodist.htm. Information about regional, state, and multi-state EPA Ecoregion products can be obtained at http://www.epa.gov/wed/pages/ecoregions/level_iv.htm.

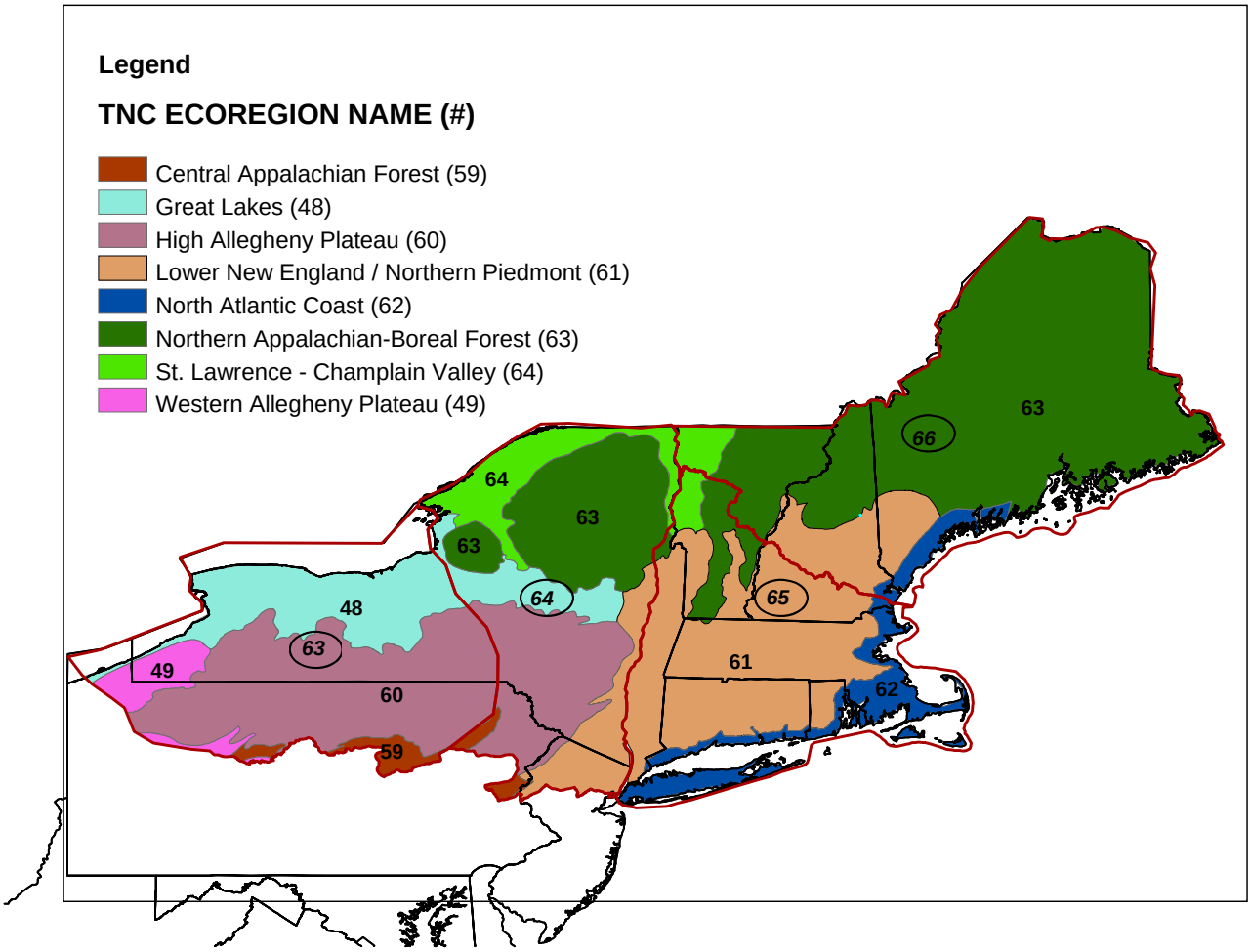

Figure 2. TNC Ecoregions for Map Zones 63, 64, 65, and 66. Numbers in ovals are MRLC mapzones, and remaining numbers are TNC ecoregion numbers. The keys use the ecoregion name followed by the number in parentheses.

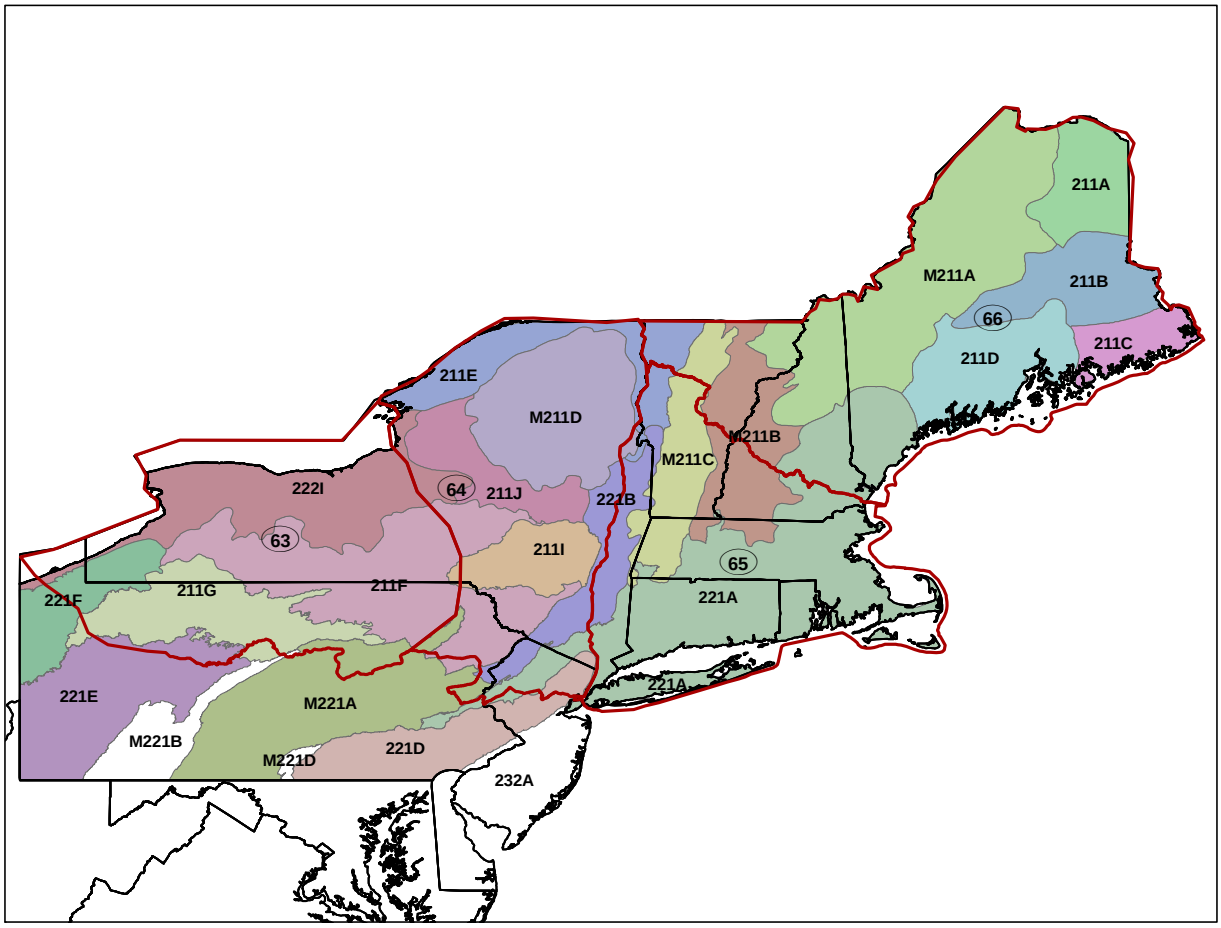

Figure 3. US Forest Service ECOMAP Sections for Map Zones 63, 64, 65, and 66. Numbers in ovals are MRLC mapzones; the other numbers are sections. The keys refer to these as "USFS Section" followed by the number.

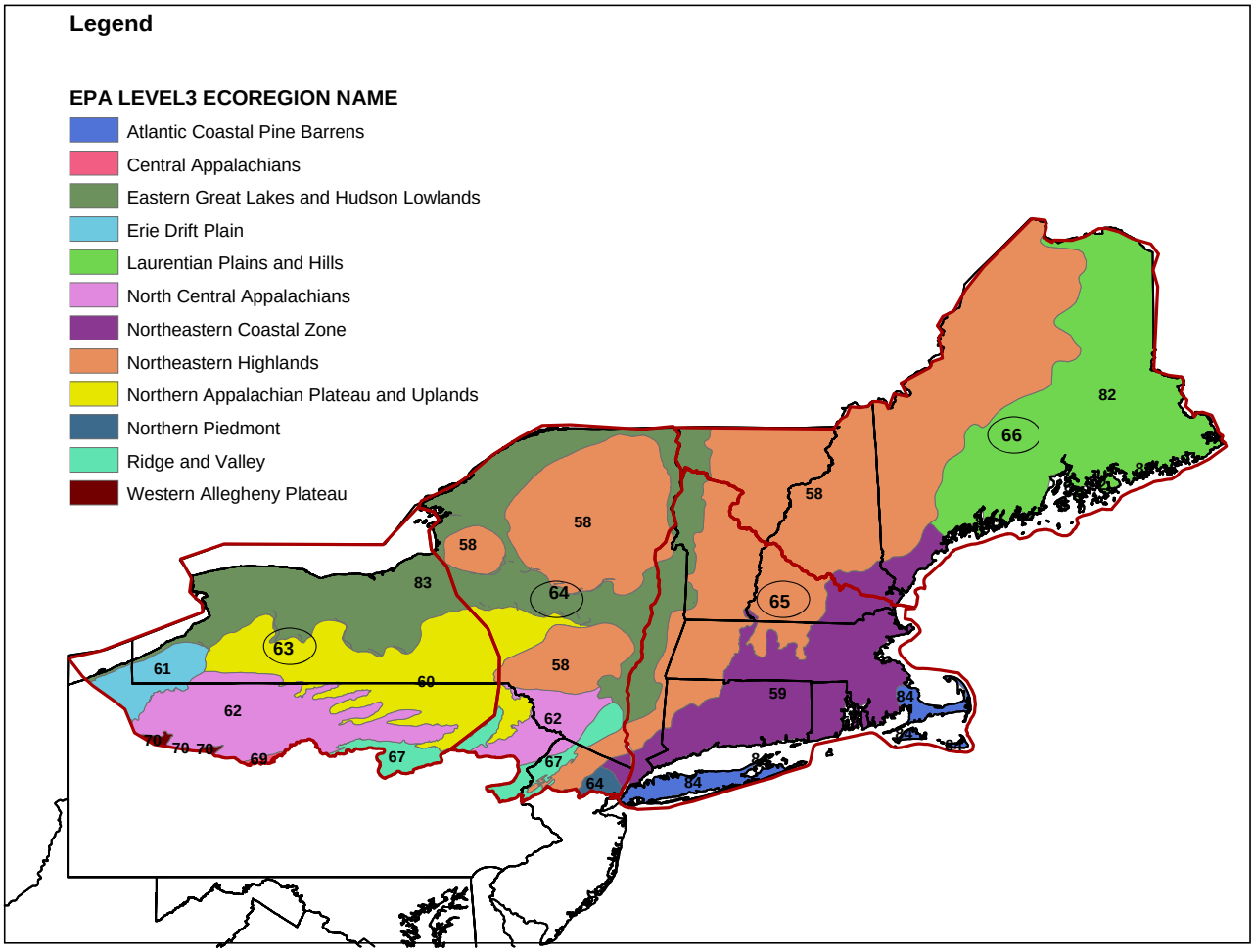

Figure 4. EPA Level III Ecoregions for Map Zones 63, 64, 65, and 66. Numbers in ovals are mapzones.

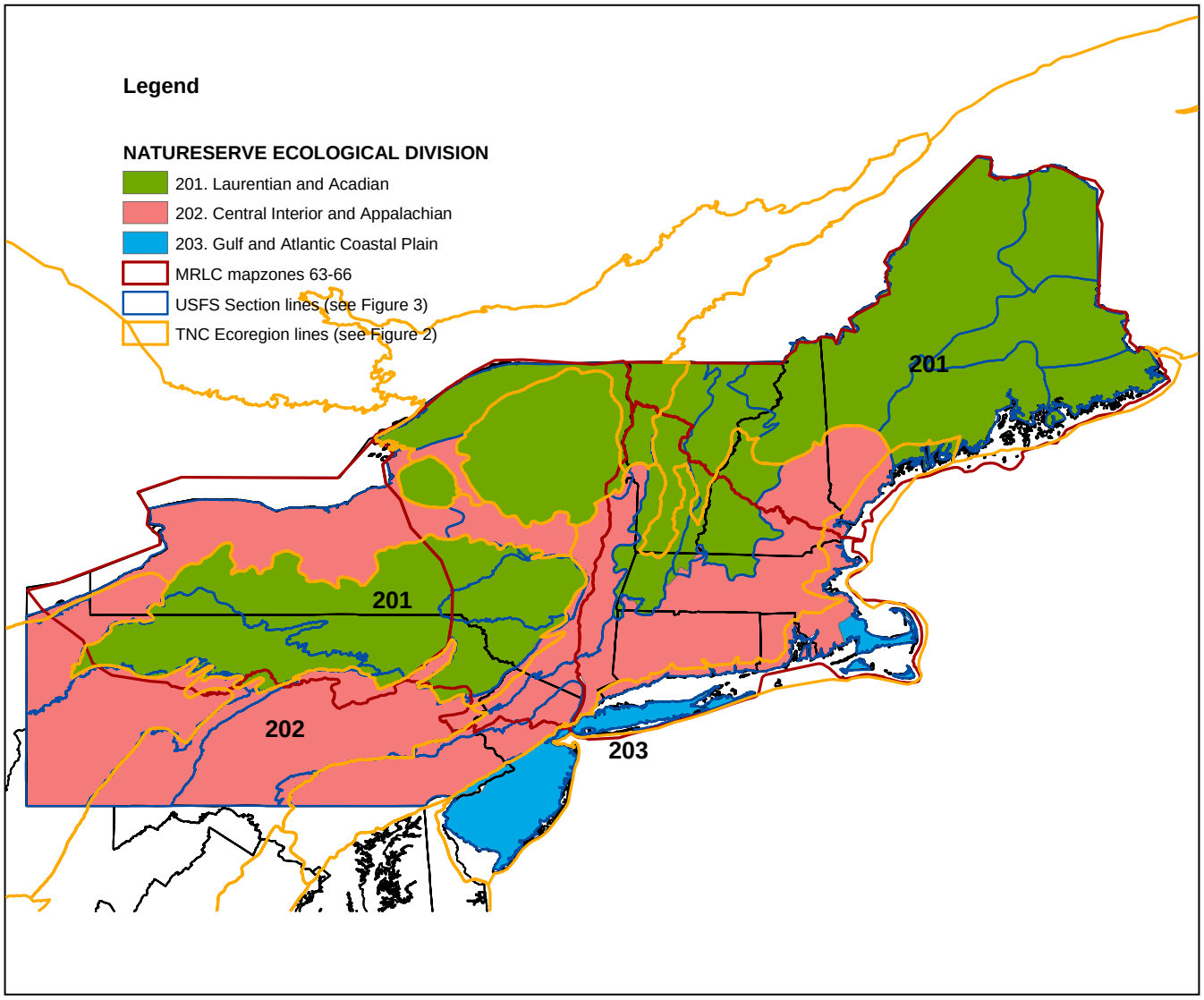

Figure 5. Ecological Divisions for Map Zones 63, 64, 65, and 66.

The keys address LANDFIRE legend units that represent natural or near-natural ecological systems. Much of the landscape, however, has been highly altered. LANDFIRE legend units for land-use types (e.g. developed lands), semi-natural, and altered vegetation are not formally incorporated into the keys, since they are typically recognizable without the use of a key, or else their floristic composition is so variable as to be not useful in a field key. We provide a table below showing the LANDFIRE legend units that represent non-natural vegetation, with a short description for each.

Land Use, Unvegetated, Semi-natural and Altered Vegetation

Legend unit	EVT	Description
LAND USE OR UNVEGETATED SURFACES		
Open Water		Open water
Developed		Generally developed lands.
Developed, Open Space		Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
Developed, Low Intensity		Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-50% of total cover. These areas most commonly include single-family housing units.
Developed, Medium Intensity		Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 50-80% of the total cover. These areas most commonly include single-family housing units
Developed, High Intensity		Includes highly developed areas where people reside in high numbers. Examples include apartment complexes, row houses and commercial/industrial facilities. Impervious surfaces account for 80 to100% of the total cover.
Agriculture		Generally developed for agricultural uses.
Pasture/Hay	82	These agriculture lands typically have perennial herbaceous cover (e.g. regularly-shaped plantings) used for livestock grazing or the production of hay. There are obvious signs of management such as irrigation and haying that distinguish it from natural grasslands. Identified CRP lands are included in this land cover type.
Cultivated Crops and Irrigated Agriculture	82	These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.

Continued…

SEMI-NATURAL / ALTERED VEGETATION		
Ruderal Vegetation		Vegetation resulting from succession following significant anthropogenic disturbance of an area. It is generally characterized by unnatural combinations of species (primarily native species, though they often contain minor to substantial numbers and amounts of species alien to the region as well)
Ruderal Upland - Old Field	2531	Herbaceous or herb-shrub vegetation resulting from succession following virtually complete removal of native woody cover of an area, primarily on lands cleared for agriculture or pasture. Soils often show a plow layer, which alters the successional pathway and may increase the likelihood of invasions by exotic species. It is generally characterized by unnatural combinations of native and alien species, including pasture grasses and forbs such as goldenrods, asters, Queen Anne's lace, black-eyed Susans, hawkweeds, etc.
Ruderal Forest - Northern and Central Hardwood and Conifer	2532	Upland forests resulting from succession following virtually complete removal of native woody cover of an area, i.e. land clearing for agriculture or some types of forestry. It is characterized by combinations of early-successional trees are not typical of natural ecological systems, and do not indicate a particular natural ecological system. In the northeast, these forests often contain substantial amounts of red maple, white pine, red-cedar (south) or balsam fir (north), aspen, and/or birch, with associates of sassafras, black locust, apple, pin cherry, and sometimes walnut. They may contain lesser amounts of more natural matrix forest species such as oaks, northern hardwoods, and hemlock or spruce.
Introduced Vegetation		Vegetation dominated by introduced species. These are spontaneous, self-perpetuating, and not (immediately) the result of planting, cultivation, or human maintenance. Land occupied by introduced vegetation is generally permanently altered (converted) unless restoration efforts are undertaken.
Introduced Upland Vegetation – Treed	8401	Land cover is significantly altered or disturbed by introduced tree species.
Introduced Upland Vegetation - Shrub	8402	Land cover is significantly altered or disturbed by introduced shrub/vine and/or herbaceous vegetation.
Introduced Upland Vegetation – Annual Grassland	8405	Land cover is significantly altered or disturbed by introduced annual grasses. Natural vegetation types are no longer recognizable.
Introduced Upland Vegetation - Perennial Grassland and Forbland	8404	Land cover is significantly altered or disturbed by introduced, non-native perennial grasses and forbs. Natural vegetation types are no longer recognizable.
Introduced Wetland Vegetation	8411	Land cover is altered or disturbed and dominated by introduced wetland vegetation. Species may include *Lythrum salicaria, Phalaris arundinacea, Phragmites australis*, etc.
Continued…		

Modified/Managed Vegetation		Vegetation resulting from management or modification of natural/near natural vegetation, but producing a structural and floristic combination not clearly known to have a natural analogue. Modified vegetation may

		be easily restorable by either management, restoration of ecological processes, and/or succession.
Modified/Managed Upland Vegetation		Land cover is apparently managed/modified and dominated by trees and/or shrubs. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Forest and Woodland		Land cover is apparently modified by recent fires which have burned forest and woodland vegetation. Vegetation is a mixture of herbaceous, shrub, and tree species.
Recently Burned Shrubland		Land cover is apparently modified by recent fires which have shrubland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Recently Burned Grassland		Land cover is apparently modified by recent fires which have burned grassland vegetation. Vegetation is a mixture of herbaceous and shrub species.
Managed Tree Plantation		Land cover is apparently modified and appears as a managed tree plantation.
Recently Logged Timberland		Land cover is apparently modified and appears as logged timberland.
Modified/Managed Wetland Vegetation		These areas include created and obviously managed wetlands of varying size resulting from water diversion. Artificial Wetlands will be mapped where obvious built structures may be distinguished from imagery.

Key to the Major Divisions of the Key

1a. Trees[2] or tall shrubs (over 2 m) as uppermost layer, with total woody cover in that layer 10-15% or more **2**

1b. Tree and tall shrub cover in the uppermost stratum less than 10-15%; uppermost vegetation stratum strongly shrubs <2m tall, herbaceous, or both, or vegetation sparse **3**

2b. Upland forests, woodlands, glades/savannas, and tall shrublands (composition is not affected by flooding or saturated soil conditions) .....**Key A (p. 13)**

2a. Wetland or floodplain forests, woodlands, and shrub swamps (composition is affected by flooding or saturated soil conditions; including floodplains and bottomlands as well as seepage forests).....**Key B (p. 21)**

3a. Open uplands (e.g. dune grasslands and shrublands, dry summits) .....**Key C (p. 25)**

3b. Open wetlands (including pond margins, marshes, low shrub swamps, and wet depressions) .....**Key D (p. 29)**

Please note the following symbols:

***** indicates NatureServe ecological system that has been grouped into broader LANDFIRE Map Unit. Included to help clarify key, but crews need to record broader LANDFIRE Map Unit(**)

****** indicates broader LANDFIRE Map Unit.

******* small patch ecological system, not being mapped by LANDFIRE; included for completeness of the key.

[2] Trees are defined here as woody plants >3 m tall with a single main stem.

KEY A – UPLAND FORESTS, WOODLANDS, AND SAVANNAS

1a. Conifer forests and woodlands: deciduous trees[3] (and shrubs > 2 m tall) less than 25% of the total canopy cover **2**

1b. Deciduous or mixed forests and woodlands: deciduous trees (and shrubs > 2 m tall) more than 25% of the total canopy cover **17**

2a. Dominant[4] conifers are *Tsuga canadensis* and/or *Pinus* spp., or in some settings *Juniperus virginiana* **3**

2b. *Picea* spp., *Abies balsamea,* and/or *Thuja occidentalis* dominant **12**

3a. Closed-canopy forests with *Pinus banksiana* dominant (for *Pinus banksiana* on rocky outcrops, follow second half of couplet), or co-dominant with black spruce (*Picea mariana*); uncommon in this region ..... **Boreal Jack Pine-Black Spruce Forest (2344)**

3b. *Tsuga canadensis, Pinus strobus, Pinus resinosa, Pinus rigida,* or *Juniperus virginiana* dominant; or in rare cases *Pinus banksiana* in a rocky open woodland setting **4**

4a. *Tsuga canadensis* more abundant than *Picea* or *Pinus* **5**

4b. *Pinus* spp. or less often *Juniperus virginiana* are the dominant conifers **6**

5a. *Picea rubens* often present (generally only as a minor associate, and not necessarily in the canopy) with *Tsuga,* and *Quercus rubra* the only oak species present (where oaks are present at all); northern and higher elevation portions of region: USFS Sections (or subsections) M211 (all sections), 211E, 211Fa, Fb, and Ff, 211I, 211J, and possibly 221Al ..... **Laurentian-Acadian Pine-Hemlock-Hardwood Forest (2366)**

5b. More Appalachian in character; *Picea rubens* absent, and other species of oaks (*Quercus alba* or *Quercus velutina*) may be present along with *Q. rubra;* southern portion of region: USFS Sections (or subsections) in 221, 222, 211G, and 211Fc and Fd ..... **Appalachian (Hemlock)-Northern Hardwood Forest (2370)**

6a. Maritime forests along sandy portions of immediate coastline north to Merrymeeting Bay, Maine (North Atlantic Coast ecoregion, TNC 62; USFS 221Aa, Ab, Ac, Ak, An, 211Db), forming a narrow band where the trees are stunted and salt-swept trees as a result of salt spray, high winds, sand movement, and overwash during extreme disturbance events; trees often with distorted branches; canopy composition varies from coniferous to deciduous to mixed, but can include areas where *Pinus rigida* or *Juniperus virginana* are dominant ..... **Northern Atlantic Coastal Plain Maritime Forest (2379)**

6b. Forests and woodlands that do not feature stunted and salt-swept trees as a result of maritime exposure, or if so are in the Northern Appalachian – Boreal Forest ecoregion (TNC 63) **7**

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[3] In this document, "deciduous trees" does not include larch, our only deciduous conifer. "Broad-leaf trees" would be a more accurate term, but "deciduous" is far more widely used throughout the region.

[4] "Dominant": the species with the highest percent of cover, usually in the uppermost layer (from FGDC Vegetation standard).

7a. Pine barrens: *Pinus rigida* strongly dominant, sometimes associated with shrubby *Quercus* spp., on mostly flat sandy outwash; canopy closure varies.....**8**
7b. *Pinus rigida* not strongly dominant, or if so, then in a rocky ridge rather than sandplain setting **9**

8a. Barrens in the North Atlantic Coast ecoregion (TNC 62) from southern Maine and Cape Cod south to New Jersey; near-coastal species such as *Morella pensylvanica* and *Schizachyrium littorale* often present..... **Northern Atlantic Coastal Plain Pitch Pine Barrens (2355)**
8b. Pine barrens interior from the coastal plain, occurring in the more temperate portions of the region..... **North-Central Appalachian Pine Barrens (2354)**

9a. Northern portions of the region: primarily Northern Appalachian – Boreal Forest ecoregion (TNC 63), and parts of the St. Lawrence / Champlain Valley ecoregion (TNC 64) or Great Lakes ecoregion (TNC 48), or USFS Sections M211, 211A-E, 211J, and 222; *Pinus strobus* and/or *P. resinosa* (or rarely *Pinus banksiana)* as important pine species, not *Pinus rigida; Quercus rubra* generally the only oak species present.....**10**
9b. More temperate portions of the region: Lower New England / Northern Piedmont ecoregion (TNC 61), High Allegheny Plateau ecoregion (TNC 60), and parts of the St. Lawrence / Champlain Valley ecoregion (TNC 64) or Great Lakes ecoregion (TNC 48); rarely along the coast in Northern Appalachian – Boreal Forest ecoregion (TNC 63) north to Acadia National Park; species composition reflects the more temperate affinities with *Quercus prinus, Q. alba, Q. velutina, Q. coccinea, Q. ilicifolia, Carya* spp., and/or *Pinus rigida* present; typically oak-dominated systems, but may feature areas of pine dominance.....**11**

10a. Continuous-canopy forest in various landscape settings but not typically on open rocky ridges ..... **Laurentian-Acadian Northern Pine-(Oak) Forest (2362)**
10b. Woodlands with some combination of *Pinus strobus, Pinus resinosa, Picea rubens,* and *Quercus rubra* (or rarely *Pinus banksiana)* forming a discontinuous canopy (typically less than 60% overall cover, sometimes very sparse), on exposed hilltops and outcrops or rocky slopes, occurring as a mosaic of wooded and open patches, usually with a well developed understory featuring heath shrubs such as *Vaccinium angustifolium, Kalmia angustifolia,* and *Gaylussacia baccata* ..... **Northern Appalachian – Acadian Rocky Heath Outcrop*****

11a. Pine-oak woodlands with discontinuous canopy (typically less than 60% overall cover, sometimes very sparse), occurring as a mosaic of wooded and open patches, usually with a well developed understory; on sparsely wooded hilltops and outcrops or rocky slopes ..... **Central Appalachian Pine-Oak Rocky Woodland (2377)**
11b. Oak-pine forests, sometimes with local pine dominance, with generally continuous canopies; understory varies; in various landscape settings but not occurring as patchywoodlands on rocky substrates ..... **Central Appalachian Dry Oak-Pine Forest (2369)**

12a. In mountain settings, generally above 450 m (1500′); montane species such as *Sorbus americana* or *Sorbus decora, Dryopteris campyloptera, Oxalis montana, Empetrum* spp., *Vaccinium uliginosum,* and/or *Vaccinium vitis-idaea* usually present **13**
12b. Forests and woodlands lower in the toposequence and usually at elevations below 450 m (1500′), though occasionally on isolated rocky summits and somewhat higher elevations, on hilltop summits, rolling landscapes or flats, not mountains; *Empetrum* spp., *Vaccinium uliginosum, Vaccinium vitis-idaea, Vaccinium boreale,* and *Minuartia groenlandica* absent.....**14**

13a. Mid-elevation forest (<900 m or 2700′) with continuous canopy; *Empetrum* spp., *Vaccinium uliginosum, Vaccinium boreale, Sibbaldiopsis tridentata,*and/or *Minuartia groenlandica* absent or essentially so **.....Acadian-Appalachian Montane Spruce-Fir Forest (2374)**

13b. Subalpine or hilltop woodlands, canopy discontinuous, generally less than 50% tree canopy closure overall (though stunted trees may form a dense shrub layer); mostly >900 m (2700′) except in limited occurrences near the downeast coast of Maine (USFS 211Ca and 211Cb); some combination of *Empetrum* spp., *Ledum groenlandicum, Kalmia angustifolia, Vaccinium uliginosum, Vaccinium vitis-idaea, Vaccinium boreale, Sibbaldiopsis tridentata,*and/or *Minuartia groenlandica* generally present **.....Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (2389)**

14a. Open canopy woodlands, generally less than 50% tree canopy closure overall, usually with heath shrubs below, on sandy outwash or on exposed hilltops **15**

14b. Spruce-fir forests with more-or-less closed canopies, widespread in the northern part of the region **16**

15a. Partial-canopy woodlands on sandplains and coarse outwash (sometimes with undulating topography including wetland pockets), dominated by *Picea mariana* or, less often, by *P. rubens;* extensive dwarf heath shrub cover and sometimes extensive fruticose lichen cover; rare **.....Acadian Sub-Boreal Spruce Barrens (2464)**

15b. Low to mid-elevation hilltops and summits; trees may include *Picea rubens* and *Abies balsamea,* but can also include *Pinus strobus, Pinus resinosa,* and *Quercus rubra;* heath shrubs such as *Vaccinium angustifolium, Kalmia angustifolia,* and *Gaylussacia baccata* characteristic **.....Northern Appalachian – Acadian Rocky Heath Outcrop*****

16a. *Picea rubens* and/or *Abies balsamea* as the dominant conifers, *Picea mariana* absent or very liimited; sometimes with northern hardwood species (*Betula alleghaniensis, B. papyrifera, Fagus grandifolia)* as associates; upland matrix forests with mostly closed canopies in various landscape settings**.....Acadian Low-Elevation Spruce-Fir-Hardwood Forest (2373)**

16b. *Picea mariana* characteristic and often dominant; forests on imperfectly drained flat soils (that may appear superficially dry for part of the growing season), often forming extensive flats along valley bottoms; bryophyte layer extensive, and herb and shrub layers generally sparse **.....Acadian Near-Boreal Spruce Flat (2465)**

17a. *Picea rubens* and/or *Abies balsamea* forming a mixture with *Betula, Fagus,* and other non-oak hardwood species, *Pinus,* if present, less abundant than *Picea* and *Abies* **18**

17b. Forests and woodlands without at least 25% *Picea* and *Abies* in the canopy.....**20**

18a. Northern hardwood forests characterized by *Fagus grandifolia, Acer saccharum, Betula alleghaniensis,* and/or *Fraxinus americana* with a conifer component of *Picea rubens, Tsuga canadensis, Pinus strobus,* and/or *Abies balsamea;* hardwoods generally at least 50% of the canopy cover**..... Laurentian-Acadian Northern Hardwoods Forest (2302)**

18b. Mixed versions of spruce-fir forests characterized by a variable mixture of *Betula papyrifera, Betula alleghaniensis, Acer rubrum,* and/or *Populus* spp. with *Picea rubens* and *Abies balsamea*; *Acer saccharum* and *Fraxinus americana* absent or essentially so; conifers generally at least 50% of the canopy cover except in some early-successional patches.....**19**

19a. In mountain settings, generally above 450 m (1500′); montane species such as *Sorbus americana* or *Sorbus decora, Dryopteris campyloptera,* or *Oxalis montana* usually present; *Betula alleghaniensis* often present as a persistent component of the canopy **.....Acadian-Appalachian Montane Spruce-Fir Forest (2374)**

19b. Forests lower in the toposequence and usually at elevations below 450 m (1500′), on rolling landscapes or flats, not mountains; montane associates absent or very limited **.....Acadian Low-Elevation Spruce-Fir-Hardwood Forest (2373)**

20a. Maritime forests along sandy portions of immediate coastline of the North Atlantic Coast ecoregion (TNC 62) north to Merrymeeting Bay, Maine (USFS subsections 221Aa, Ab, Ac, Ak, An, 211Db), subject to salt spray, high winds, sand deposition and shifting, and occasional overwash during extreme disturbance events; trees often stunted, canopy composition varies from coniferous to deciduous to mixed, and can include *Fagus grandifolia, Ilex opaca, Amelanchier canadensis, Prunus serotina, Quercus stellata, Quercus velutina,* and *Acer rubrum*... **Northern Atlantic Coastal Plain Maritime Forest (2379)**

20b. Forests and woodlands not exposed to extreme maritime environments **21**

21a. Hardwood or mixed forests in mesic settings, mostly closed-canopy and including *Acer saccharum* as a canopy associate or dominant; if *Fagus grandifolia* is prominent and *Acer saccharum* is limited or absent, then oaks and pines are absent or minor; other tree species can include *Acer rubrum, Fraxinus americana, Betula alleghaniensis, Betula papyrifera, Tilia americana, Liriodendron tulipifera, Tsuga canadensis, Pinus strobus,* or rarely *Magnolia acuminata* and *Juglans nigra*.....**22**

21b. Hardwood or mixed forests or woodlands in dry-mesic to dry settings, where *Quercus* spp., or *Quercus* with *Fagus grandifolia,* are the dominant hardwoods (not including *Acer rubrum,* which may be prominent especially in mid-successional stands); *Acer saccharum* and *Betula alleghaniensis* less abundant than *Quercus* and *Fagus,* or (uncommonly) *Acer saccharum, Quercus rubra, Ostrya virginiana,* and/or *Betula* spp. sharing dominance in a rocky woodland setting.....**25**

22a. Rich mixed mesophytic forest found in found (in these map zones) in limited areas of the unglaciated Allegheny Plateau in NW Pennsylvania and SW New York, with *Magnolia acuminata* and *Juglans nigra* as indicator species along with the more widespread canopy components of *Acer saccharum, Quercus rubra, Tilia americana, Prunus serotina, Betula lenta,* and *Fagus grandifolia;* canopy typically diverse, with many co-dominant species*;* spring ephemerals abundant in the herb layer; species in the herb/shrub layers that indicate the more southern Appalachian affinities of this type include *Hydrangea arborescens, Cimicifuga racemosa, Disporum lanuginosum,* and/or *Euonymus obovatus* **..... South-Central Interior Mesophytic Forest (2321)**

22b. Mesic forests throughout the region without the mixed-mesophytic characteristics described above.....**23**

23a. On rich loam soils over calcareous till of the glaciated Great Lakes plain in the snowbelt of western PA and NY, in these mapzones USFS section 221F only; *Acer saccharum* and *Fagus grandifolia* dominate the canopy, with a rich herbaceous layer featuring spring ephemerals, typical species including *Arisaema triphyllum, Galium aparine, Osmorhiza claytonii, Polygonatum biflorum,* and *Trillium grandiflorum*; *Tsuga canadensis* absent or minimal **..... North-Central Interior Beech-Maple Forest (2313)**

23b. Not in the glaciated lakeplain of westernmost PA and NY (USFS Section 221F); or if so then lacking the rich woods characteristics described above, typically on less nutrient-rich soils, and *Tsuga canadensis* may be present or co-dominant **24**

24a. Hardwood or mixed forests typically dominated by some combination of *Acer saccharum, Fagus grandifolia,* and/or *Betula alleghaniensis*; *Liriodendron tulipifera* absent (except in very rare instances outside of its contiguous range), if oaks present, then generally restricted to *Quercus rubra*; *Prunus serotina* may be present but is rarely an important component of the canopy; *Picea rubens* a typical conifer associate in New England and the Adirondacks, with or without *Tsuga canadensis* and *Pinus strobus;* throughout this region except in Lower New England and Northern Piedmont sections (USFS sections 221A and 221D), and the Allegheny Plateau (USFS sections 211G and 221F)
..... Laurentian-Acadian Northern Hardwoods Forest (2302)

24b. Hardwood or hemlock-hardwood forests of Lower New England, the Hudson Valley, and northern Pennsylvania and southern New York, often also dominated by some combination of *Acer saccharum, Fagus grandifolia,* and/or *Betula alleghaniensis*, but with *Picea rubens* absent and *Liriodendron tulipifera* a frequent associate (within its range, which limits it in New England essentially to Connecticut and Rhode Island); if oaks are present, they may include species besides *Quercus rubra; Prunus serotina* may be an important canopy tree in places; *Tsuga canadensis* the typical conifer associate, and may form patches of conifer dominance within the hemlock-hardwood matrix; overlaps with Laurentian-Acadian Northern Hardwoods Forest in the Glaciated Allegheny Plateau and Catskills (USFS Sections 211F and 211I) **.....Appalachian (Hemlock)-Northern Hardwood Forest (2370)**

25a. Forests in the coastal plain (North Atlantic Coast ecoregion, TNC 62) with an essentially closed canopy dominated by *Quercus* spp., or a mixture of *Quercus* and *Fagus grandifolia*, or less commonly entirely *Fagus grandifolia;*, characteristic from Long Island to Cape Cod and environs, sporadic northward
.....Northern Atlantic Coastal Plain Dry Hardwood Forest (2324)

25b. Forests inland from or north of the coastal plain, or if in the North Atlantic Coast ecoregion (TNC 62) then not dominated by *Quercus* spp. and/or *Fagus grandifolia* **26**

26a. Closed-canopy or essentially closed-canopy forests; may have well-developed grassy or ericads shrub understory but rarely with expanses of bare rock; not on strongly xeric sites; often covering large expanses.....**27**

26b. Partial canopy woodlands (canopy closure generally 20% - 60% overall and crowns not touching) of excessively drained hilltops, rocky slopes, or rarely sand plains; grassy or ericad shrub understory usually well developed except on expanses of bare rock; generally occurring as patchy landscape elements as opposed to matrix forest.....**29**

27a. Mixed, closed-canopy forests of *Quercus rubra* mixed with *Pinus strobus* and/or *Tsuga canadensis*, other oaks absent, *Acer rubrum* a common associate; *Fagus grandifolia* sometimes present or even co-dominating the hardwood portion; widespread in northern half of region (especially USFS Provinces 211 and M211)
..... **Laurentian-Acadian Pine-Hemlock-Hardwood Forest (2366)**

27b. Oak species other than *Quercus rubra* typically present and often dominant; more typical of southern half of region.....**28**

28a. Dry-mesic forests with a component of *Carya* spp. or *Liriodendron tulipifera* mixed with the typically dominant *Quercus* spp.; extending into this region only peripherally in the Central Appalachian and Western Allegheny Plateau portions of Pennsylvania and New York, and a portion of the Northern Piedmont in easternmost Pennsylvania and southeasternmost (mainland) New York[5]; pines (*Pinus strobus*) rarely prominent except in patches of successional forest; ericad shrubs sparse or absent, not forming a well-developed layer
.....Northeastern Interior Dry-Mesic Oak Forest (2303)

28b. Dry or dry-mesic forests of the High Allegheny Plateau (TNC 60), Great Lakes (TNC 48), St. Lawrence / Champlain Valley (TNC 64), and Lower New England / Northern Piedmont (TNC 61) ecoregions; or dry oak forests in the southernmost portions of the region; characterized by mixtures of *Quercus* spp., or *Quercus* spp. with *Carya* spp. and/or *Pinus* spp.; well-developed ericad shrub layer may be present (especially on drier sites)
..... Central Appalachian Dry Oak-Pine Forest (2369)

29a. Small-patch woodlands or partly wooded openings of cliff and/or talus slope settings.....**30**

29b. Woodlands or partly wooded openings of other settings: ridgetops, upper slopes and rock outcrops, or rarely (in western New York) limestone pavements or excessively well drained sandplains **34**

30a. Acidic, with *Pinus* spp., *Picea* spp., *Quercus* spp. or *Betula* spp. characteristic trees, and calciphilic herbs absent.....**31**

30b. Calcareous to circumneutral, with *Thuja occidentalis* a characteristic tree **32**

31a. Northern portions of region: Northern Appalachian – Boreal Forest (TNC 63), St. Lawrence / Champlain Valley (TNC 64), and Great Lakes (TNC 48) ecoregions, peripheral in Lower New England / Northern Piedmont ecoregion (TNC 61) where *Picea* spp. present
..... Laurentian-Acadian Acidic Cliff and Talus***

31b. Southern portions of region: Central Appalachian Forest (TNC 59), Western Allegheny Plateau (TNC 49), High Allegheny Plateau (TNC 60), Lower New England / Northern Piedmont (TNC 61) ecoregions**.....North-Central Appalachian Acidic Cliff and Talus*****

[5] *Quercus-Carya* forests do extend well northward into the region, but by convention, those north of the Central Appalachian and Western Allegheny Plateau ecoregions are treated as components of the Central Appalachian Dry Oak-Pine Forest (see other half of couplet).

32a. Northern portions of region: Northern Appalachian – Boreal Forest (TNC 63), St. Lawrence / Champlain Valley (TNC 64), and Great Lakes (TNC 48) ecoregions except along Lake Erie (USFS subsections 222Ia and 222Ib), peripheral in Lower New England / Northern Piedmont ecoregion (TNC 61) where *Thuja occidentalis* present ..... **Laurentian-Acadian Calcareous Cliff and Talus*****

32b. Southern portions of region: Central Appalachian Forest (TNC 59), Western Allegheny Plateau (TNC 49), High Allegheny Plateau (TNC 60), Lower New England / Northern Piedmont (TNC 61) ecoregions, and subsections 222Ia and 222Ib of the Great Lakes ecoregion) **33**

33a. West of the Appalachians: Western Allegheny Plateau (TNC 49) and Great Lakes (TNC 48) ecoregions ..... **Central Interior Calcareous Cliff and Talus*****

33b. Appalachian and eastward: Central Appalachian Forest (TNC 59), High Allegheny Plateau (TNC 60), and Lower New England / Northern Piedmont (TNC 61) ecoregions ..... **North-Central Appalachian Circumneutral Cliff and Talus*****

34a. Rare grass-savanna community ("oak openings") limited to a few locations in western New York's Erie-Ontario lakeplain (USFS Section 222I); sparse canopy of *Quercus muehlenbergii, Q. alba,* and *Q. velutina* over a well-developed herbaceous layer of prairie grasses including *Sorghastrum nutans, Andropogon gerardii,* and *Schizachyrium scoparium;* ericad shrubs not prominent; known examples in this region are primarily on dolomite knobs, historically and elsewhere on sand plains ..... **North-Central Oak Barrens (2395)**

34b. Not as above **35**

35a. Woodland or patchy wood-herbaceous cover on flat to nearly flat "pavement" settings of limestone, dolostone, or sandstone; rare **36**

35b. Woodland or patchy wood-herbaceous cover on rocky upper slopes, ridges and outcrops, often with wooded and open patches forming a mosaic; widespread **37**

36a. Alvars: rare woodland or patchy wooded-herbaceous communities on flat limestone or dolostone pavement near the Great Lakes, flooded in the springtime and drying out over the season; limited in this region to Jefferson County, New York (USFS subsections 211Ee and 222Ie); patchy and variable tree canopy of *Juniperus virginiana, Thuja occidentalis, Fraxinus americana, Acer saccharum, Ostrya virginiana, Quercus macrocarpa,* and others; *Juniperus communis, Shepherdia canadensis,* and *Arctostaphylos uva-ursi* characteristic shrubs; alvar woodlands typically occurring in a mosaic with alvar grasslands, alvar shrublands, and open limestone pavement ..... **Great Lakes Alvar (2409)**

36b. Sandstone pavement with *Pinus banksiana* characteristic and heath shrubs prominent in the understory or openings among the trees; limited in this region to Clinton County, New York (USFS subsection 211Ec) ..... **Laurentian Acid Rocky Outcrop*****

37a. *Pinus strobus, P. rigida,* or sometimes *P. resinosa* with *Quercus prinus, Q. rubra,* and/or *Q. ilicifolia* prominent; sometimes pines essentially absent and *Quercus prinus, Q. rubra, Ostrya virginiana,* or (uncommonly) *Acer saccharum* dominant; southern half of region: High Allegheny Plateau (TNC 60), Central Appalachian Forest (TNC 59), Lower New England / Northern Piedmont (TNC 61) ecoregions, as well as rocky portions of coastal ecoregions where *Pinus rigida* and/or *Quercus ilicifolia* are present
..... Central Appalachian Pine-Oak Rocky Woodland (2377)

37b. *Pinus strobus, Picea rubens,* and/or *Thuja occidentalis* characteristic conifers, often mixed with hardwoods including *Quercus rubra, Betula papyrifera, Acer saccharum, Ostrya virginiana,* and others; *Pinus rigida, Quercus ilicifolia, Quercus prinus* absent; northern half of region: Northern Appalachian – Boreal Forest ecoregion (TNC 63) and Great Lakes (TNC 48) ecoregions **38**

38a. Outcrops or summits of circumneutral to calcareous bedrock (or local calcium influence on primarily acidic rock), indicated by the dominance of *Thuja occidentalis, Acer saccharum, Ostrya virginiana* among the trees present; calciphilic herbs such as *Carex eburnea, Carex platyphylla, Solidago caesia, Asplenium* spp., etc. are good indicators where present, and heath shrubs are generally not common; scattered and uncommon in area
..... Laurentian-Acadian Calcareous Rocky Outcrop***

38b. Commonly found on ridges, outcrops, or summits of acidic bedrock; *Pinus* spp., *Picea rubens, Quercus rubra, Betula papyrifera, Betula populifolia* characteristic trees, and *Thuja occidentalis* absent or merely incidental; heath shrubs common and calciphilic herbs absent
.....Northern Appalachian-Acadian Rocky Heath Outcrop***

KEY B – WETLAND FORESTS & WOODLANDS

1a. Freshwater tidal wetlands occurring near the upper limit of tidal influence on coastal rivers, with partial or full tree cover, dominant species typically *Acer rubrum* and/or *Fraxinus pennsylvanica* ..... **Northern Atlantic Coastal Plain Tidal Swamp*****

1b. Non-tidal wooded wetlands **2**

2a. Floodplain and riparian settings in which river and stream processes are prominent; in some parts, flooded or saturated soils in spring do not necessarily remain so through the season..... **3**

2b. Basin wetlands, flatwoods, peatlands, seepage swamps (not associated with stream channels), and pondshores: moving-water forces less important than in floodplain and riparian settings; soils in most cases saturated for much or all of the growing season. **7**

3a. Floodplains dominated by *Picea* spp. and/or *Populus balsamifera*, in northernmost portions of region; *Acer saccharinum* absent..... **4**

3b. Floodplains and riparian wetlands through most of the region; *Acer saccharinum* often present and sometimes dominant; *Picea* spp. and *Populus balsamifera* absent or merely incidental **5**

4a. Spruce flats along small to medium-sized rivers dominated by *Picea rubens* and/or *P. mariana;* soils typically do not remain saturated to the surface through the season; canopy strongly coniferous ..... **Acadian Near-Boreal Spruce Flat (2465)**

4b. Deciduous floodplain forests dominated by *Populus balsamifera* and/or *Fraxinus nigra*, sometimes mixed with *Abies balsamea;* primarily Canadian, with a few documented in northern Maine..... **Eastern Boreal Floodplain (2444)**

5a. Floodplain forests and riparian wetlands of northern affinity: in USFS Sections 211A-E and all sections of M211 - basically the Northern Appalachian – Boreal Forest (TNC 63) and St. Lawrence / Champlain Valley (TNC 64) ecoregions (as well as the mapzone 66 portion of section 221A), north of the range of *Platanus occidentalis; Acer saccharinum* usually present and sometimes dominant..... **Laurentian-Acadian Floodplain Forest*** ..... **Laurentian-Acadian Floodplain Systems (2475) ****

5b. Floodplain forests and riparian wetlands of more central Appalachian affinity (Division 202 and the High Allegheny Plateau portion of Division 201), often with *Platanus occidentalis, Betula nigra,* or *Populus deltoides; Acer saccharinum* often present **6**

6a. Floodplains of larger-watershed rivers and streams in low-gradient areas, fairly extensive floodplain development; some depositional landforms (bars, levees, oxbows) usually well developed and vegetation often segregated by landform; some inclusions of higher-energy riparian communities may be present but overall character of the river reach is floodplain-dominated ..... **Central Appalachian River Floodplain*** ..... **Central Interior and Appalachian Floodplain Systems (2471) ****

6b. Wetland forests or irregular mosaics of forest, shrubland, and herbaceous wetland along streams of small watersheds with irregular flooding and little floodplain development; stream gradient varies; flooding tends to be variable and of shorter duration than in river floodplain systems ..... **Central Appalachian Stream and Riparian*** ..... **Central Interior and Appalachian Riparian Systems (2472) ****

7a. Acidic peatlands with a partial (usually stunted) tree cover and well-developed *Sphagnum* substrate; ericad shrubs (*Chamaedaphne calyculata, Ledum groenlandicum, Kalmia angustifolia, Rhododendron canadense, Kalmia polifolia, Andromeda polifolia* var. *glaucophylla)* usually form a dense layer or are at least common in patches; *Sphagnum* surface may be in contact with groundwater (acidic fens) or may be raised above the water table (true bogs) **8**

7b. Swamps with a full tree cover or, if with a <70% canopy cover then with a mineral soil substrate or at most a thin layer of peat over mineral soil; ericad shrubs not the dominant vegetation feature[6] **11**

8a. North Atlantic Coast ecoregion (TNC 62) or near-coastal plain if *Chamaecyparis thyoides* present ..... **Atlantic Coastal Plain Northern Bog*****

8b. Interior to the coastal plain and *Chamaecyparis thyoides* not present **9**

9a. Raised bogs in Maine, northernmost Vermont, and limited portions of the northern Adirondacks with a partial canopy or mosaic of open and wooded portions; peat accumulation and vegetation layer is raised above the water table over at least the central (sometimes off-center) part of the bog, creating ombrotrophic conditions; developing in large, more-or-less closed basins ..... **Boreal-Laurentian Bog***
..... **Boreal Swamp and Bog Systems (2477) ****

9b. Oligotrophic to minerotrophic peatlands in which vegetation is in contact with the water table, not distinctly raised above it; in various sized basins, including glacial kettleholes **10**

10a. Peatlands in the northern part of region: USFS Sections M211 or 211A,B,C,D,E[7]
..... **Boreal-Laurentian-Acadian Acidic Basin Fen***
..... **Laurentian-Acadian Shrub-Herbaceous Wetland Systems (2494) ****

10b. Peatlands in the southern part of region: USFS Sections 221, 222, or 211F,G,I,J
..... **North-Central Interior and Appalachian Acidic Peatland***
..... **Central Interior and Appalachian Swamp Systems (2479) ****

11a. Swamps dominated by *Chamaecyparis thyoides* or featuring it in a mixture with other wetland trees, typically *Acer rubrum* ..... **Northern Atlantic Coastal Plain Basin Peat Swamp***
..... **Gulf and Atlantic Coastal Plain Swamp Systems (2480) ****

11b. Swamps dominated by trees other than *Chamaecyparis thyoides* **12**

12a. Swamps with *Thuja occidentalis* dominant or a prominent component (usually >30% relative cover) **13**

12b. Swamps dominated by *Picea* spp., *Tsuga canadensis*, deciduous trees, or a mixture of those **14**

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[6] Acadian Near-Boreal Spruce Barrens (2464), in the northernmost portions of these mapzones, can have irregular topography with patches of heath shrubs on saturated soils in the lower areas; see couplet 15 in Key A.

[7] Occasionally, peatlands with more southerly coastal elements such as *Chamaecyparis thyoides* or *Ilex glabra* may occur in USFS subsection 211D: these should be considered outliers of the Atlantic Coastal Plain Northern Bog system (see couplet 8).

13a. Swamps in flat basins dominated by *Thuja occidentalis*
.....Laurentian-Acadian Alkaline Conifer-Hardwood Swamp*
.....Laurentian-Acadian Swamp Systems (2481) **

13b. Swamps on slopes, often adjacent to basins or streams, where the ground remains saturated by the movement of cold groundwater; *Thuja occidentalis* and/or *Picea rubens* dominant
.....Acadian-Appalachian Conifer Seepage Forest*
.....Laurentian-Acadian Swamp Systems (2481) **

14a. Swamps with *Picea* spp. dominant or, if mixed with deciduous trees, contributing the majority of the conifer cover; *Rhododendron maximum* and *Nyssa sylvatica* absent (rarely present in southern Maine).....**15**

14b. *Picea* spp. absent or essentially so, or (less commonly) if *Picea rubens* is dominant then associates include more temperate species such as *Rhododendron maximum* or *Nyssa sylvatica*; dominant trees usually include *Tsuga canadensis* or deciduous species **16**

15a. *Picea mariana* the dominant spruce; forested peatlands of northern Maine, northern Vermont, northern New Hampshire, and the Adirondacks; prominent heath shrub layer, usually featuring *Chamaedaphne calyculata* and/or *Ledum groenlandicum*
.....Boreal-Laurentian Conifer Acid Swamp*
..... Boreal Swamp and Bog Systems (2477) **

15b. Coniferous or mixed swamps with *Picea rubens* the dominant spruce, *Acer rubrum* the most common deciduous tree; forested swamps on mineral soil or at least not on deep peat; understory shrubs often present but not the characteristic bog ericads
..... Laurentian-Acadian Conifer-Hardwood Acid Swamp*
.....Laurentian-Acadian Swamp Systems (2481) **

16a. Deciduous swamps in the Northern Appalachian – Boreal Forest ecoregion (TNC 63) dominated by *Acer rubrum* or (less commonly) *Fraxinus* spp.; *Abies balsamea* a frequent associate**..... Laurentian-Acadian Conifer-Hardwood Acid Swamp***
.....Laurentian-Acadian Swamp Systems (2481) **

16b. Swamps elsewhere in the region.....**17**

17a. *Quercus* spp. (usually *Quercus palustris* and/or *Quercus bicolor*) dominant among the deciduous tree species.....**18**

17b. Swamps dominated by *Tsuga canadensis* or other conifers, or by *Acer rubrum, Nyssa sylvatica,* or *Fraxinus* spp.....**19**

18a. Basin swamps on mineral soil that may dry out over the course of the growing season, not featuring a central deeper depression or pond, not formed as a limestone collapse feature (sinkhole)**..... North-Central Interior Wet Flatwoods (2510)**

18b. Swamps formed around a limestone collapse feature (sinkhole), often only partially wooded; present in these regions only rarely, and at the southern periphery
..... Central Interior Highlands and Appalachian Sinkhole and Depression Pond***

19a. Coastal plain swamps with *Liquidambar styraciflua* present and often dominant or co-dominant with *Acer rubrum; Magnolia virginiana, Quercus phellos,* or other trees of coastal plain affinity that range primarily southward of these regions may also be present; rare in these regions, confined to southeasternmost New York state
..... Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest*
.....Gulf and Atlantic Coastal Plain Swamp Systems (2480) **

19b. Swamps interior from the coastal plain, or if in the coastal plain then lacking more southern-affinity tree species such as *Liquidambar styraciflua*, *Magnolia virginiana,* and *Quercus phellos*[8] **20**

20a. Small-patch swamps in circumneutral or more nutrient-rich settings (basins or gentle slopes), with *Fraxinus* spp. (*F. nigra* particularly characteristic), and/or *Larix laricina* present along with *Acer rubrum*; shrub or herb indicators of enriched conditions present, such as *Rhamnus alnifolia, Mitella nuda, Saxifraga pensylvanica, Geum rivale, Tiarella cordifolia;* central New York and southern New England southward (not expected in Northern Appalachian – Boreal Forest ecoregion, TNC 63)**.....North-Central Interior and Appalachian Rich Swamp***

20b. Hemlock-hardwood or hardwood swamps in acidic settings; *Tsuga canadensis, Acer rubrum,* and *Nyssa sylvatica* characteristic, *Fraxinus nigra* absent or unimportant; widespread and common, size variable; typical shrub associates include *Rhododendron maximum, Vaccinium* spp.**.....North-Central Appalachian Acidic Swamp***
.....Central Interior and Appalachian Swamp Systems (2479) **

[8] Swamps along stream channels may be considered part of the Central Appalachian Stream and Riparian System; see couplet 6B above.

KEY C – HERB/SHRUB AND SPARSELY VEGETATED UPLANDS

1a. Along or near the Atlantic or Great Lakes shores: sandy beaches and dunes, rocky shores along the immediate coastline, coastal grasslands/heathlands, and Great Lakes alvars.....**2**
1b. Settings other than coastal areas, including hills away from the immediate coastline.....**9**

2a. North Atlantic coast.....**3**
2b. Great Lakes shores.....**7**

3a. Substrate rock or cobble; mostly found in the coastal portion of the Northern Appalachian – Boreal Forest ecoregion (TNC 63), in small occurrences southwestward in the North Atlantic Coast ecoregion (TNC 62); vegetation mostly sparse **4**
3b. Substrate sand or sandy soils; mostly in the North Atlantic Coast ecoregion (TNC 62), occasionally northeastward in the coastal portion of the Northern Appalachian – Boreal Forest ecoregion (TNC 63).....**5**

4a. Consolidated rock substrate; rocky shores of various heights and slopes; vegetation mostly confined to cracks in the bedrock **.....Acadian-North Atlantic Rocky Coast***
4b. Loose cobble rock substrate, forming a rock beach **..... North Atlantic Cobble Shore***

5a. Rare coastal heathlands and grasslands located back from active dune areas; trees sparse or absent (where trees are present, *Pinus rigida* and/or *Quercus stellata* typical*)*; dominated by heath shrubs, particularly *Vaccinium* spp., *Gaylussacia* spp., and *Arctostaphylos uva-ursi; Hudsonia* spp. also characteristic along with native grasses such as *Schizachyrium* spp. and *Carex pensylvanica*; scattered locales on Cape Cod and the nearby islands and on Long Island**..... Northern Atlantic Coastal Plain Heathland and Grassland (2522)**
5b. Sand beach and dune systems with actively moving sand along the immediate shore **6**

6a. Beaches occurring shoreward of dunes, vegetation sparse, annual forbs prominent
.....Northern Atlantic Coastal Plain Sandy Beach*
.....Gulf and Atlantic Coastal Plain Sparsely Vegetated Systems (2498) **
6b. Dunes with more continuous vegetation, grasses prominent; may include shrubby portions or occasional stunted *Pinus rigida*
.....Northern Atlantic Coastal Plain Dune and Maritime Grassland (2436)

7a. Alvars: rare herbaceous or wooded-herbaceous communities on flat limestone or dolostone pavement near the Great Lakes, flooded in the springtime and drying out over the season; limited in this region to Jefferson County, New York (USFS subsections 211Ee and 222Ie); *Juniperus communis, Shepherdia canadensis,* and *Arctostaphylos uva-ursi* characteristic shrubs; alvar grassland and pavement vegetation with *Deschampsia cespitosa, Sporobolus* spp., *Carex crawei, Danthonia spicata;* sometimes interspersed with alvar woodlands featuring *Juniperus virginiana, Thuja occidentalis, Fraxinus americana, Acer saccharum, Ostrya virginiana, Quercus macrocarpa,* and others; typically in a mosaic of grasslands, shrublands, woodlands, and open limestone pavement**.....Great Lakes Alvar (2409)**
7b. Dunes and dune/swale complexes **8**

8a. Large stabilized dunes, mostly not immediately influenced by current shore processes, sometimes developing on old glacial moraines and may be many meters above current water levels, not forming a mosaic with interspersed dune swales prominent; vegetation varies from graminoid-dominated to shrubby to scattered trees ..... **Great Lakes Dune*** ..... **Laurentian-Acadian Sparsely Vegetated Systems (2499) ****

8b. Low dune ridges forming a mosaic pattern of dune ridges and wet swales; most often found where post-glacial streams entered an embayment and provided a dependable sand source; foredunes commonly 1-2 meters high, with *Ammophila breviligulata, Calamovilfa longifolia, Salix serissima, Salix cordata,* and *Populus balsamifera* most common; shrubby and wooded vegetation developing on backdunes; dune swales typically featuring *Juncus balticus, Juncus pelocarpus, Juncus nodosus, Eleocharis acicularis,* and *Schoenoplectus americanus;* possible only in western New York in these mapzones, and development of true ridge-and-swale morphology (as it is described from Michigan, for example) not confirmed ..... **Great Lakes Dune and Swale (2466)**

9a. Subalpine and alpine systems, mostly above 770 m (2500′), above the elevation of continuous tree cover but with scattered or sparse trees up to treeline; or rarely at lower elevations on the downeast Maine coastal mountains (Acadia National Park region); indicator species include *Betula papyrifera* var. *cordifolia, Vaccinium uliginosum, Empetrum* spp., *Rubus chamaemorus, Vaccinium boreale* and *Minuartia groenlandica* **10**

9b. Lower-elevation, or not strongly montane; indicator species listed above absent **11**

10a. True alpine dwarf-shrub and herbaceous vegetation of the region's highest elevations above treeline, with one or more of the diagnostic species *Diapensia lapponica, Rhododendron lapponicum, Harimanella hypnoides, Loiseleuria procumbens, Phyllodoce caerulea,* and *Carex bigelowii; Vaccinium uliginosum* typical and often dominant ..... **Acadian-Appalachian Alpine Tundra (2386)**

10b. Dwarf-shrub, herbaceous, and stunted woodland or krummholz vegetation near or above treeline, lacking the true alpine species; dominants include *Picea mariana, Betula papyrifera* var. *cordifolia, Vaccinium uliginosum, Empetrum* spp., *Kalmia angustifolia, Ledum groenlandicum*; small *Sphagnum* wetlands with *Vaccinium oxycoccos, Rubus chamaemorus,* etc., may occur in bedrock depressions; *Vaccinium boreale* and *Minuartia groenlandica* are diagnostic where present; extensive areas at treeline may be dominated by krummholz (shrub-form, matted, dense spruce, fir, and birch) ..... **Acadian-Appalachian Subalpine Woodland and Heath-Krummholz (2389)**

11a. Lakeshore or rivershore habitats, the upland portions usually occurring as very small patches among the more typical wetland portions, with vegetation usually sparse **12**

11b. Not along shores: rocky hilltops, cliffs, outcrops, etc **13**

12a. Boreal rivershores subject to regular and sometimes severe ice-scour that prevents the development of most floodplain forests; shorelines are a mosaic of shrublands, tall grasslands, graminoid-forb-dwarf shrub shoreline seeps, and (non-wetland) rivershore outcrops; characteristic species on the outcrops include *Allium schoenoprasum, Packera paupercula, Trisetum spicatum, Campanula rotundifolia*; where present, *Anemone multifida, Oxytropis campestris, Viola novae-angliae, ,* and/or *Muhlenbergia richardsonis* are diagnostic; peripheral in our region, known only from northern Maine and perhaps New Hampshire..... **Boreal Ice-Scour Rivershore***
..... **Laurentian-Acadian Floodplain Systems (2475) ****

12b. Lakeshores, and rivershores lacking the boreal ice-scour characteristics, more widespread through region..... **Laurentian-Acadian Rocky Lakeshore***
..... **Laurentian-Acadian Sparsely Vegetated Systems (2499) ****

13a. Flat sandplains often embedded within or adjacent to wooded pitch pine barrens, *Vaccinium angustifolium* and *Schizachyrium scoparium* typical, vegetation often appearing as a grassland, or less commonly as a dwarf shrubland (these are inclusions in a wooded system type but can occasionally occur as large openings)..... **14**

13b. Not on sandplains: hill summits, rock outcrops, cliffs, or talus slopes **15**

14a. Sandplain grasslands or dwarf shrublands expression of pine barrens in the North Atlantic Coast ecoregion (TNC 62) from southern Maine (rarely) and Cape Cod south to New Jersey; species with coastal affinities such as *Morella pensylvanica* and *Schizachyrium littorale* often present..... **Northern Atlantic Coastal Plain Pitch Pine Barrens (2355)**

14b. Sandplain grasslands or dwarf shrublands expression of pine barrens interior from the coastal plain, occurring in the more temperate portions of the region
..... **North-Central Appalachian Pine Barrens (2354)**

15a. Sparsely wooded or non-wooded hill summits or rock outcrops..... **16**

15b. Vertical or near-vertical cliffs and the talus slopes below them..... **17**

16a. Summits and outcrops of circumneutral to calcareous rock (limestone, dolomite, some basalts), with calciphilic plants such as *Carex eburnea, Carex platyphylla, Solidago caesia, Asplenium* spp., *Thuja occidentalis, Solidago ptarmicoides, Cystopteris bulbifera,* and/or *Dasiphora fruticosa* ssp. *floribunda;* typically summit or upper-slope small openings
..... **Laurentian-Acadian Calcareous Rocky Outcrop*****

16b. Summits and outcrops of acidic rock, heath shrubs including *Vaccinium* spp., *Kalmia angustifolia,* and/or *Gaylussacia baccata* often present; usually small but sometimes extensive along low- to mid-elevation ridgelines
..... **Northern Appalachian-Acadian Rocky Heath Outcrop*****

17a. Acidic, with *Pinus* spp., *Picea* spp., *Quercus rubra,* or *Quercus prinus* characteristic as scattered trees, and calciphilic herbs absent **18**

17b. Calcareous to circumneutral, with *Thuja occidentalis, Tilia americana,* and *Staphylea trifolia* characteristic as scattered trees, and with calciphilic herbs such as *Asplenium* spp., *Pellaea* spp., *Woodsia obtusa, Impatiens pallida, Carex eburnea, Carex scirpoidea, Cystopteris bulbifera, Cryptogramma stelleri,* etc. **19**

18a. Northern portions of region: Northern Appalachian – Boreal Forest ecoregion (TNC 63), St. Lawrence / Champlain Valley ecoregion (TNC 64), and Great Lakes ecoregion (TNC 48), peripheral in Lower New England / Northern Piedmont ecoregion (TNC 61) where *Picea* spp. present ..... **Laurentian-Acadian Acidic Cliff and Talus*****

18b. Southern portions of region: Central Appalachian Forest (TNC 59), Western Allegheny Plateau (TNC 49), High Allegheny Plateau (TNC 60), and Lower New England / Northern Piedmont (TNC 61) ecoregions ..... **North-Central Appalachian Acidic Cliff and Talus*****

19a. Northern portions of region: Northern Appalachian – Boreal Forest (TNC 63), St. Lawrence / Champlain Valley (TNC 64), and Great Lakes (TNC 48) ecoregions, except along Lake Erie (USFS subsections 222Ia and 222Ib), peripheral in Lower New England / Northern Piedmont ecoregion (TNC 61) where *Thuja occidentalis* present ..... **Laurentian-Acadian Calcareous Cliff and Talus*****

19b. Southern portions of region: Central Appalachian Forest (TNC 59), Western Allegheny Plateau (TNC 49), High Allegheny Plateau (TNC 60), and Lower New England / Northern Piedmont (TNC 61) ecoregions, and subsections 222Ia and 222Ib of the Great Lakes ecoregion (TNC 48) **20**

20a. West of the Appalachians: Western Allegheny Plateau (TNC 49) and Great Lakes (TNC 48) ecoregions ..... **Central Interior Calcareous Cliff and Talus*****

20b. Appalachian and eastward: Central Appalachian Forest (TNC 59), High Allegheny Plateau (TNC 60), and Lower New England / Northern Piedmont (TNC 61) ecoregions ..... **North-Central Appalachian Circumneutral Cliff and Talus*****

KEY D – HERBACEOUS AND HERB/SHRUB WETLANDS

1a. Tidal wetlands **2**
1b. Non-tidal wetlands **9**

2a. Brackish to freshwater tidal vegetation occurring on the reaches of large rivers influenced by both freshwater inputs and tidal flooding, including tall marsh vegetation dominated by graminoids such as *Zizania aquatica* and *Schoenoplectus* spp.; *Spartina* spp. may be present on lower reaches of the estuary but will be mixed with other brackish marsh species listed here; lower marshes dominated by forbs including *Limosella subulata, Sagittaria* spp., *Amaranthus cannabinus, Hibiscus moscheutos, Eriocaulon parkeri, Acorus calamus,* and *Isoetes riparia,* among others; *Distichlis, Salicornia,* and *Sarcocornia* are absent **3**
2b. Salt marshes at estuary mouths and salt marshes or salt ponds behind sandy beaches **5**

3a. Freshwater tidal vegetation near the upper tidal reaches of large rivers, characterized by *Zizania aquatica, Pontederia cordata, Sagittaria latifolia, Alisma plantago-aquatica, Eriocaulon parkeri, Lilaeopsis chinensis, Cardamine longii, Acorus calamus,* and *Isoetes riparia*
.....Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh*
..... Gulf and Atlantic Coastal Plain Tidal Marsh Systems (2490) **
3b. Brackish intertidal marshes of estuaries; tall graminoids such as *Schoenoplectus americanus, Schoenoplectus pungens, Spartina pectinata* and *Typha* spp. abundant; *Spartina patens* and/or *Spartina alterniflora* may be present on lower reaches of the estuary; some areas dominated by low forb vegetation including *Amaranthus cannabinus, Polygonum* spp., *Limosella subulata, Lilaeopsis chinensis, Sagittaria calycina* **4**

4a. Brackish tidal marshes north of Cape Cod (Massachusetts)**.....Acadian Estuary Marsh***
..... Laurentian-Acadian Salt Marsh and Estuary Systems (2491) **
4b. Brackish tidal marshes from Cape Cod southward
..... Northern Atlantic Coastal Plain Brackish Tidal Marsh*
..... Gulf and Atlantic Coastal Plain Tidal Marsh Systems (2490) **

5a. Salt ponds formed behind barrier beaches or sand spits, in which salinity can fluctuate widely over time depending on whether the pond has recently been flooded by saltwater as a result of a storm-driven breach of the barrier; irregularly flooded, with mixture of salt marsh, brackish marsh, and shrublands on the periphery of the pond and brackish subtidal vegetation in the pond; *Spartina* not dominant over large areas; rare, New Hampshire to Long Island (New York)**..... Atlantic Coastal Plain Northern Salt Pond Marsh*****
5b. Saltmarshes developing on flat shores, in some parts of the coast behind beach-dune systems, *Spartina patens* and/or *Spartina alterniflora* usually dominant over much of the marsh, widespread throughout the coastal region **6**

6a. Saltmarshes east and north of Merrymeeting Bay (Maine), not associated with sand beach and dune systems**.....Acadian Coastal Salt Marsh***
..... Laurentian-Acadian Salt Marsh and Estuary Systems (2491) **
6b. Saltmarshes south and west of Merrymeeting Bay **7**

7a. Saltmarshes from Cape Cod southward, mostly associated with sand beach and dune systems
.....Northern Atlantic Coastal Plain Tidal Salt Marsh*
.....Gulf and Atlantic Coastal Plain Tidal Marsh Systems (2490) **
7b. Saltmarshes from north of Cape Cod to Merrymeeting Bay **8**

8a. Small saltmarshes in pockets where the coastline is predominantly rocky, not associated with sandy beaches **.....Acadian Coastal Salt Marsh***
..... Laurentian-Acadian Salt Marsh and Estuary Systems (2491) **
8b. Saltmarshes developing behind beach-dune systems, sometimes extending up the associated outer river mouth; vegetation includes *Spartina* marshes, *Salicornia*-dominated salt pannes, and salt shrublands of *Iva frutescens, Baccharis halimifolia,* and *Panicum virgatum*
.....Northern Atlantic Coastal Plain Tidal Salt Marsh*
.....Gulf and Atlantic Coastal Plain Tidal Marsh Systems (2490) **

9a. Wetlands associated with Great Lakes dunes or estuaries.....**10**
9b. Wetlands not associated with Great Lakes dunes or estuaries **11**

10a. Graminoid or graminoid-shrub wetlands (dune swales) between or in front of dune ridges
..... Great Lakes Dune and Swale (2466)
10b. Wetlands occurring along the St. Lawrence River and portions of tributary rivers and streams that are directly affected by Great Lakes water regimes; settings include submergent marsh, emergent marsh, shore fens amd strands, and wet meadows
.....Great Lakes Freshwater Estuary and Delta*
.....Great Lakes Coastal Marsh Systems (2492) **

11a. Wetlands along river floodplains or immediate sides of stream channels, where river and stream processes are prominent; in some parts, flooded or saturated soils in spring do not necessarily remain so through the season.....**12**
11b. Moving-water forces less important than in river floodplain and riparian settings: basin wetlands, flatwoods, peatlands, seepage fens, and pondshores; soils in most cases saturated for much or all of the growing season. **15**

12a. Boreal rivershores subject to regular and sometimes severe ice-scour that prevents the development of most floodplain forests; shorelines are a mosaic of shrublands, tall grasslands, graminoid-forb-dwarf shrub shoreline seeps, and (non-wetland) rivershore outcrops; calciphilic herbs often present, especially in seeps, including *Pentaphylloides floribunda, Carex flava, Carex garberi, Lobelia kalmii, Triantha glutinosa, Parnassia glauca,* and others; peripheral in our region, known only from northern Maine and perhaps New Hampshire **.....Boreal Ice-Scour Rivershore***
.....Laurentian-Acadian Floodplain Systems (2475) **
12b. Rivershores lacking the boreal ice-scour characteristics, more widespread through region.....**13**

13a. Floodplain wetlands, usually interspersed with forest cover, of northern affinity (Division 201): in USFS Sections 211A-E and all sections of M211 - basically the Northern Appalachian – Boreal Forest (TNC 63) and St. Lawrence – Champlain Valley (TNC 64) ecoregions, as well as the mapzone 66 portion of section 221A; north of the range of *Platanus occidentalis; Acer saccharinum* usually present and sometimes dominant ..... **Laurentian-Acadian Floodplain Forest*** ..... **Laurentian-Acadian Floodplain Systems (2475) ****

13b. Floodplain and riparian wetlands of more central Appalachian affinity (Division 202, and the High Allegheny Plateau portion of Division 201), often with *Platanus occidentalis, Betula nigra,* or *Populus deltoides; Acer saccharinum* often present **14**

14a. Floodplains of larger-watershed rivers and streams in low-gradient areas, fairly extensive floodplain development; some depositional landforms (bars, levees, oxbows) usually well developed and vegetation often segregated by landform; some inclusions of higher-energy riparian communities may be present but overall character of the river reach is floodplain-dominated ..... **Central Appalachian River Floodplain*** ..... **Central Interior and Appalachian Floodplain Systems (2471) ****

14b. Wetland forests or irregular mosaics of forest, shrubland, and herbaceous wetland along streams of small watersheds with irregular flooding and little floodplain development; stream gradient varies; flooding tends to be variable and of shorter duration than in river floodplain systems ..... **Central Appalachian Stream and Riparian*** ..... **Central Interior and Appalachian Riparian Systems (2472) ****

15a. Peat-based wetlands (bogs and fens) **16**

15b. Wetlands on mineral soils or on submerged muck over mineral soil **22**

16a. Alkaline fens, with calciphilic indicator species including *Dasiphora fruticosa* ssp. *floribunda, Betula pumila, Carex flava, Carex sterilis, Parnassia glauca, Packera aurea, Lobelia kalmii, Salix candida* **17**

16b. Acidic fens and bogs with a well-developed *Sphagnum* substrate; ericad shrubs (*Chamaedaphne calyculata, Ledum groenlandicum, Kalmia angustifolia, Rhododendron canadense, Kalmia polifolia, Andromeda polifolia* var. *glaucophylla)* usually form a dense layer or are prominent in patches; calciphilic indicators are lacking; *Sphagnum* surface in contact with groundwater (acidic fens) or raised above the water table (true bogs) **18**

17a. Small sloping fens fed by springs or groundwater seepage, peat layer typically shallow; primarily in southern portion of these mapzones: Division 202, mostly Central Appalachian Foreset (TNC 59) and Lower New England / Northern Piedmont (TNC 61) ecoregions ..... **North-Central Appalachian Seepage Fen*****

17b. Basin fens of various sizes developing in areas of limestone bedrock, fen surface mostly not sloping, peat deposits typically deep; throughout these mapzones ..... **Laurentian-Acadian Alkaline Fen*****

18a. North Atlantic Coast ecoregion (TNC 62) or near-coastal plain if *Chamaecyparis thyoides* present ..... **Atlantic Coastal Plain Northern Bog*****

18b. Interior to the North Atlantic Coast (TNC 62) and *Chamaecyparis thyoides* not present **19**

19a. Oligotrophic to minerotrophic peatlands throughout the region; in various sized basins, including glacial kettleholes; vegetation in contact with the water table, not distinctly raised above it.....**21**

19b. Raised bogs in Maine, northernmost Vermont, and limited portions of the northern Adirondacks with a partial canopy or mosaic of open and wooded portions; peat accumulation and vegetation layer is raised above the water table over at least the central (sometimes off-center) part of the bog, creating ombrotrophic conditions; developing in large, more-or-less closed basins.....**20**

20a. Bogs along the eastern Maine coast (and a short ways inland, USFS subsection 211Cb) with a raised margin and flat center, graminoid carpets of *Trichophorum cespitosum* characteristic, *Empetrum nigrum* and *Rubus chamaemorus* indicator species; rarely, in extreme maritime settings, developing as blanket bogs over rock (in which case the noticeably raised margin is lacking) rather than as basin peatlands **.....Acadian Maritime Bog*** **..... Boreal Swamp and Bog Systems (2477) ****

20b. Bogs in more inland or southerly regions or, if near-coastal in subsection 211Cb, then lacking the maritime bog characteristics described above **..... Boreal-Laurentian Bog*** **..... Boreal Swamp and Bog Systems (2477) ****

21a. Peatlands in the northern part of region: USFS Sections M211 or 211A,B,C,D,E **..... Boreal-Laurentian-Acadian Acidic Basin Fen*** **..... Laurentian-Acadian Shrub-Herbaceous Wetland Systems (2494) ****

21b. Peatlands in the southern part of region: USFS Sections 221, 222, or 211F,G,I,J **..... North-Central Interior and Appalachian Acidic Peatland*** **.....Central Interior and Appalachian Swamp Systems (2479) ****

22a. Pondshores with sandy or gravelly substrate, usually exposed over the course of the season; vegetation often sparse and in concentric rings.....**23**

22b. Wetlands in various basin settings, including ponds and wet meadows, substrate primarily organic (usually muck), vegetation generally dense.....**25**

23a. Pondshores in the North Atlantic Coast ecoregion (TNC 62); sandy, groundwater flooded depressions with Coastal Plain floristic elements; diagnostic species include *Rhexia virginica, Gratiola aurea, Panicum verrucosum, Euthamia caroliniana (= Euthamia tenuifolia), Carex striata, Rhynchospora macrostachya, Xyris difformis, Fimbristylis autumnalis, Sabatia kennedyana, Drosera filiformis, Juncus repens;* some are permanently flooded, and in others the water level fluctuates over the season, often resulting in concentric rings of different vegetation associations **..... Northern Atlantic Coastal Plain Pond*****

23b. Pondshores interior from the coastal plain **24**

24a. Ponds and their shores formed by the collapse of limestone sinkholes, very rare in these mapzones **... Central Interior Highlands and Appalachian Sinkhole and Depression Pond*****

24b. Sparsely vegetated gravelly and sandy lakeshores throughout the region, not associated with karst features**..... Laurentian-Acadian Lakeshore Beach*** **.....Laurentian-Acadian Sparsely Vegetated Systems (2499)****

25a. Herbaceous emergent or submergent marshes in basins with permanent standing water; aside from *Typha*, vegetation generally does not persist through winter; typical species include *Typha* spp., *Schoenoplectus americanus, Thelypteris palustris, Impatiens capensis, Vallisneria americana, Potamogeton* spp., *Nuphar lutea* ssp. *advena,* and *Nymphaea odorata*.....**Laurentian-Acadian Freshwater Marsh***
..... Laurentian-Acadian Shrub-Herbaceous Wetland Systems (2494) **

25b. Herbaceous, herb-shrub, or shrub wetlands in seasonally flooded basins, usually without permanent standing water; vegetation persistent through winter; typical species include *Alnus, Calamagrostis canadensis, Carex stricta*
..... Laurentian-Acadian Wet Meadow-Shrub Swamp*
..... Laurentian-Acadian Shrub-Herbaceous Wetland Systems (2494) **