



STROUDTM

WATER RESEARCH CENTER

ADVANCING KNOWLEDGE AND STEWARDSHIP OF FRESH WATER SYSTEMS
THROUGH RESEARCH, EDUCATION, AND RESTORATION

Riparian Buffers and the Challenge of Invasive Plants

Insights from research and practice

Thanks to:

- David Wise, Calen Wylie
- Dr. Bern Sweeney, other Stroud Staff
- Art Gover, Penn State
- Landowners & Farmers



Context for Presentation:

**Restore rivers, lakes
& estuaries by
restoring health of
small streams**

**Small streams =
85% of all flowing
streams in PA...&
the World**



1st and 2nd order streams dominate



Is this stream healthy? Macroinvertebrates provide clues



Pollution indicators



Annelid worms



Diptera (midges)

Clean stream indicators



Ephemeroptera (mayflies)



Plecoptera (stoneflies)



Trichoptera (caddisflies)

What Do Aquatic Insects Need?



They need:
Cool Clean Water
Habitat
Food

Trees help with all 3

Are Trees Enough?





Riparian Forest Buffer
≥ 35 ft or it's not a buffer!



100 Feet is Best



Why Trees & Shrubs for Streams?

- Shade for cooler water
- Filtered light not direct sun
- Roots to filter runoff & stabilize banks
- Wider, shallower streams
- Large woody debris when trees fall in
- Dissolved carbon (food)
- Leaves as solid carbon (food)

Native Trees & Shrubs for Floodplains

Great Trees for Riparian Sites*

- Sycamore
- Black Willow
- River Birch
- Swamp White Oak
- Pin Oak
- Black Gum
- Red&Silver Maple
- Hackberry
- Basswood
- Tulip Poplar

*Context: Southeastern PA

Great Shrubs & Small Trees for Riparian Sites*

- Red, Silky, Gray Dogwood
- Arrowwood Viburnum
- Black, Red Chokeberry
- Serviceberry
- American Plum
- Hornbeam
- Elderberry
- Alders
- Shrub willows
- Many others!



Dozens of Challenges to Buffer Success

- Deer, Voles, Mice
- Shelter and Stake Problems
- Gaps in Maintenance
- Flooding and Saturated Soils
- *Invasive Plant competitors*

Many Great Trees...

Establishment of trees and
shrubs is the **Bigger
Challenge**







We Know What Works!



-
-
-



Shelter and Stake Upkeep

Regular Mowing Program



Vegetation Control Program



Can't We Let Natural Regeneration Happen?

Perhaps on some sites, but...

SE PA Is Plagued By Invasive Plants ...and a growing problem elsewhere





Reed Canary Grass *Phalaris arundinacea*



Mile-A-Minute

Persicaria perfoliata



Oriental Bittersweet

Celastrus orbiculatus

(common problem: bittersweet in shelter)



Damage to Young Tree



Japanese Hops

Humulus japonicus





Canada Thistle

Cirsium arvense

Many Others!



Stroud's Research and Techniques for Reforestation and Invasives



Success in
multiflora rose



Methods

initial clearing w/
forestry mower



Methods

- broadcast Rodeo on invasives after regrowth
- seeded pasture mix (limed/fertilized)



Methods

Normal maintenance:

- 2x/yr herbicide
- 2-3x/yr mowing





2016 before work

2017 after work
(17 months later)



Success in reed
canary grass



Success in reed canary grass

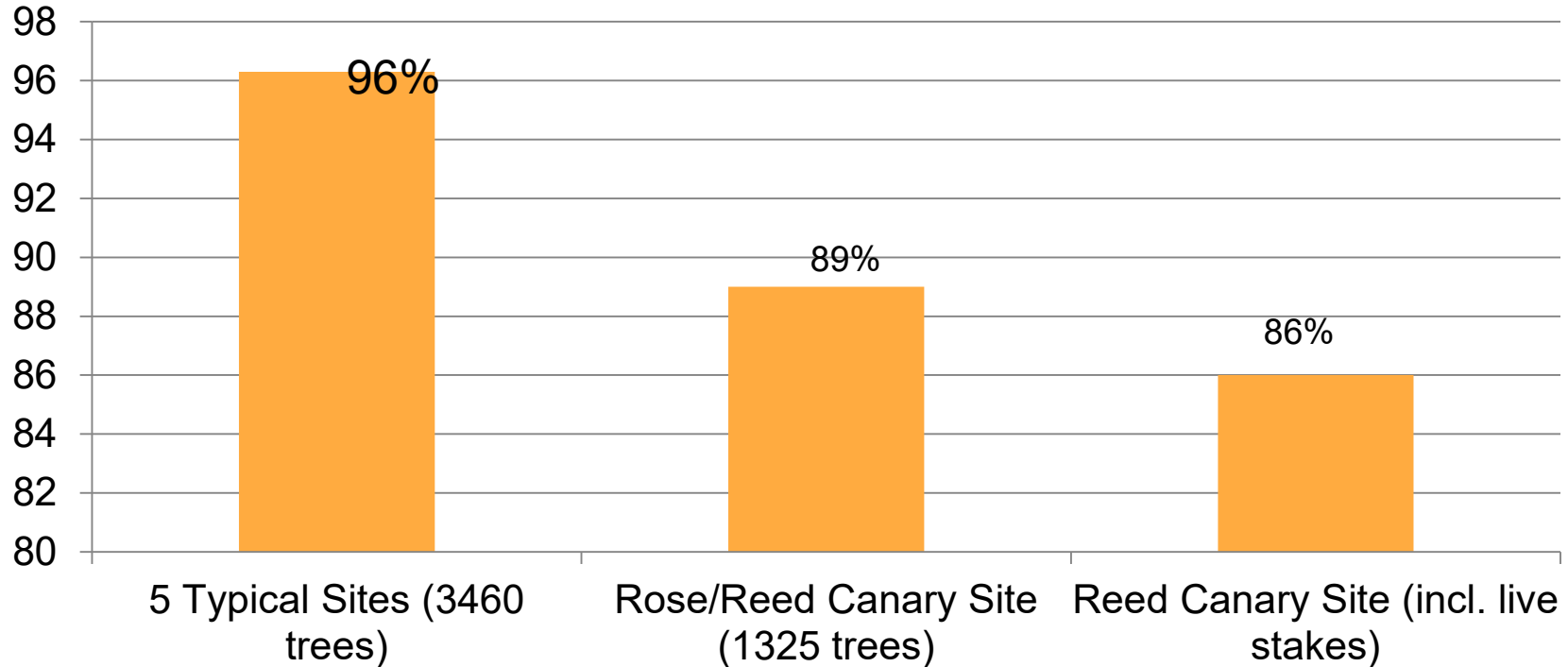
Standard approach works:

- 5' tube
- 2x/yr herbicide
- 2-3x/yr mowing
- 2 yr old Chester Co site



Survival Rates for Current Methods:

3-Year % Survival using 2x/yr herbicide, 2-4x/yr mow and annual maintenance



Using Pre-Emergence Herbicide INSIDE Tubes

Issue: invasives in tubes

- Birds carry seeds
- Invasives compete with trees

Oriental bittersweet in tube



Source: FSU Ornithology

Gray Catbird
May 17, 2008
Lebbie McKenzie

Using Pre-Emergence Herbicide INSIDE Tubes

Tests of Snapshot™ INSIDE tree tubes

- intent is to prevent germination of seeds
- Apply before seed germ – for us, Feb/March
- easy task via custom shaker below
- First trial:
 - differing dosages – no effect
 - problem: bittersweet germination in May

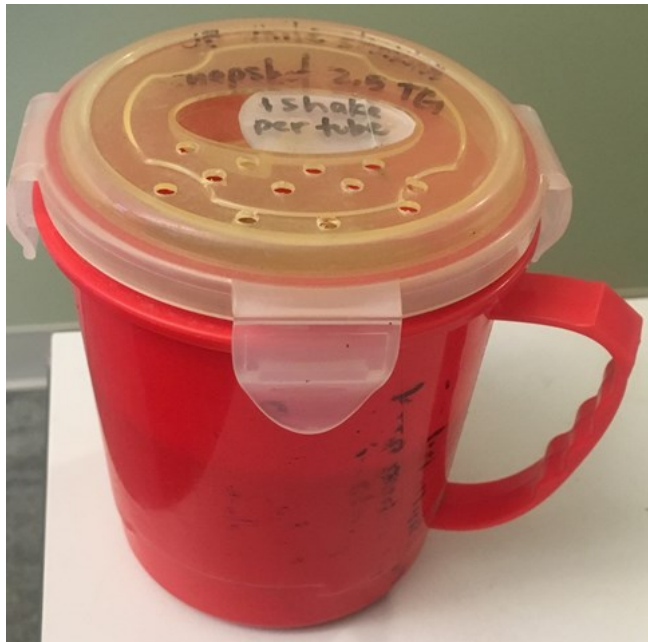


Photo: Calen Wylie

Specimen Label



Snapshot® 2.5 TG

Specialty Herbicide

®Trademark of Dow AgroSciences LLC

A selective preemergence herbicide for control of certain broadleaf weeds and annual grasses in:

- Landscape Ornamentals
- Christmas Tree Plantations
- Container Grown Ornamentals
- Field Grown Ornamentals
- Groundcovers/Perennials
- Non-Bearing Fruit and Nut Trees
- Non-Bearing Vineyards
- Non-Cropland

Active Ingredients:


trifluralin: α, α, α -trifluoro-2,6-dinitro- <i>N</i> , <i>N</i> -dipropyl- <i>p</i> -toluidine.....	2.0%
isoxaben: <i>N</i> -[3-(1-ethyl-1-methylpropyl)-5- isoxazolyl]-2,6-dimethoxybenzamide and isomers.....	0.5%
Other Ingredients.....	97.5%
Total.....	100.0%

Contains 1.25 lb active ingredient per 50 lb bag.

EPA Reg. No. 62719-175

Rout™ : additional active ingredients

For Sale To, Use and Storage By
Commercial Nursery, Cut Flower,
Foliage and Landscape Personnel Only



Specimen label for information purposes only. The Scotts Company makes no representations as to the accuracy of this label. It is the responsibility of the user to read and follow the label attached to the pesticide product container.

GROUP	3	14	HERBICIDES
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Net Weight:
50 lb (22.68 kg)
Stock # 95721

Rout®

Ornamental Herbicide
For pre-emergence control of weeds in container, field grown and landscape ornamentals, cut flowers and foliage crops.

ACTIVE INGREDIENTS:

Oxyfluorfen ¹	2.00%
Oryzalin ¹¹	1.00%
OTHER INGREDIENTS	97.00%
Total	100.00%

¹CAS # 42874-03-3
¹¹CAS # 19044-88-3
EPA Reg. No. 58185-27 EPA Est. 8378-IN-1

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

KEEP OUT OF THE REACH OF CHILDREN
CAUTION

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FIRST AID
IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call poison control center or doctor for treatment advice.

PERSONAL PROTECTIVE EQUIPMENT (PPE)
Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category F on an EPA chemical resistance category selection chart.

Mixers, loaders, applicators and other handlers must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves such as barrier laminate, butyl rubber 14 mils, nitrile rubber 14 mils, or Viton 14 mils
- Chemical-resistant footwear plus socks
- Protective eyewear
- Chemical-resistant headgear for overhead exposures
- Chemical-resistant apron (mixers and loaders)
- Under prolonged use, a dust filter and disposable protective garment are additionally recommended.

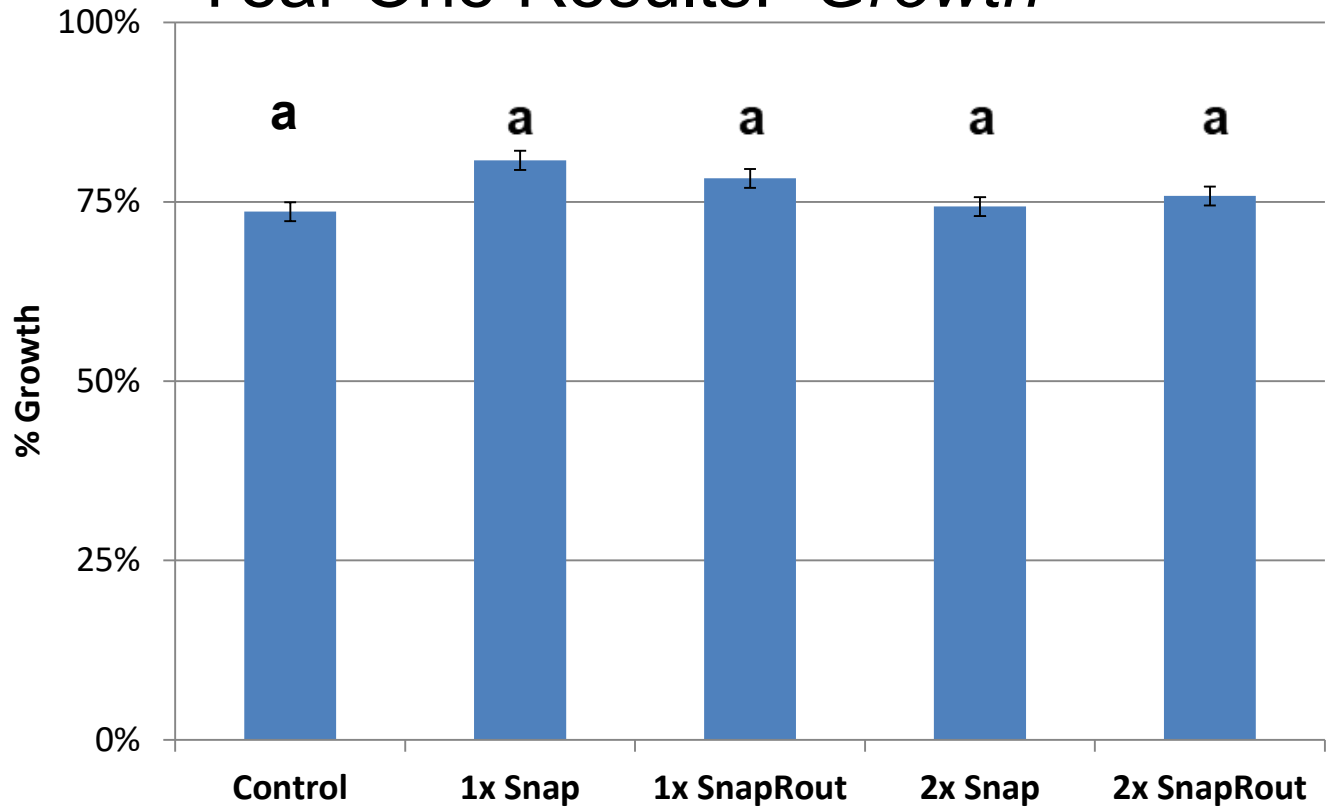
Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables use detergent and hot water. Keep and wash PPE separately from other laundry. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them.

When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the Worker

What a typical application looks like



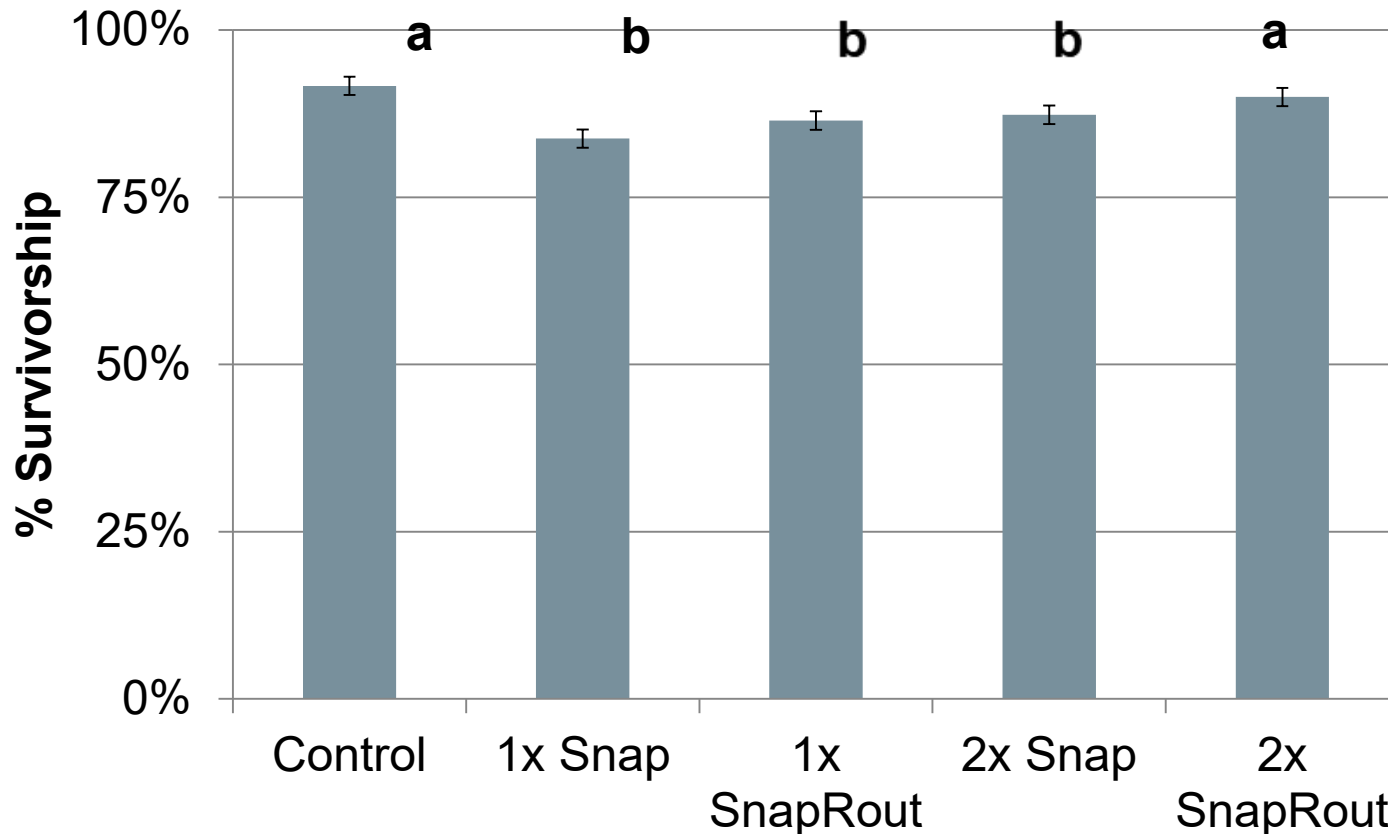
2nd Generation Pre-emergence Herbicide Tests: Year One Results: *Growth*



1x = Feb/Mar applic
2x= Feb/Mar + late May

Bittersweet? **Yes** **Yes** **Yes** **No** **No**

2nd Generation Pre-emergence Herbicide Tests: Year One Results: *Survivorship*



Conclusions:

Oriental bittersweet in tube



Two applications per year -> no weeds thru August

Snapshot alone was sufficient

Appears safe for trees

- *Alternative? Hand pulling vines from tubes*



Other Trials at Stroud:

- Center-hole bird net method
- Gravel protection from voles
- Different shelter types
- Deer fencing for shrub clusters
- Reforestation of legacy sediments
- Reforestation in shade



Herbicide Treatment vs Gravel Mulch for Voles

Reclaiming our Understory



How to replace invasives with natives, at scale?



Thank You!

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Research Center

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