Prevent and Manage Weeds without Polluting the Water

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It’s All About Clean Rivers
Removing solids, nutrients and metals

What’s downstream?
- Drinking water intakes?
- Fish and wildlife
- Recreation (swimming, boating)?

Stormwater facilities reduce water pollution!
- total suspended solids (TSS) ↓ all. Highest removal for bioretention (rain gardens), porous pavement
- Nutrients more a mixed bag, particulate forms more readily removed than dissolved. Phosphorous ↑ many studies, may be due to media, fertilization, erosion
- Heavy metals ↓ Less removal of dissolved metals
- Type of pollutant removal effectiveness variable: depends on type of BMP, etc. Performance Study summaries by pollutant and type of facility available at Int’l Stormwater BMP Database (www.bmpdatabase.org).
It’s All About Clean Rivers 
Removing pesticides?

SW Facility effectiveness for pesticides?
• not tracked in the International Stormwater Database Summaries.

Nationwide, monitoring by USGS**
• >90% of urban stream samples exceed aquatic benchmarks for at least one pesticide. (2002-2011 data)

Local pesticide monitoring program run by DEQ (Clackamas, Molalla-Pudding, Yamhill)
• lots of herbicide detects.
• Glyphosate found in almost 80% of samples where tested
• Diuron (pre-emergent) in almost 90% of samples

General Principles

- Consider your philosophy for weed management in the context of the site objectives. *Clean water not the same as aesthetic only.*

- **Monitoring and Identification:** Monitor sites regularly and know your weeds. Identify them.

- **Understand the life cycle** *(weed management calendar in folders for some invasives)*

- Timing for action: May do more damage in a facility removing weeds in winter than later in season.
Early Detection Rapid Response (EDRR)

ODA designates noxious weeds across state: A, B, or T-listed
• A-listed and T-listed species the primary targets for EDRR efforts.

Clackamas County WeedWise (SWCD) implements state noxious weed efforts in Clackamas County
• Priority – Actively targeted for eradication. WeedWise program available for assistance. Examples: (knotweeds, giant reed)
• Maintenance - Damaging and widespread. WeedWise Program encourages control, can assist with development of a plan. (examples: Canada thistle, blackberry)

City of Portland EDRR List: Treatment, containment, and Watch. (Example: Giant hogweed on treatment list)

Required reporting for higher level species on these lists 1-866-INVADER.
Prevent...Prevent...Contain!

- Avoid “seed-friendly” clothing (wool, fleece, and velcro). Wear smooth outer layers like nylon or gaiters. Avoid footwear w/ deep treads.
- Inspect and clean your boots, tools, and machinery before and after mobilization to a site. Dispose of debris at designated cleaning stations or
- Bag and dispose of any reproductive parts (i.e. seeds, rhizomes, root fragments)
Prevent....Prevent...Defend!

• Minimize soil disturbance and clean out sediment regularly
• Prevent existing weeds from going to seed
• Periodically survey for newly invading weeds
• Replant treated areas when the bulk of the invasive weeds have been removed.
Suppression Principles

• Catch them early, young, and small.
• Change the conditions. Examples: moisture, light can be changed with microtopography, competitive plantings.
• Use multiple techniques (many small hammers)
• Plan for something else to take the space.
• For difficult to eradicate: Weaken plants with repeated non-chemical methods before using chemical methods
Manual Removal Tools for Larger Plants

Clackamas Weedwise loans out these and other tools for use in Clackamas County:

- **Uprooter**
  - Tap root

- **Shrubbuster**
  - Fibrous root

- **Extractigator**
  - Tap root
Small manual tools

• Hori knife

Stand up weeders
Reed Canary Grass
(Phalaris arundinacea)

Why a problem:
• Height/density! Impedes water flow. Outcompetes natives quickly. Sod layer – can be 20 inches thick.

Biology / Dispersal
• Spreads by rhizomes, fragments and seeds. Seed germination requires light

Prevention:
• Maintaining a healthy dense community of native or otherwise desirable plants, shade can prevent seed germination
• Don’t disperse RCG seed or propagules (eg rhizome fragments),
• Prevent seed production and dispersal (Cut prior to flowering/seeding).
Reed Canary Grass Suppression Tactics

Mechanical
- Dig small patches when soils moist (remove / dispose of all rhizomes)
- Mow/ trim 5X annually or more often. Use mowing/trimming to weaken and eliminate seed bank. Mow for several years prior to herbicide treatment.
- Spot treatment w/ flamer (emerging shoots)

Light/Water/Heat
- Smothering – short term w/ geotextile, or layers of cardboard/shade mulch.
- Solarization
- Long term shade w/ high-density cottonwood/alder/conifers
- Tillage/outflooding to 18-32” has worked on large wetlands

Herbicide
- Late summer/fall 2% aquatic glyphosate (Aquamaster), after suppression, stems up to 12” high, wick wipe or hand wipe stems/leaves

Sources:
https://www.invasive.org/gist/moredocs/phaaru01.pdf
King County Noxious Weed Control Program. 2015. Reed Canarygrass Best Management Practices.
Canada Thistle
(Circium arvense)

Why a problem:
• Aggressive, inhibits other plants chemically, can be difficult to eradicate

Biology / Dispersal
• Perennial. Spreads by wind-dispersed seeds and roots. Lateral root systems can spread 20’ in one season. Root fragments, which can be viable 20 years, result in new infestations. Seed germination requires light.

Prevention:
• Maintain a healthy dense community of native or otherwise desirable plants, reduce light to soil surface
• Don’t disperse root fragments or flower/seed heads
• Prevent seed production and dispersal (cut prior to flowering/seeding).
Canada Thistle Suppression Tactics

Mechanical
• Pull/dig when young – dispose of fragments
• Cut or pull new growth promptly.
• Mow/trim several times in growing season to deplete root reserves.

Light/Biocontrol
• Reduce light with competing plants tall enough to shade rosettes. Smother w/inorganic mulches. Two biocontrols available though not considered very effective: a) stem gall fly – harvest and scatter galls. b) crown/root weevil (aspirate adults from young plant rosettes. Do not mow if using biocontrols

Herbicide
• Aminopyralid (Milestone) or Clopyralid considered effective on young plants during growing season. Cut 3-5 weeks before application. Wick wipe or hand wipe rosettes

Sources:
Knotweeds (Japanese knotweed: *Polygonum cuspidatum*) and three lookalikes (Giant, Bohemian, and Himalayan)

Why a problem:
- Very vigorous, outcompetes natives easily, can induce erosion

Biology / Dispersal
- Perennial with deep-rooted creeping rhizomes. propagates through stem and root fragments, which may be transported by water or eroded soil. Seed is a less important mechanism for spread.

Prevention:
- Don’t accept soil from unknown origin
- Minimize soil disturbance
Knotweeds

Suppression Tactics

Mechanical

• Generally not recommended even for small infestations.

Light

• Some have suppressed small infestations by smothering cut canes w/ tarps/geotextiles. Edges must be overlapped and secured. Trampling over the tarps in spring helps to break new shoots.

Biocontrol

• Biocontrol under development by ODA (psyllid Apalara itadori).

Herbicide

• In September, inject glyphosate or imazapyr in each stem at first aboveground internode. Or wipe cut, 3-ft stems with 33% solution.

Sources:
Using Herbicides

- Municipalities are actively discouraging use of herbicides for stormwater facilities for most weeds. City of Milwaukie, Portland, others effectively managing stormwater facilities in right of way with almost exclusively manual means.

- If on public land or under contract to a municipality, consult municipality guidelines or IPM plan (MS-4 permit governs).

- If use at all, preference is for aquatic-labeled herbicides

- Spot treatments or wipe or injection treatments that are effective are less polluting than broadcast or spray treatments.

- Always read and follow the label. DEQ staff: “Following the label might not be good enough, if it the application contributes to a water quality standards violation.”
Issues Using Aquatic Herbicides in Stormwater Facilities

- Labels are not very clear: sites not standardized. Aquatic sites, streams, ditches. Some labels (e.g. Milestone Specialty) specifically list “dry storm water retention areas.” May need to look for Special Local Need labels.

- Invasive of concern not always listed on label (example: blackberry listed on 485 labels in PICOL, reed canarygrass listed on none), so specific use instructions not always available.

- Some labels that say “aquatic weed control” only provide application for submerged- not emergent – weeds -- or vice versa.

- If applied to standing or running water, need to pass Aquatic category exam (if commercial applicator). For public applicators this is true IF also using power equipment.

- Some aquatic herbicide labels warn potential to contaminate groundwater

- Conversions may be needed: labels may contain only acreage rates, which will not necessarily work well in linear type facilities or with spot treatments.

- If you use surfactants you may eliminate benefit of using aquatic herbicide. ONLY use surfactants approved for use in aquatic areas (consult WA DOE list)
## Common Aquatic Herbicides

### Persistence/Toxicity

#### Selected Herbicides Used in Aquatic/Semi-Aquatic Environments

<table>
<thead>
<tr>
<th>Active Ingredient</th>
<th>Example Tradenames</th>
<th>Fish: LC50-Acute (NOEC-Chronic) mg/L</th>
<th>Days Half-Life in Water (photo/hydro)</th>
<th>Invertebrate Aquatic EC50-Acute/NOEC-Chronic mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate (tech / aquatic formulations)</td>
<td>Aquamaster</td>
<td>38 (25)</td>
<td>60 / stable</td>
<td>40 (30)</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>Habitat</td>
<td>100 ( )</td>
<td>2.1 / 30</td>
<td>100 ( )</td>
</tr>
<tr>
<td>2, 4-D</td>
<td>Base Camp Amine 4</td>
<td>100 (27.2)</td>
<td>38 / stable</td>
<td>134 (46)</td>
</tr>
</tbody>
</table>

Sources: Pesticide Properties Database, U Hertfordshire

LC50 (mg/L) <0.1 very highly toxic, 0.1-1 highly toxic, >1-10 moderately toxic, >10-100 slightly toxic
Lunch Time!

Southwest Buffet!
• Vegan option available for those of you who are vegetarian or vegan

This is Your Time to Meet and Learn from Your Peers
• Mix it Up!
• Informally, what are you learning?
• What are common design, install, or maintenance issues?
• How do you deal with these?
• How do others at your table deal with these?
• Opportunity to share ideas/insights/questions/tips with rest of us at end of lunch

Please stack your plates in center of table when done - we’ll pick up.