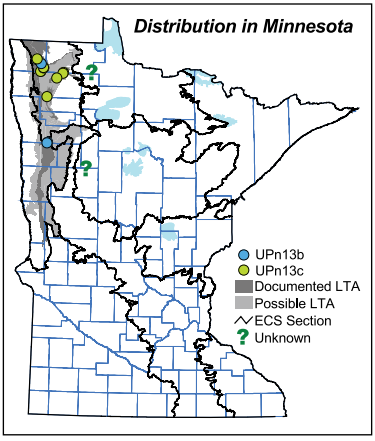
Northern Dry Savanna

Sparsely treed and often shrubby communities with grass-dominated herbaceous ground layers on nearly level to steeply sloping sites with droughty soils. Moderate growing-season moisture deficits occur during most years, and severe moisture deficits are frequent, especially during periodic regional droughts. Trees are open grown, typically small, and gnarled. Historically, fire occurred every few years.

Vegetation Structure & Composition

Description is based on summary of vegetation data from 14 plots



- **Graminoid** cover is patchy to continuous (25–100%). Species composition varies with variation in soils and topography and is similar to that of Northern Dry Prairie (UPn12). The tall grass big bluestem *(Andropogon gerardii)* is usually at least a codominant, but most of the other major graminoids are midheight and short grasses. Porcupine grass *(Stipa spartea)* is the most common of these; little bluestem *(Schizachyrium scoparium)* and blue grama *(Bouteloua gracilis)* are often common as well. Junegrass *(Koeleria pyramidata)* is typically present but has minor cover. Sand reed grass *(Calamovilfa longifolia)*, a tall grass, is often common on very sandy soils. Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*, a woodland species, is occasionally present.
- **Forb** cover is sparse to patchy (5–50%). Forb species composition also is similar to that of UPn12. Of the characteristic forbs, the most common are white sage *(Artemisia ludoviciana)*, gray goldenrod *(Solidago nemoralis)*, Missouri goldenrod *(Solidago missouriensis)*, silky aster *(Aster sericeus)*, hoary puccoon *(Lithospermum canescens)*, field pussytoes *(Antennaria neglecta)*, and northern bedstraw *(Galium boreale)*. The low, mat-forming fern ally rock spikemoss *(Selaginella rupestris)* is typically common on sands.
- **Climbing plants** and **vines** are a minor component. Virginia creeper *(Parthenocissus* spp.) is occasionally present.
- **Shrub layer** is sparse to patchy (5–50% cover) and composed of low (< 20in [50cm]) semi-shrubs, taller (up to 6ft [2m]) shrubs, seedlings and stunted (< 6ft) grubs of bur oak, and root suckers of quaking aspen. Leadplant *(Amorpha canescens)*, prairie rose *(Rosa arkansana)*, and poison ivy *(Toxicodendron rydbergii)* are common semi-shrubs; American hazelnut *(Corylus americana)* and wolfberry *(Symphoricarpos occidentalis)* are the most important tall shrubs. Saskatoon juneberry *(Amelanchier alnifolia)* and chokecherry *(Prunus virginiana)* are frequently present. Shrubby bur oak grubs are typically a significant component.
- **Trees** occur as scattered individuals or as scattered clumps (with total cover 10–70%, typically 25–50%). Trees are usually < 33ft (10m) tall and frequently < 16ft (5m), with open-grown form. Bur oak is the only species commonly present, although quaking aspen and green ash sometimes invade following fire suppression.

Landscape Setting & Soils

UPn13 historically occurred as patches of variable size and shape within larger mesic prairie or parkland landscapes where local topography or substrate favored frequent, often severe growing-season moisture deficits. UPn13 occurred on beach ridges of Glacial Lake Agassiz, which occupy a broad zone along the east side of the RRV and split into three bands that arc eastward through the LAP, and on a few localized

deposits of wind-reworked sands ("dune blankets") on the eastern edge of the RRV and in the LAP. UPn13 probably was also present on ice-contact deposits and outwash in the morainic area in the eastern part of the RRV, and possibly also in this area on steep erosional slopes on unsorted till, but no surviving examples are known. Soils are highly permeable sands or loamy sands, the latter often having a substantial gravel fraction. The soil moisture regime is somewhat excessively drained or excessively drained. With the exception of dune sands, soils are mollisols, with a thick, dark, humus-rich surface horizon, although this is usually thinner and has lower humus content than in soils of mesic prairies. In sands there is little or no soil profile development, but some staining and organic debris are usually present in the upper few inches where the sand surface has been stable for an extended time.

Natural History

Savannas depend on fire recurring with sufficient frequency and severity to prevent trees and shrubs from dominating and shading out sun-loving herbaceous plants, but not enough to completely prevent fire-tolerant tree species from reaching maturity. Historically, savannas typically occurred in physical proximity to prairies but where various circumstances provided some attenuation of the fire regime of the adjoining or surrounding prairie. These include the presence of streams, lakes, and steep topography, which inhibited the spread of fire. The low productivity and surface instability of sand substrates in UPn13 result in reduced fuel loads and thus lower intensity fires than in prairie communities on more productive loam soils. All savannas are highly sensitive to fire suppression, quickly succeeding to woodland and eventually to forest in the absence of fire. Dry savannas are more resilient than mesic savannas because the xeric conditions and lower fertility of dry sites inhibit tree and shrub growth and reproduction. These same factors also greatly influence herbaceous species composition, excluding species not adapted to either frequent drought or low nutrient availability. On dune sands, blowout formation and migration produce dramatic local variation in species composition, from sparse stands of pioneer species on bare, sterile sand to relatively dense sods of grasses and forbs on long-stabilized, organically enriched sand. Before Euro-American settlement, browsing, grazing, and trampling by large ungulates were regular occurrences in dry savannas, but the contribution of these to the composition and structure of the vegetation is not well understood.

Similar Native Plant Community Classes

- **UPs14 Southern Dry Savanna**

UPs14 is similar to UPn13 but typically has less shrub cover and is less likely to have quaking aspen. Northern pin oak is frequently present in UPs14 but does not occur in UPn13. Several herbaceous species characteristic of UPs14 rarely or never occur in UPn13, but not all of these are present in the northern part of the range of UPs14 where it borders UPn13. Most of the species that appear to be restricted to UPn13 occur commonly in prairies or woodlands in the range of UPs14, so their rarity in the plot data for the latter may be a sampling artifact. Veiny meadow-rue *(Thalictrum venulosum)* is an exception. The boundary between the ranges of these classes is set by convention; further study may determine that it should be repositioned or abandoned.

UPn13 Indicator Species	(freq%) ***UPn13***	UPs14
Smooth blue aster *(Aster laevis)*	**71**	-
Veiny meadow-rue *(Thalictrum venulosum)*	**50**	-
American vetch *(Vicia americana)*	**43**	-
Nodding wild rye *(Elymus canadensis)*	**36**	-
Blue giant hyssop *(Agastache foeniculum)*	**36**	-
Pale vetchling *(Lathyrus ochroleucus)*	**36**	-
Prairie wild onion *(Allium stellatum)*	**50**	3
Spreading dogbane *(Apocynum androsaemifolium)*	**50**	3

UPs14 Indicator Species	(freq%) UPn13	***UPs14***
Hairy puccoon *(Lithospermum carolinense)*	-	**66**
Slender nut sedge *(Cyperus lupulinus)*	-	**47**
Skyblue aster *(Aster oolentangiensis)*	-	**38**
Long-leaved panic grass *(Panicum perlongum)*	-	**34**
Northern pin oak (C,U)	-	**34**
Muhlenberg's sedge *(Carex muhlenbergia)*	-	**34**
Round-headed bush clover *(Lespedeza capitata)*	-	**31**
Bird's foot coreopsis *(Coreopsis palmata)*	-	**28**

- **UPn12 Northern Dry Prairie**

UPn12 and UPn13 are quite similar in their herbaceous component; "savannas are prairies with trees" is approximately true. UPn13 is more likely than UPn12 to have woodland herbs such as spreading dogbane *(Apocynum androsaemifolium)*, pale

vetchling *(Lathyrus ochroleucus)*, Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*, and erect or smooth carrion-flowers *(Smilax ecirrata* or *S. herbacea)*. By convention, total tree cover must exceed 10% for a site to be classified as UPn13 rather than UPn12.

UPn13 Indicator Species	(freq%) ***UPn13***	UPn12
Starry false Solomon's seal *(Smilacina stellata)*	**64**	-
Erect or Smooth carrion-flower*	**29**	-
Pennsylvania sedge**	**21**	-
Spreading dogbane *(Apocynum androsaemifolium)*	**50**	2
Pale vetchling *(Lathyrus ochroleucus)*	**36**	2
Bur oak (C)	**86**	7
American hazelnut *(Corylus americana)*	**57**	7
Poison ivy *(Toxicodendron rydbergii)*	**64**	9

UPn12 Indicator Species	(freq%) UPn13	***UPn12***
Prairie turnip *(Pediomelum esculentum)*	-	**41**
Flodman's thistle *(Cirsium flodmanii)*	-	**38**
Grooved yellow flax *(Linum sulcatum)*	-	**36**
Toothed evening primrose *(Calylophus serrulatus)*	-	**33**
Narrow-leaved purple coneflower***	-	**24**
Blanketflower *(Gaillardia aristata)*	-	**24**
Ground plum *(Astragalus crassicarpus)*	-	**21**
Pasqueflower *(Anemone patens)*	7	**52**

*Erect or Smooth carrion-flower *(Smilax ecirrata or S. herbacea)* **Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*
***Narrow-leaved purple coneflower *(Echinacea pallida)*

- **UPn24 Northern Mesic Savanna**

There are no documented surviving occurrences of UPn24, and lack of data makes comparison with UPn13 speculative. The tree canopy of UPn24 is dominated by bur oak, with trembling aspen possibly a significant component. Basswood may be present occasionally. The shrub layer is probably more developed than in UPn13, with gray dogwood *(Cornus racemosa)* more important than in UPn13. The herbaceous layer is similar to that of UPn23. Soils are loams that are finer textured than those of UPn13 and are always mollisols.

- **FDw24 Northwestern Dry-Mesic Oak Woodland**

FDw24 is similar to UPn13 when FDw24 has significant presence of prairie species in the understory (FDw24a). This is especially true for examples of UPn13 that are succeeding to woodland in the absence of fire. FDw24 has a more developed canopy of bur oaks than UPn13, and a denser shrub layer, notably of juneberries (*Amelanchier alnifolia* and *A. humilis)* and American hazelnut. Downy arrowwood *(Viburnum rafinesquianum)* is frequent in FDw24 but does not occur in UPn13. Conversely, the low semi-shrubs prairie rose and leadplant that are common in UPn13 do not occur in FDw24. A number of herbaceous species characteristic of dry prairies that are common in UPn13 do not occur in FDw24, including porcupine grass and rough blazing star *(Liatris aspera)*; a few species typical of woodlands that are common in FDw24 are rare or do not occur in UPn13, including Canada mayflower *(Maianthemum canadensis)* and false melic grass *(Schizachne purpurascens)*.

UPn13 Indicator Species	(freq%) ***UPn13***	FDw24
Porcupine grass *(Stipa spartea)*	**93**	-
White sage *(Artemisia ludoviciana)*	**93**	-
Smooth blue aster *(Aster laevis)*	**71**	-
Rough blazing star *(Liatris aspera)*	**71**	-
Hoary puccoon *(Lithospermum canescens)*	**71**	-
Field pussytoes*	**64**	-
Silky aster *(Aster sericeus)*	**64**	-
White prairie clover *(Dalea candida)*	**50**	-

FDw24 Indicator Species	(freq%) UPn13	***FDw24***
Downy arrowwood *(Viburnum rafinesquianum)*	-	**67**
Canada mayflower *(Maianthemum canadense)*	-	**67**
Early meadow-rue *(Thalictrum dioicum)*	-	**17**
Wild sarsaparilla *(Aralia nudicaulis)*	-	**17**
False melic grass *(Schizachne purpurascens)*	7	**67**
Lindley's aster *(Aster ciliolatus)*	14	**100**
Mountain rice grass (*Oryzopsis asperifolia*)	7	**50**
Maryland black snakeroot *(Sanicula marilandica)*	7	**50**

*Field pussytoes *(Antennaria neglecta* or *A. neodioica)*

- **FDw34 Northwestern Mesic Aspen-Oak Woodland**

FDw34 is similar to UPn13 when FDw34 has significant presence of prairie species in the understory (FDw34a). This is especially true for examples of UPn13 that are succeeding to woodland in the absence of fire. The tree canopy is much more developed in FDw34, with quaking aspen the dominant species, although bur oak is usually important, and jack pine is occasionally present. FDw34 has a much denser shrub layer than UPn13, typically dominated by American hazelnut. Gray dogwood and several other species that do not occur in UPn13 are also frequently present in FDw34. The low shrub lowbush blueberry *(Vaccinium angustifolium)* is occasional in FDw34 but rare in UPn13. Conversely, leadplant is frequent in UPn13 but absent from FDw34. Several characteristic woodland herbs that rarely or never occur in UPn13 are regularly present in FDw34, notably Canada mayflower and mountain rice grass *(Oryzopsis asperifolia)*. Of the prairie herbs that occur in FDw34, most are more common in UPn23

than in UPn13, and several are rare or never present in UPn13, such as bluejoint *(Calamagrostis canadensis)* and tall meadow-rue *(Thalictrum dasycarpum)*.

UPn13 Indicator Species	(freq%) ***UPn13***	FDw34
Porcupine grass *(Stipa spartea)*	**93**	-
Rough blazing star *(Liatris aspera)*	**71**	-
Junegrass *(Koeleria pyramidata)*	**71**	-
Silky aster *(Aster sericeus)*	**64**	-
Missouri goldenrod *(Solidago missouriensis)*	**64**	-
Leadplant *(Amorpha canescens)*	**50**	-
Purple prairie clover *(Dalea purpurea)*	**50**	-
Sand reed grass *(Calamovilfa longifolia)*	**43**	-

FDw34 Indicator Species	(freq%) UPn13	***FDw34***
Canada mayflower *(Maianthemum canadense)*	-	**91**
Bebb's willow *(Salix bebbiana)*	-	**82**
Tall meadow-rue *(Thalictrum dasycarpum)*	-	**64**
Downy arrowwood *(Viburnum rafinesquianum)*	-	**55**
Wild sarsaparilla *(Aralia nudicaulis)*	-	**55**
Gray dogwood *(Cornus racemosa)*	-	**55**
Bluejoint *(Calamagrostis canadensis)*	-	**55**
Mountain rice grass *(Oryzopsis asperifolia)*	7	**100**

Native Plant Community Types in Class

- **UPn13a Dry Barrens Jack Pine Savanna (Northern)**

Sparsely treed, graminoid-dominated communities on medium sands. Present mostly on undulating outwash sands, sometimes locally wind-reworked into dune forms. There is little or no soil profile development. Jack pine is the principal tree, with trembling aspen, bur oak, and red pine sometimes present. The shrub component is similar to that of UPn13b (see below), but lowbush blueberry is typically present as well. The herbaceous flora is also similar to that of UPn13b, although several dry woodland species may be present, such as cow wheat *(Melampyrum lineare)*, bracken *(Pteridium aquilinum)*, and mountain rice grass. There are no vegetation plot data available for UPn13a; description of the community type is based on inference from UPn13b, Jack Pine Woodland (Sand) (FDn12a), and Jack Pine - (Yarrow) Woodland*, Bur Oak - Aspen Subtype* (FDc23a2). UPn13a was developed as a community type to apply to jack pine–dominated savanna communities in Crow Wing and Pine counties, but subsequent analysis indicates that these are best grouped with Southern Dry Savannas (UPs14), as examples of the Jack Pine Subtype of Dry Barrens Oak Savanna (Southern) (UPs14a1), rather than with UPn13. There are no documented examples of UPn13a, but historically this type would have occurred in the western parts of the MOP and the MDL.

- **UPn13b Dry Barrens Oak Savanna (Northern)**

Sparsely treed, graminoid-dominated communities on wind-reworked sands. Dune forms are typically evident, with small local blowouts present. There is little or no soil profile development. Bur oak is the principal tree, but quaking aspen is frequently present as shrub- or sapling-size root suckers. The shrub layer is usually sparse (5–25% cover). Meadowsweet *(Spiraea alba)* is invariably present, and prairie willow (*Salix humilis)* and sand cherry (*Prunus pumila)* are more frequently present in UPn13b than in any of the other types in this class. The low semi-shrubs leadplant and prairie rose are also common. The herbaceous flora is similar to that of UPn12a. Several sand specialists occur in no other type in the class, for example, western spiderwort (*Tradescantia occidentalis)*, Schweinitz's nut sedge *(Cyperus schweinitzii)*, and sand dropseed (*Sporobolus cryptandrus)*. Several species common in UPn13b but uncommon in the other dry savanna types are purple lovegrass (*Eragrostis spectabilis)*, sand reed grass, hoary frostweed (*Helianthemum bicknellii)*, and rock spikemoss. The cover of the herb layer is usually less than 100%, with bare sand exposed among plants. UPn13b has been documented at a few locations, one on the eastern edge of the RRV and the others on the western side of the LAP. Description is based on summary of vegetation data from 4 plots.

- **UPn13c Dry Sand - Gravel Oak Savanna (Northern)**

Sparsely treed, graminoid-dominated, forb-rich communities on coarse-textured, usually gravelly soils on glacial lake beach ridges, outwash, and ice-contact deposits. Present mainly on gentle slopes. Soils have mollic epipedons. Bur oak is the principal tree; trembling aspen is sometimes present as shrub- or sapling-size root suckers. The shrub layer is sparse to patchy (5-50% cover). Wolfberry, American hazelnut, chokecherry, and Saskatoon juneberry are common taller shrubs, and the low semi-shrubs leadplant and prairie rose are also common. The herbaceous flora is similar to that of Dry Sand - Gravel Prairie (Northern) (UPn12b). Several species often present in UPn13c but rare in the community types in UPn13 on sands (UPn13b and presumably UPn13a)

include prairie dropseed *(Sporobolus heterolepis)*, Kalm's brome *(Bromus kalmii)*, and Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*, which are often present in UPn13c but absent from UPn13b, and northern bedstraw, harebell *(Campanula rotundifolia)*, and veiny meadow-rue, which are common forbs in UPn13c that are rare in UPn13b. These species are probably similarly frequent in UPn13d, which occurs on even loamier soils than UPn13c. UPn13c has been documented at several locations within the LAP. Description is based on summary of vegetation data from 10 plots.

- **UPn13d Dry Hill Oak Savanna (Northern)**

Sparsely treed, graminoid-dominated, forb-rich communities on medium- to fine-textured soils on steep slopes on till. Soils have well-developed mollic epipedons. The principal tree is bur oak, but trembling aspen is usually present, most commonly as shrub- and sapling-size root suckers. The shrub layer is more prominent than in other types in this class. The most common shrubs are American hazelnut, chokecherry, and wolfberry. The herbaceous flora is similar to that of Dry Hill Prairie (Northern) (UPn12d); sand specialist species are absent. UPn13d is restricted to the morainic area in the eastern part of the RRV. There are no vegetation plot data available for UPn13d; description is based on inference from Dry Hill Prairie (Southern) (UPs13d) and UPn13c.

photo by R. P. Dana, MN DNR

Kittson County, MN

UPn13 Northern Dry Savanna — Species Frequency & Cover

	freq%	cover
Forbs, Ferns & Fern Allies		
White sage *(Artemisia ludoviciana)*	93	●●
Gray goldenrod *(Solidago nemoralis)*	93	●●
Yarrow *(Achillea millefolium)*	79	●
Hoary puccoon *(Lithospermum canescens)*	71	●
Smooth blue aster *(Aster laevis)*	71	●
Rough blazing star *(Liatris aspera)*	71	●
Missouri goldenrod *(Solidago missouriensis)*	64	●●
Silky aster *(Aster sericeus)*	64	●●
Field pussytoes *(Antennaria neglecta* or *A. neodioica)*	64	●
Northern bedstraw *(Galium boreale)*	64	●
Bastard toad-flax *(Comandra umbellata)*	64	●
Starry false Solomon's seal *(Smilacina stellata)*	64	●
Tall cinquefoil *(Potentilla arguta)*	64	●
Tall wormwood or Tarragon *(Artemisia campestris* or *A. dracunculus)*	57	●
Wild bergamot *(Monarda fistulosa)*	57	●
Harebell *(Campanula rotundifolia)*	57	●
Spreading dogbane *(Apocynum androsaemifolium)*	50	●●
Veiny meadow-rue *(Thalictrum venulosum)*	50	●●
Stiff goldenrod *(Solidago rigida)*	50	●●
Prairie wild onion *(Allium stellatum)*	50	●
White prairie clover *(Dalea candida)*	50	●
Purple prairie clover *(Dalea purpurea)*	50	●
Field chickweed *(Cerastium arvense)*	50	●
Plantain-leaved pussytoes *(Antennaria plantaginifolia)*	50	●
Stiff sunflower *(Helianthus pauciflorus)*	43	●●
Oval-leaved milkweed *(Asclepias ovalifolia)*	43	●
American vetch *(Vicia americana)*	43	●
Alumroot *(Heuchera richardsonii)*	43	●
Blue giant hyssop *(Agastache foeniculum)*	36	●●
Heath aster *(Aster ericoides)*	36	●
Long-headed thimbleweed *(Anemone cylindrica)*	36	●
Slender beard tongue *(Penstemon gracilis)*	36	●
Daisy fleabane *(Erigeron strigosus)*	36	●
Pale vetchling *(Lathyrus ochroleucus)*	36	●
Canada goldenrod *(Solidago canadensis)*	36	●
Rock spikemoss *(Selaginella rupestris)*	29	●●
Prairie smoke *(Geum triflorum)*	29	●
Bearded birdfoot violet *(Viola palmata)*	29	●
Hoary frostweed *(Helianthemum bicknellii)*	29	●
Erect or Smooth carrion-flower*	29	●
Grasses & Sedges		
Big bluestem *(Andropogon gerardii)*	93	●●●●
Porcupine grass *(Stipa spartea)*	93	●●●
Junegrass *(Koeleria pyramidata)*	71	●
Slender wheatgrass *(Elymus trachycaulus)*	50	●
Sand reed-grass *(Calamovilfa longifolia)*	43	●●
Little bluestem *(Schizachyrium scoparium)*	36	●●●
Nodding wild rye *(Elymus canadensis)*	36	●
Blue grama *(Bouteloua gracilis)*	29	●●●
Blunt sedge *(Carex obtusata)*	29	●
Kalm's brome *(Bromus kalmii)*	29	●
Prairie dropseed *(Sporobolus heterolepis)*	29	●
Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*	21	●●
Semi-Shrubs		
Poison ivy *(Toxicodendron rydbergii)*	64	●●
Prairie rose *(Rosa arkansana)*	64	●
Leadplant *(Amorpha canescens)*	50	●●●
Shrubs		
Snowberry or Wolfberry *(Symphoricarpos albus* or *S. occidentalis)*	64	●●
Saskatoon juneberry *(Amelanchier alnifolia)*	64	●
American hazelnut *(Corylus americana)*	57	●●●
Chokecherry *(Prunus virginiana)*	57	●
Sand cherry *(Prunus pumila)*	36	●
Meadowsweet *(Spiraea alba)*	29	●

Trees	Canopy		Shrub Layer	
	freq%	cover	freq%	cover
Bur oak	86	●●●	100	●●
Quaking aspen	-	-	29	●

*Erect or Smooth carrion-flower *(Smilax ecirrata* or *S. herbacea)*