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DRAFT DATA REPORT

THE DISTRIBUTION AND ABUNDANCE OF WADING BIRDS IN THE SOUTHERN GOLDEN GATE ESTATES AND SURROUNDING AREAS, 2001

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INTRODUCTION

Major changes in water management that are currently being proposed will alter the hydrology of the Southern Golden Gate Estates areas and, consequently, the use of these areas by wading birds. Areas of the everglades adjacent to the to Southern Golden Gates Estates support concentrations of foraging and nesting wading birds (Hoffman et al. 1994, Ogden 1994). However, wading bird habitats have been reduced in the Southern Golden Gates Estates due to channelization and road building. Modifications to the current hydrologic patterns in the Southern Golden Gates Estates are proposed to improve the wetland habitats. Because wading birds are a group of species that responds to changes in water conditions, they provide a good index of changes in hydrology. To determine current (pre-project) conditions monthly systematic reconnaissance flights (SRF) were conducted from January to June 2001 to investigate the relationship between the current hydrologic patterns in the Southern Golden Gates Estates area and the distribution and abundance of wading birds. This document presents the results of these surveys. These data, when combined with survey data from other parts of the Everglades/South Florida Ecosystem, will provide a synoptic view of distribution and abundance of wading birds.

The study consisted of 6 monthly aerial surveys of the area documenting numbers and locations of wading birds, wading bird activity and surface water coverage. This data was entered into an data base, compiled into tables, and plotted on maps using Geographic Information System software. The information

can then be used by resource managers to help evaluate restoration efforts in the area.

BACKGROUND

The Everglades ecosystem including the Southern Golden Gates Estates originally extended from the southern shore of Lake Okeechobee south and west to the coastal mangrove forests and estuaries of the Gulf of Mexico and Florida Bay, and consisted of a complex vegetation mosaic (Davis et al. 1994). Water levels within this marsh system rose and fell with the annual rain cycle (Walters et al. 1992). The majority of rain in this ecosystem generally occurs between late May and early November (Bancroft 1989, Duever et al. 1994).

The original Everglades marsh ecosystem provided abundant primary and secondary production during the summer and fall months (Holling et al. 1994), and this productivity was concentrated during the dry season when water levels receded. The concentrations of food provided ideal foraging habitat for numerous wetland species, especially large flocks of wading birds (Bancroft 1989, Ogden 1994). However, the hydrology of the Everglades has been severely altered (Light and Dineen 1994) by extensive draining and the construction of canals and levees. The resulting system is not only spatially smaller, but also drier than historical levels (Walters et al. 1992, Fennema et al. 1994). Moreover, the timing and distribution of water flow has been highly altered.

Breeding populations of wading birds have responded negatively to altered hydrology (Ogden 1994, Kushlan and Fohring 1986, Ogden et al. 1987, Bancroft 1989) as numbers of breeding wading birds in the Everglades have decreased by more than 90%. During favorable years in the 1930's, up to 250,000 wading birds,

including white ibises (*Eudocimus albus*), wood storks (*Mycteria americana*), great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*), and tricolored herons (*E. caerlea*) nested in the central and southern Everglades (Ogden 1994). Maximum numbers had decreased to 54,000 by the 1970's and further to 22,000 by the 1980's (Ogden 1994). During the 1930's approximately 90% of the wading birds nested along the interfaces between the freshwater Everglades and the mangrove-estuaries (Ogden 1994). By the 1980's, the majority of nesting wading birds had shifted to nesting in the interior freshwater Everglades, principally in the Water Conservation Areas (WCA) (Ogden 1994). These changes were presumably the result of extensive hydrological alterations (water flow and volume) in the Everglades system (Ogden 1994, Bancroft 1989).

Significant declines in the numbers of wading birds have contributed to the movement toward restoring the hydrologic conditions of the Everglades to more historic patterns. The South Florida Water Management District (SFWMD) and the U.S. Army Corps of Engineers (USACE) are currently evaluating and implementing water requirements that would restore areas of the Everglades in ways that improve and restore the natural conditions of south Florida's Everglades (Water Supply Plan 1994, COE 1994). One goal of this process is to improve conditions for wading birds within the remaining Everglades system.

Major changes in water management in south Florida are in the process of being implemented or are being proposed. In 1993, the Florida Legislature passed the Everglades Forever Act which calls for the construction of 34,000 acres of wetland treatment marshes along the northern edge of the WCA's. Loxahatchee National Wildlife Refuge has proposed increasing water depths and hydroperiods within the refuge. The USACE, SFWMD, and ENP are initiating Modified Water

Deliveries for Northeast Shark Slough and Shark Slough in ENP, and the SFWMD is attempting to restore natural hydrologic conditions within the WCA's.

All of these changes will alter the hydrology of the southern Florida which currently support huge concentrations of foraging wading birds (Hoffman et al. 1994) and the largest percentage of the remaining nesting wading birds in the Everglades (Ogden 1994). Bancroft and Sawicki (1995) examined how various hydrologic patterns within the WCA's influenced the distribution and abundance of wading birds and developed a simple predictive model of the distribution of wading birds to evaluate the relative importance of water levels in determining distribution. It is critical that we continue to investigate the relationship between modified hydrologic patterns in the Everglades system and the distribution, abundance, and reproductive success of wading birds. The changes in hydrologic patterns will not only influence the distribution and abundance of wading birds in the Everglades National Park, the Water Conservation Areas and Big Cypress National Preserve but also Southern Golden Gate Estates. Southern Golden Gate Estates is intricately linked to the other areas of the Everglades system. Wading bird surveys of the Southern Golden Gate Estates will be included with other survey areas to provide synoptic picture of wading bird distribution and abundance in the Everglades system.

METHODS

Systematic Reconnaissance Flights

Similar to Bancroft and Sawicki (1995) and Nelson and Theriot (1996, 1997, 1998, 1999, and 2000, the hydrology in the Southern Golden Gates Estates and surrounding areas were examined in relationship to the distribution and abundance of wading birds. We estimated the number and distribution of foraging wading birds using a systematic aerial transect method (Norton-Griffiths 1978) as modified by the Audubon Society (Bancroft and Sawicki 1995). Using identical survey parameters (height, ground speed, strip width, transect spacing) as Bancroft and Sawicki (1995), we flew surveys in the areas consisting of east-west transects spaced at 2 km^2 intervals. Transects were flown in a Cessna 182 at approximately 61 m (200 ft) altitude and a ground speed of 146-183 km/h (80-100 nautical mph). Two observers recorded all wading birds observed on each side of the aircraft within 150 m wide strips paralleling the plane's path. The strips were defined by wax-pencil marks on the windows and on the plane's struts. When birds were sighted in the strips, the longitude was recorded from a Global Positioning System receiver. The species, number, behavior, and longitude was recorded for all sightings within the strips. Other species including raptors, deer, etc. were also recorded as they were encountered.

During the surveys, surface water coverage will be recorded. Bancroft and Sawicki (1995) classified water coverage into four categories; (1) *wet* conditions were defined as having water completely covering the ground surface, (2) *wet transitional* conditions had partially exposed ground, but more than 50% of the

ground surface flooded, (3) *dry transitional* conditions for areas less than 50% flooded, and (4) *dry conditions* where surface water appeared only in ponds, canals, and alligator holes. These water conditions will be recorded on a broad scale, such that each 2-km x 2-km cell will be assigned a single value in a given month.

We identified to species great blue herons (*Ardea herodias*), great egrets, wood storks, white ibises, and glossy ibises (*Plegadis falcinellus*). Tricolored herons, little blue herons, and snowy egret were classified into a group called "small herons." We grouped these species during analysis because it is difficult at times to identify them to species from a moving airplane (Bancroft and Sawicki 1995).

Water Analyses

The water data recorded during the surveys was coded numerically and transferred to computer files for mapping. Each 4-km^2 cell will be assigned a single water category code (see above).

Monthly Classification of Water Conditions

We used classification analysis to separate each month we flew into one of four subgroups based upon water conditions (Norusis 1988). We calculated three variables which include the number of cells classified as wet, wet transitional, dry transitional, and dry. The number of cells in each water category were normalized to z-values (Sokal and Rohlf 1981). For each gage, the stage data was normalized to a mean of zero by subtracting the mean from all months from each value. We used squared Euclidean distances agglomerative hierarchical clustering using average linkage between groups to classify each survey into groups. Three

variables represent the spatial extent of water coverage. The four identified by Bancroft and Sawicki (1995) were termed wet months, intermediate months, dry months, and extra dry months.

For each classification of wetness, we examined the use of areas within the Southern Golden Gate Estates by calculating the percentage of months in which the species was seen in each cell. Maps were produced by dividing the percentages into seven ranges and plotting the results. Comparison of these maps for each of the month groups provided an indication of how different species shift their foraging distribution based upon changing water conditions within the areas. Water maps for each group were calculated by coding the water data from 1 to 4, where 1 was wet and 4 was dry.

Survey Personnel

In 2001, David Nelson occupied the right front sat of the airplane, counted birds, and recorded water conditions on the right side of the plane. Bob Metzger occupied the left rear seat and counted birds on the left side of the plane. The pilot for the surveys was Alex Mendez. Aircraft were provided by Wyatt Aviation.

Data Management

Data were entered into handheld computers during the flights. The data was entered from the handheld computer into spreadsheet software and corrected for entry errors. The data was then entered into a data management system developed by Dave Buker of ENP and modified by Mr. Chuck Dickerson. For a more detailed description of the database see Sawicki et al. (1995).

A video recording was made of each transect, each month and archived for future reference.

PRELIMINARY RESULTS

During January 2001, eleven transects were surveyed from Highway 29 including Fakahatchee Strand State Preserve and Southern Golden Gate Estates (Table 2). In February the survey area was expanded to the north, south and west, encompassing 17 transects. The survey area was expanded in March and April to the south and west, encompassing 18 transects. The survey area was expanded again in May and June to the west and South, encompassing 25 transects including the 10,000 Island Area and coastline south of Marco Island.

Wading birds observed during the survey can be found in Table 1 and Tables A1-A6. Since the number and length of transects were expanded several times during the survey at the request of the project managers, bird numbers between months should be not be compared by transect until they are normalized for a specific length or area. Drought conditions prevailed during 2001 greatly reducing surface water throughout the region including Big Cypress National Preserve, Everglades National Park, and the Water Conservation Areas.

Wading bird numbers were generally very low throughout the study area during all months. The drought conditions were probably a major contributing factor to few wading birds being present in the study area. Almost no wading birds were observed within the Southern Golden Gates Estates. Almost no surface water was observed in the Southern Golden Gates Estates. The only water present in the Southern Golden Gates Estates could be found in the canals with steep banks and deeper water depths making the water inaccessible to the wading birds.

Table 1. Transect latitudes, western and eastern longitudes.

Tran-Sect	Lat. Deg.	Lat. Min	East Long. Deg.	East Long. Min.	West Long. Deg	West Long. Min. Jan	West Long. Min. Feb	West Long. Min. Mar.	West Long. Min. Apr	West Long. Min. May	West Long. Min. Jun
30	26	13.06	81	20.70	81		30.30	30.50	30.70	30.70	30.70
31	26	11.98	81	20.70	81		30.30	30.30	30.30	30.50	30.80
32	26	10.90	81	20.70	81		30.10	31.20	30.50	30.50	30.50
33	26	09.81	81	20.70	81		33.10	33.10	33.10	33.10	33.10
34	26	08.73	81	20.70	81	35.00	39.80	39.80	39.80	39.80	39.80
35	26	07.65	81	20.70	81	34.70	39.80	39.80	39.80	39.80	39.80
36	26	06.56	81	20.70	81	32.50	39.60	41.00	40.00	40.30	40.90
37	26	05.48	81	20.70	81	32.50	40.30	41.00	41.00	40.60	41.00
38	26	04.40	81	20.70	81	35.00	40.30	41.00	41.00	40.50	41.00
39	26	03.31	81	20.70	81	34.00	36.25	41.00	41.00	38.90	41.00
40	26	02.23	81	20.70	81	34.00	36.25	36.25	36.60	36.60	36.60
41	26	01.15	81	20.70	81	34.50	36.25	36.25	35.90	37.60	36.70
42	26	00.06	81	20.80	81	34.50	36.25	36.25	36.40	37.30	36.70
43	25	58.98	81	20.90	81	34.30	36.25	36.25	36.25	36.70	37.10
44	25	57.9	81	21.20	81	31.40	35.25	36.25	36.40	36.70	38.10
45	25	56.81	81	21.50	81		34.70	35.25	36.20	38.80	38.90
46	25	55.73	81	21.50	81		30.00	30.25	30.60	39.50	39.70
47	25	54.65	81	22.10	81			30.40	30.60	35.90	38.80
48	25	53.56	81	22.50	81					35.90	38.90
49	25	52.48	81	23.00	81					34.30	31.70
50	25	51.40	81	23.00	81					33.90	34.30
51	25	50.31	81	23.00	81					29.10	31.70
52	25	49.23	81	23.50	81					28.80	28.80
53	25	48.15	81	23.50	81					24.30	28.10
54	25	47.06	81	23.50	81					24.20	24.30

Table 2. Estimated abundance of wading birds with the Southern Golden Gates Estates and surrounding areas from January to June 2001.

Species	Jan	Feb	Mar	Apr	May	Jun
Great Blue Herons		5	1	15	4	6
Great Egrets	54	43	41	52	25	95
Small Dark Herons	4	1	2		1	2
Small White Herons		1		3	1	27
White Ibises	59	12	12		20	114
Glossy Ibis		2		5		
Wood Storks	2	7	3	6	9	
Cattle Egrets	2	1	7		7	1
Great White Heron		1	2	1	7	1
Roseate Spoonbill	1					
Total	122	73	68	82	73	246

LITERATURE CITED

Bancroft, G. T. 1989. Status and conservation of wading birds in the Everglades. Am. Birds 43:1258-1256.

Bancroft, G. T., and R. J. Sawicki. 1995. The distribution and abundance of wading birds relative to hydrologic patterns in the Water Conservation Areas of the Everglades: Final Report. National Audubon Society, Tavernier, FL.

Davis, S. M., L. H. Gunderson, W. A. Park, J. R. Richardson, and J. E. Mattson. 1994. Landscape dimension, composition, and function in a changing Everglades ecosystem. Pages 419-444 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

Duever, M. J., J. F. Meeder, L. C. Meeder, and J. M. McCollom. 1994. The climate in south Florida and its role in shaping the Everglades ecosystem. Pages 225-248 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

Gunderson, L. H. 1994. Vegetation of the Everglades: determinants of community composition. Pages 232-340 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

Hoffman, W., G. T. Bancroft, and R. J. Sawicki. 1994. Foraging habitat of wading birds in the Water Conservation Areas of the Everglades. Pages 585-614 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

Holling, C. S., L. H. Gunderson, and C. J. Walter. 1994. The structure and dynamics of the Everglades system: Guidelines for ecosystem restoration. Pages 741-756 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

Light, S. S., and J. W. Dineen. 1994. Water control in the Everglades: A historical perspective. Pages 474-483 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

Kushlan, J. A., and P. D. Frohring. 1986. The history of the southern Florida wood stork population. Wilson Bulletin 98:368-386.

Norton-Griffiths, M. 1978. Counting animals, Handbook No. 1. African Wildlife Leadership Foundation, Nairobi, Kenya.

Ogden, J. C. 1994. A comparison of wading bird density colony dynamics (1931-1946 and 1974-1989) as an indication of ecosystem conditions in the southern Everglades. Pages 533-570 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

Sokal, R. R., and F. J. Rohlf. 1981. Biometry, 2nd ed., W. H. Freeman, San Francisco.
859 pp.

Walters, C., L. Gunderson, and C. S. Holling. 1992. Experimental policies for water management in the Everglades. Ecol. Appl. 2:189-202.

White, P. S. 1994. Synthesis: Vegetation pattern and process in the Everglades ecosystem. Pages 445-460 *in* S. M. Davis and J. C. Ogden (eds.). Everglades: The ecosystem and its restoration. St. Lucie Press, Delray Beach, FL.

APPENDIX A: DATA ON BIRDS OBSERVED IN THE SOUTHERN GOLDEN GATES ESTATES AND SURROUNDING AREAS, 2001