Wildlife and Vegetation Assessment

Russellville Solar, LLC

Logan County, Kentucky
February 16, 2022

Tables

Appendices

1 Introduction

Tennessee Valley Authority (TVA) entered into a power purchase agreement (PPA) with Russellville Solar LLC (Russellville Solar), a wholly owned subsidiary of Silicon Ranch Corporation (SRC), on January 8, 2021, to purchase the electric power generated by a proposed solar photovoltaic (PV) facility in Logan County, Kentucky. The proposed solar facility, known as Logan County Solar, would be owned by SRC and operated by Russellville Solar and would have an installed capacity of 173 megawatts (MWs). The solar facility would connect to TVA's adjacent existing Springfield-Logan Aluminum 161-kV Transmission Line (TL). Under the terms of the PPA, TVA would purchase the electric output from the solar facility for an initial term of 20 years, subject to satisfactory completion of all applicable environmental reviews.

The proposed solar facility would occupy portions of nine individual tracts of land in Logan County, approximately two miles southwest of Russellville, Kentucky, together totaling approximately 1,569 acres. The solar facility interconnection would require upgrades along approximately 2,500 feet of the adjacent TL. Together, these areas total approximately 1,579 acres and are referred to herein as the Study Area (Appendix A, Figure 1 and 2). The solar facility would consist of arrays of crystalline silicon PV panels attached to ground-mounted single-axis trackers, central inverters, several medium voltage transformers and one or two main power transformers, a substation and battery energy storage system, internal site access roads, and all associated cabling and safety equipment. The placement of the facility components would avoid and minimize impacts to environmental resources, including cultural resources, to the maximum extent possible.

The Study Area is within a rural agricultural area and is bounded on the west by Watermelon Road and the RJ Corman Railroad, which roughly parallels U.S. Highway 79 approximately a quarter mile south of the highway. A.P. Miller Road traverses western and central portions of the Project site, and Joe Montgomery Road traverses eastern portions of the Study Area. The Study Area is predominantly flat to gently sloping agricultural land with scattered forested areas and some wetlands, streams, ponds, and karst features. Several residences and agricultural buildings are scattered across the Study Area.

Between May 17 and 19 and on October 25, 2021, HDR conducted field surveys following TVA's *Guidelines for Conducting Biological and Cultural Surveys and Impact Analyses* (TVA 2020) to map vegetation and identify potential habitat for federally and state-listed threatened and endangered species within the Study Area. Mason Brock, botanist and Herbarium Collections Manager at Austin Peay State University, conducted plant habitat assessments/surveys for rare plant species in forested areas on May 17 and 18, 2021 and on October 17, 2021. This report documents the results of these field surveys. Photographs referenced in the body of this report are presented in Appendix E.

On November 17, 2021, Brock conducted additional surveys for rare plant species in an area briefly considered for inclusion in the overall study area, located north of the northwest quadrant of the Study Area. While this area was ultimately not included in the Study Area, Brock's survey findings are provided in Appendix C.

2 Vegetation Field Survey

2.1 Methods

Following TVA guidelines, HDR referenced the TVA Regional Natural Heritage Database (RNHD) for state listed plants for the Study Area and the surrounding five-mile area (TVA 2021), the United States Fish and Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) database for federally threatened and endangered plants (USFWS 2021a), and the Office of Kentucky Nature Preserves Kentucky Biological Assessment Tool (KYBAT; Office of Kentucky Nature Preserves 2021). Results are included in Appendix B.

The surveys were conducted by Jessica Tisdale, Amanda Mills, and Lyranda Thiem, environmental scientists with HDR, to document plant communities and invasive plants and conduct habitat assessments for rare, non-forest plant species and all other state and federal listed species in the Study Area. Mason Brock, botanist and Herbarium Collections Manager at Austin Peay State University, conducted plant habitat assessments/surveys for rare plant species in forested areas. Brock's findings are summarized herein and reported in detail in Appendix C.

Biologists traversed the Study Area by conducting pedestrian survey of the Study Area on foot at a casual pace. Plant communities observed within the Study Area were classified to the macrogroup level using the Grossman (Grossman et al. 1998) classification system (Table 1). Plant communities were delineated using ArcMap and field notes (Appendix D), and the area of each vegetation community type was calculated as a percentage of the total Study Area. The general location and abundance of non-native invasive plants present within the Study Area were also noted.

2.2 Results

2.2.1 Vegetation Communities

The majority of the Study Area is agricultural land that lies on gently rolling karst plain underlain by limestone. Current agricultural activities within the Study Area are focused on corn and winter wheat. Photographs 1 and 2 depict agricultural land within the Study Area. Out of the three forest types based on Grossman et al. (1998) in the Study Area, there are four large forested areas representative of the Appalachian-Interior-Northeastern Mesic Forest macrogroup (M883). Forested areas comprise approximately 11 percent of the Study Area, and the majority of large contiguous stands are located in the northern half of the Study Area. Other small forested areas are located along field margins and drainage ways and in upland areas (Appendix A, Figure 3-1 through 3-4). Photographs 3 to 5 depict forested areas within the Study Area. Table 1 provides a summary of the vegetation community types as defined by Grossman et al. (1988) with five of the community types occupying less than one percent of the Study Area. CSC04, CFO09, and M303 are not described in detail since they represent human disturbance areas that include agricultural ponds, lawns and ruderal shrublands/meadow areas, respectively. One rare plant community, Sinkhole Pond Marsh, was in the Eastern North American Marsh, Wet Meadow and Shrubland macrogroup level and is mentioned below.

Table 1. On-Site Vegetation Communities

Macro Group Level Vegetation Community Code	Vegetation Community	Area (acres)	Percentage of Study Area
CFO04	Row and Close Grain Crop Cultural Formation	1365.7	87
M883	Appalachian-Interior-Northeastern Mesic Forest	139.6	9
M013	Eastern North American Ruderal Forest	33.7	2
CSC02	Herbaceous Agricultural Vegetation Cultural Subclass	18.1	1
M503	Central Hardwood Swamp Forest	8.2	>1
CSC04	Agricultural & Developed Aquatic Vegetation Cultural Subclass	6.7	>1
CFO09	Lawn, Garden, & Recreational Vegetation Cultural Formation	3.5	>1
M303	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland	1.9	>1
M069	Eastern North American Marsh, Wet Meadow and Shrubland	1.8	>1

After Grossman et al. 1998

2.2.1.1 CFO04 ROW AND CLOSE GRAIN CROP CULTURAL FORMATION

Row and Close Grain Crop Cultural Formation is the dominant land use, comprising 87 percent of the Study Area. Vegetation in these agricultural fields is planted in corn (*Zea maize*) and winter wheat (*Triticum aestivum*). At the time of the survey, some agricultural fields were recently planted with corn and others were in winter wheat fields that will most likely be double cropped with soybean. Other weedy species found along edges and in bare earth patches were the typical pioneering species such as Kentucky bluegrass (*Poa pratensis*), butterweed (*Packera glabella*), pigweed (*Amaranthus* spp.), clover (*Trifolium* spp.), and other native forbs such as wingstem (*Verbesina alternafolia*) and fleabane (*Erigeron* spp.) (Photographs 1 and 2).

2.2.1.2 M883 APPALACHIAN-INTERIOR-NORTHEASTERN MESIC FOREST

This vegetation community (Photographs 4 and 7) comprises nine percent of the Study Area and characterizes the majority of non-crop/agricultural vegetation types. There are inclusions of rich calcareous forests around sinkhole areas and areas along water features that align more closely with the G601 South-Central Interior Alkaline Forest and Woodland macrogroup. Additionally, most of the canopy species tends to be a more mesic than a calcareous and dry species composition.

Typical canopy species observed in this vegetation community within the Study Area include common hackberry (*Celtis occidentalis*), mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), shagbark hickory (*Carya ovata*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), white ash (*Fraxinus americana*), American elm (*Ulmus americana*), black walnut (*Juglans nigra*), black locust (*Robinia pseudoacacia*), honey locust (*Gleditsia triacanthos*), southern red oak (*Quercus falcata*), eastern cottonwood (*Populus deltoides*), post oak (*Q. stellata*) and black oak (*Q. velutina*). Mid-story species include American persimmon (*Diospyros virginiana*), black cherry (*Prunus serotina*), osage orange

(*Maclura pomifera*), sassafras (*Sassafras albidum*), American elm, winged elm (*Ulmus alata*), slippery elm (*Ulmus rubra*), red maple, eastern redcedar (*Juniperus virginiana*), mockernut hickory (*Carya tomentosa*), shingle oak (*Q. imbricaria*) and southern red oak. Understory shrubs, woody vines, and sapling species include coralberry (*Symphoricarpos orbiculatus*), green ash (*Fraxinus pennsylvanica*), red maple, sugar maple, common hackberry, poison ivy (*Toxicodendron radicans*), and southern red oak. Herbaceous cover in this vegetation community typically includes white snakeroot (*Ageratina altissima*), blackberry (*Rubus* spp.), greenbriers (*Smilax* spp.), goldenrods (*Solidago* spp.) southern chervil (*Chaerophyllum tainturieri*), common selfheal (*Prunella vulgaris*), jumpseed (*Persicaria virginiana*), wild onion (*Allium* spp.), common bedstraw (*Galium aparine*), and fleabane.

Other uncommon species observed include basswood (*Tilia americana*), paw-paw (*Asimina triloba*), hophornbeam (*Ostrya virginiana*), chinkapin oak (*Q. muehlenbergii*), willow oak (*Q. phellos*), pin oak (*Q. palustris*), water oak (*Q. nigra*), and American sycamore (*Platanus occidentalis*). Typical non-native species observed include Japanese honeysuckle (*Lonicera japonica*), Chinese privet (*Ligustrum sinense*), wintercreeper (*Euonymus fortunei*), Japanese stiltgrass (*Microstegium vimineum*) and multiflora rose (*Rosa multiflora*).

Small flower baby blue eyes (*Nemophila aphylla*), a new occurrence for Logan County, was found in this vegetation community (Appendix C).

2.2.1.3 M013 EASTERN NORTH AMERICAN RUDERAL FOREST

This vegetation community (Photographs 8 and 9) is small in area at two percent cover and is characterized by narrow (5-10') and wide (>10') fence rows, small, wooded areas inside and along active agriculture fields. It is scattered throughout the Study Area.

Typical canopy species observed in this vegetation community within the Study Area included honey locust, black locust, white ash, osage orange, eastern red cedar, eastern cottonwood, maple, common hackberry, eastern redcedar, tulip poplar, hickories, and black walnut. Understory shrubs, woody vines, and sapling species include honey locust, black locust, common hackberry, devil's walking stick (*Aralia spinosa*), and poison ivy. Herbaceous cover in this vegetation community typically includes butterweed, blackberry, greenbriers, Virginia creeper, wingstem, sweet violet (*Viola odorata*), white snakeroot, horseweed (*Conya canadensis*), American pokeweed (*Phytolacca americana*) and common bedstraw.

Other uncommon species observed include basswood, hophornbeam, water oak, and American sycamore. Typical non-native species observed include Japanese honeysuckle, Chinese privet, wintercreeper, Japanese stiltgrass and multiflora rose.

2.2.1.4 CSC02 HERBACEOUS AGRICULTURAL VEGETATION CULTURAL SUBCLASS

This vegetation community (Photographs 10 and 11) comprises one percent of the Study Area and includes pasture and hayfield cover classes. Vegetation in hayfields within the Study Area is dominated by tall fescue (*Schedonorus arundinaceus*), curly dock (*Rumex crispus*), white clover (*Trifolium repens*), red clover (*Trifolium pretense*), Virginia wild rye (*Elymus virginicus*), Kentucky bluegrass, slender yellow woodsorrel (*Oxalis dilenii*), lambsquarters (*Chenopodium album*), purple dead-nettle (*Lamium purpureum*), Johnsongrass (*Sorghum halepense*), giant

ragweed (*Ambrosia trifida*), garlic mustard (*Alliaria petiolata*), broomsedge, bluestem (*Andropogon virginicus*), wild onion, buttercup (*Ranunculus* spp.), and tiny bluet (*Houstonia pusilla*).

2.2.1.5 M503 CENTRAL HARDWOOD SWAMP FOREST

This vegetation community (Photographs 3 and 12) is uncommon at less than one percent in the Study Area and is associated with wetland depressions draining to sinkholes, ephemeral streams/drainages, and headwater wetlands located within the large forest stands. These areas are comprised of species tolerant of wet or inundated conditions and have some of the highest species diversity in the Study Area.

Typical canopy species observed in this vegetation community within the Study Area included American sycamore, eastern cottonwood, green ash, white ash, water oak, red maple, swamp chestnut oak (*Q. michauxii*), and box elder (*Acer negundo*). Mid-story species include black willow (*Salix nigra*), red maple, water oak, common hackberry, American hornbeam (*Carpinus caroliniana*) and willow oak. Understory, woody vines, and sapling species include red maple, green ash, poison ivy, and Virginia creeper. Herbaceous cover in this vegetation community typically includes giant cane (*Arundinaria gigantea*), velvet panicum grass (*Dichanthelium scoparium*), common blue violet (*Viola sororia*), inland woodoats, sedges (*Carex* spp.), greenbriar, Virginia creeper, common bedstraw, and purple deadnettle (*Lamium purpurea*).

The state rare plant, cypress-knee sedge (*Carex decomposita*) was found on the edge of this vegetation community (Appendix C; Photograph 13).

2.2.1.6 M069 EASTERN NORTH AMERICAN MARSH, WET MEADOW AND SHRUBLAND

This vegetation community is uncommon and is characterizes by herbaceous cover with standing water that persists for extended periods of time. Five small areas within the larger forested stands were in the Study Area. Typical herbaceous cover in this community includes three-way sedge (*Dulichium arundinaceum*), water horehound species (*Lycopus* spp.), stiff marsh bedstraw (*Gallium tinctorium*), other sedges (*Carex* spp.) and rushes (*Juncus* spp.).

The state rare plant, cypress-knee sedge is likely located in the northeast quadrant forested area where it was found in the adjacent Central Hardwood Swamp Forest community. The rare community, Sinkhole Pond Marsh, (*Carex* spp. Central Interior Pond Marsh Alliance (A3475)) was identified in this northeast quadrant forested area within the Eastern North American Marsh, Wet Meadow and Shrubland macro group level (Figure 3-2). This plant community is vulnerable (G3), with relatively few populations or occurrences known (NatureServe Explorer 2021aa).

2.2.2 Non-Native and Invasive Plants

No federal-noxious weeds (US Department of Agriculture, Natural Resources Conservation Service 2012) were observed, but many non-native invasive plant species were observed throughout the Study Area. In addition to tall fescue, invasive species observed in the Study Area include Japanese honeysuckle, wintercreeper (Photograph 14), Japanese stiltgrass, musk thistle (*Carduus nutans*), johnson grass, Oriental lady's thumb (*Persicaria longiseta*), Chinese privet, beefsteak plant (*Perilla frustescens*), garlic mustard, poison hemlock (*Conium*

maculatum) (Photo 15), Asiatic dayflower (*Commelina communis*) and multiflora rose. These species were most often found in ruderal forested areas, along field edges, and in areas prone to disturbance. Japanese honeysuckle, wintercreeper, Japanese stiltgrass, Oriental lady's thumb, Chinese privet, and multiflora rose were found randomly scattered in some of the forested stands. Where present, these species represented less than five percent of the vegetation communities across the Study Area. During field surveys, invasive plants were found in both forest and herbaceous vegetation areas.

2.2.3 Listed and Protected Plant Species

According to the USFWS IPaC database, no federally listed plants occur within Logan County, Kentucky (USFWS 2021a). Also, KYBAT has no records of any federally listed plants within five miles of the Study Area (Office of Kentucky Nature Preserves 2021). Table 2 lists state-listed endangered and threatened plant species that may occur within Logan County, Kentucky based on the RNHD (TVA 2021) and KYBAT (Office of Kentucky Nature Preserves 2021). Specific locations of known records of occurrence are not available, but likelihood of species occurrence can be estimated by matching species habitat requirements with land cover types.

Table 2. State-Listed Plant Species in Logan County, Kentucky

Scientific Name	Common Name	State Status	Habitat	Likelihood of Occurrence in Study Area[1]
Carex alata	Broadwing Sedge	T	Open wet prairies and sinkhole swamps	**Possible**; Species collected within 750 feet of Study Area. Suitable habitat exists around sinkhole pond east of Joe Montgomery Road.
Carex decomposita	Cypress-knee Sedge	T	Swamps, sinkhole ponds, often on floating logs or cypress knees	**Yes**; Suitable habitat exists around sinkhole pond east of Joe Montgomery Road. See Appendix F for further details and location.
Delphinium carolinianum	Carolina Larkspur	T	Dry woods, prairies, sandhills	Unlikely; No suitable habitat on site
Fimbristylis puberula	Hairy Fimbristylis	T	Strictly found in glades and dry rocky prairies	Unlikely; No suitable habitat on site
Forestiera ligustrina	Upland Swamp Privet	T	Soils near/on rocky slopes and along streams in barrens and glades	Unlikely; No suitable habitat on site
Glyceria acutiflora	Sharp-scaled Manna-grass	E	Wetlands and pond fringes	**Possible**; Species collected within 750 feet of Study Area. Suitable habitat exists around sinkhole pond east of Joe Montgomery Road. See Appendix C for further details and location.
Juncus filipendulus	Plain's Rush	T	Wet limestone glades	Unlikely; No suitable habitat on site
Leavenworthia torulosa	Necklace Glade-cress	T	Limestone glade outcrops	Unlikely; No suitable habitat on site
Nemophila aphylla	Small flower baby blue eyes	--	High-nutrient rich forest with history of disturbance	**Yes**; high-nutrient forested areas. See Appendix E for detail of locations found.

Scientific Name	Common Name	State Status	Habitat	Likelihood of Occurrence in Study Area[1]
Oenothera triloba	Sundrops	T	Limestone glades and dry gravelly outcrops	Unlikely; No suitable habitat on site
Onosmodium molle ssp. molle (Lithospermum molle)	Soft False Gromwell	H	Dry prairies, glades, and limestone bluffs	Unlikely; No suitable habitat on site
Phemeranthus calcaricus	Limestone Fame-flower	E	Limestone glade outcrops	Unlikely; No suitable habitat on site
Symphyotrichum priceae	White Heath Aster	E	Limestone and glade outcrops	Unlikely; No suitable habitat on site

Sources: Office of Kentucky Nature Preserves 2021; TVA 2021

E = Endangered, T = Threatened, H = Historic, -- = Not Listed/recently discovered

[1]Species Presence and Habitat/Likelihood of Presence and Habitat described and confirmed in Appendix C for all plant species.

During the field surveys, two state-listed plant species were documented within the Study Area (Appendix C)**.** A small population of the cypress-knee sedge was found in a high-quality sinkhole swamp community (Photograph 13; Appendix C). Specimens of this sedge were found growing on the bases of emergent trees and also as free-standing tussocks in shallow water. The other species, the small flower baby blue eyes, was not documented on the initial list of rare species (Appendix B) because it was only discovered in Logan County in 2020 by Mason Brock, and not much information is known about this species (Appendix C). This species is a southern species that approaches the northern edge of its range in Kentucky, and populations have been documented in Fulton and Hickman counties in western Kentucky (Shaw et al. 2021). Habitat for this species includes high-nutrient forests with a history of disturbance and it is generally a weedy species. Within the Study Area, it occurred in the Appalachian-Interior-Northeastern Mesic Forest community in areas with trees that appear to be less than 40 years with some populations forming large colonies.

The broadwing sedge is a species of sedge that can be found in open wet prairies and sinkhole swamps. Although no individuals could be found within the Study Area, specimens were collected within 750 feet of the Study Area. Suitable habitat exists around the sinkhole pond east of Montgomery Road and along thin wet woods on the eastern border of the project boundaries (Appendix C). The sharp-scaled manna grass also was collected within 750 feet of the Study Area, just outside the boundaries. Suitable habitat exists around the sinkhole pond east of Joe Montgomery Road where it could still occur in the seedbank.

No dry prairies, limestone glade, or dry rocky outcrops were observed within the Study Area; therefore, Carolina larkspur, hairy fimbristylis, upland swamp privet, plain's rush, necklace glade-cress, sundrops, soft false gromwell, limestone fame flower, and white heath aster are unlikely to occur.

2.2.3.1 OTHER PLANTS OF CONSERVATION CONCERN

In addition to state-listed species, KYBAT also identifies other plant species of special concern which are species uncommon in Kentucky or have unique or highly specific habitat requirements or scientific value and therefore require careful monitoring of their status. Table 3

lists plant species of special concern that may occur within Logan County, Kentucky (Office of Kentucky Nature Preserves 2021).

During the plant survey, suitable habitat inside the Study Area was found for hair grass in a narrow strip of woodland edge along the east side of Joe Montgomery Road, but no individuals were observed (Appendix C). Within this location a few prairie remnant associate species were noted such as ashy sunflower (*Helianthus mollis*).

No dry prairies, limestone glades, or dry rocky outcrops were observed within the Study Area, therefore blue wild indigo, purple prairie-clover, prairie dock, barrens silky aster, or Eggleston's violet are unlikely to occur within the Study Area.

The plant survey on October 17 covered a small area of proposed transmission line. No state-listed plant species were located in this portion of the Project Site (Appendix C). Two sinkhole depressions were a focus of the field survey. Sinkhole depressions are a geologic feature known to harbor rare plant species in the Pennyroyal Plain region. The survey determined that both sinkholes are in a highly ecologically degraded state. No rare plant species were observed in the vicinity of these sinkholes, and it is highly unlikely that surveys at an earlier point in the growing season would reveal any. The assemblage of plant species seen was indicative of near complete diversity loss (likely either due to row-cropping or broad-spectrum herbicide application) in the recent past.

Table 3. Plant Species of Special Concern in Logan County, Kentucky

Scientific Name	Common Name	Habitat	Likelihood of Occurrence in Study Area[1]
Baptisia australis var. minor	Blue Wild-indigo	Glades, barrens, prairie patches and open woodland	Unlikely; No suitable habitat on site.
Dalea purpurea	Purple Prairie-clover	Dry prairies and limestone barrens	Unlikely; No suitable habitat on site
Muhlenbergia glabrifloris	Hair grass	Mesic to wet prairie remnants, occurs in areas of repeated disturbance	**Possible**; occurs in areas of repeated disturbance. Suitable habitat exists in limited areas on site. See Appendix E for further details and location.
Silphium pinnatifidum	Prairie-dock	Dry prairies and glades and occasionally found in mesic prairies	Unlikely; No suitable habitat on site
Symphyotrichum pratense	Barrens Silky Aster	Dry prairies and glades	Unlikely; No suitable habitat on site
Viola egglestonii	Eggleston's Violet	Limestone glade outcrops	Unlikely; No suitable habitat on site

Source: Office of Kentucky Nature Preserves 2021, Rare Species by County
S = Species of special concern
[1]Species Presence and Habitat/Likelihood of Presence and Habitat described and confirmed in Appendix E.

3 Wildlife Field Survey

3.1 Methods

Following TVA guidelines (TVA 2020), HDR referenced the TVA RNHD (TVA 2021) for state-listed wildlife within three miles of the Study Area, the USFWS IPaC database (USFWS 2021a) for federally threatened and endangered wildlife in Logan County, and KYBAT for occurrences within one mile of the Study Area (Office of Kentucky Nature Preserves 2021). Results are included in Appendix B.

Pedestrian surveys of the Study Area for terrestrial wildlife were conducted by Jessica Tisdale and Amanda Miles between May 17 and 19, 2021 and by Jessica Tisdale and Lyranda Thiem on October 25, 2021. The pedestrian surveys focused on forested edges, roadside edges, recently disturbed areas, and areas of old homestead and farm buildings. Transects were walked across large, forested stands and along streams, drainageways, and the perimeters of crops fields. Isolated pockets of woodlands were inspected, and larger woodland blocks within the Study Area were also traversed for bat habitat assessment. The Study Area was also traversed by vehicle via access roads and paved roads.

3.2 Results

3.2.1 Wildlife

Table 4 presents a list of species that were either directly observed within the Study Area, or whose evidence (e.g., tracks, scat, remains) was noted during the field survey.

Table 4. Wildlife Species Observed in the Study Area

Species Observed (Common Name)	Notes/Habitat Observed in Study Area
Birds	
American Crow	Observed flying and perching on power poles
American Robin	Observed widely across site, home sites
Barn Swallows	Observed inside farm barns throughout
Eastern Bluebird	Observed flying over cropland
Blue Grosbeak	Observed in shrub areas
Northern Cardinal	Observed in forested stands
Common Grackle	Observed widely across site
Common Nighthawk	Observed flying off ground nest in wheat field
Downy Woodpecker	Observed and heard in forested stands
Eastern Wood-Pewee	Observed in forested stands
Eastern Phoebe	Observed in forested stands
Eastern Towhee	Observed in forested stands
Great Blue Heron	Observed flying over site
Indigo Bunting	Observed in forested stands
Mallard	Observed in pond in the SW portion of site
Mourning Dove	Observed and heard widely across site
Northern Bobwhite	Observed flying over cropland
Pileated Woodpecker	Observed and heard in forested stands
Prothonotary Warbler	Observed in large forested stands
Red-winged Blackbird	Observed foraging in winter wheat fields
Savannah Sparrow	Observed on utility poles and over ag. fields
Tufted Titmouse	Observed near a home site
Wild Turkey	Observed at edge of forest

Species Observed (Common Name)	Notes/Habitat Observed in Study Area
Black Vulture	Observed in barns where likely nesting, and flying over site
Wood Duck	Observed in a few ponds on site
Amphibians	
Cricket Frog	Heard near sinkhole pond wetlands in NE
Bullfrog	Heard and observed in a few ponds on site
Spring Peeper	Heard in a few wetlands
American Toad	Observed throughout forested stands
Reptiles	
Common Snapping Turtle	Observed in pond
Insects	
Carpenter bee	Observed in many barns on site
Swallowtail Butterfly	Observed in forested edges throughout site
Monarch Butterfly	Observed in northeast forested/powerline edge
Mammals	
Cottontail Rabbit	Observed near where forested edge meet corn field
Big Brown Bat	Captured by mist net within forested area
Eastern Red Bat	Captured by mist net within forested area
Evening Bat	Captured by mist net within forested area
Tracks/Scat/Remains	
Deer Track	Observed along streams and drainageways
Raccoon Track	Observed along streams and drainageways

3.2.2 Listed and Protected Wildlife Species

"Listed" species are recognized by federal, state, or other agencies in an effort to protect them and their habitat under the federal Endangered Species Act (ESA; 1973), as well as under state laws and per local policies. These species are vulnerable to habitat loss and population decline because of their rarity. HDR's assessment also considered species protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712), Executive Order for Migratory Birds (E.O. 13186 of January 10, 2001), and the Bald and Golden Eagle Protection Act of 1940 (BGEPA; 16 U.S.C. 668-668d).

3.2.2.1 FEDERALLY AND STATE-LISTED THREATENED AND ENDANGERED WILDLIFE

The IPaC search identified three federally bats and two federally listed mussel species as having the potential to occur within the Study Area (USFWS 2021a, Appendix B). No designated critical habitat for federally listed species occurs on or in the vicinity of the Study Area.

Eighteen additional state-listed species were identified on the TVA RNHD and KYBAT as having the potential to occur the in the Study Area (Office of Kentucky Nature Preserves 2021; TVA 2021). These additional species consist of six mollusks, two crustaceans, four birds, four fish, one lamprey, and one amphibian. Table 5 provides a summary of the federally and state-listed species that were identified in the IPaC report and the TVA RNHD and KYBAT searches for the Study Area.

Table 5. Federally and State-Listed Species Potentially Occurring in the Study Area

Scientific Name	Common Name	State Status	Federal Status	Likelihood of Presence/Habitat in the Study Area
Mammals				
Myotis grisescens	Gray Bat	Threatened	Endangered	**Possible**; roosts in caves year-round and connecting sinkhole fissures/karst features. Various foraging habitats including wet meadows, damp woods, and uplands.
Myotis septentrionalis	Northern Long-eared Bat	Threatened	Threatened	**Possible**; various habitats including wet meadows, damp woods, and uplands, including abandoned buildings, sinkhole/karst features; statewide.
Myotis sodalis	Indiana Bat	Endangered	Endangered	**Possible**; various habitats including wet meadows, damp woods, and uplands, including abandoned buildings and sinkhole fissures/karst features; statewide.
Birds				
Lanius ludovicianus	Loggerhead Shrike	Species of special concern	--	**Possible**; old field, grassland/herbaceous, savanna, cropland/hedgerows, perches on fence posts. Suitable habitat and hunting perches are limited on site.
Peucaea aestivalis	Bachman's Sparrow	Endangered	--	**Possible**; Early successional areas with scattered saplings (often pines), bushes, or understory, brushy or overgrown hillsides, overgrown fields with thickets and brambles. Suitable habitat is present.
Tyto alba	Common Barn Owl	Species of special concern	--	**Possible**; Herbaceous wetlands, riparian areas, grasslands, cropland, human habitation. Suitable habitat is present.
Amphibian				
Hyla gratiosa	Barking Treefrog	No Status	--	**Possible**; shallow lacustrine water, scrub-shrub wetlands, forested wetlands hardwood forests. Suitable habitat is present.
Fish				
Erimystax insignis	Blotched Chub	Endangered	--	Unlikely; habitat includes medium to large clear streams with moderate flow over clean gravel and coble substrates; No suitable habitat on site
Etheostoma microlepidum	Smallscale Darter	Endangered	--	Unlikely; occurs in the lower Cumberland River drainage. Habitat includes small rivers with shallow rifles and gravel substrates. No suitable habitat on site.
Hemitremia flammea	Flame Chub	Endangered	--	Unlikely; inhabits springs, shallow seepage waters, and spring-fed streams usually over gravel in areas

Scientific Name	Common Name	State Status	Federal Status	Likelihood of Presence/Habitat in the Study Area
				where aquatic vegetation is abundant. No suitable habitat present.
Lepomis miniatus	Redspotted Sunfish	Threatened	--	Unlikely; Habitat includes swamps, oxbow lakes, creeks, and small to moderately sized rivers. Usually associated with vegetation as well as muddy and sandy benthic; No suitable habitat on site.
Mollusks				
Alasmidonta marginata	Elktoe	Threatened	--	Unlikely; species typically found in small creeks and streams. No suitable habitat on site
Epioblasma triquetra	Snuffbox Mussel	Endangered	Endangered	Unlikely; small to medium sized rivers in areas with a swift current; No suitable habitat available.
Medionidus conradicus	Cumberland Moccasinshell	--[2]	--	Unlikely; inhabits small streams preferably in headwaters in sand and gravel substrates; No suitable habitat available.
Pegias fabula	Little-wing Pearlymussel	Endangered	Endangered[1]	Unlikely; inhabits cool, clear, and relatively high gradient streams where it is found lying on a rocky stream bed in shallow water. No suitable habitat on site.
Pleurobema oviforme	Tennessee Clubshell	Endangered	--	Unlikely; requires at least moderate flow. No suitable habitat on site
Pleuronaia dolabelloides	Slabside Pearlymussel	Threatened	Endangered[1]	Unlikely; found primarily in large creek to moderately sized rivers. Generally observed in gravel substrates within interstitial sand, with moderate current. No suitable habitat on site.
Quadrula cylindrica cylindrica	Smooth Rabbitsfoot	Endangered	Threatened	Unlikely; typically, in small to medium rivers with moderate to swift currents. No suitable habitat on site and outside Critical Habitat.
Toxolasma lividus	Purple Lilliput	Endangered	--	Unlikely; riffle habitats in small to medium-sized rivers and creeks. No suitable habitat on site.
Villosa lienosa	Little Spectaclecase	--[2]	--	Unlikely, small to medium streams in sand or gravel. No suitable habitat on site.
Villosa vanuxemensis	Mountain Creekshell	Threatened	--	Unlikely; endemic to Tennessee and Cumberland River systems
Crustaceans				
Orconectes pellucidus	Mammoth Cave Crayfish	Species of special concern	--	**Possible**; subterraneous streams, cave systems. Possible suitable habitat on site.
Orconectes ronaldi	Mud River Crayfish	No Status	--	**Possible**; subterraneous streams, cave systems, small rivers with cobble and gravel. Possible suitable habitat on site.

Scientific Name	Common Name	State Status	Federal Status	Likelihood of Presence/Habitat in the Study Area
Lamprey				
Ichthyomyzon castaneus	Chestnut Lamprey	Species of special concern	--	Unlikely; medium and large rivers, large reservoirs, larvae burrow in bottom of smaller streams with moderate current. No suitable habitat on site.
Snails				
Leptoxis praerosa	Onyx Rocksnail	Species of special concern	--	Unlikely; inhabit medium sized rivers, on rocks in riffles with good flow; No suitable habitat on site.
Pleurocera alveare	Rugged Hornsnail	Species of special concern	--	Unlikely; strictly restricted to large rivers with solid substrates, No suitable habitat on site.
Pleurocera curta	Shortspire Hornsnail	Species of special concern	--	Unlikely; inhabit smaller rivers and streams; No suitable habitat on site
Rabdotus dealbatus	Whitewashed Rabdotus	Threatened	--	Unlikely; prefers open glades and meadows; No suitable habitat on site.

Sources: Office of Kentucky Nature Preserves 2021; TVA 2021; USFWS 2021a
[1]Historic for County; not listed on ECOS IPAC pdf; in IPAC range shapefile (USFWS 2021b). [2]No status in the TVA RHND.

HDR also conducted a desktop database search and field pedestrian survey to identify the types of habitats present on the proposed Study Area, including habitats that could potentially support the species listed in Table 4. Surveys of biological resources in the Study Area were conducted between May 17 and 19 and on October 25, 2021. The surveys focused on the general characteristics of the land cover, vegetation communities, and wildlife habitats currently present within and immediately adjacent to the Study Area.

HDR's desktop database search and pedestrian survey indicated that the Study Area contains suitable habitat for three federally listed bats, four state-listed plants, two state-listed birds, and one state-listed amphibian as described in this section. Occurrences of one state-listed plant species, cypress-knee sedge were located in the Study Area (Photographs 12 and 13).

3.2.2.1.1 Mammals

Three species of federally listed mammals potentially occur in the Study Area: the gray bat, the northern long-eared bat (NLEB), and the Indiana bat. The gray bat prefers cave habitat year-round. Winter habitat for this species includes deep vertical caves with domed halls, and summer habitat includes warm caves with restricted ceiling access (USFWS 1997). The Indiana bat and NLEB prefer winter habitats that include caves and mines (USFWS 2006, 2015). Although no caves were observed within the Study Area, Stand 8 contained four sinkhole fissures/karst features, Stand 9 contained one sinkhole fissure/karst feature, and an old concrete well was observed in Stand 16, indicating the potential for gray bat habitat (Section 5.1.2.1.16) (Appendix A, Figure 4). Caves utilized by bats are known to occur elsewhere in Logan County. These caves may provide habitat for Indiana and/or gray bats.

During the summer, the Indiana bat and NLEB roost singly or in colonies underneath bark, in cavities, or crevices of both live and dead trees of varying size, age, and species (USFWS

2006, 2015). Suitable summer roost habitat for the Indiana bat and NLEB consisting of trees of varying ages, including dead snags, occurs in the Study Area. There is approximately 158 acres of moderately to highly suitable summer roost habitat located within the Study Area. Additionally, several abandoned residential buildings that could provide suitable summer roost habitat for NLEBs may be demolished for the project. Jackson Group completed mist net surveys within two forested stands (Stand 8 and Stand 14) in late May through early June of 2021, and no listed bat species were captured. During the field survey two big brown bats (*Eptesicus fuscus*), one evening bat (*Nycticeius humeralis*), and one eastern red bat (*Lasiurus borealis*) were captured within the Study Area.

Foraging habitat for all three bat species occurs over ponds, wetlands, and streams located in the Study Area. Additional foraging habitat for the Indiana bat and NLEB occurs over forested habitat, forest edges, and tree lines. Water resources for all three bat species include ponds primarily fed by rainwater and stream channels located in the Study Area. A more detailed description of potential habitat for listed bats in the Study Area is presented in Section 3.2.2.1.1.1.

3.2.2.1.1.1 Potential Summer Bat Habitat Assessment

During the field assessment by HDR, forested areas were assessed for the presence of live trees that exhibit exfoliating bark, dead tree snags with cracks or crevices that could serve as suitable roost habitat, and sinkhole fissures/karst features. Buildings on the Study Area were also evaluated for their potential as suitable bat habitat. Photographs were taken to visually document the assessment areas (Appendix E). Seventeen forest stands totaling approximately 188 acres (Appendix A, Figures 4-1 through 4-4) were determined to provide low to high potential summer roost and forage habitat for the NLEB and Indiana bat (Table 6). The boundaries of potentially suitable forested area habitat were mapped using a combination of aerial photography, GIS, and sub-meter GPS field mapping. A total of 12 buildings, five sinkhole fissures/karst features, and 12 large snag trees that could provide suitable bat habitat for the NLEB and Indiana bat were documented with photographs and GPS field mapping (Appendix E, Photograph 11, 16, 21, 24, 26, 35, 38, 40, 41; Appendix A, Figures 4-1 through 4-4). Below is a summary of habitat assessment findings. Refer to Appendix F for bat habitat assessment data sheets completed by HDR for the forested areas as part of this study.

Table 6. Potential Bat Roost Forest Stands Summary

Stand Number	Habitat Suitability	Area (acres)
Stand 1	Moderate	3.7
Stand 2	Moderate	1.3
Stand 3	Moderate	1.0
Stand 4	Low	4.4
Stand 5	Low	2.7
Stand 6	High	9.1
Stand 7	High	40.1
Stand 8	Moderate	25.3
Stand 9	High	36.6
Stand 10	Low	9.2

Stand Number	Habitat Suitability	Area (acres)
Stand 11	Low	5.1
Stand 12	Low	1.2
Stand 13	Low	2.1
Stand 14	High	40.6
Stand 15	Low	0.5
Stand 16	Moderate	2.2
Stand 17	Low	3.0
	TOTAL	188.1

3.2.2.1.1.1.1 Stand 1

Stand 1 consists of a mixed deciduous forest that is characteristic of two stands, one within the southwest quadrant off Watermelon Road and the other off A.P. Miller Road. Canopy and midstory trees include common hackberry, black walnut, shagbark hickory, honey locust, black locust, and a goldenrod species (*Solidago* spp.). A few large snags were identified and mapped. Agricultural ponds with ephemeral stream channels and a seasonal wetland were also observed within Stand 1. HDR determined that Stand 1 has moderate habitat suitability due to the presence of large snags. Photographs 15 and 16 (Appendix E) are representative of Stand 1 and one of the outstanding bat snags.

3.2.2.1.1.1.2 Stand 2

Stand 2 consists of a mixed deciduous forest along an ephemeral stream channel that flows south off the Study Area. The stream channel is surrounded by winter wheat and has a muddy bottom. Canopy and midstory trees include common hackberry, eastern cottonwood, black locust, and honey locust. HDR determined that Stand 2 has moderate habitat quality due to the presence of large trees with exfoliating bark. No snags were observed in this area. Photographs 8 and 17 (Appendix E) are representative of Stand 2.

3.2.2.1.1.1.3 Stand 3

Stand 3 consists of a mixed deciduous forest with a thick herbaceous understory. A seasonal wetland is also adjacent to Stand 3. Canopy and midstory trees include common hackberry, black cherry, shagbark hickory, honey locust, and Japanese honeysuckle. HDR determined that Stand 3 has moderate habitat quality due to the presence of small to medium sized trees with exfoliating bark, and the presence of several snags (less than 5–8 inches diameter at breast height). Photograph 18 (Appendix E) is representative of Stand 3.

3.2.2.1.1.1.4 Stand 4

Stand 4 is representative of five small separate forested areas in the southwest portion of the Study Area. Buildings suitable for bat roosting are present within several of the stands. The northernmost forested area, near the intersection of A.P. Miller Road and Watermelon Road, contains a wooden barn and abandoned home (Photograph 19). Three forested areas, near Watermelon Road and south of A.P. Miller Road, contain a house, an overgrown cemetery area, and a small stand of trees growing within an old pond bed. The southernmost stand, located off Watermelon Road, is adjacent to a current residence with three active agricultural barns. One of these barns is located adjacent to an agricultural pond and small pasture area (Photograph 21).

Canopy and midstory trees in all of these forested areas include red maple, tulip poplar, and shagbark hickory. HDR determined that all forested areas associated with Stand 4 have low quality due to the lack of presence of large trees with exfoliating bark, patchiness and dispersion of trees and the absence of snags. The Buildings section below describes the suitable bat roosting habitat the agricultural barns provide. Photographs 19 to 21 (Appendix E) are representative of Stand 4.

3.2.2.1.1.1.5 Stand 5

Stand 5 consists of hedgerows across the Study Area. Midstory and understory trees include common hackberry, black cherry, southern red oak, black oak, and eastern red cedar. HDR determined that Stand 5 has low habitat quality due to containing no observed trees with exfoliating bark, lack of snags, and no water source within the stand area. Photograph 5 (Appendix E) is representative of Stand 5.

3.2.2.1.1.1.6 Stand 6

Stand 6 represents three forested stands in proximity to one another. There is one structure (old barn) with an intermittent stream running nearby (located in the westerly stand). Along the length of the stream there are also sinkhole features. Canopy, midstory and understory trees include black walnut, eastern cottonwood, common hackberry, honey locust, black cherry, American sycamore, and post oak. HDR determined that Stand 6 has high habitat quality due to the presence of large trees with exfoliating bark, the presence of several snags, a nearby water source, and a sinkhole acting as a cave-like structure for gray bats. Photographs 23 through 26 (Appendix E) are representative of Stand 6.

3.2.2.1.1.1.7 Stand 7

Stand 7 consists of a large diversity of a mixed hardwood forest. Intermittent streams, ephemeral streams, ponded stagnant water, and three separate wetland features totaling approximately 5 acres exist near Stand 7. Dominant canopy, midstory, and understory trees include persimmon, blackgum, white ash, sugar maple, oak species, tulip poplar, willow oak, shagbark hickory, chinkapin oak, and American elm. HDR determined that Stand 7 has high habitat quality due to the presence of large trees with exfoliating bark, and the presence of several small snags. Photographs 7 and 27 (Appendix E) are representative of Stand 7.

3.2.2.1.1.1.8 Stand 8

Stand 8 consists of a large deciduous forest with four limestone sinkhole fissures/karst features that would be considered potential bat habitat. There is a pond acting as a good water source, one large seasonal wetland (1.84 acres) and a small seasonal wetland (0.18 acres) that exist within the forested stand. Dominant canopy, midstory, and understory include common hackberry, white ash, American sycamore, persimmon, eastern red cedar, sugar maple, and osage orange. HDR determined that Stand 8 has moderate habitat quality due to the presence of small trees with exfoliating bark, four sinkhole fissures/karst features, and several snags (Appendix A, Figure 4). Wintercreeper, an invasive plant, was prolific along the ephemeral drainage in the northwest portion of the stand. Photographs 3, 14, 28 and 43 (Appendix E) are representative of Stand 8. Between May 30 and June 1, 2021, one evening bat and one big brown bat were captured by mist netting within Stand 8.

3.2.2.1.1.1.9 Stand 9

Stand 9 consists of a large deciduous forest with the primary water source being a natural sinkhole pond and three wetland areas. Dominant canopy, midstory, and understory include mockernut hickory, shagbark hickory, black cherry, tulip poplar, eastern red cedar, sugar maple, black oak, post oak, southern red oak, mockernut hickory, and American beech (*Fagus grandifolia*). HDR determined that Stand 9 has high habitat quality due to the high percentage of trees with exfoliating bark, one sinkhole fissure/karst feature, and the diversity and age of the trees (Appendix A, Figure 4). Photographs 4,12,13, and 29 (Appendix E) are representative of Stand 9.

3.2.2.1.1.1.10 Stand 10

Stand 10 is a mixed deciduous forest and acts as a barrier or old tree rows between agricultural fields. Dominant canopy, midstory, and understory include cottonwood species (*Populus* sp.), sassafras, eastern red cedar, white ash, common hackberry, white oak, southern red oak, American elm, black cherry, and black oak. HDR determined that Stand 10 has low habitat quality due to lack of a water source near the trees with exfoliating bark and snags. Photographs 9, 30 and 31 (Appendix E) are representative of Stand 10.

3.2.2.1.1.1.11 Stand 11

Stand 11 consists of a small, young deciduous forest located inside an agricultural field. Dominant canopy, midstory, and understory include black walnut, black locust, sassafras, mulberry (*Morus alba*), shingle oak, black cherry, honey locust, and basswood. HDR determined that Stand 11 has low habitat quality due to lack of a water source near trees with exfoliating bark and snags. Photographs 5 and 32 (Appendix E) are representative of Stand 11.

3.2.2.1.1.1.12 Stand 12

Stand 12 is a small, young deciduous forest located inside an agricultural field. Dominant canopy, midstory, and understory include eastern red cedar, black cherry, common hackberry, and honey locust. HDR determined that Stand 12 has low habitat quality due to lack of a water source, lack of trees with exfoliating bark, and only a few small snags. Photograph 33 (Appendix E) is representative of Stand 12.

3.2.2.1.1.1.13 Stand 13

Stand 13 is a mixed deciduous forest. Dominant canopy, midstory, and understory include hackberry, black walnut, black cherry, box elder, American sycamore, and honey locust. HDR determined that Stand 13 has low habitat quality due to lack of a water source near areas with trees with exfoliating bark. Photographs 34 and 35 (Appendix E) are representative of Stand 13.

3.2.2.1.1.1.14 Stand 14

Stand 14 consists of a large deciduous forest located west of Joe Montgomery Road between corn fields and includes an abandoned farmstead. There is a total of four abandoned agricultural buildings that provide suitable bat roosting habitat (Appendix A, Figure 4-2). An old tobacco barn is located to the east within the stand (Photograph 36), and in the northernmost limit of Stand 14, there are three abandoned agricultural barns. Water sources within Stand 14 include a pond, a seasonally wet wetland, and an ephemeral channel flowing southeast. Dominant canopy, midstory, and understory include black gum, common hackberry, black

cherry, sugar maple, shagbark hickory, mockernut hickory, tulip poplar, sassafras, basswood, and black locust. HDR determined that Stand 14 has high habitat quality due to the presence of several trees with exfoliating bark and a good water source. Photographs 6, and 36 to 38 (Appendix E) are representative of Stand 14. Between June 2 and 5, 2021, one eastern red bat and one big brown bat were captured by mist netting within Stand 14.

3.2.2.1.1.1.15 Stand 15

Stand 15 consists of a small, young deciduous forest located inside an agricultural field. Dominant canopy, midstory, and understory include eastern red cedar, black cherry, common hackberry, and honey locust. HDR determined that Stand 15 has low habitat quality due to the lack of trees with exfoliating bark and lack of a water source. Photograph 39 (Appendix E) is representative of Stand 15.

3.2.2.1.1.1.16 Stand 16

Stand 16 is a deciduous forest located at the end of Joe Montgomery Road. Three old buildings (old home and two sheds) and a concrete well exist within the old home site that is heavily forested. Dominant canopy, midstory, and understory include common hackberry, black cherry, sugar maple, shagbark hickory, mockernut hickory, tulip poplar, sassafras, and black locust. HDR determined that Stand 16 has moderate habitat quality due to trees with exfoliating bark and the abandoned buildings. No snags or a water source were observed. Photographs 40 to 42 (Appendix E) are representative of Stand 16.

3.2.2.1.1.1.17 Stand 17

Stand 17 consists of a small, young deciduous forest surrounded by agricultural field and a unpaved farm road. Dominant canopy, midstory, and understory include common hackberry, black walnut, blackgum, black cherry, basswood, flowering dogwood, sassafras, Chinese privet, coral berry bush, American jumpseed, wingstem, greenbrier, wintercreeper, Japanese siltgrass, and multiflora rose. HDR determined that Stand 17 has low habitat quality due to the lack of trees with exfoliating bark and lack of a water source. Photograph 44 (Appendix E) is representative of Stand 17.

3.2.2.1.1.1.18 Buildings

Twelve buildings in the Study Area provide suitable roosting bat habitat. These buildings fall within Stands 4, 6, 14 and 16 (Appendix A, Figures 4-1 through 4-4). Photographs 11, 24, 36, 38, 41, and 42 represent a few of these buildings that are comprised of wooden agricultural barns and abandoned residences and associated storage sheds.

3.2.2.1.1.1.19 Project-Related Tree Clearing and Building Demolition

While most of the Study Area consists of agricultural fields, approximately 93 acres of trees and other tall vegetation have the potential to be removed from the Study Area. This represents approximately 50 percent of the forested portion of the Study Area and includes all or portions of Stands 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16. Seventy-two of the 93 acres that would be cleared for the project are defined as moderate- and high-quality bat foraging habitat. Efforts will be made to minimize clearing of forest and other tall vegetation as refinement of the project design allows. Appendix A, Figures 5-1 through 5-4 outline the portions of the Study Area where tree clearing may occur.

All 12 buildings that could provide suitable summer roost habitat for the NLEB and Indiana bat have the potential to be demolished for the project. The project would avoid the five identified sinkhole fissures/karst features that could provide bat habitat by maintenance of 100- to 425-foot protective buffers surrounding these features, depending on the particular sinkhole fissure/karst feature.

3.2.2.1.2 Birds

Three bird species, Bachman's sparrow, loggerhead shrike and common barn owl, are listed by the state as potentially occurring within the Study Area. Bachman's sparrow prefers open pine stands, early successional areas with scattered saplings, brushy overgrown hillsides and overgrown fields. Loggerhead shrike prefers old fields, savanna like habitats, cropland/hedgerows and frequently perches on fences and scattered trees. The common barn owl prefers herbaceous wetlands, riparian areas, croplands and human habitation areas. Suitable habitat exists across the Study Area in the form of edges of forested areas, overgrown hedgerows, pasture areas, croplands, young successional areas around old barns and home sites. This patchy limited habitat for these three species warrants the species be listed as possible in the Study Area; however, no occurrences were noted during the field survey.

3.2.2.1.3 Amphibian

The barking tree frog is listed as a species of special concern and prefers shallow lacustrine waters and wetlands for breeding and occurs in pine and hardwood forested stands. Forested and wetland areas occurred in the Study Area in a handful of locations.

There will be minimal impacts to this species habitat since wetlands and large deciduous forested stands will be avoided; however, tree fence lines and small deciduous stands will be cleared.

3.2.2.1.4 Fish

Four fish species are state-listed as potentially occurring in the Study Area: blotched chub, small scale darter, red spotted sunfish, and flame chub. The blotched chub prefers medium to large clear streams with moderate flow over clean gravel and coble substrates (NatureServe Explorer 2021a). The small-scale darter occurs in the lower Cumberland River drainage. Habitat within this system includes small rivers with shallow rifles and gravel substrates (NatureServe Explorer 2021b). Redspotted sunfish inhabit swamps, bottomland lakes, pools of creeks, and small to moderately sized rivers, usually in association with vegetation or other cover and bottom of mud or sand in quiet or moderately flowing waters (NatureServe Explorer 2021e). The flame chub prefers springs, shallow seepage waters, and spring-fed streams usually over gravel in areas where aquatic vegetation is abundant. Streams observed within the Study Area did not contain gravel substrate bottoms with slow moving water.

No suitable habitat exists for any of the state-listed fish species within the Study Area; therefore, no impacts to these species are anticipated.

3.2.2.1.5 Mollusks, Crustaceans, and Lamprey

There are two federally listed and eight state-listed mollusk species, and two state-listed crustacean species that may occur in the Study Area. The federally listed snuffbox mussel, smooth rabbitsfoot and the state-listed Cumberland moccasinshell, Tennessee clubshell,

sladside pearlymussel, little spectaclecase, mountain creekshell require small to medium-sized rivers, where most of them occupy sand and gravel shoal areas with at least moderate current velocities and clean water (NatureServe Explorer accounts). These habitats do not occur in the Study Area.

The state-listed elktoe, little-wing pearlymussel, and purple lilliput prefer habitat of small- to medium-sized creeks and streams with gravel substrates (NatureServe Explorer 2021f, 2021i, 2021m). There are limited small-sized streams with gravel substrate and no medium-sized streams within the Study Area. The existing small-sized streams are degraded and provide marginal habitat for these three species; therefore, minimal impacts to these species are anticipated.

The state-listed Mammoth Cave crayfish inhabits subterranean streams and caves. No caves were identified within the Study Area; however, subterranean streams most likely exist where ephemeral channels dissipate into the ground. The current project footprint would avoid the five identified sinkhole fissures/karst features; therefore, minimal impacts to these species are anticipated (NatureServe Explorer 2021t).

The state-listed Mud River crayfish inhabits open water and can be observed under boulders in creeks and small rivers with cobble, gravel, woody debris, and mud substrates (Taylor 2000; NatureServe Explorer 2021u). There are no small rivers with cobble, gravel or boulders within the Study Area, and therefore, no potential impacts are anticipated to this species.

The state-listed species of special concern, chestnut lamprey (NatureServe Explorer 2021v) inhabits medium and large rivers and larvae burrow in the bottom of smaller streams with moderate current. There were no perennial streams within the Study Area, and therefore, no potential impacts are anticipated with this species.

3.2.2.1.6 Snails

There are four state-listed snail species as potentially occurring in the Study Area: onyx rocksnail, rugged hornsnail, shortspire hornsnail, and whitewashed rabdotus. The onyx rocksnail inhabits medium sized rivers, on rocks in riffles with good flow (NatureServe Explorer, 2021p). The rugged hornsnail is strictly restricted to large rivers with solid substrates (NatureServe Explorer 2021q). The shortspire hornsnail inhabits smaller rivers and streams (NatureServe Explorer, 2021r). Many of the streams located in the Study Area are smaller in size with little substrate material. No suitable habitat exists for any of the state-listed species within the Study Area; therefore, no impacts to these species are anticipated.

The state-listed whitewashed rabdotus inhabits open glades and meadows (NatureServe Explorer 2021s). No glades or open meadows were identified within the Study Area; therefore, no impacts to this species are anticipated.

3.2.2.2 MIGRATORY BIRDS AND EAGLES

E.O. 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) directs federal agencies to take certain actions to further implement MBTA. MBTA prohibits the “take” of migratory birds. The regulatory definition of “take” as defined by 50 CFR § 10.12, “means to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue hunt, shoot,

wound, kill, trap, capture, or collect." The following prohibitions apply to migratory bird nests: "possession, sale, purchase, barter, transport, import and export, take, and collect." MBTA is executed and enforced by USFWS. Russellville Solar and its contractors would act in compliance with MBTA.

Approximately 235 species of migratory birds have been identified in Logan County (eBird 2021), and many of these birds occur in the Study Area. The following discussion of migratory birds focuses on those species that are identified as birds of conservation concern. The Study Area is located within the Bird Conservation Region 24 (BCR 24), Central Hardwoods (NABCI 2020), where 23 species are identified as birds of conservation concern (USFWS 2021c). These species are not listed under ESA but are a high conservation priority of the USFWS and, without additional conservation action, are likely to become candidates for listing under ESA. Thirteen of the 23 species likely occur in the Study Area based on the presence of their suitable habitat. Suitable habitats for these species occur in deciduous forests, forest edges, scrub/shrub areas, and at ponds in the Study Area. Some also use agricultural or grassland habitats for foraging and nesting.

Table 7. Migratory Bird Species of Conservation Concern Potentially Occurring in the Study Area.

Common Name	Scientific Name	General Habitat Description	Habitat in Study Area
Migratory Species (present as spring and fall migrant and/or during winter)			
Bald eagle	*Haliaeetus leucocephalus*	Nest in forested areas adjacent to large bodies of water. For perching they prefer tall coniferous or deciduous trees.	Not likely
Lesser yellowlegs	*Tringa flavipes*	Winters and migrates along mudflats, sandy beaches, shores of lakes and ponds and wet meadows.	**Yes**, limited
Bobolink	*Dolichonyx oryzivorus*	Grasslands, meadows, and hayfields	**Yes**, limited
Rusty blackbird	*Euphagus carolinus*	Winters in swamps, wet woodlands, and pond edges.	**Yes**, limited
Semipalmated sandpiper	*Calidrus pusilla*	Winters and migrates along mudflats, sandy beaches, shores of lakes and ponds and wet meadows.	**Yes**, limited
Breeding Season Migrants (may occur only during the breeding season and as spring and fall migrants)			
Eastern whip-poor-will	*Antrostomus vociferus*	Woodlands with open understory	**Yes**
Chimney swift	*Chaetura pelagica*	Forages over variety of habitats, requires chimneys or large hollow tree snags with open tops for nesting	**Yes**
Bewick's wren (Eastern)	*Thryomanes bewickii bewickii*	Overgrown fields, fencerows, woodland edges, often around buildings	**Yes**, limited
Kentucky warbler	*Oporornis formosus*	Deep shaded woods with dense, humid thickets; bottomlands near creeks and rivers, ravines in upland deciduous woods, and edges of swamp	**Yes**, limited

Common Name	Scientific Name	General Habitat Description	Habitat in Study Area
Prairie warbler	*Dendroica discolor*	Various shrubby habitats, including regenerating forests, open brushy fields, and Christmas tree farms	**Yes**
Wood thrush	*Hylocichla mustelina*	Breeds in mature deciduous and mixed forests, forests with dense understory, and forest edges.	**Yes**
Grasshopper sparrow	*Ammodramus savannarum*	Grasslands, meadows, and hayfields	**Yes**, limited
Resident Species (may occur year-round)			
Red-headed woodpecker	*Melanerpes erythrocephalus*	Deciduous woodlands with oak or beech, groves of dead or dying trees, river bottoms, recent clearings, farmland, grasslands, forest edges and roadsides	**Yes**
Field sparrow	*Spizella pusilla*	Old fields, brushy areas	**Yes**

Source: USFWS 2021c

Deciduous forest, open farmland, and forest edges within the Study Area provides potential breeding habitat for some of the listed species in Table 7. Deciduous forest provides habitat for the whip-poor-will, red-headed woodpecker, wood thrush and Kentucky warbler. There will be impacts to some upland deciduous forest in the Study Area; however, approximately 50 percent of the onsite forest will be avoided. Although ponds with associated swamp forest are only a small percentage of the Study Area, these may be used by bird species in the winter such as the rusty blackbird. The farm ponds in the Study Area, as well as any open fields that are seasonally flooded, particularly in the spring, provide suitable habitat for the lesser yellowlegs and semipalmated sandpiper during their spring and fall migrations. There will be no habitat impacts from the project to ponds and associated swamp forests which are utilized by the rusty blackbird, lesser yellowlegs and semipalmated sandpiper. Prothonotary warblers occur in the swamp forest during the summer. There will be no impact to prothonotary warbler habitat as all swamp forests will be avoided. Shrubby habitats at woodland edges near agricultural fields may provide suitable habitat for the prairie warbler. The open agricultural fields and shrubby ruderal areas are suitable habitat for the field sparrow and Bewick's wren. Open fields, pasture, shrubby ruderal habitat area for the prairie warbler, field sparrow and Bewick's wren will be impacted by the project footprint. There are multiple snags, and hollow trees and an old home site with a chimney in Stand 16 in the Study Area that provide habitat for the chimney swift. Anticipated impacts to chimney swift habitat will be minimal. Grasslands and meadows are a small percentage of the Study Area and could be utilized by the bobolink and grasshopper sparrow. There will be limited to no habitat impacts on grasslands and meadows used by the bobolink.

Both bald and golden eagles are protected by MBTA and BGEPA. Under BGEPA, it is illegal to kill, harass, possess (without a permit), or sell bald and golden eagles and their parts.

Bald eagles typically utilize forested areas adjacent to large bodies of water for nesting habitat. Tall, mature coniferous or deciduous trees that afford a wide view of the surroundings are used as nest trees and roost trees. Bald eagles typically avoid heavily developed areas. Suitable summer nesting habitat for bald eagles generally consists of prominent trees along riparian

corridors on large bodies of water. Winter habitat in Kentucky includes reservoirs and large rivers. Bald eagles are known to nest in Kentucky, with 187 nesting pairs as of 2019 (KDFWR 2021). The suitability of the Study Area as habitat for the bald eagle is low due to the absence of large water bodies.

The golden eagle is a rare winter resident in south-central Kentucky and most reports of it have been in the vicinity of reservoirs. Wintering habitat includes a mix of forest, open habitats for foraging. The Study Area encompasses suitable winter roosting and foraging habitat; therefore, the golden eagle could potentially occur in the Study Area. It is anticipated there will be minimal to no habitat impacts to both the bald and golden eagle.

4 Results Summary

Approximately 89 percent of the Study Area is composed of agricultural land or lawns, while approximately 11 percent is forested. One rare plant community, Sinkhole Pond Marsh, was identified in the northeast portion of the Study Area. A small population of the state-listed cypress-knee sedge was found in this community. One other state-listed species, the small flower baby blue eyes, was located in young growth portions of the Appalachian-Interior-Northeastern Mesic Forest community areas, present mostly in northern portions of the Study Area. As presented in Appendix C, this species was first described in 2020 but may have been overlooked; the plant may not, therefore, warrant state-listing.

Forested areas, five sinkhole fissures/karst features, and 12 buildings within the Study Area provide potential bat roosting and/or foraging habitat for federally listed bat species. However, mist net surveys for these bats were completed in late May through early June 2021, and no listed bat species were found. Two big brown bats, one evening bat, and one eastern red bat were captured during the mist net surveys in Stands 8 and 14. Ninety-three acres of trees and shrubby vegetation, representing 50 percent of the forested areas in the Study Area, and all 12 buildings have the potential to be removed for the project. The project would avoid impacts to the five identified karst features by maintaining minimum 100-foot protective buffers.

While none were observed during the field surveys, limited potential habitat is present in the Study Area for the three state-listed bird, the one state-listed amphibian, and the two state-listed crayfish.

Thirteen of the 23 birds of conservation concern are likely to occur in the Study Area based on suitable habitat. Although the implementation of the project may reduce the foraging potential of the Study Area and in proposed work areas, the project is not anticipated to have an adverse effect on migratory birds.

5 References

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A

Appendix A - Figures

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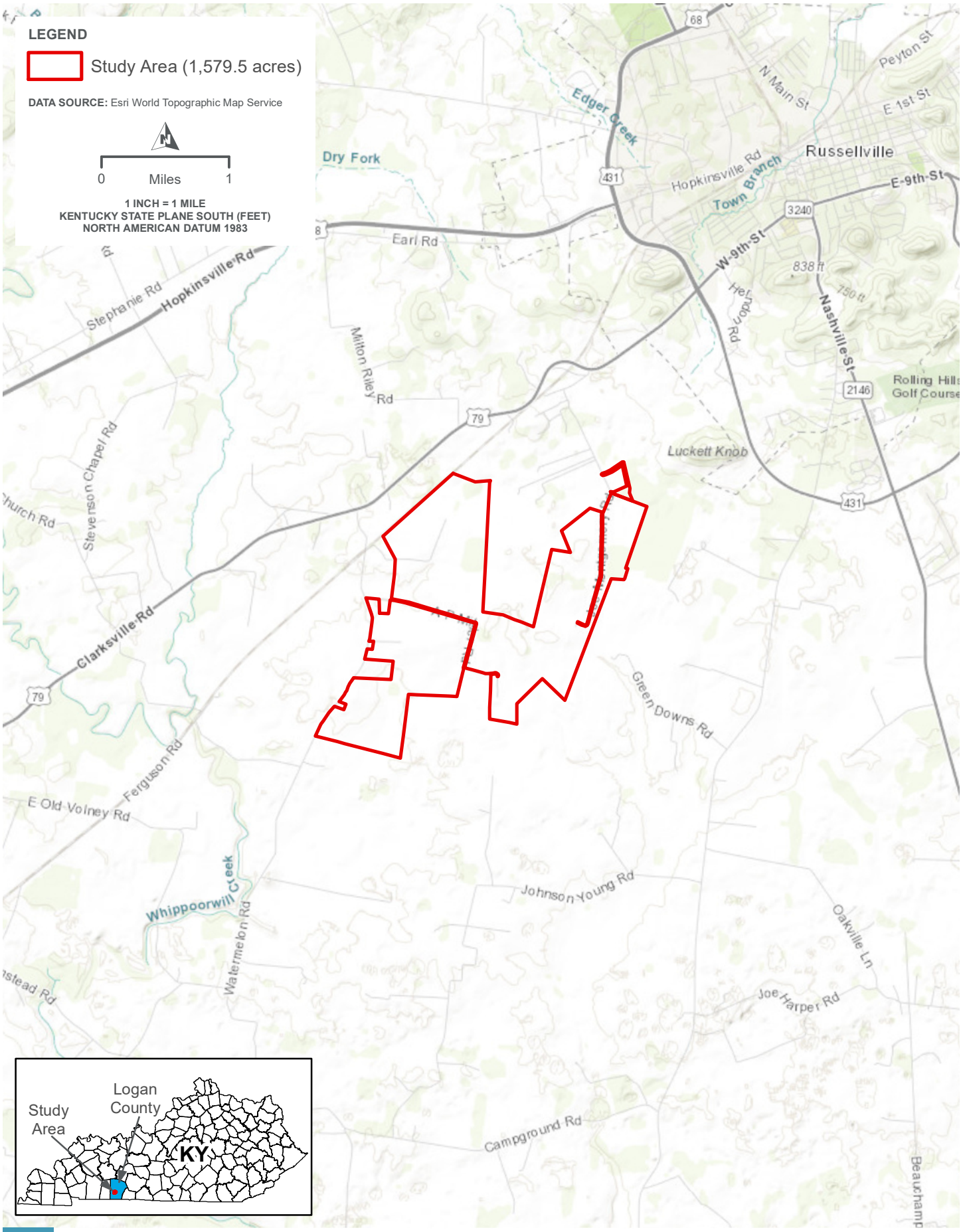
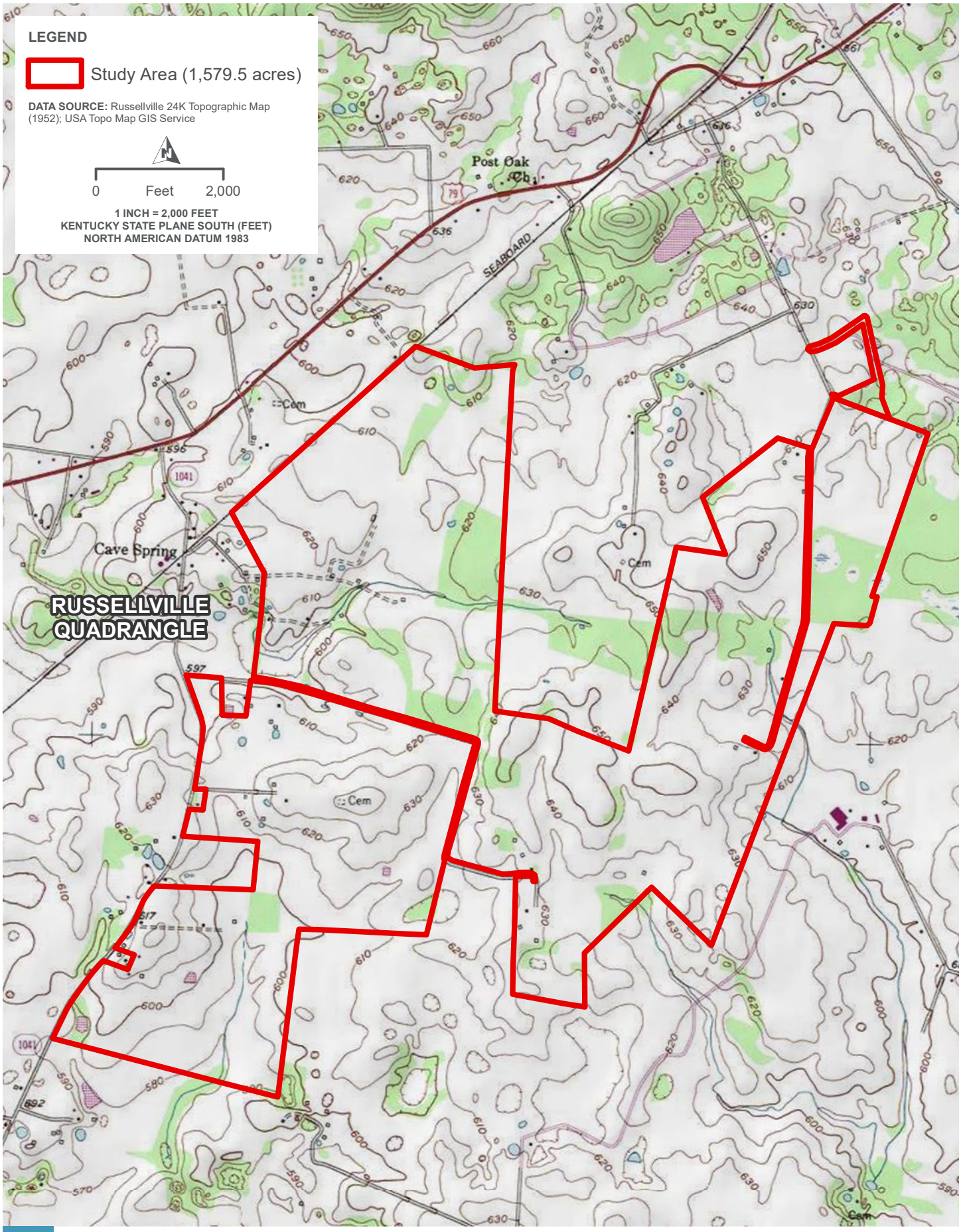


RUSSELLVILLE SOLAR
VICINITY MAP

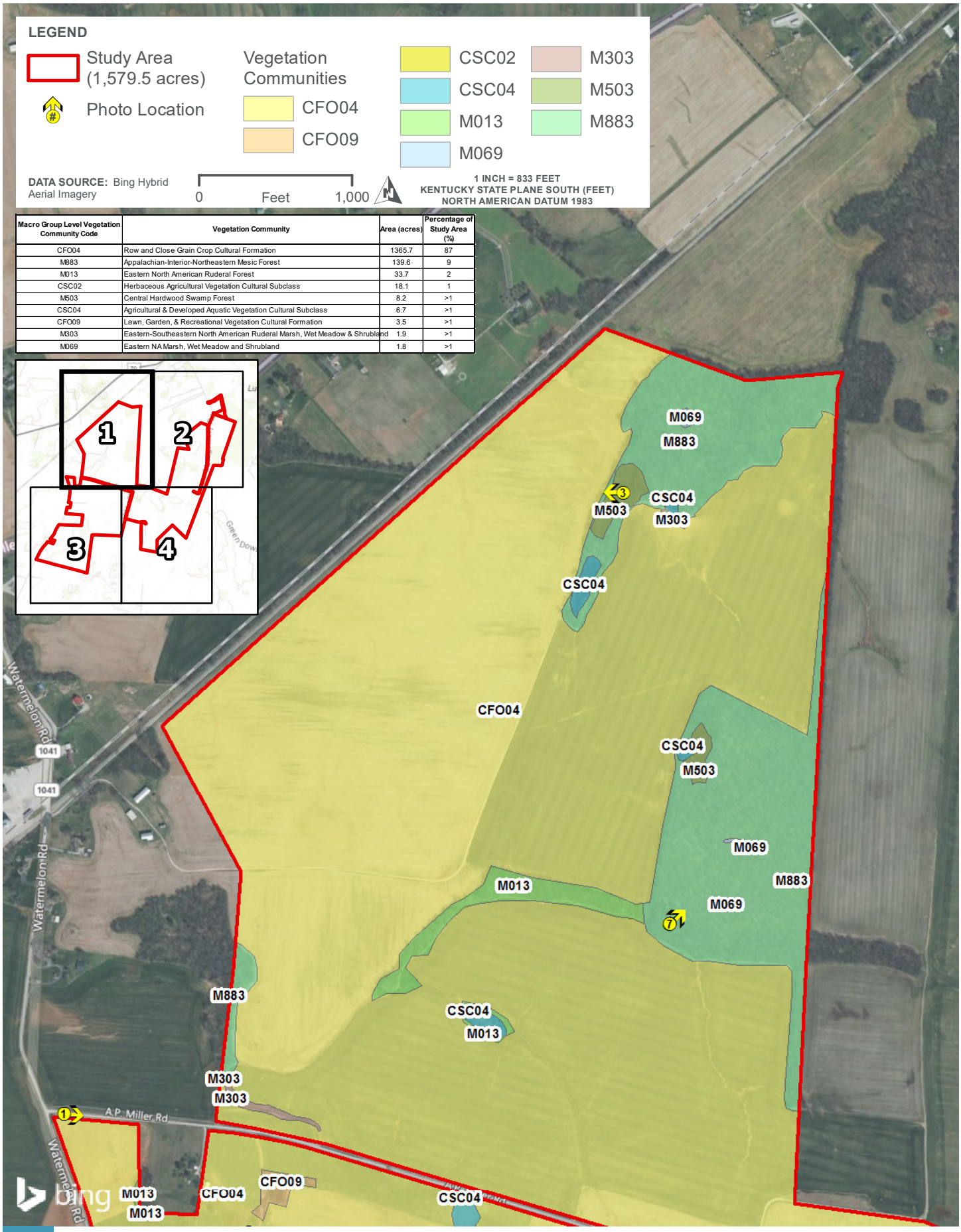
FIGURE 1



RUSSELLVILLE SOLAR

USGS TOPOGRAPHIC QUADRANGLE

FIGURE 2



Macro Group Level Vegetation Community Code	Vegetation Community	Area (acres)	Percentage of Study Area (%)
CFO04	Row and Close Grain Crop Cultural Formation	1365.7	87
M883	Appalachian-Interior-Northeastern Mesic Forest	139.6	9
M013	Eastern North American Ruderal Forest	33.7	2
CSC02	Herbaceous Agricultural Vegetation Cultural Subclass	18.1	1
M503	Central Hardwood Swamp Forest	8.2	>1
CSC04	Agricultural & Developed Aquatic Vegetation Cultural Subclass	6.7	>1
CFO09	Lawn, Garden, & Recreational Vegetation Cultural Formation	3.5	>1
M303	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland	1.9	>1
M069	Eastern NA Marsh, Wet Meadow and Shrubland	1.8	>1

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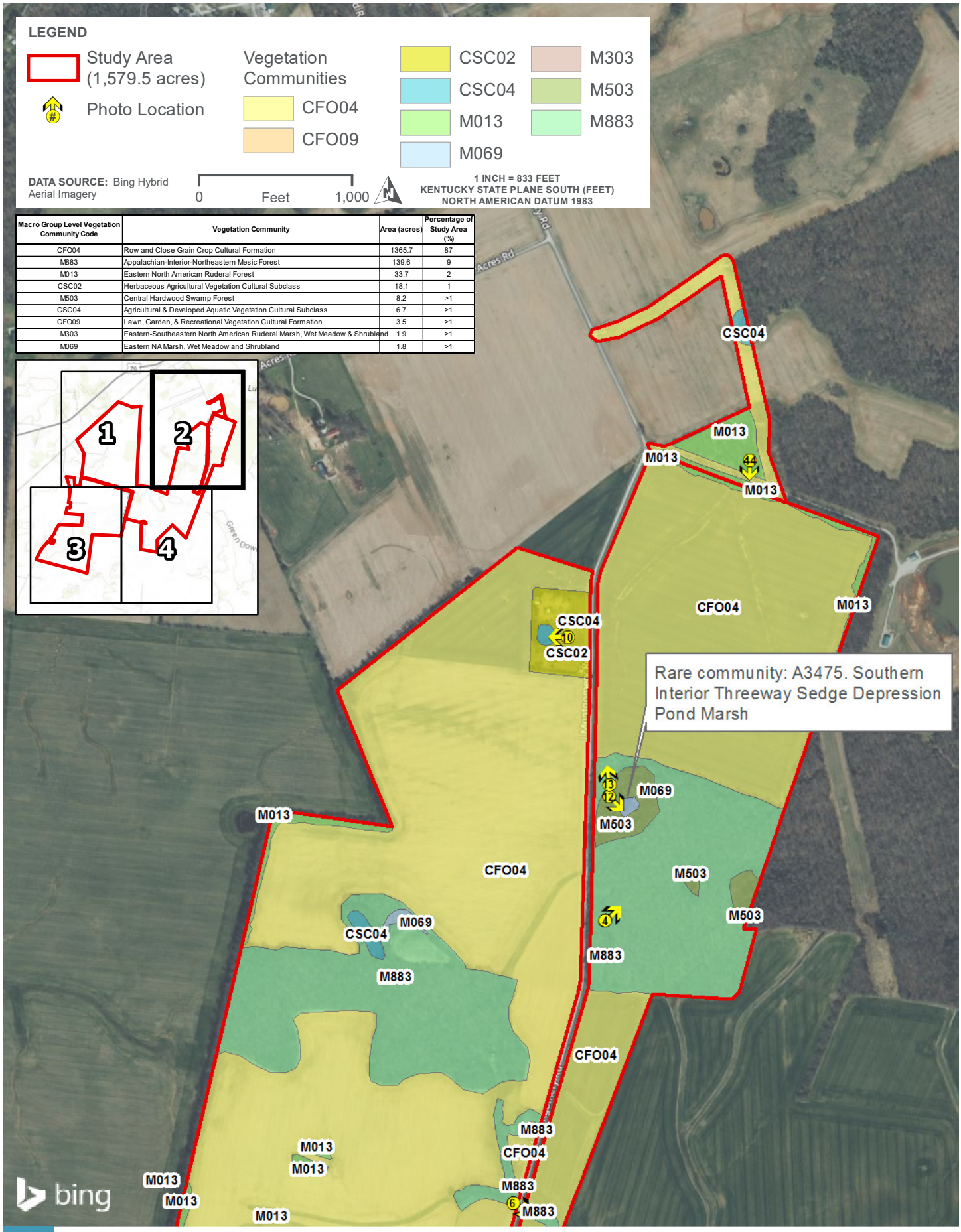
RUSSELLVILLE SOLAR

VEGETATION COMMUNITIES

FIGURE 3 PAGE 1 OF 4



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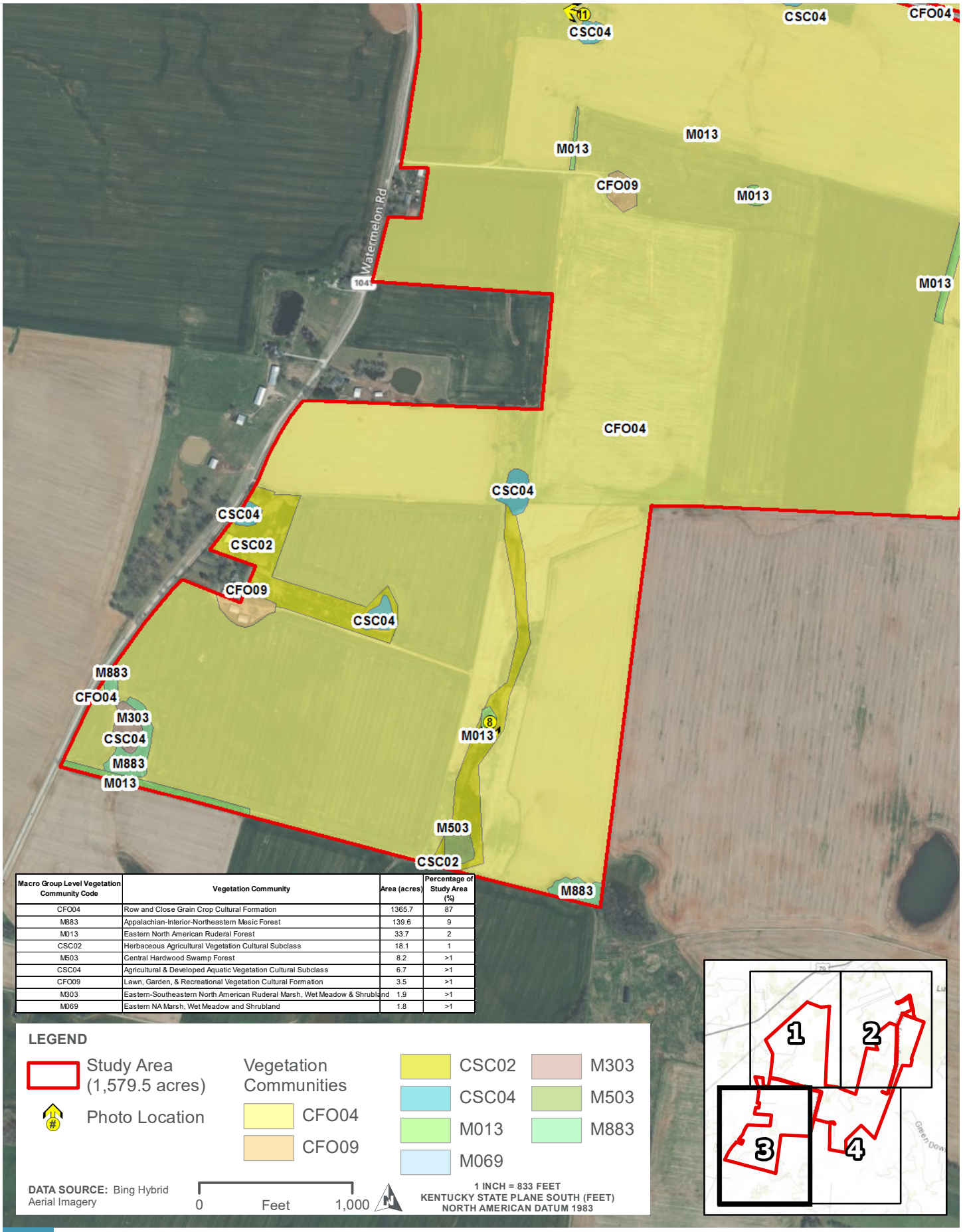
M883	Appalachian-Interior-Northeastern Mesic Forest	139.6	9
M013	Eastern North American Ruderal Forest	33.7	2
CSC02	Herbaceous Agricultural Vegetation Cultural Subclass	18.1	1
M503	Central Hardwood Swamp Forest	8.2	>1
CSC04	Agricultural & Developed Aquatic Vegetation Cultural Subclass	6.7	>1
CFO09	Lawn, Garden, & Recreational Vegetation Cultural Formation	3.5	>1
M303	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland	1.9	>1
M069	Eastern NA Marsh, Wet Meadow and Shrubland	1.8	>1

RUSSELLVILLE SOLAR
VEGETATION COMMUNITIES
FIGURE 3 PAGE 2 OF 4



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CSC02	Herbaceous Agricultural Vegetation Cultural Subclass	18.1	1
M503	Central Hardwood Swamp Forest	8.2	>1
CSC04	Agricultural & Developed Aquatic Vegetation Cultural Subclass	6.7	>1
CFO09	Lawn, Garden, & Recreational Vegetation Cultural Formation	3.5	>1
M303	Eastern-Southeastern North American Ruderal Marsh, Wet Meadow & Shrubland	1.9	>1
M069	Eastern NA Marsh, Wet Meadow and Shrubland	1.8	>1

LEGEND

Study Area (1,579.5 acres)

Photo Location

Vegetation Communities

CFO04

CFO09

CSC02

CSC04

M013

M069

M303

M503

M883

DATA SOURCE: Bing Hybrid Aerial Imagery

0 Feet 1,000

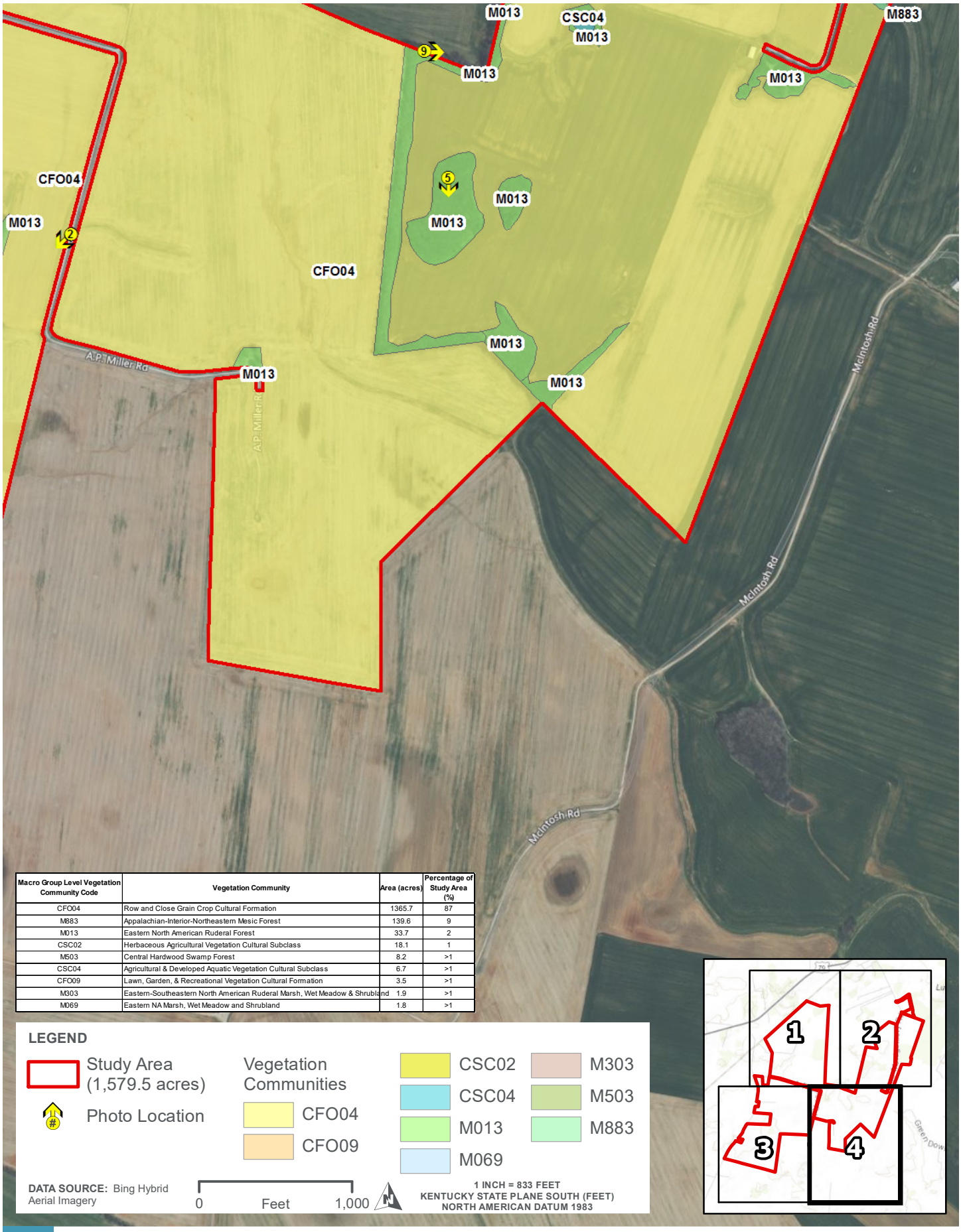
1 INCH = 833 FEET
KENTUCKY STATE PLANE SOUTH (FEET)
NORTH AMERICAN DATUM 1983

HDR SILICON RANCH

RUSSELLVILLE SOLAR

VEGETATION COMMUNITIES

FIGURE 3 PAGE 3 OF 4



Macro Group Level Vegetation Community Code	Vegetation Community	Area (acres)	Percentage of Study Area (%)
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LEGEND

Study Area (1,579.5 acres)

Photo Location

Vegetation Communities

CFO04

CFO09

CSC02

CSC04

M013

M069

M303

M503

M883

DATA SOURCE: Bing Hybrid Aerial Imagery

0 Feet 1,000

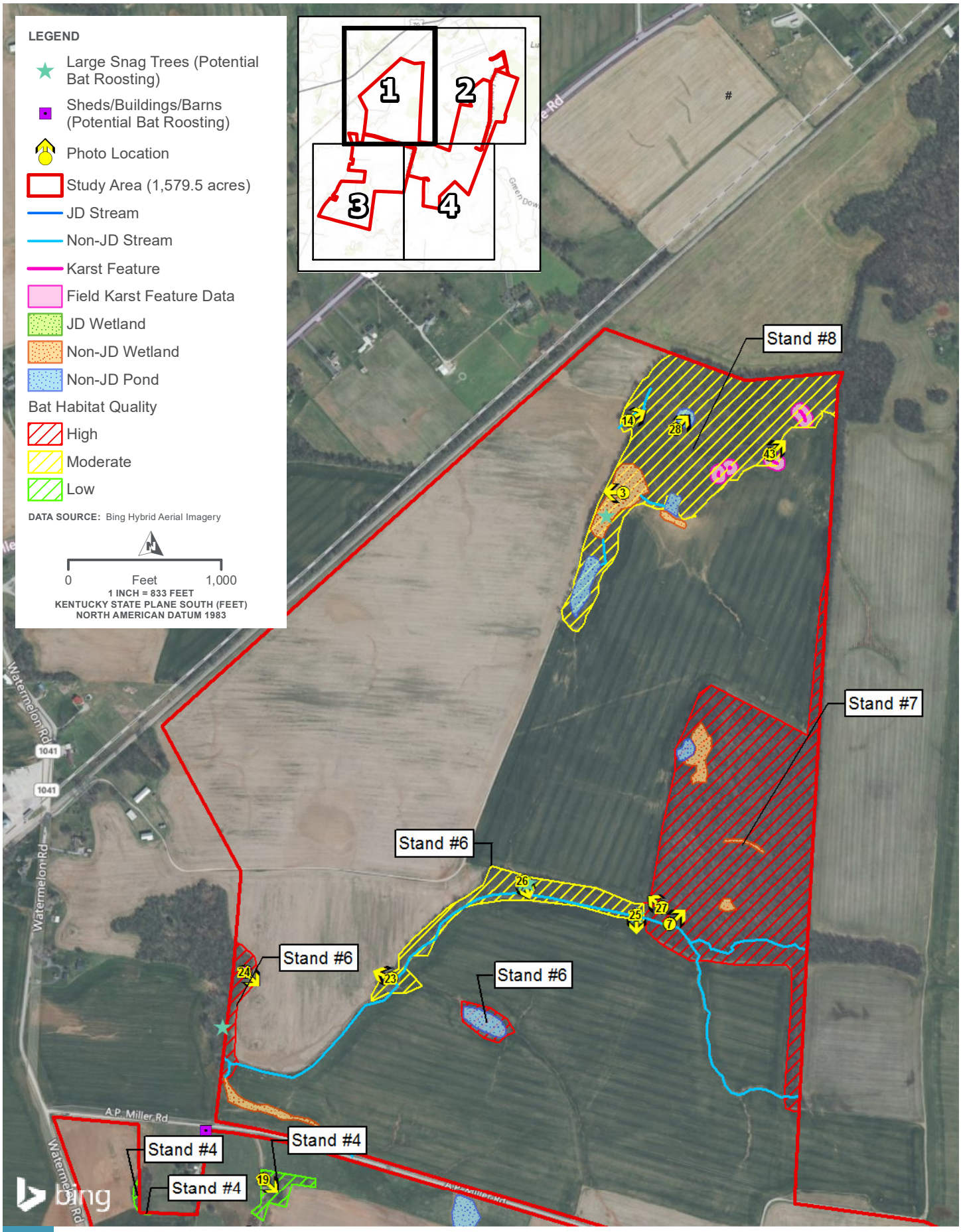
1 INCH = 833 FEET
KENTUCKY STATE PLANE SOUTH (FEET)
NORTH AMERICAN DATUM 1983

HDR SILICON RANCH

RUSSELLVILLE SOLAR

VEGETATION COMMUNITIES

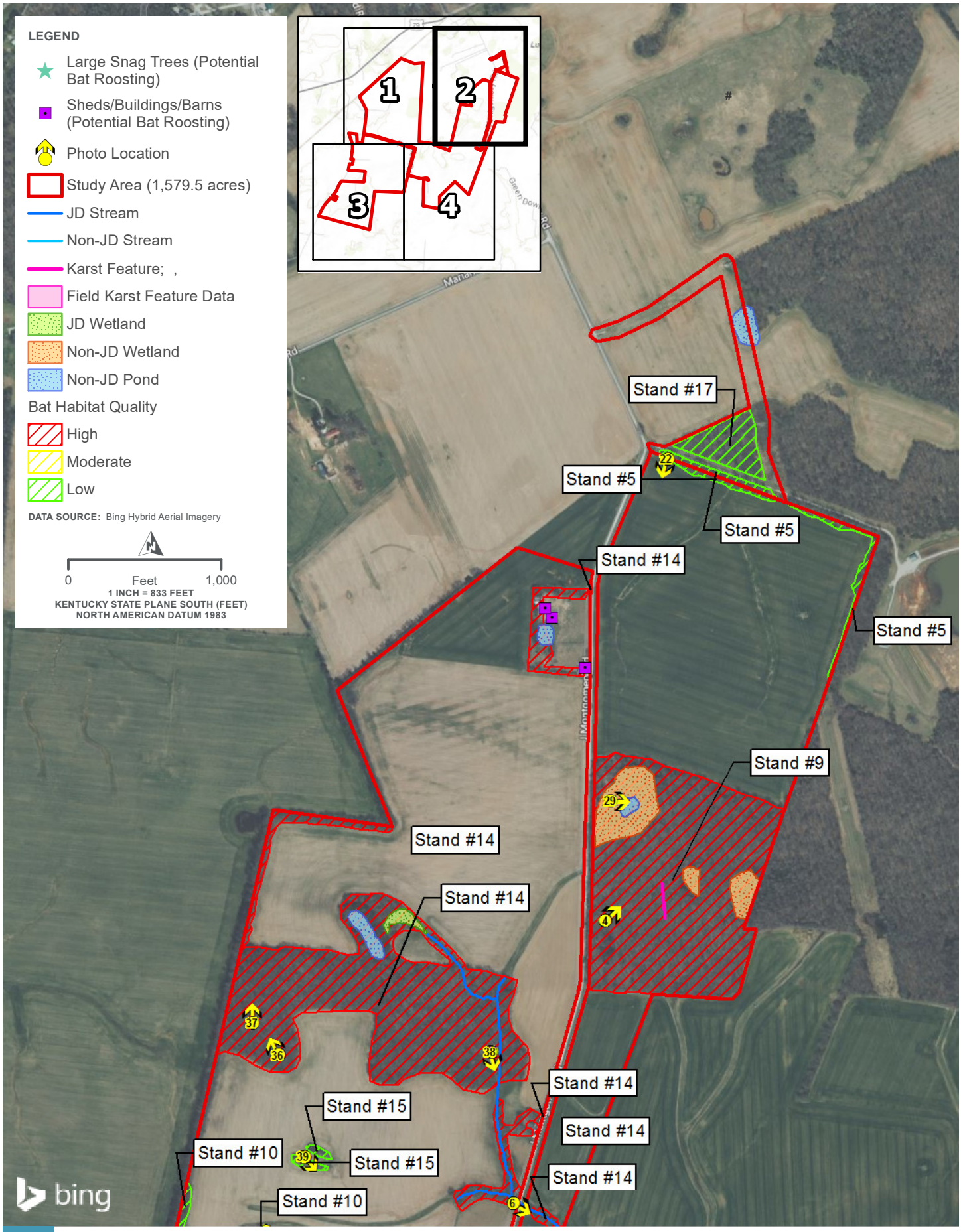
FIGURE 3 PAGE 4 OF 4



RUSSELLVILLE SOLAR

POTENTIAL SUMMER BAT HABITAT

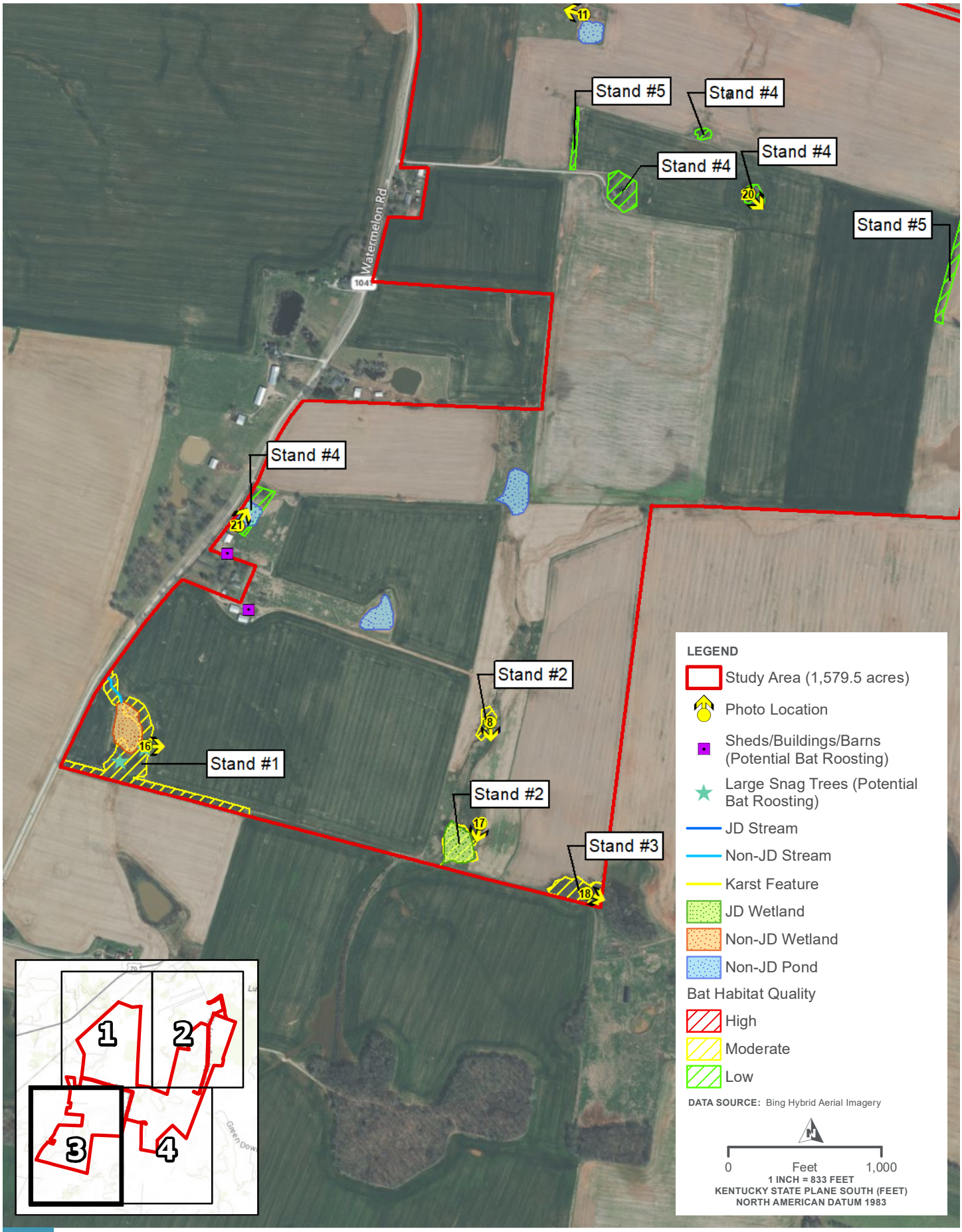
FIGURE 4 PAGE 1 OF 4



RUSSELLVILLE SOLAR

POTENTIAL SUMMER BAT HABITAT

FIGURE 4 PAGE 2 OF 4

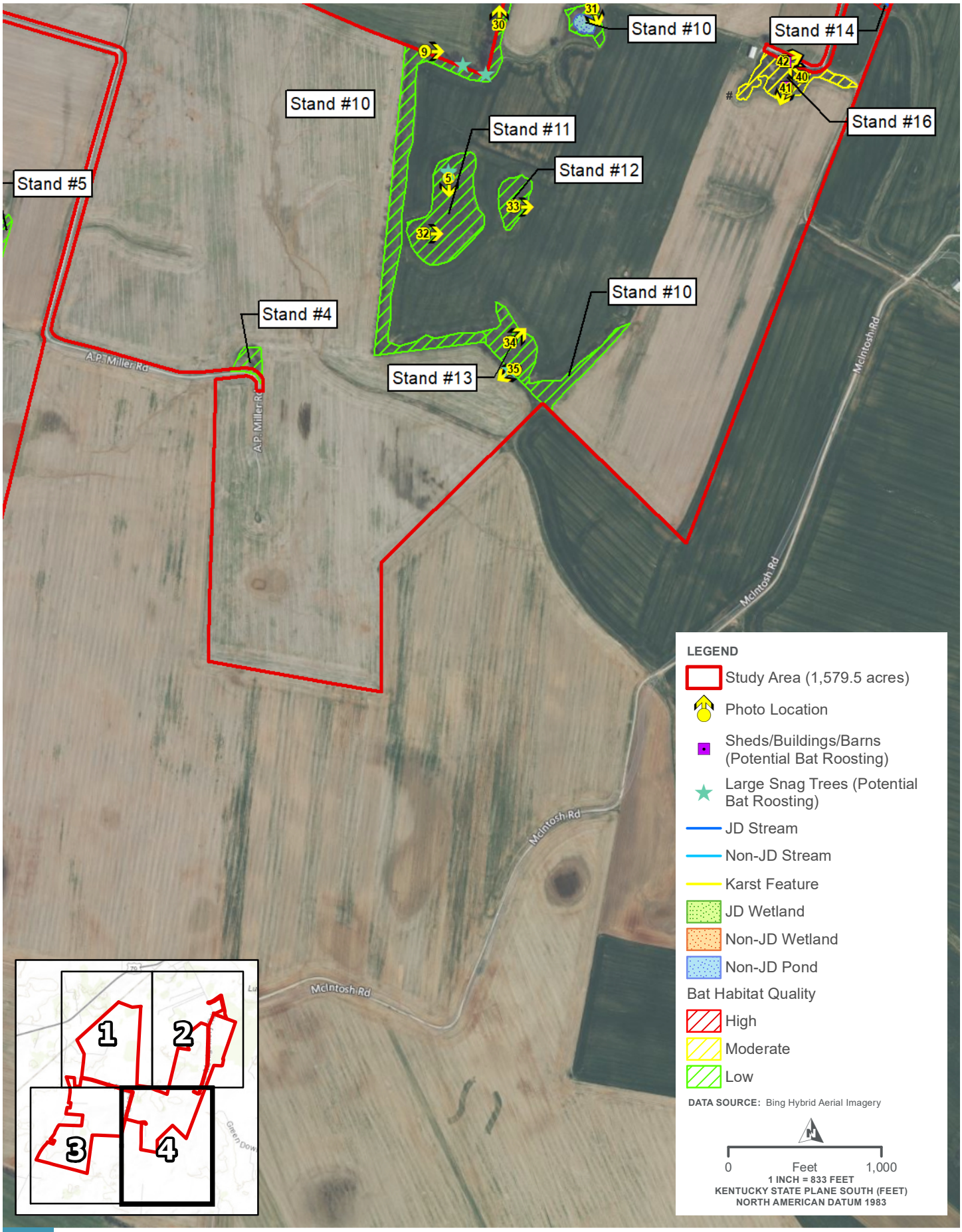


HDR SILICON RANCH

RUSSELLVILLE SOLAR

POTENTIAL SUMMER BAT HABITAT

FIGURE 4 PAGE 3 OF 4



HDR SILICON RANCH

RUSSELLVILLE SOLAR

POTENTIAL SUMMER BAT HABITAT

FIGURE 4 PAGE 4 OF 4

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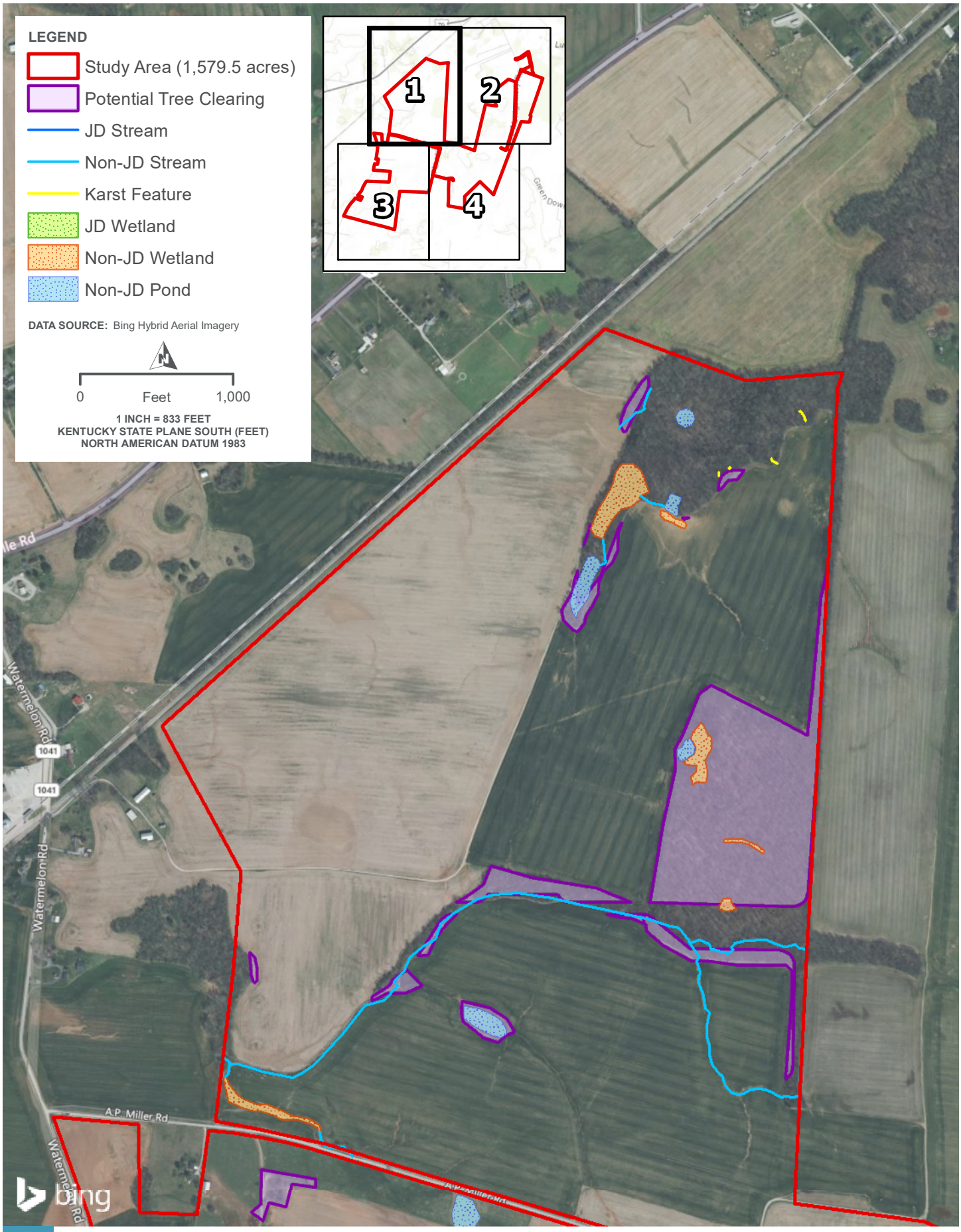
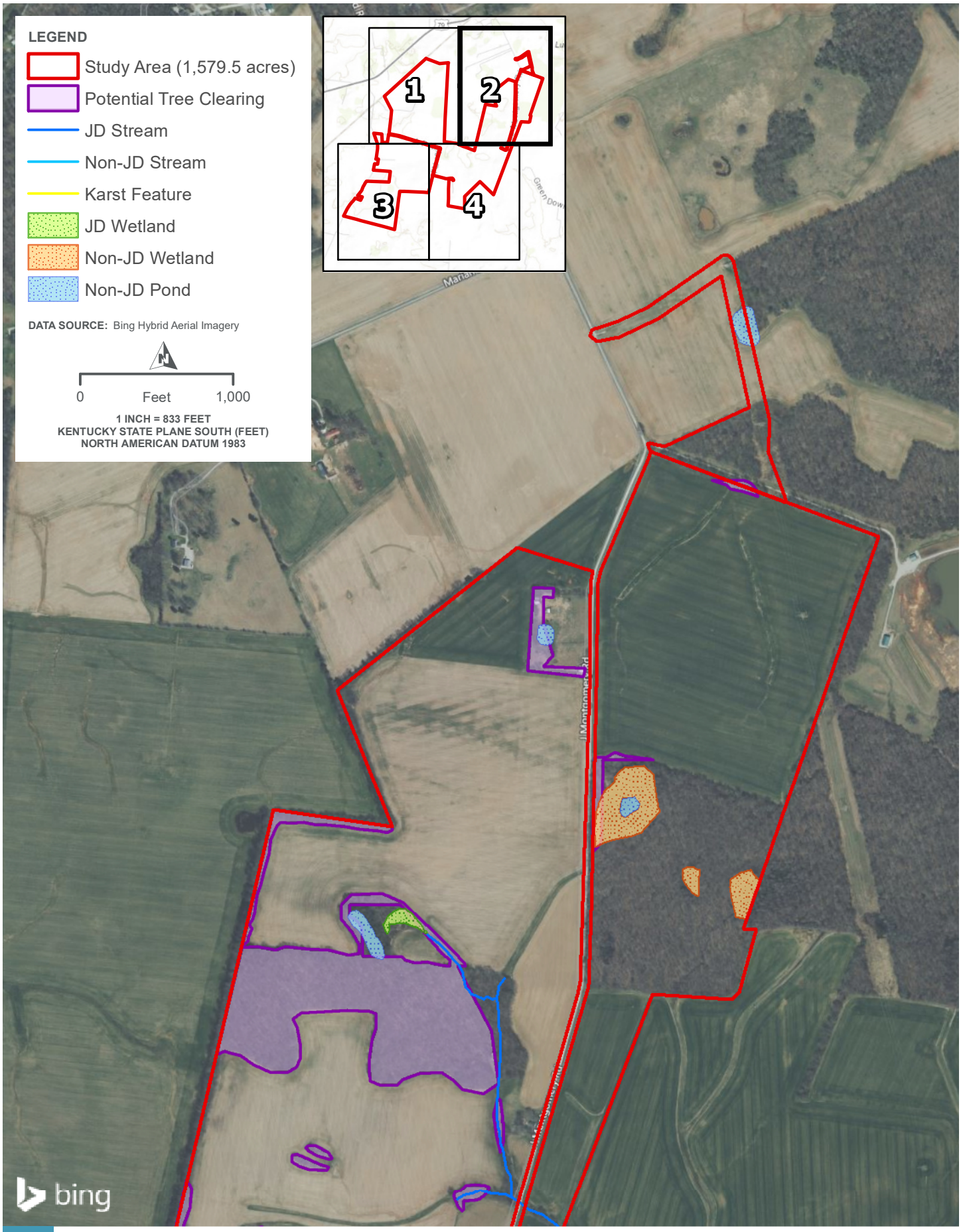


RUSSELLVILLE SOLAR

POTENTIAL TREE CLEARING

FIGURE 5 PAGE 1 OF 4

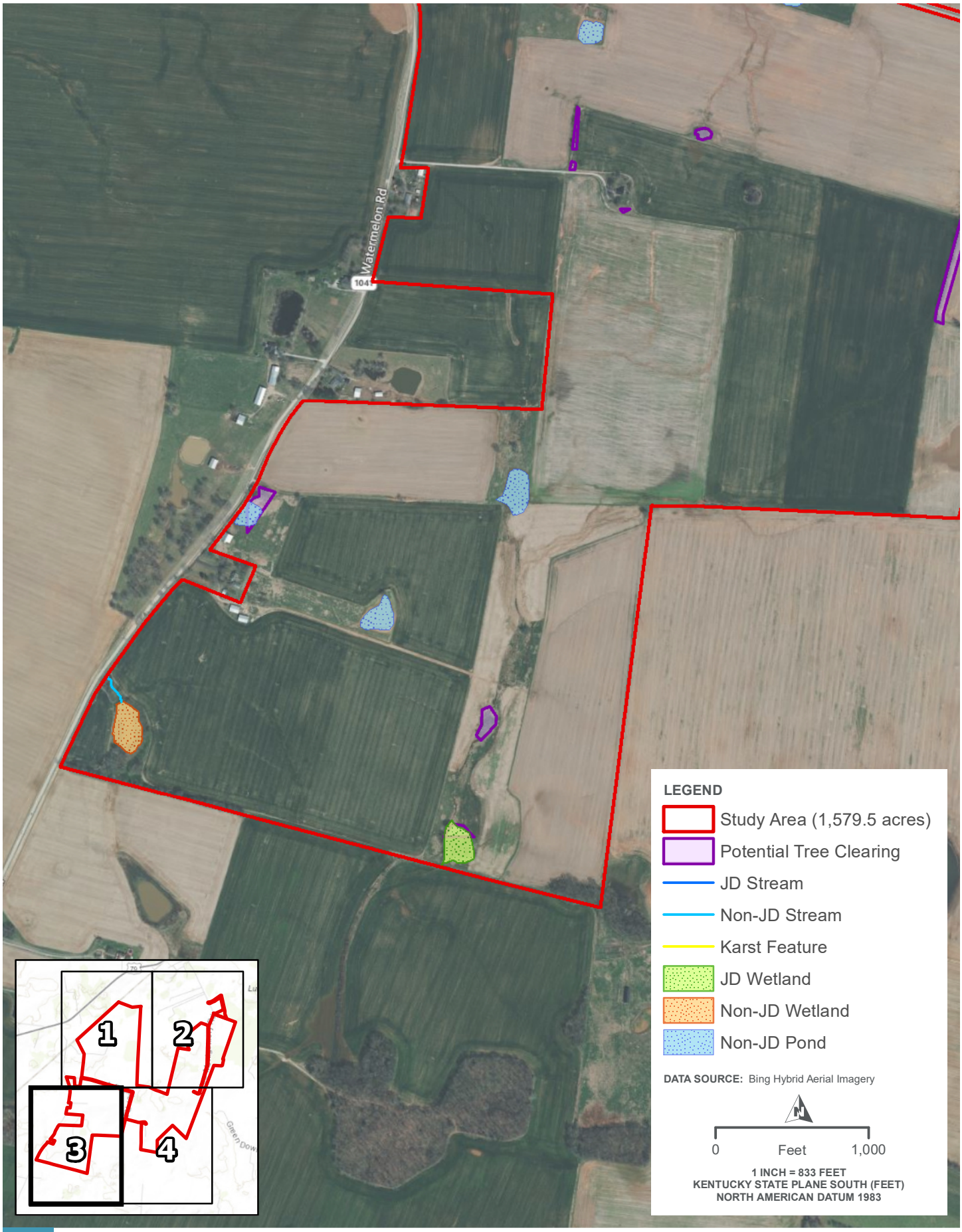


HDR SILICON RANCH

RUSSELLVILLE SOLAR

POTENTIAL TREE CLEARING

FIGURE 5 PAGE 2 OF 4

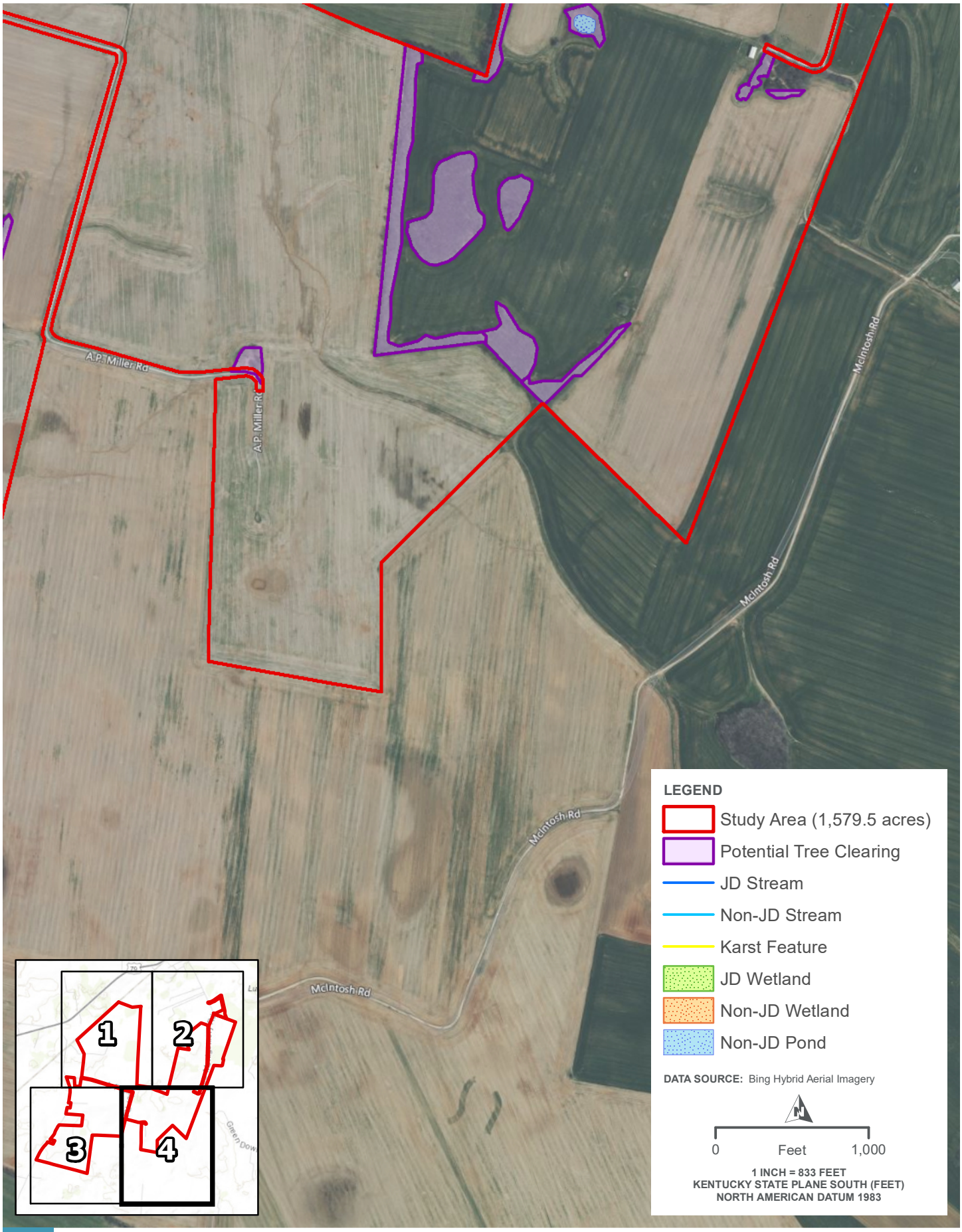


HDR SILICON RANCH

RUSSELLVILLE SOLAR

POTENTIAL TREE CLEARING

FIGURE 5 PAGE 3 OF 4



RUSSELLVILLE SOLAR

POTENTIAL TREE CLEARING

FIGURE 5 PAGE 4 OF 4

B

Appendix B - IPAC, TVA RHND, KYBAT Results

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IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Logan County, Kentucky

Local office

Kentucky Ecological Services Field Office

(502) 695-0468
(502) 695-1024

J C Watts Federal Building, Room 265
330 West Broadway
Frankfort, KY 40601-8670

http://www.fws.gov/frankfort/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Gray Bat Myotis grisescens — Endangered

Wherever found

This species only needs to be considered if any of the following conditions apply:

- The project area includes a half-mile buffer around a known gray bat bibernacula and/or roost.
- The project area includes potential gray bat habitat.

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6329

Indiana Bat Myotis sodalis — Endangered

Wherever found

This species only needs to be considered if any of the following conditions apply:

- The project area includes known 'summer 1' habitat.
- The project area includes 'potential' habitat. All activities in this location should consider possible effects to this species.

There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/5949

Northern Long-eared Bat Myotis septentrionalis — Threatened

Wherever found

This species only needs to be considered if the following condition applies:

- The specified area includes areas in which incidental take would not be prohibited under the 4(d) rule. For reporting purposes, please use the "streamlined consultation form," linked to in the "general project design guidelines" for the species.

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9045

Clams

NAME	STATUS

Rabbitsfoot Quadrula cylindrica cylindrica — Threatened

Wherever found

There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/5165

Snuffbox Mussel Epioblasma triquetra — Endangered

Wherever found

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4135

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME	TYPE
Indiana Bat Myotis sodalis https://ecos.fws.gov/ecp/species/5949#crithab	Final
Rabbitsfoot Quadrula cylindrica cylindrica https://ecos.fws.gov/ecp/species/5165#crithab	Final

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird

species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Rusty Blackbird Euphagus carolinus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Semipalmated Sandpiper Calidris pusilla This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Wood Thrush Hylocichla mustelina This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

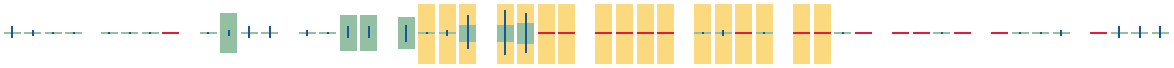
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Prairie Warbler BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Red-headed Woodpecker BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



Rusty Blackbird BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Semipalmated Sandpiper BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Wood Thrush BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and

avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird

impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish and Wildlife Service office or visit the NWI map for a full list.

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1A
- PEM1F
- PEM1Fh
- PEM1Ch
- PEM1Cd
- PEM1Cx
- PEM1Fx
- PEM1Ah
- PEM1Ad

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1A
- PFO1C
- PFO1F
- PSS1A
- PSS1C
- PSS/EM1A
- PFO1/SS1A
- PFO5F
- PFO1Ah
- PFO5H

PFO5Hh

FRESHWATER POND

PAB3H
PAB4F
PAB4Fh
PAB4Fx
PAB3Hh
PUBHx
PUBFx
PAB3F
PAB4Hh
PUSC
PUBF
PAB3Hx
PAB3Fx

LAKE

L1UBHh
L1AB3Hh

RIVERINE

R4SBA

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

ANDY BESHEAR
GOVERNOR

REBECCA W. GOODMAN
SECRETARY

ZEB WEESE
EXECUTIVE DIRECTOR

ENERGY AND ENVIRONMENT CABINET
OFFICE OF KENTUCKY NATURE PRESERVES

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601
TELEPHONE: 502-573-2886
TELEFAX: 502-564-7484

April 9, 2021

Kelly Thames
HDR, Inc.
440 South Church Street, Suite 1000
Charlotte, NC 28202

Project:	SR Russellville; SR Russellville
Project ID:	21-0128
Project Type:	Standard (*customers will be invoiced), 1 mile buffer ($120 fee)
Site Acreage:	1,639.49
Site Lat/Lon:	36.792826 / -86.937704
County:	Logan
USGS Quad:	RUSSELLVILLE KY
Watershed HUC12:	Dry Fork-Whippoorwill Creek; Pleasant Grove Creek-Red River

Dear Kelly Thames,

This letter is in response to your data request for the project referenced above. We have reviewed our Natural Heritage Program Database to determine if any of the endangered, threatened, or special concern plants and animals or exemplary natural communities monitored by the Office of Kentucky Nature Preserves occur within your general project area. Your project does pose a concern at this time, therefore please see the attached reports and report key for more detailed information.

I would like to take this opportunity to remind you of the terms of the data request license, which you agreed upon in order to submit your request. The license agreement states "Data and data products received from the Office of Kentucky Nature Preserves, including any portion thereof, may not be reproduced in any form or by any means without the express written authorization of the Office of Kentucky Nature Preserves." The exact location of plants, animals, and natural communities, if released by the Office of Kentucky Nature Preserves, may not be released in any document or correspondence. These products are provided on a temporary basis for the express project (described above) of the requester, and may not be redistributed, resold or copied without the written permission of the Biological Assessment Branch (300 Sower Blvd - 4th Floor, Frankfort, KY, 40601. Phone: 502-782-7828).

Please note that the quantity and quality of data collected by the Kentucky Natural Heritage Program are dependent

on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in Kentucky have never been thoroughly surveyed and new plants and animals are still being discovered. For these reasons, the Kentucky Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of Kentucky. Heritage reports summarize the existing information known to the Kentucky Natural Heritage Program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. We would greatly appreciate receiving any pertinent information obtained as a result of on-site surveys.

If you have any questions, or if I can be of further assistance, please do not hesitate to contact me.

Sincerely,

Elizabeth Mason
Geoprocessing Specialist

Standard Occurrence Report
KNP monitored species within 1 Miles of Project Area

EO ID	Scientific Name	Common Name	GRank	SRank	SPROT	USESA	STWG	Last Obs Date	Precision	EO Rank	Lat / Lon	Directions	Habitat
14193	*Carex alata*	Broadwing Sedge	G5	S1S2	T			2016-05	S	NR	36.7982 / -86.9136	579m E of J Montgomery Rd and 583m NW of end of DI Wilkens Rd	Generally known from wet soil mostly near the coast (Gleason & Cronquist 1991); marshes (KY)
14192	*Carex decomposita*	Epiphytic Sedge	G3G4	S2	T			2016-05	S	NR	36.7982 / -86.9137	579 meters E of J Montgomery Rd and 583m NW of end of DI Wilkens Rd	Swamps, sinkhole ponds, often on floating logs; also often growing on cypress knees, cypress bases (often at or near water level) (Weakley 2015).
19107	*Cave*		GU	SNR	N			No Date	S	E		Sensitive Element - Contact KSS at ksscaves.com	
19168	*Cave*		GU	SNR	N			No Date	S	E		Sensitive Element - Contact KSS at ksscaves.com	
19252	*Cave*		GU	SNR	N			No Date	S	E		Sensitive Element - Contact KSS at ksscaves.com	
19255	*Cave*		GU	SNR	N			No Date	S	E		Sensitive Element - Contact KSS at ksscaves.com	
20550	*Cave*		GU	SNR	N			No Date	S	E		Sensitive Element - Contact KSS at ksscaves.com	
21451	*Cave*		GU	SNR	N			No Date	S	E		Sensitive Element - Contact KSS at ksscaves.com	
4342	*Delphinium carolinianum ssp. calciphilum*	Carolina Larkspur	G5T2T4	S1S2	T			1981-Pre	C	H?	36.8596 / -86.8790	Logan County	
15481	*Glyceria acutiflora*	Sharp-scaled Manna-grass	G5	S1S2	E			2016-05-01		BC	36.7984 / -86.9139	Powerline cut east of Joe Montgomery Road, SW of Russelville on Hwy 79.	Shallow water and wet mucky soils in mountain ponds, wet pastures (Weakley 1998); muddy pools and pond margins.
10203	*Ichthyomyzon castaneus*	Chestnut Lamprey	G4	S2	S		Y	1955-05-06	G	H	36.7844 / -86.9961	WHIPPOORWILL CREEK (PLOTTED AT US 79 BRIDGE).	Moderate-size creeks, large rivers, and reservoirs. Substrate consists of gravel and rubble with areas of sand and silt. Larvae require clear streams with stable bars of silt, sand and organic detritis (Becker 1983, Pflieger 1975, Rohde and Lanteigne-Cour

Standard Occurrence Report
KNP monitored species within 1 Miles of Project Area

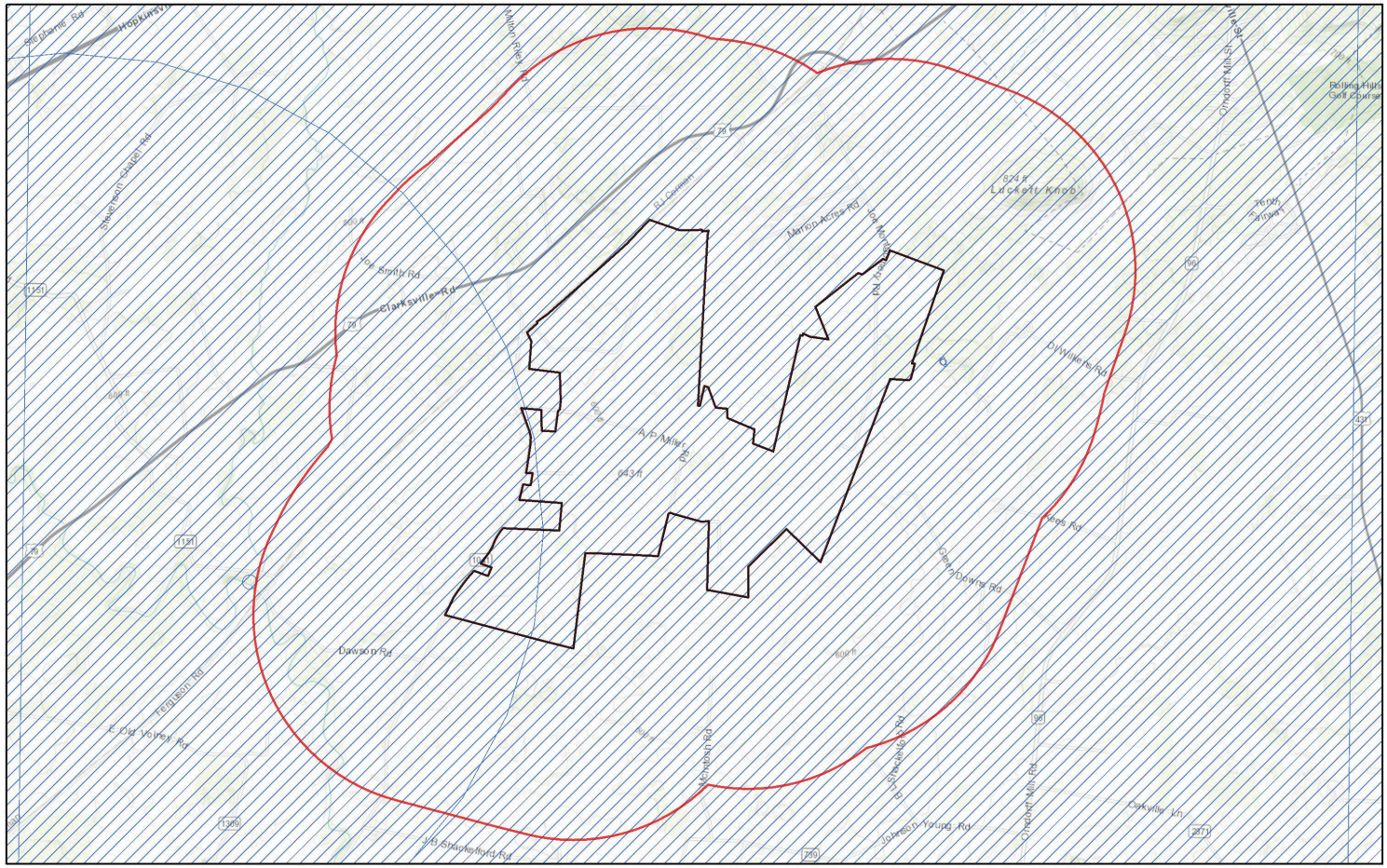
EO ID	Scientific Name	Common Name	GRank	SRank	SPROT	USESA	STWG	Last Obs Date	Precision	EO Rank	Lat / Lon	Directions	Habitat
15802	*Lanius ludovicianus*	Loggerhead Shrike	G4	S3S4B,S4N	S	SOMC	Y	1989-06-20	Q	NR	36.8125 / -86.9375	CW block of quad	
4903	*Lithospermum molle*	Soft-hairy False-gromwell	G4G5	SH	H			1978-pre	C	H	36.8596 / -86.8790	Logan County	Limestone glades and woodland.
2433	*Peucaea aestivalis*	Bachman's Sparrow	G3	S1B	E	SOMC	Y	1906-04-14	C	H	36.8601 / -86.838	Logan Co.	Early successional areas with scattered saplings (often pines), bushes, or understory, brushy or overgrown hillsides, overgrown fields with thickets and brambles.
16076	*Sinkhole/depression marsh*		G3G4	S1S2	E			2016-05-01	S	AC	36.7982 / -86.9137	Logan Co., KY: Joe Montgomery Road. Park along the road near the white house (N 36.79449 W 86.92123) and walk E along the S end of the swamp forest (Bestsource).	
6874	*Villosa vanuxemensis*	Mountain Creekshell	G4	S2	T		Y	2000-05-22	S	A	36.7808 / -86.9786	WHIPPOORWILL CREEK-DRY FORK AT FERGUSON-OLMSTEAD RD, 6.75 MI SW RUSSELLVILLE.	Inhabits sand to heterogenous mixtures in and adjacent to shallow riffles and shoals in slow to fast current of small to medium-sized streams (Ahlstedt 1984, Gordon and Layzer 1989).

Managed Areas within 1 Miles of Project Area

MA ID	Managed Area Name	Unit Type	Owner Name	Managing Institution
1038	*Agricultural Conservation Easement*	Conservation Easement	Private Individual & Kentucky Department of Agriculture	Kentucky Department of Agriculture
468	*Whipporwill Creek Outstanding Resource Water*	Outstanding State Resource Water	Multiple	Kentucky Division of Water

THESE DATA ARE VALID ONLY ON THE DATE ON WHICH THE REPORT WAS GENERATED.
THESE DATA MAY ONLY BE USED FOR THE PROJECT NAMED ABOVE.

SR Russellville



April 9, 2021

- Project Boundary
- Buffered Project Boundary
- Element Occurences

1:45,492

0 0.375 0.75 1.5 mi

0 0.5 1 2 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri

Standard Occurrence Report Key
Office of Kentucky Nature Preserves

KNP Monitored Species within x Miles of Project Area

Federally and state listed species, species of conservation concern, and exemplary natural communities known to occur within the project area.

- **EO**: Element Occurrence; Specific example of a species at a geographic location
- **EO ID**: Kentucky Nature Preserves unique identifier for the Element Occurrence
- **Scientific Name**: Scientific name used by Kentucky Nature Preserves
- **Common Name:** Common name used by Kentucky Nature Preserves
- **GRANK**: Estimate of species abundance on a global scale

GX	Presumed extinct: Not located despite intensive searches and rediscovery unlikely	G#G#	Range rank; numeric range rank used to indicate uncertainty about the exact status of the taxon
GH	Possibly extinct: Missing; known from only historical occurrences but still hope of rediscovery	GNR	Not ranked
G1	Extremely Rare	GU	Unrankable due to lack of information or substantially conflicting information
G2	Rare	?	Qualifier that may be added to the rank to indicate uncertainty
G3	Uncommon	T #	May be appended to ranks for infraspecific taxa
G4	Common	Q	Qualifier that indicates questionable taxonomy
G5	Very Common		

- **SRANK**: Estimate of species abundance in Kentucky

SX	Presumed extirpated: Not located despite intensive searches and rediscovery unlikely	S#S#	Range rank - numeric range rank used to indicate uncertainty about the exact status of the taxon
SH	Possibly extirpated: Known from historical occurrences only but still hope of rediscovery	SNR	Not ranked
S1	Extremely Rare	SU	Unrankable due to lack of information or substantially conflicting information
S2	Rare	SNA	Not Applicable; may be non-native, hybrid, or long distance migrant
S3	Uncommon	?	Qualifier that may be added to the rank to indicate uncertainty
S4	Many Occurrences	B	Qualifier to indicate breeding population of the element
S5	Very Common	N	Qualifier to indicate non-breeding population of the element

Standard Occurrence Report Key
Office of Kentucky Nature Preserves

- **SPROT**: Office of Kentucky Nature Preserves species state status

E	Endangered
T	Threatened
S	Special Concern
H	Historic
X	Extirpated
N or blank	None

- **USESA**: U.S. Fish and Wildlife status

C	Candidate
PE	Proposed Endangered
PT	Proposed Threatened
LT	Listed as Threatened
LE	Listed as Endangered
SOMC	Species of Management Concern
LTNL	Listed Threatened in part of its range, but not listed in Kentucky
Delisted	Delisted
N or blank	None

- **STWG**: Species included in the Kentucky Department of Fish and Wildlife's State Wildlife Action Plan as Species of Greatest Conservation Need under the State and Tribal Wildlife Grants program

Y	Yes
Blank	No

- **Last Obs Date**: Date the species was last observed to be extant at the site

- **Precision**: The precision of the record

S	Seconds; Can be accurately mapped within a 3-second radius (approximately 100 ft)
M	Minutes; Can be mapped within a 1-minute radius (approximately 1.5 miles)
G	General; Only known to a place name (within about 5 miles)
C	County; Only known to the county
Q	Quad; Only known to the county

Standard Occurrence Report Key
Office of Kentucky Nature Preserves

- **EO Rank**: Rank of the Element Occurrence based on assessment of viability

A	Excellent estimated viability	D	Poor estimated viability
A?	Possibly excellent estimated viability	D?	Possibly poor estimated viability
AB	Excellent or good estimated viability	E	Verified extant (viability not assessed)
AC	Excellent, good, or fair estimated viability	F	Failed to find
B	Good estimated viability	F?	Possibly failed to find
B?	Possibly good estimated viability	H	Historical
BC	Good or fair estimated viability	H?	Possibly historical
BD	Good, fair, or poor estimated viability	X	Extirpated
C	Fair estimated viability	X?	Possibly extirpated
C?	Possibly fair estimated viability	U	Unrankable
CD	Fair or poor estimated viability	NR	Not ranked

- **Lat/Long**: Coordinates of the centroid of the Element Occurrence
- **Directions**: Directions to the Element Occurrence
- **Habitat:** Habitat the species is typically associated with

Critical Habitats within x Miles of Project Area

Designated Endangered Species Act critical habitats known to occur within the project area.

Managed Areas within x Miles of Project Area

Areas managed for conservation known to occur within the project area.

Areas of Significant Biodiversity within x Miles of Project Area

Areas occurring within the project area that have identified by biologists and ecologists as being of significant value because of a high level of biodiversity and/or containing significant occurrences of rare plants, animals, or natural communities.

Bat Habitats within x Miles of Project Area

USFWS known Indiana bat and Northern Long-Eared Bat habitats that occur within the project area.

From: Smith, Elizabeth
To: RichardsonSeacat, Harriet
Subject: RE: SR Russellville - RNHD Pull
Date: Wednesday, March 31, 2021 2:08:01 PM
Attachments: image001.png
Russellville.zip
SR Russelville.kmz

See attached.

Due to COVID-19 safety precautions enacted by TVA, I am currently teleworking.

Should you need to speak with me directly, my mobile phone # is listed below.

Elizabeth R. Smith
NEPA Specialist

NEPA Programs
Tennessee Valley Authority
400 W. Summit Hill Drive
Knoxville, TN 37902

865-632-3053 (w)
865-250-9138 (m)
esmith14@tva.gov

From: RichardsonSeacat, Harriet <Harriet.RichardsonSeacat@hdrinc.com>
Sent: Wednesday, March 31, 2021 1:47 PM
To: Smith, Elizabeth <esmith14@tva.gov>
Subject: SR Russellville - RNHD Pull

Hey Elizabeth – I think you mentioned that the RNHD had been pulled for Russellville. Can you please send those results along to me? Given overall timeline, we're going to need to get on the bio survey pretty quickly, too, pending insights from Adam on timing.

Thanks!
Harriet

Harriet L. Richardson Seacat, M.A.

Environmental Project Manager

HDR
440 S. Church Street, Suite 1000
Charlotte, NC 28202-2075
D & M 256.614.9007
harriet.richardsonseacat@hdrinc.com

hdrinc.com/follow-us

C

Appendix C - T & E Plant Habitat Surveys in Forested Areas Reports

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Report on Threatened and Endangered Species Habitat Survey in Forested Areas for Russellville Solar Site, Logan County, Kentucky

June 2021, by Mason Brock

During May 17-18th 2021, surveys were conducted over forested habitat for the presence of federal and state-listed threatened or endangered plant species. As a result of the survey, the presence of **two state-listed plant species** was documented at the Project Site, the details of which are outlined below.

Habitat Overview

I will provide a brief description of the local ecological communities that will provide the background for determining the presence/absence of habitat for listed taxa. The Project Site lies on a gently-rolling karst plain underlain by limestone. Historically, this geologic region south of Russellville (known as the Pennyroyal Plain) was a mosaic of:

1. Open prairie (the historical "Big Barrens")
2. Rich calcareous forest (primarily around streams and steep sinkholes)
3. Sinkhole ponds (both forested swamps and open wet meadows)
4. Dry limestone glades (natural bedrock outcrops)

The species on the targeted threatened and endangered list can all be categorized as being found in one (or more) of these four generalized habitat types.

At the Project Site, remnants of both mature **calcareous forest** (dominated by sugar maple, ash, and hickories), **sinkhole swamp** communities, and a very small strip of **mesic prairie remnant**.

Other forested sections at the Project Site include younger successional woodlands of old fencerows and abandoned agricultural lots. These comprised largely of weedy non-conservative species.

Species Descriptions

Baptisia australis var. *minor*

This is a species of high quality dry prairies and glades. No habitat was found.

Bouteloua curtipendula

This species is found in glades and dry rocky prairies. No habitat was found.

Carex alata

This species is found in open wet prairies and sinkhole swamps. **It has been collected within 250 meters of the Project Site** just outside of the boundaries, although no individuals could be found within the project area. Suitable habitat exists around the sinkhole pond east of Joe Montgomery Road at 36.80010, -86.91936, and along the thin wet woods in the vicinity of 36.79865, -86.91644 on the eastern border of the project boundaries. (See "Maps and Photographs" section for more details.)

Carex decomposita

This species is present in the Project Site. A small population was noted in the high-quality sinkhole swamp community to the east of Joe Montgomery road at 36.80010, -86.91936. Specimens were found primarily growing on the bases of emergent trees, but also as free-standing tussocks in shallow water. This species appears to be absent from the other ponds on site, as they appear to have been historically impacted by agriculture or are man-made. (See "Maps and Photographs" section for more details.)

Dalea purpurea

This is a species of dry prairies and limestone barrens. No available habitat was found.

Fimbristylis puberula

In Kentucky, this species in found strictly in glades and dry rocky prairies. No habitat was found.

Forestiera ligustrina

This is a species of dry rocky woods over limestone, barrens, and glades. No suitable habitat was found.

Glyceria acutiflora

This species is found in open wet sinkholes. **It has been collected within 250 meters of the Project Site** just outside of the boundaries, although no individuals could be found within the project area. Suitable

habitat exists around the sinkhole pond east of Joe Montgomery Road at 36.80010, -86.91936, where it could still occur in the seedbank. (See "Maps and Photographs" section for more details.)

Juncus filipendulus

This species is found in wet limestone glades. No habitat was found.

Leavenworthia torulosa

This is a species of limestone glade outcrops. No habitat exists on the Project Site.

Muhlenbergia glabrifloris

This species is found in mesic to wet prairie remnants. **Suitable habitat was found** in the narrow strip of woodland edge along the east side of Joe Montgomery Road, north-south from 36.80088, -86.92000 to 36.79734, -86.92009. A few prairie remnant associate species were noted here such as *Helianthus mollis*. No individuals of *Muhlenbergia glabrifloris* (a late-summer blooming species) were noted in the project area. (See "Maps and Photographs" section for more details.)

Nemophila aphylla

This species is present in the Project Site. It was not on the initial list of rare species, as it was only first discovered in Logan County in 2020 (by the author). This information has not yet been widely disseminated. *Nemophila aphylla* is a southern species that approaches the edge of its northern range in Kentucky. It is found in high-nutrient forests with a history of disturbance, and is generally a weedy species. Some of the forest blocks that *Nemophila aphylla* is found in at the Project Site appear to be less than 40 years old. It is was noted at nine locations, with some populations forming large colonies. It is of my professional opinion that the merits of state-listing this species is questionable, as it has probably been widely overlooked in the state. (See "Maps and Photographs" section for more details.)

Oenothera triloba

This is a species of limestone glades and dry gravelly outcrops. No suitable habitat was found.

Onosmodium molle ssp. *molle*

This is a species of dry prairies, glades, and limestone bluffs. No suitable habitat was found.

Phemeranthus calcaricus

This is a species of limestone glade outcrops. No habitat was found.

Silphium pinnatifidum

This is typically a species of dry prairies and glades, although it can occasionally be found in high quality mesic prairies. This conspicuous species would have been easily noted if it was present in the Joe Montgomery prairie remnant strip (see: *Muhlenbergia glabrifloris* for details). It is unlikely that any habitat remains for it in the Project Site.

Symphyotrichum pratense

This is a species of dry prairies and glades. No available habitat was found.

Symphyotrichum priceae

This is a species of limestone glade outcrops. No available habitat was found

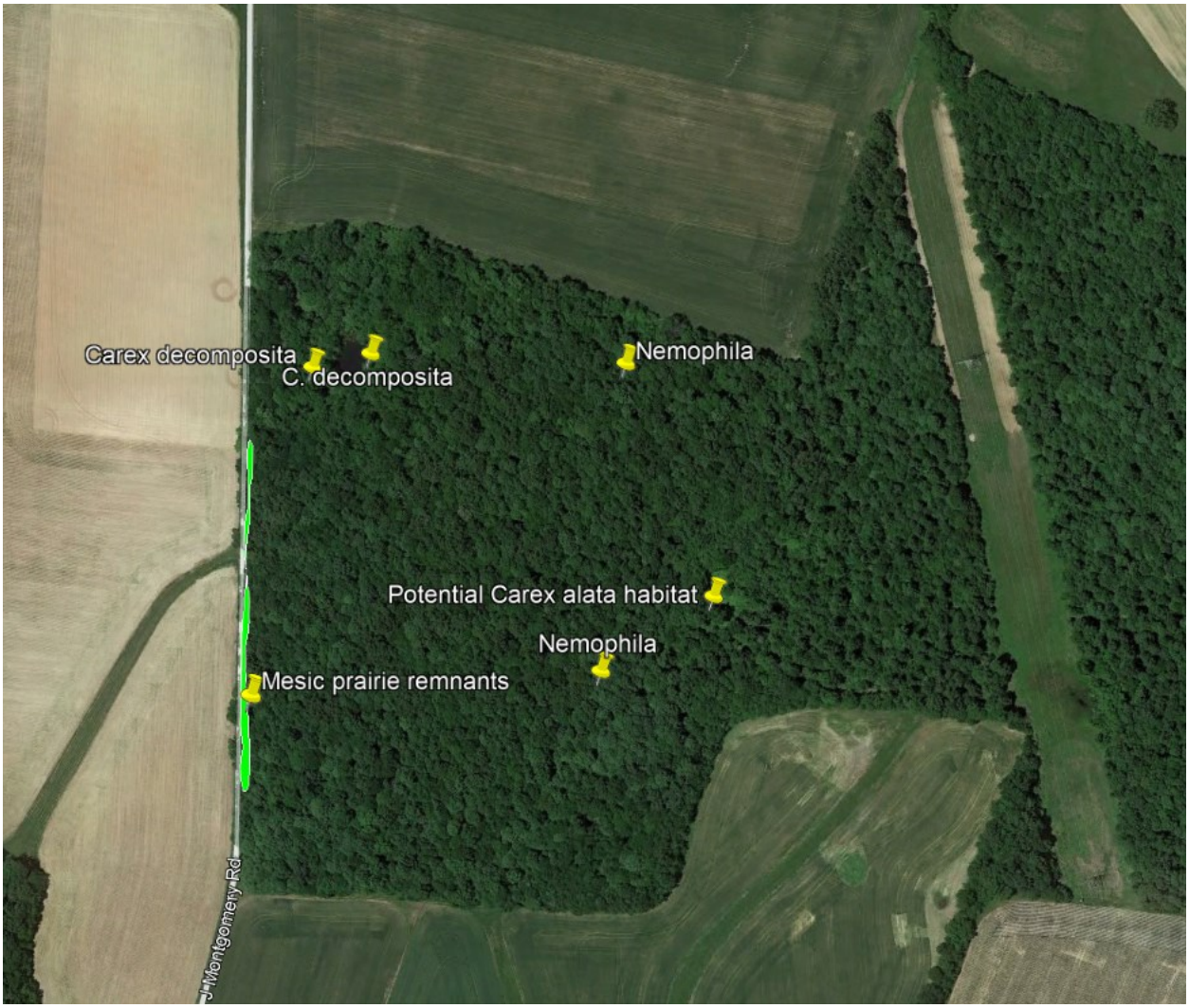
Viola egglestonii

This is a species of limestone glade outcrops. No available habitat was found.

Maps and Photographs

Joe Montgomery Road Swamp

The forest and openings east of Joe Montgomery Road (Map 1) harbor the majority of the rare species and rare species habitat found on the Project Site. The sinkhole ponds in the northwest section of the forest block has extant populations of *Carex decomposita* and is a likely habitat for both *Carex alata* and *Glyceria acutiflora*. The low quality mesic prairie strip along the roadside border, highlighted in green, is a potential habitat for *Muhlenbergia glabrifloris*.. Both *Carex alata* and *Glyceria acutiflora* are found in the broad powerline cut just outside the property to the east, indicating high potential to the present in any woodland openings.



Map 1. East of Joe Montgomery Road in northeast section of Project Site

Carex decomposita growing out of base of willow tree

Carex decomposita as a tussock in shallow sinkhole pond

Nemophila aphylla

This weedy species was found in forest blocks throughout the Project Site, excluding the area at the northwestern-most corner. The nine locations noted are shown in Map 2 as points. The population at 36.795921, -86.926743 is noted as being particularly large.

Map 2. Locations of *Nemophila aphylla* in Project Site

Open *Nemophila aphylla* habitat around base of large *Quercus falcata* at 36.799785, - 86.917465

Older *Acer saccharum* forest with *N. aphylla*, 36.797580, - 86.918075

N. aphylla around base of large *Liriodendron*, 36.799785, - 86.917465

Young successional, high-nutrient woodland with *N. aphylla*, 36.796943, - 86.923942

Large *N. aphlla* patch, in high-nutrient thin woodland. 36.795606 -86.926933

N. aphylla in *Symphoricarpos* thickets, young woodland. 36.789744, -86.930244

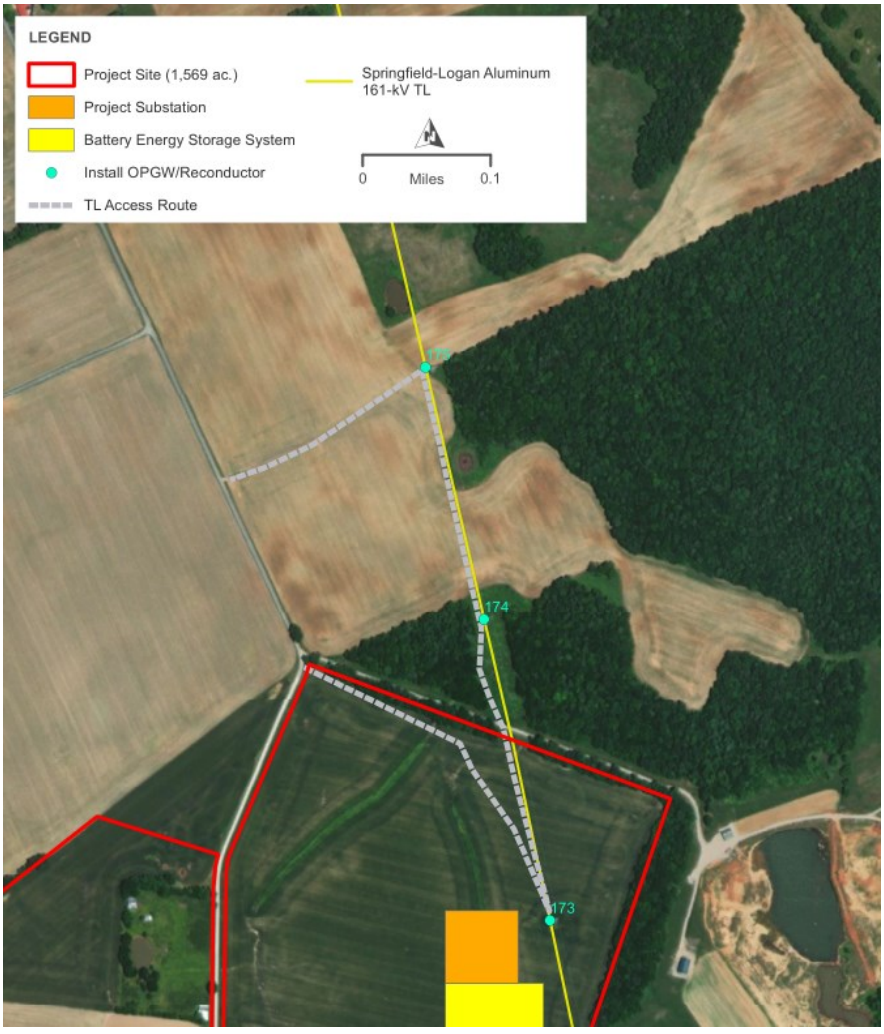
N. aphylla in weedy *Symphoricarpos* thickets with *Carya ovata*, *Asimina triloba*. 36.798620, -86.938929

Report on Threatened and Endangered Species Habitat Survey for Russellville Solar Site, Logan County, Kentucky

October 2021, by Mason Brock

During October 17th 2021, surveys were conducted over a small area of proposed transmission line for the presence of federal and state-listed threatened or endangered plant species. **No state-listed plant species** were located in this portion of the Project Site.

Site Overview



Map of survey area

The portion surveyed was from marker 175 south to the project boundary line (the gravel road between markers 173 and 174). Although largely agricultural, this area was chosen to be surveyed due to the line traversing two sinkhole depressions. Sinkhole depressions are a geologic feature known to harbor rare plant

species in the Pennyroyal Plain region.

This survey has determined that both sinkholes are in a highly ecologically degraded state. No rare plant species were observed in the vicinity of these sinkholes, and it is highly unlikely that surveys at an earlier point in the growing season would reveal any. The assemblage of plant species seen was indicative of near-complete diversity loss (likely either in the form of row-crops or broad-spectrum herbicide) in the recent past.

Image 1. Pokeweed (*Phytolacca americana*), indicative of high levels of disturbance

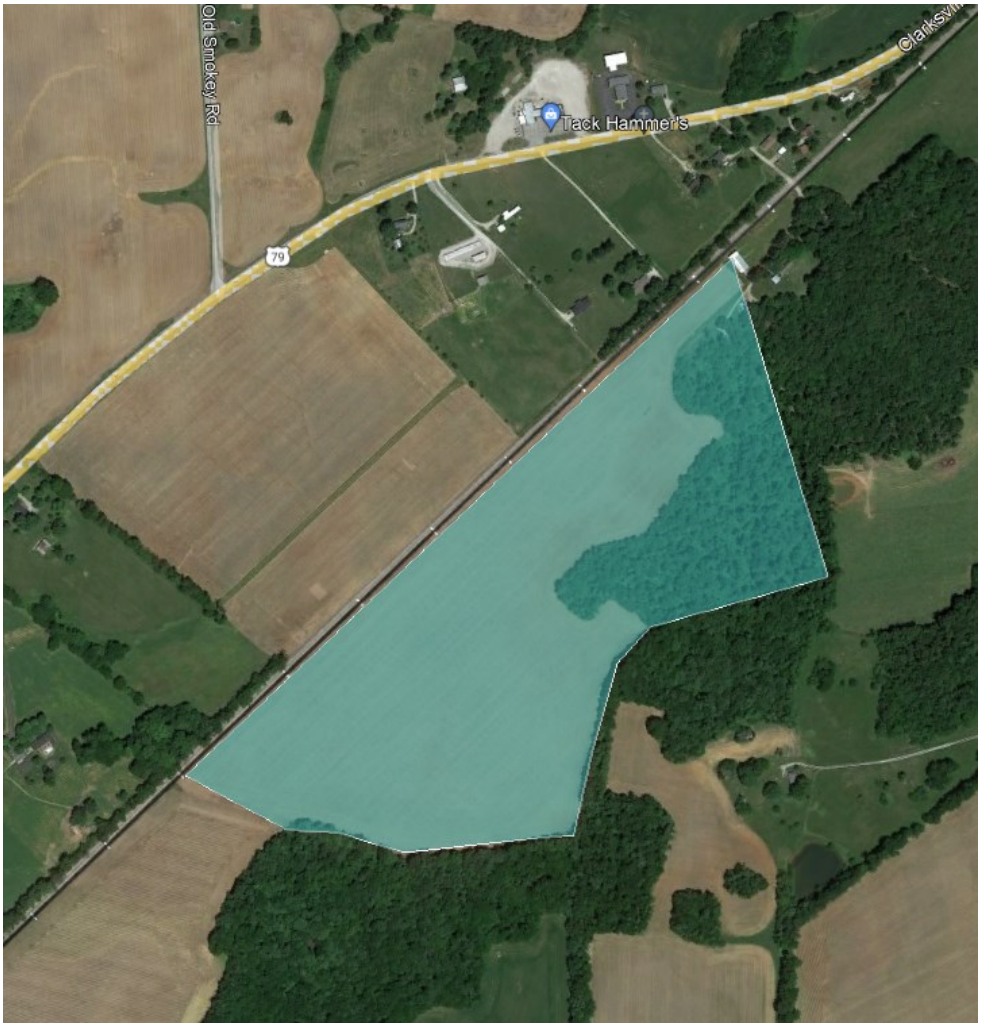
Report on Threatened and Endangered Species Habitat Survey for Russellville Solar Site, Logan County, Kentucky

November 2021, by Mason Brock

During November 17th 2021, surveys were conducted over an area at the Russellville Solar Site for the presence of federal and state-listed threatened or endangered plant species. **No state-listed plant species** were located in this portion of the Project Site.

In addition, notes were taken of physical features of the forest community.

Site Overview



Map of survey area

The portion surveyed is located at the northern boundary of the project site, southeast of the Hwy 79 and

Old Smokey Road intersection. It is largely agricultural except for a forested area in the eastern boundary.

Forest composition

The forest in this parcel is notably young compared to the surrounding forest immediately adjacent to the parcel boundaries. It appears to be recovering from a clear-cut, and consists largely of successional thickets and 10-20 year old stands. Although the vast majority of the forest is young saplings and brush, two small areas have a more intact community: **1.** A very small area of older mature forest on the southern boundary of the forested block, perhaps inadvertently spared from logging due to very close proximity to the property boundary. **2.** A small area of stunted woodland over thin rocky soil (likely a former glade-barren) directly north of a broad karst outcrop area.

Image 1. Young successional forest, consisting of American elm and black locust at western "arm" of forest block 36.810436, -86.935494

Image 2. Older forest of moderate-age black walnut and sugar maple at southern boundary. The trees behind the black walnut in this photo (center) are outside the parcel boundary
36.810191, -86.934648

Image 3. Low quality successional thickets comprise the vast majority of the forested block. The larger trees are fast-growing weedy black cherries, perhaps less than 20 years old. 36.81057 -86.93321

Image 4. A small area near the northern end of the forest block is clear of brush and saplings with stunted pole-size trees, appearing as a rocky oak woodland. It is likely a former glade-barren area. This area has had less disturbance than the surrounding successional forest 36.811642, -86.933494

Geologic features

A moderately large broad and shallow sinkhole is present on the northwestern corner of the forest block. It is dry with a soil floor, with conspicuous limestone outcrops and fissures around its edges. No obvious subterranean openings were detected. The largest recesses of the sinkhole are roughly 4 feet deep.

Image 5. Sinkhole outcrop fissures 36.811364 -86.934028

No streams or pools were seen in the parcel area. A small dry gully is adjacent to the parcel on the southern border, but it is almost entirely outside the property boundary.