Thank you!

Thornton Lake Neighborhood Workshop
April 21, 2012

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I. Overview of Lake Ecology and Building Blocks for a Healthly Lake

II. Understanding Aquatic Invasive Species in Thornton Lake
Algae – Lake aerator (above)
What is (are) the *most likely* source(s) of invasive species arriving in your water garden?

a) Hitchhikers on the plants and animals you put in
b) Wind
c) Birds and animals
d) Spontaneous generation (they just appear)
e) All of the above
Hitchhikers on top of hitchhikers!

Zebra mussels on aquatic plant
How are invasive, aquatic plant species introduced?

- Intentional introduction
- Aquaria dumping
- Pond flooding
- Hitchhiker route
The Oregon Gardens in Silverton
Case Study: Aquatic Invasion of the Oregon Gardens
Azolla, Mexican water fern
Caution! Don’t fall into pond

Pond here!
Introduction of the ? ? to Control Aquatic Weeds in Devils Lake, Lincoln City, OR
Acarp consumed macrophytes (Large aquatic plants).

Water quality problems (high nutrients) still persist.

During a blue-green algae blooms
Lakes and ponds are ecosystems: the interaction of a community of organisms (biotic) with their environment (abiotic)
Building blocks of a lake food web

- **Abiotic factors:**
  - Sunlight, carbon dioxide ($CO_2$) and oxygen ($O_2$)
  - Nutrients in the open water
  - Nutrients in the sediment

- **Biotic factors:**
  - Primary producers
    - Algae (diatoms, phytoplankton)
    - Macrophytes (aquatic plants, weeds)
  - Detritivores – organisms that eat dead organic matter
  - Decomposers – convert dead tissue to inorganic matter
    - Fungus and bacteria
Abiotic factors: Sunlight, CO$_2$, and O$_2$

- Sunlight and inorganic carbon (i.e. carbon dioxide, CO$_2$) required for photosynthesis
- By-product of photosynthesis is oxygen, O$_2$
- Sunlight influences water temperature
  - Rate of biological processes
    - Photosynthesis
    - Reproduction
    - Decomposition
  - Ability of gasses to dissolve
Abiotic factors: Nutrients in water column

- Potassium (K), calcium (Ca), magnesium (Mg), chloride (Cl) and sulfate (SO₄), Nitrogen (N), phosphorus (P), iron (Fe) and micronutrients
- Algae and floating plants obtain nutrients from water column
Abiotic factors: Nutrients in water column and sediment

- **K, Ca, Mg, Cl and SO₄** typically obtained from water column

- Nitrogen (N), phosphorus (P), iron (Fe) and micronutrients typically taken up through roots in sediment
Biotic factors: primary producers

- Algae & macrophytes (plants)
- Produce oxygen, absorb nutrients
- Algae provide food for zooplankton
- Plants provide cover for zooplankton, aquatic insects & fish
- Causes of excessive production (algae blooms)
  - Rich sediment
  - Shallow water
  - High light
Biotic factors: detritivores & decomposers

- Nature’s garbage collectors
- Detritivores – primary consumers that eat detritus (dead organic matter)
  - Freshwater shrimp, insects
- Decomposers – use enzymes to break down detritus and release inorganic nutrients back to ecosystem
  - bacteria and fungus
How “good” lakes might go “bad”

- Algae typically limited by phosphorus in water column
- Excess nutrients + light = algae blooms
  - Limits light for submersed plants
  - Cyanobacteria
    - Potentially toxic
    - Unpalatable to zooplankton
- Noxious weeds (and many natives) tend to spread rapidly
Simplified pond succession

- Emergent
- Rooted floating leaved
- Rooted submerged
Dense macrophyte beds alter the "architecture" of fish habitat
Slowing lake succession

- Reduce sediment and detritus from landscape
- Manage vegetation
- Reduce nutrients that prompt algae blooms!
- Avoid noxious weeds that rapidly spread
- Think in terms of your lake as an ecosystem
A rain garden is a “sunken garden bed” that collects & treats stormwater runoff from rooftops, driveways, sidewalks, parking lots & streets.
Stormwater Pollutants

- Suspended solids/sediments
- Nutrients (nitrogen, phosphorus)
- Metals (copper*, lead, zinc, cadmium, mercury)
- Oil & grease*
- Cleaning chemicals
- Detergents or soaps
- Bacteria
- Pesticides*
- Increased temperature

*Recent studies show link between these pollutants and salmonid olfactory disorientation and pre-spawning mortality.
NE 36th and Emerson, Portland
Brasenia schreberi - Water Shield
Schoenoplectus *montanae* - Great Bulrush

(above) Bird’s nest in Great Bulrush
**Sagittaria latifolia** - Wapato

**Typha latifolia** - Wide-leaf Cattail

**Sparganium emersum** – Burr Reed
Salix sp. - Willow

Polygonum sp. – water smartweed
Nuphar lutea - Yellow Pond Lily
(with Western Painted Turtles and Wood Ducks)
Yellow Flag Iris

Frog surveys
“duckweed”

Parrot’s feather milfoil

Eurasian milfoil

Polygonum persicaria – Ladies thumb
Eurasian watermilfoil
Myriophyllum spicatum
Myriophyllum spicatum (Eurasian watermilfoil)

- Native range: Europe, Asia, north Africa
- Introduced to North America in late 1800’s
- Documented in PNW in mid-20th century
Reproduction from fragments (and seeds)
Iris pseudacorus
(Yellow flag iris)

- Native to Europe, north Africa
- Documented in N. America about 1900
- Widely planted ornamental plant
Fallopia japonica -
Japanese Knotweed
Long distance dispersal via large, corky floating seeds, also reproduces via vigorous rhizomes
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