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BIRD USE OF FLOODED AGRICULTURAL FIELDS DURING SUMMER AND EARLY FALL AND SOME RECOMMENDATIONS FOR MANAGEMENT

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Intertidal mud and sand flats are now very limited on the southeast coast of Florida (Martin, Palm Beach and Broward counties) because much of this type of habitat has been destroyed by dredge and fill projects to provide waterfront property for development and deep water to accommodate commercial and recreational boat traffic. The remaining tidal flat acreage receives increasing recreational activity, which limits bird use. Thus, it was of interest to find waders, waterfowl, shorebirds, and other birds that require shallow-flooded flats utilizing inundated agricultural fields in western Palm Beach County. Although heavy use by birds of another Florida agricultural area situated on a drained marsh (Zellwood, Lake Apopka, Lake and Orange cos.) is well known (Robertson and Ogden 1968, 1969; Stevenson 1968, 1972; Ogden 1970, 1971; Robertson 1970, 1972; etc.), this situation inland from the Gold Coast has only recently been noted. We report here some preliminary findings of bird utilization on temporarily flooded agricultural lands of Palm Beach County and suggest some management goals for fallow agricultural lands, government lands, and other land holdings.

DESCRIPTION OF AREA AND METHODS

To the south and east of Lake Okeechobee and between the lake and the Loxahatchee National Wildlife Refuge and Everglades Conservation Areas 2 and 3 lies the Everglades Agricultural Area. This region of about 405,000 ha (1,000,000 acres) was the northern part of the Everglades marsh prior to drainage. Drainage was begun between 1900 and 1910, and has continued to the present (Parker *et al.* 1955, Tebeau 1971, Johnson 1974). Now most of the land is planted in sugarcane (*Saccharum officinarum*) and winter vegetable crops, with some used for pasture and sod farming. Approximately 90% of this large agricultural complex lies within western Palm Beach County. The region's pure organic peat soils overlie a porous limestone formation (Davis 1946). Surface and ground water levels are manipulated through an extensive system of canals and pumps.

During late spring and summer, when no crops are being grown, some fields are flooded to retard unwanted plant growth, to control nematodes that damage roots of crops, and to reduce the loss of soil from subsidence (Stephens 1956, 1974). Only a small percentage of the region is flooded in any one year. Mositure conditions in the fields we studied ranged from damp to flooding up to 30 cm. The surrounding fields are planted in sugarcane, which

requires a year to mature, being harvested in late fall and winter.

In 1976 observations were made in fields along the east side of the Hillsboro Canal 9.7 km (6 mi.) south of U. S. Highway 441; and in 1977 on A. Duda and Sons Farm 8 km (5 mi.) southeast of Belle Glade. Approximately 122 ha (300 acres) were censused in 1976, and 810 ha (2000 acres) in 1977. Most of the fields are about 130 ha (320 acres) rectangles. In 1977 fields were flooded in early and mid May (J. M. Kirby pers. comm.) and most were drained by late August or early September. The flooding is scheduled to correspond to vegetable crop production with no consideration given to wildlife use. It is coincidental that inundation occurs at a time when it provides attractive feeding and resting areas during a large part of the fall migration of many shorebirds. Also the shallow flooding is suitable for nesting of certain species and presents good conditions for feeding by waders when much of their natural foraging areas are deeply flooded from summer rains.

Fields were systematically checked on each visit. Counts and estimates were recorded for each field. Three to five hours were required to census the area, more time being required when larger numbers of birds were present. One of us made the counts while the other recorded the data. The common and scientific names of non-breeding birds mentioned in this paper are listed in the Appendix.

Results and Discussion

The census results for 1976 and 1977 are summarized in Table 1. Fifty-nine species were recorded, representing 16 families (1 Podicipedidae, 1 Pelecanidae, 1 Phalacrocoracidae, 1 Anhingidae, 10 Ardeidae, 1 Ciconiidae, 3 Threskiornithidae, 6 Anatidae, 1 Pandionidae, 4 Rallidae, 4 Charadriidae, 15 Scolopacidae, 2 Recurvirostridae, 1 Phalaropodidae, 7 Laridae, and 1 Rynchopidae), and breeding evidence was found for 10 species of 6 families. Several species that also utilized the flooded fields are not treated in this paper; they include: Belted Kingfisher, Tree, Bank, and Barn swallows, Red-winged Blackbird, and Boat-tailed Grackle. The difference in species diversity between 1976 and 1977 is attributed to the difference in size of the two areas studied.

The large numbers of Great and Snowy egrets, both night herons, Wood Storks, Fulvous Whistling- and Mottled ducks, American Coots, Lesser Yellowlegs, Pectoral, Least, Stilt, and Semipalmated sandpipers, and Black-necked Stilts are of particular interest. The cummulative totals (Table 1) probably represent little duplication of individuals for most species of shorebirds (except Killdeer and Black-necked Stilt), since they were in migration and censuses were spaced seven or more days apart. Among the

TABLE 1

Birds Utilizing Flooded Agricultural Fields in Late Summer and Early Fall, Palm Beach County, Florida.

	1976			1977						
	August			July	August				Sept.	
	15	28	Total	24	7	13	20	27	10	Total
P.-bi. Grebe*	15		15	53	75	15	86	51	27	307
White Pelican				44	85	5	42	44	32	252
D.-cr. Cormorant						1	1			2
Anhinga	7		7	25	14	1	25	3	6	74
Gr. Bl. (White) Heron				1			1	1	1	4
Gr. Blue Heron				46	36	16	25	47	61	231
Green Heron		2	2	27	5	14	9	7	13	75
L. Blue Heron		5	5	138	154	35	12	27	120	486
Cattle Egret	135	103	238	125	124	80	115	135	66	645
Great Egret	15	150	165	280	1400	125	228	1360	1900	5293
Snowy Egret	3	97	100	18	370	25	165	340	770	1688
La. Heron	2	2	4	24	23	15	29	59	30	180
Bk.-cr. N. Heron	1		1	132	58	1	142	2	27	362
Ye.-cr. N. Heron				252	250	8	133	2	13	658
Least Bittern				14	4	2	6	2		28
Wood Stork		10	10	1	2400	75	746	1500	2480	7203
Glossy Ibis	2	150	152	302	455	100	37	136	121	1151
White Ibis		1	1	371	325	300	304	642	495	2437
Roseate Spoonbill		1	1		2		12	34	22	70
Fulvous Wh. Duck*	86	800	886	327	335	85	246	96	82	1171
Mottled Duck*	128	65	193	291	165	30	183	57	128	854
Green-w. Teal								1		1
Blue-w. Teal	19	12	31	4	31	1	26	136	567	765
N. Shoveler							2		3	5
Ruddy Duck				1	1		4	6		12
Osprey					1				1	2
King Rail*	1		1	4	2	8		2		16
Purple Gallinule*				10	8	2	8	15	6	49
Com. Gallinule*	223	175	398	300	361	125	270	277	169	1502
Am. Coot*	159	350	509	1800	3100	300	2570	3610	4400	15,780

Table 1. continued-

	15	28	Total	24	7	13	20	27	10	Total
Semipal. Plover	7	10	17		8	10	5	2	24	49
Killdeer*	38	51	89	149	190	150	38	81	68	676
Black-be. Plover	11	15	26		3		7	1	312	323
Ruddy Turnstone	2	2	4	2	17	18	27	9	8	81
Upland Sandpiper								9		9
Spotted Sandpiper	2		2	2		3	7	4		16
Solitary Sandpiper							3			3
Willet		9	9						1	1
Gr. Yellowlegs		310	310	16	300	5	7	63	820	1211
Lr. Yellowlegs	2800	7600	10,400	81	15,500	1000	8	446	22,500	39,535
Pectoral Sandpiper	180	26	206	125	820	100	26	14	7	1092
White-r. Sandpiper		1	1							
Least Sandpiper	1200	4000	5200	1835	5500	1500	210	256	12,450	21,751
Sh.-bi.Dowitcher	48	276	324	21	680	60	18	60	4800	5639
L.-bi. Dowitcher							3		2	5
Stilt Sandpiper	45	29	74	15	355	25	1	61	1145	1602
Semipal. Sandpiper	28	4100	4128	8	4250	800	127	176	4000	9361
W. Sandpiper		220	220	1	275	1	3	2	780	1062
peep spp.	1000	4000	5000	7100	16,000		275	150	10,900	34,425
Ruff				1						1
Am. Avocet	5	4	9					15	28	43
Black-n. Stilt*	237	125	362	431	1330	250	132	283	860	3286
Wilson's Phalarope					8	1			1	10
Ring-bi. Gull		1	1	5	5	5		4	39	58
Laughing Gull				17	17	15	8	8	5	70
Gull-bi. Tern*	94		94	5	18	25	11	27	36	122
Forster's Tern							2		1	3
Least Tern							2			2
Caspian Tern					3	1	2	6	28	40
Black Tern	100	97	197	10	80	30	43	87	261	511
Black Skimmer				7					98	105
Total Species	30	34	--	44	46	43	50	49	50	--
Total Individuals	6593	22,799	29,392	14,421	55,143	5368	6392	10,356	70,714	162,394

* Breeds in the area

shorebirds the Lesser Yellowlegs was the most abundant (comprising 46% of all shorebirds identified to species), followed by the Least Sandpiper (25%). Large numbers of "peep" sandpipers were not identified to species because of distance from observation stations.

In the flooded fields during 1977 (24 July - 10 September) there were two peaks in the shorebird migration (Fig. 1); one on 7 August when 43,716 individuals of 13 species were recorded and one on 10 September when we had 57,778 birds of 16 species. The mean number of individuals for all bird species per hectare on 10 September was 87.3 (35.4 per acre), and for the shorebirds 72.5 (29.4 per acre) or 83% of all species. As the birds were often concentrated in tight feeding flocks in certain areas, the density of bird life in small parts of the fields was estimated to have ranged up to 100X the above figures for brief periods.

Although all species recorded were observed feeding in the fields and adjacent ditches and canals, no effort was made to determine what the birds were eating.

The Ruddy Turnstone and Willet are generally associated with coastal saltwater habitats in Florida, but both were observed inland on freshwater, the former on a regular basis (Table 1).

A male Ruff still showing much of its alternate plumage was found on 24 July 1977, in a recently drained field feeding in association with Lesser

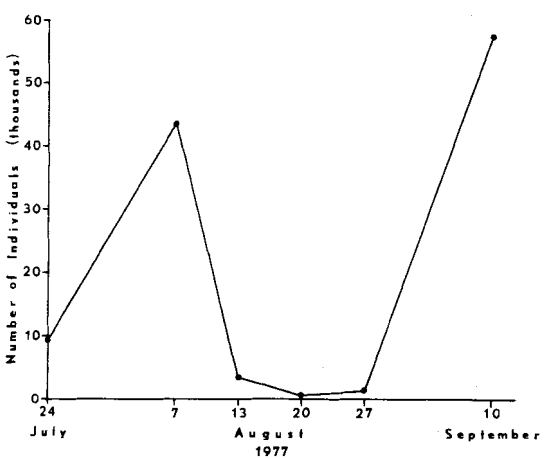

Fig. 1. Distribution of migration for 20 species of shorebirds for the 1977 observation period, excluding 2 breeding species (Killdeer and Black-necked Stilt).

Yellowlegs and Pectoral Sandpipers. The head and neck of this individual were white while the remainder of the plumage was brown. This is the second record of this species for Palm Beach County.

The 10 species found breeding in the flooded fields and on access roads were: Pied-billed Grebe, Fulvous Whistling-Duck, Mottled Duck, King Rail, Purple Gallinule, Common Gallinule, American Coot, Killdeer, Black-necked Stilt, and Gull-billed Tern. The birds have apparently adjusted their breeding to correspond to the period of inundation. All breeding observations were from the access roads; no search was made in the fields themselves. Some of the fields were partly vegetated and others had vegetation around the perimeter. Thus, the number of nests and broods found does not represent a complete nesting survey.

Breeding evidence is as follows:

PIED-BILLED GREBE (*Podilymbus podiceps*). — Five nests with incubating birds were found on 15 August 1976, and one nest with incubating bird and a brood of five small young were observed on 24 July 1977.

FULVOUS WHISTLING-DUCK (*Dendrocygna bicolor*). — Many young birds were noted among the large flock recorded on 28 August 1976 (Table 1). Nine broods, totalling 72 young, ranging from ¼ to ½ grown, were seen on 24 July 1977. Three broods totalling 20 young were observed on 13 August 1977.

MOTTLED DUCK (*Anas fulvigula*). — A brood of seven young was found on 24 July 1977. On subsequent visits in August 1977, many large young were seen.

KING RAIL (*Rallus elegans*). — A lone young bird was seen on 24 July 1977, and a brood of four half-grown young was flushed on 13 August 1977.

PURPLE GALLINULE (*Porphyrula martinica*). — Several young, not fully grown, were seen in canals clogged with water hyacinth (*Eichhornia crassipes*) on 24 July and in the first half of August 1977.

COMMON GALLINULE (*Gallinula chloropus*). — Twenty-four broods, totalling 71 young, most of which were still downy, were counted on 24 July 1977, and at the same time, many almost full grown young were also noted.

AMERICAN COOT (*Fulica americana*). — A pair with three young about a week old, and another pair with three newly hatched chicks were found on 15 August 1976. Seven young in four broods were seen on 24 July 1977.

KILLDEER (*Charadrius vociferus*). — Several young were seen in July and August 1977 along the access roads.

BLACK-NECKED STILT (*Himantopus mexicanus*). — Numerous young just off nests were seen on 15 August 1976. Four nests with eggs, and 3 broods totalling 10 young, were found on 24 July 1977.

GULL-BILLED TERN (*Gelochelidon nilotica*). — Three fledged young were being fed by two adults on 13 August 1977.

SUMMARY AND RECOMMENDATIONS

The results of limited census work at two localities in western Palm Beach County in 1976 and 1977 demonstrate that fallow agricultural fields during periods of flooding, drawdown, and drying receive heavy bird use, especially

by shorebirds. Such areas replace much of the mud flat habitat that has been lost along the southeastern coast of Florida and greatly supplement that still extant.

More extensive studies of bird populations in this type of man-made habitat are needed. Research should determine optimum water levels, the duration of flooding required by each species, and the best time to initiate and terminate flooding and make a qualitative and quantitive analysis of prey species utilized by the birds.

Because the mud-flat type habitat is important to many bird species, perhaps agricultural interests in the Everglades Region and elsewhere in Florida could implement a management plan that is designed to increase the amount of habitat for birds requiring shallow flooded flats (in this case fallow fields) as well as to prolong the life of the pure organic soils. Such a project would greatly benefit a sizeable population of both resident and migratory birds.

We further suggest that the development of additional "flooded field habitat," simulating the rapidly disappearing bare mud flats that are important habitat for feeding and resting by resident, migratory, and wintering shorebirds in Florida (and elsewhere in the United States), is a management goal worthy of consideration by various agencies and groups such as the U. S. Fish and Wildlife Service on the National Wildlife Refuges, by the U. S. Army Corps of Engineers on flood control and navigation projects, by state agencies on certain wildlife managed lands, and by private conservation organizations, corporations, and individuals. The availability of mud flat habitat is now very limited or absent altogether in many areas where it formerly existed. Most impoundments on federal and state wildlife refuges are designed and managed for waterfowl with excellent results. However, in most waterfowl impoundments, the depth of flooding is too great or the drawdown is at the wrong time or the impoundment has too much vegetation to be of much use by shorebirds. The shorebird habitat found in such impoundments is usually small areas along the margins. If management areas can be created and maintained for waterfowl, why not for shorebirds?

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Appendix. — Common and scientific names of non-breeding birds referred to in this paper. White Pelican (*Pelecanus erythrorhynchos*), Double-crested Cormorant (*Phalacrocorax auritus*), Anhinga (*Anhinga anhinga*), Great Blue Heron (*Ardea herodias*), Green Heron (*Butorides striatus*), Little Blue Heron (*Florida caerulea*), Cattle Egret (*Bubulcus ibis*), Great Egret (*Casmerodius albus*), Snowy Egret (*Egretta thula*), Louisiana Heron (*Hydranassa tricolor*), Black-crowned Night Heron (*Nycticorax nycticorax*), Yellow-crowned Night Heron (*Nyctanassa violacea*), Least Bittern (*Ixobrychus exilis*), Wood Stork (*Mycteria americana*), Glossy Ibis (*Plegadis falcinellus*), White Ibis (*Eudocimus albus*), Roseate Spoonbill (*Ajaia ajaja*), Green-winged Teal (*Anas crecca*), Blue-winged Teal (*A. discors*), Northern Shoveler (*A. clypeata*), Ruddy Duck (*Oxyura jamaicensis*), Osprey (*Pandion haliaetus*), Semipalmated Plover (*Charadrius semipalmatus*), Black-bellied Plover (*Pluvialis squatarola*), Ruddy Turnstone (*Arenaria interpres*), Upland Sandpiper (*Bartramia longicauda*), Spotted Sandpiper (*Actitis macularia*), Solitary Sandpiper (*Tringa solitaria*), Willet (*Catoptrophorus semipalmatus*), Greater Yellowlegs (*T. melanoleuca*), Lesser Yellowlegs (*T. flavipes*), Pectoral Sandpiper (*Calidris melanotos*), White-rumped Sandpiper (*C. fuscicollis*), Least Sandpiper (*C. minutilla*), Short-billed Dowitcher (*Limnodromus griseus*), Long-billed Dowitcher (*L. scolopaceus*), Stilt Sandpiper (*Micropalama himantopus*), Semipalmated Sandpiper (*C. pusillus*), Western Sandpiper (*C. mauri*), Ruff (*Philomachus pugnax*), American Avocet (*Recurvirostra americana*), Wilson's Phalarope (*Steganopus tricolor*), Ring-billed Gull (*Larus delawarensis*), Laughing Gull (*L. atricilla*), Forster's Tern (*Sterna forsteri*), Least Tern (*S. albifrons*), Caspian Tern (*S. caspia*), Black Tern (*Chlidonias niger*), Black Skimmer (*Rynchops niger*), Belted Kingfisher (*Megaceryle alcyon*), Tree Swallow (*Iridoprocne bicolor*), Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Red-winged Blackbird (*Agelaius phoeniceus*), Boat-tailed Grackle (*Quiscalus major*).