Weed and Algae Control in Ponds

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September 20, 2008
Sisters, OR

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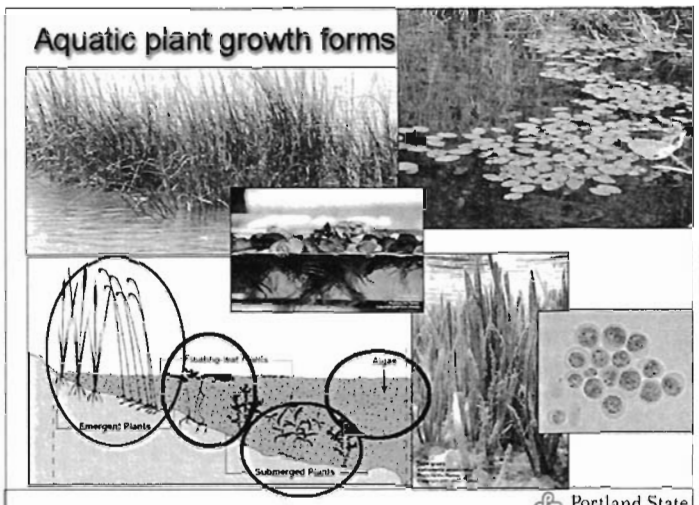
Aquatic plant growth forms



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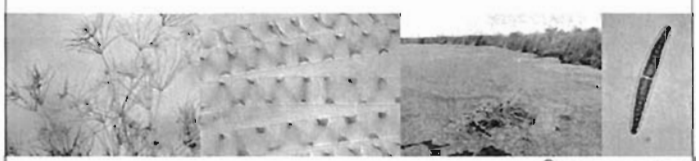
What are algae?

- Primary producers
- Photosynthetic organisms
- Phytoplankton
- "Pond scum"
- Moss

- Freshwater, marine and some terrestrial habitats
- Microscopic to megascopic
- Single celled to multi-celled, unbranched or branched, etc.



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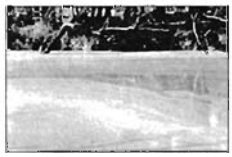
What causes algae blooms?



= (+ + Nutrients) -

= light + algae + nutrients - grazers

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Why are blooms a problem?

- Aesthetics
- Decreases light penetration for submersed plants
- Change diurnal pH and dissolved oxygen patterns:
  - Higher during the day (photosynthesis)
  - Lower at night (respiration)
  - Stressful to fish and invertebrates
- May be toxic (cyanobacteria)
- Filamentous forms clog pumps and intake structures
- "Crashes" increase oxygen demand for decomposition

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How to avoid blooms

- Reduce nutrient loading
  - Use "lake-friendly" lawn fertilizer (phosphate-free)
  - Maintain vegetated buffer zone on shore
  - Maintain septic tanks
  - Avoid overfeeding fish
- Maintain healthy macrophyte community
- Barley straw
  - Deters algae growth
  - Required well-oxygenated water
  - Inconsistent results (*Lembi 2002, http://www.agcom.purdue.edu/AgCom/Pubs*)

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How to control algae

- Nutrient manipulation
  - Aeration to reduce phosphorus release from sediment **when bottom water is anoxic**
  - Alum (aluminum sulfate) to precipitate phosphorus
- Biomanipulation
  - Reduce zooplanktivorous fish (eat zooplankton/ grazers)
- Direct Control
  - Dyes to shade algae and reduce photosynthesis
  - Algaecides
    - Human and ecosystem health concerns
    - **Follow the label**

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How to control algae

- Algaecides
  - Copper
    - Copper sulfate
    - Chelated copper
      - Komeen, Cutrine
  - Endothall - amine salt (Hydrothol 191)
    - Highly toxic to fish
  - Peroxygen granular (GreenClean)
    - Relatively new algaecide

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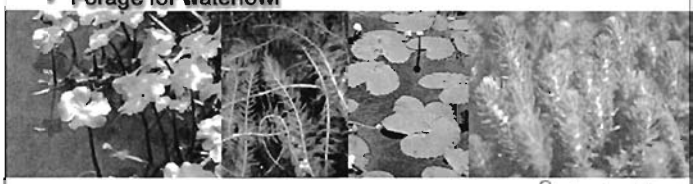
What are macrophytes and what are they good for?

- Desirable = aquatic plants
- Undesirable = WEEDS (even some native species)
- Vascular, multicellular
- Typically with distinct roots, stems, and leaves
- Provide cover for fishes and invertebrates from predators
- Shade
- Forage for waterfowl



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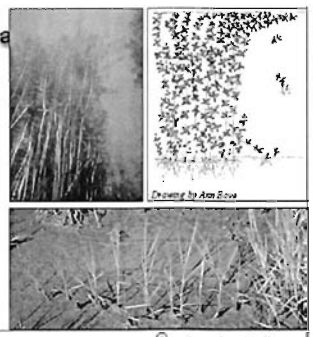
What makes a weed a weed?

- Prohibited (state or federal noxious weed lists)
- Unwanted, undesirable, nuisance
- Typically fast growing
- Broad temperature and light tolera
- Variable mechanisms of spread
  - Vegetative
    - Fragments
    - Tubers & turions
    - Rhizomes
    - Stolons
  - Seed



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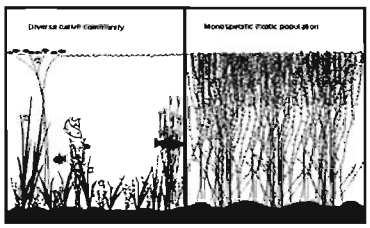
Why are weeds a problem?

- Shade understory vegetation
- Disrupts wind mixing
  - Temperature & oxygen higher at surface
  - Extreme diurnal changes in pH & oxygen = fish toxicity



Drawing by Robert Doyle

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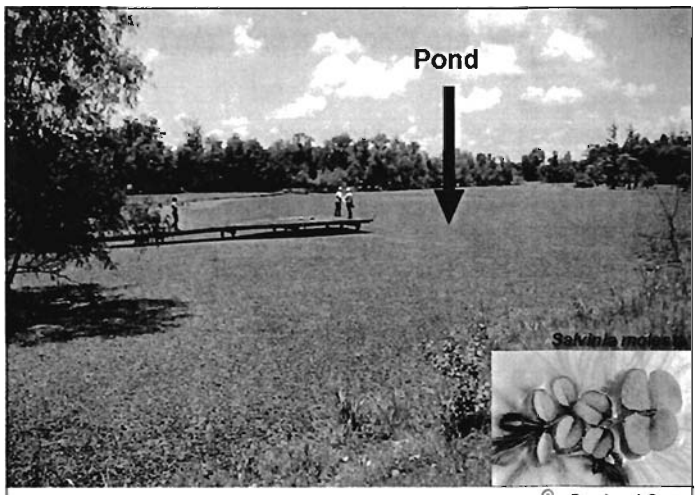

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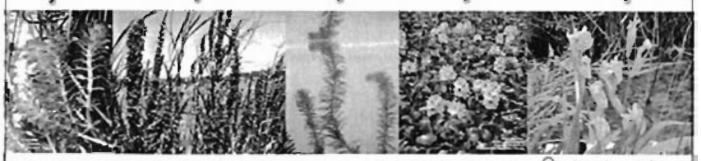
How to avoid weeds

- Prevention: know your plants & avoid weeds
- Frequent weeding to remove weeds that "hitchhike" on "good" plants
- Think ecosystem: maintain diverse plant community
- Maintain filtration system in ornamental ponds
  - Physical to remove debris
  - Biological to maintain nitrogen cycle

↑ Water lettuce

Hydrilla ↓ | Purple loosestrife ↓ | Brazilian elodea ↓ | Water hyacinth ↓ | Yellowflag iris ↓



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How to control weeds

Manual

- Hand-pulling, or underwater weeding
  - Target specific weeds, move around obstructions, minimal equipment
  - Labor intensive, creates murky water and fragments
- Rakes, cutters
  - Inexpensive
  - Labor intensive, creates murky water and fragments

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How to control weeds

Biological

- Insects
  - No agents that are reliably effective available
    - Milfoil weevils (Eurychiopis lecontei)

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How to control weeds

Biological

- Grass carp
  - Generalist herbivore
    - Some preferences but often nonselective
  - Restricted use in Oregon - triploid, "sterile" fish only
  - Typically "all or nothing" effect

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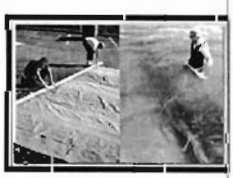
How to control weeds

Physical

- Benthic barriers
  - Sediment blanket that blocks light, compresses plants
  - Controls rooted plants
  - Expensive for large ponds
  - Requires regular maintenance
  - Interferes with bottom habitat
  - Unruly to anchor in large ponds



- Drawdown
  - May be ineffective in wet conditions and without freezing

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How to control weeds

Mechanical harvesters

- Machines that cut and collect plant tips
  - Lawn mowing
  - Opens water surface
  - Requires off-site disposal
  - Creates fragments
  - Nonselective

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How to control weeds

Chemical

- Mode of action
  - Contact – kills portion of the plant
  - Systemic – kills entire plant
  - Selective – some but not all plants affected
  - Broad-spectrum – most all plants affected

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EPA registered herbicides for aquatic use

	Contact	Systemic
Selective		Fluridone (*Sonar*) 2,4-D (*Aquaclean/ Navigate)* Triclopyr (*Renovate*)
Broad spectrum	Endothall (dipotassium salt) (*Aquathol*) Diquat (*Reward*)	Glyphosate Fluridone Imazapyr (*Habitat*)* Carfentrazone (*Stingray*)*

*emergent and floating leaf plants

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Pros and Cons of Herbicides

- Pros
  - Often less expensive than other methods
  - Easy to apply and can be used in areas where other means cannot
  - Potential for selective removal of weeds without harming native plants
- Cons
  - Water-use restrictions
  - Potential off-site impacts
  - Perception of human and ecosystem health issues
  - Potential shift to algae problems

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Things to consider with herbicides

- kind, amount, and growth stage of target plant and nontarget plants
- kind of water body: lake or river, its volume and water flow
- uses of the water body: recreational, commercial, wildlife
- wind speed and direction, temperature of the water and the air, oxygen levels in the water, pH, and other environmental variables
- amount of suspended organic clay particulates in the water
- type and depth of organic material in the sediments
- kinds and numbers of personnel and equipment required to do the job
- economic and environmental costs of herbicide **and** weed
- amount of time available to apply the herbicides and before the plants must be controlled

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Summary

- Prevention is first line of defense
  - Reduce nutrient inputs and keep debris out
- Know your plants
  - Scientific names
  - How they reproduce and spread
- Maintain diverse community
- Know local permitting issues

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WA Dept. of Ecology: www.ecy.wa.gov/programs/wq/

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