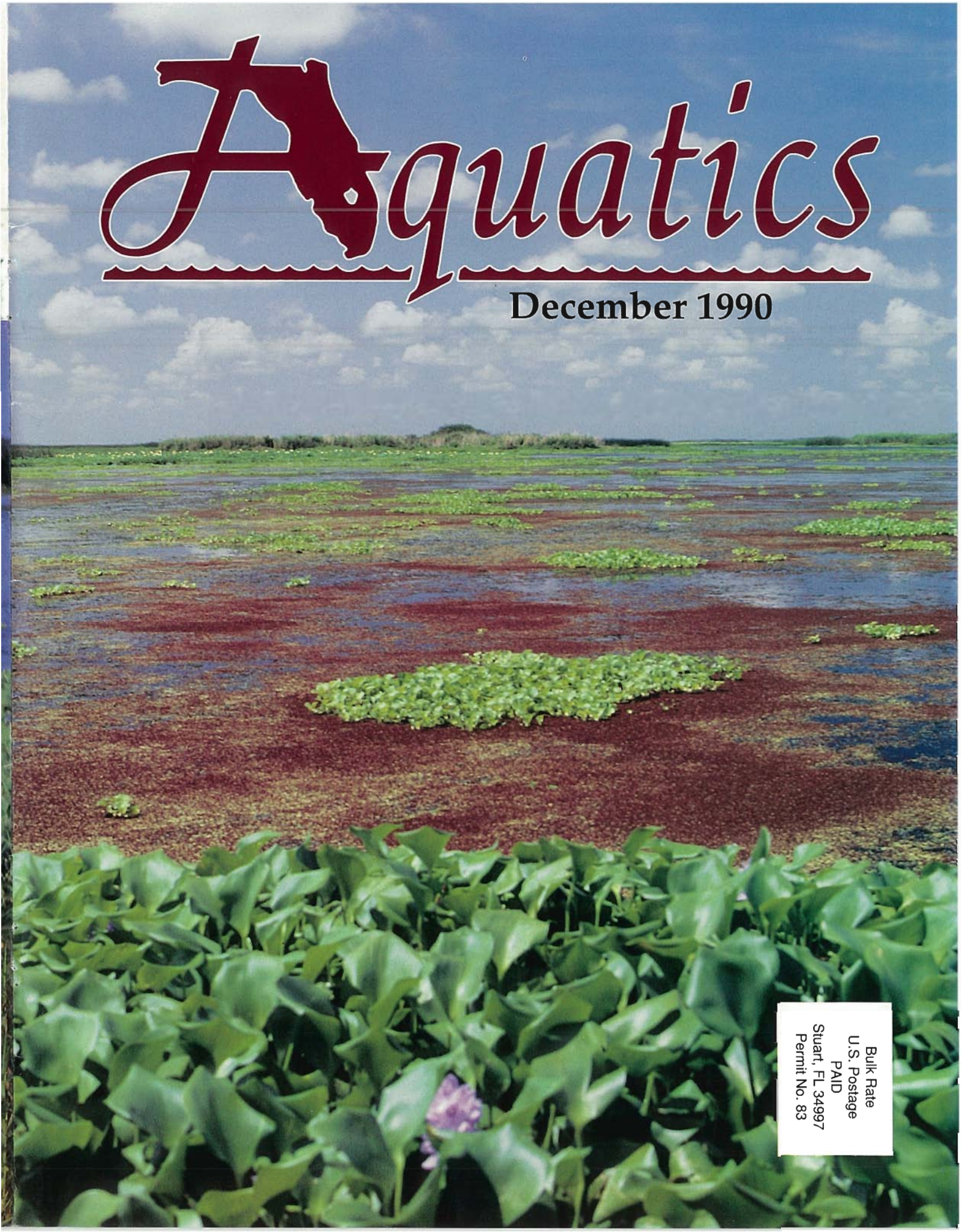
Aquatics

December 1990



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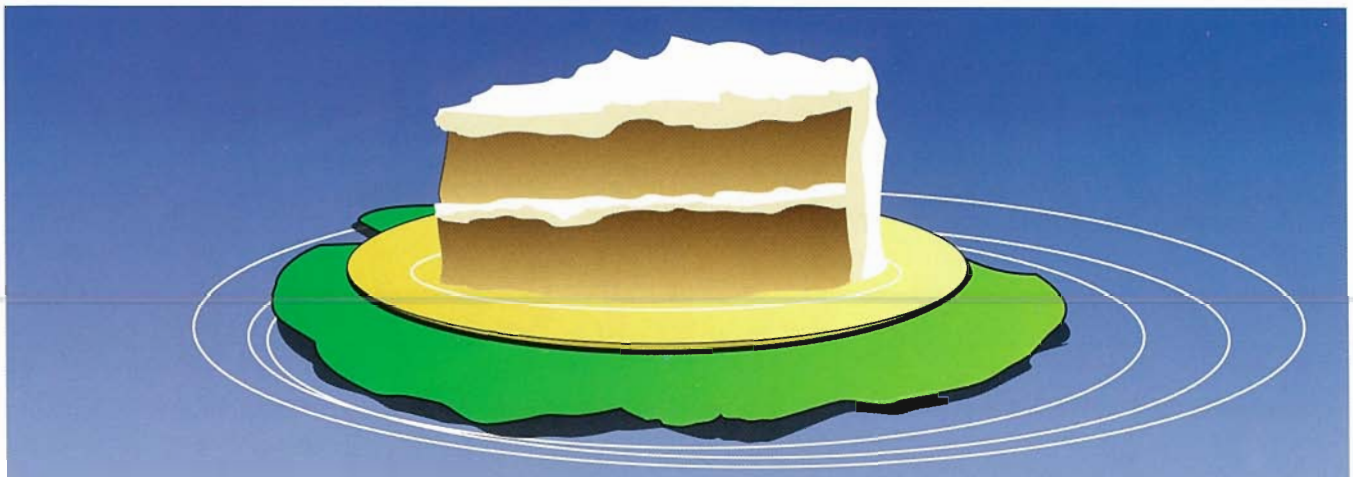

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"Maintenance control" has been achieved throughout the state. We have all done our jobs to keep Florida's lakes and rivers weed-free. Yet, our successes may be our undoing. People soon forget what "crisis management" looks like. Complaints from anglers, fish-camp managers and the general public about inadequate weed control only change to concerns of excessive management. Legislators only hear from their constituents who complain. If the resource users, regulators and managers don't make an effort to be heard, and educate lawmakers in the process, the very resources we strive to manage will suffer.

The concept of "maintenance control" should be easy for the general public and legislators to comprehend. We accept the maintenance costs of owning a car. Most people (with the possible exception of my sister) realize that an oil change is cheaper than an engine overhaul. The average homeowner spends up to five percent of his or her home's value annually on maintenance such as painting, appliances, general renovations and lawn care. Farmers in the Midwest spend an average of six to eight percent of their total crop earnings on weed control each season. Without this investment, estimated yield losses from weeds alone would be at least 20 percent.

Sportfishing in Florida brings the state about $1 billion annually. Individual lake studies show that the failure to control weeds can reduce local sportfishing revenues by 90 percent. If the state dedicated only five percent of the estimated annual value of sportfishing to aquatic weed control, $50 million would be realized. Current estimates are that only $7 million is needed. What a bargain!

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– Dan Thayer

About The Cover

Water hyacinth and azolla combine to give Lake Okeechobee a colorful, weedful holiday effect.

Photo by David Sutton, University of Florida, IFAS Fort Lauderdale, FL

Aquatics

December 1990/Vol. 12, No. 4

CONTENTS

AQUATICS: Published quarterly as the official publication of the Florida Aquatic Plant Management Society. This publication is intended to keep all interested parties informed on matters as they relate to aquatic plant management particularly in Florida. To become a member of the FAPMS and receive the Society newsletter and Aquatics magazine, send $10.00 plus your mailing address to the Treasurer.

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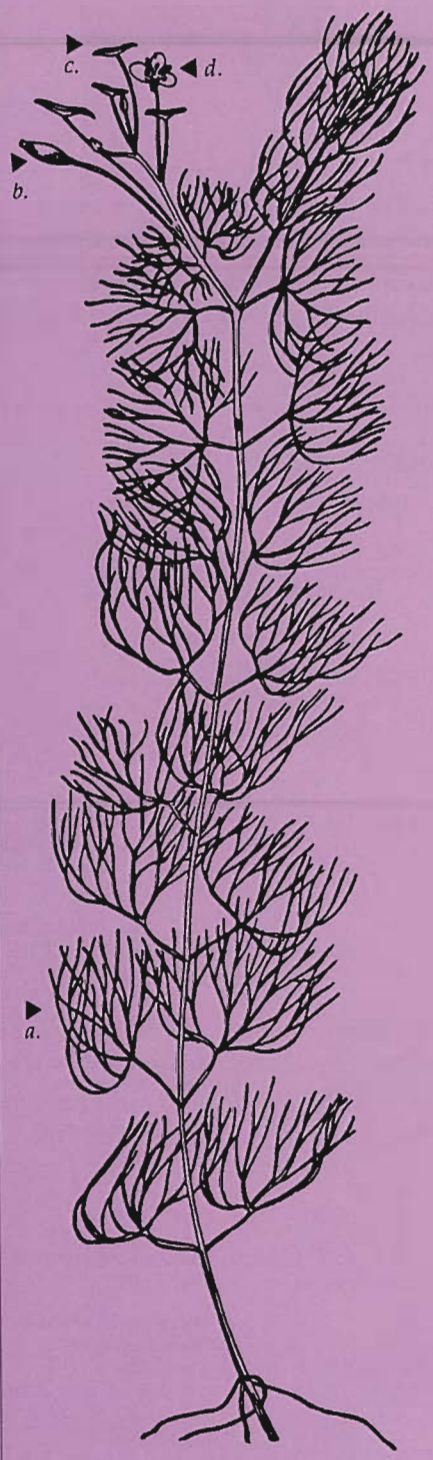


Cabomba caroliniana, *plant: a. submersed leaf; b, ovule; c, floating leaf; d, flower.*[1]

[1]Line drawing reprinted from Muenscher, W.C., *Aquatic Plants of the United States*, 1967, p. 233. Cornell University Press, Ithaca, New York.

The flower of Cabomba caroliniana *is small but structurally resembles those of other members of the water lily family, the Nymphaeaceae.*

A Florida Native – Cabomba (Fanwort)

By
Chuck Hanlon
Center for Aquatic Plants – IFAS
Gainesville, Florida

There are seven species of cabomba in the water lily family, *Nymphaeaceae*. In the United States, cabomba is chiefly found along the coastal plain from Virginia to south Florida, and west to Texas and northward to Oklahoma, Illinois and Tennessee (Fassett, 1953). *Cabomba caroliniana* (green-cabomba) and *C. pulcherrima* (purple-cabomba) are native throughout the southeastern United States. These submersed aquatic perennials are popular aquarium plants and their spread into other areas has been aided by the careless dumping of aquariums. There is some question as to whether green-cabomba and red-cabomba are the same or separate species. It is possible that green-cabomba may be an induced trait, as research has not found any characteristics other than color differentiation between these two plants. It has been suggested that water temperature may be responsible for the color change (Godfrey and Wooten, 1981).

Cabomba usually grows rooted, and is found in 1 to 3 meters of water, however, cabomba occurs at Manatee Springs State Park at a depth of 10m (Tarver et. al., 1988). Since alkaline water inhibits cabomba growth and can cause defoliation (Tarver and Saunders, 1977) it is most often found growing in waters which have a pH between

4 and 6 (Tarver et al., 1988). The submersed leaves of cabomba are either green or reddish-purple, generally positioned opposite, and have a fan-shaped appearance hence the commonly used name "fanwort." When floating leaves are present, usually during flowering, they attach alternately to the stem and have a firm texture.

Cabomba reproduces mainly by fragmentation, however, sexual reproduction from seed germination does occur. Monoecious (sexually complete), flowers are produced singularly on flowering stalks or peduncles. Flowers contain three sepals and petals and each petal possesses two clear fluid patches called nectaries (Schneider and Jeter, 1982) which attract insects and encourage cross-pollination.

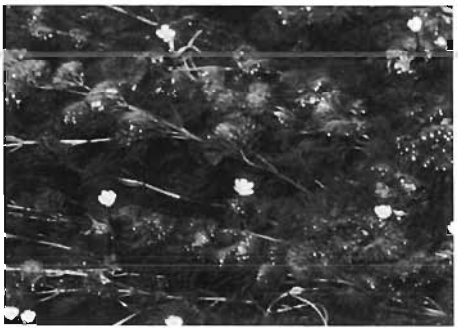
Cabomba flowering (anthesis) occurs over a two day period with flowers opening about 10:00 a.m. and closing around 4:00 p.m. Flower buds generally lie just beneath the surface but are elevated several cm above the water by peduncle elongation several hours before anthesis (Schneider and Jeter, 1982). During the first evening and then after the second day, flowers are again found below the surface. First day flowers have 6 short indehiscent stamens (do not release pollen) and 2 to 4 longer pollen receptive stigmata which are bent out and positioned over the nectary. By the second day, the spherical stigmata turn inward and are no longer receptive to pollen. During this time, the stamens elongate, become positioned above the nectaries and begin releasing a sticky pollen which soon dries and turns powdery. Due to the timing differences between the development of male and female flower parts, self-pollination appears to be a rare event if it occurs at all.

Most cabomba seeds are produced between May and October and are often the result of insect pollination. Insects attracted to second day flowers are dusted with pollen from the flowers' anthers. These insects then visit first day pollen receptive flowers. Stigmas on first day flowers are positioned above the nectaries and if pollen from the insects body contacts the stigma while the insect is feeding or crawling around, cross-pollination or fertilization can occur.

Following fertilization, mature seeds develop in approximately one month. Pistils containing the seeds break away from the plant and fall to the bottom. The pistil eventually decomposes, leaving the seeds at the hydrosoil surface (Gangstad, 1980). Submersed flowers which never emerge generally behave similarly to emergent flowers. They undergo anthesis, but, it is not certain that they ever produce seed (Tarver and Sanders, 1977).

Cabomba is not considered a major aquatic weed problem, although its abundance has been

increasing in recent years. In 1982, cabomba was found in an estimated 2,100 acres of Florida's lakes, rivers and canals. Between 1982 and 1988 cabomba coverage increased by more than 50 percent. During this time, DNR reported that there were 3,086 acres of cabomba in Florida waters in 1984 and 3,734 acres in 1988 (Schardt and Nall, 1988).



Dense growth of Cabomba caroliniana *flowering in a Dade County, Florida canal.*

Lakes in Florida's panhandle region are generally considered acidic (low pH), with low alkalinity and soft-water (Canfield, 1981.) These conditions are favorable for cabomba growth and therefore it is not surprising that most of Florida's cabomba is found in this area. In 1988, the states largest cabomba infestation occurred at Lake Iamonia in Leon county. Approximately 25 percent of the lake or 1,500 acres was filled with cabomba. Cabomba was also prominent at Lake Miccosukee in Jefferson County where 900 acres of cabomba covered 14 percent of the lake, (Schardt and Nall, 1988.)

In summary, cabomba is native to the southeastern United States and is generally not considered a major weed problem. Other than providing fish habitat, no wildlife value has been reported. The major means of reproduction is vegetative, however, plants can also be produced from seed.

References

Canfield, B.A. 1981. Chemical and trophic state characteristics of Florida lakes in relation to regional geology. Fl. Agric. Exp. Stn. J. Ser. No. 3513.

Fassett, N.C. 1953. A monograph of Cabomba. *Castanea* 18:116-128.

Gangstad, E.O. 1980. Weed control methods for public health applications. CPR Press Inc., Boca Raton, Florida. 301 pp.

Godfrey, R.K. and J.W. Wooten. 1981. Aquatic and wetland plants of southeastern United States. *Dicotyledons*. University of Georgia Press. Athens, Georgia. 933 pp.

Schardt, J.D. and L.E. Nall. 1988. Florida aquatic plant survey. Dept. Nat. Res., Tallahassee, Florida.

Schneider, E.L. and J.M. Jeter. 1982. Morphological studies of the Nymphaeaceae XII. The floral biology of *Cabomba caroliniana*. Amer. J. Bot. 69(9) 1410-1419.

Tarver, D.P. and D.R. Sanders, Sr. 1977. Selected life cycle features of fanwort. *J. of Aquatic Plant Management*. 15:18-22.

Tarver, D.P., J.A. Rodgers, M.J. Mahler and R.L. Lazor. 1988. Aquatic and wetland plants of Florida. Bureau of Aquatic Plant Management, Florida Dept. Nat. Res., Tallahassee, Florida.

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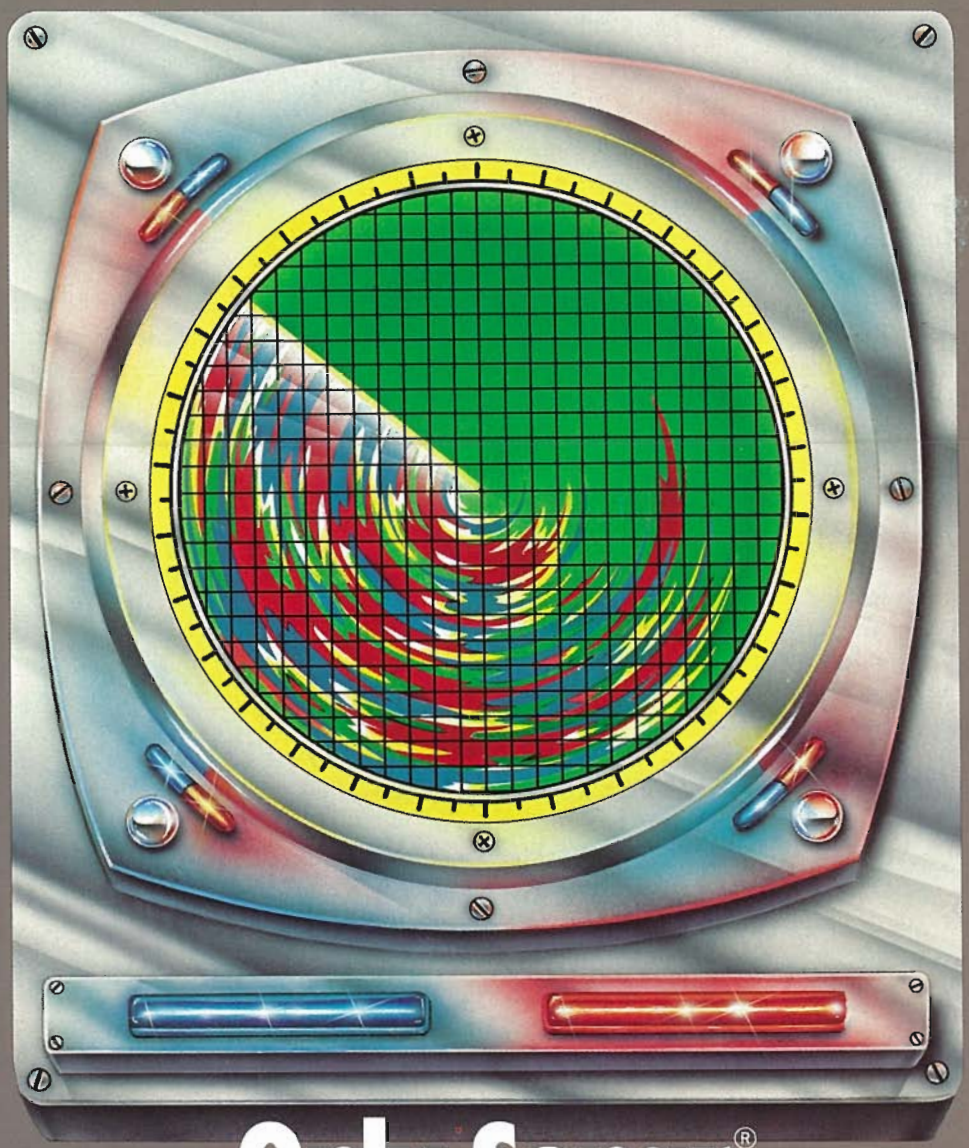

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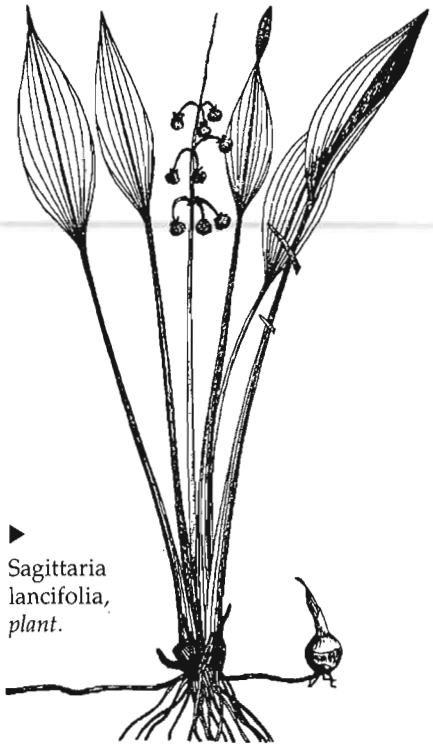

Sagittaria lancifolia, *plant.*

A Method for Germination of Arrowhead, Pickerelweed and Spikerush Seeds

By
David L. Sutton, Professor
University of Florida – IFAS
Fort Lauderdale, Florida

Introduction

Information is needed on cultural practices and planting techniques for use in the establishment of desirable, native aquatic plants in lake restoration and mitigation projects. Seeds of aquatic plants may be used to produce plants for nursery-grown stock, or the seeds could be sown at the site to be restored.

In Florida, a permit is required from the Florida Department of Natural Resources for collection of up to 25 percent of a local population of a particular species on public lands. Commercial culture of aquatic plants would lessen the demand for removal of aquatic plants from Florida's fragile freshwater systems. Also, the use of proper culture techniques will result in the availability of nursery-grown stock free of contamination by weeds.

Many aquatic plants produce an abundance of seeds, but little information is available on their germination for use in commercial nursery operations. For the past several years we have been investigating potential methods for germination of emerged aquatic plant seeds for use in the production of seedlings for lake restoration and wetland mitigation projects.

Seeds were found to germinate better in muck soil than in sand during germination studies with several emerged aquatic plants (Sutton, 1989), but sprouting of a number of unwanted weed seeds also occurred in the muck soil. These germination studies also showed that the addition of fertilizer to the muck soil was necessary for good growth of the seedling aquatic plants. This study was conducted with a sterilized potting medium in an attempt to eliminate sprouting of unwanted weed seedlings.

Methods

Seeds of arrowhead (*Sagittaria lancifolia* L. and *Sagittaria latifolia* Willd.), pickerelweed (*Pontederia cordata* var. *lancifolia* (Muhl.) Torrey), and spikerush (*Eleocharis cellulosa* Torr.) were collected from mature plants in culture at the Fort Lauderdale Research and Education Center (FLREC). The seeds were stored in an air-conditioned room until needed for use in germination tests.

Germination tests were conducted by sowing 25 seeds in standard 1-gallon nursery plastic pots as shown in Figures 1 and 2. For each germination test, 10 pots were used for a total of 250 seeds. An ice pick was used to punch holes in the pots which allowed water to enter and saturate the sand and soil (Hyponex potting soil[1]). The pots were placed in such a manner that the top of the soil was approximately 1 inch above the water surface in an outdoor cement tank located at the FLREC. The dimensions of the tank were 20 feet in length by 10 feet in width with pond water at a depth of 14 inches. Pond water flowed into the

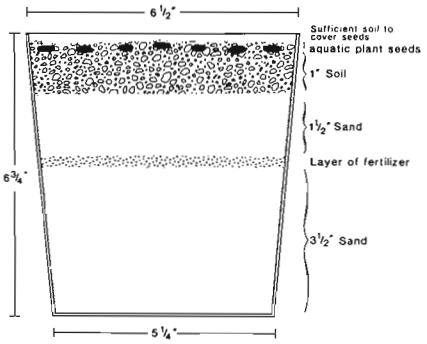

Figure 1. *Cross section of germination container showing location of sand, soil, fertilizer and aquatic seeds.*

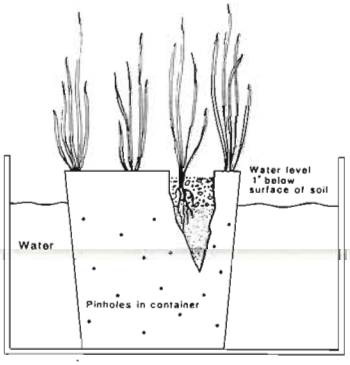

Figure 2. *Schematic showing germination container in tank with water and sprouted aquatic plant seeds.*

tank on the surface at one end and out of the tank from a bottom drain at the other at a rate which allowed for a complete exchange of water every 24 hours.

Media used in the pots were coarse builders' sand and Hyponex potting soil. Prior to placing the Hyponex potting soil in the pot, it was autoclaved for 1 hour at 250 F° with 15 pounds of pressure. Then the soil was dried at 140 F° for seven days, and allowed to cool prior to placing it in the pots.

The fertilizer layer in each pot was equivalent to 2.3 oz of 18-6-12 Osmocote formulated for an eight to nine month release rate at 70 F° per ft^2, 0.08 oz of dolomite per ft^2, and 0.08 oz of Esmigran per ft^2.

Seeds of *S. lancifolia* were sown on July 3, 1989 and allowed to germinate for six weeks. Two batches of *S. latifolia* seeds collected from different donor plants were sown on February 23, 1990 and allowed to germinate for 6 weeks. Pickerelweed and spikerush seeds were sown December 12, 1989 and allowed to germinate for 12 weeks. The pots were observed weekly and the number of sprouted seeds counted.

▶ Sagittaria latifolia, *plant.*

The weekly values in Figures 3 to 5 are the means of 10 pots for the *S. lancifolia*, pickerelweed and spikerush seeds. The *S. latifolia* results are the weekly values for the means for the two batches of seeds consisting of 10 pots in each batch.

Result and Discussion

No significant differences in germination were observed for the two batches of *S. latifolia* arrowhead seeds; therefore, the values for this species of arrowhead shown in Figure 3 are the average of both batches of seeds. Seeds of *S. latifolia* arrowhead seeds began sprouting within 2 weeks of being placed in the pots and approximately 70 percent of them had germinated within six weeks.

Germination of the *S. lancifolia* seeds was not observed until four weeks after they had been sown in the pots (Figure 3). After six weeks only 29 percent of these seeds had

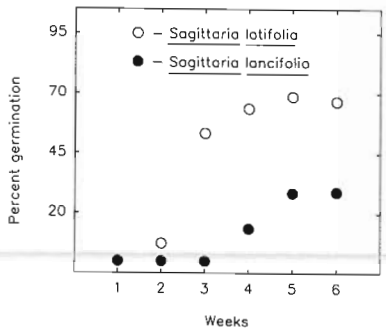

Figure 3. *Germination of arrowhead seeds.*

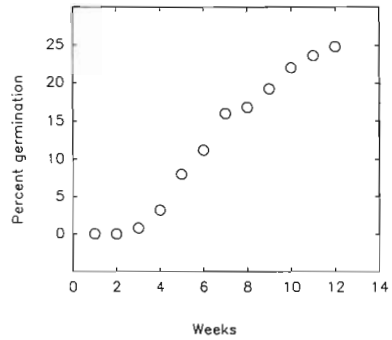

Figure 4. *Germination of pickerelweed seeds.*

germinated.

Pickerelweed seeds began sprouting within three weeks after being sown in the pots, and by the end of 12 weeks almost 25 percent of them had germinated (Figure 4).

Seedlings of the spikerush *E. cellulosa* did not appear until seven weeks after they had been sown in the pots and only 16 percent of the seeds had germinated by the end of the 14 weeks (Figure 5). Extending the germination period for the *E. cellulosa* seeds beyond 14 weeks would probably not improve germination. When the plants were removed from the pots after the 14-week period, several of the seedlings appeared to have formed from rhizomes and a number of the seedlings were beginning to form rhizomes with buds which would quickly result in an increase in the number of new plants.

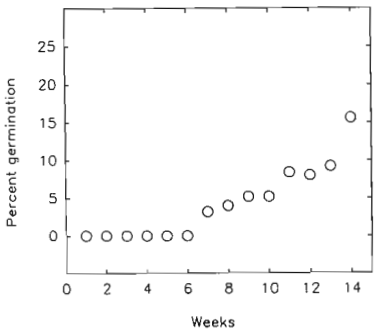

Figure 5. *Germination of spikerush,* Eleocharis cellulosa, *seeds.*

Although the aquatic plant seeds tested in this study were not sown on different dates, *S. latifolia* seeds displayed the highest germination rate under these conditions. The spikerush, *E. cellulosa*, seeds exhibited the lowest germination rate of the emerged plant species studied.

The use of sterilized soil was intended to eliminate the germination of unwanted seeds in the soil used in this study. However, under the outdoor conditions of the study, seedlings of the spikerush *Eleocharis geniculata* (L.) R. & S. were found in some of the germination containers on several occasions. The source of these seeds was not readily apparent, but for some reason, the germination containers attracted various birds. Perhaps the spikerush seeds were carried on the feet of these birds, or the seeds may have been wind borne. In commercial nursery operations, precautions will need to be taken to prevent the introduction of unwanted weed seeds by birds, wind or other means.

This study shows the potential of using sterilized soil to essentially eliminate problems with unwanted weed seeds in the production of aquatic plant seedlings. Poor germination of some of the seeds in this study may have been the result of birds eating the seeds, lack of sufficiently mature seeds or other problems related to environmental factors, such as temperature. Future germination studies need to focus on the ways to improve the germination rate of these and other aquatic plant seeds so that adequate supplies of plants are available for lake restoration and mitigation projects.

◀ Eleocharis cellulosa, *plant.*

▶ Pontederia cordata, *plant*

Acknowledgments

The author wishes to thank Patti Richardson, Maria Bravo and Joanne Korvick for their technical assistance with this study. Mr. John Knaub of the University of Florida's Instructional Resources in Gainesville drew Figures 1 and 2.

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References

Sutton, D.L., 1989. Use of seeds for establishment of desirable aquatic plants. Final Report to the State of Florida, Department of Natural Resources, Bureau of Aquatic Plant Management Research and Permitting Section. Tallahassee, FL. 44 pages.

[1]Hyponex potting soil was purchased from a local K-Mart store. Osmocote (18-6-12) with an eight to nine month release time at 70 F° is manufactured by Sierra Chemical Company, Milpitas, CA 95035; Esmigran by Mallinckrodt, Inc., St. Louis, MO 63147; and dolomite (Soil Doctor) by Soil Doctor, Inc., Crystal River, FL 32629. Mention of a trademark or a proprietary product does not constitute a guarantee or warranty of the product by the University of Florida and does not imply its approval to the exclusion of other products that also

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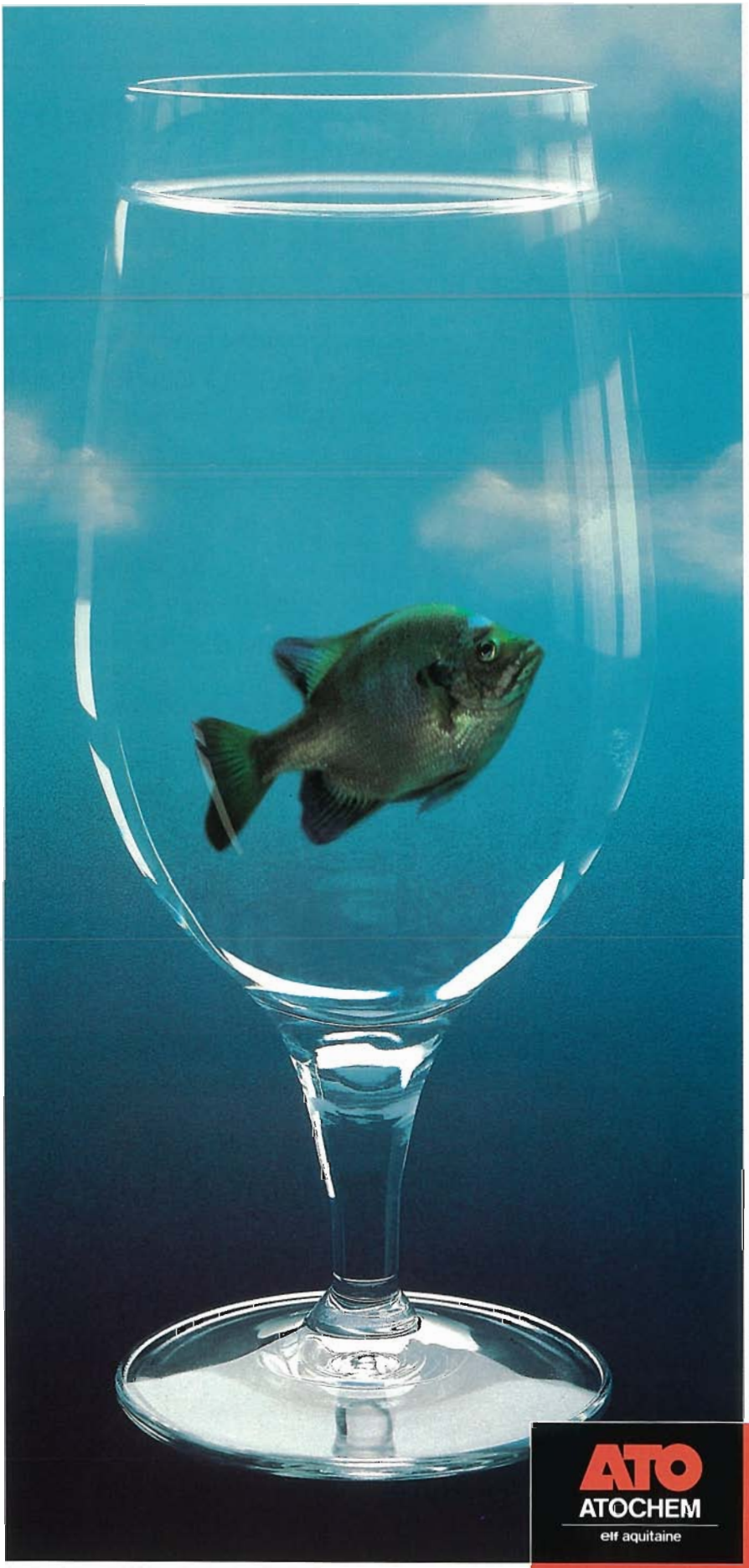

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The Impact of Herbicides on Bulrush Communities – An Evaluation of Water Hyacinth Control Efforts Within Native Plants[1]

By

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South Florida Water Management District
West Palm Beach, Florida
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Gainesville, Florida

Introduction

This study was undertaken to address concerns of the effects of water hyacinth control performed within valued native plant communities. Bulrushes are highly valued in Florida waters.However, when bulrush communities are weed-infested, weed control must proceed within their boundaries.

The southern or giant bulrush, *Scirpus californicus* (C. Meyer) Steud., is a member of the Cyperaceae or sedge family and is one of the 13 species of Scirpus listed by Godfrey and Wooten (1979) as occurring in Florida. It is known to range throughout the Gulf states to southern California, into South America and also on Easter Island and Hawaii (Small, 1972; Godfrey and Wooten, 1979; Heiser, 1979). The genus comprises about 150 species worldwide and is cosmopolitan in distribution with the best representation in North America (Beetle, 1950; Riemer, 1984).

This species is noted for its long, straight, bladeless stems which may grow to nine feet in length, and in water up to six feet deep (Fassett, 1957; Wunderlin, 1982; Dresser *et al.*, 1987). The stems may be one inch in diameter at the base and gradually tapering to a sharp point. The cross section of the stem may be cylindrical at the base and more triangular towards its apex. The inflorescence is at the tip of the stem with chestnut brown spikelet clusters. The fruit is a grayish brown nutlet surrounded by feathery bristles. The plant reproduces by seed or vegetatively from rhizomes (Small, 1972; Godfrey and Wooten, 1979; Dressler *et al.*, 1987).

Environmental requirements for species in the genus Scirpus vary greatly in relation to sediment type, salinity, water depth and water quality (Laing, 1941; Rossi and Nuncia, 1976; Beel, 1977; Stanley and Hoffman, 1977; Barko and Smart, 1978; Heiser, 1979; Barclay and Crawford, 1982 and 1983). Giant bulrush is found in shallow ponds, lake margins, canals and ditches, stream or river banks and fresh to brackish marshes. The literature on the ecology of giant bulrush, *S. californicus* is limited. A study by Rossi and Nuncia (1976) in lakes and rivers of Argentina indicated that in winter, giant bulrush put more growth into rhizome elongation rather than in new longitudinal stem growth. They found that rhizomes could withstand long periods of moisture deprivation and, under adequate humidity, rapidly recolonized. They also found that development of new rhizome was strongly correlated with soil aeration. Anaerobic rhizome development was only 4 percent of rhizome growth under aerobic conditions.

A species often found growing in association with *S. californicus* and commonly misidentified as such, is *S. validus*. *Scirpus validus*, or softstem bulrush, prefers sandy to sandy-loam soils and attempts to transplant *S. validus* indicates that it does not survive in silty or silty-loam soils with organic contents greater than 35 percent (Stanley and Hoffman, 1977). Barko and Smart (1978), reported that the growth of *S. validus* on silty clay soils was nearly ten times greater than growth on pure sand soils during a two month period under laboratory conditions. It was reported by Laing (1941) that shoots of *S. validus* died

[1]Cooperative investigation supported by the Florida Department of Natural Resources Contract No. C3132, the U.S. Department of Agriculture, Agricultural Research Service, and the Institute of Food and Agricultural Sciences under Cooperative Agreement No. 58-7B30-3-570.

[2]Former Research Biologist, Florida Department of Natural Resources, Center for Aquatic Plants, Gainesville, Florida.

under soil conditions with less than one percent oxygen after a period of only eight days and that the buds on the rhizome of *S. validus* remained dormant when placed in oxygen free conditions. Bud development sustained active growth when placed in moist, aerobic conditions and obtained maximum growth at 10 percent oxygen, by volume. The shoots produced from these buds were killed when returned to an oxygen- free environment. Another species, *S. maritimus* remained healthy and produced normal shoot development and growth from unextended buds for up to eight weeks of anaerobic conditions (Barclay and Crawford, 1982 and 1983).

S. californicus and other bulrush species are widely acclaimed for their value as fishery and wildlife habitat (Beetle, 1950; Davis and vander Valk, 1978; Heiser, 1979; Langland, 1981; Denson and Langford, 1982; Johnson and Montalbano, 1984). Parts of plants of the

TABLE 1. *Herbicide treatments applied to bulrush in 1985 at East Lake Tohopekaliga, Osceola County, Florida.*

Treatment #	Herbicide	Rate (lbs/acre)	Adjuvant	Rate
1	2,4-D	2.0	–	–
2	2,4-D	1.0	–	–
3	2,4-D	1.0	CIDE-KICK[1]	0.25%v/v
4	2,4-D	2.0	CIDE-KICK	0.25%v/v
5	2,4-D	2.0	573 Polymer[2]	0.06%v/v
6	2,4-D	1.0	573 Polymer	0.06%v/v
7	diquat	1.0	–	–
8	diquat	2.0	–	–
9	diquat	1.0	CIDE-KICK	0.25%v/v
10	diquat	1.0	573 Polymer	0.06%v/v
11	diquat	2.0	CIDE-KICK	0.25%v/v
12	diquat	2.0	573 Polymer	0.06%
13	2,4-D + diquat	2.0 + 2.0	CIDE-KICK + I'VOD[1]	0.25%v/v + 1-30
14	–	–	CIDE-KICK	0.25%v/v
15	–	–	573 Polymer	0.06%v/v
16	–	–	I'VOD	1-30
17	diquat	1.0	I'VOD	1-30
18	diquat	2.0	I'VOD	1-30
19	–	–	KAMMO[2]	0.25%v/v
20	–	–	AGRI-DEX[2]	0.25%v/v
21	Control (no treatment)			

[1]CIDE-KICK and I'VOD are manufactured by JLB International Chemical Co.

[2]573 Polymer, KAMMO and AGRI-DEX are manufactured by Helena Chemical Co.

genus Scirpus have been found in the stomachs of 31 species of American ducks with the most frequent consumers of bulrush seeds being mallard, pintail, green-winged and blue-winged teals, and lesser scaup (Beetle, 1950). The open growth form of bulrush communities creates an, "edge effect," providing increased substrate for the attachment of food organisms and also serves as important spawning areas for centrarchids. Bulrush stands also function as natural fish attractors in Lake Tohopekaliga as evidenced by high rates of fish capture there, (Denson and Langford, 1982). In Central and South America *S. californicus*, or *totora*, is used by the Indians for making boats called *maraias*, mats or *esteras* used as beds, rugs, windbreaks, fences, storage bins, roofs and even entire houses are also made from the reeds. The rhizome of *totora* is utilized to make bread and entire plants are commonly consumed by livestock (Heiser, 1979). *Scirpus* sp. are also an excellent candidate for marsh re-establishment because of the easy transplanting and rapid expansion rates.

In spite of its many beneficial attributes, Scirpus is also considered to be a "weedy" species in certain water bodies. Hold *et al.* (1977), even lists Scirpus as one of the world's worst weeds. Scirpus species are vigorously stoloniferous and are well adapted to habitat created by flooding of irrigation ditches (Beetle, 1950; Wunderlin, 1982). It quickly colonizes and clogs canals, slowing stream flow and necessitating clearing operations. Flow has been reduced to one-third of normal rates in severe cases. These plants have also been known to interfere with rice production and disrupt harvesting in fish hatcheries and fish rearing ponds (Surber, 1947; Mashhor, 1987).

TABLE 2. *Treatments applied to bulrush in 1986 at East Lake Tohopekaliga, Osceola County, Florida.*

Treatment #	Treatment	Number of Applications Per Treatment
1	2,4-D @ 3.0 lbs/acre	ONE
2	Control 1	
3	2,4-D @ 3.0 lbs/acre	TWO
4	Mechanically Cut	THREE
5	2,4-D @ 3.0 lbs/acre	THREE
6	Control 2	
7	diquat @ 1.25 lbs/acre	TWO
8	diquat @ 1.25 lbs/acre	THREE
9	Mechanically Cut	TWO
10	Control 3	
11	diquat @ 1.25 lbs/acre	ONE
12	Mechanically Cut	ONE

Where control operations are justified, the primary methods appear to be mechanical clearing, ditch reconstruction and/or herbicidal control. Control with 2,4-D at a rate of 1 gal/ac (assumed 4 lb a.i./gal) in 50 gallons of water plus six ounces of "wetter" has been reported (Surber, 1947; Lowman, 1965; Lopinot, 1976), however it was noted that plants treated the previous fall resprouted the following spring indicating that complete control required more than one application. Other herbicides listed as effective include; granular 2,4-D ester at 100 lbs/ac, dichlobenil granules at 100 lbs/ac and a solution of three quarts diquat and one quart Banvel D in 50 gallons of water.

Materials and Methods

The evaluations were conducted on East Lake Tohopekaliga, a 12,500 acre lake in northern Osceola County, Florida. The work was

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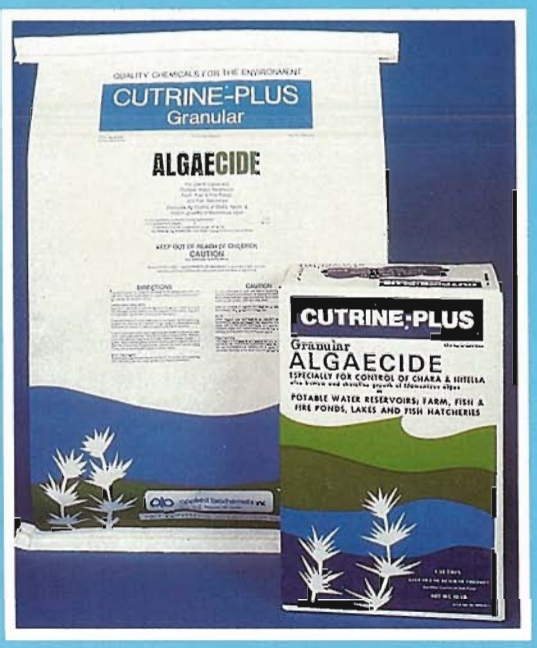

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TABLE 3. *Mean percent change in live stem density (sampling period 1) from initial bulrush stem density resulting from herbicide-adjuvant treatments. Means with the same letter are not significantly different (∝=0.05).*

Treatment #	Herbicide	Rate (lbs/acre)	Adjuvant	Mean % Change in Live Stem Density	Duncan Grouping	
20	–	–	AGRI-DEX	33.3		A
14	–	–	CIDE-KICK	28.0	B	
21	Control	–	–	16.4	B	C
15	–	–	573 Polymer	16.0	B	C
19	–	–	KAMMO	11.9	D	C
16	–	–	I'VOD	4.8	D	C
6	2,4-D	1.0	573 Polymer	-1.4	D	
1	2,4-D	2.0	–	-17.9		E
2	2,4-D	1.0	–	-24.8		E
3	2,4-D	1.0	CIDE-KICK	-27.8	F	E
5	2,4-D	2.0	573 Polymer	-33.1	F	E
4	2,4-D	2.0	CIDE-KICK	-42.2	F	
9	diquat	1.0	CIDE-KICK	-83.5		G
7	diquat	1.0	–	-84.4		G
10	diquat	1.0	573 Polymer	-85.6		G
18	diquat	2.0	I'VOD	-90.5		
8	diquat	2.0	–	-91.9		G
17	diquat	1.0	I'VOD	-94.0		G
11	diquat	2.0	CIDE-KICK	-94.0		G
12	diquat	2.0	573 Polymer	-94.0		G
13	2,4-D + diquat	2.0 + 2.0	CIDE-KICK + I'VOD	-96.2		G

coordinated with the Florida Department of Natural Resources, the University of Florida's Center for Aquatic Plants, the Florida Game and Freshwater Fish Commission, the South Florida Water Management District and the U.S. Army Corps of Engineers, Jacksonville District. The site was selected because of the extensive stands of bulrush located throughout the littoral zone, approximately 225 acres (Schardt, 1986), and the historically problematic water hyacinth management programs associated with these dense stands of vegetation. Treatment plots were all 3,000 square foot (30 x 100) divided into three subplots with three replications per subplot. Plots were located on the west shore of

TABLE 4. *Mean percent change in live stem density (sampling period 4) from initial bulrush stem density resulting from herbicide-adjuvant treatments. Means with the same letter are not significantly different (∝=0.05).*

Treatment #	Herbicide	Rate (lbs/acre)	Adjuvant	Mean % Chamge in Live Stem Density	Duncan Grouping		
14	–	–	CIDE-KICK	28.8		A	
20	–	–	AGRI-DEX	23.4	B		
19	–	–	KAMMO	2.4	B	C	
21	Control	–		-17.0		C	
15	–	–	573 Polymer	-18.2		C	
16	–	–	I'VOD	-22.2	D		
10	diquat	1.0	573 Polymer	-46.5	D	E	
2	2,4-D	1.0	–	-57.8	F	E	
7	diquat	1.0	–	-58.0	F	E	
18	diquat	2.0	I'VOD	-58.8	F	E	
1	2,4-D	2.0	–	-65.9	F	E	G
17	diquat	1.0	I'VOD	-68.8	F	E	G
3	2,4-D	1.0	CIDE-KICK	-69.9	F	E	G
4	2,4-D	2.0	CIDE-KICK	-70.7	F	E	G
6	2,4-D	1.0	573 Polymer	-74.5	F	H	G
11	diquat	2.0	CIDE-KICK	-76.1	F	H	G
8	diquat	2.0	–	-79.9	F	H	G
5	2,4-D	2.0	573 Polymer	-86.6		H	G
9	diquat	1.0	CIDE-KICK	-97.7		H	
12	diquat	2.0	573 Polymer	-98.5		H	
13	2,4-D +	2.0 +	CIDE-KICK +	-98.6		H	

the lake in approximately three to four feet of water. The average density of live bulrush stems in all the plots prior to treatment was 44 stems per square meter. Table 1 lists the herbicide treatments applied in 1985 and Table 2 lists treatments applied in 1986. All herbicide applications were tank mixed in an equivalent of 100 gal/acre water. To assess treatment injury, permanent sample stations (nine per plot) were established using one quarter meter square (0.25 m^2) floating PVC frames.

For the 1985 study, live stem counts were performed biweekly throughout the project in each of the 21 plots. Because the determination for living versus dead stems was a subjective measure for early herbicide symptoms, stem counts for successive sampling dates were averaged into sampling periods in order to reduce variability associated with counting error. Data from the first sample period (14 and 21 days post treatment) and the last sample period (16 and 20 weeks post treatment) are presented.

For the 1986 study, live stem counts were performed at periodic intervals following each of the three application dates.

For both the 1985 and 1986 study, a percentage change in live stem density from initial stem density was calculated for all frames in each of the plots and for each of the sample dates. Means for each of the treatments were calculated and comparisons between treatments were made at each sample date.

Results and Discussion

The 1985 study results presented in Tables 3 & 4, provide the Duncan multiple range groupings for significant differences between means during sampling periods one and four, respectively. Analysis of the data and field observations indicated that the initial impact of the contact herbicide, diquat, had manifested itself by producing brown necrotic stems to the waterline. By 21 days post treatment (sampling period one) all diquat treatments produced at least an 83 percent reduction in live stems when compared to pre-treatment densities. During the same period, the systematic herbicide, 2,4-D, produced a gradual browning of the stems, but no dramatic necrosis. During sampling period one, 2,4-D treatments, with the exception of plot 13, exhibited a maximum 42 percent reduction. The greatest percent change in bulrush density with 2,4-D, was at the 2.0 lbs per acre rate with the addition of the adjuvant CIDE-KICK.

As winter approached, a rapid decline in live stem density for the control plot (number 21) was observed; thus, sampling period four was used to represent the end effects of the treatments conducted in the study. As noted from Table 4, the diquat treatments, with the exception of two treatments, exhibited a tendency towards recovery from the initial effects of the contact herbicide. This was particularly true with the lower rate of diquat. All of the 2,4-D treatments continued to decrease in live stem densities through time. In particular, the presence of adjuvant in 2,4-D treatments tended to enhance the effects of 2,4-D on bulrush. This could be due to interaction with the cuticle and possible increased uptake and/or translocation of 2,4-D. However, no significant difference was noted between the 2,4-D and diquat at the lower rates with no adjuvants. It should be remembered that this data is based on a single mid-summer treatment when the plants had perhaps reached maximum annual biomass and density. Herbicide treatments made early in the growing season and/or multiple treatments, as would be the case in an actual water hyacinth management programs, may produce more definitive and different results. Therefore, the goal of the 1986 study was to address these questions.

It is clear, however, that single treatments with the combination of 2,4-D, diquat, I'VOD, and CIDE-

KICK had severe impact on bulrush when compared to lower rates of the herbicides alone.

It was interesting to note that none of the adjuvants were greatly phytotoxic by themselves when compared over the entire period of the study. However, in the absence of the herbicides, AGRI-DEX and CIDE-KICK significantly increased the density of stems when compared to the control plot (Tables 3 & 4). The mechanism of this effect is unknown.

Results of the 1986 study are presented in Figures 1-3. Results from the 1985 study indicated that early growing season treatments with multiple applications throughout the growing season, would be more indicative of an actual water hyacinth management program. Therefore, plots were established which were treated once, twice and three times throughout the growing season using diquat, 2,4-D and mechanical cutting of bulrush stems.

Percent change in live stem density for control (no treatment) plots shows a gradual decrease over time, indicating that bulrush reaches a maximum annual biomass and density early in the spring.

Bulrushes in the mechanically cut plots were clipped several inches above the water line to insure that the floating frames remained stationary. Although cut stems continued to grow, 35 weeks after clipping, nearly all the living bulrush stems were new sprouts, indicating that the cut stems eventually died. Past experience with clipping stems below the water surface indicated that the stems did not grow and rotted soon after cutting.

The effects of multiple applications of mid-label rates of both diquat and 2,4-D can be seen in Figures 2 and 3. It appears that 2,4-D effectively translocates into rhizomatous tissue preventing resprouting from treated stems. Multiple applications effectively controlled bulrush and no new growth was observed in the plots throughout the study period. Diquat killed emergent stems, but appeared to have little to no effect on the ability of the bulrush rhizome to send up new sprouts. The effect of diquat on bulrush stems was similar to the effect of mechanical cutting when percents of live stem density of new sprouts are compared.

Based on results of the 1985 and 1986 studies, it can be concluded that the use of the lower rates of 2,4-D or diquat with no additional adjuvants appeared to have low adverse impact on bulrush. The combination of 2,4-D and diquat is commonly used when water hyacinth and water lettuce are found growing together. However, it should be avoided in bulrush communities. Throughout the summer months, bulrush treated with 2,4-D gradually decreased in overall stem density, whereas diquat treated bulrush stems died rapidly, but tended to recover over the growing season. Field and lab studies (data not presented here) indicate that the uncontrolled growth of water

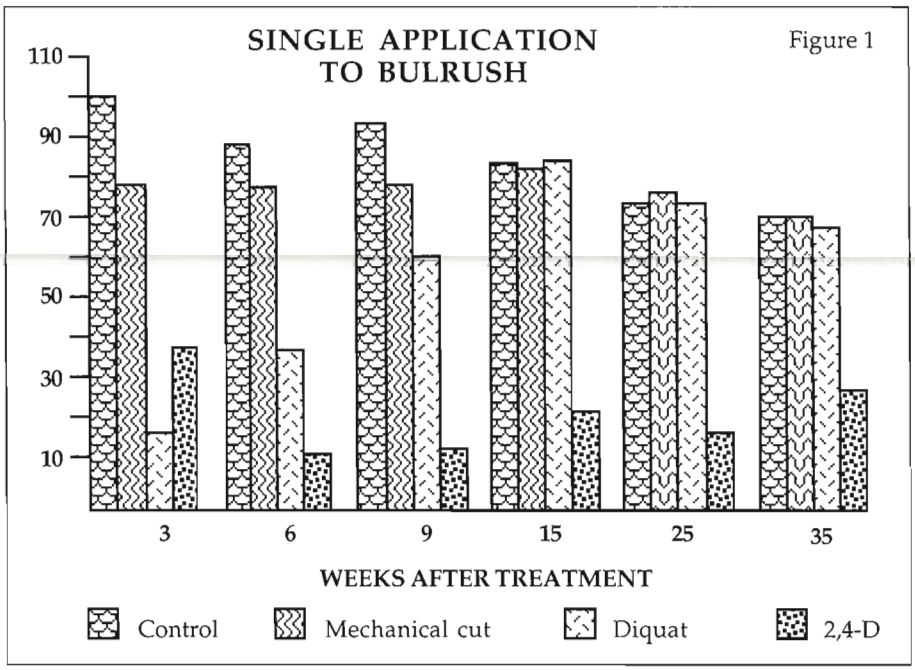


Figure 1

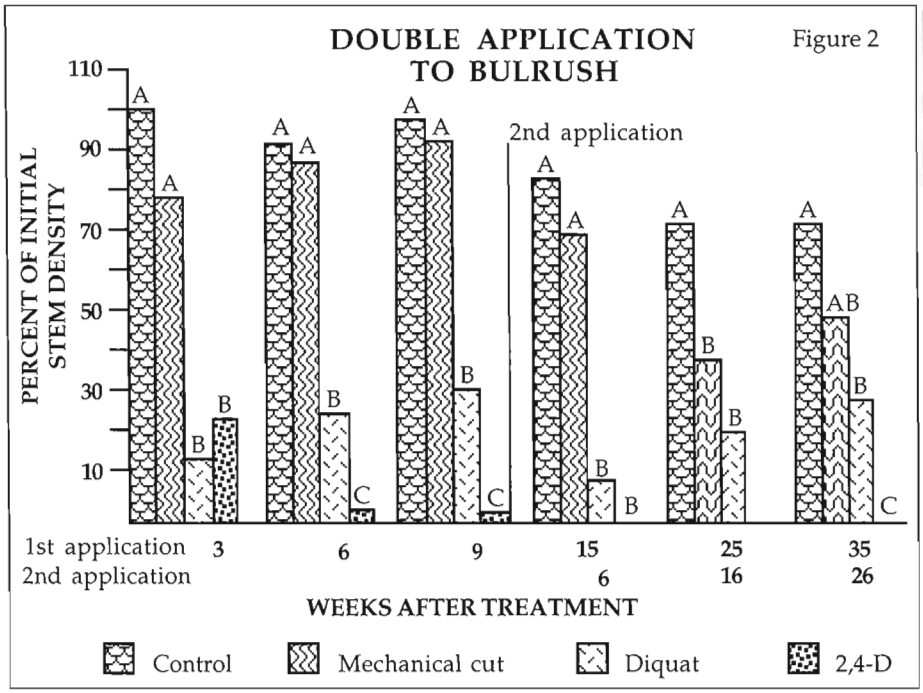
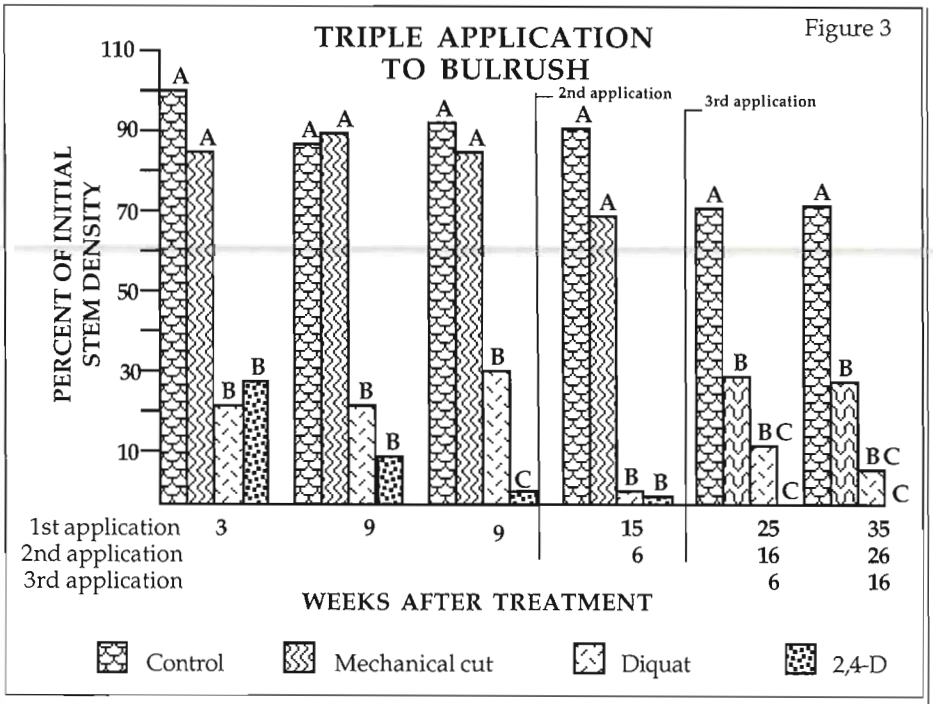


Figure 2



hyacinth has an adverse impact upon the bulrush community which is equal to the effects of some of the more severe herbicide-adjuvant combinations. This "water hyacinth effect" could be due to a combination of environmental factors. The mechanism is believed to include effects of the deposition of organic matter by water hyacinth. This has been estimated at up to 5.2 tons per acre per year (Joyce, 1985). Negative effects also include shading of the hydrosoil and wind blown water hyacinth mats which physically tear bulrush stems from the rhizomes. When water hyacinth are allowed to grow uncontrolled, the combined effect of the water hyacinth and their subsequent herbicidal control can locally eliminate bulrush communities. Multiple treatments (1 every 3 months) using the mid-label rate of 2,4-D effectively eradicated the bulrush in the treatment plots after two applications. Diquat used at mid-label rates killed emergent vegetation, but appeared to have little to no effect on the ability of the rhizome to send up new sprouts, even after three applications. When comparing the new sprouts of mechanically cut bulrush to the regrowth of diquat treated bulrush, stem densities appeared to be very similar.

Acknowledgments

We would like to thank M. S. Glenn, W. T. Haller, G. M. Van Dijk, and G. P. Jubinsky for their technical assistance.

Literature Cited

Barclay, A. M. and R. M. M. Crawford. 1982. Plant growth and survival under strict anaerobiosis. J. Exper. Bot. 33 (134); 541-549.

Barclay, A. M. and R. M. M. Crawford, 1983. The effect of anaerobiosis on carbohydrate levels in storage tissue of wetland plants. Ann. Bot. 51:25 5-259.

Barko, J. W. and R. M. Smart. 1978. The growth and biomass distribution of two emergent freshwater plants. *Cyperus esculentus* and *Scirpus validus*, on different sediments. Aquat. Bot. 5:109-117.

Beal, E. O. 1977. A manual of marsh and aquatic vascular plants of North Carolina. North Carolina Agricultural Experiment Station. Technical Bulletin 247. 298 pp.

Beetle, A. A. 1950. Bulrushes and their multiple uses. Econ. Bot. 4(2):132-137.

Davis, C. B. and A. G. vander Valk. 1978. Litter decomposition in prairie glacial marshes in *Freshwater Marshes*. Academic Press. New York. 99-113.

Denson, K. and F. Langford. 1982. Expansion of transplanted giant bulrush in a central Florida lake. In Proc. 36th annual meeting of Southeastern Assoc. Fish and Wildlife Agencies. 17 pp.

Dressler, R. L., D. W. Hall, K. D. Perkins, and N. H. Williams. 1987. Identification Manual for Wetland Plant Species of Florida. University of Florida. 297 pp.

Fassett, N. C. 1957. A Manual of Aquatic Plants. University of Wisconsin Press. 405 pp.

Godfrey, R. K. and J. W. Wooten. 1979. Aquatic and wetland plants of the southeastern United States. Monocotyledons. University of Georgia Press. Athens. 712 pp.

Heiser, C. B. 1979. The Totora (Scirpus californicus) in Ecuador and Peru. Economic Botany 32:222-236.

Holm, L. G., D. L. Pluckett, J. V. Pancho, and J. P. Herberger. 1977. The World's Worst Weeds: Distribution and Biology. University of Hawaii Press. Honolulu. 609 pp.

Joyce, J. C. 1985. Benefits of maintenance control of water hyacinths. Aquatics 7(4):11-13.

Johnson, F. A. and F. Montalbano. 1984. Selection of Plant Communities by Wintering Waterfowl on Lake Okeechobee, Florida. J. Wildl. Manage. 48(1):1984.

Laing, H. E. 1941. Effect of concentration of oxygen and pressure of water upon growth of rhizomes of semi-submerged water plants. Bot. Gaz. 102:712-724.

Langeland, Ken. 1981. Bulrush - *Scirpus* sp. Aquatics 3(4):4 & 15.

Lopinot, A. C. 1976. Aquatic weeds, their identification and methods of control. Illinois Department of Conservation. Fishery Bulletin No. 4. 56 pp.

Lowman, F. G. 1965. Aquatic weed control in Texas. In Proc. 18th Southern Weed Control Conference. 450-452.

Mashhor, Mansor. 1987. The Major Aquatic Plants of Peninsular Malaysia. Aquatics 9(1):17-19.

Riemer, D. N. 1984. Introduction to Freshwater Vegetation. The AVI Publishing Company. 207 pp.

Rossi, J. B. and M. T. Nuncia. 1976. Ecology of Scirpus californicus, development of the rhizome. Bulletin of Argentina Society of Botany 17(3-4):280-288.

Schart, J. D. 1986. 1986 Florida Aquatic Plant Survey. Fl. Dept. of Natural Resources. Tallahassee. 124 pp.

Small, J. K. 1972. Manual of the Southeastern Flora. Hafner Pub lishing Company. Part One. 774 pp.

Stanley, L. D. and L. O. Hoffman. 1977. Artificial establishment of vegetation and effects of fertilizer along shorelines of Lake Oake and Sakakawea, mainstem Missouri River reservoirs. In Proc. Great Lakes Vegetation Workshop.

Surber, E. W. 1947. The control of aquatic plants with phenoxyacetic compounds. U.S. Fish and Wildlife Service 217:1-5.

Wunderlin, R. P., 1982. Guide to The Vascular Plants of Central Florida. University Presses of Florida. 472 pp.

14TH ANNUAL FAPMS MEETING

Nancy Allen presents Terry Warson with 1990 Applicator of the Year Award.

The 14th Annual Meeting of the Florida Aquatic Plant Management Society was held October 2-4 at the Bahia Mar Hotel in Fort Lauderdale. Once again, a new registration record (411 registrants!) was reached despite travel restrictions which prevented the attendance of many Florida and Federal government employees. Because of the fiscal restrictions, several speakers had to cancel their scheduled presentations. Thankfully, other excellent speakers filled the openings.

1990 Award Winners

William Maier Scholarship Fund Award

$450 awards were made to **Brian Smith** and **Greg MacDonald**, both University of Florida Master's Degree candidates studying under Dr. Shilling.

Applicator of the Year

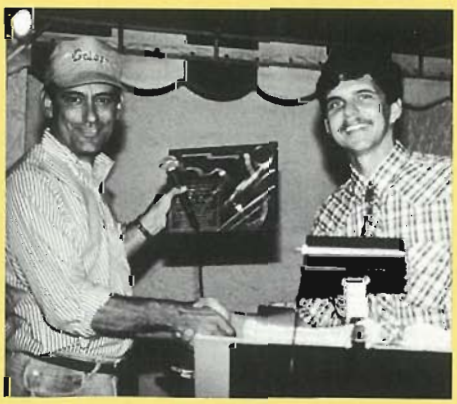
Terry "Turkeyfoot" Warson, Lead Aquatic Plant Technician, Citrus County Aquatic Services, Lecanto, FL.

Best Applicator Paper

Charles Graves, Herbicide Technician I, South Florida Water Management District, Okeechobee Field Station.

1990 President's Award

Outgoing 1990 Society President Brian Nelson awarded the President's Award to **Joseph C. Joyce**. The President's Award is not necessarily presented every year but only when the current President feels an individual has served the Society in an outstanding way. Dr. Joyce's outstanding service to the Society includes his being chairman of the William Maier Scholarship Foundation. The foundation has established a large endowment under Joe's leadership and has made annual awards to students of aquatic plant management disciplines. The Foundation is also developing new awards to support the education of Society members or their dependents. Also, Joe is always ready to go to bat for the interests of the Society and serves ably in his role as politico-communicator with legislators and regulators.



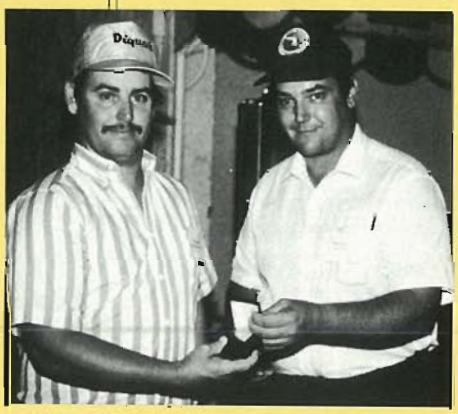
1990 President Brian Nelson presents Joe Joyce with the 1990 Presidential Award.

Incoming 1991 President Dan Thayer presents 1990 President Brian Nelson with the Society's Leadership Award.

Spanish Doubloon Raffle

Once again, Bill Haller convinced many indecisive members that the best thing to do was to give until it hurt and buy chances to win the silver doubloon donated by Mel Fisher's Treasure Salvors, Inc.

The coin came from the 1621 wreck of the Santa Nuestra de Atocha and is valued at $900. Dr. Haller's entreaties fattened the William Maier Scholarship Fund by approximately $1,500. The winner was **Carl Smith**, Highlands County Environmental Services, Sebring, FL.



Bill Haller presents the Spanish silver doubloon to the raffle winner, Carl Smith.

Membership Award

Bill Moore, new member enlistment officer extraordinaire, once again signed up the most new members during the past year.

Exhibitor Award

David Tarver, DowElanco.

Photo Contest

Operations

1st Place – **Nancy Allen**
2nd Place – **Nancy Allen**
3rd Place – **Nancy Allen**

Aquatic Scenes

1st Place – **Wendy Andrew**

AQUAVINE

IN MEMORIAM MARVIN TUCKER

Marvin "Dutch" Tucker, 68, died Thursday, Nov. 1 at home in Cocoa. Mr. Tucker was a founder of aquatic plant control in Florida. He was a charter member of the Hyacinth Control Society, forerunner of the national Aquatic Plant Management Society and FAPMS. He was a lifelong resident of Brevard County and supervisor of Brevard's Herbicide Control Department for 21 years. He had retired two years ago.

Before regional management programs began, Mr. Tucker took on water hyacinth management on the upper St. John's River. Under his steerage, all of Brevard County's miles of drainage canals and rights-of-way were brought under control. Invaluable knowledge was developed in the process.

In honor of Mr. Tucker's major contributions to our industry, a special Marvin "Dutch" Tucker fund of the Aquatic Plant Management Society's William Maier Scholarship Foundation has been created. Contributions to the fund are being held by the Brevard County comptroller's office for presentation to the Society at a later date. Checks should be payable to the William Maier Scholarship foundation and sent to:

Richard Van Epp
Brevard County Scenic
Improvement Department
3695B Lake Drive
Cocoa, FL 32922

NEW WEED MANUAL AVAILABLE

A new book *Weeds in Florida*, by D.W. Hall and V.V. Vandiver, Jr., is now available. Included are forty terrestrial and aquatic weeds of economic consequence in Florida. Color photographs of seedlings and adult stages of each weed aid identification. Description, history, range and biology of each weed are also provided. The book is available for $7.00 including postage. Florida residents should add 6% sales tax. Checks or money orders should be made payable to "University of Florida."

Weeds in Florida, IFAS Publication SP-37, is available from:

Publications
IFAS Building 664
Gainesville, FL 32611-0001

SHIRLEY FOX'S DNR TENURE ENDS

Shirley Fox's last day as DNR Aquatic Plant Management Bureau Chief was November 30, 1990. Mrs. Fox has been Chief for the past five years. With her leadership, Florida's aquatic plant management program matured and achieved new statewide levels of effective control and cooperative communication. Major

exotic aquatic weeds were brought under maintenance control for the first time this century. Also during her tenure, the Aquatic Plant Bureau grew, refined its regulatory role and set future goals. We'll miss her and wish Shirley best wishes for continued successes in the future!

S.C.A.P.M.S. AQUATIC PLANT SCHOLARSHIP GRANT

The South Carolina Aquatic Plant Management Society, Inc., a non-profit corporation established for the purpose of promoting the management of noxious aquatic vegetation in South Carolina, is seeking applications for a scholarship grant. The Society intends to award a $1,000 grant to the successful applicant in the Fall of 1991. Grant funds may be used by the recipient to cover costs associated with education and research expenses.

Eligible applicants must be enrolled as full time undergraduate or graduate students in an accredited college or university in the United States. Performance of research directly related to aquatic plant management in South Carolina is also required.

Applications must be received no later than May 1, 1991 and will be evaluated on the basis of relevant test scores (ACT, SAT, GRE, etc.), high school and/or college grades, quality and relevance of research project, a proposed budget, information obtained from references and other related considerations. Other factors being equal, preference will be given to applicants enrolled in Southeastern and South Carolina academic institutions.

The successful applicant will be required to present an oral report on the research project at the annual meeting of the Society.

Persons interested in applying for the scholarship grant should contact:

Danny Johnson
S.C. Water Resources Commission
1201 Main Street
Suite 1100
Columbia, S.C. 29201
Phone: (803) 737-0800

UPCOMING IFAS COOPERATIVE EDUCATION SERVICE SHORT COURSES

The following short courses are coming up and sponsored by the UF IFAS Coop. Education Service. For details contact Uday K. Yadav, (407)323-2500, ext. 5559.

Jan. 25, 1991
Annual Mid-Florida Turfgrass Conference, Seminole Community College, Sanford, FL.

Feb. 22, 1991
Urban Tree Symposium, featured speaker will be renowned arborculturist, Alex Shigo, Seminole Community College, Sanford, FL.

April 18
Pest Control Workshop, Agriculture Center Auditorium, Sanford, FL.

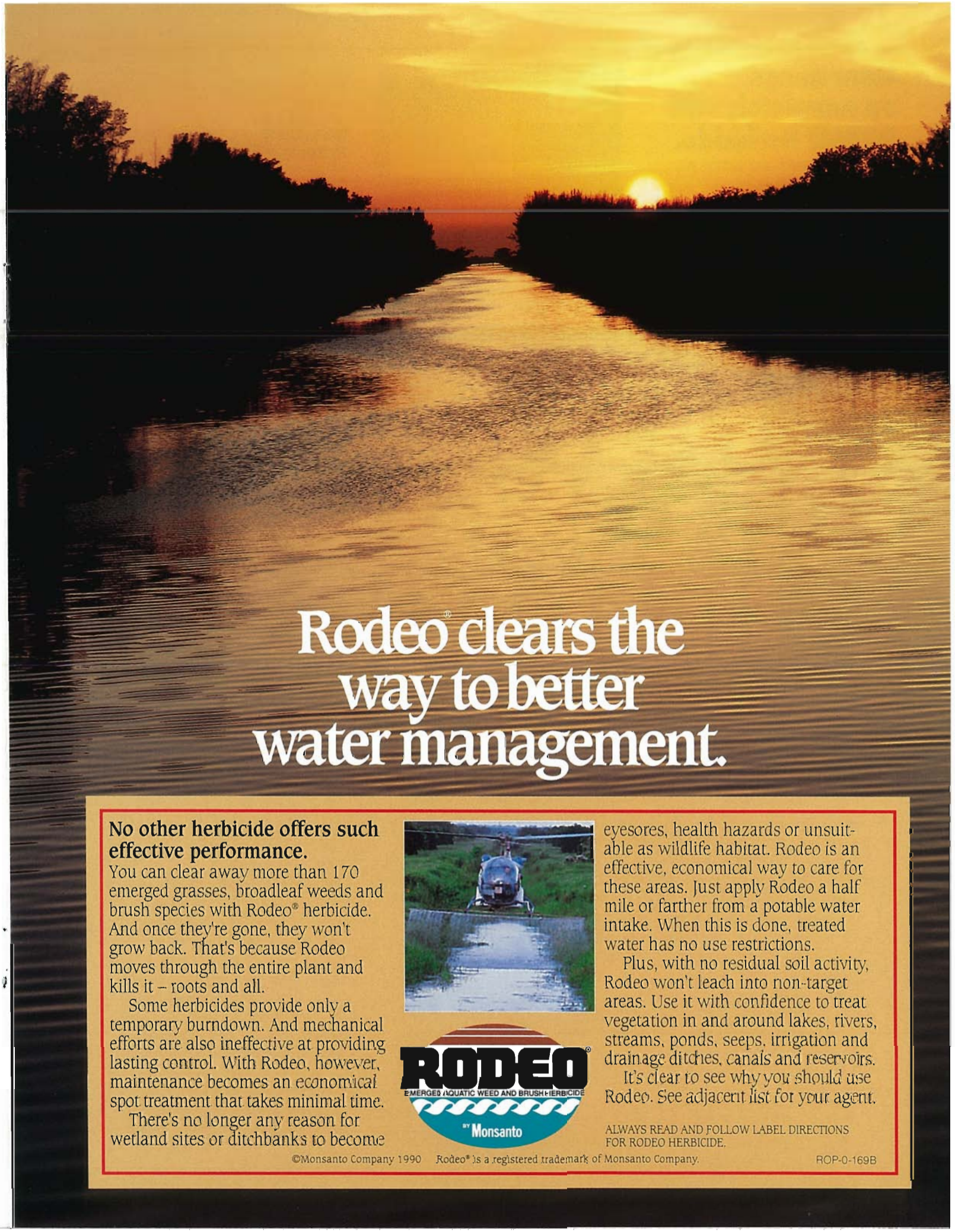
UPCOMING MEETINGS

Jan. 14-16, 1991
Southern Weed Science Society Annual Meeting, San Antonio, TX.

Feb. 4-7, 1991
Weed Science Society of America Annual Meeting, Louisville, KY.

CORPS PERSONNEL CHANGE

Wayne Jipsen, park ranger at the U.S Army Corps of Engineers Clewiston Natural Resources Office, joined the Jacksonville District office December 1. Wayne's work as biologist will support and help coordinate the Jacksonville District's aquatic plant control activities along with current staffers, Dr. William Zattau and Anne Galloway. Congratulations go to Wayne, especially if he manages to find his office/cubicle/workspace in the Jacksonville modular maze.



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