Aquatic Plant Management Methods in the United States

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The Beginning

- Waterhyacinth introduced into the St. Johns River, FL in the 1890’s
- 1899 Congress passed the Rivers and Harbors Act
Rivers and Harbors Act 1899

- Authorized the US Corp of Engineers to crush, divert or remove waterhyacinth from access areas of the St. Johns River

- May 1899, Florida Legislature prohibited planting of waterhyacinth in “waters of the State of Florida”
Rivers and Harbors Act

- 1902 Amendment: allow for the "extermination" of water hyacinth by mechanical and chemical or any other means
State of Florida Regulations

- In 1931: Chapter 1465 to allow the use of "any poisonous substance, chemical or spray in killing water hyacinths, providing no such poisonous substance, chemical or spray shall be used which might injure fish life or human or other animal life"
Societies and Organizations

- Strictly devoted to aquatic plant management
- To provide scientific information and expertise to understand and solve aquatic plant issues

1961, Originally the Hyacinth Control Society

Established in 1996
Mechanical Control

If you can think it........it has probably been built

Waterhyacinth control was almost exclusively done by mechanical means through the 1940’s

Some still used today
Elevator Boat, 1914, Original Drawing, US Army Corps of Engineers, Jacksonville District
Destruction Boat, 1945, Original Drawing, US Army Corps of Engineers, Jacksonville District
Destroyer boat chopping water hyacinth in Withlacoochee River, 1940

Courtesy:
U.S. Army Corps of Engineers
Jacksonville Archives
Crusher Boats (Kennys)

- Used until the 1940’s
- Harvested plants
- Used 40,000 psi to crush plants
Saw Boats

- Used in the 1940’s
- Saw blades shredded water hyacinth
- Operated closer to shore than crusher boats
Hi-ballers

- Harvested
- Mulched
- Shot out with high pressure cannon
Harvesters

- Cut vegetation
- Convey vegetation out of water
- Dispose of vegetation on shore
Conveyor # 15 removing water hyacinth from Caloosahatchee River - 1939
Courtesy U.S. Army Corps of Engineers
Jacksonville Archives.
Largest Harvester
1970’s Hydrilla Rake
Truck holds 3 tons of waterhyacinth
Mechanical Weed Cutters

- Cut plants below water surface
- Cut vegetation not collected from cutter like harvesters
Rotovators

- Utilizes rototiller blades to dig into bottom sediments
- Removes entire plant
- Used for Eurasian watermilfoil
Dredges and Pumps

“Underwater vacuum”
Dragline and Trackhoes

- Large shovel machines
- Uses cables and draglines
- Cast out into weed mat and retrieved
Removing water hyacinth from Lake Okeechobee - 1937

Courtesy U.S. Army Corps of Engineers

Jacksonville Archives
Weed Rollers

- Fairly new
- Used around boat docks
- Heavy rollers 30 ft. long
- Move in a 270° arc
- Compresses plants and soils
Shredders “Cookie Cutter”

- Two counter rotating blades
- Shred plants and islands
- Can dismantle small trees
Chaining

- Large chains hooked to heavy machines
- Dragged through plant mat
Weed Barge

- Boat pushes plant mats out of the way
Hand Harvesting

- Self explanatory
- Not nearly as interesting or fun as the other methods
Chemical Control

By 1948, the US Army Corps of Engineers began using 2,4-D to control waterhyacinth.

Sodium arsenite was used in Florida until 1905.
Aquatic Herbicides

- 2,4-D
- Carfentrazone-ethyl
- Copper sulfate
- Copper chelate
- Diquat
- Endothall
- Fluridone
- Glyphosate
- Imazamox
- Imazapyr
- Penoxsulam
- Sodium carbonate per oxyhydrate
- Triclopyr
Airboat granular herbicide applicator
Large scale granular herbicide application
Herbicide applied to water
What have we learned over the years?

Concentration and exposure time relationships

Triclopyr v EWM (K. Getsinger, USAERDC)
Precision Herbicide Application
Biological Control
Alligatorweed

- 1960: USDA laboratory established in Argentina for development of alligatorweed biocontrol agents
- The alligatorweed flea beetle (*Agasicles hygrophila*) was released in Florida during the mid-1960s.
Grass Carp

- Various hybrids and chromosome morphs of the Asian grass carp (*Ctenopharyngodon idella*) were first used to control hydrilla in Florida by researchers beginning in 1970.
- Widely used today.
Waterhyacinth

- 1972: The mottled water hyacinth weevil was the first insect approved as an agent for release on waterhyacinth
Waterhyacinth
Water Lettuce

- Water lettuce leaf weevil (*Neohydronomous affinis*) was imported from South America and released in Florida in 1987
Hydrilla

- Hydrilla tuber weevil (*Bagous affinis*) was first released in 1987 for hydrilla control
Hydrilla
Physical Control
Water Level Manipulations

- Drawdown
Light Reduction

- Dyes applied to water
Dredging

- Removal of bottom sediments
Benthic Barrier

- Sand-Gravel
- Burlap
- Plastic
- Rubber
- Fiberglass screens
- Nylon
- Others
Nutrient Inactivation

- Alum removes phosphorus not nitrogen
- Rooted plants limited by nitrogen in sediments
- Not widely used
Goal of Aquatic Plant Management

- Remove non-indigenous plants and restore a diverse community of desirable native plant species

- Unlike in agro-ecosystems where weed management seeks to remove “many” and leave “one”……..

- In aquatic plant management we seek to remove “one” and leave “many”

- The best method to control aquatic plants is prevention
Acknowledgements

Florida Fish and Wildlife Conservation Commission
http://myfwc.com/wildlifehabitats/InvasivePlants_HistoryofManagement.htm

University of Florida Center for Aquatic and Invasive Plants
http://aquat1.ifas.ufl.edu/guide/sup2herb.html
http://aquat1.ifas.ufl.edu/guide/intrguid.htm