

Savanna Habitat Restoration and Management

INTRODUCTION

The purpose of this technical note is to provide guidance to field office staff when designing and installing Savanna Habitats under the Wisconsin FOTG Practice Standard 643, Restoration and Management of Declining Habitats.

BACKGROUND

The definition of the North American Savanna can be easily debated. Very few savanna habitats remain that can be used for reference. From four to six savanna communities can be identified based on moisture gradient, soil type and associated flora. For the purposes of this technical note, three major savanna habitats in Wisconsin will be addressed. These include Oak Openings, Oak Barrens, and Jack Pine Barrens.

All three of these savanna types are considered rare and declining in Wisconsin due to intentional and unintentional post settlement manipulation. Cropping, grazing, invasion of exotic species, and the absence of natural management regimes such as fire has contributed to the decline of these habitats.

Oak Openings, dominated by bur oak on mesic and dry mesic prairie on the uplands, and swamp white oak on wet-mesic prairie on the low areas, and located south and west of the tension zone, was the most common savanna in Wisconsin. Refer to Figures 1 and 2.

Oak Barrens occurred on the central sand plains and outwash terraces of major rivers. These savannas were dominated by Hill's Oak (Northern Pin Oak) and Black Oak on dry-mesic prairie with sand barren grassland in the understory. Refer to Figures 2 and 3.

North of the tension zone, the oak barrens gave way to **Jack Pine Barrens** with sand barren grassland understory. Refer to Figures 1 and 3.

Figure 4 shows the major ecological landscapes in Wisconsin. This map can be used as a supplemental guide to the other maps included in this technical note.

The Northern Sands, Northeast Sands, Central Sand Plains, Central Sand Hills, and the Southwest Savanna ecological landscapes are the landscape

areas in Wisconsin where the three major savannas were historically common. This does not mean that savanna habitats did not exist in other ecological landscapes. Local soil information can be used to identify areas that may have been savanna habitat. Since these habitats were dominated by prairie vegetation, mollisols commonly formed over time as the dominant soil order. **Note that not all mollisols developed under savanna habitat vegetation, but under the influence of some type of grassland habitat.**

The information presented in this technical note is intended to assist conservation planners with the design and establishment of the three major savanna habitat types listed above. Other reference material, such as Agronomy Technical Note 5, Prairie Establishment/Restoration Seeding Recommendations, will be used to develop seeding mixes and planting plans for the grass/forb component of the savanna habitats.

APPLICATION AND PROCEDURE

Site Planning

To determine the appropriate type of savanna to restore, review the following maps and gather soil information for the site to be restored.

Utilize soil maps, historical photos, and existing vegetation to help determine the direction of the savanna restoration. Savanna habitats were not structurally uniform on a large scale, but represented a gradient between treeless prairie and forest, more so in the Oak Openings and Oak Barrens than in the Jack Pine Barrens. As the habitat transitioned from prairie to forest, the presence of woody species increased, but not uniformly across the landscape.

Typically denser stands of oak occupied ridges and knolls and graded irregularly, following the landform, to wider spacing. Patches, groves, tongues and peninsulas of widely spaced trees projected from denser forest into open prairie.

In these communities, grasses and forbs are the dominants with trees as the modifier. Refer to Figures 1 through 3 for the savanna habitat common for the site being planned.

Tables 1 through 9 list plant species common to the respective savanna habitats. These lists are not all inclusive and are only a list of the plants that are known to have been present. On wet-mesic sites, Swamp White Oak replaces Bur Oak as the dominant tree species in the Oak Openings. On dry-mesic to dry sites, Hill's Oak (Northern Pin Oak) and Black Oak dominate.

North of the tension zone, Jack Pine Barrens dominate the savanna habitats.

Figure 2
Oak Openings and Oak Barrens

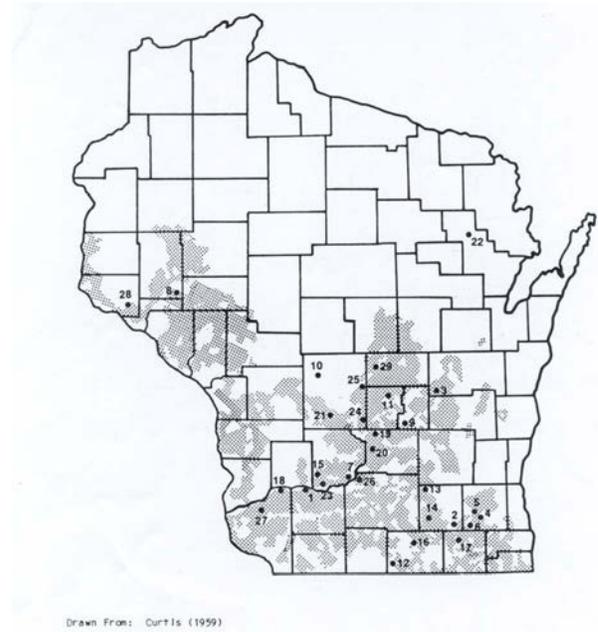
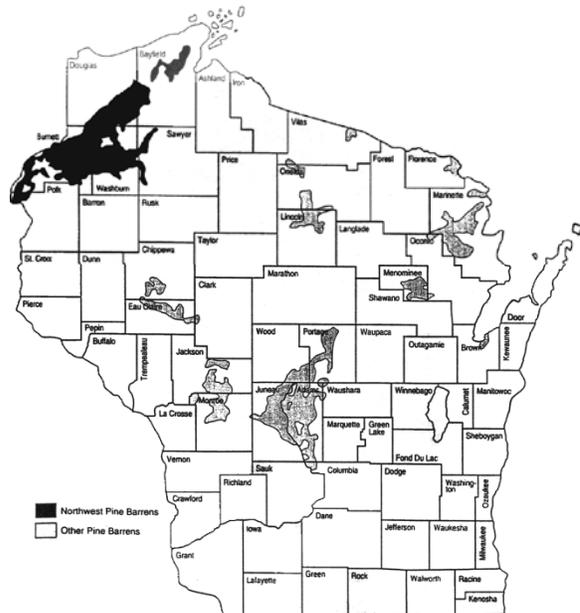


Figure 1
Tension Zone



Figure 3
HISTORICAL PINE BARRENS IN WISCONSIN



Planting Plan Development

For isolated plantings, (no connections to existing forestland on the property or adjacent) plant $\frac{1}{3}$ of the area at 250 trees per acre (150 per acre for Pine Barrens), $\frac{1}{3}$ at 60 trees per acre, and $\frac{1}{3}$ at 25 trees per acre.

For plantings that will border existing woodlands, wetlands, prairies, and lakes, plant $\frac{1}{2}$ of the area at 60 trees per acre, and $\frac{1}{2}$ at 25 trees per acre.

Start denser parts of the stand on knolls and ridge tops grading irregularly following the landform down slope to the wider spacing.

Shrubs are a highly variable component of these ecosystems. It can be anticipated that shrubs will eventually become established in these habitats through natural processes. If shrubs are included in the establishment of the habitat, no more than 40% of the planting will be established to shrubs for Pine Barrens, 15% for Oak Barrens, and 25% for Oak Openings. They will replace the trees on a one-to-

one basis. For example, an area that should be planted at a rate of 60 trees per acre will have no more than 24 shrubs per acre. If 24 shrubs per acre are planted, then no more than 36 trees per acre will be planted. Likewise if 10 shrubs per acre are included in the planting, trees will be planted at a rate of 50 trees per acre.

When establishing savanna habitat in existing sod, consider the use of weed control mats and tree tubes to decrease the risk of loss to rodents and competing vegetation. Monitor and address competing vegetation until trees have reached a sufficient height to overtop the grass/herbaceous cover (usually 3 to 5 years).

Tree species to be planted on a given site will be randomly mixed according to Tables 1 through 9 and site conditions.

Prescribed fire is not recommended as a management tool until the planting is at least five years old.

Table 1
Oak Openings - Tree Species

Species	Common Name	Number by Species to Plant/Acre	Number by Species to Plant/Acre	Number by Species to Plant/Acre
<i>Quercus macrocarpa</i>	Bur Oak	10	24	98
<i>Quercus velutina</i>	Black Oak	6	16	68
<i>Quercus alba</i>	White Oak	6	14	58
<i>Carya ovata</i>	Shagbark Hickory	2	4	16
<i>Quercus ellipsoidalis</i>	Northern Pin Oak	1	2	10
Totals		25/acre	60/acre	250/acre

Plant trees on a 42 x 42 foot spacing for 25 trees/acre, 27 x 27 foot spacing for 60 trees/acre, and 13 x 13foot spacing for 250 trees/acre. **For wet-mesic to wet conditions, substitute Swamp White Oak for the other oak species.** See Forestry Technical Note 2 for Tree and Shrub Establishment.

Table 2
Oak Openings - Common Forbs

Species	Common Name
Euphorbia corollata	Flowering Spurge
Comandra richardsiana	Bastard Toadflax
Monarda fistulosa	Wild Bergamot
Amphicarpa bracteata	Hog Peanut
Heliopsis helianthus	Ox Eye

Use Agronomy Technical Note 5, Prairie Establishment/Restoration Seeding Recommendations, to select grass and forb mix for the prairie component of the savanna habitat.

Table 3
Oak Openings - Common Shrubs

Species	Common Name
Ceanothus americanus	New Jersey Tea

Table 4
Oak Barrens - Tree Species

Species	Common Name	Number by Species to Plant/Acre	Number by Species to Plant/Acre	Number by Species to Plant/Acre
Quercus macrocarpa	Bur Oak	1	2	6
Quercus velutina	Black Oak	20	48	120
Quercus alba	White Oak	1	4	9
Carya ovata	Shagbark Hickory	1	1	3
Quercus ellipsoidalis	Northern Pin Oak	2	5	12
Totals		25/acre	60/acre	150/acre

Plant trees on a 42 x 42 foot spacing for 25 trees/acre, 27 x 27 foot spacing for 60 trees/acre, and 13 x 13 foot spacing for 250 trees/acre. See Forestry Technical Note 2 for Tree and Shrub Establishment.

Table 5
Oak Barrens - Common Forbs

Species	Common Name
Euphorbia corollata	Flowering Spurge
Commandra richardsiana	Bastard Toadflax
Antennaria neglecta	Field Pussytoes
Smilacina racemosa	False Soloman's- Seal
Pteridium aquilinum	Western Bracken Fern
Smilacina stellata	Starry False Soloman's-Seal
Helianthemum canadense	Frostweed
Fragaria virginiana	Common Strawberry
Lupinus perennis	Wild Lupine

Use Agronomy Technical Note 5, Prairie Establishment/Restoration Seeding Recommendations, to select grass and forb mix for the prairie component of the savanna habitat.

Table 6
Oak Barrens - Common Shrubs

Species	Common Name
<i>Amorpha canescens</i>	Downy Indigobush
<i>Corylus Americana</i>	American Hazelnut

Table 7
Pine Barrens - Tree Species

Species	Common Name	Number by Species to Plant/Acre	Number by Species to Plant/Acre	Number by Species to Plant/Acre
<i>Quercus macrocarpa</i>	Bur Oak	3	6	16
<i>Pinus banksiana</i>	Jack Pine	16	38	96
<i>Populus grandidentata</i>	Bigtooth Aspen	1	2	4
<i>Pinus resinosa</i>	Red Pine	1	2	4
<i>Quercus ellipsoidalis</i>	Northern Pin Oak	4	12	30
Totals		25/acre	60/acre	150/acre

Plant trees on a 42 x 42 foot spacing for 25 trees/acre, 27 x 27 foot spacing for 60 trees/acre, and 17 x 17 foot spacing for 150 trees/acre. See Forestry Technical Note 2 for Tree and Shrub Establishment.

Table 8
Pine Barrens - Common Forbs

Species	Common Name
<i>Euphorbia corollata</i>	Flowering Spurge
<i>Fragaria virginiana</i>	Common Strawberry
<i>Apocynum androsaemifolium</i>	Spreading Dogbane
<i>Anemone patens</i>	Pasque Flower
<i>Lithospermum canescens</i>	Golden Puccoon
<i>Lupinus perennis</i>	Wild Lupine
<i>Froelichia floridana</i>	Plains Snakecotton
<i>Polygonella articulate</i>	Coastal Jointweed

Use Agronomy Technical Note 5, Prairie Establishment/Restoration Seeding Recommendations, to select grass and forb mix for the prairie component of the savanna habitat.

Table 9
Pine Barrens - Common Shrubs

Species	Common Name
<i>Vaccinium angustifolium</i>	Low Blueberry
<i>Corylus americana</i>	American Hazelnut
<i>Ceanothus ovatus</i>	Redroot
<i>Gaylussacia baccata</i>	Huckleberry
<i>Prunus pumila</i>	Sand Cherry

FIGURE 4
Wisconsin Ecological Landscapes

