Basic Weed Science and Management

Pamela Monnette  Chris Cornwell
OSU Extension  Lincoln County Service
Overview of Weeds Workshop

- Weed biology and ecology
- Sort weeds into functional groups
- Introduction to weed control strategies
  - That don’t require you know the weed name!

<table>
<thead>
<tr>
<th>Weed</th>
<th>Spring</th>
<th>Summer</th>
<th>Autumn</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td>common ragweed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Ambosia artemisifolia</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Learning Objectives

- Describe differences in life cycles and morphology
- Apply this learned weed biology to guide effective weed management techniques
- Understand Integrated Pest Management techniques
- Both chemical and non-chemical control
What makes a Weed a Weed?

• “A plant out of place” (or not intentionally grown)

• A plant whose “virtues” have not yet been discovered

• A plant that is competitive, persistent and interferes with human activity

• “Noxious Weed” is a legal designation for a plant that is injurious to public health, agriculture, recreation, wildlife or any public or private property
What makes a Weed a Weed?

Plant's Characteristics:

- Aggressive colonization, growth, reproduction
- Hard seed coat, long lived seeds (seed bank), variable germination
- Vegetative propagation
What makes a Weed a Weed?

Environmental Conditions:

- May be adapted to specific conditions and have a competitive advantage

- Commonly adapted to disturbance
  - Disturbance liberates resources, nutrients, moisture, light & space
Why are Weeds so Weedy?
Why are Weeds so Weedy?
Nature Abhors a vacuum!
Why are Weeds so Weedy??

- Aggressive vegetative growth right away
- Abundant and rapid reproduction
- Great seed dispersal mechanisms
- Long-lived seeds and plant parts (rhizomes)
- Widely adaptable to soils and climates
- Thrive in disturbed/bare soil
Introduction to Basic Weed Management
We need to understand the biology and ecology of the weeds before we can ‘manage’ them...
Best way to manage weeds...

- Know what weeds you’re dealing with...
Identify weeds based on...
Identify weeds based on...

Morphology:
- Monocot (grasses)
- Dicot (broadleaves)
Identify weeds based on...

- **Botanical Characteristics - Plant family**
  - Families have characteristics in common
Top four weediest plant families

1. Asteracea
2. Poacea
3. Brassicacea
4. Fabacea
Asteraceae (sunflower family)

Dandelion, sowthistle, tansy, groundsel
Poaceae (grass family)

Annual bluegrass, quackgrass, wild oats
Brassicacea (mustard family)

Wild mustard, bittercress, shepherd’s purse
Fabaceae (legume or pea family)

Scotch broom, black medic, sweet clover
Identify weeds based on...
Lifecycle

Annual
- Grasses

Biennial
- Broadleaf

Perennial
- Grasses
Annual Weeds

- Go from seed to seed in less than 1 year
- Can be periods as short as 45 days
- Plants die after they set seed
- Growth parallels most cultivated crops
- Early colonizers of disturbed sites!
Reproduction via Seeds

Seeds have special adaptations to facilitate dispersal.
Plant Characteristics

Functional Groups:

- Winter annual
  - Spring: produce seed spring and early summer
  - Winter: dormant in winter
  - Summer: die in summer
  - Fall: germinate in fall and winter
Winter Annuals

- Germinate in late fall - early spring, set seed in spring/early summer
- Spread through seed production
- Eg: little bittercress, snapweed, some mustards, chickweed
Shepherd’s Purse (Capsella bursa-pastoris)
**Henbit** (*Lamium sp.*)
Groundsel (Senecio sp.)
Chickweed (Stelaria sp.)
Annual Bluegrass (*Poa sp.*)
Summer Annuals

- Germinate in the spring/summer, bloom and set seed before fall frost
- Many annoying weeds in this group for the home garden!
- Germinate quickly and are aggressive
- Eg: lambsquarters, pigweed, crabgrass, purslane, mallows, ragweed
Pigweed (Amaranthus sp.)
Lambsquarters (Chenopodium sp.)
Bedstraw (Galium sp.)
Nightshade (Solanum sp.)
Purslane (Portulaca sp.)
Barnyardgrass
(Echinochloa crus-galli)
Crabgrass (Digitaria spp.)
Plant Characteristics

Functional Groups

- Biennials
- Creeping Perennials
- Herbaceous Perennials
- Woody Perennials
Biennial Weeds
* Finishes it’s life cycle in two years
* Examples of biennials: wild carrot, tansy, prickly lettuce
* Biennials reproduce via seed
Wild Carrot (Daucus carota)
Tansy Ragwort (*Senecio jacobaea*)

Rosette = Year One

Mature plant = Year Two
Perennial Weeds
Perennial Weeds

- Herbaceous plants that die back and regrow every year
- Often most difficult to manage
- Underground roots or stems survive
- Eg: dandelion, Canada thistle, bindweed
Examples of perennials: Canada thistle, dandelion, plantains

Reproduces vegetatively and by seed
Vegetative Reproduction

Perennials can also reproduce by:

- Stem tubers = enlarged rhizomes or stolons, also called nutlets
- Fragments

Stolons (runners)

Rhizomes (modified underground stems)
• Perennial weeds can be especially difficult to manage.
• The key is to consider when the plants are placing their reserves below ground, which is the best time to kill them.
Curly Dock
(Rumex crispus)
Canada Thistle (Cirsium arvense)
Creeping Perennial Weeds
Bindweed
(Convulvulus arvensis)
Horsetail (Equisetum sp.)
Yellow Archangel (Lamiastrum galeobdolon)
Herbaceous and Woody Perennials

Blackberry

Scotch Broom
How to Manage our Weeds with Pami!
Keys to Weed Management
Keys to Weed Management

- Prevent the introduction of new weeds
- Discourage new weeds so they can’t compete with desirable plants
- Stop weeds from going to seed in order to reduce the weed seed bank in soil
Integrated Weed Management

- Prevention
- Cultural Control
- Physical Control
- Chemical Control
- Biological Control

Apply weed control BEFORE plants go to seed!
The EASIEST method of weed control

Get to know really tough weeds in the seedling stage and look for them

- Beware of what you bring in to your garden...
  - Potting soil: nutsedge & oxalis
  - Landscape soil: bindweed, creeping bentgrass
  - Compost: wild onion

- Limit “friendship spreading” or trading of invasive plants with your neighbor
Mechanical Control

- Mowing
- Plowing
- Digging
- Mulching
Manual Control

- Hoeing
- Pulling
- Small populations
- Biennials and some perennials
- Caution: Disturbance can lead to new flush

For – Biennials and simple Perennials
Not – Annuals, creeping Perennials

Is this one a flower or a weed? I'm not sure whether to admire it or not.

© Original Artist
Rototilling can move seeds from soil surface below zone of germination . . . but can also bring seeds to soil surface. Can work well on younger weeds, don’t get too close to desirable plants!
Prevention and Physical Control

Organic Mulch:
- Can build soil quality
- Conserves water
- Minimizes erosion
- Prevents emergence
- Must be weed seed free

For – Annuals, Not so much – Perennials, Biennials
Prevention and Physical Control

Plastic or Fabric Mulches:

- Landscape fabric

  Cost: high  
  Durability: Long, up to 5 years

Advantages: Very effective, long lasting, allows air and water penetration.
Disadvantages: Expense, installation somewhat more complicated.
Special uses: Excellent mulch for permanent plantings of woody landscape plants. Usually topped with organic mulch or rock to make it attractive and long lasting.
Prevention: Mulches

- Plastic Mulches:
  - Work well in the short-term; annual gardens
  - Different colors available, (can help with growing warm season plants)
  - Temporarily discourage weeds
  - Can be unattractive
  - Can hold in moisture
  - Work well with drip irrigation installed
Interplant crops, or plant at close spacing to encourage competition with weeds

Use drip irrigation and precise fertilizer application to avoid “feeding weeds”

Clean grounds/beds before planting

Choose vigorous crops to plant (transplants)

Intercrop short-seasoned plants with longer-seasoned ones
Cultural

- Create environment for maximum competition against weeds
- Soil Fertility
- Crop Rotation
- Competitive Varieties
- Cover Crops
- Consider Planting Date and Rate
- Composting
Examples of weeds that often indicate poor growing conditions - need to modify the soil

<table>
<thead>
<tr>
<th>Weeds</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knotweed, annual bluegrass</td>
<td>Soil compaction, low soil oxygen levels</td>
</tr>
<tr>
<td>Chickweed</td>
<td>Low soil N levels, thin grass</td>
</tr>
<tr>
<td>Dandelion</td>
<td>Low fertility, drought, low mowing</td>
</tr>
<tr>
<td>Plantains</td>
<td>High soil pH</td>
</tr>
<tr>
<td>Sedges</td>
<td>Poor drainage, over watering</td>
</tr>
<tr>
<td>Quackgrass</td>
<td>Poor and/or sandy soil</td>
</tr>
<tr>
<td>Spurge</td>
<td>Low fertility, drought, Ca soils, low mowing</td>
</tr>
<tr>
<td>Thistle spp.</td>
<td>Low fertility, drought, compaction</td>
</tr>
<tr>
<td>Wild carrot, garlic, onion</td>
<td>Wet, heavy soils</td>
</tr>
</tbody>
</table>
Specific Examples
Ecological Approaches to Weed Control

- Manage colonization and competition by limiting access to resources
  - banding, mulch, transplant

- Manage colonization and competition for space by filling the space with manageable species
  - cover crops, complementary plantings

- Managing competition through planting arrangement
<table>
<thead>
<tr>
<th>Early Spring</th>
<th>Early Summer</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radish</td>
<td>Tomato</td>
<td>Beets</td>
</tr>
<tr>
<td>Kohlrabi</td>
<td>Pepper</td>
<td>Spinach</td>
</tr>
<tr>
<td>Turnip</td>
<td>Eggplant</td>
<td>Chard</td>
</tr>
<tr>
<td>Greens</td>
<td>Summer squash</td>
<td>Broccoli/Cabbage</td>
</tr>
<tr>
<td>Peas</td>
<td>Beans</td>
<td></td>
</tr>
</tbody>
</table>
Chemical Control
What to know about herbicides...

- Terminology
- Systemic vs. Contact Herbicides
Chemical Control

- First: Read the entire label
- Effective for specific spot treatments
- Effective on stubborn perennial weeds
- Recognize potential unintended effects...in a garden setting drift is a very real danger. Spray generally in the morning, not too early, no inversion, not rainy, not windy. Careful where you walk!
- Most labels: the minimum PPE is long sleeves etc...
Check out what is available to use and on what in the Pacific Northwest Weed Management Handbook.
Herbicide Actions

For a herbicide to be effective, it must

1) come in contact with a plant surface,
2) remain on the surface long enough to be absorbed,
3) reach a target site inside the plant in sufficient concentrations to disrupt a physiological process or development.
Herbicide Types

**Systemic** – travel through plant’s vascular system to reach site of action

- interfere with the plant’s physiological and metabolic processes
- glyphosate (Roundup type products)

**Contact** – penetrate the cuticle and act in leaves and shoots

- kill by acute toxicity
- acetic acid
Specific Example
Glyphosate (Roundup)

- Broad spectrum herbicide
- Systemic
- Post emergence/foliar active
- Weeds/trees/shrubs/bark
- Concentration varies by product
- Wind drift hazard/droplet size
- No residual or pre-emergent activity, use before planting but weeds will re-germinate
Apply glyphosate, a “systemic herbicide,” on the foliage (leaves) of the target plant.

The sap (plant-sugar) or phloem carries the herbicide from the leaves, down to the roots.

It is possible to apply glyphosate, a non-selective herbicide, in a selective manner using a “wick”.

A lot of information and misinformation out there about health effects - go to dependable sources: University research – (OSU) etc.
Examples of Herbicide drift damage
Specific Example Phenoxy Herbicides (2,4-D, Dicamba, Crossbow)

- “Weed and Feed” for Lawns
- Brush Killer
- Post emergence/foliar active
- Systemic (sugar flow)
- Volatilization hazard (air temperature)
2,4-D

- Weed B Gon MAX, PAR III, Trillion, Tri-Kil, Killex
- Mimics the effect of plant hormones and causes the plant to grow uncontrollably which leads to abnormal growth and in some plants death.
- Only effective on broadleaf (dicot) weeds
  - Will not affect lawns
- In the soil 2,4-D has a half life of less than 7 days and in water it is broken down in one to several weeks
Contact Herbicides

- Contact herbicides destroy cell membranes or interfere with cell division.
- Because a contact herbicide only affects tissue to which it is applied, complete coverage is essential.
- Not as effective on perennial weeds or grasses and most effective on SMALL broadleaf weeds.
Biological Control

- Use of other living organisms for the management of certain weed species
  - Insects
  - Diseases
  - Livestock
- Long-term approach
Summary

<table>
<thead>
<tr>
<th>Learn</th>
<th>Utilize</th>
<th>Adopt</th>
</tr>
</thead>
</table>
| Learn to recognize common weed species in your garden or on your property  
  • Familiarize yourself with biology of that plant | Utilize adaptive management strategy  
  • Prevention is key  
  • Integrated strategy that suits your goals and lifestyle | Adopt a long-term strategy/outlook  
  • Learn to accept presence of some weeds  
  • On-going holistic management approach may be best |
Resource Recommendations

PNW Handbook
http://pnwpest.org/pnw/weeds
https://pnwhandbooks.org/weed

https://extension.oregonstate.edu/pests-diseases/weeds