Sustainable Weed Management in Landscapes and Rights-of-Way

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UC Cooperative Extension, Sacramento County
Acknowledgements

- 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

Annual bluegrass

Crabgrass

Nutsedge flower
Why are Weeds Invading?

Maintenance problem

*Compacted soils or bare areas*

Knotweed

Spotted spurge
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

Bermudagrass flower head

Lawns mowed too short

Invading Bermudagrass
Soil Seed Bank

- 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

- annual bluegrass
- crabgrass
- broadleaf plantain
# Longevity of Weed Seeds in Soil

<table>
<thead>
<tr>
<th>Weed</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milkweed</td>
<td>3</td>
</tr>
<tr>
<td>Cocklebur</td>
<td>16</td>
</tr>
<tr>
<td>Johnsongrass</td>
<td>20</td>
</tr>
<tr>
<td>Redroot pigweed</td>
<td>40</td>
</tr>
</tbody>
</table>
Longevity of Weed Seeds in Soil

- Groundsel: 58 years
- Field Violet: 400 years
- Chickweed: 600 years
- Shepherdspurse: 35 years
- Annual Bluegrass: 68 years
- Prostrate Knotweed: 400 years
- Lambsquarters: 1700 years
Tillage/Cultivation

- 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

- Insulates roots from temp. extremes
- Improves plant establishment
- Protects trees from mechanical injury
- Decreases weeds & erosion
- Conserves soil moisture → Increases root growth
- Increases microbial biomass & activity
- Increases water penetration
Potential Problems with Mulch

- 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)

- 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!

Bermudagrass

Spotted spurge

Bindweed
Mulching and Weed Control

- 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

Encore Recycling
44090 County Road 28H, Woodland
http://encore-recycling.com
Soil Solarization

- 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

Soil Solarization

July 19
July 26
Aug. 15
Flaming

- 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
Portable or hand held flamers

Not dry grass!
Flaming

Before

5 min.

10 min.
Synthetic Mulches
Polypropylene and Polyester

- 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

Bill Roach, The HLA Group
Native Grasses on Ditchbank
Bioswale

Bill Roach, The HLA Group
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
Mix of native grasses & weeds

Mowing to benefit native grasses
Evaluation of Least-Toxic Herbicides

Cheryl Wilen
UC Statewide IPM Program
Phil Boise
Urban Ag Ecology
The Problem

- 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

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

- Ingredients are GRAS or food quality
- Listed as Organic
- Caution label
- Possibility of better public acceptance
## Results (% control)

**45 DAT 1st app, 35DAT 2nd app**

<table>
<thead>
<tr>
<th></th>
<th>UNTREATED</th>
<th>ROUNDUP</th>
<th>ECOEXEMPT</th>
<th>MATRAN</th>
<th>CIMONEX</th>
<th>ALL DOWN</th>
<th>BURNOUT II</th>
<th>WEEDZAP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1X</strong></td>
<td>0</td>
<td>98.5</td>
<td>30.0</td>
<td>13.8</td>
<td>6.3</td>
<td>28.8</td>
<td>36.3</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>2X</strong></td>
<td>0</td>
<td>98.5</td>
<td>30.0</td>
<td>15.0</td>
<td>6.3</td>
<td>38.8</td>
<td>51.3</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Percent Control
Grasses

- UTC
- Roundup Pro
- EcoExempt
- Matran
- Cimonex
- AllDown
- Burn Out
- Weed Zap

1X
2X
Percent Control
Broadleaves

UTC
Roundup Pro
EcoExempt
Matran
Cimonex
AllDown
Burn Out
Weed Zap

Percent Control

1X
2X

UTC
Roundup Pro
EcoExempt
Matran
Cimonex
AllDown
Burn Out
Weed Zap

Percent Control

1X
2X
## Costs

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

- Mowing
- Fabric
- W. Chips
- Herbicide

% Weed Control

- 2009
- 2010
- 2011
<table>
<thead>
<tr>
<th>Agrostis</th>
<th>Field sedge</th>
<th>Dune sedge</th>
<th>Native grass meadow</th>
<th>UC Verde Buffalo</th>
<th>Tall Fescue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molate</td>
<td>Field sedge</td>
<td>Dune sedge</td>
<td></td>
<td>UC Verde Buffalo</td>
<td>Tall Fescue</td>
</tr>
<tr>
<td>T. hairgrass</td>
<td>Field sedge</td>
<td>Dune sedge</td>
<td></td>
<td>UC Verde Buffalo</td>
<td>Tall Fescue</td>
</tr>
<tr>
<td>Junegrass</td>
<td>Field sedge</td>
<td></td>
<td></td>
<td>UC Verde Buffalo</td>
<td>Tall Fescue</td>
</tr>
<tr>
<td>Blue grama</td>
<td>Field sedge</td>
<td>Dune sedge</td>
<td></td>
<td>UC Verde Buffalo</td>
<td>Tall Fescue</td>
</tr>
</tbody>
</table>
C. pansa  C. praeg.
Carex Under Stress
Late August 2011

80% ET₀
(some dormancy)

40% ET₀
Weed Control for Plugs
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

<table>
<thead>
<tr>
<th>Active Ingr.</th>
<th>Product</th>
<th>Rate/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Prodiamine</td>
<td>Barricade 65 WG</td>
<td>1.5 lbs</td>
</tr>
<tr>
<td>2 Pendimethalin</td>
<td>Pendulum AquaCap</td>
<td>4 qts</td>
</tr>
<tr>
<td>3 Oryzalin</td>
<td>Surflan AS</td>
<td>4 qts</td>
</tr>
<tr>
<td>4 Dithiopyr</td>
<td>Dimension 2 EW</td>
<td>2 qts</td>
</tr>
<tr>
<td>9 Mulch</td>
<td>Wood chips</td>
<td>2 in.</td>
</tr>
</tbody>
</table>
## Post-Emergents (Organic)
Sprayed June 7

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

- Fiesta
- Finalsan
- BioLink
- UTC
- Dimension
- Barricade
- Pendulum
Trial 2
# Treatments (Post-Emergent)

Sprayed Aug. 29

<table>
<thead>
<tr>
<th>Active Ingred.</th>
<th>Product</th>
<th>Rate/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Clethodim</td>
<td>Envoy</td>
<td>12 oz</td>
</tr>
<tr>
<td>2 Carfentrazone</td>
<td>Shark</td>
<td>10 oz</td>
</tr>
<tr>
<td>3 Halosulfuron</td>
<td>Sedgehammer</td>
<td>1 oz</td>
</tr>
<tr>
<td>4 Clove leaf oil</td>
<td>Matran</td>
<td>20% v/v</td>
</tr>
<tr>
<td>5 Ammon. soap of fatty acid</td>
<td>Finalsan</td>
<td>20% v/v</td>
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<tr>
<td>9 Mulch</td>
<td>Wood chips</td>
<td>2 in.</td>
</tr>
</tbody>
</table>
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)
Trial 3
# Treatments
Sprayed on large plots – Oct. 3

<table>
<thead>
<tr>
<th></th>
<th>Active Ingred.</th>
<th>Product</th>
<th>Rate/Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carfentrazone + 2,4-D + Mecoprop + Dicamba</td>
<td>Speed Zone Southern</td>
<td>4 pts.</td>
</tr>
<tr>
<td>2</td>
<td>Fluazifop</td>
<td>Fusilade II</td>
<td>20 oz.</td>
</tr>
<tr>
<td>3</td>
<td>Untreated</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
Effects on Weed Control
Oct. 18 (15 DAT)

(No phytotoxicity on Carex)
Weed Control in Establishing Carex
Summary

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