

A photograph of a person wearing a backpack and a hat, standing in a dense field of green knotweed plants. The person is positioned in the lower center of the frame, facing away from the camera. The field is filled with large, heart-shaped leaves and tall, thin, yellowish-green flower stalks. In the background, there are large, moss-covered tree trunks and a dense forest canopy. The overall scene is a lush, green natural environment.

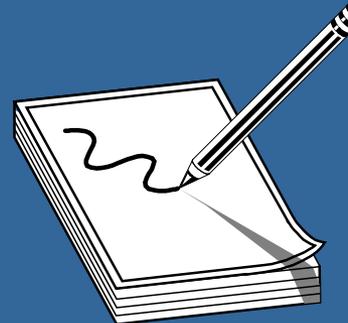
Much Ado About Knotweed

Presented by

Clallam County Noxious Weed Control Board

Topics

- What's a weed?
- Why are they successful?
- Botany 101-Lifecycles
- Control Methods
- Controlling Knotweed
- Other Resources
- Hands-on Training



What's Wrong with Weeds?

WEED = Plant out of Place

Compete for light, water, nutrients, space



What's Wrong with Weeds?

Impacts:

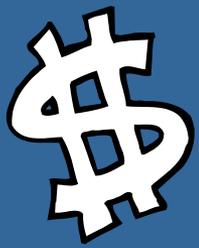
- Reduce crop value or production
- Pose hazard to humans and animals
- Poor Aesthetics
- Lower land values or decrease uses
- Reduce recreational uses
- Destroy wildlife habitat
- *Noxious Weeds can significantly alter ecological functions*



Garlic Mustard



Garlic Mustard damages forest



What's wrong with weeds?

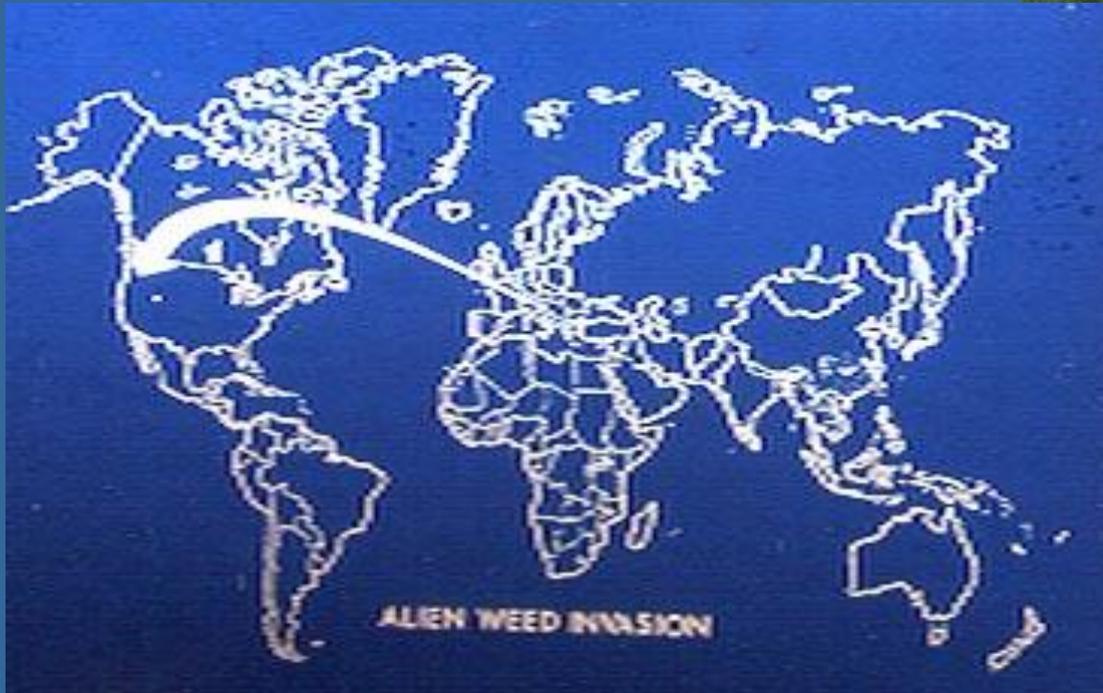
WEEDS COST YOU TIME, ENERGY, MONEY

- Weeds have an estimated cost to the nation's farmers, water quality and recreational areas of \$34.7 billion annually.

—Cornell University Study



Origin of Weeds



Noxious Weeds – Non-native, invasive plant species that are aggressive and difficult to control once established.

- Many are beyond agricultural problems
- Control may be required under State law.

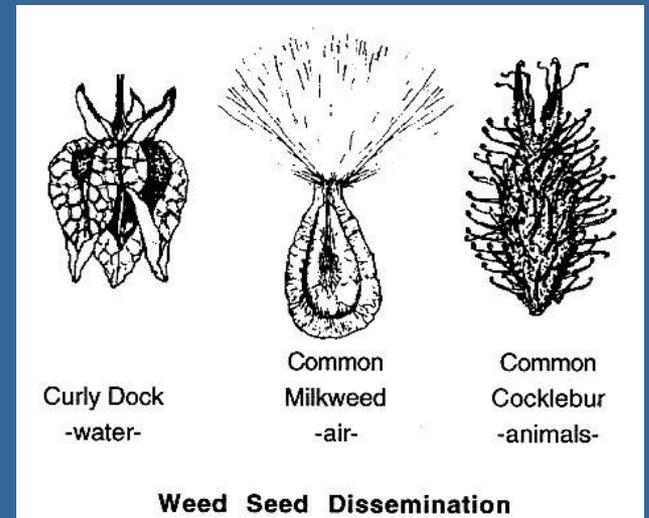
How Weeds Spread

- Humans and Human Activities
- Nature takes over

Water

Air

Animals



PEOPLE MOVE WEEDS!!

Weed Establishment and Persistence

- Adapted to many types of disturbance and adverse conditions
- Effective dispersal mechanisms that assure wide distribution
- Long lived seeds that can remain dormant in soil/Prolific seed production, growth rate
- Lack of natural checks/balances



How to stop weeds?

Know the plant

+

Interrupt life cycle

+

Limit access to resources

+

Learn, refine techniques

KILL!

Weeds of the West



KNOW YOUR WEED!!

Many resources-

- Master Gardeners
- Weed Board
- Conservation District
- Reference books
- Internet

County weed board: www.clallam.net/weed

State weed board:

www.nwcb.wa.gov/index.htm

Washington State Extension Service

<http://pep.wsu.edu/Hortsense/>

Element stewardship abstracts:

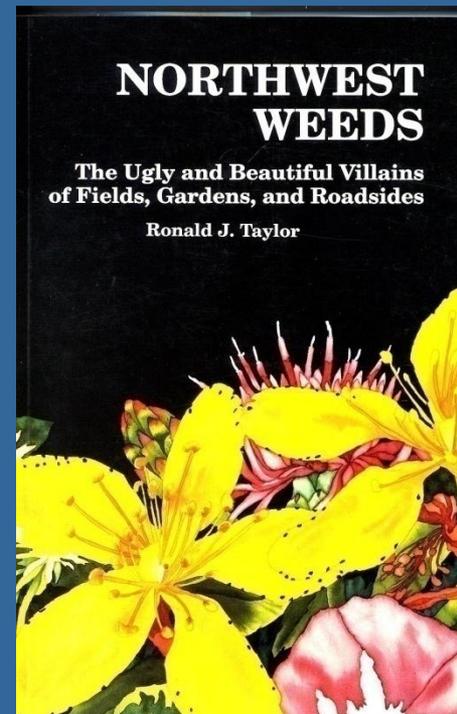
www.tncweeds.ucdavis.edu/esadocs.html

Center for Invasive Plant Management:

www.weedcenter.org

Cornell University:

www.ansci.cornell.edu/plants/index.html



Weeds by Life Cycles

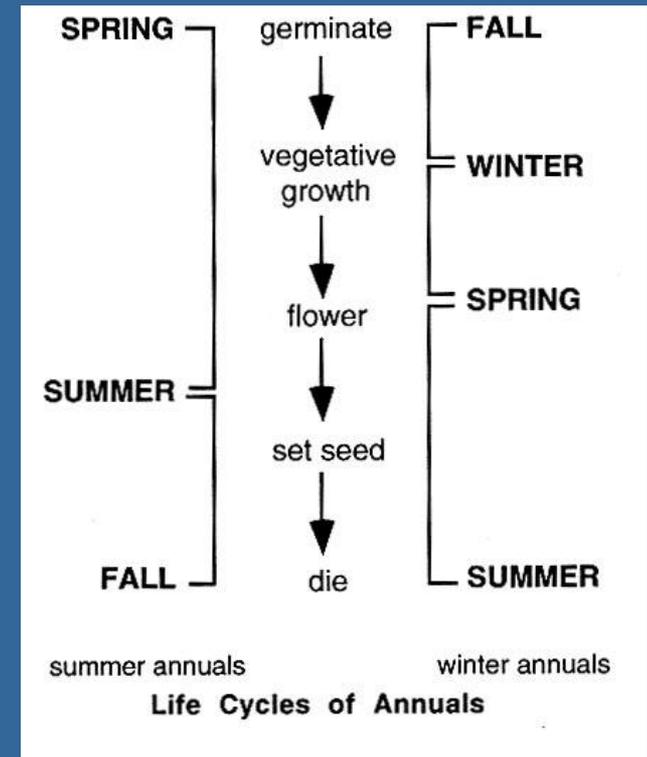
Annuals

Biennials

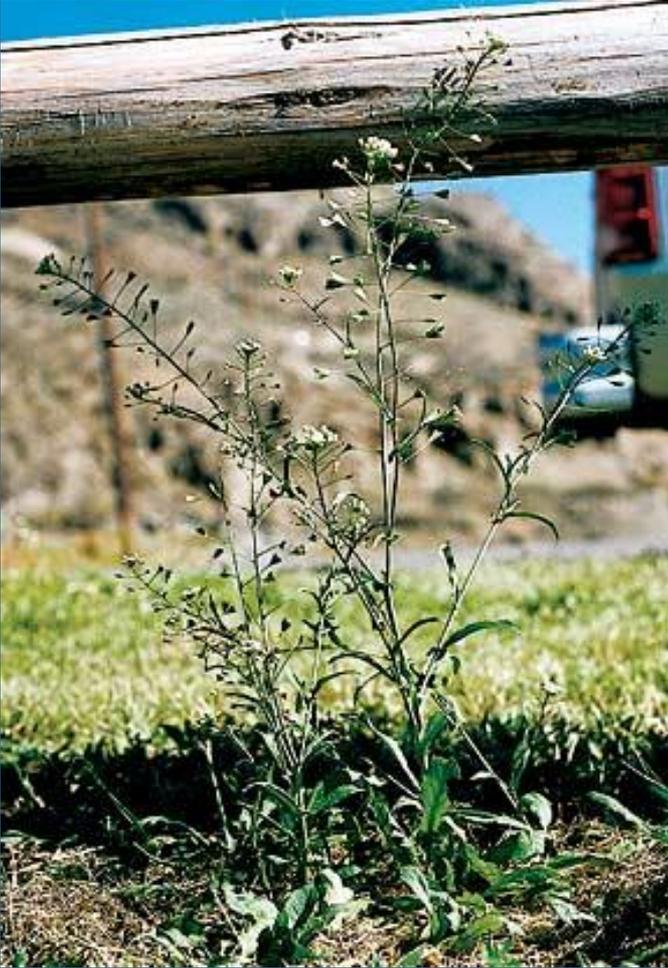
Perennials

Annuals

- Complete life cycle in 12 months or less.
- Two types- *winter* and *summer* annuals
- Problem as weeds: fast growing, high seed production, abundance of dormant seed
- **Strategy**: *Control seed production*



Common Annuals: herb Robert, hairy bittercress
chickweed, lambsquarters, mustards





Annual Weed Success

- Annual Weeds “win” because they are able to:
 - Make lots of seed, resulting in many individual weeds occurring at the same time
 - Even if only one weed/ft² survives out of perhaps 100 seedlings/ft², it can replenish the seed bank in a single season!
 - Often germinate (or emerge) more quickly than crop or desirable plants
 - Every cultivation brings buried seed to the soil surface where they can germinate

Weed Seed Germination

- Return of weed seed to field would result in:
 - Command + Basagran (PRE + POST)
 - 3 weeds/m² (12,000/acre)
 - Sencor (PRE)
 - 469 weeds/m² (1.9 million/acre)
 - Untreated check
 - 8055 weeds/m² (32.6 million/acre)

Biennials

- Complete life cycle in two years
- First year, plants form basal leaves (rosette),
- Second year, plant flowers, matures, and dies.
- Strategy: control seed production

Common Biennials:

Tansy ragwort

Bull thistle

Poison hemlock

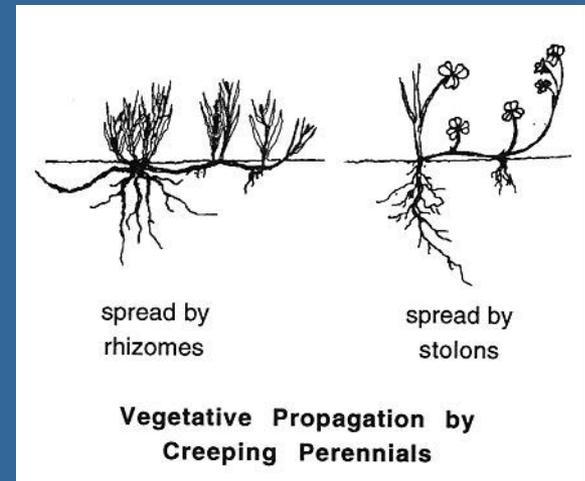




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Perennials

- Live more than two years or indefinitely
- Most spread by seed and vegetatively
- Two types, simple and creeping perennials
- Strategy: must control both seed and vegetative reproduction



Common perennials: Canada thistle, knapweeds, quack grass, invasive knotweeds





What do you think?



GARDEN



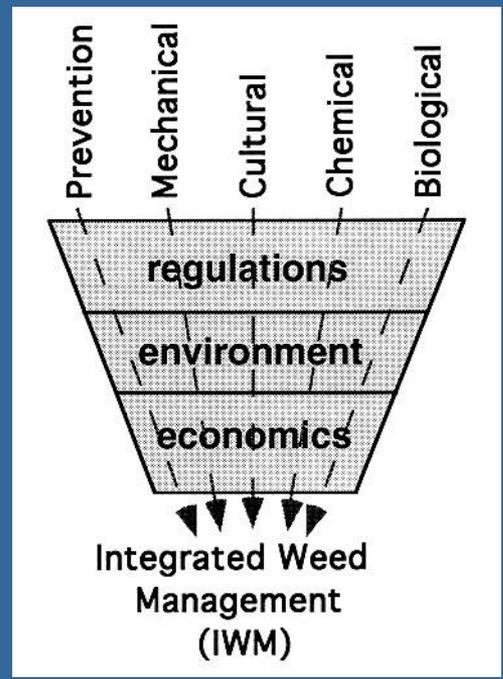
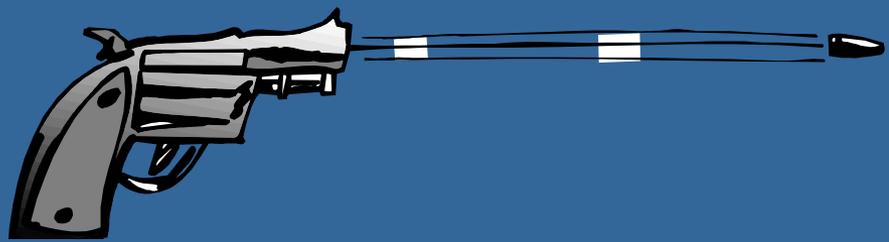
PERENNIAL BED



- What type of weed will dominate initially? **Annual, biennial, perennial?**
- What type of weed will be the biggest problem in the long term? **Annual, biennial, perennial?**

Integrated Weed Management

No Silver Bullet!!



Passive Management

- Planning
- Prevention
- Cultural
- Biological



Active Management

- Manual
- Mechanical
- Chemical



An ounce of prevention.....



Prevention



- Set goals-Plan-Be realistic
- Identify weeds/ sources/ tolerance
- Pinpoint underlying conditions-amend soil
- Site preparation/low maintenance design/weed barriers
- Use clean seed and materials
- Keep equipment clean
- Minimize bare ground
- Dispose of weeds properly
- Document actions and determine what works







THE ASSOCIATED PRESS

ighth consecutive All-Star game on Sunday.

an All-Star

nal week of fan voting
ers — Milwaukee out-
Ryan Braun overtook
ffey Jr. in the NL out-
rrieffey finished fourth
left off the team.
ielders Kosuke Fuku-
nd Soriano and rookie
Geovany Soto were cho-
start for the Cubs, who
he best record in the
Soriano has been out
broken left hand, but
turn in time to play.

well represented

Wood
s pitchers Kerry
yan Dempster and third
yan Aramis Ramirez and
an NL players, was
n by NL manager Clint
r Carlos Zambrano
by NL manager
e of Colorado.
s been a charmed season
e Cubs, trying in 100 years.
e Cubs, Series in 1936,
World Series in 1988 and the All-
before, in 1988 and the All-
t six players in the
Ortiz,

NL with 3,889,602.
The AL starting lineup:
Youkilis at first base, Pedroia at
second base, Jeter at shortstop,
Rodriguez at third base, out-
fielders Josh Hamilton of
Texas, Ichiro and Ramirez, and
Minnesota catcher Joe Mauer.
Starting for the NL: Hous-
ton first baseman Lance Berk-
man, Utley at second base,
Florida shortstop Hanley
Ramirez and Atlanta third
baseman Chipper Jones, with
Soriano, Fukudome and Braun
in the outfield. Soto will become
the first rookie catcher to start
for the NL.

"The beauty of it, the fans
got to vote eight, the players got
to vote 16, at the end of the day,
the challenges you have to make
this seat is you have to make
there's a "Hurdle said.
sure there's a "Hurdle starters
from each team for the starters
from voting day.
Fan Wednesday in the NL
ended Griffey was second Monday,
Griffey released about 167,000
balloting Braun by about 167,000
leading Braun by about 87,000
But long NL outfielders



Pickles



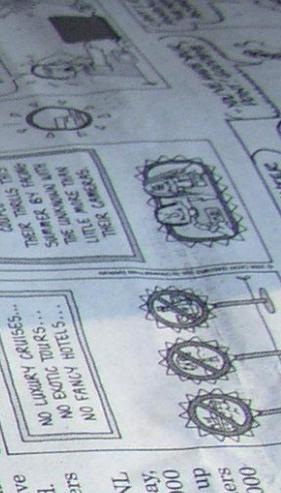
Frank & Ernest



Garfield



Cathy





SINCE 1954
SuperSoil
POTTING SOIL

Potting Soil
Tierra para macetas



Grow Bigger, More Beautiful
Plants & Flowers

Enriched with Plant Foods
Enriquecida con abonos
Ideal for Pots & Containers
Ideal para macetas y cestas

2
CUBIC FEET

2 CUBIC FEET (56.6 L)
19.5 x 30 x 30 in (50 x 76 x 76 cm)

SINCE 1954
SuperSoil
POTTING SOIL

Potting Soil



2
CUBIC FEET



TOP SOIL



CARPINITO FARMS

TOP SOIL

Excellent Growing Medium
for Lawns, Gardens and Flower Beds
Nursery Shrubs and Ornamentals
Repairing and Patching Lawns
Loosens Clay and Hard Soils
Extremely Rich & Drought Tolerant

TOP SOIL



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Extremely Rich & Drought Tolerant

One Cubic Foot

TOP SOIL







Let your planting
do the work!

Cultural

Healthy plantings resist weeds!!

- Use resistant or competitive, site-appropriate plants-think native
- Plant at the best time, bigger plants fill in faster
- Maintain proper water and nutrients levels
- Plant closely or between rows, apply mulch
- No bare ground- non-invasive ground covers
- Rotate crops, use cover crop

Biological

- Good for large scale problem or hard to reach sites

➤ Animals

➤ Insects



- Appropriate population establishment may be slow or difficult

- Will suppress the problem-not eliminate it



NEW MANUAL!

Targeted
Grazing

A natural approach to vegetation management



<http://www.cnr.uidaho.edu/rx-grazing/Handbook.htm>

Biological



Chicken tractor
Rabbit tractor?





Kill 'em when they're young!

Manual/Mechanical

Do It Early and Do It Often!!



➤ **Flaming*** - often kills annuals, suppresses some perennials: hand-held flamers may be great for hard-to-reach spots like fence lines or ditches. Best on seedlings and young plants (before true leaves). *Restrictions may apply.



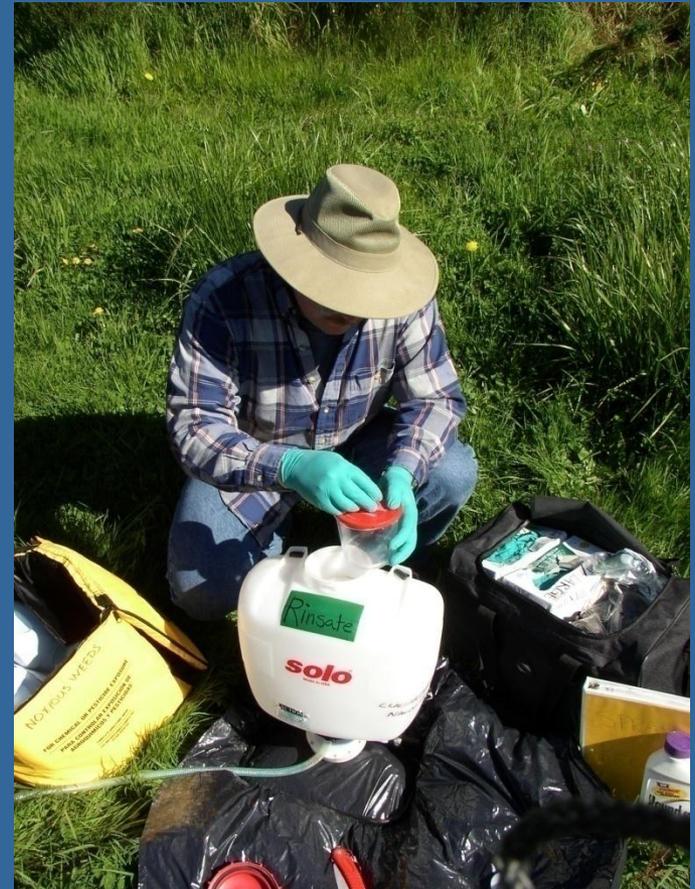


When to bring out the big hammer?

Depends on the scope of the problem.

Chemical

- Site
- Modes of action
- Weather conditions
- Timing
- Careful measurement and application
- Tools
- Regulated
- Expensive?

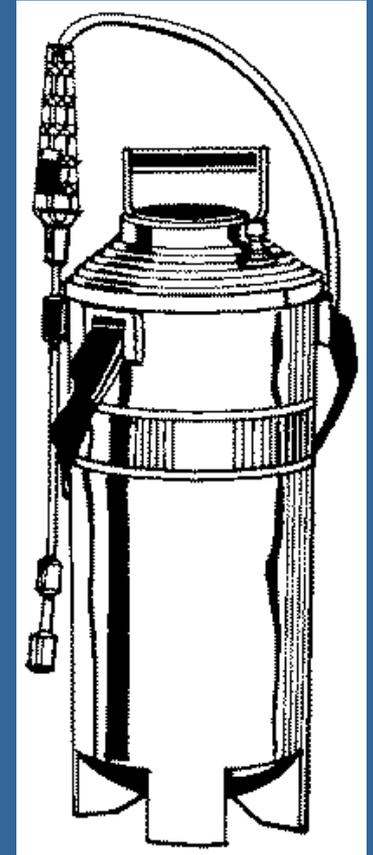


Choosing

To select the best herbicide for a particular weed you must understand how herbicides:

- enter and move in plants
- kill or control plants
- can be used to kill only targeted weeds, not the crop or other plants

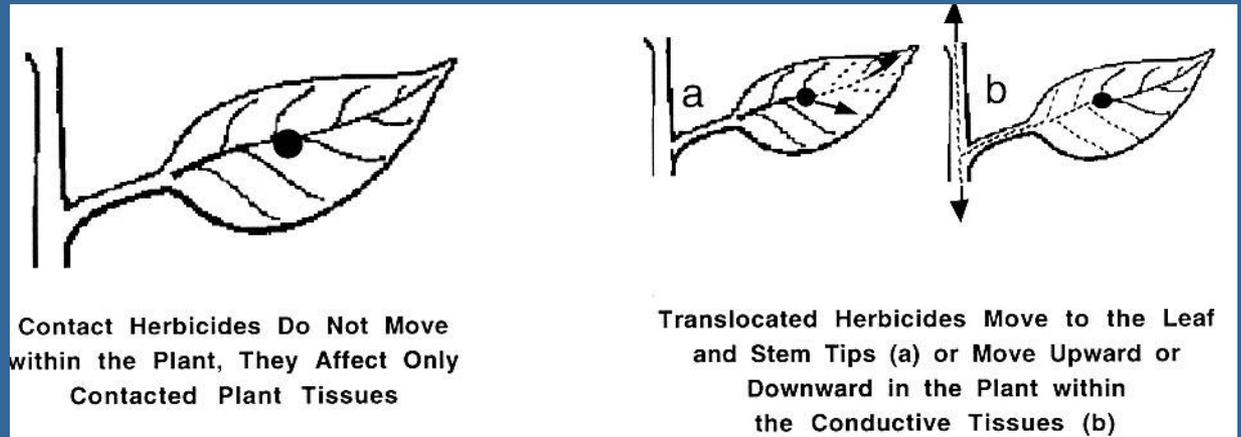
Be mindful of residual effects



GOAL: TO GET THE JOB DONE WITH THE LEAST IMPACT

Contact vs. Translocated

- Contact herbicides are applied to foliage and kill only plant parts touched. Non-selective and fast acting, good for annuals.
- Translocated herbicides are absorbed through foliage, shoots, or roots and move throughout plants. Injury takes awhile to show, some are selective, good for perennials.



Modes of Action

- Growth regulators disrupt hormone balance and protein synthesis. Selectively kills broadleaves, usually translocated through foliage. E.g. 2,4-D, Garlon
- Amino Acid Synthesis Inhibitors prevent the production of amino acids. Non-selective, translocate usually from foliage. E.g. Roundup
- Lipid Inhibitors-prevent production of fatty acids needed for cell membrane. Selectively kill grasses, translocate through foliage.
- Seedling Growth Inhibitors-interfere with new plant growth.
- Photosynthesis inhibitors interfere with photosynthesis. Usually applied pre-emergence, in well established perennial plantings, water moves chemical into contact. E.g. Casaron
- Cell membrane disrupters-non-selective, contact herbicides, good for annual weeds. E.g. Finale
- Pigment Inhibitors prevent plants from forming chlorophyll. E.g. Amitrol

Residual Effects

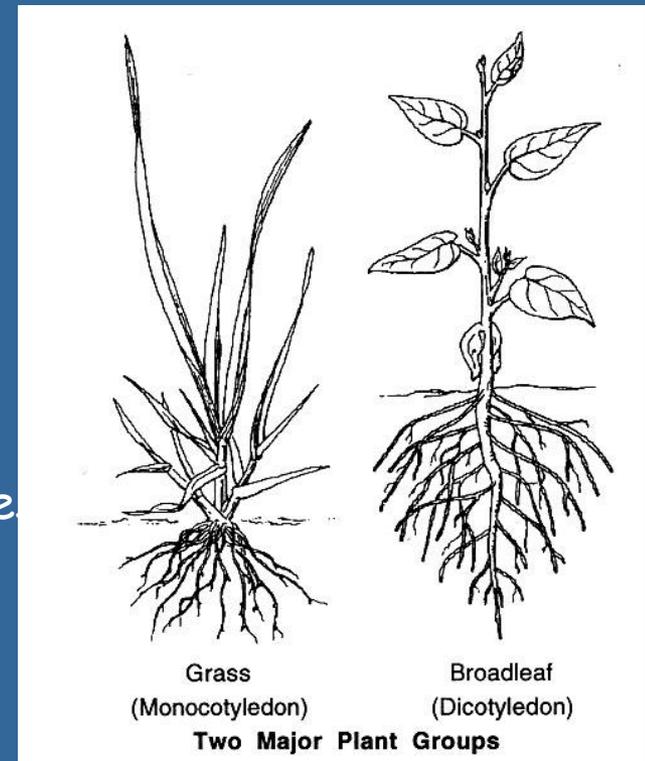
- What is a half-life?
- How long does the herbicide last?
- Pro-Might last long enough to kill weeds not evident during application or work through soil to get at roots
- Con-Might affect new plantings
- Look on the label!

Weed Classification by Structure

- Two major plant groups when classified by *structural characteristics*

monocots- (grasses and sedges)-one seed leaf, leaves narrow, veins parallel to leaf edges

dicots- (broadleaf plants)- two seed leaves, leaves broad with netlike veins



Selective vs. Nonselective

Selective herbicides control weeds while doing little or no damage to the crop.

Non-selective herbicides kill or control almost all plants.

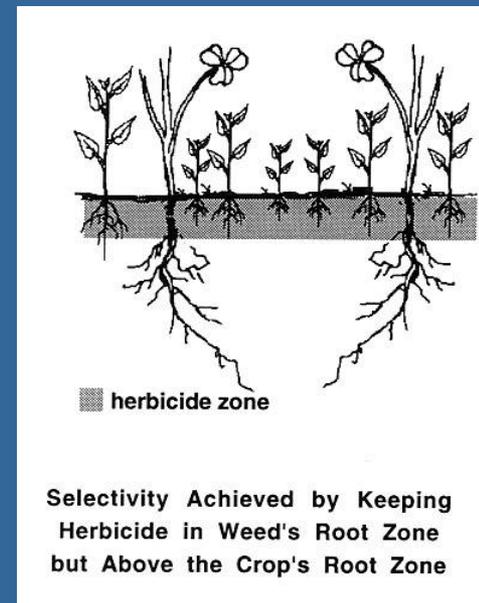
Factors:

Plant factors

- Structure-(waxy, hairy)
- Plant physiology-(species, life cycle)

Chemical and Application Factors

- Application Rate
- Formulation, use of adjuvant
- Application Timing and/or Method





Labels can be confusing!

It's all in the Label!

- Right place -chemicals may only be used on type of site or crop for which they are registered
- Right kind -choose type of chemical that will work for your situation and plant species
- Right time -consider the weather conditions and the biology of the plants you wish to control
- Right amount -more is NOT better

Recommendations: PNW Handbook, WSU- <http://pep.wsu.edu/Hortsense/>

Information Center Online: <http://picol.cahe.wsu.edu/LabelTolerance.html>

Sample Labels: www.greenbook.net

What's in a name?

Names

- Brand name
- Common name
- Scientific name

Signal Words

- Danger-Poison
- Danger
- Warning
- Caution

SPECIMEN LABEL. Database and format copyright

Dow AgroSciences

Stinger*
Herbicide

For selective postemergence control of broadleaf weeds in asparagus, Christmas tree plantations, tree plantations, fallow cropland, field corn, grasses grown for seed, mint, sugar beets, wheat, barley and oats not underseeded with a legume, conservation reserve program (CRP) acres, non-cropland, and rangeland and permanent grass pastures

Active Ingredient:

clopyralid: 3,6-dichloro-2-pyridinecarboxylic acid, monoethanolamine salt	40.9%
Inert Ingredients:	59.1%
<hr/>	
Total	100.0%

*Trademark of Dow AgroSciences LLC

Acid Equivalent:

clopyralid: 3,6-dichloro-2-pyridinecarboxylic acid—31% (3 lb/gal)
EPA Reg. No. 62719-73

KEEP OUT OF REACH OF CHILDREN
CAUTION/PRECAUCION

Site-must
be listed!

Active Ingredients

Hazards

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

Causes Eye Injury • Harmful If Inhaled Or Absorbed Through Skin

Avoid contact with eyes, skin, or clothing. Avoid breathing spray mist.

Personal Protective Equipment (PPE)

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Waterproof gloves
- Shoes plus socks

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

User Safety Recommendations

Users should:

- Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.

First Aid

If in eyes: Flush with plenty of water. Get medical attention if irritation persists.

If on skin: Wash with plenty of soap and water. Get medical attention.

Environmental Hazards

Do not contaminate water when disposing of equipment washwaters. Do not contaminate water used for irrigation or domestic purposes. Do not apply directly to water, to areas where surface water is present, or to intertidal areas below the mean high water mark.

Clopyralid is a chemical which can travel (seep or leach) through soil and under certain conditions contaminate groundwater which may be used for irrigation or drinking purposes. Users are advised not to apply clopyralid where soils have a rapid to very rapid permeability throughout the profile (such as loamy sand to sand) and the water table of an underlying aquifer is shallow, or to soils that would allow direct introduction into an aquifer. Your local agricultural agencies can provide further information on the type of soil in your area and the location of groundwater.

Physical or Chemical Hazards

Do not use or store near heat or open flame.

Notice: Read the entire label. Use only according to label directions. **Before buying or using this product, read "Warranty Disclaimer" and "Limitation of Remedies" elsewhere on this label.**

In case of emergency endangering health or the environment involving this product, call 1-800-992-5994. If you wish to obtain additional product information, visit our web site at www.dowagro.com.

Agricultural Chemical: Do not ship or store with food, feeds, drugs or clothing.

Personal Protection Equipment

Storage and Disposal

Agricultural Use Requirements

Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific instructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE) and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard.

Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 12 hours.

PPE required for early entry to treated areas that is permitted under the Worker Protection Standard and that involves contact with anything that has been treated, such as plants, soil, or water, is:

- Coveralls
- Waterproof gloves
- Shoes plus socks

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

Storage: Store above 28°F or warm to 40°F and agitate before use.

Pesticide Disposal: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

Metal Container Disposal: Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

Plastic Container Disposal: Do not reuse container. Triple rinse (or equivalent). Puncture and dispose of in a sanitary landfill, or by incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

General info

General Information

Stinger* herbicide is recommended for selective, postemergence control of broadleaf weeds in asparagus, barley, oats and wheat not underseded with a legume, Christmas tree plantations, fallow cropland, field corn, grasses grown for seed, mint (spearmint and peppermint), sugar beets, cottonwood/poplar and eucalyptus tree plantations, rangeland and permanent grass pastures, conservation reserve program (CRP) acres, and non-cropland areas including fence rows, around farm buildings, and equipment pathways.

General Use Precautions

Use directions in Dow AgroSciences supplemental labeling may supersede directions or limitations in this labeling.

Advisory: In California, the maximum application rate for Stinger is $\frac{2}{3}$ pint per acre per growing season.

Do not contaminate irrigation ditches or water used for irrigation or domestic purposes.

Do not apply by aircraft unless otherwise permitted by specific use directions or supplemental labeling.

Do not use in greenhouses.

Chemigation: Do not apply this product through any type of irrigation system.

Retreatment is allowed, but do not apply more than the maximum allowable rate per crop growing season. An application to fallow cropland preceding or following an application to dryland small grains (wheat, barley or oats) is allowed, but is not allowed preceding or following an application to irrigated small grains.

Do not transfer livestock from treated grazing areas to sensitive broadleaf crop areas without first allowing 7 days of grazing on an untreated pasture. Otherwise, urine may contain enough clopyralid to cause injury to sensitive broadleaf plants.

Residues in Plants or Manure: Do not use plant residues, including hay or straw from treated areas, or manure from animals that have grazed or consumed forage from treated areas for composting or mulching where susceptible plants may be grown the following season. Do not spread manure from animals that have grazed or consumed forage or hay from treated areas on land used for growing susceptible broadleaf crops. To promote herbicidal decomposition, plant residues should be evenly incorporated or burned. Breakdown of clopyralid in crop residues or manure is more rapid under warm, moist soil conditions and may be enhanced by supplemental irrigation.

Advisory (Avoid Movement of Treated Soil): Avoid conditions under which soil from treated areas may be moved or blown to areas containing susceptible plants. Wind-blown dust containing clopyralid may produce visible symptoms, such as epinasty (downward curving or twisting of leaf petioles or stems), when deposited on susceptible plants, however, serious injury is unlikely. To minimize potential movement of clopyralid on wind-blown dust, avoid treatment of powdery dry or light sandy soils until soil is settled by rainfall or irrigation or irrigate shortly after application.

Avoiding Injury to Non-target Plants

This product can affect susceptible broadleaf plants directly through foliar contact and indirectly by root uptake from soil in treated areas. Do not allow spray drift to come in contact with vegetables, flowers, tomatoes, potatoes, beans, lentils,

Alternatives

➤ **Corn Gluten**

➤ **Vinegar Solutions**

➤ **Herbicidal Soaps
or Essential oils**

www.gardensalive.com

www.aenews@wsu.edu

www.harmonyfarm.com

www.finegardening.com

Organic Farming

- Know the current rules about what you can and cannot do
- Where weed infestations are severe, consider using chemical control prior to receiving certification
- Know the current market value of your crop

Tools

- Back pack
- Spray bottles
- Wipers
- Injectors

Sprayers



Wipers



Injectors





Knotweeds

(Polygonum.spp)

- Imported from Asia
- Environmental damage
- Property damage

S

(Polygonum.spp)



- Bamboo-like hollow stems
- Spikes of white flowers
- Extensive roots!



- 4 species

Japanese

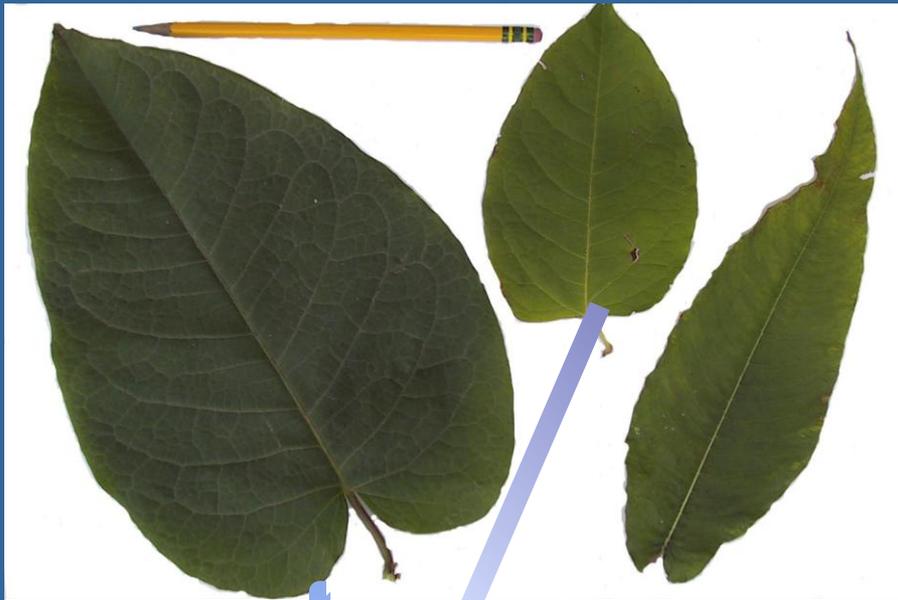


Giant



Himalayan



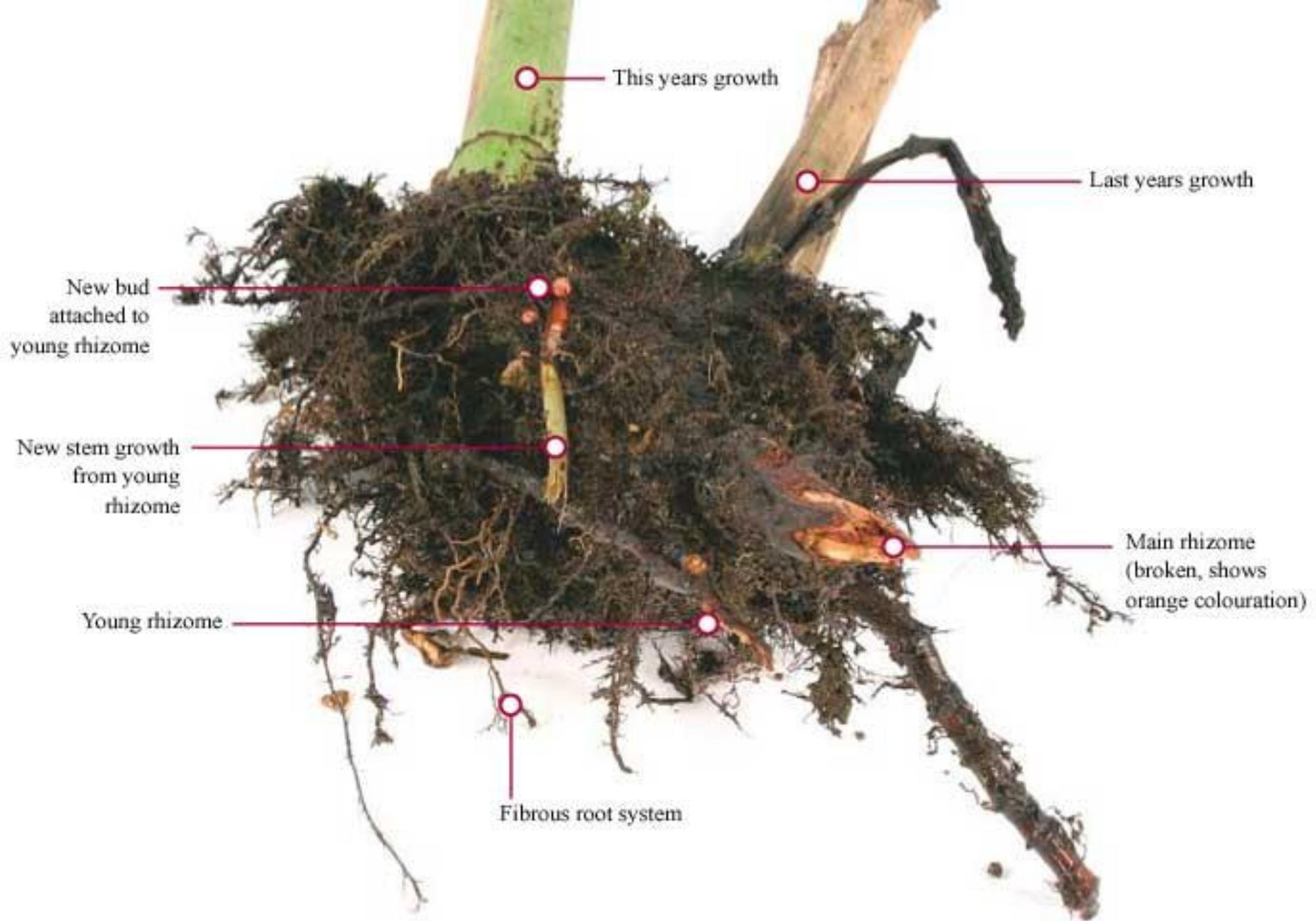


Giant

Japanese

Bohemian (a hybrid)





How knotweed grows and spreads (<http://www.knotweed.co.uk>)



Knotweed can
grow from stem
fragments

Or from
tiny root
fragments-
as small
as 1/2 in.

3/28/06
5:30 pm

3/29/06
4:20 pm

3/29/06
10:00 AM

3/30/06
7:50 am

3/31 6:50 am

3/31
10:15 AM

3/25/06

10:00 AM



WEED
ROL



Knotweed



Root mass



12 days later





Plants and Streams

- Shade water
- Add nutrients
- Filter pollutants
- Influence structure
- Deflect energy
- Bank stabilization
- Habitat diversity











**Knotweed
does NOT
reduce bank
erosion**



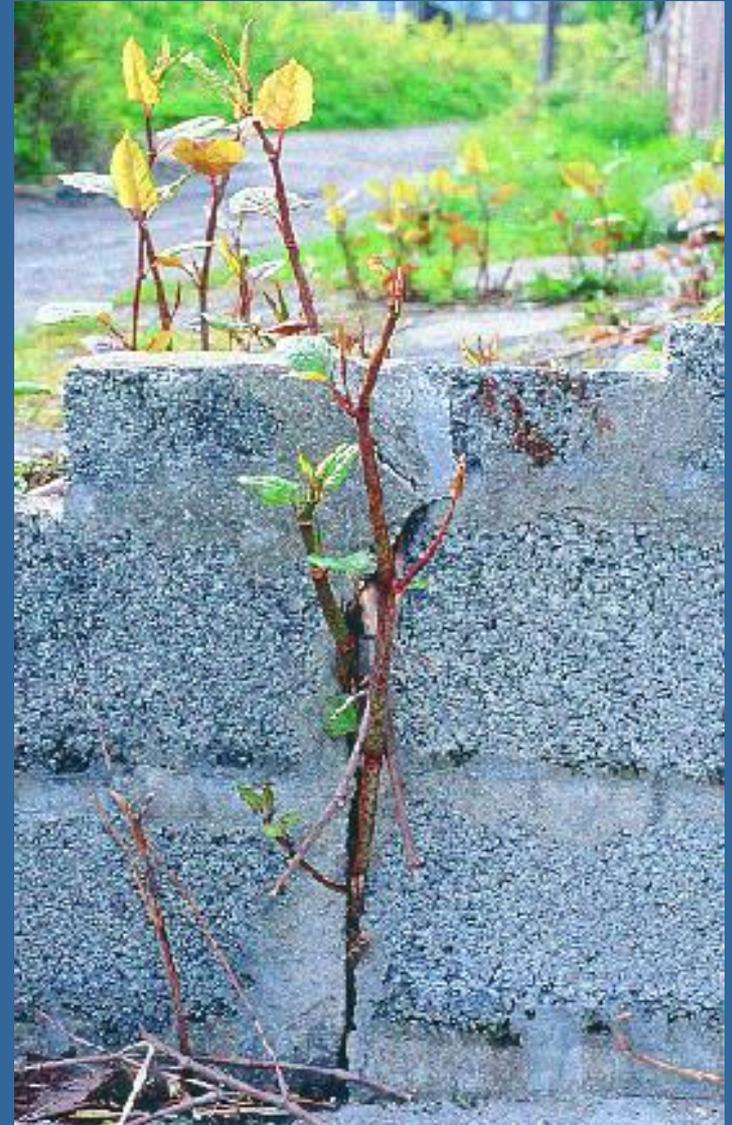
Knotweed Beaver Dam





severe property damage





Knotweed can easily
grow through asphalt
and concrete

Sekiu





20 10:31 AM



20 10:00 AM



2005 5 17



Non-herbicide

Only in places easy to get to and maintain

- Cutting-only for very small patches, cut every 2 weeks from April until October or plants dying back
- May take 3-7 years
- Smothering-cut knotweed to the ground
- Loosely spread geotextile or heavy landscape fabric 15 -20 feet past edge of patch-secure with rocks
- Stomp every two weeks, keep clear of debris
- Leave in place 5-7yrs

Knotweed Control: Shade Cloth



Landscape fabric installed after cutting knotweed, staked and roped to secure. Note new sprouts coming up through holes.

Digging-For very small patches only, dry uplands 5-7 yrs- very careful disposal



Using Herbicides

Timing

Treat when mature

-flowering up to just before die back-

Can cut in spring, but wait until late summer, early fall to treat

In general herbicide applications are best prior to mechanical or manual treatments,
not vica versa

Procedure

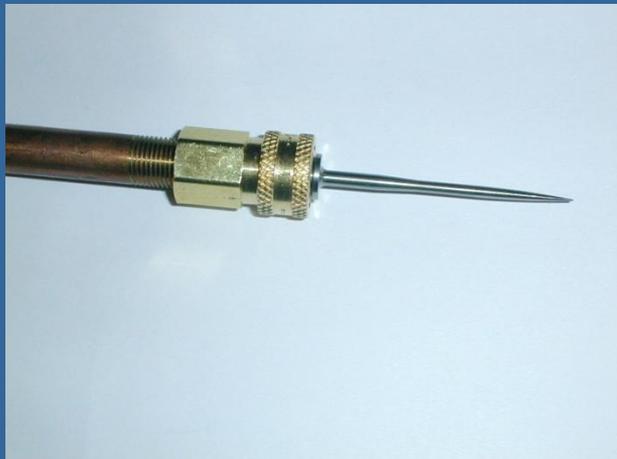
Large plants >1/2 in. diameter

- Injection-JKInjector guns
- Glyphosate-3 mls/cane, undiluted
- No more than 2000 canes/acre

Injection



Injector guns







Marking stems



Application Problems



Cane splitting



Small canes

Procedure

Smaller plants <1/2 in. diameter

- Foliar spray-backpacks or liter sized containers
- 4% Glyphosate, 1% Imazapyr, 1% surfactant
- Uniform coverage
- Wipe-see instruction sheet for formula

Foliar Applications



Spray



Wipe

Check out and Return

- Attend a class-check out from several locations
- Triple rinse any equipment-spray out rinsate on site where it won't harm desirable plants
- Rinse off the outside of equipment
- Dunk guns in bucket of lightly soapy water-let dry
- Return promptly-tell us about equipment problems
- Let us know how it went! How much treated, etc.

Are there others?

Things to think about:

- Does it self seed or spread easily?
- Is it out-competing other plants?
- Does it form a monoculture?



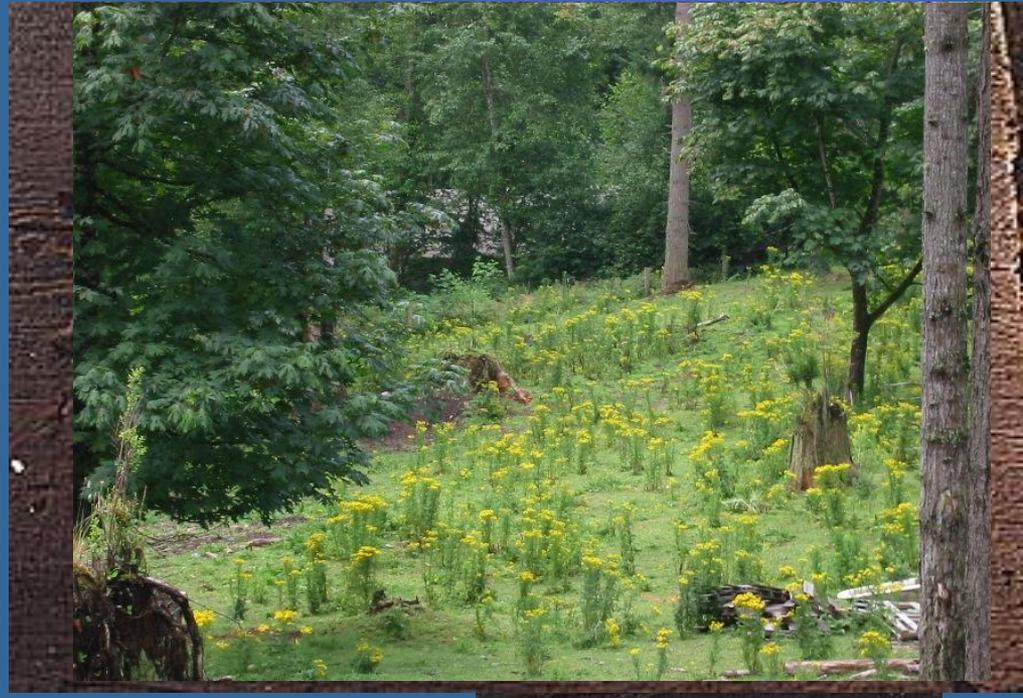
True Origin of Weeds



Crossing paths on their respective journeys of destiny, Johnny Appleseed and Irving Ragweed nod "hello."

People Move Weeds!!

- Sneaky Hitchhikers
- Contaminated Soil
- Poor Land Management
- Development
- Ornamentals on the Loose
- Mother Nature takes over!





Holy
Hogweed
Batman,
what
should we
do?

Avoid "over achievers"



Go native!



Sue Palmer
2006



Become the expert! Watch for new plants or "suspicious" plant behavior



Yellow archangel
(*Lamiastrum galeobdolon*)
dominating forest understory



False brome (*Brachypodium sylvaticum*)
In Oregon, moving into Washington

Look what the dog dragged in





Choose weed-free bird seed

Use weed free compost materials and mulch





Keep equipment weed free

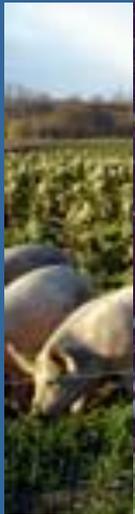
GET INVOLVED!

- Become the expert
- Spread the word
- Be a weed watcher
- Become a volunteer
 - ✓ Eurasian watermilfoil project
 - ✓ Burnt Hill elk habitat restoration
 - ✓ Knotweed control
 - ✓ Weed pulls



- 
- A large red barn with a white cupola on a green field with mountains in the background. The barn is the central focus, with a white cupola on top. The field is lush green, and the mountains in the background are blue and hazy. The sky is blue with white clouds.
- Set GOAL!-Be realistic about resources
 - Positive ID-interrupt life cycle
 - Determine tolerance-Creating an unnatural system?
 - Correct underlying conditions
 - Prevention, early detection and action
 - Combinations better than single strategy
 - Edges are most difficult to manage
 - Healthy plantings resist weeds
 - Clean practices/Proper disposal
 - Be chemical-fertilizer wise-use as appropriate
 - Persistent follow up! Evaluate, fine tune

Ultimate Goal: Minimize Weed Impacts, Maximize Land Uses and Values



Ultimate Goal: Protect Natural Resources



NEVER GIVE UP RD



DEAD END

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QUESTIONS?

