

New Research on Noxious Weed Control

Tim Miller

WSU Mount Vernon NWREC



Today's Session

- Identification, biology, and control of several **tough perennial weeds**
 - European Coltsfoot
 - Italian Arum
 - Yellow Archangel
 - Butterfly Bush
 - Yellow Flag Iris
- But first, some general thoughts:

Strategies for Managing Invasive Plants

- **Mechanical Controls**
 - Physical removal (using hands or machines), barriers (plastic, fabrics, or composite materials), mulches, flame, or flooding
- **Biological Controls**
 - Introduce organisms that feed on or infect the introduced species
- **Chemical Controls**
 - Aquatic and terrestrial herbicides
- Control measures are often followed by **re-introduction** of plants that compete with the weakened introduced species

Herbicide Treatments

Things to Consider

- The weed species to be controlled
 - Not all herbicides work on **all species**
 - Try to **match products** that are most likely to have activity on the species in question
 - Select rates that make sense based on control of **related weed species**, or weeds with the same growth habit
 - Would **combination or sequential treatments** perhaps work better?
 - Herbicide **application timing** can be important!

Know Your Enemies!

Dr. Miller WSU Mount Vernon

Weeds of the West



NEW!
Revised
Edition

PLANTS OF THE PACIFIC NORTHWEST COAST

Washington, Oregon,
British Columbia & Alaska

POJAR ❖ MACKINNON

Noxious Weeds That Harm Washington State

Eastern WA Field Guide



Washington State Noxious Weed Control Board
www.nwcb.wa.gov

Aquatic and Riparian Weeds of the West

Joseph M. DiTomaso
Evelyn A. Healy

Sponsored by the California Weed Science Society

WEEDS of eastern WASHINGTON



&
adjacent areas

by xerpha m. gaines & d. g. swan • illustrations: h. c. keller

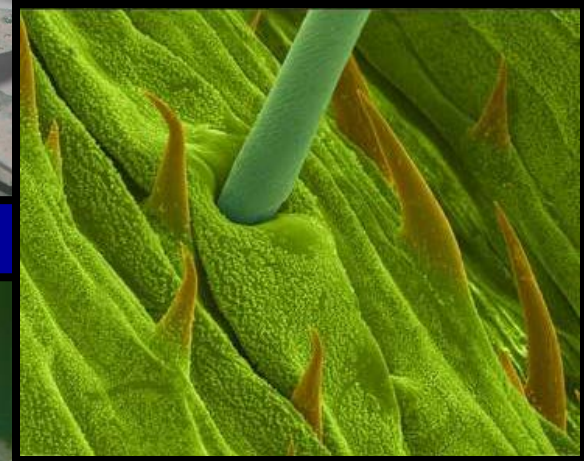
Spray at the Proper Stage of Growth

- Perennials
 - Bud stage
 - Late fall
- Biennials
 - First-year rosettes
- Annuals and seedlings
 - PRE: Just prior to weed seed germination
 - POST: As early as possible after seed germination is complete for the year



Optimize Herbicide Applications!

- Temperature
- Moisture
- Leaf surface condition
 - Dust
 - Hairs
 - Cuticle
- Surfactants(?)



1st Species: European Coltsfoot

- *Tussilago farfara* (List A in OR, Class B in WA), Asteraceae (sunflower family)
- European coltsfoot grows in a range of sites from full sun to mostly shade
- It grows from rhizomes, but also produces fuzzy seedheads that blow seeds far and wide

Flowers stalks
arise in early
spring, **before
emergence of
leaves**



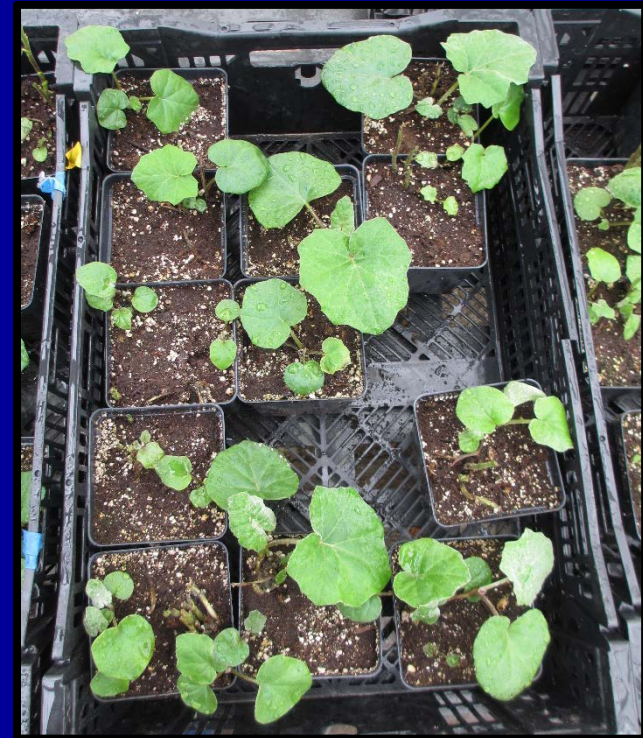
Dandelion-like **seedheads**
are borne as leaves emerge



Leaves are
fuzzy and
heart-
shaped
(outline like
a **horse's
hoof**)

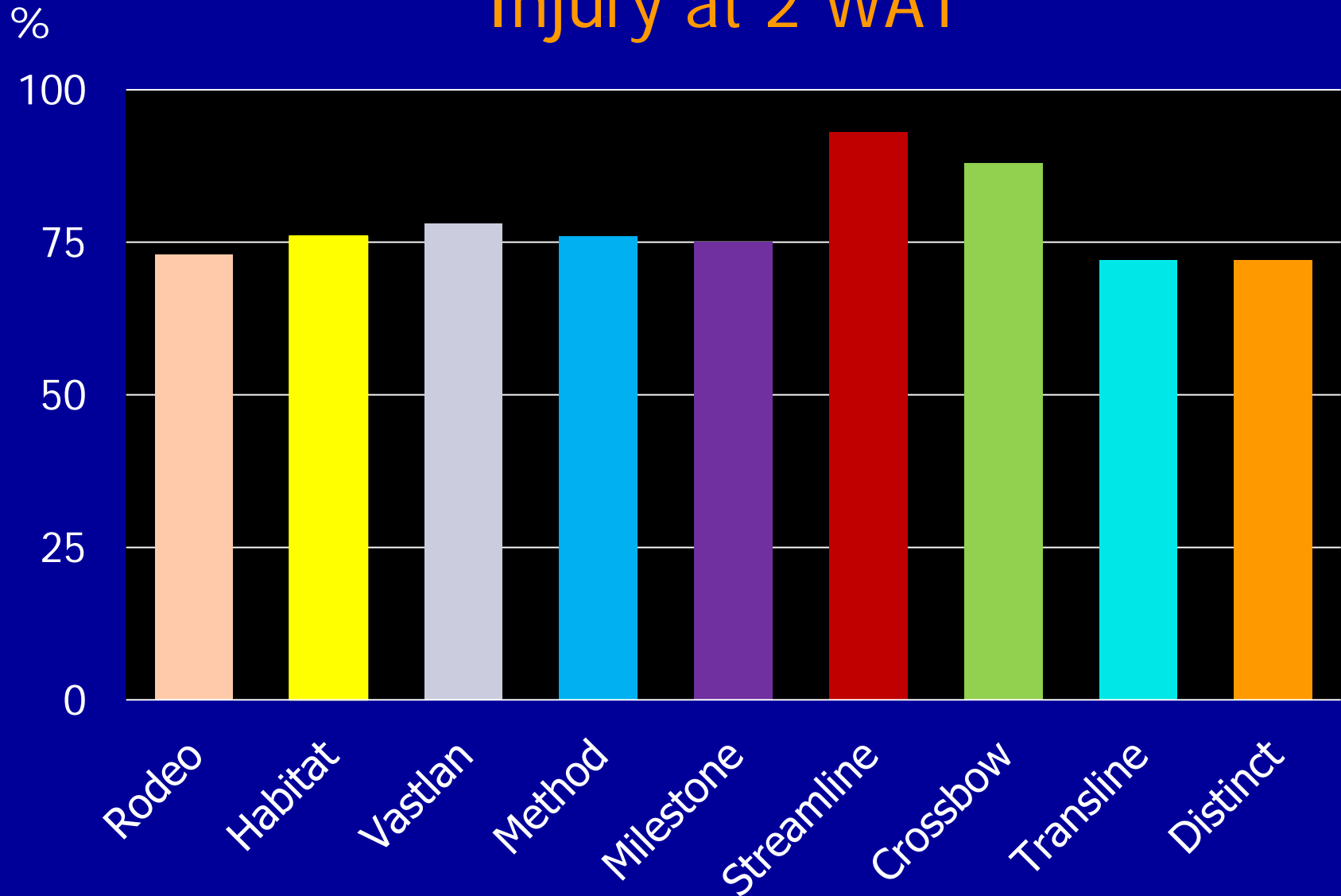
European Coltsfoot Trial

- Greenhouse trial conducted at WSU Mount Vernon NWREC (2018)
- **Coltsfoot crowns and rhizomes** were dug from a field infestation near Arlington in March
- Those were transplanted into **small pots** and placed in the greenhouse
- When at least three leaves were on each plant, **herbicides were applied** (May 1)
- Injury **rated** and **plants clipped** (May 14, 2 WAT)
- Regrowth **rated, clipped, and weighed** (June 14, 6 WAT)



European Coltsfoot Control

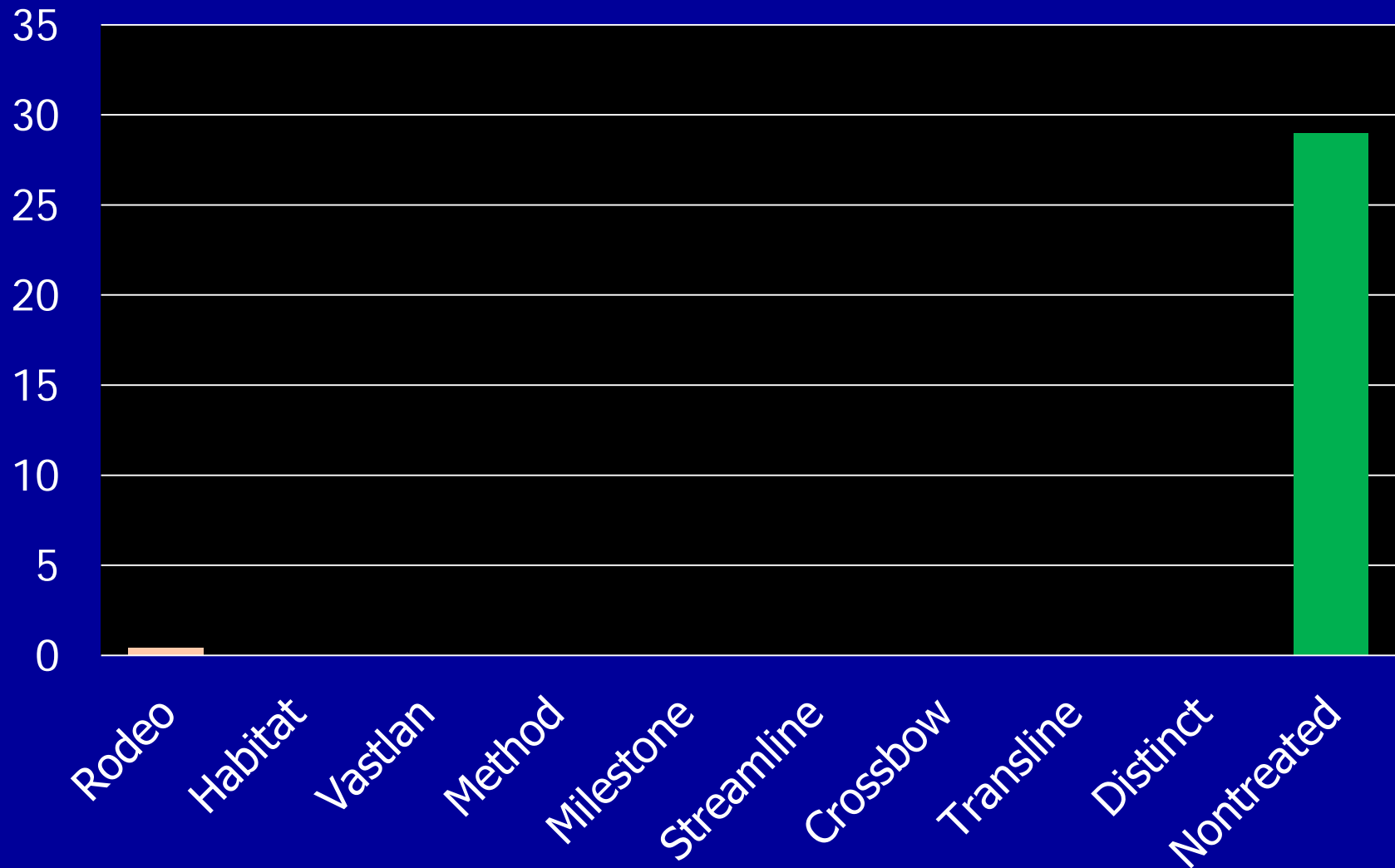
Injury at 2 WAT



European Coltsfoot Control

Leaf Biomass at 6 WAT

g/plant



2nd Species: Italian Arum

- *Arum italicum* (Class C in WA), Araceae (arum family)
- Italian arum grows in a range of sites from full sun to mostly shade, often fully crowding out other vegetation
- It grows from tubers found beneath the cluster of leaves
- It generally spreads slowly unless cultivated



Leaves are glossy green, arrowhead-shaped, and usually variegated with white markings



Plants primarily reproduce
from tubers produced
among the roots





Italian arum produces a spadix and spathe that bears tight clusters of 3-seeded, bright orange berries in late summer and fall

Italian Arum Herbicide Trial

- Greenhouse trial conducted at WSU Mount Vernon NWREC (2012-13 and 2016-17)
- **Italian arum tubers** were dug from field infestations near Olympia and Mount Vernon
- Those were transplanted into **small pots** and placed in the greenhouse
- Nothing whatever happened for several months, but foliage finally started to emerge in the fall, to the point where **every single pot eventually had leaves (!!)**

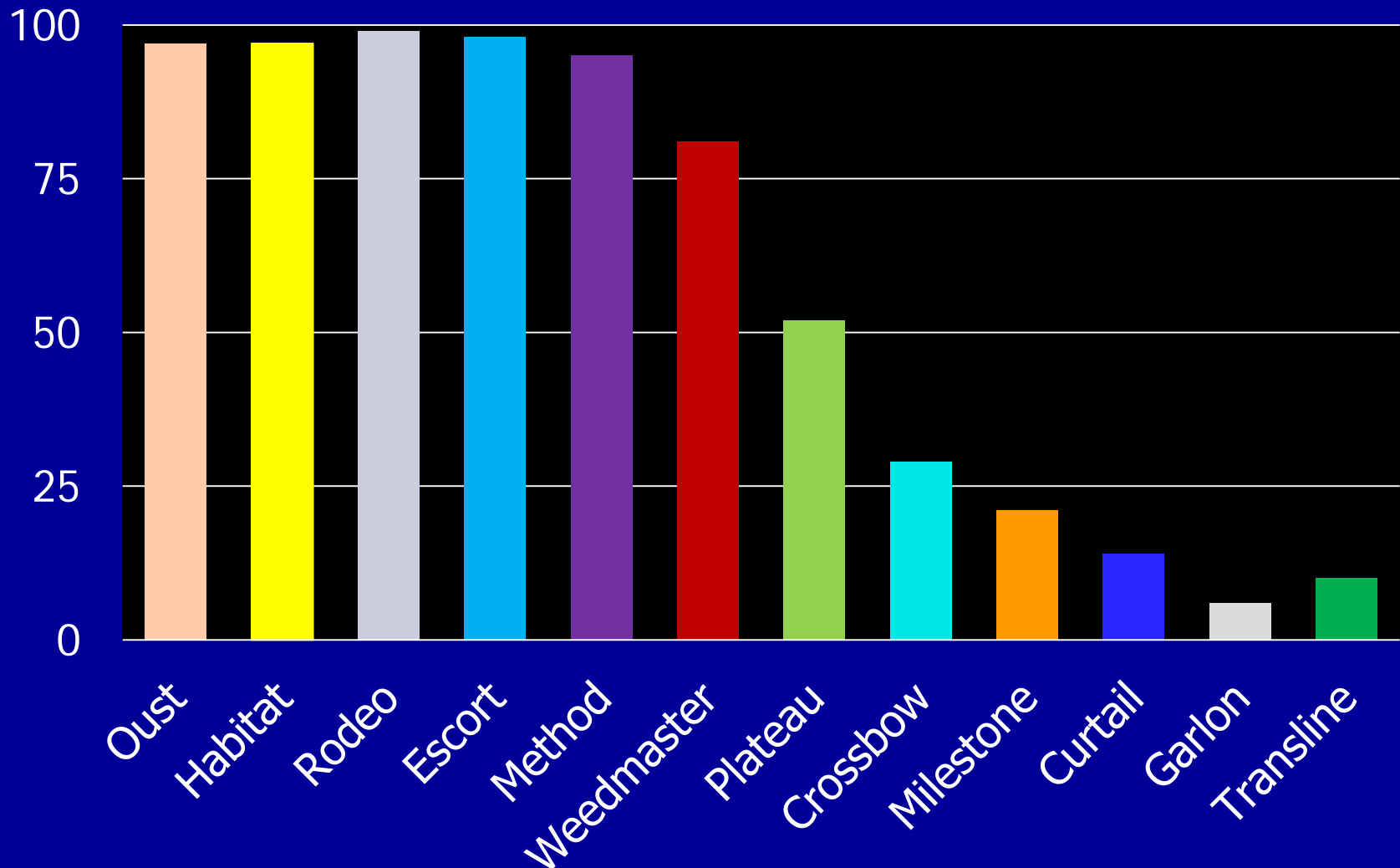


Italian Arum Herbicide Trial

- Plants grew through the winter, then were treated with 12 different herbicides in May
- Plants were allowed to translocate the herbicide for 30 days
- Foliar chlorosis was estimated in June (no difference noted between treatments)
- Foliage was then clipped off at the soil level
- The pots were then maintained for 5 more months and re-grown leaves were weighed to determine herbicide efficacy

Italian Arum Control

% From Leaf Biomass at 6 MAT, 2016 & 2017



So Do We Declare Success?

- Unfortunately, foliage of this species typically **dies back in early summer anyway**, so it's difficult to say the defoliation was entirely due to these herbicide treatments
- Tubers produced in the pots were collected at 12 MAT both years
 - Many of the treated plants, though leaves were dead, still had **white, crisp tubers**
 - Unsure if these tubers would be **capable of sprouting** or not

3rd Species: Yellow Archangel

- *Lamium galeobdolon* (sometimes also as *Lamium galeobdolon*) (Class B in WA, List B in OR), Lamiaceae (mint family)
- Commonly-planted ground cover has attractive variegated foliage
- Grows well in half shade to full sun
 - Can grow under Douglas fir and western hemlock
 - Limited growth under western red cedar
- Reproduction primarily via rooting nodes, but also produces viable seeds

Bright yellow
flowers in
axillary whorls



Almost
complete
ground
coverage





Easy to propagate



Adventitious rooting



Yellow Archangel Field Trial

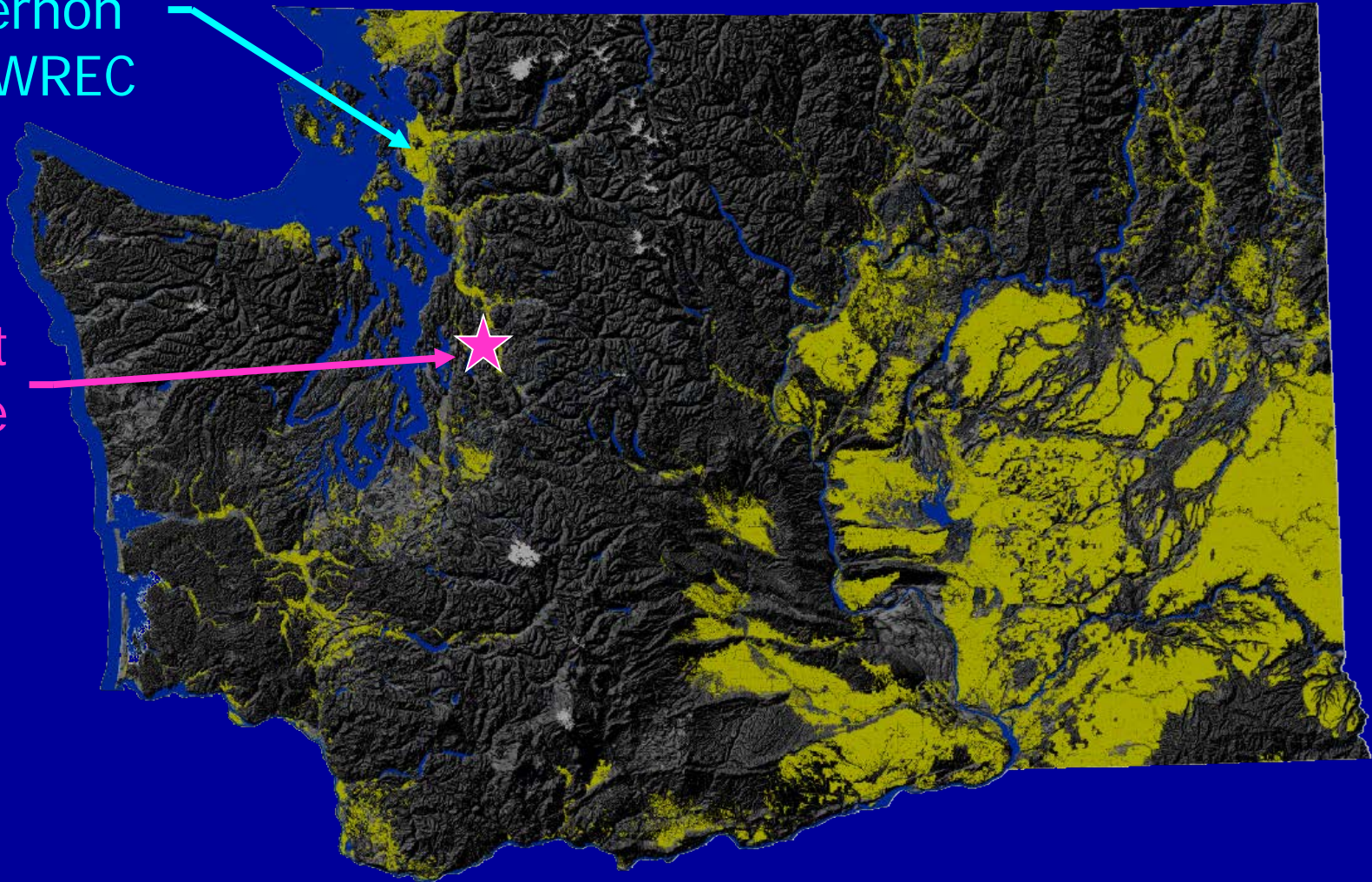
Phase 1, 2008-09

- Products working the best in a **greenhouse trial** were tested on a park population in Kirkland, WA (**Sasha Shaw** and **Frances Lucero**, co-investigators)
- Herbicides applied in mid-June, 2008, immediately after bloom
 - **Vinegar** and **Matran EC** also tested (applied twice: June and September, 2008)
- Visual observations and biomass collected

Yellow Archangel Trial Site

WSU Mount
Vernon
NWREC

Plot
Site



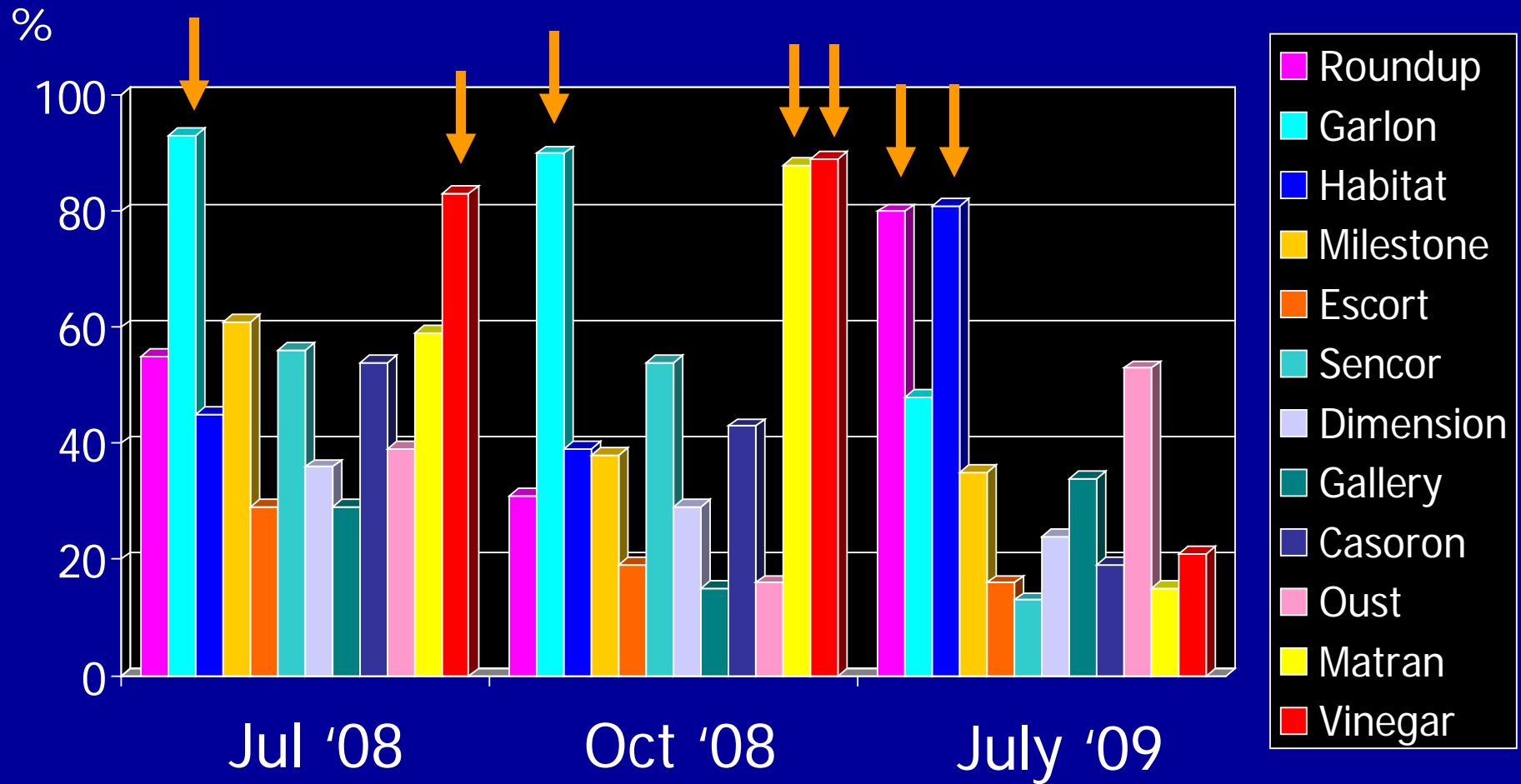


20% Acetic Acid

Untreated

Level of leaf "burn" at 1 week after treatment

Yellow Archangel Control



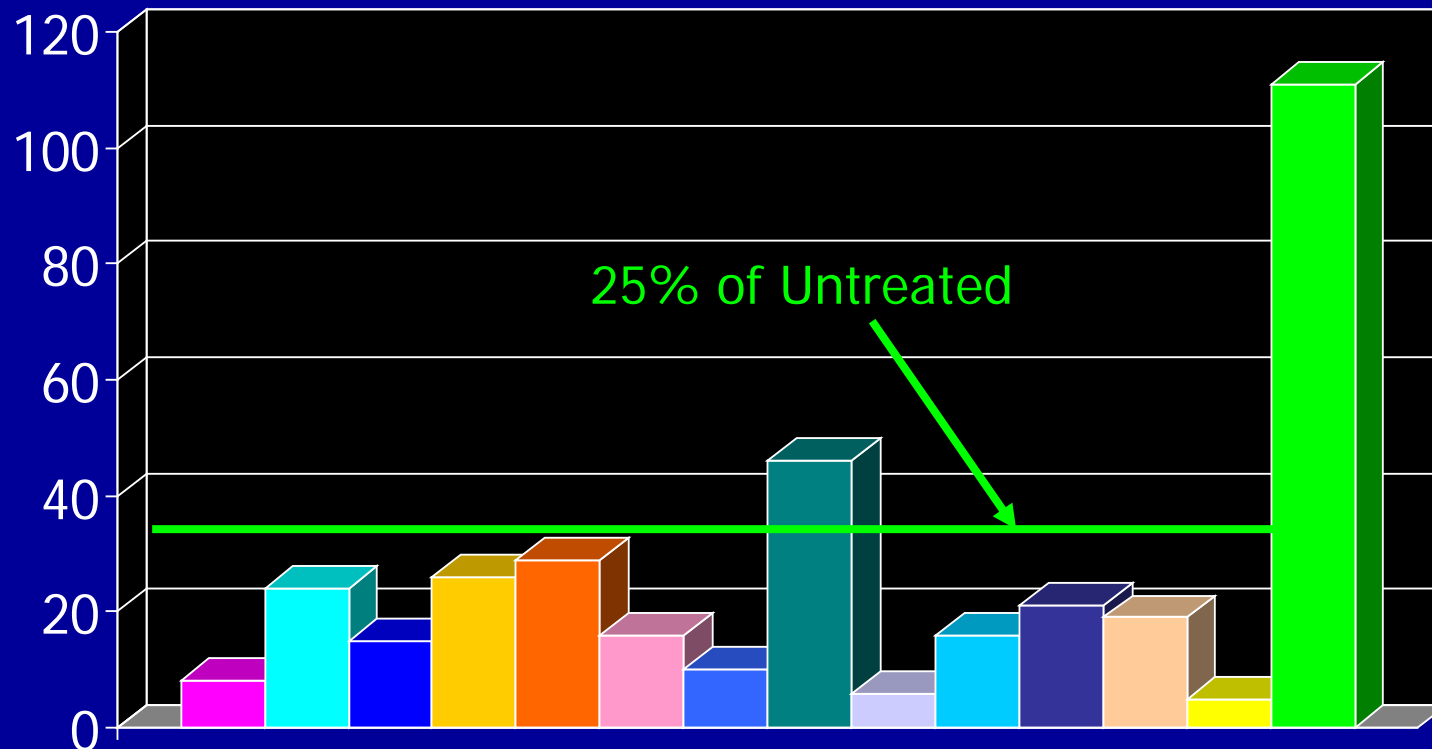
Yellow Archangel Field Trial

Phase 2, 2009-10

- Six products from Phase 1 were re-applied in October, 2009 on the same field population
- Herbicides applied with and without Roundup in tank mixture
- Visual observations and biomass collected in July, 2010

Yellow Archangel Biomass

g/quadrat



25% of Untreated

Jul '10

9 MAT

- Roundup
- Garlon
- Habitat
- Milestone
- Escort
- Oust
- Casoron
- Crossbow
- Mile + Rup
- Hab + Rup
- Esc + Rup
- Oust + Rup
- Gar + Rup

What About Yellow Archangel Seeds?

- Some seed germinated under **simulated winter conditions**
- Seed in soil **sporadically germinated** when areas were thoroughly weeded
 - It is not known how long these seeds were in the soil before they germinated
- While germination appears low, **yellow archangel seedlings do occur**
 - Areas should be monitored for seedlings following yellow archangel removal



4th Species: Butterfly Bush

- *Buddleja davidii* (a.k.a *Buddleia davidii*), Buddlejaceae (butterfly bush family)
- Originally from **China**, butterfly bush has naturalized in **Europe, Australia, New Zealand, and Canada**
- Wild populations have been found in **CA, OR, WA, and BC**, as well as in several **New England, mid-Atlantic, Great Lakes, Southeastern, and Midwestern states**



Plants may
grow as tall as
15 to 20 feet



Opposite leaves
with distinctive
arcuate venation



Flowers tubular with four petal tips and
yellow-orange centers; colors from
lavender to dark purple to rose or white



Seedlings **colonize**
cobbles on stream
flood plains

WA Field Trial, 2006-07

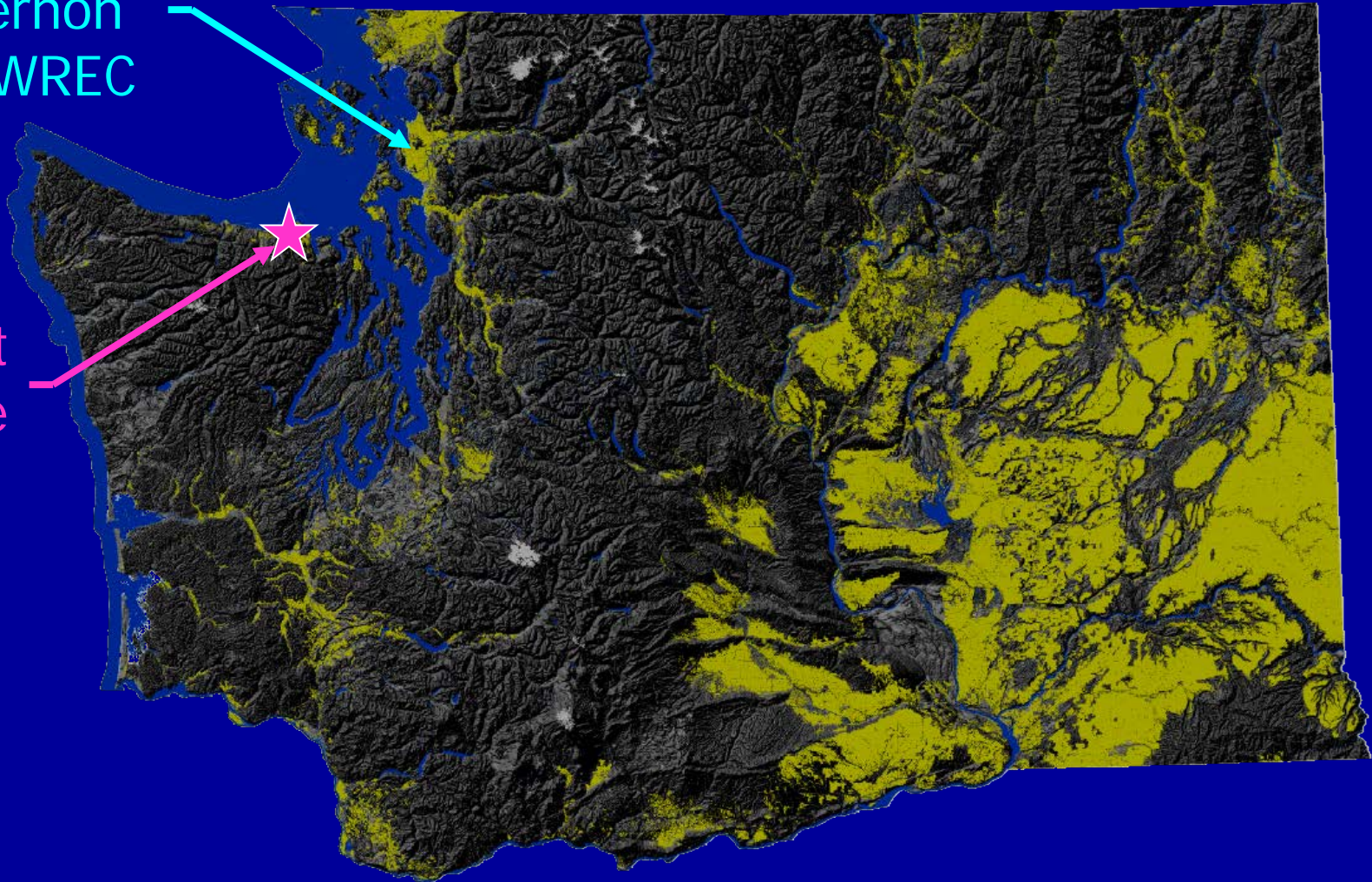
Materials and Methods

- **Cathy Lucero**, co-investigator, Clallam County Noxious Weed Control Board
 - Assistance by the **Dungeness Meadows Homeowners Association**
- **Cut-stem** or **foliar** treatments
 - Treated at pre- or post-flowering
- Trial maintained for **12 months**

Butterfly Bush Trial Site

WSU Mount
Vernon
NWREC

Plot
Site



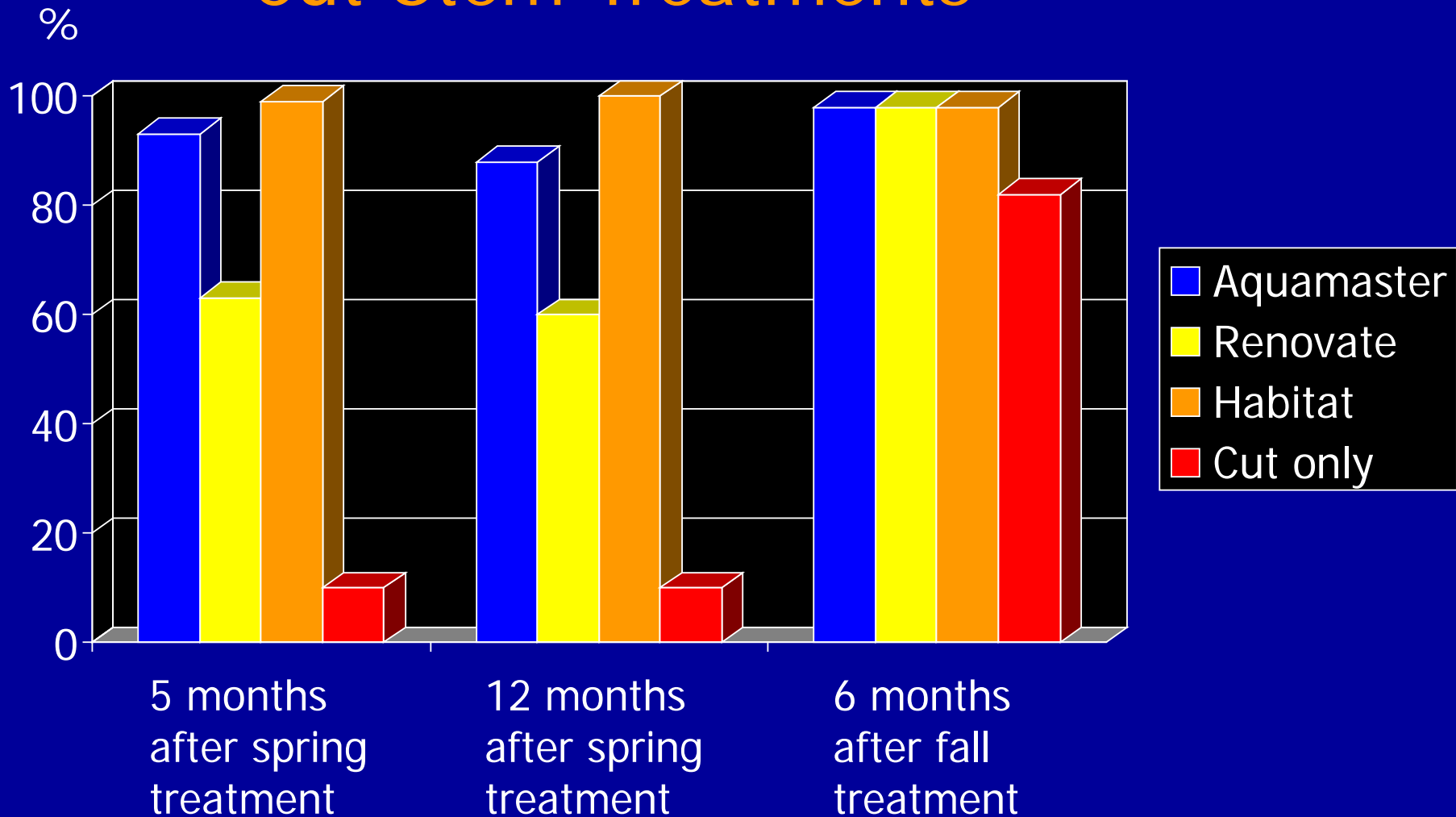
Field Trial

Materials and Methods

- Herbicides tested were **Aquamaster** (glyphosate), **Renovate** (triclopyr), and **Habitat** (imazapyr)
 - 33% herbicide sprayed on **freshly-cut stems**
 - Various rates on **foliage** (using the product remaining after cut stems were treated)
 - All treatments used **0.5% non-ionic surfactant**
- Plots measured about 20 ft by 20 ft
 - **3 to 31 butterfly bush plants** per treatment
 - **3 replicates** used in the trial

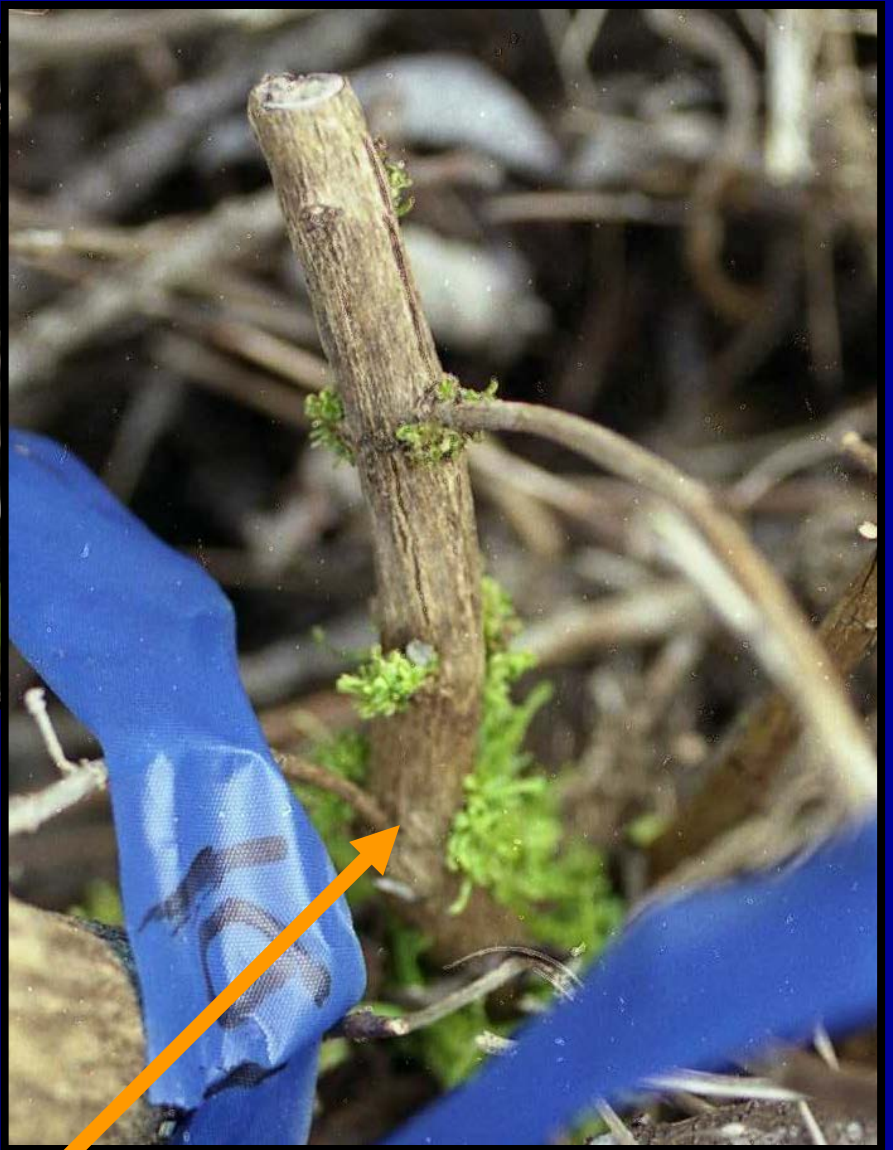
Butterfly Bush Injury

Cut-Stem Treatments





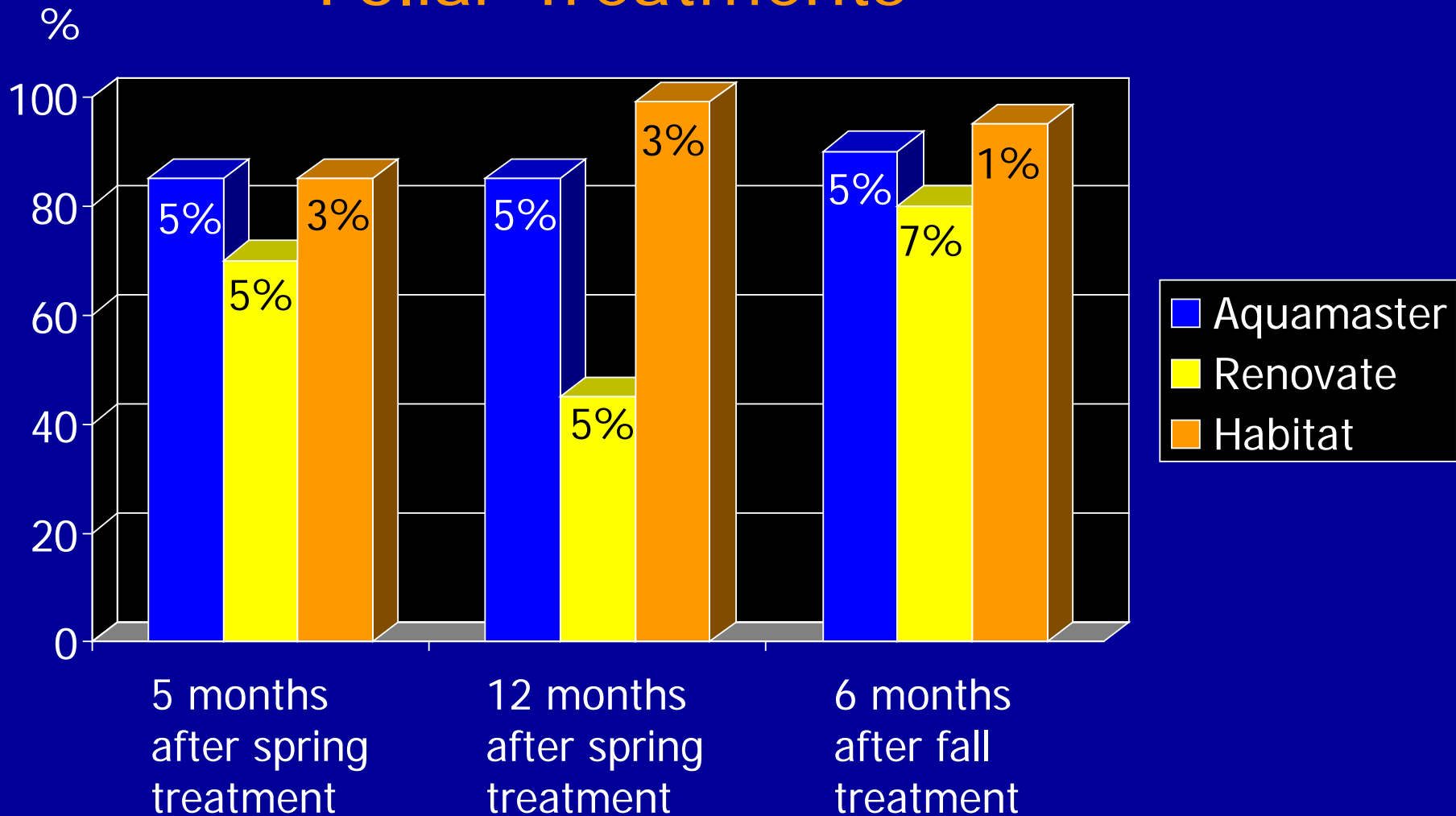
Re-growth after
Habitat application



Re-growth after
Aquamaster application

Butterfly Bush Injury

Foliar Treatments



So, What's The Bottom Line?

- Cut-stem applications offer great potential for control of large butterfly bush plants
 - Three tested herbicides showed good activity
 - Habitat, glyphosate, and Garlon 4 all active
 - There did not appear to be a “better” time to treat (pre- vs. post-bloom)
 - There is anecdotal evidence that old plants do not re-sprout as vigorously as young plants (at all?) after basal cutting of stems
- Foliar applications were not nearly as effective on established butterfly bush plants
 - Post-bloom sprays slightly more effective

5th Species: Yellow Flag Iris

- *Iris pseudacorus* (List B in OR, Class C in WA), Iridaceae (iris family)
- Forms monotypic stands, usually in wet areas, often even crowding out cattail
- True riparian species, found primarily on shores with seasonal inundation
 - Can maintain itself in standing water up to about a foot deep
- Can handle pHs from about 3 to 8
- Can handle some brackishness
- Prefers full sun to part shade



Look for the **two-inch wide, flat leaves** of YFI growing in clumps from **thick rhizomes**



YFI grows
thickly **along**
banks of
ponds,
lakes, and
slow-moving
streams



Flower color ranges from bright yellow to cream to yellow-orange



Look for black/brown **nectar guides** on tepals



YFI Seed Pods

- Borne in clusters at the tip of each stem
- Pods split into three sections at maturity
- Commonly produce 20 to 30 seeds/pod

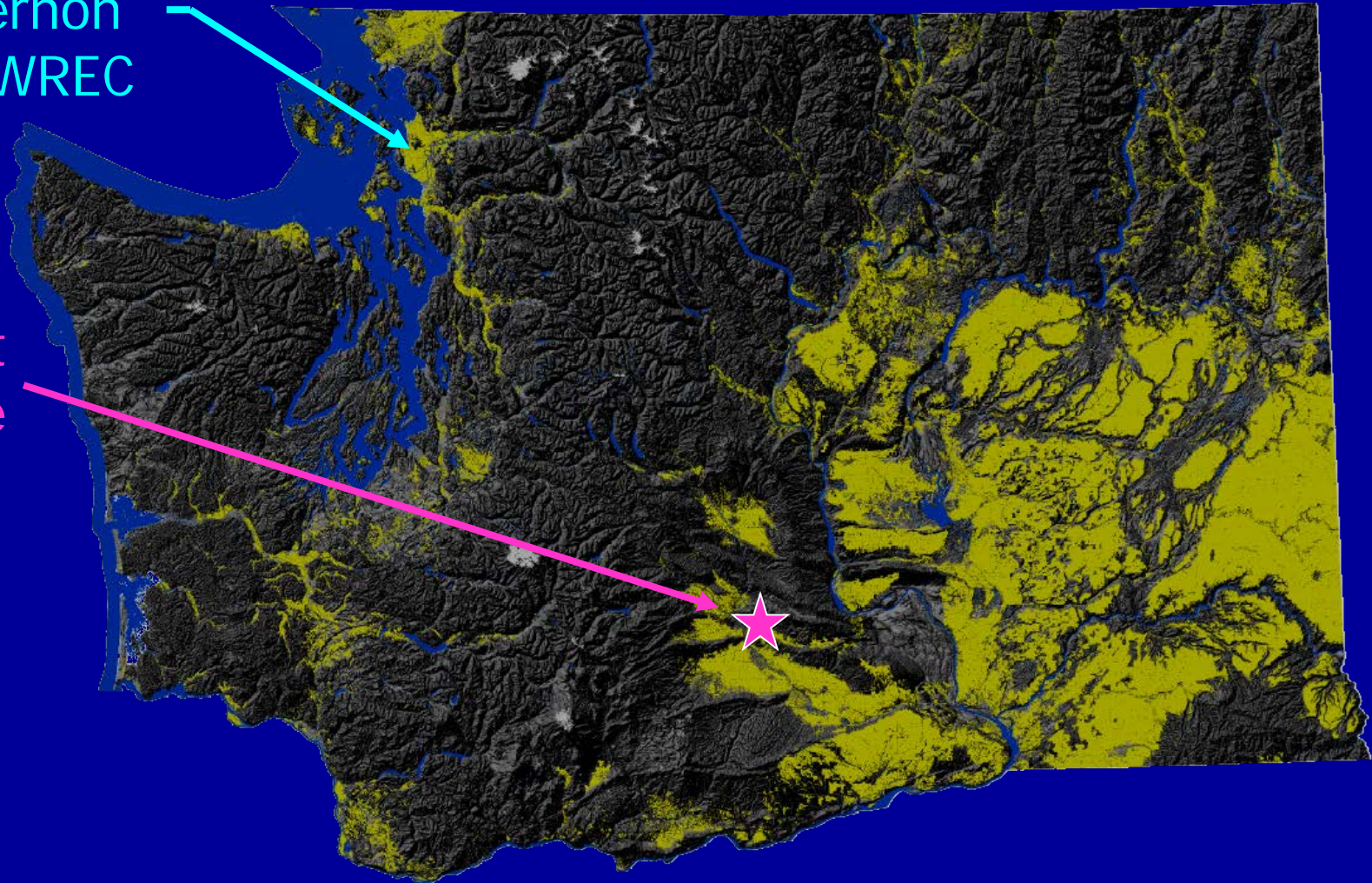


Seeds are about **1/3-inch** wide;
pods about **three inches** long

Yellow Flag Iris Field Site

WSU Mount
Vernon
NWREC

Plot
Site



Herbicide Screen

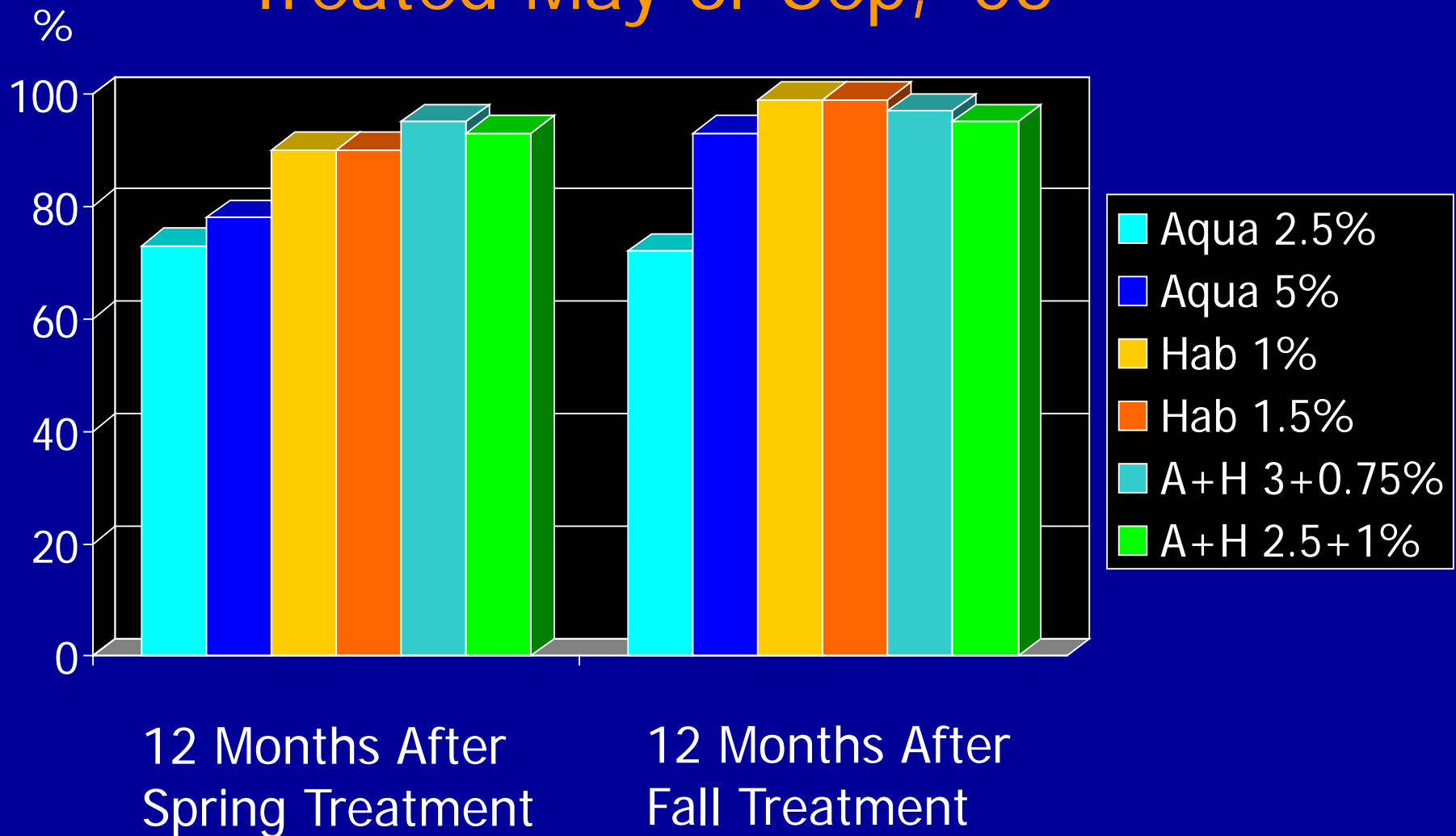
- Three aquatic herbicides were tested for efficacy
 - Glyphosate: Aquamaster, Rodeo, and others (2.5 and 5%)
 - Imazapyr: Habitat (1 and 1.5%) and others
 - Combinations of Aquamaster + Habitat (3 + 0.75% and 2.5 + 1%)
 - Triclopyr: Renovate—non-replicated test only (1 and 1.5%)(not very effective...)

Herbicide Screen

- Products applied at two timings
 - Pre-bloom (May 4, 2005)
 - Post-bloom (September 27, 2005)
- Applications made with CO₂-pressurized backpack sprayer delivering ~35 gpa from a 5-nozzle boom
- Nonionic surfactant added (1%, v/v)

Yellow Flag Iris Injury

Treated May or Sep, '05





YFI re-
growth

YFI
seedlings

Marshpepper smartweed

5% Glyphosate (12 months after spring treatment)

Non-chemical Control Test

- Four mulch products tested for efficacy:
 - Black plastic
 - Clear plastic
 - Shade cloth
 - Commercial plastic tarp
- All placed over established YFI plants shortly after onset of early spring growth (April) and anchored with cinder blocks
- Kept in place for about one year



Black Plastic

June '05



Black Plastic

June '05



May '06

~70% YFI

control



Clear Plastic

June '05



Clear Plastic

June '05



May '06

~85% YFI

control



Shade Cloth

June '05



Shade Cloth

June '05



May '06
~95% YFI
control



Plastic Tarp

June '05



Plastic Tarp

June '05



May '06
~99% YFI
control



Have You
Had
Enough?



WASHINGTON STATE UNIVERSITY

World Class. Face to Face.