

Aquatics

SEPTEMBER 1980



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AQUA-VINE



The Florida Aquatic Plant Management Society's annual meeting has been set to convene October 29, 1980. Then on October 31, 1980, all arrangements are receiving final touches by the various committees. With all the legislative activities, the establishment of an advisory council, and the resulting re-organization, this meeting may be one of the most rewarding and educational meetings ever to convene on Florida's aquatic plant management.

To assist in the planning of this meeting the Board has established a policy to encourage pre-registration. All persons should pre-register no later than 10 days in advance for the same rate of \$15.00. Registration at the meeting was set at \$25.00. All pre-registrations will be refunded if for some reason you are unable to attend. We hope this will encourage each and every one of you to send in a pre-registration to:

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Ed Menninger Retires

The Board of Directors of the Florida Aquatic Plant Management Society has requested me to express to you our deep and sincere appreciation for your assistance in the development and continued publication of our Society's official publication, "AQUATICS".

As you are well aware the initial stages in the development of "AQUATICS" was very sensitive and somewhat uncertain. The advice and direction provided by yourself and Southeastern Printing were instrumental in helping our Society and "AQUATICS" through this initial critical period. Although "AQUATICS" is still experiencing some growing pains, the membership and Board of FAPMS are very proud of "AQUATICS" and we are convinced

Editorial
by William L. Maier

Re-organization of the State's aquatic plant control program is in full progress. Although a lot of people are involved with potential agency changes and apprehension about personal hardships everything appears to be going well. The majority of Commission personnel have been contacted by the districts and are being considered for employment, most with increases in salaries and benefits with minimal relocations required. Additionally, opportunities for promotions within the State's programs are being realized. When completed, this re-organization will have met major goals of placing aquatic plant control responsibilities closer to home, reduces the number of public employees, and increases the use of commercial contractors. The only disheartening fact of this whole process is in recruitment of experience and educated persons in aquatic plant control. This profession has grown tremendously over the past ten years. Numerous states are responding to the needs of aquatic plant management as well as industry. Even in a time of economic hardships this profession has continued to grow by leaps and bounds. It is high time for our educational systems to recognize the importance of aquatic plant management by encouraging promising students to consider a career in this field. Through these efforts the profession will continue to improve.

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AQUATICS: Published quarterly as the official publication of the Florida Aquatic Plant Management Society. This publication is intended to keep all interests informed on matters as they relate to aquatic plant management, particularly in Florida.

CORRESPONDENCE: Address all correspondence regarding editorial matter to William L. Maier, Editor, AQUATICS Magazine, 3315 Whirlaway Trail, Tallahassee, Fla. 32308.

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COVER

This signifies a familiar scene of a Game and Freshwater Fish Commission crew spraying water hyacinth.

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CALENDAR NOTES

October
29, 30, 31 The Florida Aquatic Plant Management Society's Annual Meeting, at Howard Johnson's, on I-4 and Lee Road, Orlando.
* pre-registration 10 days in advance.

November
17-20 Department of the Army Waterways Experiment Station. The Corps of Engineers will hold its Annual Meeting, concerning Aquatic Plant Control Research Planning and Operations Review, Sheraton-Savannah Inn, Savannah, Ga. Anyone interested please contact Mr. W. N. Rushing at 601/634-3542.

THE CATTAIL: Eat em up!

The cattail family, *Typhaceae*, consists of a solitary genus and is one of the most common groups of aquatic species in Florida. Members of this native family are found in all counties of the state. Easily recognized by young and old, botanist and schoolchildren, the cattail is actually deceiving in true identity. Although nearly all outdoorsmen have at one time or another become acquainted with cattail, few are aware that there are four species found within the United States and fifteen worldwide. *Typha domingensis* Pers., *T. glauca* Godr., *T. angustifolia* L., and *T. latifolia* L. are the species in the U.S. All except *T. glauca* occur in Florida.

Identification of cattail species found in Florida:¹

1. *Typha latifolia* L. — Common cattail
 - A. Grows to a height of about 3 meters.
 - B. Leaves grayish-green, essentially flat 6-23 mm wide often wider than the stem.
 - C. Sheaths cylindrical but open to base.
 - D. Staminate (upper male section) and dark brown pistillate parts (lower section) of the spike touch. Male section up to 12 cm long and female portion up to 20 cm long.
 - E. Fruit 15-35 mm thick when magnified appears minutely pebbled.
 - F. Pollen grains in fours.
2. *Typha angustifolia* L. — Narrow-leaved cattail
 - A. Grows to a height of about 1.5 meters.
 - B. Leaves dark-green, usually less than 10 are convex on the back, 3-7 mm wide.
 - C. Sheaths cylindrical but open to base.
 - D. Staminate and pistillate parts of spike separated by a short distance.

E. Pistillate portion reddish-brown 15 cm long and 15 mm thick when in fruit, minutely bristly.

F. Pollen grains simple.

3. *Typha domingensis* Pers. Tule-Cattail

A. Grows to a height of about 3 meters.

B. Leaves yellowish-green, usually 6 to 10 are flat, 7-15 mm wide and shorter than the inflorescence (flower portion).

C. Sheaths tapering at throat to the blade.

D. Staminate portion of spike 20-40 cm long, usually separated (sometimes by as much as 6 cm) from the pistillate portion.

E. Fruit portion is whitish-brown and minutely bristly.

Habitat preference for the species found in Florida include irrigation ditches, pond and lake margins, river banks, shallow bays and both fresh and brackish water marshes. Once established in a wetland system, cattail can survive in water depths of over 3 feet; although bog areas which experience



Photos by David P. Tarver

Perhaps the most well known wetland plant, the cattail is widely distributed throughout Florida.



Large quantities of cattail "fuzz" (seeds) were used in stuffed toys, life preservers, and padding in tanks and airplanes during World War II.

*Biologist, Natural Resources



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that the initial and continued success of the magazine are due to your dedication and desire to produce a quality product.

Again Ed, thank you and Southeastern Printing for your past and continued cooperation.

Sincerely;

Joseph C. Joyce
President Elect

The Aqua-Vine Section of "Aquatics" has been added to provide information on current events and recent publications from industry and government to increase the dissemination of aquatic plant control techniques and regulatory changes. Complete copies of reports mentioned in this section can be obtained on request to the respective authors or the Editor of "Aquatics".

The Aquatic Plant Technical Advisory Council had its first meeting in July. This council has been established to review and make recommendations to the Department of Natural Resources on control operations and research. Mr. Harold Brown was elected by this council to serve as chairman. Dr. Arnett Mace was elected as vice chairman and Dr. Alva Burkhalter will serve as secretary. The following is a list of the appointed council members:

Mr. Joe Schweigart
South Florida Water Management District
Post Office Box V
West Palm Beach, Florida 33402
(305) 686-8800

Mr. Tom Lawton
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Indialantic, Florida 32903
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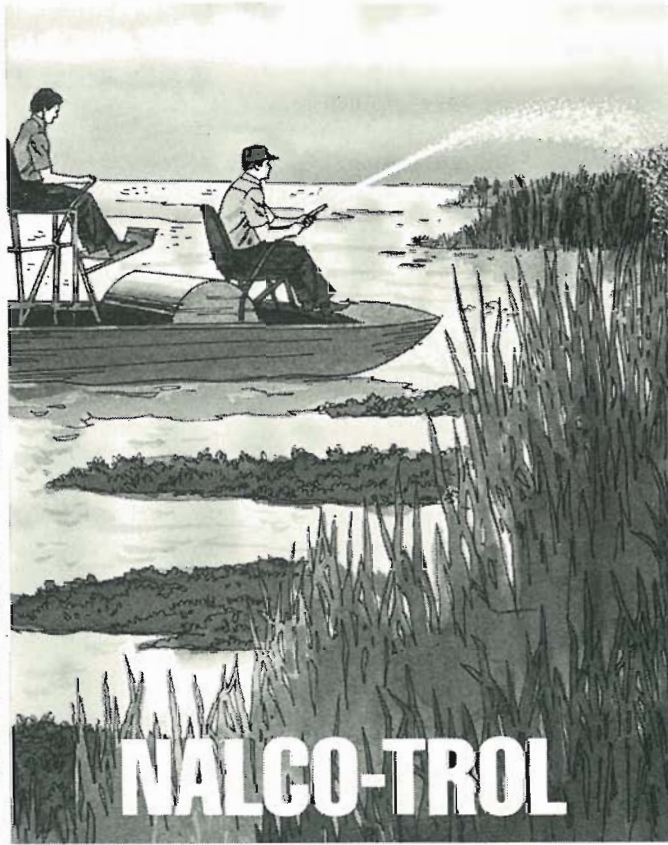
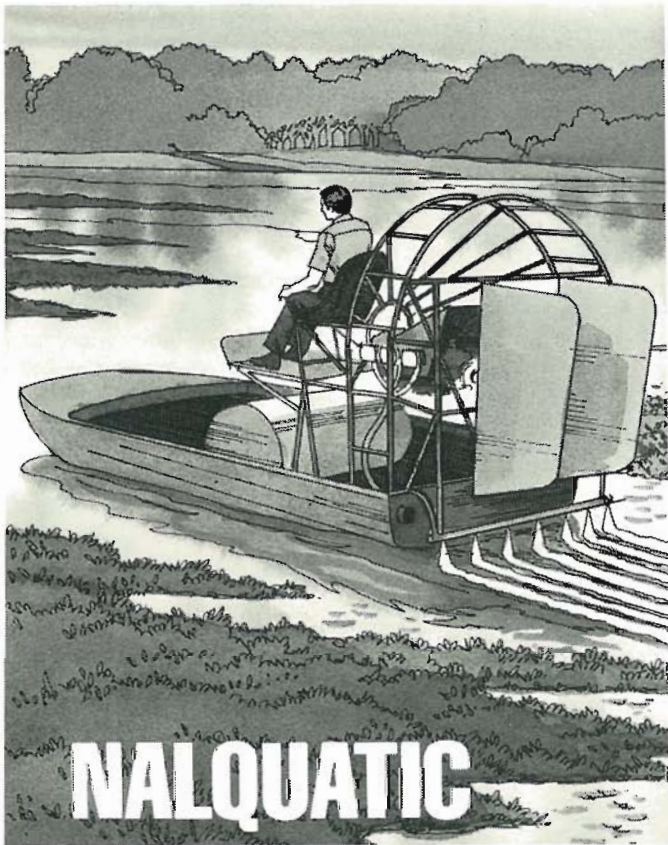
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periodic flooding are the most desired habitat.

Cattails have a history of serving the needs of a diverse group of animals, man being no exception. The stalks, thick rootstocks and roots are important foods for muskrats and beaver. Geese and teal are reported to consume the small seeds and occasionally the roots. A wide array of song birds and waterfowl utilize the shelter and nesting cover dense stands of cattail provide. The root system and stem serve as shelter for small fish and invertebrates. Stands of cattails also contribute to erosion prevention, soil stabilization and form effective barriers for water sheet flow.

Although many people are aware of the fact that parts of the cattail plant are edible, only recently has this use reappeared. The following information from the *Louisiana Conservationist*, 1972, is most informative and reveals that cattails are not only edible but make excellent dishes for the table.

The utilization of wild plant foods need not be restricted to survival alone, this is especially true when some equal or surpass the flavor of potatoes and sour cream. Cattails is one such plant.

It is one of the most versatile wild veg-

etables easily and abundantly available. The American Indian knew this and utilized the plant long before the arrival of the white man. It's an old Boy Scout saying, "you name it and we'll make it with cattails."

Indian records cite the tribes living along the southern and eastern shores of the U.S. not only used the plant for food but wove the leaves into matting and baskets, blended the entire plant with mud to create building material, and plied the mature tail portions.

Another use was recognized during World War II when manufacturers converted large quantities of cattail into stuffed toys, life preservers, and tank and airplane padding. As the economy recovered, the cattail was replaced by synthetic substances in this industry, so that presently its use is confined almost entirely to woven rush seating, dimensional background for floral arrangements, and baskets for tourist trade.

In spite of its wide use in the past, what is known least about the plant is its succulent edibility. The U.S. Air Force survival booklet states of the cattail: "... eat the edible young shoots that taste like asparagus; eat the rootstalk boiled or raw; use the pollen to make small pancakes and bread." Additional re-

search reveals that not only the young shoots and rootstalks as edible but the root system, root buds, root bud sprouts, stems, green tails and spikes, and the pollen, all have various recipes surrounding them.

Recipes (*Louisiana Conservationist*, 1972 by Frank Davis)² Note — Obviously select plants free of pesticides.

POLLEN

Starting at the top of the plant, pollen flour is first product harvested once the tail spikes turn yellow. Collection is simply a matter of bending the cattail heads over into a large bowl or other suitable container and rubbing the pollen off. If you sift the material collected it will produce a powder as fine as talcum, which if mixed half-and half with grain flour for biscuits, pancakes, and muffins gives the finished pastry a bakery-shop color and a delectable taste.

GREEN CATTAILS

Green tails, those harvested in late

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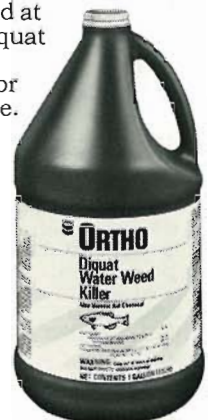
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INVESTIGATION OF THE PRESENCE AND SURVIVABILITY OF HYDRILLA PROPAGULES IN WATERFOWL

Joseph C. Joyce, William T. Haller and Douglas Colle*

The invasion of the exotic aquatic plant species, hydrilla (*Hydrilla verticillata*, Royle) into the nation's waterways

* University of Florida, Gainesville

has created significant adverse impacts to recreation, fishery management, flood control, navigation and water management practices in general. Additionally, hydrilla's ability to out-com-

pete native vegetation for space, light and nutrients results in severe reductions in the diversity of aquatic vegetation available for utilization as food and shelter by fish and wildlife.

The relationship between migratory waterfowl and aquatic plants is well established. Seasonal waterfowl migrations to southern regions occur to take advantage of milder winter temperatures and more abundant food resources. Furthermore, water management practices are routinely developed to favor certain aquatic macrophytes which are preferred by the game species. However, since hydrilla infestations characteristically reduce aquatic macrophyte diversity, hydrilla has the potential to 1) cause shifts in the feeding habits of all waterfowl species or 2) select for certain species which have shown a preference for hydrilla.

An additional relationship between hydrilla and waterfowl is the possibility of the transport of hydrilla fragments or its vegetation propagules to other uninfested water bodies. Hunters frequently report finding hydrilla fragments, turions and tubers in the digestive tract of game birds. There have also been reports of turions passing through the gizzard into the intestines. This latter mechanism of transport from one lake to another is potentially highly significant due to the large number of waterfowl which overwinter on hydrilla infested lakes. Thus, the purpose to this study was to 1) gain insight into the relative proportions of hydrilla and 2) the survivability of reproductive structures in the digestive system.

Hydrilla produces two specialized reproductive structures, turions and tubers. Turions, or winterbuds, develop in the leaf axil, primarily on floating fragments. After maturing the turions

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Carl G. Tye Retires

Carl G. Tye, Aquatic Weed Control Foreman with Polk County Environmental Services Department, retired July 31, 1980. Carl is a 14 year veteran in aquatic weed control and has in part been responsible for effective, efficient aquatic weed control operations in Polk County. He was recently honored with a special luncheon where he was presented with a Lew's Speed Spool and graphite rod as a retirement tool.

Our hearty congratulations for a job well done and best wishes for many happy retirement years.

ANNOUNCING

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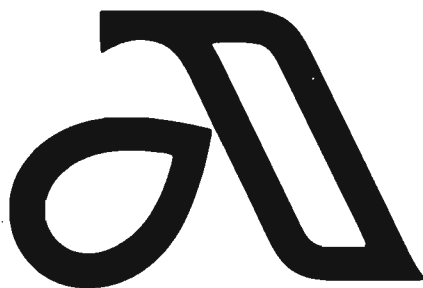
On January 28 thru 29, 1980 a group of aquatic pesticide applicators met at Purdue University (W. Lafayette, IN) to initiate a formal organization devoted to the advancement of aquatic plant management in the midwest. It has long been recognized that aquatic weed problems in the midwest are on the increase and concern for this situation has been expressed by both commercial applicators and the general public. The aquatic weed problems and the environment they impinge upon are quite distinct from those of the southeastern states

where most of the past impetus for research and education originated. A concern for our own unique problems plus the realization that the aquatic environment is a complex and delicate system emphasizes the need for a separate professional and scientific organization in the midwest.

What can the MIDWEST AQUATIC PLANT MANAGEMENT SOCIETY do for you? In addition to an affiliation with a professional organization, you will be able to participate in organizing an annual conference with lectures and workshops devoted to various aspects of aquatic plant management (you can already mark your calendar for the first conference, January 26, 1981 at Purdue). Through the Society you will have an active voice in educating and informing personnel in state regulatory agencies *before* decisions are handed down. And, you will receive a newsletter at least twice a year with pertinent information on advancement in the field, how to obtain literature, hints on weed identification, news from colleagues, etc.

If you are interested in our objectives, we invite you to join the MIDWEST AQUATIC PLANT MANAGEMENT SOCIETY. Send your dues to the secretary-treasurer: Debbie Torrey, 665 Walter Way Apartment H, Warsaw, IN 46580. □

The Florida Aquatic Plant Management Society, Inc., has not tested any of the products advertised in this publication nor has it verified any of the statements made in any of the advertisements. The Society does not warrant, expressly or implied, the fitness of any product advertised or the suitability of any advice or statements contained herein.



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GREEN CATTAILS

spring and early summer, taste exactly like zucchini squash. Prepared by boiling for twenty minutes or until tender, the green tails can be served as an a la carte vegetable or added like water chestnuts to dishes such as chop suey, chow mein, and sect gum to enhance the flavor.

How about cattail on the cob? Well, you can gather up enough green tails (you actually eat the tender, green spikes) in a few minutes to serve them salted and buttered like corn on the cob.

Harvest them just before they drop the protective sheath and cook them immediately, lest they lose their flavor, by boiling in salted water until tender. Not only do they harvest like corn on the cob, husk like corn on the cob, and taste like corn on the cob, they even smell like fresh corn on the cob while cooking.

A cattail casserole can be prepared by scraping the bud material from the cores and blending it with two cups of seasoned bread crumbs, one beaten egg, and a half cup whole milk. Salt and pepper to taste and bake at 350-degrees for about a half-hour. It is tasty hot or served cold on saltines as a TV snack.

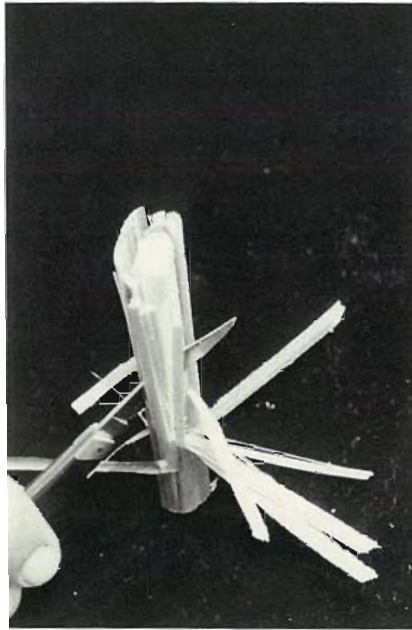
Incidentally, fresh green cattails, like all fresh vegetables, may be frozen for later use by par-boiling.

SHOOTS

"Cossack Asparagus" is the slang term given to the juvenile tail shoots. To harvest the young sprouts, grab the plant's inside leaves and pull sharply so that the tender inside shoots break off at the roots. After shucking the leaves and exposing the inside section, you can either nibble on the raw core like one would carrots or saute the pieces with seasoned salt and butter. The flavor is remarkable.

STEMS

Looking for a low calorie potato? Wash the stems of the cattail and cut them lengthwise. Then boil them for about fifteen minutes. You will find the pulp tastes just like baked potatoes. Try to obtain young stems, since the older the plant the more stringy the pulp.



The pulp or inner core of the cattail stem can be eaten raw or used to thicken stews and soups. Young cattail stems taste like baked potato when boiled.

ROOTS AND STEMS

For a side dish, try washing and peeling the cattail roots and stem bases, slicing them lengthwise, and boiling them for three to six minutes. When cool enough to handle, the roots and stems can be scraped for the thickened material and strained to remove the fibrous tissue.

Believe it or not, what is extracted from the scrapings has an ambrosial, starchy flavor and look resembling coconut creme filling. Additionally, this extraction can be used to lend better consistency to soups, stews, and gravies.

ROOT BUD SPROUTS

Just to illustrate the wide versatility of the plant usage for food, you can take the root buds (parts of the rootstock that have elongated but not yet broken ground), cover them with hot vinegar, seal them in Mason jars, and store them for a few weeks. At the end of that period you will be pleased to serve your guests some very appetizing cattail pickles!

ROOT BUDS

Located on the growing ends of the rootstock, the bud-like sprouts when

washed and prepared by peeling, boiling, and serving with butter have a sweet taste that complements any meat dish.

ROOTS

Cattails have a tangled root-mass just below the surface of the ground. And because they are so compact, a square yard of cattail swampland will produce enough roots to make several pounds of cattail flour.

Here's how it's done:

After digging, washing, and peeling the roots, you will have a neat "bunch" of white cores about a half-inch thick. Using a container of cool water, separate the cores into fibers, working them to extract the juice from the strands.

If you remove the fibrous material and let the water settle, the starch, the "root flour", will precipitate to the bottom. Finally, after the precipitation process is completed several times, you will be able to collect a fine, white material from the container.

Used wet and mixed half-and-half with grain flour, the product will make savory breads, cookies, and other baked goods.

What else can you do with cattails? Your only limitation is your talents. Every cook has favorite recipes into which the cattail and its versatility will blend. And in an age when health enthusiasts are joining forces with those wanting to regain slenderized figures and cut food bill costs, cattail cuisine might be just the thing to look into.

So the next time you receive a complaint about over abundant cattails or crank up the spray rig to control a dense stand, just remember, these plants which are considered undesirable are also a very tasty treat and the price can't be beat. □

LITERATURE CITED

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drop off and sink to the bottom, where they germinate and produce new plants the following spring and summer. Tubers, the primary structure which enables hydrilla to survive adverse environment conditions is formed 5-10 cm deep in the hydrosol at the ends of rhizomes where they are protected from chemical treatment, freezing, etc. Tubers also provide a good nutritional forage due to a starch and protein content of 46.8% and 5.3% dry weight respectively. Furthermore, tubers and turions are generally formed between September and May and are readily available to overwintering waterfowl.

In order to evaluate the magnitude of hydrilla utilization and transport by waterfowl, waterfowl specimens were either obtained from hunters or collected from Lake Ocklawaha near Palatka, Florida, by firearms and an airboat under the provisions of permits granted by the U.S. Fish and Wildlife Service and the Florida Game and Freshwater Fish Commission. The species collected by air boat were the most abundant species in the lake i.e. coots, and ringnecks. Both morning and afternoon samples were taken in order to determine daily food habit trends.

The digestive tracts were divided into three areas for examination; a) the temporary crop, from the throat to the entrance to the gizzard; b) the gizzard; and c) the intestines, from the exit from the gizzard to the anus. Each section was examined for the presence of hydrilla fragments, turions and/or tubers. The presence of other plant species and materials was also noted, however, other than the tuber and turions no quantitative measurements were made. Intact hydrilla tubers and turions growth chambers at 25°C under a 12 hr. photoperiod. The tubers and turions were inspected daily for 21 days for percentage germination and any decaying tubers were removed.

The following is a brief summary by species of the results:

Ring-necked ducks The ring-necked ducks were all collected from Lake Ocklawaha. Lake Ocklawaha or Rodman Reservoir has a wide diversity of aquatic vegetation, however, the dominant plant species is hydrilla. These diving ducks appeared to be feeding almost exclusively on hydrilla, hydrilla tubers and hydrilla turions. Of the 23 specimens collected by both methods, 22 had hydrilla in either the temporary crop and/or gizzard and 15 of the 23 contained either hydrilla tubers or turions. One specimen had a total of 57 tubers and 4 turions in

its crop and 6 tubers and 1 turion plus a large quantity of ground up tuber material in its gizzard. Pond weed (*Potamogeton* sp.) seeds were the next most common item found in these ducks. One duck contained 11 snails in its crop, however, it is not known if the snails were consumed selectively or incidentally to the foraging of hydrilla. These observations are in agreement with published reports that 81 percent of the ring-neck's diet is composed of vegetation material.

Based on the quantity and types of material found in the ringnecks collected prior to 8:30 a.m. as compared to those collected after 12:00 noon, it appears that the ring-necks are consuming large quantities of hydrilla tubers and turions which are almost completely consumed by the next morning. It is not known if these ducks were actually grubbing the tubers out of the hydrosol, however, there was little soil in either the crop or gizzards of the afternoon specimens indicating the tubers had been pulled out of the soil along with the hydrilla rhizomes through some type of mechanical process created by winds, boats or other waterfowl species, etc. which made the tubers readily available for grazing by the ring-necks.

The largest quantity of plant material was found in the crops of the afternoon specimens, followed by the gizzards of the afternoon specimens. The least amount of material was found in the temporary crops of the morning specimens. At no time was an identifiable tuber or turion found in the lower digestive tract. Of the tubers collected, germination decreased from 55.6% for the tubers in the temporary crops to about 10% for those found intact in the gizzard. Turion germination decreased from about 30% in the crop to about 25% in the gizzard.

Coots — Coots are the most abundant avian species present on Lake Ocklawaha and form large flocks of several hundreds of birds which graze on the vegetative portions of submersed aquatic macrophytes. The gizzard of this species was 50 to 75% larger than that of the other species taken. Furthermore, the gizzards were consistently full of plant fragments, predominantly hydrilla. Hydrilla turions and other plant species such as coontail (*Ceratophyllum demersum*) appeared to be incidental to the consumption of hydrilla. One specimen had ingested an intact hydrilla stem which was in excess of 76 mm in length. As with the ring-necked ducks, no hydrilla turions or tubers were found in the intestines. None of the turions taken

from the coots germinated.

Widgeon — These river ducks are generally considered dabblers and feed almost exclusively on vegetation found on or near the surface of the water. The ten specimens were collected by hunters from the Wacissa River near Tallahassee, Florida. Feeding was almost exclusively on southern naiad (*Najas quadalupensis*) and some pond weed (*Potamogeton* sp.) despite the presence of numerous other submersed aquatics such as hydrilla and equia. No hydrilla tubers or turions were noted.

Additional species — Isolated specimens of Bluewinged Teal and Canvasback were also examined. Neither species contained hydrilla tubers or turions, however, the Canvasback did have hydrilla plant fragments in its gizzard.

The results of this limited waterfowl sampling indicates that ring-necks and coots are feeding almost exclusively on hydrilla and that ring-necks are actively feeding upon hydrilla tubers and turions. Whether the significant feeding upon hydrilla by several waterfowl species observed is a definite preference for hydrilla or merely a reflection of the dominance of hydrilla is unknown. Also, the quantities of hydrilla consumed are substantial but unqualified at this time.

None of the specimens collected had identifiable tubers or turions past the gizzard in the intestine. Furthermore, the average percentage tuber germination of the tubers removed from the crops and gizzards are well below value generally reported for tubers. However, since tuber germination is generally related to (1) the organic content of the hydrosol where found and (2) the depth of water from which collected it is not possible to speculate on any type of inactivation by the digestive tract, other than mechanical grinding by the gizzard.

The species investigated do not apparently pass any viable hydrilla tubers or turions through their digestive tracts such that this would be a mode of subsequent infestations. However, several other species such as scaup which were not collected have been observed to feed on hydrilla and may possibly pass viable propagules. However, our examination of the gizzards and their contents indicates that this possibility is remote. Forced feeding of caged specimens and the collection of additional species may be required to answer these and other questions.

Appreciation is extended to the U.S. Fish and Wildlife Service and the Florida Game and Freshwater Fish Commission who granted permits allowing this study to be conducted. □

AIRBOAT ENGINES

By Jon R. Cook*

The South Florida Water Management District began using airboats powered by automobile engines within the chemical weed control program approximately ten years ago. Corvair and Volkswagen engines were the primary power plants used and were found to be quite adequate for the spraying operations and general canal maintenance. At that time, the typical airboat hull was about 11 to 13 feet long of fiberglass construction and carried only a small conventional spraying unit. These boats were utilized in spraying only floating and ditchbank vegetation. As the chemical weed control program expanded, the

need for larger and more powerful airboats became apparent. A boat that would have the capabilities of performing both surface spraying and submersed treatment operations was needed. Another consideration was to develop a boat that would be economical to operate, maintain and have the ability to carry larger payloads.

Airboats are normally powered by aircraft engines due to the low R.P.M. and high torque advantages. Aircraft engines do run on unleaded fuel or aviation gasoline, but many of them require a higher octane rating. This raises operating costs considerably. The maintenance of these engines is another disadvantage. Specialized mechanics are needed for some minor and a majority of major repairs.

The District planned to build twenty airboats and researched several types of engines, since this project would be costly. The decision was made in favor of the 1968-1970, 472 cubic inch Cadillac V-8 engine for the following reasons:

1. These engines develop the horsepower, and torque to operate an airboat efficiently.
2. The engines and replacement parts are readily available through auto parts and salvage dealers.
3. Auto mechanics are more familiar and knowledgeable with repair procedures of these engines. Each of the District's field stations already have several auto mechanics within the organization.
4. These engines run on regular grade gasoline, which is easily accessible at the District's Field Stations.

5. Automobile engines are water cooled and able to idle at low speeds for long periods of time without overheating. This is a very important function when engaged in floating or ditchbank spray operations.

6. The initial cost is approximately \$2500.00 less than an aircraft engine, which is the main reason for the District's decision to use automobile engines.

One example illustrating the desirability of the auto engine in the District's program, occurred when an airboat was submerged accidentally during launching. The airboat was not recovered for 30 minutes and it was then transported to the Field Station's maintenance shop. After a thorough check of the engine, the only replacement needed was the starter, at a cost of approximately \$20.00. This item (the starter) would have cost over \$200.00 had the boat been powered by an aircraft engine. Also, had it been an aircraft engine, the magnetos would require removal and a complete drying out period before the engine could be started. This would lengthen the repair time, whereas the Cadillac engine was ready and usable the following day.

There are many instances in which the Cadillac engine has proven superior to the aircraft engine throughout the District. During these inflationary times, we must explore and use alternate methods as much as possible. This was the Water Management District's intent at the onset of the project and continues to be one of our main objectives. □

*Biologist, South Florida Water Management District



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