

**Waterfowl Aerial Surveys of Lake Murray, South Carolina:
2006–2007 Report**

A Final 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 Saluda Hydroelectric Project (FERC No. P-516) by the South Carolina Electric & Gas Company (SCE&G), the South Carolina Department of Natural Resources (SCDNR) submitted a study request asking for an evaluation of wintering waterfowl usage at Lake Murray, South Carolina. Kleinschmidt Associates, a consulting firm specializing in engineering, regulatory management and environmental services, is coordinating the relicensing process for SCE&G. In early November 2006, 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 describing waterfowl use of Lake Murray, which is located in Lexington, Richland, Saluda, and Newberry Counties.

Six fixed-wing aerial surveys of the entire Lake Murray basin were conducted between 14 December, 2006 and 27 February, 2007, during which over 4,000 waterfowl were documented using the reservoir. Seven waterfowl species (includes American Coots [*Fulica americana*]) were identified using Lake Murray during the surveys. The Mallard (*Anas platyrhynchos*) was the only dabbling duck species seen at Lake Murray and was the only species observed on every aerial survey, but their numbers never exceeded more than 211 individuals on any single survey. Canada Geese (*Branta canadensis*) were observed on five of six aerial surveys, with a maximum of 144 observed. Three diving duck species were observed at Lake Murray, including the Bufflehead (*Bucephala albeola*), Ring-necked Duck (*Aythya collaris*), and Lesser Scaup (*Aythya affinis*). Lesser Scaup were the most numerous waterfowl seen on Lake Murray during the aerial surveys, with more than 500 observed on three occasions, and a maximum of 1,535 observed on 19 February, 2007. Lesser Scaup were noted in the vicinity of Goat Island and Pine Island near the Saluda Dam on three surveys where they were observed to have churned-up the shallow waters, presumably as they were bottom feeding. Lesser Scaup often prefer feeding on small mussels such as the Asiatic clam (*Corbicula fluminea*) which occur in southeastern reservoirs.

A declining trend in waterfowl use of the reservoir in recent years noted from SCDNR mid-winter waterfowl surveys is likely attributed to several factors, including a multi-year partial drawdown and nuisance aquatic plant control activities that have undoubtedly affected invasive and native vegetation communities that wintering waterfowl depend on as food resources. Additionally, recreational boat use by the general public that was noted during the winter 2006–2007 aerial surveys may well be high enough to create disturbance to waterfowl and thereby also contribute to the limited use of the reservoir by these species. With what may be lower quantity and quality waterfowl food resources and observed levels of disturbance on the reservoir in winter, Lake Murray will likely function primarily as a temporary stopover location for migrating waterfowl.

Introduction

On 29 April, 2005 South Carolina Electric & Gas Company (SCE&G) filed a notice of intent with the Federal Energy Regulatory Commission (FERC) to seek a new license for the Saluda Hydroelectric Project (FERC No. P-516), which includes Lake Murray. The current license for the 206 MW Saluda Hydroelectric plant, which is located near Columbia, SC, expires in 2010. Kleinschmidt Associates, a consulting firm specializing in engineering, regulatory management and environmental services, began coordinating the relicensing process for SCE&G. In addition to its notice of intent, SCE&G also submitted its initial consultation document to begin the official relicensing process. As a result of the review of documents associated with the filing by numerous state and federal resource agencies, the United States Fish and Wildlife Service (USFWS), South Carolina Department of Natural Resources (SCDNR), National Marine Fisheries Service (NMFS), and several Non-governmental Organizations (NGO's) requested studies to determine the potential impact of Project operation on fish and wildlife resources, including the status of overwintering waterfowl on Lake Murray. In early November 2006, 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 (6 flights) describing waterfowl use of Lake Murray.

Study Area

Lake Murray (Figure 1) is a 50,000-acre hydroelectric reservoir created in 1930 with the construction of an earthen dam in the Dreher Shoals area of the Saluda River. The lake basin drains some 2,420 square miles in portions of Lexington, Richland, Saluda, and Newberry Counties of South Carolina.

The Saluda Hydro Project is typically used to meet SCE&G's reserve capacity obligations. Seasonally, as the project is operated, Lake Murray undergoes drawdowns and refills. The minimum drawdown is usually to 350 feet MSL (November–December) and the maximum elevation is held to 358 feet MSL (May–June; Figure 2). Spillway gates prevent the reservoir from rising above the 360-foot capacity level. Although originally developed for hydroelectric power production, damming of the natural watercourse of the Saluda River to create the reservoir also provided for recreational and real estate development, which have flourished because of the proximity to the state capital in Columbia.

Aerial Surveys Methods

Kleinschmidt Associates provided for air services through Eagle Aviation Inc. (located at Columbia Metro Airport), which supplied aircraft (Cessna 172) and a pilot (Paul Watkins) for the six planned Lake Murray aerial bird surveys. Because of potential bias associated with multiple observers, all aerial surveys were conducted by a single observer. The SREL observer, W. L. Stephens, Jr., accompanied the pilot in the aircraft; the pilot was instructed to fly at an altitude of approximately 200–300 ft and an airspeed of about 80–105 mph. Surveys consisted of complete coverages of the lake basin, thus providing what were considered true count data as opposed to randomized line-transect surveys which would yield only 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. Bird species and numbers of individuals were recorded directly onto field maps of the lake; after survey completion, observed birds were tallied by species and recorded on a summary data sheet. Additional data provided on each summary data sheet included: date, time of survey, and general weather conditions at the time of the aerial survey (i.e., visibility, wind, temperature, rainfall). Meteorological information from Dutch Oaks station, Irmo, SC was also gathered

for each flight period. Aerial surveys were conducted during the early-afternoon hours, with all surveys being started by 1500hrs. Surveys lasted 1.5–2 hours.

Data were stored on a networked PC-workstation operating in a Microsoft-Windows environment. The Statistical Analysis System (Statistical Analysis System, SAS Institute, Inc., Cary, NC) was used to summarize the aerial survey data.

Aerial Survey Results and Discussion

Six fixed-wing aerial surveys of the entire Lake Murray basin were conducted between 14 December, 2006 and 27 February, 2007. A flight scheduled for 29 November, 2006 was cancelled due to limited visibility (fog) conditions in and around the survey area, and could not be rescheduled until mid-December, 2006. A flight scheduled for 5 January, 2007 was rescheduled for 9 January, 2007 because of inclement weather on the original date. Also, a flight scheduled for 6 February, 2007 was cancelled by Eagle Aviation due to plane/pilot availability; this flight was rescheduled to 19 February, 2007. Weather conditions during the flights are provided in Table 1.

Seven waterfowl species (includes American Coots [*Fulica americana*]) were identified using Lake Murray during the surveys (Table 2). During the surveys, over 4,000 waterfowl were documented using the reservoir (Table 3). Mallards (*Anas platyrhynchos*) were the only dabbling duck species seen at Lake Murray and were the only species observed on every aerial survey, but their numbers never exceeded more than 211 individuals on any single survey (Table 3). Canada Geese (*Branta canadensis*) were observed on five of six aerial surveys, with a maximum of 144 observed. Three diving duck species were observed at Lake Murray, including the Bufflehead (*Bucephala albeola*), Ring-necked Duck (*Aythya collaris*), and Lesser Scaup (*Aythya affinis*; Table 3).

Figure 3 shows the Lake Murray locations of waterfowl concentrations of >100 individuals observed during aerial surveys in the winter of 2006–2007. These locations included an area just west of the SC Hwy 391 bridge over the Saluda River fork, the Hollow Creek region of the lake, the Lowman Creek area near the Lighthouse Marina, and around islands in the vicinity of the Saluda Dam. Lesser Scaup were the most numerous waterfowl seen on Lake Murray during the aerial surveys, with more than 500 observed on three occasions, and a maximum of 1,535 observed on 19 February, 2007 (Table 3). Lesser Scaup were noted in the vicinity of Goat Island and Pine Island near the Saluda Dam (Figure 1) on three surveys where they were observed to have churned-up the shallow waters, presumably as they were bottom feeding. Lesser Scaup often prefer feeding on small mussels such as the Asiatic clam (*Corbicula fluminea*) which occur in southeastern reservoirs.

A declining trend in waterfowl use of the reservoir in recent years noted from SCDNR mid-winter waterfowl surveys (see Appendix 1) is likely attributed to several factors, including a multi-year partial drawdown (drawdown began in the fall of 2002; refill began in the spring of 2005) and nuisance aquatic plant control activities that have affected vegetation and associated macro-invertebrates that wintering waterfowl depend on as food resources. Additionally, recreational boat use by the general public that was noted during the winter 2006–2007 aerial surveys, even during the coldest months of the year, may well be high enough to create disturbance to waterfowl and thereby also contribute to the limited use of the reservoir by these species. With what may be lower quantity and quality waterfowl food resources and observed levels of disturbance on the reservoir in winter, Lake Murray will likely function primarily as a temporary stopover location for migrating waterfowl.

Acknowledgments

We extend our sincere thanks to Paul Watkins, pilot with Eagle Aviation, who, together with SREL's Warren L. "Cub" Stephens Jr., spent hours above Lake Murray surveying waterfowl. C. Shane Boring, an Environmental Scientist with Kleinschmidt Associates, provided guidance throughout the study period. Carl L. Strojjan and Laura L. Janecek 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 Lake Murray in 2006–2007.

Survey Date:	12/14/2006	12/27/2006	1/9/2007	1/19/2007	2/19/2007	2/27/2007
Observer	W.L. Stephens	W.L. Stephens	W.L. Stephens	W.L. Stephens	W.L. Stephens	W.L. Stephens
Start Time	14:45	13:00	12:00	12:30	15:00	14:00
Stop Time	16:15	14:45	13:30	14:30	16:30	15:30
Noted General Conditions	PC/Hazy/Calm	Clear/Calm	Clear/Windy	Clear/Windy	Clear/Cool	Clear/Cool
Irmo Temp Range (C)*	17-19°C	11°C	13-14°C	13-14°C	14-15°C	20°C
Irmo Wind (mph)*	Calm-SW@2	Calm-W@5	Calm-SW@17; Gusts@22	Calm-SW@14; Gusts@23	Calm-SSW@2	Calm-SSW@6
Irmo Rainfall (mm)*	None	None	None	None	None	None
Irmo Sky Conditions*	OVC	FEW	CLR	BKN	FEW	BKN

*Dutch Oaks, Irmo, SC; Latitude: N 34 ° 8 ' 49 " (34.147 °); Longitude: W 81 ° 12 ' 54 " (-81.215 °); Elevation: 366 ft; Station Hardware: Oregon Scientific WMR968; Abbreviations: PC=Partly Cloudy, OVC=Overcast, FEW=Few Clouds, SCT=Scattered Clouds, CLR=Clear Skies, BKN=Broken Skies

Table 2. Species list compiled from waterfowl aerial surveys of Lake Murray in 2006–2007.

Guild	Common Name	Scientific Name
Swans	Mute Swan	<i>Cygnus olor</i>
Geese	Canada Goose	<i>Branta canadensis</i>
Dabbling Ducks	Mallard	<i>Anas platyrhynchos</i>
Diving Ducks	Ring-necked Duck	<i>Aythya collaris</i>
	Lesser Scaup	<i>Aythya affinis</i>
	Bufflehead	<i>Bucephala albeola</i>
Rails	American Coot	<i>Fulica americana</i>

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Table 3. Counts of waterfowl identified during aerial surveys of Lake Murray in 2006–2007.

Survey Date:	12/14/06	12/27/06	1/9/07	1/19/07	2/19/07	2/27/07	All Surveys
Mallard	211	46	16	23	25	7	328
American Black Duck							0
Mottled Duck							0
Gadwall							0
American Wigeon							0
Green-Wing Teal							0
Blue-Wing Teal							0
Northern Shoveler							0
Northern Pintail							0
Wood Duck							0
Total Dabblers:	211	46	16	23	25	7	328
Redhead							0
Canvasback							0
Scaup spp.		920	100	600	1535		3155
Ring-necked Duck		106					106
Common Goldeneye							0
Bufflehead		14	8	11	8		41
Ruddy Duck							0
Total Divers:	0	1040	108	611	1543	0	3302
Scoter spp.							0
Long-tailed Duck							0
Harlequin Duck							0
Total Seaducks:	0	0	0	0	0	0	0
Merganser spp.							0
Unidentified Ducks							0
Total Ducks:	211	1086	124	634	1568	7	3630
Brant							0
Snow Goose							0
White-Fronted Goose							0
Canada Goose		66	144	140	9	19	378
Total Geese:	0	66	144	140	9	19	378
Tundra Swan							0
Trumpeter Swan							0
Mute Swan					2		2
Total Swans:	0	0	0	0	2	0	2
American Coot	50						50
Grand Total:	261	1152	268	774	1579	26	4060

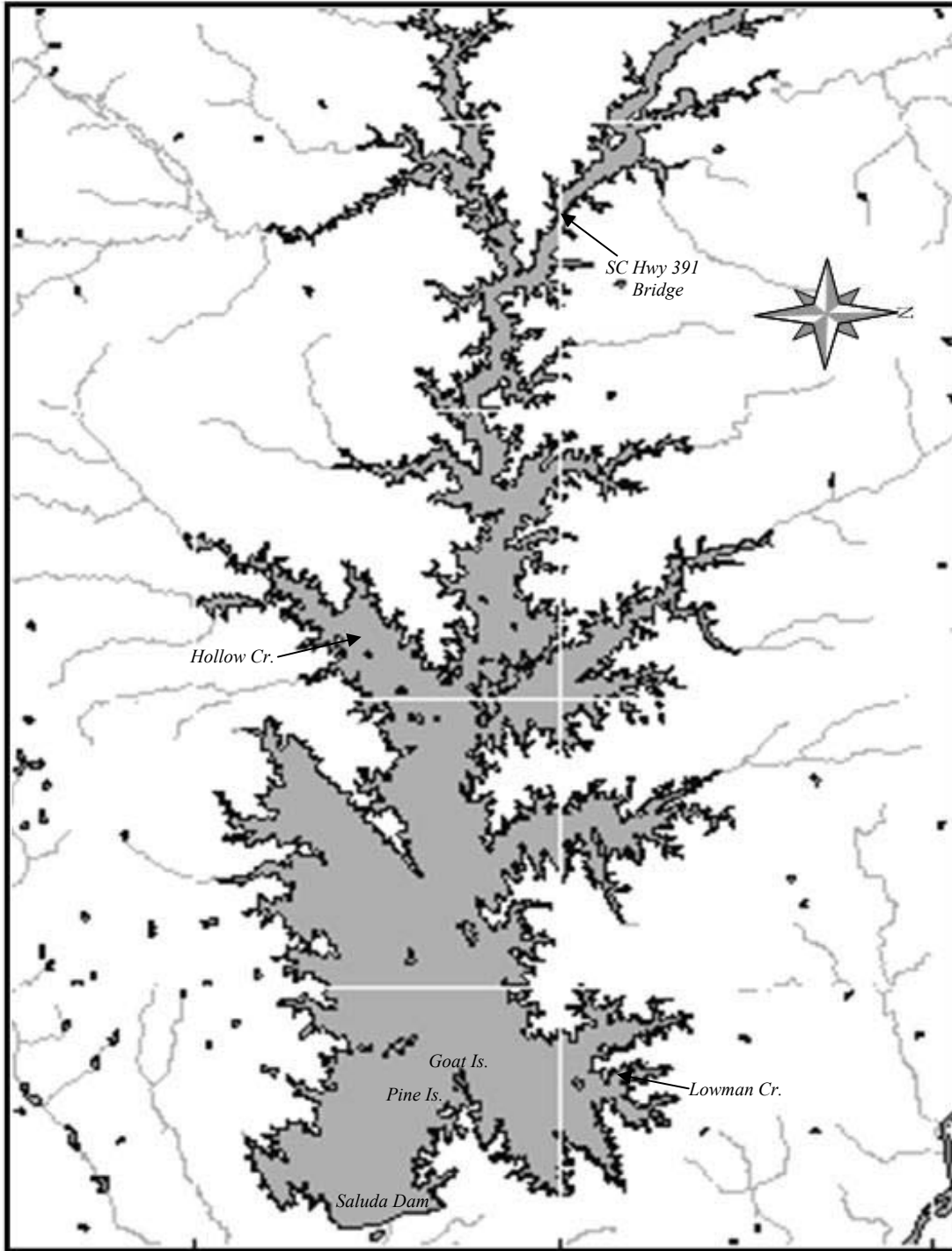


Figure 1. Map of Lake Murray showing locations referred to in the report.

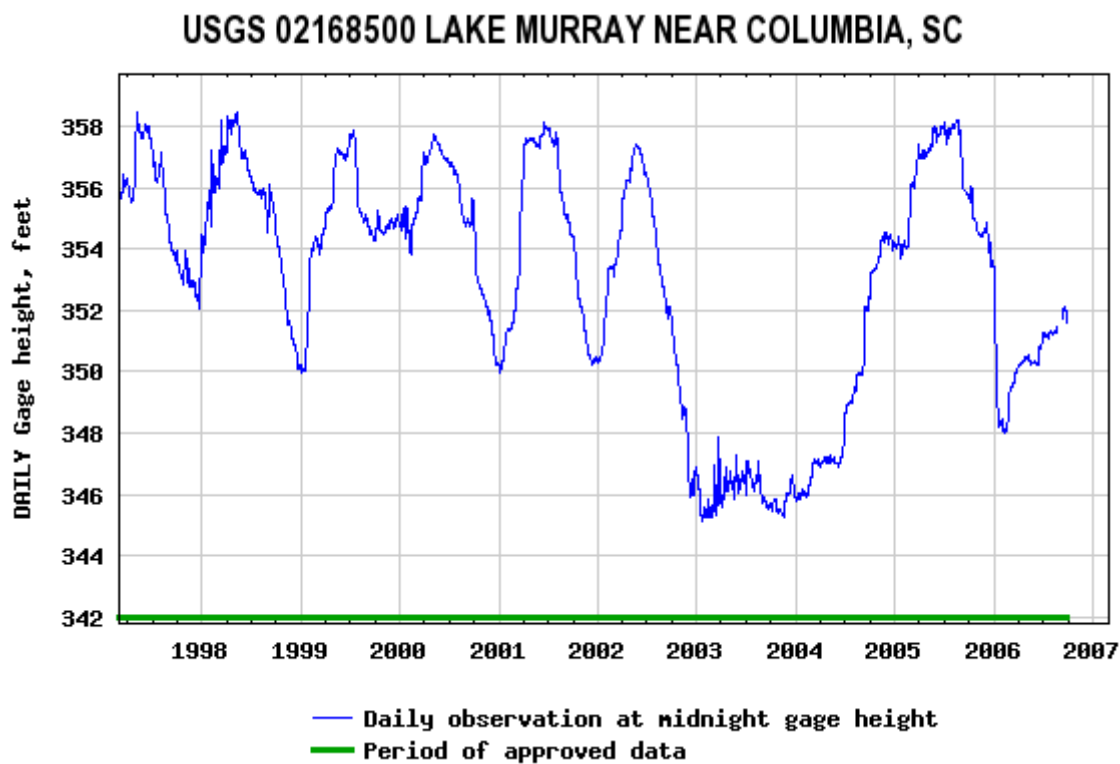


Figure 2. Lake Murray daily gage height (feet; full pool = 360feet) during March 1997–March 2007. Location: Latitude 34°03'07", Longitude 81°13'15" (NAD27), Lexington Co., SC, Hydrologic Unit 03050109; Description: Drainage area: 2,420.00 square miles; Datum of gage: -0.64 feet above sea level NGVD29. Source: U.S. Geological Survey National Water Information System.

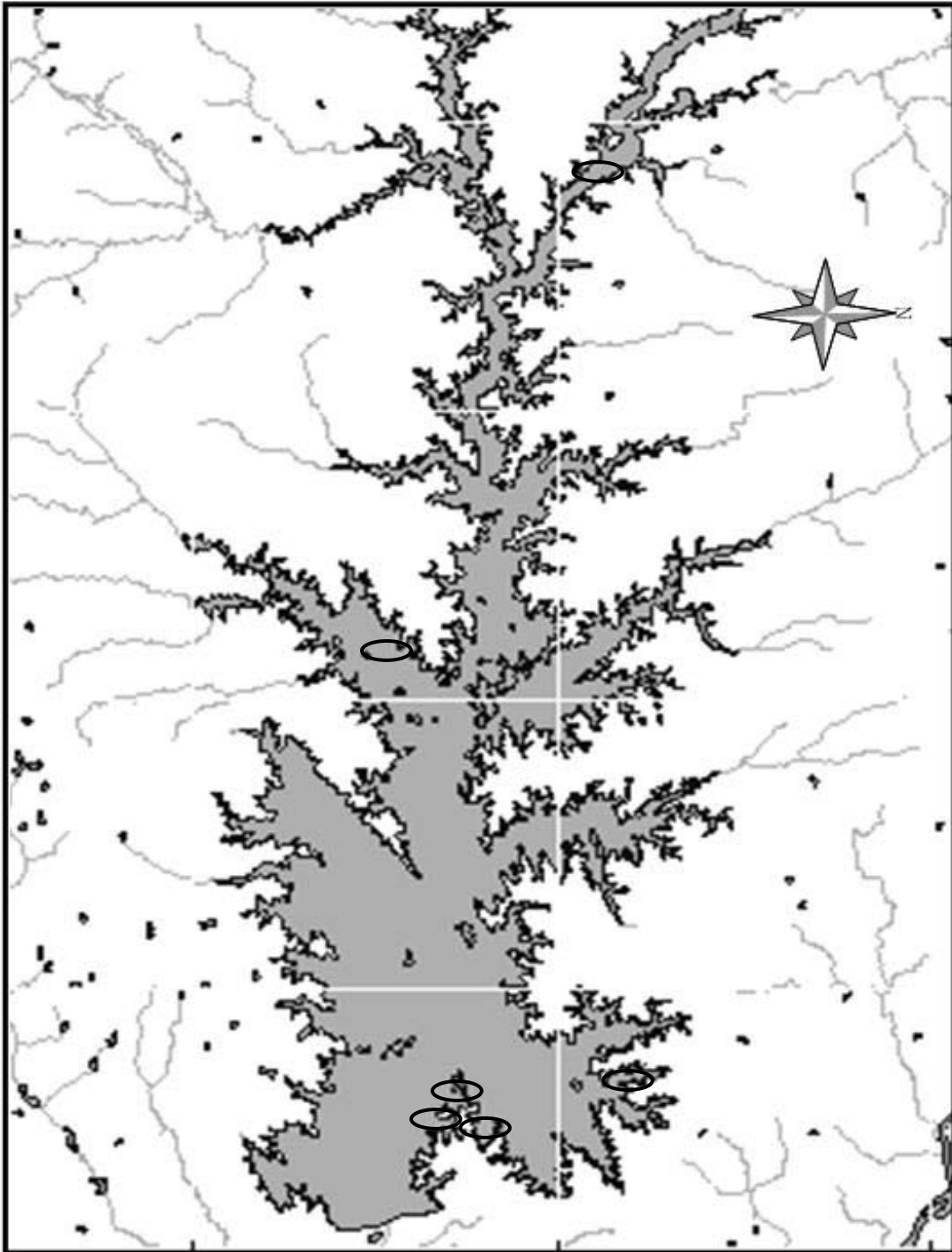


Figure 3. Map of Lake Murray showing locations of waterfowl concentrations of >100 individuals observed during aerial surveys in 2006–2007.

Appendix 1. South Carolina Department of Natural Resources mid-winter waterfowl counts from Lake Murray.

Survey Date:	2003	2004	2005	2006	All Surveys
Mallard	26	19	2	44	91
American Black Duck	4				4
Mottled Duck					0
Gadwall					0
American Wigeon					0
Green-Wing Teal					0
Blue-Wing Teal					0
Northern Shoveler	3				3
Northern Pintail					0
Wood Duck					0
Total Dabblers:	33	19	2	44	98
Redhead			1		1
Canvasback					0
Scaup spp.	2610	1718	2	4	4334
Ring-necked Duck	200	1353	34		1587
Common Goldeneye	3				3
Bufflehead	80	40		139	259
Ruddy Duck	7				7
Total Divers:	2900	3111	37	143	6191
Scoter spp.					0
Long-tailed Duck					0
Harlequin Duck					0
Total Seaducks:	0	0	0	0	0
Merganser spp.			5	4	9
Unidentified Ducks		4		4	8
Total Ducks:	2933	3134	44	195	6306
Brant					0
Snow Goose					0
White-Fronted Goose					0
Canada Goose	394	86	12	56	548
Total Geese:	394	86	12	56	548
Tundra Swan					0
Trumpeter Swan					0
Mute Swan					0
Total Swans:	0	0	0	0	0
American Coot	19500	9000	753	125	29378
Grand Total:	22827	12220	809	376	36232