

# Sustainable Weed Management in Landscapes and Rights-of-Way

23<sup>rd</sup> Annual Horticultural Pest Control Seminar

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**University of California**  
Agriculture and Natural Resources

*Making a Difference  
for California*

# Acknowledgements

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- Cheryl Wilen, UCCE So. Calif.
- Scott Oneto, UCCE Central Sierra
- Joe DiTomaso, UC Davis
- Bill Roach, The HLA Group

# Why are Weeds Invading?

- Poorly maintained areas
- Underlying problem



# Why are Weeds Invading?

## Maintenance problem

*Overwatered or  
waterlogged areas*



# Why are Weeds Invading?

**Maintenance problem**

***Compacted  
soils or bare  
areas***





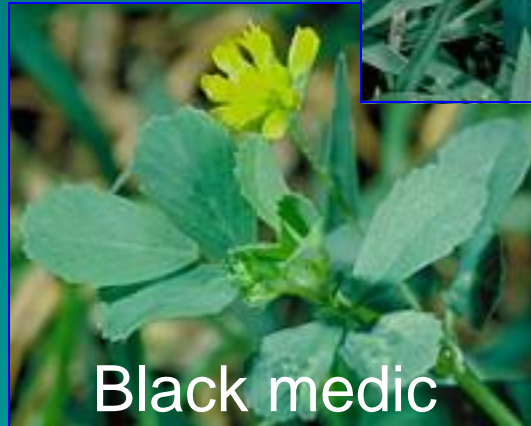
# Why are Weeds Invading?

## Maintenance problem

*Lawns low in  
nitrogen  
fertilizer*



White clover



Black medic



Burclover

# Why are Weeds Invading?

**Maintenance problem**

*Thin areas in  
lawns*



Dandelion

# Why are Weeds Invading?

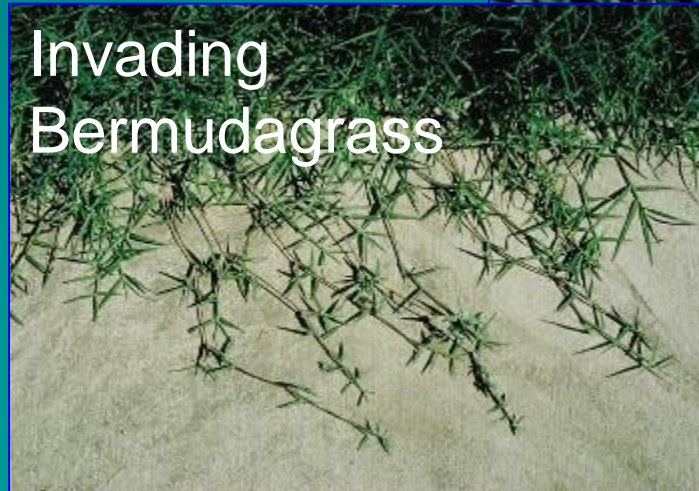
## Maintenance problem

*Lawns mowed  
too short*

Bermudagrass  
flower head



Invading  
Bermudagrass



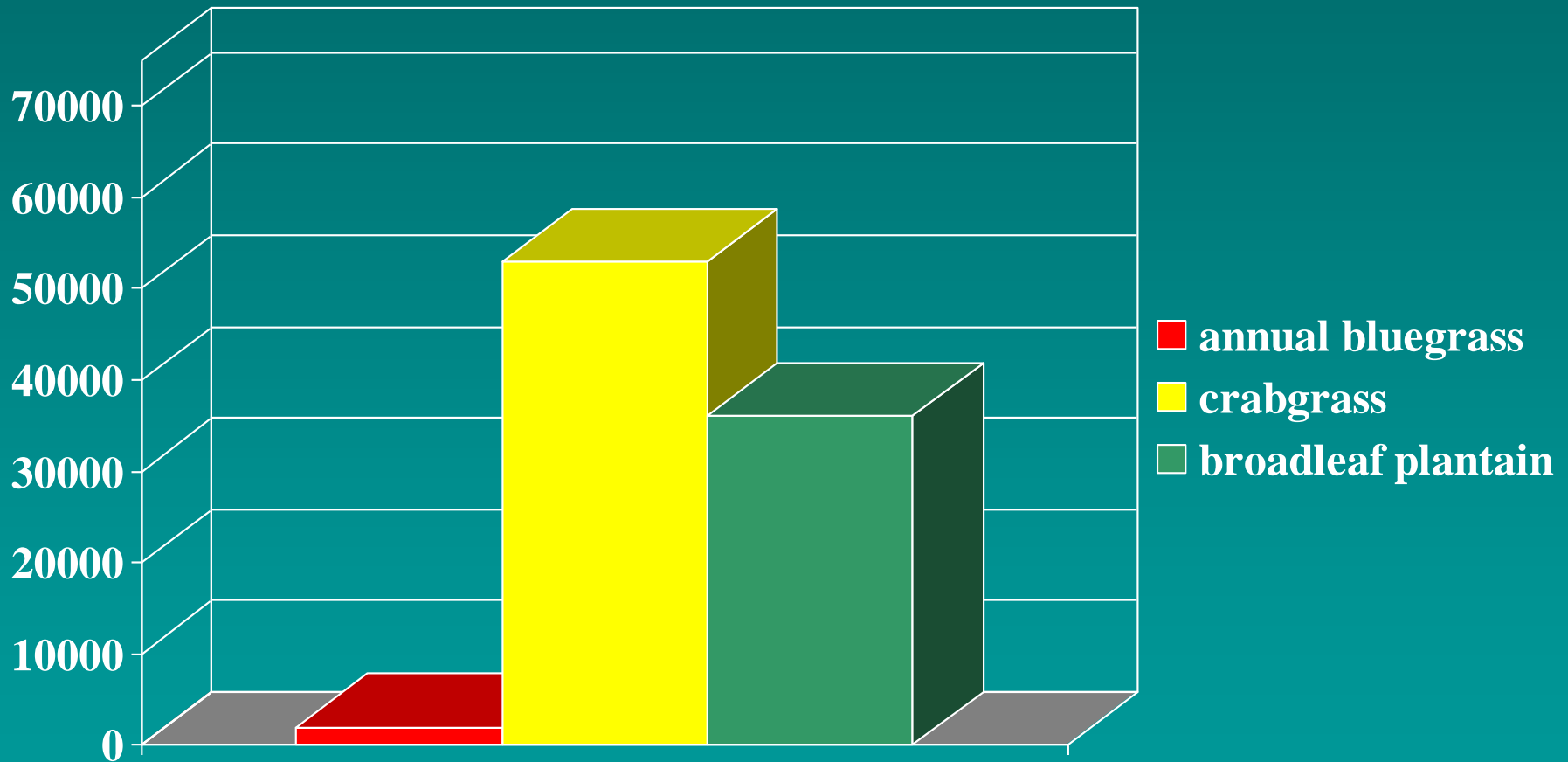


# Soil Seed Bank

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- A plant's persistence is ensured by the seed bank
- Seeds are deposited, stored and later removed for use
- Some not deposited, used within a year
- Not all seeds survive

# Approximate No. of Seeds/Plant



# Longevity of Weed Seeds in Soil

Weed	Years
Milkweed	3
Cocklebur	16
Johnsongrass	20
Redroot pigweed	40

# Longevity of Weed Seeds in Soil





# Tillage/Cultivation

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- Best on annuals when weeds are small
- Dry conditions after cultivation help to prevent re-rooting
- Goal is to detach, damage, or bury weed parts such that they cannot recover
- Brings weed seeds to surface soil

# Organic Mulch



**Wood chips, bark, needles, walnut or almonds shells, etc.**





# Mulch FOHC





# Mulch Reduces Weeds if Deep Enough





# Potential Benefits of Mulch

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- Insulates roots from temp. extremes
- Improves plant establishment
- Protects trees from mechanical injury
- ↓ weeds & erosion
- Conserves soil moisture → ↑ root growth
- ↑ microbial biomass & activity
- ↑ water penetration

# Potential Problems with Mulch

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- May prolong saturation in heavy soils
  - » Favors root and crown rot
- Vertebrate pests (moles, voles, mice)
- Can't see soil moisture
- Some wood chips poor quality
- Time consuming to spread (\$)

# Mulch Basics (Wood Chips)

(LGtoM, CIWMB, 2002)

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- Remove weeds, water before applying
- Application rate: Generally 2-6 in. deep
  - » Fine = 2 in. Coarse = 4-6 in.
- Durability of wood chips increases with underlying fabric or plastic
- Softwood mulches (conifer) last longest
  - » Less microbial feeding

# Some Weeds Blend in With Mulch

# Mulch Doesn't Control Perennials!



Spotted spurge



Bermudagrass



Bindweed



# Mulching and Weed Control

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- Thickness to mulch depends on mulch type
- Various studies:
  - » 3-in. layer: 85% weed control over 3-yrs.
  - » 4-in. mulch gave better control than 3-in.
  - » Phenols & tannins in coniferous bark improved weed control

# Plastic Mulch





# Plastic or Fabric Underneath?







Synthetic mulches will usually become exposed and shred, especially on slopes



# Plastic Recycling

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## **Encore Recycling**

44090 County Road 28H, Woodland

<http://encore-recycling.com>

# Soil Solarization

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- Use of clear plastic to heat soil & kill most weeds, seeds, and diseases
- Cover bare, moist soil with 1.5 to 2 mil UV-protected plastic during summer
- Seal edges with soil, leave on 4-6 weeks
- Repair tears

# Soil Solarization in Strawberry Field



Manually



Clear plastic,  
UV protected

Mechanically



Research Trial

# Solarization

- Kills most seeds and seedlings in top 6-8"
- Also can control insects, pathogens, and nematodes
- Poor control of deep rooted perennials
- Need high intensity light, 4-6 weeks during summer





# Bermudagrass Trial

## Sacramento, 2007



Sheet  
Mulch





# Bermudagrass Trial

## Sacramento, 2007

### Soil Solarization





# Flaming

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- Kills weeds much like a contact herbicide
- Treated leaves go from a glossy to a mat finish
- Mainly effective on young annuals
- Expensive in most cases

# Flaming





# Portable or hand held flamers

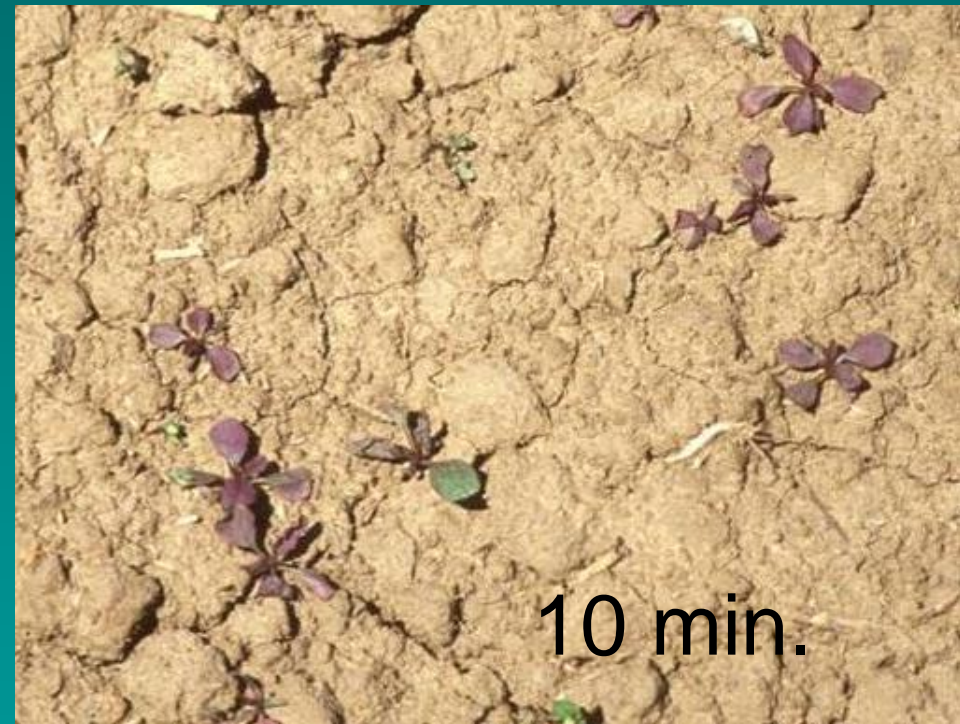
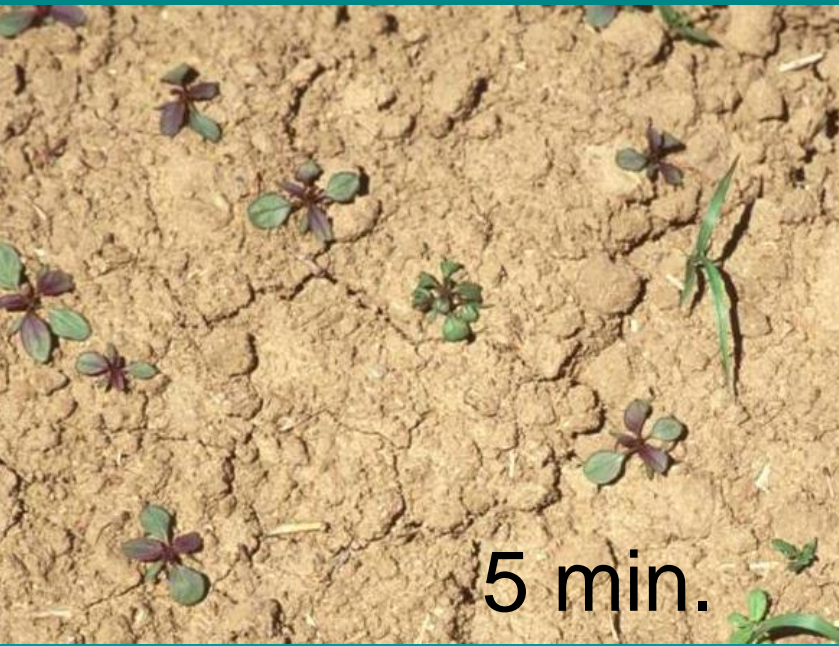


Not dry grass!





# Flaming



# Synthetic Mulches

## Polypropylene and Polyester

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- Better weed control than chips alone
- Slower breakdown of wood chips
- Allow water & air movement
- Do not improve soil quality
- Most are effective 3-5 yrs. (under chips)
- Most are not recyclable (landfill!)



# Weed Control After 4 Years (UCD)



1 pre-emerg.  
applic.



1 wood chip  
applic.

Wood chips  
+ woven  
polyprop.





# Low-Impact Development Bioswales



- Mechanical
- Drain, direct, dispatch
- Flow control, detention, retention



- Biological
- Slow, spread, soak
- Filtration, infiltration, treatment

# Native Grasses on Ditchbank





# Bioswale



# Bioswale UCD Brewery



Bill Roach, The HLA Group



# Roadside Weeds



UC Davis Weed Science Program  
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Photo by Joe DiTomaso



# Native Grasses on Roadsides

Hedgerow Farms,  
Winters





# Trailside Native Grass Planting

Folsom, Dec. 2001



Before tilling



After tilling





Raking to incorporate

Many weeds  
came up with  
grasses







May 2002

Mix of native grasses  
& weeds

Mowing to benefit  
native grasses



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# Evaluation of Least-Toxic Herbicides

Cheryl Wilen

UC Statewide IPM Program

Phil Boise

Urban Ag Ecology



# The Problem

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- Desire to reduce use of synthetic herbicides
  - » environmental and human health
- Reduce labor time
  - » including notification/reporting
- Regulations
  - » Healthy Schools Act
  - » Local codes

# The Solutions

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- Do nothing
- Mow
- Use less synthetic herbicides
- Use more mechanical/physical controls
- Use alternative herbicides

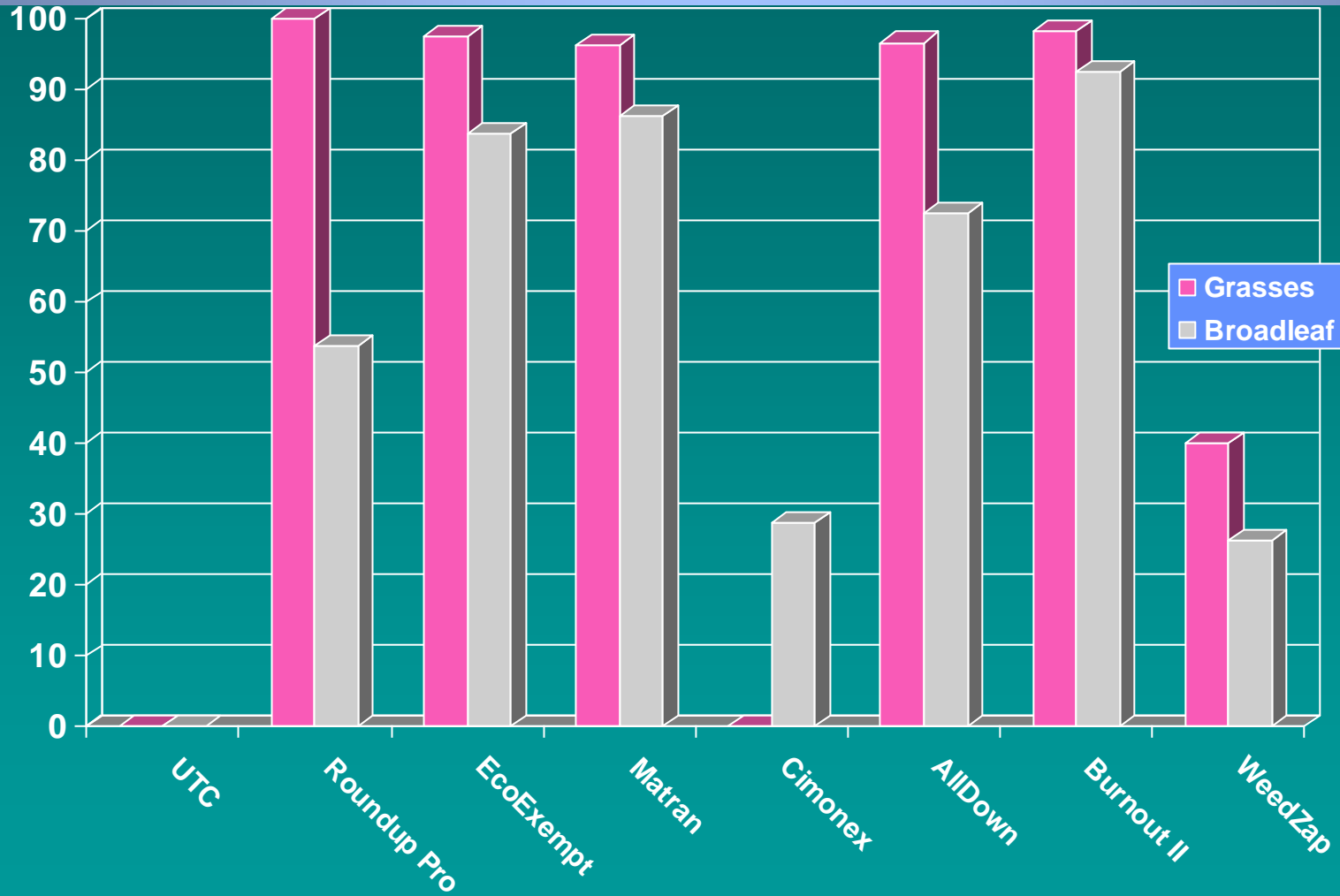
# Products

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- Ingredients are GRAS or food quality
- Listed as Organic
- Caution label
- Possibility of better public acceptance



# Percent Control 6DAT



# Results (% control)

45 DAT 1st app, 35DAT 2nd app



**UNTREATED**



**ROUNDUP**



**ECOEXEMPT**



**MATRAN**

1X 0  
2X 0

98.5  
98.5

30.0  
30.0

13.8  
15.0



**CIMONEX**



**ALL DOWN**



**BURNOUT II**



**WEEDZAP**

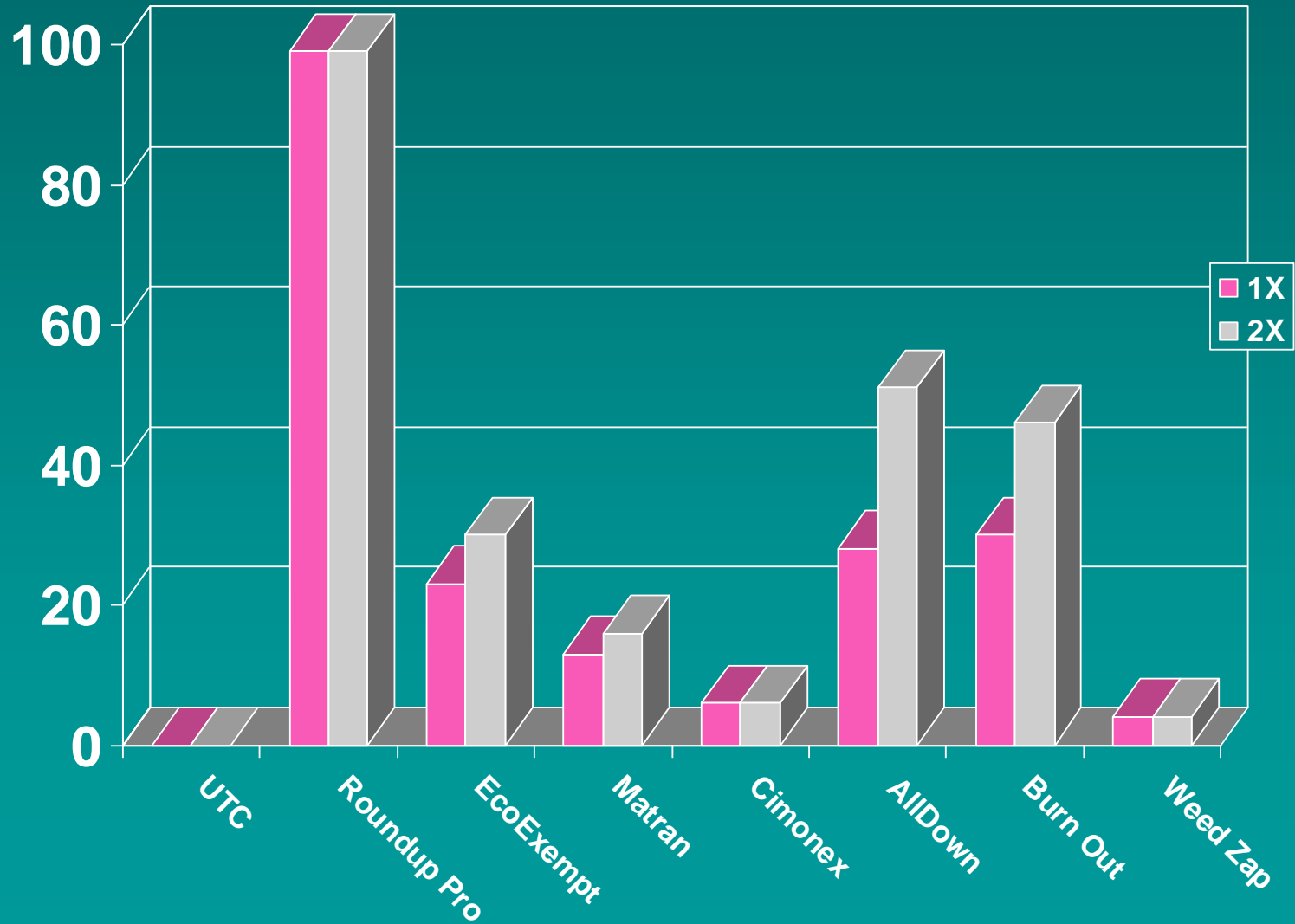
1X 6.3  
2X 6.3

28.8  
38.8

36.3  
51.3

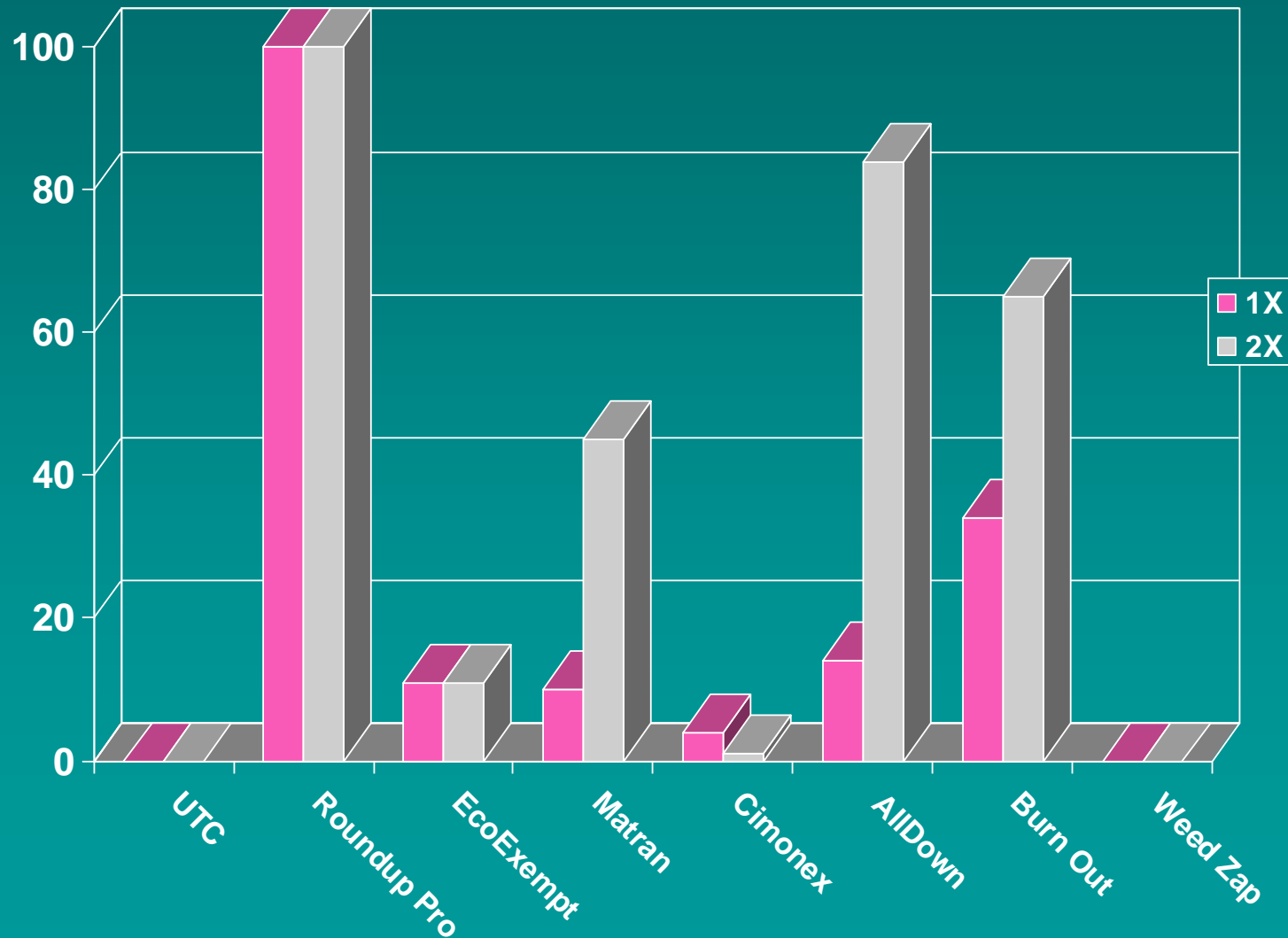
5.0  
5.0

# Percent Control Grasses





# Percent Control Broadleaves



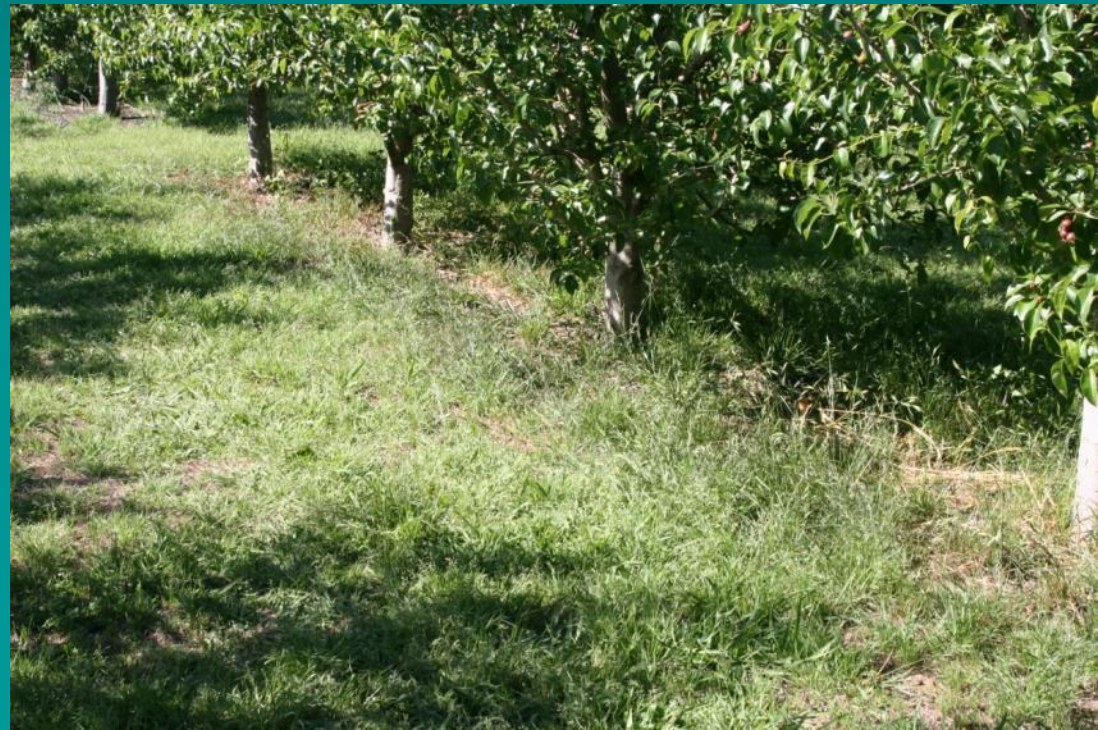
# Costs

	<u>\$/gal</u>	<u>gal/A</u>	<u>\$/A</u>
Roundup Pro	47.60	1.70	80.92
EcoExempt	97.00	19.00	1843.00
Matran	80.00	7.60	608.00
Cimonex	n/a	57.00	
AllDown	15.20	114.00	1732.80
Burnout II	32.00	38.00	1216.00
Weed Zap	n/a	14.25	
Reward	126.00	0.66	83.00

# Org. Orchard Study GreenMatch, Vinegar

May 2009

Feb. 2009





# Wood Chips



10/08, 4/10 & 4/11

5' strip, 6" deep (224 cu.  
yds./acre) or 4"







# Wood Chips

Only occasional  
weed growth





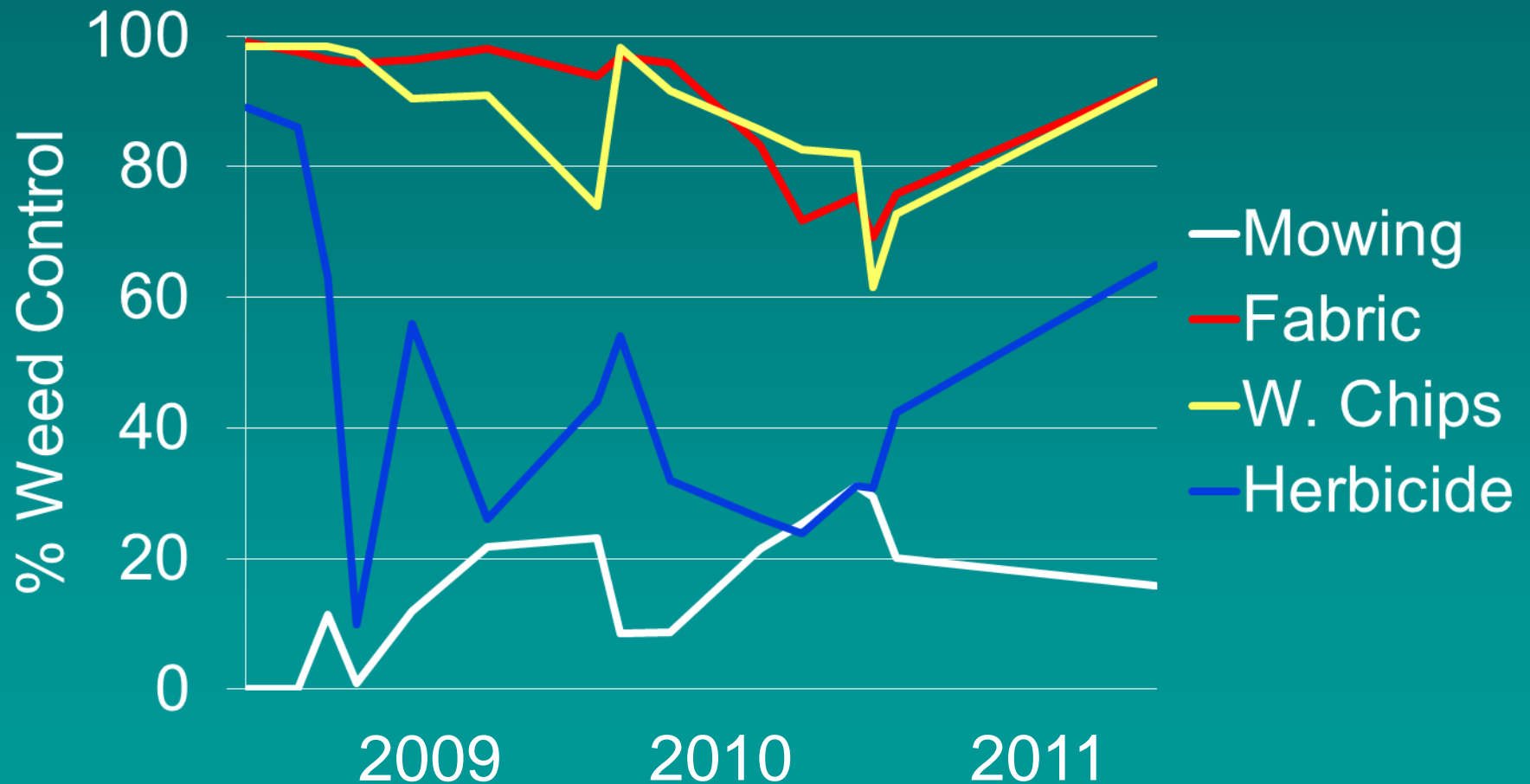
# Landscape Fabric

- 3 ft. wide/side, overlapped 8 in. (~5 ft. wide)
- Pins placed every 2 ft.
- Lasts 8 years (?)





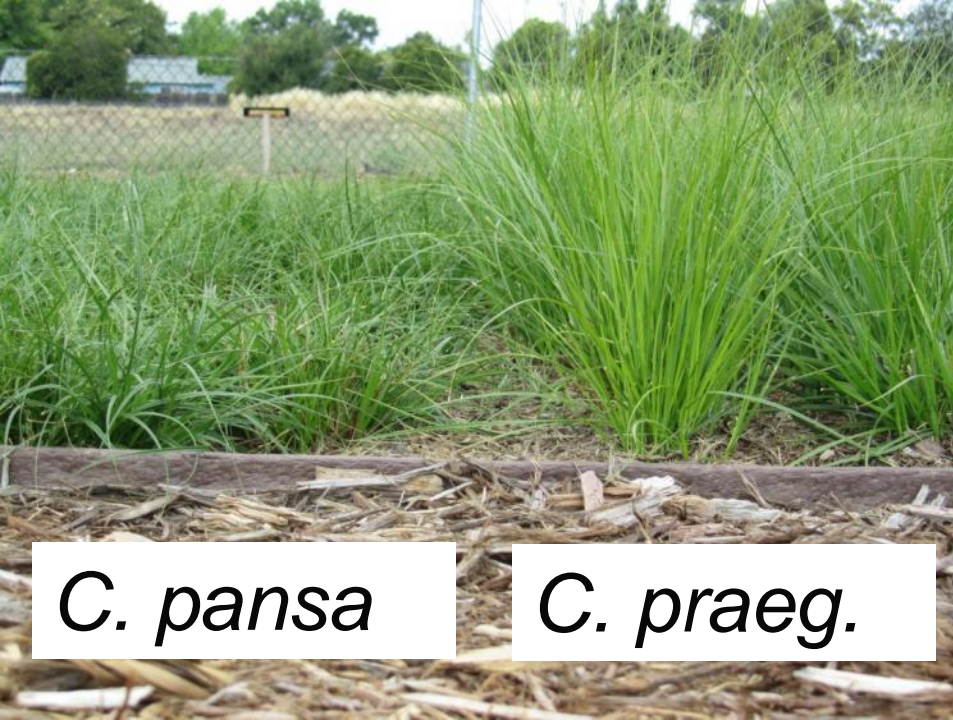
# % Control of Weeds



# Turf Demonstration

## Planted Sept. 2010

Agrostis	Field sedge	Native grass meadow	UC Verde Buffalo	Tall Fescue
	Dune sedge			
Molate	Field sedge		UC Verde Buffalo	Tall Fescue
T. hairgrass	Dune sedge			
Junegrass	Field sedge		UC Verde Buffalo	Tall Fescue
Blue grama	Dune sedge			



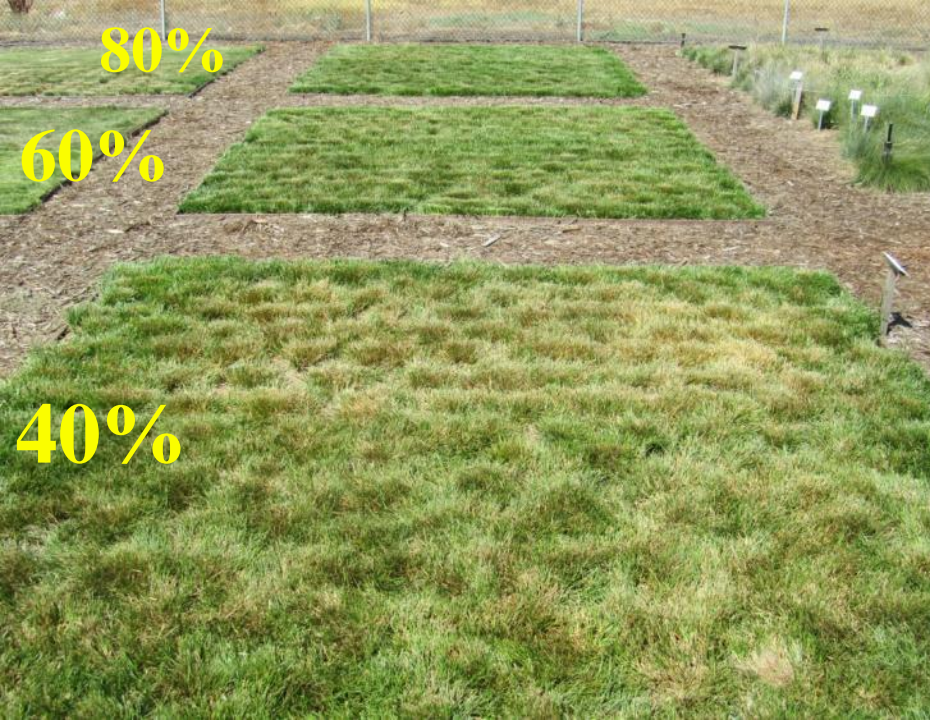
*C. pansa*

*C. praeg.*

Carex  
May 2012







# Carex Under Stress

## Late August 2011

80%  $ET_0$   
(some dormancy)



40%  $ET_0$





# Weed Control for Plugs

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# *Carex pansa* Weed Control Trials 2012

Chuck Ingels, UCCE Sacramento County  
John Roncoroni, UCCE North Coast (Weed Science)

Cornflower Farms  
Elk Grove



# Carex pansa Planting Cornflower Farms



April

Aug. (cut)



Sept.



# Trial Setup

- Replicated trial: 10 treatments, 4 reps
- Plots 5 ft. x 7 ft.
- *Carex pansa* planted May 22, 2012
- Spacing: 1 ft.



# Trial 1



# Pre-Emergents

## Sprayed May 24

	Active Ingred.	Product	Rate/Acre
1	Prodiamine	Barricade 65 WG	1.5 lbs
2	Pendimethalin	Pendulum AquaCap	4 qts
3	Oryzalin	Surflan AS	4 qts
4	Dithiopyr	Dimension 2 EW	2 qts
9	Mulch	Wood chips	2 in.

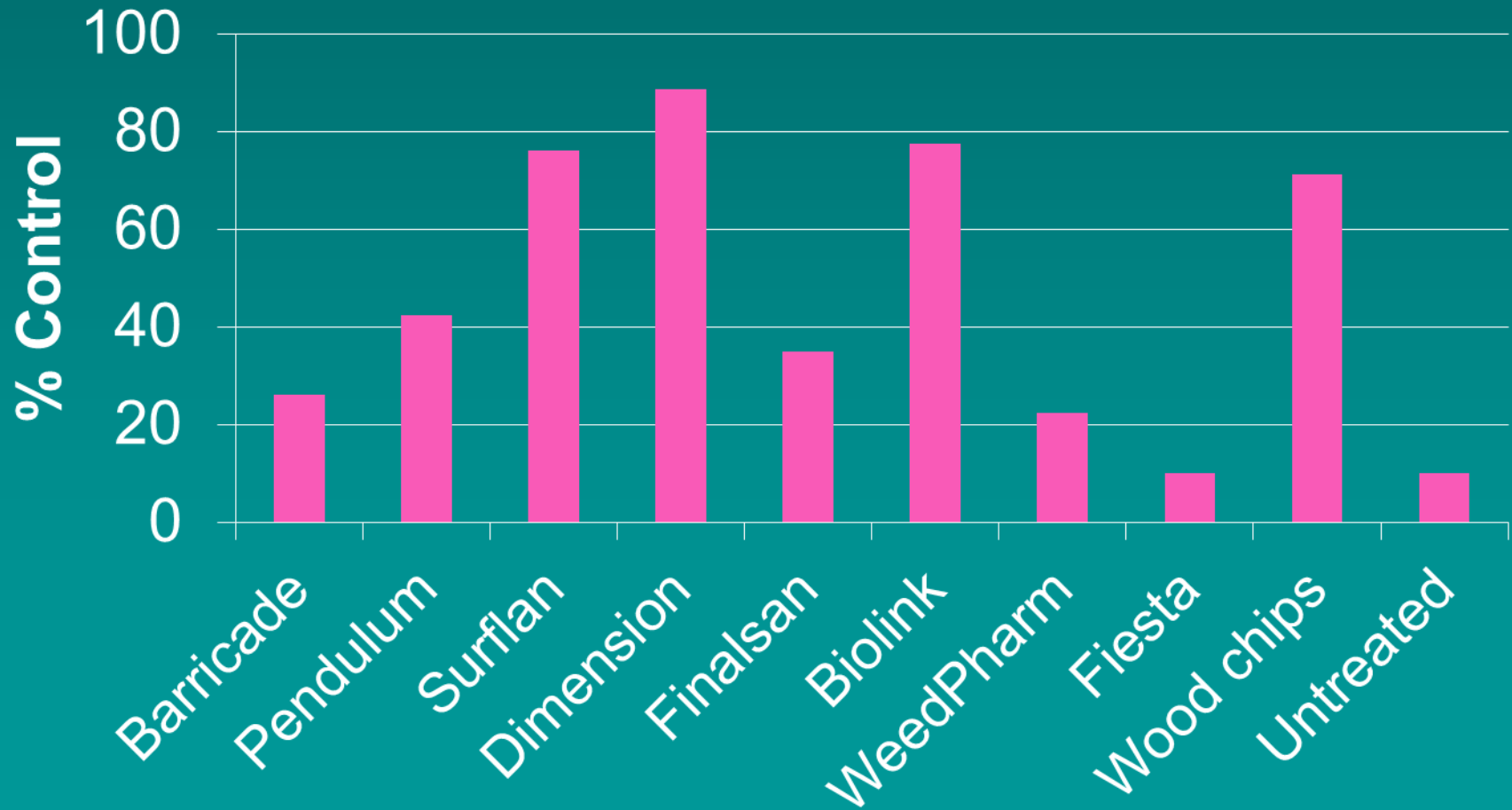
# Post-Emergents (Organic)

## Sprayed June 7

	Active Ingred.	Product	Rate
5	Ammon. soap of fatty acid	Finalsan	10% v/v
6	Fatty acid	BioLink	6% v/v
7	Acetic acid	WeedPharm (20%)	full
8	Iron (FeHEDTA)	Fiesta	3 % v/v
10	Untreated		

# Effects on Young Weed Control

## June 26 (33 and 19 DAT)





# Effects on *Carex* (Phytotoxicity)

June 26 (33 and 19 DAT)



# Trial 1

June 12 (19 and 5 DAT) Dimension



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# Trial 2



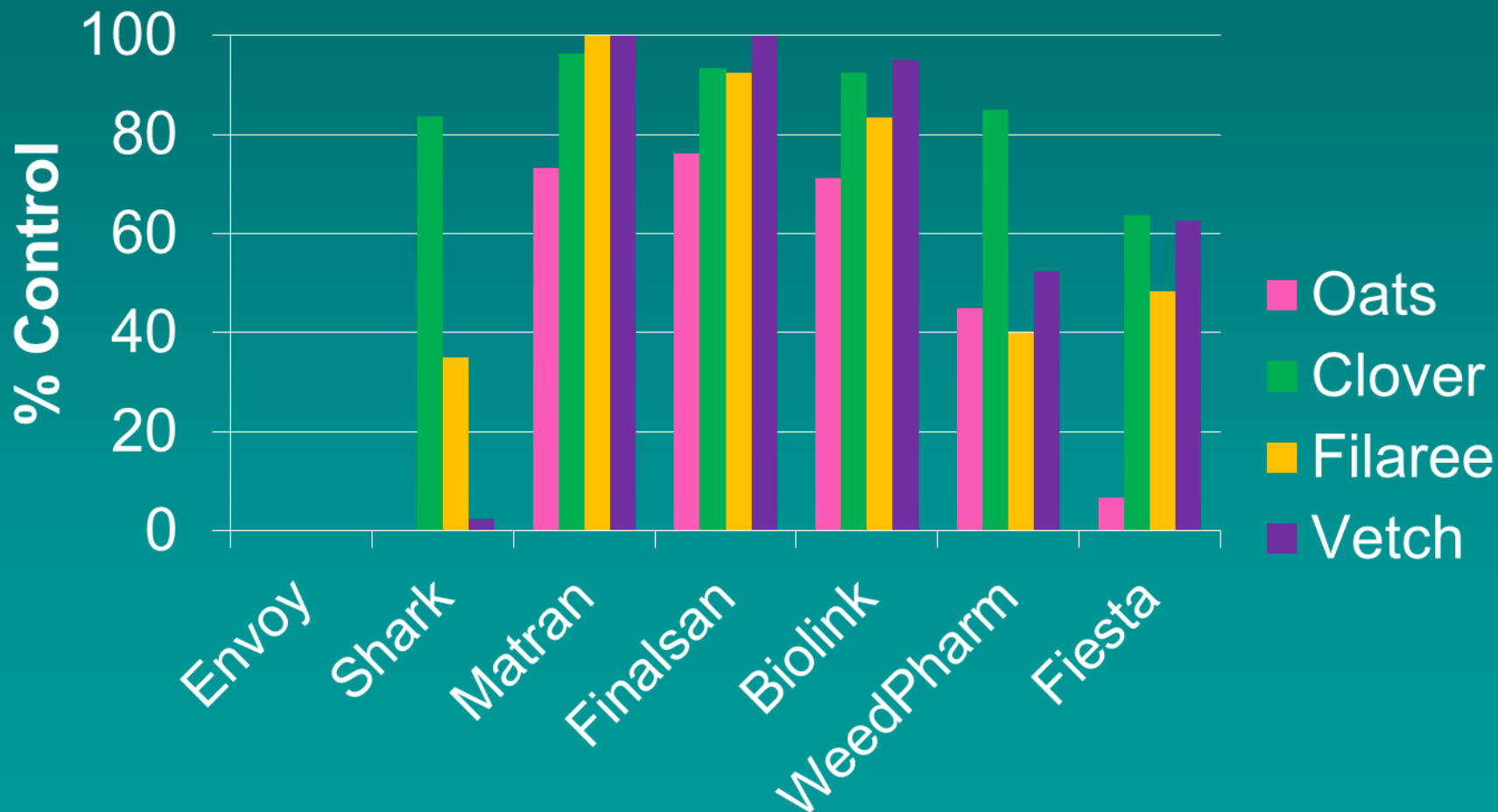
# Treatments (Post-Emergent)

## Sprayed Aug. 29

	Active Ingred.	Product	Rate/Acre
1	Clethodim	Envoy	12 oz
2	Carfentrazone	Shark	10 oz
3	Halosulfuron	Sedgehammer	1 oz
4	Clove leaf oil	Matran	20% v/v
5	Ammon. soap of fatty acid	Finalsan	<b>20%</b> v/v
6	Fatty acid	BioLink	6% v/v
7	Acetic acid	WeedPharm (20%)	full
8	Iron(FeHEDTA)	Fiesta	<b>10 %</b> v/v
9	Mulch	Wood chips	2 in.

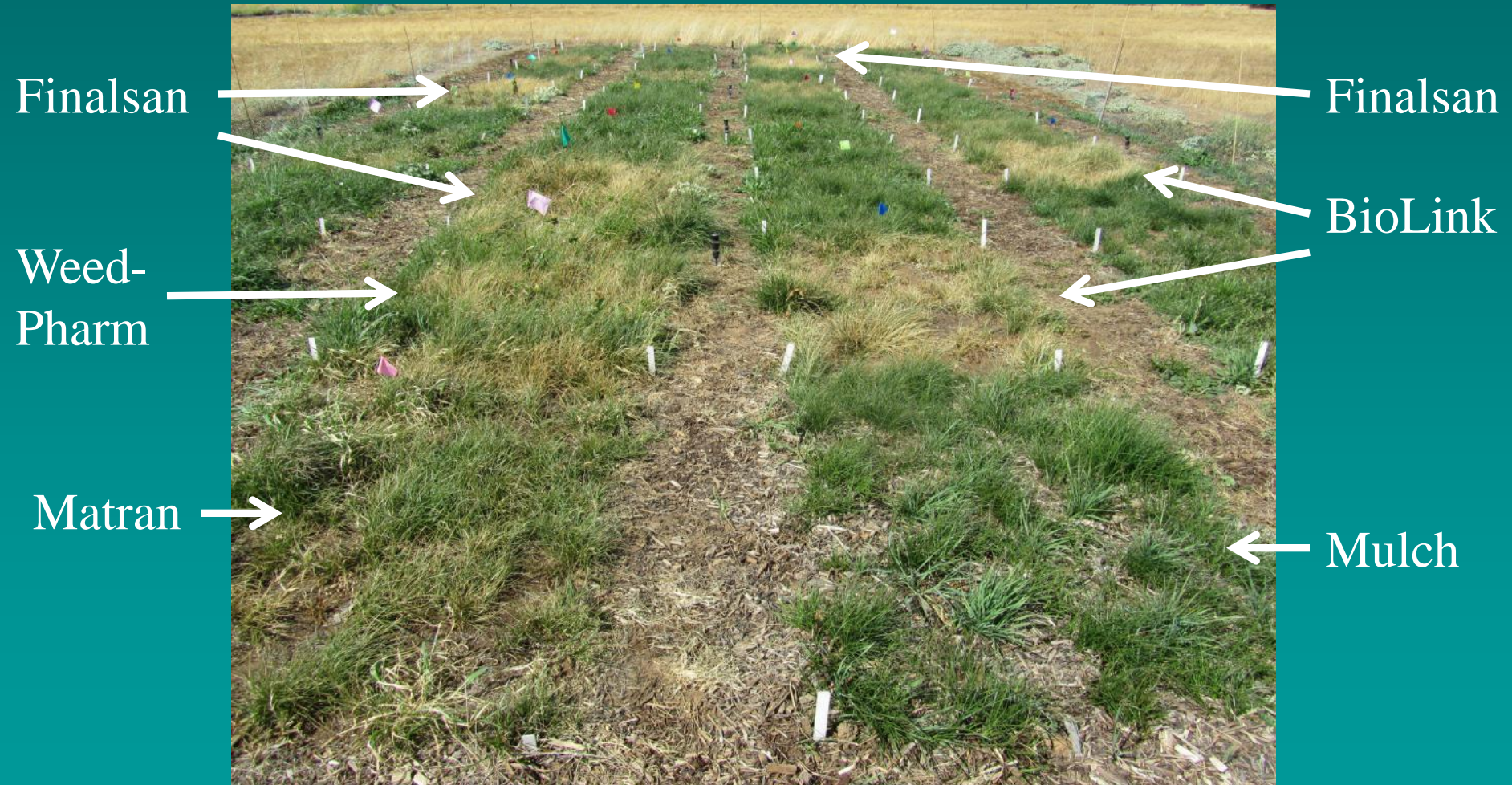
# Effects on Weed Control

Aug. 31 (2 DAT)



# Trial 2

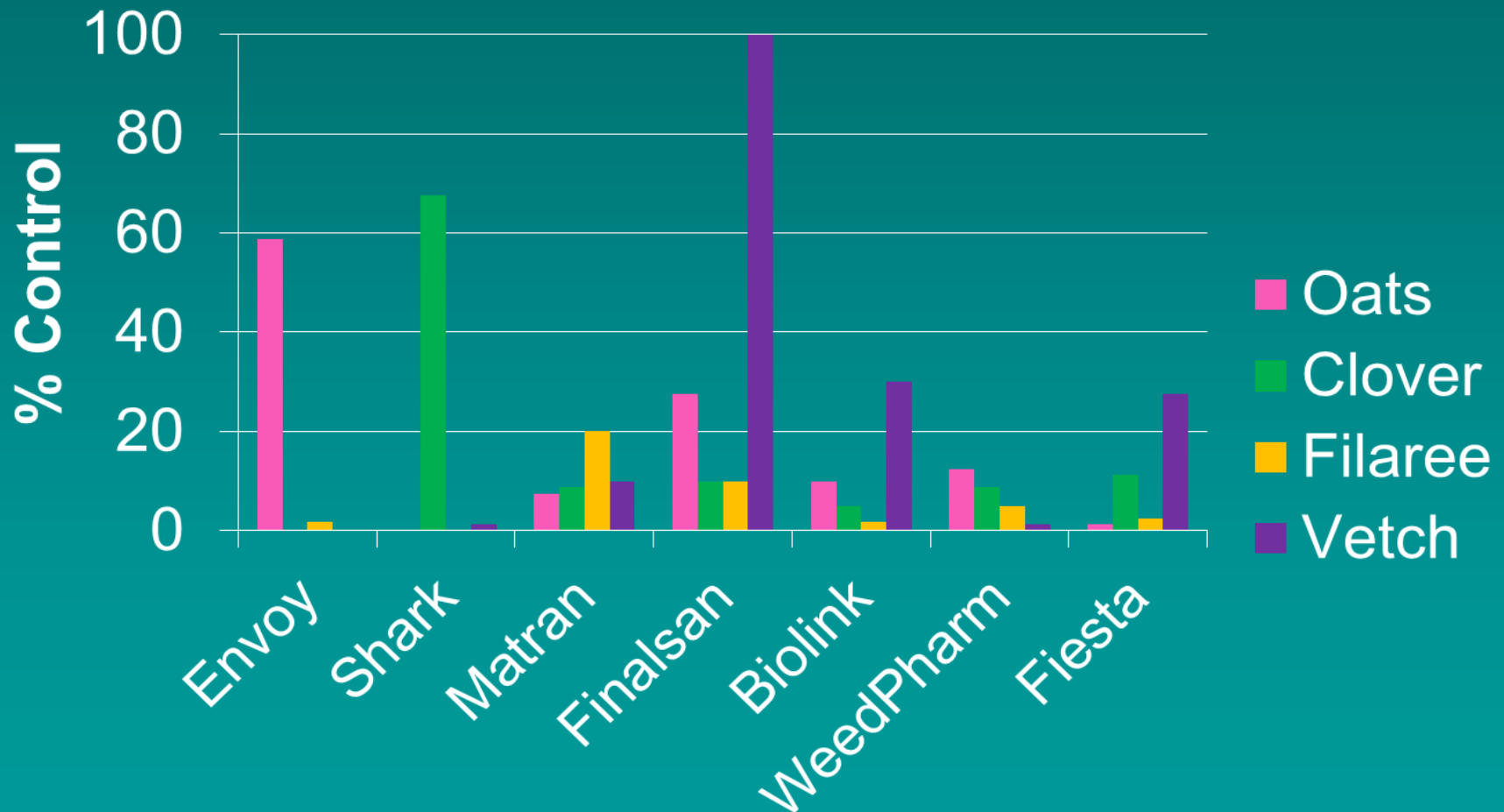
Aug. 31 (2 DAT)





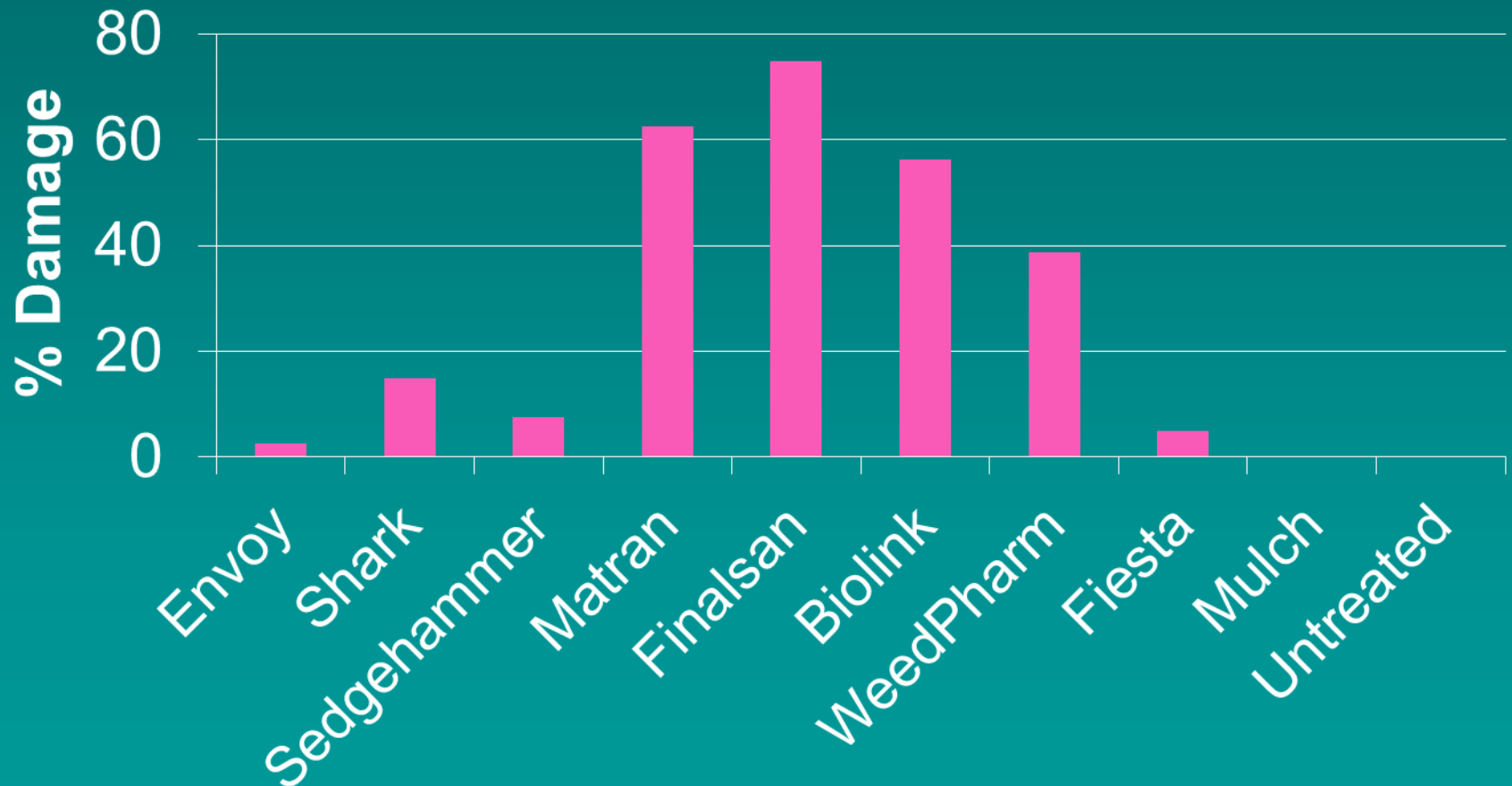
# Weed Control with Herbicides

Sept. 18 (20 DAT)



# Effects on *Carex* (Phytotoxicity)

Sept. 18 (20 DAT)



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# Trial 3



# Treatments

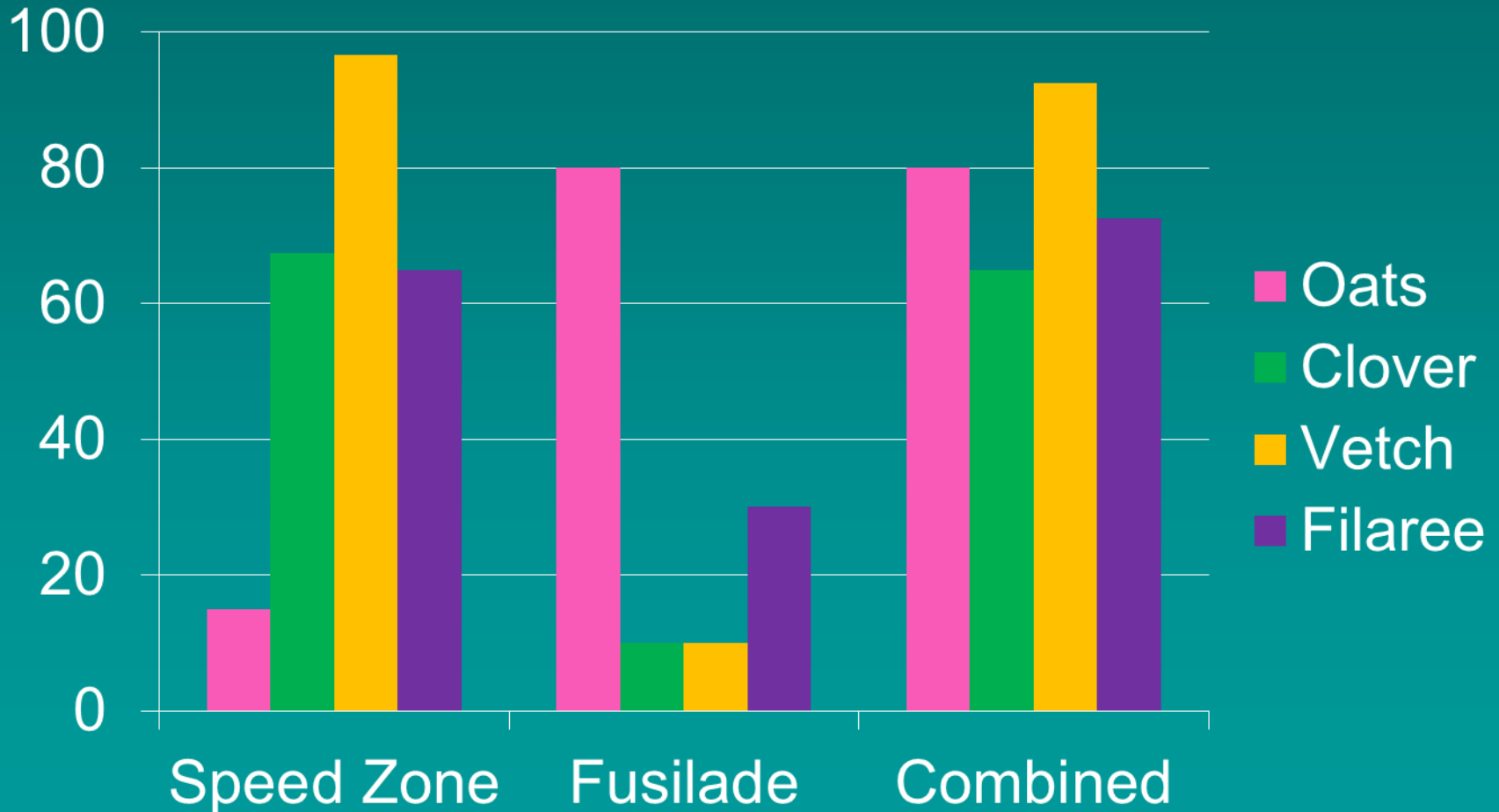
## Sprayed on large plots – Oct. 3

	Active Ingred.	Product	Rate/Acre
1	Carfentrazone + 2,4-D + Mecoprop + Dicamba	Speed Zone Southern	4 pts.
2	Fluazifop	Fusilade II	20 oz.
3	Untreated	--	--

# Effects on Weed Control

## Oct. 18 (15 DAT)

(No phytotoxicity on *Carex*)



# Weed Control in Establishing *Carex*

## Summary

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- Surflan & Dimension effective, had no phytotoxicity
- Speed Zone + Fusilade effective, had no phytotoxicity
- Wood chips effective, time consuming to apply
- Phytotoxicity from Matran, Finalsan, BioLink, and WeedPharm, not Fiesta
- Organic (contact) herbicides have quick knockdown, weeds regrow (weeds were beyond optimum stage)