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EVALUATION OF HABITAT MANIPULATION FOR DUCKS IN AN ALABAMA BEAVER POND COMPLEX

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ABSTRACT

A three-year study was initiated in 1972 to evaluate habitat manipulation practices for ducks in a beaver pond complex located at Hardaway, Macon County, Alabama. Three methods for controlling water level were not effective. Seed yields were determined for four planted and one naturally occurring plant species. Japanese millet (*Echinochloa crusgalli* var. *frumentacea*) averaged 2342 kg/ha; jungle rice (*Echinochloa colonum*), 1847 kg/ha; chiwapa millet (*Echinochloa frumentacea*), 2064 kg/ha; sunflower (*Helianthus* sp.), 1625 kg/ha; and red-rooted sedge (*Cyperus erythrorhizos*), 834 kg/ha. During the hunting seasons of 1972-1975, 134 dabbling ducks were collected for food habit analysis. The five most important food items ranked by importance value for the combined period were: *Quercus nigra*, *Ludwigia leptocarpa*, *Sparganium chlorocarpum*, *Glycine max*, and *Polygonum hydropiperiodes*. The planting of several millet species for ducks was of little value on this study area.

INTRODUCTION

The value of beaver ponds as duck habitat has long been recognized. Wildlife biologists with both state and federal agencies are requested to provide technical assistance to landowners interested in manipulating the habitat to improve duck hunting on these ponds. Current recommendations for management of beaver ponds as waterfowl habitat in the southeast are based on the works of Arner (1963) and Arner et al. (1966).

Auburn University Agricultural Experiment Station biologists were asked to provide this type of assistance to the Glenncrest Hunting Club located on a 160-hectare beaver pond complex near Hardaway, Macon County, Alabama. This club is operated as a commercial duck hunting area and an average of 40 memberships are sold to interested sportsmen. In recent years, the duck harvest has declined from an average of 28 ducks per season per member in 1969 to 12 in 1971 (conversation on July 15, 1975 with Spencer Johnson, owner, Glenncrest Hunting Club, Hardaway, Alabama). A study was conducted to evaluate various methods which might be economically employed to reverse this trend by attracting greater numbers of ducks to the beaver pond complex during legal shooting hours. Experiments were designed to answer the following three questions: (1) Could a water regulation device be used to manipulate water levels so that non-native duck foods could be grown? (2) Could adequate yields of these sown crops be produced? (3) Would these foods be preferred by ducks and entice them to feed on the ponds during legal shooting hours?

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We wish to thank Mr. Spencer Johnson, owner of the Glenncrest Hunting Club, for his cooperation and assistance in this study, and the Soil Conservation Service for providing seed for some of the plantings.

MATERIALS AND METHODS

Study Area

The beaver pond complex is located in a large bottomland area which surrounds Town Creek near Hardaway in Macon County, Alabama. The complex is approximately 25 years old. The only source of water is surface runoff. Four main ponds make up the complex; two of these ponds were chosen for study.

Pond A, 121.5 hectares, is formed by six main dams which are located on an old ox-bow off the main stream. Major herbaceous plant species occurring are *Eleocharis sp.*, swamp smartweed *(Polygonum hydropiperoides)*, burreed *(Sparganium chlorocarpum)*, cattail *(Typha latifolia)*, and red-rooted sedge *(Cyperus erythrorhizos)*. Common woody species present are red maple *(Acer rubrum)*, bald cypress *(Taxodium distichum)*, and buttonbush *(Cephalanthus occidentalis)*. In addition to native plants, two species, Japanese millet *(Echinochloa crusgalli* var. *frumentacea)* and jungle rice *(Echinochloa colonum)* were planted in the pond in 1971 and both have since volunteered in each of the past four years.

Pond B is located 0.4 kilometers south of Pond A and is 6 hectares. Four dams on the pond are located on a small ditch which empties into Town Creek. Major herbaceous plant species occurring are red-rooted sedge, swamp smartweed, water primrose *(Ludwigia leptocarpa)*, and sesbania *(Sesbania exaltata)*. Jungle rice and Japanese millet have also volunteered each year from initial plantings in 1971. Woody species present are black willow *(Salix nigra)* and bald cypress. Scientific nomenclature follows Radford et al. (1973).

The complex supports a resident population of wood ducks. In addition, a variety of species of migrant ducks such as mallards, pintails, and greenwing teal use the ponds during the winter months.

Water Level Control

Three devices for manipulating water levels were evaluated over the three-year period. Each year all dams were broken using 50 per cent ditching dynamite or by using a pick and shovel, and one of the control devices was installed in the breaks of selected dams. The remaining dams were kept open to allow drainage throughout the growing season by using a pick and shovel.

On July 2, 1972, breaks were made in dams on each pond using dynamite, and electrified wire installed in two dams to deter beaver repair efforts. Two strands of electrified wire were installed approximately 7.6 centimeters above the water. Metal rods with ceramic insulators were used to support the wire. A Holdem Model 69 fence charger was used with an Eveready 12-volt dry cell battery as the source of electricity.

On June 23, 1973, trenches were cut in dams on each pond using a pick and shovel and drains installed in four dams. Each drain consisted of three pipes. Drain material was solid and perforated PVC sewer pipe.

In 1974, no water control device was used. Water levels were controlled by breaking the dams with a pick and shovel as often as necessary.

On June 15, 1975, dams were broken on Pond B using a pick and shovel, and three-log drains as described by Arner et al. (1966) were installed in three of the dams.

All dams were checked for beaver repair weekly or following any rainfall. In cases where water control devices had failed, water levels were controlled by breaking the dams as often as necessary to prevent flooding of the sown plant species.

Plantings

In 1972 and 1973, Japanese millet, chiwapa millet *(Echinochloa frumentacea)*, jungle rice, corn *(Zea mays)*, and sunflower *(Helianthus sp.)*, were tested to determine their productivity in the beaver ponds and degree of duck usage. All millets were sown immediately following draining with a hand Cyclone Seeder at a rate of 22 kg/ha; corn and sunflower were hand drilled at a rate of 11 kg/ha.

In Pond A, on July 2, 1972, 12.2 hectares of mud flats were planted with Japanese millet. On July 10, 1973, these same mud flats were planted with jungle rice and Japanese millet.

In Pond B, on August 6, 1972, Japanese millet was planted on the 4 hectares of exposed mud flats. On June 23, 1973, eleven 0.0004-hectare square plots were established. Plots were 6.36 meters square and the corners were marked with iron pipe measuring 1.5 meters in length. Plots were

grouped in each of four different areas of the pond to reduce variability. Two plots were randomly selected and planted with one of the following: chiwapa millet, jungle rice, corn, or sunflower. Seeded corn and sunflower plants were destroyed by beavers before production was complete. Sunflower seedlings of the same age as those destroyed were transplanted in the plots from an upland site and protected with an exclosure constructed of chicken wire to prevent beaver damage. Four hectares of remaining mud flats were planted with Japanese millet, jungle rice, and chiwapa millet.

On July 15, 1974, 12.2 ha of mud flats in both ponds were planted with Japanese millet. Dates to maturity were determined for the millets and native red-rooted sedge.

Yield Measurements

After maturity of seeded plants in 1972 and 1973, seed production was determined by removing seed heads from the sunflower, millets, and red-rooted sedge within randomly placed 1 meter square sample plots (Low and Bellrose, 1944). Two samples were made for Japanese millet on October 7, 1972. On August 30, 1973, seven samples each were taken for the jungle rice, red-rooted sedge, chiwapa millet, and sunflower. Seed heads were clipped with pruning shears, placed in paper bags, allowed to air dry, and then threshed through a series of graduated sieves of sizes 13, 6.5, and 3.2 millimeters and 18-mesh screen wire. The seeds were then cleaned in a Bates Laboratory Aspirator and weighed to the nearest 0.1 gram.

Food Habits

During the hunting seasons of 1972 to 1974, digestive tracts were collected from ducks harvested on the complex. Plant material was placed in paper envelopes and air dried for two weeks to permit separation and identification. Seeds were identified using Martin and Barkely (1961), Musil (1963), and Harlow (1964), as well as with the use of a seed collection made from plants occurring on the complex. Animal and plant materials were separated and their volume measured by water displacement using graduated cylinders. From these data, per cent volume and per cent occurrence were calculated for each food item. Importance value for each food item was determined by multiplying per cent volume by per cent occurrence (Keith, 1961).

RESULTS

Water Level Control

The method using electrified wire failed to prevent beavers from rebuilding dams. Beavers pushed sticks into the wires subsequently shorting out the electrical system and allowing the beavers to continue their repair efforts. In one case, fluctuating water levels, caused by rains, shorted the wires on one of the chargers.

The drain pipes, installed in 1973, failed to maintain the desired water levels. Beavers chewed holes in the perforated pipes and packed mud into the solid pipes on one drain. On the other three drains, beavers plugged the holes in the perforated pipe with stalks of millet and smartweed.

Three-log drains, installed on Pond B in 1975, failed to maintain desirable water levels as beavers stopped the water flow by building new dams in front of these drains.

Yields

Table one shows the seed yields and days for maturity of the five plant species evaluated. Japanese millet (2,342 kg/ha) produced the highest yields and red-rooted sedge (834 kg/ha) produced the lowest. Heavy competition from native species was noted in some areas of the pond. Although Japanese millet planted in 1973 had poor germination, good crops of jungle rice and chiwapa millet were produced during the same period. Corn and sunflower seeded in 1973 were destroyed by beavers and insects before maturity. Transplanted sunflower protected by wire exclosures did mature and produced seed (Table 1).

Food Habits

A total of 134 ducks representing five species (114 wood ducks, 16 mallards, 6 greenwing teal, 2 pintails, 1 black duck) were collected over the three-year period for food habit analysis. Analysis of these data did not show a significant difference in the food habits among the five duck species. The top five food items by importance value for each year in order were as follows: 1972-1973, burreed, sedge *Cyperus odoratus*, water oak *(Quercus nigra)*, water primrose, and Japanest millet (Table 2); 1973-1974, water oak, swamp smartweed, burreed, red-rooted sedge, and *Cyperus odoratus* (Table 3); 1974-75, water primrose, soybeans *(Glycine max)*, water oak, burreed, and swamp smartweed (Table 4).

Table 1 Days for maturity and seed yields in kilograms per hectare collected for four plant species from test plots in a beaver pond, Hardaway, Alabama, 1972-73.

Type Plant Sampled	*Yield Range kg/ha*	*Average kg/ha*	*No. Samples*	*s-[1] y*	*Days for Maturity*
Japanese millet *(Echinochloa crusgalli* var. *frumentacea)*	1927-2757	2342	2	415.0	65
Chiwapa millet *(Echinochloa frumentacea)*	1894-2250	2064	7	53.1	80
Jungle rice *(Echinochloa colonum)*	1618-2103	1847	7	66.5	95
Sunflower *(Helianthus* sp.*)*	1105-2263	1625	7	183.5	100
Red-rooted sedge:[2] *(Cyperus erythrorhizos)*					
Early	370- 627	534.6	4	60.6	100
Late	707-1094	834	7	49.7	75

[1] Standard error obtained from $\sqrt{s^2/N}$.
[2] Yields were determined from two stands which matured at different times.

Table 2. Ten most important food items of 34 ducks,[1] Hardaway, Alabama, 1972-73, ranked by importance value.[2]

Plant	*Importance Value*	*Percent Volume*	*Percent Occurrence*
Sparganium chlorocarpum	505.00	10.90	50.00
Cyperus odoratus	275.30	6.72	41.10
Oqercus nigra	257.40	22.01	11.70
Ludwigia leptocarpa	216.20	9.17	23.50
Echinochloa crusgalli	152.10	17.45	8.80
Cyperus erythrorhizos	135.50	7.70	17.60
Panicum sp.	39.70	3.36	11.70
Carya aquatica	30.10	10.39	2.90
Amaranthus sp.	22.00	1:52	14.70
Scirpus sp.	10.50	1.22	8.80
Animal material	32.76	2.80	11.70

[1] Includes 26 wood ducks, 4 greenwing teal, 3 mallards, 1 black duck.
[2] Importance value = percent volume × percent occurrence (Keith, 1961).

Table 3. Ten most important food items of 55 ducks,[1] Hardaway, Alabama, 1973-74, ranked by importance value.[2]

Plant	Importance Value	Percent Volume	Percent Occurrence
Quercus nigra	7572.80	94.70	80.50
Polygonum hydropiperoides	23.10	.98	23.60
Sparganium chlorocarpum	6.80	.32	20.00
Cyperus erythrorhizos	6.70	.62	10.90
Cyperus odoratus	3.90	.31	12.70
Unidentified seeds	3.80	.54	7.20
Ludwigia leptocarpa	3.40	.95	3.60
Amaranthus sp.	.50	.04	14.50
Polygonum densiflorum	.50	.06	9.00
Zea mays	.40	.27	1.80
Animal material	21.89	1.10	19.90

[1] Includes 41 wood ducks, 10 mallards, 2 pintails, 2 greenwing teal.
[2] Importance value = percent volume × percent occurrence (Keith, 1961).

Table 4. Ten most important food items of 50 ducks,[1] Hardaway, Alabama, 1974-75, ranked by importance value.[2]

Plant	Importance Value	Percent Volume	Percent Occurrence
Ludwigia leptocarpa	698.40	23.30	30.00
Clycine max	196.80	19.70	10.00
Quercus nigra	118.00	9.80	12.00
Sparganium chlorocarpum	110.10	3.70	30.00
Polygonum hydropiperoides	21.90	1.60	14.00
Zea mays	21.00	5.25	4.00
Echinochloa colonum	19.40	9.70	2.00
Quercus sp.	18.90	4.70	4.00
Unidentified seed	11.90	1.00	12.00
Bidens sp.	10.50	1.30	8.00
Animal material	86.38	6.17	14.00

[1] Includes 47 wood ducks, 3 mallards.
[2] Importance value = percent volume × percent occurrence (Keith, 1961).

The top five food items by importance value for the combined three-year study were water oak, water primrose, burreed, soybeans, and swamp smartweed (Table 5).

DISCUSSION

The problem of water level control is of primary importance. If the pond is to be planted, water must be removed and kept off until the seeds mature. None of the permanent water control devices were effective in maintaining a desirable water level. Water levels were maintained only through the repeated breaking of dams as they were repaired. In 1974 when this was the only technique used, dams had to be broken thirteen times within the two month period required for the maturation of the planted crops.

If the seeds produced in the pond are to be utilized by the ducks, plantings must be flooded at the proper time. The only source of water for the ponds in the complex is surface runoff. Even though beavers were allowed to rebuild the dams by the end of September 1973, an early fall drought resulted in the ponds remaining dry until mid-November. Over the three-year period it was also

observed that repeated draining of the ponds was promoting an increase of plants which had little or no value as potential duck foods. Stands of cattail and sesbania completely enveloped the mud flats which made it very difficult to plant foods and obtain good yields. They also suppressed growth and production of some of the naturally occurring foods.

Based on the food habit data (Tables 2-5), no evidence was found that the planted foods were utilized to the degree that justified their use in the management plan. Water oak acorns were the most important duck food item overall in this study (Table 5). Lower ranking of acorns in 1972 (Table 2) and 1974 (Table 4) may have been due to low mast production. Although acorn production was not determined by sampling of mast trees, few acorns were observed on the ground during the fall of either of these two years. Water oaks normally produce good mast crops four out of every six years (Goodrum, 1971).

Most of the water oak acorn production occurred in the flood plain along Town Creek outside the watershed of any of the ponds. In years of good acorn availability, ducks apparently fed very little on these ponds. Even in years of apparent poor availability, acorns were used more than planted foods.

Soybeans and corn were rated high in importance value in this study. They are both expensive and difficult, if not impossible, to grow in beaver ponds. The nearest corn to the complex was 4.8 air kilometers and soybeans, 3.2 kilometers. These foods evidently were drawing ducks from the ponds during feeding periods.

The seed yields for all three millets showed that adequate production in these ponds was possible (Table 1). Sufficient hectares of millet species were present in the complex to evaluate duck usage. The importance value of Japanese millet in 1972 (Table 2) was high but not as high as would be expected considering the amount that was produced. Although some seed was evidently lost to songbirds, natural aquatic species and food items not found in the complex were preferred to the millet. In either case, the use of millet in this management plan does not appear justified. Thus, it becomes evident that trying to use this type of habitat manipulation to compete with acorn mast and attract ducks for shooting to these ponds is very difficult.

The most practical management program based on these data for this complex would be to leave it in its present state for the following three reasons: (1) Food habits indicate that the planting of foods such as Japanese millet, chiwapa millet, and jungle rice is not justified due to a lack of sufficient usage by wintering ducks, (2) Complete drainage of ponds without a permanent water supply may result in a dry pond during the fall migration as occurred in 1973, (3) Repeated drainings of the ponds may lead to a plant community composed of undesirable species.

In summary, this study indicates that landowners should carefully consider the aforementioned factors as well as the proximity of the pond to more preferred duck foods such as acorns, corn, and soybeans before attempting to manage a beaver pond with artificial plantings to improve duck hunting. Even after all these factors are considered, they should also recognize that their time, effort, and costs may very likely go unrewarded.

Table 5. Ten most important food items of 134 ducks,[1] Hardaway, Alabama, 1972-75, ranked by importance value.[2]

Plant	*Importance Value*	*Percent Volume*	*Percent Occurrence*
Quercus nigra	2566.60	62.60	41.00
Ludwigia leptocarpa	152.30	8.50	18.00
Sparganium chlorocarpum	60.06	2.31	26.00
Glycine max	24.80	6.18	4.50
Polygonum hydropiperoides	5.00	.50	10.00
Cyperus erythrorhizos	4.90	.49	7.00
Echinochloa crusgalli	4.70	2.40	2.00
Bidens sp.	4.50	.45	10.00
Zea mays	3.30	1.65	2.50
Animal food	46.47	2.83	16.42

[1] Includes 114 wood ducks, 16 mallards, 6 greenwing teal, 2 pintails, 1 black duck.
[2] Importance value = percent volume × percent occurrence (Keith, 1961).

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WILDLIFE POPULATIONS IN COASTAL MARSHES INFLUENCED BY WEIRS

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ABSTRACT

The abundance of various species of wildlife in marshes and ponds influenced by weirs was measured and compared to similar data collected on non-weired or control areas from January through December, 1974. Weirs were constructed in marsh drainage systems and held water levels in ponds and bayous several inches below the elevation of the adjacent marsh; however, control areas were subjected to natural tidal influences. Greater duck, coot, and non-game bird usage was found in ponds influenced by weirs, especially during low water periods occurring in the winter. Field data indicated that weirs had no measurable effects on fur bearer or small mammal populations, with the exception of swamp rabbits. Whether populations were high or low was generally independent of the influence of weirs in the areas surveyed. Survey methods most reliable were aerial bird counts and ground counts of muskrat beds and nutria trails.

INTRODUCTION

Coastal marshes, which extend across the entire coast of Louisiana, cover 4,000,000 acres (O'Neil 1949) and support very high populations of fur bearers, waterfowl, and non-game wildlife (St. Amant 1959). As a result of man's activity, these marshes have undergone tremendous modification and in many instances their wildlife productive capacity has been greatly reduced. Of particular importance are tidal marshes where canals have been dug or channels deepened, thereby causing drastic tidal fluctuation, rapid drainage, and extreme salinity fluctuation. Therefore, as a result of man's activity, it has been necessary to develop special management procedures to offset or moderate the damaging effects on marsh wildlife and wildlife habitat.

One marsh management technique often used in Louisiana coastal marshes to stabilize water levels and salinities and, at the same time, make the marshes more accessible to trappers and hunters is the construction of weirs in the drainage systems of a particular area. Weirs resemble low dams and are

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