

Region 8

Huntington Harbour

2005.

358

**Eradication of *Caulerpa taxifolia* in the US Five  
Years After Discovery:  
Are We There Yet?**



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# Acknowledgements

- Southern California Caulerpa Action Team
- California Dept. of Fish and Game
- Merkel and Associates (Keith Merkel, Rachel Woodfield, Robert Mooney)
- Wailun Tan (USDA-ARS/ UC Davis)

## What is *Caulerpa taxifolia*?

- Marine alga
- Native to tropics (Australian origin-but selected for cool-water tolerance)
- Bright green, with fern-like fronds
- Used in saltwater aquaria

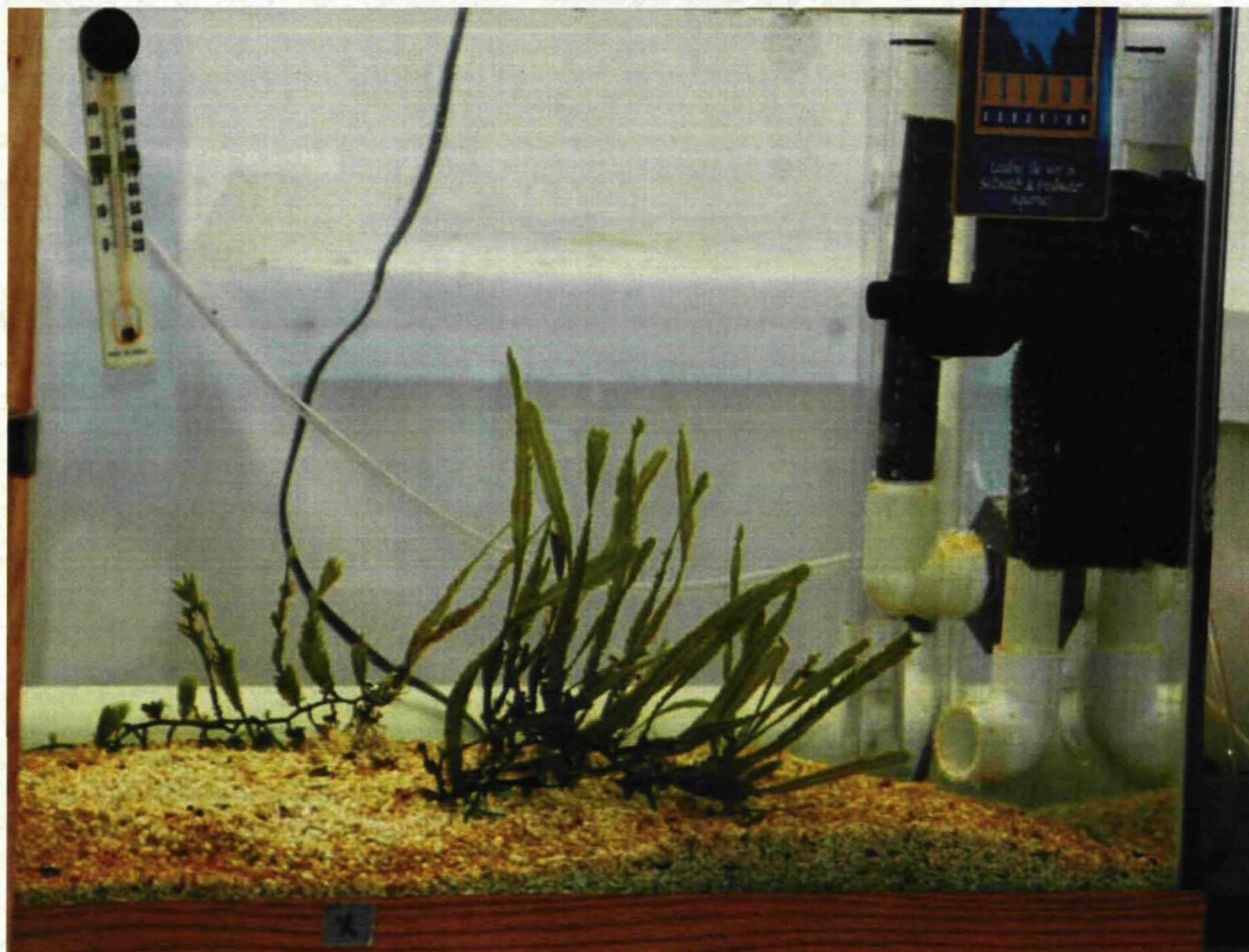
# *Caulerpa taxifolia*



Photo: Rachel Woodfield

*Caulerpa taxifolia*





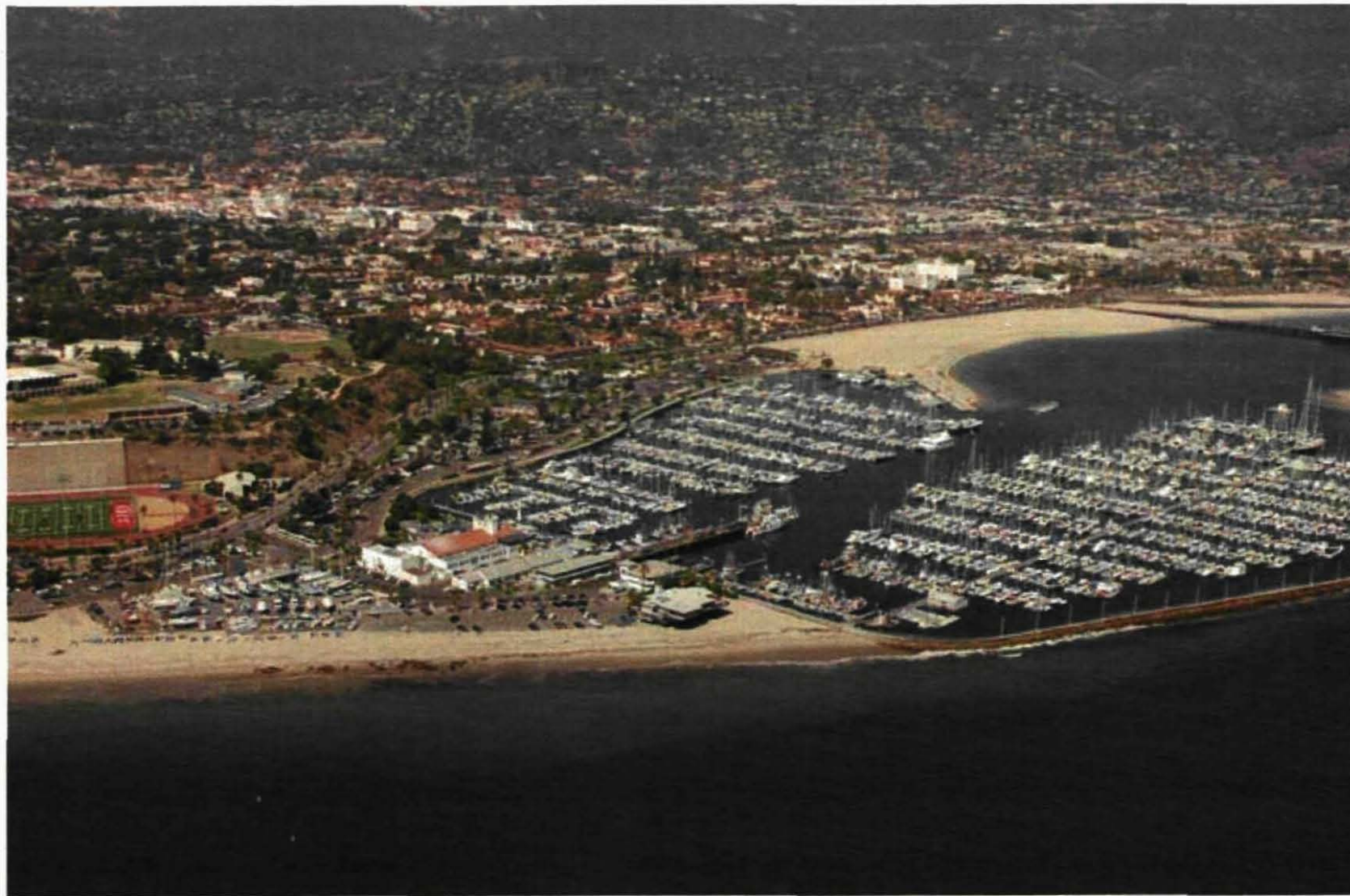
# Why is *C. taxifolia* a concern?

## History in Mediterranean Sea:

- 1984: one small (1 m<sup>2</sup>) patch
- 2001: >100 sites; >15,000 hectares; five countries;  
>>>out of control !
- Habitat Changer
- Reduced biodiversity

*California/USA- Threat to >800 km of shoreline*

# Santa Barbara Harbor



# China Cove/Newport Beach



# Emerald Cove -Laguna

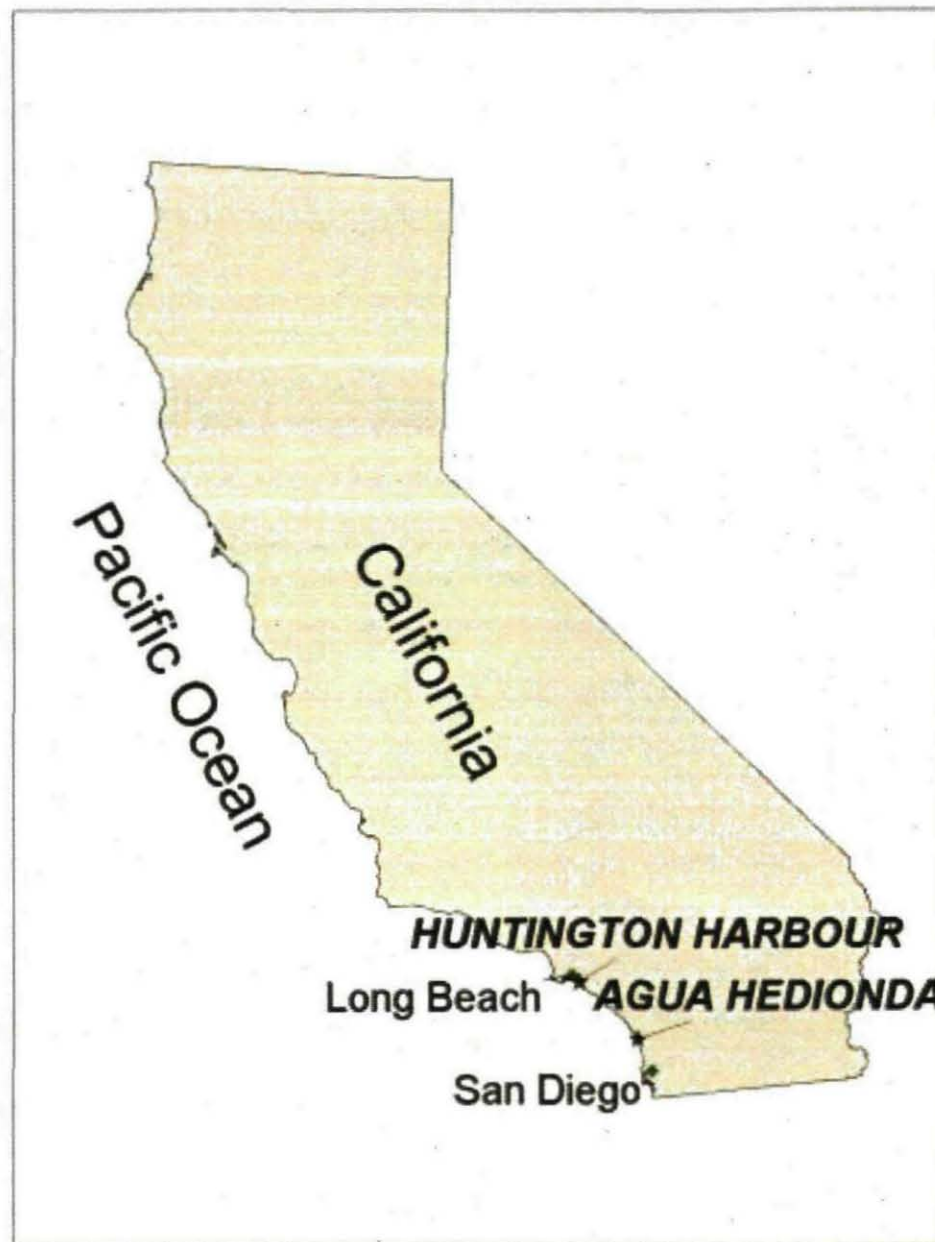


## Why is *C. taxifolia* invasive?

- Long survival out of water
- Not eaten by herbivores outside its native range
- Spreads by fragmentation
  - Very small pieces are viable
- Invasive

## What is *C. taxifolia* invasive?

- Cold-tolerant (aquarium strain)
- Can form dense mats
- Can grow on any substrate
- Can grow rapidly
- Can grow over a wide range of depths



*Caulerpa taxifolia* in the US:



Agua Hedionda Lagoon  
30 mile north of San Diego, CA  
**Discovered June 12, 2000**



Huntington Harbour  
Near Long Beach, CA  
**Discovered July, 2000**

*Caulerpa taxifolia* in Agua  
Hedionda Lagoon



*Caulerpa taxifolia* in Agua  
Hedionda Lagoon



***East Basin - Cumulative total June***  
***2000 - April 2002***



# What has been done?

- Response team immediately formed : “SCCAT”
  - Southern California *Caulerpa* Action Team

## Steering Committee:

CA-State Regional Water Board

CA Dept. of Fish and Game

US- NOAA Fisheries

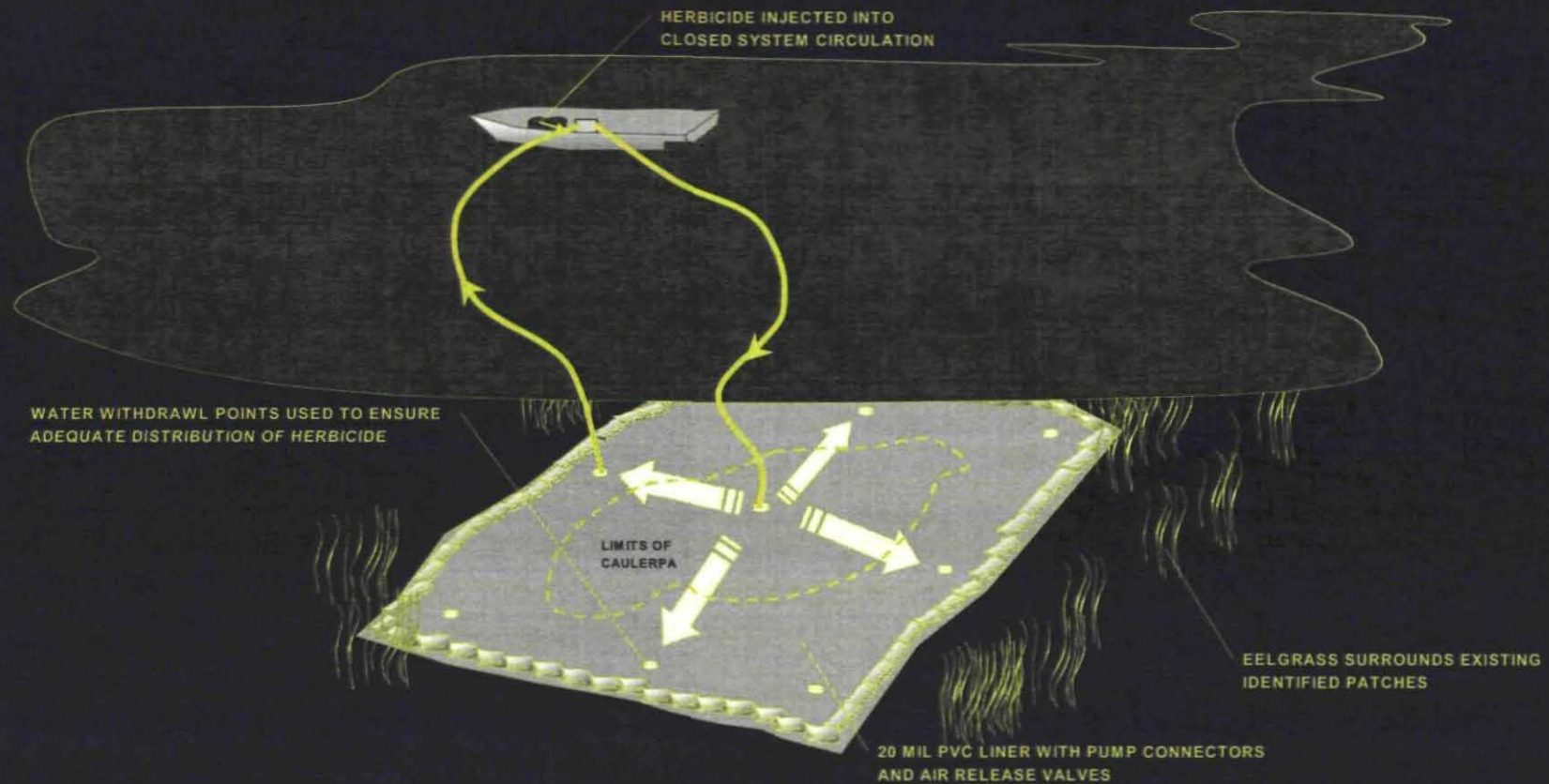
USDA- Agricultural Research Service

- Goals
  - Eradication of existing infestations
  - Prevention of new infestations
- Action plan; Implementation

## What has been done?

- Containment / treatment
- Intensive surveillance of waters known to be infested
- Mapping / record keeping
- Verification of Treatment Efficacy (sediment bioassays)
- Limited surveillance of other waters

# Diagram depicting typical tarping of Caulerpa colonies for containment and treatment with chlorine.



## PVC Containment and Treatment System for *Caulerpa taxifolia*

Injection port for sodium hypochlorate



## What has been done?

- Develop Criteria for Eradication
- Surveillance evaluation
- Outreach / education
- Stakeholder meetings
- Legislation

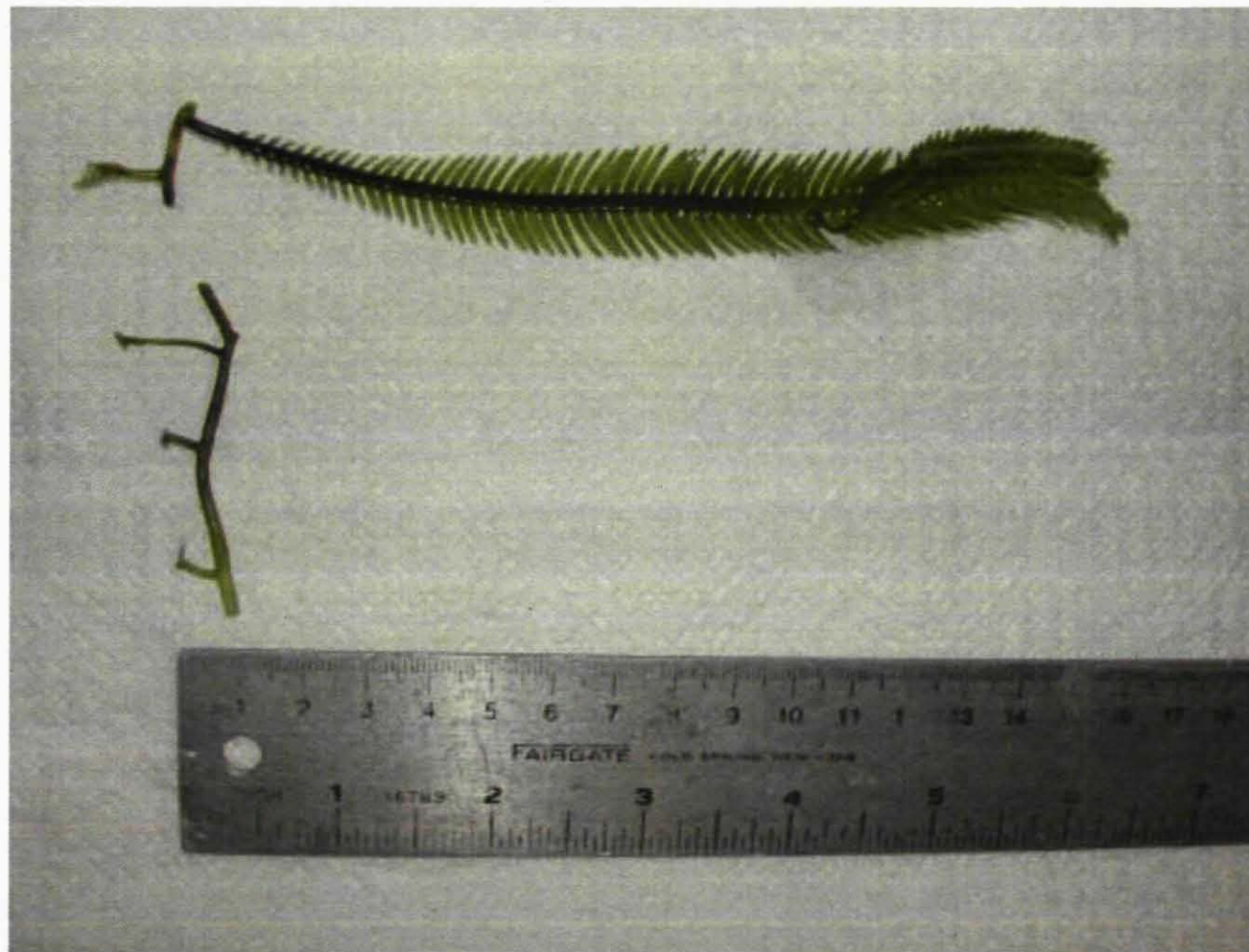
## What is the current status?

- None found in Agua Hedionda Lagoon since September 2002
  - Surveillance ongoing
- None found in Huntington Harbour since November 2002
- Continue Surveillance
- Declare full eradication in fall of 2005 (?)

**PVC Core sampler  
used for removal  
and transport of  
sediment from *C.  
taxifolia*- infested  
sites after treatment  
with chlorine.**



**Two types of *Caulerpa taxifolia* explants used to inoculate “control” (untreated) sediment cores to verify adequate grow-out conditions.**



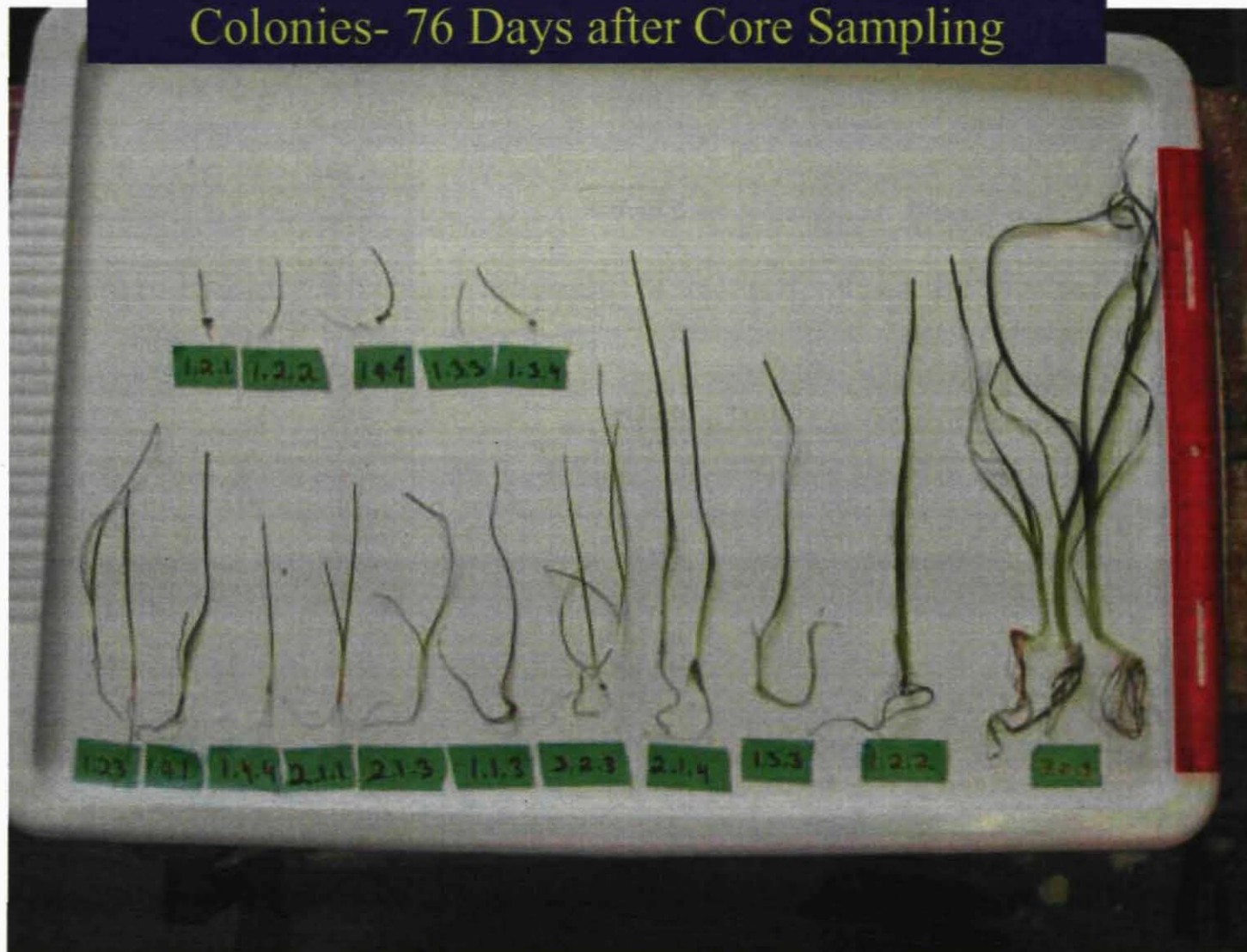
# Control Cores 42 DAP

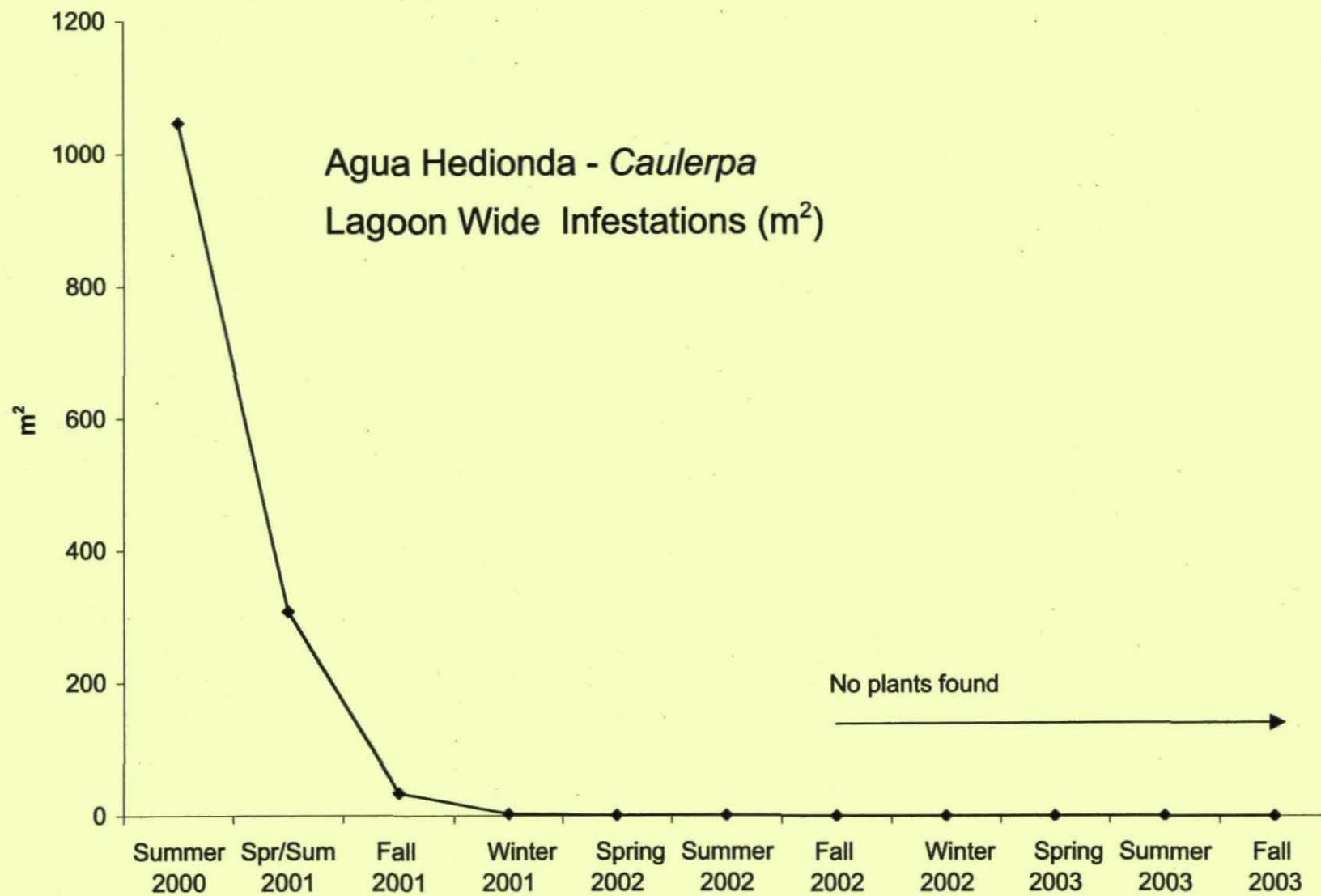


## **Eelgrass in Chlorine-Treated Cores- 76 DAP**



Eelgrass Seedlings Emerged from Sediment  
Cores from Tarped and Treated *C. taxifolia*  
Colonies- 76 Days after Core Sampling





## Summary: Post-Discovery Actions:

- 
- JUNE 12, 2000- DISCOVERED IN CARLSBAD, CALIFORNIA  
(CONFIRMED 3 DAYS LATER)
  - JUNE 28- MULTI AGENCY MEETING: US Fish and Wildlife Service,  
Calif. Dept. of Food and Agriculture, California Dept. of  
Fish and Game, US Dept. of Agriculture-Agricultural  
Research Service & APHIS, San Francisco Estuary  
Institute, UC-Davis, San Diego Regional Water Quality  
Control Board, NOAA-Fisheries
  - JUNE 29- >>First Eradication Treatments
  - JULY 2000- DISCOVERED IN HUNTINGTON HARBOUR >>  
Eradication underway after confirmation
  - JULY, 10, 11, 2001 ANS Sponsored conference on “Implimenting a  
National Prevention Program”
  - SEPT. 24TH, 2001 State legislation signed to BAN *C. taxifolia* plus 8 other  
species in California
  - JAN. 2002 International Conference on *Caulerpa taxifolia*
  - 2001, 2002 Efficacy Assessment, Containment, treatments of very  
small plants
  - September, 2004 No new plants found (last found:Sept/Nov 2002)

## **What Now?**

✓ **Continue surveillance**

✓ **Establish Criteria for**

**“Notification of Eradication”**

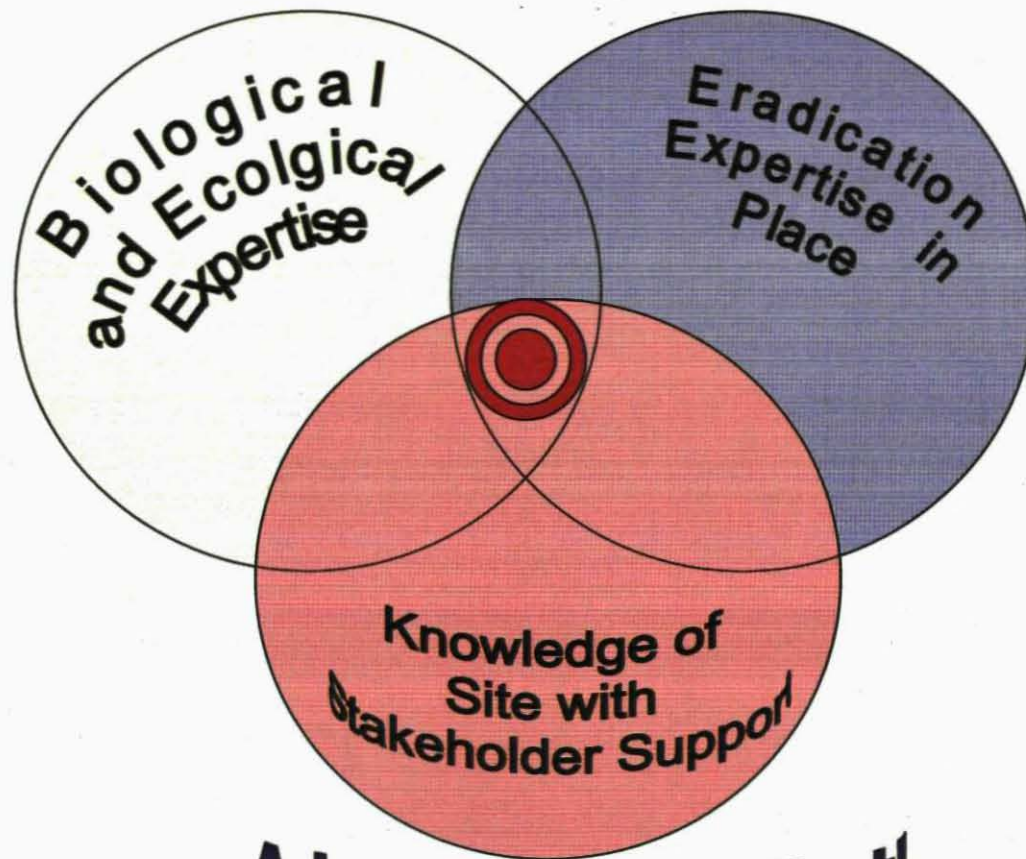
**Fall 2005 ?**

✓ **Communicate “End Game” to  
stakeholders**

✓ **Celebration: *Grilled lobster  
smothered in garlic-roasted  
caulerpa!!***

# Optimal Conditions for Rapid Response

*Pre-Invasion Planning !*

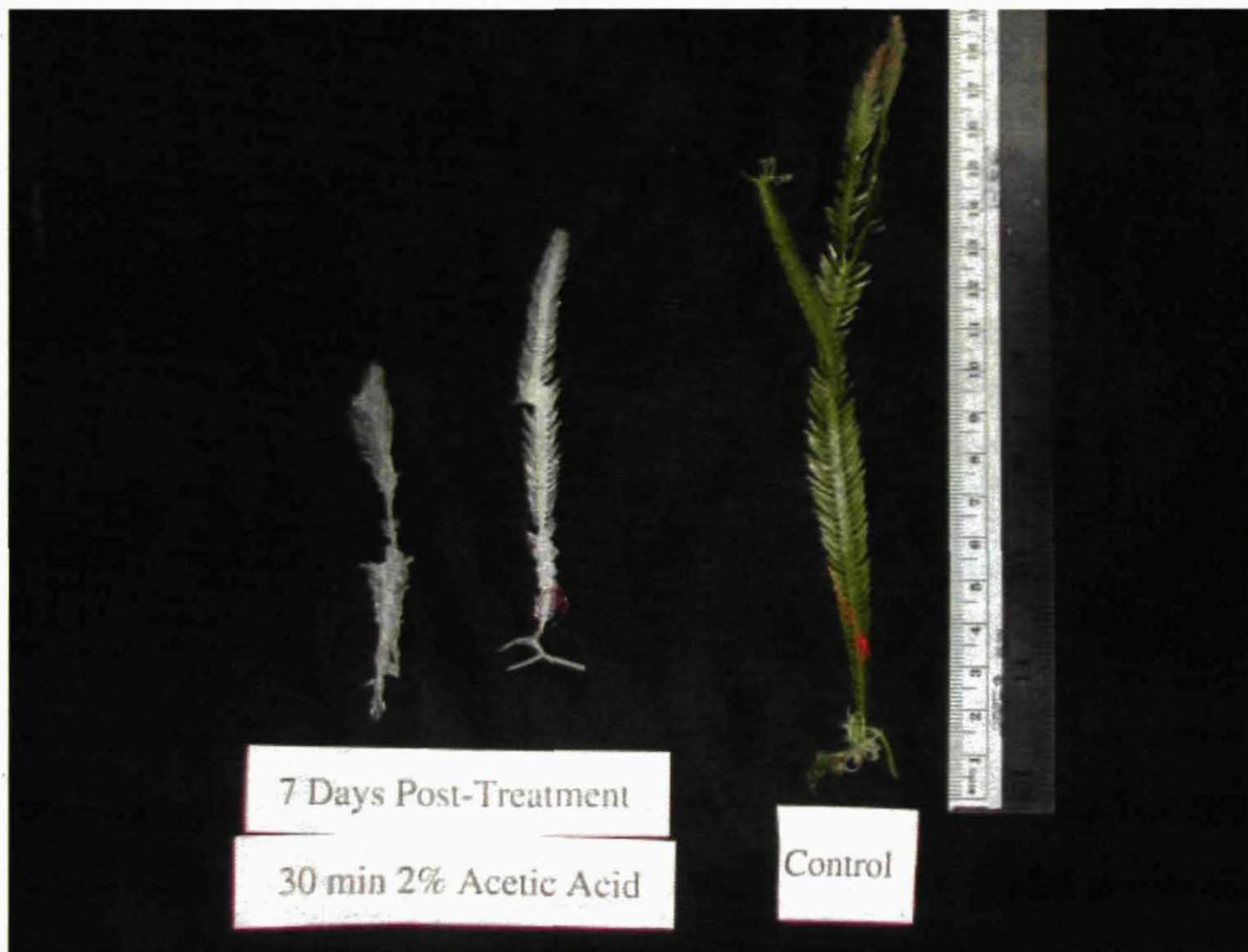


**Adequate Funds-Fast!**

## **Why Has the California Response been Successful?**

- **Scientific and Political “Awareness” in place two years before the first population was found**
- **Fortuitous detection (Knowledge...and LUCK !!)**
- **Essential components of Eradication program quickly assembled through agency consensus (1 to 2 weeks)**
- **Field team was already in place**
- **Political will rapidly followed scientific input**
- **Extremely dedicated people With a Clear Goal**
- **\$ 1 million “raised” for first year of project (About \$3.4 million since 2000)**
- **Full Eradication Will Cost ca. \$5 MILLION**

## Potential Use of Acetic Acid for Eradication



## Preventing New Introductions of Invasive Marine Plants

- Improved Communication with Aquarium Industry & Hobbyists on “INVASIVE SPECIES”
- Use “Case Study” examples to explain costly impacts
- Promote environmental stewardship via media, clubs, associations:  
**This must include *plant communities* as part of the ecosystem**
- Research, identify and promote use of safe alternative plants
- Provide incentives to the retailers, e.g. recognition of responsible marketing, inventory and sales