S.A.L.T.
SHARKS AQUACULTURE LIFE TRAINING

Freshwater Plant Aquaculture
2018 Summer SALT Schedule:
Introduction to Florida Aquaculture Commodities

All sessions are scheduled on Mondays from 10 – 11:30 am and will be held at the FWC Marine Lab conference room.

**June 18**th — Recirculating Aquaculture Systems
Meet with Brian Catanzaro, Pentair Aquatic Ecosystems, Apopka, FL
Website: [https://pentairaes.com](https://pentairaes.com)

**June 25**th — Molluscan Shellfish Aquaculture
Meet with Leslie Sturmer, UF/IFAS Shellfish Extension, Cedar Key, FL
Website: [http://shellfish.ifas.ufl.edu](http://shellfish.ifas.ufl.edu)
Tour Clamtastics Shellfish Hatchery with Anthony Hinkle, Cedar Key, FL

**July 2**nd — No session due to holiday week

**July 9**th — Aquatic Plant Culture
Meet with Brandon McLane, Florida Aquatic Nurseries, Davie, FL
Website: [http://www.floridaaquatic.com/](http://www.floridaaquatic.com/)

**July 16**th — Shellfish aquaculture regulations and leasing process
Meet with DACS Division of Aquaculture representative, Tallahassee, FL
Website: [https://www.freshfromflorida.com/Divisions-Offices/Aquaculture](https://www.freshfromflorida.com/Divisions-Offices/Aquaculture)

**July 23**rd — Food Fish Culture
Meet with Geno Evans, Evans Fish Farm, Pierson, FL
Website: [http://evansfishfarm.com/](http://evansfishfarm.com/)

**July 30**th — Ornamental Fish Culture
Meet with Eric Cassiano, UF/IFAS Tropical Aquaculture Lab, Ruskin, FL
Website: [http://tal.ifas.ufl.edu](http://tal.ifas.ufl.edu)

**August 6**th — Alligator and Reptile Culture
Meet with Allen Register, Gatorama, Palmdale, FL
Website: [http://gatorama.com/](http://gatorama.com/)

Any questions about these sessions, please contact Leslie Sturmer,
[Lnst@ufl.edu](mailto:Lnst@ufl.edu) (email) or 352-543-5057 (office phone) or 352-493-8340 (cell).
Plant Aquaculture: Freshwater Plants
M. Dennis Hanisak
OUTLINE

- Major Uses of Freshwater Plants
- Current Cultivation of Freshwater Plants in Florida
- Future Applications in Florida
CULTIVATION OF FRESHWATER PLANTS IN FLORIDA

This industry began in Florida in the 1930’s

Current aquatic plant production mainly for
- aquariums
- food
- water gardening
- wetland restoration

Industry is primarily in central and southern parts of the state
CULTIVATION OF FRESHWATER PLANTS IN FLORIDA

Annual sales of aquatic plants = $17.6 million by 19 growers in 2005

Aquatic plants are ~23.4% of Florida Aquaculture sales

Plants for water gardens, aquariums, wetlands restoration, and food markets such as watercress were included.

### AQUACULTURE - Value of Sales - Florida, 2005

<table>
<thead>
<tr>
<th>Item</th>
<th>Operations With Sales</th>
<th>Net Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ornamental Fish</td>
<td>133</td>
<td>$33,232,000</td>
</tr>
<tr>
<td>Aquatic Plants</td>
<td>19</td>
<td>$17,560,000</td>
</tr>
<tr>
<td>Clams 1/ &amp; Oysters</td>
<td>153</td>
<td>10,694,000</td>
</tr>
<tr>
<td>Alligators</td>
<td>14</td>
<td>4,070,000</td>
</tr>
<tr>
<td>Other Food Fish 2/</td>
<td>19</td>
<td>1,731,000</td>
</tr>
<tr>
<td>Catfish</td>
<td>23</td>
<td>1,434,000</td>
</tr>
<tr>
<td>Tilapia</td>
<td>18</td>
<td>477,000</td>
</tr>
<tr>
<td>Live Rock</td>
<td>6</td>
<td>341,000</td>
</tr>
<tr>
<td>All Sportfish</td>
<td>8</td>
<td>191,000</td>
</tr>
<tr>
<td>All Other Aquaculture 3/</td>
<td>-</td>
<td>5,245,000</td>
</tr>
</tbody>
</table>

1/ Includes clam seed
3/ Includes baitfish, crustaceans, and other aquatics.

National Agricultural Statistics Service 2006
CULTIVATION OF FRESHWATER PLANTS IN FLORIDA

National Agricultural Statistics Service 2006
**CULTIVATION OF FRESHWATER PLANTS IN FLORIDA**

<table>
<thead>
<tr>
<th>Item</th>
<th>Value of Sales</th>
<th>Operations with Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012 (dollars)</td>
<td>2005 (dollars)</td>
</tr>
<tr>
<td>Ornamental Fish</td>
<td>27,269,000</td>
<td>33,232,000</td>
</tr>
<tr>
<td>Mollusks</td>
<td>11,889,000</td>
<td>10,694,000</td>
</tr>
<tr>
<td>Alligators</td>
<td>7,995,000</td>
<td>4,070,000</td>
</tr>
<tr>
<td>Aquatic Plants</td>
<td>5,327,000</td>
<td>8,360,000</td>
</tr>
<tr>
<td>Other Food Fish</td>
<td>2,978,000</td>
<td>1,731,000</td>
</tr>
<tr>
<td>Tilapia</td>
<td>1,227,000</td>
<td>477,000</td>
</tr>
<tr>
<td>Catfish</td>
<td>390,000</td>
<td>1,434,000</td>
</tr>
<tr>
<td>Live Rock</td>
<td>373,000</td>
<td>341,000</td>
</tr>
<tr>
<td>All Other Aquaculture</td>
<td>11,303,000</td>
<td>5,436,000</td>
</tr>
<tr>
<td>Total</td>
<td>68,751,000</td>
<td>65,775,000</td>
</tr>
</tbody>
</table>

(NA) Not Available

National Agricultural Statistics Service 2013

Food markets such as watercress were not included in reported sales values.
PERMITTING

Regulated by 2 Florida Department of Agriculture and Consumer Services (FDACS) divisions

- Division of Aquaculture
- Division of Plant Industry (DPI)

Aquaculture Certificate of Registration & Certificate of Nursery Registration
PROHIBITIONS

Class I plants are not permitted for possession, collection, transportation, cultivation, and importation, except as provided in Rule 5B-64.011, F.A.C.

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Common Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternanthera philoxeroides</td>
<td>Alligatorweed, green lead plant</td>
</tr>
<tr>
<td>Casuarina spp.</td>
<td>Australian Pine</td>
</tr>
<tr>
<td>Crassula helmsii</td>
<td>Swamp stone crop</td>
</tr>
<tr>
<td>Eichhornia spp.</td>
<td>Waterhyacinth</td>
</tr>
<tr>
<td>Hydrilla verticillata</td>
<td>Hydrilla, Florida elodea, stargrass, oxygen grass</td>
</tr>
<tr>
<td>Ipomoea aquatica</td>
<td>Water spinach</td>
</tr>
<tr>
<td>Ipomoea fistulosa</td>
<td></td>
</tr>
<tr>
<td>Lagarosiphon spp.</td>
<td>African elodea</td>
</tr>
<tr>
<td>Limnocharis flava</td>
<td>Sawah flowing rush</td>
</tr>
<tr>
<td>Lythrum salicaria</td>
<td>Purple loosestrife</td>
</tr>
<tr>
<td>Melaleuca quinquenervia</td>
<td>Melaleuca</td>
</tr>
<tr>
<td>Mimosa pigra</td>
<td>Giant sensitive plant, cat’s claw</td>
</tr>
<tr>
<td>Monochoria hastata</td>
<td></td>
</tr>
<tr>
<td>Monochoria vaginalis</td>
<td></td>
</tr>
<tr>
<td>Myriophyllum spicatum</td>
<td>Eurasian watermilfoil</td>
</tr>
<tr>
<td>Nechamandra alternifolia</td>
<td></td>
</tr>
<tr>
<td>Oryza rufipogon</td>
<td>Wild Red rice</td>
</tr>
<tr>
<td>Pontederia rotundifolia</td>
<td>Tropical pickerelweed</td>
</tr>
<tr>
<td>Salvinia spp., (excluding S. minima)</td>
<td></td>
</tr>
<tr>
<td>Schinus terebinthifolius</td>
<td>Brazilian-pepper</td>
</tr>
<tr>
<td>Sparganium erectum</td>
<td>Exotic bur-reed</td>
</tr>
<tr>
<td>Stratiotes aloides</td>
<td>Water-aloe, soldier plant</td>
</tr>
<tr>
<td>Trapa spp.</td>
<td>Water chestnut</td>
</tr>
<tr>
<td>Vossia cuspidata</td>
<td>Hippo grass</td>
</tr>
</tbody>
</table>
PEPPER BUSTING AT LUKENS...
FULL THROTTLE
March 6, 2018

Often going unnoticed, Cedar Key Pepper Busters are about and active. Sometimes so very active that one can’t even find them in the woods. They are deep in the scrub and pinelands, with saws, canisters, and doggedness, dashing the number of pepper trees around Cedar Key. Often one can spot their cars, their trailers, and their tracks, but so deep in the woods are they, one cannot hear nor see them.

The team includes leader Roger McDaniels and Tom Simpson, Doug Maple, Jay Bushnell, Dave Trehane, Ed DeHaan, Refuge Wildlife Fire Management Officer Vic Doig, and Lower Suwannee and Cedar Keys National Wildlife Manager Andrew Gude.

The Brazilian pepper, a Category I Invasive plant, infects both aquatic and terrestrial habitats. Introduced into Florida in the mid-1800s from Argentina, Paraguay, and Brazil, the plant was initially used as a decorative bush as it is lush and, full, and has beautiful red berries. The plant, though, in the same family as ivy and sumac, can be irritating to the skin, with some individuals highly allergic to it. As an invasive, it adapts easily and is steadily creeping its way north along the state of Florida.

Pictured here are: Roger McDaniels distributing equipment and Tom Simpson, Andrew Gude, only four of the seven cars operated by the busters.
PROHIBITIONS

Class II plants may be cultured in an aquatic plant nursery and exported out-of-state only with DPI approval.

<table>
<thead>
<tr>
<th>SCIENTIFIC NAMES</th>
<th>COMMON NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hygrophila polysperma</td>
<td>Hygro</td>
</tr>
<tr>
<td>Limnophila sessilflora</td>
<td>Ambulia</td>
</tr>
<tr>
<td>Pistia stratiotes</td>
<td>Waterlettuce</td>
</tr>
</tbody>
</table>
USES OF FRESHWATER PLANTS: FOOD

Eleocharis dulcis
(Water Chestnut)

“Aquacrops”

Nasturtium officinale
(Watercress)
Much of the U.S. winter supply of watercress is grown in Central Florida.

Watercress is a good source of vitamins A and C, niacin, thiamine, riboflavin, and iron. Zesty flavor often added to foods.

Nasturtium officinale (Watercress)
USES OF FRESHWATER PLANTS: FODDER

*Eichhornia crassipes* (Water Hyacinth)

*Lemna valdiviana* (Small Duckweed)

*Eichhornia crassipes* (Water Hyacinth)
WATER HYACINTH

Introduced into the U.S. in 1884 at an exposition in New Orleans

Within 70 years of reaching Florida, the plant covered 126,000 acres of waterways

Blocks waterways and limits boat traffic, recreation, flood control and wildlife use
PERMIT REQUIREMENTS FOR CULTIVATION: WATER HYACINTH

It is illegal to collect, transport, possess or cultivate this plant (Rule 62C-52.011 FAC)

Federal noxious weed & FDACS Class I prohibited aquatic plant

Steps in obtaining a special state permit:

1. Register as a nursery with the Division of Plant Industry.

2. Apply for a collection permit using the information provided on the Arthropod, Plant and Plant Pest Movement Permit page.

3. Request and submit the Compliance Agreement for Water Hyacinth to the Division of Plant Industry. This compliance agreement is available from your local plant inspector.

Note: If you plan to export water hyacinth out of Florida, you must obtain a federal permit for interstate movement using the Application for Permit to Move Live Plant Pests or Noxious Weeds.
USES OF FRESHWATER PLANTS:
AQUARIUM PLANTS/ORNAMENTALS

*Nympaea odorata*
(Yellow Water Lilly)

*Egeria densa*
(Common Water weed)
1. 1st day flower – female
   - Remove stamen so it can’t self pollinate
2. 2nd or 3rd day flower – male
   1. Pluck anthers for pollen
3. Drop anthers inside stigma of 1st day flower
4. Close flower and cover with cheesecloth to fertilize
5. Seed forms
6. Pod develops

https://www.victoria-adventure.org/waterlilies/growing_from_seed.html
CULTIVATION OF FRESHWATER PLANTS
IN FLORIDA: AQUARIUM PLANTS

Cabomba caroliniana
(Fanwort)

Elodea canadensis (Elodea)
CULTIVATION OF FRESHWATER PLANTS IN FLORIDA: WETLAND RESTORATION

- Using native plants to restore ecosystem services provided by plants
- Includes a wide range of aquatic plants depending on habitat(s) in a project
EMERGING USES OF FRESHWATER PLANTS

Bioremediation
- Nutrients (Wastewater Treatment, Aquaculture)
- CO2 Scrubbers (Climate Change)
- Biofuel (Bioconversion to Ethanol, Methane, Methanol)
- Heavy Metals

Aquaponics
- Cultivation of plants and aquatic animals in a recirculating environment
- Sea Vegetables
AQUAPONICS

Aquaponic Swiss chard

Aquaponic red lettuce
S.A.L.T.
SHARKS AQUACULTURE LIFE TRAINING

Handouts
S.A.L.T.
SHARKS AQUACULTURE LIFE TRAINING

Break Time
Tour: Florida Aquatic Nurseries, Davie, FL
Host: Brandon McLane
Website: http://www.floridaaquatic.com/