AgPro
Research and Extension Update
2014

Dr. Andy Kaufman

Tropical Landscape & Human Interaction Lab

Tropical Plant & Soil Sciences

CTAHR

University of Hawaii

Lab Overview

The Tropical Landscape and Human Interaction Lab

Is a multidisciplinary research laboratory dedicated to studying the connection between plants, the outdoor landscape and the associated human responses…

Project Examples

Reducing Infrastructure Damage by Trees

Kalani Matumura & Leinala'a Bright: Graduate Students

You may seen these before…..?

- The Majority of research on urban trees is done in temperate climates. Information is lacking for tropical/sub-tropical environments such as Hawaii!

❖Honolulu Street Trees

✿ **Currently:**
- **235,000 trees managed by C&C[1]**
- **142,000 street trees (60%) on C&C roads**

✿ **45% of the C&C Urban Forestry budget is spent for infrastructure damage to sidewalks, gutters, roads and sewer pipes due to damage by tree roots.**

✿ **28% budget on tree pruning**

✿ **27% budget on tree planting, removal, inspection and administrative costs**

❖[1.] City of Honolulu, Hawaiʻi Municipal Forest Resource Analysis, November 2007,
Center for Urban Forest Research USDA Forest Service, Pacific Southwest Research Station
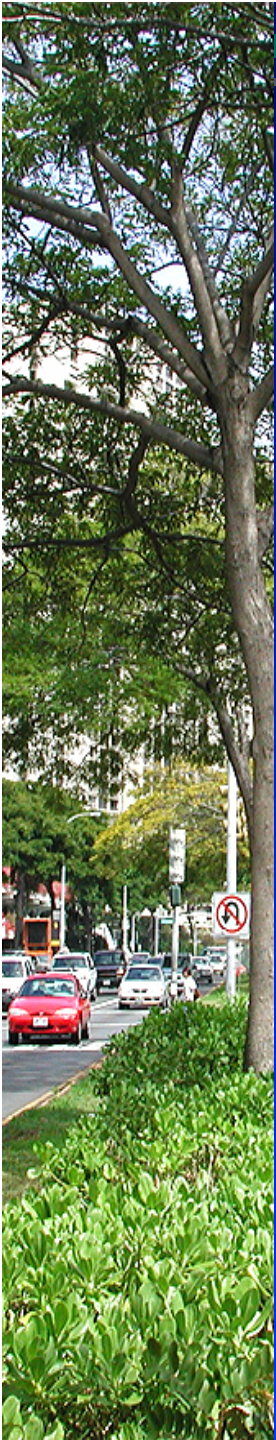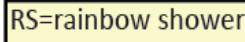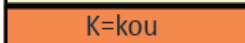
Objectives of this Project

⚜ **Determine regrowth rates after pruning for several species over a 2 year period.**

⚜ **Select proper planting area for improved tree health.**

⚜ **Gain an understanding of growth rates for different tree species.**

⚜ **Develop recommendations on species selection, tree planting guidelines, and maintenance.**

⚜ **Reduced tree infrastructure costs.**

Waimanalo Field Planting Diagram

KEY

RS=rainbow shower
K=kou

RS — 3'x3', 4'x4', and 5'x5' pits with concrete slab

RS — 3'x3' pit with root paths

K — 3'x3' pit with Silva Cells

Green and Healthy Hawai'i: **Identifying & Introducing Alternative Ornamental Landscape Plants in Response to Invasive Species Issues**
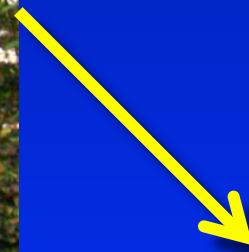
Funded by: Hawaii Invasive Species Council, (HISC)

Alberto Ricordi: Graduate Student

Objectives of this Project

❀ **Promote non-invasive species for the Landscape Industry to create a more sustainable island landscape.**

❖**Strawberry guava (*Psidium cattleyanum*), a common invasive species in Hawai'i**

Material and Methods

Pimenta dioica

Allspice

Medium size accent tree.

Harpulia pendula
Tulipwood

Psydrax odorata
Alahe'e

Caesalpinia ferrea
Brazilian ironwood
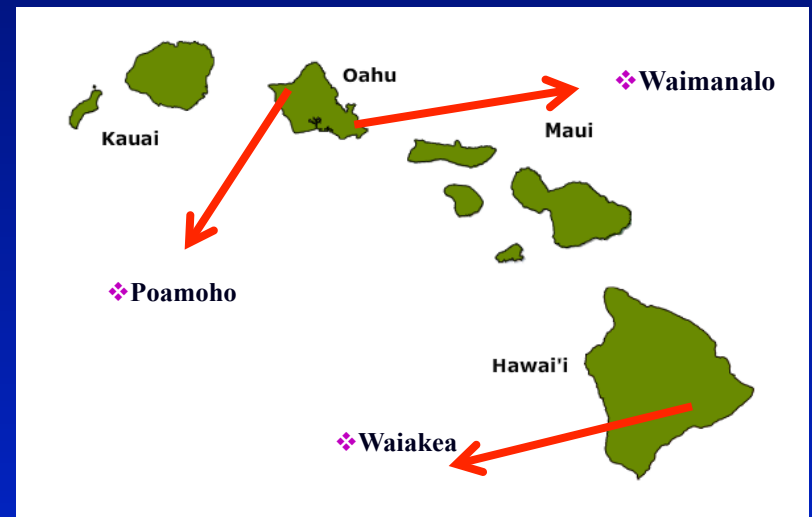Leopard tree

Field-trials with Available Alternatives

- ❁ **3 Locations**
  - ▪ **Waimanalo (Oahu)**
  - ▪ **Poamoho (Oahu)**
  - ▪ **Waiakea (Big Island)**

- ❁ **Two fertilizing treatments**
  - ▪ **Slow release fertilizer**
  - ▪ **No fertilizer at all**

- ❁ **19 Species – 10 Native + 9 Exotics**
  - ▪ **Total 480 plants**

Waimanalo Research Station

❖**Field after planting**
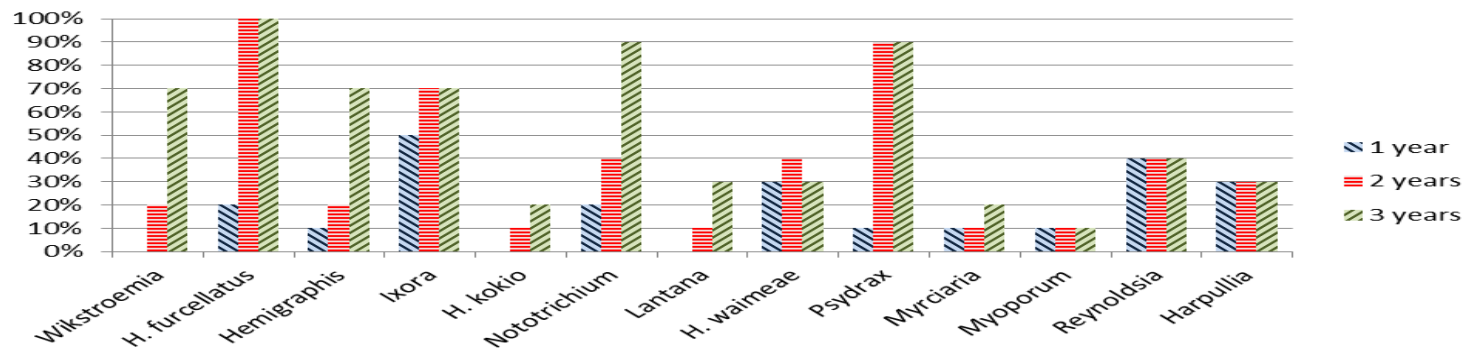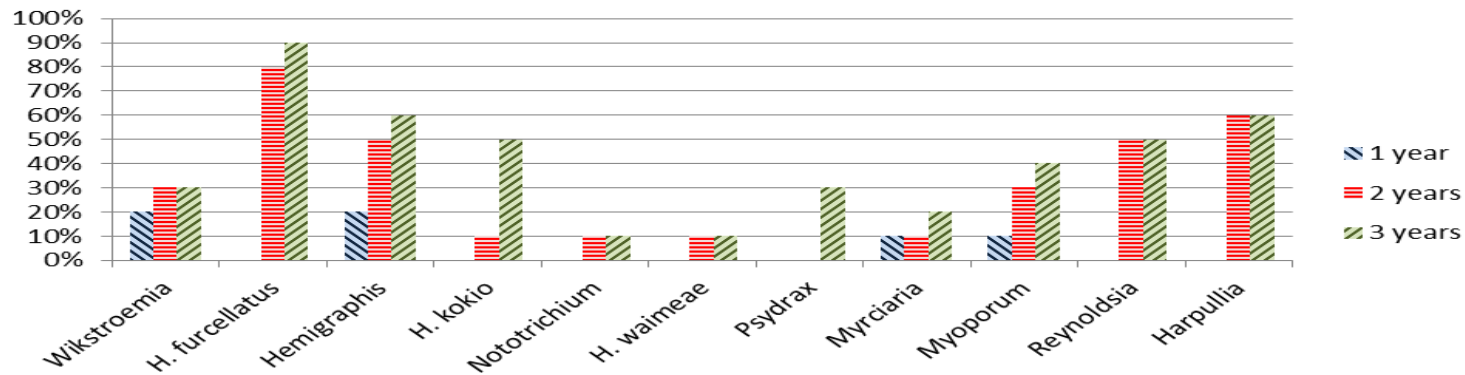

❖**Weeding**

❖**Weed matts to suppress weeds**
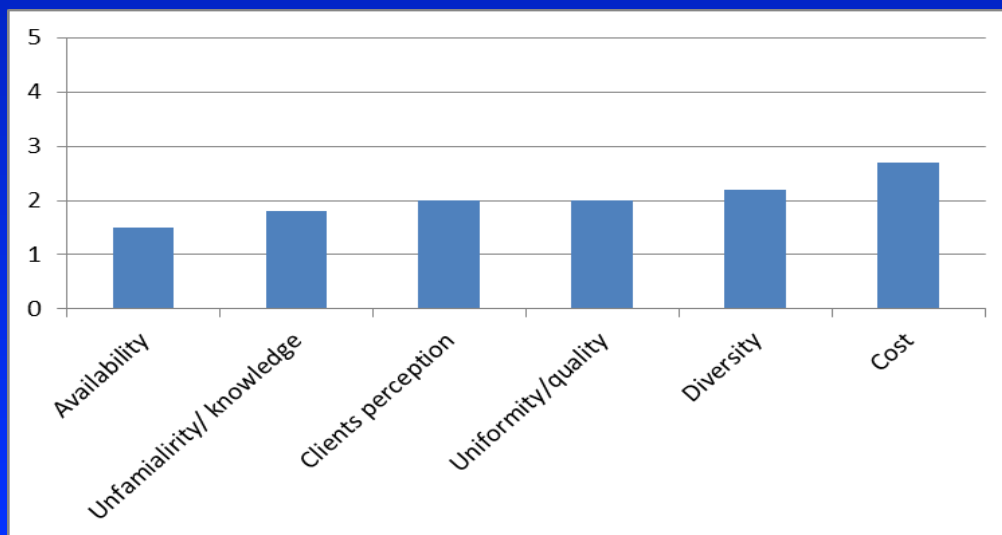
Results (Mortality rates)
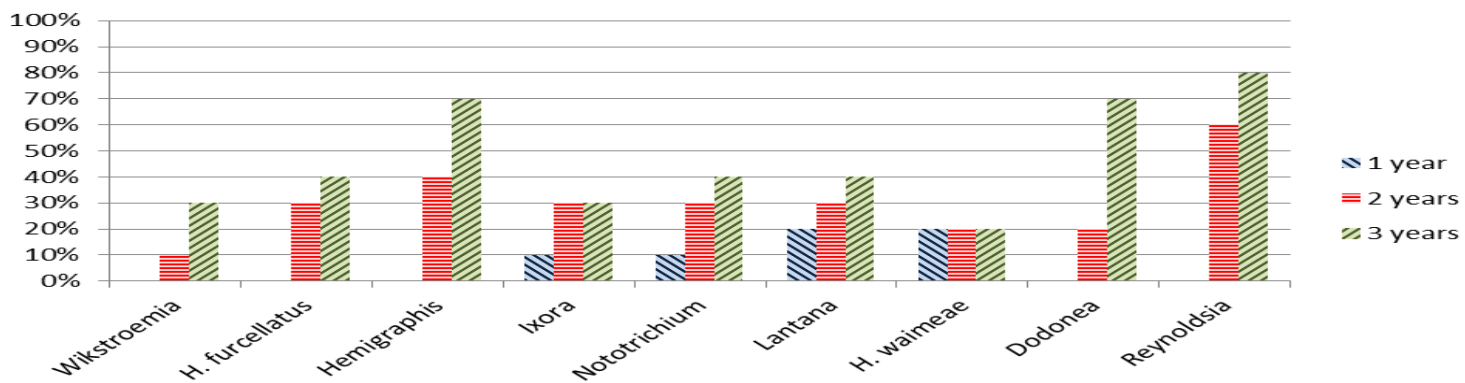
Results – Field Day

✿ **Participants**

- **Landscape Architects, Arborists, Landscape contractors, and Nurserymen attended.**

✿ **Issues for using non-invasive plants in the L.S.**

- **Availability was voted the main issue.**
- **Confirmed difficulties found when looking for plants for this project.**
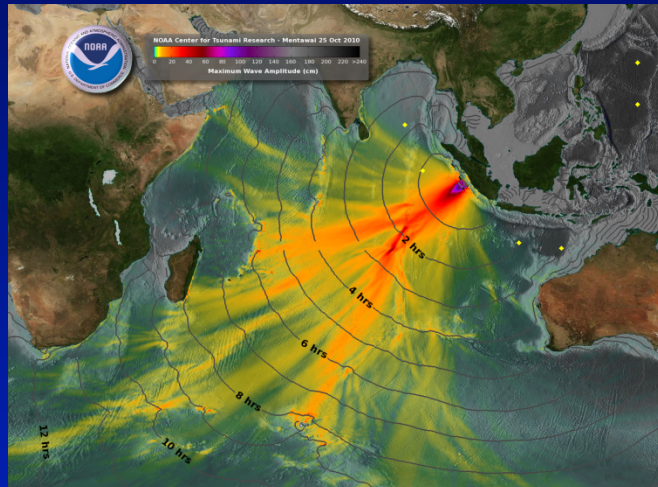- **More studies were requested.**

Deflecting the Wave: Using Coastal Vegetation to Mitigate Tsunami and Storm Surge Phase III

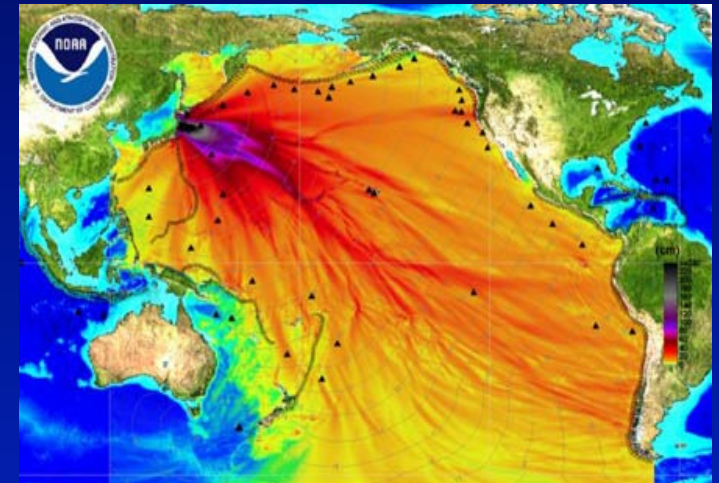**Funded by: Kaulunani Urban & Community Forestry Program**

Alberto Ricordi & Timothy Gallaher: Graduate Students

Overview

❖**December 2004 Indonesia/ Indian Ocean tsunami**
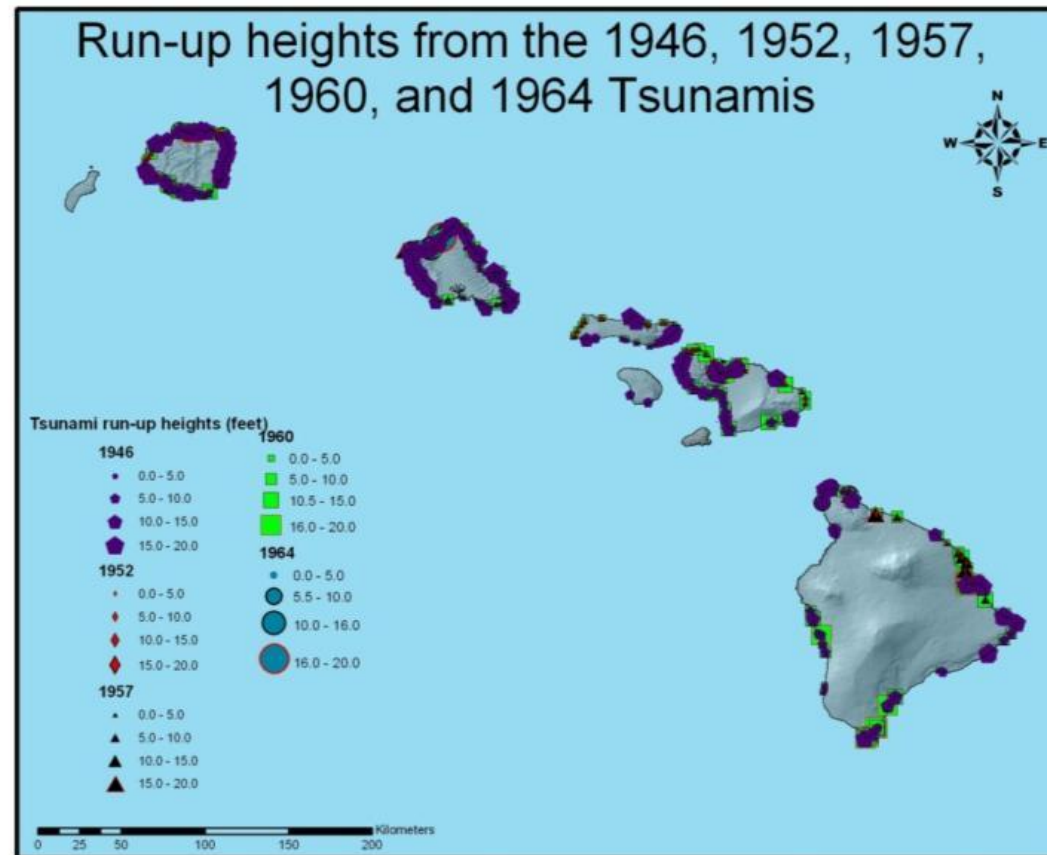- Death toll: > 200,000
- Cost: >14 Billion

❖**March 2011 Japan/Pacific Ocean tsunami**
- Death toll: > 16,000
- Cost: > 300 Billion

- **Interest in bio-shields following 2004 tsunami**
- **Anecdotal accounts**
- **Research conflicting**
- **Most research to date based on one large event**

Tsunami in Hawaii

❖ **1946, 1952, 1957, 1960, 1964, 1975, 2011**
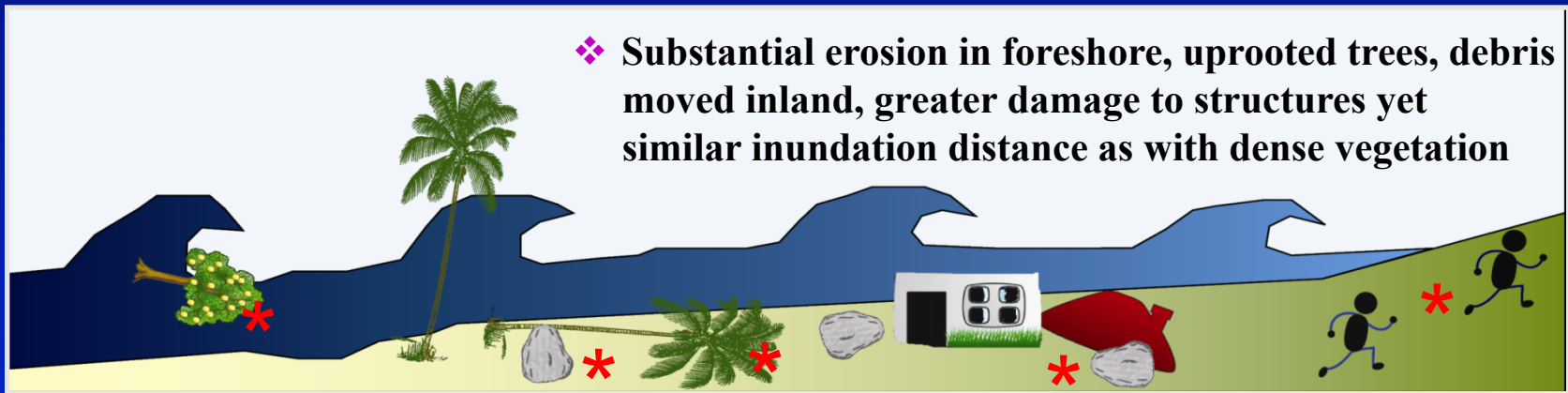

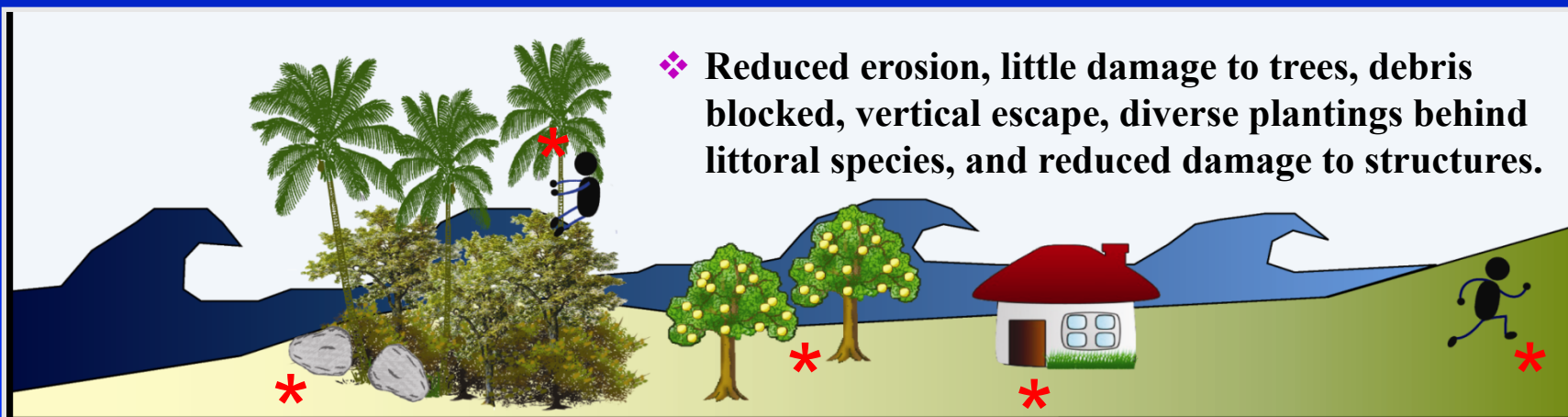Run-up heights from the 1946, 1952, 1957, 1960, and 1964 Tsunamis

Tsunami data from Loomis, 1976. Digitized by Hawaii State Office of Planning Staff in October, 1999
Base Layer: Hawaii Digital Elevation Model USGS

Previous research suggests that a coastal forest with high stem density & complex vertical structure will provide the greatest protection from storm surge and tsunami events.
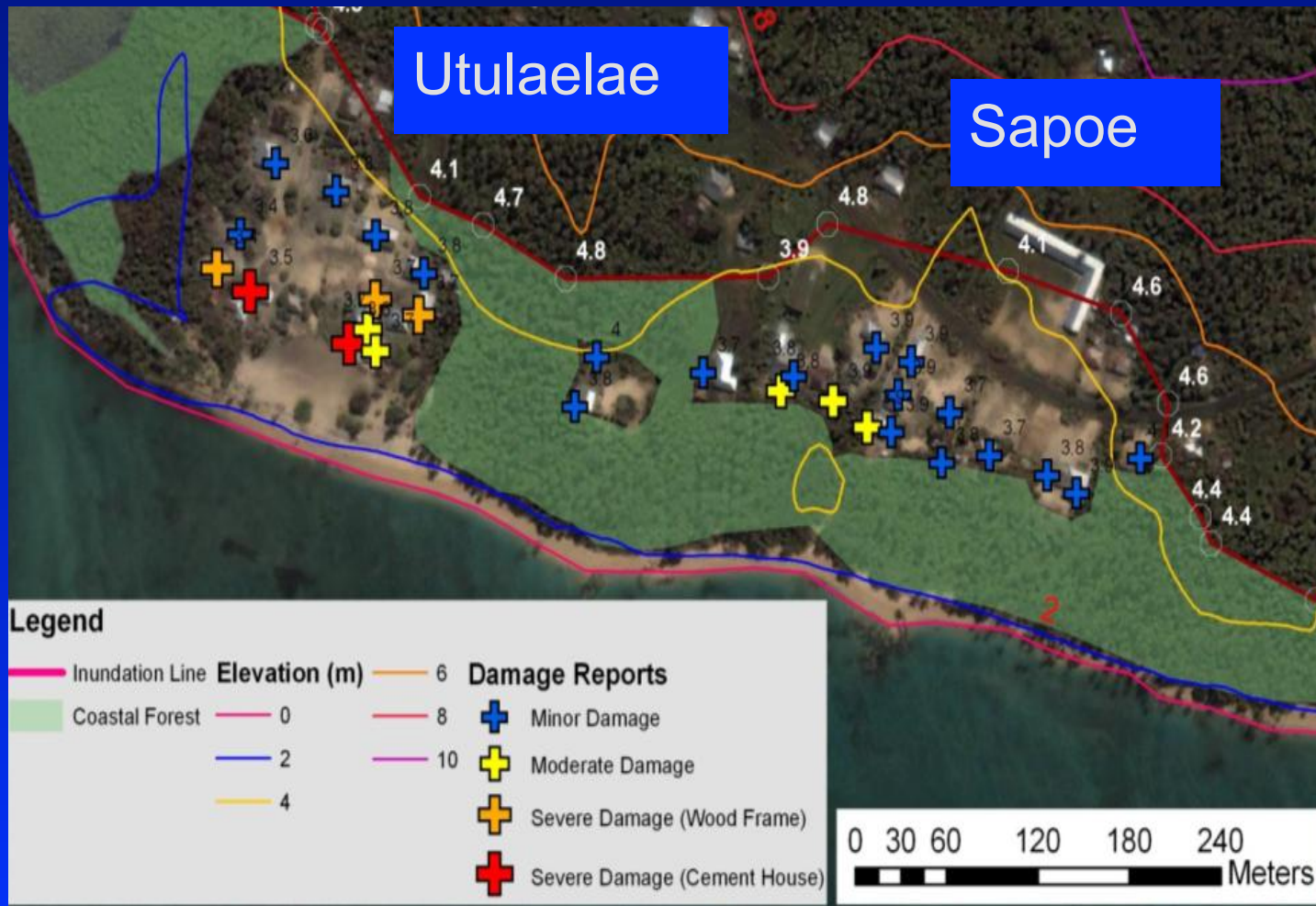

❖ Substantial erosion in foreshore, uprooted trees, debris moved inland, greater damage to structures yet similar inundation distance as with dense vegetation

Without Bioshield

❖ Reduced erosion, little damage to trees, debris blocked, vertical escape, diverse plantings behind littoral species, and reduced damage to structures.

With Bioshield

Samoa Observations

Coastal Restoration + Bio-Shield Design

❖Photos by Randy Thaman

❖**A successful coastal restoration project in Tonga recommended a three step plan:**

❖   1. **Plant a dense buffer of highly salt tolerant species,**

❖   2. **Behind this plant less tolerant species,**

❖   3. **Finally add biodiversity to the new coastal forest with enrichment plantings of key species.**
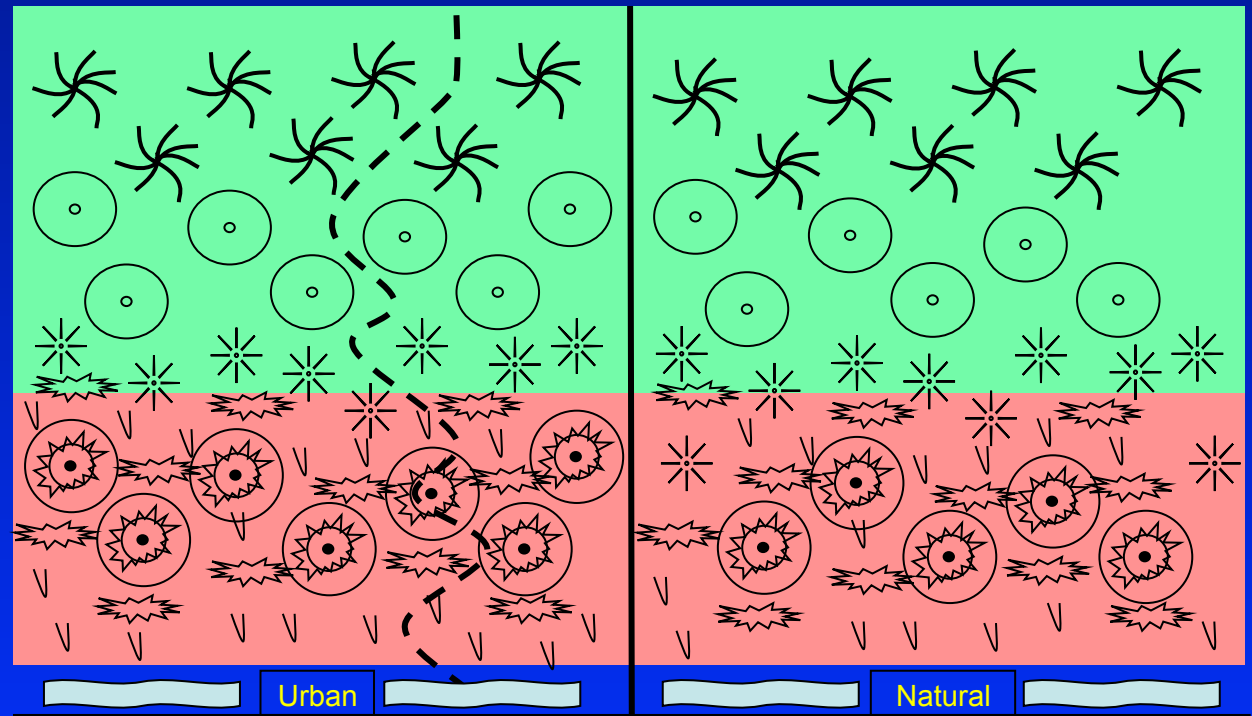
Current Steps

Bio-shield design for natural
and non-urban areas

Background zone planting

Foreground zone planting

Urban

Natural

Symbol Key: ✳ = Palm   ⊙ = Tree   ✳ = shrub   ∫ = Walking path

∨ = Grass   ⊛ = Tree w/large shrub   ✲ = Ground cover

People's Psychophysiological Responses to Tropical Urban Tree Pruning in Hawai'i

Funded by: Kaulunani Urban & Community Forestry Program

Post-Doc: Sangmi Lee, Dankook University, Korea
Srudents: Aarthi Padmanabhan & Aliah Irvine, University of Hawaii

THE PROBLEM

- Often, trees are taken for granted, and their attributes are not fully realized…

- Lack of budget, education of plant/tree care in the LS…

- Large heading cuts: unsightly and can severely shorten the life of the tree.

- In Hawaiʻi, people seem to have an affinity against trees instead of embracing trees attributes.

OBJECTIVES OF STUDY

- **DETERMINE** residents of Hawaiʻi social and physiological responses to tropical trees in Hawaiʻi.

- **CHARACTERIZE** differences in people's social and physiological response to proper and improper tree care practices in Hawaiʻi.

- **PREVENT** destructive tree care practices in the State of Hawaiʻi.

- **PROVIDE** environmental education to tree care professionals, policy makers and the general public.

METHODS and MATERIALS

❖**Electrode Placement & Recording**

❖**Set up and calibrating psychophysiology instruments.**
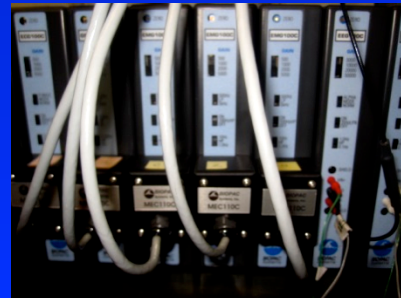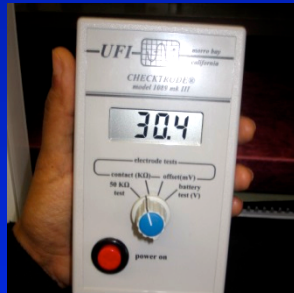
Good Form.

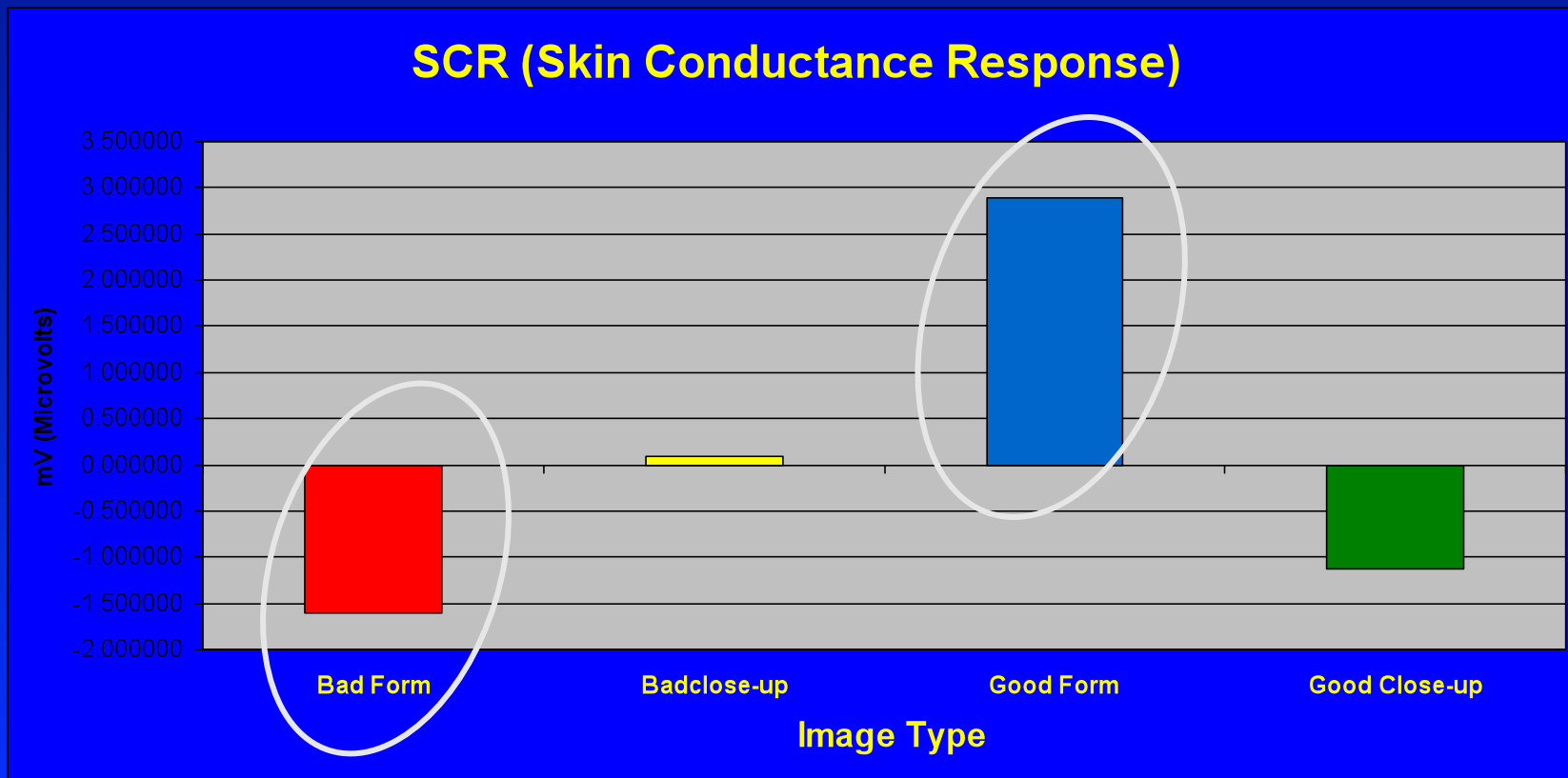**Bad Form.**

Visual Stimulus Examples

**Good Close-up.**

Bad Close-up.

PRELIMINARY RESULTS

✿ **Activation for Good Form indicates a positive arousal state.**

✿ **Based on LS sustainability theories, seeing a healthy tree would indicate short term or long term resources.**

PRELIMINARY RESULTS

✿ **In terms of information processing, psychophysiological data reveals for bad form tree images there is information rejection.** *(People do no want to process that image).*

✿ **SCR and EMG-Z & O psychophysiological data indicates looking at good form full trees is a rewarding experience.**

✿ **Data also reveals that respondents do not like bad form tree images.**
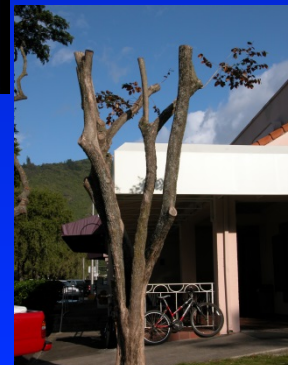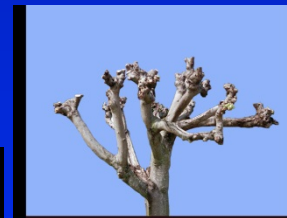
Mahalo for your time...

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