# Waterfowl Aerial Surveys of Monticello and Parr Reservoirs, South Carolina: 2015–2016 Report

A First-Year Report of Activities under Contract Agreement between
The University of Georgia Research Foundation, Inc.
Savannah River Ecology Laboratory and
Kleinschmidt Associates

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## Executive Summary

As a part of the Federal Energy Regulatory Commission (FERC) relicensing process for the Parr Hydroelectric Project (FERC No. 1894) by the South Carolina Electric & Gas Company (SCE&G), SCE&G formed a Fish and Wildlife and Water Quality Resource Conservation Group (RCG) of interested stakeholders, who submitted a study request asking for an evaluation of wintering waterfowl usage at Monticello and Parr Reservoirs, South Carolina. Kleinschmidt Associates, a consulting firm specializing in engineering, regulatory management and environmental services, is coordinating the relicensing process for SCE&G. In October 2015, the University of Georgia's Savannah River Ecology Laboratory (SREL) of Aiken, South Carolina, entered into a sub-consultant agreement with Kleinschmidt Associates to provide aerial survey data from two consecutive years describing wintering waterfowl use of Monticello and Parr Reservoirs, which are located in Newberry and Fairfield Counties, South Carolina.

In year one, nine (9) fixed-wing aerial surveys of the entire Monticello Reservoir basin and Parr Shoals Reservoir from the Parr Shoals Dam to Henderson Island were conducted between 17 November, 2015 and 15 March, 2016, during which nearly 2,200 waterfowl (representing 9 species) were documented using the Monticello Reservoir and over 4,900 waterfowl (representing 11 species) were recorded using Parr Reservoir. Nine and eleven waterfowl species (including American Coots [*Fulica americana*]) were identified using Monticello and Parr Reservoirs, respectively, during the first-year surveys. A greater diversity of dabbling ducks was seen on Parr Reservoir than on Monticello Reservoir. However, the same three diving duck species, including ring-necked ducks, lesser scaup (*Aythya affinis*), and buffleheads (*Bucephala albeola*), were seen on both reservoirs. Canada geese (*Branta canadensis*), mallards, and ring-necked ducks were seen on Monticello Reservoir during all nine aerial surveys; ring-necked ducks (88.9% of surveys) and mallards (77.8% of surveys) were the most-often observed species on Parr Reservoir. Most waterfowl seen on Parr Reservoir were found at Broad River WMA and/or Enoree WMA, where active management for waterfowl by SCDNR has created favorable conditions (e.g., food, cover, limited human disturbance) preferred by waterfowl. There was more late-season (particularly late February and March) waterfowl use of the Enoree WMA than had been the case earlier in the fall/winter while the waterfowl hunting season was active.

Dabbling duck numbers on Monticello Reservoir never exceeded 78 birds on an individual flight, but in contrast, dabbling duck numbers on Parr Reservoir exceeded 100 individuals on five of nine surveys. Diving duck numbers on Monticello Reservoir exceeded 100 individuals on only one survey, but again in contrast, diving duck numbers on Parr Reservoir exceeded 100 individuals on all but one flight. In contrast to higher duck use of Parr Reservoir (including Broad River and Enoree WMAs) than Monticello Reservoir, Canada geese were seen on Monticello more consistently and in higher numbers than on Parr Reservoir. Snow geese (*Chen caerulescens*) however, were only seen on Parr Reservoir and on only three surveys. American coots were seen on Monticello Reservoir on three aerial surveys, while seen on only a single flight over Parr Reservoir. There was no clear relationship between Parr Shoal Reservoir water levels at the time of aerial surveys and numbers or types of waterfowl seen at Parr Shoals reservoir, including the WMAs. However, as water levels at Broad River WMA impoundments

were actively drawn down for management purposes in March, following the hunting season, waterfowl naturally moved out of those managed impoundments.

Concentrations of 50+ waterfowl observed on Parr Reservoir included primarily the Broad River and Enoree WMAs. For the Monticello Reservoir, waterfowl concentration locations were spread widely around the reservoir, but flocks appeared to favor the western half of the reservoir and coves elsewhere that provided protection from the prevailing winds.

In addition to the waterfowl observed during the aerial surveys, we also noted other avian species (non-game species) on both reservoirs as they were encountered during the aerial surveys, including mostly piscivorous birds. Among these additional species, most frequently recorded were non-specific gulls/terns and double-crested cormorants (*Phalacrocorax auritus*), which were seen on both reservoirs on almost all surveys. Perhaps of more interest was the bald eagle (*Haliaeetus leucocephalus*) sightings made during the waterfowl surveys. Bald eagles were seen on eight of nine surveys of Parr Reservoir and three of nine surveys of Monticello Reservoir. Bald eagle sightings included both adults (8) and immature (11) birds.

## Introduction

South Carolina Electric & Gas Company (SCE&G) is the Licensee of the Parr Hydroelectric Project (FERC No. 1894). The Project consists of the Parr Shoals Hydro Development and the Fairfield Pumped Storage Development. Both developments are located along the Broad River in Newberry and Fairfield Counties, South Carolina. The Project is currently involved in a relicensing process which involves cooperation and collaboration between SCE&G as licensee and a variety of stakeholders including state and federal resource agencies, state and local government, non-governmental organizations (NGOs), and interested individuals. The collaboration and cooperation is essential to the identification and treatment of operational, economic, and environmental issues associated with a new operating license for the Project. Kleinschmidt Associates, a consulting firm specializing in engineering, regulatory management and environmental services, is coordinating the relicensing process for SCE&G.

In preparation for relicensing, SCE&G formed a Fish and Wildlife and Water Quality Resource Conservation Group (RCG) which is comprised of interested stakeholders who are working with SCE&G to identify potential issues, make biological study recommendations, and provide technical and experience-based input related to wildlife resources in the Project area. During an initial scoping meeting to identify issues of importance, the RCG recognized the need for a waterfowl survey to better understand waterfowl utilization of Project waters. Further, this information will be useful in evaluating potential Project effects (including water level fluctuation effects) on wintering waterfowl utilizing Monticello and Parr reservoirs. In October 2015, the University of Georgia's Savannah River Ecology Laboratory (SREL) of Aiken, South Carolina, entered into a sub-consultant agreement with Kleinschmidt Associates to provide aerial survey data from two consecutive years describing wintering waterfowl use of Monticello and Parr Reservoirs. The primary objective of this study was to evaluate the current abundance and distribution of wintering waterfowl (ducks, geese, swans, and coots) using Monticello and Parr Reservoirs. Herein, we summarize data collected by SREL during nine (9) aerial surveys of

waterfowl conducted during the first year, with surveys running from mid-November, 2015 through March, 2016.

## Study Area

The Parr Hydroelectric Project is located in Newberry and Fairfield Counties, South Carolina, on the Broad River, approximately 26 river miles upstream from the City of Columbia, South Carolina. The Project includes the existing Parr Shoals Development, which consists of a powerhouse with 6 generators, a 2,715 foot long dam, the 4,400 acre Parr Shoals Reservoir (Figure 1), and transmission and support facilities. The Project also includes the existing Fairfield Pumped Storage Development, which is composed of the 6,800 acre Monticello Reservoir (Figure 2), four earthen dams, an intake channel, a gated intake structure, four surface penstocks splitting into eight concrete-encased penstocks, a semi-outdoor generating station housing eight pump-turbine units and transmission and support facilities. The two developments are operated together as a single hydroelectric generating facility which utilizes pumped storage of water to efficiently provide energy as needed based on customer demand. The facilities can generate as much as 544,000 kilowatts during periods of high electricity demand. Functionally, water in Monticello Reservoir flows through turbine generators and continues into Parr Reservoir where it is held. When energy demands are low, electricity from base-load fossil and nuclear generating plants is used to pump water back into Monticello Reservoir. Monticello Reservoir has little natural inflow other than negligible rainfall in the immediate area of the reservoir, so pumping of water from Parr Reservoir back into Monticello Reservoir is necessary to maintain the needed water resource.

The Project's alternate cycles of generation and pumping cause daily fluctuations in the water levels of both Monticello and Parr Reservoirs. Monticello Reservoir drops up to 4.5 feet over a 10 to 12 hour period during the generating phase. At the same time, the water is flowing into Parr Reservoir, causing it to rise as much as 10 feet. During the pumping cycle the reverse occurs, with water level rises in Monticello Reservoir and drops in Parr Reservoir. Figure 3 shows the Parr Reservoir elevation of surface waters during the period when aerial surveys were executed through the fall/winter of 2015–2016. In addition to its use as part of the Fairfield Pumped Storage, Monticello Reservoir also provides cooling water for the 966 megawatt V. C. Summer Nuclear Station located on its shores (Figure 2). Approximately 7.2 miles of the Monticello Reservoir shoreline are within the Nuclear Exclusion Zone "NEZ" of the V. C. Summer Nuclear Station and thus are not open to access by the general public. The shoreline within the NEZ is marked with signs and buoys and is not available for public use. A smaller Monticello Sub-Impoundment (The Recreational Lake; Figure 2) is located north of the large body of water, is about 300 acres in size with 10.2 miles of shoreline, and is maintained at a stable water level not affected by the operation of the pumped storage facility. This lake was constructed by SCE&G solely for recreational use. The Parr Shoals Reservoir was originally formed in 1914 as part of a conventional hydro project at Parr Shoals. The height of its dam was raised nine feet in the 1970s during construction of the pumped storage project, nearly doubling the reservoir's surface area.

Both Monticello and Parr Reservoirs offer a variety of recreational opportunities to the public. In particular, portions of Project lands are under management jurisdiction of the South Carolina Department of Natural Resources (SCDNR). Waterfowl management areas located on the Broad River and Enoree River are available for public use and are managed by the SCDNR under its Game Management Program. The Broad River and Enoree River Waterfowl Management Areas (WMA) provide important habitat for overwintering waterfowl, as well as recreational waterfowl hunting opportunities that are important to the local economy. Both areas were established in the late 1970s as mitigation when Parr Reservoir was expanded during construction of the Fairfield Pumped Storage Development. The Broad River WMA includes five impoundments totaling approximately 130 acres of waterfowl habitat. The area includes one green-tree impoundment with an oak canopy; the remaining four impoundments are planted in corn or millet and flooded seasonally. Over 500 acres of the remaining area are either upland or uncontrolled backwater. Although a wide variety of duck species may be present, the primary species harvested are ring-necked ducks (*Aythya collaris*), wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), and green-winged teal (*Anas crecca*). Mallard numbers have reportedly decreased in harvests from recent years.

## Aerial Surveys Methods

On days when aerial surveys were conducted, SREL personnel traveled by UGA vehicle to Daniel Field Airport, on Highland Avenue in Augusta, GA where the services of Augusta Aviation, Inc. (http://www.augustaaviation.com) were engaged to provide fixed-wing aircraft (Cessna Skyhawk) and pilot services for the aerial waterfowl surveys over Monticello and Parr reservoirs. These aerial surveys were conducted in close coordination with V.C. Summer Nuclear Station's security organization (Mr. Gregg Douglass) and local air-traffic controllers to assure safety of all aircraft operating in the vicinity of Monticello and Parr reservoirs during the execution of these surveys. Both reservoirs, in their entirety, were surveyed for waterfowl use. Specifically with respect to Parr Reservoir, aerial surveys were conducted from Parr Shoals Dam to the base of Henderson Island and included the Enoree River and Broad River WMAs, managed by SCDNR (Figure 1).

Because of potential bias associated with multiple observers, all aerial surveys were conducted by a single observer. The SREL observer, C. S. Eldridge, accompanied the pilot in the aircraft; the pilot was instructed to fly at an altitude of approximately 200–300 ft and airspeed of about 80–105 mph, consistent with Federal Aviation Administration (FAA) regulations. Surveys consisted of complete coverages of the lake basins, thus providing what were considered true count data as opposed to randomized line-transect surveys which would yield calculated estimates of bird abundance (this latter technique is often used when study areas are much larger geographic regions). The pilot was instructed to circle above larger flocks of birds while species were identified and counts were made. The SREL observer identified species and counted all waterfowl (ducks, geese, swans, and coots) observed during aerial surveys. Bird species and numbers of individuals were recorded directly onto field maps of the two reservoirs; after survey completion, observed birds were tallied by reservoir and species and recorded on a summary data sheet. Boats observed during the aerial surveys were noted as well. Additional data provided on each summary data sheet included: date, start/end times of survey, and general weather

conditions at the time of the aerial survey (i.e., visibility, wind, temperature, rainfall). Meteorological information from a weather station near Peak, SC (KSCLITTL12) was also gathered for each flight period. Aerial surveys were conducted during the mid-late morning hours, with all surveys being started by 1125hrs. Actual duration of each aerial survey was approximately 1.5 hours, plus additional flight time of about 40 minutes each for travel time to and from Daniel Field Airport in Augusta, GA.

Data were stored on a networked PC-workstation operating in a Microsoft-Windows environment. The JMP Analysis System (SAS Institute, Inc., Cary, NC) was used to summarize the aerial survey data. Data were summarized in both graphical and tabular format. Summaries below include location graphics of waterfowl numbers, as well as tabular summaries and descriptions of temporal changes in waterfowl distributions (species- and/or subfamily-specific). Waterfowl surveys were conducted during the fall-winter months (mid-November through late-March) of 2015-2016. As previously noted, nine (9) aerial surveys were conducted over a period of five (5) months, executed as follows: 1 in late November, 2 in December, 2 in January, 2 in February, and 2 in March.

## Aerial Survey Results and Discussion

*Year one (2015–2016)*

During year one, nine fixed-wing aerial surveys of the Monticello and Parr Reservoirs were conducted between 17 November, 2015 and 15 March, 2016. Dates of the nine individual aerial surveys and prevailing weather conditions during the 2015–2016 flights are provided in Table 1.

Nine waterfowl species (includes American Coots [*Fulica americana*]) were identified using Monticello Reservoir during the 2015–2016 aerial surveys (Table 2) and 11 waterfowl species (including coots) were identified using Parr Reservoir during the 2015–2016 aerial surveys (Table 2). A greater diversity of dabbling ducks was seen on Parr Reservoir (5) than on Monticello Reservoir (3; Table 2). However, the same three diving duck species, including ring-necked ducks, lesser scaup (*Aythya affinis*), and buffleheads (*Bucephala albeola*), were seen on both reservoirs (Table 2). Canada geese (*Branta canadensis*), mallards, and ring-necked ducks were seen on Monticello Reservoir during all nine aerial surveys (Table 2); ring-necked ducks (88.9% of surveys) and mallards (77.8% of surveys) were the most-often observed species on Parr Reservoir (Table 2). Most waterfowl seen on Parr Reservoir were found at Broad River WMA and/or Enoree WMA, where active management for waterfowl by SCDNR has created favorable conditions (e.g., food, cover, limited human disturbance) preferred by waterfowl. For the Broad River and Enoree WMAs at Parr Reservoir, the same eight waterfowl species were identified at both WMAs (Table 3), with ring-necked ducks most frequently seen at Broad River WMA (88.9% of surveys), and ring-necked ducks and blue-winged teal (*Anas discors*) most frequently seen at Enoree WMA (44.4% of surveys for each of the two species; Table 3). There was more late-season (particularly late February and March) waterfowl use of the Enoree WMA than had been the case earlier in the fall/winter while the waterfowl hunting season was active.

During these aerial surveys, about 2,200 waterfowl were documented using Monticello Reservoir (Table 4) and more than 4,900 waterfowl were documented using the Parr Reservoir (Table 5). Dabbling duck numbers on Monticello Reservoir never exceeded 78 birds on an individual flight ( $\bar{x}$ = 41.2; Table 4), but in contrast, dabbling duck numbers on Parr Reservoir exceeded 100 individuals on five of nine surveys (maximum = 238; $\bar{x}$ = 104.8; Table 5). Diving duck numbers on Monticello Reservoir exceeded 100 individuals on only one survey (330 on 5 January 2016; $\bar{x}$ = 79.2;), but again in contrast, diving duck numbers on Parr Reservoir exceeded 100 individuals on all but one flight, the last one in March of 2016 (maximum = 665; $\bar{x}$ = 385.6; Table 5). In contrast to higher duck use of Parr Reservoir (including Broad River and Enoree WMAs) than Monticello Reservoir, Canada geese were seen on Monticello more consistently and in higher numbers than on Parr Reservoir (Monticello $\bar{x}$ = 99.0, Parr $\bar{x}$ = 26.4; Tables 4 and 5). Snow geese (*Chen caerulescens*) however, were only seen on Parr Reservoir and on only three surveys (maximum = 62; Table 5). American coots were seen on Monticello Reservoir on three aerial surveys (maximum = 100; Table 4), while seen on only a single flight over Parr Reservoir (245 on 21 December, 2015). There was no clear relationship between Parr Shoal Reservoir water levels at the time of aerial surveys (Figure 3; Table 1) and numbers or types of waterfowl seen at Parr Shoals reservoir, including the WMAs (Table 5). However, as water levels at Broad River WMA impoundments were actively drawn down for management purposes in March, following the hunting season, waterfowl naturally moved out of those managed impoundments.

Figures 4 and 5 show the respective Parr Reservoir and Monticello Reservoir locations of waterfowl concentrations of 50+ individuals observed during aerial surveys in the winter of 2015–2016. For Parr Reservoir, these locations included primarily the Broad River and Enoree WMAs (Figure 4). For the Monticello Reservoir, these locations were spread widely around the reservoir (Figure 5), but flocks appeared to favor the western half of the reservoir and coves elsewhere that provided protection from the prevailing winds.

In addition to the waterfowl observed during the aerial surveys, which were of primary concern for the purposes of this study, we also noted other avian species (non-game species) on both reservoirs as they were encountered during the aerial surveys (Table 2). Most of these species were piscivorous birds, foraging largely or exclusively on fish. Among these additional species, most frequently recorded were non-specific gulls/terns and double-crested cormorants (*Phalacrocorax auritus*; Table 2), which were seen on both reservoirs on almost all surveys. On Monticello Reservoir, we also recorded two species of grebes, including the pied-billed grebe (*Podilymbus podiceps*) and the horned grebe (*Podiceps auritus*), as well as the common loon (*Gavia immer*; Table 2). On Parr Reservoir, we also recorded Anhingas (*Anhinga anhinga*), and flocks of non-specific shorebirds using shoreline areas exposed by receding water levels. Perhaps of more interest was the bald eagle (*Haliaeetus leucocephalus*) sightings made during the waterfowl surveys. Bald eagles were seen on eight of nine surveys of Parr Reservoir and three of nine surveys of Monticello Reservoir (Table 2). Bald eagle sightings included both adults (8) and immature (11) birds.

## Acknowledgments

We extend our sincere thanks to Aaron Fiss, pilot with Augusta Aviation, who, together with SREL's Carol Eldridge, spent numerous hours above Monticello and Parr Reservoirs surveying waterfowl. C. Shane Boring, an Environmental Scientist with Kleinschmidt Associates, provided guidance throughout the study period. Cherie Summer of SREL assisted with contract arrangements. Many thanks to all those involved in one way or another.

Table 1. Weather conditions during waterfowl aerial surveys of Monticello Reservoir and Parr Reservoir in 2015–2016.

| **Survey Date:** | 11/17/2015 | 12/9/2015 | 12/21/2015 | 1/5/2016 | 1/19/2016 | 2/4/2016 | 2/16/2016 | 3/2/2016 | 3/15/2016 |
|---|---|---|---|---|---|---|---|---|---|
| **Observer** | C.S. Eldridge | C.S. Eldridge | C.S. Eldridge | C.S. Eldridge | C.S. Eldridge | C.S. Eldridge | C.S. Eldridge | C.S. Eldridge | C.S. Eldridge |
| **Start Time** | 9:51 | 10:45 | 10:39 | 10:47 | 11:25 | 11:06 | 11:00 | 11:01 | 10:00 |
| **Stop Time** | 11:15 | 12:23 | 12:20 | 12:20 | 12:56 | 12:39 | 12:37 | 12:36 | 11:30 |
| **Noted General Conditions** | PC | SNY/CLM | OVC/CLM | SNY/WNDY | SNY/WNDY | CLDY | SNY/WNDY | SNY/WNDY | SNY/CLM |
| **Peak, SC Temp Range (C)*** | 15-17ºC | 14-16ºC | 8-10ºC | 2-3ºC | 0-1ºC | 12-13ºC | 10-14ºC | 12ºC | 18-22ºC |
| **Peak, SC Wind (mph)*** | NE@3.5-E@6.9 | SW@4.6-SW@8.1 | CLM-N@5.8 | ENE@6.9-NE@8.1 | NNW@4.6-NW@5.8 | W@3.5 | W@6.9-NNW@8.1 | NW@10.4-NNW@9.2 | CLM-NNW@5.8 |
| **Peak, SC Rainfall Rate (mm/hr)*** | None | None | None | None | None | None | None | None | None |
| **Irmo Sky Conditions*** | CLR/BKN | CLR | BKN/OVC | CLR | CLR | SCT | CLR | SCT/BKN | CLR |
| **Parr Shoals Reservoir Water Level (ft)** | 264.4 | 257.2 | 260.4 | 260.1 | 262.0 | 260.4 | 262.9 | 261.3 | 259.5 |

*Central School Road (KSCLITTL12), near Peak, SC Lat: N 34.23 °; Lon: W -81.42 °; Elevation: 462 ft; **Abbreviations**: PC=Partly Cloudy, OVC=Overcast, CLDY = Cloudy, FEW=Few Clouds, SCT=Scattered Clouds, CLR=Clear Skies, BKN=Broken Skies, RN = Rain, SNY = Sunny, CLM = Calm, WNDY = Windy.

Table 2. Species list compiled from waterfowl aerial surveys of Monticello Reservoir and Parr Reservoir (including Broad River and Enoree Waterfowl Management Areas) in 2015–2016. Shown in parentheses are percentages of the 9 aerial surveys when a given species was observed.

| Guild | Common Name | Scientific Name | Monticello | Parr |
|---|---|---|---|---|
| **Waterfowl:** | | | | |
| **Geese** | | | | |
| | Canada Goose | *Branta canadensis* | **X** (100%) | **X** (44.4%) |
| | Snow Goose | *Chen caerulescens* | NONE | **X** (33.3%) |
| **Dabbling Ducks** | | | | |
| | Mallard | *Anas platyrhynchos* | **X** (100%) | **X** (77.8%) |
| | Gadwall | *Anas strepera* | NONE | **X** (66.7%) |
| | American Wigeon | *Anas americana* | NONE | **X** (33.3%) |
| | Blue-winged Teal | *Anas discors* | **X** (66.7%) | **X** (66.7%) |
| | Northern Shoveler | *Anas clypeata* | NONE | **X** (44.4%) |
| | Wood Duck | *Aix sponsa* | X (77.8%) | NONE |
| **Diving Ducks** | | | | |
| | Ring-necked Duck | *Aythya collaris* | **X** (100%) | **X** (88.9%) |
| | Lesser Scaup | *Aythya affinis* | **X** (44.4%) | **X** (33.3%) |
| | Bufflehead | *Bucephala albeola* | **X** (55.6%) | **X** (11.1%) |
| **Mergansers** | | | | |
| | Hooded Merganser | *Lophodytes cucullatus* | **X** (22.2%) | NONE |
| **Rails** | | | | |
| | American Coot | *Fulica americana* | **X** (33.3%) | **X** (11.1%) |
| **Other Birds:** | | | | |
| | Common Loon | *Gavia immer* | **X** (55.6%) | NONE |
| | Anhinga | *Anhinga anhinga* | NONE | **X** (22.2%) |
| | Double-crested Cormorant | *Phalacrocorax auritus* | **X** (100%) | **X** (100%) |
| | Pied-billed Grebe | *Podilymbus podiceps* | **X** (88.9%) | NONE |
| | Horned Grebe | *Podiceps auritus* | **X** (44.4%) | NONE |
| | Gulls/Terns | | **X** (100%) | **X** (88.9%) |
| | Shorebirds | | NONE | **X** (22.2%) |
| | Bald Eagle | *Haliaeetus leucocephalus* | **X** (33.3%) | **X** (88.9%) |

Table 3. Species list compiled from waterfowl aerial surveys of Broad River and Enoree Waterfowl Management Areas in 2015–2016. Shown in parentheses are percentages of the 9 aerial surveys when a given species was observed.

| Guild | Common Name | Scientific Name | Broad River | Enoree |
|---|---|---|---|---|
| **Waterfowl:** | | | | |
| **Geese** | | | | |
| | Canada Goose | *Branta canadensis* | **X** (22.2%) | **X** (11.1%) |
| | Snow Goose | *Chen caerulescens* | NONE | NONE |
| **Dabbling Ducks** | | | | |
| | Mallard | *Anas platyrhynchos* | **X** (33.3%) | **X** (11.1%) |
| | Gadwall | *Anas strepera* | **X** (22.2%) | **X** (22.2%) |
| | American Wigeon | *Anas americana* | **X** (11.1%) | **X** (11.1%) |
| | Blue-winged Teal | *Anas discors* | **X** (33.3%) | **X** (44.4%) |
| | Northern Shoveler | *Anas clypeata* | **X** (33.3%) | **X** (11.1%) |
| | Wood Duck | *Aix sponsa* | NONE | NONE |
| **Diving Ducks** | | | | |
| | Ring-necked Duck | *Aythya collaris* | **X** (88.9%) | **X** (44.4%) |
| | Lesser Scaup | *Aythya affinis* | **X** (33.3%) | **X** (11.1%) |
| | Bufflehead | *Bucephala albeola* | NONE | NONE |
| **Mergansers** | | | | |
| | Hooded Merganser | *Lophodytes cucullatus* | NONE | NONE |
| **Rails** | | | | |
| | American Coot | *Fulica americana* | NONE | NONE |

Table 4. Counts of waterfowl identified during aerial surveys of Monticello Reservoir in 2015–2016.

| **Survey Date:** | 11/17/15 | 12/9/15 | 12/21/15 | 1/5/16 | 1/19/16 | 2/4/16 | 2/16/16 | 3/2/16 | 3/15/16 | All Surveys |
|---|---|---|---|---|---|---|---|---|---|---|
| Mallard | 31 | 52 | 41 | 29 | 10 | 6 | 13 | 18 | 11 | 211 |
| Gadwall | | | | | | | | | | 0 |
| American Wigeon | | | | | | | | | | 0 |
| Blue-winged Teal | | | 35 | 35 | 45 | 5 | 23 | 2 | | 145 |
| Northern Shoveler | | | | | | | | | | 0 |
| Wood Duck | 3 | 3 | 2 | | 4 | 1 | | 1 | 1 | 15 |
| **Total Dabblers:** | **34** | **55** | **78** | **64** | **59** | **12** | **36** | **21** | **12** | **371** |
| Lesser Scaup | 10 | 6 | | 115 | | | | | 15 | 146 |
| Ring-necked Duck | 39 | 77 | 85 | 210 | 30 | 25 | 20 | 5 | 55 | 546 |
| Bufflehead | | | 1 | 5 | 2 | 10 | | 3 | | 21 |
| **Total Divers:** | **49** | **83** | **86** | **330** | **32** | **35** | **20** | **8** | **70** | **713** |
| Hooded Merganser | | | | 7 | 1 | | | | | 8 |
| Unidentified Ducks | | | | | | | | | | 0 |
| **Total Ducks:** | **83** | **138** | **164** | **401** | **92** | **47** | **56** | **29** | **82** | **1092** |
| Snow Goose | | | | | | | | | | 0 |
| Canada Goose | 281 | 126 | 74 | 80 | 68 | 59 | 122 | 35 | 46 | 891 |
| **Total Geese:** | **281** | **126** | **74** | **80** | **68** | **59** | **122** | **35** | **46** | **891** |
| American Coot | | 100 | | | 45 | | | | 70 | 215 |
| **Grand Total:** | **364** | **364** | **238** | **481** | **205** | **106** | **178** | **64** | **198** | **2,198** |

Table 5. Counts of waterfowl identified during aerial surveys of Parr Reservoir (including Broad River and Enoree Waterfowl Management Areas) in 2015–2016.

| **Survey Date:** | 11/17/15 | 12/9/15 | 12/21/15 | 1/5/16 | 1/19/16 | 2/4/16 | 2/16/16 | 3/2/16 | 3/15/16 | All Surveys |
|---|---|---|---|---|---|---|---|---|---|---|
| Mallard | | 6 | | 35 | 45 | 10 | 10 | 4 | 12 | 122 |
| Gadwall | | 2 | | 8 | 10 | 60 | 8 | | 5 | 93 |
| American Wigeon | | | 40 | 15 | | | | 50 | | 105 |
| Blue-winged Teal | | 230 | 10 | 45 | | 120 | | 60 | 8 | 473 |
| Northern Shoveler | | | 50 | 25 | | | 35 | 40 | | 150 |
| Wood Duck | | | | | | | | | | 0 |
| **Total Dabblers:** | **0** | **238** | **100** | **128** | **55** | **190** | **53** | **154** | **25** | **943** |
| Lesser Scaup | | | 19 | | | | 65 | 40 | | 124 |
| Ring-necked Duck | 600 | 665 | 285 | 420 | 230 | 570 | 100 | 470 | | 3,340 |
| Bufflehead | | | 6 | | | | | | | 0 |
| **Total Divers:** | **600** | **665** | **310** | **420** | **230** | **570** | **165** | **510** | **0** | **3,470** |
| Hooded Merganser | | | | | | | | | | 0 |
| Unidentified Ducks | | | | | 10 | | | | | 10 |
| **Total Ducks:** | **600** | **903** | **410** | **548** | **295** | **760** | **218** | **664** | **25** | **4,423** |
| Snow Goose | | | | 62 | 39 | 1 | | | | 102 |
| Canada Goose | | 20 | 47 | 4 | | 65 | | | | 136 |
| **Total Geese:** | **0** | **20** | **47** | **66** | **39** | **66** | **0** | **0** | **0** | **238** |
| American Coot | | | 245 | | | | | | | 245 |
| **Grand Total:** | **600** | **923** | **702** | **614** | **334** | **826** | **218** | **664** | **25** | **4,906** |

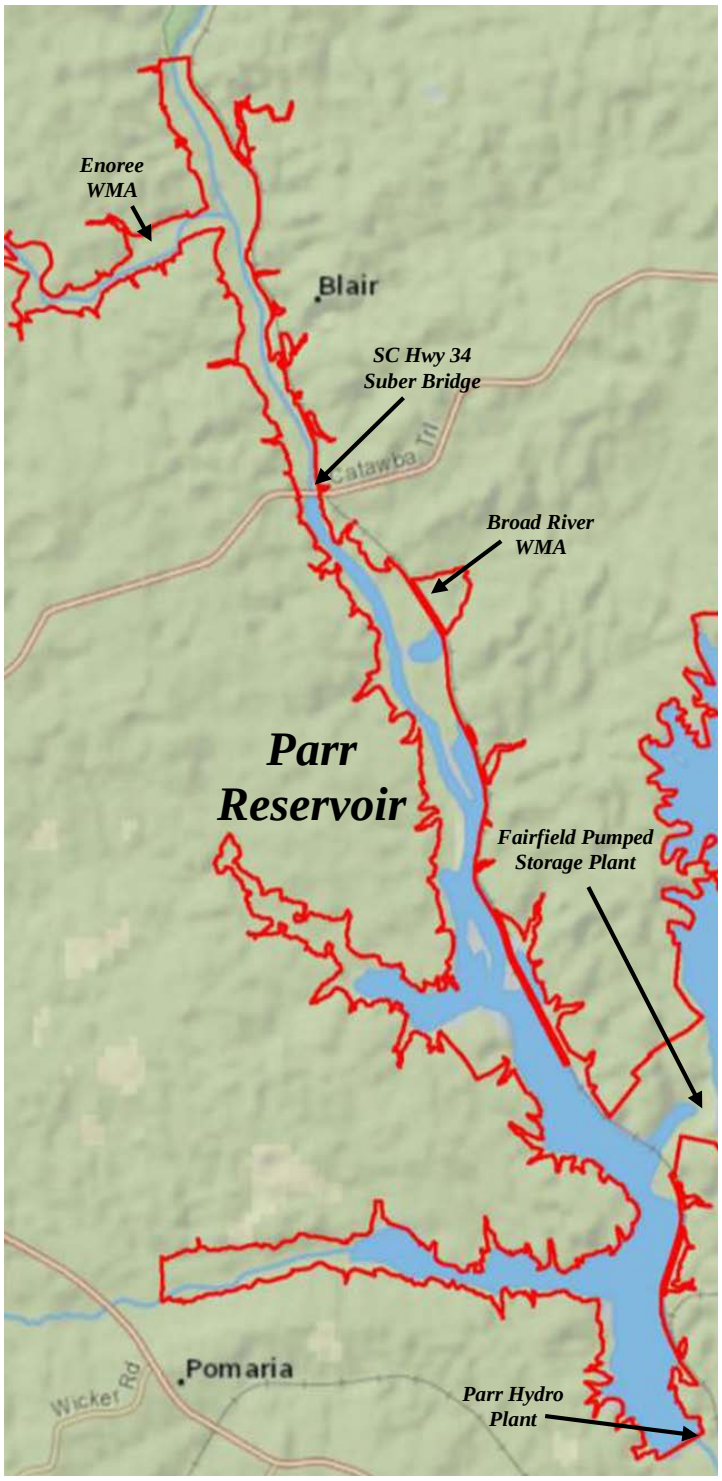


Figure 1. Map of Parr Shoals Reservoir showing locations referred to in the report. The Project boundary is outlined in red.


Figure 2. Map of Monticello Reservoir showing locations referred to in the report. The Project boundary is outlined in red.

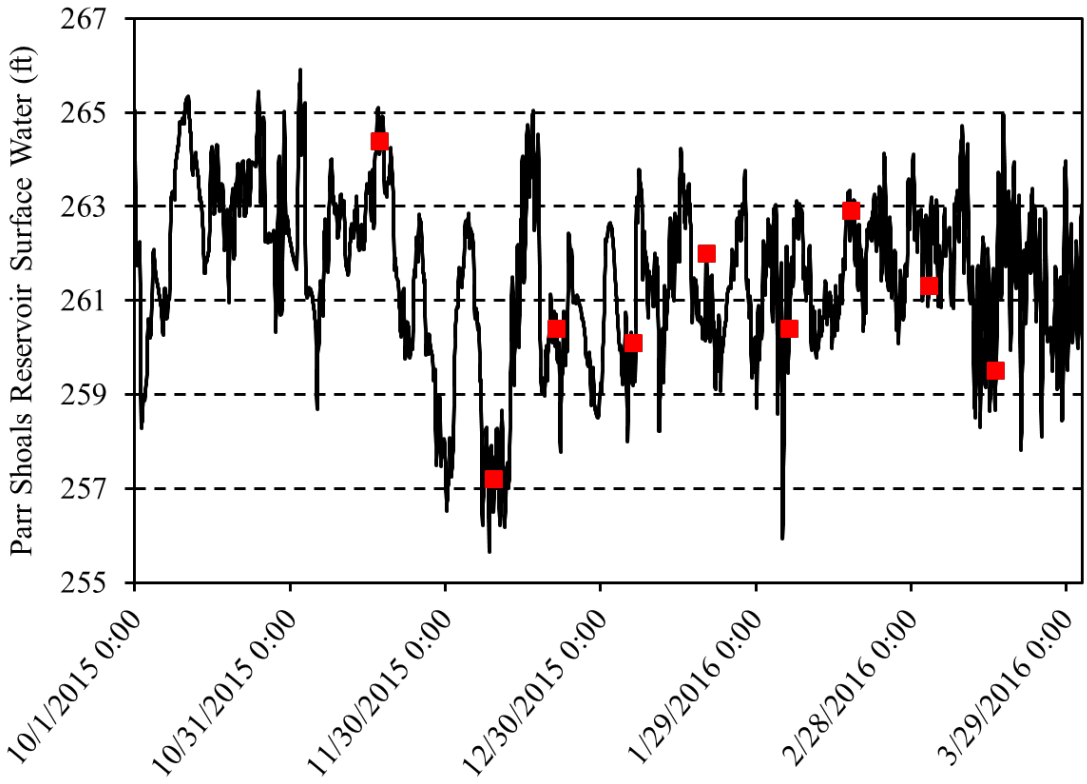


Figure 3. Parr Shoals Reservoir daily gage height (feet; full pool = 266ft [top of crest gates]) during October 1, 2015–March 31, 2016; Location: Latitude 34°15'40", Longitude 81°19'55" (NAD27), Fairfield Co., SC, Hydrologic Unit 03050106; Description: Drainage area: 4,750.00 square miles; Datum of gage: 000 feet above NGVD29. Source: U.S. Geological Survey National Water Information System. Parr Shoals Reservoir water levels at the time of the waterfowl aerial surveys are shown in by the red symbols.

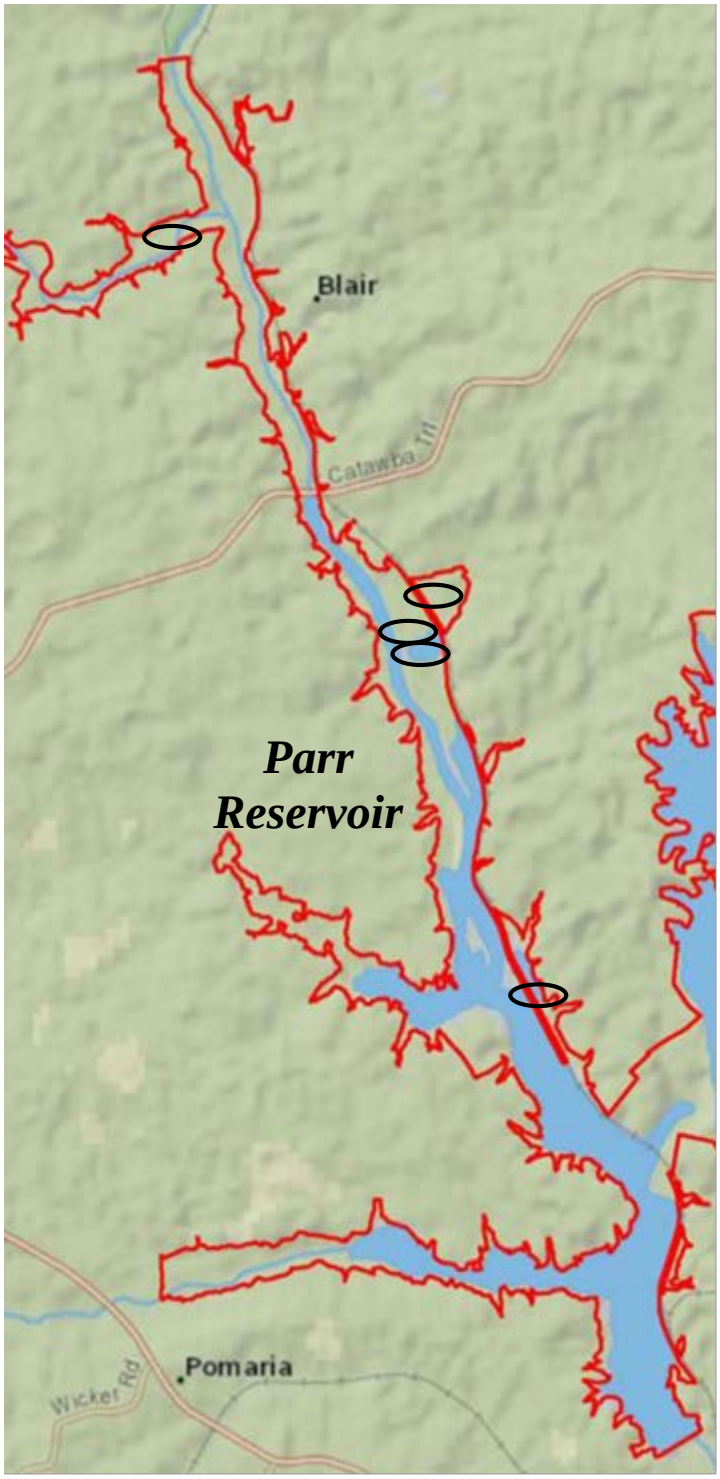


Figure 4. Map of Parr Reservoir showing locations of waterfowl concentrations of 50+ individuals observed during aerial surveys in 2015–2016. The Project boundary is outlined in red.

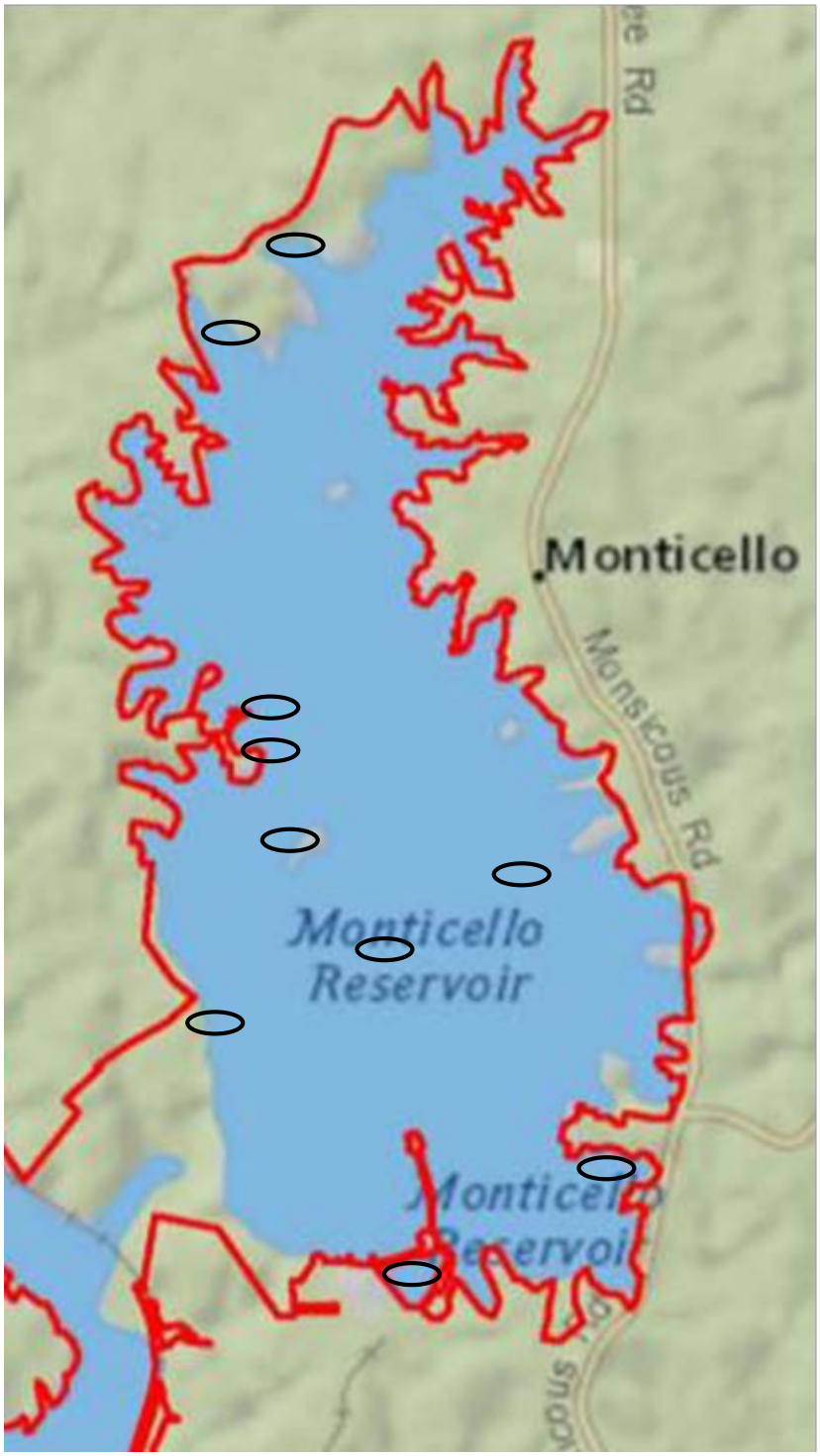


Figure 5. Map of Monticello Reservoir showing locations of waterfowl concentrations of 50+ individuals observed during aerial surveys in 2015–2016. The Project boundary is outlined in red.