

Biological and Cultural Control of Aquatic Weeds in Ponds

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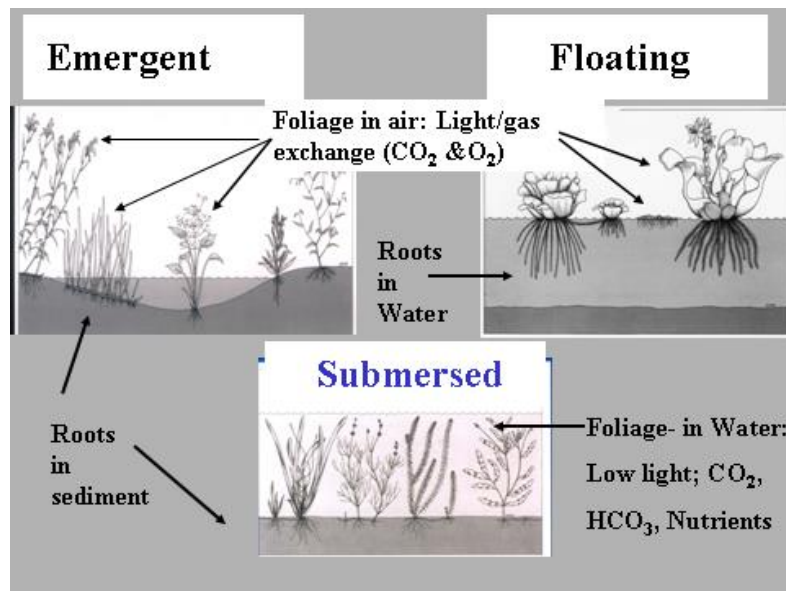
USDA-ARS Exotic and Invasive Weed Research, Davis, CA

Topics: Actions to Control Aquatic Weeds

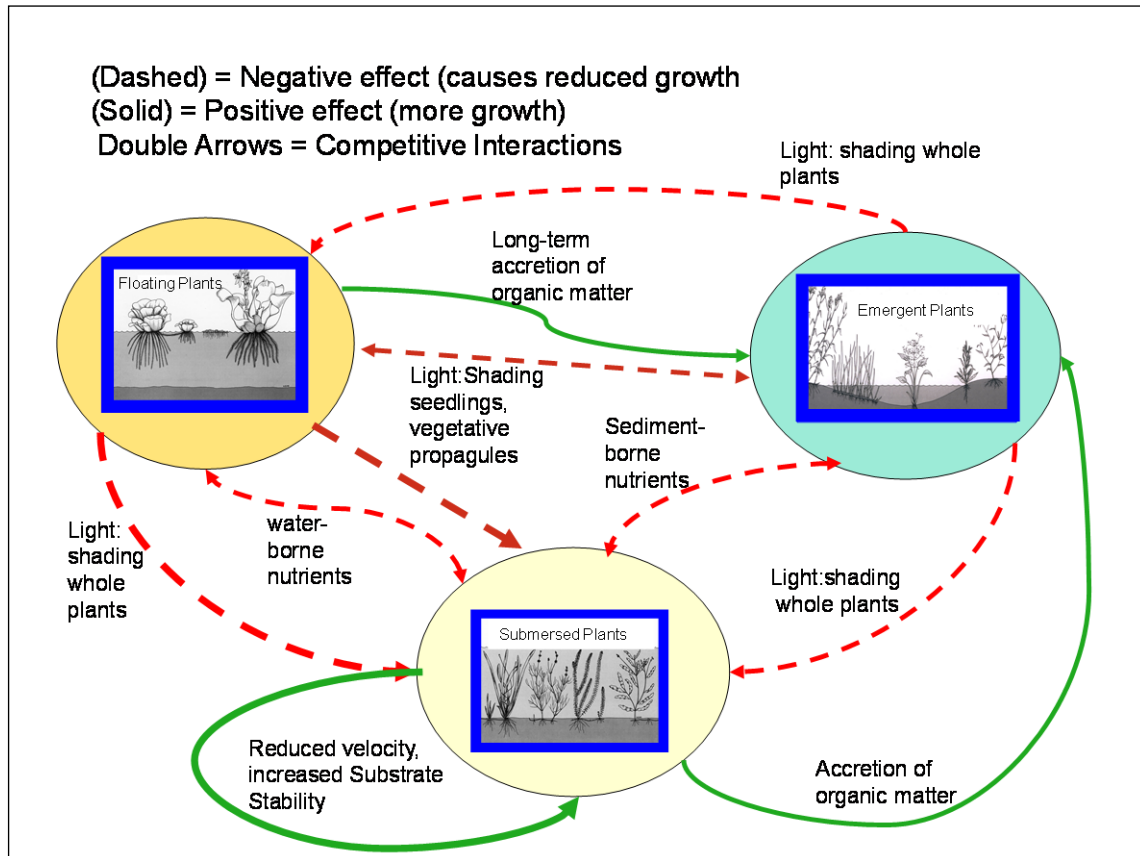
- **Define the Goal(s)** – What is the use of the pond?
- **Prevention**
- **Remediation** - Already infested? Now what?
- **Maintenance** - Protecting management investment

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!!

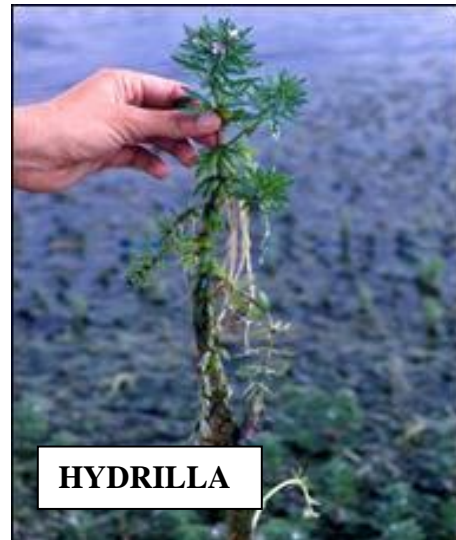
“Residential Ponds” Require Constant Management

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	
Fish	Eat anything green	Sterile (triploid 3n) Grass carp	
		Tilapia	
Insects	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)		
Pathogens	Eurasian Watermilfoil & Hydrilla	<i>Mycocleptodiscus terrestris</i> ("MT")	
Bacterial "Products"	?	Beware of Labels	
Natural products		Barley straw	

Triploid Grass Carp

- ✓ Must have permit from CA Dept of Fish and Game (cannot use carp in areas that are considered flood zones)
- ✓ Must certify that the fish are indeed triploid (3n)
- ✓ *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.