Field Key to Ecological Systems of Map Zones 54, 57, 59 60, and 61: Southern Piedmont, Southern Appalachia, Northeastern Piedmont, Chesapeake Bay, and Northern Appalachia (United States)

NatureServe
Terrestrial Ecology Department
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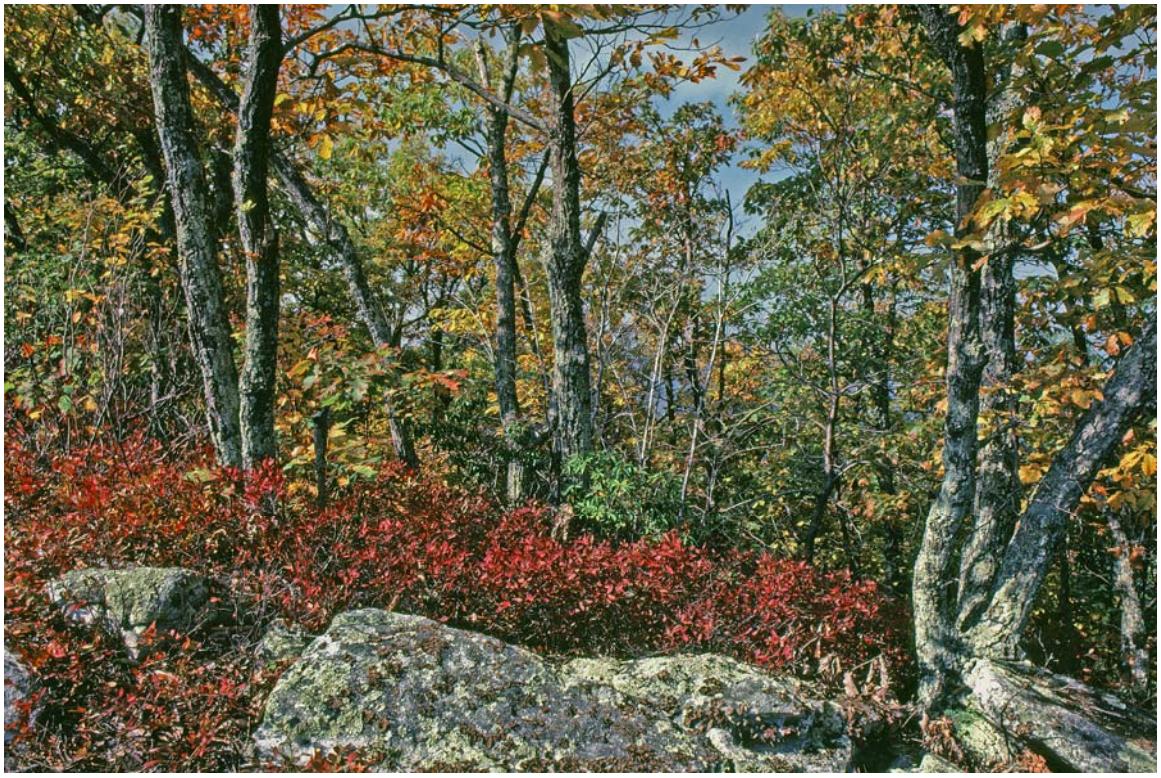

Montane Oak-Heath Forest in George Washington and Jefferson National Forest, Virginia.
photo © Gary P. Fleming

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Key to Ecological Systems of Map Zones 54, 57, 59 60, and 61

Contents

Introduction

The following keys to NatureServe ecological systems cover the areas found in NLCD map zones 54 (Southern Piedmont), 57 (Southern Appalachia), 59 (Northeastern Piedmont), 60 (Chesapeake Bay), and 61 (Northern Appalachia) (Figure 1). The systems included in these keys are intended to represent 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. However, we have chosen to be inclusive in the keys, so that the user will have information on these system types for comparison purposes. In some cases they 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).

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 numbers in

parentheses placed 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. In some cases (those marked with a single asterisk), these are systems that 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). In other cases, the systems are small-patch types not being addressed comprehensively by LANDFIRE and therefore not in the national legend; these are marked with a triple asterisk.

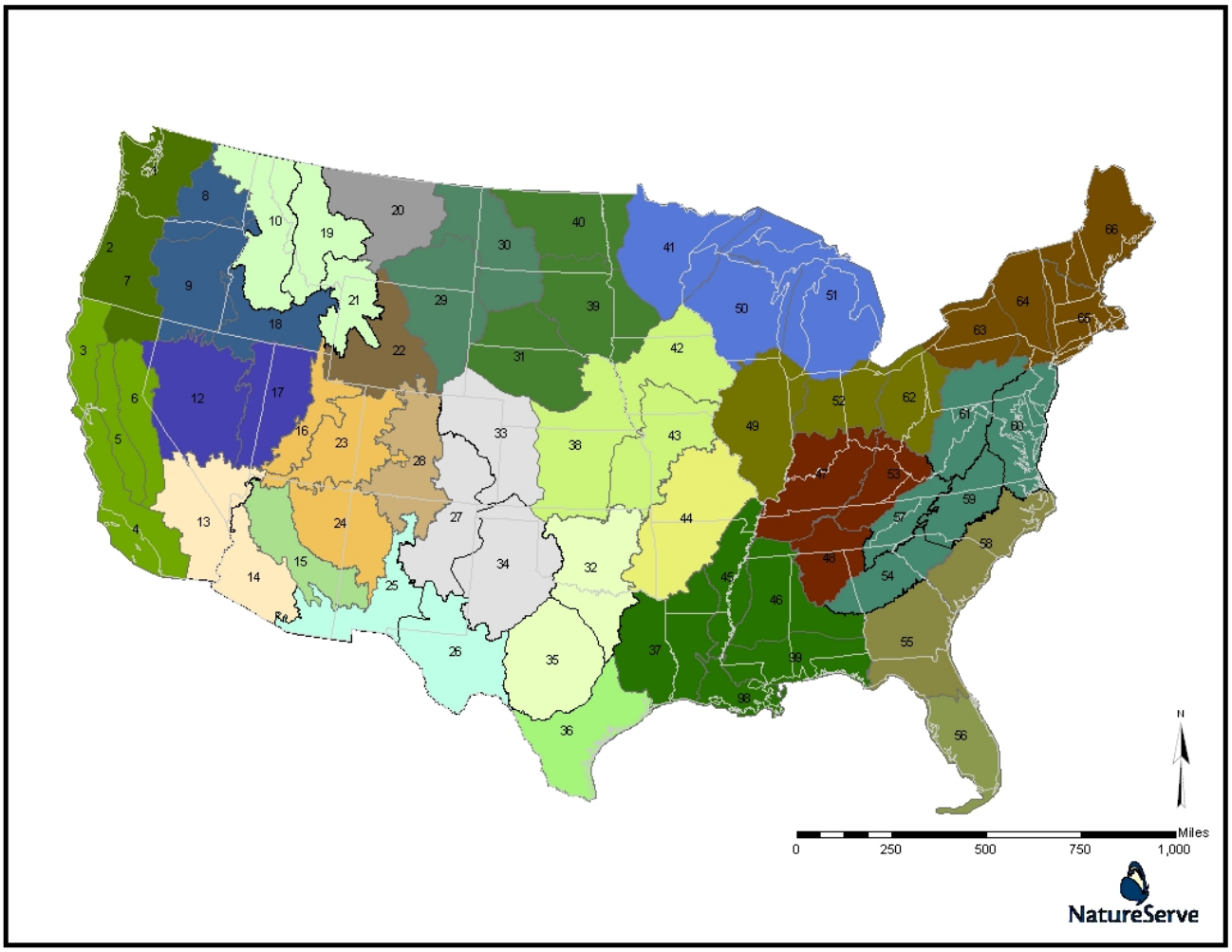

Figure 1. LANDFIRE map zone clusters with keys to ecological systems.

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, EPA level III ecoregions, TNC ecoregions, USFS Sections), and general hydrology (e.g. upland and wetland). Common terms instead of overly jargonistic or technical language is preferred in the key where possible, but some terms may require definition. 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. Systems may occur in the key in several places, if they include 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 will have 2 or more codominant species, which may or may not be present in all stands.

Some terminology is commonly employed throughout the keys that distinguish general spatial characteristics of the vegetation or environmental setting. 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 of some importance. These variables and others are used to provide the framework for the key.

Ideally, the user of the key will be able to locate themselves in relation to the EPA Level III Ecoregions (and in a few cases in relation to the Level IV subdivisions of those, see Figure 2), the US Forest Service ECOMAP regions (to the Section level, Figure 3) and The Nature Conservancy ecoregions (Figure 4). In some cases ecoregion may be the determining factor between two otherwise similar systems. In many cases, the ecoregional line correlates well with an observable variable in vegetation, topography, soil type, etc. Given the continuous nature of ecological variation, transitional areas may occur near an ecoregional boundary, so the lines should be considered as general guides.

Information about regional, state, and multi-state EPA Ecoregion products (.pdf maps at various sizes, as well as shapefiles) can be obtained at http://www.epa.gov/wed/pages/ecoregions/level_iv.htm.

Further details on TNC ecoregions and the USFS ECOMAP divisions can be found via http://www.natureserve.org/explorer/eodist.htm.

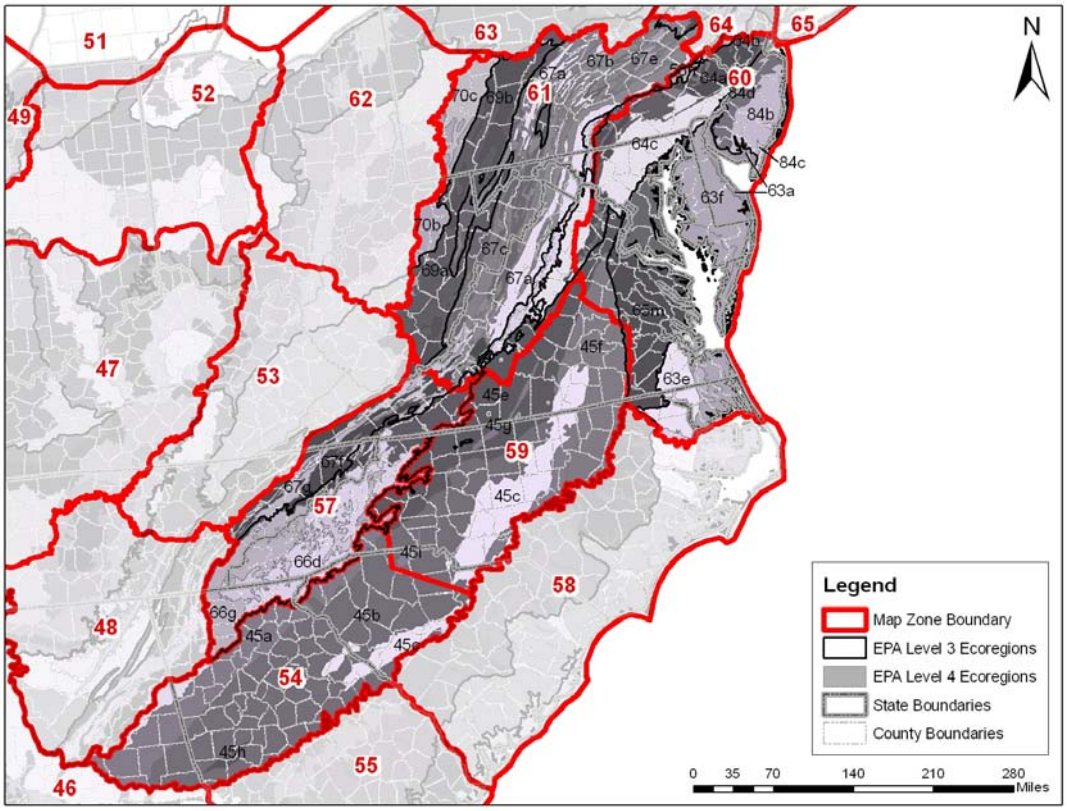

Figure 2 – EPA Level III and Level IV Ecoregions for Map Zones 54, 57, 59, 60, & 61

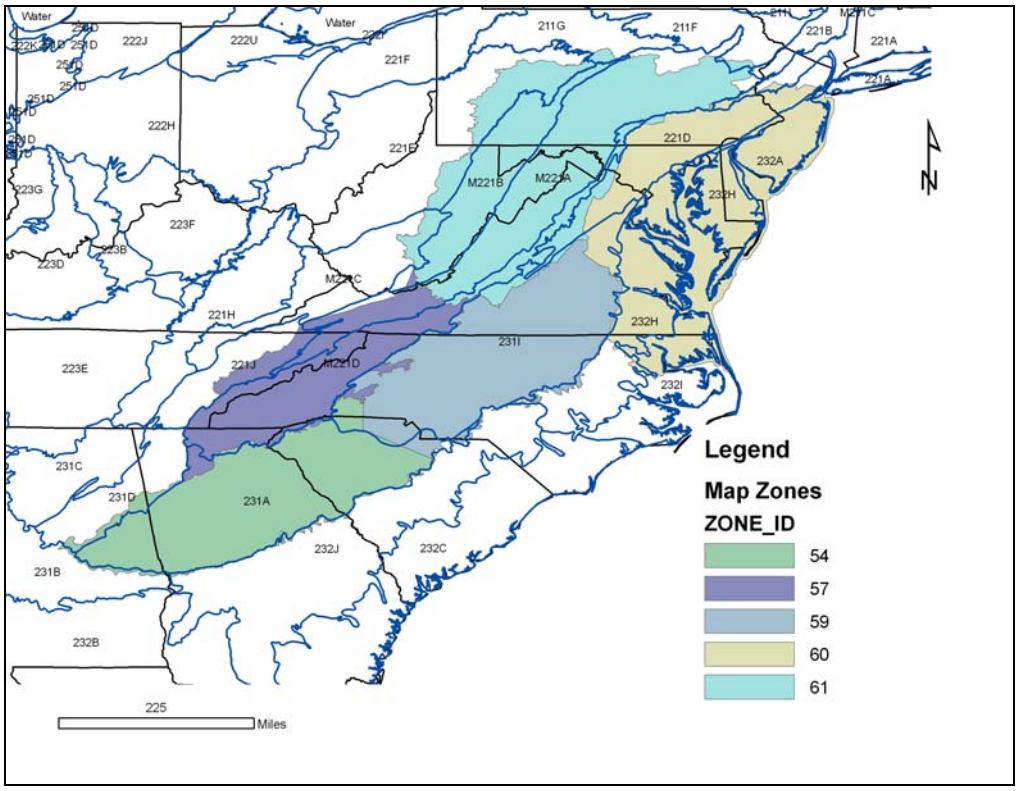

Figure 3 – US Forest Service ECOMAP Sections for Map Zones 54, 57, 59, 60, & 61

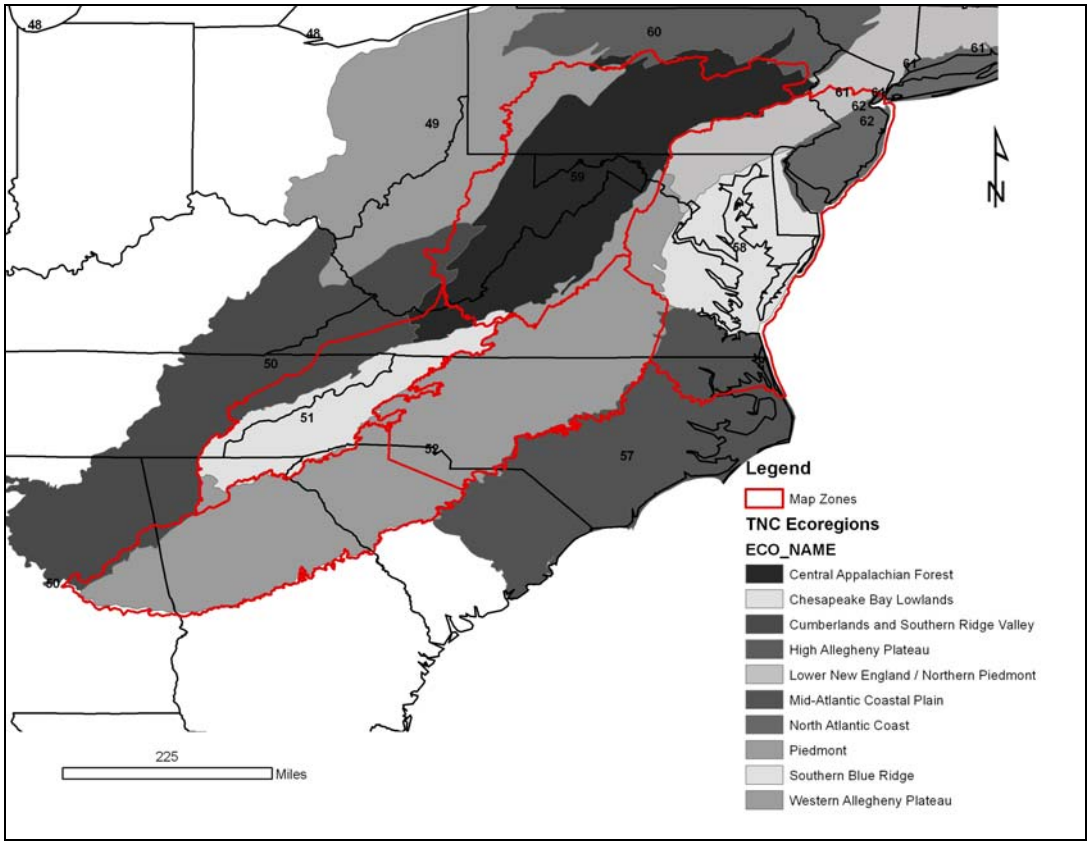

Figure 4 – TNC Ecoregions for Map Zones 54, 57, 59, 60, & 61

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 of them.

Land Use, Unvegetated, Semi-natural and Altered Vegetation

Legend unit	EVT (where applicable)	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. 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.
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 slight or 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, teasel, 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 (sometimes) forestry. It is characterized by combinations of early-successional trees that cannot be identified as natural ecological systems. In the northeast, these forests often contain substantial

		amounts of red maple, white pine, Virginia pine, red-cedar, aspen, and/or birch, with associates of sassafras, persimmon, 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 hemlocks, and given time will follow a trajectory towards one of the later successional forest types.
Ruderal Forest - Southeast Hardwood and Conifer	2533	Upland forests resulting from succession following virtually complete removal of native woody cover of an area, i.e. land clearing for agriculture or (sometimes) forestry. It is characterized by combinations of early-successional trees that cannot be identified as natural ecological systems. In the southeast, these forests often contain substantial amounts of loblolly pine, Virginia pine, red-cedar, sweet-gum, and tuliptree, with associates of sassafras, persimmon, and other old-field trees. They may contain lesser amounts of more natural matrix forest species such as oaks or other hardwoods, and given time will follow a trajectory towards one of the later successional forest types.
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/disturbed by introduced tree species.
Introduced Upland Vegetation - Shrub	8402	Land cover is significantly altered/disturbed by introduced woody and/or herbaceous vegetation (including .
Introduced Upland Vegetation – Annual Grassland	8405	Land cover is significantly altered/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/disturbed by introduced, non-native perennial grasses and forbs. Natural vegetation types are no longer recognizable.
Introduced Wetland Vegetation	8411	Land cover is altered/disturbed and dominated by introduced wetland vegetation. Species may include *Lythrum salicaria, Phalaris arundinacea, Phragmites australis*, etc.
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[1] or shrubs as uppermost layer, with total woody cover in that layer 10-15% or more **2**
1b. Total woody cover in the uppermost stratum less than 10-15%; though total woody cover may be greater; uppermost vegetation stratum strongly herbaceous **3**
2b. Upland forests, woodlands, and savannas/glades (composition is not affected by flooding or saturated soil conditions) .....**Key A**
2a. Wetland forests, woodlands, and shrublands (composition is affected by flooding or saturated soil conditions; including floodplains and bottomlands as well as seepage forests), see Key D for wetlands with a prominent herbaceous layer as "canopy" ..... **Key B (p. 15)**
3a. Open uplands (e.g. dune grasslands and shrublands, dry summits) ..... **Key C (p. 21)**
3b. Open wetlands (including pond margins, marshes, sloughs, and wet depressions) ..... **Key D (p. 23)**

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, <u>not</u> being mapped by LANDFIRE; included for completeness of the key.

KEY A – UPLAND FORESTS, WOODLANDS, AND SAVANNAS

1a. Pine (*Pinus* spp.), spruce (*Picea* spp.), fir (*Abies spp.*), or red-cedar (*Juniperus virginiana*) dominant; if mixed with deciduous trees then conifer cover greater than that of deciduous trees.....**2**
1b. Pine, spruce, fir, or red-cedar not dominant, though may be present; deciduous tree cover generally exceeds conifer cover.....**13**

2a. *Picea rubens* and/or *Abies fraseri* >10% relative canopy cover, *Tsuga canadensis* <30% relative canopy cover; montane, usually above 900m (3000′) elevation ..... **Central and Southern Appalachian Spruce-Fir Forest (2350)**
2b. Pines (various species) or *Juniperus virginiana* dominant.....**3**

3a. *Pinus palustris* characteristic, either dominant or as a subordinate to other pine (usually *P. taeda*).....**4**
3b. Other pine species, or *Juniperus virginiana*, dominant; *Pinus palustris* absent or essentially so.....**5**

4a. Southern portion of mapzone 60 (TNC Ecoregion 57), Coastal Plain south of the James River in Virginia..... **Atlantic Coastal Plain Upland Longleaf Pine Woodland (2347)**

4b. Not on the coastal plain, in mapzones 54 & 59, rare; *Pinus* x *sondereggeri* (hybrid of *P. palustris* and *P. taeda*) may occur with *P. palustris* .....**Southeastern Interior Longleaf Pine Woodland (2351)**

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

5a. Woodlands (or sometimes closed-canopy forests, especially after fire suppression) over serpentine bedrock with *Pinus virginiana, Juniperus virginiana,* or other conifers, very limited and usually small-patch, except some larger MD and PA occurrences; *Quercus stellata* and *Q. marilandica* often present; herbaceous indicators include *Packera plattensis, Hexastylis arifolia* var. *ruthii, Thalictrum macrostylum, Symphyotrichum depauperatum* ..... **Appalachian Serpentine Woodland (2375)**

5b. Open woodlands or forests, not on serpentine, wider-ranging **6**

6a. Coastal Plain (EPA Ecoregions 63, 65, 84) **7**

6b. Interior from the coastal plain..... **10**

7a. Pine barrens on extensive flat sandy deposits (not maritime dunes), generally not along the immediate coast; northern coastal plain species such as *Morella pensylvanica, Hudsonia ericoides, Corema conradii, Quercus marilandica, Ilex opaca* often present; uplands (for wetland pine barrens, see couplet 19 in Key B) .... **Northern Atlantic Coastal Plain Pitch Pine Barrens (2355)**

7b. Maritime forests and woodlands (sometimes patchy in a matrix of herbaceous and shrubland vegetation) along the immediate coast, influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast **8**

8a. Tree cover not continuous (though may be sizeable patches); dune system with a patchwork of grassland, shrubland, and woodland cover; dominant trees are *Pinus rigida, Pinus taeda,* and/or *Juniperus virginiana* (mostly a non-wooded type but may have wooded portions) ..... **Northern Atlantic Coastal Plain Dune and Maritime Grassland (2436)**

8b. Vegetation primarily woody, not herbaceous; *Pinus taeda*[2], *Pinus rigida, Pinus virginiana* are the typical pine species **9**

9a. Southern portion of mapzone 60 only (S of the Delmarva Peninsula); *Quercus virginiana* and *Morella cerifera* typically present ..... **Central Atlantic Coastal Plain Maritime Forest (2361)**

9b. Delmarva Peninsula and northward; *Pinus rigida* often present, *Quercus virginiana* absent; occurrences often have areas dominated by stunted deciduous trees including *Quercus falcata, Quercus stellata, Acer rubrum, Prunus serotina* ..... **Northern Atlantic Coastal Plain Maritime Forest (2379)**

10a. *Pinus pungens* present and often dominant; oaks may be associated but generally make up <25% of the canopy cover; very exposed sites, typically on convex ridgelines; range centered on Southern Blue Ridge (EPA ecoregion 66) north to southernmost Pennsylvania, occasionally west in the southern Ridge & Valley ..... **Southern Appalachian Montane Pine Forest and Woodland (2352)**

10b. *Pinus pungens* absent; settings various..... **11**

[2] Areas with *Pinus taeda* strongly dominant (and not planted) are considered ruderal forests in this group of mapzones: see Ruderal Forest - Northern and Central Hardwood and Conifer (2532) in mapzones 60 and 61, or Ruderal Forest - Southeast Hardwood and Conifer (2533) in mapzones 54, 57, and 59

11a. *Pinus echinata* and/or *Pinus virginiana* strongly dominant; canopy often more or less closed but may exhibit woodland physiognomy in places; *Juniperus virginiana* unimportant; acidic substrates at low to mid elevations (< 700m) in the southern Appalachians and adjacent Piedmont, and the Cumberlands ..... **Southern Appalachian Low-Elevation Pine Forest (2353)**
11b. Open-canopy or patchy-canopy woodlands, dominants various **12**

12a. Open-canopy or patchy-canopy woodlands with prominent grassy layer ("glades") with *Juniperus virginiana, Pinus virginiana,* and/or *Pinus echinata,* often mixed with oak; some areas of open rock may be included; Piedmont north to about the James River (Virginia), EPA ecoregion 45 ..... **Southern Piedmont Glade and Barrens*****
12b. *Pinus pungens* absent, *Pinus rigida* and/or *Pinus strobus* characteristic, often mixed with oaks; conifer-dominated patches are usually within a matrix of a mixed oak-pine woodland on exposed ridges; range centered on Central Appalachians, Ridge & Valley, and Northern Piedmont in these mapzones..... **Central Appalachian Pine-Oak Rocky Woodland (2377)**

13a. Coastal plain (mapzone 60 and EPA ecoregions 63, 65, 84)..... **14**
13b. Interior from the coastal plain..... **19**

14a. Maritime forests and woodlands (sometimes patchy in a matrix of herbaceous and shrubland vegetation) along the immediate coast, influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast..... **15**
14b. Forests and woodlands not along the immediate coast and not influenced by salt spray or other maritime exposure, though they may be near-coastal **16**

15a. Southern portion of mapzone 60 only (S of the Delmarva Peninsula); the broad-leaved evergreens *Quercus virginiana* and *Morella cerifera* typically present..... ..... **Central Atlantic Coastal Plain Maritime Forest (2361)**
15b. Delmarva Peninsula and north, *Pinus rigida* often present, north of the range of *Quercus virginiana*; occurrences often have areas dominated by stunted deciduous trees including *Quercus falcata, Quercus stellata, Acer rubrum, Prunus serotina* ..... **Northern Atlantic Coastal Plain Maritime Forest (2379)**

16a. Rare system of wooded ravines formed by erosion in Tertiary-aged shell deposits or limesands, forming nutrient-rich substrates; seepage wetlands often present at slope bases, with braided streams common; limitation to calcium-rich, shell-containing formations is diagnostic..... **Northern Atlantic Coastal Plain Calcareous Ravine*****
16b. In settings other than ravines in calcium-rich, shell-containing formations..... **17**

17a. Northern coastal plain, Delmarva Peninsula north; characterized by oaks , often mixed with pine; more mesic areas characterized by *Fagus grandifolia* ..... **Northern Atlantic Coastal Plain Hardwood Forest (2324)**
17b. Central coastal plain, south of the Delmarva Peninsula and James River..... **18**

18a. Drier settings, *Fagus grandifolia* absent or very minor ..... **Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (2335)**
18b. More mesic settings, *Fagus grandifolia* characteristic and often prominent ..... **Atlantic Coastal Plain Mesic Hardwood Forest (2343)**

19a. Cliff and/or partly open talus slope vegetation, woody cover often patchy, variable cover..... **20**
19b. Vegetation in settings other than cliffs and partly open talus, ranging from closed-canopy forest on deeper soils, to woodlands/glades on shallow soils over consolidated rock, or shale barrens on loose scree..... **22**

20a. Acidic rock substrate (e.g. sandstones and granitic rocks); typical trees include *Quercus prinus, Quercus rubra,* and *Betula lenta* ..... **North-Central Appalachian Acidic Cliff and Talus*****
20b. Circumneutral to calcareous rock substrate (e.g. limestone or dolomite); typical trees include any of *Thuja occidentalis, Quercus muehlenbergii, Acer saccharum, Tilia americana, Fraxinus americana*..... **21**

21a. Appalachian and eastward: EPA ecoregions 64 and northern portions of 67 and 69 (as well as a sliver of 58)..... **North-Central Appalachian Circumneutral Cliff and Talus*****
21b. Western Allegheny Plateau, continuing westward: EPA ecoregion 70 (in these mapzones) ..... **Central Interior Calcareous Cliff and Talus*****

22a. Northern hardwoods and/or mixed mesophytic forest species are dominant, and hemlock may be locally important: characteristic trees may include any combination of *Acer saccharum, Fraxinus americana, Betula alleghaniensis, Tuga canadensis, Prunus serotina, Magnolia acuminata, Magnolia fraseri, Magnolia tripetala, Aesculus flava, Halesia tetraptera,* and/or *Tilia americana* **23**
22b. Various types of oak-dominated or oak-characterized forests **27**

23a. Rich mesophytic forests with diverse herb layers, often in protected settings; characteristic trees include *Magnolia acuminata, Magnolia fraseri, Magnolia tripetala, Aesculus flava, Halesia tetraptera, Acer barbatum, Acer leucoderme, Tilia americana*; characteristic herbs include *Caulophyllum thalictroides, Cimicifuga racemosa, Panax quinquefolius, Adiantum pedatum*; some inclusions of hemlock may be present **24**
23b. Hardwood or hemlock-hardwood forests characterized by *Acer saccharum, Fraxinus americana, Prunus serotina,* etc., without a rich herb layer; on various landforms **25**

24a. Central Appalachians and Southern Blue Ridge: EPA Ecoregions 66, 69, and the portion of 67 that covers ECOMAP subsections M221Aa, M221Ca, M221Cb, 231Ia, 231Ig (basically Virginia and West Virginia) ..... **Southern and Central Appalachian Cove Forest (2318)**
24b. Cumberland and Allegheny Plateaus, west of the Allegheny Front: EPA ecoregions 67 (excluding subsections listed in previous half of couplet – basically the Tennessee portion of ecoregion 67) and 70 ..... **South-Central Interior Mesophytic Forest (2321)**

25a. Piedmont location (EPA ecoregions 45 and 64) and *Tsuga canadensis* absent or merely incidental; some species more typical of southern regions present, such as *Acer barbatum, Acer leucoderme, Oxydendrum aroboreum, Hexastylis* spp., *Magnolia tripetala, Euonymus americana* ..... **Southern Piedmont Mesic Forest (2316)**

25b. Mostly interior from the Piedmont or characterized by *Tsuga canadensis* (some hemlock-hardwoods are found on the western edge of Virginia's Piedmont; they will key here) **26**

26a. Mapzone 57 and extreme southern portions of mapzone 61 at higher elevations (>1100 m in EPA ecoregion 67 or 69, or >900 m elevation in EPA ecoregion 66); southern Appalachian character (endemics or near-endemics such as *Halesia tetraptera, Rhododendron catawbiense, Leucothoe fontanesiana* or *Ageratina altissima* var. *roanensis* typically present) ..... **Southern Appalachian Northern Hardwood Forest (2309)**

26b. Not in mapzone 57, throughout mapzone 61 (EPA ecoregions 62, 66, 67, 69, 70) and in the Northern Piedmont of mapzone 60 (EPA ecoregion 64); moderate to lower elevations; southern Appalachian endemics absent, more Central Appalachian in character ..... **Appalachian (Hemlock)-Northern Hardwood Forest (2370)**

27a. High-elevation forests (> 900 m or 3000′), exposed, trees often stunted or wind-flagged; *Quercus rubra* the major oak species (*Quercus alba* or *Quercus prinus* may be present at all but the highest elevations), sprouts of *Castanea dentata* common ..... **Central and Southern Appalachian Montane Oak Forest (2320)**

27b. Low to moderate elevation forests, a variety of oak species may be present **28**

28a. Dry forests or woodlands on calcareous substrates characterized by *Quercus muehlenbergii, Quercus shumardii*; mapzones 57 & 61, not in EPA ecoregion 66 ..... **29**

28b. Forests and woodlands (including shale barrens and glade-and-barren systems) without a strongly calcareous character, throughout region **31**

29a. Calcareous forests with more or less continuous canopies; *Quercus shumardii* characteristic along with *Quercus muehlenbergii* and sometimes *Quercus stellata*; grassy layer generally not well developed; Cumberlands and Southern Ridge and Valley (EPA ecoregions 67, 69) ..... **Southern Ridge and Valley / Cumberland Dry Calcareous Forest (2376)**

29b. Calcareous glades and woodlands with patchy canopy and prominent grassy (or graminoid) layer **30**

30a. Northern Ridge and Valley (EPA ecoregion 67a, b, c, and d, south to Roanoke VA, mapzone 61 and northernmost 57, TNC ecoregion 59); characteristic forbs include *Asclepias verticillata, Monarda fistulosa, Salvia lyrata, Symphyotrichum oblongifolium,* and *Brickellia eupatorioides* (these may also be in the Southern Ridge and Valley system) ..... **Central Appalachian Alkaline Glade and Woodland (2400)**

30b. Southern Ridge and Valley (EPA ecoregion 67 south of Roanoke, mapzone 57, TNC ecoregion 50); characteristic forbs include *Eryngium yuccifolium, Manfreda virginica,* and *Hypericum dolabriforme* ..... **Southern Ridge and Valley Calcareous Glade and Woodland*****

31a. Glade-and-barren or shale barren systems with sparse to moderate tree cover that is strongly patchy with openings of either sparse herbaceous vegetation over scree, or graminoid-dominated herb layers.....**32**
31b. Closed-canopy forests, sometimes with parts grading to woodlands (25-60% canopy cover), but overall more closed than glades or shale barrens **34**

32a. Shale barrens developing on steep slopes of loose shale scree, vegetation often very patchy with partial canopy of dry-site pine (*Pinus* spp.) and/or oak (*Quercus* spp.) species ..... **Appalachian Shale Barrens (2340)**
32b. Glades of patchy trees and graminoid openings developing on shallow soils over consolidated bedrock of upper slopes and ridges **33**

33a. Eastern and central Piedmont, mapzones 54 and 59 (EPA ecoregion 45), bedrock not mafic, generally acidic (e.g. granite or shale)..... **Southern Piedmont Glade and Barrens*****
33b. Upper Piedmont and Southern Appalachians, extending north into the Central Appalachians (EPA ecoregions 45, 66, 67); on mafic bedrock (mostly basic substrate, such as greenstone or amphibolite) ..... **Southern and Central Appalachian Mafic Glade and Barrens*****

34a. Oak-dominated forests of the Southern Appalachians and Piedmont (EPA ecoregions 45, 66b-f).....**35**
34b. Oak-dominated forests of the Ridge and Valley, Central Appalachians, Northern Piedmont, and Western Allegheny Plateau (EPA Ecoregions 58, 64, 66a, 67, 69, 70).....**37**

35a. Southern Appalachian region (EPA 66b-f); distinguished from Piedmont forests by the presence of plant species of southern Appalachian affinity such as *Magnolia fraseri, Gaylussacia ursina, Rhododendron calendulaceum,* and others ..... **Southern Appalachian Oak Forest (2315)**
35b. Piedmont region (EPA ecoregion 45).....**36**

36a. Forests or woodlands on a clay hardpan soil dominated by *Quercus stellata* on flats or narrow ridges; local, primarily in the Triassic Basins or Carolina Slate Belt .....**Piedmont Hardpan Woodland and Forest (2342)**
36b. Forests not dominated by *Quercus stellata*; other upland oaks and pines dominate, with hickories *Carya* spp.) often present; earlier-successional examples are often more strongly pine-dominated with oaks and hickories increasing over time; widely distributed ..... **Southern Piedmont Dry Oak-(Pine) Forest(2368)**
37a. West of the Allegheny Front (EPA ecoregions 69 & 70) and in portions of the Central Ridge and Valley sections (USFS 221J, the central part of EPA ecoregion 67).....**38**
37b. East of the Allegheny Front: Central Appalachians, Northern Ridge and Valley, or Piedmont (EPA ecoregion 67 northern part, corresponding to USFS section M221A, and eastward) **40**

38a. Dry oak forests on highly acidic, exposed ridges and plateaus, often with ericad shrub layers; more-mesic site species such as *Quercus rubra* and *Acer saccharum* essentially absent .....**Allegheny-Cumberland Dry Oak Forest and Woodland (2317)**

38b. In dry-mesic settings including open slopes, lower peaks, less exposed ridgelines, and the upper parts of broad valley bottoms; more-mesic oak species such as *Quercus ru*bra or other mesic hardwoods like *Acer saccharum* common **39**

39a. In USFS section M221C (part of EPA ecoregion 69), more Southern Appalachian in character, i.e. with plant species of southern Appalachian affinity such as *Magnolia fraseri, Gaylussacia ursina, Rhododendron calendulaceum,* and others (see also couplet 36) ..... **Southern Appalachian Oak Forest (2315)**

39b. Lacking Southern Appalachian character; more widespread northward .....**Northeastern Interior Dry-Mesic Oak Forest (2303)**

40a. Forests on drier sites, with coarse, well-drained soils; *Quercus prinus* a typical and often dominant oak species; forests may be all oak or mixed oak-pine; some inclusions of pine forest may also be present; heaths shrubs common and often forming a well-developed shrub layer ..... **Central Appalachian Dry Oak-Pine Forest (2369)**

40b. Forests on somewhat more mesic sites; *Quercus prinus* less important than *Q. rubra, Q. alba, Q. velutina,* and/or *Q. coccinea; Carya alba, C. ovata,* and/or *C. ovalis* may be common associates; pines rarely prominent except in patches of successional forest (*Pinus strobus* and/or *P. virginiana*); heath shrubs often present but a well-developed shrub layer is not a general characteristic of the system.....**Northeastern Interior Dry-Mesic Oak Forest (2303)**

KEY B – WETLAND FORESTS, WOODLANDS, AND SHRUBLANDS

1a. In the Coastal Plain – EPA ecoregion 63, 65, 84 ..... **2**
1b. Interior to the coastal plain **20**

2a. Tidal wooded wetlands **3**
2b. Non-tidal wooded wetlands **4**

3a. South of the James River and Delmarva Peninsula (TNC Ecoregion 57)
..... **Southern Atlantic Coastal Plain Tidal Wooded Swamp***
..... **Gulf and Atlantic Coastal Plain Swamp Systems (2480) ****
3b. Delmarva Peninsula north (TNC Ecoregions 58, 62)
..... **Northern Atlantic Coastal Plain Tidal Swamp*****

4a. River and stream processes are prominent: riparian and floodplain settings **5**
4b. Moving-water forces less important: basin wetlands, flatwoods, peatlands, seepage swamps, and pondshores. **9**

5a. North of the James River (VA); TNC Ecoregions 58, 62
..... **Northern Atlantic Coastal Plain Stream and River***
..... **Gulf and Atlantic Coastal Plain Swamp Systems (2480) ****
5b. South of the James River and Delmarva Peninsula (TNC Ecoregion 57) **6**

6a. Blackwater streams and rivers: waters carrying little mineral sediment, usually strongly stained by tannins (i.e. the color of dark tea) but with little suspended clay and not turbid **7**
6b. Brownwater streams and rivers: waters originating in portions of the coastal plain, Piedmont, or other inland areas where fine-textured sediments predominate, and therefore carrying substantial amounts of suspended silt and clay (water may appear muddy) **8**

7a. Forests or 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 and vegetation more uniform..... **Atlantic Coastal Plain Blackwater Stream Floodplain Forest***
..... **Gulf and Atlantic Coastal Plain Floodplain Systems (2473) ****
7b. Floodplains of larger-watershed rivers and streams in low-gradient areas, fairly extensive floodplain development; depositional landforms (bars, levees, oxbows) better developed and vegetation better segregated by landform
..... **Atlantic Coastal Plain Small Blackwater River Floodplain Forest***
..... **Gulf and Atlantic Coastal Plain Floodplain Systems (2473) ****

8a. Forests or mosaics of forest, shrubland, and herbaceous wetland along streams of small watersheds with irregular flooding and little floodplain development; gradient varies; flooding tends to be variable and of shorter duration than in river floodplain systems and vegetation more uniform..... **Atlantic Coastal Plain Brownwater Stream Floodplain Forest***
..... **Gulf and Atlantic Coastal Plain Floodplain Systems (2473) ****

8b. Floodplains of larger-watershed rivers and streams in low-gradient areas, fairly extensive floodplain development; depositional landforms (bars, levees, oxbows) better developed and vegetation better segregated by landform
..... **Atlantic Coastal Plain Small Brownwater River Floodplain Forest***
..... **Gulf and Atlantic Coastal Plain Floodplain Systems (2473) ****

9a. Pondshores and lakeshores **10**

9b. Other settings **12**

10a. "Delmarva Bays": ponds in sandy-rimmed groundwater flooded depressions, often partly wooded with *Liquidambar styraciflua, Acer rubrum, Quercus palustris,* and *Quercus phellos*; herbaceous flora characterized by species generally restricted to the Coastal Plain such as *Rhexia virginica, Gratiola aurea, Panicum verrucosum, Carex striata, Juncus repens, Muhlenbergia torreyi, Boltonia asteroides, Fimbristylis perpusilla, Coelorachis rugosa, Saccharum giganteum, Dichanthelium spretum*. 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*****

10b. Coastal Plain south of the Delmarva Peninsula **11**

11a. Shores of large natural lakes of the southeastern coastal plain; in mapzone 60 only in the most southern portions, southernmost Virginia south (TNC ecoregion 57), rare .....
..... **Southeastern Coastal Plain Natural Lakeshore*****

11b. Small wetlands in depressions within unconsolidated sediments, often resulting from subsidence of limestone; water level often fluctuates and vegetation often zoned, with some areas of herbaceous dominance and some rings of tree or shrub dominance; southernmost Virginia south (TNC ecoregion 57)
..... **Southern Atlantic Coastal Plain Depression Pondshore*****

12a. Swamps in flat basins (closed or open), with more-or-less full canopy and some combination of *Acer rubrum, Nyssa sylvatica* (sometimes *Nyssa biflora*), *Chamaecyparis thyoides, Quercus bicolor, Quercus palustris*, and/or *Liquidambar styraciflua;* neither *Arundinaria tecta* nor *Pinus serotina* is characteristic **13**

12b. Seepage wetlands on slopes, partly wooded or shrubby peatland pocosins, or partly wooded bogs and fens **15**

13a. Basin swamps south of the James River with a deciduous or mixed canopy; *Taxodium, Nyssa* are characteristic trees, as is sometimes *Chamaecyparis thyoides*
..... **Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (2501)**

13b. Basin swamps north of the James River, with *Acer rubrum, Liquidambar styraciflua, Quercus phellos, Nyssa sylvatica* (sometimes *Nyssa biflora*)..... **14**

14a. Hardwood swamps of seasonally flooded but not permanently saturated basins; mineral or muck soils, typical trees include *Acer rubrum, Liquidambar styraciflua, Nyssa sylvatica, Quercus phellos,* and *Fraxinus pennsylvanica*
..... **Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest***
.....**Gulf and Atlantic Coastal Plain Swamp Systems (2480) ****

14b. Saturated, acidic, peat-based swamps, usually dominated by *Chamaecyparis thyoides*, sometimes mixed with *Acer rubrum*..... **Northern Atlantic Coastal Plain Basin Peat Swamp***
.....**Gulf and Atlantic Coastal Plain Swamp Systems (2480) ****

15a. Peat-based pocosins or streamhead seepage swamps south of the James River, on acidic substrates.....**16**

15b. Wetlands north of the James River, or if south, then either on calcareous substrates or with *Pinus palustris* characteristic and often dominant.....**17**

16a. Basin hydrology prevails; canebrakes or peatland pocosins in broad flats or gentle basins where peat develops; canebrakes characterized by dominance of *Arundinaria tecta,* pocosins characterized by *Pinus serotina, Gordonia lasianthus, Magnolia virginiana, Persea palustris, Cyrilla racemiflora, Ilex coriacea, Ilex glabra, Lyonia lucida, Lyonia mariana, Smilax laurifolia, Zenobia pulverulenta* over a peat substrate
.....**Atlantic Coastal Plain Peatland Pocosin and Canebrake (2452)**

16b. Seepage hydrology prevails; wetlands in ravines or along headwater streams in dissected landscapes, not flat basins
.....**Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (2468)**

17a. Calcium-rich seepage wetlands associated with wooded ravines formed by erosion in Tertiary-aged shell deposits or limesands, forming nutrient-rich substrates; braided streams common; limitation to calcium-rich, shell-containing formations diagnostic
.....**Northern Atlantic Coastal Plain Calcareous Ravine*****

17b. Acidic wetlands, different settings **18**

18a. Central Atlantic coastal plain, southern Virginia (James River) south; *Pinus palustris* characteristic and often dominant
.....**Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (2449)**

18b. North Atlantic coastal plain.....**19**

19a. Wetlands characterized by *Pinus rigida* in the pine barrens region (southern New Jersey southward to the northern Chesapeake Bay region), hydrology variable; usually extensive, though may occur in small isolated depressions
.....**Northern Atlantic Coastal Plain Pitch Pine Lowland (2456)**

19b. Small bogs in isolated basins north of the pine barrens region, usually surrounded by pitch pine / oak forests (if undeveloped), vegetation usually shrub-dominated
.....**Atlantic Coastal Plain Northern Bog*****

20a. Floodplain or riparian setting.....**21**

20b. Basin swamps, pondshores, bogs, fens, seepage swamps: wetlands not associated with a floodplain or riparian setting **26**

21a. Floodplains of larger-watershed rivers and streams in low-gradient areas, fairly extensive floodplain development; depositional landforms (bars, levees, oxbows) better developed and vegetation better segregated by landform.....**22**
21b. Forests or mosaics of forest, shrubland, and herbaceous wetland along streams of small watersheds with irregular flooding and little floodplain development; gradient varies; flooding tends to be variable and of shorter duration than in river floodplain systems and vegetation more uniform.....**24**

22a. Piedmont, south of the Potomac River (EPA ecoregion 45)
.....**Southern Piedmont Large Floodplain Forest***
.....**Central Interior and Appalachian Floodplain Systems (2471) ****
22b. Northern Piedmont (north of the Potomac), Central and Southern Appalachians, and west **23**

23a. Northern Piedmont, Northern Ridge and Valley, and Central Appalachians west to the Allegheny Mountains.....**Central Appalachian River Floodplain***
.....**Central Interior and Appalachian Floodplain Systems (2471) ****

23b. Western Allegheny Plateau, Cumberlands, limited pockets in Southern Blue Ridge
.....**South-Central Interior Large Floodplain***
.....**Central Interior and Appalachian Floodplain Systems (2471) ****

24a. Piedmont, south of the Potomac River (EPA ecoregion 45) .....
.....**Southern Piedmont Small Floodplain and Riparian Forest***
.....**Central Interior and Appalachian Riparian Systems (2472) ****
24b. Northern Piedmont(north of the Potomac), Central and Southern Appalachians and west **25**

25a. Northern Piedmont, Northern Ridge and Valley, and Central Appalachians west to the Allegheny Mountains.....**Central Appalachian Stream and Riparian***
.....**Central Interior and Appalachian Riparian Systems (2472) ****

25b. Western Allegheny Plateau, Cumberlands, limited pockets in Southern Blue Ridge
.....**South-Central Interior Small Stream and Riparian***
.....**Central Interior and Appalachian Riparian Systems (2472) ****

26a. Mapzone 61, isolated wetlands with a perched water table in poorly drained uplands or shallow depressions in glacial plains; *Quercus palustris* and/or *Quercus bicolor* characteristic and often dominant (> 15% relative canopy cover)
.....**North-Central Interior Wet Flatwoods (2518)**
26b. Not in mapzone 61, or if there, then not dominated by *Quercus palustris* or *Quercus bicolor* **27**

27a. Pondshores and sinkholes (including sagponds) in isolated upland depressions, generally in limestone or dolomite areas and often formed by karst collapse or large or small extent
.....**Central Interior Highlands and Appalachian Sinkhole and Depression Pond*****
27b. Swamps in flat basins (closed or open), bogs, fens, or seepage swamps, not formed by substrate solution and collapse, often more extensive.....**28**

28a. Peatlands: bogs and fens, usually Sphagnum-based, either without trees or with a partial and interrupted canopy of stunted trees, and with prominent shrub/herb openings; usually "small-patch" systems of a few hectares or less **29**

28b. Basin swamps and seepage swamps on mineral soil (rarely on well-decomposed peat) with a more well-developed and continuous canopy; size variable **31**

29a. Sphagnum peatlands in small closed basins, mostly in glaciated or peri-glacial terrain; usually shrub/herb dominated but sometimes with partial tree cover (Pennsylvania and northern New Jersey in these mapzones). **North-Central Interior and Appalachian Acidic Peatland*** ..... **Central Interior and Appalachian Swamp Systems (2479)****

29b. Wetlands associated with flat sites in the High Alleghenies, Southern Blue Ridge, Central Appalachians, Cumberland Mountains, and possibly adjacent areas; Virginia and West Virginia southward **30**

30a. Wetlands in the High Alleghenies at elevations of > 1200 m (4000'), physiognomy and size varies from small-patch isolated wetlands to large complexes that may include areas of open peatland, wooded swamps, open mineral-soil wetlands, etc. ..... **High Allegheny Wetland*** ..... **Central Interior and Appalachian Swamp Systems (2479) ****

30b. Wetlands at lower elevations in the Southern Blue Ridge, Central Appalachians, and Cumberlands, generally "small-patch" systems of a few hectares or less ..... **Southern and Central Appalachian Bog and Fen*****

31a. Small seepage (groundwater-fed) wetlands associated with headwater streams or slope bases **32**

31b. Small to large basin wetlands varying from seasonally to permanently saturated, some with standing water **33**

32a. Piedmont region south of the Potomac River (EPA ecoregion 45, mapzones 54 and 59); seepage bogs or partly wooded seepage swamps, often on gentle slopes ..... **Piedmont Seepage Wetland*****

32b. Cumberland Plateau, Ridge and Valley, and locally in the southern Blue Ridge (mapzone 57) ..... **Cumberland Seepage Forest*****

33a. Wetlands in the High Alleghenies at elevations of > 1200 m (4000'), physiognomy and size varies from small-patch isolated wetlands to large complexes that may include areas of open peatland, wooded swamps, open mineral-soil wetlands, etc. ..... **High Allegheny Wetland*** ..... **Central Interior and Appalachian Swamp Systems (2479) ****

33b. Wetlands at lower elevations **34**

34a. Isolated wetlands of small, shallow basins in which *Quercus* usually dominates tree layer; Piedmont south of the Potomac River (EPA ecoregion 45) and limited areas in the adjacent Southern Blue Ridge (EPA ecoregion 66) ..... **Piedmont Upland Depression Swamp*****

34b. Basin wetlands of the Northern Piedmont (north of the Potomac), Central Appalachians, Ridge and Valley, and Western Allegheny Plateau in mapzones 60 and 61 (EPA ecoregions 64, 67, 69, 70 and a sliver of 58), usually not dominated by oaks **35**

35a. Basin wetlands with a shrub canopy (*Alnus* spp., *Cephalanthus occidentalis and Vaccinium corymbosum* typical shrubs), trees very sparse, mostly northernmost areas of these mapzones ..... **Laurentian-Acadian Wet Meadow-Shrub Swamp*** ..... **Laurentian-Acadian Shrub-Herbaceous Wetland Systems (2494) ****

35b. Basin wetlands that are primarily forested (though may have small shrubby openings) **36**

36a. Hemlock-hardwood or hardwood swamps in acidic settings; *Tsuga canadensis*, *Acer rubrum*, and *Nyssa sylvatica* characteristic, *Fraxinus nigra* absent or unimportant ..... **North-Central Appalachian Acidic Swamp*** ..... **Central Interior and Appalachian Swamp Systems (2479) ****

36b. Circumneutral or more nutrient-rich settings, with *Fraxinus* spp. (*F. nigra* particularly characteristic), and/or *Larix laricina* present along with *Acer rubrum* ..... **North-Central Interior and Appalachian Rich Swamp*** ..... **Central Interior and Appalachian Swamp Systems (2479) ****

KEY C – HERB/SHRUB AND SPARSELY VEGETATED UPLANDS

1a. Coastal sand beaches and dunes **2**
1b. Settings other than coastal sand beaches and dunes **3**

2a. 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) ****
2b. Dunes, vegetation more continuous, grasses prominent
..... **Northern Atlantic Coastal Plain Dune and Maritime Grassland (2436)**

3a. Southern Appalachians, Cumberlands, or Southern Ridge and Valley, sometimes extending into isolated montane areas (monadnocks) of the adjacent higher Piedmont, or southern part of the Central Appalachians: EPA ecoregions 66; 67f, g, h, i; **4**
3b. Piedmont, Central Appalachians, Western Alleghenies: EPA ecoregions 67a, b, c, d, e; 64, 45; 69, 70, and slivers of 58 and 62 (in these mapzones) **11**

4a. Balds, summits, ridges, and upper slopes: not predominantly vertical **5**
4b. Vertical (or near-vertical) rock faces and talus **7**

5a. Vegetation dense, not sparse, and without extensive bare rock: high elevation upland grass and shrub bald of the Southern Blue Ridge or Central Appalachians (southern portion); >1525 m (5000'), occasionally down to 1035 m (3400')
..... **Southern Appalachian Grass and Shrub Bald (2414)**
5b. Vegetation patches interspersed with extensive areas of bare or lichen-covered rock, or vegetation sparse overall **6**

6a. Smooth, curved, exfoliated outcrops of massive granite and related rocks, usually occurring as knobs rather than summit ridges; crevices largely lacking; vascular vegetation very sparse except for mats forming in shallow depressions and around the edges; may occur in the upper Piedmont on monadnocks as well as in the Southern Blue Ridge
..... **Southern Appalachian Granitic Dome***
..... **Central Interior and Appalachian Sparsely Vegetated Systems (2497) ****
6b. Rugged or fractured rock outcrops of peaks, ridgetops, upper slopes, and other topographically exposed locations; rock typically felsic or mafic, not granitic; low herbaceous or dwarf-shrub vegetation patches developing in pockets or crevices, with typical species including *Carex misera, Saxifraga michauxii,* and *Vaccinium corymbosum*
..... **Southern Appalachian Rocky Summit***
..... **Central Interior and Appalachian Sparsely Vegetated Systems (2497) ****

7a. Limestone or dolomite cliffs or sinkholes **8**
7b. Cliffs and associated formations of acidic rock such as sandstone **9**

8a. Walls of limestone sinkholes ..... **Southern Interior Sinkhole Wall*****
8b. Cliffs and associated formations, not sinkholes ..... **Southern Interior Calcareous Cliff*****

9a. Cumberlands (EPA ecoregion 67f,g,h,i, 69d,e)..... **Cumberland Acidic Cliff and Rockhouse*****
9b. Southern Blue Ridge (EPA ecoregion 66), possibly in suitable areas of the adjacent upper Piedmont; steep to vertical rock outcrops (and talus slopes), usually in stream or river gorges or bluffs; sparse vascular vegetation limited to plants on bare rock, small ledges and crevices...**10**

10a. Rock outcrops that are kept wet by spray from waterfalls and densely or moderately covered with bryophytes or algae..... **Southern Appalachian Spray Cliff*****
10b. Steep rock outcrops on lower slopes in montane regions, not subject to constant spray; herbs include a suite of rock outcrop specialists such as *Saxifraga michauxii*, *Hylotelephium telephioides*, *Asplenium montanum*, and *Polypodium* spp.; may occur in limited areas of the upper Piedmont as well as in the Southern Blue Ridge ..... **Southern Appalachian Montane Cliff and Talus*****

11a. Small, non-wooded openings in environmentally similar matrix of woodland or glade vegetation (these systems are classed as Forest and Woodland but may include openings within them which would key out here) **12**
11b. Cliffs or outcrops quite distinct from the surrounding vegetation..... **14**

12a. Steep shale slopes with loose scree substrate, patchy vegetation, usually with some areas of open woodland and some areas without woody vegetation or very sparsely vegetated ..... **Appalachian Shale Barrens (2340)**
12b. Rock substrate predominantly consolidated, not loose scree **13**

13a. On serpentine or other ultramafic rock; *Pinus virginiana* or *Pinus rigida* usually present; herb indicators include *Packera plattensis, Hexastylis arifolia var. ruthii, Thalictrum macrostylum, Symphyotrichum depauperatum*..... **Appalachian Serpentine Woodland (2375)**
13b. On calcareous substrate; *Quercus muehlenbergii* characteristic; *Pinus* spp. and *Quercus stellata* generally sparse or absent, *Carex eburnea* a diagnostic herb (though not always present) ..... **Central Appalachian Alkaline Glade and Woodland (2400)**

14a. Southern Piedmont (EPA ecoregion 45)..... **15**
14b. Northern Piedmont, Central Appalachians and westward..... **16**

15a. Flatrock formations on granite, mostly horizontal to gently sloping..... ..... **Southern Piedmont Granite Flatrock and Outcrop*****
15b. Cliffs and associated formations, not flat expanses of rock ..... **Southern Piedmont Cliff*****

16a. Acidic rock substrate (e.g. sandstones and granitic rocks) ..... **North-Central Appalachian Acidic Cliff and Talus*****
16b. Circumneutral to calcareous rock substrate (e.g. limestone and dolomite)..... **17**

17a. Appalachian and eastward: EPA ecoregions 64 and northern portions of 67 and 69 (as well as a sliver of 58)..... **North-Central Appalachian Circumneutral Cliff and Talus*****
17b. Western Allegheny Plateau, continuing westward: EPA ecoregion 70 (in these mapzones) ..... **Central Interior Calcareous Cliff and Talus*****

KEY D – HERBACEOUS AND HERB/SHRUB WETLANDS

1a. Tidal wetlands **2**
1b. Non-tidal wetlands **6**

2a. South of the James River (VA) and Delmarva Peninsula **3**
2b. Delmarva Peninsula northward **4**

3a. Marshes of fresh tidal waters in the drowned creeks and estuary shores of the embayed region; typically complexes of vegetation patches dominated by large graminoids such as *Spartina cynosuroides, Cladium mariscus* ssp. *jamaicense, Schoenoplectus pungens, Typha angustifolia, Typha latifolia,* and *Juncus roemerianus*; associates include at least some species intolerant of saltwater such as *Pontederia cordata, Sagittaria subulata, Isoetes riparia, Eriocaulon parkeri,* etc.
..... **Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh*****
3b. Intertidal flats that are tidally flooded with salt to brackish water in the Embayed Region; primarily herbaceous marsh, extensive areas dominated by *Juncus roemerianus*, areas near tidal inlets with salt marsh dominated by *Spartina alterniflora*; includes smaller areas of hypersaline flats dominated by *Distichlis spicata* and *Sarcocornia*, and salt tolerant shrublands ..... **Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh***
..... **Gulf and Atlantic Coastal Plain Tidal Marsh Systems (2490) ****

4a. Freshwater tidal vegetation occurring on the upper reaches of large rivers influenced by tidal flooding, inicluding tall marsh vegetation dominated by graminoids such as *Zizania aquatica* and *Schoenoplectus pungens*, lower marshes dominated by forbs including *Amaranthus cannabinus, Hibiscus moscheutos, Eriocaulon parkeri, Acorus calamus,* and *Isoetes riparia,* among others **Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh***
..... **Gulf and Atlantic Coastal Plain Tidal Marsh Systems (2490) ****
4b. Salt to brackish marshes, *Spartina* usually present **5**

5a. Mesohaline to saline intertidal marshes of saltwater bays and outer river mouths; 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) ****
5b. Brackish intertidal marshes of estuaries; *Spartina* may be present but tall graminoids such as *Schoenoplectus americanus* and *Typha angustifolia* are also abundant; other herbs include *Amaranthus cannabinus, Polygonum* spp., *Limosella, Lilaeopsis; Distichlis, Salicornia,* and *Sarcocornia* are absent ..... **Northern Atlantic Coastal Plain Brackish Tidal Marsh***
..... **Gulf and Atlantic Coastal Plain Tidal Marsh Systems (2490) ****

6a. Wetlands forming in pockets between coastal dunes from southern Virginia southward (TNC Ecoregion 57)..... **Southeastern Coastal Plain Interdunal Wetland*****
6b. Wetlands not associated with coastal dunes (dune systems north of the James River in southern Virginia may have small wetland swales embedded within them; these are considered inclusions in the Northern Atlantic Coastal Plain Dune and Maritime Grassland system) **7**

7a. Small wetlands on gentle slopes, fed primarily by groundwater seepage **8**
7b. Marshes and shrub-swamps in topographic basins, deep or shallow **9**

8a. Southern Appalachians, occasionally in Cumberlands (EPA ecoregions 66c-f, 69d-e)
.....**Southern Appalachian Seepage Wetland*****
8b. Central Appalachians, Northern Piedmont, and western Allegheny Plateau: EPA ecoregions 64, 66a-b, 67a-e, 69, 70 (in these mapzones) .....**North-Central Appalachian Seepage Fen*****

9a. High-elevation wetlands of the Allegheny Mountains, lower elevation limit ranging from 730 m (2400') in Maryland to 940 m (3100') in southern West Virginia; basins forming in headwater basins where drainage is impounded by knickpoints of resistant bedrock
..... **High Allegheny Wetland***
.....**Central Interior and Appalachian Swamp Systems (2479) ****
9b. Wetlands at lower elevations and not in the Allegheny Mountains, common in the glaciated Northeast; sporadic southward where occurrences are primarily in beaver-impacted wetlands...**10**

10a. Coastal plain ponds and their shores in sandy, groundwater flooded depressions characterized by a flora generally restricted to the Coastal Plain, from the Delmarva Peninsula north to Cape Cod; 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, Muhlenbergia torreyi, Rhynchospora oligantha, Rhynchospora cephalantha, Rhynchospora chalarocephala, Boltonia asteroides, Fimbristylis perpusilla, Coelorachis rugosa, Dichanthelium spretum*. Some are permanently flooded, and in others the water level fluctuates over the season, often resulting in concentric rings of different vegetation associations. "Delmarva Bays", one expression of this system, are often partly wooded with *Liquidambar styraciflua, Acer rubrum,* and *Quercus phellos*
..... **Northern Atlantic Coastal Plain Pond*****
10b. Not in the coastal plain, or if so then without strong presence of Coastal Plain flora and vegetation not in shallow groundwater-fed basins that may be concentrically patterned.....**11**

11a. Herbaceous or herb-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) ****
11b. Herbaceous emergent or submergent marshes in basins with permanent standing water, vegetation generally non-persistent through winter; typical species include *Typha latifolia, Typha angustifolia, 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) ****