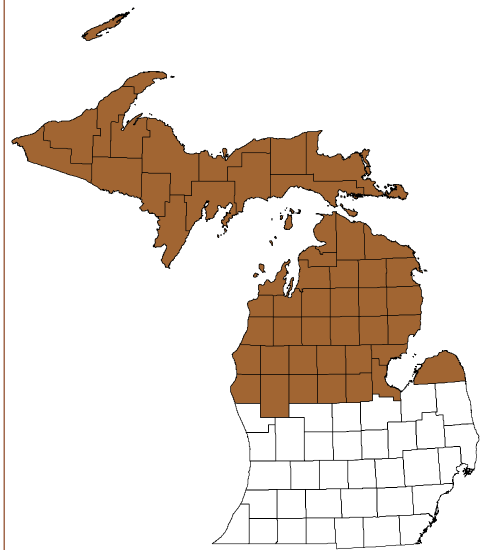
Intermittent Wetland   Community Abstract

Photo by Joshua G. Cohen

State Distribution



Overview: Intermittent wetland is a graminoid- and herbdominated wetland found along lakeshores or in depressions and characterized by fluctuating water levels, both seasonally and from year to year. Intermittent wetlands occur in depressions in glacial outwash and sandy glacial lakeplains and in kettles on pitted outwash. Soils range from loamy sand and peaty sand to peaty muck and are strongly acid to very strongly acid. Characteristic vegetation includes *Carex* spp. (sedges), *Juncus* spp. (rushes), sphagnum mosses, and ericaceous shrubs. Intermittent wetlands exhibit characteristics of both peatlands and marshes. Some intermittent wetlands formed following peat fires in bogs.

Global and State Rank: G3/S3

Range: Intermittent wetlands are an uncommon feature of glaciated landscapes of the northern Great Lakes basin, occurring in Michigan, Wisconsin, New York, and Ontario (NatureServe 2007). Within Michigan, intermittent wetlands occur throughout the state wherever environmental conditions are suitable but are most common north of the climatic tension zone in the northern Lower Peninsula and eastern Upper Peninsula. Intermittent wetlands and other peatland systems occur where excess moisture is abundant (where precipitation is greater than evapotranspiration) (Mitsch and Gosselink 2000). Conditions suitable for the development of intermittent wetlands have occurred in the northern Lake States for the past 3,000 to 6,000 years following climatic cooling (Heinselman 1970, Boelter and Verry 1977, Miller and Futyma 1987). Several natural peatland communities that share similarities with intermittent wetlands also occur in Michigan and can be distinguished from them based on comparisons of hydrology, nutrient levels, flora, and distribution. Open wetlands occurring on peat include bog, northern fen, prairie fen, northern wet meadow, southern wet meadow, and poor fen, all of which are characterized by stable water levels (Kost et al 2007). Coastal plain marsh, a grass-, rush-, and spike-rush–dominated wetland that also experiences yearly and seasonal water level fluctuations, occurs primarily south of the climatic tension zone and in northwestern Lower Michigan and is characterized by a flora with numerous coastal plain disjuncts (Kost and Penskar 2000).

Rank Justification: Intermittent wetlands are rare in the Great Lakes region and typically occur as small (e.g. less than 60 acres), isolated depressions. In Michigan, 29 intermittent wetlands have been identified, occupying less than 1,800 acres in all (Michigan Natural Features Inventory 2007). Across the Great Lakes basin, fewer than 10,000 acres of intermittent wetland persist (NatureServe 2007). Historically, widespread fires following turn-of-the-century logging drastically altered many peatlands, either converting conifer swamps to open peatland systems or destroying the peat and converting peatlands to wetlands without

Michigan Natural Features Inventory
P.O. Box 30444 - Lansing, MI 48909-7944
Phone: 517-373-1552

organic soils (mineral soil wetlands) (Dean and Coburn 1927, Gates 1942, Curtis 1959, Miller and Futyma 1987). It is possible that some of the current intermittent wetlands are the products of intense fires within bogs that destroyed or partially destroyed surface peats. Beginning in the 1920s, effective fire control by the United States Forest Service and state agencies reduced the acreage of fires ignited by man or lightning (Swain 1973). In landscapes where frequent fire was the prevalent natural disturbance factor affecting vegetative development, fire suppression has resulted in shrub and tree encroachment within intermittent wetlands and has likely led to the conversion of some wetlands to closed-canopy peatlands or shrub thickets (Curtis 1959, Riley 1989).

Photo by Joshua G. Cohen

Roads passing through intermittent wetlands drastically alter the hydrologic regime and cause severe changes in species composition and structure (i.e., shrub encroachment).

Currently, intermittent wetlands are threatened by draining, flooding, filling, development, off-road vehicle (ORV) activity, peat mining, logging, and agricultural runoff and nutrient enrichment (Bedford and Godwin 2003, NatureServe 2007). Peat mining and cranberry farming have degraded numerous peatlands throughout the region (Gates 1942, Curtis 1959, Eggers and Reed 1997, Chapman et al. 2003). Michigan, along with Florida and Minnesota, are leaders in peat production in the United States (Miller 1981). In addition to direct impacts to vegetation, alteration of hydrology from road building, ORV activity, creation of drainage ditches and dams, and runoff from logging has led to significant changes in intermittent wetland floristic composition and structure (Schwintzer and Williams 1974, Riley 1989, Chapman et al. 2003). Intermittent wetland vegetation is eventual succession to closed-canopy peatland. In addition, drainage of peatlands can result in the rapid decomposition of peat due to the creation of aerobic conditions (Curtis 1959). The sensitivity of intermittent wetlands to changes in water chemistry makes them especially susceptible to acid rain and air pollution (Siegel 1988, Chapman et al. 2003). Atmospheric deposition can contribute nitrogen, sulphur, calcium and heavy metals to intermittent wetlands (Damman 1990, Chapman et al. 2003). Dust-fall and atmospheric deposition from air pollution are serious threats to wetland systems that are located close to industrial and urban centers or surrounded by cultivated land (Damman 1990).

Photo by Joshua G. Cohen

Off-road vehicle traffic can significantly alter surficial hydrology through rutting, and reduce plant density and diversity.

Physiographic Context: Intermittent wetlands occur on poorly drained flat areas or mild depressions of sandy glacial outwash and sandy glacial lakeplains and in kettle depressions on pitted outwash (Kost et al. 2007, NatureServe 2007). The community is found in isolated depressions and along the shores of softwater, seepage lakes and ponds where water levels fluctuate both seasonally and yearly. The sandy soils underlying intermittent wetlands are strongly to very strongly acidic and are primarily sands or occasionally loamy sands. Shallow organic deposits of peat, muck, or sandy peat may overlay the sandy substrate, and in some basins, a clay layer may occur below the surface.

Intermittent wetlands may be bordered by several other wetland communities and may encircle floating bog mats. Intermittent wetlands along lakeshores can neighbor submergent marsh or emergent marsh and along the upper margin of the wetland, northern wet meadow, northern shrub thicket, or poor conifer swamp may occur. The sandy outwash, pitted outwash, and lakeplains that contain intermittent wetlands support well-drained and droughty communities in the surrounding uplands. These sandy upland communities are dominated by fire-dependent conifer and oak systems such as pine barrens, oak-pine barrens, dry northern forest, and dry-mesic northern forest in northern Michigan, and oak openings, oak barrens, dry-mesic southern forest, and dry southern forest in southern Michigan.

Photo by Michael A. Kost

Intermittent wetlands are typically surrounded by fire-prone wetlands such as pine barrens.

Peatlands develop in humid climates where precipitation exceeds evapotranspiration (Boelter and Verry 1977, Gignac et al. 2000, Halsey and Vitt 2000). The northern Lake States are characterized by a humid, continental climate with long cold winters and short summers that are moist and cool to warm (Gates 1942, Boelter and Verry 1977, Damman 1990, Mitsch and Gosselink 2000). In Michigan, intermittent wetlands are found within all four regions of the state classified by Albert et al. (1986) and Albert (1995). The mean number of freeze-free days is between 90 and 220, and the average number of days per year with snow cover of 2.5 cm or more is between 10 and 140. Annual total precipitation typically ranges from 740 to 900 mm, with a mean of 823 mm. The daily maximum temperature in July ranges from 24 to 32 °C (75 to 90 °F), the daily minimum temperature in January ranges from –21 to –4 °C (–5 to 25 °F), and the mean annual temperature is 7 °C (45 °F) (Albert et al. 1986, Barnes 1991).

Natural Processes: Water level fluctuations occur both seasonally and yearly within intermittent wetlands. Seasonally, water levels tend to be highest during the winter and spring and lowest in late summer and fall. The yearly oscillations are less predictable. Studies of hydrology in related coastal plain marsh systems have found a pattern of short drawdowns of one to three years followed by extensive periods of inundation (Schneider 1994).

Photo by Joshua G. Cohen

Intermittent wetlands are characterized by water level fluctuations. This wetland was inundated in June (above) and completely dry by early August (below).

Photo by Joshua G. Cohen

Fluctuations of water level within intermittent wetlands allow for temporal variability of the accumulation and decomposition of organic matter. Stable periods of saturated and inundated conditions inhibit organic matter decomposition and allow for the accumulation of peat and periods of drawdown facilitate organic matter decomposition (Almendinger and Leete 1998). Under cool, anaerobic, and acidic conditions, the rate of organic matter accumulation exceeds organic decay (Schwintzer and Williams 1974, Damman 1990, Mitsch and Gosselink 2000). Low levels of oxygen protect plant debris from microorganisms and chemical actions that cause decomposition. Further contributing to the accumulation of organic matter is the high level of acidity commonly associated with intermittent wetland soils, which inhibits decay organisms (Heinselman 1963, Miller 1981, Mitsch and Gosselink 2000). Dam-building activities of beaver can result in blocked drainage and flooding, which facilitate sphagnum peat development and expansion (Heinselman 1963, Heinselman 1970). High decomposition rates within intermittent wetlands are correlated with periods of water level fluctuation, which promote oxidation and the loss of organic material that would otherwise accumulate to form peat (Miller 1981, Zoltai and Vitt 1995). As noted above, intermittent wetlands often contain a shallow layer of organic peat or muck overlaying the sand substrate.

Photo by Joshua G. Cohen

Seasonal drawdown allows for seed germination.

Water level fluctuation in intermittent wetlands also facilitates seed germination and seed dispersal, and reduces competition from woody plants. Seasonal drawdowns are critical to the survival of many intermittent wetland species, especially annuals, which depend on these fluctuations for seed germination. As water levels begin to recede in early and mid-summer, direct sunlight penetrates the exposed substrate and triggers seed germination (van der Valk 1981). Diurnal temperature fluctuation also stimulates seed germination for many wetland species (Thompson and Grime 1983). During daylight, the sun warms the bare substrate, while the lack of an insulating layer of water and duff allows soils temperatures to drop lower at night. Because the vegetation of intermittent wetlands typically contains many annual species, mechanisms that contribute to seed germination such as exposure to sunlight and wide, daily fluctuations in soil temperature are critical for maintaining species diversity. Seasonal water level fluctuations also act as an important mechanism for seed dispersal (Schneider 1994). During the winter and spring when water levels rise, seeds deposited along the wetland's low-water line float to the surface and are carried by wave action to the wetland's outer margin. In addition to carrying dormant seeds, rising water levels also move sprouting seeds and organic matter into the upper shoreline in early spring. This seasonal movement of plant propagules and organic matter acts to maintain diversity and nutrient levels at the upper elevations of the wetland basin (Schneider 1994). In addition, high water levels can limit tree and shrub encroachment into intermittent wetlands since prolonged flooding can result in tree and shrub mortality.

Photo by Joshua G. Cohen

Periods of high water and fire limit tree and shrub encroachment in intermittent wetlands.

Fire is also an important component of the natural disturbance regime of intermittent wetlands. Intermittent wetlands typically occur as small depressions within a fire-dependent landscape and would have likely experienced surface fires along with the surrounding uplands when conditions were favorable. Surface fire can contribute to the maintenance of open conditions by killing encroaching trees and shrubs without completely removing the organic soils (Curtis 1959, Vitt and Slack 1975). Fire severity and frequency in intermittent wetlands is closely related to fluctuations in water level and landscape context.

Photo by Joshua G. Cohen

Fires can spread into intermittent wetlands from surrounding fire-prone uplands during late summer or fall, especially in dry years.

Prolonged periods of lowered water table can allow the vegetation and surface peat to dry out sufficiently to burn (Schwintzer and Williams 1974). When the surface peat of intermittent wetlands burns, the fire releases organic matter from the peat, kills seeds and latent buds of some species while stimulating seed germination and stem sprouting of others, increases decay of organic matter, and slows peat accumulation (Damman 1990, Jean and Bouchard 1991). Peat fires likely convert bog to more graminoid-dominated peatlands such as intermittent wetland and poor fen or if the peat is completely destroyed, to mineral soil wetlands such as northern wet meadow (Curtis 1959). Because fire has been shown to increase seed germination, enhance seedling establishment, and bolster flowering, fire likely acts as an important mechanism for maintaining plant species diversity and replenishing the seed bank of intermittent wetlands (Warners 1997).

Vegetation Description: Intermittent wetland is a graminoid- and herb-dominated wetland. In many locations, the community borders or encompasses a bog mat that supports sphagnum mosses, low ericaceous, evergreen shrubs, and widely scattered and stunted conifer trees (Kost et al. 2007, NatureServe 2007). The flora of intermittent wetlands is characteristically dominated by monocotyledons, with annual species contributing significantly to overall species diversity. For the majority of species, flowering and seed set occurs in late summer and fall, when water levels are lowest. However, species with bog affinities found on bog mats within these wetlands tend to be spring-flowering (Curtis 1959).

Photo by Michael A. Kost

Intermittent wetlands often contain distinct zones of vegetation that are patterned by the degree of water level fluctuation, peat accumulation, and organic decomposition.

Photo by Joshua G. Cohen

Intermittent wetlands typically contain several vegetation zones, especially when they are adjacent to or encircle a lake or pond. The deepest portion of the depression is usually inundated and supports floating aquatic plants including *Brasenia schreberi* (water shield), *Nuphar variegata* (yellow pond-lily), *Nymphaea odorata* (sweet-scented water-lily), *Potamogeton* spp. (pondweeds), and *Utricularia* spp. (bladderworts). Occurring along the lower shores and pond margins is a seasonally-flooded zone with sparse cover of low forbs and graminoids including *Eriocaulon septangulare* (pipewort), *Eleocharis olivacea* (bright green spike-rush), *E. robbinsii* (Robbin's spike-rush), *Fimbrystilis autumnalis* (autumn sedge), *Juncus pelocarpus*, (brown-fruited rush), *Rhynchospora* *capitellata* (beak-rush), *R. fusca* (beak-rush), *Schoenoplectus smithii* (bulrush), and *S. torreyi* (Torrey's bulrush, state special concern).

Photo by Joshua G. Cohen

Pipewort (*Eriocaulon septangulare*) is a characteristic species of the seasonally-flooded pond margins.

In the saturated soil further from the shore, where the seasonal water levels typically reach their peak, is a dense graminoid-dominated zone. This is the most floristically diverse zone and typically includes species such *Calamagrostis canadensis* (bluejoint grass), *C. stricta* (reedgrass), *Carex oligosperma* (few-seed sedge), *C. lasiocarpa* (wiregrass sedge), *Cladium marisicoides* (twig-rush), *Dulichium arundinaceum* (three-way sedge), *Euthamia graminifolia* (grass-leaved goldenrod), *Iris versicolor* (wild blue flag), *Lysimachia terrestris* (swamp candles), *Agrostis hyemalis* (ticklegrass), and *Panicum lindheimeri* (panic grass).

Photo by Joshua G. Cohen

Ticklegrass (*Agrostis hyemalis*) is often prevalent within the floristically diverse graminoid-dominated zone.

Many intermittent wetlands contain a bog mat with vegetation typical of an ombrotrophic bog. These bog mats, which often occur along the wetland margin where peats have stabilized, are characterized by sphagnum mosses and low, ericaceous shrubs, with *Chamaedaphne calyculata* (leatherleaf) being the most prevalent. Trees within intermittent wetlands are typically absent or restricted to the bog mat or the upland margin. Trees occurring on bog mats within the community are usually widely scattered and stunted conifers such as *Picea mariana* (black spruce) and *Larix laricina* (tamarack), and occasionally *Pinus banksiana* (jack pine) and *Pinus strobus* (white pine).

Photo by Joshua G. Cohen

The margins of intermittent wetlands, where peats have stabilized, are typically dominated by bog-like vegetation with low ericaceous shrubs, a continuous carpet of sphagnum mosses, and scattered and stunted conifers.

Photo by Joshua G. Cohen

Michigan Indicator Species: *Bartonia paniculata* (panicled screw-stem, state threatened), *Carex nigra* (black sedge, state endangered), *Carex wiegandii*

(Wiegand's sedge, state threatened), *Eleocharis melanocarpa* (black-fruited spike-rush, state special concern), *Eleocharis robbinsii*, *Eriocaulon septangulare*, *Gratiola virginiana* (round-fruited hedge hyssop, state threatened), *Hemicarpha micrantha* (dwarf bulrush, state special concern), *Juncus vaseyi* (Vasey's rush, state threatened), *Juncus militaris* (bayonet rush, state threatened), *Polygonum careyi* (Carey's smartweed, state threatened), *Potamogeton bicupulatus* (waterthread pondweed, state threatened), *Pycnanthemum verticillatum* (whorled mountain mint, state special concern), *Ranunculus cymbalaria* (seaside crowfoot, state threatened), *Scirpus clintonii* (Clinton's bulrush state special concern), and *Scirpus torreyi* (Torrey's bulrush, state special concern).

Photo by Joshua G. Cohen

Tracks of moose, which utilize intermittent wetlands as a seasonal source of water and browse, were common in this Luce County wetland in Upper Michigan.

Other Noteworthy Species: Intermittent wetlands provide habitat for numerous rare insect species including *Appalachia arcana* (secretive locust, state special concern), *Boloria freija* (Freija fritillary, state special concern butterfly), *Boloria frigga* (Frigga fritillary, state special concern butterfly), *Erebia discoidalis* (red-disked alpine, state special concern butterfly), *Merolonche dollii* (Doll's merolonche moth, state special concern), *Somatochlora incurvata* (incurvate emerald, state special concern dragonfly), and *Williamsoni fletcheri* (ebony boghaunter, state special concern dragonfly). Rare herptiles that utilize intermittent wetlands include *Clemmys guttata* (spotted turtle, state threatened), *Emydoidea blandingii* (Blanding's turtle, state special concern), *Pantherophis spiloides* (black rat snake, state special concern), *Sistrurus catenatus catenatus* (eastern massasauga, federal candidate species and state special concern), and *Terrapene carolina carolina* (eastern box turtle, state special concern). If suitable nesting trees or snags are available, *Haliaeetus leucocephalus* (bald eagle, state threatened), *Falco columbarius* (merlin, state threatened), and *Pandion haliaetus* (osprey, state threatened) can be found nesting in these systems and *Ardea herodias* (great blue heron, protected by the Migratory Bird Treaty Act of 1918) can establish rookeries. Other rare birds that could occur in intermittent wetlands are *Asio flammeus* (short-eared owl, state endangered), *Botaurus lentiginosus* (American bittern, state special concern), *Circus cyaneus* (northern harrier, state special concern), *Coturnicops noveboracensis* (yellow rail, state threatened), *Gallinula chloropus* (common moorhen, state special concern), *Ixobrychus exilis* (least bittern, state threatened), *Phalaropus tricolor* (Wilson's phalarope, state special concern), and *Rallus elegans* (king rail, state endangered). *Gavia immer* (common loon, state threatened) establish nest sites on natural islands and bog-mats. *Alces alces* (moose, state threatened), *Canis lupus* (gray wolf, state threatened), and *Lynx canadensis* (lynx, state endangered) utilize intermittent wetland habitat. Beaver (*Castor canadensis*) and muskrat (*Ondatra zibethicus*) can profoundly influence the hydrology of intermittent wetlands. Muskrats create open water channels through peat, and beavers can cause substantial flooding through their dam-building activities.

Photo by Joshua G. Cohen

Beaver flooding is an important natural disturbance factor influencing intermittent wetlands.

Intermittent wetlands support a large number of rare plants, including *Bartonia paniculata* (panicled screw-stem, state threatened), *Carex nigra* (black sedge, state endangered), *Carex wiegandii* (Wiegand's sedge, state threatened), *Eleocharis melanocarpa* (black-fruited spike-rush, state special concern), *Gentiana linearis* (linear-leaved gentian, state threatened), *Gratiola virginiana* (round-fruited hedge hyssop, state threatened), *Hemicarpha micrantha* (dwarf bulrush, state special concern), *Huperzia selago* (fir clubmoss, state special concern), *Juncus militaris* (bayonet rush, state threatened), *Juncus vaseyi* (Vasey's rush, state threatened), *Ludwigia alternifolia* (seedbox, state special concern), *Lycopodiella margueriteae* (northern prostrate clubmoss, state special concern), *Lycopodiella subappressa* (northern appressed clubmoss, state threatened), *Polygonum careyi* (Carey's smartweed, state threatened), *Potamogeton bicupulatus* (waterthread pondweed, state threatened), *Pycnanthemum verticillatum* (whorled mountain mint, state special concern), *Ranunculus cymbalaria* (seaside crowfoot, state threatened), *Sabatia angularis* (rose pink, state threatened), *Scirpus clintonii* (Clinton's bulrush state special concern), and *Scirpus torreyi* (Torrey's bulrush, state special concern).

Photo by Joshua G. Cohen

Preservation of intermittent wetlands depends in part on the protection of regional and local hydrologic regimes.

Conservation and Biodiversity Management: Intermittent wetland is an uncommon community type in the Great Lakes region that contributes significantly to the overall biodiversity of Michigan by providing habitat for a unique suite of plants and wide variety of animal species. Numerous rare species are associated with intermittent wetlands. Protection of the regional and local hydrologic regime is critical to the preservation of intermittent wetlands (Schneider 1994). Stabilization of water levels can allow for the establishment of perennials and woody species, which can displace less competitive annuals. Even small changes in hydroperiod may cause significant shifts in wetland community composition and structure. Resource managers operating in uplands adjacent to intermittent wetlands should take care to minimize the impacts of management to hydrologic regimes, especially increased surface flow and alteration of groundwater recharge. This can be accomplished by harvesting adjacent stands during snow cover and avoiding complete canopy removal and road construction near the wetland perimeter. A serious threat to intermittent wetland hydrology and species diversity is posed by off-road vehicle (ORV) traffic, which can significantly alter surficial hydrology through rutting and erosion. Soil erosion resulting from ORV use within the wetland or surrounding uplands may greatly disturb the seed bank, reducing plant density and diversity (Wisheu and Keddy 1989). For species that depend on recruitment from the seed bank such as annuals, significant soil disturbance may result in extirpation from the site. Reduction of access to wetland systems will help decrease detrimental impacts from ORVs.

Where shrub and tree encroachment threatens to convert open wetlands to shrub-dominated systems or forested swamps, prescribed fire can be employed to maintain open conditions. Prescribed fires are best employed in intermittent wetlands during droughts or in the late summer and fall when water levels are lowest. In addition to controlling woody invasion, fire promotes seed bank expression and rejuvenation and thus helps maintain species diversity. Intermittent wetlands are common natural features within a variety of droughty, fire-dependent, upland pine and oak matrix communities and would likely have experienced surface fires along with the surrounding uplands when conditions were favorable. When feasible, prescribed fires conducted in the adjacent uplands should be allowed to carry into intermittent wetlands. In addition, wildfires that spread through the uplands should be allowed to carry into intermittent wetlands when they do not pose serious safety concerns or threaten other management objectives.


Photo by Joshua G. Cohen
Prescribed fires and wildfires in surrounding uplands should be allowed to burn into adjacent intermittent wetlands.

Monitoring and control efforts to detect and remove invasive species are critical to the long-term viability of intermittent wetland. Invasive species that threaten the diversity and community structure of intermittent wetlands include *Phragmites australis* (reed), *Phalaris arundinacea* (reed canary grass), *Typha angustifolia* (narrow-leaved cat-tail), *Typha* x*glauca* (hybrid cat-tail), *Lythrum salicaria* (purple loosestrife), *Rhamnus frangula* (glossy buckthorn), and *Rosa multiflora* (multiflora rose).

Research Needs: Intermittent wetland is one of the least studied wetland community types of the Great Lakes region. Classification research is needed that explores the interrelationship between floristic composition and structure and physiography, hydrology, and fire. Intermittent wetland and related community types (i.e., bog, coastal plain marsh, poor fen, northern fen, and northern wet meadow) are frequently difficult to differentiate. Research on abiotic and biotic indicators that help distinguish related wetlands would be useful for field classification. Systematic surveys for intermittent wetlands and related wetlands are needed to help prioritize conservation and management efforts.

Little is known about the hydrologic and fire regimes of intermittent wetlands and the interaction of natural disturbance factors within these systems. Of particular importance is the study of how fire severity and periodicity are influenced by landscape context. Understanding the complex interaction of fire and changes in hydrologic regimes and climate is a critical research need. A relevant research question to address is how fire and flooding influence species diversity and structure of intermittent wetlands. As noted by Hammerson (1994), beaver significantly alter the ecosystems they occupy. Scientists should examine how the wetland ecosystems of the Great Lakes have been and continue to be affected by fluctuations in populations of beaver. Experimentation is needed to determine how best to prevent shrub and tree encroachment in intermittent wetlands that are threatened by conversion to shrub thicket or conifer swamp. A better understanding is needed of the influence of direct and indirect anthropogenic disturbance on intermittent wetlands. Effects of management within intermittent wetlands should be monitored to allow for assessment and refinement of management techniques. Monitoring should also focus on how intermittent wetland succession and management influence populations of rare species. The examination of non-native plant establishment in intermittent wetlands and means of controlling invasive species is especially critical. Given the sensitivity of peatlands to slight changes in hydrology and nutrient availability, it is important for scientists to predict how peatlands will be affected by global warming and atmospheric deposition of nutrients and acidifying agents (Heinselman 1970, Riley 1989, Bedford et al. 1999, Gignac et al. 2000, Mitsch and Gosselink 2000).


Photo by Joshua G. Cohen
An important research need is to determine how hydrologic fluctuations and landscape context influence fire regimes.

Similar Communities: bog, coastal plain marsh, emergent marsh, northern fen, northern wet meadow, poor fen, and submergent marsh.

Photo by Joshua G. Cohen

The deepest portions of some intermittent wetlands can support submergent marshes, providing habitat for a diversity of floating-leaved and submergent aquatic plants.

Other Classifications:

Michigan Natural Features Inventory Circa 1800 Vegetation (MNFI): Intermittent Wetland (6228).

Michigan Department of Natural Resources (MDNR): D (treed bog), V (bog), and N (marsh).

Michigan Resource Information Systems (MIRIS): 62 (non-forested wetland), 621 (aquatic bed wetland), and 622 (emergent wetland).

The Nature Conservancy National Classification: CODE; ALLIANCE; ASSOCIATION; COMMON NAME

IV.A.1.N.f; *Chamaedaphne calyculata* – (*Kalmia angustifolia*) Seasonally Flooded Dwarf-Shrubland Alliance; *Chamaedaphne calyculata / Carex oligosperma / Sphagnum* spp. Dwarf-Shrubland; Leatherleaf / Few-seed Sedge / Peatmoss Species Dwarf-Shrubland; Great Lakes Leatherleaf Intermittent Wetland

Related Abstracts: American bittern, Blanding's turtle, bog, coastal plain marsh, common moorhen, eastern box turtle, eastern massasauga, great blue heron rookery, incurvate emerald, king rail, least bittern, merlin, northern appressed clubmoss, northern fen, northern harrier, northern wet meadow, osprey, panicled screw-stem, poor fen, prairie fen, rich conifer swamp, secretive locust, short-eared owl, spotted turtle, and yellow rail.

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Photo by Joshua G. Cohen

Intermittent wetlands are common in Cheboygan County, northern Lower Michigan (above), and also in Luce County, Upper Michigan (below).

Photo by Joshua G. Cohen

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Michigan Natural Features Inventory
P.O. Box 30444 - Lansing, MI 48909-7944
Phone: 517-373-1552