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Natural Resource Stewardship and Science

Landbird Community Monitoring at Ocmulgee National Monument

2011 Data Summary

Natural Resource Data Series NPS/SECN/NRDS—2016/1020



ON THE COVER
Common yellowthroat (*Geothlypis trichas)*
Photo courtesy of Rachel Holzman

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May 2016

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

Data in this report were collected and analyzed using methods based on established peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Please cite this publication as:

Kurimo-Beechuk, E. A., and M. W. Byrne. 2016. Landbird community monitoring at Ocmulgee National Monument: 2011 data summary. Natural Resource Data Series NPS/SECN/NRDS—2016/1020. National Park Service, Fort Collins, Colorado.

NPS 363/132794, May 2016

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Executive Summary

Birds are an important component of park ecosystems. Due to their high body temperature, rapid metabolism, and high ecological position in most food webs, birds are also good indicators of the effects of local and regional ecosystem changes. Patterns in the community composition, distribution, and occurrence of breeding birds provide a metric for assessing ecological integrity and sustainability in southeastern U.S. ecosystems. Further, trends in these attributes in relation to activities occurring at Ocmulgee National Monument (e.g., management actions, natural disturbance, invasive-species treatment) will improve our understanding of the effects of various management actions and other stressors on the condition of park resources.

This report summarizes data collected during implementation of the SECN landbird community monitoring protocol (Byrne et al. 2014) at Ocmulgee National Monument in 2011.

1. Automated recording devices collected bird detection/non-detection data from 21 spatially balanced random locations within the monument.
2. Approximately 930 minutes of recordings were collected March–May and were evaluated to detect the presence of vocalizing birds.
3. Fifty-nine species of birds were detected during the sampling effort.
4. Carolina wren, northern cardinal, and tufted titmouse were the most frequently occurring and widely distributed species (i.e., occurring at all sampling locations). American crow, American goldfinch, Carolina chickadee, great crested flycatcher, and red-bellied woodpecker were also widely distributed across the monument, occurring at over 80% of the sampling locations.
5. Two non-native species, house finch and house sparrow, were detected during the sampling effort.
6. The full dataset and associated metadata can be acquired from the NPS data store at the Integrated Resource Management Applications portal (https://irma.nps.gov/App/Portal/Home).

Introduction

Overview

Birds play several critical roles in park ecosystems. They occupy and interact with several trophic levels of the food web, including their role as both predator and prey. Among their many functions, birds regulate rodent populations (Ims and Andreassen 2000) and insect populations (Mols and Visser 2002) and scavenge dead animals (Pain et al. 2003). Some avian species aid in pollination of wild and cultivated crop plants (Stiles 1978) and provide mechanisms for seed dispersal (Howe and Smallwood 1982). Bird guano contains nutrients necessary for many vegetation communities (Wootton 1991). Management activities aimed at preserving habitat for bird populations (e.g., neotropical migrants) frequently have the added benefit of preserving entire ecosystems and their attendant ecosystem services (Karr 1991, Maurer and Heywood 1993).

A wide range of stressors affect bird communities, and birds often respond quickly to environmental stressors, perturbations, or changes. Therefore, characteristics of the bird community at a park are good indicators of the extent of the impact of those stressors on park lands. Many bird species have been extensively studied; their biology and life histories are well defined and their habitat-use patterns have been identified. Consequently, the composition, richness and diversity, and distribution of bird communities provide substantial insight into the ecological condition of park resources. Information about the landbird community also provides derivative information about other characteristics of the park and surrounding area (e.g., vegetation community types, extent of fragmentation).

Because many birds are primarily diurnal, visible and vocal, and attractive, they are a major point of interest for many park visitors and for the general public. Birds have a strong public appeal and are the recreational focus for many park visitors. Birdwatching has a substantial and positive impact on the U.S. economy, contributing well over $100 billion annually (Carver 2013), and it is one of the most popular recreational activities pursued by Americans (Cordell et al. 2007).

Over 400 species of birds, representing 61 families, use Southeast Coast Network (SECN) parks annually for breeding, wintering, or as a migratory stopover area. The high bird diversity in the Southeast Coast Network exists because of the juxtaposition of SECN parks within the Atlantic Flyway. Many SECN parks occur in a highly fragmented landscape, and because the SECN encompasses inland and coastal areas, it provides a wide range of bird habitat types.

This report summarizes data collected with the SECN landbird community monitoring protocol (Byrne et al. 2014). Protocol objectives that are addressed in this report include:

a) Determine the species richness and diversity of the landbird community at each park,

b) Determine the frequency of detection of selected landbirds, and

c) Determine the distribution of landbirds within park lands.

Study Area

Ocmulgee National Monument (OCMU) is located on the "Fall Line," the transition between the rolling Piedmont and the flat Atlantic Coastal Plain. A portion of the monument is within the city limits of Macon, Georgia, and the Ocmulgee River borders the southwestern side of the monument (Figure 1). The natural resources of the monument have been heavily impacted by human activities, including Highway 16 and its associated berm, which has essentially cut off the river from its floodplain and altered the natural hydrologic pattern of the area. Despite the anthropogenic influences, Ocmulgee has high biodiversity. This is likely due to a corridor, known locally as the "Greenway," connecting the monument to other natural areas further south.
The monument primarily consists of a large floodplain, herbaceous wetlands, and adjacent uplands. The floodplain vegetation community is composed of several canopy species, including green ash (*Fraxinus pennsylvanica*), American elm, hackberry (*Celtis* spp.) and red maple, while the uplands are characterized by canopy species such as loblolly pine, sweetgum, and oaks. Smartweed (*Polygonum* spp.) and maidencane (*Panicum hemitomon*) often occur in the herbaceous wetlands.

Numerous bird species occur in the monument throughout the year, and many migratory birds use the area as a stopover location during spring and fall migrations. The endangered wood stork (*Mycteria americana*) feeds here during summer months. Numerous other wildlife species occur at Ocmulgee, including white-tailed deer (*Odocoileus virginianus*), American beaver (*Castor canadensis*), bobcat (*Lynx rufus*), and several reptiles and amphibians. Recreational fishing is allowed, and largemouth bass (*Micropterus salmoides*) is a common catch. Within the last eight years, coyotes (*Canis latrans*) have entered the monument.

Threats affecting the native plants and animals in the monument result mainly from human activities and include non-native species invasion, reduced water quality and air quality, development, and general proximity to the city of Macon. Non-native species are a disruptive influence in the monument. Non-native invasive plants at Ocmulgee include Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), and kudzu (*Pueraria montana*). Non-native animal species include nutria, fire ants (*Solenopsis invicta*), feral hogs, and domestic/feral dogs and cats. Feral pigs are responsible for a tremendous amount of resource damage in both the main unit and the detached Lamar unit.

Ocmulgee National Monument has 168 known bird species (Appendix A-1; NPSpecies 2015).

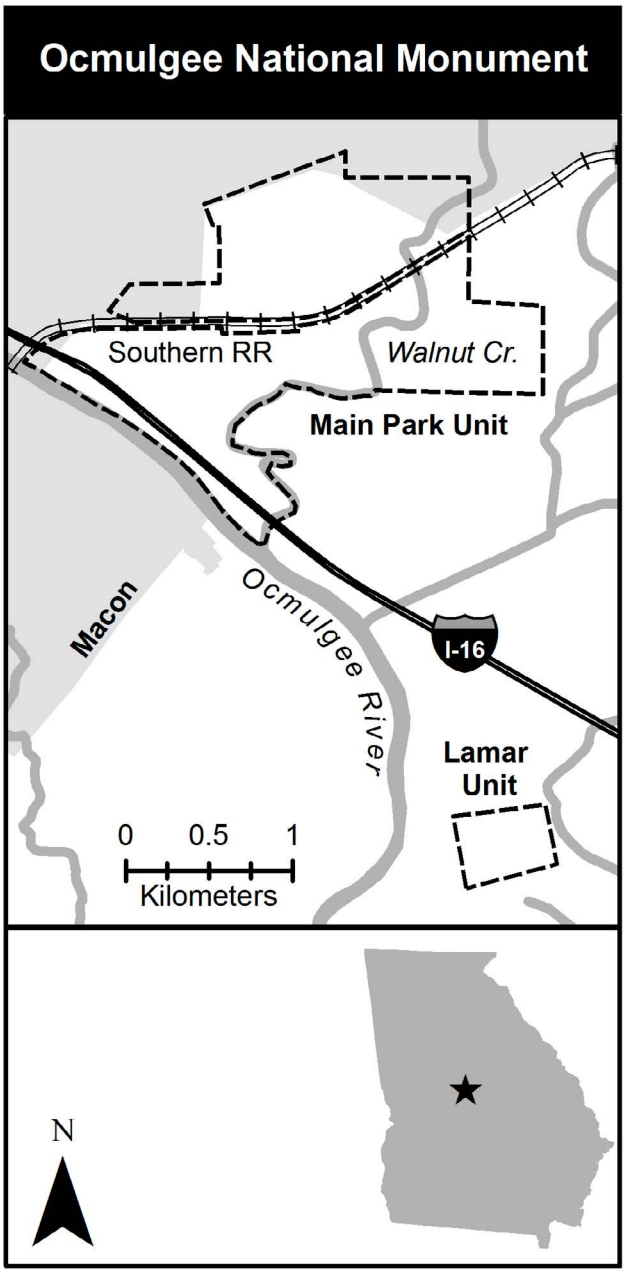


Figure 1. Location of Ocmulgee National Monument.

Methods

Sampling Design

The sampling design and sampling-location selection is detailed in Appendix B of the SECN landbird community monitoring protocol (Byrne et al. 2014) and in the sampling-location selection standard operating procedure #1.1.01 (Byrne 2012). In summary, the administrative boundary was used as the sampling frame to allow for monument-wide inference. The sampling frame was divided into a systematic 0.5-hectare grid superimposed over the entire sampling frame (i.e., monument boundary); the center point of each grid cell served as the potential sampling location. A spatially balanced sample was drawn from this grid using the Reversed Randomized Quadrant-Recursive Raster (RRQRR) algorithm (Theobald et al. 2007). Alternate points were used when specified selection criteria (e.g., safety issues, accessibility) were not met. A sample size of 21 was chosen based on consideration of the monument size, hypothesized variability, and logistical issues.

Taxonomic Standards

Taxonomy and nomenclature follow that set forth in the Integrated Taxonomic Information System (ITIS; http://www.itis.gov/). The National Park Service uses the online application NPSpecies (https://irma.nps.gov/npspecies) to document "our knowledge about the occurrence and status of species on National Park Service lands," including maintenance of species lists for NPS properties. The taxonomy and nomenclature in NPSpecies is periodically updated with the most current ITIS catalog. As noted on the ITIS webpage, the system intends not to "serve as a forum for cutting-edge taxonomic classifications," but rather to use "classifications that have gained broad acceptance in the taxonomic literature and by professionals who work with the taxa." All vocalizations are identified to the finest resolution possible in the taxonomic hierarchy. Only vocalizations identified to species level are used in the analyses presented herein.

Data Collection Techniques

Automatic recording devices (ARDs) were deployed at 21 sampling locations March–May, 2011. ARDs are deployed at the center point of each 0.5-hectare grid cell (i.e., the sampling location) and are programmed to record from 07:30 – 07:42 and 08:00 – 08:12 (i.e., 12 minutes) every five days for a period of 77 days (Byrne et al. 2014). This schedule results in 20 discrete sampling events for each sampling location. Species occurrences were derived by evaluating five recordings from each sampling location.

Manual Evaluation of Recordings

Ambient and background noise can influence detectability in auditory avian surveys (Alldredge et al. 2007, Simons et al. 2008, Pacifici et al. 2008, Simons et al. 2009). To minimize the impact of variability from background noise on detectability, three strategies are applied to all recordings: (1) omit recordings with a background noise level above approximately 45dB, if possible, (2) quantify background noise categorically, and (3) if all available recordings have moderate to high levels of background noise, use existing software tools to remove or minimize the influence of frequency ranges that are exclusive to the background noise and outside the frequency range of target vocalizations (Byrne et al. 2014). In general, sounds with a sound pressure level greater than 45 dB preclude hearing birds located over 100 meters (328 feet [ft]) from the observer. To provide a frame of reference, the approximate loudness of a watch or clock ticking is 20 dB, a quiet whisper is 30 dB, a steady and heavy rain is 50 dB, and normal conversation is 60 dB.

High levels of background noise can make it difficult to discern vocalizations, and this limits the researcher's ability to adequately detect and classify bird vocalizations. Therefore, the background noise level for each recording was classified a priori, and an index score ranging from one (low) to three (high) was assigned. Each three-minute segment (i.e., 0–3, 3–6, 6–9, and 9–12) of the recordings was a priori categorized according to background noise level (i.e., 1=low, 2=moderate, and 3=high), and an average noise score was calculated for the entire 12-minute recording. In general, the background noise level of the recording was defined as follows: (a) "low" characterizes a recording in which the vocalizations are clear and distinct, the vocalizations are the primary source of sound, and background noise is a low-volume muffle; (b) "moderate" characterizes a recording with uniform loudness of less than 45dB, in which vocalizations are identifiable and some are clear and distinct while others blend into the background noise, which may contain a

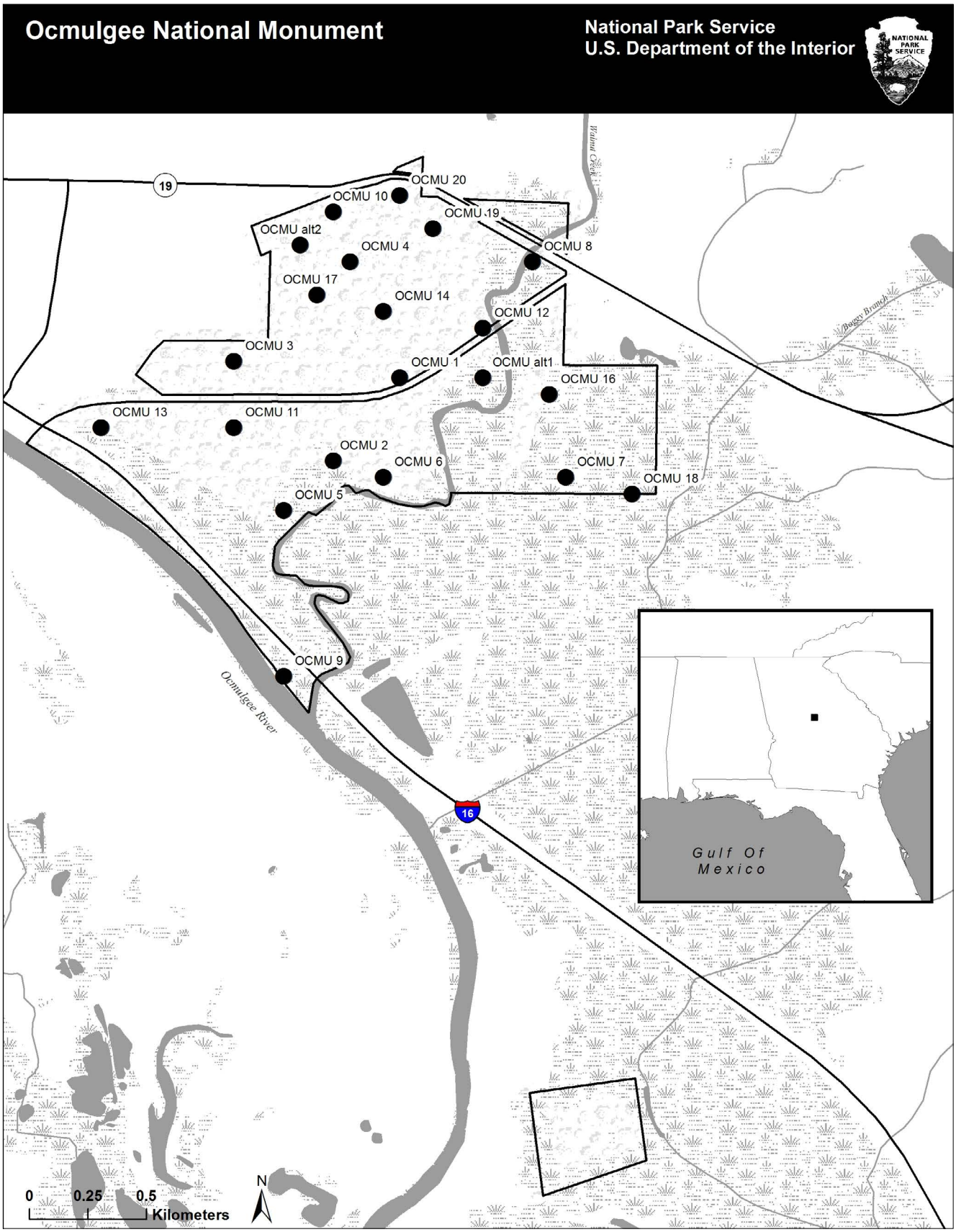


Figure 2. Landbird-community monitoring sampling locations at Ocmulgee National Monument in 2011.

low- to medium-speed wind or light rain, distant traffic, or rustling vegetation; or (c) "high" characterizes a recording in which background noise is the dominant sound, above 45dB, and some vocalizations are difficult to separate from the background noise.

Examples of background noise in recordings in the "high" category include proximate automobile traffic, high winds in vegetation, insects (e.g., cicadas), frog choruses, trains, heavy rain, or thunderstorms. If both the alternate and primary recordings have similar background noise issues, then the next consecutive sampling event (i.e., next day) is reviewed. This process continues until five monitoring events evenly spread across the March to May window with the lowest noise levels are selected for evaluation for each sampling location. If all recordings from a sampling location have a substantial amount of background noise, the required number of recordings to meet our analysis objectives will continue to be analyzed such that sample size and replicates are not lost, and background noise is categorized as previously mentioned to be later used as an explanatory variable when modeling detectability. The methodology, implemented as part of Byrne et al. (2014), was designed specifically to create an alternate recording for each day of monitoring. This facilitates the screening process and minimizes the influence of anomalous sound events that could impede or preclude species detection.

All recordings were evaluated by one trained observer, with several years of birding experience, astute at vocalization identification, whose skills were reviewed and tested. The observer performed the evaluation by listening to the recordings while simultaneously examining spectrograms in Song Scope software (Wildlife Acoustics, Inc.). The observer spent approximately one hour analyzing each 12-minute recording, including the time spent clarifying uncertain identifications with a digital library of vocalizations, online resources, or confirmation with other expert birders. All identifiable birds in each recording were documented. Some vocalizations were unidentifiable due to background noise or distance from the sampling location.

A total of 103 recordings from 21 sampling locations were evaluated (927 minutes total).

Data Analysis

Data in this report represent one year and are summarized in three general but closely linked categories: composition, richness, and distribution. Appendix B depicts all species detected by sampling location, and Appendix C depicts individual-species distribution maps.

Composition

Measures of community composition are often good indicators of abiotic variability, disturbance, or other stressors. Summaries related to composition include the total number of species detected (i.e., species richness) and naïve occupancy. Species richness is simply the number of native species detected, and is presented for the ARD method. Naïve occupancy is the percentage of the sampling locations where a species was detected at least once, without adjusting for probability of detection (i.e., detectability). Naïve occupancy is also referred to as frequency of occurrence. Naïve occupancy provides insight into the distribution of a species across the park and whether the species can be considered common or uncommon. Species with high values occur at more locations than those with low values.

Richness

Species richness is a major component of species diversity. Magurran (2004) defines diversity as "the variety and abundance of species in a defined unit of study." Diversity is a community property that is related to trophic structure, productivity, stability, (McIntosh 1967, McNaughton 1977), immigration/emigration (Colwell and Lees 2000), and ecological condition (ecological integrity, as defined by Karr and Chu 1995). Species diversity consists of two components: the number of species (species richness) and the relative abundance of those species (species evenness/dominance) within a defined community (Margalef 1958, Lloyd and Ghelardi 1964, Pielou 1966). The methodology implemented by the Southeast Coast Network does not collect abundance data; therefore, the analysis focuses on species richness estimation of the landbird community. Further, the term community refers to the assemblage of species populations that occur together in space and time (Begon et al. 1986), and we consider the all taxa-species populations that occur at a park as the community, as per the conceptual ecological models presented in our monitoring plan (see Chapter 2 in DeVivo et al. 2008).

Species richness and diversity is presented in the form of indices. Because richness and diversity indices respond differently to various mechanisms that influence community change, several indices must be used to adequately characterize richness and diversity in SECN parks (Haedrick 1975, Boyle et al. 1984). Based on characteristics of the SECN dataset and careful appraisal of the advantages and disadvantages of several richness indices, the selected richness indices are presented in Table 1, including notes on value interpretation. Because observed species richness (i.e., S_{obs}) is an underestimate (i.e., influenced by detectability,

observer error) of true species richness, richness indices more closely approximate true species richness for a defined area. In this analysis, richness estimates are based only on animal observations identified to the species level, and detections/occurrences of non-native species were not included in the calculations.

Distribution

Understanding changes in the distribution of landbirds is integral to informed management of species and their requisite habitats. Changes in species distributions over time provide useful information at both the local and landscape scale regarding how species respond to large-scale influences such as changing land use, climate, hydrology, or habitat availability and condition. Shifting species distributions alter species interactions and the food-web structure, thereby producing cascading effects on ecosystem processes (Montoya and Raffaelli 2010). Distribution maps for all bird species detected are presented in Appendix C.

Table 1. Incidence-based species richness indices used in this analysis, corresponding symbol, community attribute that the index reflects, range of index values, and notes on each index.

Index	Symbol	Community Attribute	Index Citation	Notes
Native Species Richness	$\mathbf{S_{obs}}$	Richness	n/a	Value is a positive integer that indicates the number of native species in the sample. Intuitive. Good discriminant ability if sampling effort is comparable; sensitive to sample size, the occurrence of rare species, or those with low detectability; does not account for relative abundances.
Chao 2	**Chao2**	Richness	Chao (1984) Chao (1987)	Values indicate an estimate of total species richness (including species not present in the sample); incidence-based estimate; works well with dataset containing several infrequent observations.
Incidence-based Coverage	**ICE**	Richness	Lee and Chao (1994) Chazdon et al. (1998)	Values indicate an estimate of total species richness (including species not present in the sample); incidence-based estimate.
Jackknife 1	**Jack1**	Richness	Burnham and Overton (1978) Burnham and Overton (1979) Heltshe and Forrester (1983)	Values indicate an estimate of total species richness (including species not present in the sample); incidence-based estimate; the higher the value the higher the species richness. This procedure requires no assumptions regarding the data distribution.
Jackknife 2	**Jack2**	Richness	Smith and van Bell (1984)	Values indicate an estimate of species richness; incidence-based estimate.
Bootstrap	**Boot**	Richness	Smith and van Bell (1984)	Values indicate an estimate of species richness; incidence-based estimate.

Results

Composition

Carolina wren, northern cardinal, and tufted titmouse were the most frequently occurring and widely distributed species, and were detected at all sampling locations. American crow, American goldfinch, Carolina chickadee, great crested flycatcher, and red-bellied woodpecker were also widely distributed across the monument, occurring at over 80% of the sampling locations. Several species were detected at only one sampling location (i.e., uncommon) and include: Acadian flycatcher, American coot, cerulean warbler, field sparrow, fish crow, house sparrow, Kentucky warbler, magnolia warbler, mourning dove, northern parula, ovenbird, pine warbler, song sparrow, yellow warbler, and yellow-rumped warbler. Two non-native species, house finch and house sparrow, were detected during the sampling effort (Table 2).

Table 2. Naïve occupancy estimates (i.e., proportion of sampling locations in which a species was detected) for birds at Ocmulgee National Monument in 2011.

Common Name	Scientific Name	Naïve Occupancy
Carolina Wren	*Thryothorus ludovicianus*	1.00
Northern Cardinal	*Cardinalis cardinalis*	1.00
Tufted Titmouse	*Baeolophus bicolor*	1.00
American Crow	*Corvus brachyrhynchos*	0.95
American Goldfinch	*Carduelis tristis*	0.86
Carolina Chickadee	*Poecile carolinensis*	0.86
Great Crested Flycatcher	*Myiarchus crinitus*	0.81
Red-bellied Woodpecker	*Melanerpes carolinus*	0.81
Blue Jay	*Cyanocitta cristata*	0.76
Blue-gray Gnatcatcher	*Polioptila caerulea*	0.71
Downy Woodpecker	*Picoides pubescens*	0.71
Eastern Towhee	*Pipilo erythrophthalmus*	0.67
Common Grackle	*Quiscalus quiscula*	0.57
American Robin	*Turdus migratorius*	0.52
Northern Flicker	*Colaptes auratus*	0.52
Red-eyed Vireo	*Vireo olivaceus*	0.48
White-eyed Vireo	*Vireo griseus*	0.48
Eastern Phoebe	*Sayornis phoebe*	0.43
White-throated Sparrow	*Zonotrichia albicollis*	0.38
Brown-headed Cowbird	*Molothrus ater*	0.33
Common Yellowthroat	*Geothlypis trichas*	0.33
Red-shouldered Hawk	*Buteo lineatus*	0.33
Summer Tanager	*Piranga rubra*	0.33
Eastern Wood-Pewee	*Contopus virens*	0.29
Brown-headed Nuthatch	*Sitta pusilla*	0.24
Dark-eyed Junco	*Junco hyemalis*	0.24
Indigo Bunting	*Passerina cyanea*	0.24
White-breasted Nuthatch	*Sitta carolinensis*	0.24
Brown Thrasher	*Toxostoma rufum*	0.19
Chipping Sparrow	*Spizella passerina*	0.19
Red-headed Woodpecker	*Melanerpes erythrocephalus*	0.19
Red-winged Blackbird	*Agelaius phoeniceus*	0.19
Scarlet Tanager	*Piranga olivacea*	0.19

Table 2 (continued). Naïve occupancy estimates (i.e., proportion of sampling locations in which a species was detected) for birds at Ocmulgee National Monument in 2011.

Common Name	Scientific Name	Naïve Occupancy
Belted Kingfisher	*Ceryle alcyon*	0.14
Chimney Swift	*Chaetura pelagica*	0.14
House Finch	*Carpodacus mexicanus*	0.14
Northern Mockingbird	*Mimus polyglottos*	0.14
Black-throated Blue Warbler	*Dendroica caerulescens*	0.10
Canada Goose	*Branta canadensis*	0.10
Eastern Bluebird	*Sialia sialis*	0.10
Great Blue Heron	*Ardea herodias*	0.10
Prothonotary Warbler	*Protonotaria citrea*	0.10
Veery	*Catharus fuscescens*	0.10
Yellow-throated Warbler	*Dendroica dominica*	0.10
Acadian Flycatcher	*Empidonax virescens*	0.05
American Coot	*Fulica americana*	0.05
Cerulean Warbler	*Dendroica cerulea*	0.05
Field Sparrow	*Spizella pusilla*	0.05
Fish Crow	*Corvus ossifragus*	0.05
House Sparrow	*Passer domesticus*	0.05
Kentucky Warbler	*Oporornis formosus*	0.05
Magnolia Warbler	*Dendroica magnolia*	0.05
Mourning Dove	*Zenaida macroura*	0.05
Northern Parula	*Parula americana*	0.05
Ovenbird	*Seiurus aurocapillus*	0.05
Pine Warbler	*Dendroica pinus*	0.05
Song Sparrow	*Melospiza melodia*	0.05
Yellow Warbler	*Dendroica petechia*	0.05
Yellow-rumped Warbler	*Dendroica coronata*	0.05

Richness

The native species richness for landbirds at Ocmulgee National Monument in 2011 was 57. Species richness indices were based only on native species and confidence intervals for each index were estimated with a bootstrap procedure. Richness indices varied, ranging from 63.07 to 76.98 (Table 3). The variability among indices indicates that characteristics in the dataset affected the estimates differently. Observed species richness differs from the estimated true species richness (i.e., all of the richness indices combined) by approximately 8%, suggesting the results of the current monitoring effort closely approximate true species richness.

Distribution

Distribution maps for all species detected are presented in Appendix C (Figures C-1 – C-59), and indicate the sampling location(s) in which each species occurred. Carolina wren, northern cardinal, and tufted titmouse were the most frequently occurring and widely distributed species (i.e., occurring at all sampling locations). American crow, American goldfinch, Carolina chickadee, great crested flycatcher, and red-bellied woodpecker were also widely distributed across the monument, occurring at over 80% of the sampling locations. Acadian flycatcher, American coot, cerulean warbler, field sparrow, fish crow, house sparrow, Kentucky warbler, magnolia warbler, mourning dove, northern parula, ovenbird, pine warbler, song sparrow, yellow warbler, and yellow-rumped warbler were rarely detected (i.e. occurring at only one sample location).

Table 3. Species richness indices for birds at Ocmulgee National Monument in 2011.

Index	Symbol	Value	Lower 95% CI	Upper 95% CI	Value Interpretation
Native Spp. Richness	**S_{obs}**	57.00	50.56	63.44	Number of native species detected; Species richness at the monument is considered to be high
Chao 2	**Chao2**	70.33	60.81	103.62	Estimated true species richness; Considered to be high. Large confidence interval (variability)
Incidence-based Coverage	**ICE**	69.24	65.32	73.16	Estimated true species richness; Considered to be high
Jackknife 1	**Jack1**	70.33	63.00	77.66	Estimated true species richness; Considered to be high
Jackknife 2	**Jack2**	76.98	71.67	82.29	Estimated true species richness; Considered to be high
Bootstrap	**Boot**	63.07	60.95	65.19	Estimated true species richness; Considered to be high

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Appendix A—Species List

Table A-1. Birds known to occur at Ocmulgee National Monument based upon records in NPSpecies (2015) and those detected during the sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2011
Accipitriformes	Accipitridae	*Accipiter cooperii*	Cooper's Hawk	X	
Accipitriformes	Accipitridae	*Accipiter striatus*	Sharp-shinned Hawk	X	
Accipitriformes	Accipitridae	*Buteo jamaicensis*	Red-tailed Hawk	X	
Accipitriformes	Accipitridae	*Buteo lineatus*	Red-shouldered Hawk	X	X
Accipitriformes	Accipitridae	*Buteo platypterus*	Broad-winged Hawk	X	
Accipitriformes	Accipitridae	*Circus cyaneus*	Northern Harrier	X	
Accipitriformes	Accipitridae	*Ictinia mississippiensis*	Mississippi Kite	X	
Accipitriformes	Cathartidae	*Cathartes aura*	Turkey Vulture	X	
Accipitriformes	Cathartidae	*Coragyps atratus*	Black Vulture	X	
Accipitriformes	Pandionidae	*Pandion haliaetus*	Osprey	X	
Anseriformes	Anatidae	*Aix sponsa*	Wood Duck	X	
Anseriformes	Anatidae	*Anas americana*	American Wigeon	X	
Anseriformes	Anatidae	*Anas clypeata*	Northern Shoveler	X	
Anseriformes	Anatidae	*Anas crecca*	Green-winged Teal	X	
Anseriformes	Anatidae	*Anas discors*	Blue-winged Teal	X	
Anseriformes	Anatidae	*Anas platyrhynchos*	Mallard	X	
Anseriformes	Anatidae	*Anas strepera*	Gadwall	X	
Anseriformes	Anatidae	*Aythya collaris*	Ring-necked Duck	X	
Anseriformes	Anatidae	*Branta canadensis*	Canada Goose	X	X
Apodiformes	Apodidae	*Chaetura pelagica*	Chimney Swift	X	X
Apodiformes	Trochilidae	*Archilochus colubris*	Ruby-throated Hummingbird	X	
Caprimulgiformes	Caprimulgidae	*Caprimulgus carolinensis*	Chuck-will's-widow	X	
Caprimulgiformes	Caprimulgidae	*Chordeiles minor*	Common Nighthawk	X	
Charadriiformes	Charadriidae	*Charadrius vociferus*	Killdeer	X	
Charadriiformes	Charadriidae	*Charadrius wilsonia*	Wilson's Plover	X	
Charadriiformes	Laridae	*Larus delawarensis*	Ring-billed Gull	X	
Charadriiformes	Scolopacidae	*Actitis macularia*	Spotted Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris minutilla*	Least Sandpiper	X	
Charadriiformes	Scolopacidae	*Calidris pusilla*	Semipalmated Sandpiper	X	
Charadriiformes	Scolopacidae	*Gallinago gallinago*	Common Snipe	X	
Charadriiformes	Scolopacidae	*Tringa flavipes*	Lesser Yellowlegs	X	
Charadriiformes	Scolopacidae	*Tringa melanoleuca*	Greater Yellowlegs	X	
Charadriiformes	Scolopacidae	*Tringa solitaria*	Solitary Sandpiper	X	
Ciconiiformes	Ciconiidae	*Mycteria americana*	Wood Stork	X	
Columbiformes	Columbidae	*Columbina passerina*	Common Ground-Dove	X	
Columbiformes	Columbidae	*Zenaida macroura*	Mourning Dove	X	X
Coraciiformes	Alcedinidae	*Megaceryle alcyon*	Belted Kingfisher	X	X
Cuculiformes	Cuculidae	*Coccyzus americanus*	Yellow-billed Cuckoo	X	
Falconiformes	Falconidae	*Falco columbarius*	Merlin	X	
Falconiformes	Falconidae	*Falco sparverius*	American Kestrel	X	
Galliformes	Odontophoridae	*Colinus virginianus*	Northern Bobwhite	X	
Galliformes	Phasianidae	*Meleagris gallopavo*	Wild Turkey	X	
Gruiformes	Gruidae	*Grus canadensis*	Sandhill Crane	X	
Gruiformes	Rallidae	*Fulica americana*	American Coot	X	X

Table A-1 (continued). Birds known to occur at Ocmulgee National Monument in 2011 based upon records in NPSpecies (2015) and those detected during the sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2011
Passeriformes	Bombycillidae	*Bombycilla cedrorum*	Cedar Waxwing	X	
Passeriformes	Cardinalidae	*Cardinalis cardinalis*	Northern Cardinal	X	X
Passeriformes	Cardinalidae	*Guiraca caerulea*	Blue Grosbeak	X	
Passeriformes	Cardinalidae	*Passerina caerulea*	Blue Grosbeak	X	
Passeriformes	Cardinalidae	*Passerina cyanea*	Indigo Bunting	X	X
Passeriformes	Cardinalidae	*Pheucticus ludovicianus*	Rose-breasted Grosbeak	X	
Passeriformes	Certhiidae	*Certhia americana*	Brown Creeper	X	
Passeriformes	Corvidae	*Corvus brachyrhynchos*	American Crow	X	X
Passeriformes	Corvidae	*Corvus ossifragus*	Fish Crow	X	X
Passeriformes	Corvidae	*Cyanocitta cristata*	Blue Jay	X	X
Passeriformes	Emberizidae	*Junco hyemalis*	Dark-eyed Junco	X	X
Passeriformes	Emberizidae	*Melospiza georgiana*	Swamp Sparrow	X	
Passeriformes	Emberizidae	*Melospiza melodia*	Song Sparrow	X	X
Passeriformes	Emberizidae	*Passerculus sandwichensis*	Savannah Sparrow	X	
Passeriformes	Emberizidae	*Passerella iliaca*	Fox Sparrow	X	
Passeriformes	Emberizidae	*Pipilo erythrophthalmus*	Eastern Towhee	X	X
Passeriformes	Emberizidae	*Spizella passerina*	Chipping Sparrow	X	X
Passeriformes	Emberizidae	*Spizella pusilla*	Field Sparrow	X	X
Passeriformes	Emberizidae	*Zonotrichia albicollis*	White-throated Sparrow	X	X
Passeriformes	Emberizidae	*Zonotrichia leucophrys*	White-crowned Sparrow	X	
Passeriformes	Fringillidae	*Carduelis pinus*	Pine Siskin	X	
Passeriformes	Fringillidae	*Carduelis tristis*	American Goldfinch	X	X
Passeriformes	Fringillidae	*Carpodacus mexicanus*	House Finch	X	X
Passeriformes	Fringillidae	*Carpodacus purpureus*	Purple Finch	X	
Passeriformes	Fringillidae	*Coccothraustes vespertinus*	Evening Grosbeak	X	
Passeriformes	Hirundinidae	*Hirundo rustica*	Barn Swallow	X	
Passeriformes	Hirundinidae	*Progne subis*	Purple Martin	X	
Passeriformes	Hirundinidae	*Riparia riparia*	Bank Swallow	X	
Passeriformes	Hirundinidae	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow	X	
Passeriformes	Hirundinidae	*Tachycineta bicolor*	Tree Swallow	X	
Passeriformes	Icteridae	*Agelaius phoeniceus*	Red-winged Blackbird	X	X
Passeriformes	Icteridae	*Euphagus carolinus*	Rusty Blackbird	X	
Passeriformes	Icteridae	*Icterus galbula*	Baltimore Oriole	X	
Passeriformes	Icteridae	*Icterus spurius*	Orchard Oriole	X	
Passeriformes	Icteridae	*Molothrus ater*	Brown-headed Cowbird	X	X
Passeriformes	Icteridae	*Quiscalus quiscula*	Common Grackle	X	X
Passeriformes	Icteridae	*Sturnella magna*	Eastern Meadowlark	X	
Passeriformes	Laniidae	*Lanius ludovicianus*	Loggerhead Shrike	X	
Passeriformes	Mimidae	*Dumetella carolinensis*	Gray Catbird	X	
Passeriformes	Mimidae	*Mimus polyglottos*	Northern Mockingbird	X	X
Passeriformes	Mimidae	*Toxostoma rufum*	Brown Thrasher	X	X
Passeriformes	Paridae	*Baeolophus bicolor*	Tufted Titmouse	X	X
Passeriformes	Paridae	*Poecile carolinensis*	Carolina Chickadee	X	X
Passeriformes	Parulidae	*Dendroica caerulescens*	Black-throated Blue Warbler	X	X
Passeriformes	Parulidae	*Dendroica castanea*	Bay-breasted Warbler	X	

Table A-1 (continued). Birds known to occur at Ocmulgee National Monument in 2011 based upon records in NPSpecies (2015) and those detected during the sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2011
Passeriformes	Parulidae	*Dendroica cerulea*	Cerulean Warbler	X	X
Passeriformes	Parulidae	*Dendroica coronata*	Yellow-rumped Warbler	X	X
Passeriformes	Parulidae	*Dendroica discolor*	Prairie Warbler	X	
Passeriformes	Parulidae	*Dendroica dominica*	Yellow-throated Warbler	X	X
Passeriformes	Parulidae	*Dendroica fusca*	Blackburnian Warbler	X	
Passeriformes	Parulidae	*Dendroica magnolia*	Magnolia Warbler	X	X
Passeriformes	Parulidae	*Dendroica palmarum*	Palm Warbler	X	
Passeriformes	Parulidae	*Dendroica palmarum*	Palm Warbler	X	
Passeriformes	Parulidae	*Dendroica pensylvanica*	Chestnut-sided Warbler	X	
Passeriformes	Parulidae	*Dendroica petechia*	Yellow Warbler	X	X
Passeriformes	Parulidae	*Dendroica pinus*	Pine Warbler	X	X
Passeriformes	Parulidae	*Dendroica striata*	Blackpoll Warbler	X	
Passeriformes	Parulidae	*Dendroica tigrina*	Cape May Warbler	X	
Passeriformes	Parulidae	*Dendroica virens*	Black-throated Green Warbler	X	
Passeriformes	Parulidae	*Geothlypis trichas*	Common Yellowthroat	X	X
Passeriformes	Parulidae	*Helmitheros vermivorus*	Worm-eating Warbler	X	
Passeriformes	Parulidae	*Icteria virens*	Yellow-breasted Chat	X	
Passeriformes	Parulidae	*Limnothlypis swainsonii*	Swainson's Warbler	X	
Passeriformes	Parulidae	*Mniotilta varia*	Black-and-white Warbler	X	
Passeriformes	Parulidae	*Oporornis formosus*	Kentucky Warbler	X	X
Passeriformes	Parulidae	*Parula americana*	Northern Parula	X	X
Passeriformes	Parulidae	*Protonotaria citrea*	Prothonotary Warbler	X	X
Passeriformes	Parulidae	*Seiurus aurocapillus*	Ovenbird	X	X
Passeriformes	Parulidae	*Seiurus motacilla*	Louisiana Waterthrush	X	
Passeriformes	Parulidae	*Seiurus noveboracensis*	Northern Waterthrush	X	
Passeriformes	Parulidae	*Setophaga ruticilla*	American Redstart	X	
Passeriformes	Parulidae	*Vermivora celata*	Orange-crowned Warbler	X	
Passeriformes	Parulidae	*Vermivora chrysoptera*	Golden-winged Warbler	X	
Passeriformes	Parulidae	*Vermivora peregrina*	Tennessee Warbler	X	
Passeriformes	Parulidae	*Vermivora pinus*	Blue-winged Warbler	X	
Passeriformes	Parulidae	*Wilsonia canadensis*	Canada Warbler	X	
Passeriformes	Parulidae	*Wilsonia citrina*	Hooded Warbler	X	
Passeriformes	Passeridae	*Passer domesticus*	House Sparrow	X	X
Passeriformes	Polioptilidae	*Polioptila caerulea*	Blue-gray Gnatcatcher	X	X
Passeriformes	Regulidae	*Regulus calendula*	Ruby-crowned Kinglet	X	
Passeriformes	Regulidae	*Regulus satrapa*	Golden-crowned Kinglet	X	
Passeriformes	Sittidae	*Sitta canadensis*	Red-breasted Nuthatch	X	
Passeriformes	Sittidae	*Sitta carolinensis*	White-breasted Nuthatch	X	X
Passeriformes	Sittidae	*Sitta pusilla*	Brown-headed Nuthatch	X	X
Passeriformes	Sturnidae	*Sturnus vulgaris*	European Starling	X	
Passeriformes	Thraupidae	*Piranga olivacea*	Scarlet Tanager	X	X
Passeriformes	Thraupidae	*Piranga rubra*	Summer Tanager	X	X
Passeriformes	Troglodytidae	*Thryothorus ludovicianus*	Carolina Wren	X	X
Passeriformes	Troglodytidae	*Troglodytes aedon*	House Wren	X	
Passeriformes	Troglodytidae	*Troglodytes troglodytes*	Winter Wren	X	

Table A-1 (continued). Birds known to occur at Ocmulgee National Monument in 2011 based upon records in NPSpecies (2015) and those detected during the sampling effort.

Order	Family	Scientific Name	Common Name	NPSpecies	ARD 2011
Passeriformes	Turdidae	*Catharus fuscescens*	Veery	X	X
Passeriformes	Turdidae	*Catharus guttatus*	Hermit Thrush	X	
Passeriformes	Turdidae	*Catharus minimus*	Gray-cheeked Thrush	X	
Passeriformes	Turdidae	*Catharus ustulatus*	Swainson's Thrush	X	
Passeriformes	Turdidae	*Hylocichla mustelina*	Wood Thrush	X	
Passeriformes	Turdidae	*Sialia sialis*	Eastern Bluebird	X	X
Passeriformes	Turdidae	*Turdus migratorius*	American Robin	X	X
Passeriformes	Tyrannidae	*Contopus virens*	Eastern Wood-Pewee	X	X
Passeriformes	Tyrannidae	*Empidonax alnorum*	Alder Flycatcher	X	
Passeriformes	Tyrannidae	*Empidonax flaviventris*	Yellow-bellied Flycatcher	X	
Passeriformes	Tyrannidae	*Empidonax virescens*	Acadian Flycatcher	X	X
Passeriformes	Tyrannidae	*Myiarchus crinitus*	Great Crested Flycatcher	X	X
Passeriformes	Tyrannidae	*Sayornis phoebe*	Eastern Phoebe	X	X
Passeriformes	Tyrannidae	*Tyrannus tyrannus*	Eastern Kingbird	X	
Passeriformes	Vireonidae	*Vireo flavifrons*	Yellow-throated Vireo	X	
Passeriformes	Vireonidae	*Vireo griseus*	White-eyed Vireo	X	X
Passeriformes	Vireonidae	*Vireo olivaceus*	Red-eyed Vireo	X	X
Passeriformes	Vireonidae	*Vireo philadelphicus*	Philadelphia Vireo	X	
Passeriformes	Vireonidae	*Vireo solitarius*	Blue-headed Vireo	X	
Passeriformes	Vireonidae	*Vireo solitarius*	Blue-headed Vireo	X	
Pelecaniformes	Ardeidae	*Ardea alba*	Great Egret	X	
Pelecaniformes	Ardeidae	*Ardea herodias*	Great Blue Heron	X	X
Pelecaniformes	Ardeidae	*Bubulcus ibis*	Cattle Egret	X	
Pelecaniformes	Ardeidae	*Butorides virescens*	Green Heron	X	
Pelecaniformes	Ardeidae	*Egretta caerulea*	Little Blue Heron	X	
Pelecaniformes	Ardeidae	*Egretta thula*	Snowy Egret	X	
Pelecaniformes	Threskiornithidae	*Eudocimus albus*	White Ibis	X	
Pelecaniformes	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	X	
Piciformes	Picidae	*Colaptes auratus*	Northern Flicker	X	X
Piciformes	Picidae	*Dryocopus pileatus*	Pileated Woodpecker	X	
Piciformes	Picidae	*Melanerpes carolinus*	Red-bellied Woodpecker	X	X
Piciformes	Picidae	*Melanerpes erythrocephalus*	Red-headed Woodpecker	X	X
Piciformes	Picidae	*Picoides pubescens*	Downy Woodpecker	X	X
Piciformes	Picidae	*Picoides villosus*	Hairy Woodpecker	X	
Piciformes	Picidae	*Sphyrapicus varius*	Yellow-bellied Sapsucker	X	
Podicipediformes	Podicipedidae	*Podilymbus podiceps*	Pied-billed Grebe	X	
Strigiformes	Strigidae	*Bubo virginianus*	Great Horned Owl	X	
Strigiformes	Strigidae	*Megascops asio*	Eastern Screech Owl	X	
Strigiformes	Strigidae	*Strix varia*	Barred Owl	X	
Suliformes	Anhingidae	*Anhinga anhinga*	Anhinga	X	
Suliformes	Phalacrocoracidae	*Phalacrocorax auritus*	Double-crested Cormorant	X	

Appendix B—Species Detection Matrix

Table B-1. All species detected at each sampling location at Ocmulgee National Monument in 2011. Refer to Figure 2 for labeled sampling locations.

Species	01	02	03	04	05	06	07	08	09	10	11	12	13	14	16	17	18	19	20	ALT01	ALT02
Acadian Flycatcher															X						
American Coot							X														
American Crow	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
American Goldfinch		X	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X
American Robin			X	X	X	X	X		X	X	X		X							X	X
Belted Kingfisher								X							X					X	
Black-throated Blue Warbler	X		X																		
Blue Jay	X		X	X	X	X	X	X	X	X	X	X		X	X		X	X		X	
Blue-gray Gnatcatcher	X	X		X		X	X	X	X	X	X	X			X	X	X	X		X	
Brown Thrasher				X	X	X				X											
Brown-headed Cowbird							X				X				X	X	X		X	X	
Brown-headed Nuthatch	X	X		X												X			X		
Canada Goose												X								X	
Carolina Chickadee	X	X		X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X
Carolina Wren	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cerulean Warbler		X																			
Chimney Swift			X					X							X						
Chipping Sparrow	X			X	X	X															
Common Grackle	X	X		X	X						X	X	X		X	X	X	X		X	
Common Yellowthroat		X			X		X		X		X						X			X	
Dark-eyed Junco				X							X			X		X			X		
Downy Woodpecker	X	X	X	X		X	X	X			X	X		X	X	X		X	X	X	
Eastern Bluebird											X								X		
Eastern Phoebe		X		X	X	X		X	X	X		X						X			
Eastern Towhee		X	X	X	X	X		X		X	X	X			X	X	X	X	X		
Eastern Wood-Pewee				X			X				X		X			X		X			
Field Sparrow											X										
Fish Crow																	X				
Great Blue Heron									X											X	
Great Crested Flycatcher		X	X	X	X	X	X		X	X	X	X			X	X	X	X	X	X	X
House Finch							X									X				X	
House Sparrow																	X				

Table B-1 (continued). All species detected at each sampling location at Ocmulgee National Monument in 2011. Refer to Figure 2 for labeled sampling locations.

Species	01	02	03	04	05	06	07	08	09	10	11	12	13	14	16	17	18	19	20	ALT01	ALT02
Indigo Bunting												X					X	X	X	X	
Kentucky Warbler											X										
Magnolia Warbler																		X			
Mourning Dove				X																	
Northern Cardinal	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Northern Flicker	X	X			X	X	X	X				X			X	X	X			X	
Northern Mockingbird					X						X	X									
Northern Parula						X															
Ovenbird	X																				
Pine Warbler																		X			
Prothonotary Warbler															X		X				
Red-bellied Woodpecker	X	X	X	X	X	X	X			X	X	X		X	X	X	X	X	X	X	
Red-eyed Vireo	X	X		X				X							X	X	X	X	X	X	
Red-headed Woodpecker		X	X		X	X															
Red-shouldered Hawk		X			X	X	X								X		X			X	
Red-winged Blackbird		X			X		X										X				
Scarlet Tanager		X		X	X						X										
Song Sparrow																				X	
Summer Tanager			X	X				X		X	X	X						X			
Tufted Titmouse	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Veery	X	X																			
White-breasted Nuthatch		X	X	X							X	X									
White-eyed Vireo		X	X		X	X		X				X			X			X	X	X	
White-throated Sparrow	X		X	X		X		X							X				X	X	
Yellow Warbler																				X	
Yellow-rumped Warbler											X										
Yellow-throated Warbler								X	X												

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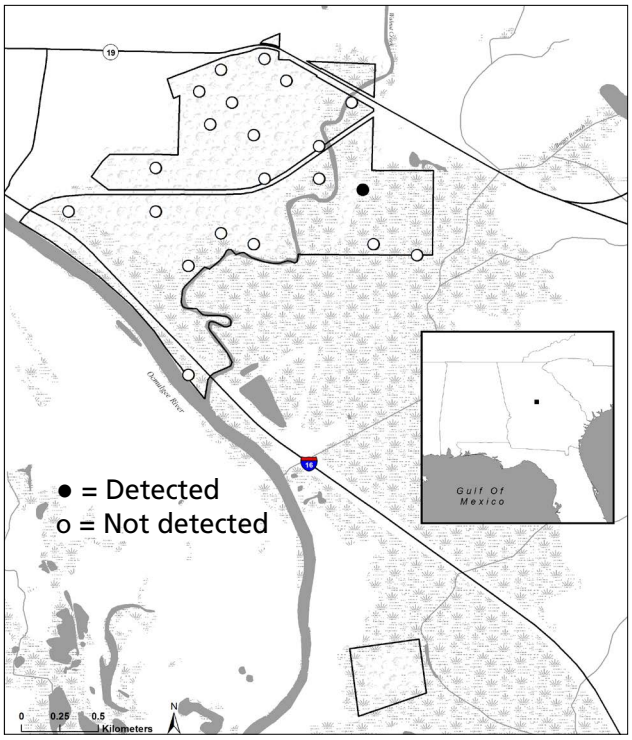


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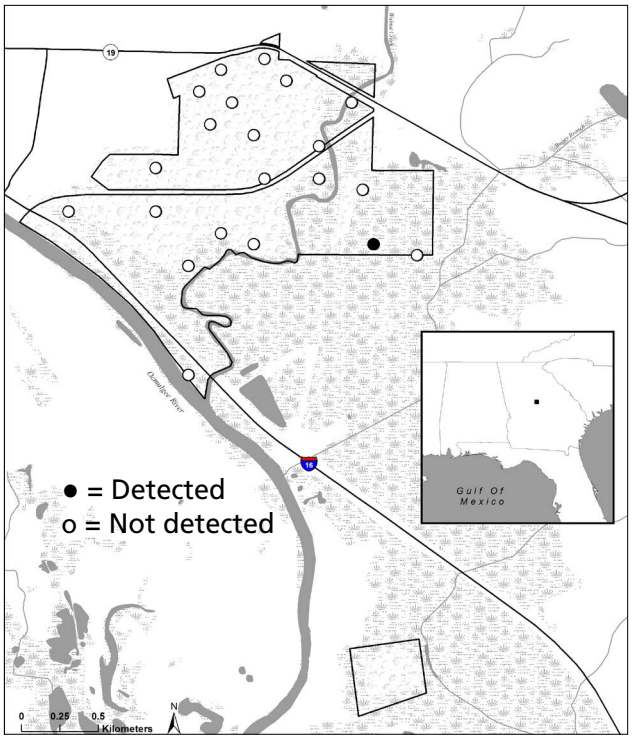


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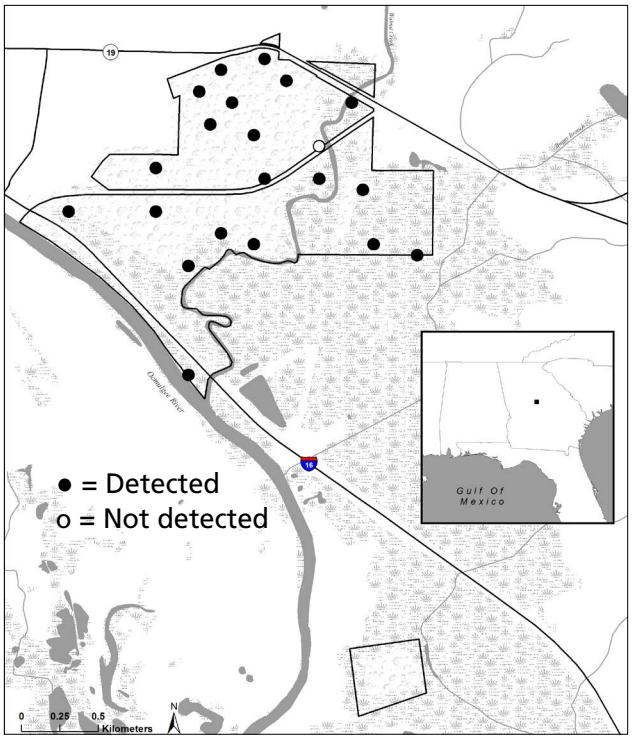


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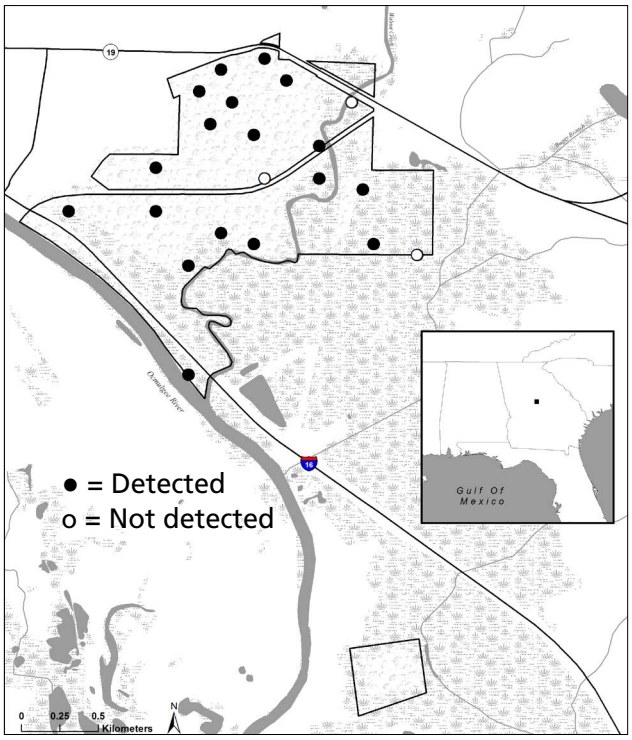


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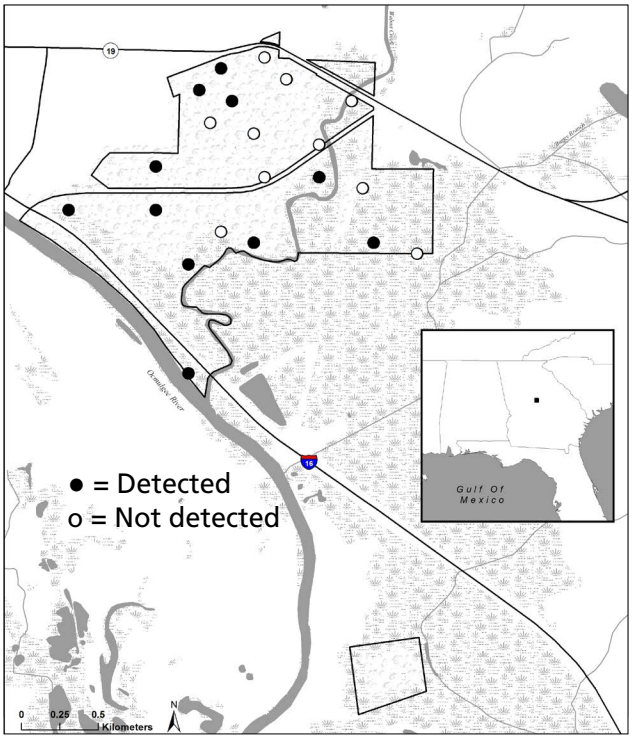


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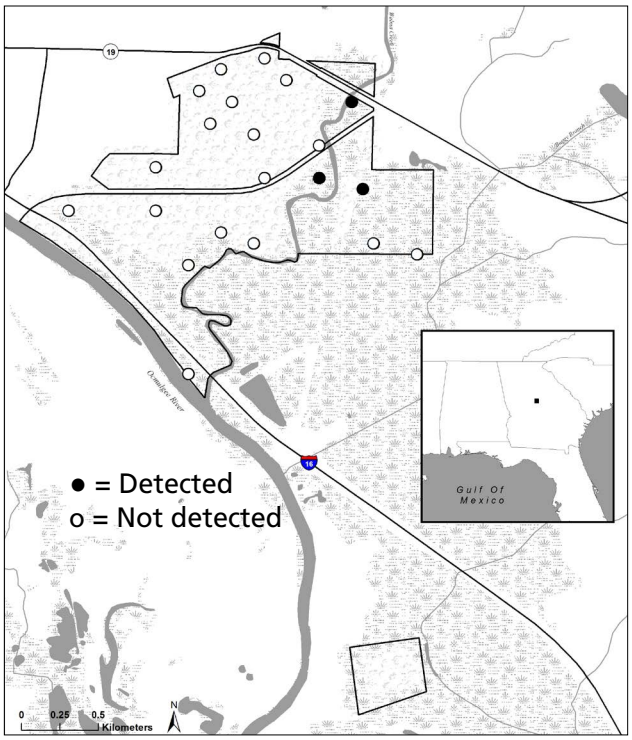


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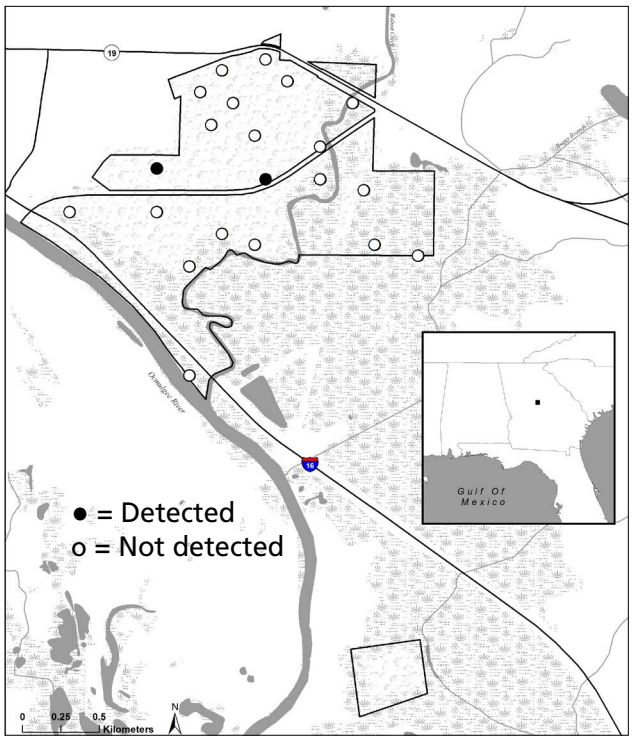


Figure C-7. Sampling locations where black throated-blue warbler (*Dendroica caerulescens*) was detected at Ocmulgee National Monument, 2011.

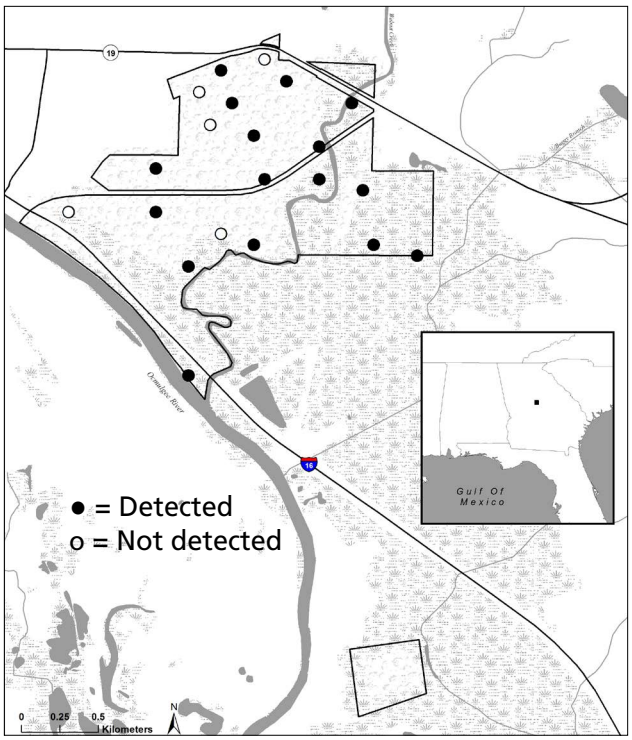


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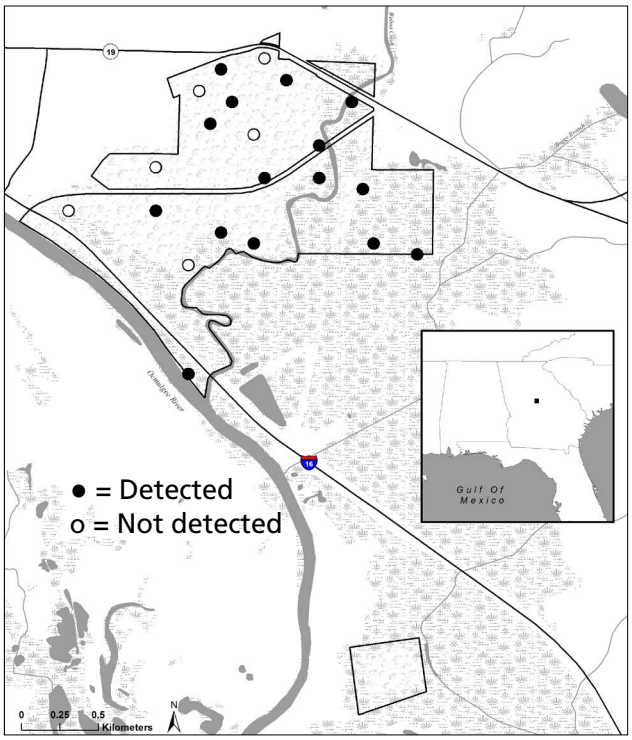


Figure C-9. Sampling locations where blue-gray gnatcatcher (*Polioptila caerulea*) was detected at Ocmulgee National Monument, 2011.

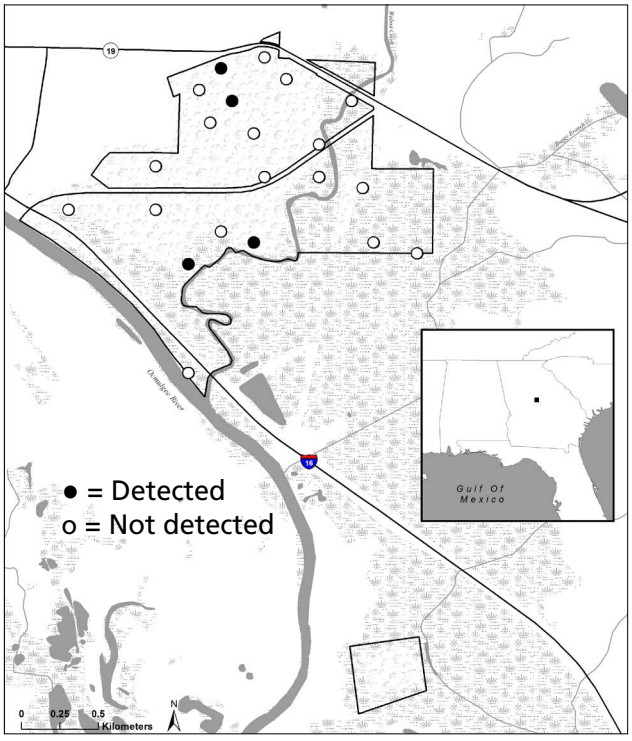


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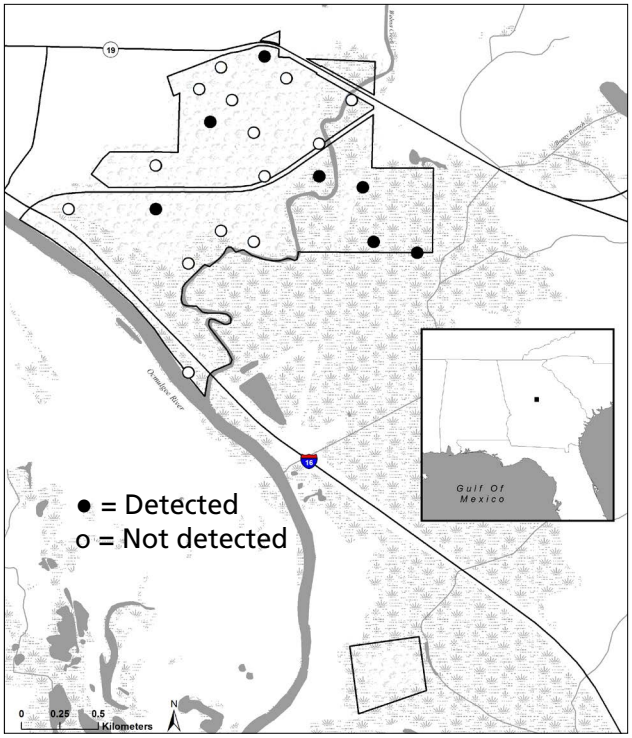


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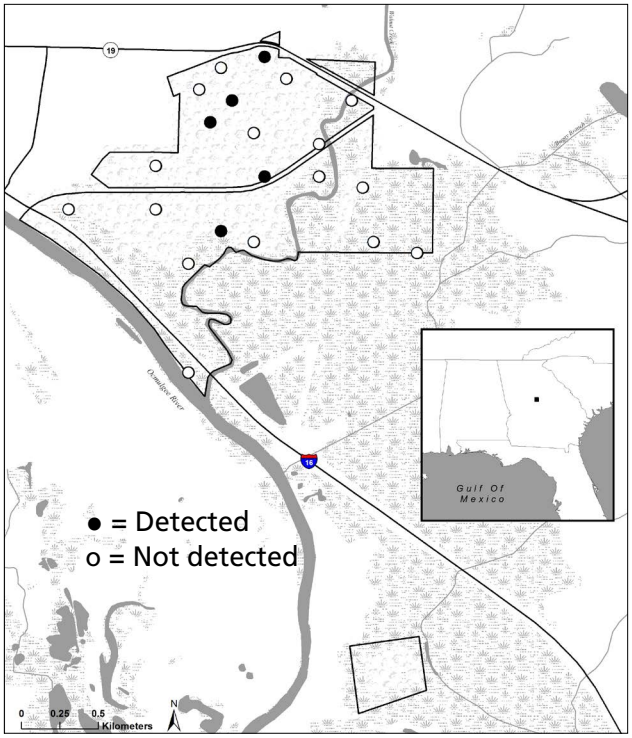


Figure C-12. Sampling locations where brown-headed nuthatch (*Sitta pusilla*) was detected at Ocmulgee National Monument, 2011.

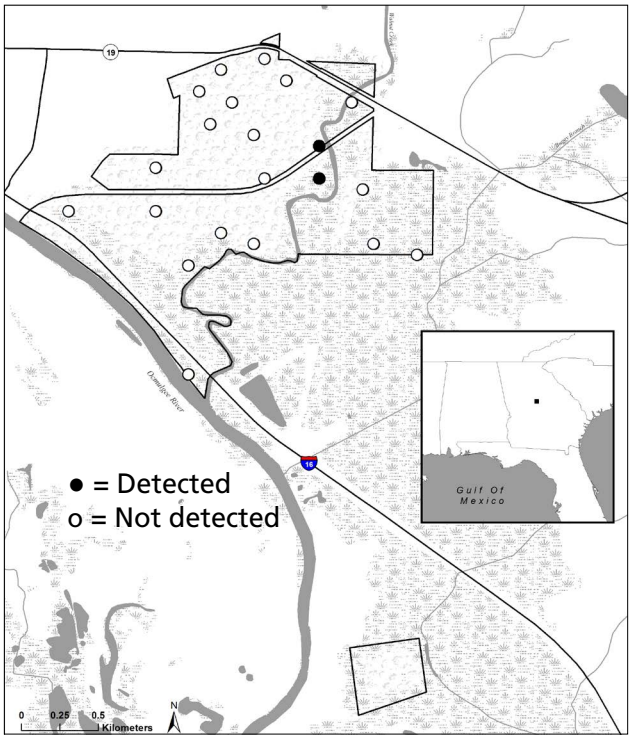


Figure C-13. Sampling locations where Canada goose (*Branta canadensis*) was detected at Ocmulgee National Monument, 2011.

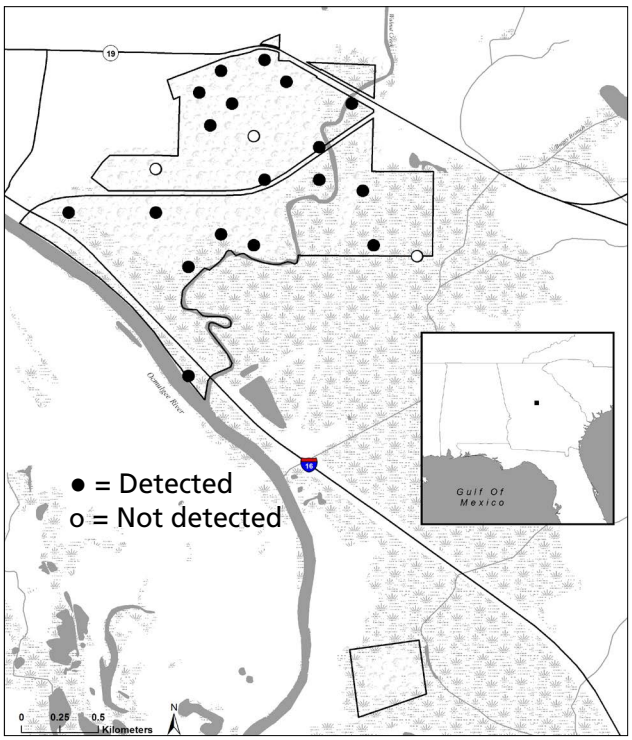


Figure C-14. Sampling locations where Carolina chickadee (*Poecile carolinensis*) was detected at Ocmulgee National Monument, 2011.

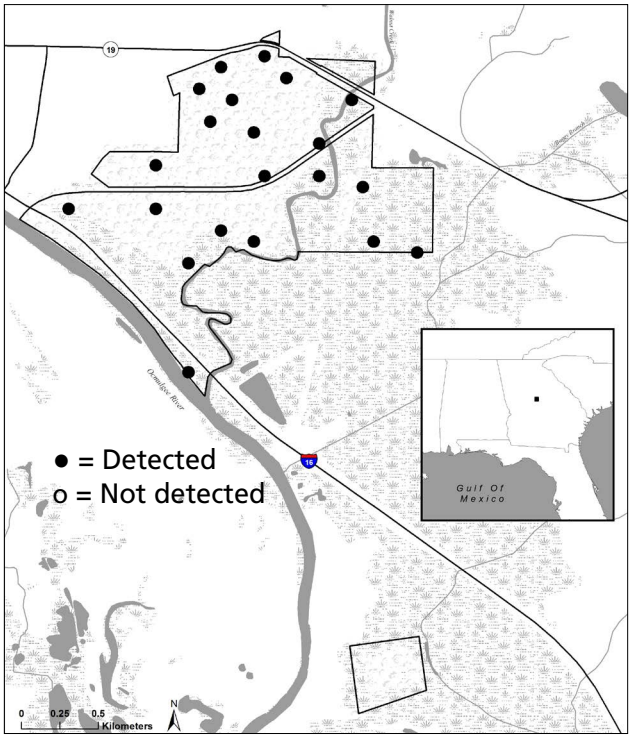


Figure C-15. Sampling locations where Carolina wren (*Thryothorus ludovicianus*) was detected at Ocmulgee National Monument, 2011.

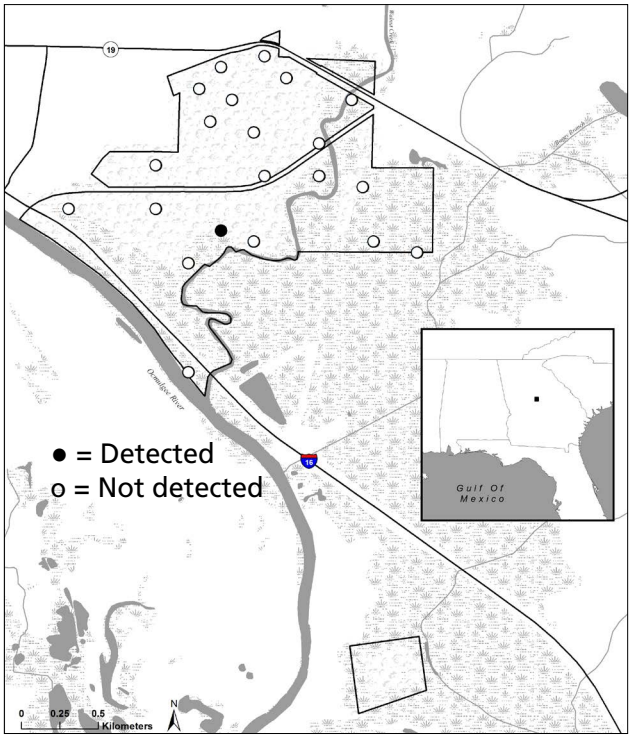


Figure C-16. Sampling locations where cerulean warbler (*Dendroica cerulea*) was detected at Ocmulgee National Monument, 2011.

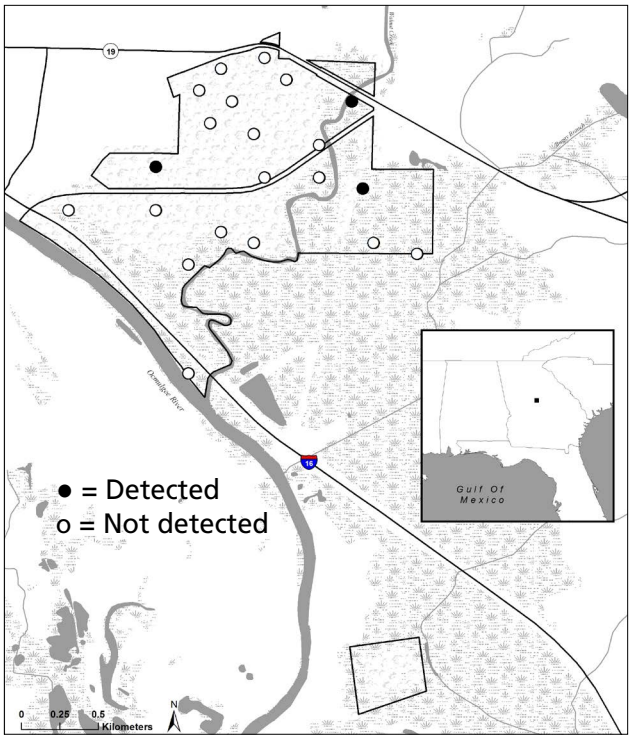


Figure C-17. Sampling locations where chimney swift (*Chaetura pelagica*) was detected at Ocmulgee National Monument, 2011.

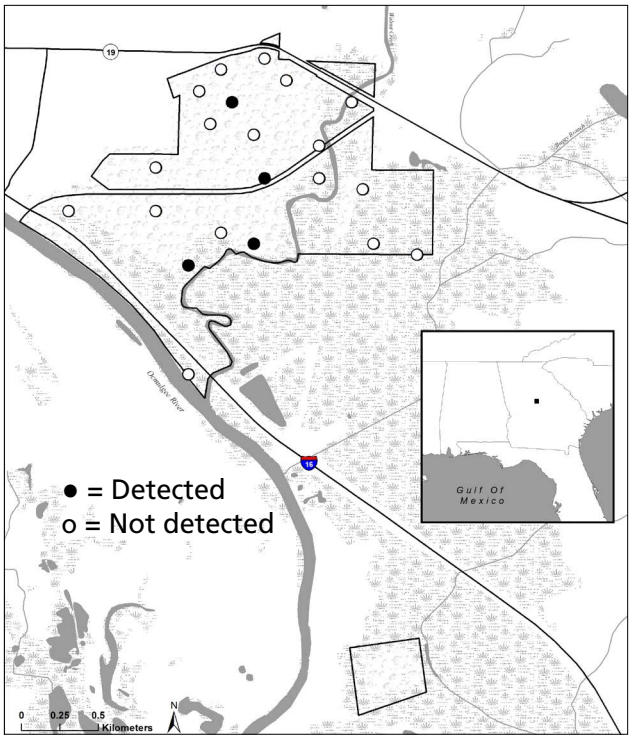


Figure C-18. Sampling locations where chipping sparrow (*Spizella passerina*) was detected at Ocmulgee National Monument, 2011.

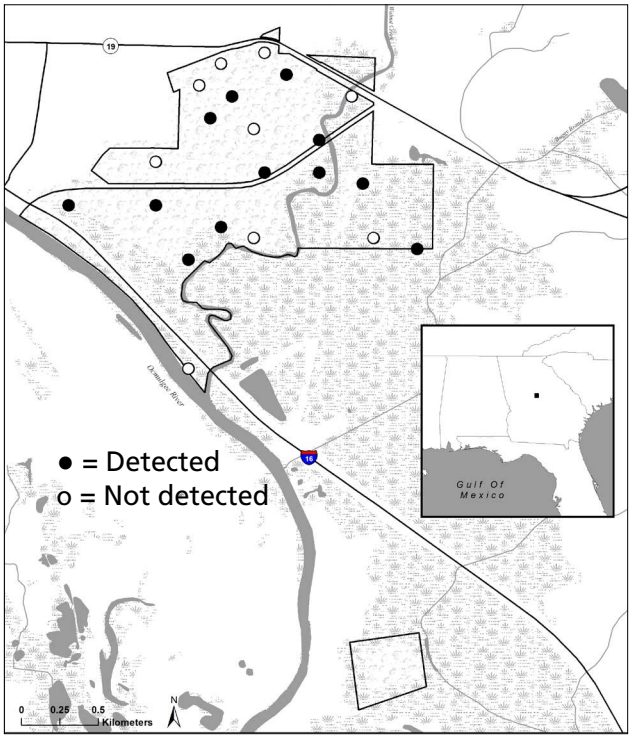


Figure C-19. Sampling locations where common grackle (*Quiscalus quiscala*) was detected at Ocmulgee National Monument, 2011.

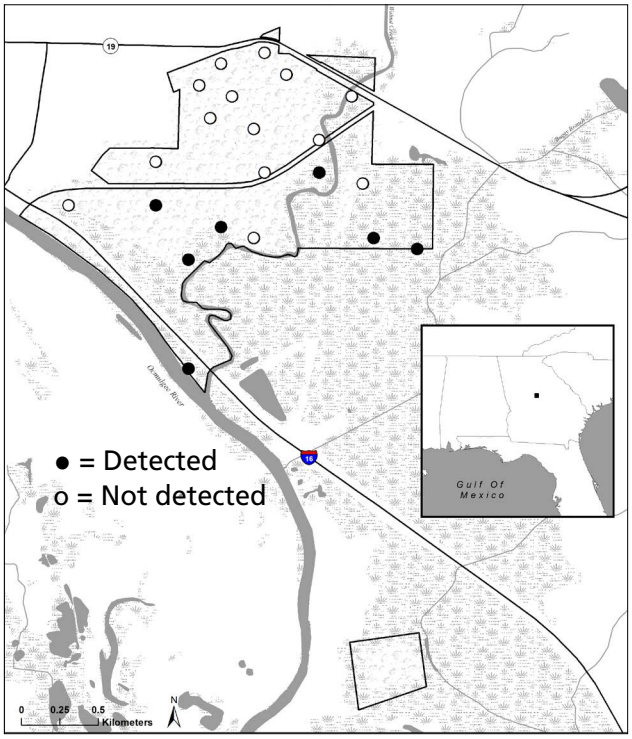


Figure C-20. Sampling locations where common yellowthroat (*Geothlypis trichas*) was detected at Ocmulgee National Monument, 2011.

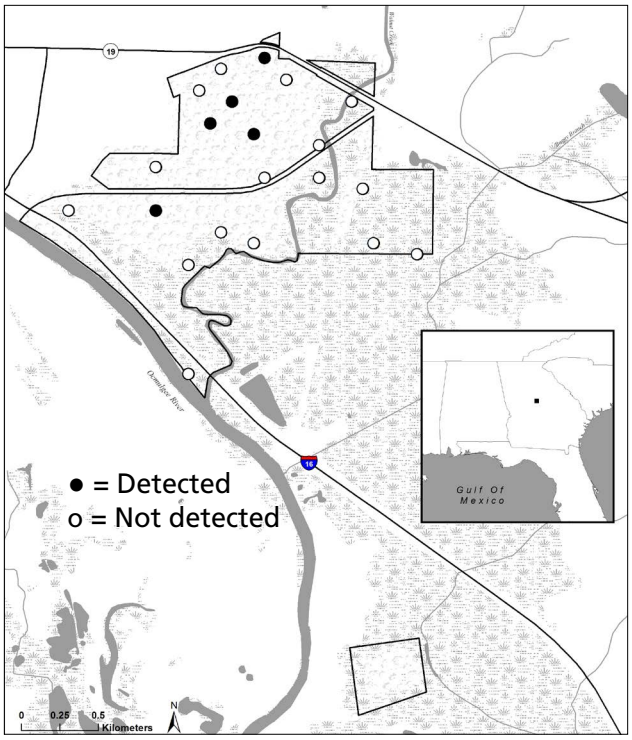


Figure C-21. Sampling locations where dark-eyed junco (*Junco hyemalis*) was detected at Ocmulgee National Monument, 2011.

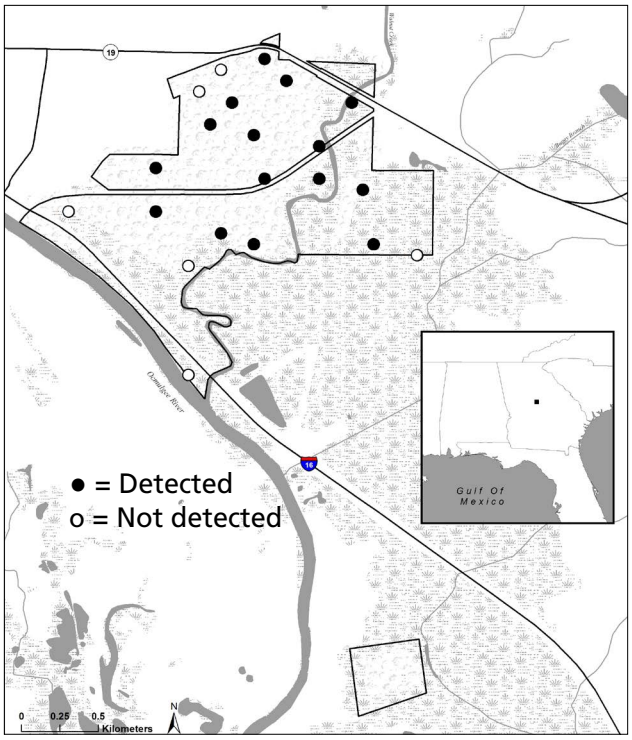


Figure C-22. Sampling locations where downy woodpecker (*Picoides pubescens*) was detected at Ocmulgee National Monument, 2011.

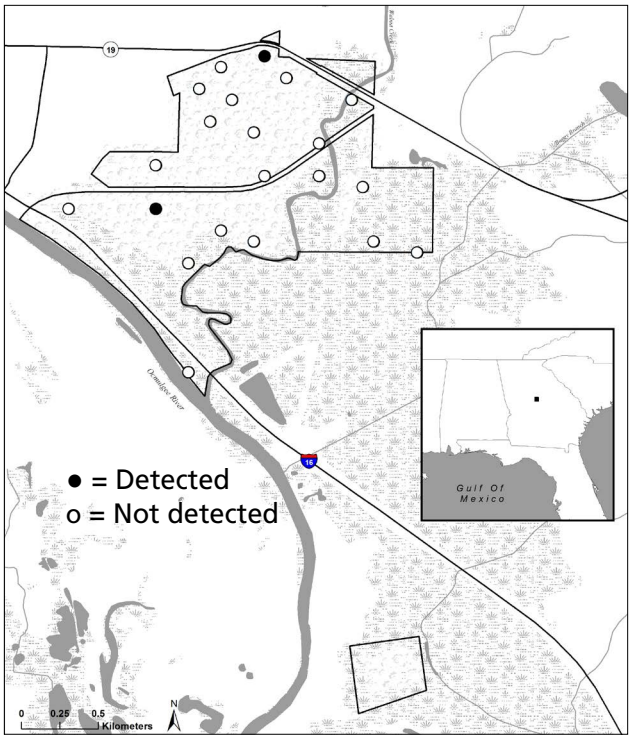


Figure C-23. Sampling locations where eastern bluebird (*Sialia sialis*) was detected at Ocmulgee National Monument, 2011.

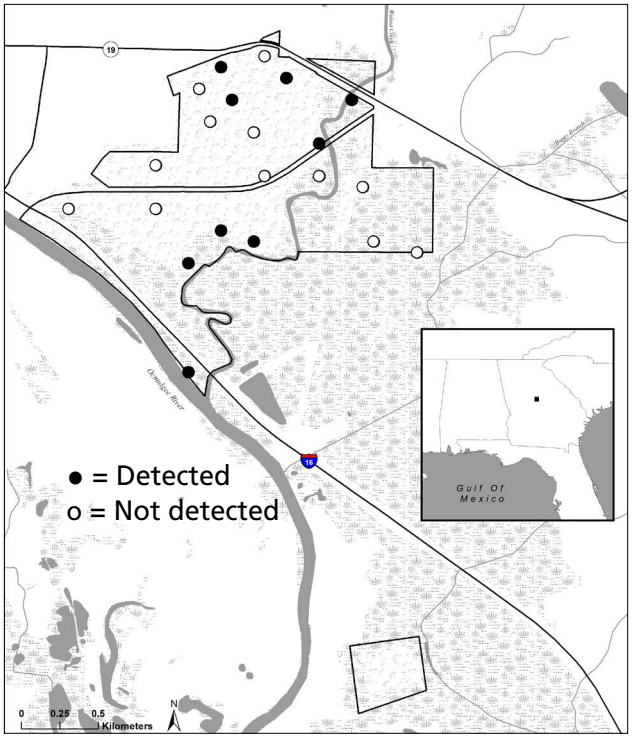


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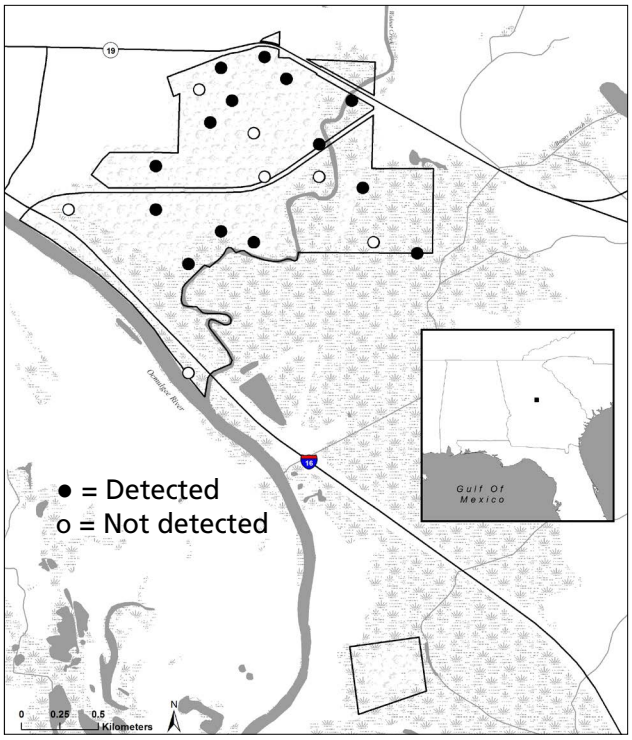


Figure C-25. Sampling locations where eastern towhee (*Pipilo erythrophthalmus*) was detected at Ocmulgee National Monument, 2011.

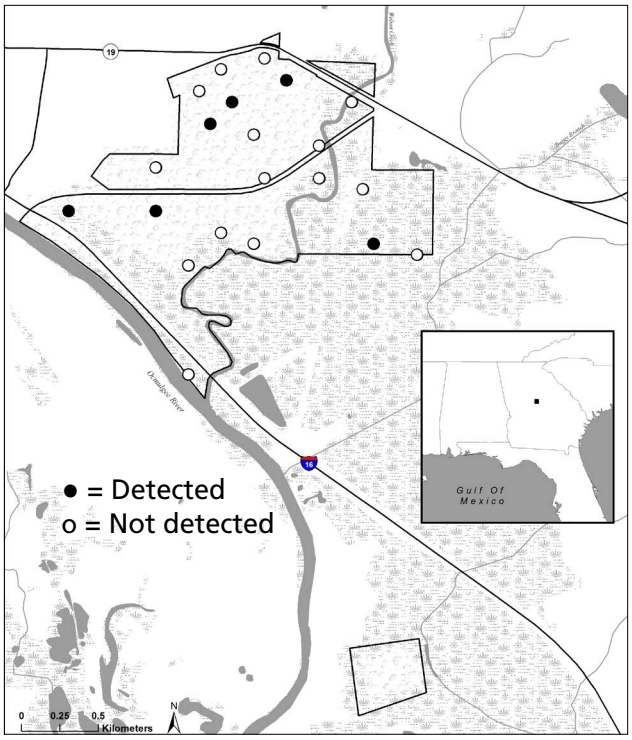


Figure C-26. Sampling locations where eastern wood-pewee (*Contopus virens*) was detected at Ocmulgee National Monument, 2011.

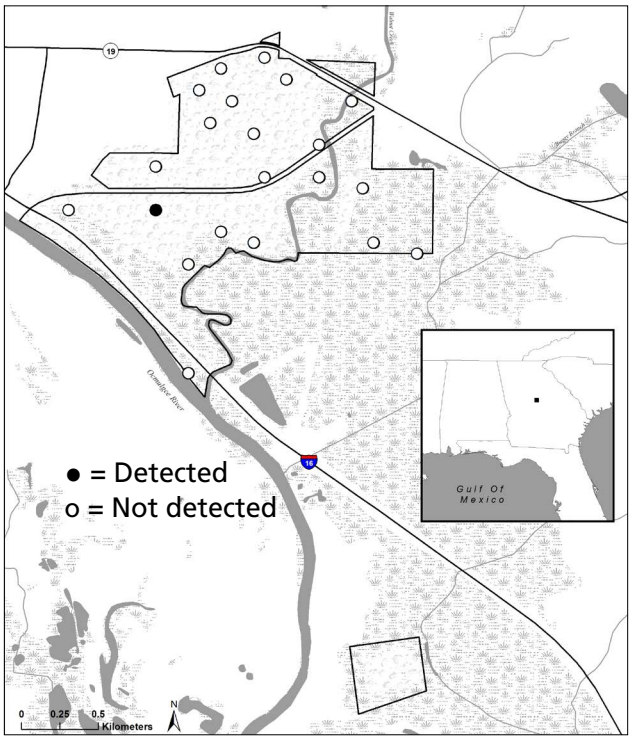


Figure C-27. Sampling locations where field sparrow (*Spizella pusilla*) was detected at Ocmulgee National Monument, 2011.

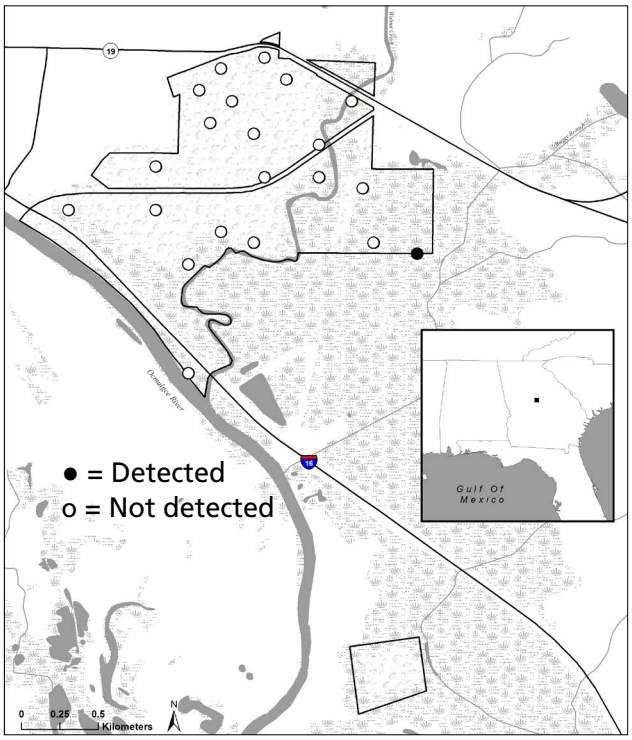


Figure C-28. Sampling locations where fish crow (*Corvus ossifragus*) was detected at Ocmulgee National Monument, 2011.

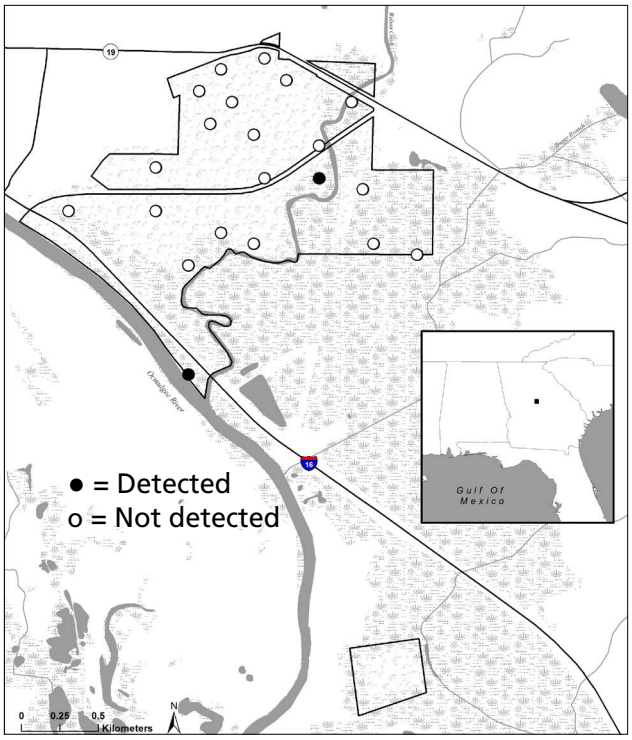


Figure C-29. Sampling locations where great blue heron (*Ardea herodias*) was detected at Ocmulgee National Monument, 2011.

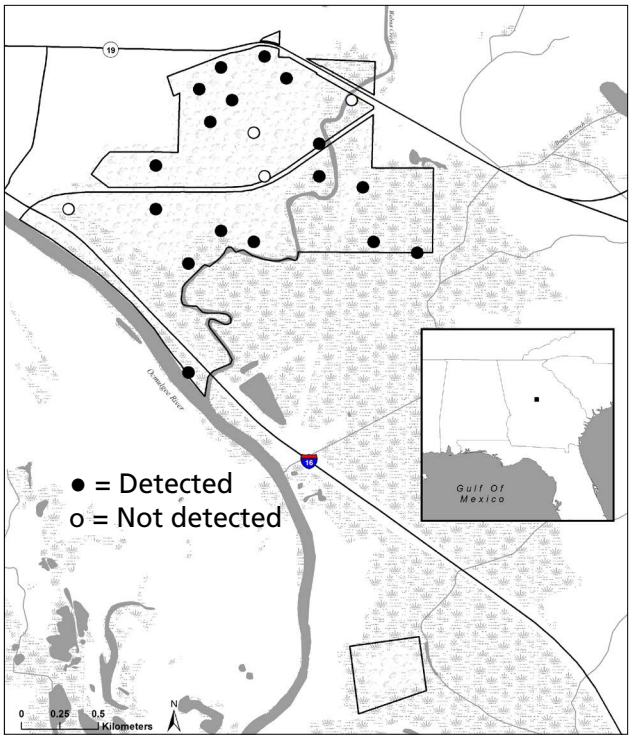


Figure C-30. Sampling locations where great crested flycatcher (*Myiarchus crinitus*) was detected at Ocmulgee National Monument, 2011.

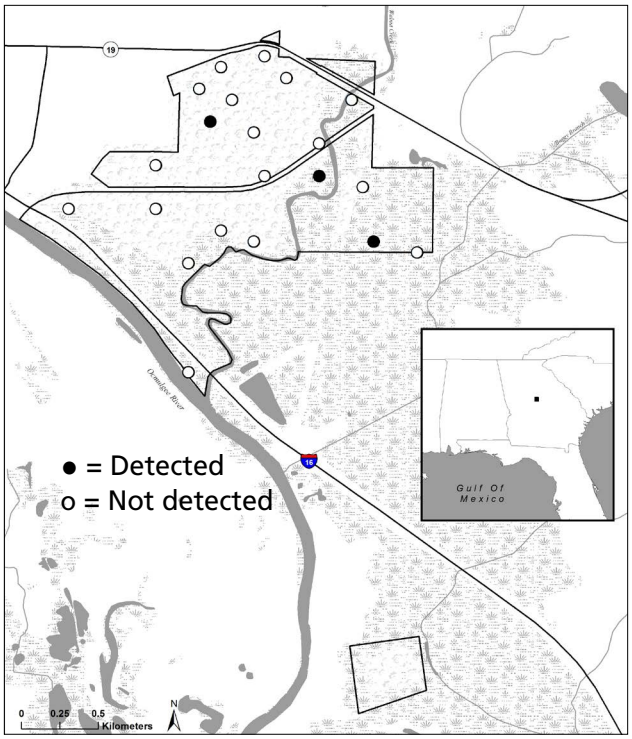


Figure C-31. Sampling locations where house finch (*Carpodacus mexicanus*) was detected at Ocmulgee National Monument, 2011.

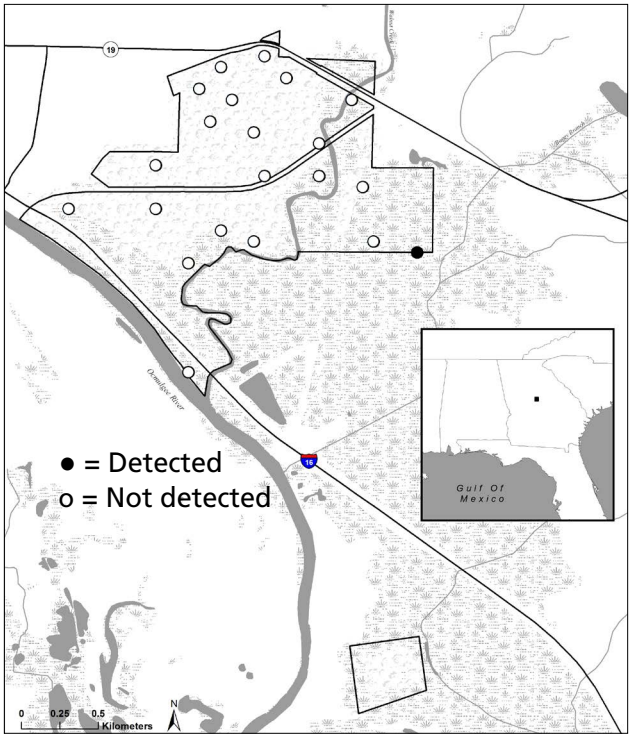


Figure C-32. Sampling locations where house sparrow (*Passer domesticus*) was detected at Ocmulgee National Monument, 2011.

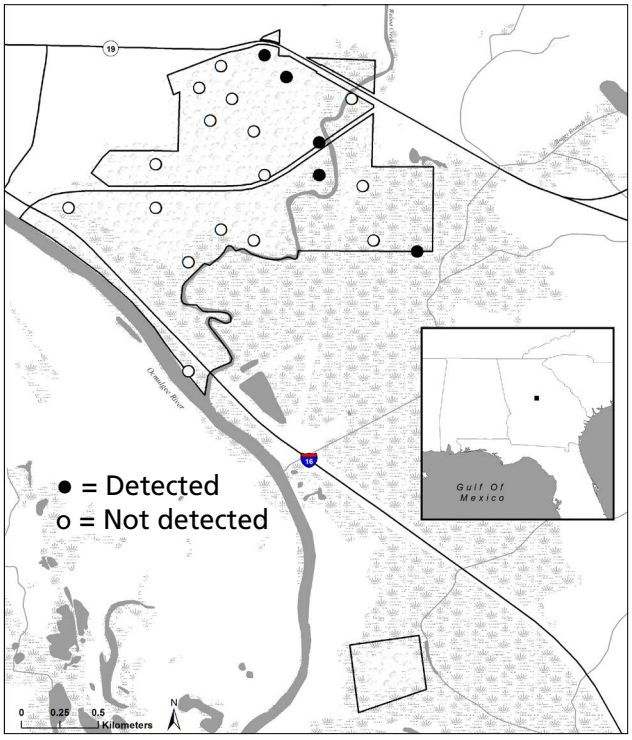


Figure C-33. Sampling locations where indigo bunting (*Passerina cyanea*) was detected at Ocmulgee National Monument, 2011.

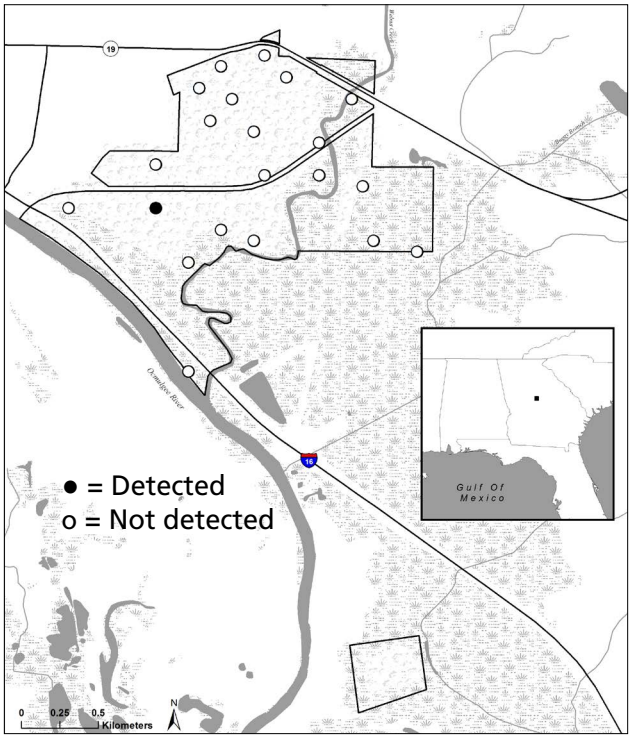


Figure C-34. Sampling locations where Kentucky warbler (*Oporornis formosus*) was detected at Ocmulgee National Monument, 2011.

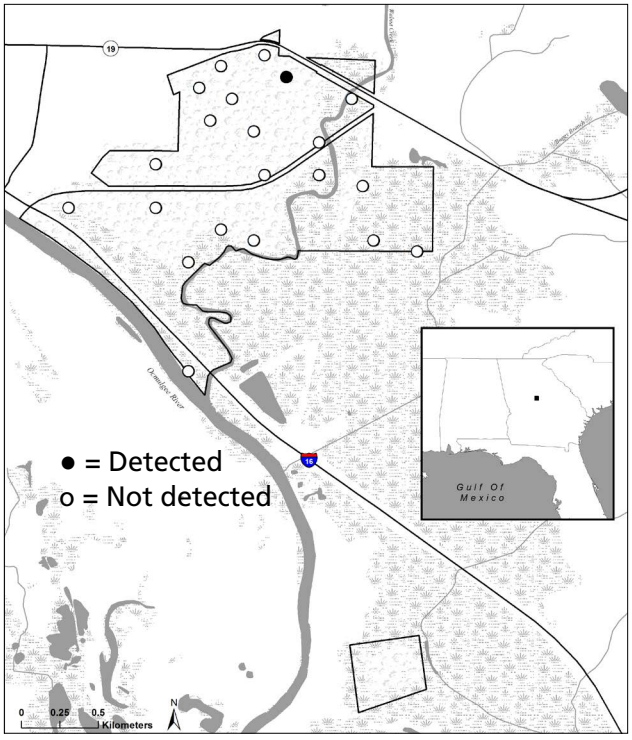


Figure C-35. Sampling locations where magnolia warbler (*Dendroica magnolia*) was detected at Ocmulgee National Monument, 2011.

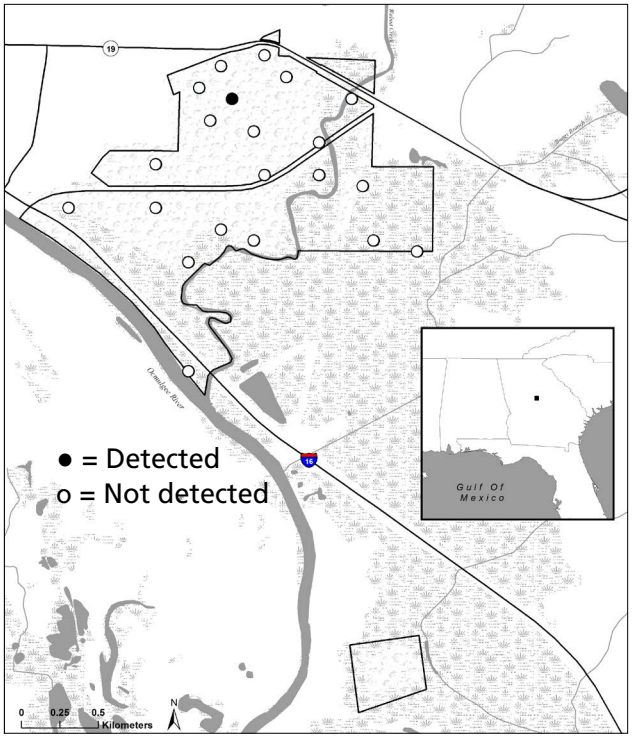


Figure C-36. Sampling locations where mourning dove (*Zenaida macroura*) was detected at Ocmulgee National Monument, 2011.

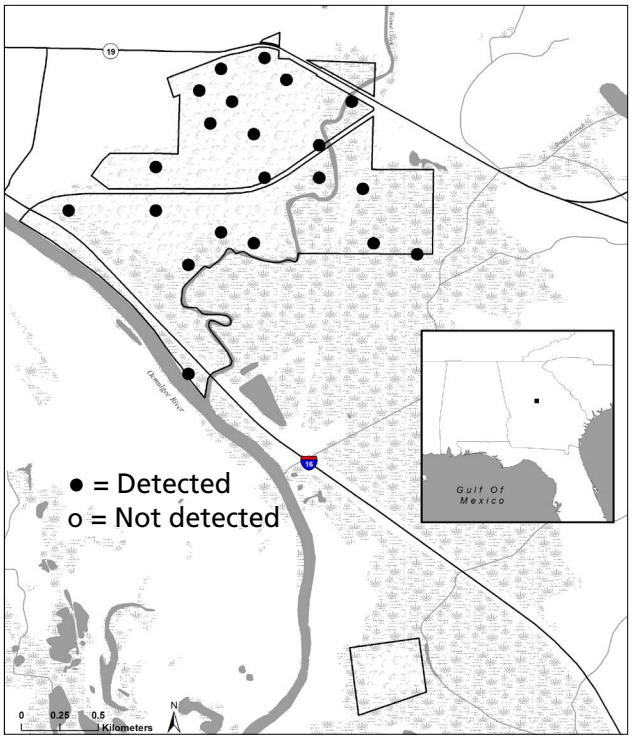


Figure C-37. Sampling locations where northern cardinal (*Cardinalis cardinalis*) was detected at Ocmulgee National Monument, 2011.

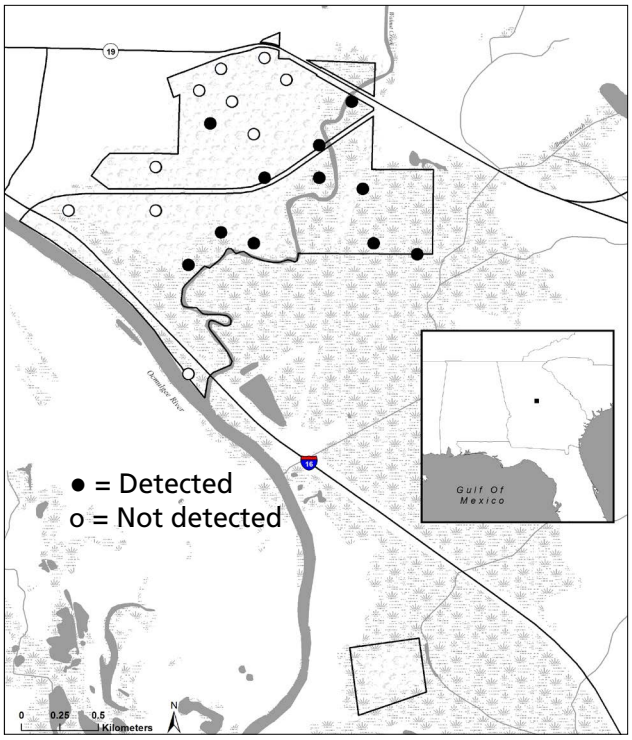


Figure C-38. Sampling locations where northern flicker (*Colaptes auratus*) was detected at Ocmulgee National Monument, 2011.

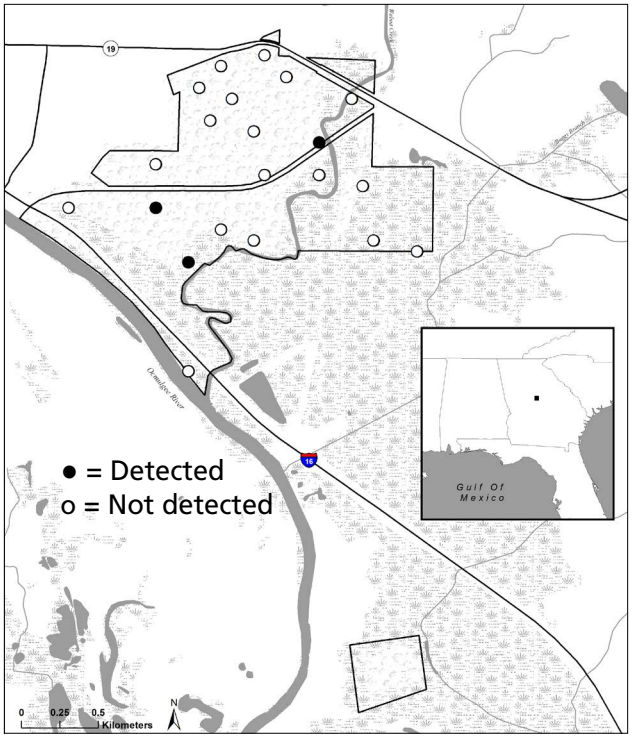


Figure C-39. Sampling locations where northern mockingbird (*Mimus polyglottos*) was detected at Ocmulgee National Monument, 2011.

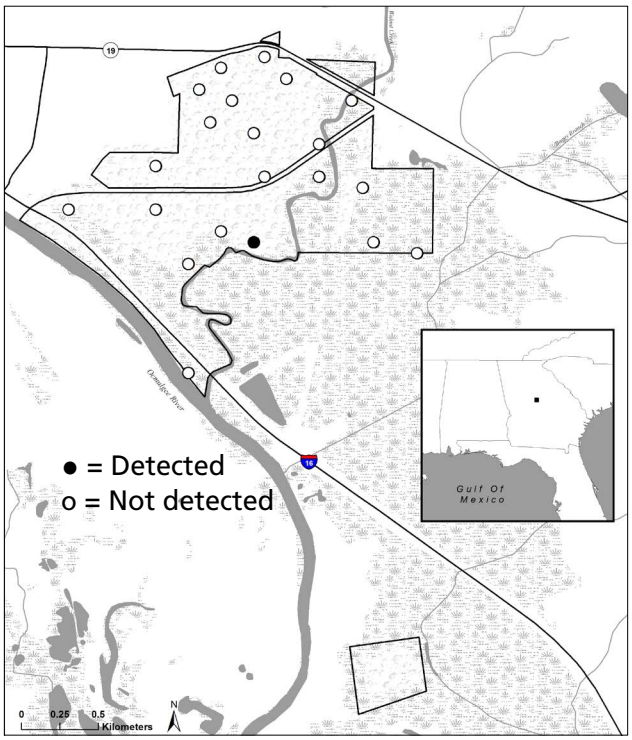


Figure C-40. Sampling locations where northern parula (*Parula americana*) was detected at Ocmulgee National Monument, 2011.

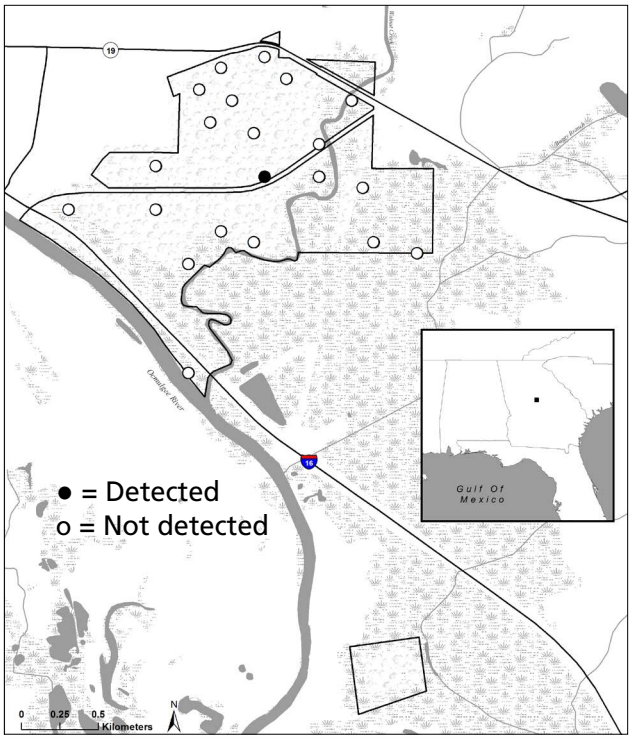


Figure C-41. Sampling locations where ovenbird (*Seiurus aurocapillus*) was detected at Ocmulgee National Monument, 2011.

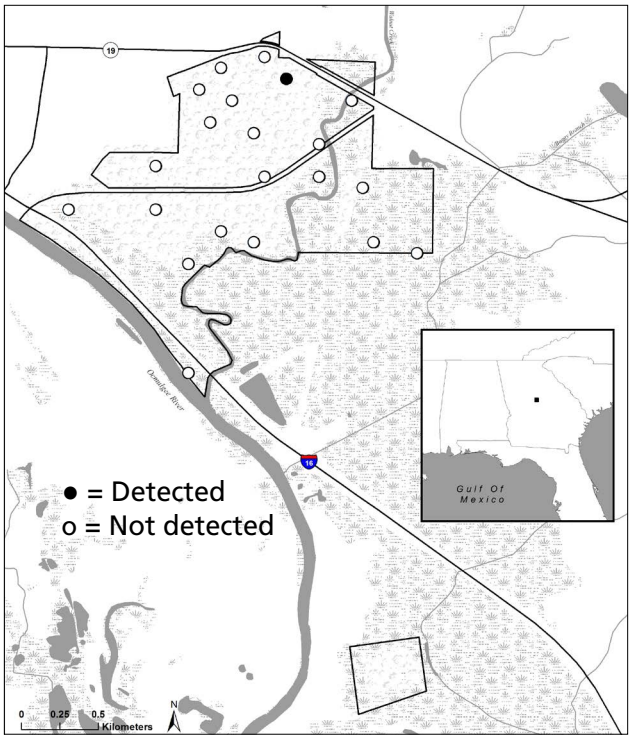


Figure C-42. Sampling locations where pine warbler (*Dendroica pinus*) was detected at Ocmulgee National Monument, 2011.

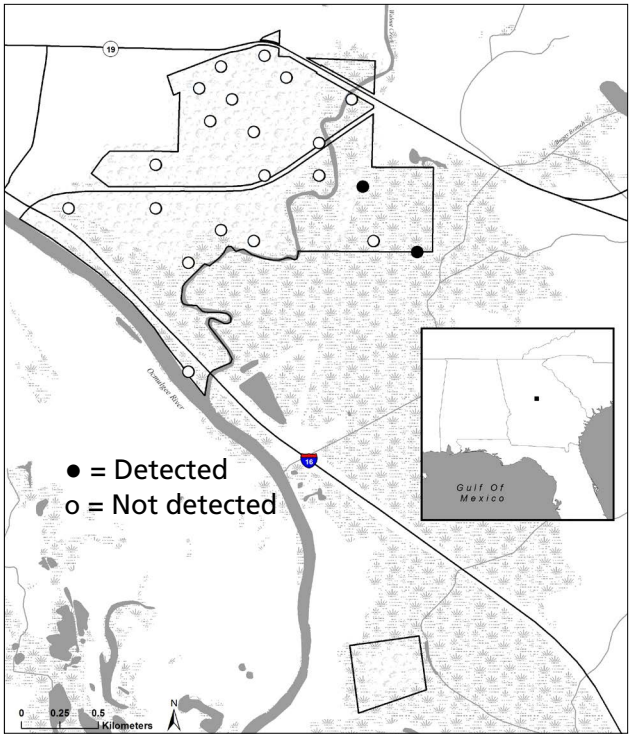


Figure C-43. Sampling locations where prothonotary warbler (*Protonotaria citrea*) was detected at Ocmulgee National Monument, 2011.

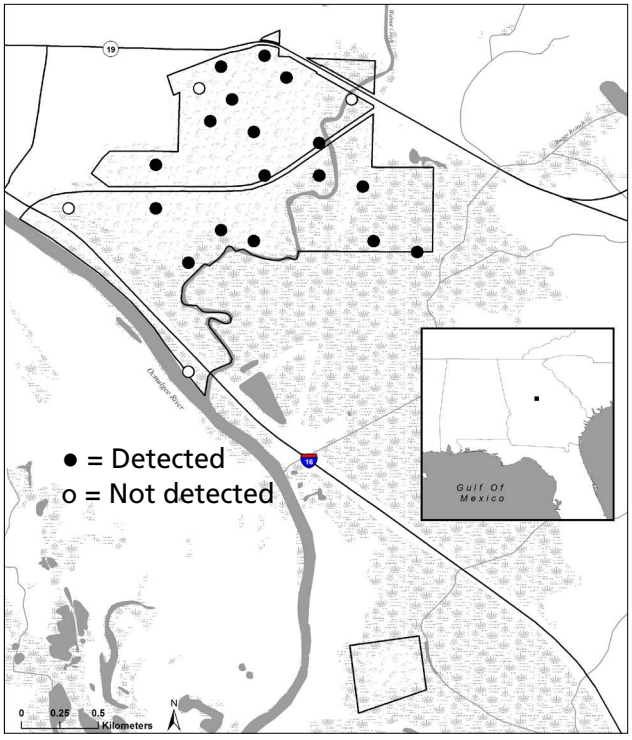


Figure C-44. Sampling locations where red-bellied woodpecker (*Melanerpes carolinus*) was detected at Ocmulgee National Monument, 2011.

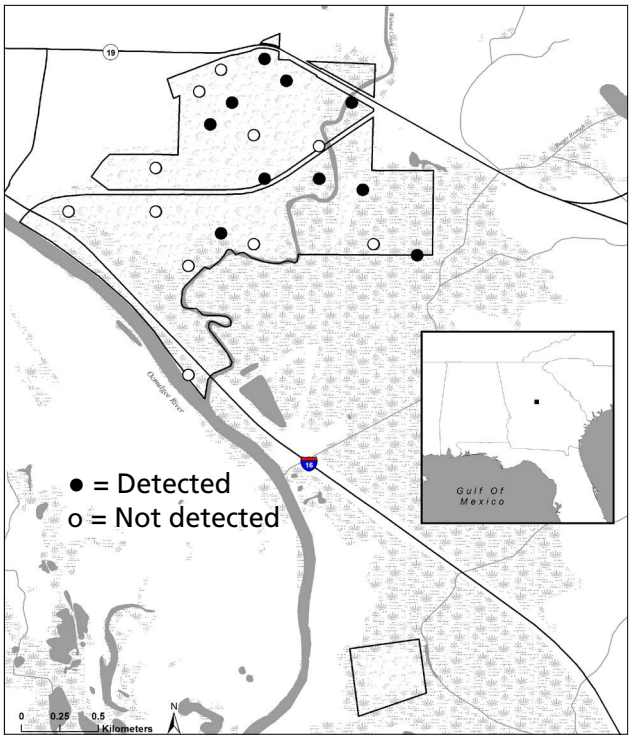


Figure C-45. Sampling locations where red-eyed vireo (*Vireo olivaceus*) was detected at Ocmulgee National Monument, 2011.

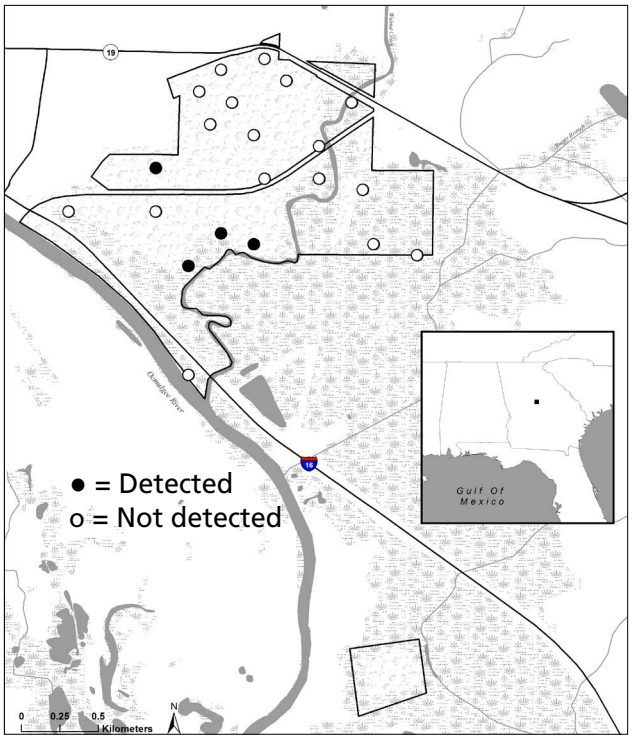


Figure C-46. Sampling locations where red-headed woodpecker (*Melanerpes erythrocephalus*) was detected at Ocmulgee National Monument, 2011.

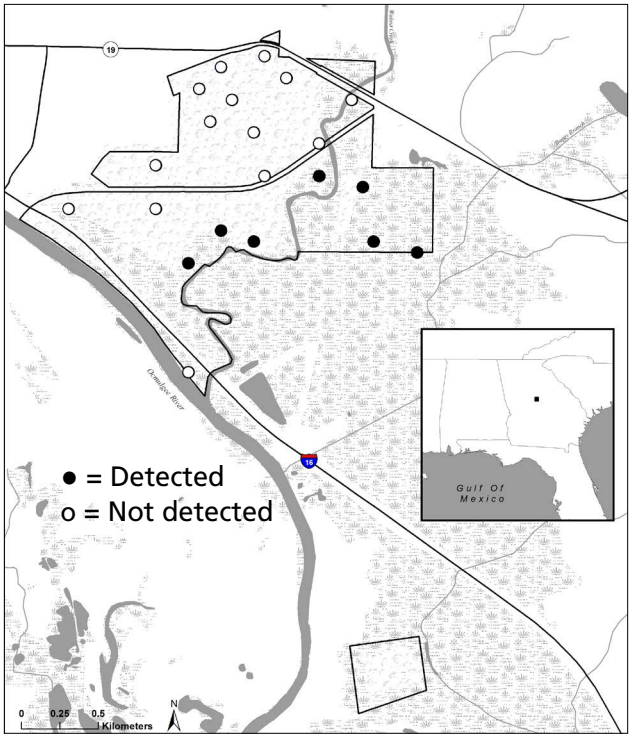


Figure C-47. Sampling locations where red-shouldered hawk (*Buteo lineatus*) was detected at Ocmulgee National Monument, 2011.

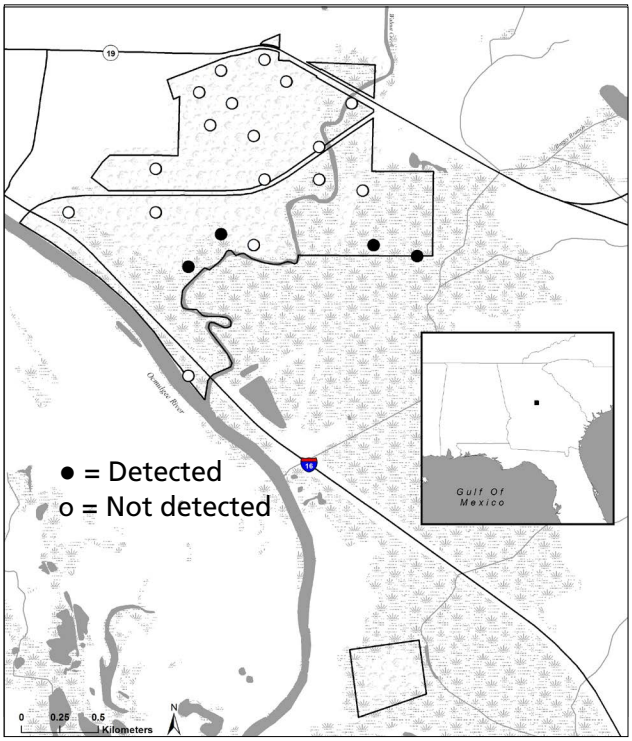


Figure C-48. Sampling locations where red-winged blackbird (*Agelaius phoeniceus*) was detected at Ocmulgee National Monument, 2011.

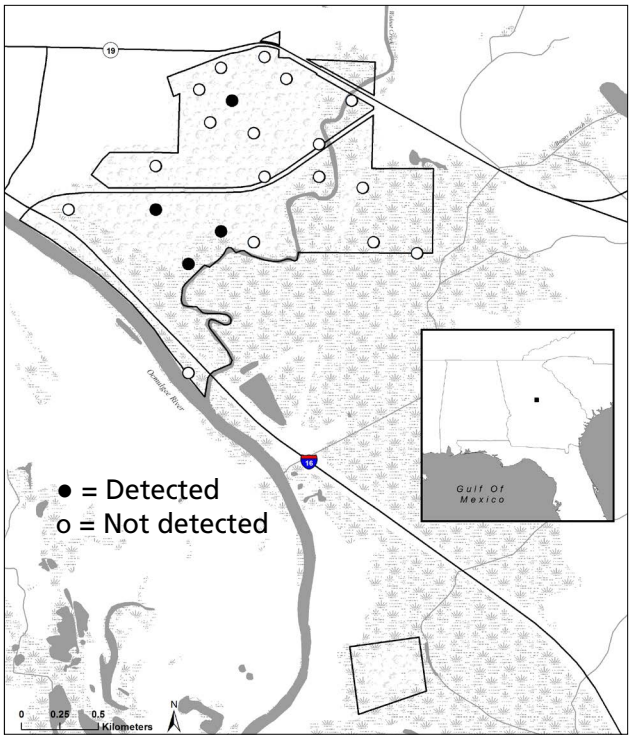


Figure C-49. Sampling locations where scarlet tanager (*Piranga olivacea*) was detected at Ocmulgee National Monument, 2011.

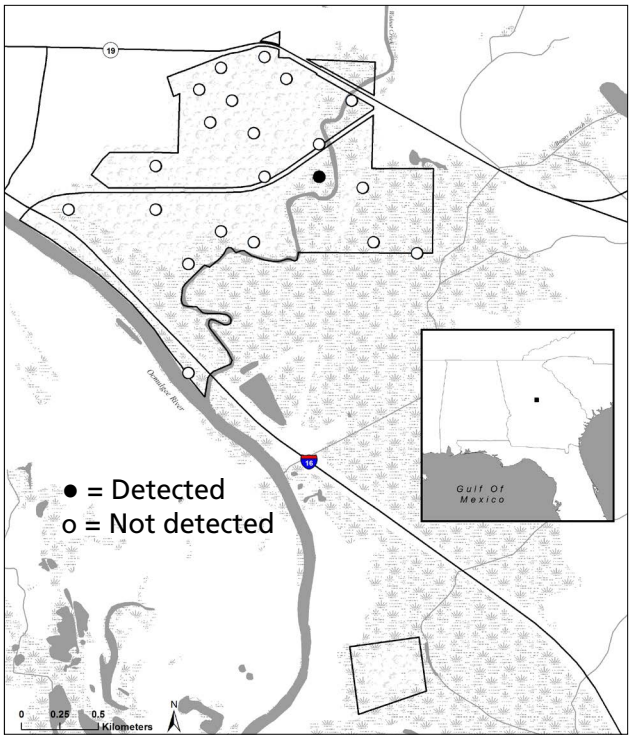


Figure C-50. Sampling locations where song sparrow (*Melospiza melodia*) was detected at Ocmulgee National Monument, 2011.

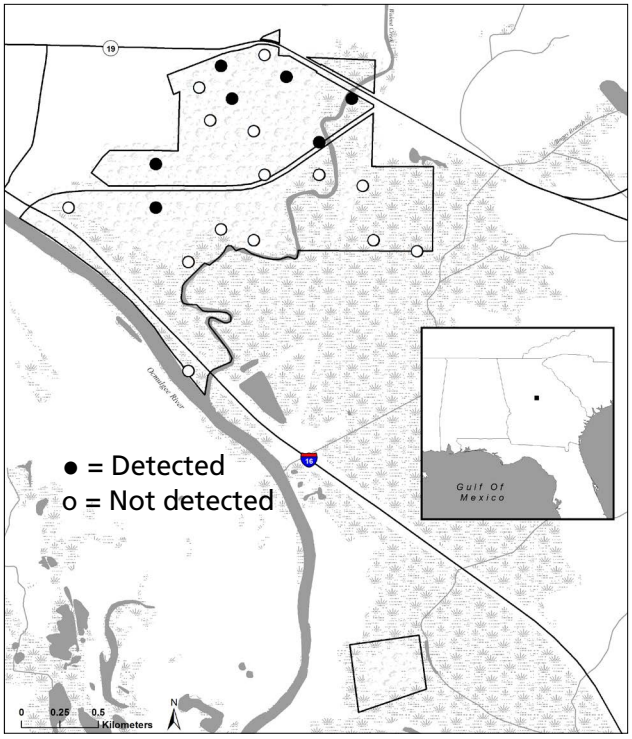


Figure C-51. Sampling locations where summer tanager (*Piranga rubra*) was detected at Ocmulgee National Monument, 2011.

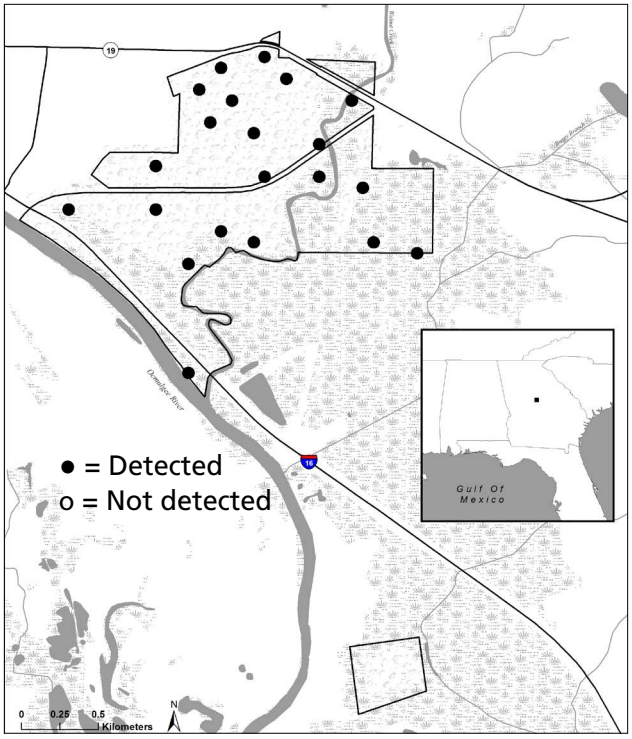


Figure C-52. Sampling locations where tufted titmouse (*Baeolophus bicolor*) was detected at Ocmulgee National Monument, 2011.

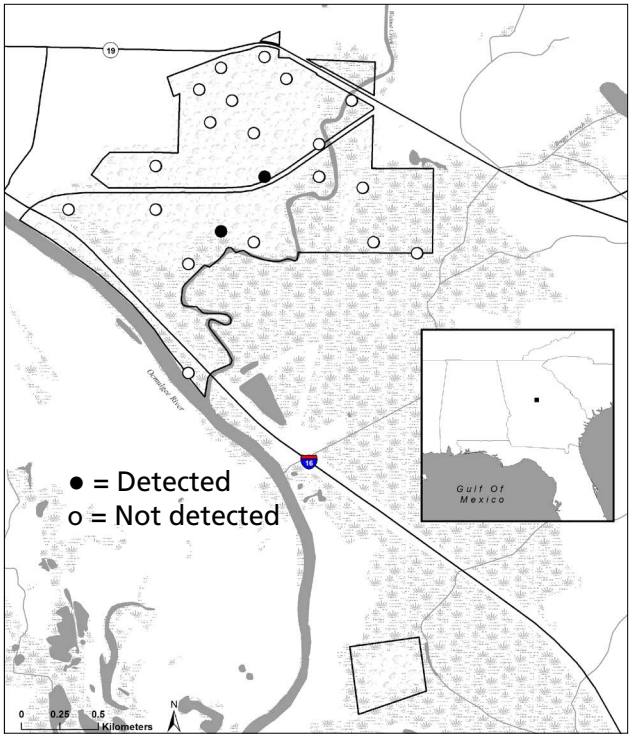


Figure C-53. Sampling locations where veery (*Catharus fuscescens*) was detected at Ocmulgee National Monument, 2011.

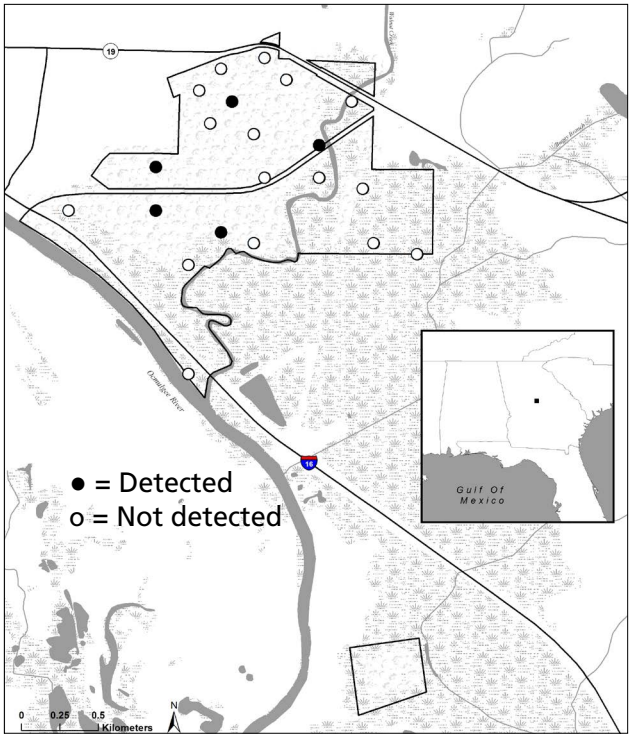


Figure C-54. Sampling locations where white-breasted nuthatch (*Sitta carolinensis*) was detected at Ocmulgee National Monument, 2011.

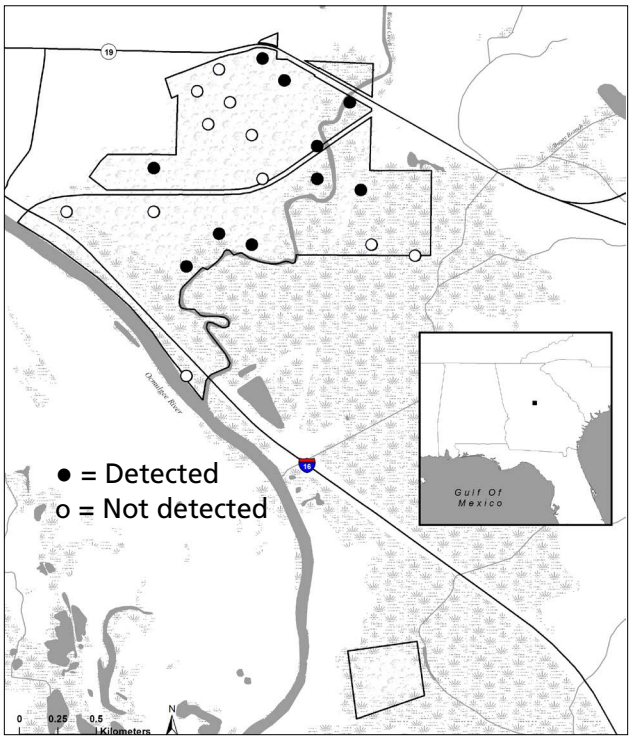


Figure C-55. Sampling locations where white-eyed vireo (*Vireo griseus*) was detected at Ocmulgee National Monument, 2011.

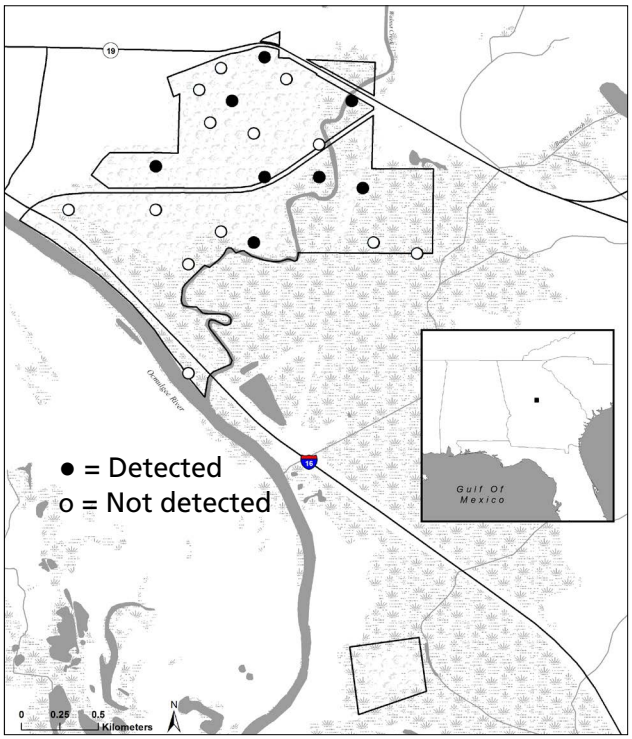


Figure C-56. Sampling locations where white-throated sparrow (*Zonotrichia albicollis*) was detected at Ocmulgee National Monument, 2011.

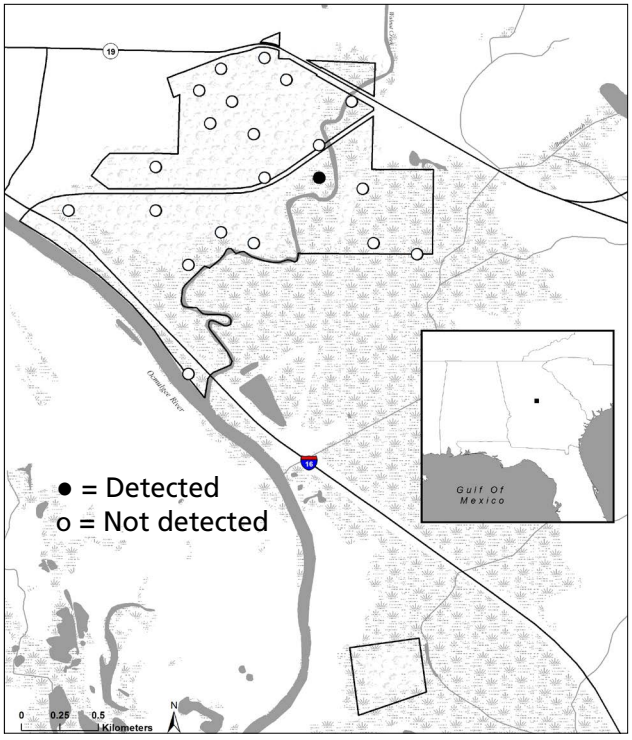


Figure C-57. Sampling locations where yellow warbler (*Dendroica petechia*) was detected at Ocmulgee National Monument, 2011.

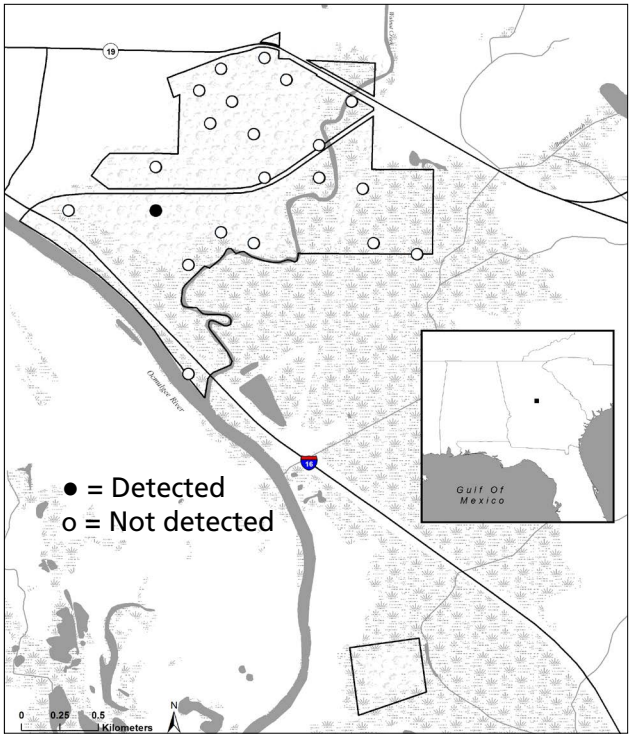


Figure C-58. Sampling locations where yellow-rumped warbler (*Dendroica coronata*) was detected at Ocmulgee National Monument, 2011.

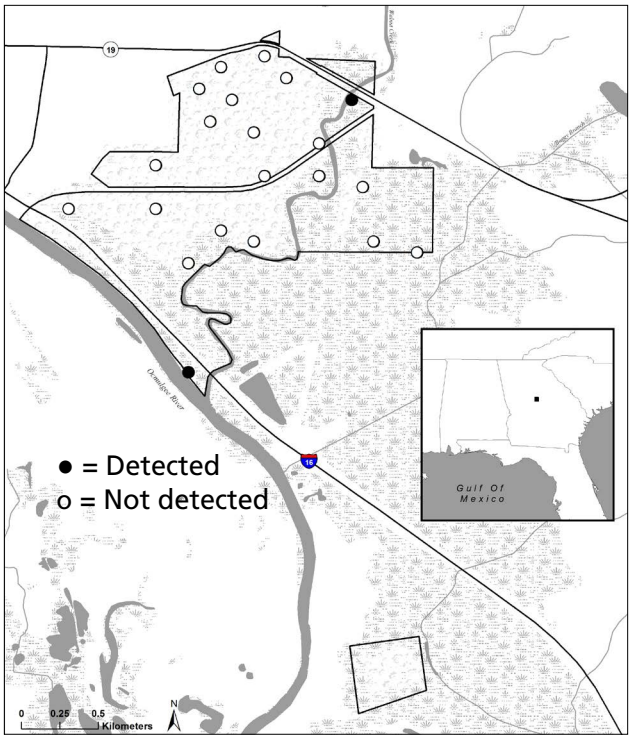


Figure C-59. Sampling locations where yellow-throated warbler (*Dendroica dominica*) was detected at Ocmulgee National Monument, 2011.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 363/132794, May 2016

National Park Service
U.S. Department of the Interior

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