SPATIAL PLANNING TO INFORM EXPANSION OF AGROFORESTRY FOR CULTURAL, ECOLOGICAL & ECONOMIC BENEFITS

Partners: University of Hawai‘i at Mānoa, Kāko‘o ‘Ōiwi, He‘eia NERR, Kamehameha Schools, The Natural Capital Project

Project Objectives

Agroforestry systems, along with lo‘i kalo and other systems, were abundant in traditional Hawai‘i, and there is great interest in their restoration today. This project aims to improve understanding of current agroforestry systems and evaluate the costs and benefits of expanding restoration. *We work at three spatial scales* (Fig 1)*:*

1. Site: Pu‘ulani at Kāko‘o ‘Ōiwi: Develop an adaptable protocol for monitoring management costs, biodiversity, carbon storage, soil health, and biocultural value of community-based agroforestry.

Agroforestry includes any land-use system that integrates trees and crops (or other tended and harvested plant or animal species). Agroforestry systems can range from a few trees in a field or pasture to stewarded multi-story forests.

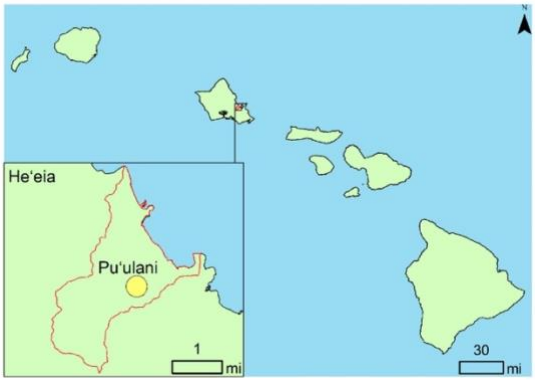

Fig 1: Pu‘ulani (yellow dot); He‘eia (red outline; Pae‘āina (whole map).

2. Ahupua‘a: He‘eia: Envision agroforestry mosaics for multiple cultural, ecological, and economic benefits using participatory mapping

3. Pae‘āina: Hawaiian Islands: Develop scenarios of potential future agroforestry systems based on an analysis of existing agroforestry systems, factors motivating farmer and community use of these systems, and crop market demand in Hawai‘i. Evaluate the potential ecosystem services (sediment retention, food production on land and sea, and carbon sequestration) & biodiversity benefits under restoration scenarios (Fig. 2).

Expected Outcomes:

- A clear pathway for increasing ecosystem services and biocultural value of land and sea through agroforestry.
- Improved knowledge base to guide incentives and other policies to support agroforestry restoration for multiple benefits.

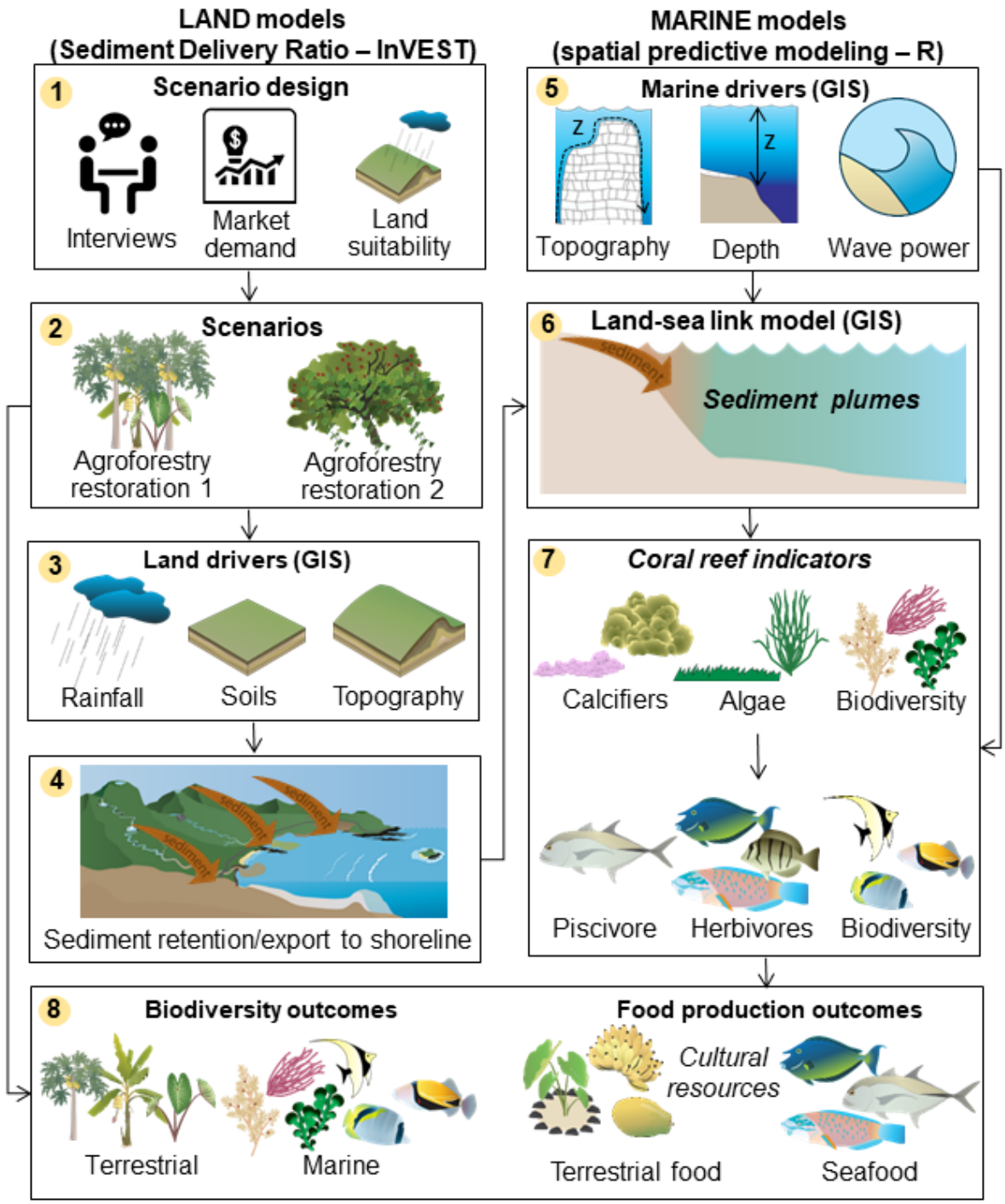

Fig 2. Overview of land-sea modeling framework. Farmer interviews, market demand analysis, and land suitability analysis (1) inform development of statewide agroforestry scenarios (2). The InVEST Sediment Delivery Ratio incorporates (3) land cover maps (agroforestry scenarios), rainfall, topography, and soil data, & outputs (4) sediment export (tons/year) to the shoreline. Based on marine conditions (5), a water quality model will diffuse sediment into the ocean (6). The predictive marine models couples reef surveys with (5) bathymetry, wave, (6) water quality data to map (7) coral reef benthic and fish indicators. (8) The outputs identify marine and terrestrial priority restoration areas, including trade-offs between biodiversity and food production on land and sea. These will be combined with maps of potential carbon sequestration with agroforestry restoration.

Mahalo to our funders: University of Hawai‘i Sea Grant College Program, He‘eia National Estuarine Research Reserve, Natural Resources Conservation Service Conservation Innovation Grant (# #NR18925190002G003), National Science Foundation Graduate Student Fellowship (#1842402)

For more information see: Sea Grant Project - Leah Bremer (lbremer@hawaii.edu); Agroforestry Interviews - Zoe Hastings (zchastin@hawaii.edu); Land-sea modeling - Jade Delevaux (jademd@hawaii.edu); Kākoʻo ʻŌiwi: https://kakoooiwi.org/; Puʻulani project