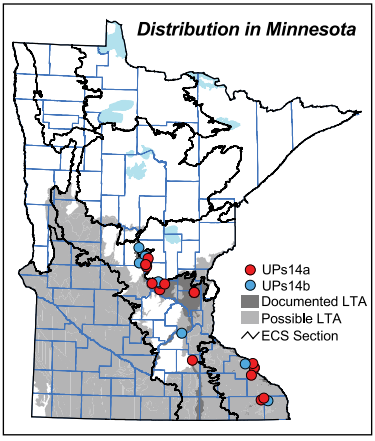
Southern Dry Savanna

Sparsely treed 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.

Vegetation Structure & Composition

Description is based on summary of vegetation data from 30 plots (relevés).



- **Graminoid** cover is patchy to continuous (25–100%). Midheight grasses are most important, although tallgrass species are often important as well, especially where conditions tend toward mesic. Species composition varies with variation in soils and topography and is similar to that of Southern Dry Prairie (UPs13). Little bluestem *(Schizachyrium scoparium)* and porcupine grass *(Stipa spartea)* are generally dominant; big bluestem *(Andropogon gerardii)* and Indian grass *(Sorghastrum nutans)* are usually present and often common, more so than in UPs13. Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*, a woodland species, is often present.
- **Forb** cover is sparse to patchy (5–50%). Of characteristic forbs, the most common are western ragweed *(Ambrosia psilostachya)*, Virginia ground cherry *(Physalis virginiana)*, gray goldenrod *(Solidago nemoralis)*, white sage *(Artemisia ludoviciana)*, hairy and hoary puccoon *(Lithospermum carolinense* and *L. canescens)*, hoary frostweed *(Helianthemum bicknellii)*, and starry false Solomon's seal *(Smilacina stellata)*. The fern ally rock spikemoss *(Selaginella rupestris)* is usually common on sand substrates.
- **Climbing plants** and **vines** are a minor component. Virginia creeper *(Parthenocissus* spp.) is frequently present, and wild grape *(Vitis riparia)* 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, and oak seedlings and stunted (< 6ft) oak "grubs." Leadplant *(Amorpha canescens)*, prairie rose *(Rosa arkansana)*, and poison ivy *(Toxicodendron rydbergii)* are common low shrubs; chokecherry *(Prunus virginiana)*, American hazelnut *(Corylus americana)*, and smooth sumac *(Rhus glabra)* are the most important tall shrubs.
- **Trees** occur as scattered individuals or as scattered small clumps (with total cover < 70%, typically 25–50%). Trees are usually < 33ft (10m) tall and frequently < 16ft (5m), with open-grown form. Bur oak is most common, but northern pin oak is also usually present. Black oak is the major oak species on sandy sites in the PPL, sometimes mixed with jack pine; in rare situations the latter is the dominant tree.

Landscape Setting & Soils

Land survey records indicate that UPs14 was common historically in the Oak Savanna Subsection of the MIM on morainic deposits of the Des Moines lobe, and in the Hardwood Hills Subsection of the MIM along the prairie-forest ecotone. UPs14 was also sporadic in the CGP, occurring in association with steep breaks and water features. No surviving examples are known in these regions. The majority of extant examples of UPs14 are on terraces along the Mississippi River and on outwash and lacustrine deposits in the Anoka Sand Plain Subsection, especially on dune forms of mid-Holocene origin; there are also infrequent occurrences on ice-contact features such as eskers and kames. In the PPL, UPs14 occurs mainly on deep, sometimes wind-reworked stream terrace sands on valley floors, sometimes on colluvial sands below sandstone outcrops, and sometimes

on “ramps” of sand moved upslope from valley floors by wind. Soils are somewhat excessively to excessively drained, usually highly permeable, coarse-textured sandy loams or loamy sands, often with a substantial gravel fraction. Soil reaction ranges from circumneutral to slightly acidic. Soils are mainly entisols, with weak profile development, but sometimes are mollisols, with thick, dark, organic-enriched upper horizons, where the parent material includes a greater fraction of silt and clay.

Natural History

Savannas form where fire recurs frequently enough to prevent trees and shrubs from dominating and shading out sun-loving herbaceous plants, but where frequency and severity are low enough to allow fire-tolerant trees to become established and sometimes reach maturity. Historically, savannas typically occurred in physical proximity to prairie, but where various factors provided some amelioration of the fire regime of the adjoining or surrounding prairie. These factors include streams, lakes, and steep topography, which limited the spread of fire and thus created conditions conducive to savanna formation in the prairie region. The very low productivity of sandy substrates as well as surface instability result in reduced fuel loads and thus fire intensity is lower in savannas than in typical prairies. All savannas are highly sensitive to fire suppression, quickly succeeding to woodland and eventually to forest in the absence of fire. Seedlings and saplings of a number of woodland trees are typically present in savannas today, reflecting reduced fire frequency and a general increase in these species in the landscape. Dry savannas are more resilient than mesic savannas because the xeric conditions and lower fertility of the soils inhibit tree and shrub growth and reproduction. These same factors also greatly influence herbaceous species composition, eliminating 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 in bare, sterile sand to a relatively dense sod 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. The contribution of these activities to the composition and structure of the vegetation is not well understood, although it is known that confined grazing by domestic livestock can badly degrade dry savannas.

Similar Native Plant Community Classes

- **UPn13 Northern Dry Savanna**

UPn13 is similar to UPs14 but typically has greater shrub cover and is more likely to have quaking aspen, mostly as suckers and saplings. 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 actually 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. The boundary between the ranges of these classes is set more or less by convention; further study may determine that it should be repositioned or abandoned.

UPs14 Indicator Species	(freq%) ***UPs14***	UPn13
Slender nut sedge *(Cyperus lupulinus)*	**50**	-
Muhlenberg's sedge *(Carex muhlenbergia)*	**37**	-
Round-headed bush clover *(Lespedeza capitata)*	**33**	-
Bird's foot coreopsis *(Coreopsis palmata)*	**30**	-
Flowering spurge *(Euphorbia corollata)*	**23**	-
Clammy ground cherry *(Physalis heterophylla)*	**23**	-
Black oak (C)	**23**	-
Hairy puccoon *(Lithospermum carolinense)*	**70**	7

UPn13 Indicator Species	(freq%) UPs14	***UPn13***
Smooth blue aster *(Aster laevis)*	-	**64**
Kalm's brome *(Bromus kalmii)*	-	**43**
American vetch *(Vicia americana)*	-	**36**
Nodding wild rye *(Elymus canadensis)*	-	**36**
Veiny meadow-rue *(Thalictrum venulosum)*	-	**36**
Pale vetchling *(Lathyrus ochroleucus)*	-	**29**
Poverty grass *(Danthonia spicata)*	-	**29**
Spreading dogbane *(Apocynum androsaemifolium)*	3	**36**

- **UPs13 Southern Dry Prairie**

UPs13 and UPs14 are quite similar in their herbaceous component; “savanna is prairie with trees” is approximately true. Along with trees, shrubs are also typically more common in UPs14, and UPs14 is more likely to have woodland herbs such as Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)* and carrion flowers *(Smilax ecirrata* or

S. herbacea). By convention, total tree cover must exceed 10% for a site to be classified as UPs14 rather than UPs13.

UPs14 Indicator Species	(freq%) ***UPs14***	UPs13
Erect, Smooth, or Illinois carrion-flower*	**23**	-
Black oak (C)	**23**	-
Virginia creeper *(Parthenocissus* spp.)	**47**	3
Bur oak (C)	**43**	3
American hazelnut *(Corylus americana)*	**43**	3
Starry false Solomon's seal *(Smilacina stellata)*	**47**	4
Chokecherry *(Prunus virginiana)*	**50**	5
Pennsylvania sedge**	**37**	4

UPs13 Indicator Species	(freq%) UPs14	***UPs13***
Prairie turnip *(Pediomelum esculentum)*	-	**37**
Aromatic aster *(Aster oblongifolius)*	-	**30**
Sage wormwood *(Artemisia frigida)*	1	**23**
Flowering spurge *(Euphorbia corollata)*	1	**22**
Prairie wild onion *(Allium stellatum)*	3	**36**
Heart-leaved alexanders *(Zizia aptera)*	3	**25**
Silky aster *(Aster sericeus)*	10	**61**
Pasqueflower *(Anemone patens)*	7	**42**

*Erect, Smooth, or Illinois carrion-flower *(Smilax* spp.) **Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*

- **FDs27 Southern Dry-Mesic Pine-Oak Woodland**

FDs27 can be similar to UPs14 but has greater tree cover, and there are several common species in the former rarely present in the latter. The shrub layer is also denser in FDs27, especially American hazelnut. Prairie rose and leadplant, important semi-shrubs in UPs14, are only occasional in FDs27. (The presence of leadplant in an occurrence of FDs27 strongly suggests recent succession from UPs14.) The two classes differ most strikingly in their herbaceous composition. Little bluestem is occasional in FDs27, but the other prairie grasses common in UPs14 are rarely or never present in the former. Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*, a minor presence in UPs14, is always present and often the dominant ground cover in FDs27. Similarly, most of the prairie forbs typical of UPs14 are uncommon to rare in FDs27, and a number of typical woodland forbs common in the latter rarely if ever occur in the former.

UPs14 Indicator Species	(freq%) ***UPs14***	FDs27
Junegrass *(Koeleria pyramidata)*	**80**	-
Western ragweed *(Ambrosia psilostachya)*	**80**	-
Porcupine grass *(Stipa spartea)*	**73**	-
Virginia ground cherry *(Physalis virginiana)*	**73**	-
Bearded birdfoot violet *(Viola palmata)*	**53**	-
Schweinitz's nut sedge *(Cyperus schweinitzii)*	**47**	-
Green-flowered peppergrass *(Lepidium densiflorum)*	**40**	-
Rough blazing star *(Liatris aspera)*	**33**	-

FDs27 Indicator Species	(freq%) UPs14	***FDs27***
Clayton's sweet cicely *(Osmorhiza claytonii)*	-	**85**
Basswood (C,U)	-	**62**
White oak (C,U)	-	**54**
Paper birch (C,U)	-	**46**
Ironwood (C,U)	-	**46**
Pagoda dogwood *(Cornus alternifolia)*	-	**46**
Elliptic shinleaf *(Pyrola elliptica)*	-	**46**
Lopseed *(Phryma leptostachya)*	3	**69**

- **UPs24 Southern Mesic Savanna**

Scarcity of data for UPs24 makes comparison with UPs14 speculative. The tree canopy of UPs24 is probably dominated by bur oak, with northern pin oak less common, and black oak absent. Trembling aspen is possibly a significant component, with white oak and basswood possibly minor components. The shrub layer is probably more developed than in UPs14, with gray dogwood *(Cornus racemosa)* possibly more important than in UPs14. The herbaceous layer is similar to that of UPs23. Soils are loams that are finer textured than those of UPs14 and are always mollisols. UPs24 is present on level to gently sloping sites.

Native Plant Community Types in Class

- **UPs14a Dry Barrens Oak Savanna (Southern)**

Sparsely treed graminoid-dominated communities on wind-reworked sands and other deep sands. Dune forms are typically evident, with small local blowouts present, and there is little or no soil formation. Black oak is the main tree in the PPL, with bur oak and occasionally jack pine. Elsewhere, bur oak is the principal tree. Northern pin oak is sometimes present, perhaps only as a result of fire suppression. Herbaceous flora is similar to that of Dry Barrens Prairie (Southern) (UPs13a). Vegetative cover is often less than 100%, with bare sand exposed among plants. Several species of sparsely vegetated sand habitats are limited to UPs14a or are rare in the other types in this class; among these are sand dropseed *(Sporobolus cryptandrus)*, umbel sedge *(Carex umbellata)*, base-branched three-awn *(Aristida basiramea)*, slender knotweed *(Polygonum tenue)*, and silky prairie clover *(Dalea villosa)*. Although rare, wild lupine *(Lupinus perennis)* is restricted to this type. UPs14a is divided into two subtypes, based on canopy composition.

- *UPs14a1 Jack Pine Subtype*

  Jack pine is present in the canopy. UPs14a1 is documented only in the PPL, where it is rare. Description is based on summary of vegetation data from 3 plots.

- *UPs14a2 Oak Subtype*

  Canopy is composed of oaks, with jack pine absent. UPs14a2 is documented in the MIM from numerous locations in the Anoka Sand Plain Subsection and one location in the Oak Savanna Subsection, and from scattered locations in the PPL. Description is based on summary of vegetation data from 16 plots.

- **UPs14b Dry Sand - Gravel Oak Savanna (Southern)**

Sparsely treed graminoid-dominated, forb-rich herbaceous communities on coarse-textured, usually gravelly soils on outwash and ice-contact deposits. Present mainly on gentle slopes, and sometimes on steep slopes. Soils have mollic epipedons. Bur oak is the principal tree, although black oak may occur rarely in the PPL. Northern pin oak is sometimes present. Quaking aspen is often present as suckers or saplings. Herbaceous flora is similar to that of UPs13b. Two grasses common in UPs14b but rarely encountered in UPs14a are side-oats grama *(Bouteloua curtipendula)* and prairie dropseed *(Sporobolus heterolepis)*. Less common components of UPs14b that are very rare in UPs14a are plantain-leaved and common pussytoes *(Antennaria plantaginifolia* and *A. neglecta)*, veiny pea *(Lathyrus venosus)*, stiff goldenrod *(Solidago rigida)*, silky aster *(Aster sericeus)*, and field chickweed *(Cerastium arvense)*. UPs14b has been documented from numerous locations in the MIM, mostly in the north end of the Anoka Sand Plain Subsection, with one location just beyond the southern tip of this subsection, and from a few locations in the PPL. Description is based on summary of vegetation data from 11 plots.

- **UPs14c Dry Hill Oak Savanna (Southern)**

Sparsely treed graminoid-dominated, forb-rich herbaceous communities on medium- to fine-textured soils on moderate to steep, erosion-cut slopes in unsorted, loamy glacial till or loess-mantled till. Soils have well-developed mollic epipedons. The principal tree is bur oak; quaking aspen is often present, mainly as suckers and saplings. Shrub layer is possibly more prominent than in other types in the class, with greater importance of smooth sumac and chokecherry. Herbaceous flora is similar to that of UPs13d. Sand specialist species are absent. UPs14c is most likely to have occurred in the Oak Savanna and Hardwood Hills subsections in the MIM and at the north end of the CGP close to the MIM and along the Minnesota River valley. There are no vegetation plot data available for UPs14c; description is based on inference from Dry Hill Prairie (Southern) (UPs13d) and UPs14b.

photo by R. P. Dana MN DNR

Big Stone County, MN

UPs14 Southern Dry Savanna — Species Frequency & Cover

	freq%	cover
Forbs, Ferns & Fern Allies		
Western ragweed *(Ambrosia psilostachya)*	80	●●
Virginia ground cherry *(Physalis virginiana)*	73	●
Hairy puccoon *(Lithospermum caroliniense)*	70	●
Gray goldenrod *(Solidago nemoralis)*	67	●
Hoary frostweed *(Helianthemum bicknellii)*	67	●
Horseweed *(Conyza canadensis)*	60	●
White sage *(Artemisia ludoviciana)*	53	●
Bearded birdfoot violet *(Viola palmata)*	53	●
Starry false Solomon's seal *(Smilacina stellata)*	47	●
Purple prairie clover *(Dalea purpurea)*	47	●
Common milkweed *(Asclepias syriaca)*	40	●
Long-headed thimbleweed *(Anemone cylindrica)*	40	●
Hoary puccoon *(Lithospermum canescens)*	40	●
Prairie pinweed *(Lechea stricta)*	33	●
Round-headed bush clover *(Lespedeza capitata)*	33	●
Skyblue aster *(Aster oolentangiensis)*	33	●
Rough blazing star *(Liatris aspera)*	33	●
Rock spikemoss *(Selaginella rupestris)*	30	●
Missouri goldenrod *(Solidago missouriensis)*	30	●
Bird's foot coreopsis *(Coreopsis palmata)*	30	●
Harebell *(Campanula rotundifolia)*	30	●
Hairy golden aster *(Chrysopsis villosa)*	30	●
Bastard toad-flax *(Comandra umbellata)*	30	●
Heath aster *(Aster ericoides)*	27	●
Showy goldenrod *(Solidago speciosa)*	27	●
Flowering spurge *(Euphorbia corollata)*	23	●
Mock pennyroyal *(Hedeoma hispida)*	23	●
Large-flowered beard tongue *(Penstemon grandiflorus)*	23	●
Erect, Smooth, or Illinois carrion-flower*	23	●
Tall cinquefoil *(Potentilla arguta)*	23	●
Stiff sunflower *(Helianthus pauciflorus)*	20	●●
Horsemint *(Monarda punctata)*	20	●●
Tall wormwood or Tarragon**	20	●
Silky prairie clover *(Dalea villosa)*	17	●

	freq%	cover
Grasses & Sedges		
Junegrass *(Koeleria pyramidata)*	80	●
Porcupine grass *(Stipa spartea)*	73	●●●
Little bluestem *(Schizachyrium scoparium)*	70	●●●
Big bluestem *(Andropogon gerardii)*	67	●●
Hay sedge *(Carex foenea)*	53	●●
Purple lovegrass *(Eragrostis spectabilis)*	53	●
Indian grass *(Sorghastrum nutans)*	40	●●●
Muhlenberg's sedge *(Carex muhlenbergia)*	37	●●
Pennsylvania sedge *(Carex pensylvanica* var. *pensylvanica)*	37	●●
Sand reed-grass *(Calamovilfa longifolia)*	37	●
Switchgrass *(Panicum virgatum)*	37	●
Prairie dropseed *(Sporobolus heterolepis)*	37	●●
Long-leaved panic grass *(Panicum perlongum)*	37	●
Scribner's panic grass *(Panicum oligosanthes)*	30	●●
Hairy grama *(Bouteloua hirsuta)*	30	●
Side-oats grama *(Bouteloua curtipendula)*	23	●●●
Fall witch grass *(Leptoloma cognatum)*	23	●
Woody Vines		
Virginia creeper *(Parthenocissus vitacea* or *P. quinquefolia)*	47	●
Semi-Shrubs		
Leadplant *(Amorpha canescens)*	53	●●
Prairie rose *(Rosa arkansana)*	43	●
Shrubs		
Chokecherry *(Prunus virginiana)*	50	●
American hazelnut *(Corylus americana)*	43	●
Smooth sumac *(Rhus glabra)*	40	●●
Low or Saskatoon juneberry *(Amelanchier humilis* or *A. alnifolia)*	37	●

Trees	Canopy		Shrub Layer	
	freq%	cover	freq%	cover
Bur oak	43	●●●	67	●
Northern pin oak	27	●●●	37	●
Black oak	23	●●●	23	●●
Jack Pine	17	●●●	17	●

*Erect, Smooth, or Illinois carrion-flower *(Smilax ecirrata*, *S. herbacea*, or *S. illinoensis)* **Tall wormwood or Tarragon *(Artemisia dracunculus* or *A. campestris)*