

Learning objectives

- How weeds evolve and move
- Ecology of weeds
- Weed competition
- Weed life cycles
- Some weed id
- What makes a plant invasive
- Weed management



Lambsquarter: Summer annual

What are weeds?

Plants that are

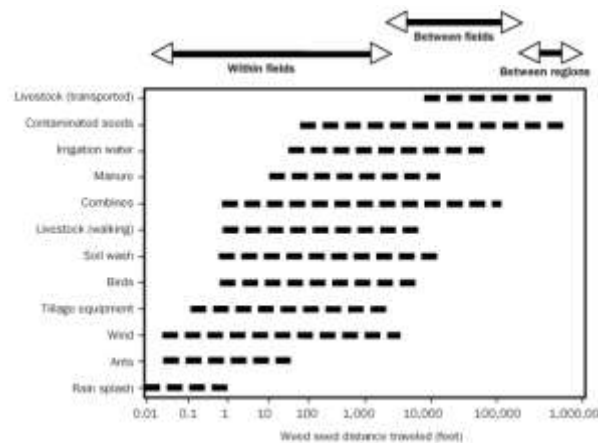
- Competitive
- Tenacious
- Definitely not wimpy
- and fantastically interesting!!



Horsetail : *Equisetum arvense*
Herbaceous perennial

Most weeds depend on human actions for dispersal

- Local movement
- Large scale movement



Large scale movement:
European immigrants
brought many of them.

Why?

- Food (many examples)
- Fiber (one nettle species and others)
- Pharmaceuticals (Foxglove and others)



Foxglove *Digitalis purpureum* biennial

Other reasons

- Attractiveness (many flowers and woody plants)
- Industrial uses (teasel and others)
- Accidentally – lots of examples



Teasel *Dipsacus fullorum* biennial

But what made them so
successful?



Photo: Margo Bors

How about:

- Similar climate (temperate latitude).
- Bred for success (either consciously or through accidental selection in the course of agricultural, forestry, and/or land management practices).
- Lost their predators in transit
- **But especially, they like disturbed ground.**



Oxalis corniculatus
Herbaceous perennial

Weeds thrive in disturbed environments

- Humans and/or natural processes change native vegetation & disturb the soil
- But this creates opportunities for weeds
- Climate change as a disturbance



We love to disturb ground!

- lawns, tilled gardens, & landscape beds
- farm fields
- waste areas, railways & roadways
- natural areas (often disturbed by a mix of human and natural processes like floods, fire, fire suppression, etc.)



Why do we (try) to manage weeds?

- Public safety
- Damage to the built environment
- Destructive to natural areas
- Poisonous
- Aesthetics
- Competition with desirable plants (crops or landscapes)



Japanese knotweed

Where do we manage weeds?

- Roadways and railways
- Pastures
- Farms & gardens
- Forests
- Parks
- "Natural" areas (sometimes)
- Commercial and industrial
- Others



What is plant succession?

Biological principle: Plant communities change over time.

Gardeners create plant communities and maintain them for the aesthetic and functional benefits they provide.



How do weeds compete?

- Quick seed germination
- Aggressive leaf canopy
- Aggressive root growth
- Can adjust growth to less than perfect conditions
- Chemical warfare (allelopathy)



Quackgrass

Weeds compete for...

Water
Nutrients
Light



Weed competition

Whoever
gets the
sunlight
wins!!



Small seedlings are very vulnerable to shading!

The most important time to weed is the 3-4 weeks after planting your vegetable seeds



Weed/crop interaction

<u>Crop</u>	<u>Weedy</u>	<u>Weeded</u>
Carrots	27 #s	503 #s
Onions	4 #s	68 #s
Potatoes	53 #s	148 #s
Cabbage	129 #s	233 #s



Weed control timing is important



Weed dispersal: By seeds and/or wandering roots/vegetative parts



Purple loosestrife:
2 million seeds/plant





Seed longevity:

Dandelion: 15,000 seeds
15 years



Purslane: 53,000 seeds
40 years



Red root pigweed:
118,000 seeds
15 years

Weed biology – seeds in soil

- Incredible number of seeds in some soils
- Some weed seeds live a very long time
- Seed decay/predation lowers seed counts
- Staggered germination
- Cultivation/rotation



Smartweed *Polygonum persicaria*
Summer annual

Weed biology – seed/plant piece dispersal

- Wind
- Animals/birds
- Water
- Disturbances
- Vehicles
- Farm & other equipment
- People



Yellow flag iris

Herbaceous
perennial



Weed biology – more reproduction by vegetative cloning



Canada thistle

Canada thistle
Cirsium arvense
Herbaceous
perennial



Quackgrass
Agropyron repens
Perennial



Quackgrass *Agropyron repens*
Perennial

Weed biology – genetic plasticity



Reed canarygrass *Phalaris arundinacea*

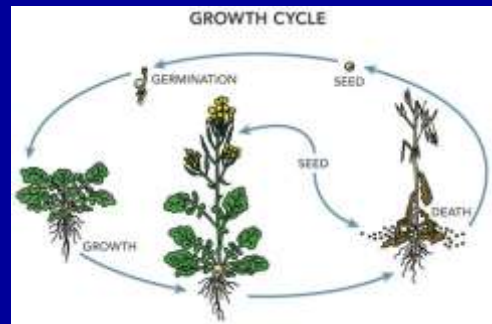
When you identify a weed, what is the most important thing you learn?



???

(*Oxalis corniculatus*)

Life cycle of the weed!!



Ok, what's so important about life cycles?



If you don't know the life cycle, you can't manage the damage!



If you know a weed's name

- You know how it grows
- And how it reproduces
- And then maybe how to manage it

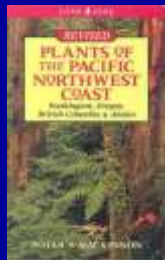
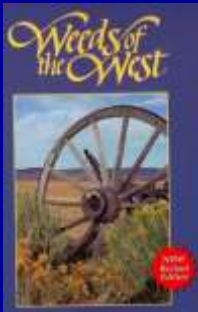


Oxalis corniculata
Herbaceous perennial

Weed Identification books I like

- *Northwest Weeds* – Ronald Taylor
- *Weeds of the West* – Extension consortium
- *Gilkey's Weeds of the Pacific Northwest* – Gilkey and Dennis
- *Plants of the Pacific Northwest Coast* – Pojar and Mackinnon

Read any good weed books lately?



How do you learn the names?

- Give your most irritating weeds nonsense or descriptive names that you will remember

(all learning starts with naming things and making distinctions between them)

- Hmmmm.... I'll call it Aunt Betty



Closing the loop

Then when you take a class, talk to someone or look through a weed id book you will buy, you can say..... Aha!! Aunt Betty = purslane. This technique really works!



Purslane - summer annual

Plant life cycles

- Annual
 - winter annuals, spring/summer annuals or the year-round annual types
- Biennial
- Perennial
 - woody
 - herbaceous (wandering or not)



Life cycle succession

- Plants (weeds) tend to group by life cycle but affected by the disturbance and succession pattern.
- Perennial landscapes, lawns, pastures, and orchards tend to favor perennial weeds.
- Periodically "bare" landscapes tend to have annual/biennial weeds and "escaped" perennials



Winter annuals

- Germinate in waves in the fall/winter/spring and go to seed in the spring to early summer
- Some, in this climate, grow year round
- Slow germination by mulching, remove when young, and keep from seeding



Groundsel – Senecio vulgaris

More winter annuals



Red dead nettle – *Lamium purpureum*



Annual bluegrass- *Poa annua*

Another winter annual



Little bitter cress
Cardamine oligosperma
and other bittercresses



Still another winter annual



Common chickweed – *Stellaria media*

Not another....winter annual



Bedstraw- *Galium aparine* aka "velcro plant"



Shepard's purse *Capsella bursa-pastoris* Annual



Shepard's purse *Capsella bursa-pastoris* Annual



Jim Hill mustard
"tumble mustard"

Sisymbrium
altissimum

annual

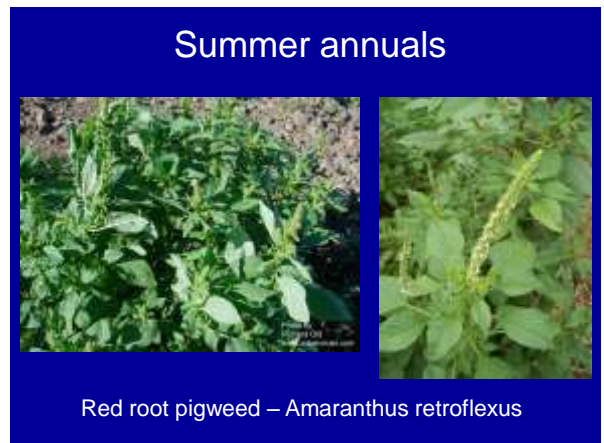


Brassica campestris
Field mustard
Winter/summer
annual



Summer annuals

- Germinate in the spring and summer
- Flower and seed by fall
- Compete with vegetable crops
- Slow germination, control to reduce competition and stop seeding.



Summer annuals



Lambsquarters *Chenopodium album*

Summer annuals



Crab grass – *Digitaria sanguinalis*

Barnyard grass
Echinochloa crus-galli
Annual



More summer annuals



Dog fennel or Mayweed
Anthemis cotula
Smells wretched



Pineapple weed
Matricaria matricaroides
Smells nice



Hairy nightshade *Solanum nigrum* Annual



Black nightshade *Solanum nigrum* Annual

Summer annuals



Petty spurge
Euphorbia peplus
Dermal toxicity - wear gloves



Biennials

- Germinate in spring-fall
- Overwinter as "rosette"
- Flower and seed next year in the late spring-summer and die
- Control rosette and stop seed



Bull thistle – *Cirsium vulgare*

Biennial rosette



Bull thistle
rosette in
winter

More biennials



Poison hemlock – *Conium maculatum*

More biennials



Wild carrot
Queen Anne's lace
Daucus carota



More biennials



Tansy ragwort – *Senecio jacobaea*
with rosette above



Tansy ragwort
Senecio jacobea
Biennial
Toxic to horses,
cattle, and humans
"Bad neighbor" plant



Cinnabar moth



St. John's Wort
Hypericum
perforatum
Perennial

Often confused at
bloom with Tansy
ragwort. Note leaf
shape and compare.

Hypericum perforatum



St. John's Wort
Hypericum perforatum
Perennial

An invasive biennial



Herb Robert – biennial and see
rosette in winter. *Geranium*
robertianum aka "Stinky Bob"



Bleeding heart
(herbaceous
perennial and not
seen in winter)
can be confused
with Herb Robert

Shiny geranium (Geranium lucidum)

- Likes sun/shade margin
- Winter/spring **annual**
- **Very invasive**
- No bad smell (unlike Herb Robert – aka Stinky Bob)
- Pull to keep from going to seed. Spot herbicide options to knock out seed set. Triclopyr, glyphosate, others as per label. Continued seed germination. Plant grass afterwards.
- A huge challenge and spreading fast!!



Shiny geranium

- Spreading rapidly in both natural sites and semi-managed landscapes. Sun/shade margins.
- Competitive planting – grasses and others
- Some herbicides were labeled in managed landscapes



Photo Bruce Newhouse

One more invasive biennial



Garlic mustard => see winter rosette.

Very competitive biennial that establishes in the understory of forests. It eliminates most of the native plants by crowding and chemical warfare

Annuals or biennials



Prickly lettuce
Lactuca serriola



Common mallow – *Malva neglecta*

Marestail (*Conyza canadensis*)

- Annual/biennial
- Native to eastern N. America but rapidly increasing in PNW.
- Windblown seeds can germinate after spraying
- Significant in some clearcuts and road margins



Marestail in clearcut



A word about herbicide resistance

- Inherited ability of a weed or crop biotype to survive a herbicide application to which the original population was susceptible.
- Example: Marestail plants that survive herbicides that normally control marestail are considered resistant plants.



Marestail (annual/biennial)

Weed characteristics that favor resistance

■ High reproductive capacity

■ Good seed dispersal

Horseweed
or Maretail
Conyza
canadensis
Summer annual/biennial



Nipplewort
Lapsana communis
Winter Annual or biennial
Margin sun/shade
Seeds heavily



Lapsana communis
Nipplewort



Perennials

- Woody – more landscape level problems
- Herbaceous (aboveground leaves die back) – common in gardens and wild areas. **Wandering or not.**
- In between (not woody but leaves don't die) – example false dandelion
- These are often our worst weeds in terms of control in gardens and landscapes
- Have to control roots and seed production

Woody perennials

- Tend to spread by bird/animal moved seeds.
- Some vegetative spread e.g. ivy and many others
- Control: physical removal (control sprouts), grazing, chemicals, bio-control.



Cutting without quickly treating the cut surface with an herbicide will create a thicket of sprouts and make the ultimate solution more difficult.

English Holly

Ilex aquifolium

Woody perennial

Woody perennials – English ivy



Very hard to control, even with chemicals. Persistent pulling.



Old man's beard

- *Clematis vitalba*
- Deciduous
- Wind moves seeds
- Vines root and climb
- Fall glyphosate treatments effective





Chris Aldassy, EMSWCD



Leo Michaels



Chris Aldassy, EMSWCD

Woody perennials – gorse and Scotch broom



Scotch broom



Gorse (note thorns)

Woody perennials - blackberries



Armenian blackberry



Evergreen blackberry

More woody perennials



Bittersweet nightshade
(semi-woody)
Solanum dulcamara



Purple loosestrife
Lythrum salicaria

Herbaceous perennials

- Tops die back
- New shoots each spring from roots/crown
- Very difficult weeds
- Continuous shoot removal, smother, chemicals



Hedge bindweed *Calystegia sepium*
aka Morning glory



More herbaceous perennials



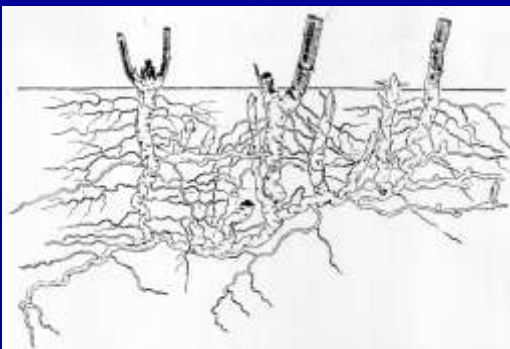
Horsetail *Equisetum arvense* Buttercup *Ranunculus repens*

Native: *Equisetum hyemale*





Canada thistle
Cirsium arvense
Perennial



Canada thistle
Cirsium arvense
Perennial



More herbaceous perennials



False dandelion
(Spotted catsear)
Hyphochaeris radicata
Perennial



Common or True Dandelion
Taraxacum officinale Perennial



Chicory *Cichorium intybus* Perennial



Broadleaf Dock
Rumex obtusifolius
Perennial



Curly Dock



Red sorrel
Rumex acetosella
Perennial



Red sorrel
Red Sorrel
Rumex acetosella
Perennial



Narrow leaf plantain
Plantago lanceolata
Herbaceous Perennial



Broad leaf plantain
Plantago major
Herbaceous Perennial

Northern willow herb
Epilobium ciliatum
 Perennial



Oxeye daisy
Leucanthemum vulgare

Slow spread by running root systems but also readily spread by seed.



Marchantia (liverwort)

- *Marchantia polymorpha* is the most common landscape or greenhouse liverwort species
- Found in the same areas as moss (shady, moist)
- Spread by spores (sexual) and small balls of cells (gemmae) formed on the plant
- There are male and female plants



More Marchantia

- Some homeowners find it objectionable, others find it interesting
- Can be a problem (and spread) in container nursery stock
- Vinegar treatment
- Keep soil or pot surface dry



Slide from Allland

Pearlwort

- *Sagina procumbens* – non-native Eurasian species
- Serious problem in nursery, turf and some landscape situations. Withstands close mowing
- Invasive in some natural areas (sea cliffs and other moist, sunny sites) where it competes with native *Sagina* species and other plants.



Pearlwort identification

- Can be confused with some moss species and corn spurry
- Very small plant with needle-like leaves
- In the “pink” (chickweed) family (so is spurry)
- Grows in mats
- Perennial (mostly)
- “Irish moss” (*S. subulata*) is a commercial species – not invasive



Pearlwort

- Small white flowers with green sepals larger than white petals
- Seed capsule
- Fairly deep taproot



Photo: G. D. Carr

Pearlwort reproduction

- Flowers from April to early October
- Each seed capsule contains 60+ very tiny seeds. Spread by equipment, feet, wind, etc.
- Seeds germinate in the early fall and early to mid spring. Some germinate in the summer in irrigated settings.
- Seeds live 8+ years
- Also reproduces by rooting from trailing shoots

Pearlwort management: landscapes

- Reduce moisture (and increase light) if possible to make it less comfortable
- Post-emergence: glyphosate (non-selective). May need repeat applications.



Viola species

- Several species – the most weedy ones are perennial
- Characterized by heart-shaped leaves and quarter-sized flowers in colors from white, yellow, blue, and purple.
- Most prefer shady locations (less competition) but can do well in very sunny sites and even dry sites.



Viola species

- Perennials reproduce by running rhizomes and seed
- Annuals just by seed
- Flower seed capsule droops to the ground, avoiding your mower



Viola management - Turf

- Mowing more often may help
- Strong turf may help exclude violets
- Hand removal of perennial species
- Chemical control: Spot spray with glyphosate and overseed. Auxin materials?



Violet management: landscape beds

- Hand removal
- Competitive plantings
- Spot spray carefully with labeled materials like glyphosate (non-selective) or triclopyr taking care to avoid damage to sensitive desirable plants.
- Learn to recognize and conserve our native wood violet (Johnny Jump-Up) *Viola glabella*



Sandmat (coastal area) *Cardionema ramosissimum*

- Native plant to the coastal dune and sandy areas, esp. in Long Beach area of Washington
- Very prickly
- Woody perennial
- Spreads by seeds and root pieces



What makes a plant invasive?



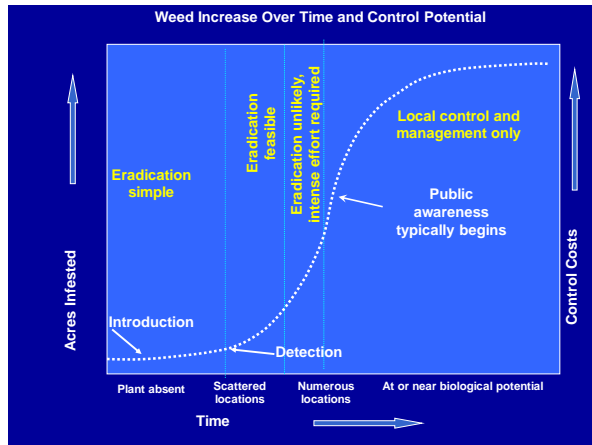
Key terms

Invasive: Can take over stable native landscapes, and may not need disturbance to get started.

Noxious: A more general term related to plants seriously injurious to crops, livestock, wildlife habitat, etc. It is part of the threat classification system for weeds.

Vegetable garden weeds may be obnoxious but not generally noxious or invasive.





Japanese knotweed complex: herbaceous perennials



Giant hogweed

- Plants top 12 feet
- High skin toxicity
- Spreads by seed and crown
- Usually found in clumps



Giant hogweed

- Reddish stem dots
- Dinner-plate sized umbels
- Manage by removing flowers and spraying the rest
- High on ODA's alert list



Yellow archangel

- Other names: aluminum or lead plant
- Invasive on forest floors
- Spreads with garden debris disposal
- Seeds and rooting runners



Lesser Celandine (Ranunculus ficaria)

- Buttercup family
- Bulblets
- Can tolerate shade
- Short growth and bloom cycle
- No controls work well except digging and sifting soil



Lesser Celandine (Ranunculus ficaria)





Italian arum

- Bulblets again
- No chemical treatment
- Slow spreader
- Very tenacious



The large view

- Prevention: Keep the plants out!
- Eradication: The plants are here but only a few of them. Complete elimination possible.
- Management: We lost. Now in damage reduction mode.

Prevention



Eradication: too late in the SE



Weeds and plant succession

- Weed flora derived from a complex mix of plant reproductive biology - what you started with in the seed/clone bank, what moves in and how they all compete.
- Landscape disturbances: natural, human engineered, or both
- Selection pressures lead to weed/plant population shifts



Lesser Celandine
Ranunculus ficaria

Selection pressure

We do various things that favor one plant type/species/group over another:

Mowing
Tilling
Burning
Herbicide use pattern
Plant material choices
Irrigation or not
Mulches
Timing of control activities
Etc.



Garlic mustard
Alliaria petiolata

Weed control options determined by

- Weed species present
- Botanical complexity of the landscape – what you want to save and stabilize versus what you want to remove.
- Tools that are available and affordable
 - mechanical
 - cultural
 - biological
 - chemical



Common Groundsel
Senecio vulgaris

Timing is everything: Stage of growth and control outcomes

- Impact on crop competition
- Control of seedlings
- Effect of growth stage on herbicide or other control tools effectiveness
 - Examples:
 - Glyphosate on woody perennials
 - Hot water/vinegar on seedlings vs established plants
 - Hoeing morning glory (carbohydrate starvation)
 - Mulching to suppress winter annual germination
 - Winter cover over beds

Mechanical weed control options

- Hand pull
- Hoe
- Chain saw
- Tractor
- Rototiller
- Flaming (may not be mechanical)



What can mechanical control achieve?

- Death of smaller plants
- Carbohydrate starvation of larger ones if very persistent
- Stop, maybe, seeding
- Reduce competition
- Excellent exercise



Tools



Hoe and a Hori Hori knife





Cultural control techniques

- A primary option for homeowners
- Collection of techniques that favor the plants you want versus their competitors
- Some techniques take planning ahead
- They include mulching, directed irrigation, competitive planting (inc. "right plant, right place"), transplants, solarization, etc. taken alone or in combination

Cultural control - mulching

- Suppresses seed germination
- Not useful on established herbaceous perennial weeds
- Adds organic matter over time
- Should be used a lot more often in the fall



Cultural control - solarization

- Cover a worked bed tightly with clear plastic in July
- Hope for 100 degree days
- Excellent on some weeds and weed seeds, poor on others
- Developed in Israel
- New work in nurseries



Cultural control – competitive plantings

- Leave few bare spots
- Use plants like daylilies, hostas, and woody materials
- As the landscape matures, the weed problems decrease



Cultural control - transplants

Helps control space in the vegetable garden or the flower bed

Transplanting done into weed-free surface.



Cultural control – zoned irrigation

- Water where your desirable plants are and not the rest of the area
- Weed growth won't be completely eliminated (rain, residual soil moisture, etc.) but will be greatly reduced.
- Annuals most affected, perennials, least.
- Drip irrigation is the most common technique

Biological weed management

Animals have been used for years for weed management, mainly goats, sheep, and geese.



Biological weed management

- Natural predators (diseases and insects) are sometimes released to help manage specific weeds over large areas.
- These projects require lots of bio-secure testing before they are approved.
- They will not eliminate a weed population but will weaken it and lower its adverse potential



Cinnabar moth & larva introduced for tansy ragwort suppression



Chemical management

- Organic and conventional herbicides
- Herbicides represent (by quantity) by far the largest amount of pesticides sold to homeowners.
- Since they are so widely used, it is crucial to know how herbicides work, their strengths, and their complications

Important herbicide terms

- Selective versus non-selective
- Contact versus systemic
- Soil persistent or not
- Foliar or soil applied
- Pre-emergent versus post-emergent

Selective herbicides

- A selective herbicide is active on a given class of plants but will not affect others.
 - Examples: "Weed and Feed", dichlobenil, trifluralin, fluazifop

You have to be very aware of the selectivity before you use a product. Always read and follow the label!

Broad spectrum products

- Some products listed as selective have a very narrow selectivity.
- A good example is Casoron (dichlobenil). It will affect almost anything coming up through the soil as a seedling or a shoot but will not generally damage established woody plants.

Non selective herbicides

- Have the capacity to injure or kill most plant species if applied at the right time
 - Examples: glyphosate (Roundup and others), soil sterilants like prometon.

Contact herbicides

- Contact herbicides injure the plant part (usually leaves) they are applied to but the chemical does not move much within the plant. Most "organic" herbicides are contact materials.
- Generally most effective on seedlings or young, poorly established plants.
- Usually not that effective on established annuals or woody or herbaceous perennial plants.

Systemic herbicides

- Usually, though not always, applied to leaves.
- Systemic herbicides are absorbed into the plant vascular system and moved throughout the plant
- Most conventional herbicides are systemic.

Soil versus foliar application

- Soil applied materials generally best on weed-free soil areas. Affect germinating seeds and emerging seedlings. Some products can affect root systems of established woody and herbaceous perennial plants. May have some foliar activity.
- Foliar materials use the leaves to capture and usually move an herbicide. Some largely foliar products may have some soil activity.

Pre versus post emergent

- Pre-emergent products generally applied to weed-free soil surfaces and affect new seed germination and early growth.
- Post-emergent products move through leaves to exert control.
- Some products have both pre and post emergent activity.

Always, Always, Always...

- **Read and follow the label instructions!**

Phenoxy herbicides

- Used for broadleaf control ("Weed & Feed" and others)
- Systemic and mostly foliar & post-emergent
- Won't damage established grass
- Some formulations volatile on hot days (>80 degrees). May move from application site and damage desirable plants.
- Common active ingredients: 2,4-D, mecoprop, mcpa, and dichloroprop

Dicamba

- Part of some lawn broadleaf control mixes
- Selective (won't generally damage grass)
- Mostly post-emergent but significant residual soil activity.
- Much greater potential for root uptake from soils. If overused, tree roots in lawns may pick it up and show aboveground tree damage.

Triclopyr

- Sold alone or mixed with 2,4-D (Crossbow)
- Used for herbaceous and woody broadleaf weed management
- Must go through foliage
- Very good on many brush species
- Little impact on grasses
- The ester formulations can be volatile on hot days. Avoid use on these days.

Glyphosate

- Active ingredient in Roundup and many other similar products
- Non-selective and must go through green tissue (immature stems or leaves)
- No residual activity once it hits soil
- Timing for control depends on species, growth stage, and weather factors

Dichlobenil (Casoron)

- Applied as a granule to weed-free areas.
- Only safe around woody plants – will damage grass, herbaceous broadleaves, bulbs, etc.
- Best used November through February just before a mild rain. Later applications should be covered with a mulch.
- Will control some tough herbaceous perennial weeds.
- Lasts a long time (no non-woody transplants for one year)

Trifluralin (Preen and others)

- Pre-emergent. Apply to weed-free soil.
- Won't generally damage established woody or herbaceous plants
- Best on germinating annual weeds, poor on perennial weeds.
- Read label carefully for specific plant comments. Transplant restrictions after application

Oryzalin

- Similar to trifluralin e.g. pre-emergent activity on annual grass and broadleaf weeds. Generally safe around established woody or herbaceous perennial plants.
- Not good on established perennial weeds.
- Restrictions on transplanting after application.

Sethoxydim and fluazifop

- Herbicides that affect established or seedling grasses but not broadleaf plants.
- Post-emergent use.
- Have slightly different profiles of which grasses they affect .
- “Grass-B-Gone” and other trade names

Plant oils

- Basis for a number of organic herbicides
- Contact herbicides that disrupt the waxy cuticle of plant leaves > dessication
- Non-selective
- Post-emergence
- Best on seedlings and annual weeds that are not yet flowering. Best applied on warm days.
- Coverage important.

Corn gluten meal

- Applied at the rate of 2 pounds/100 square feet and lightly worked in.
- Controls germinating seedlings of some plants annual broadleaf and grass species
- Soil surface should be allowed to dry somewhat after application
- Modestly effective

Vinegar

- What is sold for weed control is 20% acetic acid (store vinegar is 5%)
- Can damage eyes and skin
- Active on some plants, esp. seedlings
- Originally way oversold.
- How it sometimes works (or doesn't) is unclear.

Boiling water

- Effective on some seedlings and small established plants.
- Not too good on herbaceous perennials (they re-sprout like they do with other contact materials)
- Post-emergence
- Don't wear flip-flops when applying

Herbicide injury

- Generally unintended; sometimes malicious
- Symptoms vary with plants exposed and which products involved

Phenoxy type damage (2,4-D, dicamba, and others)



More phenoxy damage



Upward cupping of leaves on azalea. Common symptom with dicamba exposure.



Glyphosate (Roundup et al)



Yellowing of new growth is common symptom of glyphosate exposure.



Strapped leaves on maple due to Roundup.



Stunted, compact growth due to glyphosate.



Other implications of herbicide use

- Weed shifts (actually a consequence of any weed control technique, chemical or not)
- Herbicide resistance – is it likely in the home garden world? Why or why not?
- Soil biology issues – in some cases, maybe
- Others?



Marestail (horseweed) *Conyza canadensis* Summer annual

Be careful of some mixtures!

- Especially those that combine foliage absorbed materials with root absorbed materials. Read the label very carefully
- Example: glyphosate and imazapyr mix





In our soils, tree roots generally spread far beyond the drip line of the tree. This has implications for root absorbable herbicides. Problems after treating gravel driveways or lawns with tree roots under them.

How to manage specific situations without herbicides



Broad leaf weeds in lawns



Grass weeds in lawns



Weeds in vegetable gardens



Weeds in flower beds



Moss anywhere



Sprouting tree roots (including
zombie trees)



Bamboo

