



**Marine Global Earth Observatories
Mary Hagedorn**

A vibrant underwater scene featuring a diverse coral reef. The foreground is dominated by large, rounded coral structures in shades of red and pink, interspersed with yellowish, branching coral. Several orange and white clownfish are swimming among the coral. The background shows a deep blue ocean with more coral and a pinkish coral structure visible in the upper left. The overall scene is rich in color and detail, showcasing a healthy marine ecosystem.

OCEANS IN CRISIS

Smithsonian Conservation Biology Institute



Scholarly knowledge applied towards conserving and managing critically endangered species

SMITHSONIAN INSTITUTION GLOBAL EARTH OBSERVATORIES : ForestGEO



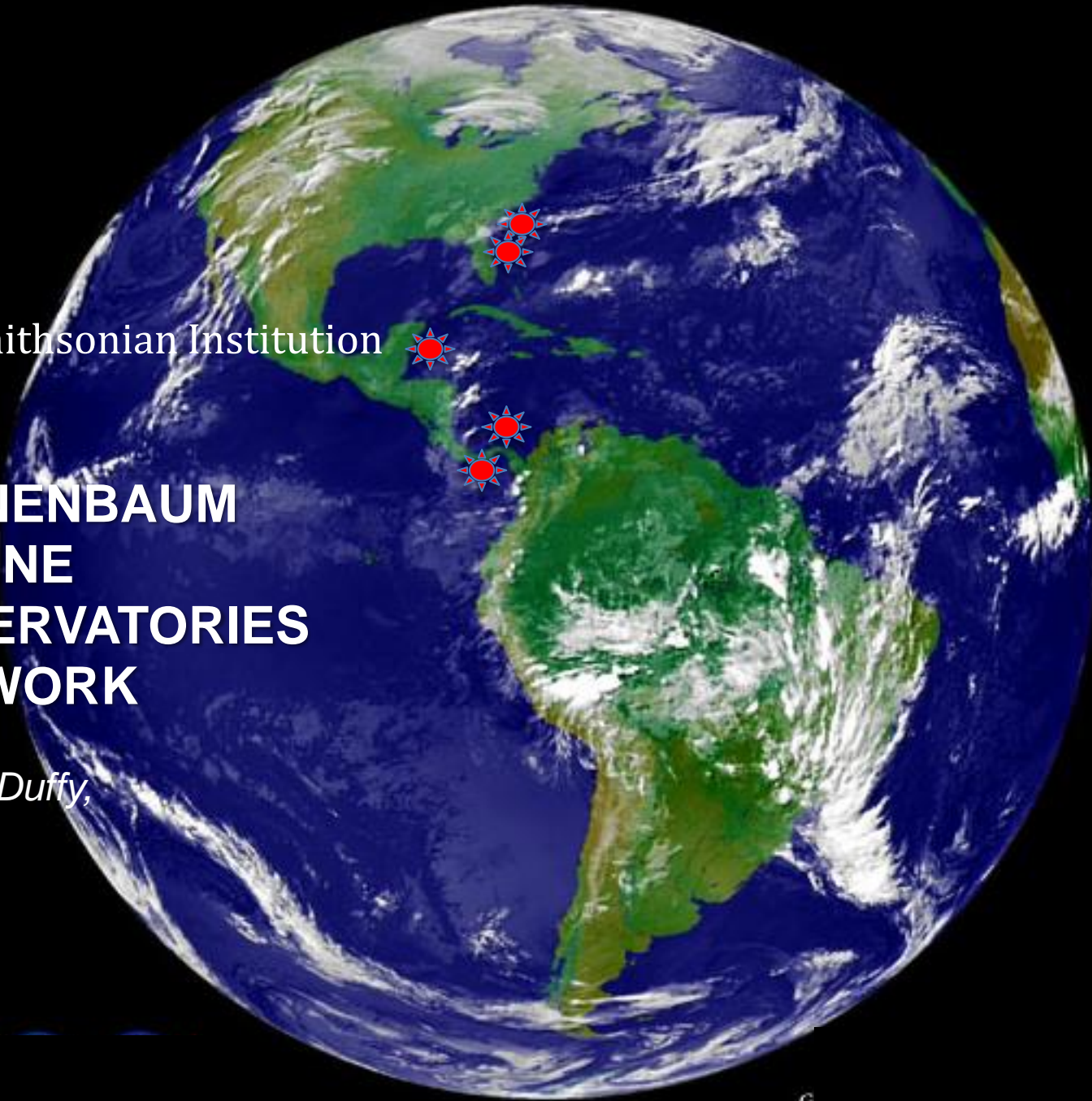
47 PLOTS / 21 COUNTRIES
4.5 MILLION TREES / 8,500 SPECIES
74 PARTNER INSTITUTIONS



Smithsonian Institution

**TENNENBAUM
MARINE
OBSERVATORIES
NETWORK**

*Emmett Duffy,
Director*



Why do healthy coasts matter?

50%

of the oxygen we breathe comes from the ocean.

75%

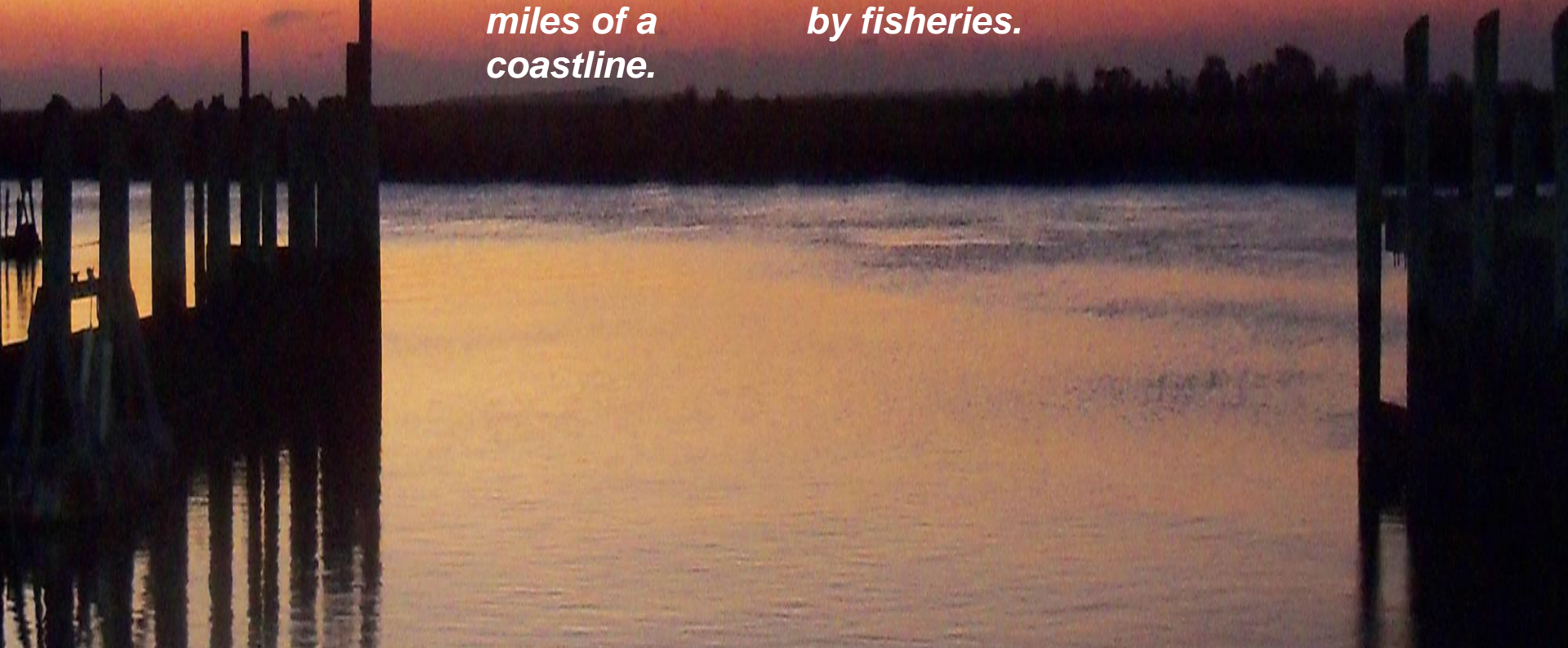
of the world's population lives on or within 100 miles of a coastline.

15%

of the global population's protein intake is provided by fisheries.

90%

of the big fish may already be gone.



The Big Questions In Our Oceans:

- *How much biodiversity do we have?*
- *How is biodiversity changing?*
- *Why is biodiversity changing?*
- *How is biodiversity important to ecosystem health?*
- *How is biodiversity important to us?*
- *What is the prognosis for the future?*
- *How can we help?*

MarineGEO: *What is it?*

First and only global network of marine ecological observatories

MarineGEOs

global, long-term (decades)

coastal

ecosystem-based

Multifaceted approach

long-term observations

experiments on mechanisms

ecosystem processes

A diverse, global partnership

Smithsonian leadership

academic, gov't, NGOs

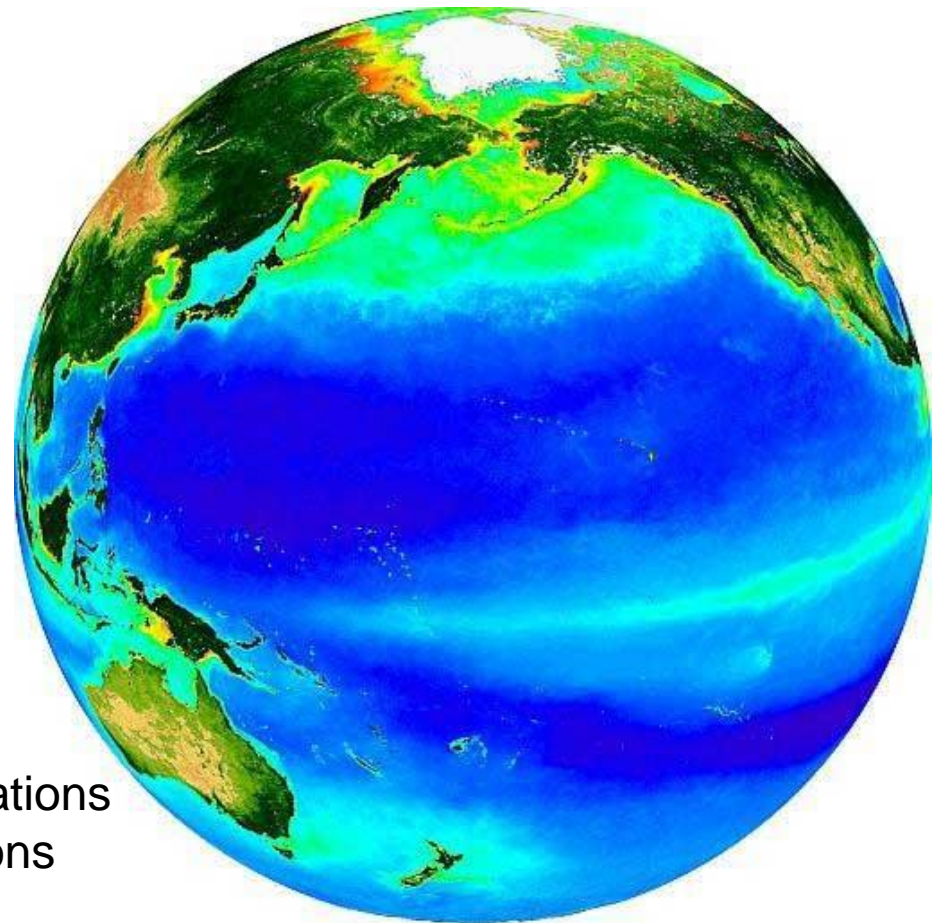
Diverse, practical outcomes

Actionable data and recommendations

legacy training of future generations

public exhibits and outreach

science-based information to drive the **Blue Economy**



Blue Economy

Defined as “the sum of all economic activity having to do with oceans, seas, harbors, ports and coastal zones.”

- ◆ 1,400 companies in San Diego
- ◆ producing over \$14 billion of direct sales
- ◆ In great need of basic science information about the ocean



What will MarineGEO do?

Objectives. Using standardized, long-term observations and networked experiments to identify causes of ecological change, we will:

- 1. Assemble a comprehensive biodiversity database for each site, including physical collections, images, and genetic material;*
- 2. Map change in marine biological communities through time and space;*
- 3. Use experiments to identify controls on biodiversity and vulnerability to stressors (nutrient loading, fishing, warming, acidification);*
- 4. Reconstruct the history of coastal communities and human impacts; and,*
- 5. Preserve living organisms and tissues in frozen repositories for establishing new populations.*

How will MarineGEO do it?

Standard Observatory Measurements

Environmental Drivers

- meteorology,
- temperature
- salinity,
- nutrients,
- dissolved O₂
- carbon and pH of water and sediments.

Habitat Structure

- remotely sensed distribution of mangroves, seagrass, kelp, marsh, coral, rock, sand and mudflats.

Biodiversity & Community Structure

- plants,
- microbes,
- plankton,
- invertebrate
- fish
- other vertebrates,
- determining what species are there, their abundance, genetic diversity, and feeding relationships.

Ecosystem Processes

- plant production (supporting the food web
- grazing,
- predation,
- decomposition,
- recruitment and invasive species will be repeatedly sampled with standardized assays.

Marine Global Earth Observatory Hawai'i

University of Hawai'i

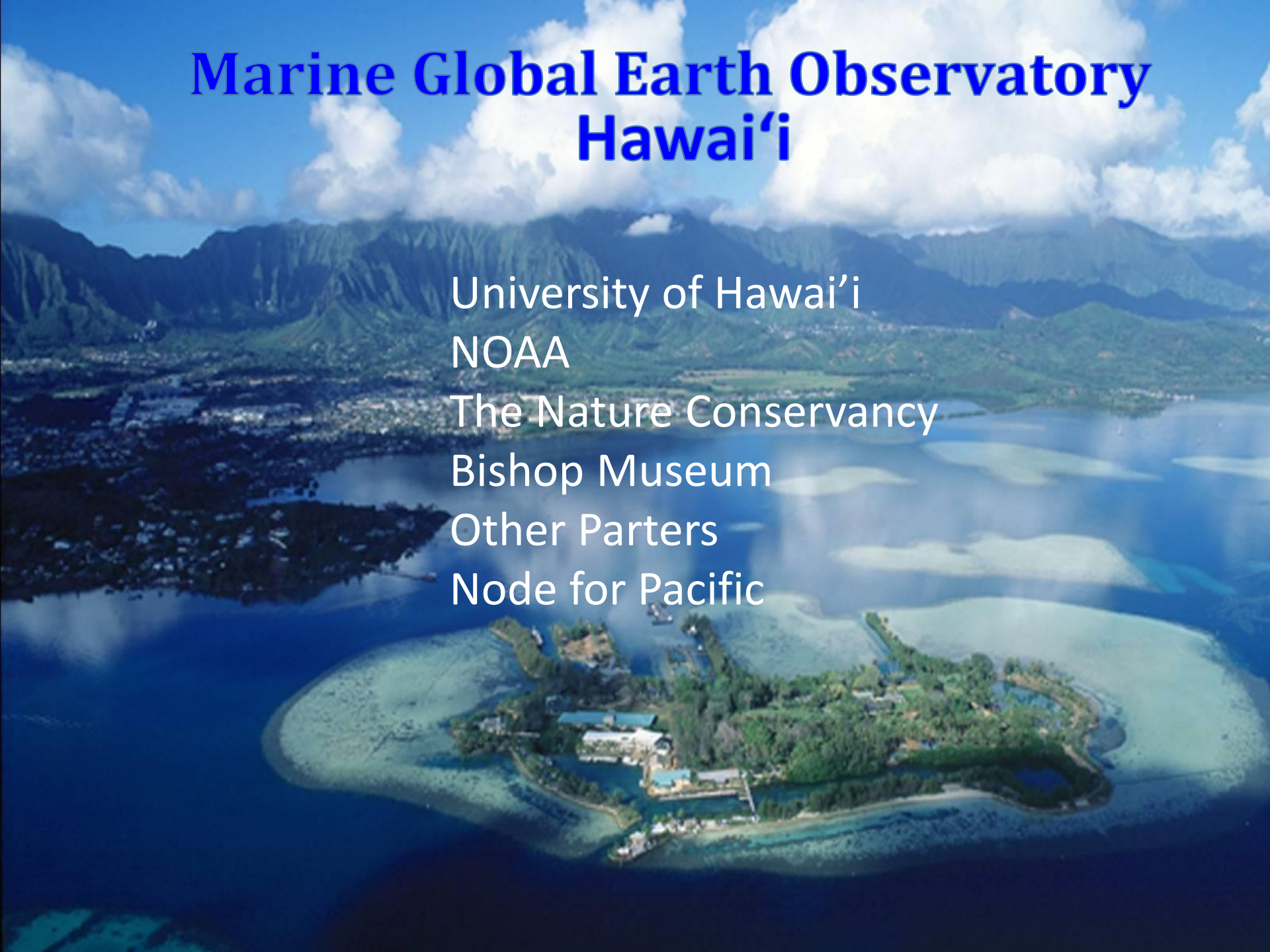
NOAA

The Nature Conservancy

Bishop Museum

Other Parters

Node for Pacific



Who will do what in MarineGEO?

Smithsonian

- expand the world's largest natural history collection,
- engage our diverse specialists to develop standardized methods,
- monitor research sites,
- **train students,**
- and create a global genome and data repository

Partners

- catalyze and sustain the network's long-term success with in-kind contributions of access to field sites, students, and facilities.
- **train students,**
- a flexible research program will encourage partners to initiate locally relevant research built around standard measurements conducted at all sites

Long-term Funding

- Smithsonian has a history of long-term commitment to monitoring projects (ex. ForestGEO- 30 yrs);
- Federal programs in the area (ex. NERRS?)
- Private sources (ex. Castel Foundation)

MarineGEO Workshop Bishop Museum Feb 10th and 11th, 2014

- engaged partners
- SI and UH signed MOU
- need to begin conversation about asking permission to work in Kaneohe Bay

