

Appendix II:

Dichotomous Keys to Geographically Isolated Wetlands in the United States

Background

For this study, we have established the practical definitions to identify ‘geographically isolated’ types of wetland ecological systems. Throughout the study we interchangeably use the terms *isolated wetland ecological systems*, *ecological system types*, and *isolated wetlands* to refer to the *classification units* that are the focus of this study and the primary unit of analysis. We specifically use the term “occurrence” when we reference patterns of on-the-ground located occurrences of these classification units. If the term “occurrence” is not used, we are referring the classification unit (i.e., the isolated wetland ecological system type—like Northern California Claypan Vernal Pool). So a statement like “California has more than 12 isolated wetland ecological systems,” means that there are more than 12 different classified types of isolated wetland systems in California. A statement like “Florida has more than 40 occurrences of “Central Florida Herbaceous Pondshore” means that more than 40 places where these pondshore system types have been located, mapped, and documented as occurring on the ground in Florida.

Because commonly referenced ‘isolated wetland’ definitions are intended for application to individual wetland occurrences, we used an additional criterion to account for variation among occurrences of a given wetland *type*. Therefore, our rule was that if more than 80% of all known occurrences of a given wetland type meet the above definition it would be considered a geographically isolated wetland *type*. While one could likely identify individual occurrences for most types of wetlands that could be considered ‘geographically isolated,’ this additional criterion provides focus on a subset of wetland types where the ‘isolated’ condition is quite characteristic.

In any case, resource managers and conservationists must be able to field-identify wetland types that we have identified as ‘geographically isolated.’ In this section, we hope to provide practical tools, in the form of a series of dichotomous keys, to help users identify isolated wetland *types* using information one would observe in the field among wetland *occurrences*.

Dichotomous Keys to Isolated Wetlands

Dichotomous keys are devised used to help distinguish among classification units. They are often “dichotomous” in that the user follows the order of the ‘couplets’ and chooses between 2 options represented in each couplet. The ordering of the couplets in each key does matter, and the user should choose the option in each couplet that best fits the data or field situation. A choice leads the user to the next couplet to be utilized in the keying process, via a number at the far right, or else leads to a final result (e.g., an isolated wetland ecological system type).

Below are dichotomous keys to NatureServe ecological systems in the United States that meet our project-specific definitions for geographically isolated wetland. The keys have been organized by Ecological Divisions (Figure AII-1) (Comer et al. 2003). The ecological system classification uses ecological division concepts to organize the classification because they reflect continental scale patterns of climate physiography, and phytogeography. Patterns of occurrence for ecological system types tend to be partially explained by these regional units. Therefore, one will see the names of these units, such as “Inter-Mountain Basins” in the name of a given ecological system type. However, this does not imply that that type only occurs within the Inter-Mountain Basins division. It does imply that the distribution of

the type is centered in that division, but it may occur in neighboring divisions as well. As such, most of the systems included here are keyed in 2 or more of the regional keys, since they could be found on the ground within these areas.

Some wetland types that do not meet the project-specific definition for geographically isolated are included in these dichotomous keys because they share some attributes with isolated types and their presence is needed so that they may be clearly distinguished. In these instances, after the name of each type, they will be labeled as NOT ISOLATED. Since this is not intended as a comprehensive key to all ecological systems in a given area, there will be conditions described in the key that lead to the NOT IN KEY result, indicating that other sources should be consulted to appropriately identify the specific type of interest.

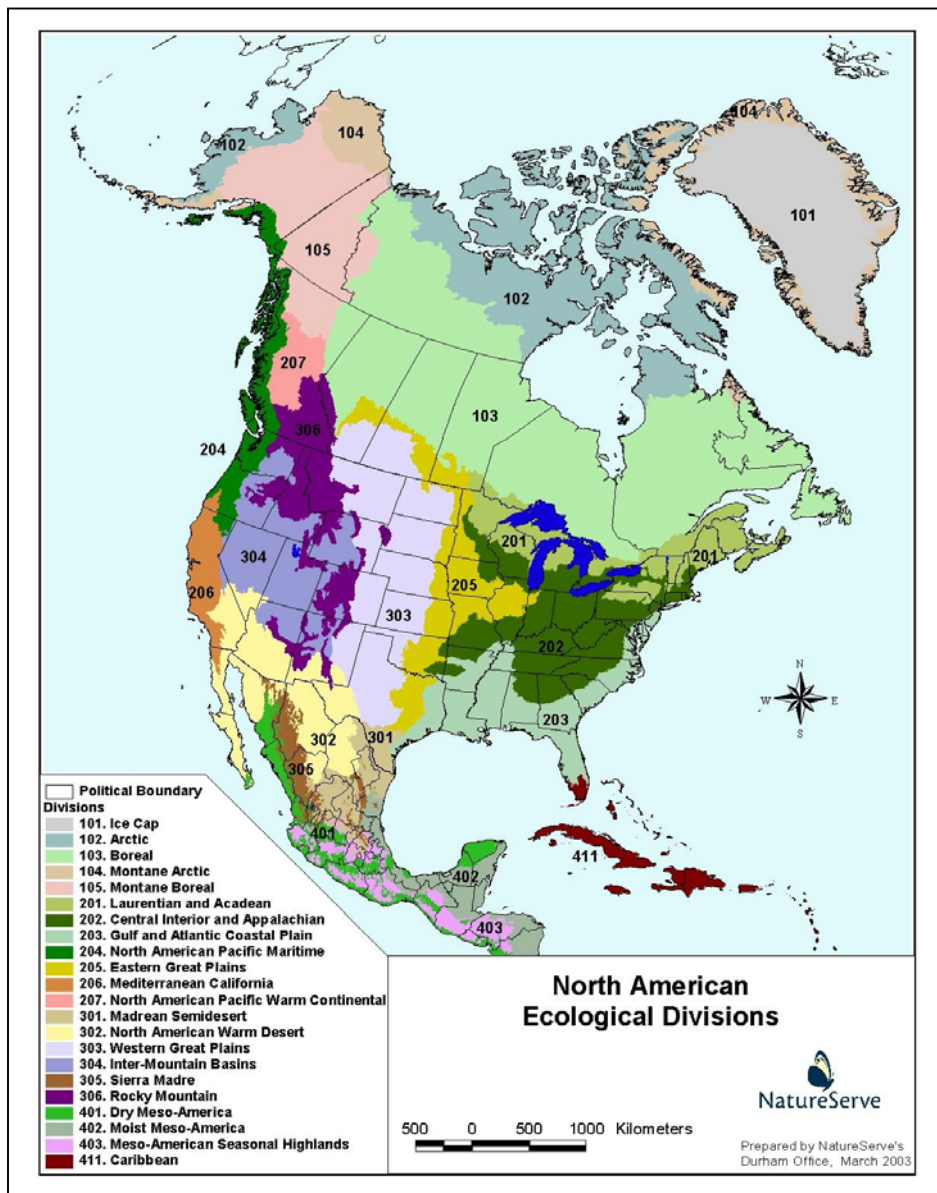


Figure VIII-1. Ecological Divisions of North America for NatureServe Ecological Systems.

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Wetland vs. Upland Key

- 1a. Land area occurring in a saturated or periodically inundated condition (e.g., marsh, swamp, bog, vernal pool, riparian, floodplain); indicators of such condition include presence of hydrophytic plants and/or hydric soils areas without soils but with hydrophytes (e.g., aquatic beds over bedrock, seaweed covered rocky shores); areas without soil or hydrophytes but occur as open shallow (<2 m) water over rock or sand substrates (e.g., gravel beaches, bedrock pools, ponds and pondshores)..... **Go to Wetland Key**
- 1b. Land area lacking indicators of a saturated or periodically inundated condition..... **Upland**

Geographically Isolated Wetland Key

- 1a. Wetland occurring on the shores of open water..... 2
- 1b. Wetland not associated with open water; occurring in areas surrounded by uplands..... 3
- 2a. Wetland occurring on shores of open water > 2 meters deep (ocean, lakes) or on the banks of rivers or streams
- 2b. Wetland occurring on shores of open water < 2 meters maximum depth
- 3a. Wetland completely surrounded by uplands and, with no apparent perennial surface water inlets and outlets..... **GEOGRAPHICALLY ISOLATED WETLAND**
- 3b. Wetland either not completely surrounded by uplands or, with apparent perennial surface water inlets and outlets

- 4a. Wetland surrounding shallow open bodies of water (< 2 meters) with no surface inlets or outlets **GEOGRAPHICALLY ISOLATED WETLAND**
- 4b. Wetland surrounding shallow open bodies of water that are apparently connected to other perennial open bodies of water, streams, rivers, or other water sources **NOT ISOLATED**

Key to Isolated Wetland Types of the Montane Arctic Division (102 & 104)

- 1a. Peatland soils that include a thick, saturated organic layer (varying from muck to fiber-rich plant material) over mineral soils, occurring with *Sphagnum* mosses 2
- 1b. Soils not as above..... **NOT IN KEY**
- 2a. Peatland limited to topographic depressions. Vegetation is dominated by low ericaceous shrubs (*Kalmia* spp., *Ledum* spp., *Betula* spp., *Myrica* spp., *Empetrum* spp., or *Chamaedaphne* spp.), and with patches of graminoids and bryophyte lawns. *Sphagnum* species, including *S. magellanicum*, *S. fuscum*, and *S. cuspidatum* may be characteristic. Conifer trees may codominate in tree and shrub layer **Boreal Depressional Bog (CES103.871)**
- 2b. Peatlands that occur on expansive, flat landscapes. Vegetation is dominated by thick to widely spaced stunted trees, continuous to patchy shrubs, and open areas of herbaceous plants. Dominant tree species include *Picea mariana*, *Picea glauca*, *Picea sitchensis*, and *Larix laricina*. Low ericaceous shrubs, including *Kalmia* spp., *Ledum groenlandicum*, *Chamaedaphne calyculata*, and *Betula nana* (= *B. glandulosa*), occur with patches of graminoids and bryophyte lawns. *Sphagnum* species, including *S. magellanicum*, *S. fuscum*, and *S. cuspidatum* may be characteristic **Boreal Blanket Bog (CES103.870) NOT ISOLATED**

Key to Isolated Wetland Types of the Montane Boreal Division (105)

- 1a. Peatland soils that include a thick, saturated organic layer (varying from muck to fiber-rich plant material) over mineral soils, occurring with *Sphagnum* mosses 2
- 1b. Soils not as above..... 5
- 2a. Peatlands influenced by rain water only, substrate & water pH is very acidic to moderately acidic..... 3
- 2b. Peatlands influenced by ground water, substrate & water pH is slightly acidic to alkaline, high in nutrients..... 4
- 3a. Peatlands are limited to topographic depressions. Vegetation is dominated by low ericaceous shrubs (*Kalmia* spp., *Ledum* spp., *Betula* spp., *Myrica* spp., *Empetrum* spp., or *Chamaedaphne* spp.), and with patches of graminoids and bryophytes. *Sphagnum* species including *S. magellanicum*, *S. fuscum*, and *S. cuspidatum* may be characteristic. Conifer trees sometimes codominate in tree and shrub layers. **Boreal Depressional Bog (CES103.871)**
- 3b. Peatlands that occur on expansive, flat landscapes in areas of high rainfall and low temperatures. Vegetation is dominated by thick to widely spaced stunted trees, continuous to patchy shrubs, and open areas of herbaceous plants. Dominant tree species include *Picea mariana*, *P. glauca*, *P. sitchensis*, and *Larix laricina*. Low ericaceous shrubs, including *Kalmia* spp., *Ledum groenlandicum*, *Chamaedaphne calyculata*, and *Betula nana* (= *B. glandulosa*), occur with patches of graminoids and bryophyte lawns. *Sphagnum* species, including *S. magellanicum*, *S. fuscum*, and *S. cuspidatum* may be characteristic

- **Boreal Blanket Bog (CES103.870) NOT ISOLATED**
- 4a. Peatlands are nutrient rich, neutral to alkaline, and are dominated by aquatic, emergent, and dwarf shrubs, or with limited portions of raised peat dominated by shrubs and trees. Groundwater, the primary water source, is nutrient-rich due to its contact with mineral soils. Waters may be acidic or basic, but typically have a pH above 4.7. Dominant species include *Myrica gale*, *Eriophorum russeolum*, *Comarum palustre* (= *Potentilla palustris*), *Dasiphora fruticosa ssp. floribunda* (= *Potentilla fruticosa*), *Calamagrostis canadensis*, *Picea mariana*, and *Carex aquatilis var. dives* (= *Carex sitchensis*).....
- **Boreal Fen (CES103.872) NOT ISOLATED**
- 4b. Wetlands not as above 5
- 5a. Wetlands occur in coastal interdunal wetlands that occur within active or partially vegetated coastal barrier islands, spits and coastal dunes ranging from SE Alaska through the Aleutian Islands. Wetlands are typically dominated by *Equisetum variegatum*, *Salix communtata*, *S. sitchensis*, or *Myrica gale*. Organic mats can develop.....
- **North Pacific Coastal Interdunal Wetland (CES204.062).**
- 5b. Physical setting and vegetation not in combinations as above..... **NOT IN KEY**

Key to Isolated Wetland Types of Laurentian and Acadian Division (201)

- 1a. Wetland dominated by trees; open areas of shrubs or herbs present 2
- 1b. Wetland dominated by shrubs, dwarf-shrubs, or herbs; trees, if present are sparse 8
- 2a. Coniferous species largely dominant; deciduous trees, if present, not abundant..... 3
- 2b. Broadleaf deciduous trees or a mix of deciduous and coniferous trees 6
- 3a. Forested coniferous peatland: *Sphagnum* mosses form a deep organic substrate; *Picea mariana* (black spruce) and *Larix laricina* (larch) are dominant conifers; saturated acidic swamp of northern New England, ranging to the Great Lakes region
- **Boreal – Laurentian Conifer Acidic Swamp (CES103.724)**
- 3b. Wetland forests dominated by *Picea* spp. or *Thuja occidentalis* (northern white cedar), lacking deep peat mat 4
- 4a. Forest characterized by *Thuja occidentalis*; occurring on gentle to moderate slopes fed by groundwater seepage..... **Acadian –Appalachian Conifer Seepage Forest (CES201.576)**
- 4b. Forests characterized by *Picea* spp. 5
- 5a. Spruce forests occurring on sandy outwash plains; undulating topography supports upland forest and shrublands; may include small wetland pockets
- **Acadian Near-Boreal Spruce Barrens (CES201.561) NOT ISOLATED**
- 5b. Spruce forests of low flat areas; shrub layers poorly developed; feathermosses (*Pleurozium* spp.) form a dense carpet..... **Acadian Near-Boreal Spruce Flat (CES201.562)**
- 6a. Wetland forest of slightly lower flat areas, dominated by oak species such as *Quercus palustris* (pin oak) or *Quercus bicolor* (swamp white oak) with other deciduous trees including *Acer rubrum* (red maple), *Fagus grandifolia* (beech), *Nyssa sylvatica* (black gum), *Liquidambar styraciflua* (sweetgum); flatwoods of central and northern Midwest, ranging to southern New England
- **North-Central Interior Wet Flatwoods (CES202.700)**
- 6b. Wetland forests comprised of a mixture of coniferous and broadleaf deciduous trees..... 7

- 7a. Wetland forest characterized by *Picea* spp., *Acer rubrum*, *Betula alleghaniensis*; understory characterized by ericaceous shrubs such as *Vaccinium corymbosum*, *Ledum groenlandicum*, as well as *Nemopanthus mucronatus*.....
..... **Laurentian-Acadian Conifer-Hardwood Acid Swamp (CES201.574)**
- 7b. Wetland forest characterized by *Thuja occidentalis* and *Fraxinus nigra*; *Cornus sericea* is commonly present; ericaceous species sparse to absent
..... **Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575)**
- 8a. Wetland complex characterized by dwarf-shrubs and herbs; trees are sparse to absent..... 9
- 8b. Wetland complex characterized by herbaceous species or shrubs; or mixed physiognomy of trees, shrubs, herbaceous species 17
- 9a. Dwarf-shrub wetland with peat substrate (rather than mineral soil or muck)..... 10
- 9b. Dwarf-shrub wetland; substrate either mucky or mineral soil, but not peaty 15
- 10a. Dwarf-shrubs primarily ericaceous: *Chamaedaphne calyculata* (leatherleaf), *Kalmia angustifolia* (sheep laurel), *Ledum groenlandicum* (Labrador-tea)..... 11
- 10b. Dwarf-shrubs characterized by *Dasiphora fruticosa* (shrubby cinquefoil); *Betula pumila* (bog birch), *Salix* spp. (willows), as well as ericaceous shrubs may also be present 12
- 11a. Bog complex of coastal Maine and Canadian maritime provinces; *Rubus chamaemorus* (cloudberry), *Empetrum nigrum* (black crowberry) usually present;
..... **Acadian Maritime Bog (CES201.580) NOT ISOLATED**
- 11b. Bog complex of interior Maine, northern New England, west to the Great Lakes; *Rubus chamaemorus* and *Empetrum nigrum* not present **Boreal-Laurentian Bog (CES103.581)**
- 12a. Interdunal wetland occurring in the coastal dune complexes of the Great Lakes
..... **Northern Great Lakes Interdunal Wetland (CES201.034)**
- 12b. Shrub wetlands not associated with Great Lakes dunes..... 13
- 13a. Peatland in which dwarf shrubs are characterized by bog birch (*Betula pumila*), shrubby cinquefoil (*Dasiphora fruticosa*), or willows (*Salix* spp.); ericaceous dwarf-shrubs minor or absent; peat generally shallow; *Photinia melanocarpa* (black chokeberry), *Andropogon gerardii* (big bluestem) and *Spartina pectinata* (prairie cordgrass) often present; alkaline fen system of Ontario, Ohio and west to South Dakota
..... **North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702)**
- 13b. Peatland dominated by dwarf-shrubs; ericaceous species *Chamaedaphne calyculata*, *Ledum groenlandicum* common; *Dasiphora fruticosa* and *Betula pumila* may be present; 14
- 14a. Northern patterned peatland with strings and pools; sedges prevalent, with *Carex lasiocarpa* most characteristic, but calciphytic species (e.g., *Carex flava*) not present
..... **Boreal-Laurentian-Acadian Acidic Basin Fen (CES201.583)**
- 14b. Calcareous fen characterized by a mixture of shrubs and herbaceous species; ericaceous shrubs not as prevalent; calciphytic species such as *Carex flava*, *Lobelia kalmii*, *Rhynchospora capillacea* characteristic
..... **Laurentian-Acadian Alkaline Fen (CES201.585)**
- 15a. Shrub and/or herbaceous wetland of Great Lakes interdunal swales
..... **Northern Great Lakes Interdunal Wetland (CES201.034)**
- 15b. Shrub wetlands of mucky, but not peaty soil; not associated with Great Lakes interdunal swales 16

- 16a. Shrub swamp of northern New England, southern Canada and upper Midwest; often a patchy mosaic of shrubland and herbaceous vegetation; typical shrubs include *Alnus* spp., *Myrica gale*, *Rosa palustris*, *Spiraea* spp., with sedges *Carex* spp. and *Schoenoplectus* spp. common; other typical graminoids include *Juncus effusus*, *Calamagrostis canadensis*, *Phalaris arundinacea* and others; setting primarily a forested landscape, often on lakeshores and streams as well as isolated basins;.....
..... **Laurentian-Acadian Wet Meadow – Shrub Swamp (CES201.582) NOT ISOLATED**
- 16b. Shrub swamp of the upper Midwest from Ohio to South Dakota; typical shrubs include *Cornus sericea*, *Cephalanthus occidentalis*, *Salix* spp.; herbaceous species characterized by prairie species *Spartina pectinata*, *Andropogon gerardii*, and *Panicum virgatum*, as well as sedges (*Carex* spp.), *Typha latifolia*, *Calamagrostis canadensis*, and *Schoenoplectus* spp.; setting typically a non-forested open grassland, on glacial potholes, lake plains, and glacial outwash.....
..... **North-Central Interior Wet Meadow – Shrub Swamp (CES202.701)**
- 17a. Water typically present most of the growing season; emergent aquatic species such as *Nymphaea odorata*, *Pontederia cordata*, *Peltandra virginica* occurring in wettest portions..... 18
- 17b. Vegetation of mixed physiognomy (shrubs, scattered trees, herbaceous species, patches of bare substrate) on sand dune or bedrock; standing water typically not present by late in growing season..... 19
- 18a. Marsh of New England, Mid-Atlantic states, ranging to northern Midwest; natural surroundings are primarily forested..... **Laurentian-Acadian Freshwater Marsh (CES201.594)**
- 18b. Marsh of Midwestern states; natural surroundings are primarily forest, savanna, and/or grassland **North-Central Interior Freshwater Marsh (CES202.899)**
- 19a. Mixed upland and wetland vegetation of Great Lakes dunes; uplands characterized by open-to-closed canopy of trees, patches of dune grasses (*Ammophila breviligulata*); swales wet in early season and support varying levels of organic soil development (muck to peat). Characteristic species include rushes (*Juncus balticus*, *Juncus pelocarpus*), sedges (*Schoenoplectus americanus*, *Carex* spp.), *Eleocharis acicularis*, or by shrubs *Dasiphora fruticosa* ssp. *floribunda*.....
..... **Great Lakes Dune and Swale (CES201.726)**
- 19b. Mixed upland and wetland vegetation of Great Lakes limestone bedrock pavement with shallow to absent soils; trees may include *Acer saccharum*, *Quercus rubra*, *Picea glauca*, *Pinus banksiana*, or *Thuja occidentalis*; shrubs and herbs form a patchy mosaic, and are characterized by *Dasiphora fruticosa* ssp. *floribunda*, *Danthonia spicata*, *Schizachyrium scoparium*, *Carex scirpoidea*, *Poa compressa*, *Sporobolus* spp. and others **Great Lakes Alvar (CES201.721)**

Key to Isolated Wetland Types of the Central Interior and Appalachian Division (202)

- 1a. Wetland of the Piedmont region or montane regions of Southern Appalachia 15
- 1b. Wetland of glacial lake plain associated with the Great Lakes..... 12
- 1c. All other wetlands 2
- 2a. Wetland dominated by trees; open areas of shrubs or herbs, or of upland vegetation often present, but wetland mostly forested **North-Central Interior Flatwoods (CES202.700)**
- 2b. Wetland dominated by shrubs, dwarf-shrubs, or herbs; trees, if present are sparse 4
- 4a. Peatland complex characterized by dwarf-shrubs; trees are sparse to absent. 5
- 4b. Wetland complex characterized by herbaceous species or shrubs; or mixed physiognomy of trees, shrubs, and herbaceous species in a patchy mosaic. Substrate either mucky or mineral soil, but peat rarely present 9

- 5a. Dwarf-shrubs primarily ericaceous and dominated by *Chamaedaphne calyculata* (leatherleaf) 6
- 5b. Dwarf-shrubs characterized by *Dasiphora fruticosa* (shrubby cinquefoil); *Betula pumila* (bog birch), *Salix* spp. (willows), as well as ericaceous shrubs may also be present but in lesser quantities. Also contain a high component of graminoid species 8
- 6a. Bog complex dominated by dwarf-shrubs; *Kalmia angustifolia* (sheep laurel), *Ledum groenlandicum* (Labrador-tea) common. Often containing scattered, stunted trees such as *Picea mariana* (black spruce) or *Larix laricina* (tamarack). Found mostly in interior Maine, northern New England, west to the Great Lakes **Boreal-Laurentian Bog (CES103.581)**
- 6b. Peatland dominated by dwarf-shrubs with patches of graminoids. *Kalmia angustifolia* and *Ledum groenlandicum* not present..... 7
- 7a. Bog heath found mostly in Laurentian-Acadian and boreal regions, but can reach further south. Characterized by ribbed bogs or fens in which a pattern of narrow (2-3 m wide) low (less than 1 m deep) ridges are oriented at right angles to the direction of the drainage. *Betula pumila* can be prevalent. Contains areas of graminoid dominance, in particular *Carex* spp. **Boreal-Laurentian-Acadian Acidic Basin Fen (CES201.583)**
- 7b. Peatlands south of the Laurentian-Acadian region down to near the glacial boundary in the northeastern and north-central U.S. They are closed basins (many are "kettleholes") dominated by ericaceous shrubs and patches of graminoids, in particular *Carex* spp..... **North-Central Interior and Appalachian Acid Peatland (CES202.606)**
- 8a. Dwarf shrubs dominate with graminoid core area characterized by prairie forbs and grasses such as *Andropogon gerardii* (big bluestem) and *Spartina pectinata* (prairie cordgrass); alkaline fen system of Ontario, Ohio and west to South Dakota. Peat very shallow. **North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702)**
- 8b. Dominated primarily by sedges; dwarf shrub layer less distinct unless impacted by grazing. Found primarily in Appalachians and eastern Great Lakes regions..... **North-Central Appalachian Seepage Fen (CES202.607)**
- 9a. Water present most of growing season 10
- 9b. Water absent most of growing season..... 11
- 10a. Emergent aquatic species such as *Typha* spp., *Schoenoplectus* spp., *Nymphaea odorata*, *Pontederia cordata*, *Peltandra virginica* occurring in wettest portions. Water present most of the growing season..... **North-Central Interior Freshwater Marsh (CES202.899)**
- 10b.Ponds vary from open water to herb-, shrub-, or tree-dominated systems. Tree-dominated examples typically contain *Quercus* species, *Platanus occidentalis*, *Fraxinus pennsylvanica*, *Acer saccharinum* or *Nyssa* species, or a combination of these. *Cephalanthus occidentalis* is a typical shrub component. This system of ponds and wetlands is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions, ranging north from the southern and central Appalachians to the Northern Piedmont regions..... **Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)**
- 11a. Dominated by hydrophytic plants, which vary from mixed grass or sedge fen with complex zonation to more tallgrass prairie species mixed with calciphiles. Restricted primarily to Ozark-Ouachita region where the soil or substrate is saturated by calcareous groundwater seepage **Ozark-Ouachita Fen (CES202.052)**.
- 11b. Dominated by sedges (*Carex* spp.) and grasses such as *Calamagrostis canadensis*. This system also can contain a zone of wet prairie species such as *Spartina pectinata*. Shrub swamps can also be associated

- with the wet meadows within this system. Typical shrub species include *Cornus* spp., *Salix* spp., and/or *Cephalanthus occidentalis*.
..... **North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)**
- 12a. Wetland associated with Great Lakes coastal dunes 13
12b. Wetland not specifically associated with dune areas 14
- 13a. Mixed upland and wetland vegetation of Great Lakes dunes; uplands characterized by open-to-closed canopy of trees, patches of dune grasses (*Ammophila breviligulata*); swales wet in early season and support varying levels of organic soil development (muck to peat). Characteristic species include rushes (*Juncus balticus*, *Juncus pelocarpus*), sedges (*Schoenoplectus americanus*, *Carex* spp.), *Eleocharis acicularis*, or by shrubs *Dasiphora fruticosa* ssp. *floribunda*.....
..... **Great Lakes Dune and Swale (CES201.726)**
- 13b. Dwarf shrub and herbaceous wetland of Great Lakes interdunal swales. Supports species of *Solidago* and *Juncus* spp. Contains very little organic soil accumulation
..... **Northern Great Lakes Interdunal Wetland (CES201.034)**
- 14a. Characterized by species more commonly found in the Atlantic Coastal Plain including *Rhynchospora scirpoides* (= *Psilocarya scirpoides*), *Rhynchospora macrostachya*, and *Scleria reticularis*. This system is a disjunct in this region and only located on glacial lake plain near southern Lake Michigan.....
..... **Atlantic Coastal Plain Northern Pondshore (CES203.518)**
- 14b. The vegetation of this community is dominated by tallgrass species such as *Andropogon gerardii*, *Panicum virgatum*, *Spartina pectinata*, *Schizachyrium scoparium*, *Sorghastrum nutans* and *Calamagrostis canadensis*. Trees and shrubs are abundant in places, due to fire suppression and hydrologic alteration. This system is found on the lakeplain near the southern central Great Lakes of the United States and Canada
..... **Great Lakes Wet-Mesic Lakeplain Prairie (CES202.027)**
- 15a. Wetland on slopes in Southern Appalachians
..... **Southern Appalachian Seepage Wetland (CES202.317)**
- 15b. Wetland not on slopes 16
- 16a. Small depressions in Piedmont (and adjacent Coastal Plain) fall line granite rock outcrops
..... **Southern Piedmont Granite Flatrock (CES202.329)**
- 16b. Wetlands not on granite outcrops..... 17
- 17a. Ponds and wetlands found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau, southern and central Appalachians and Northern Piedmont regions. Generally in karst, in basins of sinkholes or other isolated depressions on uplands.....
Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)
- 17b. Isolated wetlands primarily of the Piedmont (very limited in Southern Appalachians and Ridge and Valley) in small, shallow basins in upland settings where water pools due to limited soil drainage, generally on mafic soils
..... **Southern Piedmont / Ridge and Valley Upland Depression Swamp (202.336)**

Key to Isolated Wetland Types of the Gulf and Atlantic Coastal Plain Division (203)

- 1a. Wetlands of the West Gulf Coastal Plain, west of the Mississippi River **KEY A**
- 1b. Wetlands of the Atlantic, East Gulf and Upper East Gulf Coastal Plains, from Long Island, NY to the "Florida Parishes" of Louisiana, including Florida and the Upper East Gulf Coastal Plain of western Kentucky and Tennessee..... 2
- 2a. Wetlands of the Florida Peninsula (including Levy, Gilchrist, Alachua, Putnam, and St. Johns Counties) **KEY B**
- 2b. Isolated Wetlands of the Atlantic and East Gulf Coastal Plains, not including the Florida Peninsula 3
- 3a. Wetlands of the Atlantic Coastal Plain 4
- 3b. Wetlands of the East and Upper East Gulf Coastal Plains..... **KEY C**
- 4a. Wetlands of the Atlantic Coastal Plain including the Chesapeake Bay area of Virginia, north to (and including) Long Island, NY **KEY D**
- 4b. Wetlands of the Atlantic Coastal Plain from southeast Virginia (Norfolk area) south to north Florida (including St. Johns, Clay, Bradford and Union Counties)..... **KEY E**

KEY A - Isolated Wetland Types of the West Gulf Coastal Plain

- 1a. Wetlands are coastal, including coastal dune, coastal grasslands or interdunal wetland habitats 2
- 1b. Wetlands not on the immediate coast 3
- 2a. Herbaceous and shrubland vegetation of barrier islands, and near-coastal areas in the northern Gulf of Mexico along the upper Texas coast. Plant communities of primary and secondary dunes, interdunal swales and adjacent mainland are included, not including the wettest dune swales.....
..... **Central and Upper Texas Coast Dune and Coastal Grassland (CES203.465)**
- 2b. Pond or marsh-like vegetation of the wettest dune swales and basins on barrier islands and coastal areas from Texas to Virginia. Most examples are permanently or semi-permanently flooded with freshwater but are affected by salt spray or overwash during periodic storm events.
..... **Southeastern Coastal Plain Interdunal Wetland (CES203.258)**
- 3b. Wetlands of coastal prairies, including prairies and prairie ponds 4
- 3a. Wetlands of flatwoods (including wet hardwood flatwoods, pine - hardwood flatwoods and ponds in flatwoods..... 5
- 4a. Vegetation on Vertisols and Alfisols which developed over Pleistocene terraces flanking the Gulf Coast...
..... **Texas-Louisiana Coastal Prairie (CES203.550)**
- 4b. Vegetation of small to moderately large ponds and swales in the coastal prairie of southeastern Texas and Louisiana..... **Texas-Louisiana Coastal Prairie Pondshore (CES203.541)**
- 5a. Predominately graminoid-dominated flatwoods ponds in the Outer Coastal Plain of eastern Texas and western Louisiana. These ponds are generally circular or elliptical, flat-bottomed depressions on flat terraces, associated with pine savannas
..... **West Gulf Coastal Plain Flatwoods Pond (CES203.547)**
- 5b. Hardwood or mixed pine hardwood flatwoods, generally further north..... 6
- 6a. Hardwood flatwoods, which are often heavily oak-dominated, found on nonriverine, Pleistocene high terraces of southern Arkansas, eastern Texas, and western Louisiana.....

- **West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)**
- 6b. Pine – hardwood flatwoods found on nonriverine, Pleistocene high terraces. Topography is a complex of drier ridges and wet swales which tend to support hardwood forests or swamps. There is vegetation variability relating to soil texture, moisture and disturbance history.....
- **West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278)**

KEY B - Isolated Wetland Types of the Florida Peninsula

- 1a. Coastal wet dune swales and basins on barrier islands.....
-**Southeastern Coastal Plain Interdunal Wetland (CES203.258)**
- 1b. Non-coastal wetlands..... 2
- 2a. Deep sinkhole depressions with steep limestone walls.....
-**Southern Coastal Plain Sinkhole (CES203.495)**
- 2b. Woody or herbaceous wetlands, if in sinks, then not having steep limestone walls..... 3
- 3a. Woody wetlands, dominated by trees 4
- 3b. Herbaceous wetlands, not dominated by trees 5
- 4a. Dominated by Pond-cypress (*Taxodium ascendens*); which is generally taller in the center of the wetland, and shorter on the edges. Examples occupy poorly drained depressions, mostly in pine flatwoods.
-**Southern Coastal Plain Nonriverine Cypress Dome (CES203.251)**
- 4b. Dominated by a mixture of wetland trees, this type is found in basins with peaty substrates. Examples are generally forested; the vegetation is characterized by Bald-cypress (*Taxodium distichum*), Swamp Blackgum (*Nyssa biflora*), evergreen "bay" shrubs and/or mixed hardwoods. Emergent Slash Pine (*Pinus elliotii*) may also be present. Some characteristic shrubs include Black Titi (*Cliftonia monophylla*), Titi (*Cyrilla racemiflora*), Shining Fetterbush (*Lyonia lucida*), and Blaspheme-vine (*Smilax laurifolia*).....
-**Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)**
- 5a. Seasonal depression ponds, examples exhibit some zonation in vegetation generally surrounded by Saw Palmetto (*Serenoa repens*). Characteristic or dominant species associated with the interior of the ponds include Maidencane (*Panicum hemitomon*), Cut-throat Panicgrass (*Panicum abscissum*), *Hypericum edisonianum*, and *Andropogon brachystachyus*.....
-**Central Florida Herbaceous Pondshore (CES203.890)**
- 5b. Non-tidal marsh vegetation in former lake basins and in zones around existing natural lakes, with mostly herbaceous plant communities that may be referred to as marshes, meadows, and prairies.....
-**Floridian Highlands Freshwater Marsh (CES203.077)**

KEY C - Isolated Wetland Types of the East and Upper East Gulf Coastal Plains

- 1a. Oak (*Quercus* spp.) dominated non-alluvial wetland forest, which occupies broad flats underlain by fragipans in the Jackson Purchase region of western Kentucky and nearby Tennessee.....
-**South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480)**
- 1b. Wetland occurring further south on the East Gulf Coastal Plain..... 2
- 2a. Associated with coastal dunes and barrier islands along the Gulf of Mexico..... 3
- 2b. Not associated with coastal dunes and barrier islands along the Gulf of Mexico..... 4
- 3a. Herbaceous and shrub wetland on barrier islands and other near-coastal areas where salt spray, saltwater overwash, and sand movement are important ecological forces; apparently flooded only intermittently. Occurs in only NW Florida, coastal Alabama and SE Mississippi.....

- **East Gulf Coastal Plain Dune and Coastal Grassland (CES203.500)**
- 3b. Herbaceous and shrub wetland; apparently flooded on permanent or semi-permanent basis.....
 **Southeastern Coastal Plain Interdunal Wetland (CES203.258)**
- 4a. Seepage wetlands, found in small patches on slopes in dissected terrain, found near the Fall-line in Georgia..... **Atlantic Coastal Plain Sandhill Seep (CES203.253)**
- 4b. Wetlands found on flat areas rather than on seepage slopes 5
- 5a. Deep sinkhole depressions with steep limestone walls.....
 **Southern Coastal Plain Sinkhole (CES203.495)**
- 5b. Woody or herbaceous wetlands, if in sinks, then not having steep limestone walls..... 6
- 6a. Depressions or sinks on extreme deep sandy soils in the southern portions of the East Gulf Coastal Plain of Florida and Alabama, apparently of karstic origin but without limestone near the surface. The appearance of these pondshores is that of large, inland white sand beach, narrowly endemic plant species may be present such as *Hypericum lissophloeus*, *Rhexia salicifolia*, and *Xyris longisepala*.....
 **East Gulf Coastal Plain Sandhill Lakeshore Depression (CES203.292)**
- 6b. Other forested or herbaceous wetlands, not having the above combination of characteristics 7
- 7a. Herbaceous depressions, or depressions with scattered trees 8
- 7b. Forested wetlands..... 9
- 8a. Shallow ponds of various geomorphic origin in a variety of substrates (e.g., limesinks, Grady Ponds) which are in the East Gulf Coastal Plain, inland of the Gulf Coast Flatwoods (i.e., EPA Level III Ecoregion 65, not 75 (EPA 2004)).....
 **East Gulf Coastal Plain Northern Depression Pondshore (CES203.558)**
- 8b. Depressions found in the southern portions of the East Gulf Coastal Plain, mainly in the Gulf Coast Flatwoods region (Ecoregion 75a of EPA (2004))
 **East Gulf Coastal Plain Southern Depression Pondshore (CES203.504)**
- 9a. Forested wetland which occurs on broad upland flats of southern Alabama and Mississippi, and the Florida Parishes of Louisiana, and likely occurs in other parts of the region as well. A mosaic of open forests dominated by Loblolly Pine (*Pinus taeda*) interspersed with patches of Willow Oak (*Quercus phellos*) and sometimes other tree species. The ground has alternating mounds and swales on Luinn soil series
 **East Gulf Coastal Plain Southern Loblolly-Hardwood Flatwoods (CES203.557)**
- 9b. Forested depression wetlands, not in broad upland flats..... 10
- 10a. Forested depression wetland dominated by Pond Cypress (*Taxodium ascendens*); which is generally taller in the center of the wetland, and shorter on the edges. Examples occupy poorly drained depressions, mostly in pine flatwoods. **Southern Coastal Plain Nonriverine Cypress Dome (CES203.251)**
- 10b. Forested depression wetland dominated by a mixture of wetland trees, this type is found in basins with peaty substrates. Examples are generally forested; the vegetation is characterized by Bald Cypress (*Taxodium distichum*), Swamp Blackgum (*Nyssa biflora*), evergreen "bay" shrubs and/or mixed hardwoods. Emergent Slash Pine (*Pinus elliottii*) may also be present. Some characteristic shrubs include Black Titi (*Cliftonia monophylla*), Titi (*Cyrilla racemiflora*), Shining Fetterbush (*Lyonia lucida*), and Blaspheme-vine (*Smilax laurifolia*).....
 **Southern Coastal Plain Nonriverine Basin Swamp (CES302.384)**

KEY D - Isolated Wetland Types of the Atlantic Coastal Plain (Chesapeake Bay to Long Island)

- 1a. Wetland among coastal dunes from Chesapeake Bay to southern Maine.....
 **Atlantic Coastal Plain Northern Dune and Maritime Grassland (CES203.264)**
- 1b. Wetlands not associated with coastal dune systems 2
- 2a. Wetlands primarily herbaceous vegetation or dominated by shrubs or dwarf-shrubs 3
- 2b. Wetlands primarily forested..... 4
- 3a. Saturated peatland characterized by *Sphagnum* moss mat and low shrubs, usually *Chamaedaphne calyculata* (leatherleaf); trees may be scattered but generally is not forested
 **Atlantic Coastal Plain Northern Bog (CES203.893)**
- 3b. Wetland surrounding ponds or in isolated basins; vegetation of small basins may be dominated by *Cephalanthus occidentalis* (buttonbush), especially in portions of the Delmarva peninsula; standing water may be present, or basin may be dry by late in growing season; where shrubs are not dominant or form a margin around the basin, zonation is usually evident, dominated by low delicate herbs and graminoids including *Rhynchospora* spp., *Cyperus* spp., *Juncus pelocarpus*, *Fimbristylis* spp., *Panicum longifolium*, *Gratiola aurea*, *Rhexia virginica*, and many others.....
 **Atlantic Coastal Plain Northern Pondshore (CES203.518)**
- 4a. Broadleaf deciduous swamp of Cape Cod south to Virginia characterized by *Acer rubrum*, *Nyssa sylvatica*, and, in examples south of Long Island, New York, *Liquidambar styraciflua*.....
 **Atlantic Coastal Plain Northern Basin Swamp and Wet Hardwood Forest (CES203.520)**
- 4b. Swamp forests characterized by needle-leaved trees 5
- 5a. *Chamaecyparis thyoides* (Atlantic white cedar) dominant, or co-dominant with *Acer rubrum* (red maple); dwarf-shrub bog vegetation may be interspersed; deep peat mat with hummock and hollow microtopography evident **Atlantic Coastal Plain Northern Basin Peat Swamp (CES203.522)**
- 5b. *Pinus rigida* usually dominant; *Acer rubrum* often present; deep peat mat usually not present except in small boggy pockets; shallow organic layer usually typical over sand; ericaceous shrubs abundant, including *Gaylussacia baccata*, *Vaccinium corymbosum*, *Leucothoe racemosa*, and others; restricted to pine barrens landscapes of Cape Cod and southern New Jersey
 **Atlantic Coastal Plain Northern Pitch Pine Lowland (CES203.374)**

KEY E - Isolated Wetland Types of the Atlantic Coastal Plain (SE Virginia to N Florida)

- 1a. Coastal wet dune swales and basins on barrier islands
 **Southeastern Coastal Plain Interdunal Wetland (CES203.258)**
- 1b. Non-coastal wetlands 2
- 2a. Seepage wetlands, found in small patches on slopes in dissected terrain. This type most commonly occurs in the Fall-line Sandhills region of the Carolinas and Georgia.
 **Atlantic Coastal Plain Sandhill Seep (CES203.253)**
- 2b. Large or small depression wetlands 3
- 3a. Wetlands associated with ovoid, shallow depressions with nearly flat bottoms called Carolina bays. These are most numerous and extensive in South Carolina
 **Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)**
- 3b. Wetlands not in Carolina Bays..... 4

- 4a. Herbaceous wetlands (or with scattered trees) in small basins in unconsolidated sediments, most formed by subsidence of surface sediments caused by solution in underlying limestone. Others may be formed as swales in mainland eolian sands, or natural blockage of small drainages by sediment movement.
.....**Atlantic Coastal Plain Southern Depression Pondshore (CES203.262)**
- 4b. Forested wetlands..... 5
- 5a. Forested wetland dominated by Pond Cypress (*Taxodium ascendens*); which is generally taller in the center of the wetland, and shorter on the edges. Examples occupy poorly drained depressions, mostly in pine flatwoods
..... **Southern Coastal Plain Nonriverine Cypress Dome (CES203.251)**
- 5b. Forested wetland dominated by a mixture of wetland trees, found in basins with peaty substrates. Examples are generally forested; the vegetation is characterized by Bald Cypress (*Taxodium distichum*), Swamp Blackgum (*Nyssa biflora*), evergreen "bay" shrubs and/or mixed hardwoods. Emergent Slash Pine (*Pinus elliottii*) may also be present. Some characteristic shrubs include, Titi (*Cyrilla racemiflora*), Shining Fetterbush (*Lyonia lucida*), Blaspheme-vine (*Smilax laurifolia*), and south of the Savannah River, Black Titi (*Cliftonia monophylla*).....**Southern Coastal Plain Nonriverine Basin Swamp (CES302.384)**

Key to Isolated Wetland Types of the North American Pacific Maritime Division (204)

- 1a. Peatland soils that include a thick, saturated organic layer (varying from muck to fiber-rich plant material) over mineral soils, occurring with *Sphagnum* mosses 2
- 1b. Soils are mineral, a thin layer of organic material may occur on surface, soils not a thick layer of sphagnum moss 5
- 2a. Wetland is dominated by low ericaceous shrubs (*Kalmia* spp., *Ledum* spp., *Betula* spp., *Myrica* spp., *Empetrum* spp., or *Chamaedaphne* spp.), and with patches of graminoids and bryophyte lawns. *Sphagnum* species including *S. magellanicum*, *S. fuscum*, and *S. cuspidatum* may be characteristic. Conifer trees sometimes codominate the shrub layer
..... **Boreal Depressional Bog (CES103.871)**
- 2b. Wetland not as above 3
- 3a. Wetland a mix of conifer-dominated swamp, shrub swamp, and open sphagnum or sedge mire, often with small lakes and ponds interspersed. Vegetation includes many species common to boreal continental bogs and fens but is characterized by coastal species including *Chamaecyparis nootkatensis*, *Pinus contorta* var. *contorta*, *Picea sitchensis*, *Tsuga heterophylla*, *Ledum glandulosum*, *Thuja plicata*, *Gaultheria shallon*, *Spiraea douglasii*, *Carex aquatilis* var. *dives*, *Carex lyngbyei*, *Carex obnupta*, *Carex pluriflora*, *Darlingtonia californica*, *Sphagnum pacificum*, *S. henryense* and *S. mendocinum*
..... **North Pacific Bog and Fen (CES204.063) NOT ISOLATED**
- 3b. Wetland dominated by herbaceous plants..... 4
- 4a. Wetland of emergent plants, permanently flooded. Soil may be muck or mineral. Water often > 2 meters deep, although some marshes may be shallower. Dominant plants are species of *Scirpus* and/or *Schoenoplectus*, *Typha*, *Juncus*, *Potamogeton*, *Polygonum*, *Nuphar*, and *Phalaris*.....
..... **Temperate Pacific Freshwater Emergent Marsh (CES200.877) NOT ISOLATED**
- 4b. Wetland of herbaceous plants on organic soils
..... **North Pacific Bog and Fen (CES204.063) NOT ISOLATED**

- 5a. Wetlands of mineral soils, dominated by herbaceous forbs and graminoids, often in concentric rings around seasonally wet, shallow ephemeral water bodies found in very small depressions. Occur only on hardpans or on small depressions in volcanic bedrock that retain water for short periods (vernal pools).... 6
- 5b. Wetlands of mineral or organic soil, dominated by graminoids and lesser amounts of forbs and woody plants, typically not forming concentric ring patterns, soils seasonally wet, generally drying out by end of season..... 8
- 6a. Vernal pools with *Downingia elegans*, *Isoetes orcuttii*, *Pilularia americana*, *Triteleia hyacinthina*, *Eleocharis* spp., *Eryngium petiolatum*, *Plagiobothrys figuratus*, *Plagiobothrys scouleri*, *Grindelia nana*, *Veronica peregrina*, *Deschampsia danthonioides*, and/or *Callitriche* spp. Typically have hummocky micro-relief, are acidic wetlands. Found throughout intermountain valleys of California, Oregon and the Gulf and San Juan islands of Washington and British Columbia.
 **North Pacific Hardpan Vernal Pool (CES204.859)**
- 6b. Vernal Pools not as above..... 7
- 7a. Vernal Pools on volcanic substrates with flashy inundations (fill and evaporate rapidly, several times during the wet season) and have *Lasthenia californica*, *Downingia bicornuta*, *Psathyrotes* spp., and *Sedella* spp. (= *Parvisedum* spp.) often present. Pools with longer inundation periods have *Eryngium constancei* and *Eleocharis acicularis*.
 **Northern California Volcanic Vernal Pool (CES206.949)**
- 7b. Vernal pools are located on top of massive basalt flows where soils are very thin over solid bedrock. Characteristic species include *Blennosperma nanum*, *Epilobium densiflorum* (= *Boisduvalia densiflora*), *Callitriche marginata*, *Cicendia quadrangularis*, *Eryngium vaseyi*, *Psilocarphus brevissimus*, and *Sedella pumila* (= *Parvisedum pumilum*). *Artemisia cana* ssp. *bolanderi* can occur on better developed soils.....
 **Modoc Basalt Flow Vernal Pool (CES204.996)**
- 8a. Wetland of high-nutrient soils that are temporarily to seasonally flooded. Vegetation is dominated by *Deschampsia caespitosa*, *Camassia quamash*, *Carex densa*, and *Carex unilateralis*. Rare, known only from the Willamette Valley of Oregon and Washington
 **Willamette Valley Wet Prairie (CES204.874)**
- 8b. Not as above..... 9
- 9a. Wetlands in coastal interdunal swales among active or partially vegetated coastal barrier islands, spits and coastal dunes, ranging from SE Alaska through the Aleutian Islands. Wetlands are typically dominated by *Equisetum variegatum*, *Salix communtata*, *S. sitchensis*, or *Myrica gale*. Organic mats can develop
 **North Pacific Coastal Interdunal Wetland (CES204.NEW)**
- 9b. Physical setting and vegetation not in combinations as above..... **NOT IN KEY**

Key to Isolated Wetland Types of the Eastern Great Plains Division (205)

- 1a. Wetland characterized by closed basin with apparently little to no groundwater influence; i.e., on relatively impermeable substrates..... 2
- 1b. Wetland characterized by open basin and apparently influenced by groundwater; i.e., on permeable substrates..... 3
- 2a. Playa lake or rainwater basins characterized by the presence of an impermeable layer such as a dense clay. *Eleocharis* spp., *Hordeum jubatum*, *Coreopsis tinctoria*, *Symphyotrichum subulatum* (= *Aster subulatus*), and *Polygonum pensylvanicum* (= *Polygonum bicornne*) are common vegetation in the wetter and deeper depression, while *Pascopyrum smithii* and *Buchloe dactyloides* are more common in shallow

- depressions in rangeland. Found mostly in western Great Plains, but occasionally can occur in eastern tallgrass plains..... **Western Great Plains Closed Depression Wetland (CES303.666)**
- 2b. Prairie potholes found primarily in glaciated northern Great Plains. Includes elements of emergent marshes and wet, sedge meadows that develop into a pattern of concentric rings.
.....**Great Plains Prairie Pothole (CES303.661)**
- 3a. Wetland is dominated by *Spartina pectinata*, *Tripsacum dactyloides*, numerous large sedges, such as *Carex frankii* and *Carex hyalinolepis*, and in wetter areas, *Eleocharis* spp. Other emergent marsh species such as *Typha* spp. can be associated with this system. Forbs can include *Helianthus grosseserratus*, *Vernonia fasciculata*, and *Physostegia virginiana*. Dominant open basin wetland system found in the eastern Great Plains.....
.....**Eastern Great Plains Wet Meadow, Prairie, and Marsh (CES205.687)**
- 3b. Wetland typically occurs as lowland depressions or along lake borders that have a permanent water source through most of the year. A variety of species are part of this system, including *Typha* spp. and *Schoenoplectus* spp. The system includes submergent and emergent marshes, and associated wet meadows and wet prairies. Occurs throughout western Great Plains
.....**Western Great Plains Open Freshwater Depression Wetland (CES303.675)**

Key to Isolated Wetland Types of Mediterranean California Division (206)

- 1a. Wetlands of playa lakes or marshes, often with alkaline or saline characteristics, or freshwater..... 2
- 1b. Wetlands of vernal pools, fens or sand dunes, 4
- 2a. Marsh and Playa that are generally dominated by salt tolerant plants such as *Distichlis spicata*, *Salicornia* spp., In wet years, degree of salinity may be diluted. 3
- 2b. Wetland of emergent plants, permanently flooded. Soil may be muck or mineral.
..... **Temperate Pacific Freshwater Emergent Marsh (CES200.877) NOT ISOLATED**
- 3a. Saline/Playa depressions dominated by *Allenrolfea occidentalis*, *Suaeda moquinii*, *Distichlis spicata*, and *Salicornia rubra*. During exceptionally wet years, an increase in precipitation can dilute the salt concentration in the soils of some of examples of this system which may allow for less salt-tolerant species to occur. **California Central Valley Alkali Sink (CES206.954)**
- 3b. Old lake beds or in floodplains of major river systems where seasonal water inputs are limited dominated by *Distichlis spicata*, *Juncus balticus*, *Anemopsis californica*, *Schoenoplectus americanus* (= *Scirpus americanus*), *Atriplex* spp., *Triglochin maritima*, and *Cirsium* spp.,.....
..... **Mediterranean California Alkali Marsh (CES206.947)**
- 4a. Interdunal wetlands dominated by *Argentina anserina* (= *Potentilla anserina*), *Hydrocotyle umbellata*, *Euthamia occidentalis*, *Juncus* spp., *Carex obnupta*, and *Sparganium* spp.....
..... **Mediterranean California Coastal Interdunal Wetland (CES206.951)**
- 4b. Not as above..... 5
- 5a. Wetlands on serpentine soils, fed by groundwater seeps, have substantial *Sphagnum* accumulation. Characteristic species present include *Darlingtonia californica*, *Drosera rotundifolia*, *Eleocharis quinqueflora*, *Eriophorum crinigerum*, *Carex californica*, and *Deschampsia caespitosa*.
..... **Mediterranean California Serpentine Fen (CES206.953) NOT ISOLATED**
- 5b. Wetlands not of serpentine soils or fed by groundwater seeps. Wetlands receive only precipitation, and water accumulates on site due to impermeable layer such as a bedrock or hard clay layer, vegetation dominated by forbs, sites dry out completely every year..... 6

spinus, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, or *Sarcobatus vermiculatus*. Herbaceous vegetation such as perennial grasses or herbs may present. Wetland vegetation may be concentrated near occasional seeps/springs or tanks in drainage where water is perennial.....
**North American Warm Desert Wash (CES302.755) NOT ISOLATED**

3a. Wetlands occur in small (usually less than 0.1 ha) interdunal swales in wind deflation areas within active or partially vegetated dunes or sand sheets, where sand is scoured down to the water table. These wetlands areas are typically dominated by emergent herbaceous species like *Eleocharis* spp., *Juncus* spp or *Schoenoplectus* spp. Other characteristic species may include *Dasyochloa pulchella*, *Ephedra californica*, *Ericameria linearifolia*, *Eriogonum deserticola*, *Heliotropium convolvulaceum*, *Poliomintha incana*, *Prosopis glandulosa*, *Pleuraphis rigida*, *Psoralidium lanceolatum*, *Psorothamnus polydenius*, *Psorothamnus scoparius*, and *Psorothamnus spinosus*.
**North American Warm Desert Interdunal Swale Wetland (CES302.039)**

3b. Basin wetlands are not associated with active or partially vegetated dunes or sand sheets..... 4

4a. Sparsely vegetated, intermittently flooded wetland restricted to playas that are dry most of the year. During wet periods vegetation may become dense. However, desert playas are typically sparsely vegetated (generally less than 10% cover) depending on time since last flooding and degree of salinity. Salt crusts are common throughout, often with small saltgrass beds in depressions and sparse shrubs around the margins. Subsoils often include an impermeable layer of clay or *caliche*. Large desert playas often form vegetation rings formed in response to salinity. Characteristic species include *Allenrolfea occidentalis*, *Suaeda* spp., *Distichlis spicata*, *Eleocharis palustris*, *Sporobolus* spp., *Tiquilia* spp., or *Atriplex* spp. Ephemeral herbaceous species may have high cover periodically. **North American Warm Desert Playa (CES302.751)**

4b. Wetland NOT typically with sparse vegetation; and/or restricted to intermittently flooded playas..... 5

5a. Wetland occurs in depressions on broad mesas and plains, and valley bottoms that receive runoff from adjacent uplands where water generally infiltrates or drains off relatively quickly and lacks defining wetland soil characteristics. Vegetation is typically dominated by lush swards of *Pleuraphis mutica* (tobosa swales) or other mesic graminoids such as *Pascopyrum smithii*, *Panicum obtusum*, *Sporobolus airoides*, or *Sporobolus wrightii* that contrast sharply with surrounding desert scrub or shortgrass steppe **Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (CES302.746)**

5b. Not as above. Vegetation is typically dominated by emergent herbaceous species..... 6

6a. Herbaceous wetlands among alkaline springs at low elevation (<1000 m) and at mid-elevation (1000-2000 m) among semi-desert grasslands and Madrean evergreen woodlands. Evaporation often creates saline conditions especially on the margins as evidenced by salt-tolerant species such as *Distichlis spicata* and *Sporobolus airoides*. Typically, low-elevation examples are too warm to accumulate a deep organic layer. Vegetation mosaics respond to water depth. In shallow margins, emergent plants typical of riparian vegetation are present including species of *Carex*, *Juncus*, and *Schoenoplectus*. In adjacent deeper waters, emergent marsh can be characteristic.. ... **North American Warm Desert Cienega (CES302.747) NOT ISOLATED**

6b. Herbaceous wetland that occur in depressions (ponds, kettle ponds), as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Marshes are frequently or continually inundated, with water depths up to 2 m or greater. Soil may be muck or mineral. Common emergent and floating vegetation includes species of *Scirpus* and/or *Schoenoplectus*, *Typha*, *Juncus*, *Potamogeton*, *Polygonum*, *Nuphar*, and *Phalaris*. This system may also include areas of relatively deep water (>2 m) with floating-leaved plants
**North American Arid West Emergent Marsh (CES300.729) NOT ISOLATED**

Key to Isolated Wetland Types of the Western Great Plains Division (303)

- 1a. Wetland over shallow soils or on bedrock surface; typically found among upland forest, woodlands, and glades; exclusively in the Edward’s Plateau of Texas and into Oklahoma..... 2
- 1b. Wetland found throughout the western Great Plains. 3

- 2a. Wetland is small (up to 16 meters in diameter) in shallow depressions that hold rainwater and support wetland flora, including the Texas endemic, *Isoetes lithophila*. Found on granite outcrops of the Llano Uplift in Texas
 **Llano Uplift Granitic Forest, Woodland and Glade (CES303.657)**
- 2b. Wetland is small (up to 16 meters in diameter) shallow depression that holds rainwater and support wetland flora. Primarily restricted to limestone soils within the Edwards Plateau and dissected Pennsylvanian limestone formations within Texas and north into Oklahoma..... **Edwards Plateau Limestone Forest, Woodland and Glade (CES303.660) NOT ISOLATED WETLAND**

- 3a. Wetland characterized by moderate to strongly saline soils. Halophytic, salt tolerant species such as *Distichlis spicata* and *Hordeum jubatum* dominate. 4
- 3b. Wetland characterized by neutral to slightly alkaline soils. Little to no halophytic species present 5

- 4a. Wetland characterized by open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*. The herbaceous layer, if present, is usually dominated by graminoids.....
 **Inter-Mountain Basins Greasewood Flat (CES304.780)**
- 4b. Wetland dominated by herbaceous species such as *Distichlis spicata*, *Sporobolus airoides*, and *Hordeum jubatum*. Salt encrustations can occur on the surface in some examples. Occurs throughout the western Great Plains..... **Western Great Plains Saline Depression Wetland (CES303.669)**

- 5a. Wetland characterized by closed basin with apparently little to no groundwater influence; i.e., on relatively impermeable substrates..... 6
- 5b. Wetland characterized by open basin and apparently influenced by groundwater; i.e., on permeable substrates..... 7

- 6a. Playa lake or rainwater basins characterized by an impermeable soil layer such as dense clay. *Eleocharis* spp., *Hordeum jubatum*, *Coreopsis tinctoria*, *Symphyotrichum subulatum* (= *Aster subulatus*), and *Polygonum pensylvanicum* (= *Polygonum bicorne*) are common vegetation in the wetter and deeper depression, while *Pascopyrum smithii* and *Buchloe dactyloides* are more common in shallow depressions in rangeland. Found mostly in western Great Plains, but occasionally can occur in eastern tallgrass plains as well
 **Western Great Plains Closed Depression Wetland (CES303.666)**
- 6b. Prairie potholes found primarily in glaciated northern Great Plains. This system is typified by elements of emergent marshes and wet, sedge meadows that develop into a pattern of concentric rings.
 **Great Plains Prairie Pothole (CES303.661)**

- 7a. Wetland occurs throughout the northern Chihuahuan Desert, Sky Islands and Sonoran Desert, as well as limited areas of the southern Great Plains and Edwards Plateau on broad mesas, plains and valley bottoms. Vegetation is typically dominated by *Pleuraphis mutica* (tobosa swales) or other mesic graminoids such as *Pascopyrum smithii*, *Panicum obtusum*, *Sporobolus airoides*, or *Sporobolus wrightii*.
 **Chihuahuan-Sonoran Desert Bottomland and Swale Grassland (CES302.746)**

- 7b. Wetland typically occurs as lowland depressions or along lake borders that have a permanent water source through most of the year. A variety of species are part of this system, including *Typha* spp. and *Schoenoplectus* spp. The system includes submergent and emergent marshes, and associated wet meadows and wet prairies. Occurs throughout western Great Plains and just reaches into tallgrass regions. **Western Great Plains Open Freshwater Depression Wetland (CES303.675)**

Key to Isolated Wetland Types of the Intermountain Basin Division (304)

- 1a. Seepage wetlands restricted to wet pockets or draped across wet cliff faces of canyon walls or other steep rock outcrops; typically dominated by herbaceous vegetation. Species of *Adiantum*, *Aquilegia*, *Mimulus* are typically present to dominant. **Colorado Plateau Hanging Garden (CES304.764)**
- 1b. Wetlands restricted to drainages or basins 2
- 2a. Wetlands are restricted to intermittently flowing drainages and include a variety of sparse or patchy vegetation including *Sarcobatus vermiculatus*, *Ericameria nauseosa*, *Fallugia paradoxa*, *Artemisia cana* ssp. *cana* or *Grayia spinosa*. Herbaceous vegetation such as perennial grasses, *Distichlis spicata* or *Sporobolus airoides*, may also dominate. Wetland vegetation may concentrated near seeps/springs or tanks in drainages where standing water is perennial. **Inter-Mountain Basins Wash (CES304.781) NOT ISOLATED**
- 2b. Wetlands restricted to basins..... 3
- 3a. Wetlands occur in a small (usually less than 0.1 ha) interdunal swales that occur in wind deflation areas within active or partially vegetated dunes or sand sheets, often where sand is scoured down to the water table. These wetlands areas are typically dominated by emergent herbaceous vegetation such as species of *Eleocharis*, *Juncus* or *Schoenoplectus*, is active or partially vegetated dunes or sand sheets 4
- 3b. Wetlands are not associated with active or partially vegetated dunes or sand sheets 5
- 4a. Small interdunal wetland occurring within the transitional areas between the Great Basin and the Mojave Desert in southern Nevada. **North American Warm Desert Interdunal Swale Wetland (CES302.039)**
- 4b. Small interdunal wetlands occurring within the intermountain western US from the South-central New Mexico and Southern Colorado Plateau (including the San Luis Valley in Southern Colorado) north to the Columbia Basin, Snake River Plains, Centennial Valley of southwestern Montana and western Wyoming. These wetland areas are typically dominated by emergent herbaceous vegetation, such as species of *Eleocharis*, *Juncus*, and *Schoenoplectus*. Occasionally wetlands are dominated by trees and shrubs, such as *Populus fremontii* and *Baccharis salicifolia*. **Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)**
- 5a. Soils are organic, thick layers of peat >40 cm deep (often *Sphagnum* moss) 6
- 5b. Soils are mineral, a thin layer of organic material may occur on surface, lacking significant accumulation of *Sphagnum* moss 7
- 6a. Wetland is dominated by low ericaceous shrubs (*Kalmia* spp., *Ledum* spp., *Myrica* spp., *Empetrum* spp., or *Chamaedaphne* spp.), and with patches of graminoids and bryophyte lawns. *Sphagnum* species including *S. magellanicum*, *S. fuscum*, and *S. cuspidatum* may be characteristic. Conifer trees sometimes codominate the shrub layer. These wetlands are found at higher temperate and boreal latitudes of Canada, extending south into the Pacific Maritime, Rocky Mountain Divisions and to a limited extent the Intermountain Basin Division where it is restricted to depressional habitats higher elevation mountains. ... **Boreal Depressional Bog (CES103.871)**

- 6b. Wetland not as above. These subalpine-montane fens are confined to specific environments defined by groundwater discharge, soil chemistry, and peat accumulation of at least 40 cm. Typically dominated by *Carex aquatilis*, *Carex limosa*, *Carex lasiocarpa*, *Betula nana*, *Kobresia myosuroides*, *Kobresia simpliciuscula*, and *Trichophorum pumilum* (= *Scirpus pumilus*).
 **Rocky Mountain Subalpine-Montane Fen (CES306.831) NOT ISOLATED**
- 7a. Wetlands on exposed basalt scablands of the Columbia Plateau in Washington and Oregon. 8
 7b. Wetlands occurring throughout the intermountain western US. 9
- 8a. Wetlands that occur in small depressions in channeled basalt scablands of the Columbia Plateau in Washington's eastern Columbia River Gorge. They typically occupy the bottom of a basalt cliff (1-20+ m tall) lined circular or linear depression. Vegetation varies from emergent marsh, deeper water floating-leaved plants with trees and shrubs present adjacent to more northerly potholes.....
 **Northern Columbia Plateau Basalt Pothole Ponds (CES304.058)**
- 8b. Wetlands of mineral soils, dominated by herbaceous plants, often in concentric rings around seasonally wet, shallow ephemeral water bodies found in very small depressions (1600 square m average) throughout the exposed basalt scablands of the Columbia Plateau in Washington and Oregon.....
 **Columbia Plateau Vernal Pool (CES304.057)**
- 9a. Intermittently flooded wetlands restricted to playas that are dry most of the year. During wet periods vegetation may be relatively lush. However, playas are typically sparsely vegetated to barren (generally less than 10% cover) depending on time since last flooding and degree of salinity. Playas form with intermittent flooding, followed by evaporation, leaving behind a saline residue. Salt crusts are common throughout, often with small saltgrass beds in depressions and sparse shrubs around the margins. Subsoils often include an impermeable layer of clay or *caliche*. Large playas tend to be defined by vegetation rings formed in response to salinity. Characteristic species include *Allenrolfea occidentalis*, *Sarcobatus vermiculatus*, *Grayia spinosa*, *Puccinellia lemmonii*, *Leymus cinereus*, *Distichlis spicata*, and/or *Atriplex* spp. **Inter-Mountain Basins Playa (CES304.786)**
- 9b. Wetland not typically sparsely vegetated, or restricted to intermittently flooded playas 10
- 10a. Wetlands dominated by herbaceous vegetation 11
 10b. Wetlands dominated by woody vegetation. 12
- 11a. Herbaceous wetlands typically found along the margins of perennial lakes, or in closed basins. Sites are seasonally to semi-permanently flooded, usually retaining water into the growing season and drying completely only in drought years. Many are associated with hot and cold springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation. Salt encrustations can occur on the surface in some examples of this system, and the soils are severely affected and have poor structure. Species that typify this system are salt-tolerant and halophytic species such as *Distichlis spicata*, *Puccinellia lemmonii*, *Poa secunda*, *Muhlenbergia* spp., *Leymus triticoides* (= *Elymus triticoides*), *Schoenoplectus maritimus*, *Schoenoplectus americanus*, *Triglochin maritima*, and *Salicornia* spp.....
 **Inter-Mountain Basins Alkaline Closed Depression (CES304.998)**
- 11b. Herbaceous wetland that occurs in depressions in the landscape (ponds, kettle ponds), as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Frequently or continually inundated, with water depths up to 2 m. Soil may be muck or mineral. Emergent and floating vegetation includes species of *Scirpus* and/or *Schoenoplectus*, *Typha*, *Juncus*, *Potamogeton*, *Polygonum*, *Nuphar*, and *Phalaris*.
 **North American Arid West Emergent Marsh (CES300.729) NOT ISOLATED**

- 12a. Shrubland or steppe occurring along drainages in Great Basin mountain ranges and in lowland depressional wetlands or non-alkaline playas in the northern Great Basin and Columbia Basin that is dominated by *Artemisia cana* ssp. *bolanderi* or *A. cana* ssp. *viscidula*. *Artemisia tridentata* ssp. *tridentata*, *A. tridentata* ssp. *wyomingensis* or *A. tridentata* ssp. *viscidula* are occasionally co-dominant. The herbaceous layer generally has 25% or more cover of perennials, typically graminoids with *Poa secunda* (= *P. nevadensis*), *P. cusickii*, *Mulhenbergia filiformis*, *M. richardsonis*, and *Leymus cinereus* dominant at the drier sites, *Eleocharis palustris*, *Deschampsia caespitosa* and *Carex* species at the wetter or higher elevation sites.
 **Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub-Steppe (CES304.084)**
NOT ISOLATED
- 12b. Open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*, *Atriplex canescens*, *Atriplex confertifolia*, or *Krascheninnikovia lanata*. There may be patches of *Distichlis spicata* grassland. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons.
 **Inter-Mountain Basins Greasewood Flat (CES304.780)**

Key to Isolated Wetland Types of the Rocky Mountains Division (306)

- 1a. Soils are organic peat; includes thick layers of *Sphagnum* moss 2
- 1b. Soils are mineral, a thin layer of organic material may occur on surface; lacking a thick layer of *Sphagnum* moss 3
- 2a. Peatland has very to moderately acidic substrates, little groundwater influence. Vegetation is dominated by low ericaceous shrubs (*Kalmia* spp., *Ledum* spp., *Betula* spp., *Myrica* spp., *Empetrum* spp., or *Chamaedaphne* spp.), and with patches of graminoids and bryophytes. *Sphagnum* species including *S. magellanicum*, *S. fuscum*, and *S. cuspidatum* may be characteristic. Conifer trees sometimes codominate the tree and shrub layers. **Boreal Depressional Bog (CES103.871)**
- 2b. Peatland has slightly acidic to alkaline substrates, with apparent ground water influence. Characteristic graminoid species include *Carex aquatilis*, *Carex limosa*, *Carex lasiocarpa*, *Betula nana*, *Kobresia myosuroides*, *Kobresia simpliciuscula*, and *Trichophorum pumilum* (= *Scirpus pumilus*)
 **Rocky Mountain Subalpine-Montane Fen (CES306.831) NOT ISOLATED**
- 3a. Wetland dominated by herbaceous vegetation 4
- 3b. Wetland dominated by woody vegetation 5
- 4a. Herbaceous wetlands typically found along the margins of perennial lakes, or in closed basins. Sites are seasonally to semi-permanently flooded, usually retaining water into the growing season and drying completely only in drought years. Many are associated with hot and cold springs, located in basins with internal drainage. Soils are alkaline to saline clays with hardpans. Seasonal drying exposes mudflats colonized by annual wetland vegetation. Salt encrustations can occur on the surface in some examples of this system, and the soils are severely affected and have poor structure. Species that typify this system are salt-tolerant and halophytic species such as *Distichlis spicata*, *Puccinellia lemmonii*, *Poa secunda*, *Muhlenbergia* spp., *Leymus triticoides* (= *Elymus triticoides*), *Schoenoplectus maritimus*, *Schoenoplectus americanus*, *Triglochin maritima*, and *Salicornia* spp.
 **Inter-Mountain Basins Alkaline Closed Depression (CES304.998)**
- 4b. Herbaceous wetland that occur in depressions, as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Frequently or continually inundated, with water depths up to 2 m. Soil may be muck or mineral. Common emergent and floating vegetation

includes species of *Scirpus* and/or *Schoenoplectus*, *Typha*, *Juncus*, *Potamogeton*, *Polygonum*, *Nuphar*, and *Phalaris*. **North American Arid West Emergent Marsh (CES300.729) NOT ISOLATED**

- 5a. Wetland shrubland or steppe occurring along drainages in Great Basin mountain ranges and in lowland depressional wetlands or non-alkaline playas in the northern Great Basin and Columbia Basin Vegetation dominated by *Artemisia cana* ssp. *bolanderi* or *A. cana* ssp. *viscidula*. *Artemisia tridentata* ssp. *tridentata*, *A. tridentata* ssp. *wyomingensis* or *A. tridentata* ssp. *viscidula* are occasionally co-dominant. The herbaceous layer generally has 25% or more cover of perennials, typically graminoids with *Poa secunda* (= *P. nevadensis*), *P. cusickii*, *Mulhenbergia filiformis*, *M. richardsonis*, and *Leymus cinereus* dominant at the drier sites, *Eleocharis palustris*, *Deschampsia caespitosa* and *Carex* species at the wetter or higher elevation sites.
 **Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub-Steppe (CES304.084) NOT ISOLATED**
- 5b. Open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus*, *Atriplex canescens*, *Atriplex confertifolia*, or *Krascheninnikovia lanata*. There may be patches of *Distichlis spicata* grassland. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. **Inter-Mountain Basins Greasewood Flat (CES304.780)**

Key to Isolated Wetland Types of Tropical Florida Division (411)

- 1a. Coastal interdunal swales and basins on barrier islands
 **Southeastern Coastal Plain Interdunal Wetland (CES203.258)**
- 1b. Non-coastal wetlands 2
- 2a. Forested wetlands in poorly drained depressions found primarily in the Everglades and Big Cypress regions, dominated by Pond Cypress (*Taxodium ascendens*)
 **South Florida Cypress Dome (CES411.365)**
- 2b. Herbaceous wetlands in southern Florida, including seasonal ponds and solution holes
 **South Florida Depression Pondshore (CES411.054)**

Key to Isolated Wetland Types of Northern Polynesia Division (412)

- 1a. Wetland dominated by herbaceous plants. May appear dry for part of the year, or never wet for several years during droughts. In wet years the wetland is characterized by the dominance of the fern species: *Marsilea villosa*. During dry periods the fern becomes a dormant rhizomatous mat, and the area appears to be a weedy dryland of grasses and forbs, including *Amaranthus spinosus*, *Xanthium strumarium*, *Setaria verticillata*, *Cynodon dactylon*, *Chloris barbata*, and *Merremia aegyptia*.
 **Hawai'i 'Ihi'ihiluakea Vernal Pool (CES412.223)**
- 1b. Wetland codominated by herbaceous and woody plants. The vegetation is an uneven hummocky matrix of sedges and grasses, including *Rhynchospora rugosa* ssp. *lavarum* (= *Rhynchospora lavarum*), *Oreobolus furcatus*, *Dichantheium*, *Panicum*, and *Deschampsia*, imbedded in moss (*Racomitrium lanuginosum*, *Sphagnum* spp.). Dwarfed woody plants can occur as scattered individuals, in clumps, or as a continuous layer and include *Metrosideros polymorpha*, *Cheirodendron* spp., and *Vaccinium* spp.
 **Hawai'i Montane Bog (CES412.216)**