

APPENDIX C
Natural Community Descriptions
with Cross-Reference to Landscape Features

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PALUSTRINE

MARSH

SUBMERGENT MARSH

Overview: A chiefly submerged marsh of deep to sometimes shallow water in lakes and streams.

Associated Landscape Feature(s): Submergent wetland, River/stream/riparian/floodplain corridor

EMERGENT MARSH

Overview: A shallow water marsh characterized by emergent narrow- and broad-leaved herbs and grass-like plants as well as floating-leaved herbs at the shores of lakes and streams.

Associated Landscape Feature(s): Interior emergent wetland, River/stream/riparian/floodplain corridor

GREAT LAKES MARSH

Overview: A multi-seral non-forested wetland directly influenced by and connected to a large freshwater lake. Associated coastal features are principally freshwater deltas, riverine estuaries, coastal marshes protected by offshore bars or a barrier dune (forming a lagoon), and shallow bays on lee shores. Vegetational patterns are influenced by the type of coastal feature, but generally include the following: a deep marsh with submerged plants; an emergent marsh of mostly narrow-leaved species; and a marsh meadow that is inundated by storms and dominated by sedges. Seiches, storms, and water level cycles strikingly change vegetation over short periods by destroying some vegetation zones, creating others, and forcing all zones to shift lakeward or landward to accommodate water levels. Important habitat for migrating and breeding waterfowl, shorebirds, spawning fish, and medium-sized mammals.

Associated Landscape Feature(s): Coastal emergent wetland

NORTHERN WET MEADOW

Overview: A sedge- and grass-dominated wetland located mostly north of the transition zone, typically bordering streams but also found on pond and lake margins and above beaver dams. Soils are nearly always muck, which may be circumneutral to strongly acid. Open conditions are maintained by seasonal flooding, beaver-induced flooding, and/or fire.

Associated Landscape Feature(s): Interior emergent wetland, River/stream/riparian/floodplain corridor

SOUTHERN WET MEADOW

Overview: An open, groundwater-influenced (minerotrophic), sedge-dominated wetland that occurs in mid and southern Michigan. The community is dominated by *Carex* spp. (sedges), in particular *Carex stricta* (tussock sedge). Southern wet meadow occurs in stream valleys, on old abandoned lakebeds and along lake margins, and in depressions and channels in glacial outwash. Soils are neutral to medium acid mucks. Open conditions are maintained by seasonal flooding, beaver-induced flooding, and/or fire.

Associated Landscape Feature(s): Interior emergent wetland, River/stream/riparian/floodplain corridor

INLAND SALT MARSH

Overview: An herb-dominated wetland on mineral soil that is saturated by sodium- and chloride-laden groundwater from natural brine aquifers. Occurs along streams or rivers where glacial drift is thin enough to permit brine from deep saline aquifers to remain concentrated and emerge at discrete points. Distinct salt-tolerant vegetation is dominant within saline portions of marsh.

Associated Landscape Feature(s): Interior emergent wetland

INTERMITTENT WETLAND [BOGGY SEEPAGE WETLAND]

Overview: An herb or herb-shrub wetland along lakeshores or in depressions, experiencing fluctuating water levels seasonally and from year to year. North of the transition zone these wetlands typically occur on sandy glacial lake plains; south of the transition zone they are found on lake plains and level sandy outwash plains. Soil range from loamy sand and peaty sand to peaty muck and is very strongly acid to strongly acid. Characteristic vegetation includes *Carex* spp. (sedges), *Juncus* spp. (rushes), sphagnum mosses, and ericaceous shrubs. Some northern sites were created when fire burned bogs.

Associated Landscape Feature(s): Bog, Interior emergent wetland, Ephemeral wetland

COASTAL PLAIN MARSH

Overview: A grass- and rush-dominated wetland on shores of softwater seepage lakes, ponds, or depressions, where water levels fluctuate yearly and seasonally. Nearly always located in sandy glacial outwash or on sandy glacial lake plains with very strongly acid to strongly acid soils ranging from sand to peaty sand to peaty muck. Characterized by distinct zonation in concentric bands, which may include the following zones: open water (when present), shallow

water to recently emerged shore dominated by annual and emergent plants, moist meadow; and shrub-tree margin (when present). The community is characterized by a unique assemblage of plant species that are common to the Atlantic and Gulf coastal plains.

Associated Landscape Feature(s): Interior emergent wetland, Ephemeral wetland

INTERDUNAL WETLAND

Overview: A rush-, sedge-, and shrub-dominated wetland situated in depressions of open dunes along large freshwater lakes, experiencing a fluctuating water table seasonally and yearly, partly in synchrony with lake level changes. Typically found in long troughs between dune ridges, in wind-excavated depressions at the base of blowouts, in hollows of dune fields wedged between inland lakes and the Great Lakes, and in old river channels that once flowed parallel to the lakeshore behind foredunes. The saturated sand (sometimes covered by a thin layer of muck) and pondwater are neutral to moderately alkaline. The community contains a diverse assemblage of marsh and dune vegetation.

Associated Landscape Feature(s): Ephemeral wetland, Coastal emergent wetland, Coastal dune/beach, Inland emergent wetland (aquatic)

PRAIRIE

LAKEPLAIN WET PRAIRIE

Overview: Native lowland grassland on saturated, level, seasonally inundated sites in sandy, and less commonly, silty/clayey glacial lakeplains with seasonally high water table. Soils are moderately alkaline with moderate water retaining capacity and are typically very fine sandy loam, loam, or silty clay loam. Open conditions were historically maintained by interaction of flooding and fire. Vegetation is dominated by wet meadow and prairie grasses and forbs with numerous species restricted to the lakeplain.

Associated Landscape Feature(s): Prairie

LAKEPLAIN WET-MESIC PRAIRIE

Overview: Native lowland grassland on moist, level, occasionally inundated sites in sandy, and less commonly, silty/clayey glacial lakeplains with seasonally high water table. Soils are moderately alkaline with moderate water retaining capacity and are typically very fine sandy loam. Open conditions were historically maintained by interaction of fire and flooding. Vegetation is dominated by prairie and wet meadow grasses and forbs with numerous species restricted to the lakeplain.

Associated Landscape Feature(s): Prairie

NORTHERN WET-MESIC PRAIRIE

Overview: Native lowland grassland on moist, level, seasonally inundated sites occurring north of the transition zone located exclusively in old glacial lakebeds. Soils are circumneutral with good water retaining capacity and typically composed of lacustrine sands. Vegetation is dominated by prairie and wet meadow grasses and forbs. Open conditions were historically maintained by interaction of fire and seasonally fluctuating water levels.

Associated Landscape Feature(s): Prairie

WET PRAIRIE

Overview: Native lowland grassland on saturated, level, seasonally inundated sites along streams and rivers, at the margins of lakes, and sometimes in depressions. Occurs almost exclusively in glacial outwash, usually near moraines. Soils are neutral with good water retaining capacity and are typically loams (sometimes silt loam to nearly muck). Vegetation is dominated by wet meadow and prairie grasses and forbs. Open conditions were historically maintained by interaction of seasonally fluctuating water level and fire.

Associated Landscape Feature(s): Prairie, River/stream/riparian/floodplain corridor

WET-MESIC PRAIRIE

Overview: Native lowland grassland on moist, level, occasionally inundated sites near streams and rivers, near the margins of lakes, and sometimes around depressions. Occurs almost exclusively in glacial outwash, usually near moraines. Soils are neutral with good water retaining capacity and are typically loams (less commonly sandy loam). Vegetation is dominated by prairie and wet meadow grasses and forbs. Open conditions were historically maintained by interaction of fire and seasonally fluctuating water level.

Associated Landscape Feature(s): Prairie, River/stream/riparian/floodplain corridor

FEN

PRAIRIE FEN

Overview: An herb or herb-shrub wetland on muck or peat soils, through which flows groundwater rich in calcium and magnesium carbonates. The community is restricted to the southern oak region. Sites typically lie next to lakes or along streams and rivers, all of which occur in glacial outwash, ice contact topography or adjacent to coarse-textured end moraines. Soils are neutral to slightly alkaline saturated muck or peat with excessive water retaining capacity. Marl is often present within the soil profile or at the surface. Vegetation is characterized by diverse zonation with prairie, wet meadow and bog species commingling. Open conditions are maintained by seasonal water fluctuations, fire, beaver-flooding, and insect outbreaks.

Associated Landscape Feature(s): Fen, River/stream/riparian/floodplain corridor

NORTHERN FEN

Overview: A sedge and rush dominated wetland on neutral to slightly alkaline saturated peat through which flows groundwater rich in calcium and magnesium carbonates. Marl is typically present within the soil profile or at the surface. Community occurs where calcareous bedrock underlies a thin mantle of glacial drift, primarily north of the tension zone. Vegetation is characterized by calciphiles, bog plants, and sphagnum mosses.

Associated Landscape Feature(s): Fen, Coastal emergent wetland

PATTERNED FEN

Overview: A minerotrophic shrub-herb peatland characterized by peat ridges (strings) and hollows (flarks) oriented across a low-gradient slope and perpendicular to the flow of groundwater. Community occurs exclusively on sandy glacial lakebeds and broad glacial outwash channels located immediately adjacent to glacial lakebeds. In Michigan its distribution is limited to the eastern Upper Peninsula. The saturated peat is medium to slightly acid and conditions are wettest and most alkaline within flarks. The often inundated flarks are sedge and rush dominated while the strings are sedge dominated, frequently with significant cover provided by ericaceous shrubs and stunted conifers.

Associated Landscape Feature(s): Fen

POOR FEN

Overview: A weakly minerotrophic peatland dominated by sedges and grasses with species diversity intermediate between richer fens and poorer bogs. Community occurs predominantly in depressions on glacial outwash plains and ice-contact topography. Soils are saturated and composed of very strongly to strongly acid peat. Open conditions are maintained by fire, seasonal water level fluctuations, and growing-season frosts.

Associated Landscape Feature(s): Fen

BOG

BOG

Overview: An ombrotrophic peatland characterized by a sedge or sedge-Sphagnum floating mat and/or deep Sphagnum peat occurring on margins of lakes and ponds. Located in depressions in glacial outwash and sandy glacial lake plains and in kettles on end moraines or pitted outwash. Characterized by extremely acid saturated peat and prevalence of Sphagnum mosses and ericaceous shrubs. Open conditions are maintained by loose saturated peat, fires, growing-season frosts, and insect outbreaks. Fire occurs naturally during drought periods and can alter the hydrology, mat surface, and flora.

Associated Landscape Feature(s): Bog

MUSKEG

Overview: An ombrotrophic peatland with clumped and scattered conifers set in a matrix of Sphagnum moss occupying large depressions in glacial outwash or glacial lake plains. Tree density may be highly variable, with areas of widely-spaced, stunted conifers alternating with occasional clumps of taller trees. Soils are extremely acid saturated peat and support low levels of plant diversity. The muskeg community type generally applies only to very extensive areas, such as the drainage basin of the Tahquamenon River, which is approximately 40 miles long and in places up to 10-15 miles wide. Smaller areas are typically recognized as a zone within a bog or poor conifer swamp.

Associated Landscape Feature(s): Bog

FOREST

POOR CONIFER SWAMP

Overview: An ombrotrophic or very weakly minerotrophic, conifer-dominated peatland occurring mostly north of the transition zone and situated primarily in depressions of glacial outwash, glacial lake plains, ground moraine, and in kettles in coarse-textured moraines. Soils are saturated deep peat, and occasionally shallow peat, that are extremely acid to very strongly acid. The community is typically dominated by black spruce (*Picea mariana*), tamarack (*Larix laricina*) and occasionally jack pine (*Pinus strobus*) and balsam fir (*Abies balsamifera*).

Associated Landscape Feature(s): Lowland conifer, Swamp

RICH CONIFER SWAMP

Overview: A groundwater-influenced, or minerotrophic, forested wetland that is dominated by northern white cedar (*Thuja occidentalis*) and occurs on organic soils (e.g., peat and muck). Situated primarily along streams and lakes, but also in drainageways, and in depressions in shallow drift over limestone and dolomite; found on glacial outwash, glacial lake plains, and in coarse- to medium-textured ground moraines (especially in drumlin fields), and on foot slopes of morainal ridges. Soils are composed of saturated peat that is typically very strongly acid at the surface, and neutral to mildly alkaline below the surface. Windthrow is common natural disturbance and fire was historically infrequent. The community is characterized by a diverse microtopography and ground cover.

Associated Landscape Feature(s): Lowland conifer, Swamp, River/stream/riparian/floodplain corridor

RELICT CONIFER SWAMP

Overview: A groundwater-influenced, or minerotrophic, forested wetland community that is typically dominated by *Larix laricina* (tamarack) and occurs on deep organic soils (e.g., peat and muck) primarily in southern Lower Michigan. Situated on glacial outwash drainageways, at stream headwaters in end moraines, in kettle depressions in kettle-kame or coarse-textured end moraine topography, and rarely on sandy glacial lake plain. The community supports a very rich shrub and ground layer due to abundant moisture, a diverse microtopography, and partial canopy conditions. Occasional insect outbreaks result in tamarack mortality and large light gaps.

Associated Landscape Feature(s): Lowland conifer, Swamp, River/stream/riparian/floodplain corridor

HARDWOOD-CONIFER SWAMP

Overview: A minerotrophic swamp of less saturated conditions than conifer swamps and dominated by a mixture of lowland hardwoods and conifers. The community occurs primarily on northern floodplains, sandy glacial lake plains, and stream headwaters in moraines. Soils are neutral to medium acid shallow muck or moist mineral soil. The very rich shrub and ground layers result for abundant moisture, a diverse microtopography, and favorable drainage. The prevalent disturbance is windthrow.

Associated Landscape Feature(s): Lowland hardwood, Lowland conifer, Swamp, River/stream/riparian/floodplain corridor

NORTHERN SWAMP

Overview: A seasonally inundated, primarily deciduous forest type located north of the tension zone on level to hummocky glacial lake plains. Soils are neutral to slightly acidic hydric mineral soils and shallow muck over mineral soils. Sites are often saturated to inundated in spring and following heavy rain events, which results in numerous areas of sparse ground-layer vegetation and bare soil. The prevalent natural disturbance is windthrow.

Associated Landscape Feature(s): Lowland hardwood, Swamp

SOUTHERN SWAMP

Overview: A wetland deciduous forest type located south of the transition zone, situated primarily in depressions and channels of ground moraines, on glacial lake plains, and in depressions of glacial outwash, especially near moraines. Soils are neutral to slightly acid and composed of loam and silt loam (occasionally sandy loam) and often possess a clay layer that allows for inundation. The community is dominated by lowland maples (*Acer* spp.) and ashes (*Fraxinus* spp.) and characterized by a sparse groundlayer. The prevalent natural disturbance is windthrow.

Associated Landscape Feature(s): Lowland hardwood, Swamp

SOUTHERN FLOODPLAIN FOREST

Overview: A bottomland deciduous forest type occupying the low-lying areas adjacent to streams and rivers that are third order or greater and subject to periodic over-the-bank flooding and cycles of erosion and deposition. This is a broadly defined community type, with species composition and community structure varying regionally along with varying flooding frequency and duration. Silver maple (*Acer saccharinum*) and red ash (*Fraxinus pennsylvanica*) are the major overstory dominants.

Associated Landscape Feature(s): Lowland hardwood, Swamp, River/stream/riparian/floodplain corridor

SHRUB

NORTHERN SHRUB THICKET

Overview: A fairly persistent shrub-dominated wetland located north of the transition zone, typically occurring along streams, but also adjacent to lakes. Soils are composed of medium acid, nutrient rich muck or peat. Windthrow, fluctuating water table, and beaver limit tree establishment. The community is overwhelmingly dominated by tag alder (*Alnus rugosa*).

Associated Landscape Feature(s): Lowland shrub, Swamp, River/stream/riparian/floodplain corridor

SOUTHERN SHRUB-CARR

Overview: A shrub-dominated community characterized by seasonally fluctuating water levels and poor drainage conditions, occurring adjacent to streams, rivers and lakes in glacial outwash, ice contact topography, or coarse-textured end moraines. Soils are neutral to slightly alkaline, shallowly inundated to saturated muck with the capacity to retain excessive water. Dominant shrubs are *Cornus* spp. (dogwoods) and *Salix* spp. (willows). The community represents a long-lived successional stage between open wet meadow or fen and swamp forest.

Associated Landscape Feature(s): Lowland shrub, Swamp, River/stream/riparian/floodplain corridor

INUNDATED SHRUB SWAMP

Overview: A shrub-dominated community characterized by seasonally fluctuating water levels and very poor drainage with inundated to deeply inundated muck (1-2 feet deep), or (less frequently) mineral soil, occurring in kettleholes in kettle/kame ice-disintegration topography, in moats around bogs, and less frequently associated with wetland depressions on outwash and sandy lake plains. The community represents a long-lived successional stage between emergent marsh and swamp forest. Buttonbush (*Cephalanthus occidentalis*) overwhelmingly dominates the community.

Associated Landscape Feature(s): Lowland shrub, Swamp

PALUSTRINE/TERRESTRIAL

WOODED DUNE AND SWALE COMPLEX

Overview: A complex of sharply juxtaposed forest and marsh or swamp on alternating sand ridges and interdunal troughs along the shores of the Great Lakes. Low sand ridges are generally covered by dry and dry-mesic northern forest but may have a boreal forest character due to their close proximity to the Great Lakes. The swales support northern wet meadow, rich or poor conifer swamp, or bog vegetation. The community occurs on sandy glacial lake plains in former embayments of the Great Lakes. Wooded dune and swale complexes form over thousands of years as a result of long-term drops in lake levels combined with post-glacial uplift of the earth's crust. These long-term processes cause primary, wind-formed foredunes to rise above the influence of the lake and results in the formation of a new foredune and low, wet swale between the two dune ridges. Over several thousand years these processes result in a series of ridges and swales.

Associated Landscape Feature(s): Lowland conifer, Mesic conifer, Dry conifer, Swamp, Coastal dune/beach

BOREAL FOREST

Overview: A conifer-hardwood forest type on moist to dry sites characterized by species dominant in the Canadian boreal forest. Typically occupies upland sites along shores of the Great Lakes and can dominate northern Great Lakes islands. The community occurs primarily in glacial lake plains on sand dunes, and thin soil or cobble over bedrock, both igneous and calcareous. Sand and sandy loam soils are typically moderately acid to neutral but more acid, heavier soils may also be found. The close proximity to the Great Lakes results in high levels of windthrow and climatic conditions characterized by high humidity, snowfall, summer fog and mist, and

low summer temperatures. Insect outbreaks may result mortality of white spruce (*Picea glauca*).

Associated Landscape Feature(s): Lowland conifer, Mesic conifer, Dry conifer

TERRESTRIAL

FOREST

MESIC SOUTHERN FOREST [SOUTHERN HARDWOOD FOREST]

Overview: American beech (*Fagus grandifolia*)- and sugar maple (*Acer saccharum*)-dominated forest found on flat to rolling topography with predominantly silt loam, loam, or sandy loam soils and occurring principally on medium- or fine-textured moraines and silty/clayey lake plains. Within 10 to 20 miles of the Great Lakes shoreline, mesic southern forest can occur on sandy lake plains and sand dunes due to improved evapotranspiration conditions (climatic modification). The natural disturbance regime is characterized by gap phase dynamics; frequent, small windthrow gaps allow for the regeneration of the shade-tolerant canopy dominants.

Associated Landscape Feature(s): Mesic hardwood, Late successional forest

DRY-MESIC SOUTHERN FOREST [OAK-HARDWOOD FOREST]

Overview: An oak (*Quercus* spp.) or oak-hickory (*Carya* spp.) forest type on generally dry-mesic sites lying mostly south of the tension zone. The community occurs principally on glacial outwash, coarse-textured end moraines, sandy glacial lake plains; and sand dunes. Soils are slightly acid to neutral sandy loam and loam. Many of the current examples of this community type are the result of fire suppression of former oak openings.

Associated Landscape Feature(s): Mesic hardwood, Dry hardwood

DRY SOUTHERN FOREST [OAK FOREST]

Overview: A fire-dependent, oak-dominated forest type of dry sites lying mostly south of the transition zone, occurring principally on glacial outwash, but also on sand ridges and elevations in sandy glacial lake plains and on sand dunes. Loamy sand or sandy loam soils are strongly acid to medium acid. Many of the current examples of this community type are the result of fire suppression of former oak barrens.

Associated Landscape Feature(s): Dry hardwood

MESIC NORTHERN FOREST [NORTHERN HARDWOOD FOREST; HEMLOCK-HARDWOOD FOREST]

Overview: A forest type of moist to dry-mesic sites lying mostly north of the transition zone, characterized by the presence of northern hardwoods. Conifers such as hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*), are frequently important. This community type breaks into two broad classes, northern hardwood forest and hemlock-hardwood forest. Mesic northern forest is found chiefly on coarse-textured ground and end moraines, but is also common on silty/clayey lake plains, thin glacial till over bedrock, medium-textured moraines, kettle-kame topography, and sand dunes. It may also occasionally occur on moderately well drained to well drained sandy lake plain. The community occurs on a wide variety of soils, most typically loamy sand to sandy loam and occasionally sand, loam, and clay. The natural disturbance regime is characterized by gap phase dynamics; frequent, small windthrow gaps allow for the regeneration of the shade-tolerant canopy dominants. Infrequent fire was historically an important component of the long-term disturbance regime and typically occurred following catastrophic windthrow.

Associated Landscape Feature(s): Mesic hardwood, Mesic conifer, Late successional forest

DRY-MESIC NORTHERN FOREST [PINE-HARDWOOD FOREST]

Overview: A pine- or pine-hardwood forest type found on generally dry-mesic sites located mostly north of the tension zone. The community principally occurs on sandy glacial outwash, sandy glacial lake plains, and less often on thin glacial drift over bedrock, inland dune ridges, and coarse-textured end moraines. Soils are extremely acid to very strongly acid sand or loamy sand. Prior to European settlement, dry-mesic northern forest typically originated in the wake of catastrophic fire and was maintained by frequent, low-intensity ground fires. White pine (*Pinus strobus*) is nearly always a dominant canopy species and may occur along with red pine (*Pinus resinosa*), hemlock, red maple (*Acer rubrum*), and oaks (*Quercus alba*, *Q. velutina*, *Q. ellipsoidalis*, and *Q. rubra*)

Associated Landscape Feature(s): Mesic conifer, Dry conifer
DRY NORTHERN FOREST [PINE FOREST]

Overview: Pine- or pine-hardwood forest found on dry sites located mostly north of the tension zone. The community occurs principally on sandy glacial outwash and sandy glacial lake plains and less often on sand ridges in peatland complexes on glacial outwash or glacial lake plains. The sand soils are extremely acid to very strongly acid and excessively drained sands and low in nutrients. Two distinct variants are included within this community type, one dominated by jack pine (*Pinus banksiana*) or jack pine and hardwoods (typically northern pin oak (*Quercus ellipsoidalis*)), and another dominated by red pine (*Pinus resinosa*). Prior to European settlement, dry northern forest typically originated in the wake of catastrophic fire, and frequent, low-intensity ground fires maintained *Pinus resinosa* systems. Some sites dominated by jack pine today are the result of fire suppression within former pine barrens. Fire suppression has also resulted in conversion of former dry northern forests to more mesic forest types.

Associated Landscape Feature(s): Dry conifer

SAVANNA

LAKEPLAIN OAK OPENINGS

Overview: A fire-dependent savanna type, dominated by oaks and characterized by a graminoid-dominated ground layer of species associated with both lakeplain prairie and forest communities. The community occurs within glacial lakeplains on sand ridges, level sand plains and adjacent depressions. Open conditions were historically maintained by frequent fire and seasonal flooding.

Associated Landscape Feature(s): Savanna

BUR OAK PLAINS

Overview: A fire-dependent, savanna type dominated by bur oak (*Quercus macrocarpa*), having between 10 and 30% canopy, with or without a shrub layer. The predominantly graminoid ground layer was composed of species associated with both prairie and forest communities. Found on mesic loams and occurring typically on level to slightly undulating sandy glacial outwash and on river terraces, bur oak plains were characterized by a frequent fire regime. Bur oak plains have been extirpated from Michigan.

Associated Landscape Feature(s): Savanna

OAK OPENINGS

Overview: A fire-dependent, savanna type dominated by *Quercus alba* (white oak), having between 10 and 60% canopy, with or without a shrub layer. The predominantly graminoid ground layer was composed of species associated with both prairie and forest communities. Found on dry-mesic loams and occurring typically on level to rolling topography of outwash and coarse-textured end moraines, oak openings were characterized by a frequent fire regime. Oak openings have been nearly extirpated from Michigan; only one small example remains.

Associated Landscape Feature(s): Savanna

OAK BARRENS

Overview: A fire-dependent, savanna type dominated by oaks, having between 5 and 60% canopy, with or without a shrub layer. The predominantly graminoid ground layer is composed of species associated with both prairie and forest. Oak barrens are found on droughty soils and occur typically on nearly level to slightly undulating sandy glacial outwash, and less often on sandy moraines or ice contact features.

Associated Landscape Feature(s): Savanna

OAK-PINE BARRENS

Overview: A fire-dependent, savanna type dominated by oaks and pines, having between 5 and 60% canopy, with or without a shrub layer. The predominantly graminoid ground layer is composed of species associated with both prairie and forest. Oak barrens are found on coarse-textured, well-drained sand or loamy sand of medium to slightly acid pH and low water retaining capacity, and typically occur on nearly level to slightly undulating ground in well-drained sandy glacial outwash, sandy glacial lake plains, and less often on sandy areas in coarse-textured moraines.

Associated Landscape Feature(s): Savanna

PINE BARRENS

Overview: A coniferous, fire-dependent savanna of scattered and clumped trees located north of the tension zone on level sandy outwash and sandy glacial lake plains. Sand soils are very strongly to strongly acid, with very poor water retaining capacity. The community is dominated by *Pinus banksiana* (jack pine) with *Quercus ellipsoidalis* (northern pin oak) as a frequent canopy associate. Frequent fires and frost conditions maintain the open canopy conditions.

Associated Landscape Feature(s): Savanna

GREAT LAKES BARRENS

Overview: A coniferous savanna of scattered and clumped trees with a dense low or creeping shrub layer; often associated with interdunal wetland. Occurs on sandy, former lake embayments along the shores of the Great Lakes. Circumneutral sand soils are dry, but subsoil water levels are periodically elevated by changes in lake water levels.

Associated Landscape Feature(s): Savanna, Coastal dune/beach

NORTHERN BALD [KRUMMHOLZ RIDGETOP]

Overview: Low shrub and herb community with stunted trees and thin, slightly acid sandy soil over bedrock. Positioned at the edge of escarpments of immense bedrock ridges above wide, generally east-west running valleys. The sparse vegetation is induced chiefly by topographical position, which promotes winter desiccation and ice/snow abrasion by high winds.

Associated Landscape Feature(s): Savanna, Rock/cliff/ledge

PRAIRIE

LAKEPLAIN MESIC SAND PRAIRIE

Overview: A mesic, native grassland, prone to summer drought but sometimes inundated in early spring; consequently, species more typical of lowland prairies thrive next to ones of upland prairies. Lakeplain mesic sand prairie is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Andropogon scoparius*), and sedges (*Carex* spp.). The community occurs on level sandy glacial lake plains, and deposits of dune sand in silty/clayey glacial lake plains, which experience seasonally high water tables. Soils are principally sandy loam to sand soils that are strongly acid with poor water retaining capacity. Open conditions were historically maintained by the interaction of fire and seasonally fluctuating water level.

Associated Landscape Feature(s): Prairie

MESIC PRAIRIE

Overview: A native grassland community dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Andropogon scoparius*), and Indian grass (*Sorghastrum nutans*) that occurs on loam, sandy loam, or silt loam soils on level or slightly undulating glacial outwash in southwestern Lower Michigan. Open conditions were historically maintained by annual fires.

Associated Landscape Feature(s): Prairie

HILLSIDE PRAIRIE

Overview: A native grassland which occurs on dry exposed slopes and crests of hills, surrounded by oak forest or former oak openings. Hillside prairie occurs on glacial outwash and sites that overlook kettlehole lakes, streams, or broad river valleys and face predominantly south to west. Soils are sandy loam or loamy sand that can be either strongly acid or neutral with moderately poor water retaining capacity. The community is characterized by a thin canopy of oaks and ground layer dominated by little bluestem (*Andropogon scoparius*), big bluestem (*A. gerardii*), and needle grass (*Stipa spartea*). Steep slopes, which are fire prone, and south to west aspects increase evapotranspiration by increasing the angle of incident sunlight, increasing near-ground temperatures during the hottest part of the day, and exposing the slope to prevailing southwesterly winds.

Associated Landscape Feature(s): Prairie

MESIC SAND PRAIRIE

Overview: Mesic, native grassland, prone to summer drought but sometimes inundated in early spring; consequently, species more typical of lowland prairies thrive next to ones of upland prairies. The community is dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Andropogon scoparius*), and sedges (*Carex* spp.). Mesic sand prairie occurs on level sandy glacial outwash that experiences seasonally high water tables. Soils are principally sandy loam to sand that are strongly acid with poor water retaining capacity. Open conditions were historically maintained by interaction of fire and seasonally fluctuating water level.

Associated Landscape Feature(s): Prairie

WOODLAND PRAIRIE

Overview: Native grassland community dominated by big bluestem (*Andropogon gerardii*), little bluestem (*Andropogon scoparius*), and Indian grass (*Sorghastrum nutans*) that occurs on sandy loam or loamy sand on level to slightly sloping sites of glacial outwash, coarse-textured end moraines, and glacial till plain. Historically, woodland prairies occurred in association with oak openings. Open conditions maintained by frequent fire.

Associated Landscape Feature(s): Prairie

DRY SAND PRAIRIE

Overview: Native grassland community dominated by little bluestem (*Andropogon scoparius*), big bluestem (*A. gerardii*), and Pennsylvania sedge (*Carex pensylvanica*) that occurs on loamy sand primarily on well drained to excessively well drained, sandy glacial outwash plains and lakebeds. Vegetation is short and patchy. Open conditions were maintained by frequent fire, droughty soils, and growing season frosts. Historically, dry sand prairie occurred in association with oak barrens, oak-pine barrens, and pine barrens.

Associated Landscape Feature(s): Prairie

PRIMARY

OPEN DUNES

Overview: A grass and shrub dominated multi-seral community on wind-deposited sand formations at the shores of large freshwater lakes. Dune formation and the patterning of vegetation are strongly affected by lake-driven winds. Sand formations include beaches, foredunes, high dunes, perched dunes, dune fields, interdunal swales, and blowouts. Sands contain calcareous minerals and are neutral to slightly alkaline. Dominants and community structure vary depending on degree of sand deposition, sand erosion, and distance from the lake. The greatest concentration of dunes in Michigan occurs along the eastern and northern shorelines of Lake Michigan, with the largest dunes along the eastern shoreline due to the prevailing winds from the southwest.

Associated Landscape Feature(s): Coastal dune/beach

SAND/GRAVEL BEACH

Overview: Unstable shoreline of freshwater lakes, severely affected by wind, waves, and winter ice. Frequently shifting sand or gravel substrate permits little vegetation to develop.

Associated Landscape Feature(s): Coastal dune/beach

COBBLE BEACH [COBBLE SHORE]

Overview: Gently sloping shoreline of large freshwater lakes (chiefly northern Lake Michigan and Huron), studded with cobbles and boulders and easily inundated by storms and periodical high water. Frequent disturbance favors establishment of weedy native and alien vegetation. Soils are neutral to slightly alkaline muck and sand which accumulate between cobbles and boulders.

Associated Landscape Feature(s): Coastal dune/beach

ALVAR [ALVAR GRASSLAND]

Overview: A sedge and grass community, with scattered shrubs and sometimes trees, growing on thin soil over calcareous bedrock (dolomite or limestone) of Middle and Late Ordovician and Early Silurian origin. Alvar is characterized by a unique mix of vegetation from both boreal and prairie systems. Soils are predominantly sandy loam or loamy sand, typically less than 25 centimeters deep and mildly to moderately alkaline. The thin soils are saturated by water (or flooded) in spring and very droughty in summer. Thin droughty soils contribute to tree-killing drought and/or ground fires and thereby maintain a primarily open herbaceous and shrub plant community. In addition, windthrow is probably common due to the thin soils and location adjacent to either the Great Lakes or major streams.

Associated Landscape Feature(s): Alvar/rock

BEDROCK GLADE

BASALT BEDROCK GLADE

Overview: Droughty, thin soil and basalt bedrock outcrops covered by sparse vegetation of scattered clumps of often stunted trees and a patchy distribution of herbs, graminoids, lichens, and mosses. Located chiefly in regions of thin glacial drift, basalt bedrock glades occur on summits of rocky hills and ridges and on south to west faces of higher mountains. The community often occurs between basalt bedrock lakeshore and inland forest. Bedrock is of Precambrian and

Cambrian origin. Soil, comprised chiefly of organic matter, collects in pockets and cracks, or thinly covers level areas of bedrock. Lightning-induced fires occasionally burn these sites.

Associated Landscape Feature(s): Alvar/rock, Rock/cliff/ledge

IGNEOUS BEDROCK GLADE

Overview: Droughty, thin soil and igneous bedrock outcrops covered by sparse vegetation of scattered clumps of often stunted trees and a patchy distribution of herbs, graminoids, lichens, and mosses. Located chiefly in regions of thin glacial drift, igneous bedrock glades occur on summits of rocky hills and ridges and on south to west faces of higher mountains. Bedrock is of Precambrian and Cambrian origin. Soil, comprised chiefly of organic matter, collects in pockets and cracks, or thinly covers level areas of bedrock. Lightning-induced fires occasionally burn these sites.

Associated Landscape Feature(s): Alvar/rock, Rock/cliff/ledge

LIMESTONE BEDROCK GLADE [ALVAR GLADE]

Overview: Droughty, thin soil and limestone bedrock outcrops covered by sparse vegetation of scattered clumps of often stunted trees and a patchy distribution of herbs, graminoids, lichens, and mosses. Located chiefly in regions of thin glacial drift, limestone bedrock glades occur on summits of rocky hills and ridges and on south to west faces of higher mountains. Bedrock is of Middle and Late Ordovician and Early Silurian origin. Soil, comprised chiefly of organic matter, collects in pockets and cracks, or thinly covers level areas of bedrock. Lightning-induced fires occasionally burn these sites.

Associated Landscape Feature(s): Alvar/rock, Rock/cliff/ledge

SANDSTONE BEDROCK GLADE

Overview: Droughty, thin soil and sandstone bedrock outcrops covered by sparse vegetation of scattered clumps of often stunted trees and a patchy distribution of herbs, graminoids, lichens, and mosses. Located chiefly in regions of thin glacial drift, sandstone bedrock glades occur on summits of rocky hills and ridges and on south to west faces of higher mountains. Bedrock is of Late Precambrian origin. Soil, comprised chiefly of organic matter, collects in pockets and cracks, or thinly covers level areas of bedrock. Lightning-induced fires occasionally burn these sites.

Associated Landscape Feature(s): Alvar/rock, Rock/cliff/ledge

VOLCANIC CONGLOMERATE BEDROCK GLADE

Overview: Droughty, thin soil and volcanic conglomerate bedrock outcrops covered by sparse vegetation of scattered clumps of often stunted trees and a patchy distribution of herbs, graminoids, lichens, and mosses. Located chiefly in regions of thin glacial drift, volcanic conglomerate bedrock glades occur on summits of rocky hills and ridges and on south to west faces of higher mountains. Bedrock is of Precambrian and Cambrian origin. Soil, comprised chiefly of organic matter, collects in pockets and cracks, or thinly covers level areas of bedrock. Lightning-induced fires occasionally burn these sites.

Associated Landscape Feature(s): Alvar/rock, Rock/cliff/ledge

BEDROCK LAKESHORE

BASALT BEDROCK LAKESHORE

Overview: Basalt bedrock shoreline occurs along the shores of Lake Superior and possesses diverse and unique plant assemblages because of the stable substrate and cool moist conditions. The community is characterized by arctic/alpine vegetation. The steeply sloping lava flows contain massive rocks that are cracked and often marked with pools (which provide intermittent moist habitat in an otherwise dry environment). Little soil development takes place except in cracks, under low shrubs, or in pools. The soil is mostly organic and the pH is slightly acid to neutral. Three structure/dominance zones are typically present: splash zone of the lowest wave- and ice-swept portion; lichen-herb zone in the middle portion, splashed by spray during storms, dominated by crustose lichens with patches of herbs and occasional shrubs; and a heath zone of the upper portion, swept by winds, subject to rime accumulation, and dominated by stunted conifer trees or low evergreen shrubs. Bedrock lakeshore is characterized by stressed and unstable environment because of winter ice, storms, and wind.

Associated Landscape Feature(s): Alvar/rock

IGNEOUS BEDROCK LAKESHORE

Overview: Igneous bedrock shoreline occurs along Lake Superior shoreline and possesses diverse and unique plant assemblages because of the stable substrate and cool moist conditions.

Rocks are massive, cracked, and often marked with small pools (which provide intermittent moist habitat in an otherwise dry environment). Little soil development takes place except in cracks, under low shrubs, or in pools. The soil is mostly organic and the pH is slightly acid to neutral. Three structure/dominance zones are typically present: splash zone of the lowest wave- and ice-swept portion; lichen-moss zone in the middle portion, splashed by spray during storms, dominated by crustose lichens with patches of herbs and occasional shrubs limited to bedrock cracks; and a heath zone of the upper portion, swept by winds, subject to rime accumulation, and dominated by stunted conifer trees or low evergreen shrubs. Bedrock lakeshore is characterized by stressed and unstable environment because of winter ice, storms, and wind.

Associated Landscape Feature(s): Alvar/rock

LIMESTONE BEDROCK LAKESHORE [ALVAR PAVEMENT]

Overview: Limestone bedrock shoreline occurs along shores of Lake Michigan and Lake Huron and possesses diverse and unique plant assemblages because of the stable substrate and cool moist conditions. The broad, flat, horizontally-bedded bedrock of this community is limestone or dolomite, which are moist and highly resistant. Little soil development takes place except in cracks, under low shrubs, or in pools. The soil is mostly organic and the pH is slightly acid to neutral. Three structure/dominance zones are typically present: splash zone of the lowest wave- and ice-swept portion; lichen-herb zone in the middle portion, splashed by spray during storms, dominated by crustose lichens with patches of herbs and occasional shrubs; and a heath zone of the upper portion, swept by winds, subject to rime accumulation, and dominated by stunted conifer trees or low evergreen shrubs. Bedrock lakeshore is characterized by stressed and unstable environment because of winter ice, storms, and wind.

Associated Landscape Feature(s): Alvar/rock

VOLCANIC CONGLOMERATE BEDROCK LAKESHORE

Overview: Volcanic conglomerate bedrock shoreline occurs along the Lake Superior shoreline and possesses diverse and unique plant assemblages because of the stable substrate and cool moist conditions. The community is characterized by arctic/alpine vegetation. Conglomerate rocks are massive, cracked, and often marked with pools (which provide intermittent moist habitat in an otherwise dry environment). Little soil development takes place except in cracks, under low shrubs, or in pools. The soil is mostly organic and the pH is slightly acid to neutral. Three structure/dominance zones are typically present: splash zone of the lowest wave- and ice-swept portion; lichen-herb zone in the middle portion, splashed by spray during storms, dominated by crustose lichens with patches of herbs and occasional shrubs; and a heath zone of the upper portion, swept by winds, subject to rime accumulation, and dominated by stunted conifer trees or low evergreen shrubs. Bedrock lakeshore is characterized by stressed and unstable environment because of winter ice, storms, and wind. The plant community found on the conglomerate and volcanic rocks of the Keweenaw Peninsula is more diverse than that found on the less resistant bedrock along western Lake Superior.

Associated Landscape Feature(s): Alvar/rock

CLIFF

DRY NON-ACID CLIFF

Overview: Primarily vertical exposures of bedrock which support little vascular plant vegetation, although rock surfaces usually are covered by lichens, mosses, liverworts, and ferns. Vertical bedrock exposures are mostly limestone, dolomite, schist, and shale. Soils are mostly organic. Non-acid cliffs have a pH above 6.6. Low site moisture is often the result of south to west aspect. Cliff vegetation is largely determined by vegetation of the surrounding plant communities. Common vegetation include roundleaf serviceberry (*Amelanchier sanguinea*), smooth cliff-brake (*Pellaea glabella*), and foliose and fruticose lichens.

Associated Landscape Feature(s): Rock/cliff/ledge

MOIST NON-ACID CLIFF

Overview: Primarily vertical exposures of bedrock which support little vascular plant vegetation, although rock surfaces usually are covered by lichens, mosses, liverworts, and ferns. Vertical bedrock exposures are mostly limestone, dolomite, schist, and shale. Soils are mostly organic. Non-acid cliffs have a pH above 6.6. High site moisture is often the result of north to east aspect, proximity to water, and/or groundwater seepage from cliff face. Cliff vegetation is largely determined by vegetation of the surrounding plant communities. Vegetation of moist

cliffs typically include slender cliff-brake (*Cryptogramma stelleri*) and bulblet fern (*Cystopteris bulbifera*), as well as liverworts.

Associated Landscape Feature(s): Rock/cliff/ledge

DRY ACID CLIFF (CAN WE NARROW DOWN BEDROCK TYPE BY CLIFF TYPE)

Overview: Primarily vertical exposures of bedrock which support little vascular plant vegetation, although rock surfaces usually are covered by lichens, mosses, liverworts, and ferns. Vertical bedrock exposures are mostly conglomerate, sandstone, and granite. Soils are mostly organic. Acid cliffs have a pH below 6.5. Low site moisture is often the result of south to west aspect. Cliff vegetation is largely determined by vegetation of the surrounding plant communities. Common vegetation includes roundleaf serviceberry (*Amelanchier sanguinea*), smooth cliff-brake (*Pellaea glabella*), and foliose and fruticose lichens.

Associated Landscape Feature(s): Rock/cliff/ledge

MOIST ACID CLIFF (CAN WE NARROW DOWN BEDROCK TYPE BY CLIFF TYPE)

Overview: Primarily vertical exposures of bedrock which support little vascular plant vegetation, although rock surfaces usually are covered by lichens, mosses, liverworts, and ferns. Vertical bedrock exposures are mostly conglomerate, sandstone, and granite. Soils are mostly organic. Acid cliffs have a pH below 6.5. High site moisture is often the result of north to east aspect, proximity to water, and/or groundwater seepage from cliff face. Cliff vegetation is largely determined by vegetation of the surrounding plant communities. Vegetation of moist cliffs typically include slender cliff-brake (*Cryptogramma stelleri*) and bulblet fern (*Cystopteris bulbifera*), as well as liverworts.

Associated Landscape Feature(s): Rock/cliff/ledge

LAKESHORE CLIFF

BASALT LAKESHORE CLIFF

Overview: Vertical exposures of basalt bedrock along the Lake Superior shoreline that support little vascular plant vegetation. High site moisture is the result of proximity to water and groundwater seepage from cliff face. Cliff vegetation is largely determined by vegetation of the surrounding plant communities. Lakeshore cliff is characterized by stressed and unstable environment because of severe waves, wind, and winter ice.

Associated Landscape Feature(s): Alvar/rock

SANDSTONE LAKESHORE CLIFF

Overview: Vertical exposures of sandstone bedrock along Lake Superior shoreline that support little vascular plant vegetation. Sandstone bedrock is of Late Precambrian origin. Cliff height ranges from 15 to 200 feet. High site moisture is the result of proximity to water and groundwater seepage from cliff face. Cliff vegetation is largely determined by vegetation of the surrounding plant communities. Lakeshore cliff is characterized by stressed and unstable environment because of waves, wind, and winter ice.

Associated Landscape Feature(s): Alvar/rock

VOLCANIC CONGLOMERATE LAKESHORE CLIFF

Overview: Vertical exposures of volcanic conglomerate bedrock along Lake Superior shoreline that support little vascular plant vegetation. High site moisture is the result of proximity to water and groundwater seepage from cliff face. Cliff vegetation is largely determined by vegetation of the surrounding plant communities. Lakeshore cliff is characterized by stressed and unstable environment because of waves, wind, and winter ice.

Associated Landscape Feature(s): Alvar/rock

SINKHOLE

Overview: A karst collapse feature with distribution limited to northeast Lower Michigan and the south-central portion of eastern Upper Michigan. Vegetation is predominantly that of the surrounding forest but a moister and cooler microclimate and vertical limestone walls provides habitat for mosses and ferns.

Associated Landscape Feature(s): Alvar/rock, Rock/cliff/ledge

SUBTERRANEAN

CAVE

Overview: A cavity beneath the earth's surface, often with an opening to the surface, characterized by little or no light, no primary producers, and biotic communities of one or two trophic levels that import energy from outside the system. Little is known about the biology of Michigan's three

caves, but contrary to the situation in better-known caves of other states, no evidence exists that unusual organisms or groupings of organisms make their homes in them.
Associated Landscape Feature(s): Cave/mine

SCS Soil pH Ranges:	
below 4.5	extremely acid
4.5-5.0	very strongly acid
5.1-5.5	strongly acid
5.6-6.0	medium acid
6.1-6.5	slightly acid
6.6-7.3	neutral
7.4-7.8	mildly alkaline
7.9-8.4	moderately alkaline
8.5-9.0	strongly alkaline
above 9.0	very strongly alkaline

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