Reducing the likelihood of giant reed (*Arundo donax*) reinvasion

How does light attenuation affect giant reed establishment?

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October 5, 2011
Overview

- Introduction: riparian plant community and giant reed
- Control of giant reed
- Greenhouse Study: What factors affect giant reed establishment? -Light?
- Recommendations for land managers
- Future Work
The riparian plant community of southern California

Can you find the giant reed?
The riparian plant community of southern California
Giant Reed

- Poaceae - Grass Family
- Native to Asia
- Reproduction - vegetative (California)
- Stem height - 9 m. (30 ft.)
- How did it get here?
  - Stream bank erosion control
  - Light building material
  - “Reed” for woodwind instruments
- Considered invasive throughout California
Why is giant reed invasive?

- Displaces native flora and fauna
- Infrequently used by native wildlife
- Alters disturbance regime of the riparian plant community
  - Promotes fire
  - Stabilizes soils
  - Increases flooding severity
Mechanism of Dispersal

• Flood Dispersal
Examples of Control Methods

Ex. - Herbicide Treatment

Cut and Dab

Grind and Spray

Foliar
Greenhouse Study

• What factors affect giant reed establishment?

• How can land managers apply these findings to minimize the threat of giant reed establishment?
What factors affect giant reed establishment?

- Propagule size
- Soil moisture
- Resource competition
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• Propagule size
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  – Light
What factors affect giant reed establishment?

- Propagule size
- Soil moisture
- Resource competition
  - Light
- Cultural control
  - Native woody riparian species
Cultural Control

- The deliberate alteration of the system to reduce pest or weed populations without mechanical or chemical control.

- Not generally applied to wildlands
Benefits of Cultural Control

- Less Pesticides/Herbicides
- Provides habitat for wildlife
- Provides ecosystem services
- Preserves local genetics
Understory of restored mulefat canopy with giant reed
Shading Experiment
Feb. - Aug. 2010

• Goal: Simulate light competition in a controlled environment
  – How does giant reed react to decreased light intensity?
    • Rate of growth (RGR)
    • Proportional resource allocation
Methods

- 3 Shading Treatments (100, 35, or 5% light intensity)
  - 1 m$^3$ shade structures were covered in neutral density cloth
- Light measured continuously per shade structure
  - Hamamatsu photo sensors
- Biomass destructively harvested May and August 2010 (spring/summer)
Standardizing Plant Emergence Times
Greenhouse Layout

- 100% Light
- 5% Light
- 35% Light
- 100% Light
Results

Physiological effects of shading
- Increased relative resource allocation to shoot growth (elongation)
- Aboveground mass proportional to net rhizome mass
- Internode length - increased
- Leaf number - decreased
- Leaf area per leaf - increased
- Stem number - decreased
- Aboveground mass - decreased
- R:S - decreased (with shading and over time)
Arundo Growth

- Control, 100% Light
- 35% Light
- 5% Light

Harvest 1:
- 4/7/10
- 5/27/10
- 7/16/10
- 9/4/10

Harvest 2:
- 16/10
Conclusions

- Shading = carbon starvation
- Resource Allocation
  - Moderate shade = shift to aboveground
  - Deep shade = Extreme shift with minimal belowground storage
- Plants may be susceptible to herbivory and soil drying
recommendations for land managers

- Continue current control methods
- Seasonally dry riparian areas
  - Restore with native evergreen shrubs
  - Select drought tolerant species
  - Plant at high density
  - Use pole/whip cutting method where appropriate
- Expected Benefits
  - Reduce *A. donax* success and provide long-term control
    - Rapid establishment w/ dense canopy (6-10ft)
    - Maintain canopy during dry season
    - Increase herbivore activity and shoot grazing
Future Work

• How does propagule size influence giant reed success?

• What factors influence natural recruitment within giant reed control areas?
Acknowledgements

- Dr. Jodie Holt
- The Holt Lab
- UC Riverside Department of Botany and Plant Sciences
Questions?