Ecological Site Description

Fragipan Basin Woodland F116CY009MO

- *(Quercus stellata - Quercus velutina/Hypericum hypericoides/Schizachyrium scoparium - Carex)*
- (post oak – black oak/St. Andrew's cross/little bluestem – sedge)

An Ecological Site Description (ESD) is a reference document of ecological knowledge regarding a particular land area (ecological site). An ESD describes ecological potential and ecosystem dynamics of land areas and their potential management. Ecological sites are linked to soil survey map unit components, which allows for mapping of ecological sites. (***NOTE:*** *This is a "provisional" ESD, and is subject to change. It contains basic ecological information sufficient for conservation planning and land management in Missouri. After additional information is developed and reviewed, a "Correlated" ESD will be published and will be available via the Web Soil Survey* http://websoilsurvey.nrcs.usda.gov .)

Major Land Resource Area: 116C – St. Francois Knobs and Basins

Introduction

The St Francois Knobs and Basins (area outlined in red on the map) is the structural center of the Ozark Dome. Elevation ranges from about 450 feet along the rivers in the southern part of the area, to 1,772 feet on the summit of Taum Sauk Mountain, the highest point in Missouri. Prominent features of this MLRA are the Precambrian igneous knobs and hills that rise conspicuously to various elevations, interspersed with smooth-floored basins and valleys overlying dolomite and sandstone. Ecological Sites defined for this MLRA are associated with the igneous parent materials, either in knob or basin positions. Areas influenced primarily by dolomite and/or sandstone are included in ecological sites within MLRA 116A (Ozark Highlands).

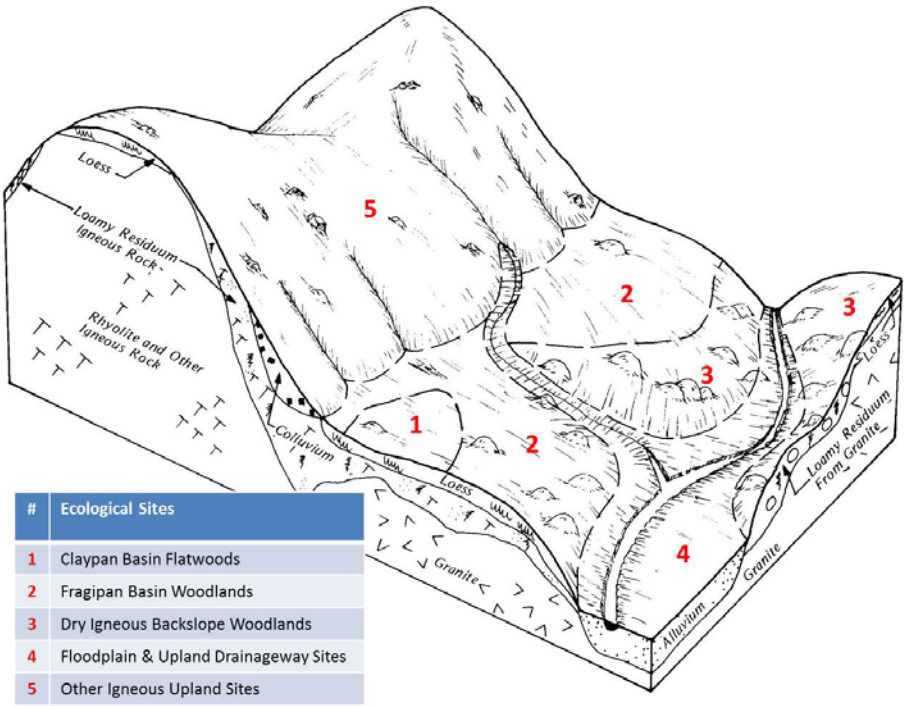
Fragipan Basin Woodlands (green areas on the map) occur throughout the area, and on outlying igneous knobs and basins in adjacent counties. Soils have root-restricting fragipans. These sites are often adjacent to Claypan Basin Flatwood ecological sites, which are in broad concave positions and are wetter. Fragipan Basin sites are typically adjacent to many of the upland igneous woodland and forest site, none of which have a root-restricting fragipan.

Physiographic Features

This site is in both basin and mountain landscapes, on summit crests and shoulders with slopes of 1 to 15 percent. The site generates runoff to adjacent, downslope ecological sites. This site does not flood.

The following figure (adapted from Brown & Gregg, 1991) shows the typical landscape position of

this ecological site, and landscape relationships among the major ecological sites in the igneous basins.



#	Ecological Sites
1	Claypan Basin Flatwoods
2	Fragipan Basin Woodlands
3	Dry Igneous Backslope Woodlands
4	Floodplain & Upland Drainageway Sites
5	Other Igneous Upland Sites

Soil Features
These soils have a root-restricting fragipan at about 24 inches. The soils were formed under woodland vegetation, and have thin, light-colored surface horizons. They have silt loam surface horizons, and loamy subsoils that have low to moderate amounts of volcanic gravel with depth. Parent material is loess over slope alluvium and residuum weathered from acidic volcanic rock such as granite. A seasonal high water table is perched above the fragipan during the spring months in most years. Soil series associated with this site include Delassus.

Ecological Dynamics
Information contained in this section was developed using historical data, professional experience, field reviews, and scientific studies. The information presented is representative of very complex vegetation communities. Key indicator plants, animals and ecological processes are described to help inform land management decisions. Plant communities will differ across the MLRA because of the naturally occurring variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Fragipan Basin Woodlands are dominated by short (40 to 60 feet) open grown post oak, with scattered white, blackjack, northern red and black oaks. Canopy closure is 50 to 80 percent. The understory is open with a dense ground flora of native grasses and forbs. The fragipan soil of this site limits the growth of trees and supports an abundance of native grasses and forbs in the understory. Fire played an important role in the maintenance of these systems as well. It is likely that these ecological sites, along with adjacent glades and woodlands burned at least once every 5 to 10 years. These periodic fires would have kept woodlands open, removed the litter, and stimulated the growth and flowering of the grasses and forbs.

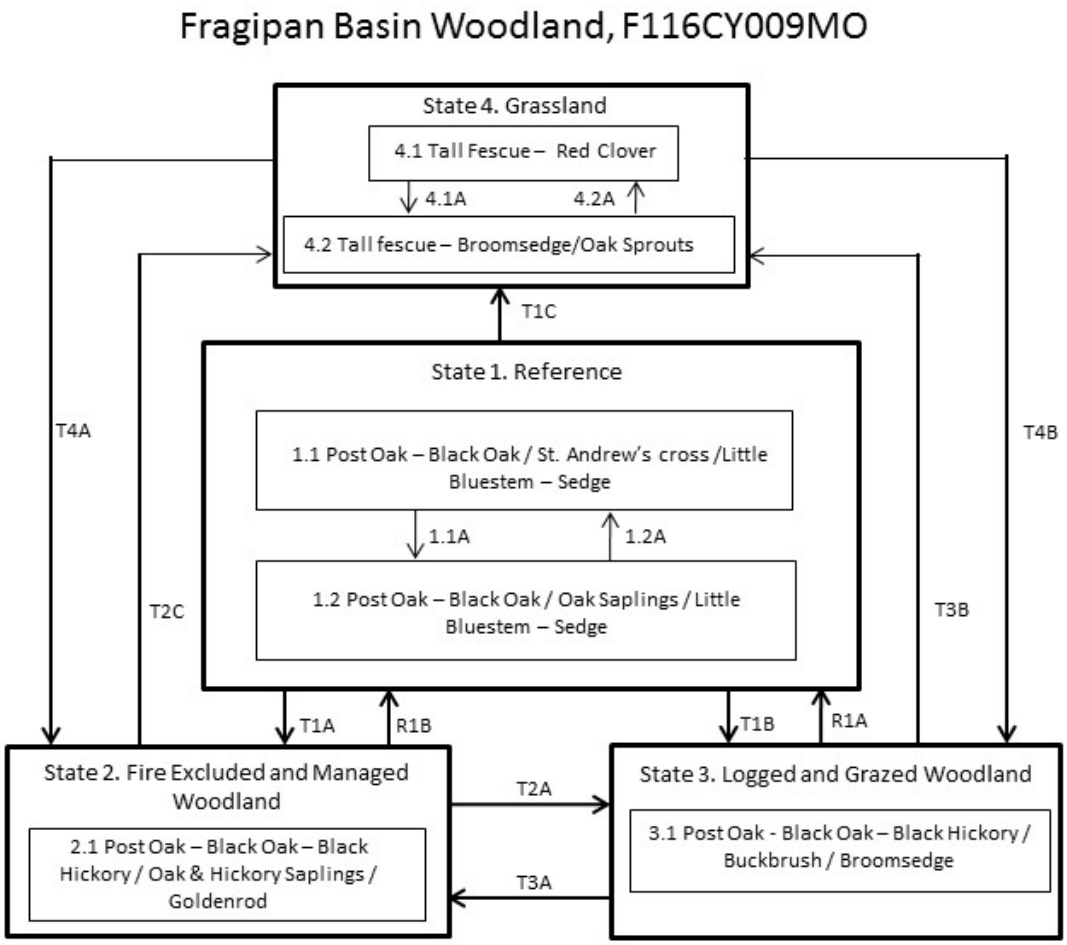
These sites were also subjected to occasional disturbances from wind and ice, as well as grazing by native large herbivores. Wind and ice would have periodically opened the canopy up by knocking

over trees or breaking substantial branches off canopy trees. Grazing by native large herbivores, such as bison, elk and deer, would have effectively kept understory conditions more open, creating conditions more favorable to oak reproduction and sun-loving ground flora species. In the long term absence of fire, woody species have encroached into these woodlands. Once established, these woodies can quickly fill the woodland system. Most occurrences today are dense, and shady with a greatly diminished ground flora. Removal of the younger understory and the application of prescribed fire have proven to be effective management tools.

Uncontrolled domestic grazing has also impacted these communities, further diminishing the diversity of native plants and introducing species that are tolerant of grazing, such as buckbrush, gooseberry, and Virginia creeper. Grazing also promotes the invasion of eastern red cedar. These grazed sites also have a more open understory in addition to soil compaction, soil erosion and lower productivity problems.

Timber harvesting is very limited on these sites because of the poor quality and tree size. They are excellent wildlife sites.

A State and Transition Diagram follows. Detailed descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.



Code	Event/Activity/Process
T1A	Fire suppression; managed timber harvest
T1B	Fire suppression; high grading timber harvest; uncontrolled domestic grazing
T1C, T2C, T3B	Clearing; grassland planting; grassland management
T2A	Uncontrolled domestic grazing; high grading harvests
T3A	Exclude domestic grazing; forest stand improvement
T4A	Tree planting; long-term succession; grazing exclusion
T4B	Grazing reduction; long-term succession

Code	Event/Activity/Process
1.1A	Fire-free interval, 5-10 years
1.2A	Fire 2-5 years
4.1A	Over grazing; no fertilization
4.2A	Brush management; prescribed grazing

Code	Event/Activity/Process
R1A	Exclude domestic grazing; thinning; prescribed fire 2-5 years; long-term succession
R1B	Thinning; prescribed fire 2-5 years

Ecological States

State 1: Reference

These open woodland reference sites were strongly influenced by fire. Herbivory by native (now expatriated) ungulates, such as bison and elk, also played a role. Consequently, drought and fire-tolerant post and black oaks stand over a ground flora of tallgrass prairie grasses, sedges and wildflowers. There are two phases associated with this reference state.

Community Phase 1.1
The overstory in this phase is dominated by post oak and black oak, with scattered blackjack oak and black hickory. This open woodland community typically has a two-tiered structure, with canopy height of 35 to 50 feet and 30 to 60 percent closure. The abundant herbaceous layer is dominated by little bluestem and sedges. Fire frequency was every 1 to 3 years. This continued fire and natural native grazing would have maintained the more open canopy and profusion of ground flora species.

Community Phase 1.2
The overstory in this phase is dominated by post oak and black oak, with scattered blackjack oak and black hickory. This brushy woodland community typically has a three-tiered structure, with 50 to 80 percent closure. It is characterized by a thick understory of oak saplings, and shrubs. The herbaceous layer is dominated by little bluestem. Fire-free intervals ranged from 5 to 10 years.

State 2: Fire Excluded and Managed Woodland
Most current areas of Fragipan Basin Woodlands have experienced fire exclusion for decades. In the absence of fire, ongoing recruitment of trees into the canopy develops a closed canopy, shading out the rich herbaceous ground flora. Black oak and mid-story species increase. Herbaceous cover and diversity greatly diminishes, leaf litter builds up, and more shade-tolerant woodland species persist, such as elm-leaved goldenrod, panic grass and spreading aster. The understory also develops with oak and hickory saplings along with sassafras and some black cherry.

State 3: Logged and Grazed Woodland
Many sites have been heavily grazed by domestic livestock at some point in their history. Grazing decreases the cover and abundance of saplings, shrubs and herbaceous ground flora, opening up the understory. Weedy native shrubs and vines, such as buckbrush, gooseberry, poison ivy and Virginia creeper, often flourish after grazing, and exotic species like fescue and sericea lespedeza increase in abundance. Poorly managed grazing can cause compaction and denudation of the soil surface, allowing mats of lichens and mosses to flourish. Soil compaction may also further limit height growth of trees. With poorly managed grazing, this can result in an increase in weedy natives such as broom sedge, and exotics such as sericea lespedeza if they are present. Single-tree timber harvesting also occurred, resulting in a high grading of the canopy structure, creating many stands with poorly formed trees.

State 4: Grassland
Fragipan Basin Flatwoods are often converted into wide, open fescue grasslands, adjacent to densely overgrown and grazed woodlots. A return from this condition to a woodland state requires enormous cost and management inputs.

Reference State Plant Community
Canopy Trees

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
POST OAK	*Quercus stellata*	20-40	50
BLACK OAK	*Quercus velutina*	20-30	60
NORTHERN RED OAK	*Quercus rubra*	5-20	50
BLACK HICKORY	*Carya texana*	10-20	40
BLACKJACK OAK	*Quercus marilandica*	5-10	30
WHITE OAK	*Quercus alba*	5-20	40

Shrubs

Common Name	Botanical Name	Cover % (low-high)	Canopy Height (ft)
ST. ANDREW'S CROSS	*Hypericum hypericoides*	5-20	4

Forbs

Common Name	Botanical Name	Cover % (low-high)
BUTTON SNAKEROOT	*Liatris pycnostachya*	5-20
WHITE WILD INDIGO	*Baptisa alba*	5-20
INDIAN PHYSIC	*Gillenia stipulata*	5-20
ELM-LEAF SOLIDAGO	*Solidago ulmifolia*	5-20
COMMON CINQUEFOIL	*Potentilla simplex*	5-20
SLENDER MOUNTAIN MINT	*Pycnanthemum tenuifolium*	5-20
MEADOW BEAUTY	*Rhexia virginica*	5-20
ASHY SUNFLOWER	*Helianthus mollis*	5-20
SKY BLUE ASTER	*Symphyotrichum oolentangiense*	5-20

Grasses and sedges

Common Name	Botanical Name	Cover % (low-high)
LITTLE BLUESTEM	*Schizachyrium scoparium*	10-20
BROOMSEDGE	*Andropogon virginicus*	5-10
UPLAND BENT GRASS	*Agrostis perennans*	5-10
WOOD REED GRASS	*Cinna arundinacea*	5-10
FUZZY WUZZY SEDGE	*Carex hirsutella*	5-10
SHALLOW SEDGE	*Carex lurida*	5-10
SLENDER SPIKERUSH	*Eleocharis verrucosa*	5-10

Site Interpretations

Wildlife

- Oaks on this site provide abundant hard mast; scattered shrubs provide soft mast; native legumes provide high-quality wildlife food.
- Sedges and native cool-season grasses provide green browse; native warm-season grasses provide cover and nesting habitat; and a diversity of forbs provides a diversity and abundance of insects.
- Post-burn areas can provide temporary bare-ground and herbaceous cover habitat is important for turkey poults and quail chicks.
- Birds species associated with this site are Indigo Bunting, Red-headed Woodpecker, Eastern Bluebird, Northern Bobwhite, Summer Tanager, Eastern Wood-Pewee, Whip-poor-will, Chuck-will's widow, and Red-eyed Vireo.
- Reptiles and amphibians associated with this ecological site include ornate box turtle, northern fence lizard, five-lined skink, coal skink, broad-headed skink, six-lined racerunner, western slender glass lizard, prairie ring-necked snake, flat-headed snake, rough earth snake, red milk snake, western pygmy rattlesnake, and timber rattlesnake.

Forestry

- Management: Site index values for oaks range from 40 to 50. Timber management opportunities are poor to fair. These sites have a root-restricting fragipan which impedes rooting. Reduced rooting depth restricts tree growth and increases windthrow hazards. These groups respond well to even-aged management. Create group openings of at least 2

acres. Large clearcuts should be minimized if possible to reduce impacts on wildlife and aesthetics. Uneven-aged management using single tree selection or small group selection cuttings of ½ to 1 acre are other options that can be used if clear cutting is not desired or warranted. These sites respond well to prescribed fire as a management tool. Favor black oak, post oak, and white oak.

- Limitations: Restricted rooting depth; seasonal wetness. Unsurfaced roads and traffic areas tend to be slippery and form ruts easily. Graveling roads facilitates year-round use. Equipment use when wet may compact soil and damage tree roots. Planting is difficult during wet spring periods. Seedling mortality may be high due to excess seasonal wetness, shallow effective rooting depths or sodium. Ridging the soil and planting on the ridges may increase survival. The use of equipment can become restricted in spring and other excessively wet periods.

Glossary

Backslope – a hillslope profile position that forms the steepest and generally linear, middle portion of the slope.

Backswamp – marshy or swampy, depressed areas of flood plains between natural levees and valley sides or terraces

Calcareous – the presence of calcium carbonate in the soil parent material within the rooting zone; relatively alkaline

Claypan – a dense, compact, slowly permeable layer in the subsoil having much higher clay content than the overlying material

Chert – hard, extremely dense or compact crystalline sedimentary rock, consisting dominantly of interlocking crystals of quartz

Cliff – a significant vertical, or near vertical, rock exposure

Dolomite – a type of sedimentary rock that is a carbonate mineral composed of calcium magnesium carbonate

Drainageway – the upper most reach of a stream channel system characterized by little meandering

Dry – a site where soil moisture is limiting during the growing season; low available water capacity

Dune – a low mound, ridge, bank or hill of loose, wind-blown sand

Exposed – steep, south and west-facing slopes, which are warmer and drier than other slope aspects

Flatwoods – a type of woodland that occurs on soils with a root restricting subsoil layer within 20 to 30 inches, resulting in very slow runoff and ponding that remains saturated for most of the winter and early spring months but dries out and becomes very dry in the summer months; plants that grow there must be adapted to both conditions

Floodplain – the nearly level plain that borders a stream and is subject to inundation under flood-stage conditions

Footslope – a hillslope position at the base of a slope where hillslope sediment (colluvium) accumulates

Forest – a vegetative community dominated by trees forming a closed canopy and interspersed with shade-tolerant understory species

Fragipan – a dense, brittle subsoil horizon that is extremely hard and compact when dry

Glade – open, rocky, barren vegetative community dominated by drought-adapted forbs and grasses, typically with scattered, stunted woody plants

Igneous – bedrock created by cooling and crystallization of magma forming igneous rock. Granite and rhyolite are typical igneous bedrocks in Missouri

Limestone – a type of sedimentary rock composed largely of calcium carbonate

Loess – material transported and deposited by wind and consisting predominantly of silt-size particles

Loamy – soil material containing a relatively equal mixture of sand and silt and a somewhat smaller proportion of clay

Marsh – a type of wetland that is dominated by herbaceous rather than woody plant species

Moist – a site that is moderately well to well drained and has high available water capacity, resulting in a well-balanced supply of moisture (neither too dry nor too wet).

Mudstone – blocky or massive, fine-grained sedimentary rock in which the proportions of clay and silt are approximately equal

Natric – a soil horizon that displays a blocky, columnar, or prismatic structure and has a subhorizon with an exchangeable-sodium saturation of over 15%

Outwash – stratified sediments of sand and gravel removed or “washed out” from a glacier by melt-water streams

Prairie – a vegetative community dominated by perennial grasses and forbs with scattered shrubs and very few trees

Protected – steep, north- and east-facing slopes, which are cooler and moister than other slope aspects

Residuum - unconsolidated, weathered, or partly weathered mineral material that accumulates by disintegration of bedrock in place

Riser – a component of terraces and flood-plain steps consisting of the steep side slope; the escarpment

Riverfront – a vegetative community in the floodplain immediately adjacent and generally parallel to a river or stream channel

River hills – a geographic area characterized by thick, dissected loess deposits, formed immediately adjacent to the edges of the Missouri and Mississippi River floodplains

Sandy – a coarse-sized soil containing a large mixture of sand and gravels and a somewhat smaller proportion of silts and clays with excessive drainage

Sandstone – a sedimentary rock containing dominantly sand-size particles

Savanna – grasslands interspersed with open-grown scattered trees, groupings of trees, and shrubs

Shale – a sedimentary rock formed from clay, silty clay, or silty clay loam deposits and having the tendency to split into thin layers

Shallow – a site with bedrock within 20 inches of the surface

Shoulder – the slope profile position that forms the convex surface near the top of a hill slope; it comprises the transition zone from summit to backslope

Sinkhole – a closed, circular or elliptical depression, commonly funnel-shaped, characterized by subsurface drainage and formed either by dissolution of the surface of underlying bedrock or by collapse of underlying caves within bedrock

Summit – the top or highest area of a hillslope

Swale –shallow, closed depressions irregularly spaced across a floodplain or terrace with an irregularly undulating surface.

Swamp – an area of low, saturated ground, intermittently or permanently covered with water, and predominantly vegetated by shrubs and trees.

Talus – rock fragments of any size or shape (usually coarse and angular) derived from and lying at the base of a cliff or very steep rock slope.

Terrace – a step-like surface, bordering a valley floor that represents the former position of a flood plain

Till – dominantly unsorted and unstratified soil material deposited directly by a glacier

Upland – a general term for the higher ground of a region, in contrast with a low-lying, adjacent land such as a valley or floodplain

Wet – a somewhat poorly, poorly or very poorly drained site that has an oversupply of moisture during the growing season

Woodland – a highly variable vegetative community with a canopy of trees ranging from 30 to 100 percent closure with a sparse midstory and a dense ground flora of grasses, sedges and forbs

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