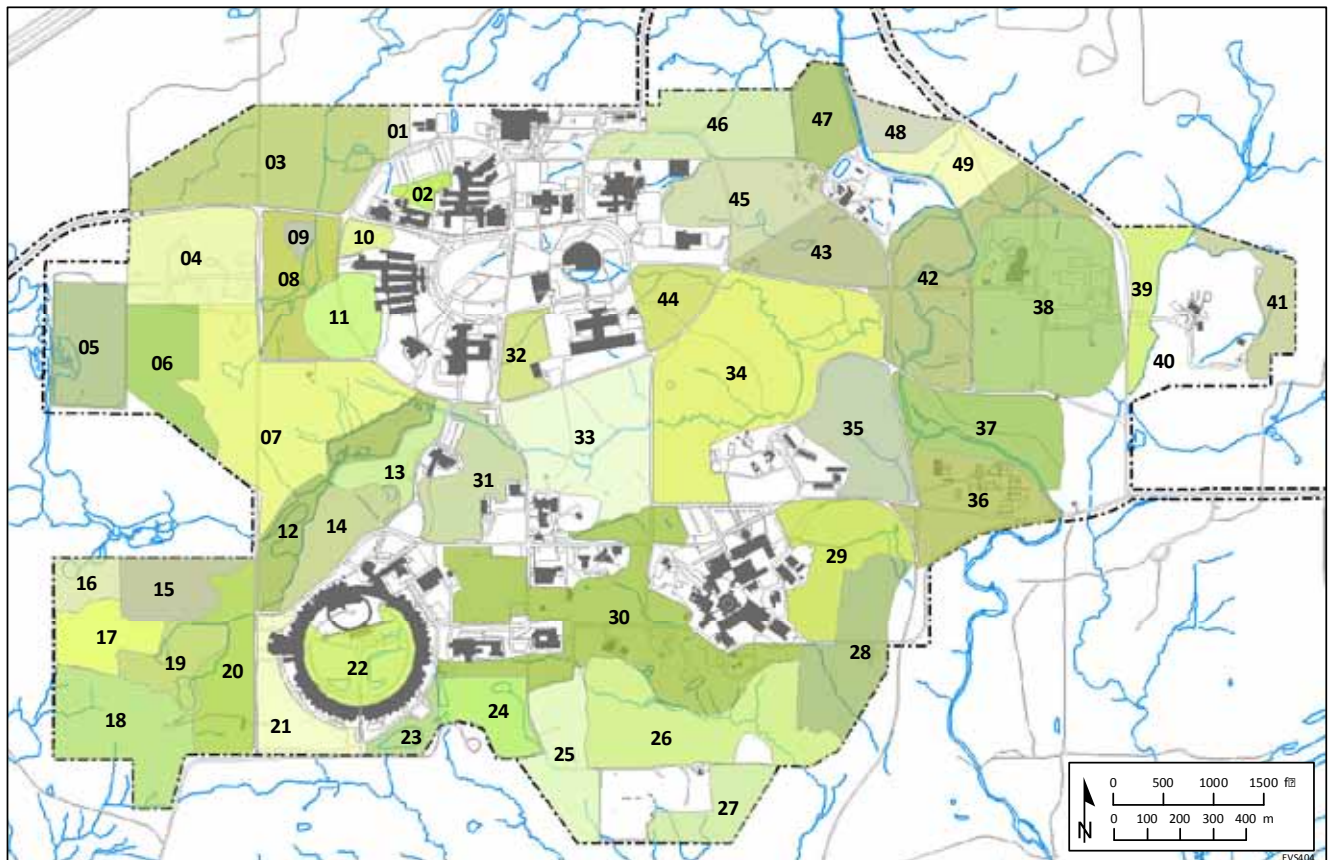


## Appendix 1: Ecosystem Management Units (EMU)

Ecosystem management units facilitate the management of natural areas on the Argonne site. Each unit groups adjacent plant communities into units that may be managed in a coordinated fashion. Units typically include a predominant habitat type and may contain more than one plant community. Discussions of floristic quality can be found in Section 4.0. Floristic quality is based on the number of native species present and their Coefficients of Conservatism (C). Each species native to the Chicago region has been assigned a C value (Swink and Wilhelm 1994). These range from 0 (non-conservative, weedy species tolerant of disturbance) to 10 (conservative species which are found most often in high-quality, undisturbed native habitats). Species with a C of 8 or higher that occur on the Argonne site are noted in the EMU descriptions below. In addition, a determination of floristic quality is made for each unit.

### Ecosystem Management Units



**EMU 01:** This unit includes mesic savanna, in two individual stands. The dominant tree species of the canopy are bur oak (*Quercus macrocarpa*) and white oak (*Q. alba*). This unit includes black walnut (*Juglans nigra*) trees planted by Argonne in 1954. The west boundary of this unit is formed by a hedgerow of large osage orange (*Maclura pomifera*) trees. The savanna communities contain several species with a C = 8: downy green sedge (*Carex swanii*), narrow-leaved oval sedge (*Carex tenera*), flowering dogwood (*Cornus florida*), and spinulose shield fern (*Dryopteris spinulosa*). Redbud (*Cercis canadensis*), present in this unit, has a C=10. A basin marsh is located between the two oak stands. This wetland is a naturally occurring wetland that is drained by a culvert under the Argonne boundary fence. Although this wetland is dominated by narrow-leaved cattail (*Typha angustifolia*), it supports a high diversity of native plant species. The floristic quality of this unit is moderate.

**EMU 02:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy are bur oak and white oak. Two small wetland areas, supported by building drainage, are dominated by narrow-leaved cattail. An area of unassociated grasses and forbs in the western portion of this unit is composed nearly entirely of non-native species. The savanna had been regularly mowed until 2005. The floristic quality of this unit is low to moderate.

**EMU 03:** This unit primarily consists of pine plantations, including red pine (*P. resinosa*), white pine (*P. strobus*), and jack pine (*P. banksiana*). Some areas that had been planted with jack pine are now considered unassociated woody growth, with black cherry (*Prunus serotina*) composing most of the tree canopy. A large wetland that is primarily a basin marsh is located within this unit and is dominated by narrow-leaved cattail, and non-natives reed canary grass (*Phalaris arundinacea*) and common reed (*Phragmites australis*). The northern portion of this wetland includes a segment of Wards Creek, a tributary of Sawmill Creek, however, much of the channel within this wetland had been excavated during development of the Argonne site to convey surface water from the 800 and 200 Areas. This wetland is drained by a culvert under the Argonne boundary fence. The floristic quality of this unit is low to moderate.

**EMU 04:** This unit is comprised of the Argonne 800 Area which had previously contained numerous temporary buildings and storage areas. The entire unit has been significantly disturbed and supports a mosaic of upland and wetland plant communities. Wetland development is associated with compacted soils, excavations, and altered drainage patterns. Although the dominant species in these communities are non-native, a variety of

disturbance-tolerant native species are present. The floristic quality of this unit is low to moderate.

**EMU 05:** This unit includes the Argonne landfill area. The landfill cover was completed in 1993 and supports an herbaceous community of mostly non-native grasses. A basin marsh is located along the western boundary fence line and is contiguous with a large marsh in Waterfall Glen Forest Preserve. Dominant species in the marsh are common reed, narrow-leaved cattail, and non-natives reed canary grass and common reed. A small remnant of a jack pine plantation is located in the southwest corner of this unit and includes deciduous woody species, primarily non-natives. The floristic quality of this unit is low.

**EMU 06:** This unit primarily consists of white pine and jack pine plantations. Much of the area that had been planted with jack pine is now becoming dominated by deciduous woody species, primarily non-natives. Sweetgum (*Liquidambar styraciflua*), planted by Argonne in 1954, occurs in the northern section of this unit. A basin marsh is located within this unit and supports a wide variety of mostly native species. The northern portion of the wetland includes a drainage ditch, conveying water to a culvert under Kearney Road. The northernmost portion of this unit consists of an area of unassociated grasses and forbs composed nearly entirely of non-native species. The floristic quality of this unit is low to moderate.

**EMU 07:** This unit primarily consists of unassociated woody growth. The dominant tree species vary throughout the unit and include the native species box elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica subintegerrima*), and eastern cottonwood (*Populus deltoides*). Green ash was planted by Argonne in this location in 1954. Portions of this unit had been disturbed in the past by facility construction and demolition. Small degraded remnants of mesic prairie occur in this unit, primarily along Kearney Road and near the intersection of Watertower and Outer Circle Roads. Numerous small wetlands occur within this unit, primarily supporting native sedges (*Carex spp.*) and bulrush (*Scirpus spp.*). A basin marsh with a variety of native sedges and forbs, is located in the western section of the unit. A wetland in the eastern portion of the unit, is supported by drainage from nearby watertowers and dominated by narrow-leaved cattail and common cattail (*Typha latifolia*). The floristic quality of this unit is low to moderate.

**EMU 08:** This unit primarily consists of unassociated grasses and forbs, composed nearly entirely of non-native species. Areas of this unit had been

disturbed in the past by facility construction and demolition. This unit includes a basin marsh. A portion of this wetland is naturally occurring, however, much of the wetland had been excavated during development of the Argonne site to convey surface water from the 800 Area. Dominant species include narrow-leaved cattail, sandbar willow (*Salix interior*), and common reed. The floristic quality of this unit is low to moderate.

**EMU 09:** This unit consists of dry-mesic savanna. The dominant tree species of the canopy is black oak (*Quercus velutina*). Green ash and black walnut, planted in this location by Argonne in 1954, occur in this unit. A variety of native herbaceous species is present under the oak canopy, but sparse in coverage. A drainage ditch along the eastern margin of the unit conveys surface water north from the 800 Area and supports a wetland community of shrubs and herbaceous species. The floristic quality of this unit is low to moderate.

**EMU 10:** This unit consists of dry-mesic savanna. The dominant tree species of the canopy are black oak and bur oak. This savanna is isolated, being surrounded by mowed lawns. A wide variety of native shrubs and herbaceous species are present. The floristic quality of this unit is moderate.

**EMU 11:** This unit includes mesic savanna, in two stands separated by Outer Circle Road. The dominant tree species of the canopy are bur oak and white oak. This unit includes black walnut trees planted by Argonne in 1954. The savanna community contains two species with a C = 8: narrow-leaved oval sedge (*Carex tenera*) and large-flowered trillium (*Trillium grandiflorum*). A variety of native shrubs and herbaceous species are present, with species diversity particularly high in the eastern section of the unit. The floristic quality of this unit is high.

**EMU 12:** This unit consists of two streamside marsh wetlands connected by a narrow channel. These wetlands are associated with the floodplain of the lower branch of Freund Brook. Agricultural drainage tiles were removed from the southern wetland in 2001 to increase the wetland area. The wetland community contains one species with a C = 9: grass-leaved arrowhead (*Sagittaria graminea*). The floristic quality of this unit is moderate.

**EMU 13:** This unit primarily consists of unassociated woody growth, composed of woody native and non-native species. Canopy species are primarily eastern cottonwood (*Populus deltoides*) and non-native black locust (*Robinia pseudoacacia*). Areas of this unit had been disturbed in the past by facility construction. This unit includes sycamore (*Platanus occidentalis*) trees planted by Argonne in 1954. A small wetland community in the northern part

of the unit is dominated by narrow-leaf cattail. The floristic quality of this unit is low to moderate.

**EMU 14:** This unit consists of mesic savanna. The dominant tree species of the canopy are bur oak and white oak. The savanna community contains one species with a C = 8: spinulose shield fern. A canal, excavated during the early development of the Argonne site, is located in the northeast part of the unit and contains a gabion dam to hold surface water runoff from nearby parking lots. The canal is a remnant of a larger wetland which was mostly filled in during construction of the Advanced Photon Source (APS). A small wetland has developed in the northeast corner of the unit as a result of altered surface drainage patterns during APS construction. The floristic quality of this unit is moderate to high.

**EMU 15:** This unit primarily consists of a jack pine plantation. Much of the area that had been planted with jack pine is now becoming dominated by deciduous woody species, primarily non-natives. The west and south boundaries of this unit are formed by a hedgerow of large osage orange trees. The floristic quality of this unit is low to moderate.

**EMU 16:** This unit consists primarily of mesic savanna. The dominant tree species of the canopy are bur oak and white oak, with black oak and red oak also present. The savanna community contains several species with a C = 8: spinulose shield fern, narrow-leaved oval sedge, downy green sedge, and lady fern (*Athyrium filix-femina*). This unit includes a basin marsh and a streamside marsh associated with the floodplain of the South Branch of Freund Brook. The basin marsh is dominated by common bur reed (*Sparganium eurycarpum*) while the streamside marsh is dominated by common reed. Grass-leaved arrowhead (*Sagittaria graminea*), C=9, and floating manna grass (*Glyceria septentrionalis*), C=8, occur in the basin marsh. The floristic quality of this unit is moderate to high.

**EMU 17:** This unit primarily consists of unassociated woody growth, composed of woody native and non-native species. Canopy species in this low-lying area are primarily box elder (*Acer negundo*) and green ash. Downy green sedge, C=8, occurs in this unit. The floristic quality of this unit is low to moderate.

**EMU 18:** This unit consists primarily of mesic prairie dominated by big blue stem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*). It is likely that much of this prairie was planted by Argonne. Prairie blazing star (*Liatris pycnostachya*) and wild quinine (*Parthenium integrifolium*), both C=8, rattlesnake master (*Eryngium yuccifolium*) and purple prairie clover



(*Petalostemum purpureum*), both C=9, and prairie dropseed (*Sporobolus heterolepis*) and bent grass (*Agrostis alba palustris*), both C=10, occur in this unit. Several small wetland areas occur within this unit and are dominated by sedges (*Carex spp.*). The floristic quality of this unit is high.

**EMU 19:** This unit consists of mesic savanna. The dominant tree species of the canopy are bur oak and white oak. Several shagbark hickory (*Carya ovata*) are also present in the canopy. The savanna community contains one species with a C = 8: spinulose shield fern. This unit includes two basin marshes, one characterized by blue flag iris (*Iris virginica shrevei*), the other by common bur reed. These wetlands contain floating manna grass and stiff bedstraw (*Galium tinctorium*), both C=8, and false aster (*Boltonia latisquama recognita*), C=9. The floristic quality of this unit is moderate to high.

**EMU 20:** This unit primarily consists of unassociated woody growth, composed of woody native and non-native species. Canopy species in this unit are primarily box elder, however, a large stand of the non-native black locust also occurs in this unit. A woodland vernal pool and a basin marsh, as well as a small streamside marsh occur in this unit. The floristic quality of this unit is low to moderate.

**EMU 21:** This unit primarily consists of unassociated grasses and forbs, composed nearly entirely of non-native species. Areas of this unit were disturbed during construction of the APS. The floristic quality of this unit is low.

**EMU 22:** This unit, located within the APS ring, primarily consists of unassociated grasses and forbs. This unit was graded for stormwater management during construction of the APS, directing surface flows to the south of the ring. Mesic prairie species were planted within this unit in 2004. The floristic quality of this unit is low.

**EMU 23:** This unit primarily consists of natural community reconstruction and includes Wetland R and surrounding prairie. The wetland was constructed in 1991 as mitigation under a U.S. Army Corps of Engineers permit, using topsoil salvaged from a wetland destroyed during APS construction. Reconstructed plant communities present in this unit include permanent pond, basin marsh, wet prairie, wet-mesic prairie, and mesic prairie. The unit contains floating manna grass, white water crowfoot (*Ranunculus longirostris*), wild quinine, and side-oats grama (*Bouteloua curtipendula*), all C=8, and grass-leaved arrowhead (*Sagittaria graminea*) and false aster (*Boltonia latisquama recognita*), both C=9. The eastern section of this unit includes a drainage swale

characterized by common reed and narrow-leaved cattail. The floristic quality of this unit is high.

**EMU 24:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy is white oak. Sensitive fern (*Onoclea sensibilis*), C=8, occurs in the savanna. A woodland vernal pool is located in this unit and has a canopy composed mostly of eastern cottonwood. A small wetland area in the southeast corner of the unit is dominated by broad-leaved woolly sedge (*Carex pellita*). The floristic quality of this unit is moderate.

**EMU 25:** This unit is primarily composed of plantations of white pine and jack pine. Areas of unassociated woody growth and unassociated grasses and forbs also cover large areas of this unit. The floristic quality of this unit is low.

**EMU 26:** This unit primarily consists of mesic and dry-mesic savanna. The dominant tree species of the canopy are white oak and bur oak, with several large red oak and black oak present. A small area of a jack pine is located in the western part of this unit. Several small wetlands supporting wet prairie or woodland vernal pool communities occur in the savanna. A streamside marsh is located in this unit and is characterized by narrow-leaved cattail. Sensitive fern (*Onoclea sensibilis*), C=8, occurs in the savanna. The floristic quality of this unit is moderate.

**EMU 27:** This unit primarily consists of mesic and dry-mesic savanna. The dominant tree species of the canopy are white oak, red oak, and black oak. The westernmost part of this unit shows evidence of disturbance and includes areas of unassociated woody growth. A small woodland vernal pool is located in the northeastern corner of this unit. The floristic quality of this unit is low.

**EMU 28:** This unit is primarily composed of jack pine plantations. Areas of unassociated woody growth, characterized by box elder, and unassociated grasses and forbs, composed nearly entirely of non-native species, also cover large areas of this unit. A basin marsh which receives drainage from the 300 Area, is located in this unit and is characterized by narrow-leaved cattail. The floristic quality of this unit is low.

**EMU 29:** This unit primarily consists of mesic and dry-mesic savanna. The dominant tree species of the canopy are white oak, black oak, and bur oak. A large stand of the non-native black locust occurs in the southern section of this unit. Areas of unassociated grasses and forbs, composed primarily of non-native species, occur within the northern section of this unit. The floristic

quality of this unit is low to moderate.

**EMU 30:** This unit primarily consists of unassociated grasses and forbs, composed nearly entirely of non-native species. Portions of this unit had been planted with jack pine, however, few individuals remain. Some areas in the southeast part of this unit were disturbed when ravines were filled in during construction of the 300 Area. The floristic quality of this unit is low.

**EMU 31:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy are white oak and bur oak, with several large red oak present. A woodland vernal pool is located in this unit and has a canopy composed mostly of eastern cottonwood. The South Branch of Freund Brook forms the north boundary of this unit. The floristic quality of this unit is moderate.

**EMU 32:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy are white oak and bur oak. This unit had been regularly mowed until 2005 and very few native species remain in the understory. Areas of unassociated grasses and forbs are located in the eastern part of this unit. A streamside marsh characterized by narrow-leaved cattail, conveys surface water from the 200 Area to the North Branch of Freund Brook. The floristic quality of this unit is low.

**EMU 33:** This unit is composed of a mosaic of white pine, jack pine, and red pine plantations, mesic savanna, and tulip poplar planted in 1954. The dominant tree species of the savanna canopy are white oak and bur oak. Areas of unassociated grasses and forbs occur in this unit, primarily around the perimeter, as well as unassociated woody growth. A basin marsh, characterized by narrow-leaved cattail, is located in the northeast corner. The South Branch of Freund Brook flows west to east through the unit. The floristic quality of this unit is low.

**EMU 34:** This unit primarily consists of mesic woodland and savanna. The dominant tree species of the canopy are white oak and bur oak, along with red oak in the woodland area. The western areas of this unit include black walnut planted by Argonne in 1954. This unit contain several species with a C = 8: large-flowered trillium, lady fern, sensitive fern, and wood sandwort (*Arenaria lateriflora*). Several small wetlands supporting wet prairie communities are located within the savanna. Three wetlands formed by stone dams constructed on Freund Brook, are located in this unit. The dam failed at the middle wetland in 1996, reducing this wetland to the stream channel. The other two wetlands include streamside marshes. The lower wetland also



includes a naturalized pond. These wetlands are characterized primarily by reed canary grass and common reed. The floristic quality of this unit is high.

**EMU 35:** This unit primarily consists of mesic woodland and savanna. The dominant tree species of the canopy are white oak and bur oak. This unit contains two species with a C = 8: large-flowered trillium and false mermaid (*Floerkea proserpinoides*). The floristic quality of this unit is moderate to high.

**EMU 36:** This unit primarily consists of unassociated grasses and forbs, composed mostly of non-native species. Portions of this unit had been planted with jack pine, however, few individuals remain. The floristic quality of this unit is low.

**EMU 37:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy are white oak and bur oak. This unit contains large-flowered trillium, C=8. Sawmill Creek, a perennial stream, flows through this unit, with streamside marsh communities occurring intermittently along its banks. Small isolated marshes occur within the floodplain. The floristic quality of this unit is moderate to high.

**EMU 38:** This unit contains areas of unassociated grasses and forbs as well as areas of natural community reconstruction. This area had been significantly disturbed during the early development of the Argonne site. Most of this unit contains a combination of native and non-native species. The southeast portion of the unit was planted with prairie species in 1996, and supports a mesic prairie community dominated by big bluestem and Indian grass. Rattlesnake master, C=9, occurs in the prairie. The floristic quality of this unit is low to moderate.

**EMU 39:** This unit primarily consists of unassociated grasses and forbs, composed mostly of non-native species. Non-native shrubs are scattered throughout the unit. The floristic quality of this unit is low.

**EMU 40:** This unit primarily consists of unassociated woody growth. The dominant species along a small intermittent stream are sandbar willow (*Salix interior*) and eastern cottonwood. Also present are remnants of jack pine plantations which include a large component of non-native shrubs. The floristic quality of this unit is low.

**EMU 41:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy are white oak and bur oak. The savanna extends into Waterfall Glen Forest Preserve. The floristic quality of this unit is low to moderate.

**EMU 42:** This unit is composed of a mosaic of mesic savanna, unassociated grasses and forbs, unassociated woody growth, and streamside marsh. The dominant species of the savanna canopy are white oak and bur oak; the dominant marsh species is reed canary grass. False pennyroyal (*Isanthus brachiatus*), C=8, occurs in this unit. The floodplain of Sawmill Creek, a perennial stream, comprises much of this unit and includes two wetlands, both streamside marshes. The floristic quality of this unit is low to moderate.

**EMU 43:** This unit was planted with jack pine in 1955, however, most of the area is now considered unassociated woody growth, with black cherry and box elder composing most of the tree canopy. A basin marsh is located in this unit. Reed canary grass is the dominant species. The floristic quality of this unit is low.

**EMU 44:** This unit includes mesic savanna, unassociated woody growth, and unassociated grasses and forbs. The dominant canopy species of the savanna are bur oak and white oak. A few individuals of jack pine, black walnut, and green ash planted in 1954 remain in this unit. The North Branch of Freund Brook flows through the savanna. The narrow floodplain supports a community of willows (*Salix spp.*) and eastern cottonwood. The floristic quality of this unit is low to moderate.

**EMU 45:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy are white oak and bur oak. A streamside marsh dominated by narrow-leaved cattail, is located in the northwest corner of this unit; A woodland vernal pool, is located in the eastern section. Sensitive fern, C=8, occurs in this unit. The floristic quality of this unit is moderate to high.

**EMU 46:** This unit primarily consists of mesic savanna. The dominant tree species of the canopy are white oak and bur oak. The western section includes an area of unassociated woody growth. Sweetgum, planted by Argonne in 1954, occur in the eastern section of this unit. A zone of unassociated grasses and forbs is located north of Outer Circle Road. A wetland, located in a drainage ditch along Outer Circle Road, continues north through the savanna and conveys surface water from the 200 Area to an unnamed tributary of Sawmill Creek. The floristic quality of this unit is moderate to high.

**EMU 47:** This unit primarily consists of natural community reconstruction. The former Lime Sludge Pond, this unit is a remnant of the Sawmill Creek floodplain that had been diked off and used for the storage of lime sludge, a byproduct of Argonne's steam generation process. Following removal of the lime sludge in 2000? The area was planted with native species to create mesic,

wet-mesic, and wet prairie communities. Basin marsh and a naturalized pond occur in the southern part of this unit. A narrow band of mesic savanna occurs along what had been the former bank of Sawmill Creek. The channelized creek forms the eastern boundary of this unit. The floristic quality of this unit is low to moderate.

**EMU 48:** This unit primarily consists of a red pine plantation. Areas of unassociated grasses and forbs, composed mostly of non-native species, also cover portions of this unit. The channelized segment of Sawmill Creek forms the western boundary of this unit. The floristic quality of this unit is low.

**EMU 49:** This unit primarily consists of mesic savanna. The dominant species of the canopy are white oak and bur oak. Areas of unassociated woody growth, and unassociated grasses and forbs also occur in this unit. Sawmill Creek forms the western boundary of this unit. The floristic quality of this unit is low to moderate.

## Existing Vegetation

