

Introduction to the Pacific Islands Fisheries Science Center Marine Mapper

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Purpose:

A screening and communication tool to support responsible offshore aquaculture development and marine planning in the U.S. Pacific Islands



NOAA



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Goals

Provide available data useful to offshore aquaculture site-selection and evaluation

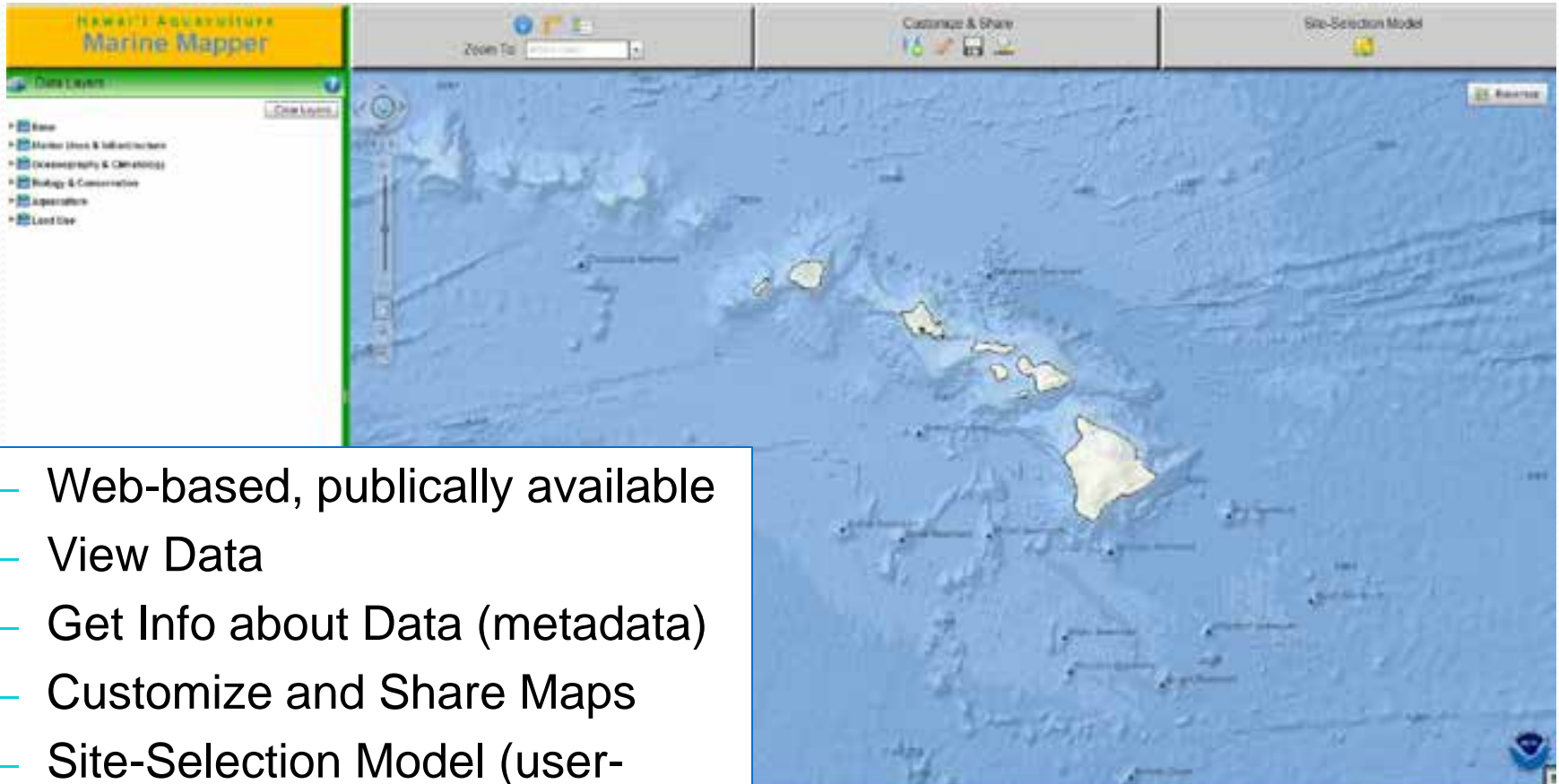
Provide an unbiased, web-accessible, user-friendly mapper and decision tool for all intended audiences

Allow users to identify areas with high and low aquaculture potential based on their valuation of variables

Process and Status

- Stakeholder meetings/interviews (Jan-May 2012)
- Gathered and compiled data (Jan-Aug, cont'd)
- Designed application with development support from ESRI (June-Oct. 2012)
- Testing on internal server (mid-Sept.-Oct. 2012)
- Move to production server (Nov 2012)
- Operational for more than one year with brief periods of down time for server maintenance

Features



- Web-based, publically available
- View Data
- Get Info about Data (metadata)
- Customize and Share Maps
- Site-Selection Model (user-centric)

Data Layers

Hawaii Aquaculture Marine Mapper

Zoom To: Oahu

Customize & Share

Site-Selection Model

Basemap

Data Layers

- base
- Marine Uses & Infrastructure
- Oceanography & Oceanography
 - Average Conditions
 - Maximum Conditions
 - Current/Custom Conditions
 - Data Bathy
 - Historical Ocean Time Series Stations
- Fishing & Conservation
 - Hawaiian Monk Seal Hawaiian Monk Seal Bank
 - State Life Conservation Districts (SLD)
 - National Parks in Marine Waters
 - Coral Reefs
 - Mesophotic Corals in the Kona Channel
 - Artificial Reefs
 - Hawaiian Monk Seal Observers
 - Hawaiian Monk Seal Pupping Sites
 - Sea Turtle Nesting & Basking Beaches
 - Hawaiian Monk Seal Foraging Areas
 - False Kicker Whale Distributions
 - Melan-headed Whales - Hawaii Island Resident Population - Primary Habitat
 - Pachyramphus (Hawaii National Monument)
- Aquaculture
 - Existing Offshore Aquaculture Leases
 - Offshore sites rejected by the Maui Fresh Fish Company
 - Harbor's Apert (most efficient path)
 - Distance from Nearest Commercial Harbor (nautical miles)
 - Nearest Harbor
 - Fish ponds (points)
- Land Use

The map displays the island of Oahu in yellow, with labels for 'Oahu', 'Hawaii', 'Kona Channel', and 'Penguin Bank'. A scale bar at the bottom indicates 0 to 50 nautical miles. The NOAA logo is visible in the bottom right corner.

Site Selection Model

- Uses a weighted overlay analysis based on user input
- Overlay analysis requires:
 - 1) selection of input data,
 - 2) adjust the value ranges for reclassification,
 - 3) reclassification of each input data layer from its native scale (e.g., Celsius for temperature, meters for depth) to an ordinal scale (1 to 5) with 5 being most suitable
 - 4) assignment of value weights to each input variable, adding to 100
 - 5) each ordinally-ranked raster cell is multiplied by the chosen weight and weighted values are summed across all input raster layers resulting in a final output raster with values of 1 to 5
- An additional optional step of selecting exclusion areas is also available to the user

Web Application

- With potential user input, created a visual design and identified key functionalities for the Mapper
- Data layers grouped into six easily understandable categories: Base, Marine Uses and Infrastructure, Oceanography and Climatology, Biology and Conservation, Aquaculture, and Land Use
- The primary functions included: navigation (e.g., zoom in/out, pan), information (e.g., legend, identify), customization (e.g., draw and measure, add data) and sharing (e.g., save, print)
- We designed and ESRI implemented a customized application for the Mapper using ArcGIS Viewer for Flex v 3.0 software and additional programming in Flex and Python
- The application was further customized using XML documents, allowing for relatively simple addition of data layers and mapping services
- Subsequent to initial development and testing of the application on PIFSC's test server, the Esri application developer came to PIFSC for a one-week site visit to conduct training in ArcGIS Viewer for Flex and to further customize the application

Hardware and Software Backbone

- Host hardware for ArcGIS server is a Dell PowerEdge 1950 equipped with 2*3GHz CPUs (each with 2 cores), and 8GB of memory
- The production ArcGIS server is a virtual machine running under VMWare ESXi 4.1.0
- The VM runs Red Hat Enterprise Linux Server release 6.5 (64-bit)
- ArcGIS Server is version 10.1
- Oracle Client is 11.2.0.2.0 (thick client, as opposed to "instant")
- Tomcat version 7.0.30

Potential Improvements

- 1. Greater incorporation of interoperable rather than served layers
 - lack of oceanographic climatologies available as interoperable layers
 - serve only those layers needed for the Site-Selection
 - issues of regional and/or national scope

Improvements cont.

- 2. Need more data related to habitat productivity and sensitive or unique biological conditions
 - limited data layers that provide adequate habitat information on key species
 - need some measure of vulnerability and /or resilience or of ecosystem services
 - regionally-specific data so not very transferable

Improvements cont.

- 3. Data sets related to potential negative impacts
 - need to develop additional models (or must adapt existing models) to incorporate into the selection tool that allows users to input potential impacts from a planned operation
 - currently working with other modelers to try to incorporate nutrient and waste product flows into selection tool
 - should probably incorporate disease/genetic transfers as well
 - may be more effective as a parallel application, rather than embedded in the Marine Mapper.

Improvements cont.

- 4. Application could include a monitoring element and would need links to real-time data
 - links to industry or regulatory monitoring instruments
 - attempt to integrate with PacIOOS servers was unsuccessful due to security concerns
 - particularly useful link would be to near real-time satellite data, such as the generated by Ocean Watch nodes

Transferability/Sustainability of Application

- Not an out-of-the-box application, customized with Flex and Python
- Despite ESRI claims, server (at least 10.1) not optimized for LINUX
- Steep learning curve for server installation and network infrastructure
- Support from ITS and quality network and server administrator who was willing to devote a lot of time to interpreting ESRI's gobbledygook
- Personal and professional contacts at ESRI had to be drawn on for success
- Time and money were/are always issues, especially for any project that requires routine maintenance
- Future of the application in doubt due to loss of support from aquaculture program

Take-away messages

USER CENTRIC

Interactive mapping designed to empower people to explore their world, to communicate their values and vision for the future, and to engage with others about these values and visions

USES

Screening level mapper and decision support tool

Communication tool

Identify knowledge gaps; prioritize future data generation and model development

FLEXIBILITY

Flexibility in design & development à easily refined and extendable application

Currently being modified for other marine planning and management uses

DEMO

www.pifsc.noaa.gov/marinemapper/MHI

www.pifsc.noaa.gov/marinemapper/AMSAM

www.pifsc.noaa.gov/marinemapper/GCNMI



Mahalo!

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