The Maui Island Plan Heritage Resources Goal:

An intact, ecologically functional system of reef, shoreline and nearshore waters that are protected in perpetuity.

Our Reefs: The Facts

- Hawaii's reefs are vast
  - 410,000 acres, representing almost 85% of coral reefs under US protection
  - Over 5,000 species, almost 25% endemic
  - Culturally, economically, biologically critical

The Value of Hawaii's Coral Reefs

"Hawaii's coral reefs generate $800 million per year in gross revenues."

"For Hawaii overall, the asset value of its 410,000 acres of coral reefs are estimated to be worth $10.3 billion."

The Cost of Degradation

"Over $20 million is lost each year from the impacts of algal blooms in Kihei alone."

From "Economic valuation of the coral reefs of Hawaii" by Caesar et al, 2002

Coral Reefs 101

Coral reefs evolved in Clean, Clear, Low nutrient water

- Biology
- Physics
- Chemistry

Inseparable

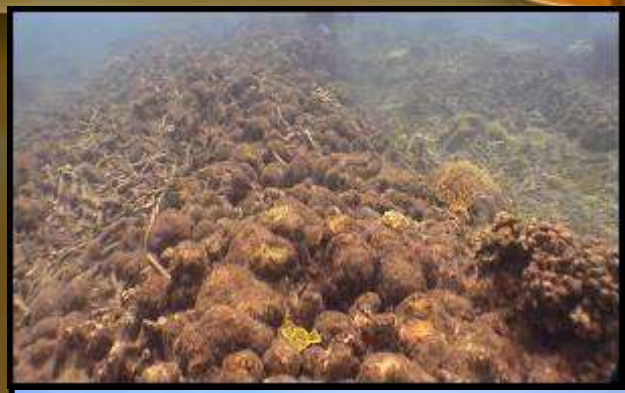
Coral reefs should be considered as whole ecosystems.
The habitat and associated marine life are deeply interlinked!

Coral Reef Ecology

What does a healthy reef look like?

What are the consequences if reefs don't cope?

- **Environmental impacts**
  - Loss of coral
  - Changes in reef community
  - Loss of biodiversity
- **Economic impacts**
  - Decreased tourism appeal
  - Decreased resident appeal
  - Near shore fisheries
- **Loss of services**
  - Subsistence
  - Recreational opportunities
  - Cultural significance
  - Shoreline protection



Maui's Reefs in Danger

Land Based Pollution

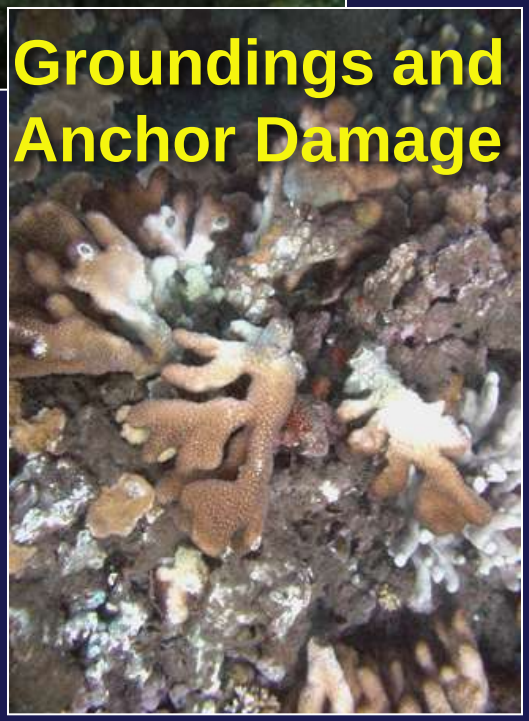
Sedimentation

Invasive Algae

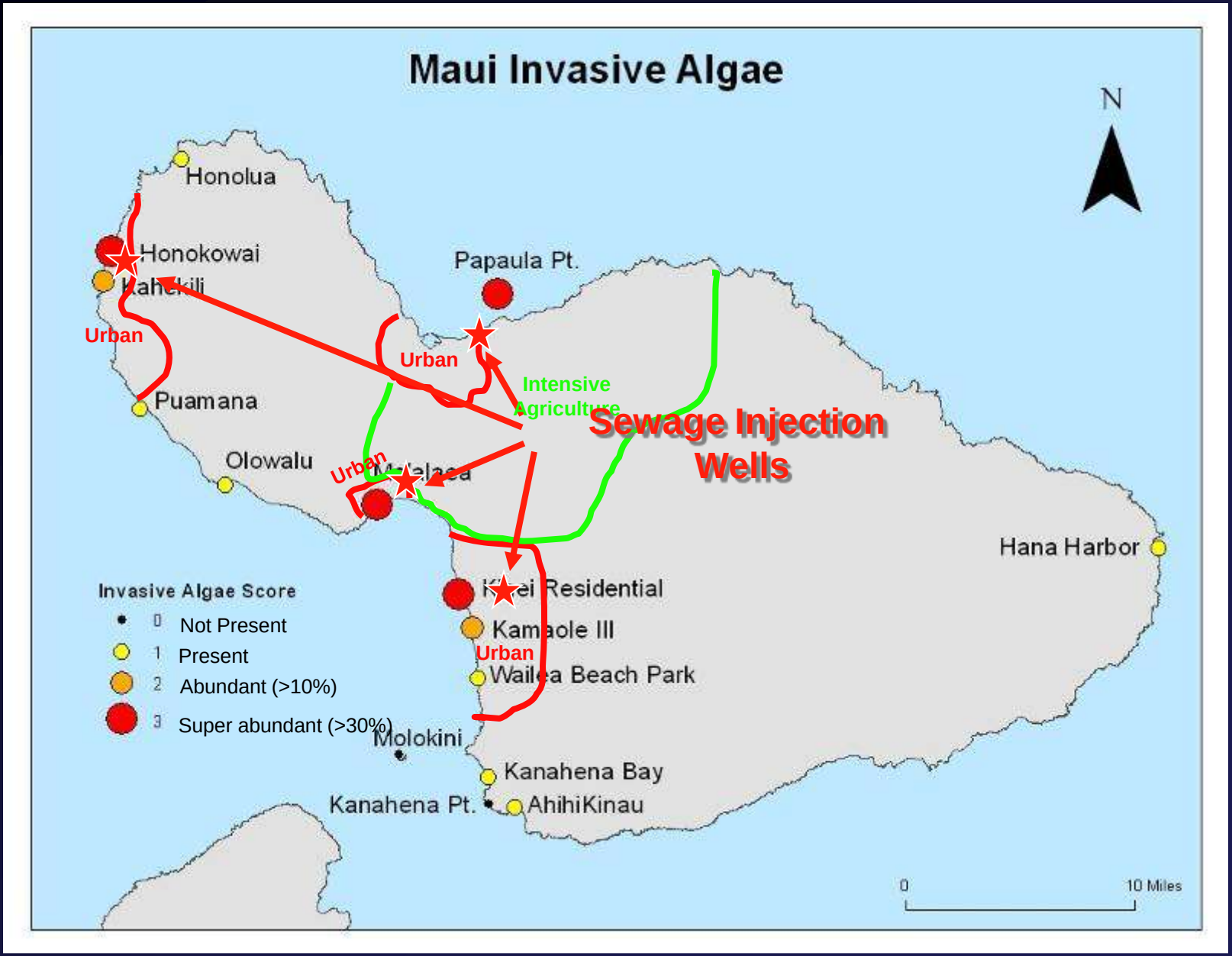
Over Fishing

Over-use

Groundings and Anchor Damage



Problems with Land Based Pollution



Injection wells at Maui's three waste-water treatment facilities put approximately 13,000,000 gallons of treated effluent into the ground each day

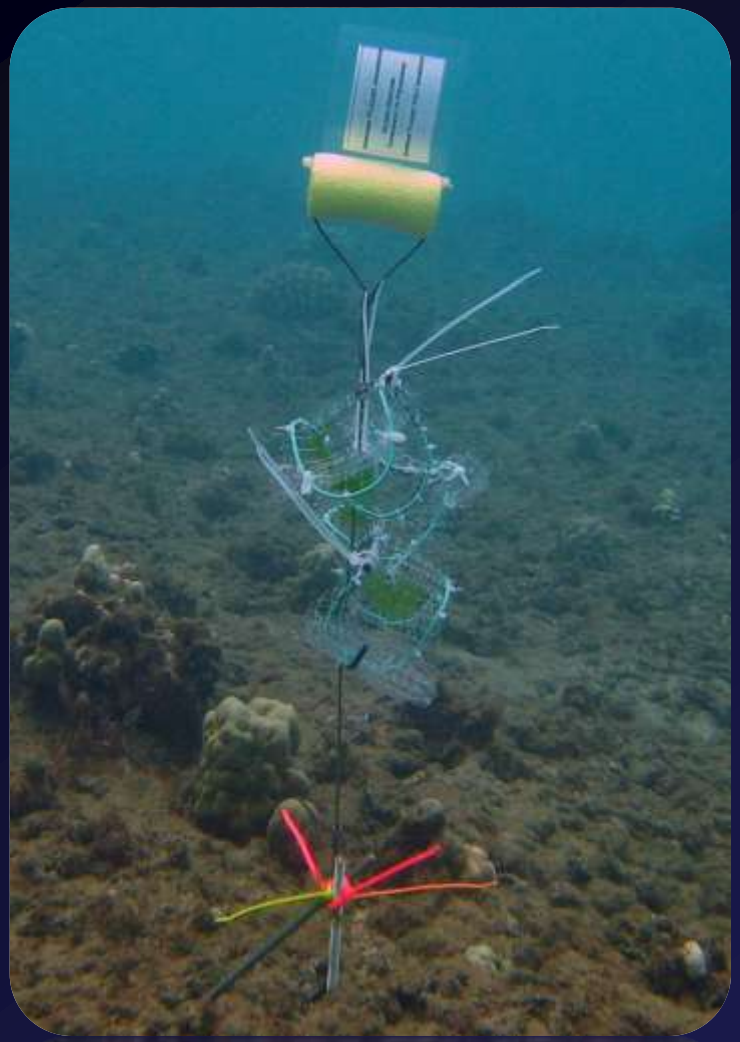
Chip Hunt – USGS
Wading Surveys –
•Fabric Brightener Fluorescence
•Pharmaceuticals
•Salinity
•Nitrogen Isotopes

"Laboratory results confirmed the presence of wastewater constituents in marine water-column samples"
Hunt & Rosa, 2010
USGS Report
http://pubs.usgs.gov/sir/2009/5253/

Meghan Dailer – Researcher, UH Botany

Where are the nutrients coming from out on the reef?

"The reefs near at Kahekili receive consistent inputs of sewage effluent via groundwater seeps" (Dailer, et al., 2010)



Native algae *Ulva* spp.→

Can Staphylococcus aureus (MRSA) survive in seawater?

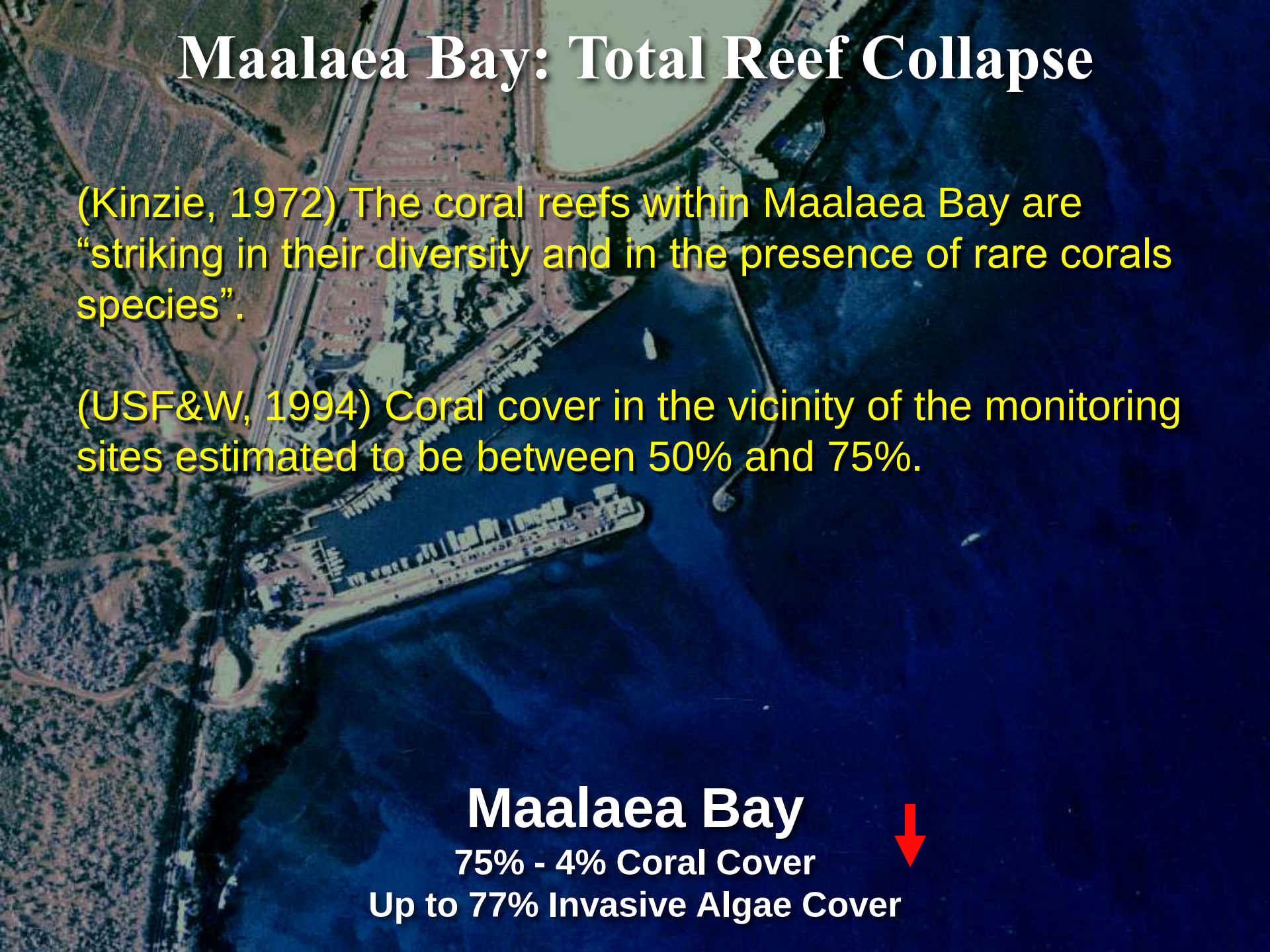
"As a marine microbiologist, I am confident that it can and does survive well in seawater, and there is a large body of peer-reviewed primary scientific literature that supports this."

Melissa Garren
Scripps Institution of Oceanography
University of California San Diego

Maalaea Bay: Total Reef Collapse

(Kinzie, 1972) The coral reefs within Maalaea Bay are “striking in their diversity and in the presence of rare corals species”.

(USF&W, 1994) Coral cover in the vicinity of the monitoring sites estimated to be between 50% and 75%.



Factors that influence recovery

- water quality
- herbivory
- biological diversity
- connectivity

Removal of stressors

Don’t Waste the Water!

Greater Use of R1 Lines

Kihei and Lahaina plants currently have limited reuse of wastewater through R1 lines; Central Maui's plant has none

Constructed wetlands could provide much-needed habitat for Hawaii's endangered waterfowl

Long-term Drought, Wildfires, and Disputes Over Water Rights

Healthy Reef, Healthy Critters!