

APPENDIX B

Key to Wetland Communities of Indiana

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1. Mature trees (dbh 3 inches or more) present and form closed stands (more than 17 trees per acre or more than 50% canopy cover)
 2. Community associated with riverine systems; soils mineral rich *Floodplain Forest*
 2. Community often associated with ancient lake basins or depressions in generally flat or rolling topography; soils poorly-drained mineral or peat/muck *Swamp Forest*
1. Mature trees absent or forming open, sparse stands
 3. Community dominated by shrubs
 4. Shrubs most low (less than 3 feet tall), dominant species include heaths or shrubby cinquefoil; Sphagnum moss layer may be present
 5. Shrubs of heath family, i.e. blueberry, cranberry, leatherleaf, some species are broad-leaved evergreens; substrate of Sphagnum moss or acidic peat, sometimes forming a floating mat; hydrology often a more or less closed basin without ground water seepage *Bog*
 5. Shrubs not belonging to the heath family, i.e. deciduous species such as shrubby cinquefoil, red osier dogwood, and ninebark; substrate a muck, marl, or mineral soil with circumneutral or alkaline reaction; hydrology a sloping to flat topography fed by mineral-rich groundwater seepage *Fen*
 4. Shrubs mostly tall (greater than 3 feet tall), dominant species include willows, various dogwood species, and buttonbush; Sphagnum moss layer absent ... *Shrub-carr*
 3. Community dominated by herbaceous plants
 6. Vegetation forming an essentially closed community of perennial species with more than 50% cover
 8. Sites often sloping and fed by groundwater seepage; vegetation in larger, alkaline sites dominated by sterile sedge, queen of the prairie, grass of Parnassa, gentians, and other calciphiles *Fens and Seeps*
 8. Sites in flat, low-lying depressional or sometimes riverine settings
 9. Vegetation including members of the heath family (e.g blueberry, cranberry, leatherleaf), pitcher plants, sundews, and sedges such as cotton grass and sedges tolerant of low nutrient conditions; substrate of Sphagnum moss or acidic peat, sometimes forming a floating mat *Bog*
 9. Vegetation dominated by sedges, grasses, and/or cat-tails with mixtures of arrowheads, and non-acid loving forbs; substrate a more or less neutral, poorly-drained mineral or muck soil
 10. Vegetation dominated by members of the sedge family and/or cat-tails with mixture of arrowheads, grasses, and forbs
 11. Herbaceous cover of submergent and emergent

plants growing in areas with greater than 6 inches of standing water throughout most of the growing season *Deep Marsh / Shallow Open Water*

11. Herbaceous cover of emergent plants on saturated soil or areas covered to 6 inches of standing water

12. Dominant cover consisting of sedges, especially the genus *Carex*
..... *Sedge Meadow*

12. Dominant cover consisting of cat-tails, bulrushes, grasses, water plantain, arrowheads *Shallow Marsh*

10. Vegetation dominated by grasses, with a mixture of bulrushes, sedges, and non-calciophilic forbs

11. Soils saturated or inundated during the growing season; dominant species include prairie grasses (e.g. prairie cordgrass, big bluestem, Canada joint grass) and prairie forbs *Wet Prairie*

11. Soils saturated for part or all of growing the season but seldom inundated; dominant species include non-prairie grasses (e.g. reed canary grass, red top, and Kentucky blue-grass), common sedges, rushes, and non-prairie forbs *Wet Meadow*

6. Vegetation open or sparse (less than 50% cover), the habitat having persistent shallow water with submergent, floating, and/or floating leaved vegetation OR a seasonally flooded flats or basin dominated by annual plant species

12. Areas of shallow, open water less than 6.6 feet deep, dominated by submergent, floating and/or floating leaved vegetation ... *Shallow Open Water*

12. Areas of shallow depressions or flats with less persistent water, dominated by annual plant species

13. Sites in northern Indiana (sometimes associated with margins of lakes) with peculiar sedges species such as twig rush, beaked sedge, 3-way sedge as well as other "coastal-plain disjuncts" such as yellow-eyed grass, meadow beauty, and cross milkwort; substrate sandy or mucky *Sand/Muck Flats*

13. Sites in poorly drained depressions typically associated with cultivated land vegetated by knotweeds, barnyard grass, species of nut sedge, stick tights, cutgrass, and ragweeds; soils of clay- or silt-loams *Seasonally Flooded Basins*

APPENDIX C

Wetland Communities of Indiana

Wetland Types in Indiana

1. FLOODPLAIN FOREST

On alluvial mostly neutral silt-loam soils associated with riverine systems. Dominate trees may be Acer saccharinum, Populus deltoides, Salix nigra, Platanus occidentalis, Quercus bicolor, Q. palustris, Celtis occidentalis, Fraxinus spp., Ulmus americana, Acer negundo, A. rubrum, Gleditsia spp., and Betula nigra. Herbaceous layer: Laportea canadensis, Impatiens spp., Rudbeckia laciniata, Cryptotaenia canadensis, Actinomeris alternifolia, Urtica dioica, Pilea pumila, Campanula americana, and graminoides such as Cinna arundinacea, Carex grayi, and C. muskingumensis. In southwestern Indiana this community has additional woody species which include Carya illinoensis and Aristolochia tomentosa.

2. SWAMP FOREST

On poorly drained mineral or peat/muck soils. Important tree species include: Quercus palustris, Q. bicolor, Acer rubrum, Nyssa sylvatica, Liquidambar styraciflua (southern half of Indiana), Fraxinus spp., and Carya laciniosa. Shrubs and herbs include Cephalanthus occidentalis, Ilex verticillata, Carex spp. (e.g. C. grayi, C. muskingumensis, C. intumescens), Ranunculus septentrionalis, ferns such as Osmunda cinnamomea, Onoclea sensibilis, grasses such as Cinna arundinacea and Glyceria striata. In the southwestern Indiana, Taxodium distichum and Quercus lyrata are among the tree species.

3. FEN

Fens are often located on sloping sites with spring-fed, calcareous water. Sphagnum moss mat absent. Soils muck/poorly-drained minerals soils; alkaline or circum-neutral. Depending upon hydrology and successional history, the fen community varies from herbaceous to shrubby to more or less forested. Common shrubs include Potentilla fruticosa, Physocarpus opulifolius, Cornus stolonifera, and sometimes Betula pumila. Characteristic herbs of a fen include Carex sterilis, Eleocharis spp., Filipendula rubra, Parnassia glauca, Solidago ohioensis, S. riddellii, Circium muticum, Lobelia kalmii, Aster puniceus, Gentianopsis procera, Gentiana crinita, Cacalia spp., Pedicularis lanceolatus, Selaginella apoda, Zizia aurea, Symplocarpus foetidus, and Caltha palustris. Some areas may be marly. The wet prairie swales (characterized by spring ponding and deep black mineral rich soil or muck) and fens may share many floristic elements: Liatris spp., Andropogon gerardii or Schizachyrium scoparium, Carex stricta, Pycnanthemum virginianum, and Rudbeckia fulgida. Tree-dominated fens have Acer rubrum, Fraxinus nigra, Larix laricina, and Thuja occidentalis.

4. BOG

Sphagnum moss mat layer. Soils are peaty and acidic. Carex spp. (including C. oligosperma, C. canescens, and C. trisperma), Chamaedaphne calyculata, Vaccinium spp. (especially V. oxycoccos and V. macrocarpon), Dulichium, Eriophorum spp., Sarracenia purpurea, Drosera spp. Other frequent woody plants are Rhus vernix, Larix laricina, Spiraea tomentosa, Decodon verticillatus, Vaccinium corymbosum, and Betula pumila. Ferns include Osmunda regalis.

5. SHRUB-CARR

Neutral to alkaline poorly-drained muck/mineral soils without Sphagnum mat. Seasonal or permanent standing water. Dominated by Cephalantha occidentalis, Salix spp., Cornus stolonifera, C. amomum, Sambucus canadensis, Decodon verticillatus, Ilex verticillata, or Acer rubrum. Additional species: Rosa palustris, Spiraea alba, Rhus vernix, Eupatorium maculatum, Onoclea sensibilis, Caltha palustris, and Symplocarpus foetidus.

6. SEDGE MEADOW

Saturated soils with water depth up to 6 inches throughout most of the growing season. Herbaceous vegetation dominated by Carex spp. (e.g. C. stricta, C. lacustris, C. pellita), plus Scirpus spp., Eleocharis spp., and Cyperus spp. Other common species include grasses (such as Calamagrostis canadensis and Leersia oryzoides), Juncus spp., Caltha palustris, Polygonum pensylvanicum, P. sagittatum, Eupatorium spp., and Bidens spp. This community is similar to wet prairie which include significant cover by grasses such as Spartina pectinata and Andropogon gerardii and additional prairie forbs.

7. DEEP MARSH/SHALLOW OPEN WATER

Standing water greater than 6 inches throughout most of the growing season. Bulrush (Scirpus acutus), Typha latifolia, Nymphaea tuberosa, Nuphar advena, Nelumbo lutea, Pontederia cordata, Brasenia shreberi, Zizania aquatica, Lemna spp., Potamogeton spp. (e.g. P. nutans), and Ceratophyllum demersum. In clear, non-polluted water one might also find Chara spp. and Valisneria americana.

8. SHALLOW MARSH

Soils usually deep, black, and organic rich. Hydrology mostly non-flowing, more or less permanent water up to approximately 6 inches deep. Typha latifolia and T. angustifolia (especially in depressional palustrine wetlands), Scirpus spp. (especially abundant in lacustrine settings), Sagittaria latifolia, Cicuta maculata and C. bulbifera, Sium suave, Leersia spp., Glyceria spp., Rumex spp., Carex spp., Juncus effusus, Alisma subcordatum, Sparganium spp., Peltandra virginica, Eupatorium perfoliatum, Asclepias incarnata, Iris virginica, Boehmeria cylindrica, Symplocarpus foetidus, Bidens spp., and Polygonum spp.

9. SAND/MUCK FLAT

Margins of lakes or on shallow basins in northern Indiana. Inundated during high water periods. Herbaceous vegetation composed of sedges (Rhynchospora macrostachya, Cladium mariscoides, Fuirena pumila, Fimbristylis caroliniana, Psilocarya scirpoides, Dulichium arundinaceum, Eleocharis olivacea), annuals, and other plants (Xyris caroliniana, Polygala cruciata, Rhexia virginica) which are also found on the Atlantic and Gulf Coastal Plains.

10. SEASONALLY FLOODED BASIN

Poorly drained depressions in outwash plains, floodplains, and glacial deposits where water stands for a few weeks each year, but are dry for much of the growing season. They are frequently cultivated or surrounded by cultivation and become colonized by annuals that provide feeding and resting areas for migrating waterfowl and shorebirds. Typical cover includes Polygonum pennsylvanicum and related species, Echinochloa crusgalli, Cyperus erythrorhizos, C. strigosus, Eleocharis obtusa, Bidens spp., Leersia oryzoides, Setaria spp., Ambrosia spp.

11. WET MEADOW

A grass dominated and probably young community that indicates recent disturbance by drainage, siltation, cultivation, pasturing, and/or temporary flooding. Once established, it may persist for extended periods of time. The site is rarely inundated but soils are saturated for all or part of the growing season. Graminoids include Phalaris arundinacea but also Agrostis alba, Poa pratensis, Carex vulpinoidea, Scirpus atrovirens, and Juncus tenuis. Forbs include Asclepias incarnata, Helianthus spp., Impatiens, Urtica dioica, Verbena hastata, Eupatorium perfoliatum, Aster simplex, Lysimachia spp.

12. SEEPS

A natural irrigation of ground water flowing at least part of the year. The flora varies with acidity. Acid seeps of unglaciated areas include Sphagnum, Osmunda spp., Dryopteris cristata, Carex bromoides, Platanthera clavellata, Aronia melanocarpa, Ilex verticillata, Polygonum arifolium. Pannes of Lake Michigan shoreline are dominated by Calamagrostis canadensis, Carex spp., and Juncus balticus; but also Cladium mariscoides, Potentilla fruticosa, and other species. Circumneutral seeps of northern Indiana are dominated by Carex spp. (e.g. C. lacustris and C. bromoides), Caltha palustris, Symplocarpus foetidus; but also include Aster puniceus, Chelone glabra, and others.

13. WET PRAIRIE

Dominated by mixes of grasses Spartina pectinata, Calamagrostis canadensis, Andropogon gerardii, Sorghastrum nutans. Other graminoids include Carex (e.g. C. stricta), Eleocharis spp., Scirpus spp., Juncus tenuis. Common associated species are Liatris spp., Helianthus grosseserratus, Solidago riddellii, Aster novae-angliae, Helenium autumnale, Zizia aurea, Osmunda regalis, Habenaria lacera, Sium suave, Veronicastrum virginicum, Oxypolis rigidior, and Pycnanthemum virginianum.

APPENDIX D

Wetland Quality Descriptions

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The following descriptions of major wetland types evaluates community quality on the basis of disturbance, native plants diversity/cover, and content of exotic or invasive native species. Assign a final quality category based upon the 3 (or 2) indicators of quality which best fit the community under investigation.

Group 1. Wooded wetlands: floodplain forest and swamp forest

Indicators of Good Quality:

- Stands undisturbed as demonstrated by large standing trees (many trees greater than 12 inches dbh) and the site minimally disturbed by human activity such as artificial drainage, grazing, logging, impoundment, and filling.
- Native disturbance species (e.g. boxelder and cottonwood and brambles) have low dominance in the community. Ground layer (ignoring zones with seasonal standing water) composed of a diversity of native species of grasses, forbs, sedges, ferns, as listed in Indiana wetland community descriptions. Natural regeneration indicated by the presence of seedlings and/or saplings of shade tolerant tree species.
- Exotic species such as garlic mustard, reed canary grass, and buckthorn none or only with scattered cover (less than 10% cover).

Indicators of Medium Quality:

- Stand moderately impacted as indicated by mostly smaller trees or some toppling of mature trees or by human activity including artificial drainage, grazing, logging, impoundment, and filling.
- Native disturbance species such as boxelder or cottonwood provide up to 40% of cover as trees and saplings. Ground layer with reduced diversity and cover of native species during the growing season.
- Ground layer with up to 40% cover by exotic species.

Indicators of Poor Quality:

- Stand noticeably impacted as indicated by consistently pole-size trees or toppled mature trees or human activity such as artificial drainage, grazing, logging, impoundment, and filling.
- Regeneration of tree species poor or consisting mostly of native disturbance species such as boxelder and cottonwood. Ground layer with poor diversity and cover of native species during the growing season; cover by weedy annual species may be high.
- Exotics and/or native herbaceous disturbance species provide greater than 40% of vegetative cover.

Group 2. Shrub scrub wetlands: shrub-carr, some bogs, some fens

Indicators of Good Quality:

- Community undisturbed by artificial drainage, grazing, filling, impoundment, or excavation.
- Dominated by native shrubs (such as dogwoods, willows, poison sumac, and heath family shrubs) with groundlayer dominated by 6 or more native sedges, grasses and forbs (deeper water sites dominated by buttonbush and nutrient poor sphagnum bogs may have a less diverse herbaceous

layer).

- Exotics, especially woody buckthorns, honeysuckles, and/or disturbance native species such as boxelder comprise less than 10% cover.

Indicators of Medium Quality:

- Community moderately impacted by disturbances listed above.
- Shrub layer predominately of native cover and herbaceous layer dominated by 3--5 native perennial species.
- Shrub layer or herbaceous layer with no more than 40% cover by native disturbance species or exotic such as buckthorns, honeysuckles, reed canary grass or purple loosestrife.

Indicators of Poor Quality:

- Community highly impacted by disturbances listed above.
- Shrub and herbaceous layer with low diversity of native perennial species; cover by weedy annual species may be high.
- Shrub and herbaceous layer with more than 40% cover of exotic or invasive native species.

Group 3. Herbaceous dominated wetlands: some bogs, some fens, wet prairie, sedge meadow, wet meadows, marshes, seasonally flooded basins, and sand/muck flats

Indicators of Good Quality:

- Community undisturbed by artificial drainage, grazing, filling, impoundment, or excavation.
- Dominated by 6 or more species of native plants as listed in community descriptions (deep marshes, where standing water exceeded 6 inches, may have fewer dominant species).
- Exotics species such as purple loosestrife or reed canary grass comprise less than 10% cover. Cat-tails comprise less than 40% cover.

Indicators of Medium Quality:

- Community moderately impacted by disturbances listed above.
- Dominated by 3--5 non-invasive native species that are often arranged in bands or somewhat homogeneous patches.
- Exotic species comprise up to 25% cover. Cat-tails may comprise 40--85% cover.

Indicators of Poor Quality:

- Community highly impacted by disturbances listed above.
- Diversity and dominance of non-invasive native species very low; cover by weedy annual species may be high.
- Exotic species provide more than 25% of vegetation cover or cat-tail more than 85% cover.