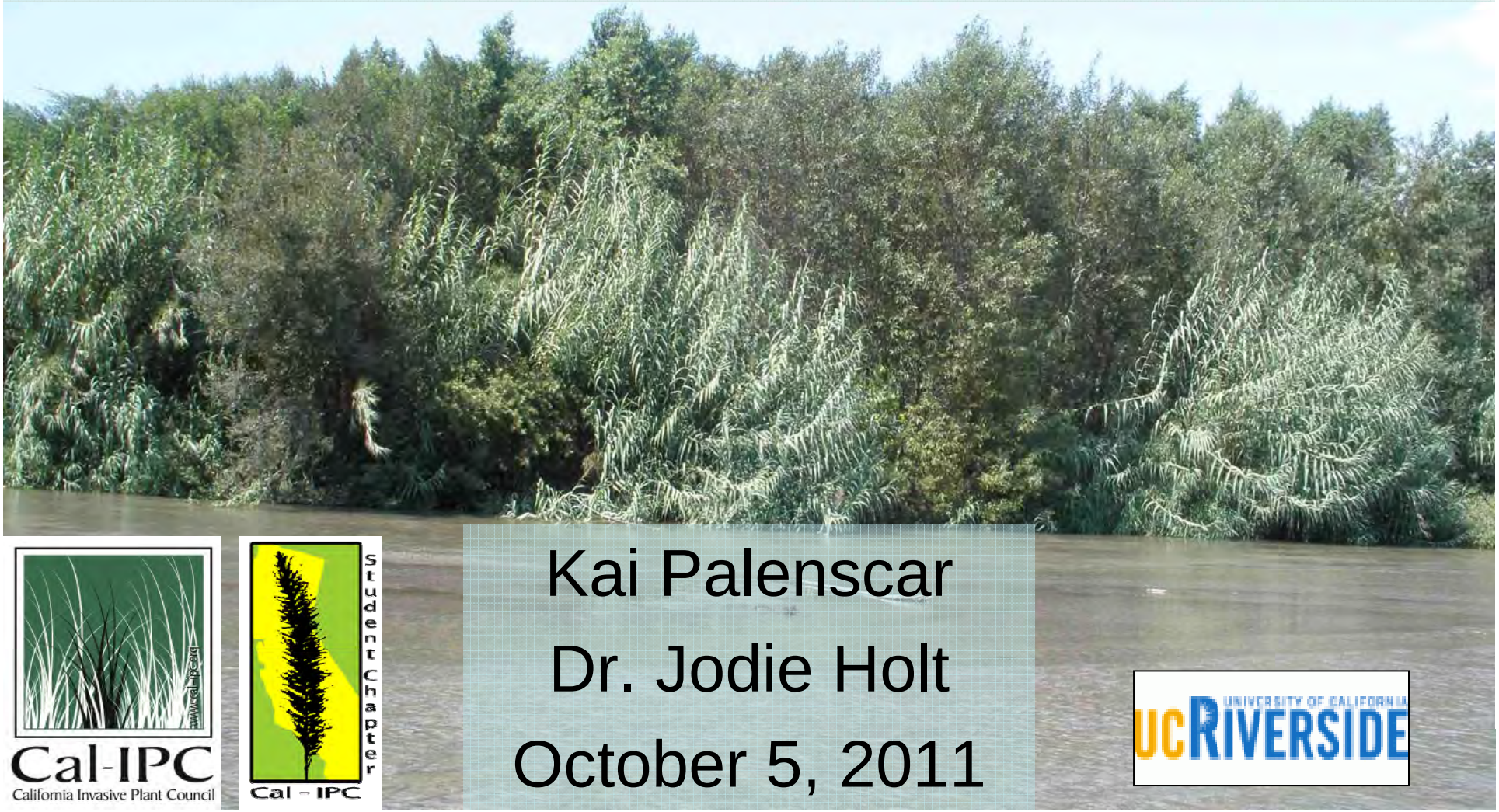
Reducing the likelihood of giant reed (*Arundo donax*) reinvasion

How does light attenuation affect giant reed establishment?



Kai Palenscar

Dr. Jodie Holt

October 5, 2011

Cal-IPC
California Invasive Plant Council

Student Chapter
Cal - IPC

UC RIVERSIDE
UNIVERSITY OF CALIFORNIA

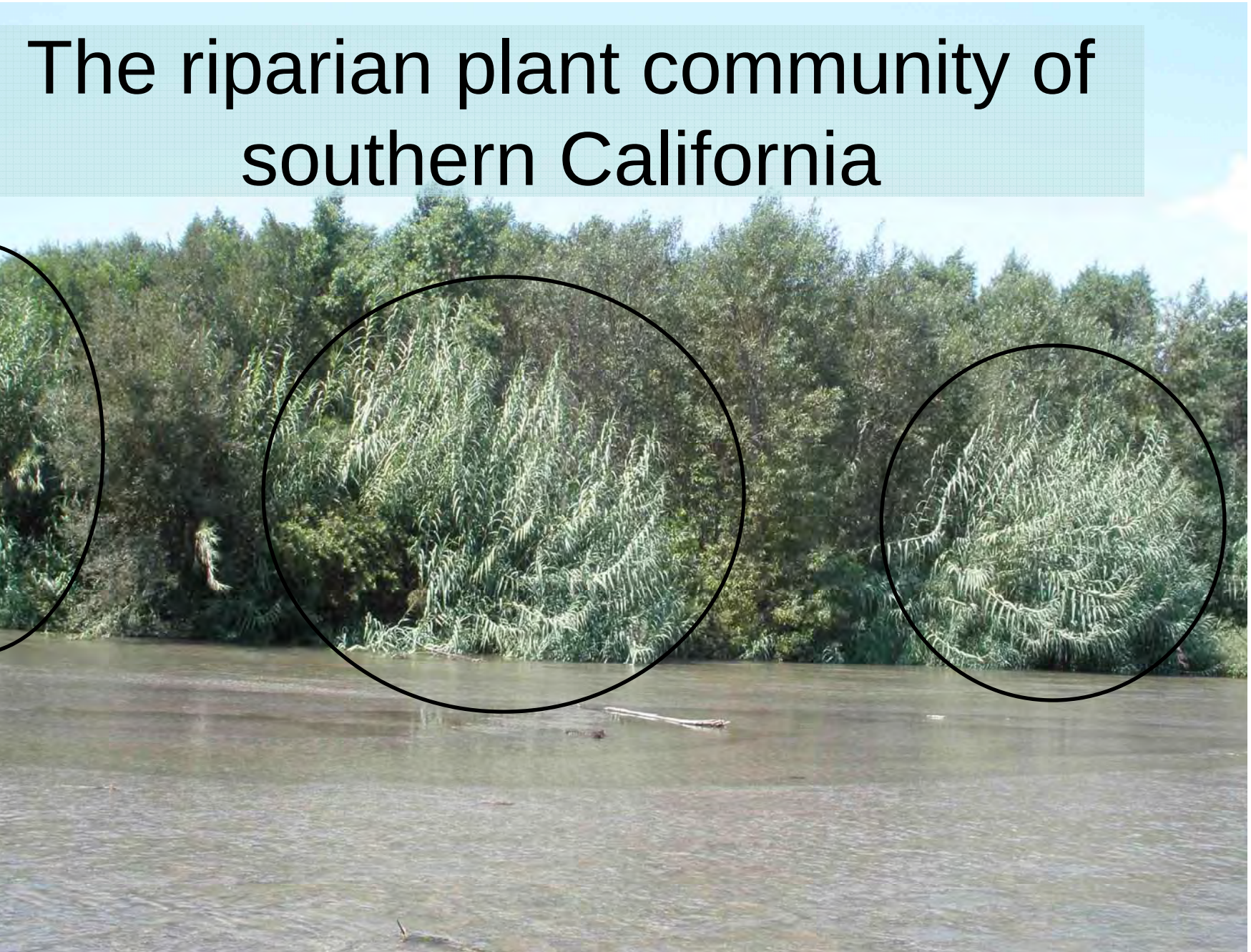
Overview

- 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
- 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

nderstory of restored mulefat canopy with giant reed

Shading Experiment

Feb. - Aug. 2010

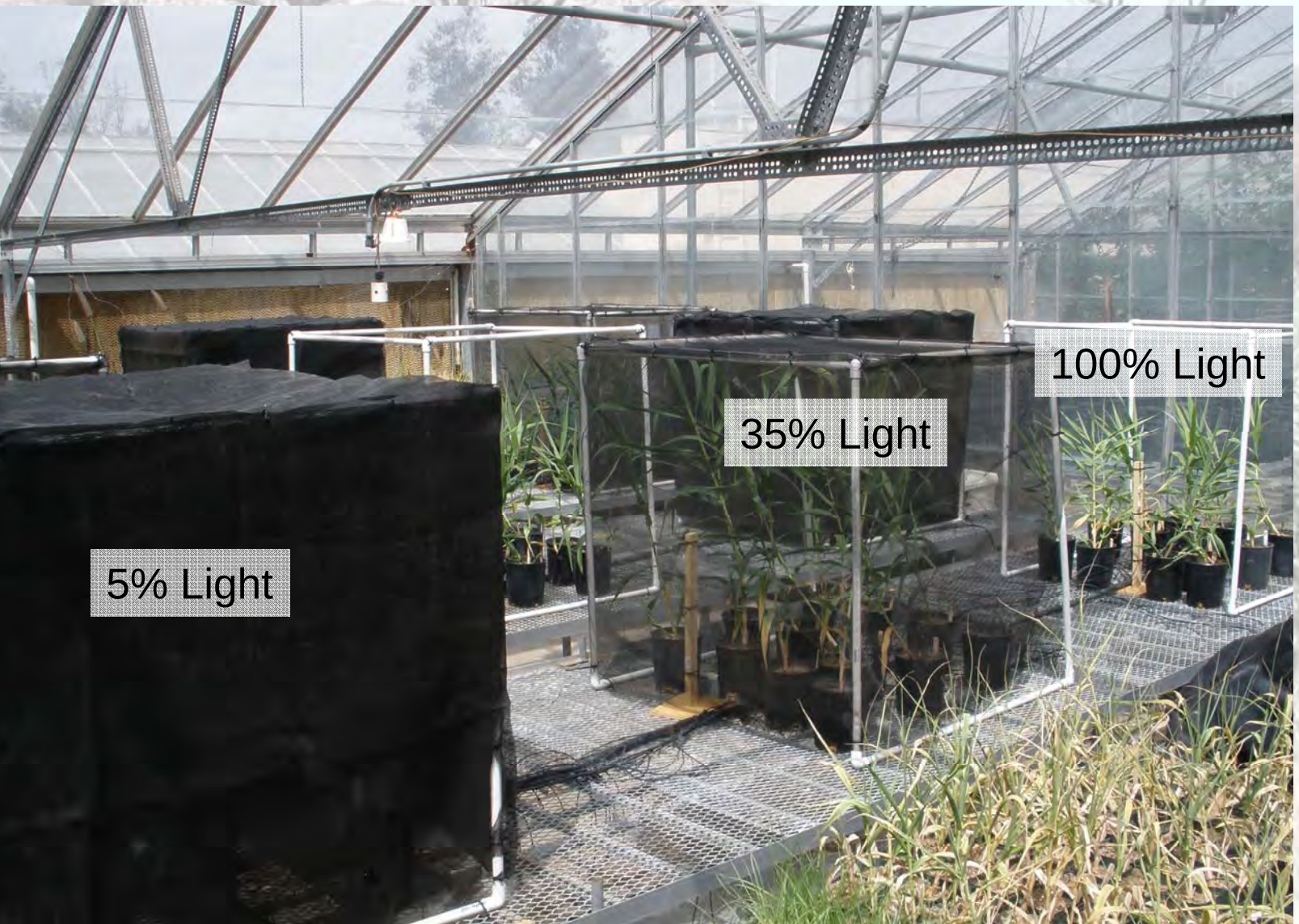
- Goal: Simulate light competition in a controlled environment
  - How does giant reed react to decreased light intensity?
    - Rate of growth (RGR)
    - Proportional resource allocation

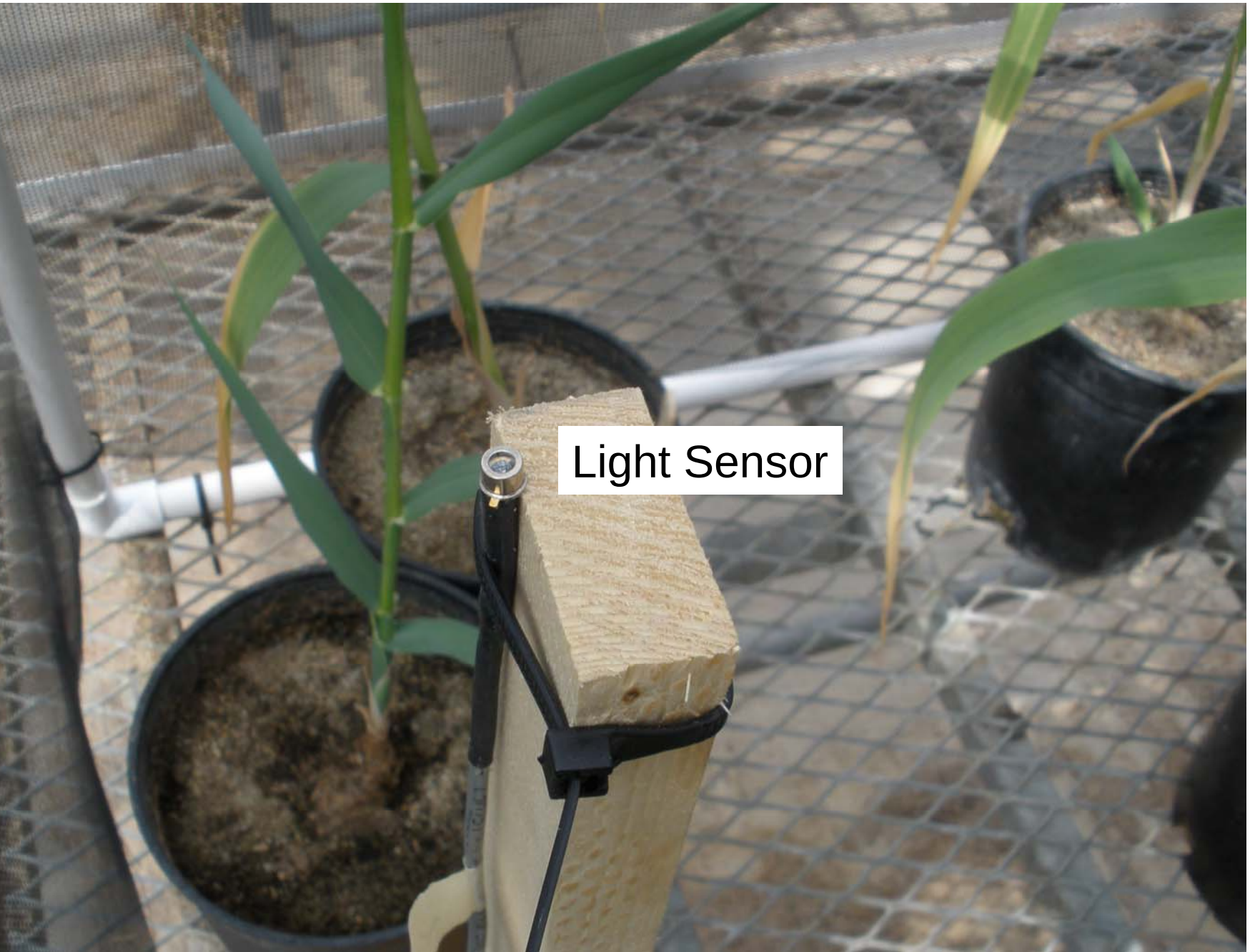
Methods

- 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



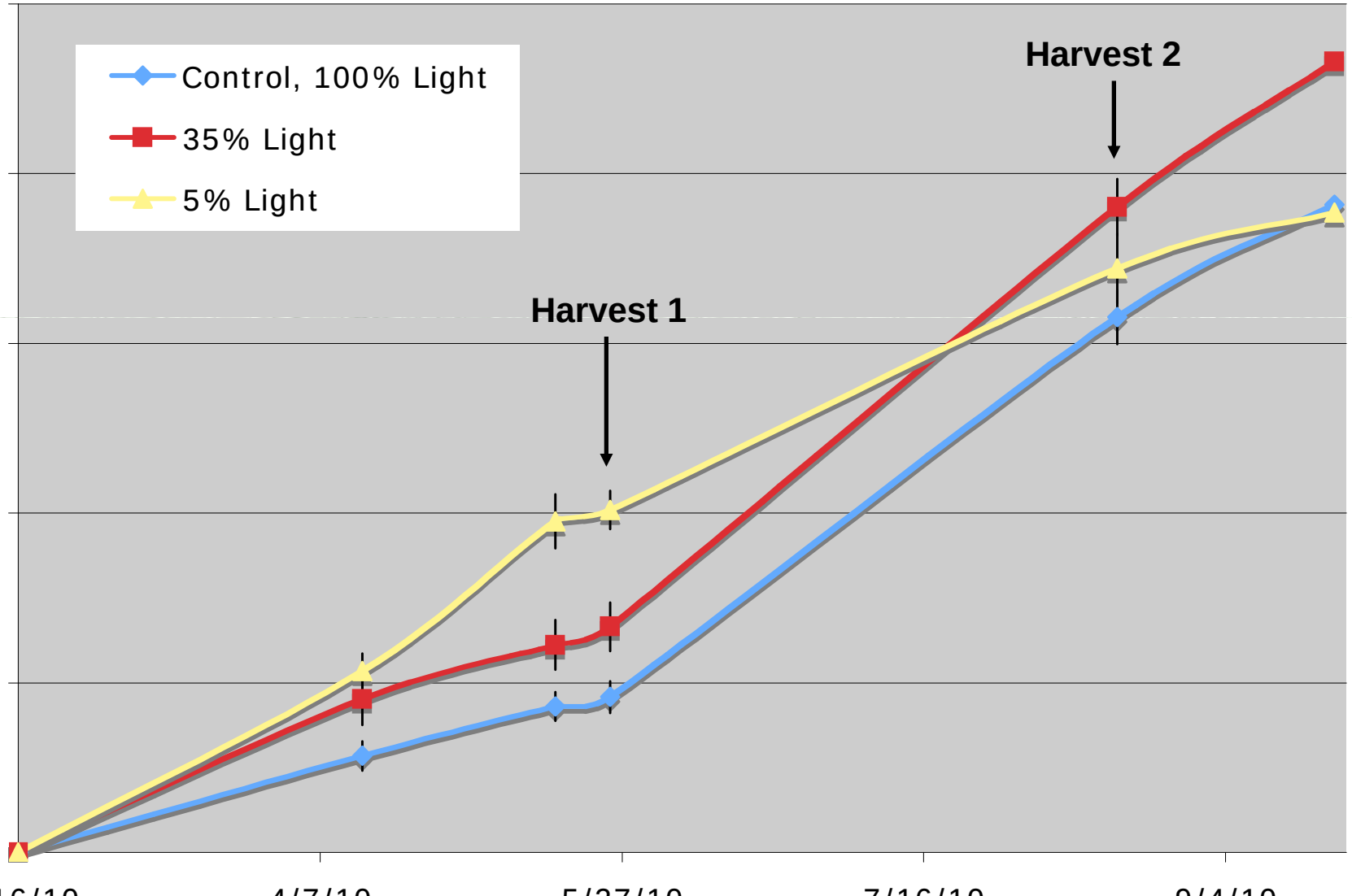

Light Sensor

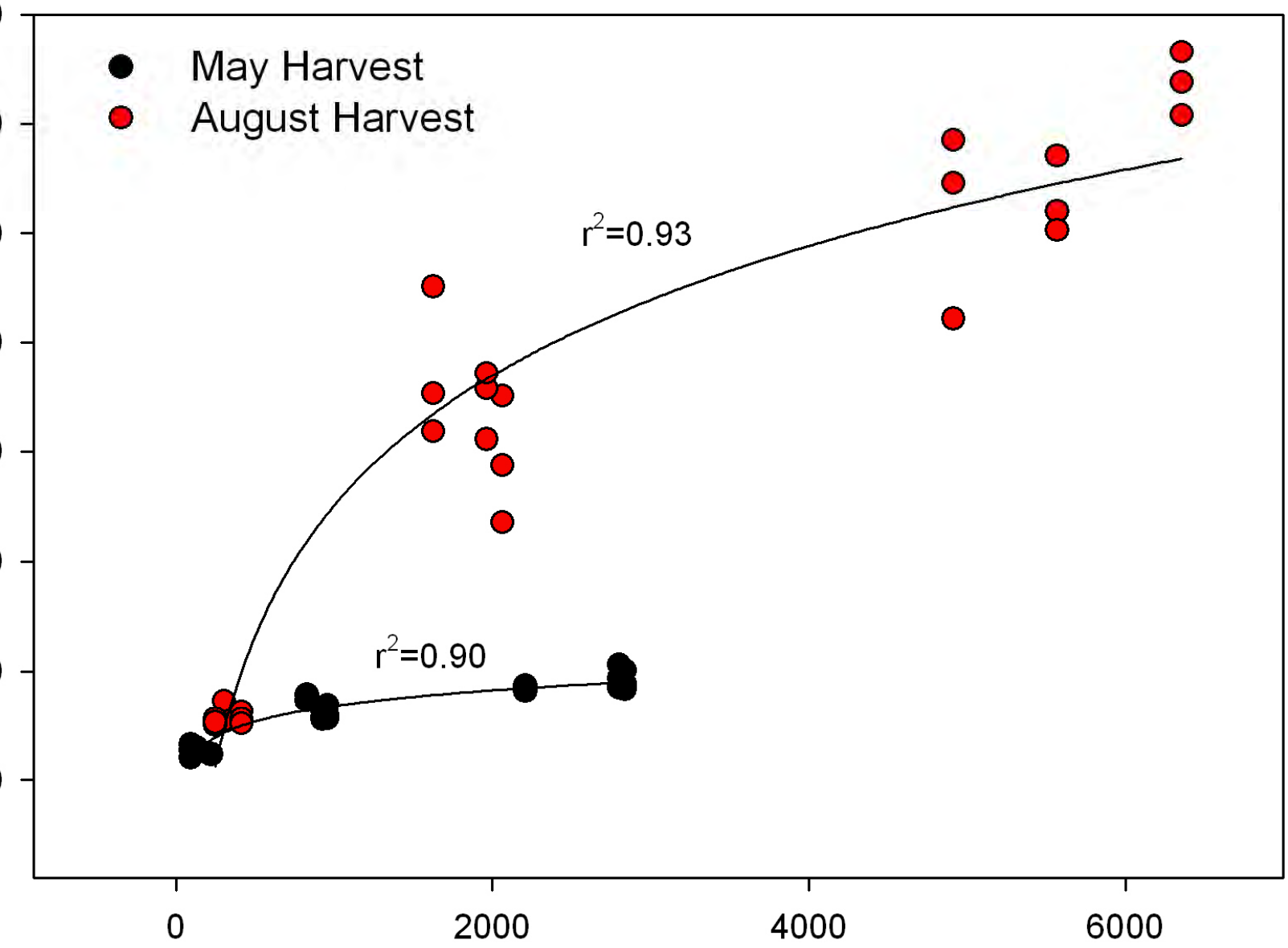
Results

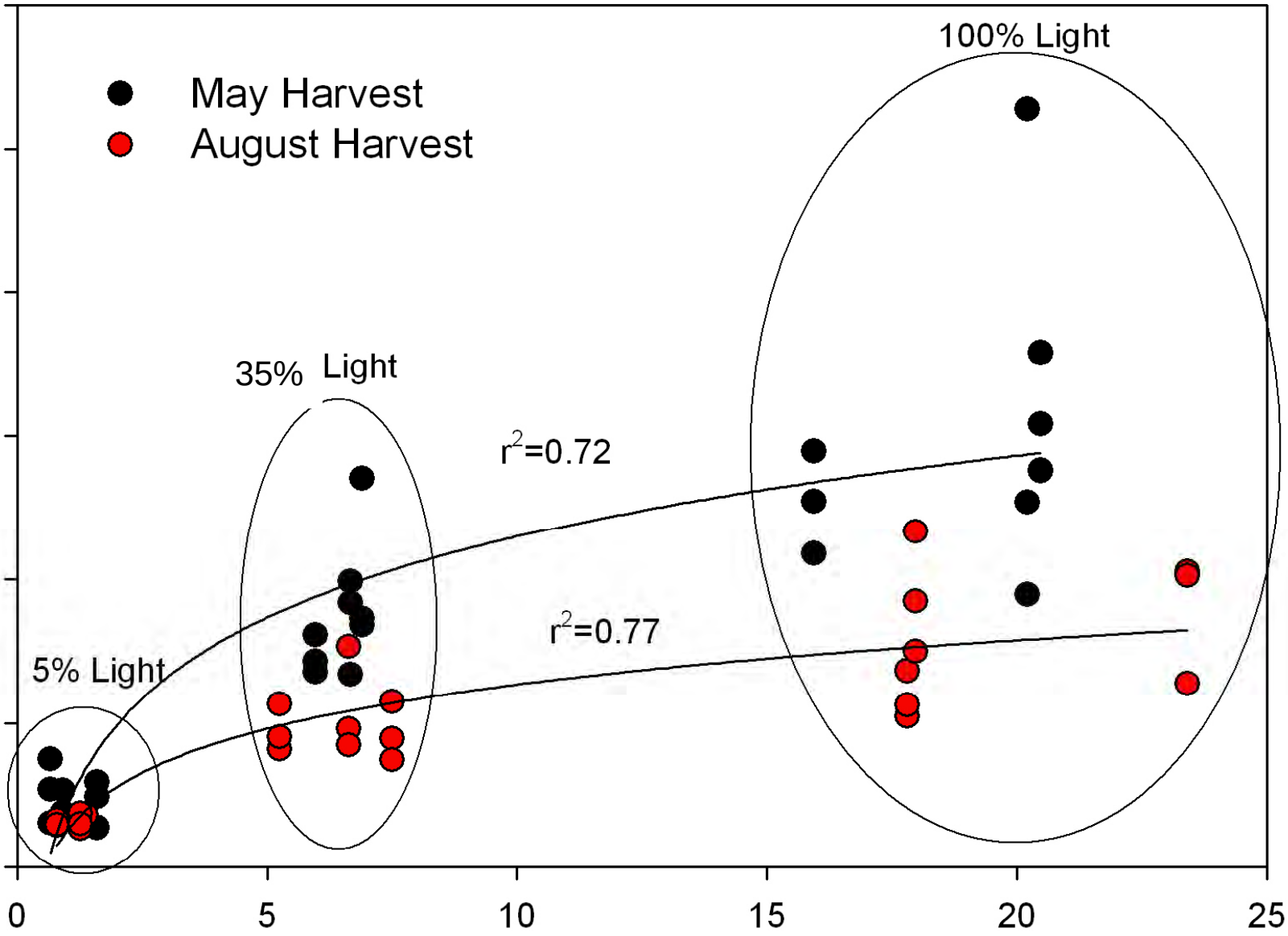
Physiological effects of shading

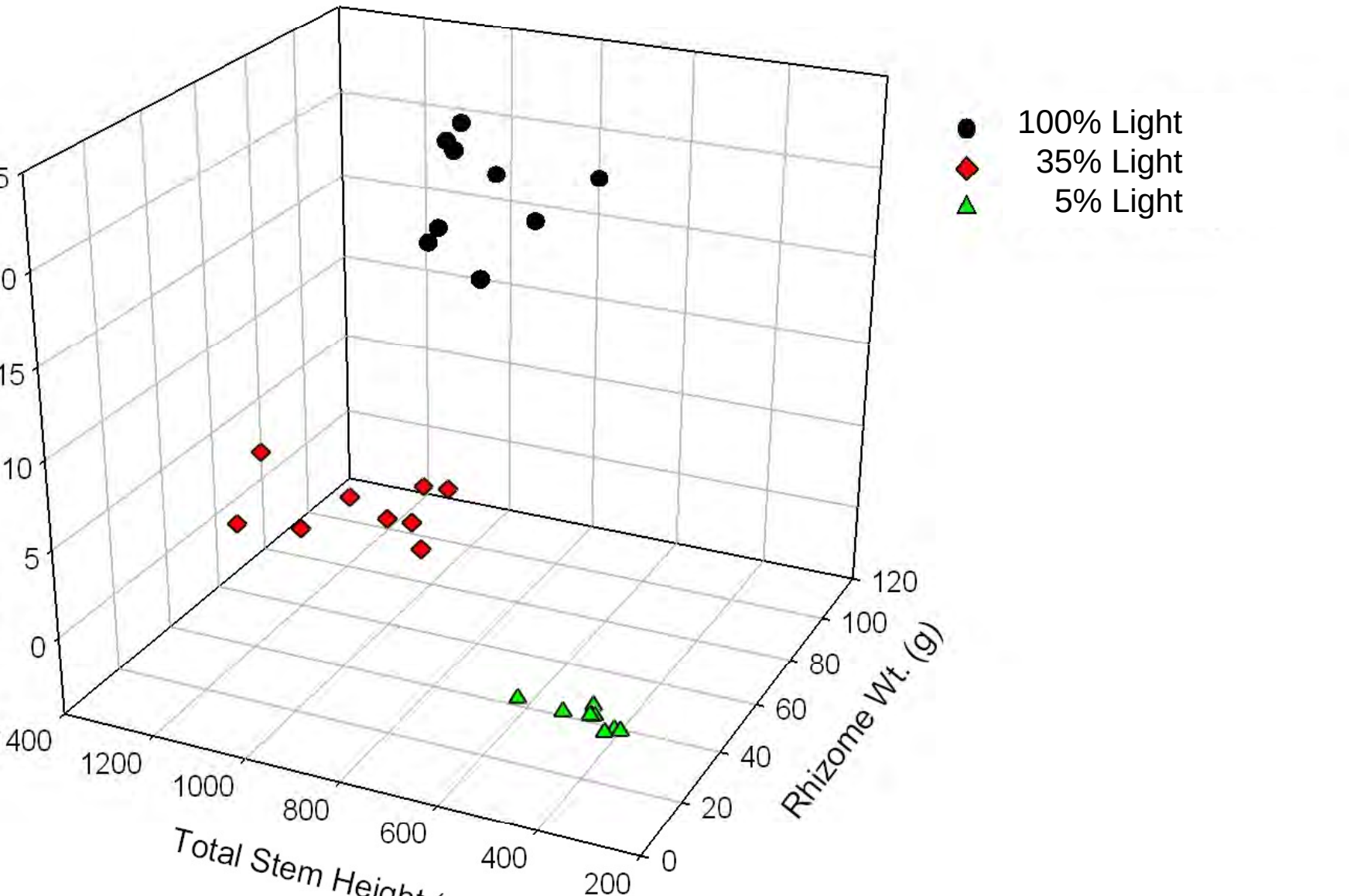
- Increased relative resource allocation to shoot growth (elongation)
- Aboveground mass proportional to net rhizome mass
- Internode length - increased
- Leaf number - decreased
- Leaf area per leaf - increased
- Stem number - decreased
- Aboveground mass - decreased
- R:S - decreased (with shading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

Arundo Growth




May Harvest
August Harvest
r2=0.93
r2=0.90
0
2000
4000
6000


May Harvest
August Harvest
100% Light
35% Light
5% Light
r2=0.72
r2=0.77
0
5
10
15
20
25


100% Light
35% Light
5% Light
Rhizome Wt. (g)
0
20
40
60
80
100
120
Total Stem Height
200
400
600
800
1000
1200
1400
0
5
10
15
20

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

ecommendations 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?

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- Dr. Jodie Holt
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e Ginger

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Questions?