Assessment of *Arundo donax* control on Lady Bird Lake
Austin TX

Texas Society for Ecological Restoration
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Lady Bird Lake *Arundo*

- Limits riparian diversity and public use
- Mixed stands and monoculture
- 3.5 acres on 5 mile shore
- Varying slope, canopy
- Along highly used trail
Lady Bird Lake Arundo
Control objectives

1. Control growth and limit spread on lake

2. Develop strategy for other City lands

What is most effective treatment for:

- Areas of high public use?
- Arundo mixed with desirable plants?

Do environmental conditions matter?
2011 Control Plan

• Limit overspray in public areas
  – Cut plants and allow at least 4 ft re-growth

• Limit non-target impacts
  – 2 % imazamox

• Monoculture patches
  – 2 % imazamox + 1 % glyphosate

• Both included 1 % MSO surfactant
2011 Implementation

- Six weeks for cutting/disposal
- Not all patches cut
- Severe drought = uneven re-growth
- Many patches < 4 ft
- Herbicide application in late October
2012
Sampling Design

• Patches fit into four treatment categories
  – Cut vs uncut
  – Stalk height when sprayed
  – Herbicide type

<table>
<thead>
<tr>
<th></th>
<th>Treatment 1</th>
<th>Treatment 2</th>
<th>Treatment 3</th>
<th>Treatment 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut/Uncut</td>
<td>Cut</td>
<td>Cut</td>
<td>Uncut</td>
<td>Cut</td>
</tr>
<tr>
<td>Stalk Height</td>
<td>&lt; 4ft.</td>
<td>4 – 10ft.</td>
<td>&gt; 10ft.</td>
<td>&gt; 10 ft.</td>
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<tr>
<td>Herbicide</td>
<td>imazamox</td>
<td>imazamox</td>
<td>imazamox</td>
<td>imazamox/ glyphosate</td>
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</tbody>
</table>

• Environmental: Canopy, Slope, Distance to water
Treatment distribution
June 2012
Sampling Methodology

- Randomly placed 1 m$^2$ quadrat subsamples

- Manual counts of
  - Brown (dead) *Arundo* stems
  - Green (live) *Arundo* stems

- Measured ht of each green stem

- % dead stems = (# brown / total # stems)$\times$ 100
# Results

Mean % dead Arundo stems, red > 50% dead

<table>
<thead>
<tr>
<th>Classification</th>
<th>Treatment 1 Cut, &lt; 4 ft, Imazamox</th>
<th>Treatment 2 Cut, 4-10 ft, Imazamox</th>
<th>Treatment 3 Uncut, &gt; 10 ft, Imazamox</th>
<th>Treatment 4 Cut, &gt; 10 ft, I + glyphosate</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>% Dead</td>
<td>n</td>
<td>% Dead</td>
</tr>
<tr>
<td>CGF</td>
<td>1</td>
<td>48.6</td>
<td>2</td>
<td>30.0</td>
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<td>35.7</td>
<td>2</td>
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<tr>
<td>CSF</td>
<td>2</td>
<td>28.0</td>
<td>2</td>
<td>11.5</td>
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<tr>
<td>CSN</td>
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<td>48.6</td>
<td>2</td>
<td>28.2</td>
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<tr>
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<td>24.5</td>
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<td>57.2</td>
<td>2</td>
<td>18.2</td>
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</table>
Analysis

Type III two-way ANOVA:

- Treatment type, canopy, slope, dist from water
  - Treatment type had significant effect on dead Arundo (p<0.01)
  - Env conditions were NOT significant

Tukey-Kramer multiple comparison test

- T1 & T2 sig diff from T 3 & T 4 (p< 0.005)
- Not from each other
L-S means for Treatments with 95% confidence limits

- For Treatment T1: $p > 0.2$
- For Treatment T3 and T4: $0.05 < p < 0.1$
Summary

• Treatments 3 & 4 killed greater % *Arundo* regardless of env conditions

• Avg % dead stalks differed b/w the two:
  – 70% w/ imazamox
  – 88 % w/ imazamox + glyphosate
  – Lack of significance was not definitive
  – Larger sample size may show more difference
Control Recommendations

• Treat full grown plants, no cutting
  – Less leaf surface limits uptake
• Treat June- Sept (before winter dormancy)
  – Less active growth limits uptake

• Adjacent vegetation
  • Imazamox 2 %, up to 5%

• Monoculture Arundo
  • 2% imazamox +
    1 % glyphosate
2012 & 2013 treatment

- No Cutting!
- Sprayed full growth plants in August
- Increased use of I + G mix
- Careful application
- 2013- improved plant loss using mix
Future work

• Monitor and re-treat as needed
• Restore monoculture *Arundo* areas
• Provide guidance for other efforts
Initial restoration work

- Sept 2013- emergent vegetation at slope base, submersed in littoral zone
- Dec 2013- seeds and mulch ‘blankets’ on upper banks
- Allow undercut bank to ‘lay back’
Acknowledgments

• Aaron Richter, City of Austin
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• Lewisville Aquatic Ecosystem Research Facility
• Johnson Lake Management
Questions?