

## Biological and Cultural Control of Aquatic Weeds in Ponds

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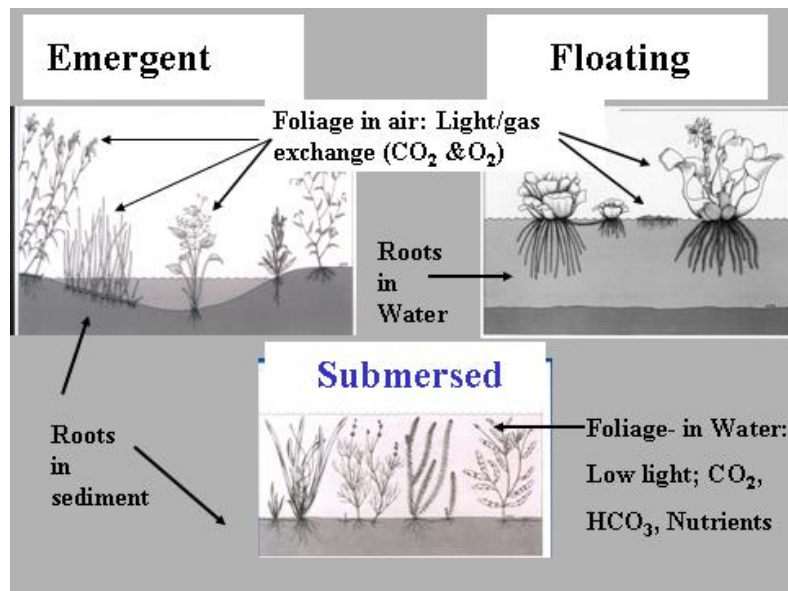
USDA-ARS Exotic and Invasive Weed Research, Davis, CA

### Topics: Actions to Control Aquatic Weeds

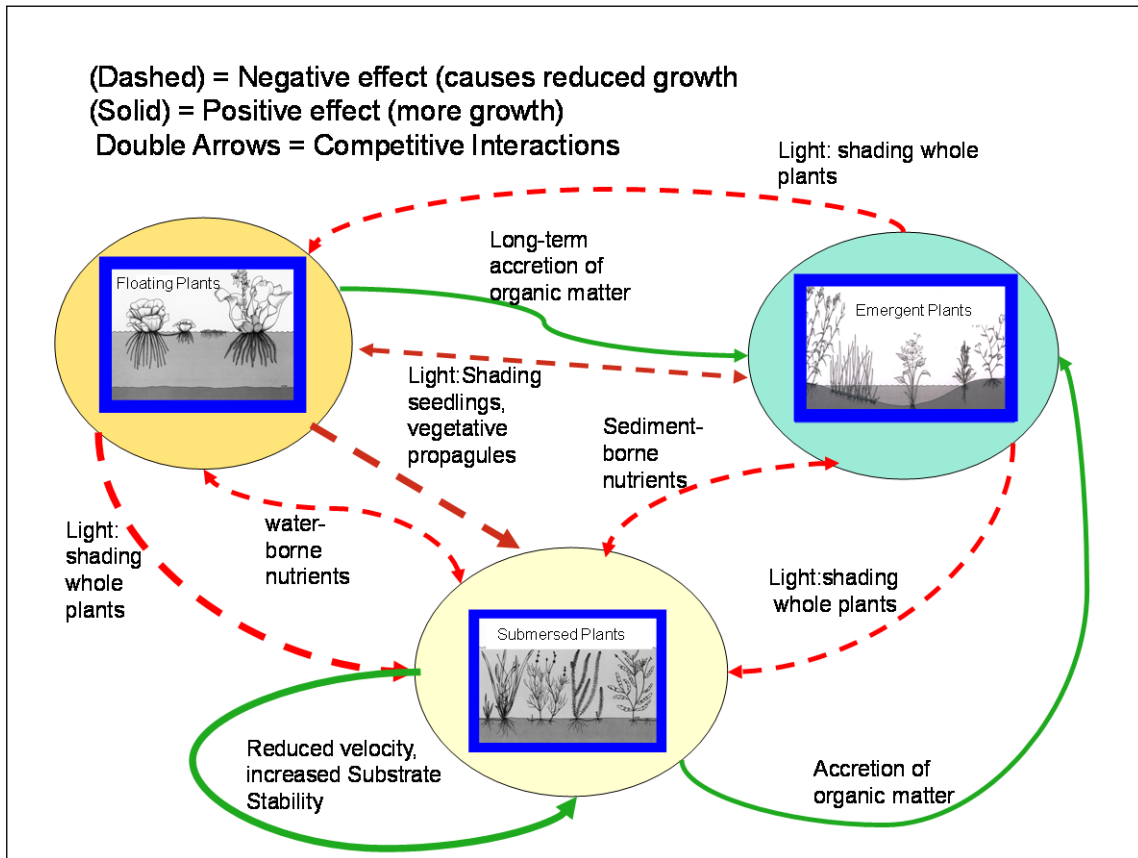
- **Define the Goal(s)** – What is the use of the pond?
- **Prevention**
- **Remediation** - Already infested? Now what?
- **Maintenance** - Protecting management investment

Pond Uses	Constraints/Regulations/Liabilities
Irrigation	Water demands, Crops, Herbicide residues, Drift, Timing
Frost Control	Herbicide residues, Sprinkler functions, Timing
Swimming	Exposure/toxicity, “Re-entry”, Perceptions (phobias)
Fishing/Aquaculture	Fish toxicity, Residues, Harvest, Water quality (e.g. DO)
Aesthetics	Perceptions (phobias), Waterfowl
Fire fighting	Access, Clogged pumps
Flood detention	Holding capacity, Drainage
Inlet/outlets	Riparian rights (neighbors)

### Types of Aquatic Vegetation: Emergent, Floating, and Submersed Plants



## Interactions between Submersed, Floating, and Emergent Aquatic Vegetation Affecting Their Establishment and Growth



### Preventative Actions to Minimize Aquatic Vegetation in Ponds

1. Design ponds with steep slopes
2. Design ponds with margin-berms
3. Design so stormwater drains AWAY from pond, not into it
4. Design with circulation (solar?)
5. Design with water-level management
6. Choose **native plants**- in pots preferably
7. Provide mixed plant canopy
8. Monitor for *introduced* Aquatic Invasive Species!!

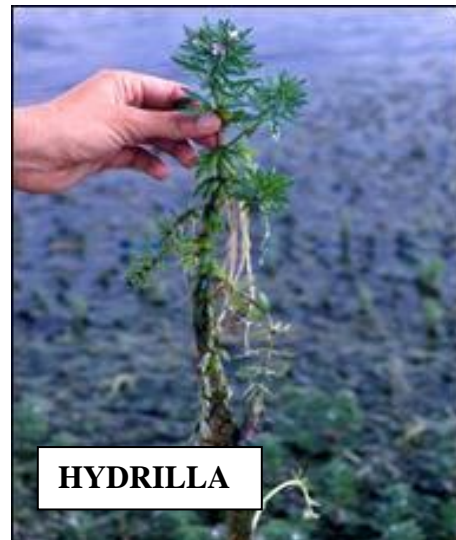
## “Residential Ponds” Require Constant Management

### Movement of Aquatic Plants in the Horticultural Trade

- In S. New England 76% of non-native aquatic plants are escapes from cultivation. (Les and Mehrhoff, 1999)
- In New Zealand 75% of aquatic invasive plants are of horticultural origin. (Champion and Clayton, 2000)
- The 1st monoecious hydrilla in CA was traced to a contaminated lily shipment.



Recently published Water Garden “Guides” and “How-To” Books often recommend Aquatic Plants that are prone to becoming invasive.



#### *Trapa natans*

“Water Chestnut”

An INVASIVE Aquatic Species

#### *Lagarosiphon major*








“African Curly Leaved Water Weed”

An INVASIVE Aquatic Species

### Remedial Actions for Weedy Ponds

1. Identify unwanted plants
2. Options for biological control?
3. Stop or minimize nutrient loading
4. Feasibility to rake/harvest/use bottom barriers?
5. Feasibility for suction removal?
6. Feasibility to install circulatory system?
7. Drain and restart!!

### Biological control Agents for Pond Management

Type	Target Weeds	Biological Control Agent	
<b>Fish</b>	Eat anything green	Sterile (triploid 3n) Grass carp	
		Tilapia	
<b>Insects</b>	Waterhyacinth	<i>Neochetina bruchi</i> (weevil) Weevil feeding causes leaf damage	 
	Hydrilla	<i>Hydrellia pakistanae</i> (fly)	
	Eurasian watermilfoil	<i>Bagous affinis</i> (tuber weevil)	
		 <i>Eurhychiopsis lecontei</i> (weevil)	
	Giant waterfern (Salvinia) 	<i>Acentria ephemerella</i> (moth)	
		<i>Cyrtobagous salviniae</i> (weevil)	
Water lettuce	<i>Neohydronomous affinis</i> (weevil)		
<b>Pathogens</b>	Eurasian Watermilfoil & Hydrilla	<i>Mycoleptodiscus terrestris</i> ("MT")	
<b>Bacterial "Products"</b>	?	Beware of Labels	
<b>Natural products</b>		Barley straw	

### **Triploid Grass Carp**

- ④ Must have permit from CA Dept of Fish and Game (cannot use carp in areas that are considered flood zones)
- ④ Must certify that the fish are indeed triploid (3n)
- ④ *Generalist herbivore – they eat anything green*

### **Average Plant Density / (# fish per acre)**

Low Plant Density / 5 fish per acre

Medium Plant Density / 10 fish per acre

High Plant Density / 15 fish per acre



### **Sustained Maintenance Actions**

1. Monitor fish populations: types, and abundance.
2. Discourage excessive waterfowl use.
3. Establish a routine maintenance schedule.
4. Have a plan to contain/remove new Aquatic Invasive Species.
5. Develop a contingency water source.
6. Maintain pump/drain/fill options.