Grass Carp for Biocontrol
Background

➢ **Common Names**: grass carp, white amur, waan ue

➢ **Scientific Name**: Ctenopharyngodon idella
   Greek for “comb-like throat teeth”

➢ Native to large river systems in Asia and the eastern portion of the former U.S.S.R.

➢ Grass carp can now be found in 93 countries; 47 states (except: Alaska, Montana, and Rhode Island)
A Brief History

➢ First imported to the U.S. in 1963 to control aquatic vegetation in aquaculture ponds

➢ First imported into Florida in 1970 by USDA

➢ Reproducing population was discovered in 1971 in the Mississippi drainage system

➢ Sterile carp were first produced in the U.S. in 1979 as inter-specific crosses between female grass carp and male bighead carp *Aristichthys nobilis* (Malone 1982)
Commonly Reach 30 lbs or More

Record weight is 99 lbs; length is 4.9 feet
Typically Live 10-15 Years, Unless...

Largemouth bass have the gap size to consume large prey. Bass size versus carp size:

<table>
<thead>
<tr>
<th>Bass Size in Inches</th>
<th>Grass Carp Size in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>18</td>
<td>11.5</td>
</tr>
<tr>
<td>24</td>
<td>16</td>
</tr>
</tbody>
</table>

You would need to stock 7.8” or larger grass carp to avoid predation by 12.8” or smaller largemouth bass!
Triploid Production

Eggs are subjected to hydrostatic pressure resulting in three sets of chromosomes – rendering the fish sterile.
Grass Carp Feeding Preferences
Frequently Eaten

- Brazilian Elodea (*Egeria densa*)
- Duckweed
- Elodea
- Hydrilla
- Musk Grass (*Chara*)
- Pondweed
- Slender Spikerush
- Southern Naiad
- Widgeon Grass

By USGS
Grass Carp Feeding Preferences
Sometimes Eaten

- Algae, Filamentous
- Baby Tears
- Bacopa
- Banana Lily
- Bladderwort
- Bog Moss
- Bulrush
- Cattail
- Coontail
- Fanwort
- Hygrophila

- Knotgrass
- Limnophila
- Maidencane
- Marine Naiad
- *Nitella* spp. (Stonewort)
- Rush Fuirena
- Soft Rush
- Southern Water grass
- Spikerush
- Water Meal
- Water Shield
Grass Carp Feeding Preferences
Rarely Eaten

- Algae, Planktonic
- Alligator Weed
- American Lotus
- Azolla (Mosquito Fern)
- Burhead Sedge
- Common Arrowhead
- Duck Potato
- Eelgrass
- Frog’s Bit
- Para Grass
- Parrot’s Feather
- Pennywort (Dollarweed)
- Pickerelweed
- Red Ludwigia
- Salvinia spp.
- Sedges
- Smartweed
- Spatterdock
- Torpedo grass
- Water Paspalum
- Water Hyacinth
- Water Lettuce
- Water Lily
- Wild Taro
<table>
<thead>
<tr>
<th>State</th>
<th>Status</th>
<th>Genetic Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>Legal - no permits required</td>
<td>Diploid or triploid</td>
</tr>
<tr>
<td>Arkansas</td>
<td>Legal - no permits required</td>
<td>Diploid or triploid</td>
</tr>
<tr>
<td>Florida</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Georgia</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Kentucky</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Louisiana</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Mississippi</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>North Carolina</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>Legal - no permits required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>Legal - dealers permitted</td>
<td>Diploid or triploid</td>
</tr>
<tr>
<td>South Carolina</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Tennessee</td>
<td>Legal - dealers permitted</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Texas</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Virginia</td>
<td>Legal - permit required</td>
<td>Triploid only</td>
</tr>
<tr>
<td>Virgin Islands</td>
<td>Legal - not available</td>
<td>Diploid or triploid</td>
</tr>
</tbody>
</table>
Online Permitting

To Apply for a New Permit - Click Here
To Amend an Existing Permit - Click Here

To search and reprint existing permits enter your last name and another selection field and press the 'Press Here to Search' button.

Last Name: [input field]  Permit #: [input field]  Date of Birth (mm/dd/yyyy): [input field]  County: [input field]

-OR-

Press Here to Search  Close this Screen

Click on the Permit # column to see your permit. Use the browser’s Print command to reprint your permit.

Contact Rhonda Howell, FWC at (352)357-2951 to reprint carp permits of more than 50 fish or for any additional questions.

Display Vendor List

Myfwc.com then Search for “carp”
Online Permitting

Permits may be obtained automatically online if **ALL** the following criteria are met:

- Single Owner
- No inlets or outlets exist where fish can escape
- Applying for 50 fish or less
- Size of the pond(s) is less than 5 acres
- No mitigation or water quality requirements by the Water Management Districts, county, city, etc.

If any criteria are not met the permit must be finalized by Rhonda Howell and/or a regional biologist.
Grass Carp Regions
# Permits Issued Statewide

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Total Permits Issued</th>
<th>New Permits</th>
<th>Amendments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012/2013</td>
<td>1,204</td>
<td>564</td>
<td>640</td>
</tr>
<tr>
<td>2013/2014</td>
<td>1,124</td>
<td>588</td>
<td>536</td>
</tr>
<tr>
<td>2014/2015</td>
<td>1,056</td>
<td>532</td>
<td>524</td>
</tr>
<tr>
<td>2015/2016</td>
<td>986</td>
<td>542</td>
<td>444</td>
</tr>
<tr>
<td>2016/2017</td>
<td>998</td>
<td>523</td>
<td>475</td>
</tr>
</tbody>
</table>
Fish Barriers

➢ Sturdy construction
➢ Gaps must be 1.5” or less
➢ Bars can be vertical or horizontal
➢ Overflow should allow for major rain events to alleviate flooding
Barrier Issues

- Poor Construction
- Need to be Maintained
- Vandalism
- Poor Design
Barrier Issues

➢ Water direction/pressure

➢ Barrier Sizes
Stocking Rates

Stocking rates are difficult to predict due to:

➢ Differences in vegetation coverage and densities (e.g., total plant acreage compared to total water body acreage)

➢ Weather events (e.g., droughts, hurricanes)

➢ Plant species present
For 100% coverage of small ponds (<5 acres), using only grass carp, the recommended stocking rates are:

- 10 fish/acre for Hydrilla and Elodea
- 15 fish/acre for Chara, Southern Naiad, Pondweed
- 20 fish/acre for Roadgrass, Duckweed & Bladderwort
- 30 fish/acre for Filamentous Algae

Stocking Rates (cont.)
Feeding Rates

➢ Depends on age/size of carp, ambient temperature, dissolved oxygen, size, location, & plant species found

➢ For a herbivore, carp have a short gut which allows them to process and eliminate plant material quickly

➢ In U.S. feeding begins ~52°F, is optimal between 68-86°F and declines above 86°F

➢ In Florida, cease feeding below ~61°F

➢ Tend to be less selective at higher temperatures

➢ Selective grazing may result in expansion of aggressive unpalatable plant species
## Feeding Rates

**Study 1 - Hydrilla** (Sanders et al. 1991)

<table>
<thead>
<tr>
<th>Carp Weight (lbs)</th>
<th>% Eaten/Body Wt/Day (lbs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;6.6</td>
<td>~100 (6.6 lbs)</td>
</tr>
<tr>
<td>6.6-13.2 (Avg. 9.9)</td>
<td>75 (7.4 lbs)</td>
</tr>
<tr>
<td>&gt;13.2</td>
<td>26-28 (3.6 lbs)</td>
</tr>
</tbody>
</table>

**Study 2 - Brazilian Elodea** (Osborne and Sassic 1981)

<table>
<thead>
<tr>
<th>Carp Weight (lbs)</th>
<th>% Eaten/Body Wt/Day (lbs/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>76 (4.2 lbs)</td>
</tr>
<tr>
<td>14.3</td>
<td>25 (3.6 lbs)</td>
</tr>
<tr>
<td>31.1</td>
<td>0.5 (1.6 lbs)</td>
</tr>
</tbody>
</table>

In Central FL grass carp can reach 31 lbs by year three
Salinity Tolerance

➢ Tolerant of low salinity levels and may move from one river to another through brackish-water estuaries

➢ 2+ year old carp survived 10.5ppt salinity for ~24 days and 17.5ppt for 5 hours. (Atlantic Ocean 33-37ppt; Gulf of Mexico 28-32ppt; Mississippi River delta 5-10ppt)

➢ Studies showed that fingerlings reduce feeding at 9 ppt and stop feeding altogether at 12 ppt. Adults fed on smooth cordgrass (*Spartina alterniflora*) in Galveston Bay TX at 9ppt, but lost weight.

Information from the USGS Nonindigenous Aquatic Species website.
Movement - Telemetry Studies

➢ High rate of movement (first 7-10 days lake and 6-12 weeks canals) after stocking emphasizes the importance of installing and maintaining barriers

➢ Reluctant to move into or spend much time in shallow (<3.3’ deep) narrow canals

➢ Preference for less confined areas (wide deep canals, canal intersections, etc.)

➢ River study showed carp moved average of 9 miles from release point; 98% of carp moved 12.5 miles or less, but hydrilla was present throughout river

70% of sightings by hydrilla stands
Public Lakes

- A stocking request is sent to FWC
- The Waterbody Specific Team:
  - Invasive Plant Management Regional Biologist
  - Waterfowl Biologist
  - Freshwater Fisheries Biologist
- The Waterbody Specific Team reviews the request and cost effectiveness related to other control options, inspects the waterbody (if necessary), and determines if the stocking of TGC will be a benefit to the waterbody.
Quiz Time - Question #1

Which barrier is the best?
Quiz Time - Question #2

What’s wrong with this barrier?
What's wrong with this barrier?

- Barrier material conducive to clogging
- Gaps larger than 1.5”
Just Some Reminders!

➢ Be very conservative in large water bodies using acres of vegetation instead of surface water acres

➢ There is **always** the possibility of the lake becoming **totally cleared** of aquatic vegetation (shift from aquatic macrophytes to phytoplankton based ecosystem)

➢ Use adaptive management (grass carp + herbicide)

➢ Plan on re-stocking every 3-5 years

➢ Be patient!!!

➢ Questions call Rhonda Howell at 352-357-2951


