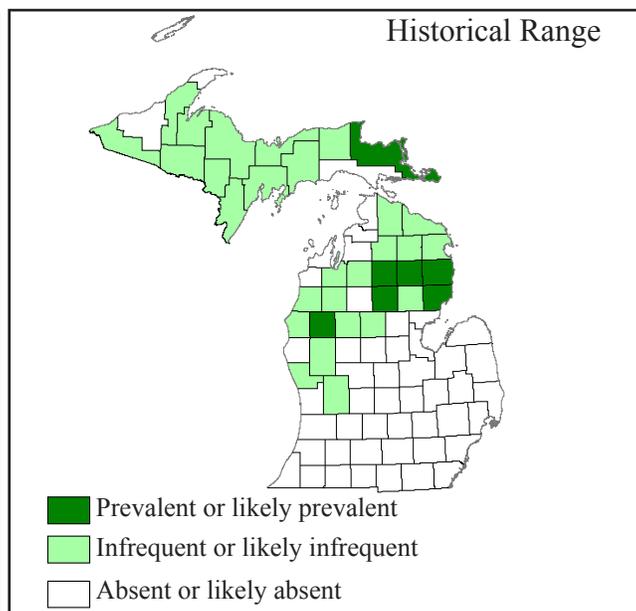




Photo by Michael A. Kost



Global and state rank: G3/S2

Total range: Along with other fire-dominated plant communities, pine barrens in Michigan probably reached their maximum extent about 6,000 years ago when post-glacial climatic conditions were comparatively warm and dry. In the 1800s, this community was found throughout the High Plains of interior Lower Michigan, in several locations in upper Michigan, and in central Wisconsin. It also occurred on sand plains associated with the upper Mississippi and St. Croix Rivers in Minnesota and Wisconsin.

Rank justification: In the 1800s, nearly 270,000 acres of pine barrens were present in Michigan (Comer et al. 1995). About 210,000 acres were distributed in Lower Michigan from Kent and Muskegon counties northeast to Cheboygan and Alpena counties. Most of this acreage was concentrated in Crawford County (55,000 acres), Iosco County (33,000 acres), and Oscoda County (28,000 acres). In Upper Michigan, pine barrens were most concentrated on the Raco Plains of Chippewa County (32,000 acres). Today, fewer than five high quality examples are known in Michigan, totaling only a few hundred acres. However, it is likely that there are many areas of restorable pine barrens. Many former sites of this type were logged and/or succeeded to closed-canopy forests as a result of fire suppression. Fire suppression has also dramatically decreased floristic diversity in many areas, even if they remain open. Other sites continue to be converted to tree plantations. The natural component of *Pinus resinosa* (red pine) in pine barrens has often been severely reduced or eliminated by logging.

Landscape context: This community is generally found in cooler climates north of the tension zone in the Great Lakes region. Pine barrens are found on outwash plains, sand

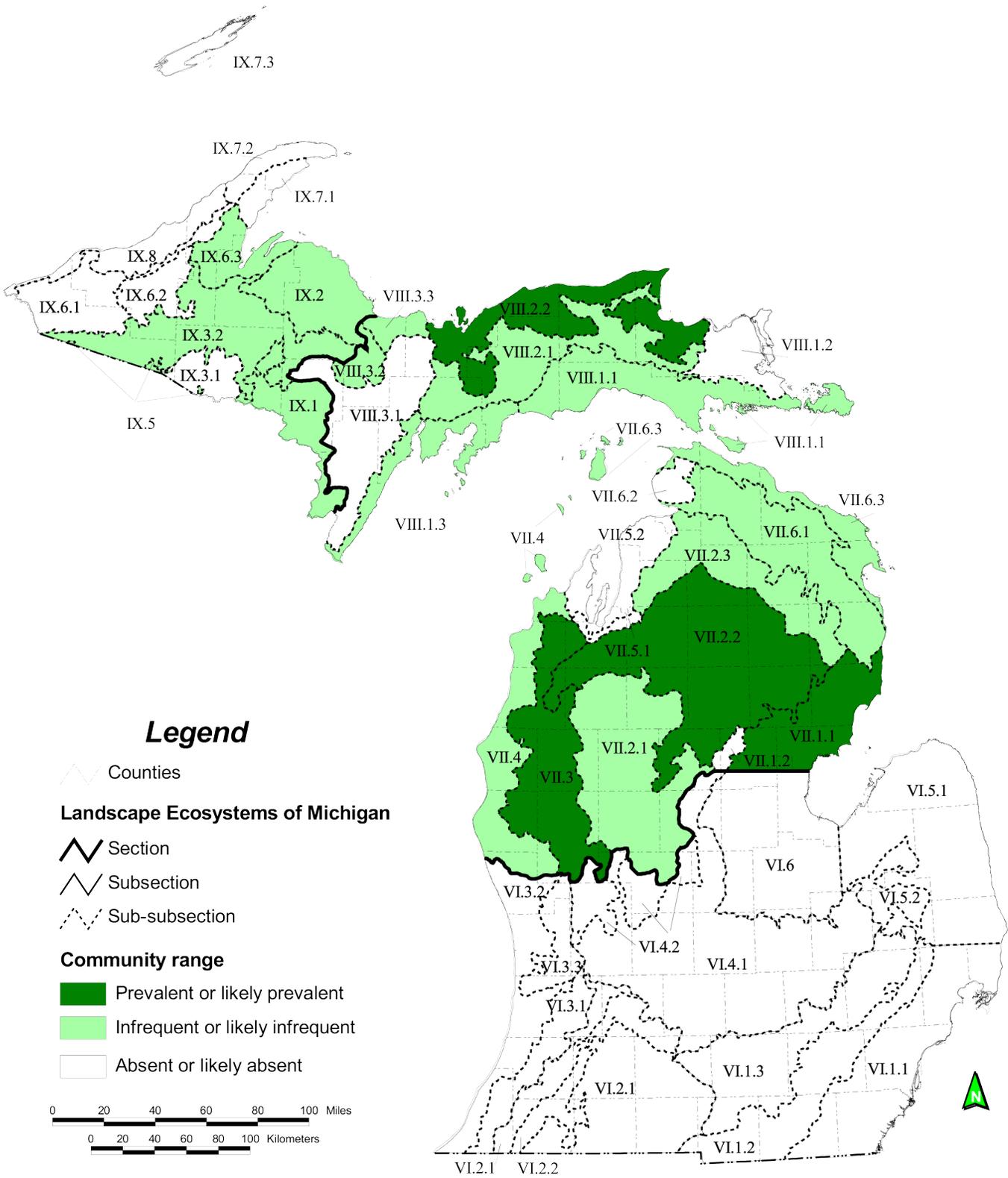
lake plain, and sandy riverine terraces (Kost et al. 2007). The topography is flat to gently rolling, typically with long expanses capable of carrying wildfires with few natural fire breaks. In rolling topography, pine barrens are found among depressions that collect cold air, forming frost pockets. The soils of this community are sandy, acidic, droughty, and relatively infertile. Zimmerman (1956) found all of Michigan's pine barrens occurring on excessively drained Grayling sands with a pH of 4.5-6.0.

Natural processes: Frequent wildfire, and, in some places, frost conditions, maintain open conditions by limiting the development of woody vegetation. Simard & Blank (1982) calculated presettlement fire frequency in the Mack Lake area of Oscoda County to have averaged in the range of 13 to 41 years. Pine barrens likely occurred on the most frequently burned portions of that landscape. Frequent fire also limits the dominance of the mat-forming sedge *Carex pensylvanica* (Pennsylvania sedge), maintaining a higher diversity of grasses and forbs.

Vegetation description: *Pinus banksiana* (jack pine) typically dominates the scattered overstory canopy. At Crex Meadows in western Wisconsin, Vogl (1961) studied pine barrens as described by original land survey records. He estimated that there were 20 trees greater than 15 cm (6 inches) in diameter per hectare. This translates to an average distance between trees of 24 meters (65 ft). The trees in this community had typical open-grown shapes. They had branches most of the way down their trunks with many needles. Many burned jack pine snags were encountered by land surveyors in Michigan.

Several other tree species can be found in this community. Historically, there was commonly a scattered supercanopy of *Pinus resinosa*. Most of these trees were likely removed during the logging-era. *Pinus resinosa* and *Pinus strobus* (white pine) were occasionally common sub-dominants





Ecoregional map of Michigan (Albert 1995) depicting historical distribution of pine barrens (Albert et al. 2008)



in Michigan pine barrens, especially in Lake County. Today, *Quercus ellipsoidalis* (northern pin oak), *Prunus serotina* (black cherry), and *Populus* spp. (aspens) are often found as stunted or young trees. *Vaccinium angustifolium* (low bush blueberry), *Comptonia peregrina* (sweetfern), *Prunus pumila* (sand cherry), *Salix humilis* (prairie willow) and *Corylus* spp. (hazelnuts) make up most of the shrub layer when present. *Danthonia spicata* (poverty grass), *Schizachyrium scoparium* [*Andropogon scoparius*] (little bluestem), and *Carex pensylvanica* are dominant herbaceous species across the range of this community. Other herbs and forbs vary from one location to another, depending on local site conditions. *Andropogon gerardii* (big bluestem), *Deschampsia flexuosa* (hair grass), *Viola pedata* (birdfoot violet), *Aster oolentangiensis* (prairie heart-leaved aster), *Cirsium hillii* (Hill's thistle, state special concern), *Koeleria macrantha* (June grass), *Liatris aspera* (rough blazing star), *Potentilla arguta* (prairie cinquefoil), and *Stipa spartea* (needle grass) are found on most sites.

This community has a well-developed sand prairie flora in the western end of its range. Sites in northern Michigan include fewer prairie-associated plant species.

Most of the recently collected data concerning tree height in this community indicate that most trees tend to be relatively short. Zimmerman (1956) reported that the tallest tree in his 50 study sites was 16 meters (52 ft). The average tree height was only 8 meters (26 ft). This may be misleading because past logging may have eliminated the largest trees and there has not been enough time to regenerate the tallest pines. Vogl (1961), in his analysis of General Land Office surveys conducted in western Wisconsin, found that the average diameter of *Pinus banksiana* was 25 cm (10 in) and *P. resinosa* was 50 cm (20 in). This indicates that taller trees may have existed before logging and the subsequent slash-fires that swept through most barrens.

Michigan indicator species: *Pinus banksiana*, *Schizachyrium scoparium*, *Viola pedata*, *Liatris aspera*, *Festuca scabrella*, *Cirsium hillii*, *Potentilla arguta*, *Prunus alleghaniensis* var. *davisii*.

Other noteworthy species: Many animals require this community to complete their life cycle. In Michigan, *Dendroica kirtlandii* (Kirtland's warbler, state endangered) breeds in dense jack pine thickets associated with this community. *Incisalia irus* (frosted elfin butterfly, state threatened), is found on pine barrens. *Tympanuchus cupido* (prairie chicken) and *T. phasianellus* (sharp-tailed grouse, state special concern) both need large tracts of open areas, as are found in pine barrens, to maintain viable populations. *Lycaeides melissa samuelis* (Karner blue butterfly, state threatened) requires *Lupinus perennis* (common lupine). This forb is found in sites in Wisconsin and western Lower Michigan in low to moderate numbers.

Appalachia arcana (secretive locust, state special concern) occurs in and along shallow wetlands among pine barrens in northern Lower Michigan.

Rare plant species commonly associated with pine barrens in Michigan's Lower Peninsula include *Festuca scabrella* (rough fescue, state threatened), *Agoseris glauca* (pale agoseris, state threatened), *Cirsium hillii* (Hill's thistle, state special concern), and *Prunus alleghaniensis* var. *davisii* (Alleghany plum, state special concern).

Poa pratensis (Kentucky bluegrass) is a common exotic grass in many sites of this community. It does best in the absence of fire. *Centaurea maculosa* (spotted knapweed), non-native *Hieracium* spp. (hawkweeds), and *Rumex acetosella* (sheep sorrel) have invaded many pine barren sites in Michigan.

Conservation/management: This community is maintained by relatively frequent ground fires. These fires suppress the growth of dense shrubs and sedges, while leaving most of the relatively fire resistant canopy trees intact. Oaks, especially *Quercus ellipsoidalis*, are present as grubs and scattered trees when fire is frequent. Oaks can become a common part of the canopy in the absence of fire. Conservation planning to allow for future use of fire in the restoration and management of pine barrens is critical to their continued existence.

Research needs: Investigation into the frequency, periodicity, and intensity of fires in pine barrens is needed to guide restoration and management activities. Variation in composition and structure of vegetation across the Great Lakes region needs further clarification. Similar region-wide investigation is needed to describe the variation in typical spatial characteristics and landscape context of pine barrens. The invertebrate and non-vascular plant components of pine barrens are currently not well-documented.

Similar communities: dry sand prairie, oak-pine barrens, oak barrens, dry northern forest, and Great Lakes barrens.

Historically, dry sand prairie was occasionally found among pine barrens. Small pockets of dry sand prairie in pine-dominated landscapes are sometimes classified as pine barrens. Great Lakes barrens are limited to the Great lakes shoreline and typically contain a significant number of evergreen understory plants. Pine barrens remnants can also have a similar physiognomy and share some species with jack pine/sedge barrens that have formed as a result of logging activities. The anthropogenic communities, i.e. sites that have been logged, grazed, etc., tend to be less diverse and have more introduced species.

Other classifications

Michigan Natural Features Inventory (MNFI)
Presettlement Vegetation: 333 - pine barren.



Michigan Department of Natural Resources (MDNR): G - grass, J0 - jack pine <100 trees/acre.

Michigan Resource Information Systems (MIRIS): 31, 33 - open land.

National Wetland Inventory (NWI): none.

The Nature Conservancy National Classification: CODE: (III.A.4a.SW2.00).

Alliance: *Pinus banksiana*-*P. resinosa* (sparse woodland alliance)

Association: *Pinus banksiana*-*P. resinosa*/*Schizachyrium scoparium*-prairie forb (sparse woodland).

Related abstracts: Kirtland's warbler, secretive locust, rough fescue, pale agoseris, Hill's thistle, Allegheny plum, dry sand prairie, oak-pine barrens, oak barrens, dry northern forest.

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Abstract citation:

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Photo by Joshua G. Cohen

Pine barrens, Crawford County, Michigan

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