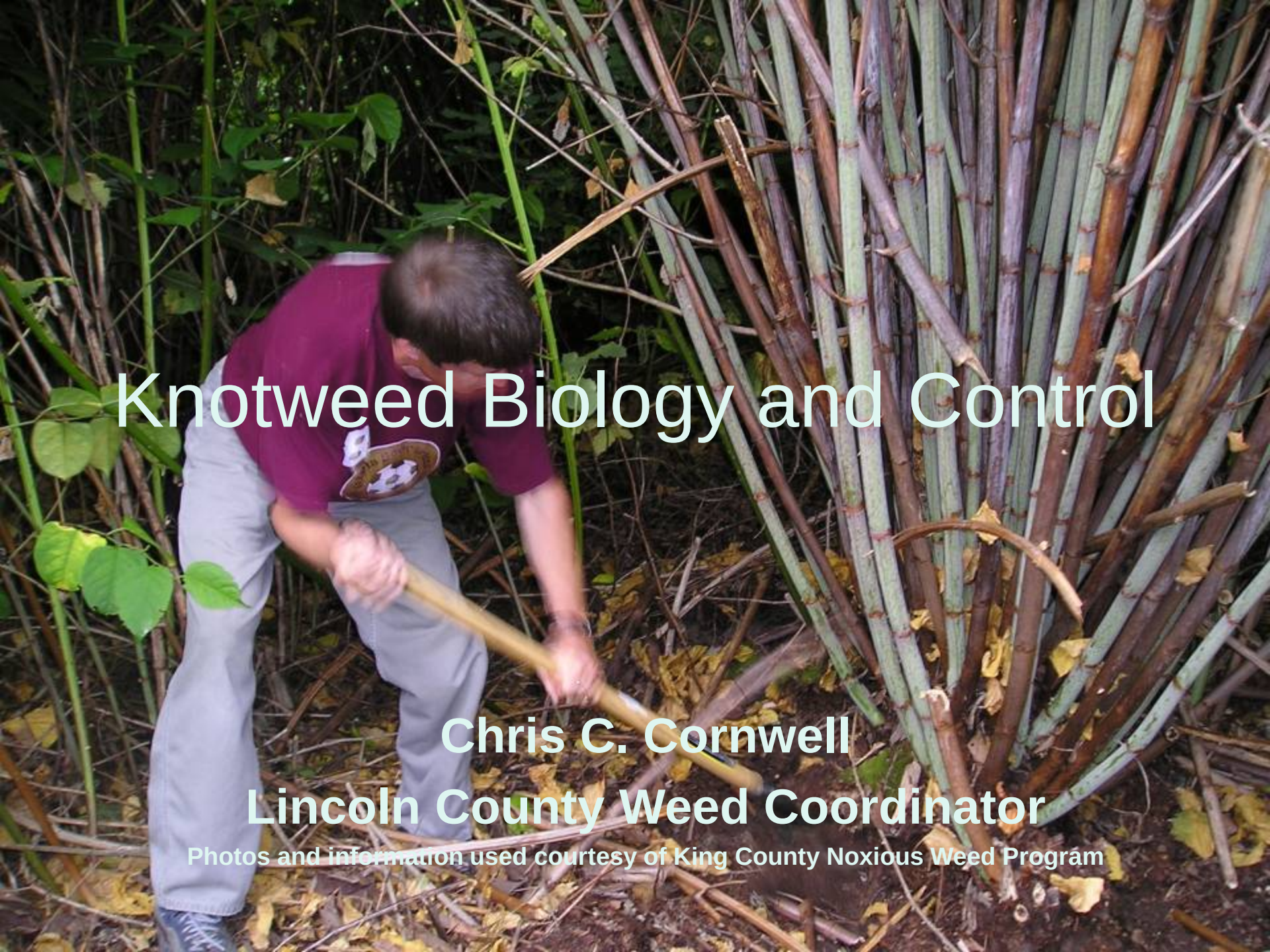

Knotweed Biology and Control

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Lincoln County Weed Coordinator

Photos and information used courtesy of King County Noxious Weed Program

Acknowledgements

- Information in this presentation is based partly on:
  - **Controlling Knotweed (*Polygonum cuspidatum*, *P. sachalinense*, *P. polystachyum* and hybrids) in the Pacific Northwest**
    - by Jonathan Soll, The Nature Conservancy, 1/16/2004
- Control recommendations and other details have been adjusted based on current information and the field experiences of our program and others in Washington State
- For more details please see the original document at http://tncweeds.ucdavis.edu/esadocs/polybohe.html

Why Worry About Knotweed?

- Originally planted as an ornamental in the United States and Europe but now considered one of the worst invasive plants in riparian habitats
- We have miles and miles of valuable riparian and wetland habitat that are vulnerable to knotweed invasion
- It is one of the most difficult plants to eradicate growing in some of the most sensitive habitats

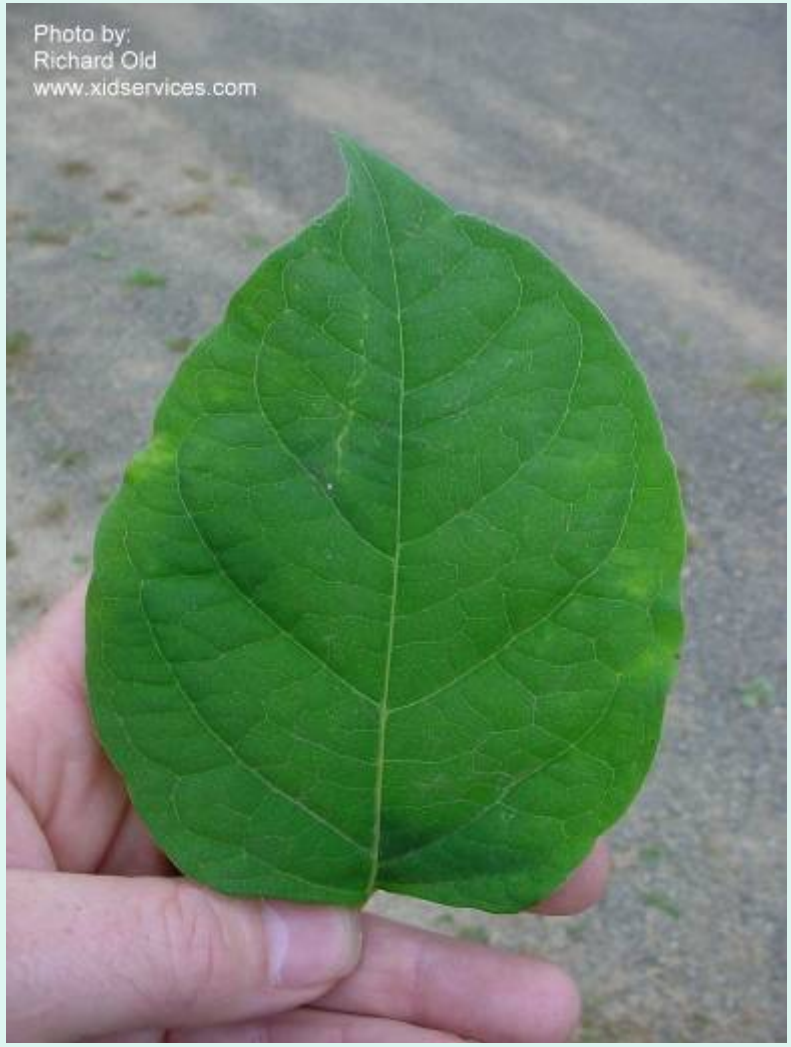
Knotweed infesting a remote area

What is Knotweed?

- Tall, robust plants from Asia in the buckwheat family (*Polygonaceae*)
  - Japanese knotweed (*Polygonum cuspidatum*, *Fallopia japonica*, *Reynoutria japonica*)
  - giant knotweed (*P. sachalinense*)
  - Bohemian knotweed hybrid (*P. X Bohemicum*)
- Other common names:
  - elephant ear bamboo
  - false bamboo
  - Mexican bamboo
  - fleeceflower

Japanese Knotweed (*Polygonum cuspidatum*)

- Grows to 6 feet usually, sometimes much larger
- Leaf bases are flat, not heart-shaped
- Most clones in US are female (will have seeds later in season)
- Flower clusters are longer and more ornamental



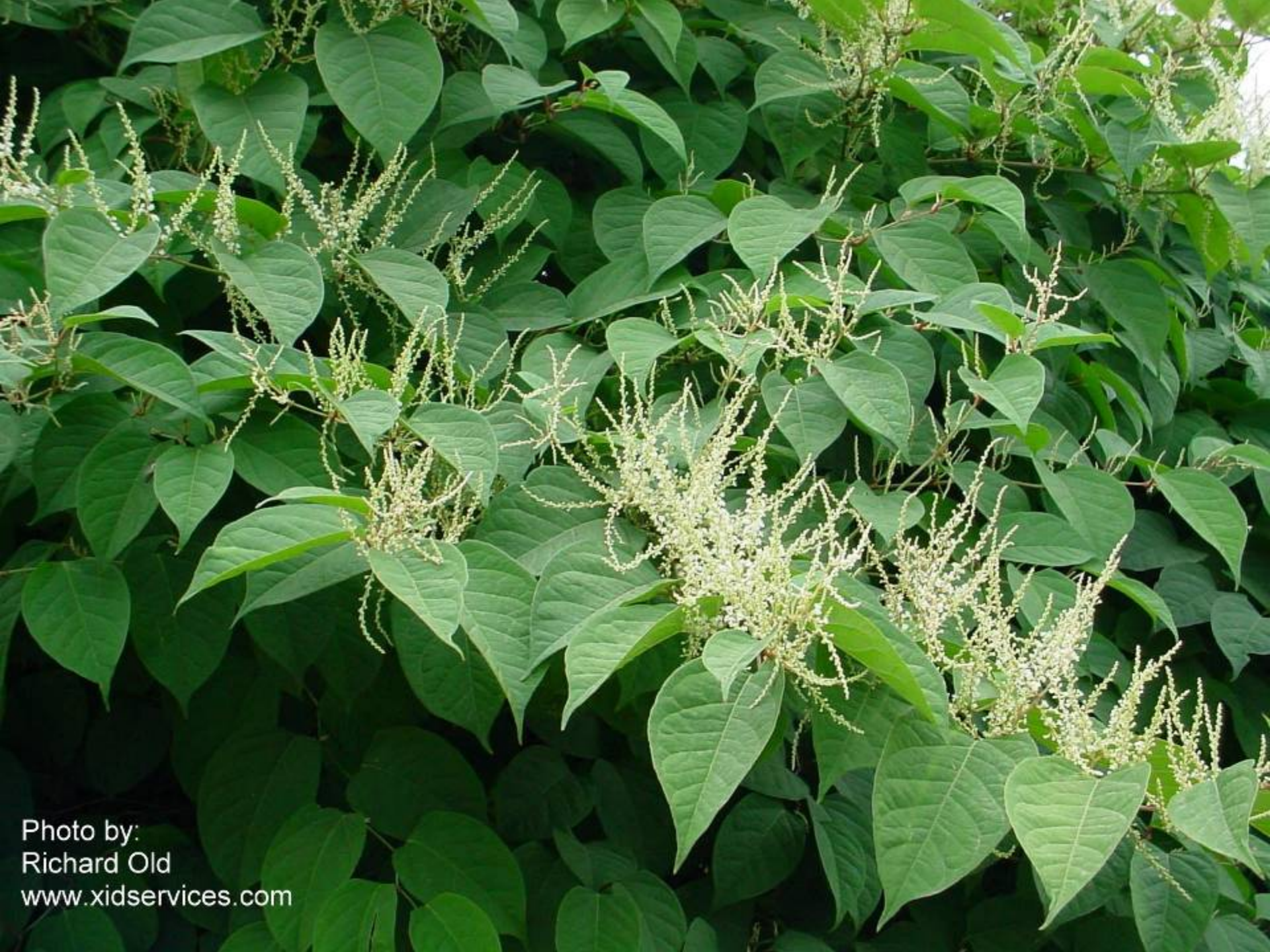


Photo by:
Richard Old
www.xidservices.com

Giant Knotweed (*Polygonum sachalinense*)

- tallest species, up to 15 feet
- leaves very large all with heart shaped bases
- flower clusters shorter
- most clones in US are female

Large leaves give giant knotweed its common name elephant ear bamboo

Giant knotweed in early spring with last year’s dead stems

Healthy Giant Knotweed

Seal Rock, Oregon 2011

Bohemian Knotweed (*Polygonum* X *Bohemicum*)

- naturally occurring hybrid between the two
- May be the most common type of knotweed found in the Pacific Northwest
- medium tall (8 to 12 feet), mixed leaf shapes
- introduced as an ornamental separately
- most clones were male (flower clusters stiffly upright, no seeds)
- recently females have been showing up with viable seeds (oh no!)

Typical stand of Bohemian knotweed with stiffly upright male flower clusters

Bohemian knotweed hybrid with seeds

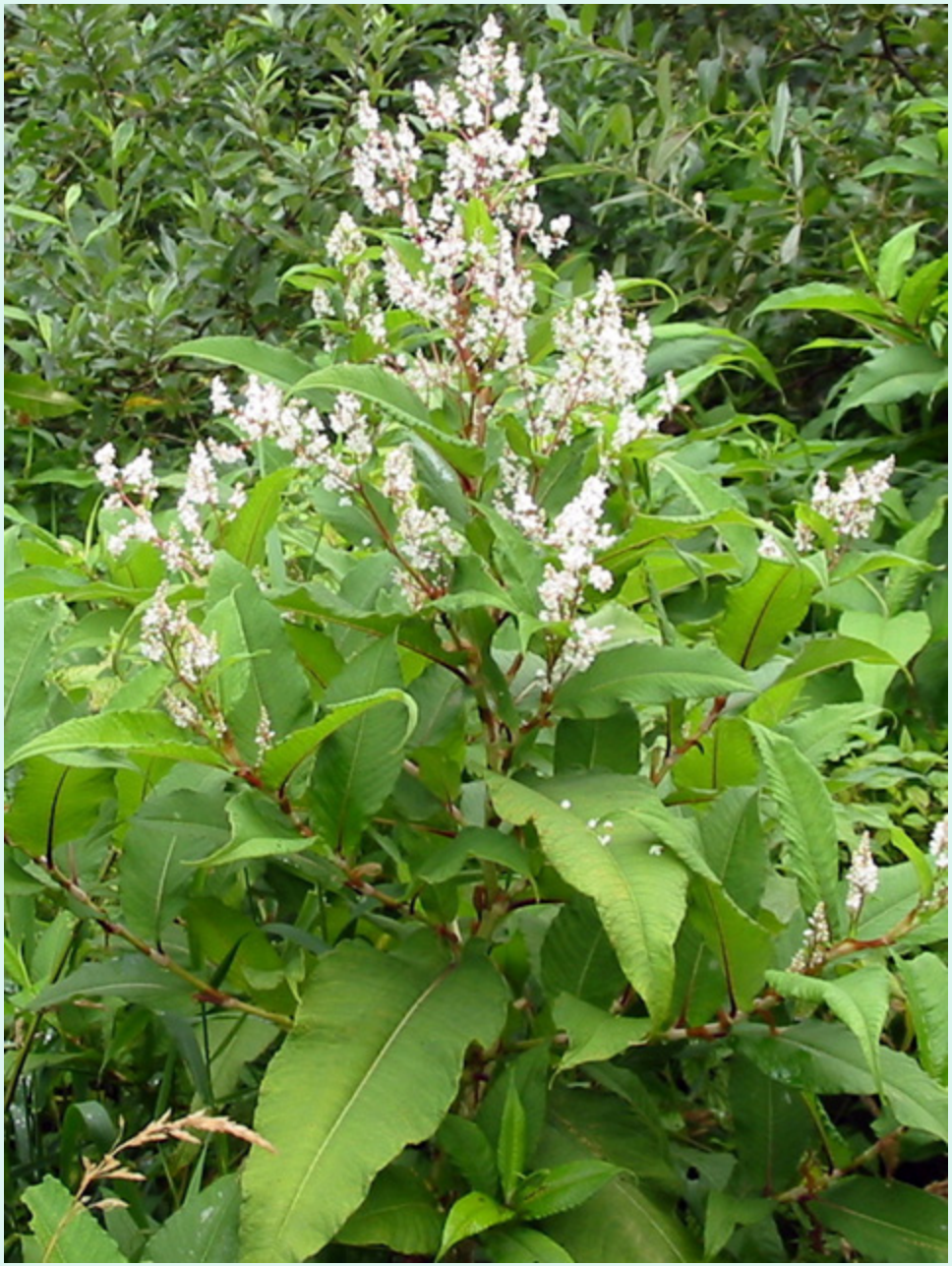
Himalayan Knotweed (Polygonum polystachyum)

Himalayan…

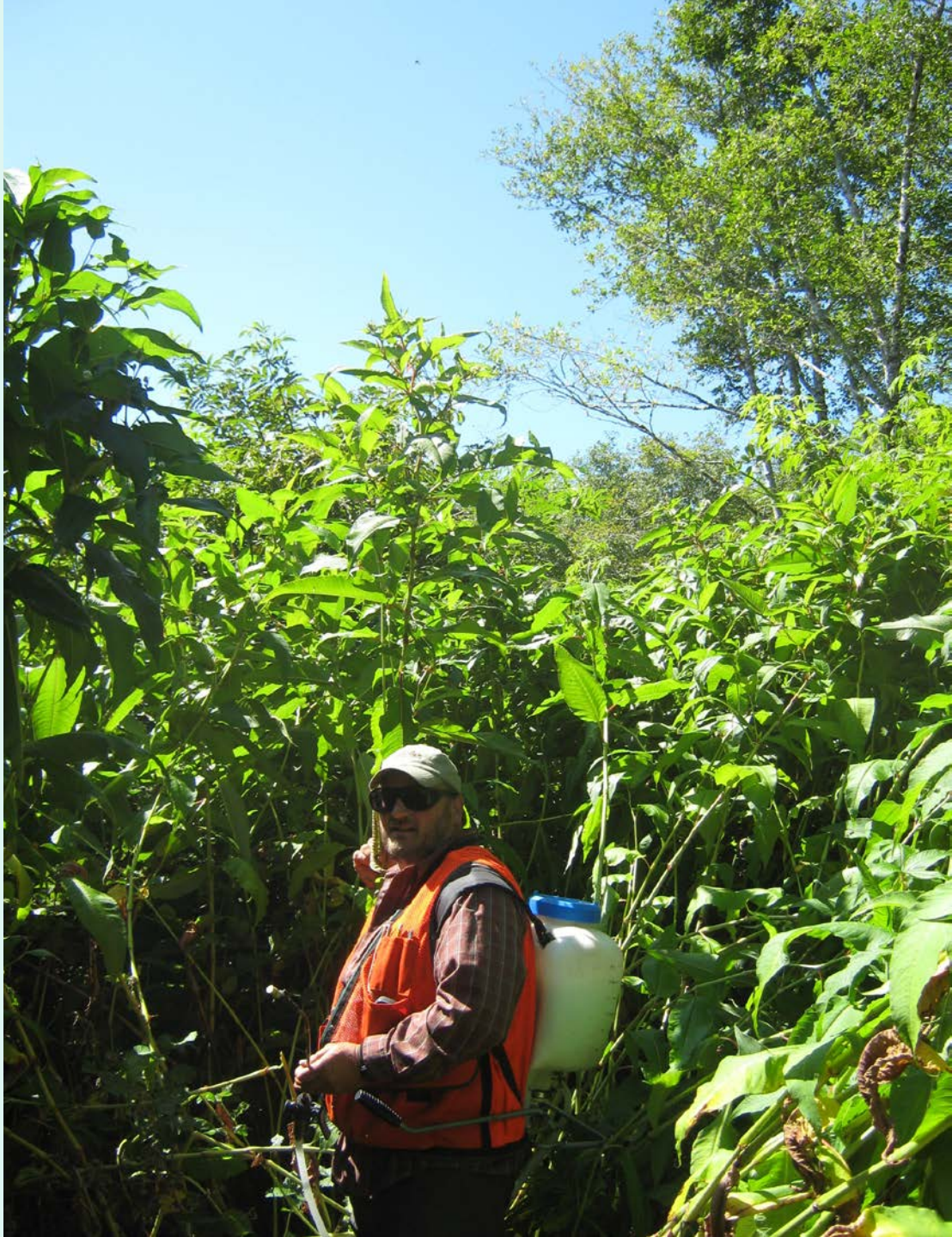
•Variable Height dependent on happiness and sunlight

• Has been seen over 8 feet tall

• Sometimes can be mistaken for a Rumex (Dock or Sorrel)



They say Himalayan gets 6 feet tall?

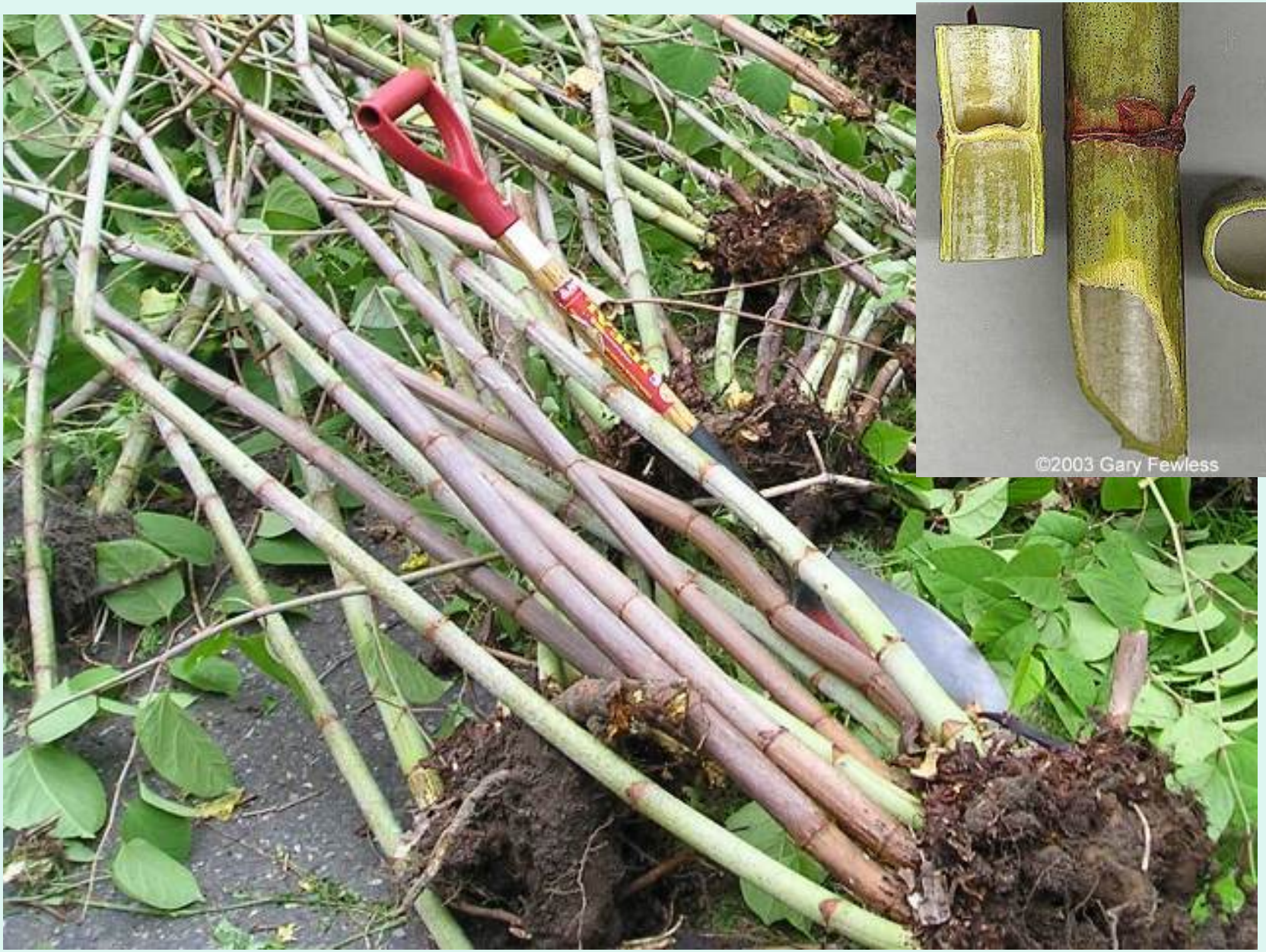


General Knotweed Characteristics:

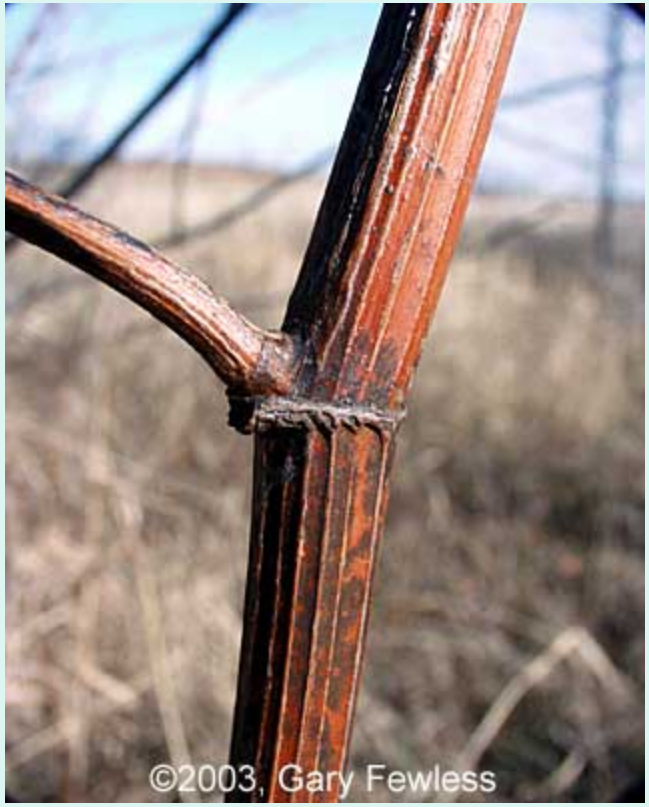
- Large, untoothed leaves, growing alternate on stems
- Small white or greenish flowers grow in dense clusters from the leaf joints in July and August

Young shoots in early spring look similar to red asparagus

Japanese knotweed shoots emerge from rhizomes in April



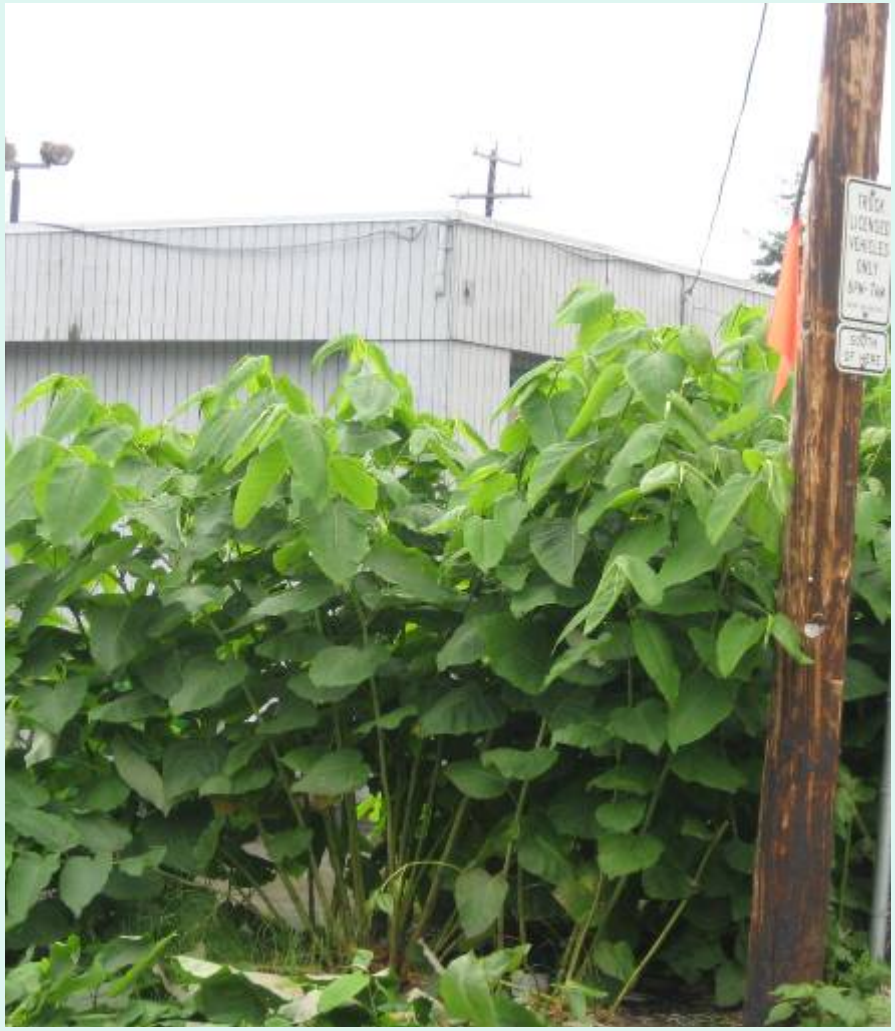
Hollow, upright, bamboo like stems often reddish or red-speckled



Plants die back to the ground after hard frosts but hard, dry stems may persist through the winter

How Knotweed Grows

- Starts growth in April, later in colder areas
- Grows extremely fast during the spring
  - Giant knotweed can reach 15 feet by late June
  - Bohemian knotweed reaches “only” 10 feet or so
- Stems from deeply buried roots may emerge in late summer



Young giant knotweed stems

How Knotweed Grows, cont.

- Upward growth slows in July and is much reduced after August, when most of the growth is underground
- Dies back to the ground with the first hard frost, and returns each spring from the same root system
- When knotweed is cut or damaged, it vigorously and rapidly re-sprouts from latent buds on root crowns and rhizomes
- Roots can spread 20 feet from the parent plant and go 7 feet down into the soil

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

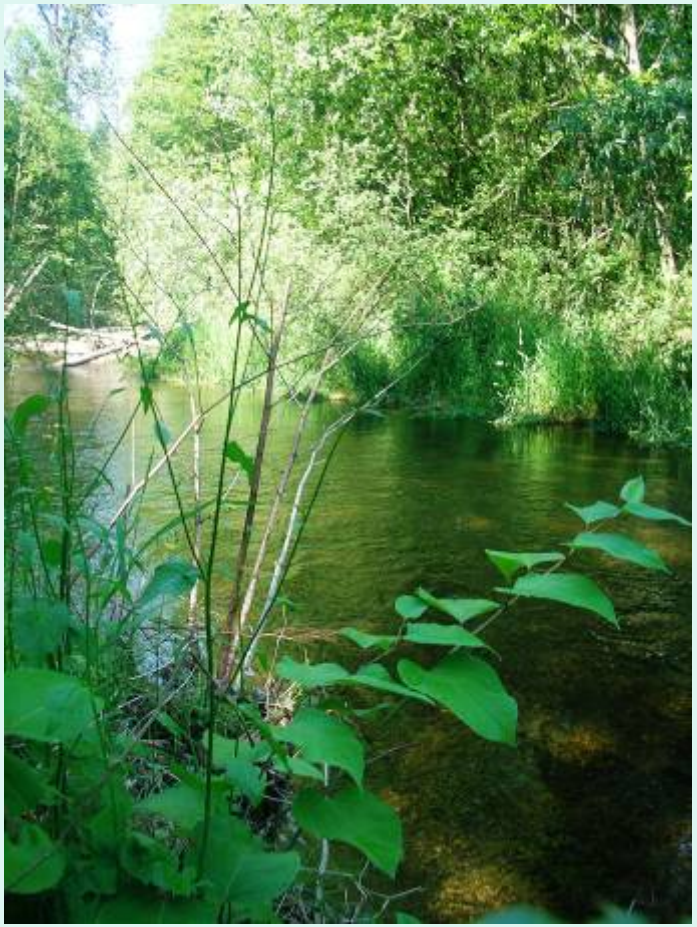
How Knotweed Reproduces

- Seedlings occur but are uncommon
- Mostly reproduces by vegetative means
  - Root and stem fragments, as small as 1/2" can form new plant colonies
  - Cut or broken stems and roots will sprout if left on moist soil or put directly into water

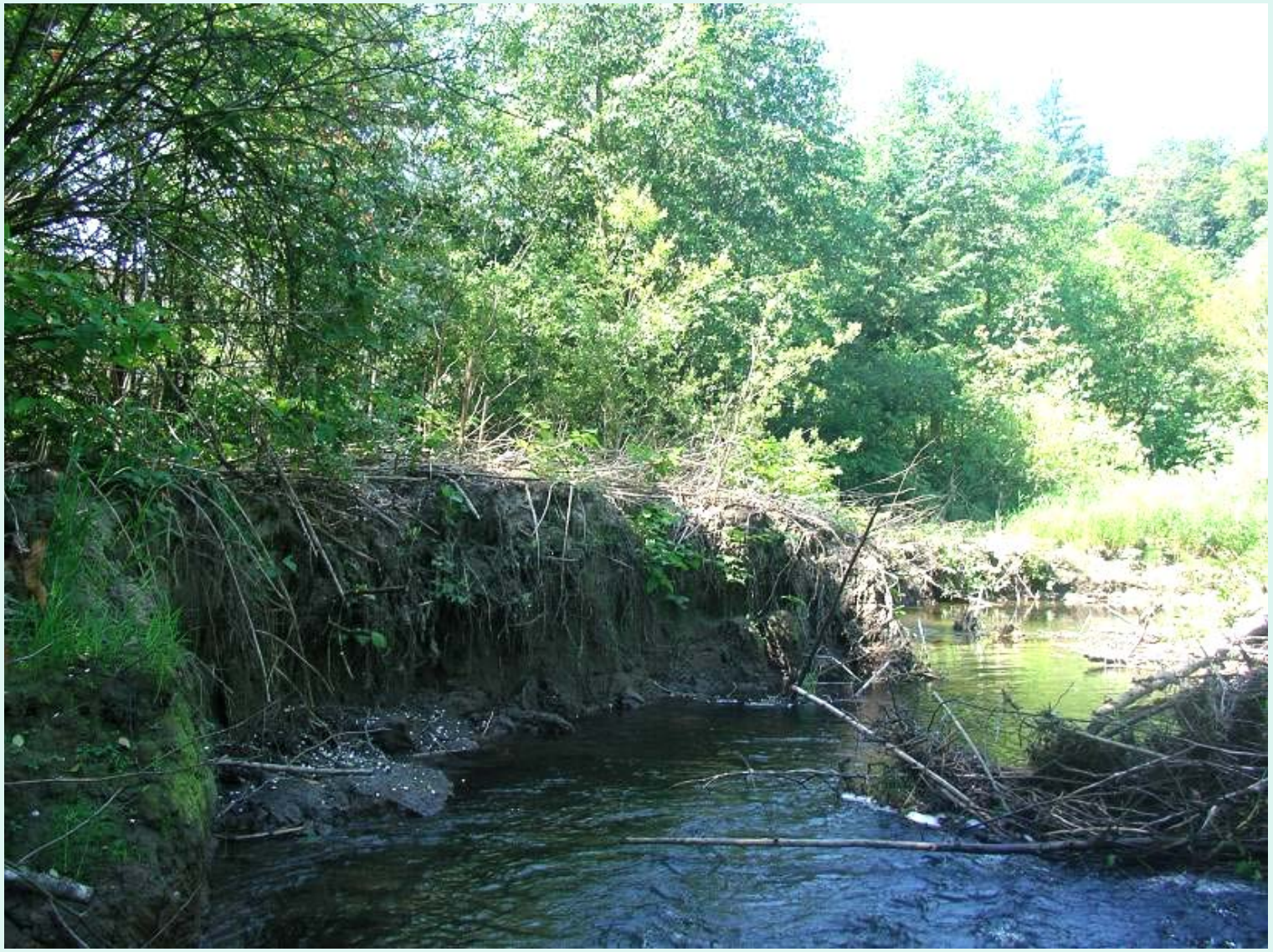
How Knotweed Spreads

- Fragments are spread by floods or high water, beavers, earth moving equipment, and in contaminated fill material
  - Seasonal high water events and floods sweep plants into rivers and creeks, then fragment and disperse knotweed plant parts throughout the floodplains and cobble bars
  - Roadside ditches, irrigation canals, and other water drainage systems can be colonized the same way

Knotweed Invasion on Rivers



Knotweed rapidly spreads along rivers as fragments get moved by floods and grow into new clones downriver



Despite knotweed's large rhizome mass, it provides poor erosion control.

It dies back in winter allowing for precipitation erosion and soil washes easily away in high water events, spreading more knotweed.

How Knotweed Takes Over

- Colonizes flood-scoured shores and islands and other exposed areas
- Emerges early in the season and quickly out-grows and shades out other plants
  - inhibits even trees such as alder and willow
  - understory of knotweed is usually bare of any other plants

Knotweed Control Issues

- It’s possible but takes dedication and commitment
  - Eradication is likely to take several years and multiple treatments
- Landscape level control requires long term planning and follow up
  - Need to work from the top of the waterway down including tributaries
  - Landscape level projects and large sites will almost certainly require integrating herbicide use into a control strategy
  - Landscape level projects may be easier with an umbrella coordination effort.

Knotweed Control Issues

- Outreach and volunteer recruitment and coordination will improve the success of large landscape level projects
  - Reach out to all public and private landowners
  - Educate the broader community
- Grants are available for invasive removal that benefits public resources
  - especially for work done through non-profit organizations or government agencies (competitive but still worth trying!)
  - State grants: ODA Noxious Weed Program
  - Federal grants: US Fish and Wildlife, Forest Service
  - Private foundations and corporations

Knotweed Control Methods

- Manual
- Mechanical
- Shade
- Chemical
- Combination

When To Use Manual Methods

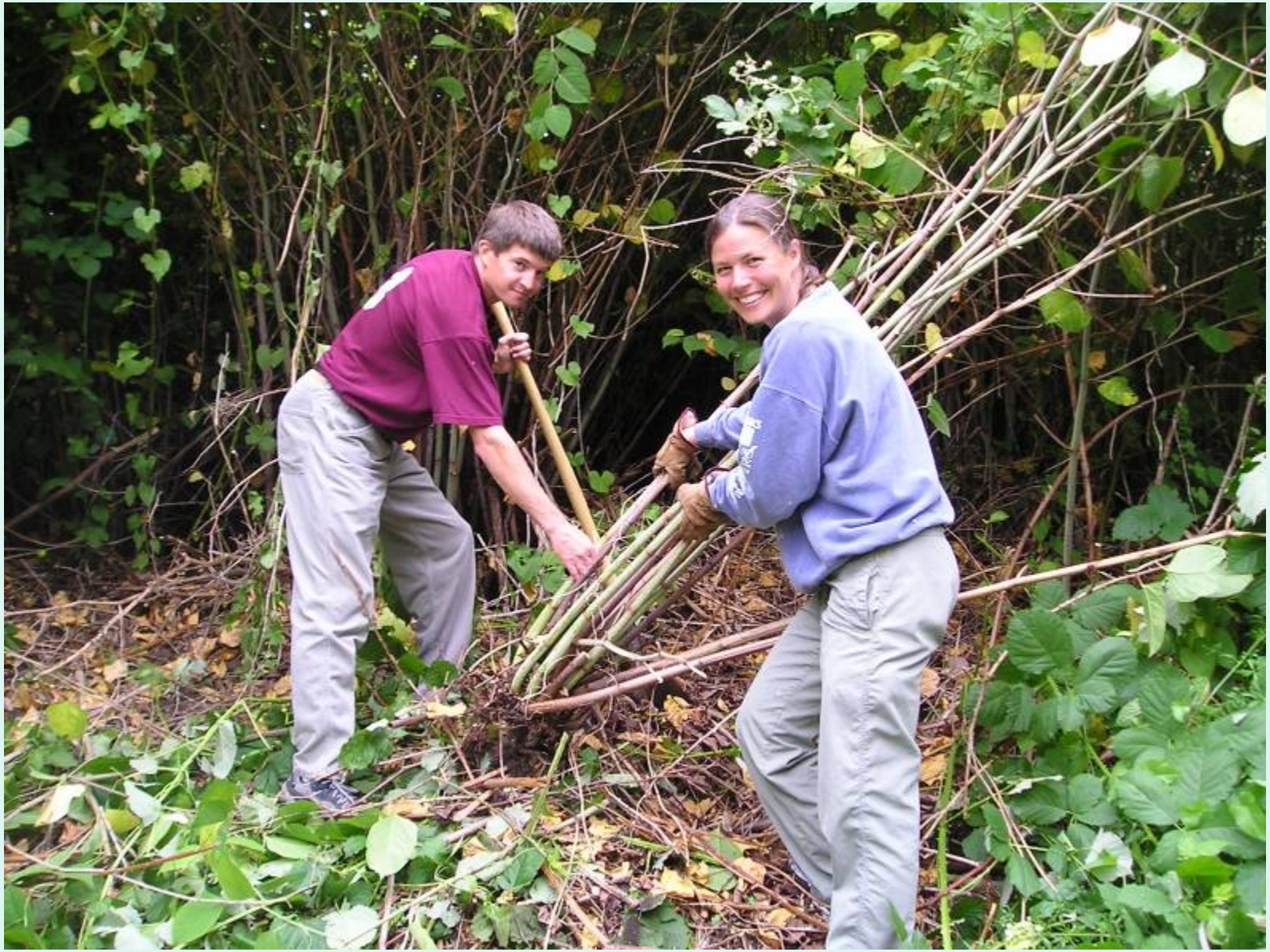
- Easy site access
- Patches are small (50 stems or less)
- You can commit to following an intensive control regimen
- You don’t intend to use stem injection method since repeated cutting tends to produce numerous small stems, too small to inject

Manual Control Issues

- Cutting and pulling stimulates shoot growth and depletes the roots
- The more shoots there are per linear foot of root, the more likely you will be to be able to physically pull the roots out, exhaust them by depriving them of energy (i.e. by cutting the shoot off) or finish them off with an herbicide treatment

Digging

- Dig up as much root as possible in August over at least three consecutive years
- Reported to work for small, isolated patches
- Be sure to carefully dry or dispose of the roots
- Do not put roots in a compost pile
  - In England, soil contaminated with knotweed roots is considered an environmental contaminant and needs to be buried 10 feet deep
- Be sure to search at least 20 feet away from the original patch center



Digging knotweed up is possible but roots may go down 7 feet deep and extend out 20 feet and re-sprouting is likely

Repeated Cutting

- Cut stems close to the ground TWICE A MONTH OR MORE between April and August
- And then cut once a month or more until the first frost
- Repeat treatment every year for about 5 years
- Try to keep plants from growing taller than 6 inches
- Using a mower/weed-eater is an option if set close to the ground
- Rake and pile up the cut stems where they will dry out, because stem fragments can root at the nodes
- Do not allow cut, mowed or pulled vegetation to enter waterways

Brush cutters–May be the first step in tackling a large stand of knotweed

The Four T's of Manual Control

- If you do try and control knotweed manually or mechanically, be sure you practice the four T's:

  Be:

  – Timely
  – Tenacious
  – Tough
  – Thorough

Covering

- Cover with heavy duty geo-textile fabric or black plastic to starve the roots
- Works better with isolated and smaller patches on open terrain
- Plan to leave the covering material in place for three to five growing seasons
- Try this right at the beginning of the year or after you've cut the plant down several times during the growing season and reduced some of the rapid plant growth

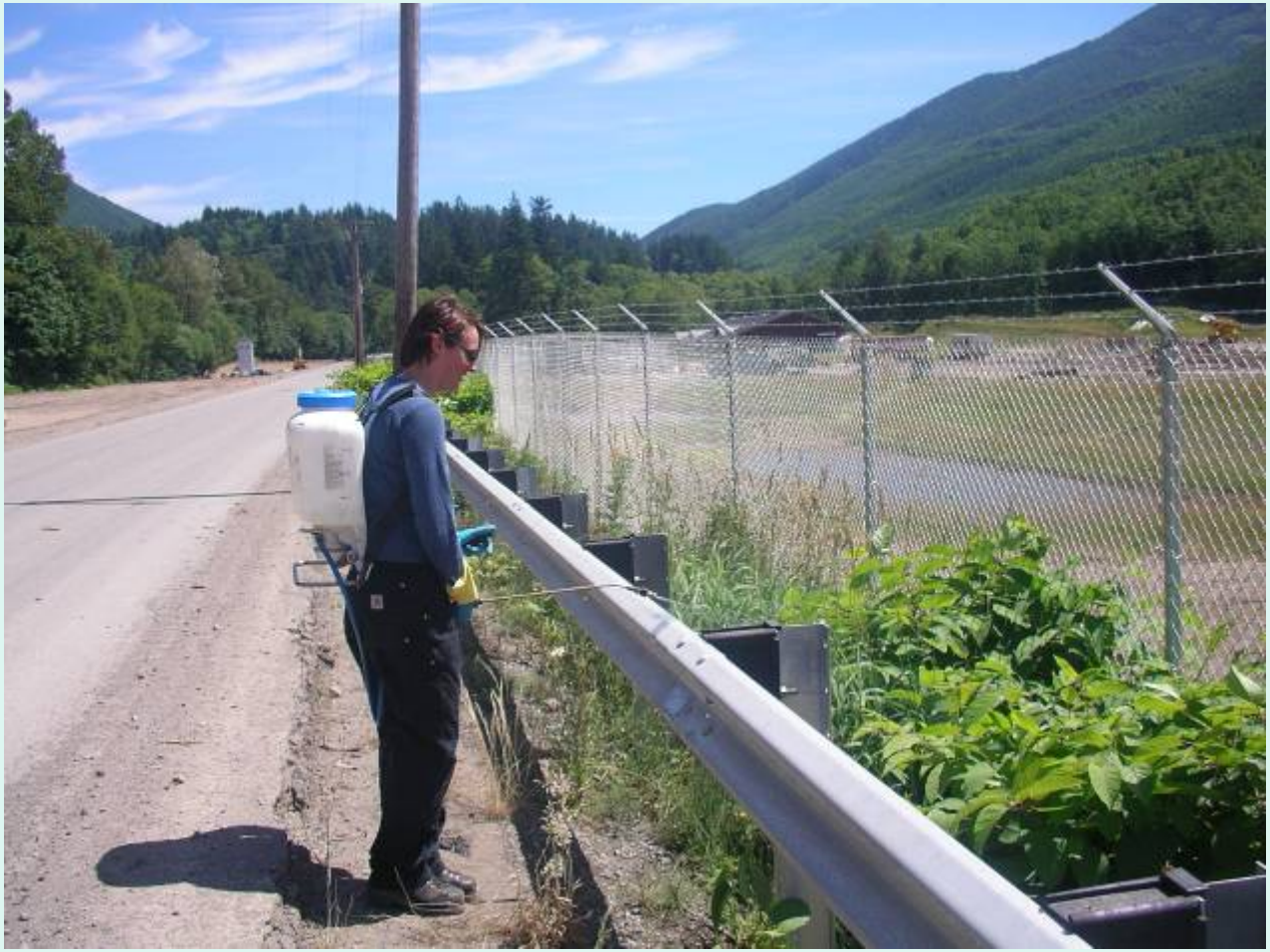
Covering: How To

- First cut stems down to ground surface and rake away stems or stomp on them to flatten as much as possible
- Next cover the area with geotextile fabric or heavy duty black plastic expanding beyond the plant base and stems at least 10 feet beyond the outside stems
- Stake and rope down the covering material as flat as possible
- Watch the holes and perimeter for new stems

Knotweed Control: Shade Cloth

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

Chemical Control



General Issues

- Use an herbicide product labeled for your site
  - e.g. aquatic, non-crop/right-of-way, home and garden, pasture, forestry
- Follow label rates – more is not necessarily better!
- Always read and follow label instructions
- Use correct PPE
  - At minimum: safety glasses, chemical proof gloves, long sleeves and pants, boots
- May need a permit from governing agency if there is any chance of herbicide getting into water

Foliar Application

- Can use backpack sprayer or large volume sprayer with hose
- Risk of drift onto desirable vegetation and into water, soil
- Easiest fastest and most effective method
- May be appropriate for roadside and large infestations where other methods aren’t possible
- Expect some survival; repeat treatment for at least one to two years, possibly longer

Timing

- From flower bud to seeding: July through September
- (On the coast this window may be August-October)
- Short plants
  - easier to reach with spray
  - may not have enough leaf surface to absorb and translocate enough chemical to be effective
- Taller plants
  - more drift potential
  - Very old plants may not be as efficient in translocating the chemicals
  - harder to get complete coverage on tall plants
  - Keep in mind that mature, healthy plants may be the most effective at moving the chemical into roots
- Best strategy may be to cut or bend stalks and allow to regrow to 3 to 6 feet tall
  - Usually takes about 4 weeks or more

Knotweed Control: Foliar Treatment

Foliar spray to treat knotweed re-growth

Herbicide Types

- Use systemic herbicide – goes from leaves to roots
- Glyphosate: 2 to 8 % solution
  - Non-selective – will harm all actively growing plants if leaves are sprayed; works well combined with Imazapyr
  - Aquamaster/Rodeo plus surfactant (LI-700, Agridex) - aquatic sites
  - Roundup Pro (has surfactant mixed in) – non aquatic sites
- Triclopyr: ¾ to 5% solution (lower concentrations result in better long term control, higher rates give good top kill)
  - Selective – will not harm grass, rushes, cattails, etc
  - Renovate – aquatic sites
  - Garlon 3A – non-aquatic sites
- Imazapyr - .5 to 1% solution
  - slow-acting and expensive but effective
  - Most effective in combination with glyphosate
  - Habitat – aquatic
  - Arsenal - non-aquatic sites

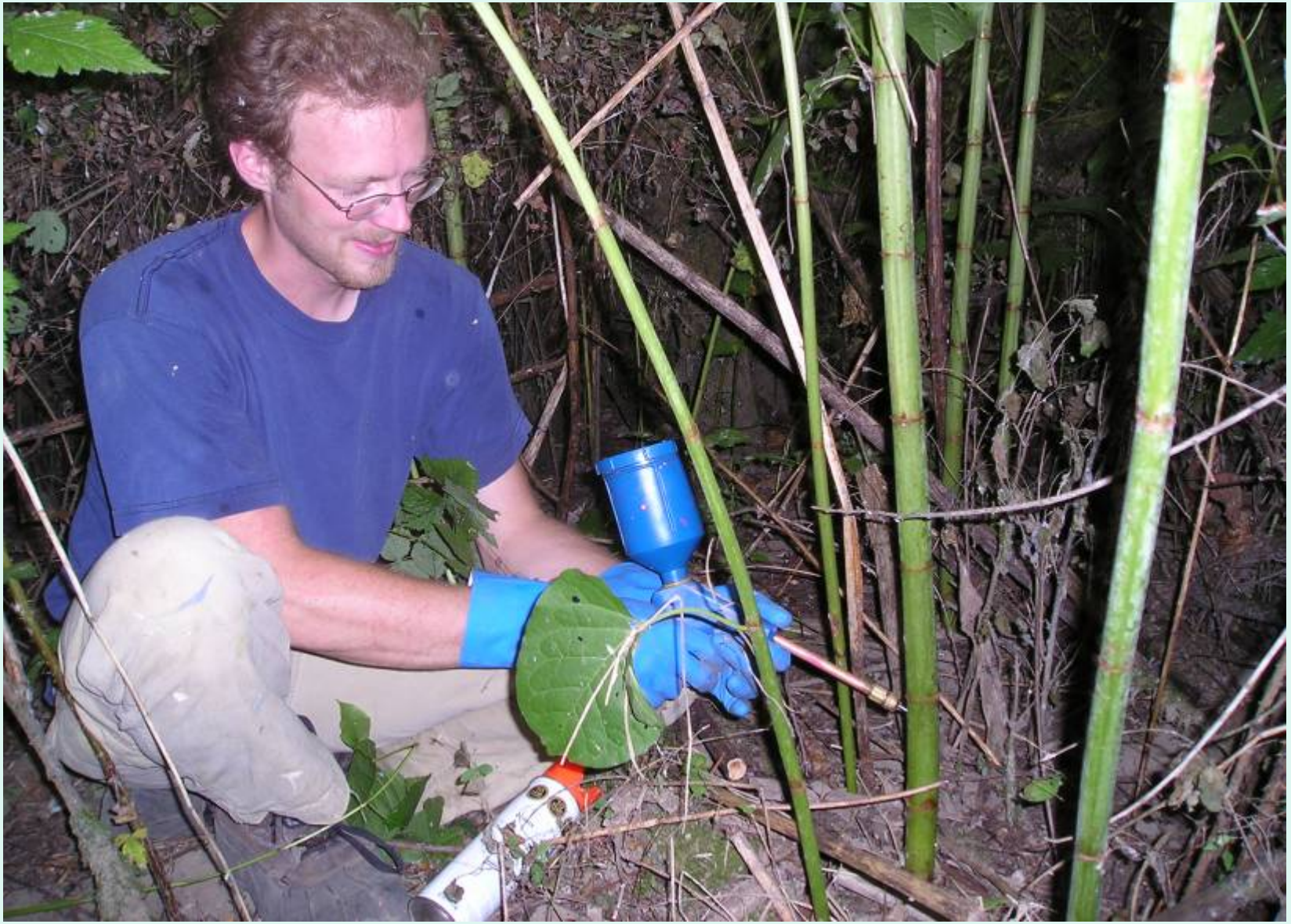
Combo Method

- In spring or summer, spray or cut/bend stems followed by fall foliar spray
- Sets plants back so they can be sprayed at the appropriate growth stage and at the best height
- Cutting first instead of spraying will reduce overall herbicide input into the watershed and is probably more labor efficient
  - can use volunteers or crews without pesticide licenses for cutting or bending

Stem Injection

- Use stem injection gun or similar tool
  - Also marker paint or marker and a cork for the needle
- Follow directions carefully especially calibration and cleaning
  - Inject 3 ml into stem between first and second nodes or between second and third node if too woody lower down
- Timing best from mid-June to end of September
- Currently only Aquamaster has a label for injection but Roundup Pro may also have it soon

Knotweed Control: Stem Injection



Injecting herbicide directly into the stems of knotweed

Pros of Stem Injection

- Highly effective: may be up to 90% or more controlled in first year
- Greatly reduces drift and highly selective
- No cut stems to deal with

Dead knotweed canes following treatment with stem injection gun

Cons of Stem Injection

- Very time and labor intensive compared with foliar spraying
- Need to inject every cane in the stand
- Glyphosate label typically 2 gallons per acre so can only inject 2500 stems per acre
- Can only inject stems over ½ inch so there will always be small stems that can’t be injected in a population, especially in the second year of treatment

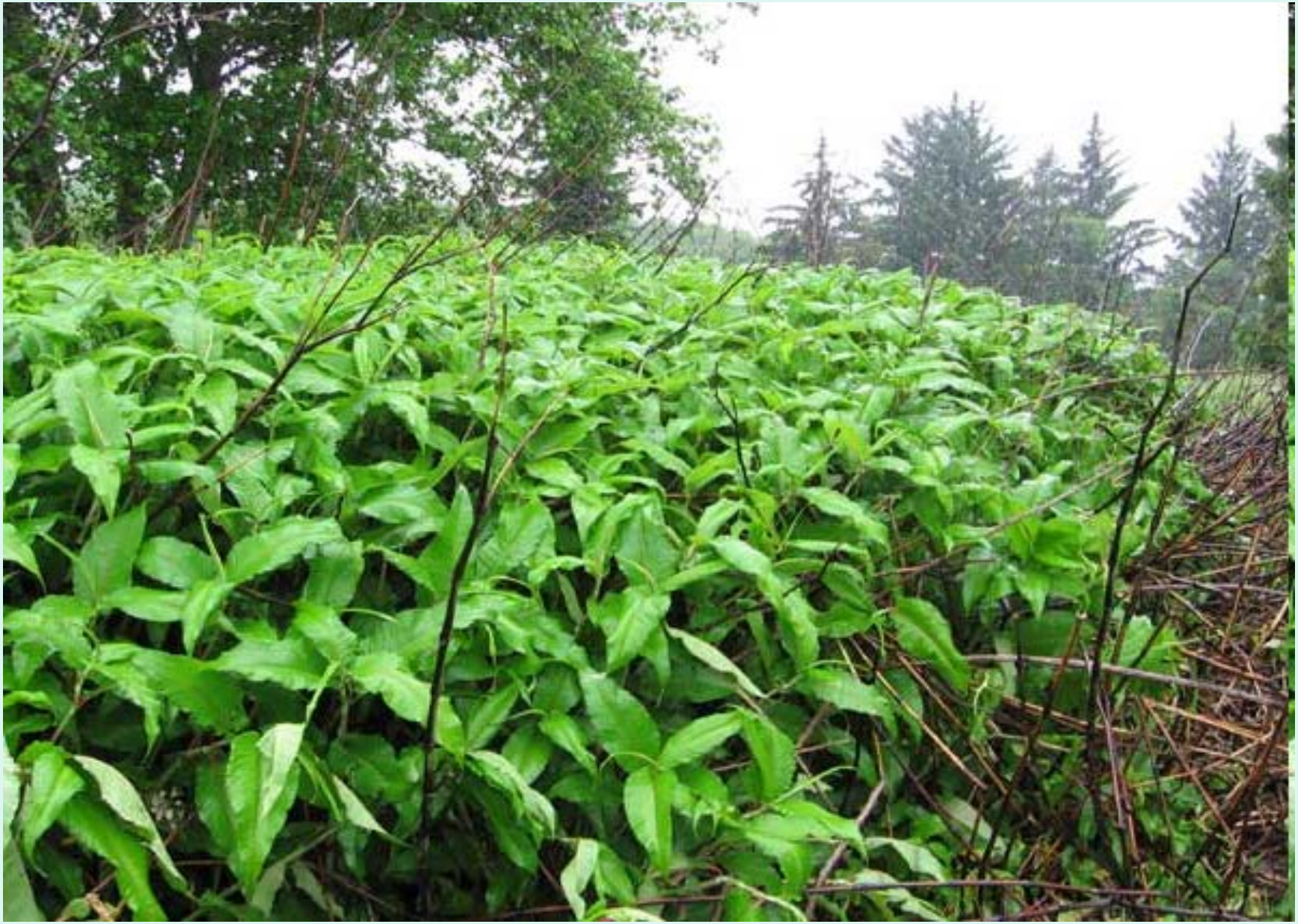
Cut Stem/Pour Application

- Similar to stem injection, may not be as effective
- May be good for small patches and greatly reduces drift
- Cut stems between lowest 2 nodes
- 3 ml undiluted (concentrated) glyphosate into stem cavity
  - Can use a large needle with measured reservoir to be precise
  - Be very careful not to splash out onto the ground
- Follow label directions on amount applied per acre
  - for the 2 gallons per acre label can only inject 2500 stems/acre
- Timing best in late summer or early fall
- Need to remove cut stems away from water where they can dry out and not spread off site

Wick Wipe Method

- Uses an applicator with a sponge on the end of a reservoir for the herbicide
- Use glyphosate or triclopyr at 33 to 50 % concentration
- Greatly reduces drift
- Hard to get chemical on leaf surface and seems to increase personal contact with herbicide

Applying herbicide to knotweed leaves with a wick wiper



Useful Websites

- The Nature Conservancy Wildlands Invasive Species Website: Knotweed Page
  - http://tncweeds.ucdavis.edu/esadocs/polybohe.html
- Washington State Department of Agriculture Knotweed Program
  - http://agr.wa.gov/PlantsInsects/Weeds/Knotweed/Knotweed.htm)
- Lincoln Soil and Water Conservation District

  Invasive Species Program

  - http://www.midcoastpartners.org/knotweed.htm
- Knotweed Brochure
  - http://www.midcoastpartners.org/Invasive%20Species%20Fliers/New%20Knotweed%20Brochure_2009.pdf

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