FLORIDA WATERFOWL HABITAT POTENTIALITIES AND PROBLEMS

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Florida, with a total area of 58,560 square miles, has within its boundaries an immense acreage of fresh and brackish waters and marshes. There are approximately 4,300 square miles of inland waters, some 2,000 square miles of fresh marshes and swamps, 7,000 square miles of Everglades, roughly 2,000 miles of prairies which are intermittently inundated, and perhaps 1,500 squre miles of brackish marshes and waters. The fresh water lakes number some 30,000, ranging in size from one-half acre or less to Lake Okeechobee's 700 square miles. The tidal coastline measures approximately 3,700 miles.

All this would appear to offer a huge amount of waterfowl habitat, but the size of the wintering population and its distribution do not completely bear this out. Over the past several years the post-shooting season wintering population has averaged around 960,000 birds, with that of the past year being some 1,000,000 birds. Their distribution indicates that some areas are heavily used, a good many more lightly used, and at least a like number used scarcely or not at all. For the acreage concerned, the number of birds carried is not high.

Of the factors possibly causing this, the one most readily apparent in the majority of habitats is a scarcity of the recognized good food plants. It is not meant by this that the present populations are starving to death; they seem to be making out quite well. What is meant is that because of climatic, soil, and water conditions vegetations have developed which produce little food and dense cover, and as a result Florida waterfowl populations are, and probably always have been, lower than the acreage of potential habitat would indicate.

Now, because of these habitat factors, and because of a constant shrinkage in habitat due to current land use practices, the matter of habitat improvement and management for waterfowl becomes increasingly important.

For study purposes the various habitats have been classified into five types and eleven sub-types. This system of classification is outlined in Table 1.

Type I-A, marine habitats, consists of open seas with large open sounds. The salinity is generally the same as, or close to, sea strength, and as a consequence alkalinity, hardness, sulfates and pH are high. The water tends to be clear and the bottom usually of sand or sandy mud. Vegetation is submerged, primarily *Halodule* and *Halophila* with some *Cymodocea* and *Thalassia*. These areas are most used for resting, but scaup feed as well as rest here. There seems to be no practical development or management to be applied to these areas even though they make up an important part of the overall waterfowl habitat except that pollution, especially the dumping of oil, should always be prevented.

Type I-B-1 is composed of inland brackish sounds, coastal creeks, and the adjacent marsh lands with their included ponds and sloughs. The water is generally brackish, but occasionally may equal or exceed normal sea water salinity. So far, any water having a chloride content of 1% to 100% of sea strength has been considered brackish. Alkalinity, hardness, sulfates, and pH are usually high,

Table 1. Florida waterfowl habitat classification.

Habitat Types
I. Salt and Brackish Habitats
A. Marine
B. Littoral
1. Marsh lands.
2. Mangrove lands.
3. Brackish zone of rivers and streams.
C. Inland Salt Springs
II. Fresh River and Stream and Adjacent Marsh Habitats
III. Fresh Lake and Pond and Adjacent Marsh Habitats
A. Intermittent ponds
B. Permanent lakes and ponds
1. Open lakes with relatively little marsh.
2. Lakes with relatively large marshes or heavy growths of pad or submerged plants.
3. Lakes with hyacinth mats but with little marsh.
IV. Everglade and Prairie Habitats
A. Sawgrass areas
B. Mixed vegetation areas
V. Swamp Habitats

free carbon dioxide low. The water in the majority of cases is clear or slightly turbid but sometimes is very turbid because of suspended matter. The soil varies from white sand to soft, very fine black silt or clay. The typical submerged vegetation is widgeon grass, muskgrass, and various marine algae with some growth of sago and *Najas*. The predominating marsh plant is *Juncus roemerianus* and there are some fairly extensive stands of *Spartina alterniflora*. Other important species are *Spartina bakeri, S. patens, S. spartinae, Distichlis spicata* and *Borrichia* spp. This type includes some of the best waterfowl areas in the state, and in the better sections carries more birds per unit than any other. The marsh itself is of very little value since its plants produce little food and grow so densely as to almost prohibit utilization. The ponds, creeks, sloughs, and open waters, however, are heavily used both for resting and feeding. Widgeon grass seems to be the single most important food plant.

Since the greatest value of this type lies in its water areas, any development and management work should obviously be aimed at increasing the amount of such areas, especially where they can be interspersed in the now unbroken marsh. This might be accomplished by impounding, blasting, or excavation. When conditions permit its use, impounding usually gives the best results. These conditions ideally are a fresh stream or run-off from the adjacent upland flowing into the area to be impounded, sufficient tidefall so that salt water can be taken into the impoundment on any high spring or fall tide, and where possible, the area should be so situated that the most acreage can be impounded with the least diking. These conditions can be found in several places along the Florida east coast, though the fresh streams are few, and there impoundment offers good possibilities. The west coast, on the other hand, which has some very extensive and largely unbroken Juncus marshes, generally does not meet the conditions for impoundment on the

tidefall score though qualifying on the others. For this reason, blasting or excavation should give best results here. The openings so created will fill naturally with water of good quality carrying little silt and should produce good growths of widgeon grass.

In the *Spartina alterniflora* marshes of this type the water is generally too turbid to permit growth of any submerged aquatics, so that while impoundment will work here, blasting or excavation will not because of the high silt load. Another problem which has been noted in this type is found in northwest Florida. There, in several very large inland brackish sounds with beautifully clear water of good quality, submerged aquatics are sparse to absent. This apparently is due entirely to the extremely hard sandy nature of the bottom. There seems to be no practical solution to this one.

Type I-B-2 differs essentially from Type I-B-1 only in having mangroves instead of marsh. Waterfowl utilization is often fair to good, but generally is not so heavy as in Type I-B-1. Developmental possibilities of this type seem to be rather restricted, but there have been practically no actual trials. Impoundment is usually not feasible because of insufficient tidefall. Blasting or excavation might give better results in increasing water areas at the expense of the mangroves. Normal run-off from adjacent uplands is important in this type as in I-B-1 in maintaining the salinities most favorable for the good food plants. Diversion of such run-off for flood control or other reasons is definitely detrimental to the best food plant production and should be prevented.

Areas of Type I-B-3, the brackish zone of rivers and streams, often produce fine stands of excellent food plants such as *Allisneria, Ruppie, Najas* and sago. Their waters have the alkalinity and hardness required by these plants, while their salinity is not high enough to inhibit such growths. Some are further improved by being fed from limestone springs. Most are not actually very extensive, however, or have little marsh, or are heavily used by man, so that their value is somewhat limited. The marshes of needlerush, sawgrass, cattail, and bunch cordgrass which occur adjacent to these rivers and streams are for practical purposes quite similar to those of Type I-B-1, and should respond to the same management practices as does that type. In sections where tidefall is sufficient, impoundments should do very well indeed, especially when the stream is small enough to be included in the impoundment.

The inland salt springs, Type I-C, are distinctly different from any other type and hence requires a separate category. In practices, though quite interesting in themselves, they are too small and few in number to be important. Their waters run about 10% sea strength in salinity and 75 ppm in alkalinity and produce some good growths of *Vallisneria, Najas,* sago, and *Chara,* so that these areas should be maintained as nearly as practicable in their natural condition.

In Type II, fresh rivers and streams with adjacent marshes, the streams themselves are usually of comparatively little value since their turbidity or dark stain, flow, depth, softness, acidity, and steep banks prohibit any real food plant production. Many of the marshes along these streams, however, are good natural area or offer good possibilities for development. In their present condition these marshes have a superabundance of cover and a low food production. The vegetation is largely dense stands of *Sagittaria lancifolia, Pontederia cordata,* and *Panicum hemitoman,* with *Cephalanthus occidentalis, Cladium,* and *Typha.* Such openings as occur are generally occupied by *Castalia odorata, Muphar advena,*

Eichhornia, and *Nymphoides aquaticum*. Smartweeds, mostly *Polygonum punctatum* and *P. portoricensis*, wild millet, spikerushes and *Scirpus californicus* are less abundant.

The dense nature of the greater part of these marshes results in the fact that most of the utilization is confined to the upper zone, where the marsh blends into the adjacent prairie. In the Kissimmee and upper St. John's valleys this zone is very extensive and carries a high population. It is valuable, however, only so long as it is flooded. Rainfall in Florida, especially south Florida, is markedly seasonal. This is shown in Table 2, which gives for each of ten stations over the state the mean monthly and annual rainfall for the period 1938 through 1947, and for the state as a whole the monthly and annual rainfall for 1939 with the departures from normal.

The fact that through peninsular Florida most of the rainfall occurs during the late spring, summer, and early fall while the migratory waterfowl are present in late fall, winter and early spring, creates real problems in any development and management work. For instance, in the river marshes where most of the utilization is confined to the upper zone of the marsh, there is plenty of water when the birds first come in. But often by the first of February water levels have dropped so that the birds cannot use this upper zone. This situation is much aggrevated by the great amount of drainage which has been done, and will be made even worse if present plans for flood control are carried out. According to the 1940 census, 16.4% of the total land area of the state was included in the various drainage enterprises. The present total is probably greater than this, and that now planned will far exceed it.

The possibilites for development management in this type seem good, though not exactly simple. The problems to be overcome are a lack of water in late winter, too dense cover, and a shortage of good food plants. The most intensive development would be impoundments which would hold water into the late spring, yet could be drained sufficienty to allow plowing for increasing food and decreasing cover. Pumping may be necessary, a somewhat costly procedure but one which should be possible if charges are made for public hunting. Less intensive management practices would be the opening up of the dense lower zone of the marsh, a difficult operation in itself, and the restriction of drainage so that the upper zone will remain flooded longer.

Type III-A habitats, intermittent ponds, are commonest in south Florida where in the aggregate they form a very extensive area. Generally fairly small individually, their vegetation usually consists of *Pontederia cordata, Sagittaria lancifolia, S. graminea, Panicum hemitemon, Nymphoides, Hydrotrida caroliniana*, and *Hypericum fasciculatum*. The soil is typically peaty muck in the center surrounded by a sand border. The water is acid, very soft, clear to stained but with little or no suspended matter. Most of these ponds are now heavily utilized, but it is entirely possible that if food production were increased by control of the *Pontederia* and *Sagittaria* with millet and smartweed being encouraged these areas could become much more valuable. Water level manipulation is practically impossible here, so that control of the vegetation could probably be best achieved by cultivation, burning, or chemical means, singly or in combination. Again, the seasonal distribution of rainfall is adverse, but the smartweeds may make satisfactory growth if started in the spring. Some actual trials must be made to work out these techniques.

Table 2. Mean monthly and annual rainfall 1938 - 1947, and average state rainfall for 1939 with departures from normal, in inches.

Stations	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Homestead	1.68	1.51	2.06	2.85	4.99	9.32	9.82	7.61	11.43	7.91	2.78	1.48	63.51
Miami	2.10	1.72	2.16	3.62	4.68	6.45	5.56	4.35	8.18	6.12	2.60	2.29	49.71
Okeechobee	1.60	1.50	3.41	2.49	3.77	5.05	5.13	4.78	6.48	3.70	1.62	1.22	40.81
Fort Myers	1.60	1.88	2.81	3.13	3.53	10.46	9.37	7.60	7.52	3.09	1.22	1.31	53.56
Inverness	2.40	3.42	3.85	2.50	3.30	8.88	10.67	9.16	6.94	3.28	0.93	2.12	57.74
Orlando	2.31	2.32	3.54	2.79	3.73	7.59	8.94	6.99	6.38	3.00	1.14	1.77	51.97
Titusville	2.12	1.65	2.89	3.54	2.60	9.54	8.76	5.62	8.69	4.43	1.80	1.96	54.75
Jacksonville	3.16	2.47	3.18	2.86	3.45	7.09	8.69	7.39	7.84	5.57	1.97	3.11	56.87
Tallahassee	3.56	3.81	5.68	4.07	4.39	7.63	8.38	7.20	5.60	2.07	2.57	4.05	59.07
Pensacola	4.34	4.23	7.38	4.45	5.05	6.26	8.78	7.27	6.34	1.27	4.60	4.96	64.98
State, 1939	1.62	2.25	1.54	4.32	5.01	9.13	7.59	10.78	5.79	2.99	1.36	2.16	54.54
Departure from normal	−1.24	−0.85	−1.69	+1.46	+0.44	+2.67	+0.62	+3.54	−1.10	−1.30	−0.88	−0.73	+0.94

Type III-B-1, open lakes with relatively little marsh, are in general poor waterfowl habitat. There is little food plant production because of poor water quality or physical characters, or both. Such areas are used for resting, and in some the mussels and gastropods apparently are plentiful enough to attract good flocks of diving ducks. So far as development or management is concerned, these lakes have few if any possibilities.

Type III-B-2, lakes with relatively large marshes or heavy growths of pad plants or submerged aquatics, includes some fine natural waterfowl areas. Lake Okeechobee and its marshes are among the best in the state, and several others are outstandingly good. In many cases, however, management such as increasing the *Brasenia, Najas, Vallisneria,* and *Potamogeton illinoensis* while decreasing the *Myriophyllum, Cabomba, Utricularia,* and *Nuphar* would be desirable. Chemical and mechanical methods are possible but are slow, costly, and uncertain so that in these lakes, where water level control is seldom possible, management is hardly feasible.

The marshes of this type often are very similar to and present much the same problems as do those of Type II, except that there seems to be somewhat less annual fluctuation of water level here. For this reason, while similar management practices should be applicable to both types, pumping is more apt to be necessary on impoundments in the lake marshes. Many marshes of this type have been dikes, drained, and cleared both for cultivation and pasturage. The fields which are left fallow and flooded are utilized fairly heavily, but it is probable that in the overall picture drainage destroys more habitat than it creates.

Type III-B-3 differs from III-B-1 in having hyacinth as a border or as drifting mats. The value, utilization, and management possibilities are about the same as in III-B-1 with the problem of hyacinth control in addition.

Type IV-A, sawgrass areas, has a vegetation of practically pure *Cladium jamaicensis.* In the main, the growth is too thick for much utilization even though food production is fairly good. Also, it is typical of sawgrass marshes to be dry for extended periods. For these reasons, any management measures should be directed toward opening up the marsh and increasing the water levels. These can be best accomplished by impoundment and pumping, though in some cases the pumping may not be necessary.

Type IV-B, Everglades and prairies with mixed vegetation, have not over 75% sawgrass with *Pontederia, Sagittaria, Typha, Scirpus, Cephalanthus, Panicum hemitomon, Hydrotrida, Nuphar, Castalia ordata,* and *Polygonum.* Some very fine natural areas are included here, but many are too thick, lack sufficient water, or are too heavily grazed for the best utilization. More information on plant succession in this type, as well as experimental work with such techniques as blasting and burning, is necessary to the formulation of sound, detailed management plans. Much land of both Types IV-A and IV-B has been drained and cleared for pasture and cultivation. Such of these as become flooded are fairly well utilized, but those which are dry are of no value. This emphasizes the fact that flood control and drainage plans which aim at a quick discharge of surface water from large areas are a real and serious threat to much of Florida's waterfowl habitat.

Type V, swamp habitats, is of most value to the wood duck though other species use many of the temporarily flooded wooded areas. The common vegetation is cypress, gums, and ti-ti, with various pines and oaks being flooded at times. The

best management seems to be maintenance of the timber, especially mature trees which provide nest sites, and maintenance of at least minimum water levels.

It is not possible to go into all the complexities of state-wide waterfowl habitat management in a paper of this length, but the more outstanding problems have been enumerated. To summarize, there are a scarcity of the recognized good food plants, too dense cover, an abundance of rain when the birds are absent and a shortage when they are present, widespread drainage, poor quaility of much of the water, and small tide-falls. To compensate, there are some extremely good natural areas and a great deal more potential habitats, areas which can be improved by known techniques or by methods which might reasonably be developed.