Aquatics

SPRING 2014

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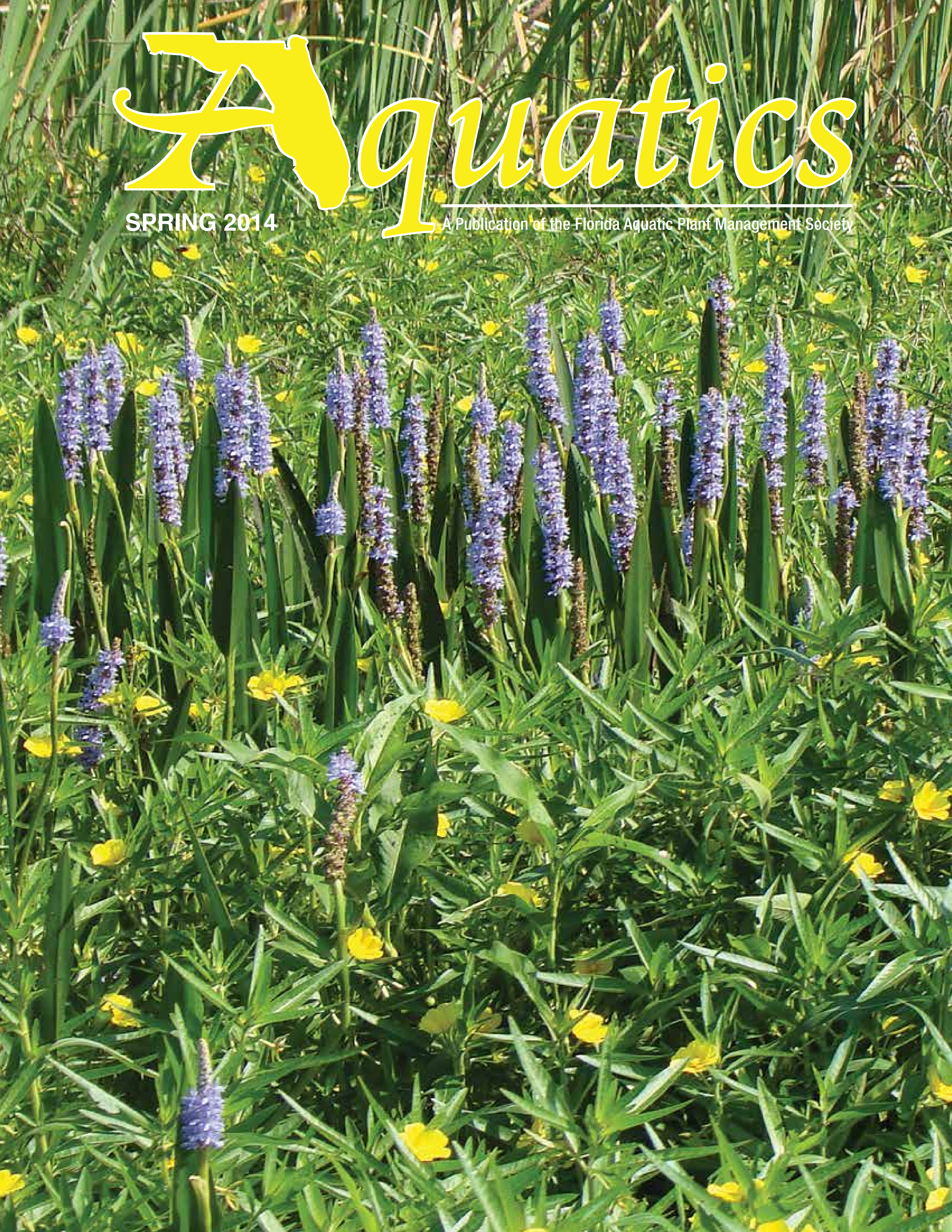

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FAPMS
Established in 1976

Ludwigia hexapetala see page 15. Photo courtesy of Keshav Setaram, SFWMD.

Floating cages. Photo courtesy of Helen Spivey. See article page 11.

Plot scheduled for hygrophila removal. Photo courtesy of Casey Williams.

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SELECTIVE ON NATIVE PLANTS!

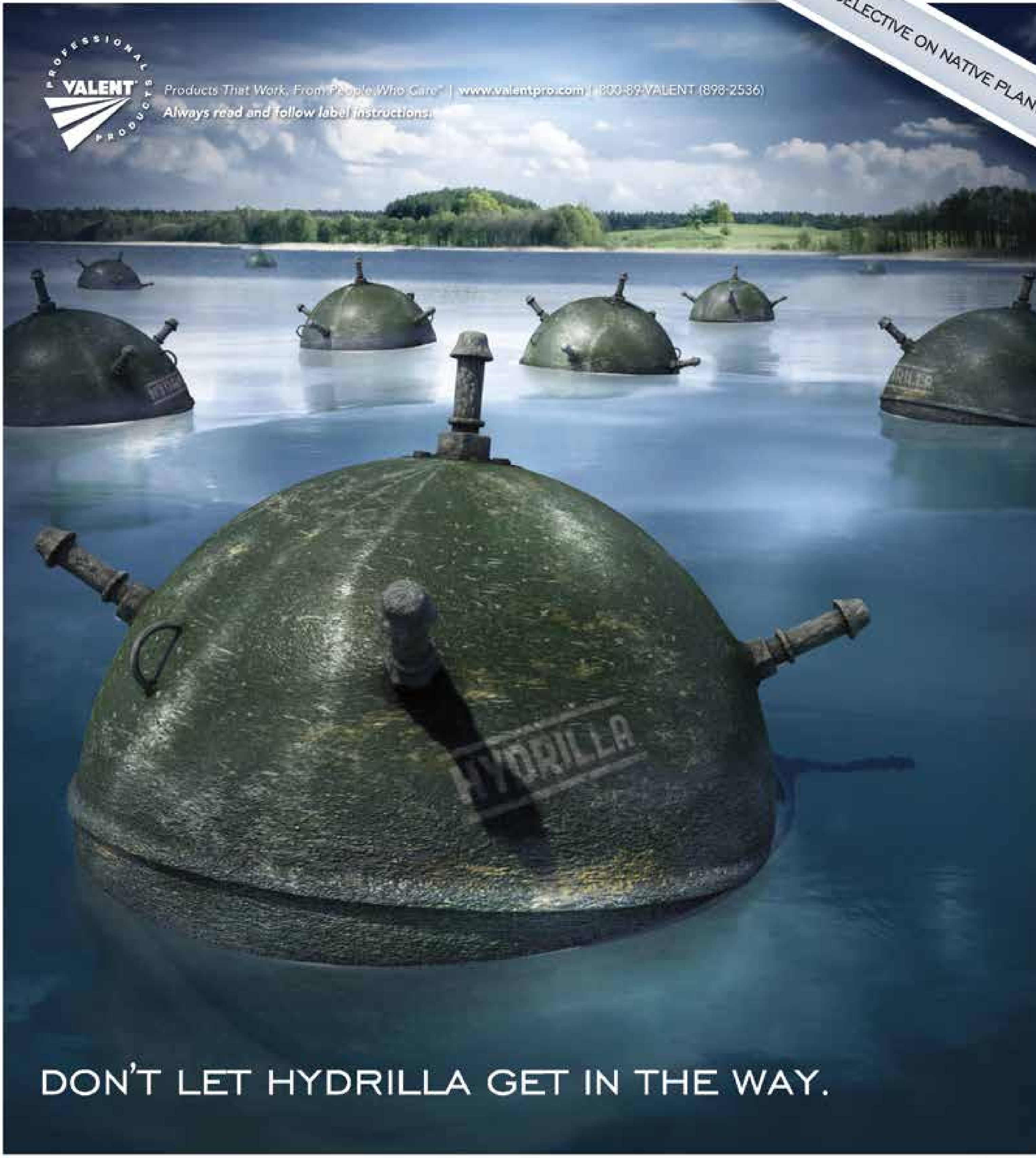

Figure 1. The endangered fountain darter, *Etheostoma fonticola*. Photo courtesy of Gregg Eckhardt.

Habitat Enhancement for an Endangered Fish Species in Comal Springs, Texas

By Casey Williams and Nick Porter

Introduction

The Comal Springs in New Braunfels, Texas is historically the largest spring system in the Southwestern United States by discharge (Brune, 1981). This spring and river system is considered critical habitat for several endangered vertebrate and invertebrate species, including the fountain darter (*Etheostoma fonticola*), a small fish species. In order to protect these species, the Edwards Aquifer Recovery Implementation Plan (EARIP) process led to the development of an approved Edwards Aquifer Habitat Conservation Plan (HCP) for the Comal Springs and Comal River system. In relation to the Comal system, the EARIP process and HCP identified a variety of options to improve and increase habitat for endangered species.

In order to improve habitat, particularly for the fountain darter, an aquatic vegetation restoration project was implemented in two sites within the Comal system: the Landa Lake restoration area and the Old Channel restoration area. These areas were outlined by the City of New Braunfels in the HCP for the Comal system as high priority locations for fountain darter habitat improvement. Landa Lake is a small impoundment located within the city of New Braunfels, Texas and covers approximately 18 acres. It is a shallow water body with the maximum depth of approximately 10 feet. Landa Lake receives spring flow from several spring runs, peripheral springs issuing from fissures

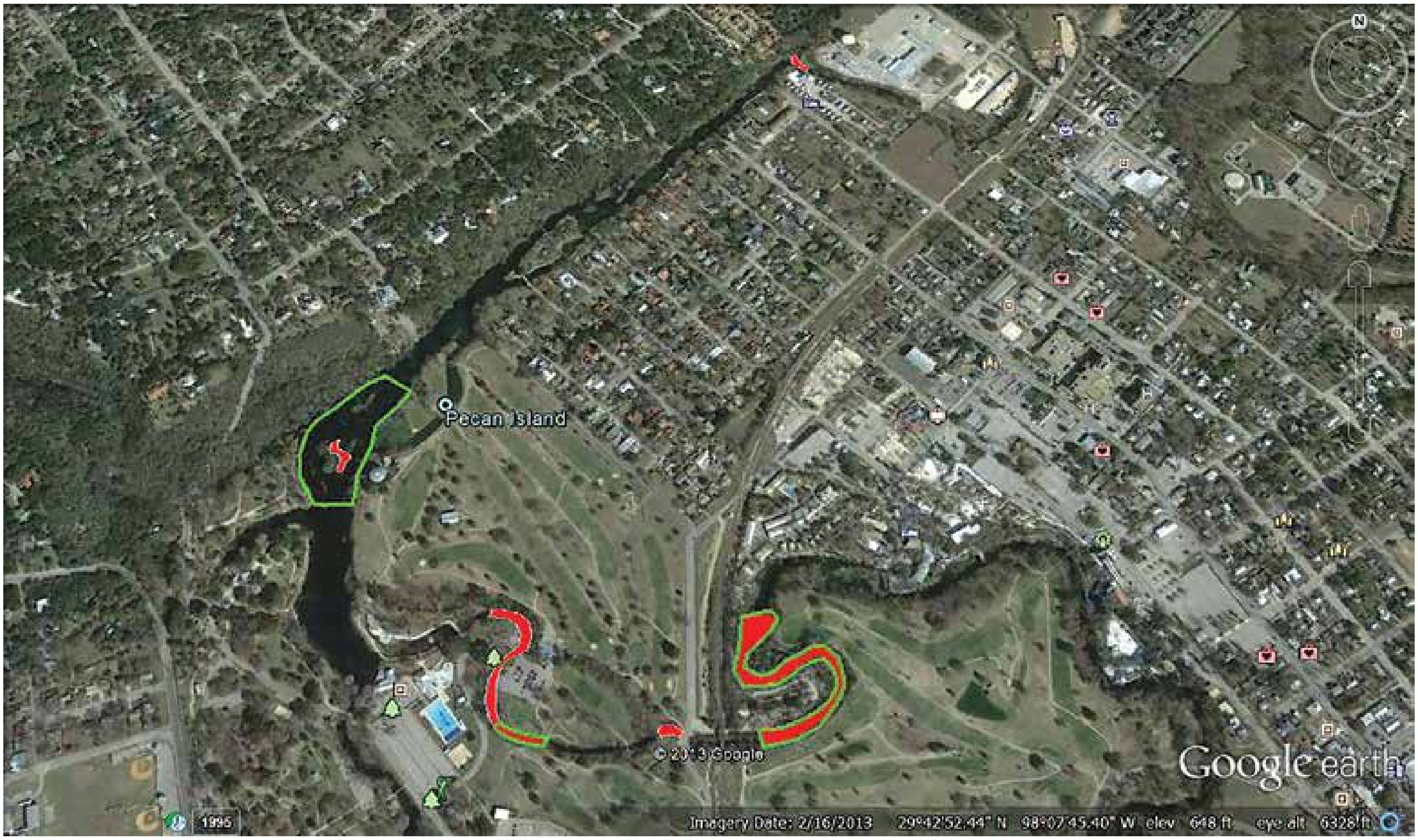

Figure 2. The layout of the Comal Spring and River System. Areas in red outline restoration locations. Image courtesy of Google Earth.

along its western bank and low pressure springs on the bottom of the lake. Landa Lake discharges into two channels: the Old Channel, which is the original water course of the upper Comal River, and the New Channel, a man-made canal. These two water courses combine to form the main stem of the Comal River.

To begin the restoration process, we assessed the quality of the habitats within the project areas during initial site visits conducted in early 2013. Site assessment factors included presence and density mapping of all aquatic vegetation, evaluation of suitable substrate for restored plant species and evaluation of suitable flow conditions within different portions of the project sites using two dimensional modeling. Also, historical accounts of aquatic vegetation were evaluated to help determine previous expanses of native vegetation.

Comal River Aquatic Plant Community

Historically, the Comal Spring system has had a diverse native plant community. Approximately ten species of obligate aquatic vascular plants, along with a community of aquatic mosses and liverworts (bryophytes), are considered native to the Comal system. Several species of aquatic plants were introduced into the Comal system. These include *Ceratopteris thalictroides*, *Limnophila sessiliflora*, *Hydrilla verticillata* and *Hygrophila polysperma*. While these plants are not native and in most instances are considered extremely invasive, *Hygrophila polysperma* (hygrophila) is the only species that has reportedly expanded its distribution since 2001 (BIO-WEST, 2012). Before restoration work began, we were able to map the aquatic vegetation across the entire system. This provided a good baseline for our restoration efforts, as well as a comparison to previous vegetation maps produced occasionally since the 1990s.The project area within the Old Channel was composed of monospecific stands of hygrophila, while Landa Lake was composed of a variety of aquatic plant species. However, compared to previous vegetation maps, hygrophila has recently become established in this area and in 2013, hygrophila was the second most common aquatic plant after *Vallisneria neotropicalis* (BIO-WEST, 2013).

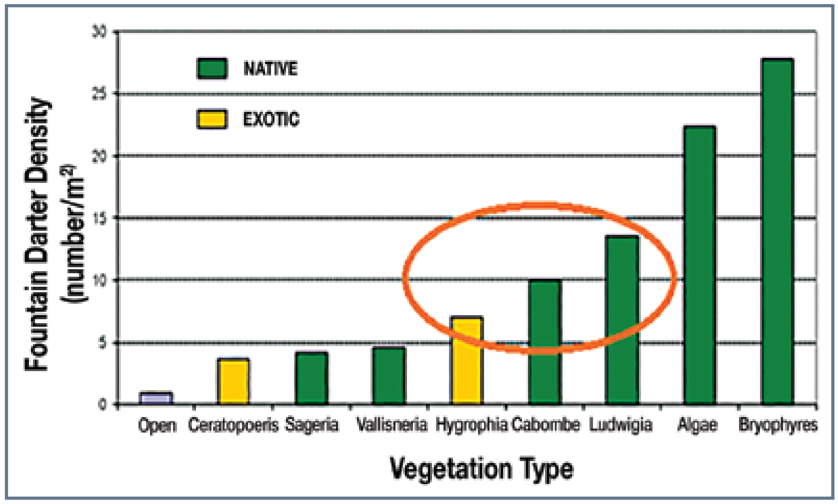

Figure 3. Darter preference for different aquatic plant species BIO-WEST, 2012.

Choosing Species Used for Restoration

In order to identify target native species for restoration we looked at several factors, including the propensity for utilization by the fountain darter, historical and current distribution of the species in the system and the suitability of the species for propagation. We identified three native species that we believed would be most suitable for restoration.

- *Cabomba caroliniana* is a perennial branching species, which typically grows in large stands, in silty substrates and in low-velocity areas or downstream of velocity shelters. It is considered excellent fountain darter habitat. Current distribution in Landa Lake is limited but it historically has had a wider distribution. Propagation difficulty for restoration purposes is not well documented.

- *Ludwigia repens* is a perennial branching species, which typically grows as monspecific stands or can be found intermixed with hygrophila. It is found in sand and gravel substrates and generally in areas with moderate velocities. This plant species provides excellent fountain darter habitat. It currently has a low distribution in the entire Comal system but was historically widespread. It is easy to propagate (Doyle, 2002).
- *Sagittaria platyphylla* is a perennial upright rosette-forming species commonly found in areas with low to moderate velocities with substrates generally consisting of sand and silt. While *Sagittaria platyphylla* provides low suitability for the fountain darter, it provides a good surface for darter egg deposition (Phillips et al. 2011). It also provides velocity shelters for *Cabomba caroliniana* and bryophytes as well. It had historically low distribution in the Comal River but is currently widespread due to previous restoration activities conducted by Doyle in 2001. It is considered easy to propagate (Doyle 2002).

Native Plant Grow Out

We initially proposed two methods of plant grow out: pond-grown and field-grown plants. For pond propagation an aquaculture pond was partially filled to depths ranging between 16 and 28 inches. While this method worked initially, warmer water temperatures in late winter to early spring quickly resulted in thick algae growth and matting that could not be prevented. Also, the labor required to pot and care for the plants in the pond and then transport them to the field proved time consuming and inefficient. For the field grow out, a suitable location in Landa Lake was determined

Figure 4. Planting a MUPPT with *Cabomba caroliniana.* Photo courtesy of Ed Oborny.

for use as an *in situ* nursery. The area was shallow (2 to 3 feet deep) with a solid gravel bottom, no vegetation or algae growth, good flow and full sunlight. In order to keep the pots in place, special Mobile Underwater Plant Propagation Trays (MUPPTs) were built to hold 48 quart-sized nursery pots each. These pots were filled with native black clay soil dredged from areas in Landa Lake. Pots were sprigged with about one dozen 8-inch-long apical stem fragments cut from an existing parent colony of *Ludwigia repens* or *Cabomba caroliniana*.Once planted, the MUPPTs were moved to the *in situ* nursery area. The plants were allowed to grow for a period of three to four weeks during the spring and summer months. This period of time allowed the plants to become rootbound and to add substantial aboveground growth. Twenty- six MUPPTs were utilized for the field grow out, yielding approximately 1,200 potted plants every three to four weeks during peak season. *Sagittaria platyphylla* did not grow well under *in situ* propagation and transplanting of ramets from the parent location to the restoration location proved more successful.

Hygrophila Removal and Native Plant Restoration

Before restoration planting began in some locations, areas of hygrophila were removed. Since the Comal River is an environmentally sensitive area, we were limited to hand removal. Garden rakes or hand pulling was used to remove most of the hygrophila top growth so that it

Figure 5. Underwater view of MUPPT planted with *Ludwigia repens*. Photo courtesy of Casey Williams.

would float into a drift net. This provided a chance for any organisms, most importantly fountain darters, present in the hygrophila to swim or fall out. Once a majority of the top growth was removed, the area was raked thoroughly to disturb and loosen the hygrophila roots from the sediment. Disturbed roots would easily float to the surface and drift into the net, where they were collected and removed. Once the area was thoroughly raked, any remaining hygrophila parts were removed by hand using snorkel or SCUBA techniques. In order for effective removal, the sediment was agitated to dislodge the roots, which was important for the elimination of hygrophila. In most cases this plant has been shown to have a shallow root system and can be thoroughly removed when growing in easily disturbed sediment. Between Landa Lake and the Old Channel, a total of approximately 1,600 m^2 of hygrophila was removed.

Once an area was cleared of hygrophila, it was ready for re-introduction of native species. Plants were placed approximately

Figure 6. Restoration plot before hygrophila removal. Photo courtesy of Casey Williams.

Figure 7. Underwater view of restoration plot after hygrophila removal and installation of *Ludwigia repens*. Photo courtesy of Casey Williams.

12 inches apart off center. Holes were excavated using hand tools. The potted plants were then removed from their propagation pots, placed into excavated holes and filled with the surrounding soil. Plant species were planted according to their habitat type. *Ludwigia repens* was planted in faster flowing water, while *Cabomba caroliniana* and *Sagittaria platyphylla* were planted in slow water. A plot letter designation (i.e. A, B, C) was given to each restoration plot area based on the date of planting.

In order to assess the spread of restoration plantings over time, we monitored a randomly selected area within certain restoration plots utilizing PVC quadrats that were one square meter and were segmented into approximately one square foot cells with string. The quadrats were placed in select restoration plots in both project areas and were monitored at least once per month using digital photographs as well as diagrammatic drawings until plant density reached 100% coverage. Additional relevant data for each quadrat (e.g., sediment type, presence of species other than those planted) were also recorded.

Aquatic gardening of the completed restoration plots was conducted throughout 2013 on an as-needed basis, which was approximately every 2 to 4 weeks. Aquatic gardening consisted of removal of any regrowth of hygrophila within the plot, removal of limbs and branches, which have the potential to cause a build-up of floating vegetation, and supplemental planting in areas where native plants were thinned or did not survive. We have found that aquatic gardening and general maintenance of the restored areas improves the chances of native plant establishment and overall success.

Results

Over the course of the 2013 growing season (April through December), we planted 10,531 plants in the Landa Lake and Old Channel Project Areas. Approximately, 8,200 of these plants were propagated in the field using MUPPTs, while the remaining were propagated in the nursery pond or were transplanted. Nearly 1,800 m^2 of area in Landa Lake and the Old Channel were planted with native aquatic plants.

Figure 8. Old Channel restoration plot 6 weeks after planting native plants in June of 2013. Photo courtesy of Casey Williams.

In many locations, especially the Old Channel, we saw dramatic growth and expansion of planted plants within 3 to 6 weeks. All three native plant species (*Ludwigia repens*, *Cabomba caroliniana*, and *Sagittaria platyphylla*) survived and

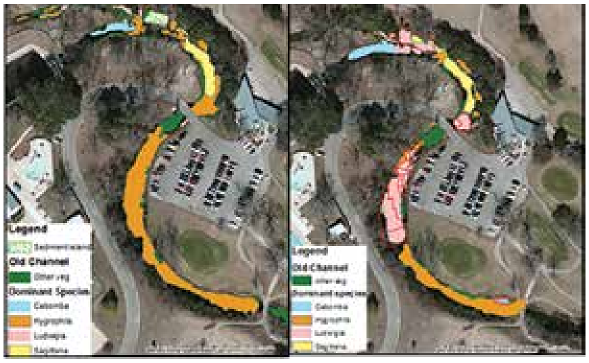

Figure 9. Dominant vegetation map of the Old Channel before restoration activities (left) and after restoration activities (right). Red boxes outline restoration plots.

are thriving in most of the planted sites. Differences in rate of plant growth and spread varied depending on species (for example, *Cabomba caroliniana* establishes more slowly than *Ludwigia repens*) and location. Towards the end of 2013 we remapped restored areas and saw dramatic increases of native plants, which were previously limited in those areas. Cover of *Ludwigia repens* increased by 660% and cover of *Cabomba caroliniana* and *Sagittaria platyphylla* increased by 35% and 13% respectively.

Hygrophila was successfully eliminated in most plots. However, in areas with gravel and rocky substrates where it was difficult to disturb the sediment, hygrophila has re-emerged, producing mixed stands. *Cabomba caroliniana* seems to be a strong competitor with hygrophila. In areas where *Cabomba caroliniana* was restored, the regrowth of hygrophila within *Cabomba caroliniana* patches was not observed. There were several advantages of propagating native plants *in situ*. Field plants were not as leggy and brittle as nursery raised plants, tended to have more branching with limited algae growth and did not desiccate from transportation. In the field nursery, bryophyte colonies readily attached to the plants, producing instant high quality darter habitat once planted.

We considered work conducted in 2013 to be a "proof of concept" exercise. In 2014, applied research experiments and studies will be conducted along with continued restoration to help guide long-term efforts. We believe thoroughness of initial removal and consistent gardening and maintenance is the ultimate key to success in this restoration process. Hygrophila will never be completely eliminated from the Comal system but this habitat restoration project has shown that it is possible to successfully remove and manage hygrophila within restoration plots while successfully reintroducing native aquatic plants into the system on a large scale.

Acknowledgments

We would like to thank the City of New Braunfels, Texas for their financial support, Dr. Robert Doyle from the Center for Reservoir and Aquatic Systems Research at Baylor University for his guidance on this project, and the biologists at the USFWS San Marcos Aquatic Resource Center for their input. Also, thank you to the various employees of BIO-WEST who were willingly and unwillingly recruited for labor.

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SPECIAL PLACES

Figure 1. The Corral with 4 floating cages. Photo courtesy of Helen Spivey.

by Helen Spivey

Special places that have been degraded always require special, often very expensive efforts to restore. However, Kings Bay in Crystal River (Citrus County, Florida) may have all the right components to accomplish a restoration just by using what nature has already given it – over 30 freshwater springs, the Gulf of Mexico 3 miles as the crow flies and Mother Nature's plant harvester, the endangered West Indian Manatee – plus an organization named KBAM (Kings Bay Adaptive Management) that came to the realization that Kings Bay can be economically restored by adapting what nature has given the system.

KBAM group members were individually thinking along the same lines when they met a few years ago. They began comparing notes and theories for facilitating on-site restoration of water clarity and control of planktonic and benthic filamentous algae such as *Lyngbya* by utilizing floating aquatic plants such as waterhyacinths and waterlettuce. Some KBAM folks had spent years studying the Bay waters; others had researched Kings Bay and its springs and the lessening of aquifer flows to them, and a few had lived in the area for a number of years and had witnessed the changes to the system. We agreed to revisit some earlier control methods and apply them to today's problems in an effort to reverse some of the damage and clear the waters of microscopic phytoplankton and filamentous algae like *Lyngbya* that add so much ugliness to the Kings Bay scene.

How did things get this way? Kings Bay experienced numerous manipulations over many years that resulted in significant ecological impairments, particularly increased nutrient concentrations. These excess nutrients led to the waters of Kings Bay becoming over-populated with waterhyacinths, waterlettuce and submerged vegetation like hydrilla that prospered on the abundant nutrients, yet the waters still remained crystal clear. How?

We knew those aquatic plants were absorbing the nutrients that were pouring into the Bay from springs via an aquifer that was overwhelmed. The aquifer gained nutrients from a burgeoning population with home landscaping (because who doesn't want a green, fertilized lawn?), agriculture, waters laden with waste from yards, roads and highways, shopping centers, and so on. Folks didn't realize that these nutrients – which they didn't know existed and couldn't even see – should never have been allowed to reach the Bay waters. The aquatic plants of Kings Bay used these nutrients to expand from a small original population to dense weedy overgrowth.

Waterhyacinths and waterlettuce are used around the world to clean up sewage treatment plant wastewaters and to clear emerald-green, cloudy eutrophic ponds to crystal clear in a matter of weeks. This made KBAM members think back to the days when those same aquatic plants kept Kings Bay crystal clear, although the populations of these plants were overabundant (and if manatees had ventured to Crystal River then in the numbers that come now, the overabundance of aquatic plants probably wouldn't have happened.) There is abundant scientific evidence that suggests these aquatic plants can keep clouded water columns clear in other places; this led to our decision to apply this phytoremediation technique here in Kings Bay, Crystal River, Citrus County, Florida USA!

The Howard T. Odum Florida Springs Institute, with experienced and dedicated water quality restoration experts, helped get us the permits required to legally possess waterhyacinths and waterlettuce in our hands. They also secured a permitted area for us to experiment with that is adjacent to the east side of Parker Island and across the lagoon from the US FWS Refuge headquarters. With the Florida Springs Institute leadership, along with donations of time, funds, pontoon boats and volunteer labor, our Hyacinth Corral was constructed and placed adjacent to Parker Island. The Corral is some 80 feet wide and 200 feet long and composed of PVC pipe booms to keep the floating plants in place. The official, scientific name of the project is the "Kings Bay Adaptive Management (KBAM) Phytoremediation Project". That's quite a mouthful, and still being used in scientific circles, but it's usually just called the "Water Hyacinth Project".

Quarterly data have been gathered and recorded by Springs Institute scientists and volunteers to establish a baseline that can demonstrate the effects of floating plants on water clarity. Our first goal was to show that despite a 30% increase in salinity in Kings Bay waters, the floating aquatic plants waterhyacinth and waterlettuce could survive and grow in those salty waters. Initial readings were taken, then the plants were gathered in tubs with secure lids, transported to the USFWS Refuge side yard, carried out to pontoon boats, and transported over the water to the nearby Corral, which took many trips and many volunteers.

Many plants survived the initial placement in Bay waters with 30% salinity, despite a storm with high winds and high tides later that week that stranded a number of plants on the shore. These plants died because they were stuck in the mud and were unable to float back into the Corral. We added more plants a month later, but this time we collected waterhyacinths and waterlettuce from a storm water project pond across the street from the Crystal River Post Office. It was a huge, mucky pond surrounded with a chain-link fence and home to a 3-foot-long alligator (some volunteers swore it was there) that fled in fright. The many tiny aquatic animals that hitchhiked on the roots of the waterhyacinths and waterlettuce would make any large bass very happy.

As before, the tubs were filled and driven to the Refuge, loaded onto boats and carried out to the Corral. Volunteers in kayaks placed the plants in the Corral, chased down any escapees and made sure all of the plants were contained in the Corral. It took many hours and concluded with our wet, muddy volunteers eating pizza on the picnic tables behind the Refuge.

This time it wasn't a storm with high tides and winds that shortened the time the plants were observed and data taken. Three happy manatees, described by a kayaker as a mother and a calf and a juvenile, discovered the Corral, and within a short few days wiped out our experiment. Luckily, the manatee's digestive system is long and complex and it has been scientifically proven that manatees utilize most of the nutrients in the foods they eat; therefore, almost none of the nutrients that are moved through their digestive tracts end up back into the waters.

Back to the drawing board… Floating Manatee Exclusion waterhyacinth cages, measuring 4' x 8', were designed. Supplies were again purchased using donations from the Florida Springs Institute, Save the Manatee Club and others; generous volunteers constructed them and on the next trip out, the cages were transported to the Corral. We later received reports of manatees bopping these cages up and down, but they were probably just scratching their backs on the plastic exclusion screening. KBAM and volunteers again collected floating plants from the storm water pen by the Post Office

Figure 2. Making sure the first two cages float. Photo courtesy of Helen Spivey.

and filled the cages, as well as the Corral. The cages worked as we had hoped, and when videos were sent of four commercial dive boats surrounding the Corral and the floating plants' leaves rapidly disappearing, leaving just a floating plant nub, we knew the manatees had come back.

We continued to collect data and to fill the Corral. The floating plants in the cages happily grew and flourished, while the plants in the Corral disappeared. At this point, we met some folks involved with mechanical harvesters at a Springs program. They volunteered to help KBAM and we quickly got an amazing lesson on how creative these folks can be.

They brought a conveyor and a tilt trailer to our next plant collection event; with volunteers in the pond feeding aquatic plants onto the conveyor, the trailer filled in no time. As we were filling the tubs at the boat launch site and putting the tubs into boats, one of the harvester guys said he had a small harvester and that if we dumped the plants from the tilt trailer into the water, he could scoop them up and transport them out to the Corral. Suddenly the Corral was filled – we never saw plants move so fast! Don't take my word for it — you can view the entire video of that day's operation by going to YouTube and searching for "Water Hyacinth Project — Crystal River, Florida" or by tying this link — www.youtube.com/watch?v=sqr_vPhIru8 – into your favorite browser.

Of course, the aquatic plants in the Corral disappeared so quickly by the manatee munching route that few were left the following week. We did one more waterhyacinth haul the following month (unfortunately without the harvester help) and one of our most avid volunteers loudly exclaimed at the exhausting finish, "I'm tired of doing this just to feed the manatees". We heard and listened; now, as we head into our final year, we will be attempting to completely exclude manatees from the floating aquatic plants now that we have proven that they see them as a salad bar and will happily eat them. To accomplish this we will have to increase the size of the floating cages to something like 8' x 8' instead of the current 4' x 8'. This will be much more costly, which has us actively soliciting donations to allow us to get it done.

With that goal accomplished, we can move forward and focus on our basic concept: if we can reduce the water turbidity (suspended planktonic algal cells) from a fraction of the water in the bay by shading the area under a Corral filled with waterhyacinth and waterlettuce, we can help dilute the cloudy algae over a wider area, particularly in a place where the water circulates with four tides every day. Once we've proven that this system works, we can expand it to all of Kings Bay, with pockets of floating aquatic plants consuming excessive nutrients while spreading over and shading out the microscopic phytoplankton that ruins the scenic views of Kings Bay.

Restoring Special Places may not need a bundle of cash to succeed; we just need to use the tools that Mother Nature has given us to allow these areas to flourish once again.

Meanwhile, newspaper stories report that some agencies are looking at adapting new methods too, and offering credits for complying. For example, farmers in parts in east Florida, where they have deep ditches filled with waters from their agricultural efforts, have been offered credits by the Florida Department of Environmental Protection to avoid the use of herbicides on the waterlettuce plants that are thriving on nutrient runoff and clogging those ditches. Instead, the agency wants farmers to mechanically harvest the aquatic plants and haul them to an area away from the waters, where they can be turned into a more useful compost.

Restoring Special Places may not need a bundle of cash to succeed; we just need to use the tools that Mother Nature has given us to allow these areas to flourish once again.

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A Note on Florida's Latest Waterprimrose, *Ludwigia hexapetala*

Figure 1. Emergent rosettes of *Ludwigia hexapetala* abound on Lake Harney, Florida. Photo courtesy of Kelli Gladding, FWC.

by Colette Jacono, PhD

As the days lengthen and temperatures rise, the plant life around our lakes and rivers is starting to stir. Before our green friends shift into full spring throttle, now is a good time to survey shorelines and offshore zones for a growth form that could later spell trouble – trouble by the name of *Ludwigia hexapetala*, Uruguayan waterprimrose. This vigorous emergent is the most recent aquatic plant to be tagged a Category I invasive species by the Florida Exotic Pest Plant Council (FLEPPC 2013). While its luxuriant leaves and bright flowers attract more attention in summer, its rosette form may be the best indicator of what is in store for the season ahead.

Floating rosettes are the early growth form, and in mild climates, the winter resting form, for a number of the most aquatic of species within the generic group of plants called *Ludwigia*. A floating rosette is a dense, circular arrangement of radiating leaves clustered near the tip of a floating stem. Very early rosettes lie on the water surface, yet they soon rise to become more emergent than floating. Their leaves are nearly orbicular or spoon shaped, with the tips rounded and the edges quickly tapering to the base. The leaf edges are smooth and their upper surfaces shiny due to protective cells that repel water. As the season progresses, the stems emerge higher and higher from the water and the stems and foliage change in character which, along with successive flowers and fruit, lend to the ability to delineate individual species within *Ludwigia*. So while simply the presence of floating rosettes does not mean an invasion of *L. hexapetala*, it is a signal that note should be made of its location and percent coverage so that monitoring can be continued until characters develop for species identification.

When spring turns to summer, the stems of *L. hexapetala* often extend upright to a meter above the water. At the same time they will sprawl across and under the surface to form floating mats, yet consider this – the proportion of emergent material is small compared to the mass of buoyant stems and roots that have been developing underwater, and out of sight. In this manner, not only does *L. hexapetala* blanket open water and native plants, but it occludes the complex structure of the littoral zone that offers the best fish habitat. Not too sparse, yet not too dense, undisturbed communities of Kissimmee grass, *Paspalidium geminatum,* provide excellent structure for supporting and distributing periphyton and epiphytic macroinvertebrates up through the water column, where they can be eaten by fish (in Florida: Schramm and Jirka, 1989; Welch 2009, and in Tanzania: Bailey et al., 1978; Bowker and Denny, 1978). Yet, with the encroachment of *L. hexapetala* into offshore zones of Kissimmee grass, as has happened in the Kissimmee Chain of Lakes (KCOL), fish habitat may also have been hit hard.

Through the height of the summer

Figure 2. Pollen bearing flowers of *Ludwigia hexapetala* on Lake Harney, Florida. Photo courtesy of Kelli Gladding, FWC.

Figure 3. Luxurious with flowers and nearly glabrous summer growth, *Ludwigia hexapetala* penetrates beds of pickerelweed and giant bulrush off the western shore of Lake Tohopekaliga, Florida. Photo courtesy of Keshav Setaram, SFWMD.

season, the emergent stems and leaves, now large and elliptic in shape, are succulent and glossy (nearly devoid of hairs) as flowering begins. Later in the season though, the stems become tough and reddish-brown, the leaves appear more lance-like or pointed in shape, and most importantly, plants put on hairs across the leaf and stem surfaces. From this point it is difficult to detail the subtle nuances between *L. hexapetala* and the closely related species, *L. grandiflora*, which has previously been recorded in Florida. Both bear clear yellow flowers that develop on short stalks directly off the stem. Distinction between the two becomes problematic when the measurements of their floral characters overlap or when leaf shape and degree of surface hairs vary because of the growth stage or changes in the aquatic environment. In the southeastern states, this is more often than not the case. Emphasis placed on character traits that are "more or less ..." holds little exactitude as intermediate types seem to be are more common than plants that are true to type in the southeast (Zardini et al, 1991; Nesom and Kartesz, 2000; author's data). Also, seed capsules, an important character for identification, typically are not produced. Use of an entire population, rather than individual specimens, will often be needed, as well as chromosome karyotyping to help distinguish identity, which can be difficult even for experts.

The new *Ludwigia* in the KCOL and in central lakes of the St. Johns River drainage may seem familiar to those who have fished or traveled the large lakes of North and South Carolina's coastal plain. Specimens from the Carolinas compare best with Florida material, indicating that region as the likely source. The question remains as to whether *L. hexapetala* is native to the southeastern US. Its earliest record dates back to 1844, from South Carolina, and 20 years later, to Georgia, but whether these records reflect the simple lack of early collection or a historical introduction is not clear. With certainty, *L. hexapetala* was introduced to France in the 1840s and later carried to Spain and Belgium. The ornamental trade carried *L. hexapetala,* as well as *L. grandiflora*, to the Pacific coast where regions of northern California, Oregon and Washington have been sorely affected.

AFLP analysis of Pacific coast populations demonstrates that the two species have remained genetically distinct in their rather newly introduced range, where clonal reproduction and spread predominates (Okada et al., 2009). Meanwhile, the prevailing theory in the southeastern US is that hybridization, or introgression between the two species, may explain the propensity of intermediate morphology displayed by so many specimens (Nesom and Kartesz, 2000; author's data). Such speculation is not out of line since natural hybrids between *L. grandiflora* and *L. hexapetala* have been demonstrated (by chromosome number) at three independent sites in Brazil, a central region of native range.

What's to come next with the *Ludwigia* saga in Florida? Herbicide warriors are already making good strides and even mechanical harvesting has had an impact. High water levels have been effective in temporarily reducing biomass and sequestering flowering in the KCOL, yet occurrences at new locations continue and the resulting need for field recognition and identification remains. Flowering specimens, pressed and labeled, may be sent for identification to the Herbarium at the Florida Museum of Natural History, 379 Dickinson Hall, PO Box 110575, Gainesville, FL 32611-0575.

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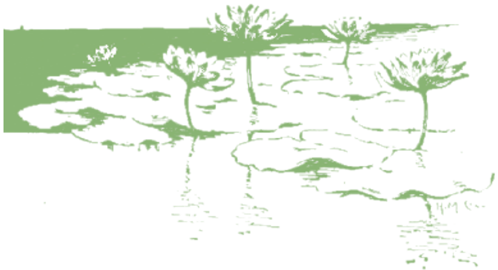


Aquavine

By Dr. Brett Hartis – North Carolina State University

Stop Aquatic Hitchhikers

Find out how to protect your waters and stop aquatic hitchhikers by visiting http://www.protectyourwaters.net/. Here you'll find a wealth of information, including the National Invasive Species Outreach and Education 2013 Annual Report. You can also learn about the damage caused by aquatic hitchhikers, simple preventative procedures and how to become informed and take action.

Valent and Nufarm Join Forces

Valent Corporation signed a formal agreement with Nufarm Americas giving them exclusive distributorship of its products. All of Valent's Professional Products, including its aquatics products Clipper and Tradewind, will now be sold by Nufarm. In the move, Bo Burns was named the National Aquatic Accounts Manager. "I'm excited about the new arrangement", said Bo, "because it gives me more products to help our customers solve aquatic problems". He said the change should also enhance customer service and support. Bo said, "Other than the company name and logo change, my duties really haven't changed". The new arrangement started February 16th, 2014. Bo's new email address is Bo.burns@us.nufarm.com.

The Aquatic Weed Control Short Course is Coming!

Make sure to mark your calendar for the UF/IFAS Aquatic Weed Control Short Course to be held at the Coral Springs Marriott on May 5 through 8. This year's course has been approved for 22 Continuing Education Units from the Florida Department of Agriculture and Consumer Services. As always, training will also be offered for folks wishing to become certified applicators and testing will take place the afternoon of Thursday May 8. For more information, please visit the Short Course website at www.conference.ifas.ufl.edu/aw/.

New Aquatic Ecosystems Restoration Mini-Course available

The UF/IFAS Aquatic Ecosystems Restoration Mini-Course is a half-day course designed to serve in-the-field practitioners and businesses that perform restoration projects or are interested in entering the market. The Mini-Course is ideal for local, state, and federal employees, scientists, aquatic plant nurseries and growers, consultants, entrepreneurs and anyone interested in aquatic and wetland habitat restoration and enhancement. The Mini-Course will be held at the Coral Springs Marriott on the afternoon of May 8. Topics will include nursery and greenhouse production of aquatic plants for restoration projects, on-site restoration and damage repair of submersed areas, criteria, design and management of large and small aquatic restoration and enhancement projects, plant selection for constructed wetlands and an overview of several current restoration projects in Florida's aquatic habitats. For more information, please visit the Mini-Course website at http://www.conference.ifas.ufl.edu/AER/.

New Blog from AERF: The Aquatics Update

The Aquatic Ecosystem Restoration Foundation would like to announce the creation of its new blog, The Aquatics Update, at http://aerfupdate.blogspot.com/. The blog will be updated several times a week and will feature the latest in aquatic plant management, science, and innovation as well as the goings-on within the AERF and its membership. Leave a comment on your favorite postings by clicking on "comment" below the post. The Aquatics Update will also feature careers in aquatic plant management in the "AERF Spotlight". Know someone you would like to feature? Send AERF their info today at facebook@aquatics.org. You can also follow AERF on twitter @AerfAquatics or like us on Facebook. Please stop by, share, like, and comment on the AERF pages and introduce others to the science of aquatic plant management!

APMS Blog, Twitter, and LinkedIn

See what's happening in the rest of the country – check out the APMS Blog! The APMS blog is available at apms-blog.blogspot.com/ or at www.apms.org under the Social Networks tab. Read national news about aquatic plant management or take in reviews of some great JAPM articles. The blog is also featuring outstanding research and careers in Aquatic Plant Management, so nominate someone today! No login or password is needed and there are no ads. The blog is updated weekly. To receive an e-mail when new material is added (optional), complete the FOLLOW BY E-MAIL field. No new content – no new e-mail. If you'd like to contribute news items or have outstanding research/careers highlighted in the blog, send an email with the link to apmsblog@gmail.com. APMS is also on Twitter! Looking for your daily dose of aquatic plant management news? Then follow APMS @APMSociety! Find an interesting news article in aquatic plant management, then tweet @APMSociety! Another excellent social network resource is the APMS LinkedIn group. Go to the APMS website at www.apms.org and click on the Social Network tab to select LinkedIn. It's a great site for professional networking, good answers to aquatic plant management questions, and fun conversations. Interested in a job in aquatic plant management? You can find many job postings on the LinkedIn site as well. Check it out!

FAPMS and SCAPMS are on Facebook

The FAPMS and SCAPMS have their own Facebook Page! Just log in to Facebook and "Like" their page to get updates on the society, news, stories and pictures. You can even submit article ideas for upcoming issues of Aquatics to FAPMS!

Calendar of Events 2014

March 30-April 2
WAPMS 33rd Annual Meeting
Reno, NV
www.wapms.org

April 23-25
Florida Vegetation Management Association (FVMA) 2014 Annual Conference & Trade Show
Daytona Beach, FL
www.myfvma.org/conference

April 28-May 1
Florida Exotic Pest Plant Council/ Florida Chapter of The Wildlife Society Joint Annual Meeting
Safety Harbor, FL
www.fltws.org

May 5-8
UF/IFAS Aquatic Weed Control Short Course
Coral Springs, FL
www.conference.ifas.ufl.edu/aw/

May 8
UF/IFAS Aquatic Ecosystem Restoration Mini-Course
Coral Springs, FL
www.conference.ifas.ufl.edu/aer/

May 18-23
Joint Aquatic Sciences Meeting
Portland, OR
aslo.org/meetings/portland2014/

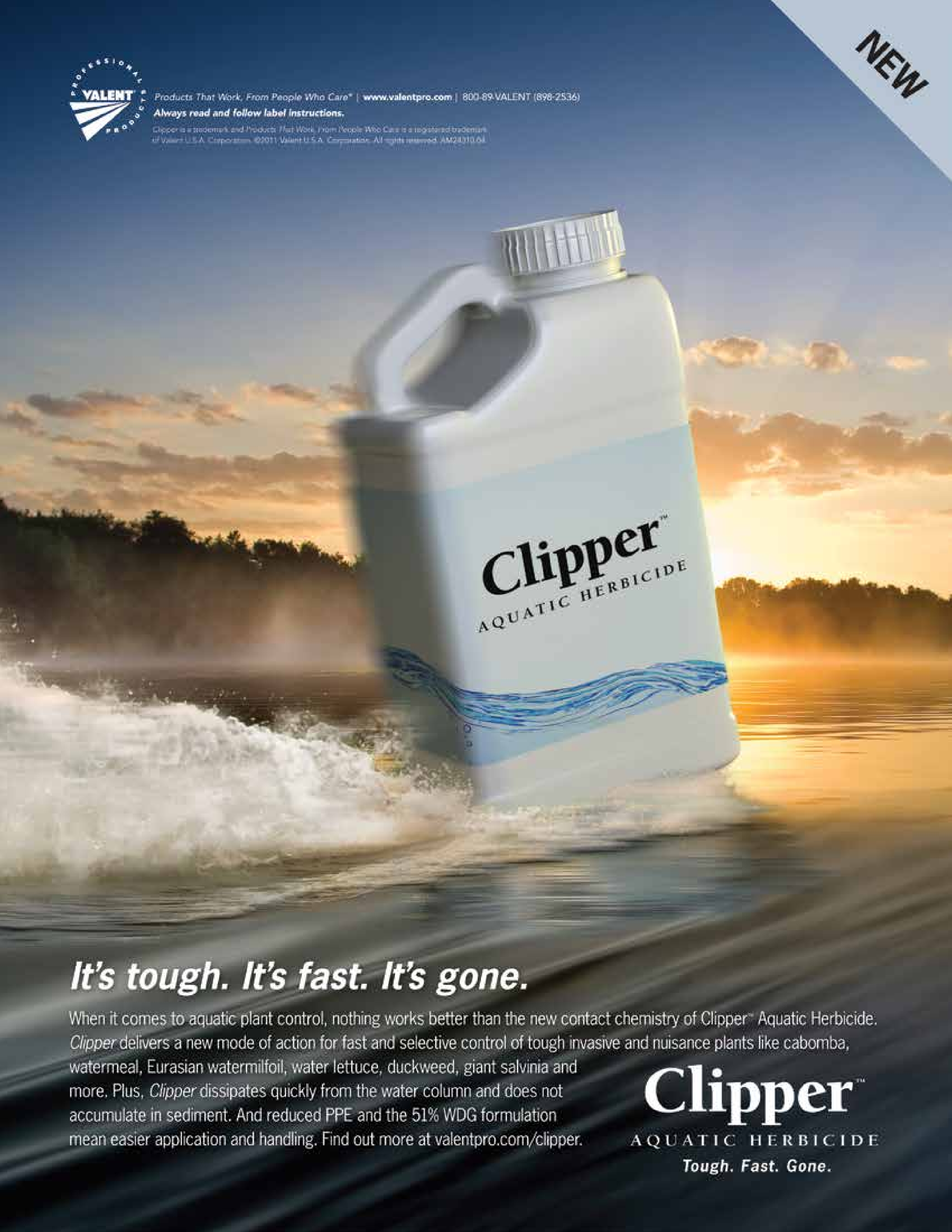
July 13-16
APMS Annual Conference – joint meeting with MidSouth APMS
Savannah, GA
www.apms.org

October 13-16
2014 FAPMS Annual Conference
Daytona Beach, FL
www.fapms.org/meeting/meet14/2014meeting.html

October 15-17
41st Annual Natural Areas Conference
Dayton, OH
www.naturalareas.org/conference/2014-natural-areas-conference

APMS 2014 Annual Meeting – July 13th-16th

The 54th Annual Meeting of the Aquatic Plant Management Society will be held July 13-16, 2014 at the Hilton Savannah DeSoto in Savannah, Georgia. Standing 15 stories in Savannah's Historic District, overlooking Madison Square, historic mansions, and oaks draped in Spanish moss, the Hilton Savannah DeSoto is a timeless sparkle on the Savannah skyline. The downtown hotel is steps from Savannah's treasured landmarks, museums, theaters, parks, and incredible dining and shopping. Come join us for an always wonderful conference and make your reservations now! For more information, go to www.apms.org and click "annual meeting" on the home page.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When it comes to aquatic plant control, nothing works better than the new contact chemistry of Clipper™ Aquatic Herbicide. Clipper delivers a new mode of action for fast and selective control of tough invasive and nuisance plants like cabomba, watermeal, Eurasian watermilfoil, water lettuce, duckweed, giant salvinia and more. Plus, Clipper dissipates quickly from the water column and does not accumulate in sediment. And reduced PPE and the 51% WDG formulation mean easier application and handling. Find out more at valentpro.com/clipper.
Clipper™
AQUATIC HERBICIDE
Tough. Fast. Gone.

Paul C. Myers Applicator Dependent Scholarship

Paul C. Myers was the President of FAPMS in 1984 and a long-time editor of Aquatics Magazine. He founded Applied Aquatic Management, Inc. in 1981 and was widely known as a leader and innovator in Aquatic Plant Management. The Paul C. Myers Applicator Dependent Scholarship provides up to $1500 to deserving dependents of FAPMS members. The scholarship is based on:

1. The applicant's parent or guardian having been a FAPMS member in good standing for at least three consecutive years.
2. Financial need. This will be determined based on need and the expected family contribution amount indicated in the processing results of a Student Aid Report (OMB No. 1845-0008). This report is available by completing a Free Application for Federal Student Aid Federal Form (https://fafsa.ed.gov/).
3. The applicant being a high school senior entering college the next academic year, attending junior college, or being a college undergraduate.
4. An evaluation of the quality of the application and required essay by the scholarship selection committee composed of three FAPMS members and four FAPMS Scholarship and Research Foundation members.
5. Submission of a completed Application Form (www.fapms.org/Myers_Application.pdf) by the closing date of June 1, 2014.