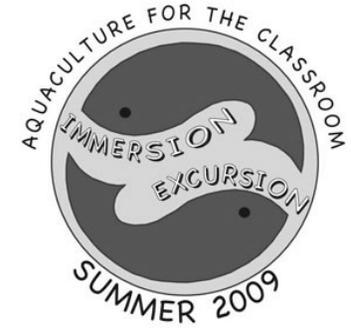


Aquaculture Immersion Excursion 2009 Teacher Workshop



Plant Aquaculture: Freshwater Plants M. Dennis Hanisak **HARBOR BRANCH**

FLORIDA ATLANTIC UNIVERSITY

Ocean Science for a Better World™

Outline

1. Major Uses of Freshwater Plants
2. Current Cultivation of Freshwater Plants in Florida
3. Future Applications in Florida

Uses of Freshwater Plants Food



Eleocharis dulcis
(Water Chestnut)



Nasturtium officinale
(Watercress)



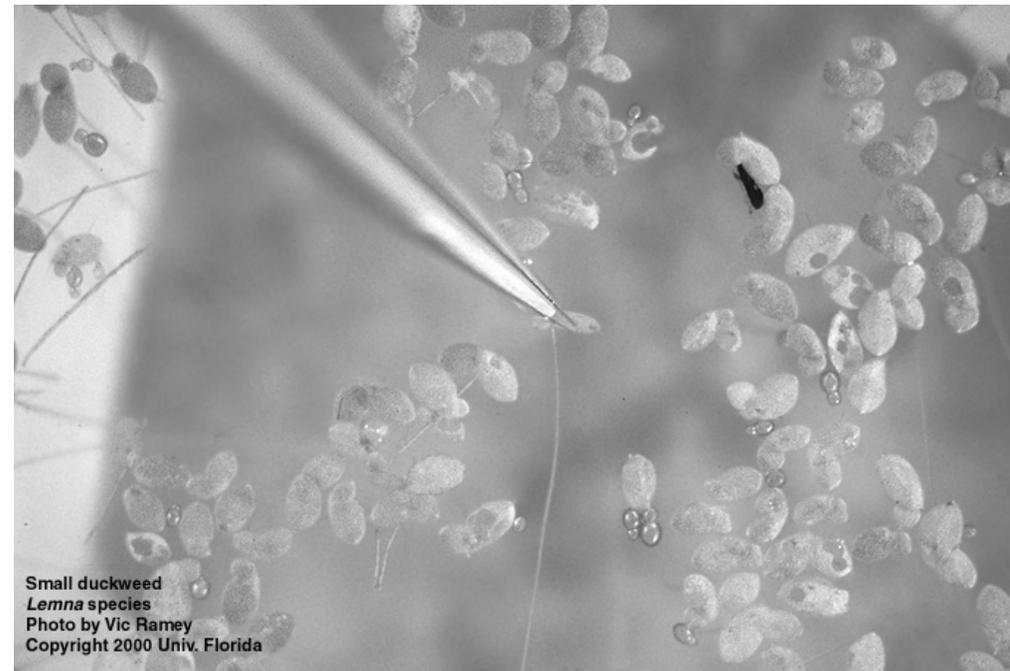
"Aquacrops"

Uses of Freshwater Plants Fodder



Water hyacinth
Eichhornia crassipes
Photo by Jeff Schardt
Copyright 2001 Florida D.E.P.

Eichhornia crassipes
(Water Hyacinth)



Small duckweed
Lemna species
Photo by Vic Ramey
Copyright 2000 Univ. Florida

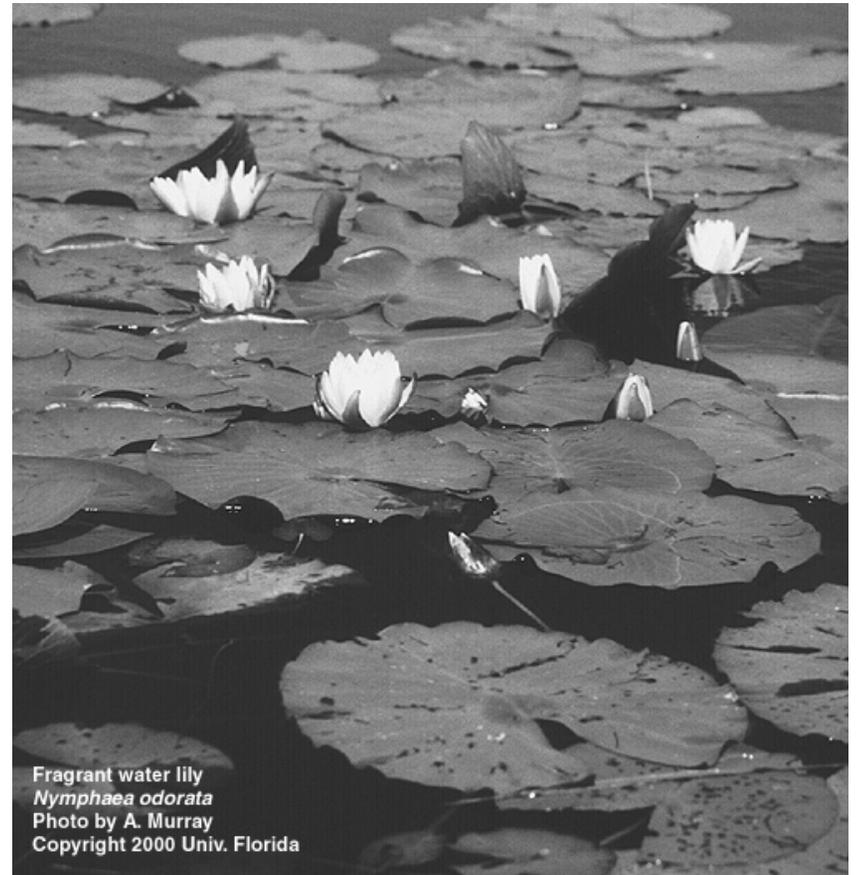
Lemna valdiviana
(Small Duckweed)

Uses of Freshwater Plants

Aquarium Plants/Ornamentals



Egeria densa
(Common Water weed)



Nymphaea odorata
(Fragrant Water Lilly)

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

AQUACULTURE - Value of Sales - Florida, 2005

- Annual sales of aquatic plants = \$17.6 million by 20 growers in 2005
- Aquatic plants are ~23.4% of Florida Aquaculture sales

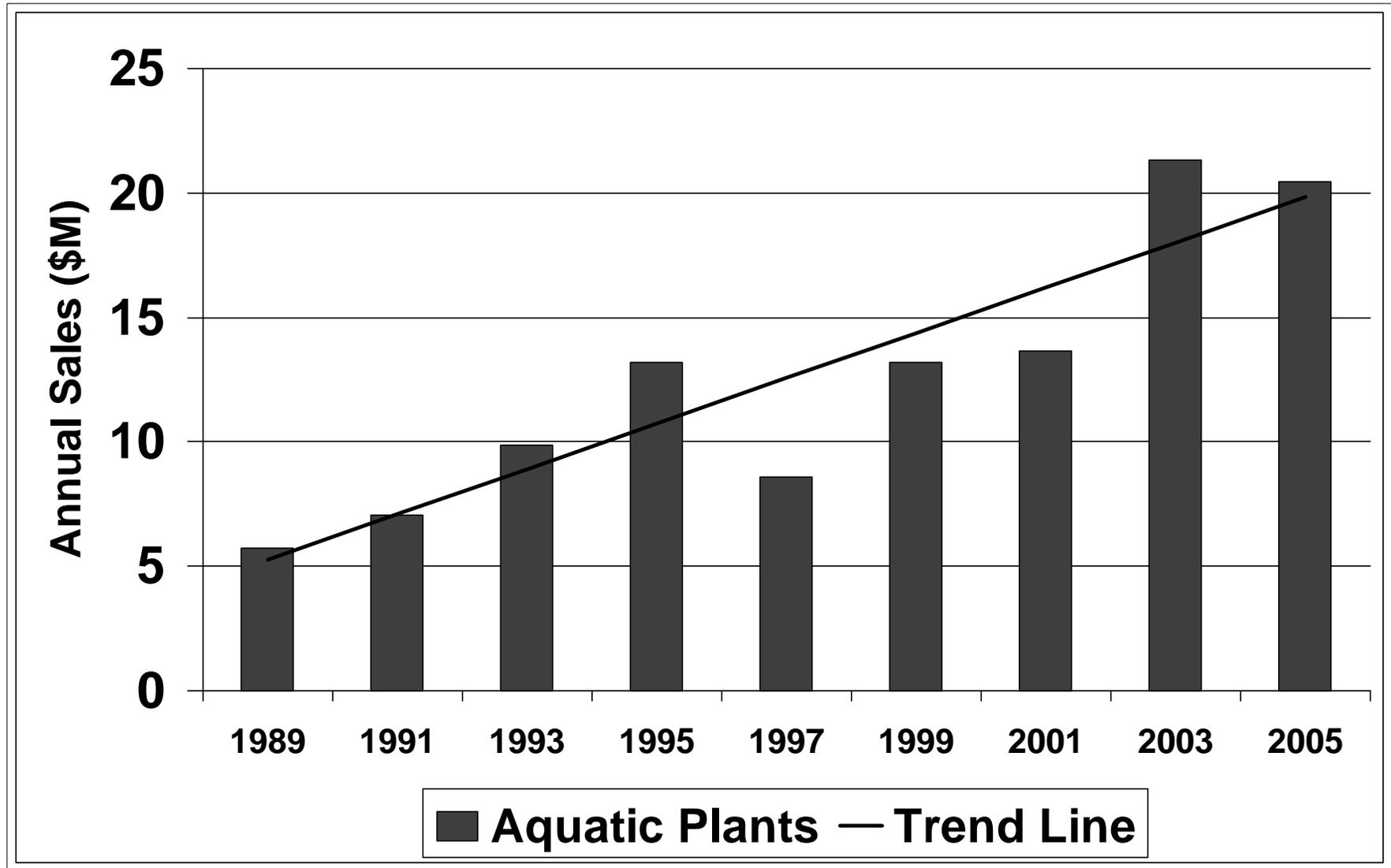
Item	Operations With Sales	Net Sales
Ornamental Fish	133	\$33,232,000
Aquatic Plants	19	17,560,000
Clams ^{1/} & Oysters	153	10,694,000
Alligators	14	4,070,000
Other Food Fish ^{2/}	19	1,731,000
Catfish	23	1,434,000
Tilapia	18	477,000
Live Rock	6	341,000
All Sportfish	8	191,000
All Other Aquaculture ^{3/}	-	5,245,000

^{1/} Includes clam seed

^{2/} Hybrid Striped Bass, Largemouth Bass, Carp, and Sturgeon.

^{3/} Includes baitfish, crustaceans, and other aquatics.

Cultivation of Freshwater Plants in Florida



Data Source: National Agricultural Statistics Service 2006

Cultivation of Freshwater Plants in Florida

Aquarium Plants

- Colorful, slow-growing submersed plants add habitat and oxygen for fish and enhance the beauty of home aquariums
- Sold bunched, bare-rooted, or potted, depending on their growth characteristics and value
- Many (?200) species are being cultivated, in tanks and ponds
- Along with ornamental freshwater fish for use in aquaria, the oldest segment of Florida Aquaculture

Cultivation of Freshwater Plants in Florida

Aquarium Plants



***Elodea canadensis* (Elodea)**



***Cabomba caroliniana*
(Fanwort)**

Cultivation of Freshwater Plants in Florida

Food

- 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)



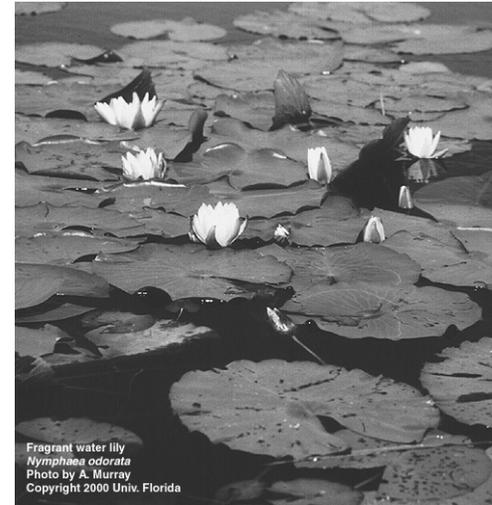
Stephens 1994

Cultivation of Freshwater Plants in Florida Wetland Restoration

- Significant human impacts on aquatic plant habitats throughout Florida
- Laws requiring restoration of damaged wetlands have created a mitigation plant industry
- Mitigation requirement has stimulated growth of cultivation of aquatic plants for restoration
- Eventually the collection of wild wetland plants will be eliminated

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



Cultivation of Freshwater Plants in Florida

Water Gardening

- Their cultivation stimulated by water gardening hobby
- Should focus on native species, avoid exotics



Nymphaea odorata
(Fragrant Water Lilly)



Pontederia cordata
(Pickerelweed)



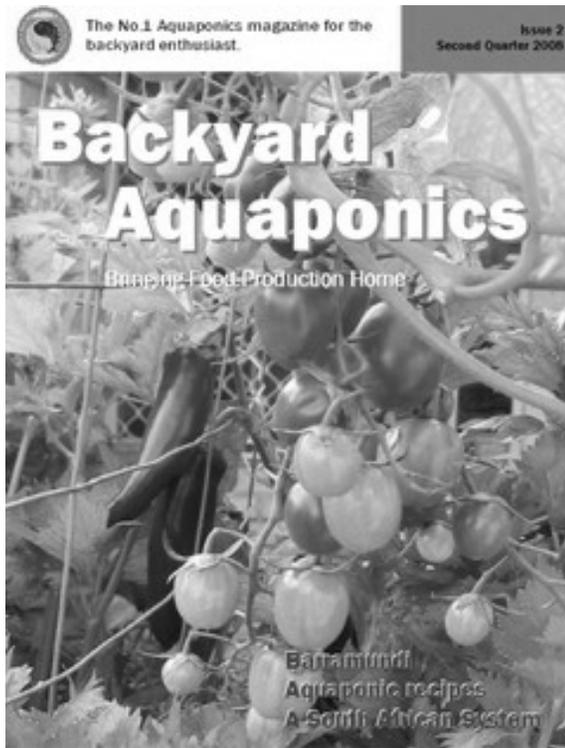
Nelumbo lutea
(American lotus)



Eichhornia crassipes
(Water Hyacinth)

Emerging Uses of Freshwater Plants

- **Bioremediation**
 - **Nutrients (Wastewater Treatment, Aquaculture)**
 - **CO₂ Scrubbers (Climate Change)**
 - **Heavy Metals**
- **Biofuel (Bioconversion to Ethanol, Methane, Methanol)**
- **Aquaponics - cultivation of plants and aquatic animals in a recirculating environment**



Aquaponics



References/Additional Reading

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