



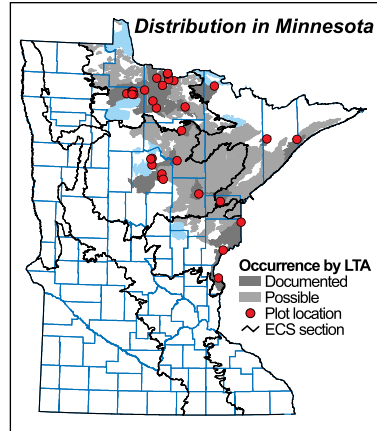
Northern Open Bog

Sphagnum-dominated peatlands with microtopography ranging from deep hollows and low Sphagnum carpets to well-developed high hummocks. Present in large patterned peatlands and in small basins in nutrient-poor outwash plains and in areas of non-calcareous till deposits in scoured bedrock terrain.

Vegetation Structure & Composition

Description is based on summary of vascular plant data from 33 plots (relevés) and bryophyte data from 7 plots.

- **Moss** cover is nearly always 100%, with cover of *Sphagnum* species about 90%. *Sphagnum fuscum* and occasionally *S. capillifolium* form tall hummocks, while *S. magellanicum* and *S. angustifolium* grow on the flanks of tall hummocks or on low hummocks. The latter also form extensive carpets in wetter hollows. *Polytrichum strictum* and *Pohlia sphagnicola* are common associates among dense *Sphagnum* clones on tall hummocks.
- **Graminoid** cover is variable, typically dominated by bog wiregrass sedge (*Carex oligosperma*), with tussock cottongrass (*Eriophorum vaginatum*) usually present and few-fruited sedge (*Carex pauciflora*) occasional.
- **Forb** cover is sparse, with pitcher plant (*Sarracenia purpurea*) typical and round-leaved sundew (*Drosera rotundifolia*) commonly present.
- **Low-shrub** cover is variable but typically composed of broad-leaved evergreens such as leatherleaf (*Chamaedaphne calyculata*), bog laurel (*Kalmia polifolia*), small cranberry (*Vaccinium oxycoccos*), bog rosemary (*Andromeda glaucophylla*), and Labrador tea (*Ledum groenlandicum*).
- **Tree** cover is sparse or absent (<25%). Trees are stunted (<33ft [10m] tall) or present only in the shrub layer. Black spruce is most likely, but tamarack may also be present.
- **Minerotrophic indicators** are absent or extremely rare; vegetation is composed mainly of bog species (see Appendix D).



Landscape Setting & Soils

APn90 is most common in large patterned peatlands on the eastern Agassiz, Aitkin, and Upham glacial lake plains, where underlying impermeable clay layers minimize ground-water movement through the surface peat. APn90 also occurs in peat-filled basins on nutrient-poor outwash plains, in scoured bedrock terrain, and on non-calcareous till. On these landforms, the basins are in small watersheds and receive minimal surface water input. In basins dominated by bog forests, APn90 often is present at the periphery of the basin, while in other basins it is present in the interior of the basin, with poor fens at the periphery. In large patterned peatlands, APn90 occurs along the flanks of raised bog crests, forming the heads of drains and incipient water tracks. Substrates are typically deep (>40in [1m]) peat, although peat can be shallower in basins on scoured bedrock terrain or on nutrient-poor sand plains. The upper peat layer is poorly decomposed (fibric) peat formed from *Sphagnum* and may be underlain by more decomposed peat of various origins, almost always with a significant content of fossil wood. Surface water is very acidic (pH <4.2), and cation concentrations, especially Ca⁺⁺, are very low (<2 ppm) but are slightly elevated compared with concentrations in peatlands east of Minnesota because of deposition of windblown prairie soil dust from cropland to the west. Water table is variable but is near the surface after heavy rains.



Natural History

APn90 develops where the peat surface becomes elevated, isolating it from mineral-rich runoff or groundwater. In these settings, all mineral and nutrient inputs come from precipitation and deposition of dust. The saturated conditions and rapid accumulation of *Sphagnum* peat prevent or inhibit establishment and growth of black spruce and tamarack. Variation in species composition in the community is typical, resulting from differences in tolerances of individual plant species to differences in water levels, differences in thickness of the upper layer of nutrient-poor peat (oligotrophic acrotelm), and variation in moss microtopography. *Sphagnum* hummocks provide relatively dry conditions (although still moist, even during drought periods) that favor growth of low ericaceous shrubs and stunted black spruce and tamarack, while hollows and areas with continuous *Sphagnum* carpets are typically dominated by graminoids.

In Minnesota, APn90 originates from transformation of Northern Spruce Bogs (APn80). The process of transformation appears to be influenced by the size of the peatland.

- In large peatlands on glacial lake plains, the peat crests in well-developed raised bogs often grow continuously. The steepening slopes of these crests channel surface water from precipitation into drains that widen and coalesce. The increasingly wet conditions in these drains favor the presence of carpet-forming *Sphagnum* species over hummock-forming species, with black spruce giving way to low shrubs and eventually to the “wet” bog species typical of graminoid bogs (see APn90b below). Downslope, these open bogs grade into Northern Poor Fens (APn91) because of increased concentrations or fluxes of cations from the surface runoff. This process also occurs in the lower interiors of ovoid-shaped bog islands in the Red Lake Peatlands.

- In small basin peatlands, APn90 appears to develop from APn80 only after disturbances such as fire (or possibly wind) eliminate the tree canopy. Loss of the tree canopy results in reduced evapotranspiration and increasingly water-logged conditions, causing a shift toward greater presence of carpet-forming *Sphagnum* species (relative to hummock-forming species) and the development of wet hollows. Ericaceous shrubs and other xerophytic bog species are the predominant vegetation on the remaining hummocks (see APn90a below).

- Fire or dwarf mistletoe (*Arceuthobium pusillum*) can also reduce the tree canopy in spruce bogs in large peatlands, making them similar in appearance to open bogs, although true conversion to open bogs has not been observed from mistletoe infestations. These areas become dominated by leatherleaf or bog wiregrass sedge (*Carex oligosperma*), but it may be decades or longer before the shade-tolerant species characteristic of forested bogs disappear (which would signify true conversion to an open bog), and by then black spruce may have regenerated at the site.

- There is currently no evidence that open bogs can develop through transformation of Northern Poor Fens. It appears that in poor fens where growth of *Sphagnum* elevates the peat surface above the influence of mineral-rich groundwater and creates bog conditions, the surface becomes sufficiently aerated to support tree growth. Therefore, as the fen is transformed into a bog, it becomes a spruce bog rather than an open bog.

Similar Native Plant Community Classes

● APn91 Northern Poor Fen

Northern Poor Fens are open peatlands and can appear similar to APn90 but are not completely isolated from mineral-rich groundwater or surface runoff and as a result support minerotrophic indicator species.

- ▶ **APn91**—Surface water pH is ≥ 4.2 . One or more minerotrophic indicators are present, usually in hollows. Minerotrophic vascular plant species include wiregrass sedge (*Carex lasiocarpa*), bog birch (*Betula pumila*), buckbean (*Menyanthes trifoliata*), candle-lantern sedge (*C. limosa*), white beak rush (*Rhynchospora alba*), creeping sedge (*C. chordorrhiza*), water horsetail (*Equisetum fluviatile*), and beaked sedge (*C. utriculata*). The most common minerotrophic bryophyte species are *Sphagnum majus*, *S. papillosum*, *S. subsecundum*, and the liverwort *Cladopodiella fluitans*.

- ▶ **APn90**—Surface water pH is < 4.2 . Minerotrophic indicators are absent; vegetation



is composed mainly of bog species (see Appendix D). If hollows are well developed, they are mostly dominated by *Sphagnum angustifolium*.

● APn80 Northern Spruce Bog

APn80 sometimes overlaps in tree cover with APn90 (see APn80a2, Semi-Treed Subtype).

► **APn80**—At least some shade-tolerant species are present, including lingonberry (*Vaccinium vitis-idaea*), creeping snowberry (*Gaultheria hispida*), stemless lady's slipper (*Cypripedium acaule*), three-fruited bog sedge (*Carex trisperma*), and poor sedge (*C. paupercula*). Light-requiring species (see below) are absent or have <5% cover. Only scattered, small *Sphagnum fuscum* hummocks are present. Extensive *Pleurozium schreberi* mats are evident underneath the black spruce canopy. Most of the higher hummocks are formed from *Sphagnum magellanicum*.

► **APn90**—Light-requiring species such as small cranberry, bog rosemary, and bog wiregrass sedge (*Carex oligosperma*) are present. High hummocks or consolidated mounds of *Sphagnum fuscum* are frequently present. Moss mats of *Pleurozium schreberi* are rare. *Sphagnum magellanicum* is restricted to lower hummocks or hollows.

Native Plant Community Types in Class

● APn90a Low Shrub Bog

Open bogs dominated by ericaceous shrubs, including leatherleaf, Labrador tea, bog laurel, and bog rosemary, which usually have >50% cover. Stunted black spruce and tamarack are often present, and high *Sphagnum* hummocks are obvious. APn90a occurs at the periphery of raised bogs and in openings in forested bogs. APn90a commonly grades into Black Spruce Bog, Semi-Treed Subtype (see APn80a2).

● APn90b Graminoid Bog

Open bogs dominated by graminoids, including bog wiregrass (*Carex oligosperma*), tussock cottongrass (*Eriophorum vaginatum*), and few-fruited sedge (*Carex pauciflora*). Ericaceous shrub cover is <50% and usually <25%. Hollows and *Sphagnum* carpets are well developed; high hummocks are less obvious. APn90b is almost always associated with large crested raised bogs and with ovoid bog islands in large patterned peatlands, where it forms incipient water tracks characterized by *Sphagnum* carpets with low hummocks. APn90b usually does not occur in smaller basins because of the absence of wet hollows. APn90b is divided into two subtypes, based on water-table fluctuations and the presence of pools.

○ APn90b1 Typic Subtype

Graminoid-dominated bogs in which the water table drops as much as 25-40in (70-100cm) during dry periods. APn90b1 is the most common or typical form of graminoid-dominated bog in Minnesota.

○ APn90b2 Schlenke Subtype

Graminoid-dominated bogs characterized by large temporary pools with scheuchzeria (*Scheuchzeria palustris*), white beak rush (*Rhynchospora alba*), and horned bladderwort (*Utricularia cornuta*). APn90b2 appears to be more typical of bogs in maritime areas than in continental areas, although it lacks some of the typical maritime bryophytes. APn90b2 is rare in Minnesota with only three known occurrences, which are associated with raised bogs in large peatlands.



photo by J.A. Janssens

Sphagnum fuscum