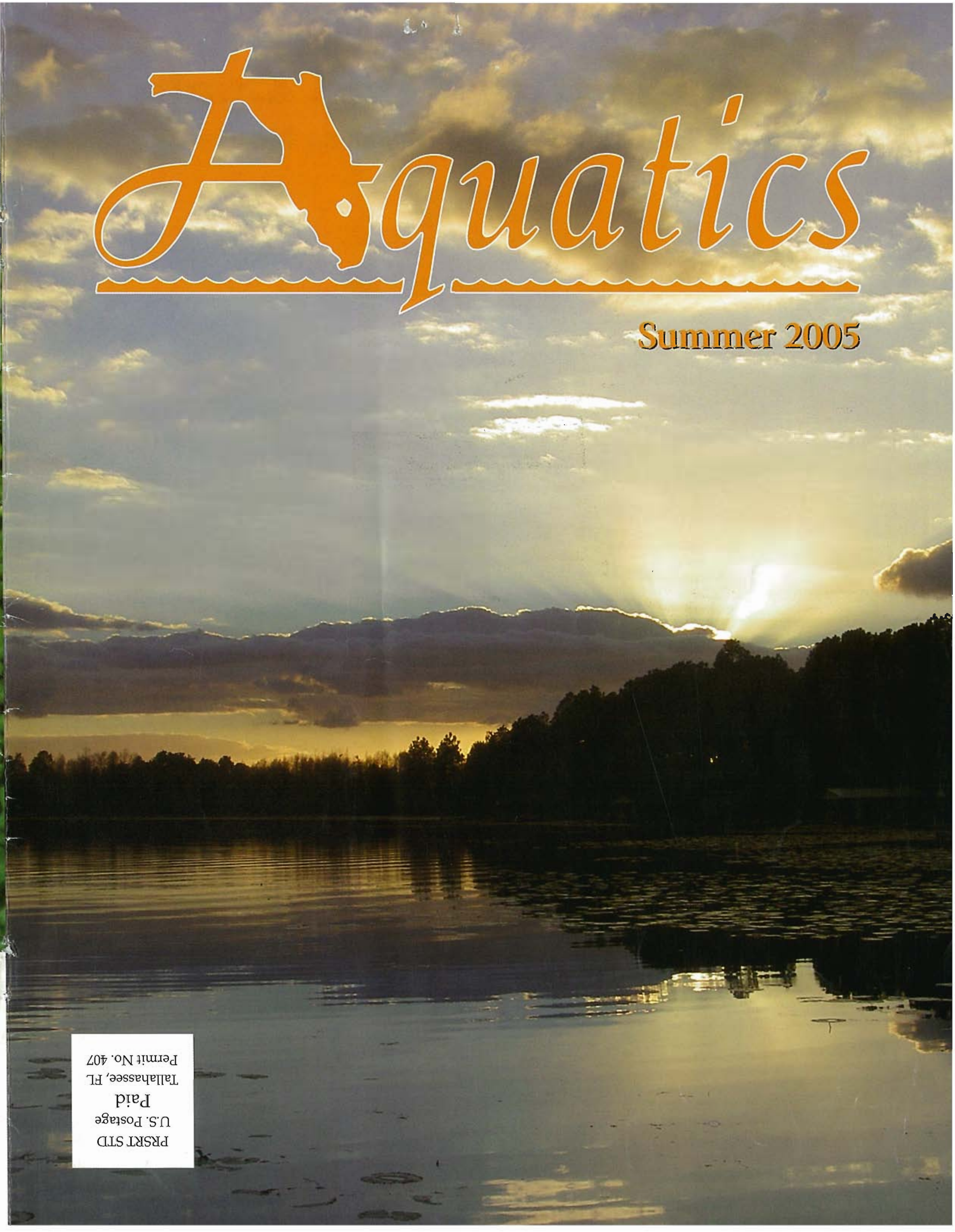
Aquatics

Summer 2005



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Gray Areas in Editing

The toughest job of the Chief Editor is making the decision on whether or not to publish articles that fall in between being informative and being a product advertisement. How does one distinguish between an advertisement that uses data and a scientific article based on data? On one level or another, most publications try to sell the reader on a product or idea anyway?

Aquatics publications are intended to keep all interested parties informed on matters as they relate to aquatic plant management. The magazine accepts informative articles, summaries of scientific papers, and editorial reviews that focus on aquatic plant management, aquatic wildlife, or related topics. Articles that clearly advertise specific products or technologies will not be accepted. Informative articles should be worded in such a way as to inform the readers without necessarily soliciting purchases of said products or technologies.

Even with these guidelines the question still remains, "How does an editor distinguish the fine line between a product promotion with data and a scientific study?" Many advertisements today cleverly use data to suggest that the product is the best in the marketplace, making it even more difficult for editors. Determining this fine line has been the most frustrating and challenging part of my position. Some days I wish for my other fun volunteer jobs with FAPMS, such as going on shopping sprees with the Awards Committee or haggling with members for their money at the merchandise booth of the annual meetings.

None of my past work experiences fully prepared me for the personal highs and lows associated with the production of *Aquatics* magazine. The past editor touched on the difficulties of obtaining articles, but forgot to mention that the toughest part of the job was declining articles. (If you are reading this Judy Ludlow, former editor, you're supposed to laugh here).

Continued on page 22

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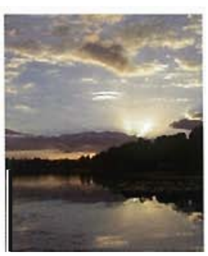

Sunset at Lake Seminole, Spring Creek. Photo by Mickey Shiver

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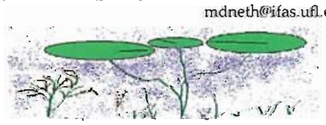

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Aquatic Plants and Fisheries:
Making Sense of Conflicting Evidence

Largemouth Bass *(Micropterus salmoides)*

Mike S. Allen
Fisheries and Aquatic Sciences
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Aquatic plant managers are often faced with angler groups who believe that the use of chemicals or biological control of aquatic plants is harmful to fish populations or fish habitat. Many aquatic plant managers have met strong resistance from some angler groups, and at the same time, support from other angler groups, lake homeowners, or recreational boaters. Fisheries research has not always helped the situation, because there are studies suggesting that aquatic plants can benefit fish populations, harm fisheries, and everything in between. For user groups that are strongly for or against an aquatic plant management plan, it is possible to find work supporting either viewpoint if their goal is to "spin" the story in their favor. In this article, we'll explore how plants influence fish communities and fisheries. We'll attempt to make sense out of the research and discuss how aquatic plant management is a vital component of today's fisheries management.

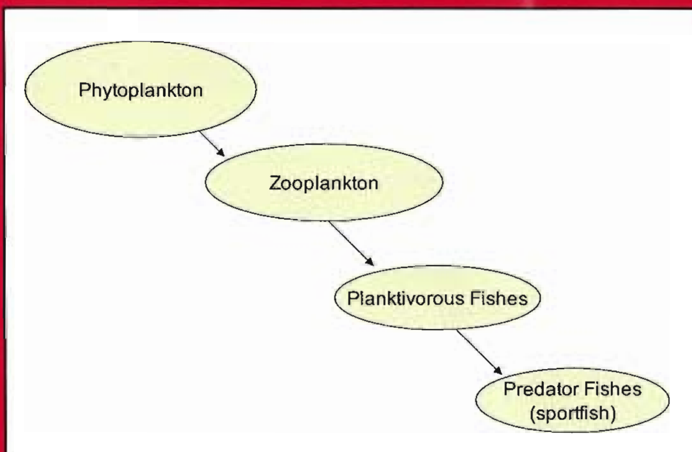


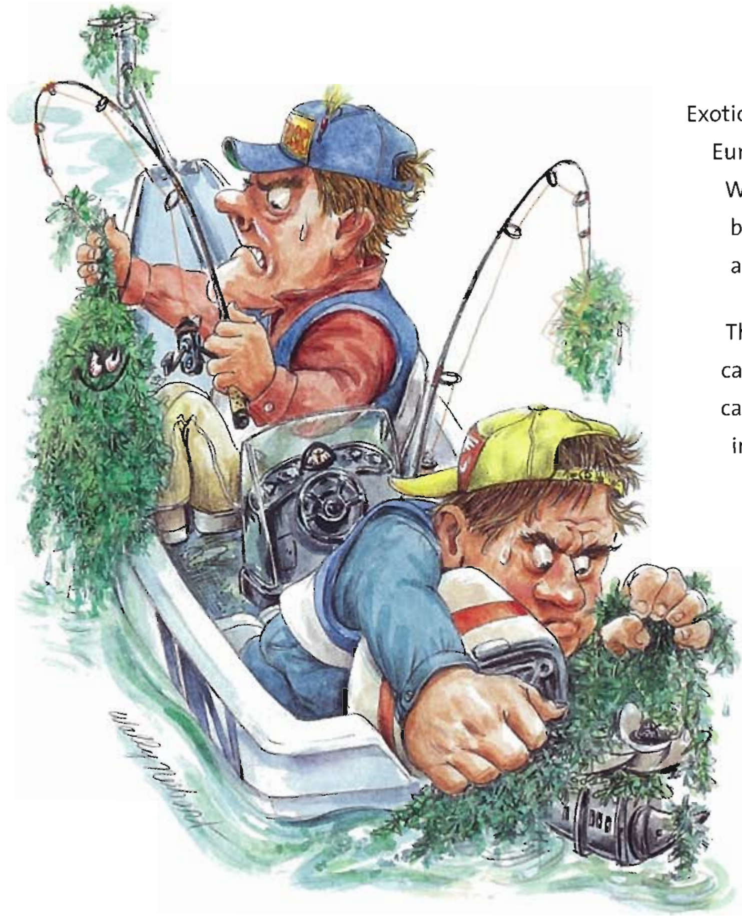
Figure 1. Simplistic aquatic food chain without aquatic plants

Influence of Aquatic Plants on Fish Communities

In the functional sense, aquatic macrophytes (submersed, floating, or emergent plants) and their associated attached algae serve structural habitat and primary production that ultimately transfer energy up the food chain, eventually to predators such as sport fish. However, whether aquatic macrophytes are present or not, primary production and food chain processes are always occurring. The presence of abundant macrophytes influences aquatic food chain structure, but it is possible to have good fisheries either with or without aquatic plants depending on the system and availability of other habitat that exists.

For example, in the absence of macrophytes, primary production in lakes results mainly from planktonic algae. The primary consumers are zooplankton (planktonic microcrustaceans), which consume phytoplankton, then followed by fishes that eat zooplankton. Predator fishes prey on the planktivorous fish to complete this simplistic lake food chain (Figure 1). Common zooplanktivorous fishes that tend to be relatively abundant in the absence of plants include threadfin shad *Dorosoma petenense*, gizzard shad *D. cepedianum*, silversides *Menidia* or *Labidesthes spp.*, along with some generalist species that can consume either zooplankton or larger inver-

Too Many Weeds Spoil the Fishing



Exotic invasive aquatic plants such as Hydrilla, Eurasian Watermilfoil, Curlyleaf Pondweed, Water Chestnut and Water Hyacinth can be detrimental to a healthy fishery in lakes across the country.

These invasive plants when left unmanaged can alter the ecosystem of lakes and reservoirs, causing a decline in the fishery, as well as interfering with other valued uses of waterbodies.

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tebrates such as bluegill *Lepomis macrochirus* and redear *M. microlophus*. The predator species in our plankton-based food chain would typically include largemouth bass *Micropterus salmoides*, smallmouth bass *M. dolomieui*, black crappie *Pomoxis nigromaculatus*, catfishes (family Ictaluridae), walleye *Sander vitreus*, or striped bass *Morone saxatilis* depending on the part of the country in which you reside. In summary, the food chain in Figure 1 has the potential to support a healthy fish community and quality fisheries without macrophytes present, but habitat availability will be important in shaping the fish population composition and fishing quality as well (discussed below).

In the presence of abundant macrophytes, the lake food chain changes to include macrophytes and associated epiphytic algae as primary producers, herbivorous invertebrates associated with the plants/epiphytes, and a somewhat different suite of insectivorous fishes that will play a larger role in the fish community and as prey species for predators (Figure 2). For a fixed amount of lake nutrients (constant trophic state), the presence of aquatic macrophytes will result in lower abundance of zooplanktivorous fishes (e.g., threadfin and gizzard shad) because some nutrients that would go into the phytoplankton/zooplankton interaction are now allocated to aquatic macrophytes and associated invertebrates (Figure 2). This increase in large invertebrates creates a feeding advantage for insect-consuming fishes such as bluegill, redear, bluespotted sunfish *Enneacanthus gloriosus*, and golden shiner *Notemigonus crysoleucas*, resulting in increases in these species relative to the condition found without plants. The predator fish community will include the same species as above, although with abundant macrophytes fishes like striped bass tend to decline because their feeding strategies are adapted to utilize open-water zooplantivorous fishes. Predators with very general feeding strategies such largemouth bass and black crappie can have strong populations with either planktonic or insectivorous fishes as the prey base (i.e., with or without plants).

Golden Shiner** (Notemigonus crysoleucas), **an insect-consuming fish common in lakes with aquatic plants.

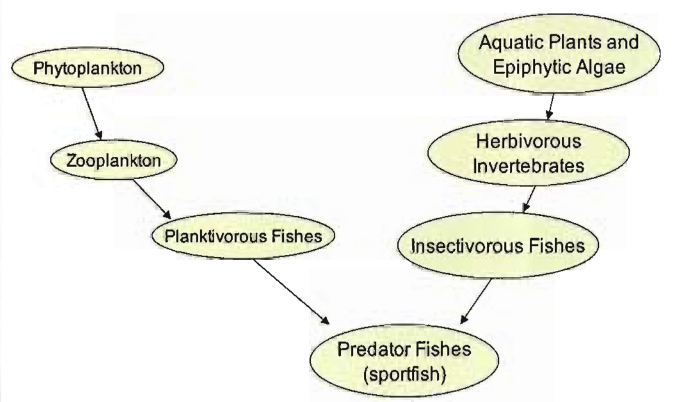


Figure 2. Simplistic Aquatic Food Chain With Aquatic Plants

Thus, changes in aquatic plants will change the fish community, but these effects may or may not result in poor fishing for anglers. It's no wonder there is conflicting evidence in the fisheries literature, because effects of aquatic plants on fish communities will vary! Now let's explore why.

Aquatic Plants and Fisheries

A fishery is defined as a system that includes the target organisms (fishes), the habitat in which they reside (including plants!), and the human users. Fishery management is the manipulation of each of each component (fish, habitat, humans) to provide sustained benefit for all parts of the system. Thus, aquatic plant management is in a way fisheries management because it modifies one component of a fishery (habitat) and therefore influences the other components (fish and humans).

We'll define fish habitat as a place that provides refuge from predators and food resources needed for survival and growth. Structurally complex habitat is a refuge from predation for juvenile fishes, particularly those species that are associated with littoral zones of lakes such as largemouth bass. Complex littoral habitat can come in many forms. Rock outcroppings, rip rap around bridges and causeways, brush and submerged trees in reservoirs, docks, and aquatic plants all serve as refuge from predators and sources of prey for juvenile largemouth bass. Availability of complex habitat generally improves largemouth bass recruitment and the number of adult fish in the population. Conversely, some predators such as black crappie utilize open-water areas of lakes as juveniles, and their abundance is usually not related to inshore habitat availability. We find good black crappie fisheries in large lakes with very low inshore habitat complexity. Thus, the utility for inshore habitat to improve fish abundance will vary among fish species.

In addition to providing refuge from predators, increased juvenile production, and the potential for more adult fish, aquatic plants also attract fish and therefore may improve angler catch rates. Similar to brushpiles and rocky habitats, aquatic plants provide clear areas for anglers to target fish. Fishing-associated benefits of aquatic plants don't result solely from production of more fish, they also help anglers catch the fish that are present.

Habitat and fish population relations are constantly changing in lakes and reservoirs. Many U.S. reservoirs that support popular largemouth bass fisheries were built prior to the 1970's, and these reservoirs initially had very high quality habitat in the form of newly submerged timber and woody debris, rocky areas, etc. Through time, sedimentation and degradation of woody debris contributed to a loss of fish habitat and a decline in reservoir productivity. Consequently, fishing quality declined compared to early years. In some cases, aquatic plants such as hydrilla *Hydrilla verticillata*, milfoil *Myriophyllum spp.*, and pondweeds *Potamogeton spp.* have become established in these reservoirs and have improved the habitat for fish. The reservoir fisheries were rejuvenated following plant expansion, with examples including Sam Rayburn Reservoir in Texas and Lake Guntersville in Alabama. Similar to reservoirs with poor habitat, large Florida lakes without significant plant coverage lack adequate habitat for littoral fishes. The occurrence of submersed plants that extend out into large Florida lakes, including invasive hydrilla, has improved some bass populations and fisheries compared to conditions prior to abundant submersed plants.

Many bass anglers in Florida prefer to fish around floating plant islands (i.e. tussocks) to catch trophy-sized fish.

Despite these benefits, aquatic plants can also be a problem for fisheries and other water uses. Exotic plant species such as hydrilla and Eurasian watermilfoil *M. spicatum* can cause problems for fishing access, homeowners, flood control, and recreational boating when present at very high coverage. Florida's shallow lakes are conducive to complete coverage by hydrilla, and studies have shown that high hydrilla coverage

(> 80-90%) reduces angler access and fishing effort, which obviously indicates negative fishery effects! Many anglers in Florida realize that too much hydrilla is a problem for shallow lakes where hydrilla can overtake the entire waterbody. Strategies to reduce hydrilla abundance while still providing adequate habitat with other plant species will continue to challenge both aquatic plant and fishery managers in the future. Some submersed plants are good for fish, but too many plants can be bad for fisheries!

Similarly, many bass anglers in Florida prefer to fish around floating plant islands (i.e., tussocks), which provide shade and cover to largemouth bass and may improve angler catch rates. Like the scenario above for submersed plants, low to intermediate coverage of tussocks can provide quality habitat and access to the fish by anglers, but expansive coverage causes oxygen depletion beneath the mats and problems with fishing access. Some can be better than none, but too much is a problem.

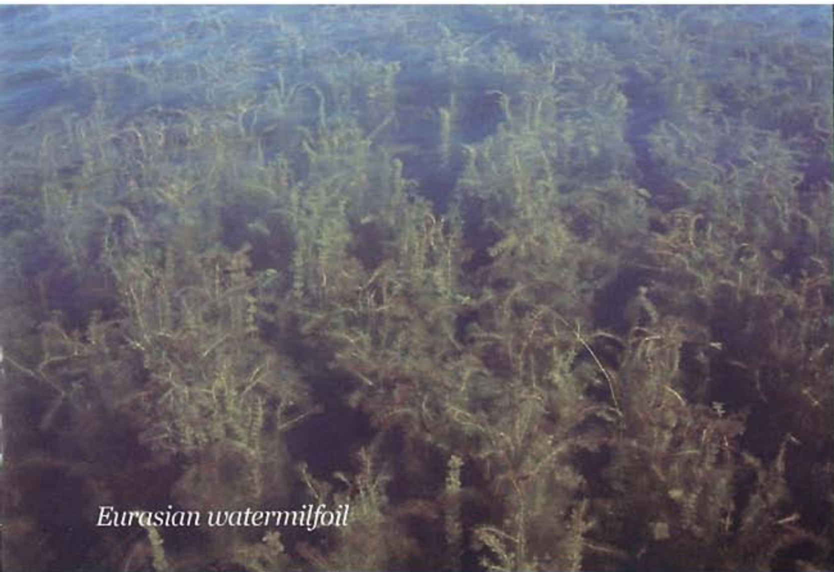
Other systems have maintained quality fisheries without aquatic plants. Some older reservoirs have maintained quality habitat and good fishing due to large numbers of docks and brushpile construction. Some natural lakes and reservoirs contain abundant rock and boulder substrate that provides quality habitat for both largemouth and smallmouth bass. Smaller natural lakes may have adequate habitat due to an emergent plant fringe and fallen trees around the lake shore.

So, herein lie the contradictions. Answers to the following questions would be:

1. Can aquatic plants (including exotic and invasive species) provide quality habitat for fish and improve fisheries? **Yes.**
2. Are aquatic plants necessary for good fishing? **In some cases yes, others no.**
3. Can aquatic plants harm fisheries? **Yes.**

Clear as mud, but extensive fisheries/plant research certainly shows that the answers to these questions are indeed correct.

In summary, fisheries management entails manipulation of habitat and fish populations for system health and human users. Habitat is modified using native aquatic plant introductions in systems with low plant abundance, placement of brush or rock structures, and aquatic plant management in systems where plants become a problem. Fish populations are modified directly through fish stocking or harvest and indirectly with habitat management. We can find evidence that plants are bad, good, and everything in between for fisheries. Obviously, aquatic plant management is critical for managing fisheries. Plant and fisheries managers are linked by definition, and we should work closely together to solve our problems.



Eurasian watermilfoil

Parrotfeather

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Using Herbicides Safely and Herbicide Toxicity[1]

J.A. Ferrell, G. E. Macdonald, B.J. Brecke, A.C. Bennett, and J. Tredaway Ducar[2] ,
UF/IFAS
Reviewed January 2005.

This excerpt was printed from University of Florida's IFAS Extension EDIS database. Document# SS-AGR-108, Reviewed January 2005.(http://edis.ifas.ufl.edu/WG048) Original written by J. Tredaway Ducar, revised by J.A. Ferrell and G. E. MacDonald.

Herbicide accidents in Florida have affected both man and the environment. Almost all herbicide accidents have been due to carelessness and could have been prevented by reading and following the label instructions on the herbicide container. The label contains important information on safety, personal protective equipment (PPE), disposal, poisoning, and treatment. The information on the label costs the basic manufacturer from 10-18 million dollars to develop.

Choosing The Correct Herbicide Or Formulation

Choosing the correct herbicide and formulation is the first preventative measure to avoid misapplication, leaching, off-site drift, and carryover. The label should be read carefully to ensure that the herbicide provides the weed control for the weed spectrum of interest while remaining safe on the crop. Formulations that are very water soluble are more prone to runoff or leaching. When applying phenoxy-type herbicides, a low volatile ester should be chosen to reduce drift and avoid injury to non-target plants. Some herbicides are very persistent and do not readily break down by photodecomposition, hydrolysis, or microbial degradation. These herbicides will list rotational crop guidelines that contain information on length of time needed before planting certain crops in order to avoid crop injury.

Transporting Herbicides Safely

It is always advised to transport herbicides in an upright position to prevent spillage. Some containers can be dangerous to carry inside your car or truck. Always transport pesticides secured properly in the trunk of a car or in the bed of a truck.

In a minor spill, sawdust, vermiculite, or even kitty litter will soak up spills. If a major spill occurs, ask your dealer or county agent to contact the nearest manufacturing representative to supervise the clean-up. The label contains the information needed if a spill does occur. Contact the county sheriff's office, state police, or Department of Transportation if a major spill occurs in a public space, especially along a highway.

Storage And Handling Of Herbicides

Always store herbicides in a locked building away from people, animals, feed, and food. The building should have a cement floor and good ventilation. Always store pesticides in the original container with the label. Keep all pesticides out of the reach of children.

Extreme caution should be taken when handling pesticides. Never open a container at eye level, especially wettable powders in paper bags. Use proper safety equipment in a well-ventilated area away from children and animals. The label states what safety clothing and equipment are required. Respirators are needed for highly toxic pesticides. Keep them clean and use only those tested by the National Institute for Occupational Safety and Health (NIOSH). Never eat, drink, smoke, or use smokeless tobacco when handling pesticides, and wash immediately if contact is made because some formulations can cause irritation, blisters, blindness, and death. Pant legs should be left outside of boots. Remove clothing that is contaminated after spilling.

Pesticide wastes are toxic. Always have a special place away from people and buildings for cleaning spray equipment and rinsing spray tanks. Some herbicides will not rinse out of spray tanks and measuring vessels with only water. For example, 2,4-D and dicamba residues will remain in spray tanks and cause phytotoxicity to susceptible plants later unless rinsed with suitable cleaners, like one containing ammonia.

Disposal Of Herbicide Containers

Read the label for disposal instructions. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of the Federal law.

Always triple rinse all glass, plastic, and metal herbicide containers and puncture plastic and metal containers except 30 and 55 gallon drums. Each time a container is rinsed, it should be one-third full of water before shaking.

Rinsate from pesticide containers and spray equipment should be added to the spray or mix-tank as diluent and sprayed back on the field.

There are no specifically designated landfills or incinerators in Florida for disposing of pesticide containers or unwanted pesticides. Remember, some drums can be reused and may be returned to your dealer.

Safe Application Of Herbicides

The first step in ensuring safe herbicide application is to **Read the Label!** The proper personal protec-


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tion equipment (PPE) should be utilized for application and removed immediately after handling the herbicides.

The application unit should be properly calibrated to deliver the correct amount of product per unit of area. Output from each nozzle should be within 10% of other nozzles. They should not vary more than +/-5% from expected output. Equipment should be rinsed thoroughly following use. Spray tips and strainers should be rinsed and residue removed.

Use caution when applying herbicides in the vicinity of susceptible crops. In order to prevent or reduce drift, the spray boom should be at the lowest setting which will still produce a good pattern. A drift control agent may be added to the herbicide mix. Low volatile formulations should be used when drift conditions are prevalent. Do not apply herbicides when wind is blowing more than 3 mph.

Some herbicides have the potential to leach, so care should be taken to avoid problems. Groundwater concerns, as well as course soil, prevents the use of many herbicides in Florida. Proper care must be taken so that contamination does not occur.

Keep all pets, people, and livestock away from area being treated. Do not allow anyone to enter the treated area during the restricted entry interval (REI) which varies based on the herbicide. Do not apply herbicides near the drip line of non-target, susceptible plants if the herbicide is absorbed or moved throughout the plant

Worker Protection Standard

1. Agricultural, forestry, nursery, and greenhouse users are affected by the Worker Protection Standard.
2. Requirements for Worker Protection Standard must be followed when they appear on the pesticide label. This includes providing personal protective equipment (PPE), observing restricted-entry intervals (REI), and notifying workers about areas where applications are taking place or where REI's are in effect. Notification may be oral or with signs posted at field entrances or both if required by the label.
3. Generic provisions of providing a decontamination facility, worker training, monitoring of handlers, cleaning, inspection and maintenance of PPE, and notification of applications are required.
4. Training for noncertified pesticide handlers and applicators can be provided by: a) a currently certified restricted-use pesticide applicator, b) a person currently designated as a trainer of certified applicators or handlers by state, federal or tribal agency having jurisdiction, or c) a person having completed a "Pesticide Safety Train-the-Trainer" program approved by the state, federal or tribal agency having jurisdiction. Reinforcement training about the specific pesticide being used should be conducted at the time the pesticide is to be handled or applied.
5. The employer must display at a centeral location information about each application, the name, telephone number, and address of the nearest emergency medical facility, and a WPS pesticide safety poster developed by EPA or an equivalent poster. Transportation to an emergency medical facility must be provided for the employee thought to have been poisoned or injured and supply the treating medical personnel any requested information from the product label. A description of the way the pesticide was used and the circumstances of the worker's exposure to the pesticide must also be given.

Toxicity Of Herbicides

Herbicides have the same mode of entry into the human body as other pesticides: through the skin (dermal), by swallowing (oral) and by breathing (inhalation). Paraquat, for example, is highly toxic orally and can be fatal. The arsenicals, such as MSMA and DSMA, can be fatal if swallowed.

Generally, herbicides are not as toxic to man as insecticides, rodenticides, and nematicides, because plants have different sites of action than humans or animals. However, some may accumulate in the body and be fatal when a certain concentration is reached.

The toxicity ratings given below refer to the acute oral toxicity as measured by the LD_{50}. Evaluations are conducted on test animals, which are normally rats, over a prescribed length of time. The acute oral toxicity is the single dose in mg/kg (mg of compound per kg body weight) taken by mouth or ingested that will kill 50% of the animal test population. It is assumed that the same dosage would apply to humans and is therefore adopted as the standard.

Table 1 lists the toxicity ratings used in the classification of herbicides. **Table 2** lists some common herbicides and gives the oral and dermal toxicity rating for each. Values preceded by "greater than" (>) mean the LD_{50} is higher than the quoted figures, which were the highest amounts tested.

Please visit the EDIS website at http://edis.ifas.ufl.edu to read this article in its entirety.

Footnotes

1. This document is SS-AGR-108, one of a series of the Agronomy Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Reviewed January 2005. Original written by J. Tredaway Ducar, revised by J.A. Ferrell and G. E. MacDonald. Please visit the EDIS Web site at http://edis.ifas.ufl.edu.
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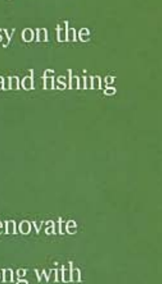

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Quantifying the Impact of Aquashade™ Dye for Growth Regulation of Submersed Aquatic Vegetation

Lee Ann M. Glomski[1] and Michael D. Netherland[2]

Submersed Macrophytes and Dyes

Despite the widespread use of shading dyes in the field of aquatic plant management, there is little information published regarding the quantitative impact of dye treatments on submersed plant growth. Many aquatic plant managers integrate the use of shading dyes into management programs on small waterbodies as a means to inhibit submersed macrophyte/algae growth and to reduce the frequency of return visits for application of herbicides or algaecides. Dye use rates, performance claims, and recommendations can vary widely.

Short-term laboratory studies by Manker and Martin (1984) on hydrilla, and Spencer (1984) on phytoplankton demonstrated shading and not photodynamic

Figure 1. The outdoor mesocosm facility used to grow hydrilla and sago pondweed for the dye studies. Shallow tanks have a 6,700 L capacity.

action was the primary mode of action for Aquashade™3 dye. The active ingredients, Acid Blue 9 (23.63%) and Acid Yellow (2.39%) are reported to inhibit plant and algae growth by filtering-out wavelengths of light critical to photosynthesis. From the field perspective, Osborne (1979) demonstrated the potential use of Aquashade™ at a use rate of 2 ppm inhibited re-growth of hydrilla following a contact herbicide treatment. In addition, application of 350 gallons of Aquashade™ to the 215-acre Adirondack Lake, NY, resulted in significant suppression of nuisance broad-leaved pondweeds (Going and Purdue 1985). Despite years of field observation, there has been limited, if any effort towards quantifying the response of submersed plant species to various concentrations of dye. Recent research on evaluation of transparency and light attenuation by Aquashade™ (Madsen et al. 1999) provides a solid framework for evaluating the impacts of this dye on the growth

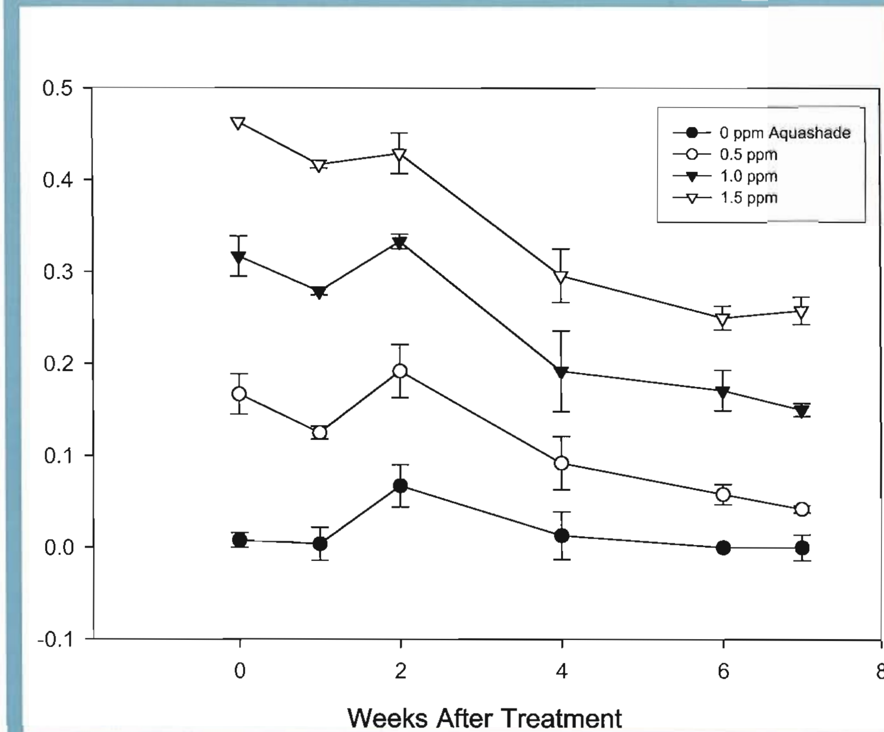

Figure 2. Residues of Aquashade dye following treatment. Actual dye concentrations are 25% of the nominal Aquashade treatment recommendation.

Figure 3. Aquashade applied at increasing rates shows the color variations in the water agains a white background.

of submersed aquatic plants.

The evaluation of water transparency as a limiting factor in supporting macrophyte growth is well described in aquatic literature and many aquatic botanists have been known to say, "it's the light stupid". Research suggests that when watercolor exceeds 50 platinum cobalt units (PCU), submersed macrophyte coverage and percent volume infested can be significantly reduced (Bachman et al. 2002). Despite the intuitive knowledge that dyes impact plant growth, our inability to quantify this level of growth inhibition following a treatment prevents us from improving recommendations for the use of dyes as plant growth inhibitors in aquatic systems.

Studies were initiated to quantify the impact of various concentrations of dye on two species of submersed macrophytes. We selected Aquashade™ for these evaluations due to the prior literature that exists for this product and the fact that it has a USEPA registration (EPA Reg. No. 33068-1) for use in numerous aquatic sites. We provide some preliminary information that suggests low concentrations of dye can have a stronger impact on submersed plant growth than was originally predicted.

Methods

To test the effects of various

dye concentrations on submersed plant growth, an outdoor mesocosm study was conducted in the summer of 2004 at the US Army Engineer Research and Development Center, Lewisville Aquatic Ecosystem Research Facility in Lewisville, TX. The submersed species hydrilla (*Hydrilla verticillata* (L.f.) Royle) and sago pondweed (*Stukenia pectinatus* (L.) Boerner) were selected for this study and were planted in two mesocosm systems, one with tanks 1.4 meters deep (hereafter referred to as shallow tanks) and one with tanks 3.0 m deep (hereafter referred to as deep tanks) (Figure 1). The shallow tanks were treated at rates of 0, 0.5, 1.0, and 1.5 ppm Aquashade™ (dye concentrations of 0.125, 0.25, and 0.375 ppm) whereas the deep tanks were only treated at 0 and 1.0 ppm. While the directions for use suggest applying enough product to achieve a target of 1 ppm, the actual dye concentration is only 25% of the suggested target rate. Water samples were collected weekly and dye concentrations were measured via spectrophotometer.

We hypothesized that hydrilla would show a minimal response to dye treatments (especially at the lower rates) due to its ability to rapidly elongate under low light conditions and concentrate biomass near the water surface. In contrast we hypothesized that sago pondweed would be impacted at increasing rates of dye due to the more uniform growth of this species throughout the water column. Plants were harvested at 9 weeks after treatment and dried to a constant weight. All plant material was destroyed at the end of the study.

Selected Results and Future Work

Dye concentrations decreased by 46 to 65% through 7 weeks (Figure 2) and Secchi disk readings for the shallow tanks remained at 1.4 meters (maximum depth of the tanks) throughout the study for all treatments. Visual observations from the mesocosms indicated that only the 1.5 ppm treatments resulted in a noticeable difference in water clarity compared to untreated controls. The impact of a dye treatment on the appearance of a natural water body can vary greatly and this is related to product use rates, initial water clarity, water depth, and the substrate type. Figure 3 shows a photograph of the incremental changes in watercolor for a 1 L sample of the mesocosm water against a white background. Results of this initial study indicated that all rates of dye evaluated reduced sago pondweed shoot biomass by 59 to 73% over a 9-week period compared to untreated controls (Table 1). Interestingly, increasing the dye concentration by 3-fold resulted in only a 14% incremental reduction in plant biomass. A 1.0 ppm treatment in the shallow and deep tanks indicated that hydrilla biomass was reduced by 50 and 84% respectively compared to the untreated controls. As predicted, treatments were more effective at increased depths due to a greater influence on light penetration through the water column Hydrilla shoot biomass was also reduced by 40% in the shallow tanks following the 0.5 ppm treatment, and this result did not support our hypothesis that hydrilla would compensate for reduced light by bolting to the water surface and concentrating biomass in the canopy. Visual observations indicated that neither hydrilla nor sago pondweed grew to the water surface in the shallow-treated tanks through the 9-week study. With the exception of reduced biomass, plants exposed to the dye treatments did not show any visible injury symptoms and they could not be distinguished from untreated plants. The ability of these treatments to significantly reduce plant growth suggests that improving guidance for integration of dye into a plant management program warrants further investigation.

These preliminary results indicate that low rates of dye can be quite effective at significantly reducing submersed macrophyte growth over an extended period of time.(move up to form 1 paragraph) Current work is being conducted to confirm these initial results and to evaluate lower dye rates on these and other submersed plants. Aside from the aesthetics (or sometimes

Species	Treatment Rate (Aquashade, ppm)	% Shoot Biomass Reduction
Sago Pondweed (Shallow Tank)	0.5	59
Sago Pondweed (Shallow Tank)	1.0	65
Sago Pondweed (Shallow Tank)	1.5	73
Hydrilla (Shallow Tank)	1.0	50
Hydrilla (Deep Tank)	1.0	84

Table 1. Impacts of Aquashade treatments on shoot biomass of sago pondweed and hydrilla compared to untreated controls.

the lack thereof) of turning water blue or turquoise following a dye application, lower use rates of Aquashade™ may have limited impact on the appearance of the water, but may still significantly reduce submersed macrophyte growth. Dye use is a well-established practice for managing submersed plant and algae growth in small water bodies, and we feel that an enhanced understanding of use rates, species response, water depth, and timing, can improve use of this tool.

Acknowledgements

Support for this paper was provided by the US Army Engineer Research and Development Center, Aquatic Plant Control Program, the Aquatic Ecosystem Research Foundation, and Applied Biochemists. Use of trade name does not indicate endorsement of such products. Permission was granted by the Chief of Engineers to publish this information.

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Spencer, D.F. 1984. Influence of Aquashade on Growth, Photosynthesis, and Phosphorous Uptake by Microalgae. J. Aquat. Plant Manage. 22: 80-84.

Footnotes

1. Analytical Services, Inc., US Army Engineer Research and Development Center, Lewisville Aquatic Ecosystem Research Facility, Lewsiville, TX 75057
2. US Army Engineer Research and Development Center, University of Florida Center for Aquatic and Invasive Plants, Gainesville, FL 32653.
3. Aquashade is a registered trademark of Applied Biochemists (Germantown, WI) and is registered by the US Environmental Protection Agency for use in aquatic sites.

Now Available

Hydrilla Issues Workshop Summary

In December 2004, the University of Florida, IFAS held a workshop in Gainesville, Florida to identify and discuss the key issues associated with hydrilla management, with the hope that this information would help future efforts to manage hydrilla. For a copy of the final document entitled "Hydrilla Management in Florida: A Summary and Discussion of Issues Identified by Professionals with Future Management Recommendations", please visit the Florida LAKEWATCH website (lakewatch.ifas.ufl.edu).

29th Annual Conference
November 8-10, 2005

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Please visit www.fapms.org to register.

AQUAVINE

The "Aquatic Plant Manager of the Year" application deadline is quickly approaching: Fall 2005. This award is designed to provide a means to recognize outstanding achievements in aquatic plant management field activities and to enhance professionalism in aquatic plant management activities in Florida. All nominees must be active members in the Florida Aquatic Plant Management Society and be directly involved in aquatic plant management field activities. Individuals are not eligible for this award if they are involved exclusively in an administrative capacity or employed in the chemical or equipment manufacturing and distribution industries. Please visit the web site www.fapms.org for more details.

Habitattitude Campaign Update: Channeled Apple Snails "Even nature lovers want them dead. They produce gritty pink eggs a thousand at a time, depositing finger-size wads all over dock pilings and tree trunks. They chomp on most aquatic plants, grow to the size of a softball and are thought to have few predators."

Habitattitude (www. habitattitude.net): Welcome to a site for aquarium hobbyists, backyard pond owners, water gardeners and others who are concerned about aquatic resource conservation. Americans enjoy a diversity of hobbies, many of which involve our natural environment. And protecting these resources is an important part of our overall enjoyment.

A concern we must all address is the expansion of harmful plants, fish and other animals throughout our country. Representing one of our greatest natural resource challenges, stopping the spread of these species appears simplistic, but global economic linkages complicate the issue. A variety of commercial and governmental activities have accidentally introduced aquatic invasive species and various aquatic resource users and consumers unknowingly spread them to other waters. If these species become established, they can wreak environmental havoc, degrade aquatic resources and make waters unusable for recreation.

This issue is relevant to everyone, but especially to those who enjoy aquaria, backyard ponds and water gardens. Increased scrutiny on our activities and their perceived linkages with the growing challenge known as invasive species requires us to show how we value and protect the environment.

If you have acquired an undesirable aquatic plant or fish species for your aquarium or water garden, it is important not to release these plants or animals into the environment. While most of these organisms will die, some may be able to survive. And a smaller number of those that do survive have the potential to create negative impacts on our natural environment and our wallets and misperceptions about our hobbies. Visit www.habitattitude.net for more news and information.

Weed Alerts: Florida Department of Environmental Protection maintains a weed alert library on the internet (www.dep.state.fl.us/lands/invaspec/2ndlevpgs/wedalrt.htm). Each fact sheet focuses on a non-native invasive plant species that poses a serious threat to Florida's ecosystems. They can be downloaded as PDF files (requires Acrobat Reader) and range in size from 170K to 600K or print copies can be ordered by contacting the bureau at: FDEP, 3900 Commonwealth Boulevard M.S. 100 Tallahassee, Florida 32399 850-245-2555 (phone) / 850-245-2572 (fax). Subject species available include: Australian Pine, Beach Naupaka, Brazilian Pepper, Chinese Tallow, Cogon grass, Giant Salvinia, Hydrilla, Japanese Climbing Fern, Melaleuca, Old World Climbing Fern, Shoebutton, Water-hyacinth, Water-lettuce, Water-spinach, and Wild Taro. Visit the internet site by using the link "FDEP WEED ALERTS" from the FAPMS website. (www.fapms.org).

Calendar

June 6-9, 2005- 16th Annual Florida Lake Management Society Conference, Hawk's Cay Resort, Duck Key, FL. http://www.flms.net/conference/info.htm

July 10-13, 2005- 45th Annual Aquatic Plant Management Society meeting. Hyatt Regency (800-223-1234) on the Riverwalk. San Antonio, TX. www.apms.org.

November 8 –10, 2005- 29th Annual Florida Aquatic Plant Management Society Training Conference. Hilton (727-894-5000), St Petersburg, FL. www.fapms.org.

November 9 –11, 2005- 25th International Symposium NALMS 2005. "Lake/Effects: Exploring the Relationship between People and Water". Madison, WI. www.nalms.org.

Editorial *Continued from page 3*

It would make the editor's job much easier if everything that was submitted was printed in the magazine. However, this would do a huge disservice to the members who read the magazine with the assumption that the facts presented in the articles are all true and unbiased. Good editors must constantly determine what level of bias in an article is acceptable. Since most printed facts are true to some degree, is not the purpose of a scientific study simply to prove a fact to a level of certainty?

Editors cannot possibly know enough about the subject matter of each article submitted to the magazine to accurately assess the "truth" in the data. Most of the articles I reviewed this year fall into two categories, those based on scientific studies, and those based on a person's expertise.

Good articles based on scientific studies show the reader how the data is unbiased, reproducible, and based on good scientific design. Likewise, good articles based on personal expertise avoid using facts that may mislead the reader into believing the article was based on scientifically defensible data.

As articles are submitted to *Aquatics* magazine, I will continue to make judgment calls on articles that fall into that gray area, somewhere between a scientific article and a product promotion. As Jim Carrey quoted in his movie Liar, Liar, "the truth shall set you free".

Please send any responses, rebuttals, or words of wisdom to the attention of Jeff Holland, Editor-in-Chief.

Corrections: Aquatics magazine, Spring 2005 issue, Vol. 27, No. 1:

The length of a full-grown Burmese python was erroneously listed as 33 feet in the article "A Story of Invasive Animals in Florida". The length of the adult Burmese python should have been stated as 22feet.

The web site link for the Florida Exotic Pest Plant Council was incorrectly listed. The correct web site is www.fleppc.org

Terms for the Board of Directors were shown incorrectly. First year board members were Dr. William Haller, Johnnie Drew, and Dr. Michael Netherland. Second year board members were Bill Torres, Polly Ellinor, and Buddy Deese. Third year board members were Christine Bauer, Todd Olson, and Chance Dubose.


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