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## 2.4 ECOLOGY

{This section describes the ecosystems and ecological characteristics of the areas that could potentially be impacted by the construction of Unit 2. The transmission lines and the collector well facilities at the Callaway Plant in Callaway County, Missouri. This section contains two main subsections: 1) Terrestrial Ecosystems, and 2) Aquatic Ecosystems. These subsections include a discussion about the affected ecosystems, flora and fauna, and important species on the Callaway Plant site.}

### 2.4.1 TERRESTRIAL ECOLOGY

{The terrestrial ecology of the Callaway Plant site, including the Callaway Plant Unit 2 construction zone, was characterized in a series of field studies conducted over a one year period extending from March 2007 to March 2008. The AmerenUE property boundary includes the area owned by AmerenUE and generally coincides with the Reform Conservation Area (Reform CA) which is managed by the Missouri Department of Conservation (MDC). The field studies included surveys for terrestrial vegetation, herpetofauna, avifauna, mammals, waters of the U.S. (including wetlands), adult/juvenile fish, benthic macroinvertebrates, and surveys for the state endangered lake sturgeon (*Acipenser fulvescens*). Methods used in each of these surveys are documented in the *Standard Operating Procedures (SOP) for the Callaway Nuclear Plant Unit 2 Siting Study, Natural Resources Field Sampling and Analysis* (MACTEC, 2007). In general, study methods within the ecological investigation area (the area included within a 6 mile (10 km) radius of Callaway Plant Unit 2) included a review of available mapping, databases, and correspondence with the appropriate agencies. Within the AmerenUE property, however, these methods were supplemented with field studies as outlined in the SOP. The subsections below summarize relevant information from each of these studies and provide other data on existing terrestrial ecology in accordance with the guidance in NUREG-1555 (NRC, 1999).

A topographic map of the site is provided as [Figure 2.3-1](#).

#### 2.4.1.1 Terrestrial Habitats

The floral survey covers each plant community type (terrestrial habitat type) observed on the AmerenUE property in 2007. The Reform CA and AmerenUE property are located at the northern edge of the Ozark Highlands in the Outer Ozark Border subsection (Nigh and Schroeder, 2002). The Outer Ozark Border consists of a belt of deeply dissected hills and bluff lands bordering the Missouri and Mississippi Rivers. Relief in the hills is 200 ft to 300 ft (61 m to 91 m), but smooth, loess covered uplands grade into adjacent ecoregions. A variety of ecological landscapes or Landtype Associations (LTAs) recognize differences in topography, geology, soils and potential natural vegetation in the Outer Ozark Border. Reform CA is subdivided by two LTAs: the Central Missouri Savanna/Woodland Dissected Plain on its northern half and the Central Missouri Oak Woodland/Forest Hills on the southern half. The flat to gently rolling uplands on the north half of Reform CA are blanketed in loess and were formerly prairie and oak savanna. The hilly portion of Reform CA has long, narrow loess covered ridges which give way to moderately steep slopes in Mississippian and Devonian limestones. This landscape was historically oak savanna and woodland high in the landscape, with white oak and mixed hardwood forests on lower slopes and bottoms. Limestone glade-woodland complexes were historically common, especially in the Devonian limestone. These landscapes offer a wide variety of potential natural communities and habitats.

The 2007 land cover survey consisted of plant community cover type mapping of both the site and ecological investigation area. U.S. Geological Survey (USGS) 2005 Land Use and Land Cover (LULC) mapping for the ecological investigation area was examined. The LULC data were noted to be coarse (30-meter grid) and contained some errors in actual cover type. Although these

data were utilized for the ecological investigation area, they were determined to be inadequate for the site due to their coarse level of detail and potential for error. As such, photo interpretation of existing land cover on the site was performed at a 1 inch (3 cm) to 300 ft (91 m) scale over 2006 National Agricultural Imagery Program (NAIP) aerials and utilizing data from the LULC to verify initial cover type. Field reconnaissance was performed within the site boundary to ground truth each cover type identified. Ground truth reconnaissance was not performed within the ecological investigation area. A map of the plant community types is presented in [Figure 2.4-1](#) (site) and [Figure 2.4-2](#) (ecological investigation area), and each plant community type is briefly discussed below.

**Impervious, High Intensity Urban, and Low Intensity Urban** – Impervious areas include streets, parking lots, and buildings with little, if any, vegetation. High Intensity Urban includes vegetated urban environments with a high density of buildings. Low Intensity Urban includes vegetated urban environments with a low density of buildings. Within the ecological investigation area these three land cover types occupy 666 acres (270 hectares), 0 acres (0 hectares) and 252 acres (102 hectares) respectively. These three land cover types occupy 338 acres (137 hectares), 114 acres (46 hectares), and 37 acres (15 hectares) of the site respectively. On site these land cover types are associated with the developed area of the plant site itself including roadways.

**Cropland** – Land cover mapping in 2007 identified 2,039 acres (825 hectares) of cropland on the AmerenUE property and 11,370 acres (4,600 hectares) of cropland in the ecological investigation area. Most of the cropland occurs in the northern part of the site surrounding the plant and south of Route 94 in the Missouri River floodplain. The designation of cropland includes land in row crops or close-grown crops and other cultivated or non-cultivated land such as hayfields or pastureland. On site row crops consist of corn (*Zea mays*), wheat (*Triticum aestivum*), and soybeans (*Glycine max*) whereas pastureland and hayfields consist primarily of red clover (*Trifolium pratense*), alfalfa (*Medicago sativa*), and various grasses such as Timothy (*Phleum pratense*) and fescue (*Festuca elatior*). Common weeds associated with Cropland include giant ragweed (*Ambrosia trifida*), annual ragweed (*A. artemisiifolia*), and foxtail (*Setaria glauca*). In 2007 MDC contracted with two permittee farmers who were awarded haying and cattle grazing contracts on the Reform Conservation Area. Other cropland on site consists of sunflowers (*Helianthus annuus*), corn and wheat left in the field as wildlife food plots (Newbold, 2007).

**Grassland** – Grasslands are lands which are dominated by native warm season or non-native cool season grasses and occupy approximately 481 acres (195 hectares) of the AmerenUE property and 12,025 acres (4,867 hectares) of the ecological investigation area. Grasslands occur primarily on the relatively flat uplands surrounding the AmerenUE property and on the levees protecting cropland in the Missouri River floodplain. Native warm season grasslands occur on the loess covered uplands of the dissected plains on the north half of Reform CA. Known locally as Coate's Prairie, this area was plowed and farmed early in the history of the area. Today, these units are a mixture of fescue dominated cropland, pasture, and native warm season grass plantings (Newbold, 2007). Native warm season grasslands surrounding the plant are dominated by big bluestem (*Andropogon gerardii*), broomsedge (*Andropogon virginicus*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), and switch grass (*Panicum virgatum*). Prairie and old field forbs are also present such as black-eyed Susan (*Rudbeckia hirta*), white wild indigo (*Baptisia alba*), ironweed (*Vernonia baldwinii*), tall goldenrod (*Solidago altissima*), and late boneset (*Eupatorium serotinum*). One large field to the east of the plant is dominated by eastern gamma grass (*Tripsacum dactyloides*) which was intentionally planted by MDC to provide habitat and forage for wildlife. Non-native cool season grasslands exist sporadically in areas surrounding the AmerenUE property and on the levees in

the Missouri River floodplain. Non-native cool season grasses include fescue, Timothy, and Kentucky bluegrass (*Poa pratensis*).

**Glade** – Glades are open, rocky barren areas dominated by drought-adapted forbs and native warm-season grasses. Glades occupy 4 acres (1.6 hectares) of the AmerenUE property and appear as essentially treeless openings within landscapes primarily dominated by woodlands. Rock outcrops characterize glades with bedrock near the surface, shallow soils and the absence of a developed canopy layer (Nelson, 2005). Limestone glades are listed in the *Missouri Species and Communities of Conservation Concern* (MDC, 2007a) as imperiled with a State Rank S2 (S2 = Imperiled in the state because of rarity or because of some factor(s) making it especially vulnerable to extirpation from the state). Limestone glades within the AmerenUE property are situated on narrow midslope bands on southwest-facing forested slopes. The MDC has engaged in periodic cutting and burning to remove invading cedar trees. Common glade species observed include side oats grama (*Bouteloua curtipendula*), big bluestem, little bluestem, purple prairie clover (*Dalea purpurea*), Missouri black-eyed Susan (*Rudbeckia missouriensis*), and fragrant sumac (*Rhus aromatica*).

**Deciduous Forest** – The Deciduous Forest cover type consists of forests with greater than 60% cover of deciduous trees. This cover type occupies 3,550 acres (1,437 hectares) of the AmerenUE property and 36,934 acres (14,947 hectares) of the ecological investigation area and was the most common cover type identified. Deciduous Forest on site primarily includes upland forests dominated by white oak (*Quercus alba*), black oak (*Q. velutina*), northern red oak (*Q. rubra*), and shagbark hickory (*Carya ovata*). Other common canopy trees include sugar maple (*Acer saccharum*), shingle oak (*Q. imbricaria*), bur oak (*Q. macrocarpa*), white ash (*Fraxinus americana*), hackberry (*Celtis occidentalis*), mockernut hickory (*Carya tomentosa*), and eastern red cedar (*Juniperus virginiana*). The forest understory consists of flowering dogwood (*Cornus florida*), downy service berry (*Amelanchier arborea*), and saplings of canopy species. Forest ground cover is patchy and, where present, includes Christmas fern (*Polystichum acrostichoides*), tick trefoil (*Desmodium glutinosum*), white snakeroot (*Eupatorium rugosum*), Virginia wild rye (*Elymus virginicus*), coral berry (*Symphoricarpos orbiculatus*), and fragrant sumac. There is no active forest management within the Reform CA other than some burning and thinning in a few small glade and savanna areas.

**Evergreen Forest** – The Evergreen Forest cover type consists of forests with greater than 60% cover of evergreen trees. At the AmerenUE property this cover type occupies 13.5 acres (5.5 hectares) and exists solely in the form of a pine plantation. The pine plantation is located adjacent to and northwest of the restricted access portion of the AmerenUE property and was intentionally planted in the 1930s with red pine (*Pinus resinosa*) and eastern white pine (*Pinus strobus*). The pine plantation has not been maintained in the recent past and thus a sparse shrub layer has become established consisting of hackberry, white ash, box elder, elderberry (*Sambucus canadensis*), and black raspberry (*Rubus occidentalis*). Ground cover in the pine plantation includes Virginia wild rye, coral berry, white snakeroot, poison ivy (*Toxicodendron radicans*), and pokeweed (*Phytolaca americana*). The Evergreen Forest cover type also occupies 2,027 acres (820 hectares) (or approximately 3%) within the ecological investigation area.

**Deciduous Woody/Herbaceous** – The Deciduous Woody/Herbaceous cover type consists of open woodland, including early successional forest, with less than 60% cover of deciduous trees and occupies 1,230 acres (498 hectares) of the AmerenUE property and 1,084 acres (439 hectares) of the ecological investigation area. This land cover type is scattered throughout the site and also includes many of the maintained transmission line corridors. Common woody species include shingle oak, white oak, white ash, persimmon (*Diospyros virginiana*), sassafras (*Sassafras albidum*), sycamore (*Platanus occidentalis*), slippery elm (*Ulmus rubra*), coral berry,

and aromatic sumac. Common herbaceous species include purpletop (*Tridens flavus*), giant foxtail (*Setaria faberii*), Virginia wild rye, broomsedge, Queen Anne's lace (*Daucus carota*), partridge pea (*Chamaecrista fasciculata*), poison ivy, and tall goldenrod (*Solidago altissima*).

Evergreen Woody/Herbaceous – The Evergreen Woody/Herbaceous cover type consists of open woodland, including early successional forest, with less than 60% cover of evergreen trees and occupies 340 acres (138 hectares) of the AmerenUE property. There were no areas of this land cover type mapped in the ecological investigation area. At the site this land cover type consists primarily of eastern red cedar thickets that have invaded glades, forest openings, pasture and old field habitat. Other woody species that can be found growing in association with the eastern red cedar include other early successional species such as persimmon, sassafras, slippery elm, black locust (*Robina pseudo-acacia*), coral berry, and fragrant sumac. Occasional immature white oak and bur oak (*Quercus macrocarpa*) are also observed. Herbaceous species may include remnant glade species such as little bluestem, big bluestem, and side oats grama (*Bouteloua curtipendula*), or typical old field species such as purpletop, giant foxtail, Queen Anne's lace and various goldenrod species.

Woody-Dominated Wetland – The Woody-Dominated Wetland cover type consists of forests with greater than 60% cover of trees with semi-permanent or permanent flood waters and occupies 402 acres (163 hectares) of the AmerenUE property and 2,108 acres (853 hectares) of the ecological investigation area. At the AmerenUE property this land cover type includes both floodplain forests and true jurisdictional forested wetlands as defined in the 1987 *Corps of Engineers Wetlands Delineation Manual*. Floodplain forests and true forested wetlands occur along the floodplains of Logan Creek, the Mollie Dozier Chute and the Missouri River. Common woody species within these communities include silver maple (*Acer saccharinum*), box elder (*A. negundo*), cottonwood (*Populus deltoides*), black willow (*Salix nigra*), peach-leaved willow (*S. amygdaloides*), and sycamore. Herbaceous groundcover, where present, includes barnyard grass (*Echinochloa crusgalli*), Virginia wild rye, water heartsease (*Polygonum coccineum*), and giant ragweed (*Ambrosia trifida*).

Herbaceous-Dominated Wetland - The Herbaceous-Dominated Wetland cover type consists of woody shrubland with less than 60% cover of trees with semi-permanent or permanent flood waters and occupies 32 acres (13 hectares) of the AmerenUE property and 154 acres (62 hectares) of the ecological investigation area. At the AmerenUE property this cover type includes portions of the four treatment lagoons adjacent to and immediately south of the plant as well as the emergent- and shrub-dominated wetlands delineated on site and on the fringe of the site stormwater runoff ponds. Dominant shrubs include black willow, peach-leaved willow, and sandbar willow (*Salix interior*). Herbaceous ground cover includes arrowhead (*Sagittaria latifolia*), narrow leaf cattail (*Typha angustifolia*), and various sedge species (*Carex* sp.).

Open Water – Open Water consists of rivers, lakes, ponds, and other open water areas and occupies 149 acres (60 hectares) of the site and 2,318 acres (938 hectares) of the ecological investigation area. Open Water on the AmerenUE property includes stormwater runoff ponds, fishing ponds, cattle ponds, portions of Logan Creek and the Mollie Dozier Chute, and the segment of the Missouri River under the transmission line corridor. The Mollie Dozier Chute is a backwater slough that frequently dries up subject to the ebb and flow of the Missouri River. The Mollie Dozier Chute defines the boundary of Binggeli Island which stretches from approximate River Mile (RM) 119 to just past RM 116. The transmission line crosses the Missouri River approximately at RM 117.5.

### 2.4.1.2 Important Terrestrial Species and Habitats

NUREG-1555 (NRC, 1999a) defines important species as: 1) species listed or proposed for listing as threatened, endangered, candidate, or of concern in 50 CFR 17.11 and 50 CFR 17.12 (CFR, 2007a), by the U.S. Fish and Wildlife Service, or the state in which the project is located; 2) commercially or recreationally valuable species; 3) species essential to the maintenance and survival of rare or commercially or recreationally valuable species; 4) species critical to the structure and function of local terrestrial ecosystems; or 5) species that could serve as biological indicators of effects on local terrestrial ecosystems. Floral and faunal surveys that document observations made on the AmerenUE property are summarized herein.

Table 2.4-1 provides a list of rare, threatened or endangered species identified within Callaway and Osage Counties in Missouri by the MDC Natural Heritage Database (MDC, 2008). Terrestrial species listed within the two counties include fifteen plant species, eight insect species, two amphibian species, one reptile species, three bird species, and two species of mammals. From this list of rare, threatened or endangered terrestrial species, only the gray bat (*Myotis grisescens*), bald eagle (*Haliaeetus leucocephalus*), and northern harrier (*Circus cyaneus*) were confirmed as important species by way of formal agency consultation (MDC, 2007m; USFWS, 2007b) and/or field studies. The remaining terrestrial species listed in Table 2.4-1 were not considered important species for the Callaway Plant Unit 2 project because they were not identified during formal agency consultation or they were not observed during the 2007 field studies.

The American elm (*Ulmus americana*), long-tailed weasel (*Mustela frenata*), sharp-shinned hawk (*Accipiter striatus*) and ruffed grouse (*Bonasa umbellus*) were identified previously as species of concern in the Environmental Report for Callaway Plant Unit 1 (Union Electric Company, 1976). Although the American elm was observed during the 2007 vegetation surveys, it is no longer listed as a species of conservation concern in the State of Missouri and is thus not considered an important species.

The long-tailed weasel has an S2 State Rank (imperiled) and was listed by the MDC Natural Heritage Database as being potentially present in Callaway County (Table 2.4-1) but it was not identified as a species of concern by either the State or the U.S. Fish and Wildlife Service (USFWS) during consultation and it was not observed during the 2007 field surveys. As such, the long-tailed weasel is not considered an important species.

The sharp-shinned hawk has an S3 State Rank (vulnerable) in Missouri but was not listed by the MDC Natural Heritage Database as being present in either Callaway or Osage County. Furthermore, it was not identified as a species of concern during agency consultation nor was it observed during the 2007 bird surveys. As such, the sharp-shinned hawk is not considered an important species.

The ruffed grouse has an SU State Rank (unrankable due to lack of information or conflicting information) in Missouri but was not listed by the MDC Natural Heritage Database as being present in either Callaway or Osage County. Furthermore, it was not identified as a species of concern during agency consultation nor was it observed during the 2007 bird surveys. As such, the ruffed grouse is not considered an important species.

Although not listed within Callaway or Osage Counties by the MDC Natural Heritage Database, the Indiana bat (*Myotis sodalis*) was identified during consultation with the USFWS as a species of concern for the Callaway Plant Unit 2 project and thus is considered an important species.

The white-tailed deer (*Odocoileus virginianus*), northern bobwhite quail (*Colinus virginianus*), mourning dove (*Zenaidura macroura*), and wild turkey (*Meleagris gallopavo*) were identified as important species on the basis of their value as recreational species.

Table 2.4-2 lists each species and habitat identified as important for the Callaway Plant site and surrounding area according to the criteria in NUREG-1555 (NRC, 1999). Each species deemed an important species is discussed in more detail below.

#### 2.4.1.2.1 Mammals

Methodology for the identification of mammal species within the ecological investigation area consisted of records review (i.e., recorded range/distributional records and MDC records for game species) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies (Union Electric, 1976) as well as additional field studies including general site reconnaissance and observation, road kills, and the use of small mammal traps placed along five study transects established in upland forest, bottomland forest, grassland and old field habitat. Along each of the five transects, 20 Sherman live traps were set for two consecutive trap nights in the spring and fall in accordance with the *Standard Operating Procedures (SOP) for the Callaway Nuclear Plant Unit 2 Siting Study, Natural Resources Field Sampling and Analysis* (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of mammal species and to aid in the identification of important species within the AmerenUE property. Refer to Figure 2.4-5 for terrestrial ecology study locations on site.

Typical mammal species observed during field surveys included white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor hirtus*), eastern cottontail (*Sylvilagus floridanus*), opossum (*Didelphis virginiana*), and rodent species such as the white-footed mouse (*Peromyscus leucopus*), deer mouse (*Peromyscus maniculatus*), and house mouse (*Mus musculus*). The complete list of mammals observed on site is recorded in Table 2.4-3. Based on the methodology outlined above three mammal species, the white-tailed deer, gray bat (*Myotis grisescens*), and Indiana bat (*Myotis sodalis*), are considered important species at the AmerenUE property. White-tailed deer are considered important because they are recreationally valuable since they are hunted in Callaway County and throughout the state. The gray bat and Indiana bat are considered important because they are listed federally as endangered species and agency consultation identified them as species that may potentially use the Reform CA.

##### 2.4.1.2.1.1 White-Tailed Deer

White-tail deer are extremely common throughout the rural areas of Missouri. They were observed in all habitats on the AmerenUE property during the 2007-2008 faunal survey. They were also one of the most frequently observed mammal species on site. The 2007 deer harvest for Callaway County recorded by the MDC included 2,164 antlered bucks, 760 button bucks, and 2,349 does for a total of 5,273 white-tail deer harvested (MDC, 2007b). In addition, due to the large deer population at Reform CA, the first managed deer hunt was held in November 29 through December 2, 2007. There were 102 hunters present at the managed hunt, and they harvested 29 deer (does and yearling bucks).

White-tail deer utilize a wide variety of habitats, including woodlands and dense thickets along the edge of forests adjacent to open fields (MDC, 2007c). The dense thickets provide cover while the fields provide opportunities to forage. Fragmented forests provide good habitat for these large herbivorous mammals. The Reform CA provides ideal habitat for deer with an abundance of forest edge, grassland/old field, and row crops.



Usually in late October or early November, female white-tail deer enter estrus which is also considered the rutting season. Females mature sexually at different ages depending on population densities; however, most mature between one and two years of age. Males compete for mates during the rut, often not eating or resting, resulting in a loss of physical condition. For female white-tail deer gestation takes between six and six and a half months usually producing only one fawn the first year, but often producing two or even three fawns in the following years. Fawns are weaned at approximately six weeks of age; however they begin grazing just days after they are born. Around 18 months males reach puberty, and they begin growing their first rack during the first spring after their birth.

Historically the natural predators of white-tail deer consisted of wolves, mountain lions, and other large carnivores. However, in Callaway County there are few natural predators, and the population levels of deer are primarily controlled by hunting.

#### **2.4.1.2.1.2 Gray Bat**

The gray bat was listed as a federally endangered species on April 28, 1976 [U.S. Fish and Wildlife Service (USFWS), 1982]. Nationally, populations of gray bats are found primarily in Alabama, northern Arkansas, Kentucky, Missouri and Tennessee. When the Gray Bat Recovery Plan was written in 1982, there had been an estimated 50% decline in the national gray bat population (USFWS, 1982). Gray bats have been recorded historically in the ecological investigation area in the vicinity of the AmerenUE property in a cave along Auxvasse Creek. Although no surveys were conducted during 2007 to determine their presence, their historical presence in the ecological investigation area coupled with the presence of suitable habitat within the normal foraging range for this species, it is assumed that gray bat is present in the ecological investigation area and possibly on site.

Gray bats live in caves year round that are typically located within two miles of streams, rivers, or lakes. They do not hibernate or roost in houses or man-made structures. In the winter, their hibernation caves (hibernacula) are usually vertical (pit) caves that have cool, stable temperatures ranging from 42 degrees to 52 degrees Fahrenheit (6 degrees to 11 degrees Celsius). The summer caves usually have domed ceilings and are warmer (58 degrees to 77 degrees Fahrenheit (14 degrees to 25 degrees Celsius)). Gray bats may also require a corridor of forest vegetation connecting the roosting cave to potential foraging areas. This corridor of forest cover protects them from predation. Their foraging habitat consists primarily of areas along rivers, streams, and reservoirs (USFWS, 1982).

During September and October, adult female gray bats enter hibernacula and are shortly followed by males and juvenile females. Gray bats hibernate in large, loose clusters across the cave ceiling and walls. In early March to mid-April, female bats emerge from hibernation and establish summer roost colonies, while males remain in the cave until mid-April or May. Gray bat winter (hibernation) and summer caves can be from a few to 200 miles (322 km) apart. They often use other caves as rest stops as they migrate to their summer roosting caves. From late May to June, pregnant females roost in maternity colonies in caves separate from males and young females. In June, each gray bat female gives birth to a single young. Four weeks later these young gray bats are able to fly. In July and August, mothers and their young rejoin the bachelor colonies. Gray bats return to the same caves year after year for roosting and hibernating.

The decline of gray bat populations has occurred for many of the same reasons that other bat species have declined. The major causes of the historical decline of the gray bat population in Missouri included human disturbance to caves, commercialization of caves, pesticide contamination, and in some cases reservoir construction that flooded some important caves.



Although threats to gray bat populations still exist, gray bat populations are currently increasing. The greatest threats to gray bat populations in Missouri are the following: human disturbance, cave modification, pesticide and pollution, and the destruction of riparian areas.

#### 2.4.1.2.1.3 Indiana Bat

The Indiana bat was federally listed as endangered March 11, 1967 (USFS, 2008). The majority of the nation's Indiana bats are found in Kentucky, Indiana, and Missouri. Since the 1960s, there has been dramatic decline of over 50% of the Indiana bat population (Clawson, 2003). No bat surveys were conducted at the AmerenUE property during 2007. However, historically Indiana bats have been observed in the vicinity and the site is within their habitat range. It is therefore assumed that they are present at the AmerenUE property. Indiana bats are also listed as state endangered. Over the last 20 years their population has declined significantly across Missouri. Missouri has approximately 5,000 known caves but only 27 have ever been known to contain Indiana bat populations (MDC, 2007d). Over 85% of the nationwide Indiana bat population hibernates in only eight different locations. Three of these eight locations are located in Missouri: in Iron, Shannon, and Washington counties (MDC, 2007d).

Indiana bats usually forage in the treetops of riparian forests and floodplains. Indiana bats are completely insectivorous, eating a diet that includes mostly moths, but also mosquitoes and aquatic insects (MDC, 2000). In addition to riparian forests they also forage in upland forests and in low fields and pastures. During the winter months Indiana bats require cool hibernacula with stable temperatures of about 40 degrees Fahrenheit (4 degrees Celsius) with the relative humidity remaining within the range of 66% to 95%. During the summer months females form maternal roost colonies in tree cavities or under loose bark of large diameter trees, such as shagbark hickory (*Carya ovata*) and cottonwood (*Populus deltoides*). Some male Indiana bats also roost within tree cavities or under the flaking bark of trees during the summer (MDC, 2000).

In early October, Indiana bats mate as they swarm at the entrances of hibernation caves in southern Missouri (MDC, 2000). Very few caves provide the necessary humidity and cold temperatures for them to properly hibernate. During hibernation their metabolism slows significantly, allowing them to conserve their fat reserves throughout the winter months. Indiana bats hibernate in clusters of from several hundred to several thousand bats. Sometimes they are clustered so closely there may be 400 bats per square foot. Since few caves (and a few mines) provide the required conditions, they return to the same cave year after year (MDC, 2000).

When spring arrives, females leave hibernacula and fly north searching for summer roost sites where they roost and raise one young (MDC, 2000). The majority of females will find roosts and raise their young in the northern half of Missouri. The females form maternity colonies consisting of 50 to 100 individuals (MDC, 2007d). Most males leave the cave and travel in small groups, roosting under the loose bark of trees. However, some males will spend the summer remaining in the hibernation caves (MDC, 2000).

The Indiana bat depends on different habitats during the summer and winter making it vulnerable to disturbances to either habitat (MDC, 2007d). One of the primary causes of decline has been the disturbance of hibernating bats in their winter caves. When humans enter caves and disturb the bats, the bats may wake and use up crucial food reserves before spring arrives. Another impact to hibernation caves is the improper installation of gates at cave entrances, which may either alter the humidity and temperatures of the cave or make the cave inaccessible to bats. Other hibernation caves have been flooded as a result of the creation of reservoirs. Indiana bat summer habitat has been altered by deforestation, agricultural development, and stream channelization (MDC, 2007d). According to biologists' surveys, in the

1970s there were approximately 399,000 Indiana bats in Missouri, while in 2003 there were approximately 66,800 Indiana bats remaining in the state (Clawson, 2003). Although the populations of some northern states are growing, namely Illinois, Indiana, New York, Ohio, and West Virginia, these numbers do not compensate for losses in the rest of the country (Clawson, 2003).

#### 2.4.1.2.2 Birds

Methodology for the identification of bird species within the ecological investigation area consisted of records review (i.e., recorded range/distributional records and MDC records for game species) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies (Union Electric, 1976) as well as additional field studies including general site reconnaissance and observation, spring waterfowl spot counts, roadside bird surveys, and transect surveys along the same five study transects established in upland forest, bottomland forest, grassland and old field habitat. Five transects were surveyed on foot on two separate days during each season (spring, summer, fall, winter) wherein the observers inventoried all birds seen or heard with 65 ft (20 m) of the transect centerline (MACTEC, 2007). Three roadside survey routes were established (Figure 2.4-3) and were sampled seasonally (spring, summer, fall, winter). Observers stopped at 0.5 mile (0.8 km) intervals to record all birds seen or heard during a three-minute sampling period. Each route was driven on two separate dates during each season with observations initiated approximately 15 minutes before sunrise each day (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of bird species and to aid in the identification of important species within the AmerenUE property. Refer to Figure 2.4-3 for terrestrial ecology study locations on site.

Typical bird species observed during field surveys included northern cardinal (*Cardinalis cardinalis*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), and tufted titmouse (*Baeolophus bicolor*). The complete list of birds observed on site is recorded in Table 2.4-4. Based on the methodology outlined above five bird species including the bald eagle (*Haliaeetus leucocephalus*), northern harrier (*Circus cyaneus*), northern bobwhite quail (*Colinus virginianus*), wild turkey (*Meleagris gallopavo*), and mourning dove (*Zenaidura macroura*), are considered important species at the AmerenUE property. The bald eagle and northern harrier are considered important because they are listed in Missouri as state-endangered species and both were observed on site. The northern bobwhite quail, wild turkey and mourning dove are considered important species because all three are recreationally valuable species that are harvested locally and throughout the state.

##### 2.4.1.2.2.1 Bald Eagle

The bald eagle was previously a federally listed species but due to its successful recovery it has now been de-listed. However, it is still listed as endangered for the State of Missouri and federally protected under the Bald Eagle Protection Act. Missouri now regularly has greater than 2,200 bald eagles each winter, making it one of the top states in the country in terms of bald eagle populations (MDC, 2007e). During the winter, Missouri's large rivers, lakes, reservoirs, and wetlands provide good habitat for the bald eagle. In particular they often congregate below the Mississippi River lock and dams where fish are plentiful. Bald eagles were observed at the Callaway site during the winter 2007 surveys along the Missouri River, along the Molly Dozier slough, and near Transect 2.

Bald eagles eat primarily fish but may also eat seagulls, waterfowl, small mammals, and carrion (MDC, 2000). They prefer nesting in tall trees in areas near large open waters such as lakes and

along rivers. The quality of the habitat seems to be more critical than its distance from the water source. Quality habitats provide a variety of prey with little to no human disturbance. Winter roost sites often are composed of clusters of large cottonwoods. Both nesting and roosting sites are often used for many years (USFWS, 2007a).

Bald eagles usually breed at the age of 4 or 5 years and mate for life (MDC, 2000). In Missouri nesting activity is usually initiated sometime from January 1st to March 1st (MDC, 2000). A large nest composed of sticks and lined with finer materials is built by the male and female. From March 1st to May 15<sup>th</sup> is the critical period for incubation and rearing of young. The pair will raise one to three young depending on the available food supply. The chicks hatch approximately 35 days after they have been laid and leave the nest about 12 weeks following hatching (MDC, 2007f).

Due to restrictions in DDT in 1972, the bald eagle population has greatly rebounded across the country. However, hunting in the late 1800s is what eliminated bald eagles in Missouri (MDC, 2007g). In the mid-1900s when DDT was negatively impacting bald eagles' ability to reproduce across the country, Missouri's eagles were already gone. Today, Missouri is one of the leading states in the country in terms of wintering bald eagle populations, and although not as dramatically, summer populations are also increasing (MDC, 2007e).

#### **2.4.1.2.2.2 Northern Harrier**

The northern harrier is not a federally listed species; however, it is state listed in Missouri as an endangered breeding species. During the mid-1900s northern harrier populations experienced a serious decline due to the thinning of their egg shells from pesticides and a loss of wetlands, their nesting habitat (MDC, 2007i). Although listed as an endangered breeding species, northern harriers are a common migrant in open grassland habitats in Missouri (MDC, 2007h). During the 2007 bird surveys, two northern harriers were observed along Transect 10 within cropland of the Missouri River floodplain.

Northern harriers require nesting areas without disturbance in either low lying or elevated areas (MDC, 2007h). Lowland habitats include pastures, prairies and dry ground in marshes, while their habitats in elevated areas include shrubby vegetation, tall weeds, and reeds. Their foraging habitat consists of open fields, grasslands, prairies, and shallow marshes (MDC, 2007h).

Leaving their winter habitats in Texas and Mexico, in March and April northern harriers arrive in Missouri for breeding (MDC, 2007i). They usually form loose nesting colonies late in the season. Northern harriers build their nests in undisturbed lowland areas on dry ground in marshes, prairies, and pastures, or on elevated ground in tall weeds, reeds, or shrubby vegetation. Their eggs incubate for 30 to 32 days, and their young are fledged approximately five weeks later (MDC, 2007i). From February to May and again from September to November, northern harriers are common migrants in Missouri. They are frequently observed in open fields, grasslands, prairies, and shallow marshes foraging on large insects, small mammals, birds, frogs, toads, snakes, lizards, and carrion (MDC, 2007i).

The northern harrier population has declined due to a number of factors. One of the major factors impacting their numbers is habitat conversion, in the form of wetlands converted to uplands, native prairies converted to agriculture, and grasslands returning to forests (MDC, 2007i). In addition, the untimely mowing or haying of grasslands has also had negative impacts on nesting areas. In the mid-1900s, northern harrier populations experienced great losses because of egg shell thinning due to pesticides and losses of nesting habitat. In some parts of the country northern harriers have disappeared from their former nesting areas, especially in

the southern portions of their range. Surveys have found that northern harrier populations are still declining in many areas of North America (MDC, 2007i).

#### **2.4.1.2.2.3 Northern Bobwhite**

Northern bobwhites are one of the United States' most important game birds and they are found statewide in Missouri. During the 2007 bird surveys 29 northern bobwhites were observed in various vegetative communities.

Since northern bobwhites are year long residents of Missouri, they often are greatly impacted by winter ice and snow if adequate cover is not available. In addition, spring rains may also negatively impact the reproductive success of this ground-nesting species (Dailey, 1996). However, their large clutch sizes allow for the rapid recovery of their population following years of low productivity. The conversion of open woodlands into other land uses or their succession into forests has also negatively impacted this species (MDC, 2007j).

Northern bobwhites prefer tall grasslands, brushland, agricultural fields, and open woodlands (MDC, 2007j). However, they can also be found using forested areas. As ground nesters they require concealment from predators and adequate cover to protect them from inclement weather.

Northern bobwhites make ground nests in shallow depressions that are lined with grass (MDC, 2007j). They produce 10 to 16 eggs that incubate for 23 to 24 days. Six to seven days following hatching the young fledge. Northern bobwhites have a high annual mortality rate; therefore their populations can experience rapid turnover. However, during good years with weather and habitat being conducive, a pair can successfully produce two or more broods during a single breeding season (MDC, 2007j).

A recent study of northern bobwhite populations in Missouri has found a decrease in the average number of quail counted at various 30-mile (48-km) routes located across the state (Dailey, 2007). The average number counted in 2006 was 3.68 per route compared to an average of 3.30 counted in 2007. From 1983 to 2006 the average count per route was 7.55. It is possible that the severe winter storms that impacted Missouri during December 2006 and January 12-14, 20-21, and February 13, 2007, could be partly responsible for the reduced population numbers. However, the larger issue for northern bobwhites in Missouri is the reduced availability of quality habitat (Dailey, 2007). During the 2007 bird survey conducted at the AmerenUE property, the average count per driving route was 5.67 northern bobwhites.

#### **2.4.1.2.2.4 Wild Turkey**

Wild turkey are commonly observed throughout the rural areas of Missouri. During the 2007 bird survey on the site, 40 wild turkeys were observed in various different habitats on the AmerenUE property. In addition, a nest was observed at the northern edge of Transect 4 on May 4, 2007, that contained 12 eggs. The 2007 turkey harvest for Callaway County recorded by the MDC included 47 adult gobblers, 56 adult hens, 19 juvenile gobblers, and 61 juvenile hens for a total of 183 wild turkeys harvested (MDC, 2007b).

Wild turkey habitats vary depending on season and reproductive behavior. About one half of the year they spend in winter habitat (October-March). Winter habitat usually consists of at least 50% mature hardwood forest that includes a variety of oak species. This habitat must provide both shelter from inclement weather and a reliable food supply. The staple food of turkey within this habitat is acorns and other mast. Nesting habitat can be varied but usually hens nest near a permanent water source along the edges of old fields, trails, or in hay fields.

Summer/fall habitat is extremely critical to both hens and their young (poults). This habitat usually consists of mowed hay fields, grazed pasture, grasslands, glades, or open woods. These areas have less plant cover, which provides ample insects and seeds.

During the winter gobblers flock together apart from the hens, young hens, and jakes, then in the early spring winter flocks break up and courtship and mating begins (MDC, 2007k). As courtship begins, males travel greater distances searching for mates and gobbling increases along with strutting displays. Late April is usually the peak time for gobbling at which time most hens are laying eggs or already incubating. Incubation takes approximately 28 days and the average clutch size is 11 poults. When the last turkey has hatched, the hen leads her brood away from the nest. The mother hen must protect her poults during the first three weeks of their life, as they are vulnerable to cold weather and may be preyed on by foxes, coyotes, bobcats, or great-horned owls. When they are two weeks old, the poults can fly short distances and at 16 weeks they look similar to adults.

According to a 1997 study conducted by a Missouri Blue Ribbon Panel of wild turkey experts, the biggest factor to wild turkey populations is the weather during the spring nesting and brood-rearing seasons (MDC, 1997a). The biologists also found only a weak association between fluctuations of wild turkey populations and the populations of their natural predators. The experts also found that in some areas of the state poaching was having a large impact on the adult gobbler populations (MDC, 1997a).

#### **2.4.1.2.2.5 Mourning Dove**

One of the most widely distributed and abundant birds in North America, the mourning dove is found in all 48 contiguous states, Hawaii, southeastern Alaska, southern Canada, the Greater Antilles and Mexico (MDC, 2007l). In Missouri, the mourning dove is found in every county in the state with the largest populations being found in the west central portion. However, most Missouri doves migrate during the winter. Those in eastern Missouri usually move southeast into Louisiana, Alabama, Georgia and Florida, while those in western and central Missouri migrate to Texas, Louisiana, Mexico and Central America. Since mourning doves migrate across state lines and international boundaries, they are considered a Federal Migratory Species (MDC, 2007l). As such, populations are managed on a national level by the USFWS.

Mourning doves usually have an abundance of available food and water in Missouri. Following the harvest of crops, such as corn and wheat, waste grain is left behind and is a great food resource for mourning doves. In addition, the seeds of bristlegrass, foxtail, ragweed, pigweed, and other annual weeds are available in the fall. Mourning doves can nest in a variety of habitats from open grasslands to trees and shrubs. They particularly prefer nesting in fields, orchards, or other areas with abundant seeds and grains. Mourning doves also roost in a variety of habitats ranging from grasslands to dense timber (MDC, 2007l).

In March, mourning doves migrate to the nesting areas used during the previous year. The males begin calling from exposed branches to establish their breeding territories. In April, the males choose a nest site and with their mates begin constructing a nest. Mourning doves are strongly monogamous. Their nests are composed of two or three twigs that are placed on horizontal tree branches. These nests are flimsy and not very secure for eggs or nestlings. Sometimes mourning doves use old robin or bluebird nests as their own. In grasslands, mourning doves will nest on the ground. During nesting the male helps incubate the eggs, feed the nestlings, and chase away rival males. The eggs are typically incubated for 14 days, and the average clutch size is two. The recently hatched offspring are usually weaned at seven days and begin eating seeds. At 13 to 15 days, the young are fully fledged. The majority of bird species stop reproducing after a successful nest. However, mourning doves average five nests

per year. In July and August, juvenile doves begin flocking together at feeding and roosting sites. The flocks reach peak numbers in late August and early September. With the first signs of winter the mourning doves migrate south, most leaving by mid-October (MDC, 2007I).

Mourning doves have been very successful at adapting to and prospering from human influence. Native Americans set prairie fires that benefited doves by establishing bare ground for feeding sites and enhancing the growth of plants that produce seeds. Land use changes with modern settlement further increased the abundance of doves. These changes included forest clearing, crop farming, livestock grazing, and the burning and introduction of exotic seed-bearing plants, all of which helped dove populations. When the passenger pigeon became extinct in the early 1900s, mourning doves became popular as game birds. Recent land use changes, such as tree planting, irrigation, and building grain storage facilities, continue to enhance dove habitat. However, not all human activities have benefited mourning doves; the establishment of larger farms, clean farming (often includes fall plowing, no brushy fencerows, and frequent mowing), and chemical pollutants can reduce dove populations. (MDC, 2007I).

#### 2.4.1.2.3 Insects

Surveys of terrestrial insect communities were not performed in the study area. Preoperational studies indicated that the most abundant and diverse group was the insects (Class Insecta), particularly the orders Thysanoptera (thrips), Homoptera (true bugs), and Coleoptera (beetles) (UE 1976). Arachnids (Class Arachnida, or spiders and ticks) were also well represented. Species composition was comparable between 1974 and 1975 data.

The only federally listed threatened or endangered insect species in Missouri are the American burying beetle (*Nicrophorus americanus*) and the Hine's emerald dragonfly (*Somatochlora hineana*) (MDC, 2007a). Neither of these species has been encountered in the ecological investigation area of the Callaway site. Small populations of the American burying beetle have been reported from states adjacent to Missouri – Arkansas, Nebraska, and Oklahoma (USFWS, 2007), but none have been encountered in Missouri since prior to 1975 (MDC 2000). This species has not been collected from either Callaway or Osage Counties. The Hine's emerald dragonfly has been found on one site (a fen in Reynolds County in 1999) in Missouri, but has not been collected near the Callaway Site (MDC, 2000; USFWS, 2001).

An additional eight species of conservation concern have been reported from either Callaway or Osage counties (see [Table 2.4-1](#)). These include three dragonflies, the Ozark clubtail (*Gomphus ozarkensis*), the gilded river cruiser (*Macromia pacifica*), and Westfall's snaketail (*Ophiogomphus westfalli*), a stonefly (*Acroneuria ozarkensis*), two butterflies, the swamp metalmark (*Calephelis muticum*) and the regal fritillary (*Speyeria idalia*), and two katydids, the two-voiced conehead (*Neoconocephalus bivocatus*) and the round-tipped conehead (*N. retusus*). Of these eight species, four (*G. ozarkensis*, *M. pacifica*, *N. bivocatus*, and *N. retusus*) are either not ranked globally or have an apparently secure (G4) status. Of the remaining group, two (*A. ozarkensis* and *O. westfalli*) have been collected only in Osage County, where activities are not anticipated to affect potential habitats for these species. None of these species were mentioned as being of concern during agency consultation associated with this project (MDC, 2007m; USFWS, 2007b) and are, therefore, not considered important species.

#### 2.4.1.2.4 Plants

Methodology for the identification of terrestrial plants within the ecological investigation area consisted of records review (recorded distributional records) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies

(Union Electric Company, 1976; Fuller, 1981; Union Electric Company, 1987) as well as additional field studies including vegetative cover type mapping and ground truthing, general site reconnaissance, and transect surveys along the same five study transects established in upland forest, bottomland forest, grassland and old field habitat. Pedestrian transect surveys were performed during the growing season in the spring and fall in order to record the various terrestrial plant species growing on site (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of terrestrial plant species and to aid in the identification of important species within the AmerenUE property. Refer to [Figure 2.4-3](#) for terrestrial ecology study locations on site. The complete list of terrestrial plants observed on site is recorded in [Table 2.4-5](#). Based on the methodology outlined above, there were no terrestrial plant species identified as important species at the AmerenUE property.

#### 2.4.1.2.5 Habitats

At the AmerenUE property two terrestrial habitat types have been identified as important habitats: limestone glade and U.S. Army Corps of Engineers (USACE) jurisdictional wetlands (see [Figure 2.4-4](#)). Glades are open, rocky, barren areas dominated by drought-adapted forbs, native warm-season grasses and typically contain an assemblage of specialized fauna. They appear as essentially treeless openings within landscapes primarily dominated by woodlands. Rock outcrops characterize glades with bedrock near the surface, shallow soils and the absence of a developed canopy layer (Nelson, 2005). Limestone glades are listed as imperiled with a State Rank S2 (S2 = Imperiled in the state because of rarity or because of some factor(s) making it especially vulnerable to extirpation from the state) (MDC, 2007a). Limestone glades cover approximately 4 acres (1.6 hectares) within the AmerenUE property and are situated on narrow midslope bands on southwest-facing forested slopes. The MDC has engaged in periodic cutting and burning to remove invading cedar trees. Common glade species observed include side oats grama (*Bouteloua curtipendula*), big bluestem, little bluestem, purple prairie clover (*Dalea purpurea*), Missouri black-eyed Susan (*Rudbeckia missouriensis*), and aromatic sumac.

The objective of the Clean Water Act (CWA) is to maintain and restore the chemical, physical, and biological integrity of the waters of the United States. Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to regulate via a permit system the discharge of dredged or fill material into the waters of the United States, including wetlands. As such, the USACE issued the *Corps of Engineers Wetlands Delineation Manual* in January of 1987 (hereafter referred to as the 1987 Manual) to provide the methodology to determine whether a given area is a wetland for purposes of CWA Section 404 compliance. The 1987 Manual is the currently accepted guidance document for making wetland determinations and is the guiding document used to identify and delineate jurisdictional wetlands at the AmerenUE property. Wetlands at the AmerenUE property were delineated within the construction zones for the planned Unit 2, transmission line corridor, and collector well system in the floodplain of the Missouri River. Site wetlands included palustrine emergent wetlands (PEM), palustrine scrub shrub wetlands (PSS) and palustrine forested wetlands (PFO). Characteristic species within these wetlands include black willow, peach-leaved willow, silver maple, narrow-leaved cattail, and various sedge species. Jurisdictional wetlands on site are included within the Woody-Dominated Wetland and Herbaceous-Dominated Wetland land cover types as described in Section 2.4.1.1. It should be noted that not all areas mapped as Woody-Dominated Wetland or Herbaceous-Dominated Wetland would qualify as jurisdictional wetlands in accordance with the 1987 Manual. The jurisdictional wetlands delineated within the construction zones for the planned Unit 2, transmission line corridor, and collector well system in the floodplain of the Missouri River are identified in [Figure 2.4-4](#).



### 2.4.1.2.6 Herpetofauna

Methodology for the identification of amphibians and reptiles (herpetofauna) within the ecological investigation area consisted of records review (i.e., recorded range/distributional records and MDC records for game species) and agency consultation. Appropriate agency consultation was conducted as described in Section 2.4.1.8. On the AmerenUE property these methods were supplemented with a review of previous studies (Union Electric, 1976) as well as additional field studies including general site reconnaissance and observation, spring night-time audio surveys for calling frogs and toads, live turtle traps, and transect surveys along the same five study transects established in upland forest, bottomland forest, grassland and old field habitat. Live turtle traps consisted of hoop net traps that were baited with fresh fish. Five traps were run for two consecutive days during the spring and fall season at various site ponds and streams (MACTEC, 2007). Supplemental field studies within the site were used in part to characterize the assemblage of amphibian and reptile species and to aid in the identification of important species within the AmerenUE property. Refer to [Figure 2.4-3](#) for terrestrial ecology study locations on site. Typical herpetofauna species observed during field surveys included Blanchard's cricket frog (*Acris crepitans*), American toad (*Bufo americanus*), bullfrog (*Rana catesbiana*), fence lizard (*Sclerophorus undulatus hyacinthinus*), and red-eared slider (*Trachemys scripta elegans*). The complete list of herpetofauna observed on site is recorded in [Table 2.4-6](#). Based on the methodology outlined above there were no amphibian or reptiles identified as important species at the AmerenUE property.

### 2.4.1.3 Habitat Importance

The importance of the habitat found at the Callaway Plant Unit 2 site to important terrestrial species is discussed in the following paragraphs.

**White-tail Deer:** As habitat generalists white-tail deer can adapt to a variety of environments. The population at the AmerenUE property is so large that a managed hunt was introduced in 2007 to help reduce the population. Due to their ability to adapt to a variety of habitats, white-tail deer populations are resilient and are not often affected by localized habitat changes. In fact, white-tail deer populations have grown in the midst of habitat fragmentation associated with human construction and development. A discussion of the potential impacts to white-tail deer and the other important species as a result of the proposed construction activities is included in Section 4.3.

**Gray Bat:** Gray bats have been recorded historically in the ecological investigation area in the vicinity of the AmerenUE property in a cave along Auxvasse Creek. However, there are no known records of gray bats on the AmerenUE property and no bat surveys were conducted in 2007. Potential foraging habitat is available along the riparian zones of Auxvasse Creek, Logan Creek, Mud Creek, Molly Dozier Slough, and the Missouri River.

**Indiana Bat:** Indiana bats have been recorded historically and are assumed to be present in the vicinity of the AmerenUE property. Large diameter trees with cavities or flaking bark that may provide roosting habitat exist at the site. Potential foraging habitat is available along the riparian zones of Auxvasse Creek, Logan Creek, Mud Creek, Molly Dozier Slough and the Missouri River and also in upland forested areas.

**Bald Eagle:** Although no nesting sites are known at the AmerenUE property, there is potential roosting and nesting habitat along the Missouri River. Since bald eagles will often reuse the same nest for many years, any disturbance to nesting sites could prevent the use of such nests in the future. Bald eagles invest much less energy into roosting sites, so these sites are less often reused.



**Northern Harrier:** Two northern harriers were observed at the AmerenUE property during the 2007 bird surveys. Northern harrier foraging habitat includes open fields, grasslands, prairies, and shallow marshes.

**Northern bobwhite:** Twenty-nine northern bobwhites were observed during the 2007 bird surveys at AmerenUE property. Since this species' breeding success is greatly affected by inclement weather, potential nesting areas with adequate cover are important habitats. Their preferred habitat includes tall grasslands, brushland, agricultural fields, and open woodlands (MDC, 2007j).

**Wild Turkey:** Forty wild turkeys were observed during the 2007 bird survey at the AmerenUE property. In addition, the Callaway County harvest numbers for wild turkey reflect the presence of a healthy population of wild turkeys. Wild turkeys use a variety of habitats based on their different needs at different times of year, including mature hardwood forest, old field, along trails, mowed hay fields, grazed pastures, glades, or open woods.

**Mourning Dove:** The mourning dove is one of the most widely distributed and abundant birds in North America; it is found in all 48 contiguous states, Hawaii, southeastern Alaska, southern Canada, the Greater Antilles and Mexico. In Missouri, the mourning dove is found in every county in the state with the largest populations being found in the west central portion. The 2007 bird surveys at the AmerenUE property observed 102 mourning doves in various habitats indicating a healthy population.

#### **2.4.1.4 Disease Vector and Pest Species**

A disease vector is an organism (commonly an insect) that carries disease agents (commonly bacteria or fungi) to a receptor host, which can be man, domestic or wild animals, or crops or wild plants. The only disease vector known to occur on the AmerenUE property is the deer tick (*Ixodes scapularis*) which has been known to transmit Lyme disease to humans. Lyme disease is a non-fatal but debilitating disease whose victims can display fever and severe joint pain. The causal agent is a bacterium, *Borrelia burgdorferi*, which is transmitted by the deer tick from white-tailed deer, squirrels, rodents, and other mammalian wildlife to humans.

No pest species are known to be widespread or cause serious problems at the AmerenUE property and surrounding ecological investigation area. Sericea lespedeza (*Lespedeza cuneata*), however, is a non-native invasive plant species prevalent at several locations on the AmerenUE property primarily in disturbed areas. Sericea lespedeza was especially prevalent along roadside right of way (ROW) areas, transmission line corridors, fallow fields, and other areas of recent human disturbance. Sericea lespedeza is a native of eastern Asia and was originally introduced into the southern United States for ground cover, erosion control and forage/hay. Each mature plant can produce thousands of seeds which are dispersed in the fall by mowing, haying and bird consumption. Seeds may remain viable for several decades. Sericea lespedeza is problematic because it spreads rapidly, it is extremely difficult to control, and it out-competes and replaces many native species. Since its introduction into Missouri, sericea lespedeza has been widely planted and has become naturalized in most if not all Missouri counties. Although sericea lespedeza is designated a noxious weed in several Kansas counties, it has not yet been declared noxious in the State of Missouri.

#### **2.4.1.5 Wildlife Travel Corridors**

Wildlife tends to move across landscapes using distinct corridors of favorable habitat. Movement of most forest wildlife across fragmented agricultural and rural landscapes is enhanced by linear corridors of forest consisting of forested hedgerows, forested stream

corridors, and forested ridge tops. The minimum width for a forest corridor to benefit wildlife is not known but may vary among species depending on body size and species-specific requirements. Wildlife movement may also be enhanced with closely spaced patches of favorable habitat that form “stepping stones” across areas of unfavorable habitat.

The landscape within the ecological investigation area is predominantly forested land fragmented by agricultural fields, small rural towns (Reform and Steedman), and rural residences. The landscape is crossed by a network of stream valleys – Auxvasse Creek, Mud Creek, Logan Creek, Big Tavern Creek, and their numerous unnamed tributaries. Most of the stream valleys in the lower reaches of the named creeks, however, have been cleared for agriculture. The riparian zones of the upper reaches of the named creeks and their smaller tributaries are mostly forested.

Within the AmerenUE property, the landscape is again mostly forested land fragmented by agricultural fields and the infrastructure associated with Callaway Plant Unit 1. The area to the south of Callaway Plant Unit 1 consists of predominantly large tracts of upland forest with small clearings for roads, transmission lines or small hayfields/pasture. Wildlife movement within this area is presumed to be essentially unimpeded. Immediately surrounding Callaway Plant Unit 1 and extending to the north, the landscape is more fragmented with large agriculture fields and narrow strips of woodland and hedgerow. These narrow strips of woodland and hedgerow may facilitate wildlife movement within and through the agricultural landscape.

The new water supply collector well system will be located within the floodplain of the Missouri River which primarily consists of row crops bordered by narrow bands of floodplain forest along the banks of the Missouri River and Mollie Dozier Chute. This floodplain corridor facilitates the movement of riparian zone species such as the gray bat, Indiana bat and bald eagle.

The AmerenUE property is located on the western edge of the Mississippi River “flyway” for migratory waterfowl. Spot surveys were conducted in the spring of 2007 to evaluate the relative importance of site wetlands and ponds to migratory waterfowl. The only pond where waterfowl were congregating was P-6 but the numbers were small. In general, the ponds at the AmerenUE property are not considered a significant resource for migratory waterfowl.

The AmerenUE property is part of a larger avian travel corridor for neotropical migratory bird species. Bird surveys conducted in 2007 demonstrate the movement of neotropical species through the site, as evidenced particularly by the spring 2007 surveys.

#### **2.4.1.6 Existing Natural and Man-Induced Ecological Effects**

Existing natural stressors to site ecosystems include weather conditions, diseases, and insects. Plant species (especially trees) vary in their tolerance of, or sensitivity to, adverse conditions brought about by any of the aforementioned stressors. Sometimes tree decline and death can be attributed to a single condition, but often it is the interaction of multiple stressors that is the ultimate cause of death. Unseasonable frost, drought, flooding, lightning damage, and high winds are all examples of weather conditions that can stress trees. Anthropogenic activities such as mechanical injury from cutting and trimming associated with transmission line corridor clearing also cause stress on trees. In some cases, these environmental conditions can cause outright death. In other cases, these conditions can stress trees to the point that they are no longer able to withstand invasion by secondary disease organisms or insect pests (MACTEC, 2008).

Disease is a condition in plants brought about as a result of invasion of plant tissues by microorganisms. Primary diseases, such as oak wilt (*Ceratocystis fagacearum*) and Dutch elm

disease (*Ophiostoma* sp.), are caused by microorganisms that can invade healthy plant tissues. These organisms consume plant-supplied water and nutrient reserves for their own growth, thereby creating stress on the tree. General forest decline disease complexes are generally caused by microorganisms that cannot invade tissues of healthy plants. When plants are stressed or injured, however, their normal resistance to invasion by decline-associated insects and pathogens is lowered. The disease-complex organisms then are able to invade plant tissues, causing further stress potentially leading to death of the tree (MACTEC, 2008).

Insects may cause direct or indirect damage to plants that may result in stress. Direct damage usually is a result of feeding on plant parts such as leaves, bark (cambial layers), wood, or roots. Oviposition (egg-laying) is another type of direct damage that can restrict the flow of water and nutrients in the plant. Insects may also cause indirect damage by serving as vectors of disease-causing organisms. In certain highly evolved pathologic systems, one or more insect-pathogen associations have evolved to spread disease within and among host plant populations (MACTEC, 2008).

Several upland areas in the northern part of the AmerenUE property are currently used for agriculture including row crops and hay/pasture land. Agricultural activities at the Reform CA in 2006 included 683 acres (276 hectares) of row crops (corn, wheat and soybeans), 409 acres (166 hectares) of hay, and over 800 acres (324 hectares) of pasture for grazing cattle. Permittee farmers also cleared approximately 270 acres (109 hectares) in 2006 for additional cropland, pasture and hayfields (Newbold, 2007). Furthermore, areas under the existing electric transmission lines on the AmerenUE property are periodically mowed and treated with herbicides to maintain the corridors and prevent trees from growing.

#### **2.4.1.7 Other Ecological and Biological Studies**

A forest pathology study was performed at the AmerenUE property in 2007 using infrared aerial photography (flown in July 2007), photointerpretation and subsequent ground-based evaluation and diagnosis of stress and/or disease. Field phytopathological assessment and diagnosis was supported by laboratory analysis of field samples as needed. This study was performed to provide a baseline assessment of forest health prior to construction and operation of Unit 2 facilities. Most of the deciduous and evergreen tree cover at the AmerenUE property and surrounding area was determined to be healthy and in good condition. However, due to the interaction of weather-related stressors, disease, and insect factors, some general decline was determined to be inevitable. There seemed to be no apparent pattern of stressed vegetation and the general forest decline noted did not appear to be due to the operation of the Callaway Plant Unit 1. The study concluded that the general health of the forests at the AmerenUE property is typical of other forests of similar age and stand structure in Missouri (MACTEC, 2008).

No other ecological or biological studies are known from the AmerenUE property within the last five years other than the surveys described herein. These studies were completed in spring 2008.

#### **2.4.1.8 Regulatory Consultation**

Agency consultation was conducted to identify known occurrences of Federal and State listed threatened, endangered, or special status species and critical habitat at the AmerenUE property and ecological investigation area. Regulatory consultation included correspondence with the MDC and the USFWS. Agency consultation letters are provided (MDC, 2007m; USFWS, 2007b) and were used in part to identify important species, as defined in NUREG-1555 (NRC, 1999). Important species are identified in Sections 2.4.1.2 (Terrestrial) and 2.4.2.2 (Aquatic).

### 2.4.1.9 Offsite Transmission and Access Corridors

There will be one new transmission line associated with the construction and operation of Callaway Plant Unit 2. This new transmission line will be approximately 6.7 miles (10.8 km) in length and 150 ft (45.7 m) in width and will be located immediately adjacent to (and on the west side of) the existing transmission line which extends southward out of the plant and crosses the Missouri River (Figure 2.4-4). The new transmission line will terminate at the tie-in point with another transmission line coming from the west called the Loose Creek line.

Methodology for the identification of flora and fauna within the transmission line corridor is the same as discussed in Sections 2.4.1.1 (Terrestrial Habitat) and 2.4.1.2 (Important Terrestrial Species and Habitat).

The planned transmission line corridor consists of areas mapped predominantly as Deciduous Forest, Deciduous Woody/Herbaceous, and Cropland. Dominant trees within the Deciduous Forest include white oak, black oak, northern red oak, shagbark hickory, sugar maple, and white ash. The Deciduous Woody/Herbaceous cover type consists of open woodland and early successional forest and includes various oak species, persimmon, sassafras, slippery elm, coral berry, aromatic sumac, and various herbaceous old field species. Cropland within the transmission line corridor consists of row crops such as corn and soy beans.

Other terrestrial habitats mapped within the planned transmission line corridor include Grassland, Evergreen Woody/Herbaceous, Woody-Dominated Wetland, and Herbaceous-Dominated Wetland. Complete descriptions of these cover types are provided in Section 2.4.1.1.

Common fauna encountered within the transmission line corridor include white-tailed deer, gray squirrel, eastern cottontail, northern cardinal, American goldfinch, eastern wood pewee, downy woodpecker, northern mockingbird, and mourning dove. Important species that may utilize the transmission line corridor include white-tailed deer, mourning dove, bobwhite quail, and wild turkey. No rare, threatened, or endangered species (flora or fauna) were observed within the transmission line corridor.}

## 2.4.2 AQUATIC ECOLOGY

### 2.4.2.1 Aquatic Habitats

#### 2.4.2.1.1 Freshwater Bodies Onsite

Freshwater bodies near the AmerenUE property include eight ponds approximately circling the operational and main proposed construction areas, several ephemeral or intermittent streams in all directions, 2 permanent streams to the south, and the Missouri River to the south (Figure 2.4-5). Drainage east of the plant enters a series of intermittent tributaries of Logan Creek, which drains directly into the Missouri River approximately 0.5 miles (0.8 km) downstream of the plant water intake structure. Drainage north and northwest of the plant enters intermittent tributaries of Auxvasse Creek, which drains into the Missouri River approximately 6 miles (10 km) upstream of the intake structure. Drainage southwest of the plant enters intermittent tributaries of Mud Creek, which drains into Logan Creek approximately 2.5 miles (4.0 km) before it enters the Missouri River. Streams, with the exception of lower Logan Creek, have substrates consisting primarily of gravel and cobble, with sand generally present and boulders occasionally present. Lower Logan Creek has predominantly sand substrate.

Surveys of adult and juvenile fish in the Missouri River and in selected streams in the ecological investigation area were conducted in July 2007, October 2007, January 2008 and March/April 2008 (Table 2.4-7). Benthic macroinvertebrate surveys in the same locations were performed in September 2007 (Missouri River), November 2007 (streams), and March 2008 (streams) and April (Missouri River and streams) 2008 (Table 2.4-10). Fish sampling methods followed the procedures used in the pre-operational environmental study at the Callaway site. Macroinvertebrate methods followed the procedures used in that study for collections from the Missouri River. For stream macroinvertebrate collections, methods followed those currently recommended by the Missouri Department of Natural Resources (MDNR, 2002).

#### 2.4.2.1.1.1 Missouri River

In the Missouri River, six fish sampling locations were surveyed using shoreline electrofishing, gill netting, hoop netting, and beach seining. A total of 4,128 fish representing 45 distinct species was collected (Table 2.4-8). Results indicated communities typical of large river habitats, including several species (e.g., shovelnose sturgeon, paddlefish, river shiner, channel shiner, and blue sucker) that are typically caught only in major rivers (Pflieger 1997). Samples were numerically dominated by gizzard shad, red shiner, and emerald shiner. Other common large-river species present in samples included shovelnose sturgeon, speckled chub, bullhead minnow, river carpsucker, channel catfish, and freshwater drum. Total abundance was substantially greater, and species richness was slightly higher, in collections from the near shore (plant side) zones. Total abundance was also higher in the zones adjacent to, and downstream of, the plant intake as compared to the zone upstream of the intake. Total richness was greatest in the adjacent zone (34 species), followed closely by the upstream (33) and downstream (30) zones, respectively. Abundance patterns primarily reflected differential capture of schooling species, rather than habitat differences among sampling locations. Nearly all species that have been consistently encountered in historical collections from this reach of the Missouri River were found in the 2007 – 2008 survey (UE, 1976; CDM, 1981; C. Gemming, MDC, personal communication August 17, 2007). The exceptions were highfin carpsucker and white crappie. Catch-per-unit-effort (CPE) rates were greatest in electrofishing and seining samples, substantially lower in gill net samples, and extremely low in hoop net samples (Table 2.4-9). The same trend was evident for species richness. Gill netting resulted in the capture of two species – lake sturgeon and paddlefish – that were not collected by any other method. Black crappie was collected only while hoop netting.

Benthic macroinvertebrate communities were likewise characteristic of large rivers. A total of 814 organisms representing 54 taxa was obtained in these surveys (Table 2.4-10). Taxonomic composition and abundance were much greater in towed (water column) samples than in ponar (depositional substrate) samples (Table 2.4-11). The most abundant taxa in ponar samples included burrowing mayflies (Hexagenia and Pentagenia), the Asiatic clam Corbicula, and tubificid worms. In tow samples, the mayfly Labiobaetis and the caddisflies Hydropsyche orris and Potamyia flava were the dominant taxa. Communities did not clearly differ between locations upstream and downstream of Callaway Plant, although both abundance was somewhat greater and taxa richness was slightly higher in the downstream zone. Both areas had numerous representatives of the Ephemeroptera, Plecoptera, and Trichoptera (EPT) groups, a category that is indicative of good stream quality (DeShon 1995; Barbour, et al. 1999). Many taxa that were reported in historical macroinvertebrate surveys were also collected in 2007 – 2008, despite much less sampling effort (UE, 1976; CDM, 1981, Poulton et al., 2005). The most extensive taxa list for the Missouri River in the study area was reported by CDM (1981), when monthly surveys were conducted.

#### 2.4.2.1.1.2 Small Streams

Surveys for fish and benthic macroinvertebrates were performed in seven stream segments on the AmerenUE property (see [Figure 2.4-5](#)). These included Logan Creek (one perennial and two intermittent segments), Mud Creek (one perennial and one intermittent segment), and unnamed tributaries of Auxvasse Creek (two intermittent segments). Samples were collected using 6-ft by 6-ft kick seines in riffle areas and 6-ft by 20-ft seines in the run and pool habitats. In summer and fall 2007, only three of the seven streams contained water, but these contained fish assemblages indicative of small, rocky-bottomed streams. In January 2008, two attempts were made to sample these streams. The first occasion followed a thunderstorm and the streams were too high and turbid to sample. On the second occasion, the streams that contained water were covered with ice more than an inch thick, and samples were not taken. In March, all seven streams contained flowing water, a reflection of the relatively wet conditions present in the early months of 2008. Samples from the two perennial stream segments were numerically dominated by sand shiner (Logan Creek only), redbfin shiner, and mosquitofish ([Table 2.4-12](#)). Other common or abundant species included stonerollers, red shiner, creek chub and orangethroat darter. In the intermittent stream segment – a tributary of Auxvasse Creek – that generally contained water, stonerollers comprised nearly 50% of the collection, with most of the rest consisting of juvenile centrarchids. For three of the four streams that contained water only in March 2008, abundance was extremely low. In the fourth – a tributary of Logan Creek – the assemblage consisted almost entirely of juvenile centrarchids. Taxonomic richness was substantially higher in the two perennial segments, ranging from 16 to 21 species, as compared to only 5 or less in the intermittent sample reaches. No threatened or endangered species, or species of special conservation concern were found in these samples. Almost all the stream species that were collected in previous surveys of creeks in the AmerenUE property (CDM, 1981 and 1982; C. Gemming, MDC, personal communication August 17, 2007) were collected in the present study. The exceptions included golden shiner and common shiner in the 1981 study, and fathead minnow and blackspotted topminnow in the 2003 (MDC) study.

Benthic macroinvertebrate collections were performed at 3 of the 7 small stream locations in fall 2007 – the perennial segments of Logan Creek and Mud Creek and at one of the intermittent tributaries of Auxvasse Creek. In March 2008, all seven contained flowing water and invertebrate assemblages. A total of 928 specimens representing 56 distinct taxa was found in these samples ([Table 2.4-13](#)). As noted in the fish surveys, total richness was greater in the permanent sections of Mud Creek and Logan Creek (56 to 63 taxa) as compared to the intermittent stream sections (19 to 39 taxa). Crustaceans, particularly the isopods Caecidotea and Lirceus, and the amphipod Crangonyx were common to abundant in the study area. Flatworms (Turbellaria), mollusks (e.g., physid snails and sphaeriid clams), and tubificid worms (e.g., Branchiura sowerbyi and Limnodrilus spp) were other common non-insect taxa. Mayflies (Caenis and Stenonema femoratum), stoneflies (Allocaenia and Isoperia) and caddisflies (Ironoquia and Rhyacophila spp) were most numerous in the permanent sections of Logan and Mud creeks. Aquatic beetles were largely represented by the riffle beetles Dubiraphia and Stenelmis, and the water penny Ectopria. Among the dipteran family Chironomidae, the most abundant genus was Hydrobaenus, Cricotopus/Orthocladius, Chironomus, Eukiefferiella claripennis gp. Glyptotendipes, Kiefferulus, and Stictochironomus) were also common at one or more of the sample sites.

#### 2.4.2.1.1.3 Ponds

Six of the eight ponds at the site were built as catch basins during the original construction of the plant and two existed prior to Unit 1 construction (see [Figure 2.4-5](#)). They were built near the upper points of intermittent drainages, to prevent migration of material away from the site. They range approximately in size (area) from 2 to 15 acres (0.8 to 6.1 hectares). Depths are

generally five feet or less. Deeper spots (7 ft to 10 ft (2 m to 3 m)) were found during surveys at ponds P1 and P6. Four of the ponds (P1, P2, P7, and P8) are actively managed by MDC, and are open to the public for fishing (S. Voney, MDC, personal communication, August 15, 2007; B. McKeage, MDC, personal communication). Surveys of three of the ponds (P1, P6, and P8) were conducted by MDC in June 2004. Four species were collected. Largemouth bass and bluegill were common to abundant in each of the ponds. Two to three channel catfish were found in each pond. A single green sunfish was collected in P6. Each of the ponds contained young-of-the-year centrarchids, indicating that some reproductive activity is occurring.

In 1984, MDC stocked lake sturgeon into five of the ponds – P1, P2, P4, P5, and P6. Gill net surveys were performed in November 2007 in an attempt to determine whether individuals of this species remained in any of these ponds. A total sampling effort of 4 to 6 net days was performed at each pond. No fish were collected at ponds P2 and P4, although common snapping turtles – ranging from 8.2 inches to 9.4 inches (205 mm to 235 mm) in carapace length – were found in each. At pond P1, one common carp 16.1 inches (403 mm in length) and two channel catfish 17.4 inches to 18.5 inches (434 mm to 462 mm) were collected. At pond P6, three channel catfish 27.6 inches to 29.3 inches (691 mm to 733 mm) were found, and at P7, two channel catfish 15.6 inches to 17.4 inches (390 mm to 435 mm) and two freshwater drum 15.9 inches to 16.2 inches (397 mm to 405 mm) were collected.

#### 2.4.2.1.1.4 Wetlands and Other Waters of the U.S.

Wetlands and streams were delineated on the AmerenUE property within the Unit 2 construction zone, the Unit 2 transmission line corridor (described in Section 2.4.1.9), and within the potential construction zone for the new water intake facilities in the well field area of the Missouri River. Wetlands were delineated in accordance with the 1987 *Corps of Engineers Wetlands Delineation Manual*. In addition, wetlands were deemed jurisdictional waters of the United States if a direct hydrologic connection could be made to a Traditional Navigable Water, such as the Missouri River, in accordance with the U.S. Supreme Court ruling in *Solid Waste Agency of Northern Cook County versus U.S. Army Corps of Engineers*. Streams were identified as jurisdictional waters of the United States based on the presence of an ordinary high water mark (OHWM), bed and bank, and the presence of a surface water connection to Traditional Navigable Waters of the United States such as the Missouri River.

Because the Callaway Site was sited at the highest point in the local landscape, several small drainages radiate away from the plant to the north and south. These small unnamed streams are tributary to several named streams in the site and ecological investigation area including Auxvasse Creek, Mud Creek, and Logan Creek, all of which are tributary to the Missouri River. Since the small unnamed drainages and named streams are connected to the traditionally navigable waters of the Missouri River, all said drainages and streams are considered jurisdictional waters of the U.S.

In general, four wetland types were delineated at the AmerenUE property: isolated ponds, stormwater runoff ponds, Logan Creek wetlands, and big river wetlands located within the Missouri River floodplain. Functional values for each of the four wetland types are presented in [Table 2.4-14](#).

**Isolated Ponds** – In the higher elevations surrounding the plant site are several small, non-jurisdictional, isolated ponds which are classified by Cowardin, et al. (1979) as palustrine unconsolidated bottom (PUB) wetlands. Most of these isolated ponds are man-made and were constructed for grazing cattle. Some of the isolated ponds have developed a fringe community of wetland vegetation consisting of cattails (*Typha angustifolia* and *T. latifolia*), arrowhead (*Sagittaria latifolia*), sedges (*Carex spp.*) and willows (*Salix amygdaloides* and *S. nigra*). The



isolated ponds surrounding the AmerenUE property are typically too small and many are not permanent enough (vernal) to support fish which makes them valuable breeding habitat for salamander, frog, and toad species. This is especially true for the ponds not being used by cattle. Because the ponds are not connected via a significant nexus to the traditionally navigable waters of the Missouri River, the isolated ponds are not considered jurisdictional waters of the U.S. and would not be regulated by the USACE.

Site Ponds – Also located in the higher elevations surrounding the Callaway Plant are the larger site ponds (designated as P-1 through P-8 in [Figure 2.4-5](#)) on the small unnamed streams radiating away from the plant. Six of the ponds were constructed as impoundments or catch basins during construction of Callaway Plant Unit 1. Because ponds P-2 through P-8 have a surface water connection to the unnamed streams which eventually flow into named streams and then to the Missouri River, these ponds are considered jurisdictional waters of the U.S. runoff pond P-1 is isolated and, thus, is not a jurisdictional water of the U.S. Some of the ponds have developed an emergent (PEM) or scrub-shrub (PSS) wetland fringe consisting of American lotus (*Nelumbo lutea*), cattails, sedges, and occasional black and peach-leaved willows. Because they are located in the headwaters of the various stream systems in the area, the ponds have played a valuable role in controlling runoff and retaining sediment. Ponds P-1, P-2, P-7, and P-8 are actively managed by the MDC and are open to the public for fishing. For additional information on the ponds see Section 2.4.2.1.1.3.

Logan Creek Wetlands – Only a small portion of the Logan Creek floodplain was surveyed for wetlands, primarily the portion that is traversed by the transmission line corridor. In this area a few wetlands were delineated with portions of PEM, PSS, and Palustrine Forested (PFO) wetlands in accordance with the Cowardin system (Cowardin, et al., 1979). These wetlands have direct surface water connections to Logan Creek and are thus considered jurisdictional waters of the U.S. Hydrophytic vegetation includes the dark green rush (*Scirpus atrovirens*), river oats (*Chasmanthium latifolium*), buttonbush (*Cephalanthus occidentalis*), black willow, silver maple (*Acer saccharinum*), and box elder (*A. negundo*).

Big River Wetlands – Wetlands identified on the floodplain of the Missouri River have been classified as either PEM, PSS or PFO wetlands (Cowardin, et al., 1979) and manifest the greatest overall functional value when compared with the other wetland types identified at the AmerenUE property ([Table 2.4-14](#)). High functional values associated with these wetlands include groundwater recharge/discharge, flood storage, fish habitat, nutrient/contaminant removal, wildlife habitat, and uniqueness/heritage value due to their importance for listed species such as gray bats (*Myotis grisescens*), Indiana bats (*M. sodalis*), and bald eagles (*Haliaeetus leucocephalus*). Many of the same plant species identified in the Logan Creek wetlands were also observed in the Missouri River floodplain wetlands. These big river wetlands are considered adjacent to the traditionally navigable waters of the Missouri River and are thus jurisdictional waters of the U.S.

#### 2.4.2.2 Important Aquatic Species

NUREG-1555 (NRC, 1999a) defines important species as: 1) species listed or proposed for listing as threatened, endangered, candidate, or of concern in 50 CFR 17.11 and 50 CFR 17.12 (CFR, 2007a), by the U.S. Fish and Wildlife Service, or the state in which the project is located; 2) commercially or recreationally valuable species; 3) species essential to the maintenance and survival of rare or commercially or recreationally valuable species; 4) species critical to the structure and function of local terrestrial ecosystems; or 5) species that could serve as biological indicators of effects on local terrestrial ecosystems.



A list of species considered important in the project area was compiled based on these criteria and summarized in [Table 2.4-15](#). A single species may meet more than one of the five criteria. A 6<sup>th</sup> criterion, status as a potential nuisance to plant operation, is not discussed, as no nuisance aquatic species are expected to occur in the ecological investigation area of the project area.

- ◆ Species Under Special Protection – Threatened, Endangered, or Candidate Species: Any species that is known to occur or could occur in the various water bodies near the AmerenUE site that is afforded special protection under the federal Endangered Species Act, or under the equivalent State of Missouri law, is defined as an important species.
- ◆ Commercially Harvested Species: Fish that rely on habitat in the ecological investigation area of the AmerenUE site during any life stage, and are commercially harvested to a substantial degree, are considered important resources.
- ◆ Recreational Target Species: Fish that rely on habitat in the ecological investigation area of the AmerenUE property during any life stage, and are preferentially taken by recreational anglers or trappers to a substantial degree are considered important resources.
- ◆ Keystone Species: Any species that is essential to maintaining the structure and function of the aquatic ecosystem in the ecological investigation area of the AmerenUE site will be identified as important.
- ◆ Indicator Species: A species whose abundance, distribution, or condition is known or believed to be a reliable predictor of the status of another species of interest is considered an important species.

#### 2.4.2.2.1 Description of Important Species

Each important species is described in terms of the following parameters, which provide a context within which site-related effects may be measured and interpreted:

- ◆ Critical life support (natural history) requirements, including spawning areas, nursery grounds, food habits, feeding areas, wintering areas, and migration routes (including maps)
- ◆ Temporal and three-dimensional spatial distribution and abundance, especially in the discharge area and receiving water body (including maps)
- ◆ Seasonal catch data (location, volume, and value) for commercially and recreationally important species
- ◆ Existing stressors and adverse effects not related to the proposed project

#### 2.4.2.2.2 Threatened/Endangered Species or Species of Concern

Four fish and two unionid mussels that are listed as either federally endangered or state endangered may potentially occur near the study area and were considered for this analysis. The fish are lake sturgeon, Topeka shiner, flathead chub, and pallid sturgeon. The mussels are the pink mucket and the scaleshell. Although neither of these species have been collected in the vicinity of the project, they were mentioned as species of concern during consultation with malacologists from the Missouri Department of Conservation and U.S. Fish and Wildlife Service

(MDC, 2007m; USFWS, 2007b). Due to the remote likelihood of encountering either pink mucket or scaleshell in the study area, assessment of these species was limited to searches of historical records. Neither has been found in the Missouri River near the site, or in Auxvasse Creek – the only stream in the vicinity of the Callaway Site where surveys have been performed (S. McMurray, MDC, personal communication November 28, 2007). Six additional fish species were considered that were: (a) listed as vulnerable (S3) in Missouri (MDC, 2007a); (b) listed as critically imperiled (G1), imperiled (G2), or vulnerable (G3) globally (MDC 2007); and (c) had previously been collected in the study area (Pflieger, 1997) or were collected during this study. These are paddlefish, sturgeon chub, sicklefin chub, blacknose shiner, blue sucker, and plains topminnow.

Fifteen additional species that have been encountered in either Callaway or Osage County and that are included in Missouri's list of conservation concern (MDC, 2008) are listed in [Table 2.4-1](#). These included nine fish and six mussel species, and were excluded from the following sections for one of three reasons. First, seven of the fish species – highfin carpsucker, starhead topminnow, mooneye, western silvery minnow, plains minnow, silver chub, and ghost shiner – have global status as secure (G5) or apparently secure (G4) (MDC, 2008). Second, two of the fish species – Alabama shad and Niangua darter – were encountered in streams of Osage County, but not in the Missouri River. No activity associated with this project is anticipated to affect any streams in Osage County. Third, the six mussel species – elktoe, rock pocketbook, spectaclecase, elephant ear, black sandshell, and hickorynut – did not come up as species of concern during consultation with malacologists from the Missouri Department of Conservation and U.S. Fish and Wildlife Service (MDC, 2007m; USFWS, 2007b). Consequently, none of these taxa were considered as important species.

#### 2.4.2.2.2.1 Lake Sturgeon

The lake sturgeon (*Acipenser fulvescens*) – listed as endangered by the state of Missouri – is a large (commonly 6 ft (1.8 m) or longer) primitive species that inhabits lakes and rivers in North America including the Mississippi River drainage and Hudson Bay and the Great Lakes (Pflieger, 1997). Prior to 1900, it was a common and economically important species. But overfishing, river pollution, and river damming have resulted in a steep decline in the number of lake sturgeon (Dewey, T. and D. Sturgeon, 2001).

The lake sturgeon feeds on the bottom searching for snails, clams, insect larvae, and crayfish. Due to the limited light on the river bottom, lake sturgeons use their sensitive barbels to locate food items. Spawning occurs in small tributary streams when water temperatures reach 59 to 64°F (typically late spring). More than 500,000 adhesive eggs are deposited by females in the shallow water of gravel riffles. Lake sturgeon are a slow-growing, long-lived species, not reaching sexual maturity until an age of 15 to 20 years old and only spawn every 4 to 7 years, from then on (Smith, 2002).

One sub-adult specimen 30.9 inches (773 mm) in total length was collected from the Missouri River in a gill net upstream and across the river from the Callaway Site in January 2008. This species has also been collected by MDC in the Missouri River between river miles 112 and 132 in the period from 2001 – 2006 (C. Gemming, MDC, personal communication, August 17, 2007). In the 1980s, the MDC conducted a stocking program and introduced juveniles into lakes and rivers of the state (Pflieger, 1997). Five ponds on the AmerenUE property were stocked during this program. In November 2007, AmerenUE's subcontractor biologists surveyed these ponds using large (3-inch and 4-inch (8-cm and 10-cm)) mesh gill nets. Two to four nets were set in each pond for 48 hours, and were checked every 12 hours. No lake sturgeons were collected during this effort. Since the species requires clean (i.e., silt-free) sand or gravel substrate to

spawn and extensive amounts of silt were present in these ponds, lake sturgeon may not have persisted.

#### **2.4.2.2.2.2 Topeka Shiner**

The Topeka shiner (*Notropis topeka*) – a federal and state endangered species – is a small, (1.5-inch to 2.5-inch (3.8-cm to 6.4-cm)) schooling minnow that occurs primarily in the runs and pools of prairie streams (Pflieger, 1997). Its historical distribution included portions of Iowa, Kansas, Minnesota, Missouri, Nebraska, and South Dakota (web, 2007). It has undergone a steep decline in abundance, believed to be primarily associated with increased sedimentation and water quality degradation from pesticide application, livestock operations, and urban development (Pflieger, 1997).

The Topeka shiner is a carnivorous, schooling fish found near the water surface or the midwater. In central Missouri, spawning occurs from late May to mid-July. During the spawning act, males will follow females by swimming below them. Topeka shiners spawn over the nests of green-and orange-spotted sunfish with males occupying territories around the edges of the sunfish nests). Males grow faster and larger than females. Breeding males will be tinged with orange on their head and body and have orange-red fins. Small tubercles will be present over the top portion of their head. The life span of a Topeka shiner is short, not exceeding three years and the majority of individuals reach sexual maturity by age 2 (Pflieger, 1997).

The species was collected from Auxvasse Creek, west of the site but within the ecological investigation area of the AmerenUE property, prior to 1945 (Pflieger 1997), but was not found in stream collections of the 2007/2008 study or in previous surveys of Logan Creek (UE, 1976; CDM, 1982).

#### **2.4.2.2.2.3 Flathead Chub**

The flathead chub (*Platygobio gracilis*) is an endangered species in Missouri (MDC, 2007a). It is a small (generally 4-inch to 6-inch (10-cm to 15-cm)) minnow found in the mainstems of large streams and rivers, generally in swift, turbid water (Pflieger, 1997). Its abundance has declined, however, from high levels (approximately 30% of small fishes) in seine collections from the Mississippi and Missouri Rivers in the 1940s to about 1% in the 1980s (Pflieger, 1987). The primary threats to this species are hypothesized to be habitat alterations changing riverine habitats to standing water habitats of reservoirs (Rahel and Thel, 2004a). The consequent reduction in turbidity aids both sight-feeding competitors for food and piscivorous species that prey on the flathead chub (Rahel and Thel, 2004a).

This continually moving, active minnow is found in schools with other large-river minnows. Since the flathead chub inhabits more turbid waters, it relies on external taste buds to locate food items. Its diet primarily constitutes small terrestrial insects that fall into the water. Other food items include invertebrates and detritus. In Missouri, this fish spawns in July and August (Pflieger, 1997). Breeding males exhibit small tubercles on the upper portion of head and body and on all fins except the caudal fin. These fish spawn in response to flooding to keep their semi-buoyant eggs afloat until hatching occurs. Strong river currents are required during the hatch to keep the weak-swimming fry suspended. Otherwise, the fry would sink to the bottom and become buried (Rahel and Thel, 2004a).

Flathead chub has been collected from the Missouri River upstream and downstream of the study area since 1980 (Pflieger 1997), and was collected in small numbers in pre-operational surveys for Callaway Site (CDM, 1982). It was not collected in the current study.

#### 2.4.2.2.2.4 Pallid Sturgeon

The pallid sturgeon (*Scaphirhynchus albus*) is a federally listed endangered species, as well as an endangered species in Missouri (MDC, 2007a). This large (up to 5 ft (1.5 m) in length) primitive species occurs throughout the Missouri River and in the Mississippi River downstream of the mouth of the Missouri (Pflieger, 1997). It inhabits open channels of large turbid rivers, preferring bottom areas with strong currents and firm substrate (Pflieger, 1997). The pallid sturgeon has been listed as an endangered species since 1990; its decline is believed to be attributable to overfishing and habitat destruction associated with the impoundment of the upper Missouri River (Kallemeyn, 1983).

The diet of the pallid sturgeon consists of aquatic invertebrates and fish. The pallid sturgeon consumes more fish than the similar shovelnose sturgeon. Males reach sexual maturity at 5 to 7 years of age while females do not spawn until the age of 15 to 20 years of age with several years between spawning events thereafter. Females may contain several hundred thousand eggs. Hybridization with the shovelnose sturgeon has occurred in the most recent decades, likely due to human-induced changes in their environment that brought the two species in more direct competition (Pflieger, 1997).

Pallid sturgeon has been collected from the Missouri River near the study area since 2001 by MDC (C. Gemming, MDC, personal communication, August 17, 2007). It was not encountered in pre-operational studies conducted near the Callaway site, or in the current study.

#### 2.4.2.2.2.5 Pink Mucket

The pink mucket (*Lampsilis abrupta*) is found in gravel and cobble substrates of rivers and streams (Oesch, 1984). This species occurs in several states containing or bordering the lower Mississippi and Ohio Rivers and their large tributaries (MDC, 1997b). It is state and federally listed as an endangered species (MDC, 2007a). Its decline has been attributed to habitat alteration from dam construction, channelization, river dredging (MDC, 1997), and overharvest by the commercial mussel industry (USEPA, 2007).

The pink mucket is a long-term breeder in that the glochidia (larvae) are found in females in September and are held by the females until they are released the following June. Six species have been confirmed as suitable hosts for the pink mucket: largemouth bass, spotted bass, smallmouth bass, walleye, sauger, and freshwater drum. In order to attract the host, the female pink mucket possess a spot on the shell that mimic a fish eye. Once the host is attracted to the female, she releases the glochidia to attach themselves to the host (USEPA, 2007).

Pink mucket individuals and shells have been collected from lower portions of the Osage and Gasconade Rivers, near their entrances into the Missouri (A. Roberts, USFWS, personal communication November 28, 2007). Neither of these locations is within the ecological investigation area of the AmerenUE property.

#### 2.4.2.2.2.6 Scaleshell

The scaleshell mussel (*Leptodea leptodon*) is a federally listed and state listed endangered species (MDC, 2007a). It occurs in medium to large rivers with low to medium gradients, primarily inhabiting stable riffles and runs with gravel or mud substrates and moderate current velocity (Roberts, 2007). Factors contributing to the decline of the scaleshell throughout its range include water quality degradation, sedimentation, and competition from the non-native zebra mussel (Roberts, 2007).

Little is specifically known about the scaleshell reproductive biology. Similar to the pink mucket described above, the scaleshell mussel is also believed to be a long-term breeder. Females develop the unfertilized eggs in the fall, uptake the sperm released by the males, where the fertilized eggs develop into glochidia. During the following spring or summer the female expels the glochidia for attachment to a suitable host (USFWS, 1998).

Currently, the scaleshell can only be found consistently in the Meramec, Bourbeuse, and Gasconade Rivers in central Missouri (Roberts, 2007). It has also been collected from the lower Osage River, upstream of the Callaway Plantsite, and from Auxvasse Creek, to the west of the plant (S. McMurray, MDC, personal communication November 28, 2007).

#### **2.4.2.2.2.7 Paddlefish**

The paddlefish is a large (commonly exceeding 60 pounds (27 kg)) primitive species with a cartilaginous, rather than bony, skeleton and an elongate, paddle-shaped snout (Pflieger, 1997). It is ranked as vulnerable (S3) in Missouri, although its global rank (G4) indicates that its status is apparently secure at present (MDC, 2007a). It is also a sport fish in Missouri, and is taken by snagging during its spawning season in the spring (Pflieger, 1997). This species was formerly abundant in the Mississippi River valley, but has declined in number since 1900 due to overfishing and habitat destruction (Pflieger, 1997).

Paddlefish require open water that is slow-moving during most of its life; however, it needs free-flowing water with the presence of gravel bars during its spring spawning season. Paddlefish swim free in open water continuously filtering out microcrustaceans and insect larvae from the water with its gill rakers. Its long snout contains sense organs that are used to locate concentrations of food. Spawning occurs in the spring when the paddlefish migrate upstream during high water. The adhesive eggs are deposited on shallow, silt-free gravel bars for the males to fertilize. Eggs hatch in approximately nine days when water temperatures near 57°F. For a successful spawn, many days of high water are needed after the hatch in order to facilitate the newly hatched fry to be swept downstream. Paddlefish are long-lived where 20 year-old fish are common and some reach 30 years of age (Pflieger, 1997).

Paddlefish have frequently been encountered in Missouri River fish surveys near the Callaway site. Collections were reported from preoperational studies in 1974 and 1975 (UE 1976). Totals of 5 and 10 individuals were collected in 1980 and 1981 surveys, respectively (CDM 1981 and 1982). They have also been found in or near the study area since 2001 by the MDC (C. Gemming, MDC, personnel communication, August 17, 2007), and one specimen was collected in the current study.

#### **2.4.2.2.2.8 Sturgeon Chub and Sicklefin Chub**

The sturgeon chub (*Macrhybopsis gelida*) and the sicklefin chub (*Macrhybopsis meeki*) are small (2.5-inch to 3.5-inch (6.4-cm to 8.9-cm)) members of the minnow family that primarily inhabit large, turbid rivers. Both species are considered vulnerable (S3) in Missouri and vulnerable (G3) globally (MDC 2007). Both occur in the Missouri River and the Mississippi River downstream from the entrance of the Missouri (Pflieger, 1997). Sturgeon and sicklefin chubs have undergone population declines since the 1940s, a pattern that has been attributed to the conversion of riverine habitat to reservoir habitat in the upper Missouri River (Stukel, 2001).

Both the sturgeon chub and the sicklefin chub are confined to the open channels of large rivers in strong current over sand and gravel substrates. These minnows do not enter tributary streams. Both of these species are adapted for life in turbid water by having reduced eyes and external taste buds for locating food. The sicklefin chubs' eyes are even partly covered by skin.

They are likely bottom feeders locating their food by taste. Spawning occurs in the spring. Breeding males of the sturgeon chub have small tubercles along the pectoral fin rays (Pflieger, 1997).

Sicklefin chub was previously collected from the Missouri River in pre-operational surveys; six specimens were found in 1981 and two were found in 1982 (CDM, 1981 and 1982). A single sturgeon chub specimen was encountered while seining upstream of the Callaway site. Additionally, MDC biologists encountered both species in surveys between river miles 112 and 132 between 2001 and 2006 (C. Gemming, MDC, personal communication, August 17, 2007).

#### **2.4.2.2.2.9 Blacknose Shiner**

The blacknose shiner (*Notropis heterolepis*) is a small (2-inch to 2.5-inch (5-cm to 6.4-cm)) minnow that inhabits small creeks and weedy shallows in natural lakes and ponds (Smith 1985). It is listed as imperiled (S2) in Missouri, but apparently secure (G4) globally (MDC, 2007). It is found in most states and Canadian provinces surrounding the great lakes; in Missouri, it is apparently restricted to streams in the upper Osage, Big Piney and Gasconade drainages and tributary streams of the lower Missouri River (Pflieger, 1997). Destruction of vegetated backwater habitat is proposed as the factor most attributable to declining numbers of this species (Mayhew, 1987).

The blacknose shiner is a schooling, midwater minnow that often occurs in association with other minnows: sand shiner, bigeye shiner, redbfin shiner, bluntnose minnow, and brook silverside. It feeds near the bottom on insects, crustaceans, and other small invertebrates. In Missouri, spawning occurs in June and July. Breeding males develop small tubercles on the upper portion of their head and along the pectoral fin rays. Spawning habits have not been observed. Individuals do not live beyond their second summer (Pflieger, 1997).

Blacknose shiner has been collected from Auxvasse Creek (west of the study area) and Loutre River (east of the study area) (Pflieger, 1997). It was not, however, encountered in previous surveys of Logan and Mud Creeks (CDM, 1982) or in the present study.

#### **2.4.2.2.2.10 Blue Sucker**

The blue sucker (*Cycleptus elongatus*) is a medium to large-sized (1.5-inch to 2-inch (3.8-cm to 5-cm) or greater) fish in the sucker family that primarily inhabits swift current areas of large rivers (Pflieger, 1997). It is listed as vulnerable (S3) in Missouri and potentially vulnerable (G3/G4) globally (MDC, 2007a). It is primarily found in the Mississippi and Missouri Rivers, and their major tributaries where its movements are not blocked by dams (Elstad and Werdon, 1993). In Missouri, blue suckers are most common in the Missouri River and Mississippi River, as well as in the lowland section of the St. Francis River (Pflieger, 1997). Replacement of riverine habitat by reservoirs through impoundment is the principal threat to blue sucker populations (Montana AFS Website, 1998).

The blue sucker is a highly mobile fish with a streamlined body to maintain its position in strong currents. It is typically found in deep riffles and fast moving chutes over rock, gravel, or sand bottoms (Smith, 2002). Based on the composition of its diet (caddisflies, midges, and hellgrammites), blue suckers are likely bottom feeders over firm, silt-free substrates. In Missouri, this species spawns in the late spring. Males are sexually mature near the age of four, while females are not sexually mature until the age of six. Life span for a blue sucker is approximately 10 years (Pflieger, 1997).

Blue sucker has been consistently collected from the Missouri River – albeit in low numbers – in surveys near the study area. In pre-operational surveys from 1980 through 1982, one specimen was found (CDM, 1981). Sturgeon monitoring surveys conducted by MDC have collected this species (C. Gemming, MDC, personal communication, August 17, 2007), and 6 individuals have been found in the present study.

#### **2.4.2.2.2.11 Plains Topminnow**

The plains topminnow (*Fundulus sciadicus*) is a small (2-inch to 2.5-inch (5-cm to 6.4-cm)) fish that inhabits quiet pools of small creeks, and backwaters of larger streams (Pflieger, 1997). It is listed as vulnerable (S3) in Missouri and apparently secure (G4) globally (MDC, 2007a). It is found in several states in the northern Great Plains, including Colorado, Kansas, Nebraska, South Dakota and Wyoming (Rahel and Thel, 2004b). In Missouri, it is primarily found in creeks of the northern and western margins of the Ozarks, the former of which are all tributaries to the Missouri River (Pflieger, 1997). The primary threats to this species are habitat loss associated with receding water tables, and water quality degradation from sewage discharges and agricultural runoff (Rahel and Thel, 2004b).

The plains topminnow is typically found near the surface of clear water without noticeable current, adjacent to or in beds of aquatic vegetation. It occurs singly or in small groups. Small insects are likely the primary component of its diet. Spawning for this species occurs in the late spring and early summer. Females deposit eggs on aquatic vegetation or on algae and hatch in 8 to 10 days at a water temperature near 70°F. Breeding males exhibit orange-red fins (Pflieger, 1997).

The plains topminnow has not been found in pre-operational or subsequent surveys of Logan and Mud Creeks (UE, 1976; CDE, 1981 and 1982; MDC, personal communication), but was reported from Tavern Creek in Callaway County, east of the study area (Pflieger, 1997).

#### **2.4.2.2.3 Harvested Fish**

The majority of fish harvested either commercially or recreationally has been from the MDC-managed ponds and the Missouri River. Annual commercial fish harvests from the Missouri River (statewide) ranged from 128,000 to over 700,000 pounds (58,060 to 317,515 kg) from 1991 through 1999 (MDC, 1999). Throughout this period, Callaway County ranked from 4<sup>th</sup> to 9<sup>th</sup> of 32 counties with regard to commercial fish harvest from the Missouri River. Prior to 1993, shovelnose sturgeon, paddlefish, smallmouth and bigmouth buffaloes, channel, blue, and flathead catfishes, and freshwater drum were harvested from the Missouri River (Robinson 1994). From 1993 on, however, commercial harvests of paddlefish and catfish have not been legal in the Missouri River and in 2005 commercial shovelnose sturgeon harvests were also prohibited from the section of the river that is adjacent to the AmerenUE property. Paddlefish and catfish harvest restrictions were associated with concern about low abundance coupled with an intention to make policies consistent with other Missouri River states. Although bullheads are not included in the restriction, commercial fishermen have evidently stopped harvesting these species (V. Trevnichek, MDC, personal communication, April 8, 2008). In the years since 1999, commercial fish harvest from the Missouri River has ranged between 163,000 and 308,000 pounds annually, and has been dominated by non-native rough species such as carp, grass carp, Asiatic (silver, black and bighead) carp, and by smallmouth and largemouth buffalo (V. Trevnichek, MDC, personal communication, April 8, 2008). Recreational fishing occurs in the Missouri River near the AmerenUE property. A list of fish reportedly caught between the Mokane and Hermann accesses over an approximate one-year period from January 2004 through January 2005 includes 35 species, although most of these were encountered in low numbers (S. Sheriff, MDC, personal communication January 28, 2008).

#### 2.4.2.2.3.1 Smallmouth and Bigmouth Buffaloes

Smallmouth (*Ictiobus bubalus*) and bigmouth (*I. cyprinellus*) buffaloes are large-sized fish (15 inches to 31 inches (38 cm to 79 cm)) or greater and are common and widespread in Missouri, particularly in the Missouri and Mississippi Rivers and their large tributaries (Pflieger, 1997). These species are opportunistic feeders, ingesting both living plant (algae or rooted plants) and animal (insect larvae) material as well as detritus (McComish, 1967).

The smallmouth buffalo prefers clearer water than the bigmouth buffalo and is found less often in swift currents. The bigmouth buffalo is more tolerant of turbid and slow-moving or standing water and is found in deep pools. The peak of the smallmouth buffalo spawning season occurs in late June and early July, while the bigmouth buffalo spawns in late April and early May. During the spawn for both species, females are accompanied by one to two males. Females deposit their adhesive eggs in relatively shallow water over varying substrates in tributary streams or in quite backwaters. Once the males fertilize the eggs, the eggs develop without any parental care. Eggs hatch in nine to ten days (Pflieger, 1997).

They are commercially harvested from the Missouri River (V. Travnichek, MDC, personal communication February 25, 2008). Both species have been regularly collected in Missouri River surveys near Callaway site, with smallmouth buffalo appearing to be more numerous (UE, 1976; CDM, 1981 and 1982). In 2007 surveys, 15 smallmouth buffalo were found.

#### 2.4.2.2.3.2 Blue Catfish

Blue catfish (*Ictalurus furcatus*) is a large (20 inches to 44 inches (50 cm to 112 cm) in length and 3 pounds to 40 pounds (1.4 kg to 18 kg) in weight) species that primarily occurs in the Mississippi, Missouri, and Osage rivers, and in the lower reaches of their largest tributaries (Pflieger, 1997). Blue catfish is carnivorous, eating fishes, crayfish, immature aquatic insects, and mollusks near the bottom. Its barbells, rather than sight, are more important in locating food (Pflieger, 1997). It is an important food fish, and is harvested both recreationally and commercially.

The blue catfish inhabits chutes and pools of large rivers and the lower end of major tributaries (Smith, 2002). It is typically found in swift current with silt-free sand and gravel. Blue catfish make seasonal migrations in response to water temperature, moving downstream in the winter and upstream in the summer. Spawning normally occurs near the month of June. Males select and clean a natural cavity nest site (piles of drift, logs, undercut banks, burrows of muskrats and beavers). Eggs are deposited in the nest and hatch in approximately 7 days. The fry remain in the nest for an additional 7 to 8 days. Males guard the fry during this time until the fry leave the nest (Pflieger, 1997).

The commercial harvest of blue catfish in the Mississippi and Missouri Rivers increased dramatically in recent decades, but peaked in 1990 with a harvest of 150,000 pounds (68,040 kg) (Robinson, 1994). This species was consistently encountered in collections from the Missouri near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). In the present study, 24 blue catfish were collected.

#### 2.4.2.2.3.3 Channel Catfish

Channel catfish (*Ictalurus punctatus*) is smaller (12 inches to 32-inches (31 cm to 81 cm) and 0.8 pounds to 15 pounds (0.4 kg to 7 kg)) than the closely related blue catfish, and is more widely distributed (Pflieger, 1997). It occurs throughout the state, but particularly numerous in prairie streams of the north and west, in the larger lowland streams and ditches of the southeast, and in the Mississippi and Missouri Rivers (Pflieger, 1997). Its diet is extremely variable, and may



include living or dead plant or animal material (Pflieger, 1997). Channel catfish occur naturally, but are also reared for stocking into artificial impoundments throughout the state.

Channel catfish are found in a variety of habitats, but are characteristically found in low to moderate gradient, somewhat turbid streams. Adults can be found in large, deep pools, while young channel catfish are often found in the shallower parts of the pools or in riffles. In Missouri, the channel catfish spawns from late May to late July. As with the blue catfish, channel catfish males select a natural cavity nest site, females lay their eggs in the bottom of the nest, and the male guards the larvae until they leave the nest (approximately 7 to 8 days after the hatch) (Pflieger, 1997).

It is valuable as a game fish, particularly in the northern prairie streams of Missouri (Purkett, 1958) and is one of the most important commercial species in the state (Robinson, 1994). Channel catfish were common in past surveys in the Missouri River near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). A total of 104 individuals was collected in the present study. They have also been stocked into the MDC managed ponds on the site, and seven specimens were collected during the lake sturgeon survey in November 2007.

#### **2.4.2.2.3.4 Flathead Catfish**

Flathead catfish (*Pylodictis olivaris*) is the third largest (15 inches to 45 inches (38 cm to 114 cm) and 1 pound to 45 pounds (0.5 kg to 20 kg)) catfish species in Missouri and occurs in most of the large streams in the state (Pflieger, 1997). Adults are generally found in pools, and near submerged woody debris or other cover and feed primarily on fish and crayfish (Pflieger, 1997).

The flathead catfish is a solitary species that usually will have a favorite resting place (drift pile or log) where it can be found every day unless disturbed. At night, adults move from deeper water to feed in more shallow water. The flathead catfish is not a scavenger, rarely consuming decomposing or dead matter. Spawning occurs in late June and July. One of the parents will excavate a depression in a natural cavity, where the female will deposit more than 100,000 eggs. Once fertilized, one of the parents continually fans the eggs to provide oxygen and flush away silt during egg development. The male guards the hatched fry for approximately 7 days until they leave the confines of the nest (Pflieger, 1997).

It is commonly taken by sport fisherman and is an important commercial species in the Mississippi and Missouri Rivers (Pflieger, 1997). Flathead catfish was common in all previous surveys on the Missouri River near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). In the present study, 15 flathead catfish were collected.

#### **2.4.2.2.3.5 White Bass**

White bass (*Morone chrysops*) is a medium-sized (typically 9 inches to 15 inches (23 cm to 38 cm) in length) schooling predator that is increasing in abundance in the Missouri River and its tributaries (Pflieger, 1997). It generally inhabits deep pools in streams and rivers, and the open water of lakes and reservoirs (Pflieger, 1997). Young white bass feed primarily on crustaceans and aquatic insects, while adults feed primarily on fish.

White bass are found over sand and rocky bottoms and tend to avoid turbid waters. Gizzard shad is a main component of their diet and the abundance of white bass can exhibit considerable fluctuations in response to gizzard shad abundance. White bass spawn in the early spring (March and April in Missouri), migrating up tributary streams. Spawning occurs over rock or gravel, usually in current, and with no nest preparation. Males crowd around females to fertilize the eggs as they are released. The adhesive eggs settle to the bottom and

hatch in approximately two days. A large, adult female may produce up to one million eggs in a single spawning season (Pflieger, 1997).

This is a major sport species in Missouri, particularly during its spring spawning migrations, and in the summer when large schools are feeding near the water's surface (Pflieger, 1997). White bass were common to abundant in pre-operational surveys in the Missouri River near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). In the present study, 29 individuals in the genus *Morone* were collected that were either white bass or hybrids of white and striped bass.

#### **2.4.2.2.3.6 Bluegill**

Bluegill (*Lepomis macrochirus*) is a sunfish that commonly reaches a length of 9 inches (23 cm) and a weight of 12 ounces (340 g) (Pflieger, 1997). It is found in running or standing waters throughout the state. Its propagation for stocking lentic environments from small farm ponds to large reservoirs has made bluegill more widespread and abundant now than 50 to 60 years ago (Pflieger, 1997). The diet is primarily insects, but small fish, crayfish and snails and, occasionally, plant material are also eaten (Pflieger, 1997).

Bluegill are found in deep pools and backwaters of low-gradient streams. They thrive in clear water where aquatic vegetation and other cover are present (Smith, 2002). During the hottest part of the day, bluegill stay in deep water or the shade of a overhanging tree and move to shallow water in the early morning and night to feed. Spawning occurs from May to August with a peak in June. Bluegill will nest on any type of bottom substrate, but prefer gravel. Males build nests in 1 to 2 feet of water and strongly guard the nest until the eggs hatch. Females may deposit eggs in more than one nest. (Pflieger, 1997).

It is a very popular recreational species because of its wide distribution and good flavor (Becker, 1983). Bluegill were collected in pre-operational surveys of the Missouri River and streams near the AmerenUE property (UE, 1976; CDM, 1981 and 1982). Similarly, they were found in nearly all sampling locations in the present study. Bluegill have also been stocked into the MDC managed ponds on the site, although no specimens were collected during the lake sturgeon survey in November 2007.

#### **2.4.2.2.3.7 Spotted and Largemouth Basses**

Spotted bass (*Micropterus punctulatus*) and largemouth bass (*M. salmoides*) are two medium-sized (spotted bass 10-inch to 17-inch (25-cm to 43-cm); largemouth bass 10-inch to 20-inch (25-cm to 51-cm)) sunfish species that inhabit a variety of running and standing water habitats (Pflieger, 1997). The largemouth bass is more widely distributed, and is common or abundant in all regions except streams of the northwestern region of the state (Pflieger, 1997). Spotted bass is primarily found in the lowland ditches and large Ozark streams in southeastern Missouri, and in the White, Spring, and Missouri River systems (Pflieger, 1997). The spotted bass diet is primarily aquatic insects supplemented with crayfish and fish, whereas largemouth bass feed mostly on fish, but will eat a variety of other animals including large insects, crayfish, frogs, or mice (Pflieger, 1997).

The spotted bass is primarily found in permanent-flowing waters that are warmer and more turbid than those of the smallmouth bass. Spotted bass are active fish that move into smaller tributary streams when flow is high in the spring and move to larger waters in the fall when the high water resides. Spawning occurs in mid-April to early June. Males build the nest and protect the eggs after the female deposits them. Eggs hatch in 2 to 3 days (Pflieger, 1997).

The largemouth bass thrives in somewhat clearer water with no noticeable flow. Largemouth bass spend the heat of the day in deeper water near some type of cover (logs, downed trees, submerged vegetation) and move to shallow water in the evening to feed. Spawning occurs from mid-May to June. A firm substrate such as gravel or rock is preferred for a nest. Depending on water clarity, the nest will be constructed in water ranging from 1 ft to 15 ft (0.3 m to 4.6 m). As with the spotted bass, the male guards the nest until the eggs hatch. However, the male will also remain with the schooling fry for some time after they leave the nest (Pflieger, 1997).

Both species are important game fish; the largemouth bass is one of the most popular sport fishes in North America. Both species were found in the Missouri River and in small streams in the pre-operational studies of the 1970s (UE, 1976). Only spotted bass was encountered in the Missouri River; however, both species were common in streams in the studies of the early 1980s (CDM, 1981 and 1982). The present study has likewise collected one specimen each of spotted bass and largemouth bass in the Missouri River but largemouth bass only in the small streams. Largemouth bass have also been stocked into the MDC managed ponds on the site, although no specimens were collected during the lake sturgeon survey in November 2007.

#### 2.4.2.2.3.8 White and Black Crappies

White crappie (*Pomoxis annularis*) and black crappie (*P. nigromaculatus*) are sunfish species that may attain lengths of 14 inches (36 cm) and weights of 1.5 pounds (0.7 kg), and primarily inhabit lowland lakes, large Ozark reservoirs, and navigation pools of the upper Mississippi River (Pflieger, 1997). The diet of adult crappie is primarily fish, supplemented by insects and crustaceans (Pflieger, 1997).

In reservoirs, crappies are found near standing timber or cover and in streams are found in deep pools. The black crappie is less tolerant of turbidity and siltation than the white crappie. Crappies move to shallower water in the spring to spawn. Crappies do not school, but loosely aggregate near cover. Nesting activity is initiated when water temperatures reach approximately 56°F (Pflieger, 1997). Nests are built in areas free from wave action. Males fan out nests on practically any silt free substrate. Females deposit between 10,000 and 180,000 eggs (Smith, 2002). Eggs hatch in about 3 days and remain attached to the substrate for another 3 to 4 days at which time they leave the nest. Fry do not school after they leave the nest (Pflieger, 1997).

Crappies are highly valued as panfish. White crappie was consistently collected from both the Missouri River and small streams near the AmerenUE property in pre-operational surveys in the 1970s (UE 1976). Black crappie, however, was only encountered in stream samples from one year during this period. In surveys from the early 1980s, white crappie was the more commonly found species in both the Missouri River and in streams (CDM, 1981 and 1982). In the present study, only black crappie was collected and only a single specimen from the Missouri River.

#### 2.4.2.2.3.9 Sauger

Sauger (*Stizostedion canadense*) is primarily an inhabitant of large rivers; it commonly attains a length of 12 inches (31 cm), up to a maximum of 18 inches (46 cm) (Smith, 2002). It is the most common large percid in the Missouri sections of the Missouri and Mississippi Rivers (Pflieger, 1997). Adult sauger feed primarily on fish, predominantly emerald shiner and small gizzard shad (Wahl and Nielson, 1985).

The sauger is more tolerant of high turbidity than the walleye and is found in areas with swift current. Its eyes are specially adapted to gather light during the late evening and nighttime when it feeds and is most active. Spawning occurs at night in late April and early May. Adults

make migratory runs up tributary streams to spawn. The adhesive eggs are scattered in riffles by the females. Males accompany the females and immediately fertilize the eggs. Eggs hatch in approximately 7 days (Pflieger, 1997).

Although not as popular as the closely related walleye, sauger is a valued sport fish in Missouri (Pflieger, 1997). This species was consistently collected from the Missouri River near the AmerenUE property in pre-operational surveys (UE, 1976; CDM, 1981 and 1982). In the present study, a single sauger was collected while electrofishing in July 2007.

#### **2.4.2.2.3.10 Freshwater Drum**

Freshwater drum (*Aplodinotus grunniens*) is typically 12 inches to 20 inches (31 cm to 51 cm) in length as an adult and occurs in large streams throughout the state, but is most numerous in the Missouri and Mississippi Rivers and prairie streams (Pflieger, 1997). It has commonly been considered to be a mollusk feeder, but research has suggested that adults feed primarily on fish, crayfish and immature aquatic insects (Priegel, 1967).

The freshwater drum is usually found in deep pools (i.e., greater than 30 ft deep), avoids swift current, is tolerant of high turbidity, and feeds on or near the bottom. Spawning occurs in tributary streams in late spring and early summer in open water. Eggs of freshwater drum float for 1 to 2 days before hatchings (Pflieger, 1997). The drumming sound for which this species is named originates from the swim bladder and is assumed to play a role in the spawning act (Smith, 2002).

This species is valuable as both a sport and a commercial fish in the Mississippi and Missouri Rivers (Pflieger, 1997). Freshwater drum was consistently collected in the Missouri River and in Logan Creek in pre-operational surveys of the 1970s (UE, 1976) and were among the most abundant species in Missouri River collections from the early 1980s (CDM, 1981 and 1982). In the present study, drum were relatively numerous (63 individuals) in Missouri River surveys, but were not collected in the small streams. Additionally, two specimens were collected from an onsite pond (P6) during the lake sturgeon survey in November 2007.

#### **2.4.2.2.3.11 Shovelnose Sturgeon**

Shovelnose sturgeon (*Scaphirhynchus platyrhynchus*) is the smallest member of the family in Missouri, rarely exceeding 30 inches in length or 5 pounds in weight (Pflieger, 1997). It is the most numerous sturgeon in the Missouri and Mississippi Rivers, despite a steep decline in abundance since 1900. It inhabits the open channels of large rivers, residing on the bottom in areas of swift current over a sand or gravel bottom (Pflieger, 1997).

The shovelnose sturgeon feeds on the bottom, using its highly protrusible mouth to suck up its food. Aquatic insect larvae, primarily mayflies, caddisflies, and dipterans, comprise the bulk of its diet (Held, 1969). Spawning is believed to occur in the open channels of large rivers in a strong current over rocky or gravelly bottom, primarily in May (Pflieger, 1997). In the upper Mississippi River, this species was reproductively mature at 5 to 7 years of age. Shovelnose sturgeon from this population averaged 8.3, 12.4, 16.1, 19.1, 21.3, and 23.6 at the ends of their first, second, third, fourth, fifth, and sixth years (Helms, 1973).

This species was historically taken from the Missouri River both recreationally (S. Sherriff, MDC, personal communication January 28, 2008) and commercially (MDC, 1999). Between 1991 and 1999, annual totals of 717 to 15,410 pounds of sturgeon – predominantly shovelnose – were harvested from the Missouri River. Commercial fishing restrictions on this species, combined with a health advisory not to consume its flesh or eggs due to PCB and chlordane

contamination likely limit the harvest of shovelnose sturgeon from the Missouri River near the Callaway site. This species was commonly collected in pre-operational studies (CDM, 1981 and 1982), and was relatively numerous (55 individuals in the present study).

#### **2.4.2.2.4 Harvested Invertebrates**

This section is not used

#### **2.4.2.2.5 Other Important Resources**

##### **2.4.2.2.5.1 Submerged Aquatic Vegetation**

In the Missouri River, preoperational studies found very little submerged aquatic vegetation. The study in the mid-1970s found a few hydrophytes, primarily *Potamogeton*, in a cut-off chute, but none in the Missouri River itself (UE, 1976). The study in 1980 found no vascular hydrophytes in the Missouri River near the AmerenUE property (CDM, 1981).

In surveys of Logan and Mud Creeks in the 1970s, submerged aquatic vegetation was limited to sparse growths of water primrose (*Jussiaea*), water willow (*Dianthera*), duckweed (*Lemna*), sedges (*Carex*), a filiform pondweed (*Potamogeton*), a water plantain (probably *Alisma*), and watercress (*Nasturtium officinale*) (UE, 1976). The later study likewise reported sparse populations in Logan Creek, probably due to widely fluctuating water levels, high turbidity, and high current velocity which likely inhibited hydrophyte growth (CDM, 1981).

In the present study, no systematic surveys for aquatic macrophytes were performed. However, extensive areas of the Missouri River near the Callaway Site were visited during fish and macroinvertebrate surveys, and no submerged aquatic vegetation was encountered. Similarly, no submerged aquatic vegetation was observed during our surveys of the small streams of the study area. The extensive areas of high current velocity and turbid water conditions are not optimum conditions for colonization of macrophytes. Other studies of large river systems have found little submerged aquatic vegetation in main channel or channel border habitats (MACTEC, 2006, USFWS, 2007).

##### **2.4.2.2.5.2 Phytoplankton**

Preoperational studies characterizing the phytoplankton assemblages in the ecological investigation area of the AmerenUE property found low densities in the Missouri River, most likely attributable to the high turbidity, high current velocity, and scarcity of stable bottom substrate (UE, 1976; CDM, 1981). The study in the 1970s found the assemblage dominated by diatoms, particularly *Asterionella*, with greatest density occurring in the winter (UE, 1976). The later study reported maximum density in the fall, with centric diatoms the most abundant group (CDM, 1981). Overall, the assemblage appeared to be diverse, and therefore unstressed by pollution (UE, 1976).

In Logan and Mud creeks, species composition was similar to that observed in the Missouri River in the earlier study, but densities were much greater due to the stable substrate, lower turbidity and reduced current velocity (UE, 1976). Seasonal variations appeared to be typical of temperate streams, with green and euglenoid species most abundant in warmer months, but diatoms predominating when colder temperatures were present (UE, 1976). The later study found the same seasonal abundance pattern in the creeks as in the Missouri River, i.e., unimodal with maximum density in the fall (CDM, 1981). The most abundant groups in this study were flagellated chrysophytes, cryptophytes, and euglenoids.

#### 2.4.2.2.6 Nuisance Species

The Asian clam (*Corbicula fluminea*) is a freshwater bivalve of Asian origin that had been introduced into North America in the early 1900s (Counts, 1985). Adults are typically 1 inch (3 cm) or less in length; the shell is yellow-green with obvious concentric ridges (Gottfried and Osborne, 1982). They feed primarily on phytoplankton, which they filter from the water near the bottom of the stream, river, or lake that they inhabit. Its reproductive capability and transportation by barges hauling river gravel or releases by fishermen and aquarists have led to its high degree of infestation in the United States (Lachner, 1970). Their high growth and production rates may enable this species to alter trophic and nutrient dynamics in aquatic systems (Stites et al., 1995). They can tolerate extensive sedimentation (Belanger et al., 1985) and wide ranges of temperature (Janech and Hunter, 1984) and salinity (King et al., 1986). Moreover, they are more pollution-tolerant than native mussels (Jenkinson, 1979). *Corbicula* infestations can present problems to power plants by blocking intake structures and reducing flow of cooling water (NRC, 1981). In the present study, these were collected in depositional habitats in the Missouri River near the AmerenUE property.

#### 2.4.2.3 Habitat Importance

The Missouri River and onsite streams and ponds were described above in terms of the typical surface water habitats, and the biological communities associated with them. In general, large river habitats and intermittent headwater streams are considered important. Even so, there is nothing of regional significance about this particular segment of the Missouri River or these particular small streams. In the Missouri River, all species of importance also are found elsewhere in the system. In the streams and ponds, none of the aquatic species encountered in this study were considered to be restricted to this area. No significant loss of important onsite river, stream or pond habitat is expected.

#### 2.4.2.4 Other Preexisting Environmental Stresses

The lower Missouri River has experienced a variety of water quality disturbances since the early 1900s, including oxygen depletions, fish kills, oil spills, and contamination from point and non-point discharges (Walter, 1971). Municipal sewage pollution combined with other urban and industrial discharges were among the major problems through the 1970s (Munger et al., 1974). Land-use trends, particularly widespread application of pesticides such as organochlorines and chlordane, as well as releases of polychlorinated biphenyl (PCB) compounds, led to the issuance of public health advisories for several Missouri River fish species during the 1980s (Poulton et al., 2005). More recently, habitat loss associated with sedimentation has been recognized as an additional impairment of the Missouri River (Poulton et al., 2005).

#### 2.4.2.5 Transmission and Access Corridors

There will be one new transmission line associated with the construction and operation of Callaway Plant Unit 2. This new transmission line will be approximately 6.7 miles (10.8 km) in length and 150 ft (45.7 m) in width and will be located immediately adjacent to (and on the west side of) the existing transmission line which extends southward out of the plant and crosses the Missouri River (Figure 2.4-4). The new transmission line will terminate at the tie-in point with another transmission line coming from the west called the Loose Creek line.

Terrestrial habitats within the new transmission line corridor are described in Section 2.4.1.9. Aquatic resources traversed by the planned transmission line include a few unnamed intermittent streams, two crossings of Logan Creek, the Mollie Dozier Chute, and the Missouri River. Common amphibious species of the unnamed intermittent streams, Logan Creek, and

the Mollie Dozier Chute include Blanchard's cricket frog, southern leopard frog, and the American toad. Common turtles associated with the more permanent waters of Logan Creek include false map turtle, red-eared slider, and common snapping turtles. Fish species observed in the Missouri River and Logan Creek are listed in Table 2.4-9 and Table 2.4-11, respectively. Benthic macroinvertebrate species observed in the Missouri River and Logan Creek are listed in Table 2.4-10 and Table 2.4-12, respectively. Outside of the Missouri River, no rare, threatened, or endangered species were observed within the transmission line corridor.}

### 2.4.3 REFERENCES

**{Anonymous. 2007.** Topeka shiner fact sheet. [Online]. U.S. Fish and Wildlife Service. Available: <http://www.fws.gov/mountain-prairie/species/fish/shiner/facts.htm>.

**Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999.** Rapid bioassessment protocols for use in wadeable streams and rivers: Periphyton, benthic macroinvertebrates and fish, 2<sup>nd</sup> edition. USEPA Office of Water, EPA 841-B-99-002. Washington, D.C.

**Becker, G.C. 1983.** Fishes of Wisconsin. University of Wisconsin Press, Madison, WI.

**Belanger, S.E., J.L. Farris, D.S. Cherry, and J. Cairns, Jr. 1985.** Sediment preference of the freshwater Asiatic clam, *Corbicula fluminea*. Nautilus 99:66-73.

**Camp, Dresser and McKee, Inc. (CDM). 1981.** Water quality and aquatic biological preoperational monitoring program for the Callaway Nuclear Plant, Volume 1. Unpublished report. Milwaukee, WI.

**Camp, Dresser and McKee, Inc. (CDM). 1982.** Water quality and aquatic biological preoperational monitoring program for the Callaway Nuclear Plant, Volume 2. Unpublished report. Milwaukee, WI.

**Clawson, 2003.** National Status of the Indiana Bat. Missouri Department of Conservation, Clawson, R. L., 2003.

**Counts, C.L. III. 1985.** *Corbicula fluminea* (Bivalvia: Corbiculidae) in the state of Washington in 1937, and in Utah in 1975. Nautilus 99:18-19.

**Cowardin, L.M., V. Carter V., F.C. Golet, E.T. LaRoe. 1979.** Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service Report No. FWS/OBS/-79/31. Washington, D.C.

**Dailey, 1996.** Wildlife Harvest and Population Status Report-Northern Bobwhite. Unpublished. Missouri Department of Conservation, Dailey, T. V., 1996.

**Dailey, 2007.** Wildlife Harvest and Population Status Report, Northern Bobwhite – 2007. Dailey, T. V., 2007.

**DeShon, J.E. 1995.** Development and application of the invertebrate community index (ICI). In: W.S. Davis and T. Simon (eds.) Biological assessment and criteria: tools for water resource planning and decision making. Lewis Publishers, Boca Raton, FL. Pp. 217-243.

**Dewey, T. and D. Sturgeon. 2001.** *Acipenser fulvescens* [Online]. Animal Diversity Web. Available: [http://animaldiversity.ummz.umich.edu/site/accounts/information/Acipenser\\_fulvescens.html](http://animaldiversity.ummz.umich.edu/site/accounts/information/Acipenser_fulvescens.html).



**Elstad, S.A. and S.J. Werdon. 1993.** Draft status report on blue sucker (*Cycleptus elongatus*), a candidate endangered or threatened species. Unpublished report. U.S. Fish and Wildlife Service, Bismarck, ND.

**Evers, D.C. 1994.** Endangered and threatened wildlife of Michigan. University of Michigan Press, Ann Arbor, MI.

**Fuller, 1981.** Callaway Nuclear Generating Plant Environmental Monitoring Program, Preoperational Vegetation Inventory. Union Electric Company, Environmental Services Department, September 30, 1981.

**Gottfried, P.K. and J.A. Osborne. 1982.** Distribution, abundance and size of *Corbicula manilensis* (Phillipi) in a spring-fed central Florida stream. Florida Scientist 45:178-188.

**Janech, M.G. and R.D. Hunter. 1995.** *Corbicula fluminea* in a Michigan river: Implications for low temperature tolerance. Malacological Review 28:119-124.

**Jenkinson, J.J. 1979.** The occurrence and spread of *Corbicula manilensis* in east-central Alabama. Nautilus 94:149-153.

**Kallemeyn, L.W. 1983.** Status of the pallid sturgeon. Fisheries 8:3-9.

**King, C.A., C.J. Langdon, and C.L. Counts, III. 1986.** Spawning and early development of *Corbicula fluminea* (Bivalvia: Corbicularidae) in laboratory culture. Amer. Malacol. Bull. 4:81-88.

**Lachner, E.A., C.R. Robins, and W.R. Courtenay, Jr. 1970.** Exotic fishes and other aquatic organisms introduced into North America. Smithsonian Contr. to. Zool. 59:1-29.

**MACTEC, 2007.** Standard Operating Procedures (SOP) for the Callaway Nuclear Plant Unit 2 Siting Study, Natural Resources Field Sampling and Analysis. MACTEC Engineering and Consulting, November 30, 2007

**MACTEC, 2008.** Callaway Nuclear Power Plant Forest Pathology Report. MACTEC Engineering and Consulting, April 2008.

**Mayhew, J. (Editor). 1987.** Iowa fish and fishing. Unpublished report. Iowa Department of Natural Resources, Des Moines, IA.

**McComish, T.S. 1967.** Food habits of bigmouth and smallmouth buffalo in Lewis and Clark Lake and the Missouri River. Trans. Am. Fish. Soc. 96:70-74.

**MDC, 1997a.** "Blue-ribbon Turkey Panel Reports to Commission. Missouri Department Conservation, March 1997.

**MDC, 1997b.** Endangered species guidesheet: Pink mucket. [Online]. Available: <http://mdc.mo.gov/nathis/endangered/endanger/pnkmuck/>

**MDC, 1998.** Hine's emerald dragonfly: Best management practices. [Online]. Available: <http://mdc4.mdc.mo.gov/Documents/12097.pdf>.

**MDC, 2000.** Missouri Animals of Conservation Concern. Missouri Department of Conservation, Conservation Commission of the State of Missouri, 2000.

**MDC, 2007a.** Missouri Species and Communities of Conservation Concern. Missouri Department of Conservation, January 2007.

**MDC, 2007b.** Missouri Department of Conservation, Telecheck: Deer and Turkey Harvest, Deer and Turkey Harvest Totals. <http://www.mdc.mo.gov/cgi-bin/maps/deerturkey/totals.cgi> November, 2007.

**MDC, 2007c.** White-Tailed Deer – (*Odocoileus virginianus*). Missouri Department of Conservation, December, 2007. <http://www.mdc.mo.gov/nathis/mammals/deer2/>

**MDC, 2007d.** Endangered Species Guidesheet, Indiana Bat. Missouri Department of Conservation, December, 2007. <http://mdc.mo.gov/nathis/endangered/endanger/bat>

**MDC, 2007e** The Bald Eagle in Missouri. <http://mdc4.mdc.mo.gov/Documents/12138.pdf> Missouri Department of Conservation, December, 2007.

**MDC, 2007f.** Bald Eagle, *Haliaeetus leucocephalus*. <http://www.mdc.mo.gov/nathis/birds/birdatlas/maintext/0400056.htm> Missouri Department of Conservation, December, 2007.

**MDC, 2007g.** Bald Eagle Facts. <http://mdc.mo.gov/documents/events/eagledays/facts.pdf> Missouri Department of Conservation, December, 2007.

**MDC, 2007h.** Northern Harrier, *Circus cyaneus*. <http://www.mdc.mo.gov/nathis/birds/birdatlas/maintext/0400122.htm> Missouri Department of Conservation, December, 2007.

**MDC, 2007i.** Best Management Practices, Missouri Department of Conservation, Northern Harrier, *Circus cyaneus*. [http://mdc.mo.gov/documents/nathis/endangered/n\\_harrier.pdf](http://mdc.mo.gov/documents/nathis/endangered/n_harrier.pdf) Missouri Department of Conservation, December, 2007.

**MDC, 2007j.** Northern Bobwhite, *Colinus virginianus*. <http://www.mdc.mo.gov/nathis/birds/birdatlas/maintext/0400213.htm> Missouri Department of Conservation, December, 2007.

**MDC, 2007k.** The Life History of the Wild Turkey. <http://www.mdc.mo.gov/nathis/birds/turkey/life.htm> Missouri Department of Conservation, December, 2007.

**MDC, 2007l.** The Mourning Dove in Missouri. <http://www.mdc.mo.gov/nathis/birds/doves/distrib.htm> Missouri Department of Conservation, December, 2007.

**MDC, 2007m.** Missouri Department of Conservation, Heritage Review Report, July 13, 2007.

**MDC, 2008.** Missouri Natural Heritage Database. <http://www.mdc.mo.gov/cgi-bin/heritage/> Missouri Department of Conservation, April, 2008.

**Missouri Department of Natural Resources (MDNR). 2002.** Semi-quantitative macroinvertebrate stream assessment. Unpublished report. Jefferson City, MO.

**Moen, T. 1955.** Food of the freshwater drum, *Aplodinotus grunniens* Rafinesque, in four Dickenson County, Iowa, lakes. Proc. Iowa Acad. Sci. 62:589-598.

**Montana American Fisheries Society (MAFS). 1998.** Montana's fish species of special concern: Blue sucker. [Online]. Available:  
<http://www.fisheries.org/units/AFSmontana/SSCpages/Bluesuckstatus.htm>

**Munger, P.R., and 16 other authors. 1974.** A baseline study of the Missouri River: Rulo, Nebraska to the mouth near St. Louis, Missouri. Unpublished report. U.S. Army Corps of Engineers, Kansas City District.

**Nelson, P.W. 2005.** The Terrestrial Natural Communities of Missouri. Third Edition. Missouri Natural Areas Committee. Missouri Department of Natural Resources, Jefferson City, Missouri.

**Newbold, 2007.** Reform Conservation Area 2006-07 Annual Report. Missouri Department of Conservation.

**Nigh, T.A. and W.A. Schroeder. 2002.** Atlas of Missouri Ecoregions. Missouri Department of Conservation, Jefferson City, Missouri.

**Nuclear Regulatory Commission (NRC). 1981.** Flow blockage of cooling water to safety system components by *Corbicula* sp. (Asiatic clam) and *Mytilus* sp. (mussel). Unpublished report. USNRC: Office of Inspection and Enforcement, Washington, DC.

**NRC, 1999.** Standard Review Plans for Environmental Reviews for Nuclear Power Plants, NUREG-1555, Nuclear Regulatory Commission, October 1999.

**Oesch, R.D. 1984.** Missouri naiades: A guide to the mussels of Missouri. Missouri Department of Conservation, Jefferson City, MO.

**Pflieger, W.L. 1997.** The fishes of Missouri. Missouri Department of Conservation, Jefferson City, MO.

**Poulton, B.C., A.L. Allert, K.R. Echols, and W.G. Brumbaugh. 2005.** Validation of aquatic macroinvertebrate community endpoints for assessment of biological condition in the Lower Missouri River. Unpublished report. U.S. Geological Survey: Columbia Environmental Research Center. Columbia, MO.

**Priegel, G.R. 1967.** Food of the freshwater drum, *Aplodinotus grunniens*, in Lake Winnebago, Wisconsin. Trans. Am. Fish. Soc. 96:218-220.

**Purkett, C.A., Jr. 1958.** Growth of fishes in the Salt River, Missouri. Trans. Am. Fish. Soc. 87:116-131.

**Rahel, F.J. and L.A. Thel. 2004a.** Flathead chub (*Platygobio gracilis*): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available:  
<http://www.fs.fed.us/r2/projects/scp/assessments/flatheadchub.pdf>

**Rahel, F.J. and L.A. Thel. 2004b.** Plains topminnow (*Fundulus sciadicus*): A technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available:  
<http://www.fs.fed.us/r2/projects/scp/assessments/plainstopminnow.pdf>

- Roberts, A.D. 2007.** Scaleshell mussel recovery plan (draft). U.S. Fish and Wildlife Service, Fort Snelling, MN.
- Robinson, J.W. 1994.** Missouri's commercial fishery harvest, 1992. Unpublished report. Missouri Department of Conservation, Jefferson City, MO.
- Sigler, W.F. 1949.** Life history of the white bass, *Lepibema chrysops* (Rafinesque) of Spirit Lake, Iowa. Iowa State Coll. Res. Bull. 366:201-244.
- Smith, C.L. 1985.** The inland fishes of New York State. New York State Department of Environmental Conservation, Albany, NY.
- Smith, P.W. 2002.** The fishes of Illinois. University of Illinois Press, Urbana, IL.
- Stites, D.L., A.C. Benke, and D.M. Gillespie. 1995.** Population dynamics, growth, and production of the Asiatic clam, *Corbicula fluminea*, in a blackwater river. Can. J. Fish. Aquat. Sci. 52:425-437.
- Stukel, E.D. 2001.** Sturgeon and sticklefin chubs. South Dakota Conservation Digest. [Online]. Available: <http://www.nativefish.org/articles/sicklefin.php>.
- The Nature Conservancy (TNC), 2000.** Missouri Flora. October 2000.
- Union Electric Company, 1976.** Callaway Plant Environmental Report, Operating License Stage, Volume I.
- Union Electric Company, 1987.** Callaway Terrestrial Monitoring Program: Update of the botanical database for ten terrestrial vegetation plots. Union Electric Company, Environmental Services Department, February 1987.
- U.S. Environmental Protection Agency (USEPA), 2007.** Risks of Atrazine Use to Eight Federally Listed Endangered Freshwater Mussels-Appendix C: Status and Life History of Eight Assessed Mussels, February 28, 2007.
- U.S. Fish and Wildlife Service (USFWS), 1982.** Gray Bat Recovery Plan. Twin Cities, Minnesota. 21 pp. + Appendices. U.S. Fish and Wildlife Service, 1982.
- U.S. Fish and Wildlife Service (USFWS), 1998.** Leptodea leptodon (Scaleshell mussel) Range Status Assessment. U.S. Fish & Wildlife Service, Fort Snelling, MN.
- U.S. Fish and Wildlife Service (USFWS), 2001.** Endangered species facts: Hine's emerald dragonfly. [Online]. Available: <http://midwest.fws.gov/endangered>.
- U.S. Fish and Wildlife Service (USFWS), 2007.** American burying beetle (*Nicrophorus americanus*). [Online]. Available: <http://www.fws.gov/southdakotafielddoffice/BEETLE.HTM>.
- U.S. Fish and Wildlife Service (USFWS), 2007a.** National Bald Eagle Management Guidelines. U.S. Fish and Wildlife Service, 2007.
- U.S. Fish and Wildlife Service (USFWS), 2007b.** Fish and wildlife resources potentially affected by Callaway Plant Unit 2. October 18, 2007.

**U. S. Forest Service (USFS), 2008.** Region 9, Indiana Bat.  
<http://www.fs.fed.us/r9/wildlife/tes/indianabat.htm> U.S. Forest Service, January, 2008.

**Walter, C.M. 1971.** Everyone can't live upstream: A contemporary history of the water quality problems on the Missouri River (Sioux City, Iowa to Hermann, Missouri). Unpublished report. U.S. Environmental Protection Agency, Region 7, Kansas City, MO.}

**Table 2.4-1—{List of Rare, Threatened or Endangered Species Historically Recorded in Callaway and Osage Counties, Missouri}**

(Page 1 of 2)

Scientific Name	Common Name	Status		County	
		State	Federal	Callaway	Osage
Vegetation					
Aralia nudicaulis	Wild sarsaparilla	S2		√	
Carex conoidea	Field sedge	S1		√	
Carex trichocarpa	Hairy-fruited sedge	S1		√	
Corispermum villosum	Oriental tick-seed	SU		√	
Cyperus setigerus	Bristled cyperus	S1		√	
Cystopteris tenuis	Bladderfern	S1		√	
Dodecatheon amethystinum	Amethyst shooting star	S2			√
Fragaria vesca var. americana	Woodland strawberry	S1		√	
Geum virginianum	Pale avens	S1			√
Huperzia porophila	Fir clubmoss	S2		√	
Lycopodium digitatum	Clubmoss	S2		√	
Oryzopsis racemosa	Black-seeded mountain rice	S1		√	
Parmotrema hypoleucinum	Lichen	S1			√
Trifolium stoloniferum	Running buffalo clover	E/S1	E	√	
Woodwardia areolata	Netted chain fern	S2		√	
Insects					
Acroneuria ozarkensis	Ozark stonefly	S2			√
Calephelis muticum	Swamp metalmark (butterfly)	S3		√	
Gomphus ozarkensis	Ozark clubtail (dragonfly)	S3		√	√
Macromia pacifica	Gilded river cruiser	S3		√	
Neoconocephalus bivocatus	Two-voiced conehead katydid	S3		√	
Neoconocephalus retusus	Round-tipped conehead katydid	S4		√	
Ophiogomphus westfalli	Westfall's snaketail (dragonfly)	S3			√
Speyeria idalia	Regal fritillary butterfly	S3		√	
Freshwater Mussels					
Alasmidonta marginata	Elktoe	S2			√
Arcidens confragosus	Rock Pocketbook	S3			√
Cumberlandia monodonta	Spectaclecase	S3	C		√
Elliptio crassidens	Elephantear	E/S1			√
Lampsilis abrupta	Pink mucket	E/S2	E		√
Leptodea leptodon	Scaleshell	E/S1	E		√
Ligumia recta	Black sandshell	S2			√
Obovaria olivaria	Hickorynut	S3			√
Fish					
Acipenser fulvescens	Lake sturgeon	E/S1		√	√
Alosa alabamae	Alabama shad	S2			√
Carpiodes velifer	Highfin carpsucker	S2			√
Cycleptus elongates	Blue sucker	S3		√	√
Etheostoma nianguae	Niangua darter	E/S2	T		√
Fundulus dispar	Starhead topminnow	S2		√	
Fundulus sciadicus	Plains topminnow	S3		√	√
Hiodon tergisus	Mooneye	S3		√	√
Hybognathus argyritis	Western silvery minnow	S2		√	√
Hybognathus placitus	Plains minnow	S2		√	√
Macrhybopsis gelida	Sturgeon chub	S3		√	√
Macrhybopsis meeki	Sicklefin chub	S3		√	√

**Table 2.4-1—{List of Rare, Threatened or Endangered Species Historically Recorded in Callaway and Osage Counties, Missouri}**

(Page 2 of 2)

Scientific Name	Common Name	Status		County	
		State	Federal	Callaway	Osage
<i>Macrhybopsis storeriana</i>	Silver chub	S3		√	√
<i>Notropis buchanani</i>	Ghost shiner	S2		√	√
<i>Notropis heterolepis</i>	Blacknose shiner	S2		√	
<i>Platygobio gracilis</i>	Flathead chub	E/S1		√	√
<i>Polyodon spathula</i>	Paddlefish	S3		√	√
<i>Scaphirhynchus albus</i>	Pallid sturgeon	E/S1	E	√	√
<b>Amphibians</b>					
<i>Cryptobranchus alleganiensis</i>	Eastern hellbender	E/S1			√
<i>Rana areolata circulosa</i>	Northern crawfish frog	S3		√	
<b>Reptiles</b>					
<i>Crotaphytus collaris</i>	Eastern collared lizard	S4			√
<b>Birds</b>					
<i>Haliaeetus leucocephalus</i>	Bald eagle	E/S3		√	√
<i>Laterallus jamaicensis</i>	Black rail	S1		√	
<i>Tyto alba</i>	Barn owl	E/S3		√	
<b>Mammals</b>					
<i>Mustela frenata</i>	Long-tailed weasel	S2		√	
<i>Myotis grisescens</i>	Gray bat	E/S3	E	√	√

Source of information is the on-line MDC Natural Heritage Database <http://www.mdc.mo.gov/cgi-bin/heritage/>

**Legend:**

State Rank

Federal

S1: Critically Imperiled

E: Endangered

S2: Imperiled

T: Threatened

S3: Vulnerable

C: Candidate

S4: Apparently Secure



**Table 2.4-2—{Important Terrestrial Species and Habitat Identified at the AmerenUE Property 2007-2008}**

Scientific Name	Common Name	Description	Location	Rationale
<b>Mammals</b>				
<i>Odocoileus virginianus</i>	White-tailed deer	Large herbivorous mammal prefers forest edge habitat.	Reform Conservation Area	Game species
<i>Myotis grisescens</i>	Gray bat	Small winged mammal, 3" (8 cm) in length with 10-12" (25-31 cm) wingspan, weighs 9 g. The largest <i>Myotis</i> species in Missouri.	Cave along Auxvasse Creek	Federal Endangered State Endangered
<i>Myotis sodalis</i>	Indiana bat	Small winged mammal, 2" (5 cm) in length with 8" (20 cm) wingspan, weighs about 7 g.	Reform Conservation Area	Federal Endangered State Endangered
<b>Birds</b>				
<i>Haliaeetus leucocephalus</i>	Bald eagle	Large bird, 31" (79 cm) in length, with 80" (203 cm) wingspan, weighs 4,325 g	Along Missouri River, Molly Dozier Slough, and near Transect 2	State Endangered
<i>Colinus virginianus</i>	N. bobwhite	Small bird, 9.8" (24.9 cm) in length, with 13" (33 cm) wingspan, weighs 170 g	Reform Conservation Area	Game species
<i>Circus cyaneus</i>	N. harrier	Medium sized bird, 18" (46 cm) in length, with 43" (109 cm) wingspan, weighs 420 g	Reform Conservation Area	State Endangered
<i>Zenaidura macroura</i>	Mourning dove	Small bird, 12" (31 cm) in length, with 18" (46 cm) wingspan, weighs 120 g	Reform Conservation Area	Game species
<i>Meleagris gallopavo</i>	Wild turkey	Large bird, 37-46" (94-117 cm) in length, with 50-64" (127-163 cm) wingspan, weighs 4,200-7,400 g	Reform Conservation Area	Game species
<b>Habitats</b>				
Jurisdictional Wetlands		Stormwater runoff ponds P-2 through P-8 and site wetlands that have a significant nexus with the Missouri River	Reform Conservation Area	Federal protection under CWA
Glade		Openings within oak-hickory forest that have shallow soils and are dominated by drought-tolerant grasses and forbs	Approx. 1.5 miles south of Unit 1	State rank S-2

**Table 2.4-3—{Mammals Observed at the AmerenUE Property, Spring and Fall 2007}**

Species	Common Name	Abundance	Season Observed		Comments
			Spring	Fall	
<i>Canis latrans</i>	Coyote	Occasional	√	√	general site recon
<i>Castor canadensis carolinensis</i>	Beaver	Uncommon	√	√	MO River, Logan Creek
<i>Cryptotis parva</i>	Least shrew	Uncommon		√	trapping survey
<i>Didelphis virginiana</i>	Opossum	Occasional	√	√	general site recon
<i>Marmota monax</i>	Groundhog	Occasional	√	√	general site recon
<i>Mephitis mephitis avia</i>	Striped skunk	Occasional	√	√	general site recon
<i>Mus musculus</i>	House mouse	Uncommon	√		trapping survey
<i>Odocoileus virginianus</i>	White-tailed deer	Common	√	√	general site recon
<i>Ondatra zibethicus</i>	Muskrat	Uncommon	√	√	general site recon
<i>Peromyscus leucopus</i>	White footed mouse	Occasional	√	√	trapping survey
<i>Peromyscus maniculatus</i>	Deer Mouse	Occasional	√		trapping survey
<i>Procyon lotor hirtus</i>	Raccoon	Occasional	√	√	general site recon
<i>Sciurus carolinensis</i>	Gray squirrel	Common	√	√	general site recon
<i>Sciurus niger</i>	Fox squirrel	Occasional	√	√	general site recon
<i>Sylvilagus floridanus</i>	E. cottontail	Common	√	√	general site recon
<i>Tamias striatus</i>	E. chipmunk	Occasional	√	√	general site recon
<i>Vulpes vulpes</i>	Red fox	Uncommon	√	√	general site recon
<b>Total Species Richness</b>		<b>17</b>			

**Table 2.4-4—{Birds Observed Seasonally at the AmerenUE Property 2007}**  
(Page 1 of 5)

Scientific Name	Common Name	Relative Abundance	Season Observed			Location	D <sup>2</sup>
			Spring	Summer	Fall		
<i>Accipiter cooperii</i>	Cooper's hawk	Uncommon	✓			RB-3, T-5	X
<i>Agelaius phoeniceus</i>	Red-winged blackbird	Common	✓	✓		RB-1, RB-2, RB-3, T-1, T-3, P-5, P-9	X
<i>Aix sponsa</i>	Wood duck	Occasional	✓	✓	✓	P-3, P-9	X
<i>Ammodramus henslowii</i>	Henslow's sparrow						X
<i>Ammodramus savannarum</i>	Grasshopper sparrow	Uncommon	✓	✓	✓	RB-2, T-5	X
<i>Anas clypeata</i>	Northern shoveler	Occasional	✓			P-1, P-6, P-9	
<i>Anas crecca</i>	Green-winged teal	Occasional	✓			P-2, P-3, P-9	
<i>Anas discors</i>	Blue-winged teal	Common	✓	✓	✓	P-2, P-3, P-6, P-7, P-9, R-7	
<i>Anas platyrhynchos</i>	Mallard	Common	✓	✓	✓	P-5, P-6, P-8, P-9	
<i>Anas strepera</i>	Gadwall	Uncommon	✓		✓	P-6, P-9	
<i>Archilochus colubris</i>	Ruby-throated hummingbird	Occasional	✓	✓	✓	RB-1, RB-2, RB-3, T-1	X
<i>Ardea alba</i>	Great egret	Rare			✓	R-7	
<i>Ardea herodias</i>	Great blue heron	Abundant	✓	✓	✓	RB-1, RB-2, RB-3, P-1, P-4, P-5, P-6, P-9, R-7	X
<i>Aythya collaris</i>	Ring-necked duck	Uncommon	✓		✓	P-6, P-9	
<i>Baeolophus bicolor</i>	Tufted titmouse	Abundant	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Bartramia longicauda</i>	Upland sandpiper						X
<i>Bombycilla cedrorum</i>	Cedar waxwing	Abundant	✓		✓	RB-1, RB-2, RB-3, T-2, T-3, T-5	X
<i>Branta canadensis</i>	Canada goose	Abundant	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, P-3, P-4, P-5, P-6, P-8, P-9	X
<i>Bubo virginianus</i>	Great horned owl	Uncommon	✓			T-1	X
<i>Bucephala albeola</i>	Bufflehead	Uncommon	✓			P-7	
<i>Buteo jamaicensis</i>	Red-tailed hawk	Common		✓	✓	RB-2, RB-3, T-2, T-3, T-4, T-5	X
<i>Buteo lineatus</i>	Red shouldered hawk	Uncommon			✓	RB-2, RB-3	
<i>Butorides virescens</i>	Green heron	Common		✓	✓	RB-3, T-1, P-5, P-9, R-7	X
<i>Calidris minutilla</i>	Least sandpiper	Rare	✓			P-9	
<i>Caprimulgus carolinensis</i>	Chuck-Will's-widow						X
<i>Caprimulgus vociferus</i>	Whip-poor-will						X
<i>Cardinalis cardinalis</i>	Northern cardinal	Abundant	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Carduelis tristis</i>	American goldfinch	Abundant	✓	✓	✓	RB-1, RB-2, RB-3, T-2, T-3, T-5	X
<i>Carpodacus mexicanus</i>	House finch	Common	✓	✓		RB-1, RB-3, T-1, T-3	X
<i>Carpodacus purpureus</i>	Purple finch	Rare			✓	RB-1	
<i>Cathartes aura</i>	Turkey vulture	Abundant	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Catharus fuscus</i>	Veery	Common	✓	✓		RB-3, T-2, T-4, T-5	

**Table 2.4-4—{Birds Observed Seasonally at the AmerenUE Property 2007}**  
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Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D <sup>2</sup>
			Spring	Summer	Fall	Winter		
<i>Ceryle alcyon</i>	Belted kingfisher	Occasional		✓	✓	✓	T-1, T-4, P-5	X
<i>Chaetura pelagica</i>	Chimney swift	Occasional	✓		✓		RB-1, RB-3, T-3	X
<i>Charadrius vociferus</i>	Killdeer	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, P-3, P-5, P-6, P-7, P-9	X
<i>Chondestes grammacus</i>	Lark sparrow	Rare	✓				RB-2	X
<i>Circus cyaneus</i>	Northern harrier <sup>1</sup>	Rare	✓				RB-2	
<i>Cistothorus platensis</i>	Sedge wren							X
<i>Coccyzus americanus</i>	Yellow-billed cuckoo	Occasional	✓	✓			RB-1, RB-2, RB-3, T-1	X
<i>Coccyzus erythrophthalmus</i>	Black-billed cuckoo							X
<i>Colaptes auratus</i>	Northern flicker	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Colinus virginianus</i>	Northern bobwhite	Abundant	✓	✓			RB-1, RB-2, RB-3, T-1, T-3, T-4, T-5, P-8	X
<i>Columba livia</i>	Rock dove							X
<i>Contopus virens</i>	Eastern wood pewee	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Corvus brachyrhynchos</i>	American crow	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Corvus ossifragus</i>	Fish crow	Rare	✓				T-1	
<i>Cyanocitta cristata</i>	Blue jay	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Dendroica coronata</i>	Yellow-rumped warbler	Uncommon	✓				RB-1, T-2	
<i>Dendroica dominica</i>	Yellow-throated warbler							X
<i>Dendroica discolor</i>	Prairie warbler	Common	✓	✓			RB-1, RB-2, RB-3, T-1, T-5	X
<i>Dendroica palmarum</i>	Palm warbler	Occasional	✓				RB-1, RB-2	
<i>Dendroica petechia</i>	Yellow warbler	Common	✓				RB-1, RB-2, RB-3, T-4	X
<i>Dendroica pinus</i>	Pine warbler	Rare		✓			RB-1	
<i>Dendroica virens</i>	Black-throated green warbler	Rare	✓				T-4	
<i>Dryocopus pileatus</i>	Pileated woodpecker	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Dumetella carolinensis</i>	Gray catbird	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Empidonax spp.</i>	Willow/Alder flycatcher							X
<i>Empidonax traillii</i>	Willow flycatcher							X
<i>Empidonax virens</i>	Acadian flycatcher							X
<i>Eremophila alpestris</i>	Horned lark	Uncommon	✓	✓			RB-1, RB-2	X
<i>Euphagus carolinus</i>	Rusty blackbird	Uncommon	✓	✓			RB-1, RB-2	
<i>Falco sparverius</i>	American kestrel	Uncommon	✓			✓	RB-1, RB-2,	X
<i>Fulica americana</i>	American coot	Common	✓			✓	P-1, P-5, P-6, P-7, P-9	
<i>Geothlypis trichas</i>	Common yellowthroat	Abundant	✓	✓			RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Guiraca caerulea</i>	Blue grosbeak	Uncommon	✓				RB-2, T-3	X

**Table 2.4-4—{Birds Observed Seasonally at the AmerenUE Property 2007}**  
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Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D <sup>2</sup>
			Spring	Summer	Fall	Winter		
<i>Haliaeetus leucocephalus</i>	Bald eagle <sup>3</sup>	Uncommon				✓	Observed on Missouri River and surrounding areas	
<i>Helmitheros vermivorus</i>	Worm-eating warbler	Occasional	✓				RB-3, T-2, T-4,	
<i>Hirundo rustica</i>	Barn swallow	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-3, T-5, P-5, P-6, P-7, P-9	X
<i>Hylocichla mustelina</i>	Wood thrush	Abundant	✓	✓		✓	RB-1, RB-2, RB-3, T-1, T-2, T-4	X
<i>Icteria virens</i>	Yellow-breasted chat	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Icterus galbula</i>	Baltimore oriole	Occasional	✓				RB-2, RB-3, T-5	X
<i>Icterus spurius</i>	Orchard oriole	Uncommon	✓	✓			RB-3	X
<i>Junco hyemalis</i>	Dark-eyed junco	Abundant				✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	
<i>Lanius ludovicianus</i>	Loggerhead shrike							X
<i>Melanerpes carolinus</i>	Red-bellied woodpecker	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Melanerpes erythrocephalus</i>	Red-headed woodpecker	Occasional	✓				RB-2, RB-3, T-2, T-3	X
<i>Meleagris gallopavo</i>	Wild turkey	Common	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-2, T-4, T-5	X
<i>Melospiza georgiana</i>	Swamp sparrow	Uncommon				✓	T-1, T-4	
<i>Melospiza lincolni</i>	Lincoln's sparrow	Rare			✓		T-4	
<i>Melospiza melodia</i>	Song sparrow	Abundant	✓	✓		✓	RB-1, T-1, T-2, T-3, T-4, T-5	X
<i>Mimus polyglottos</i>	Northern mockingbird	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Mniotilta varia</i>	Black and white warbler	Common	✓	✓			RB-2, RB-3, T-2, T-4	X
<i>Molothrus ater</i>	Brown-headed cowbird	Common	✓	✓			RB-1, RB-2, RB-3, T-1, T-4, T-5	X
<i>Myiarchus crinitus</i>	Great Crested flycatcher	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-5	X
<i>Oporornis formosus</i>	Kentucky warbler	Common	✓	✓			RB-2, RB-3, T-1, T-2, T-4, T-5	X
<i>Otus asio</i>	Eastern screech owl							X
<i>Parula americana</i>	Northern parula	Abundant	✓	✓			RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Passer domesticus</i>	House sparrow	Occasional	✓	✓	✓		RB-1, RB-3	X
<i>Passerculus sandwichensis</i>	Savannah sparrow	Common	✓	✓			RB-1, RB-2, T-3, T-5	
<i>Passerella iliaca</i>	Fox sparrow	Common			✓	✓	RB-3, T-1, T-2, T-5	
<i>Passerina cyanea</i>	Indigo bunting	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Petrochelidon pyrrhonota</i>	Cliff swallow	Occasional	✓				T-3, T-5	X
<i>Peuceptes ludovicianus</i>	Rose-breasted grosbeak	Common	✓				RB-1, RB-2, RB-3, T-3, T-5	X
<i>Picoides pubescens</i>	Downy woodpecker	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Picoides villosus</i>	Hairy woodpecker	Uncommon			✓	✓	RB-3, T-4	X
<i>Pipilo erythrophthalmus</i>	Eastern towhee	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Piranga olivacea</i>	Scarlet tanager							X

**Table 2.4-4—{Birds Observed Seasonally at the AmerenUE Property 2007}**  
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Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D <sup>2</sup>
			Spring	Summer	Fall	Winter		
<i>Piranga rubra</i>	Summer tanager	Uncommon	✓	✓			RB-3, T-2	X
<i>Podilymbus podiceps</i>	Pied-billed grebe	Occasional	✓				P-1, P-5, P-6, P-9	
<i>Poecile atricapillus</i>	Black-capped chickadee	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Poecile carolinensis</i>	Carolina chickadee	Uncommon	✓	✓	✓		RB-2, RB-3, T-4	
<i>Polioptila caerulea</i>	Blue-gray gnatcatcher	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	X
<i>Progne subis</i>	Purple martin							X
<i>Protonotaria citrea</i>	Prothonotary warbler	Uncommon	✓				RB-3, T-4	X
<i>Quiscalus quiscula</i>	Common Grackle	Common	✓	✓			RB-1, RB-2, RB-3, T-1, T-2, T-5	X
<i>Regulus calendula</i>	Ruby-crowned kinglet	Rare				✓	T-1	
<i>Sayornis phoebe</i>	Eastern phoebe	Common	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-3, T-4, T-5	X
<i>Seiurus aurocapillus</i>	Ovenbird	Occasional	✓	✓	✓		RB-2, RB-3, T-2, T-5	
<i>Seiurus motacilla</i>	Louisiana waterthrush	Occasional	✓	✓			T-1, T-4, T-5, P-3, P-9	X
<i>Sialia sialis</i>	Eastern bluebird	Common	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-3, T-5	X
<i>Sitta carolinensis</i>	White-breasted nuthatch	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	X
<i>Spiza americana</i>	Dickcissel	Common	✓	✓			RB-1, RB-2, RB-3, T-3	X
<i>Spizella arborea</i>	American tree sparrow	Uncommon				✓	RB-3, T-3	
<i>Spizella passerina</i>	Chipping sparrow	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-3, T-5	X
<i>Spizella pusilla</i>	Field sparrow	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-3, T-5	X
<i>Stelgidopteryx serripennis</i>	Northern rough-winged swallow	Common	✓		✓		RB-1, RB-2, RB-3, P-9	X
<i>Streptopelia decaocto</i>	Eurasian collared-dove							X
<i>Strix varia</i>	Barred owl	Uncommon	✓				T-3	X
<i>Sturnella magna</i>	Eastern meadowlark	Common	✓	✓			RB-1, RB-2, RB-3, T-3	X
<i>Sturnella neglecta</i>	Western meadowlark							X
<i>Sturnus vulgaris</i>	European starling	Common	✓	✓		✓	RB-1, RB-2, RB-3, T-5	X
<i>Tachycineta bicolor</i>	Tree swallow	Uncommon	✓		✓		RB-1, RB-2	X
<i>Thryothorus ludovicianus</i>	Carolina wren	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Toxostoma rufum</i>	Brown thrasher	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, T-5	X
<i>Tringa melanoleuca</i>	Greater yellowlegs	Uncommon	✓				P-3, P-6	
<i>Troglodytes aedon</i>	House wren	Common	✓	✓	✓		RB-1, RB-2, RB-3, T-2	X
<i>Turdus migratorius</i>	American robin	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-2, T-3, T-4, T-5	X
<i>Tyrannus tyrannus</i>	Eastern kingbird	Abundant	✓	✓	✓		RB-1, RB-2, RB-3, T-1, T-2, T-3, T-5, P-9	X
<i>Vermivora peregrina</i>	Tennessee warbler	Abundant	✓	✓			RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	
<i>Vermivora pinus</i>	Blue-winged warbler	Abundant	✓	✓			RB-1, RB-2, RB-3, T-1, T-2, T-3, T-4, P-3	X

**Table 2.4-4—{Birds Observed Seasonally at the AmerenUE Property 2007}**  
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Scientific Name	Common Name	Relative Abundance	Season Observed				Location	D <sup>2</sup>
			Spring	Summer	Fall	Winter		
<i>Vermivora ruficapilla</i>	Nashville warbler	Occasional	✓				RB-1, RB-3, T-1	
<i>Vireo bellii</i>	Bell's vireo							X
<i>Vireo flavifrons</i>	Yellow-throated vireo	Rare	✓				RB-3	X
<i>Vireo gilvus</i>	Warbling vireo	Uncommon	✓				RB-1, RB-2	X
<i>Vireo griseus</i>	White-eyed vireo	Abundant	✓		✓		RB-1, RB-2, RB-3, T-1, T-3, T-4, T-5	X
<i>Vireo olivaceus</i>	Red-eyed vireo	Abundant	✓		✓		RB-1, RB-2, RB-3, T-1, T-2, T-4, T-5	X
<i>Wilsonia pusilla</i>	Wilson's warbler	Uncommon	✓	✓			RB-3, T-4	
<i>Zenaida macroura</i>	Mourning dove	Abundant	✓	✓	✓	✓	RB-1, RB-3, T-1, T-2, T-3, T-5	X
<i>Zonotrichia albicollis</i>	White-throated sparrow	Abundant	✓	✓	✓	✓	RB-1, RB-2, RB-3, T-2, T-4, T-5	
<i>Zonotrichia leucophrys</i>	White-crowned sparrow	Common	✓	✓			RB-1, RB-2, T-2, T-5	
<b>Total Species Richness: 122</b>								

Notes:

See Figure 2.4-3 for T, RB, and P locations

- <sup>1</sup> State rank of S2 indicates imperiled: "imperiled in the nation or state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the nation or state" (1,000-3,000 remaining individuals).
- <sup>2</sup> Species recorded from the Danville Breeding Bird Survey. (North American Breeding Bird Survey Danville Route - <http://www.mbr-pwrc.usgs.gov/cgi-bin/rtena25.pl?52019>)
- <sup>3</sup> State rank of S3.



**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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	Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed												Wetlands Indicator Status					
						T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous		Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	C <sup>2</sup>
	<i>Acer negundo</i>	Boxelder	1	1	1	A				U					O			P			1	FACW-	
	<i>Acer rubrum</i>	Red maple	1	1	1				R				R								6	FAC	
	<i>Acer saccharinum</i>	Silver maple	1	1	1	A				U							P				1	FACW	
	<i>Acer saccharum</i>	Sugar maple	1	1	1	A	A				O		C		O						5	FACU	
	<i>Achillea millefolium</i>	Common yarrow	1	1	1				C	R			O	R	O						*	FACU	
	<i>Agrimonia pubescens</i>	Soft agrimony	1	1	1		R			U	U		R		U						3	UPL	
	<i>Agrostis gigantea</i>	Redtop	1	1	1				C		A		O								*	FACW	
	<i>Alisma subcordatum</i>	Water plantain	1	1	1												P				5	OBL	
	<i>Alliaria officinalis</i>	Garlic mustard	1	1	1												P				0	FAC	
	<i>Allium canadense</i>	Meadow onion	1	1	1	O			R				R								1	FACU	
	<i>Alopecurus carolinianus</i>	Annual foxtail	1	1	1										C	O					0	FACW	
	<i>Ambrosia artemisiifolia</i>	Annual ragweed	1	1	1	U		O	R	A		U/O	O	R	O	O	P				0	FACU	
	<i>Ambrosia bidentata</i>	Southern ragweed	1	1	1										C						0	FACU-	
	<i>Ambrosia trifida</i>	Great ragweed	1	1	1	A			U			U/O		R	U	U	P	P			0	FAC+	
	<i>Amelanchier arborea</i>	Downy service berry	1	1	1		O/C				O			O	O						6	FACU	
	<i>Ammania coccinea</i>	Toothcup	1	1	1												P				6	OBL	
	<i>Amorpha canescens</i>	Lead plant	1	1	1											U			U		8	UPL	
	<i>Ampelopsis cordata</i>	Raccoon grape	1	1	1					U					U						4	FAC+	
	<i>Andropogon gerardii</i>	Big blue stem	1	1	1			C/A					O		U/O	O			C		5	FAC-	
	<i>Andropogon virginicus</i>	Broomsedge	1	1	1			O		R			O		C	C					2	FAC-	
	<i>Antennaria plantaginifolia</i>	Pussy toes	1	1	1						O			O	U/O						5	UPL	
	<i>Apios americana</i>	American potato-bean	1	1	1	U	A		C				O				P				6	FACW	
	<i>Apocynum cannabinum</i>	Clasping-leaf dogbane	1	1	1	O		R	R	O			U	R				P			3	FAC	
	<i>Arisaema dracontium</i>	Green dragon	1	1	1				R					R							6	FACW	

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed										C <sup>2</sup>	Wetlands Indicator Status								
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest			Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Arisaema triphyllum	Jack-in-the-pulpit	1	1																			6	FACW-	
Asarum canadense	Wild ginger	1	1																				6	UPL
Asclepias purpurascens	Purple milkweed	1	1	1																			6	FACU
Asclepias quadrifolia	Fourleaf milkweed	1	1																				6	UPL
Asclepias syriaca	Common milkweed	1	1																				0	UPL
Asclepias tuberosa	Butterfly weed	1	1	1																			5	UPL
Asclepias viridis	Green-flowered milkweed	1		1																			6	UPL
Asimina triloba	Common pawpaw	1	1																				5	FAC
Asparagus officinalis	Asparagus	1		1																			*	FACU
Asplenium platyneuron	Ebony spleenwort	1	1	1																			4	FACU
Aster anomalus	Blue aster	1		1																			6	UPL
Aster ericoides	Heath aster	1		1																			4	FACU-
Aster lateriflorus	Side-flowering aster	1		1																			3	FACW-
Aster oblongifolius	Aromatic aster	1		1																			6	UPL
Aster oolentangiensis	Sky blue aster	1	1	1																			7	UPL
Aster patens	Purple daisy	1	1	1	O	O																	5	UPL
Aster pilosus	Hairy aster	1	1	1																			0	FACU-
Baptisia alba (Baptisia leucantha)	White wild indigo	1		1																			6	FACU
Baptisia leucophaea	Cream wild indigo	1		1																			6	UPL
Bidens frondosa	Common beggar's ticks	1		1																			2	FACW
Bidens polylepis	Bur marigold	1		1	O	O																	1	FACW
Boehmeria cylindrica	False-nettle	1	1																				4	OBL

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed										Wetlands Indicator Status							
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest		Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	C <sup>2</sup>
Bouteloua curtipendula	Side oats grama	1		1												U		A	7	UPL		
Campsis radicans	Trumpet creeper	1	1	1	A	O							O						3	FAC		
Carex annectens	Yellow-fruit sedge	1	1			O	U					U	U				P	P	4	FACW		
Carex blanda	Woodland sedge	1	1			R							R				P	P	3	FAC		
Carex frankii	Frank's sedge	1	1														P	P	5	OBL		
Carex glaucoidea	Blue sedge	1		1						U			R		U				4	UPL		
Carex rosea	Rosy sedge	1	1			R		O					R						4	UPL		
Carex sp. <sup>3</sup>	Sedge	1					R										P	P				
Carex vulpinoidea	Fox sedge	1	1															P	4	OBL		
Carya illinoensis	Pecan	1	1	1			R	R				R	R				P		6	FACW		
Carya ovata	Shagbark hickory	1	1	1	O	A		C		U/O			O		U/O				4	FACU		
Carya tomentosa	Mockernut hickory	1	1	1		C		O		O/C			O		O/C				5	UPL		
Celtis laevigata	Sugarberry	1	1		U								R				P		4	FACW		
Celtis occidentalis	Common hackberry	1	1	1				C	O				O	C			P		4	FAC-		
Cephalanthus occidentalis	Buttonbush	1	1	1														P	3	OBL		
Cercis canadensis	Eastern redbud	1	1	1	U								U			O		O	3	FACU		
Chamaecrista fasciculata	Partridge pea	1	1	1					U						O	U			1	FACU-		
Chasmanthium latifolium	River oats	1	1	1				U					U		U		P	P	4	FACW		
Chenopodium sp.	Lambsquarters	1	1																			
Chrysanthemum leucanthemum	Ox-eye daisy	1		1											U				*	UPL		
Cichorium intybus	Chickory	1		1											O				*	UPL		
Cirsium altissimum	Tall thistle	1		1					O						O	O			4	UPL		
Cirsium vulgare	Bull thistle	1	1	1					R										*	FACU-		

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed												C <sup>2</sup>	Wetlands Indicator Status				
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous			Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water
Commelina communis	Asiatic day flower	1	1	1																*	FAC	
Conyza canadensis	Horseweed	1	1	1						U						O				0	FAC-	
Cornus drummondii	Rough-leaved dogwood	1		1												U				1	FAC	
Cornus florida	Flowering dogwood	1	1	1							C			C		C				5	FACU-	
Coronilla varia (Securigea varia)	Crown vetch	1		1												U				*	UPL	
Croton capitatus	Hogwort	1		1												U		U		0	UPL	
Cunila origanoides	Dittany	1		1									U							5	UPL	
Cyperus esculentus	Chufa	1		1	O													P		1	FACW	
Cyperus strigosus	Straw-colored flatsedge	1		1	O													P		1	FACW	
Cystopteris protруса	Lowland bladderfern	1	1		O															5	UPL	
Dactylis glomerata	Orchard grass	1		1									U			U				*	FACU	
Dalea purpurea	Purple prairie clover	1		1											O			C		8	UPL	
Danthonia spicata	Poverty oat grass	1		1										U		O				3	UPL	
Daucus carota	Queen Anne's Lace	1	1	1						O						O	O	U		*	UPL	
Desmanthus illinoensis	Illinois bundle flower	1		1									U			U				3	FAC-	
Desmodium canadense	Showy tick trefoil	1		1												O				4	FAC-	
Desmodium glutinosum	Pointed tick trefoil	1		1							O/C			U/O		O/C				3	UPL	
Desmodium nudiflorum	Bare-stemmed tick trefoil	1		1	C/A	C/A					U			O		U				4	UPL	
Desmodium paniculatum	Panicled tick trefoil	1		1		O	O							O						3	FACU	
Dianthus armeria	Deptford pink	1	1	1									R			U/O				*	UPL	
Digitaria sp.	Crab grass	1		1												U						

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed												C <sup>2</sup>	Wetlands Indicator Status						
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous			Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water		
Dioscorea sp.	Yam	1		1																				
Diospyros virginiana	Common persimmon	1	1	1	U			O/C	C				O	U	O	O							3	FAC
Echinacea pallida	Pale purple coneflower	1	1	1											U	U							7	UPL
Echinochloa crusgalli	Barnyard grass	1		1	O	U			O				R	U	U			P	P			*	FACW	
Echinodorus berteroi	Upright burhead	1		1														P	P			8	OBL	
Elaeagnus umbellata	Autumn olive	1	1	1		R	U					U	R									*	UPL	
Eleocharis obtusa	Blunt spike rush	1	1	1											U			P				4	OBL	
Eleocharis smallii	Small's spike rush	1	1	1														P				5	OBL	
Elymus canadensis	Canada wild rye	1		1											U	U						5	FAC-	
Elymus hystrix (Hystrix patula)	Bottlebrush grass	1		1				O/C					U									4	UPL	
Elymus villosus	Silky wild rye	1		1									U		U							4	FACU	
Elymus virginicus	Virginia wild rye	1	1	1	U	U		R	O	O/C			U/O	O	O	O		P	P			4	FACW-	
Equisetum arvense	Common horsetail	1		1												U						1	FAC	
Eragrostis sp.	Love grass	1		1											U									
Erigeron annuus	White-top fleabane	1		1									O		O							1	FAC-	
Erigeron strigosus	Prairie fleabane	1	1	1					U/O													3	FAC-	
Eupatorium altissimum	Tall boneset	1		1											O	O				O		3	FACU	
Eupatorium rugosum (Ageratina altissima)	White snakeroot	1		1					O	O/C	C		O	O	O	O						2	FACU	
Eupatorium serotinum	Late boneset	1		1			O		O	O			O	U	O	O						1	FAC+	
Euphorbia sp.	Spurge	1		1															O					
Festuca arundinacea	Tall fescue	1	1	1			A	A	C	C		C/A	U		C	O						*	FACU+	
Festuca elatior	Meadow fescue	1	1	1								C				O						*	FACU-	

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed										C <sup>2</sup>	Wetlands Indicator Status						
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest			Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water
Forestiera acuminata	Swamp privet	1	1														P		6	OBL		
Fragaria virginiana	Virginia strawberry	1	1						R				R						2	FAC-		
Fraxinus americana	White ash	1	1	1	O	O		O	O	C		O/C	O						3	FACU		
Fraxinus pennsylvanica	Green ash	1	1	1	C			O	O			O					P	P	5	FACW		
Fraxinus quadrangulata	Blue ash	1	1	1											U			U	6	UPL		
Galium concinnum	Shining bedstraw	1	1	1		U		O	O	U		U		U					4	FACU		
Galium tinctorium	Stiff marsh bedstraw	1	1		O							U					P	P	6	OBL		
Gerardia tenuifolia (Agalina tenuifolia)	Slender false foxglove	1	1	1										O			P		4	FACW		
Geum canadense	White avens	1	1	1								U	U						2	FAC		
Gleditsia triacanthos	Honeylocust	1	1	1	O		U		C		U	U							2	FAC		
Glyceria striata	Fowl manna grass	1	1	1	O					U		U					P	P	4	OBL		
Glycine max	Soybean	1	1	1					A	A									*	UPL		
Gratiola neglecta	Clammy hedgehyssop	1	1		R												P		4	OBL		
Hedeoma pulegioides	American pennyroyal	1	1	1			O				U								4	UPL		
Helianthus hirsutus	Oblong sunflower	1	1	1									O						4	UPL		
Helianthus maximiliani	Maximillian sunflower	1	1	1					O						U				5	UPL		
Heliopsis helianthoides	False sunflower	1	1	1											U			U	5	UPL		
Humulus japonicus	Japanese hop	1	1	1								U	U						*	FACU		
Hydrophyllum appendiculatum	Great waterleaf	1	1		C								U						5	UPL		
Hypericum sp.	St. Johnswort	1	1	1													U					
Ilex sp.	Holly	1	1	1										U								
Impatiens campensis	Spotted touch-me-not	1	1	1	U			U	U			U					P	P	3	FACW		

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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Botanical Name	Common Name	Taxa	Spring		Fall	Qualitative Abundance in Area Surveyed								Wetlands Indicator Status								
			T-1	T-2		T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	C <sup>2</sup>	Wetlands Indicator Status	
Ipomea hederacea	Small morning glory	1	1	1																	1	FACW
Juglans nigra	Black walnut	1	1	1	C						U			U							4	FACU
Juncus dudleyi	Dudley's rush	1		1																	6	FAC
Juncus tenuis	Roadside rush	1		1			U/O						U								0	FAC
Juniperus virginiana	Eastern red cedar	1	1	1	U	O	U	C	O	O		U	O	O	A						2	FACU
Krigia biflora	Dwarf dandelion	1	1			O		U					U								5	FACU
Lactuca floridana	Blue lettuce	1		1												U					3	FAC-
Leersia oryzoides	Rice cut grass	1	1	1														P			4	OBL
Leersia virginica	White grass	1		1										U				P			4	FACW
Lespedeza cuneata	Sericea lespedeza	1	1	1					O	O					O	O					*	UPL
Lespedeza virginica	Slender bush clover	1		1								U			U						5	UPL
Leucanthemum vulgare	Ox-eye daisy	1	1						U												*	UPL
Lobelia cardinalis	Cardinal flower	1		1						U					U			P			6	OBL
Lonicera japonica	Japanese honeysuckle	1	1	1									U			U					3	FACU
Ludwigia alternifolia	Seedbox	1	1	1					U	U								P			4	OBL
Ludwigia peploides	Floating seedbox	1	1	1														P			3	OBL
Lycopus sp.	Bugleweed	1		1														P				
Maianthemum racemosum	False Solomon's seal	1	1		U								U					P			4	FACU
Medicago lupulina	Black medick	1	1				A						O								*	FAC-
Medicago sativa	Alfalfa	1		1								C/A									*	UPL
Melilotus alba	White sweet-clover	1		1								U			U						*	FACU
Melilotus officinalis	Yellow sweet-clover	1		1								U									*	FACU
Menispermum canadense	Canada moonseed	1		1										O							4	FAC+



**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
(Page 8 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed												Wetlands Indicator Status					
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous		Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	C <sup>2</sup>
Mimulus alatus	Winged monkey flower	1	1	1		O					U					U		P			5	OBL
Monarda bradburiana (M. russelliana)	Bradbury beebalm	1		1	O	O				U				U		O	O		O		5	UPL
Monarda fistulosa	Wild bergamont	1	1			O															4	FACU
Morus alba	White mulberry	1		1	U			U					U								*	FAC
Morus rubra	Red mulberry	1	1	1	R	R							R	O							4	FAC-
Nelumbo lutea	American lotus	1	1	1														P	U	6	OBL	
Nyssa sylvatica	Black gum	1	1	1	U			R					U								5	FAC
Oenothera biennis	Common evening primrose	1		1													U/O				0	FACU
Osmorhiza sp.	Sweet cicely	1		1											O							
Ostrya virginiana	Hop hornbeam	1	1			U		A					U/O								4	FACU-
Oxalis stricta	Yellow wood sorrel	1	1	1	U	R		U					U		O						0	FACU
Panicum boscii	Bosc's panic sedge	1	1	1						U			R								5	UPL
Panicum capillare	Old witchgrass	1	1	1											U/O		P				0	FAC
Panicum cf. lanuginosum	Panic grass	1		1												U					0	FAC
Panicum clandestinum	Deer tongue grass	1	1	1		O							U		O/C		P				4	FACW
Panicum dichotomum	Forked panic grass	1	1	1				R					R		C						6	FAC-
Panicum latifolium	Broad-leaf panic grass	1	1	1				U	U				U		O						6	FACU
Panicum virgatum	Switchgrass	1	1	1	O		C						O		U						4	FAC+
Parietaria pensylvanica	Pennsylvania pellitory	1		1										U							3	FACU
Parthenocissus quinquefolia	Virginia creeper	1	1	1	C	C/O		C/O	O/U	U/O			O								3	FAC-
Paspalum sp.	Beed grass	1		1												U						

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
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Botanical Name	Common Name	Taxa	Qualitative Abundance in Area Surveyed										C <sup>2</sup>	Wetlands Indicator Status										
			Spring		Fall	Transmission Line									Open Water									
					T-1	T-2	T-3	T-4	T-5	Cropland	Grassland	Deciduous Forest				Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade			
<i>Penstemon digitalis</i>	Beard-tongue	1	1	1																		4	FAC-	
<i>Penthorum sedoides</i>	Ditch stonecrop	1	1	1																			4	OBL
<i>Phalaris arundinacea</i>	Reed canary grass	1	1	1																			0	FACW+
<i>Phleum pratense</i>	Timothy	1	1	1																			*	FACU
<i>Phryma leptostachya</i>	American lopseed	1	1	1																			2	UPL*
<i>Phyla lanceolata</i> (Lippia lanceolata)	Fog fruit	1	1	1																			3	OBL
<i>Phytolacca americana</i>	Common pokeweed	1	1	1																			2	FAC-
<i>Pilea pumila</i>	Clearweed	1	1	1	O																		4	FACW
<i>Pinus resinosa</i>	Red pine	1	1	1																			*	
<i>Pinus strobus</i>	White pine	1	1	1																			*	
<i>Plantago major</i>	Common plantain	1	1	1																			*	FAC+
<i>Plantago rugelii</i>	Pale plantain	1	1	1																			0	FAC
<i>Plantago virginica</i>	Virginia plantain	1	1	1																			1	FACU-
<i>Platanus occidentalis</i>	Sycamore	1	1	1	O																		3	FACW
<i>Poa compressa</i>	Canada bluegrass	1	1	1																			*	FACU+
<i>Poa pratensis</i>	Kentucky bluegrass	1	1	1																			*	FAC-
<i>Podophyllum peltatum</i>	May-apple	1	1	1																			4	FACU
<i>Polygonatum biflorum</i>	Solomon's seal	1	1	1																			7	FACU
<i>Polygonum coccineum</i>	Water heartsease	1	1	1	O																		5	OBL
<i>Polygonum hydropiper</i>	Marshpepper	1	1	1	O																		3	OBL
<i>Polygonum hydropiperoides</i>	Swamp smartweed	1	1	1																			4	OBL
<i>Polygonum lapathifolium</i>	Heartsease	1	1	1																			0	FACW+

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
(Page 10 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed												C <sup>2</sup>	Wetlands Indicator Status			
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous			Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade
Polygonum pennsylvanicum	Pennsylvania knotweed	1	1	1													P			1	FACW
Polygonum persicaria	Lady's thumb	1	1	1											U		P			*	FACW
Polygonum punctatum	Smartweed	1	1	1											U		P	P		3	OBL
Polygonum virginianum	Virginia knotweed	1		1										U			P			1	FAC
Polystichum acrostichoides	Christmas fern	1	1	1	U	U	O	O		O			O/C		U					5	UPL
Populus deltoides	Eastern cottonwood	1	1	1	R					U			R				P			2	FAC+
Potentilla simplex	Common cinquefoil	1	1					R					R							3	FACU-
Prunella vulgaris	Lawn prunella	1	1	1				O					U						*	FAC	
Prunus serotina	Black cherry	1	1	1	U	U	U	O	C			U	U/O						2	FACU	
Pycnanthemum tenuifolium	Slender mountain mint	1		1											O				4	FAC	
Quercus alba	White oak	1	1	1	C/A	A	A	A		C/A			A			U			4	FACU	
Quercus bicolor	Swamp white oak	1	1														P		7	FACW+	
Quercus imbricaria	Shingle oak	1	1	1				O	R			O		U/O	O				3	FAC-	
Quercus macrocarpa	Bur oak	1	1	1				O				U				U			4	FAC-	
Quercus marilandica	Black jack oak	1	1	1				O				U				U		U	4	UPL	
Quercus muehlenbergii	Chinkapin oak	1	1	1	U							U	U			O		O	4	NI	
Quercus palustris	Pin oak	1	1			C						U					P		4	FACW	
Quercus rubra	Northern red oak	1	1	1	O	A		A				A		O	U			U	5	FACU	
Quercus stellata	Post oak	1	1	1								U			U			U	4	FACU-	
Quercus velutina	Black oak	1	1	1	O	O		O		O			O						4	UPL	
Ranunculus sceleratus	Celery leaf buttercup	1		1														P	5	OBL	
Rhamnus caroliniana	Carolina buckthorn	1	1			U													6	FAC-	

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
(Page 11 of 14)

Botanical Name	Common Name	Taxa	Spring		Fall	Qualitative Abundance in Area Surveyed										Wetlands Indicator Status											
						T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Dediduous Forest	Evergreen Forest						Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	C <sup>2</sup>
Rhus aromatica	Fragrant sumac	1	1	1	U	A		A		A		C			O			C	3	UPL							
Rhus glabra	Smooth sumac	1	1	1					O						U/O				1	UPL							
Ribes missouriense	Missouri gooseberry	1	1	1	U				C	U		U	U						3	UPL							
Robinia pseudo-acacia	Black locust	1	1	1					C		O		O		O				2	FACU-							
Rosa multiflora	Multiflora rose	1	1	1	O				U	U		U	U						*	FACU							
Rubus flagellaris	Common dewberry	1	1	1							O		O	O					2	FACU-							
Rubus occidentalis	Black raspberry	1	1	1							O		O	O					3	UPL							
Rubus pensilvanicus	Yankee blackberry	1	1	1										O					2	FAC-							
Rubus sp. <sup>†</sup>	Blackberry	1			O	U	C	O	A			O															
Rudbeckia hirta	Black-eyed susan	1	1	1								U/O			U			U	1	FACU							
Rudbeckia missouriensis	Missouri black-eyed susan	1	1	1											O			C	6	FACU-							
Rudbeckia triloba	Brown-eyed susan	1	1	1										U					4	FAC-							
Rumex crispus	Curly dock	1	1	1	O					R									*	FAC+							
Sagittaria latifolia	Broad-leaf arrowhead	1	1	1													P	P	4	OBL							
Salix amygdaloides	Peach-leaved willow	1	1	1							U						P	P	5	FACW							
Salix exigua (Salix interior)	Sandbar willow	1	1	1													P	P	3	OBL							
Salix nigra	Black willow	1	1	1	O						U						P	P	2	OBL							
Salvia azurea	Blue sage	1	1	1							U		R						4	UPL							
Sambucus canadensis	Elderberry	1	1	1										C					2	FACU-							
Sanguinaria canadensis	Bloodroot	1	1	1	U														5	FACU-							
Sanicula gregaria	Black-snakeroot	1	1	1	C	O						U							2	FAC+							
Sassafras albidum	Sassafras	1	1	1	U	O		C	C/A	O			O		U	O			2	FACU							
Satureja arkaniana	Low calamint	1	1	1											U				7	FACW							

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
(Page 12 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed										Wetlands Indicator Status							
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest		Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	C <sup>2</sup>
Schizachyrium scoparium	Little bluestem	1														O		C		5	FACU-	
Scirpus atrovirens	Dark green rush	1	1	1															P		4	OBL
Scirpus fluviatilis	River bulrush	1	1																P		7	OBL
Scutellaria laterifolia	Mad-dog skull cap	1	1																P		5	OBL
Setaria faberii	Giant foxtail	1		1	C				O	O/C						C	O				*	FACU+
Setaria glauca	Yellow bristle grass	1		1							U/O					O	O				*	FAC
Setaria viridis	Green foxtail	1		1												O	O				*	UPL
Sicyos angulatus	Bur cucumber	1	1	1														P			4	FACW-
Silphium laciniatum	Compass plant	1		1								U				U					6	FACU-
Silphium perfoliatum	Cup plant	1	1	1														P	P		3	FACW-
Silphium terebinthinaceum	Prairie dock	1		1					U							U					5	FAC-
Sisyrinchium albidum	White blue-eyed grass	1	1		U				R				R								6	FACU
Smilax bona-nox	Saw greenbriar	1	1		R				U	U			U								3	FACU+
Smilax tamnoides var. hispida	Bristly greenbriar	1		1									U	O							3	FAC
Solanum carolinense	Carolina nightshade	1		1				O	U	U			U/O	R		O/C					0	FACU-
Solidago altissima	Tall goldenrod	1	1	1				C		A			C			A	C				1	FACU
Solidago juncea	Early goldenrod	1	1	1					O/C					U							5	UPL
Solidago nemoralis	Old-field goldenrod	1	1	1	O	O	A	U	A				C	U	U	O	C		O		2	UPL
Solidago radula	Rough goldenrod	1		1							U			U							6	UPL
Solidago ulmifolia	Elm-leaved goldenrod	1		1	O	O					O			O		U					4	UPL
Sorghastrum nutans	Indian grass	1		1				A					O				O				5	FACU+
Sorghum halepense	Johnson grass	1		1	O											U		P			*	FACU

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
(Page 13 of 14)

Botanical Name	Common Name	Taxa	Spring	Fall	Qualitative Abundance in Area Surveyed										Wetlands Indicator Status								
					T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland	Deciduous Forest	Evergreen Forest		Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water	C <sup>2</sup>	
<i>Spiranthes cernua</i>	Nodding ladies' tresses	1		1																		4	FACW-
<i>Symphoricarpos orbiculatus</i>	Coralberry, buckbrush	1	1	1	U	U	R	O	C				R	U	O	O/C	O					1	FACU
<i>Teucrium canadense</i>	American germander	1		1												U			U			2	FACW-
<i>Thalictrum revolutum</i>	Waxyleaf meadow-rue	1	1		U								R									5	FAC
<i>Thlaspi arvense</i>	Field pennycress	1	1		A																*	NI	
<i>Tilia americana</i>	American basswood	1	1	1	U	U		O		U			U									5	FACU
<i>Toxicodendron radicans</i>	Poison ivy	1	1	1	O	O	C	A	A				O	C	C	O/C			P			1	FAC+
<i>Tridens flavus</i>	Grease grass, pupletop	1		1					C							C	O			O		1	UPL
<i>Trifolium pratense</i>	Red clover	1	1						C		U/O										*	FACU+	
<i>Trifolium repens</i>	White clover	1	1	1			C		O			O									*	FACU+	
<i>Trillium recurvatum</i>	Purple trillium	1	1		U			R					R									6	FACU-
<i>Tripsacum dactyloides</i>	Eastern gamma grass	1	1	1								O										5	FAC+
<i>Triticum aestivum</i>	Wheat	1	1	1							A										*	UPL	
<i>Typha angustifolia</i>	Narrow-leaved cattail	1	1	1														P				2	OBL
<i>Ulmus rubra</i>	Slippery elm	1	1	1	C	O	R	A	O			U	O/C	O		U	P					3	FAC
<i>Urtica dioica</i>	Stinging nettle	1	1	1	O																	3	FAC+
<i>Vaccinium vacillans</i>	Late low blueberry	1	1	1		O							U									5	UPL
<i>Verbascum blattaria</i>	Moth mullein	1	1	1												U	O		O		*	FACU-	
<i>Verbascum thapsus</i>	Common mullein	1	1	1					U												*	UPL	
<i>Verbena urticifolia</i>	White vervain	1	1	1									U									4	FAC+
<i>Vernonia baldwinii</i>	Western ironweed	1	1	1	O		O/C					O					O		C			2	UPL
<i>Vernonia missurica</i>	Missouri ironweed	1	1	1												U						4	FAC+

**Table 2.4-5—{Terrestrial Plants Observed Seasonally at the AmerenUE Property, 2007}**  
(Page 14 of 14)

Botanical Name	Common Name	Taxa	Qualitative Abundance in Area Surveyed										Wetlands Indicator Status								
			Spring	Fall	T-1	T-2	T-3	T-4	T-5	Transmission Line	Cropland	Grassland		Deciduous Forest	Evergreen Forest	Deciduous Woody/Herbaceous	Evergreen Woody/Herbaceous	Woody-Dominated Wetland	Herbaceous-Dominated Wetland	Glade	Open Water
Viola sororia	Hairy wood violet	1	1	1				O	U											2	FAC-
Vitis aestivalis	Summer grape	1	1	1	U	U		O	U				O							5	FACU
Vitis cinerea	Winter grape	1	1	1												U				4	FACW-
Vitis riparia	River bank grape	1	1	1												P				4	FACW-
Xanthium strumarium	Cocklebur	1		1	C				U											*	FAC
Zea mays	Corn	1	1	1	R										A					*	UPL
Total Taxa		295	158	245																	

1 Transmission Line = location of the new Unit 2 transmission line corridor.

2 Coefficient of Conservatism is a scale of 0 – 10 with 0 being weedy species tolerant of disturbance and 10 being highly conservative species typically found in natural areas. C values obtained from *Missouri Flora* (The Nature Conservancy, 2000).

\* Adventive species are not assigned C values.

† Carex sp. and Rubus sp. are not counted in the total taxa number

#### Wetlands Indicator Status

OBL Obligate Wetland Plants  
FACW Facultative Wetland  
FAC Facultative Plants  
FACU Facultative Upland  
UPL Obligate Upland Plants

Categories were originally developed and defined by the USFWS National Wetlands Inventory and subsequently modified by the National Plant List Panel. The three facultative categories are subdivided by (+) and (-) modifiers.

Abundance Categories: A = abundant, C = common, O = occasional, U = uncommon, R = rare

Table 2.4-6—{Herpetofauna Observed Seasonally at the AmerenUE Property 2007}

Scientific Name	Common Name	Relative Abundance	Season Observed			Location
			Spring	Summer	Fall	
<i>Acris crepitans blanchardi</i>	Blanchard's cricket frog	Abundant	✓			Site ponds, wetlands, MO River floodplain
<i>Agkistrodon contortrix phaeogaster</i>	Osage Copperhead	Occasional		✓	✓	Logan creek low water crossing
<i>Ambystoma maculatum</i>	Spotted salamander	Uncommon	✓			Cattle pond near T-3 by entrance gate
<i>Apalone mutica</i>	Smooth softshell	Uncommon		✓		Missouri River
<i>Apalone spinifer hartwegi</i>	Western Spiny softshell	Uncommon		✓		Low water crossing near T-1
<i>Bufo americanus americanus</i>	Eastern American toad	Abundant	✓		✓	Site ponds, wetlands, MO River floodplain
<i>Chelydra serpentina</i>	Common snapping turtle	Common	✓	✓		P-6 and Logan Creek
<i>Chisemys picta bellii</i>	Western Painted turtle	Uncommon	✓	✓	✓	P-5, P-6, Logan Creek, quarry pond
<i>Coluber constrictor flaviventris</i>	Eastern yellow-bellied racer	Occasional	✓			Near pump house bridge
<i>Diadophis punctatus amyi</i>	Prairie Ring-necked snake	Occasional			✓	Bluffs near T-1, creek near quarry, limestone glades
<i>Elaphe obsoleta obsoleta</i>	Black rat snake	Occasional		✓		Katy Trail near T-1, gravel road near Auxvasse Creek
<i>Eumeces fasciatus</i>	Common Five-lined skink	Occasional		✓		T-2
<i>Eumeces laticeps</i>	Broad head skink	Uncommon		✓		Parking lot on North CC
<i>Gastrophysa carolinensis</i>	Eastern narrowmouth toad	Uncommon	✓	✓		MO River floodplain near Katy Trail
<i>Graptemys pseudogeographica pseudogeographica</i>	False map turtle	Occasional	✓	✓		Logan Creek and Mollie Dozier Chute
<i>Hyla versicolor/chrysoseis</i>	Gray treefrog	Common	✓			Site ponds, wetlands, MO River floodplain, Mollie Dozier Chute
<i>Lampropeltis calligaster calligaster</i>	Prairie kingsnake	Occasional		✓		Parking lot on North CC
<i>Nerodia sipedon sipedon</i>	Northern water snake	Common		✓		Logan Creek, near pump house
<i>Notophthalmus viridiscens louisianensis</i>	Central newt	Uncommon		✓		Cattle pond near T-3 by entrance gate, T-3 mammal trap
<i>Oophidrys aestivus aestivus</i>	Rough green snake	Uncommon	✓			Transmission line corridor near T-1
<i>Ophisaurus attenuatus</i>	Western Slender Glass Lizard	Uncommon			✓	T-5
<i>Pseudacris crucifer crucifer</i>	Northern spring peeper	Common	✓			Site ponds, wetlands, Mollie Dozier Chute
<i>Pseudacris triseriata</i>	Western chorus frog	Uncommon	✓			Isolated ponds
<i>Rana catesbiana</i>	Bullfrog	Common	✓		✓	P-4, P-5, P-6
<i>Rana clamitans melanota</i>	Green frog	Common	✓		✓	Site ponds, wetlands, and MO River floodplain
<i>Rana palustris</i>	Pickeral Frog	Uncommon	✓			Fishless Pond 5
<i>Rana sphenoccephala utricularia</i>	Southern Leopard Frog	Common	✓	✓		Site ponds, wetlands, MO River floodplain, and Mollie Dozier Chute
<i>Scincella lateralis</i>	Ground skink	Occasional		✓	✓	T-2, T-4
<i>Sclerophorus undulatus hyacinthinus</i>	Fence Lizard	Common			✓	T-2, T-4
<i>Storeria dekayi</i>	Midland brown snake	Occasional			✓	T-5
<i>Terrapene carolina triunguis</i>	Three-toed box turtle	Occasional			✓	Throughout study area
<i>Trachemys scripta elegans</i>	Red-eared slider	Common	✓	✓	✓	P-6, Logan Creek, Mollie Dozier Chute
<b>Total Species Richness: 32</b>						



**Table 2.4-7—{Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations Near Callaway Plant, by Season, 2007-2008}**

(Page 1 of 2)

Species	Scientific Name	July 2007	October 2007	January 2008	Spring 2008
Chestnut lamprey	<i>Ichthyomyzon castaneus</i>		2		
Lake sturgeon	<i>Acipenser fulvescens</i>			1	
Shovelnose sturgeon	<i>Scaphirhynchus platyrhynchus</i>	13	6	36	
Paddlefish	<i>Polyodon spathula</i>	1			
Spotted gar	<i>Lepisosteus oculatus</i>	1			
Longnose gar	<i>Lepisosteus osseus</i>	3	10		
Shortnose gar	<i>Lepisosteus platostomus</i>	4	3		
Goldeye	<i>Hiodon alosoides</i>	30	7	18	
Mooneye	<i>Hiodon tergisus</i>			1	
Skipjack herring	<i>Alosa chrysochloris</i>		2		
Gizzard shad	<i>Dorosoma cepedianum</i>	1,104	30	496	
Stoneroller	<i>Campostoma</i> sp.	94	4		4
Largescale stoneroller	<i>Campostoma oligolepis</i>	3			
Central stoneroller	<i>Campostoma pullum</i>	2			1
Grass carp	<i>Ctenopharyngodon idella</i>		2		
Red shiner	<i>Cyprinella lutrensis</i>	749	237	20	4
Common carp	<i>Cyprinus carpio</i>	17	13		
Plains minnow	<i>Hybognathus placitus</i>	3	1	6	
Silver carp	<i>Hypophthalmichthys molitrix</i>	2		8	
Striped shiner	<i>Luxilus chrysocephalus</i>	6			
Redfin shiner	<i>Lythrurus umbratilis</i>	195	22		44
Speckled chub	<i>Macrhybopsis aestivalis</i>			89	
Sturgeon chub	<i>Macrhybopsis gelida</i>			1	
Silver chub	<i>Macrhybopsis storeriana</i>	5	1		
Emerald shiner	<i>Notropis atherinoides</i>	187	504	137	
River shiner	<i>Notropis blennioides</i>	1	3		
Sand shiner	<i>Notropis ludibundus</i>	171	3		
Ozark minnow	<i>Notropis nubilus</i>	19	1		
Channel shiner	<i>Notropis wickliffi</i>	28	2	1	
Bluntnose minnow	<i>Pimephales notatus</i>	21	3		19
Bullhead minnow	<i>Pimephales vigilax</i>	22	16	13	
Creek chub	<i>Semotilus atromaculatus</i>	70			
Carp sucker or Buffalo	<i>Carpionodes lictiobus</i>	4	8		
Carp suckers	<i>Carpionodes</i> sp.			3	
River carp sucker	<i>Carpionodes carpio</i>	15	13	11	
White sucker	<i>Catostomus commersoni</i>	9	1		
Blue sucker	<i>Cycleptus elongatus</i>	1	4	1	
Smallmouth buffalo	<i>Ictiobus bubalus</i>	3	10	2	
River redhorse	<i>Moxostoma carinatum</i>			2	
Golden redhorse	<i>Moxostoma erythrurum</i>			2	
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>	1	1	1	
Yellow bullhead	<i>Ameiurus natalis</i>	1			1
Blue catfish	<i>Ictalurus furcatus</i>	2	15	7	
Channel catfish	<i>Ictalurus punctatus</i>	6	92	12	

**Table 2.4-7—{Taxonomic Composition and Abundance in Fish Surveys of the Missouri River and Stream Stations Near Callaway Plant, by Season, 2007-2008}**

(Page 2 of 2)

Species	Scientific Name	July 2007	October 2007	January 2008	Spring 2008
Flathead catfish	<i>Pylodictis olivaris</i>	1	14		
Blackstripe topminnow	<i>Fundulus notatus</i>	13	5		1
Mosquitofish	<i>Gambusia affinis</i>	34	268	4	2
Brook silverside	<i>Labidesthes sicculus</i>	3	13		8
Temperate basses	<i>Morone</i> sp.	14	9	5	
White bass	<i>Morone chrysops</i>	1			
Sunfishes	<i>Lepomis</i> sp.	5	5	18	44
Green sunfish	<i>Lepomis cyanellus</i>	13	3		10
Orangespotted sunfish	<i>Lepomis humilus</i>	2			
Bluegill	<i>Lepomis macrochirus</i>	13	2	3	
Longear sunfish	<i>Lepomis megalotis</i>	4			
Spotted bass	<i>Micropterus punctulatus</i>	1			
Largemouth bass	<i>Micropterus salmoides</i>	6	1	1	
Black crappie	<i>Pomoxis nigromaculatus</i>	1			
Fantail darter	<i>Etheostoma flabellare</i>		1		
Johnny darter	<i>Etheostoma nigrum</i>	3	10		
Orangethroat darter	<i>Etheostoma spectabile</i>	62	5		
Missouri saddled darter	<i>Etheostoma tetrazonum</i>			1	7
Slenderhead darter	<i>Percina phoxocephala</i>	2			
Sauger	<i>Stizostedion canadense</i>	1			10
Freshwater drum	<i>Aplodinotus grunniens</i>	3	32	28	
<b>Total</b>		<b>2,975</b>	<b>1,384</b>	<b>928</b>	<b>155</b>
<b>Species richness</b>		<b>49</b>	<b>40</b>	<b>27</b>	<b>11</b>

**Table 2.4-8—{Taxonomic Composition and Abundance in Fish Surveys of the Missouri River Near AmerenUE Property}**

Species	Total	Plant Side "Near Shore"	Opposite Side "Far Shore"	Upstream of Existing Intake	Adjacent to Existing Intake	Downstream of Existing Intake
Chestnut lamprey	2	1	1	2		
Lake sturgeon	1		1	1		
Shovelnose sturgeon	55	9	46	12	39	4
Paddlefish	1		1	1		
Spotted gar	1		1	1		
Longnose gar	13	7	6	2	9	2
Shortnose gar	7	4	3	1	4	2
Goldeye	55	38	17	32	18	5
Mooneye	1		1			1
Skipjack herring	2	2			2	
Gizzard shad	1,630	1,347	283	261	1,159	210
Grass carp	2	1	1		2	
Red shiner	927	838	89	168	89	670
Common carp	18	10	8	7	7	4
Plains minnow	10	5	5	3	1	6
Silver carp	10	5	5	6	2	2
Speckled chub	89	80	9	52	13	24
Sturgeon chub	1	1		1		
Silver chub	6	5	1	1	5	
Emerald shiner	828	546	282	325	53	450
River shiner	4	3	1	1	2	1
Sand shiner	24	18	6		17	7
Channel shiner	31	18	13	12	11	8
Bluntnose minnow	1	1			1	
Bullhead minnow	51	40	11	8	30	13
Carp suckers	3	3		3		
Carp sucker or Buffalo	8		8			8
River carpsucker	39	14	25	21	9	9
Blue sucker	6	3	2	2	1	3
Smallmouth buffalo	15	6	9	8	7	
River redhorse	2	1	1	1	1	
Golden redhorse	2	1	1	1	1	
Shorthead redhorse	3	1	2		2	1
Blue catfish	24	4	20	20	3	1
Channel catfish	110	44	66	31	41	38
Flathead catfish	15	13	2	4	8	3
Mosquitofish	4	1	3	1		3
Brook silverside	4	4			3	1
Temperate basses	28	17	11	9	10	9
White bass	1		1		1	
Sunfishes	18	4	14	2	2	14
Bluegill	6	1	5	2	1	3
Spotted bass	1	1			1	
Largemouth Bass	1	1				1
Black crappie	1	1		1		
Missouri saddled darter	1	1			0	1
Slenderhead darter	2	2			2	
Sauger	1		1			1
Freshwater drum	63	20	43	15	42	6
Total	4,128	3,123	1,005	1,018	1,599	1,511
Species Richness <sup>1</sup>	45	40	36	33	34	30

<sup>1</sup> Unidentified species within a genus did not count toward the species richness total unless they were the only representatives identified within that genus.

**Table 2.4-9—{Taxonomic Composition and Catch-Per-Effort by Method in Fish Surveys of the Missouri River and Stream Station Near AmerenUE Property, 2007-2008}**

(Page 1 of 2)

Species	Missouri River				Streams Seining (#/haul)
	Electrofishing (#/hour)	Gill Netting (#/24 hr)	Hoop Netting (#/24 hr)	Seining (#/haul)	
Chestnut lamprey	0.33				
Lake sturgeon		0.03			
Shovelnose sturgeon	0.17	1.80			
Paddlefish		0.03			
Spotted gar	0.17				
Longnose gar	0.50	0.27	0.07		
Shortnose gar	0.50	0.30	0.03	0.03	
Goldeye	3.00	0.30		0.81	
Mooneye	0.17				
Skipjack herring	0.17	0.27			
Gizzard shad	64.00	0.43		34.28	
Stoneroller*					3.64
Largescale stoneroller					0.11
Central stoneroller					0.11
Grass carp	0.17		0.03		
Red shiner	0.50			25.67	2.96
Common carp	2.33	0.13			0.43
Plains minnow				0.28	
Silver carp	1.67				
Striped shiner					0.21
Redfin shiner					9.32
Speckled chub				2.47	
Sturgeon chub				0.03	
Silver chub				0.17	
Emerald shiner	1.83			22.69	
River shiner				0.11	
Sand shiner				0.67	5.36
Ozark minnow					0.71
Channel shiner	0.50			0.78	
Bluntnose minnow				0.03	0.82
Bullhead minnow				1.42	
Creek chub					2.50
Carp sucker or Buffalo*				0.22	0.14
Carp suckers*				0.08	
River carpsucker	5.00	0.20		0.08	
White sucker					0.36
Blue sucker	0.50	0.23			
Smallmouth buffalo	2.00	0.10	0.07		
River redhorse	0.33				
Golden redhorse	0.33				
Shorthead redhorse	0.33	0.13			
Yellow bullhead					0.70
Blue catfish	2.33	0.33			
Channel catfish	2.33	0.40	0.20	2.28	

**Table 2.4-9—{Taxonomic Composition and Catch-Per-Effort by Method in Fish Surveys of the Missouri River and Stream Station Near AmerenUE Property, 2007-2008}**

(Page 2 of 2)

Species	Missouri River				Streams Seining (#/haul)
	Electrofishing (#/hour)	Gill Netting (#/24 hr)	Hoop Netting (#/24 hr)	Seining (#/haul)	
Flathead catfish	1.67		0.17		
Blackstripe topminnow					0.67
Mosquitofish				0.11	10.86
Brook silverside				0.11	0.71
Temperate basses*	2.00	0.03		0.42	
White bass		0.03			
Sunfishes*	0.50			0.42	1.93
Green sunfish					0.93
Orangespotted sunfish					0.07
Bluegill	0.50			0.08	0.43
Longear sunfish					0.14
Spotted bass				0.03	
Largemouth bass	0.17				0.25
Black crappie			0.03		
Fantail darter					0.29
Johnny darter					0.46
Orangethroat darter					3.11
Missouri saddled darter				0.03	
Slenderhead darter	0.17			0.06	
Sauger					
Freshwater drum	8.00	0.30	0.03	0.14	
Total	102.17	5.33	0.63	93.47	46.61
Species richness	29	17	6	24	24

**Table 2.4-10—{Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008}**

(Page 1 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
Caecidotea			12	1,551
Caecidotea (unpigmented)				3
Cambaridae (not Orconectes)				1
Crangonyx			2	1,130
Hyaella azteca				3
Hydracarina			1	
Lirceus	2		40	157
Orconectes			2	12
Palaemonetes kadiakensis			8	9
Cf Stygobromus				1
Gordiidae				1
Turbellaria				219
Ancylidae			1	1
Corbicula	6			
Lymnaeidae			7	15
Menetus			5	2
Musculium			16	
Physidae			15	40
pLANORBELLA				3
Pisidium			5	
Sphaeriidae			33	35
Amercaenis	6			
Apobaetis	1			
Caenis	7		35	
Callibaetis			4	
Camelobaetidius	1			
Cercobrachys	4			
Heptageniidae	1			
Hexagenia	39			
Isonychia	11			
Labiobaetis	128			
Leptophlebiidae	1			
Pentagenia	9			
Stenacron	1			
Stenonema femoratum			12	23
Stenonema integrum	11			
Tricorythodes	1			
Anax				1
Argia	1			3
Dromogomphus	3			
Enallagma				1
Gomphidae	4			
Nasiaeschna pentacantha			1	
Neurocordulia molesta	5			
Pachydiplax longipennis			6	
Perithemis			1	

**Table 2.4-10—{Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008}**

(Page 2 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
Sympetrum			1	
Acroneuria	1			
Allocapnia				398
Capniidae			2	
Isoperla				44
Neoperla	4			
Aquarius			1	3
Belostoma				1
Saldidae	1			
Corydalus	1			
Sialis			6	
Cheumatopsyche	1			
Cyrnellus fraternus	1			
Diplectrona				1
Hydropsyche orris	272			
Hydropsychidae	1			
Ironquia				21
Nectopsyche	1			
Neureclipsis	1			
Potamyia flava	167			
Ptilostomis				3
Pycnopsyche				2
Rhyacophila fenestra/ledra				19
Rhyacophila lobifera				28
Agabus				7
Berosus				1
Dineutus				4
Dubiraphia			29	2
Dytiscidae			2	
Ectopria				30
Gyrinus				1
Helichus				1
Hydrophilidae (not Berosus)				1
Hydroporus				8
Lutrochus				2
Macronychus glabratus	1			
Peltodytes			1	3
Psephenus				2
Scirtidae			3	2
Stenelmis	5		3	73
Atherix	1			
Ceratopogoninae	5		8	2
Chaoborus	2		5	
Clinocera				1
Culicidae			1	
Cf Erioptera				12

**Table 2.4-10—{Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008}**

(Page 3 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
Hexatoma				2
Simuliidae (not Prosimulium)				2
Tabanidae				7
Tipula				2
Branchiura sowerbyi	4		85	36
Enchytraeidae				17
Erpobdellidae			1	17
Glossiphoniidae			1	1
Haplotaxis gordioides				2
Limnodrilus claparedeianus	5			9
Limnodrilus hoffmeisteri	4		3	4
Limnodrilus udekemianus	1			
Lumbricidae			8	1
Tubificidae w/ hair chaetae	8		69	78
Tubificidae w/out hair chaetae	30		121	79
Ablabesmyia annulata	10			
Ablabesmyia rhamphe gp	1		2	
Clinotanypus				10
Coelotanypus	3			
Natarsia			2	9
Procladius			2	9
Tanypus carinatus			5	
Tanypus neopunctipennis			9	
Thienemannimyia gp	5			
Zavreliomyia	2		1	
Sympotthastia				32
Bryophaenocladius				1
Cricotopus/Orthocladius*				113
Cricotopus cf luciae				56
Diplocladius cultriger				14
Epoicocladius	1			
Eukiefferiella claripennis gp				84
Hydrobaenus (not "o")			21	654
Hydrobaenus cf sp. "o"				606
Orthocladius (Euortho) w/13 teeth				32
Orthocladius (Euortho) with 19 teeth				16
Orthocladius obumbratus/robacki				8
Parametriocnemus				10
Paraphaenocladius			1	
Tvetenia				37
Axarus	3			
Chernovskiiia	5			
Chironomini (pupa)	2			
Chironomus			156	22
Cryptochironomus	3			
Dicrotendipes			6	



**Table 2.4-10—{Taxonomic Composition and Abundance in Benthic Macroinvertebrate Surveys of the Missouri River and Stream Surveys Near Callaway Plant, Fall 2007 and Spring 2008}**

(Page 4 of 4)

Taxon	Missouri River		Streams	
	Fall 2007	Spring 2008	Fall 2007	Spring 2008
<i>Dicrotendipes modestus</i>			14	
<i>Dicrotendipes neomodestus</i>			5	
<i>Dicrotendipes nervosus</i>			1	
<i>Dicrotendipes simpsoni</i>			10	
<i>Endochironomus</i>			1	
<i>Glyptotendipes</i>	1		49	12
<i>Goeldichironomus</i>			31	
<i>Kiefferulus</i>			41	
<i>Microtendipes pedellus</i> gp			1	
<i>Paratendipes albimanus</i>			1	
<i>Paratendipes basidens</i>	3			
<i>Polypedilum flavum</i>	9			
<i>Polypedilum halterale</i> gp	3			4
<i>Polypedilum scalaenum</i> gp	1			
<i>Robackia claviger</i>	1			
<i>Saetheria</i>	1			
<i>Stictochironomus</i>			9	46
<i>Paratanytarsus</i>				1
<i>Rheotanytarsus</i>	1			
<i>Tanytarsus</i>			4	
<b>Number of Organisms</b>	<b>814</b>		<b>928</b>	<b>6,012</b>
<b>Taxa richness</b>	<b>54</b>	<b>0</b>	<b>56</b>	<b>83</b>
<b>EPT Richness</b>	<b>21</b>		<b>4</b>	<b>10</b>

**Table 2.4-11—{Taxonomic Composition and Abundance by Method and by Location, in Benthic Macroinvertebrate Surveys of the Missouri River Near AmerenUE Property, 2007-2008}**

(Page 1 of 2)

	Ponar Samples	Surface Tow Samples	Upstream of Existing Intake	Downstream of Existing Intake
Lirceus	2		1	1
Corbicula	6		5	1
Amercaenis		6	1	5
Apobaetis		1		1
Caenis		7	1	6
Camelobaetidius		1		1
Cercobrachys		4	1	3
Heptageniidae	1			1
Hexagenia	26	13	20	19
Isonychia		11	5	6
Labiobaetis		128	49	79
Leptophlebiidae		1		1
Pentagenia	6	3	6	3
Stenacron		1	1	
Stenonema integrum		11	3	8
Tricorythodes		1		1
Argia		1		1
Dromogomphus		3	2	1
Gomphidae	2	2	2	2
Neurocordulia molesta	2	3	2	3
Acroneuria		1		1
Neoperla		4	2	2
Saldidae	1			1
Corydalus		1	1	
Cheumatopsyche		1		1
Cyrnellus fraternus		1		1
Hydropsyche orris	2	270	61	211
Hydropsychidae	1			1
Nectopsyche		1	1	
Neureclipsis		1		1
Potamyia flava		167	32	135
Macronychus glabratus		1	1	
Stenelmis	2	3	2	3
Atherix	1			1
Ceratopogoninae	4	1	1	4
Chaoborus		2	2	
Branchiura sowerbyi	4		4	
Limnodrilus claparedeianus	5		2	3
Limnodrilus hoffmeisteri	4		1	3
Limnodrilus udekemianus	1		1	
Tubificidae w/ hair chaetae*	6	2	2	6
Tubificidae w/out hair chaetae*	30		20	10
Ablabesmyia annulata	6	4	2	8
<i>Ablabesmyia rhamphe</i> gp	1			1
Coelotanypus	3		3	
<i>Thienemannimyia</i> gp		5	3	2

**Table 2.4-11—{Taxonomic Composition and Abundance by Method and by Location, in Benthic Macroinvertebrate Surveys of the Missouri River Near AmerenUE Property, 2007-2008}**

(Page 2 of 2)

	Ponar Samples	Surface Tow Samples	Upstream of Existing Intake	Downstream of Existing Intake
<i>Zavreliomyia</i>		2		2
<i>Epoicocladus</i>	1		1	
<i>Axarus</i>		3		3
<i>Chernovskiiia</i>	4	1		5
<i>Chironomini (pupa)*</i>		2	2	
<i>Cryptochironomus</i>	3		1	2
<i>Glyptotendipes</i>		1	1	
<i>Paratendipes basidens</i>	1	2	1	2
<i>Polypedilum flavum</i>		9	1	8
<i>Polypedilum halterale</i> gp	2	1	1	2
<i>Polypedilum scalaenum</i> gp	1			1
<i>Robackia claviger</i>		1	1	
<i>Saetheria</i>		1	1	
<i>Rheotanytarsus</i>		1		1
Number of Organisms	128	686	250	564
Taxa Richness	25	42	37	43
EPT Richness	4	21	13	19

\* Family level or higher taxa designations (unitalicized) are only counted for the taxa richness total if there is not a genus within that group present.

**Table 2.4-12—{Taxonomic Composition and Abundance in Fish Surveys of Streams in the AmerenUE Property}**

Species	Scientific name	Permanent		Intermittent Tributaries				
		Logan Creek	Mud Creek	Logan Creek-A*	Mud Creek*	Logan Creek-B	Auxvasse Creek-A*	Auxvasse Creek-B
		S1	S2	S3	S4	S5	S6	S7
Stoneroller	<i>Campostoma</i> sp.	64	13					25
Largescale stoneroller	<i>Campostoma oligolepis</i>		3					
Central stoneroller	<i>Campostoma pullum</i>	1					1	1
Red shiner	<i>Cyprinella lutrensis</i>	33	50					
Common carp	<i>Cyprinus carpio</i>	7	5					
Striped shiner	<i>Luxilus chrysocephalus</i>	6						
Redfin shiner	<i>Lythrurus umbratilis</i>	147	112			2		
Sand shiner	<i>Notropis ludibundus</i>	149	1					
Ozark minnow	<i>Notropis nubilus</i>	19	1					
Bluntnose minnow	<i>Pimephales notatus</i>	21	2					
Creek chub	<i>Semotilus atromaculatus</i>	33	34					3
Carp sucker or Buffalo	<i>Carpiodes/lctiobus</i>	4						
White sucker	<i>Catostomus commersoni</i>	10						
Yellow bullhead	<i>Ameiurus natalis</i>	2						
Blackstripe topminnow	<i>Fundulus notatus</i>	6	13					
Mosquitofish	<i>Gambusia affinis</i>	146	158					
Brook silverside	<i>Labidesthes sicculus</i>	16	4					
Sunfishes	<i>Lepomis</i> sp.	12				37		5
Green sunfish	<i>Lepomis cyanellus</i>	9				11		6
Orangespotted sunfish	<i>Lepomis humilis</i>		2					
Bluegill	<i>Lepomis macrochirus</i>	3				1		8
Longear sunfish	<i>Lepomis megalotis</i>	1	3					
Largemouth bass	<i>Micropterus salmoides</i>					1		6
Fantail darter	<i>Etheostoma flabellare</i>	4	4					
Johnny darter	<i>Etheostoma nigrum</i>	12	1					
Orangethroat darter	<i>Etheostoma spectabile</i>	11	72	2			2	
Total		716	478	2	0	52	3	54
Species richness†		21	16	1	0	4	2	5

\* No fish – creek was dry.

† Unidentified species within a genus did not count toward the species richness total unless they were the only representatives identified within that genus.

**Table 2.4-13—{Taxonomic Composition and Abundance in Benthic Macoinvertebrate Surveys of Streams in the AmerenUE Property}**

(Page 1 of 2)

Taxon	Permanent		Intermittent Tributaries				
	Logan Creek	Mud Creek	Logan Creek-A*	Mud Creek*	Logan Creek-B*	Auxvasse Creek-A	Auxvasse Creek-B*
	S1	S2	S3	S4	S5	S6	S7
Caecidotea		12					
Crangonyx						2	
Hydracarina	1						
Lirceus	7	33					
Orconectes		2					
Palaemonetes kadiakensis		8					
Ancylidae		1					
Lymnaeidae	2	5					
Menetus	1					4	
Musculium						16	
Physidae	6	7				2	
Pisidium						5	
Sphaeriidae						33	
Caenis	9	26					
Callibaetis		4					
Stenonema femoratum		12					
Nasiaeschna pentacantha		1					
Pachydiplax longipennis		1				5	
Perithemis						1	
Sympetrum						1	
Capniidae	2						
Aquarius		1					
Sialis		6					
Dubiraphia	4	25					
Dytiscidae	1	1					
Peltodytes		1					
Scirtidae	1	2					
Stenelmis		3					
Ceratopogoninae	5	2				1	
Chaoborus	2	3					
Culicidae	1						
Branchiura sowerbyi	43	42					
Erpobdellidae		1					
Glossiphoniidae						1	
Limnodrilus hoffmeisteri	1	1				1	
Lumbricidae		7				1	
Tubificidae w/ hair chaetae*	10	40				19	
Tubificidae w/out hair chaetae*	34	84				3	
Ablabesmyia rhamphe gp		2					
Natarsia	1	1					
Procladius	1	1					
Tanytus carinatus	5						
Tanytus neopunctipennis		9					
Zavreliomyia		1					

**Table 2.4-13—{Taxonomic Composition and Abundance in Benthic Macoinvertebrate Surveys of Streams in the AmerenUE Property}**

(Page 2 of 2)

Taxon	Permanent		Intermittent Tributaries				
	Logan Creek	Mud Creek	Logan Creek-A*	Mud Creek*	Logan Creek-B*	Auxvasse Creek-A	Auxvasse Creek-B*
	S1	S2	S3	S4	S5	S6	S7
Hydrobaenus	1	19				1	
Paraphaenocladus	1						
Chironomus	88	53				15	
Dicrotendipes*	6						
Dicrotendipes modestus	1					13	
Dicrotendipes neomodestus	5						
Dicrotendipes nervosus						1	
Dicrotendipes simpsoni	9	1					
Endochironomus						1	
Glyptotendipes	26	23					
Goeldichironomus	25	5				1	
Kiefferulus	34	5				2	
Microtendipes pedellus gp		1					
Paratendipes albimanus		1					
Stictochironomus		6				3	
Tanytarsus		2				2	
Number of Organisms	333	461	0	0	0	134	0
Taxa Richness†	27	40	0	0	0	22	0
EPT Richness	2	3	0	0	0	0	0

\* No organisms – creek was dry.

† Family level or higher taxa designations (unitalicized) are only counted for the taxa richness total if there is not a genus within that group present.

**Table 2.4-14—{Summary of Wetland Functional Values}**

Functional	Relative Functional Value by Wetland Type			
	Isolated Ponds	Settling Ponds	Logan Cr Wetlands	Big River Wetlands
Groundwater Recharge-Discharge	L	M	H	H
Flood Storage	L	L-M	H	H
Fish Habitat	L	M	L	H
Sediment Retention	L	H	M	H
Nutrient/Contaminant Removal	L	L	M	H
Wildlife Habitat (fishless vernal pools, waterfowl)	L-M	M	H	H
Recreation (fishing, hunting, etc.)	L	M	L	L
Uniqueness-Heritage (important for listed species)	L	L	H	H

Functional values assigned based on professional judgement whereby H = high value/benefit; M = medium value/benefit; L = low value/benefit; 0 = not applicable

**Table 2.4-15—{Important Aquatic Species Collected from or Potentially in the Missouri River or Streams Near the AmerenUE Property}**

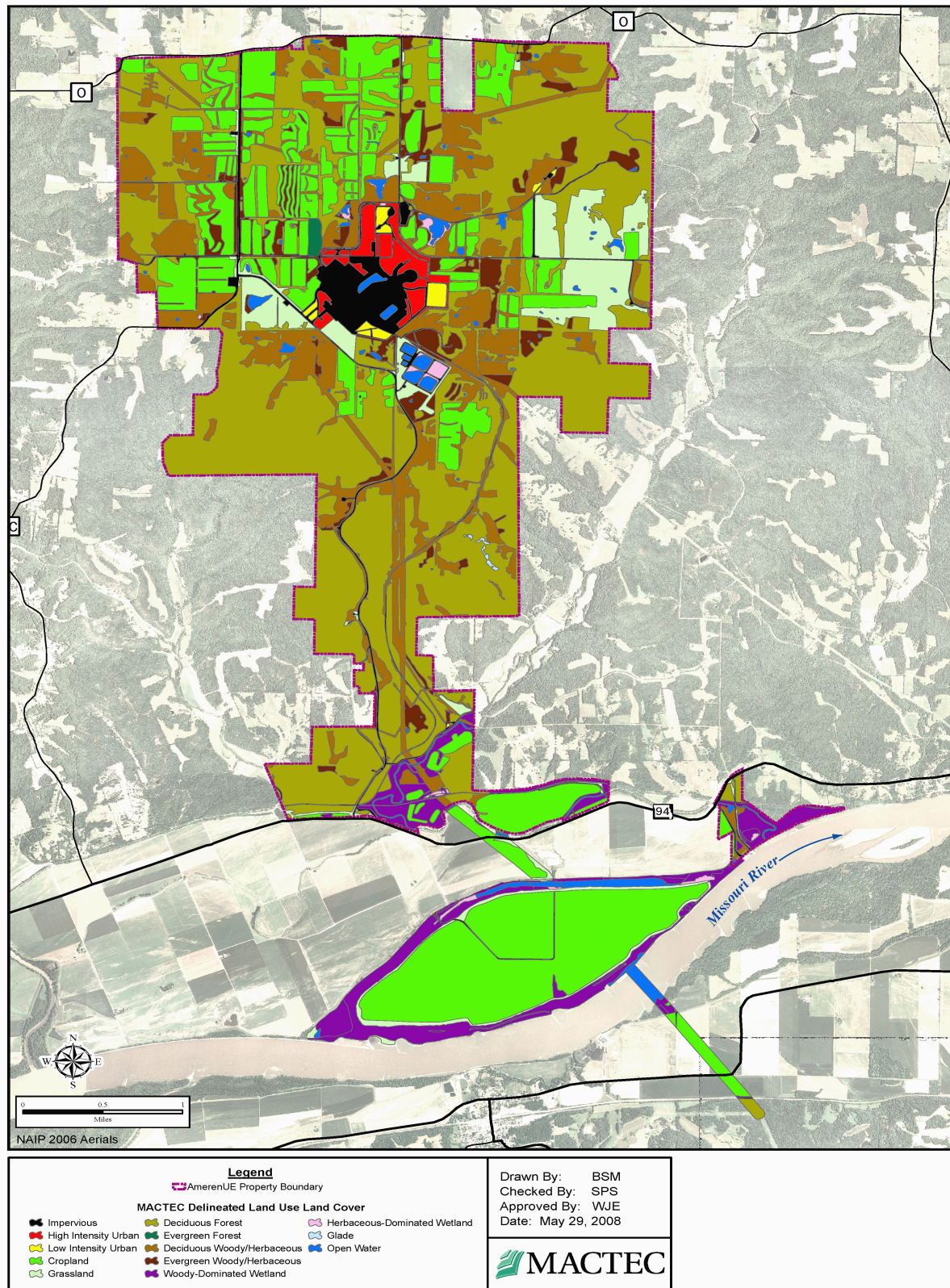
Common Name	Scientific Name	Threatened or Endangered Species	Missouri S3 (Vulnerable) Species*	Recreationally or Commercially Important Species
<b>Fish</b>				
Lake sturgeon	Acipenser fulvescens	X		
Pallid sturgeon	Scaphirhynchus albus	X		
Shovelnose sturgeon	Scaphirhynchus platyrhynchus			X
Paddlefish	Polyodon spathula		X	X
Sturgeon chub	Macrhybopsis gelida		X	
Sicklefin chub	Macrhybopsis meeki		X	
Blacknose shiner	Notropis heterolepis		X	
Topeka shiner	Notropis Topeka	X		
Flathead chub	Platygnathia gracilis	X		
Blue sucker	Cyprinella elongata		X	
Smallmouth buffalo	Ictalurus nebulosus			X
Bigmouth buffalo	Ictalurus cyprinellus			X
Blue catfish	Ictalurus furcatus			X
Channel catfish	Ictalurus punctatus			X
Flathead catfish	Pylodictis olivaris			X
Plains topminnow	Fundulus sciadicus		X	
White bass	Morone chrysops			X
Bluegill	Lepomis macrochirus			X
Spotted bass	Micropterus punctulatus			X
Largemouth bass	Micropterus salmoides			X
White crappie	Pomoxis annularis			X
Black crappie	Pomoxis nigromaculatus			X
Sauger	Stizostedion canadense			X
Freshwater drum	Aplodinotus grunniens			X
<b>Mussels**</b>				
Pink mucket	Lampsilis abrupta	X		
Scaleshell	Leptodea leptodon	X		

\* Only species that were also listed as globally vulnerable, and had previously been collected in the study area, were considered.

\*\* Neither mussel species has been collected from the site or ecological investigation area, but both potentially occur in the ecological investigation area.



Figure 2.4-1—{Site Land Cover}



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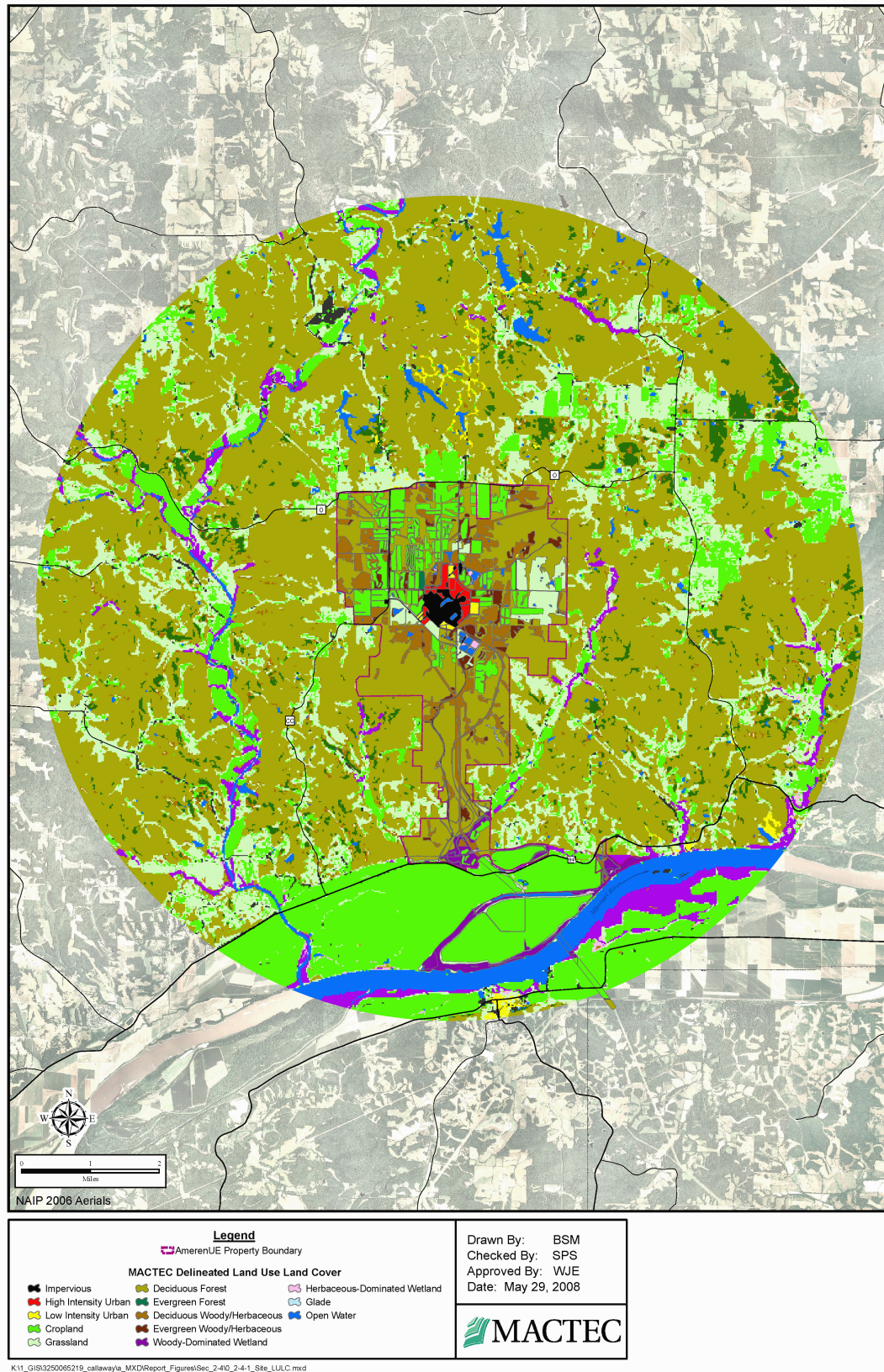
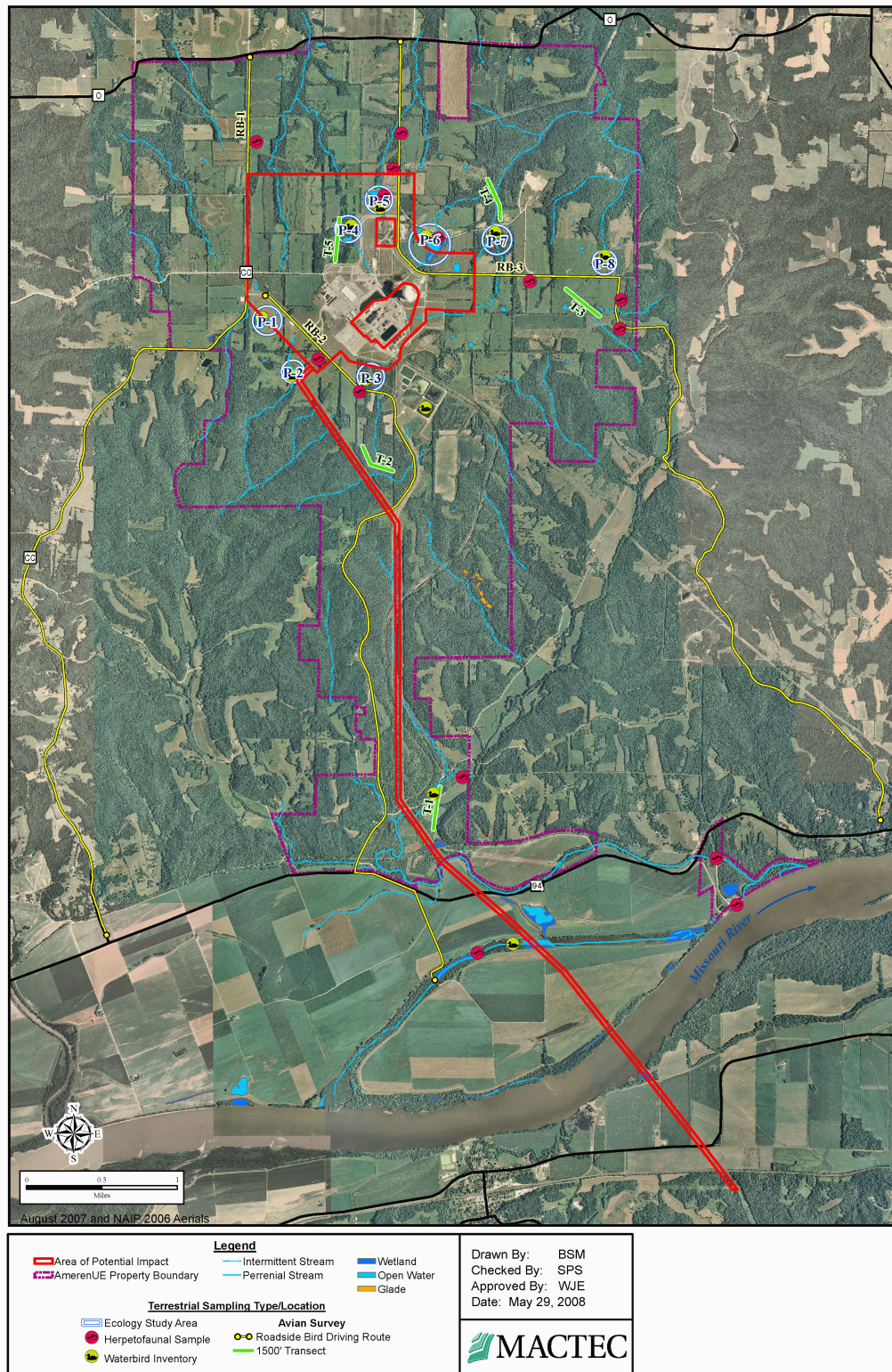
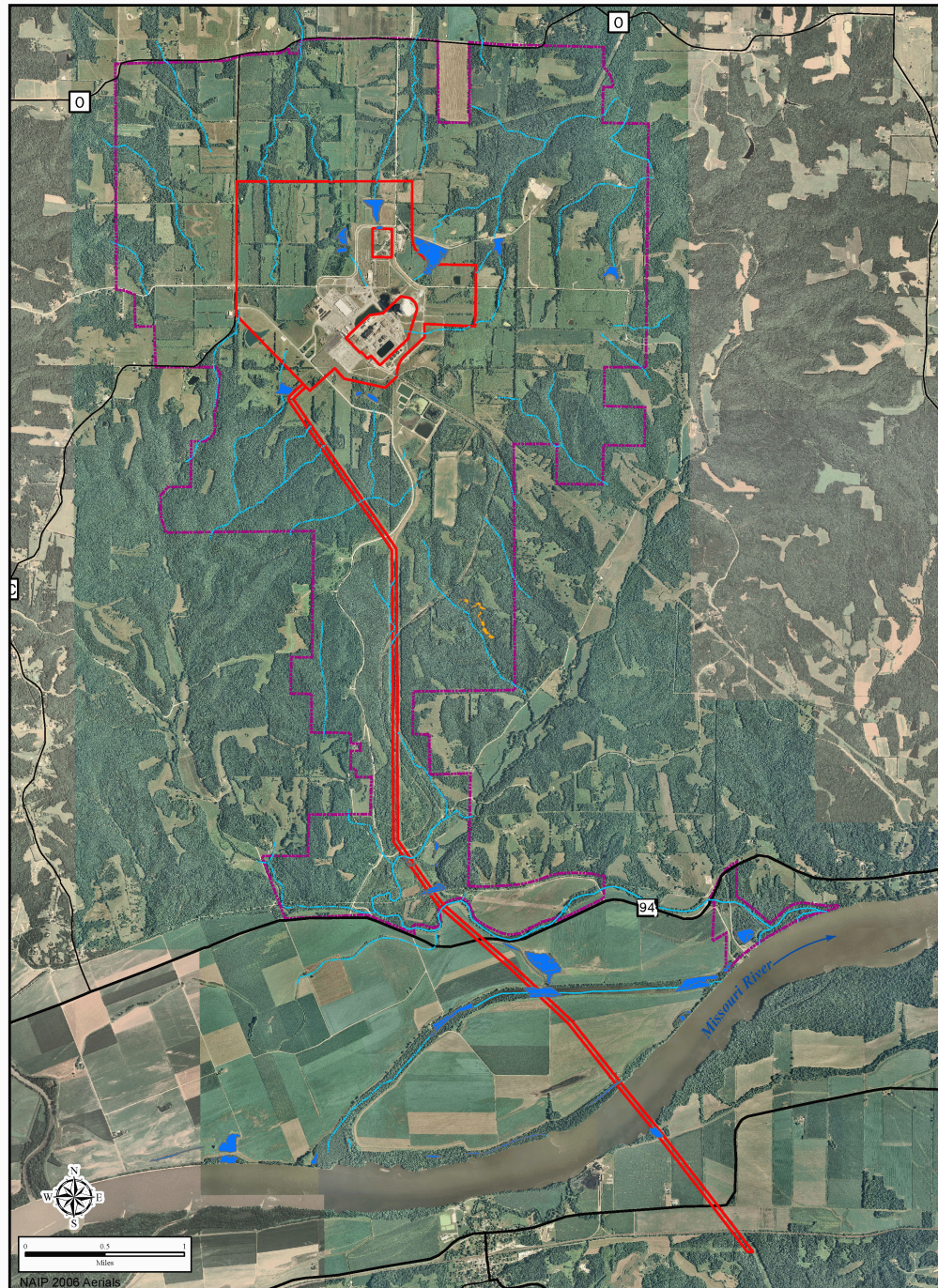
**Figure 2.4-2—{Land Cover-Ecological Study Area}**



Figure 2.4-3—{Terrestrial Sampling Locations}





**Figure 2.4-4—{Terrestrial Important Habitats}**

<b>Legend</b> Area of Potential Impact AmerenUE Property Boundary  <b>Habitats</b> Intermittent Stream Perennial Stream Glade USACE Jurisdictional Wetland/Pond		Drawn By: BSM Checked By: SPS Approved By: WJE Date: May 29, 2008

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**Figure 2.4-5—{Aquatic Sampling Locations}**