Participatory Marine Protected Area Design Using an Web-Based Open Source Tool

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Outline

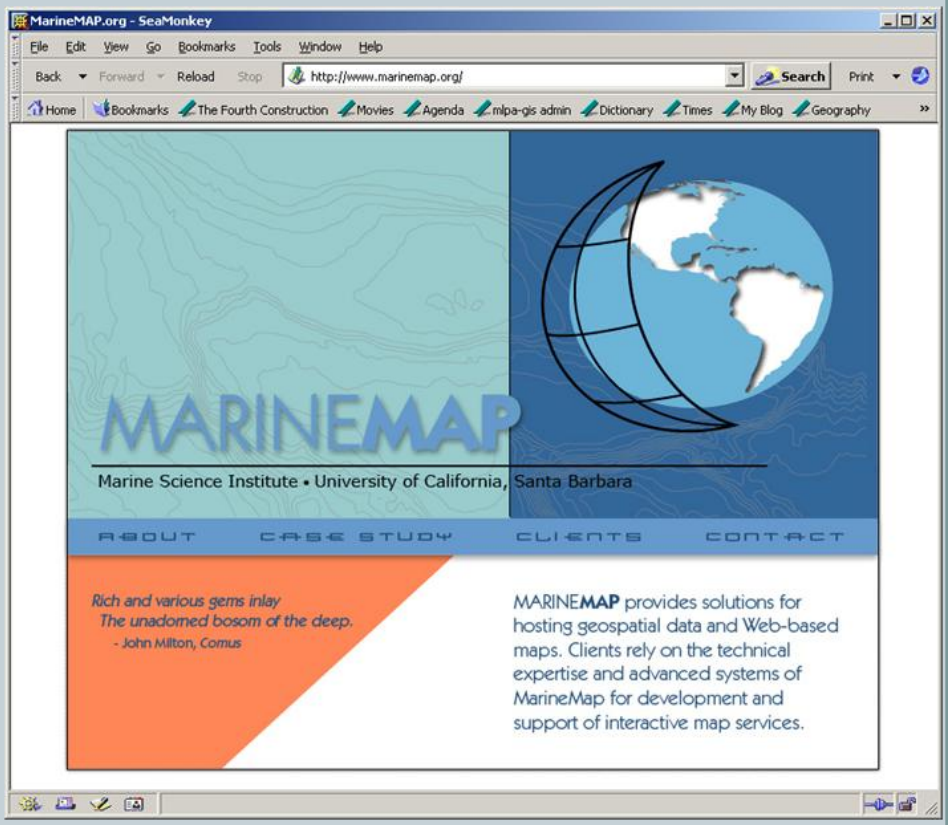
- California Marine Life Protection Act (MLPA) Initiative
  - Task at hand
  - Stakeholders, Science Advisory Team, Blue Ribbon Task Force
- WebGIS-Based Decision Support System
  - Geospatial Database
  - MarineMap Decision Support Tool

California Marine Life Protection Act Initiative

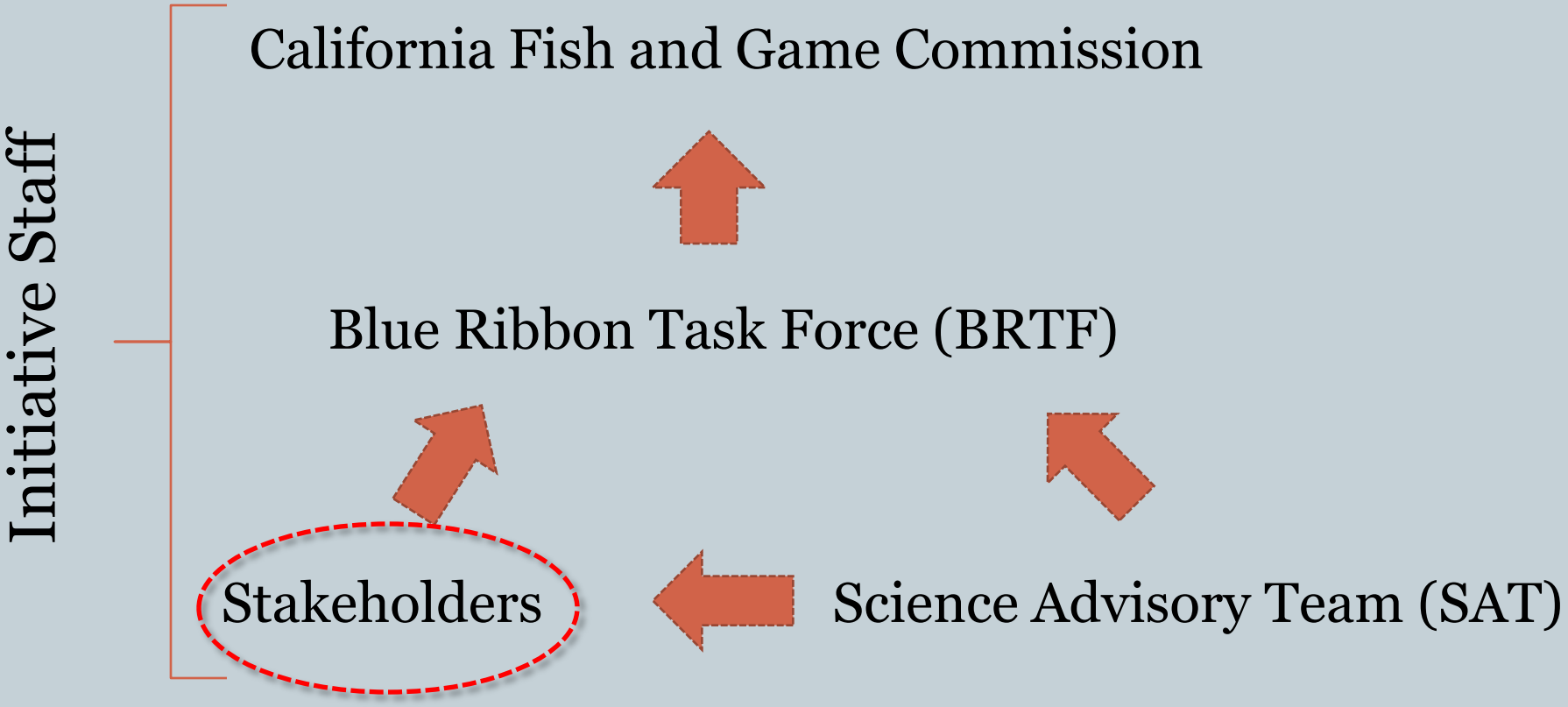
- Marine Life Protection Act (1999)
  - Mandates establishment of a managed network of MPAs to:
    - Protect marine life, habitat, ecosystems and natural heritage.
    - Improve recreational, educational and study opportunities provided by marine ecosystems.
  - Must use best, readily available science to guide decisions.
- MLPA Initiative – a Public-Private Partnership
  - Initiative Staff
    - Dept. of Fish and Game, Contractors (Planners, Facilitators, GIS Specialists, Outreach Coordinators)
  - Stakeholders
    - Fishers, Conservationists, Teachers, Scientists, Divers, Artists, Surfers, Tribal Representatives, Agency Representatives, Politicians, Residents
  - Science Advisory Team
  - Blue Ribbon Task Force

MarineMap.org

- Consortium of scientists and technologists
  - TNC
  - Ecotrust
  - UCSB
- Contracted by Initiative to develop and host decision support system

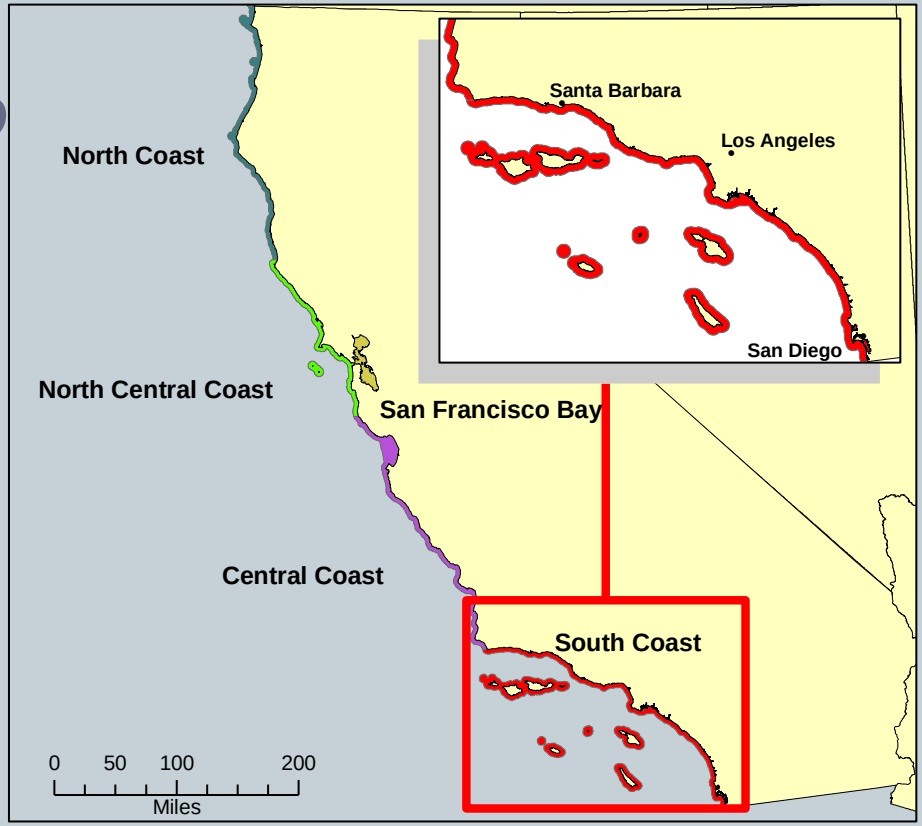


MLPA Initiative Structure



MLPA Initiative Study Regions

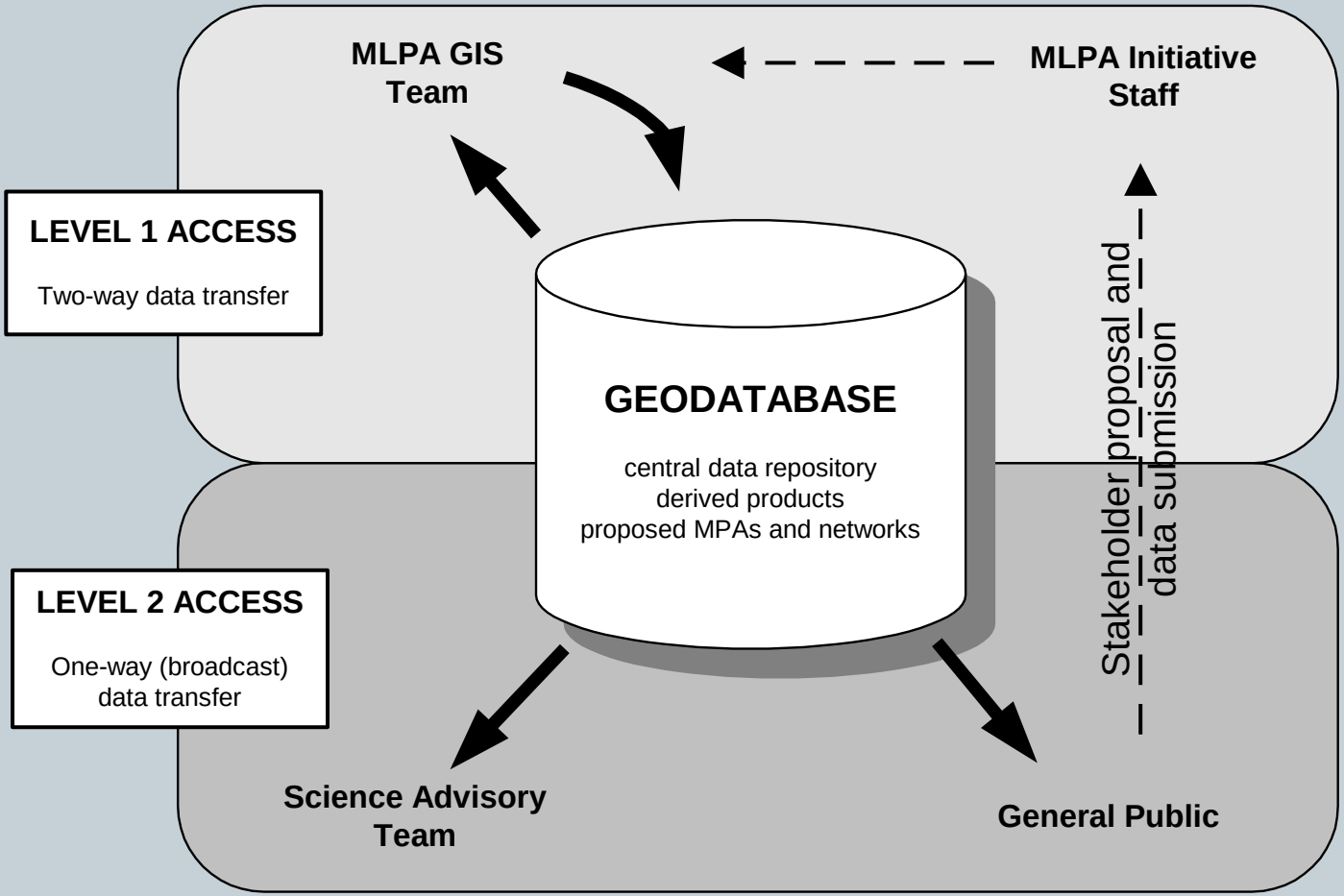
- To be completed by 2011
  - Completed Phase I and II (29 new MPAs established for Central California in August, 2007)
- Now: Southern California
  - Includes Channel Islands



Geospatial Information Used in Process

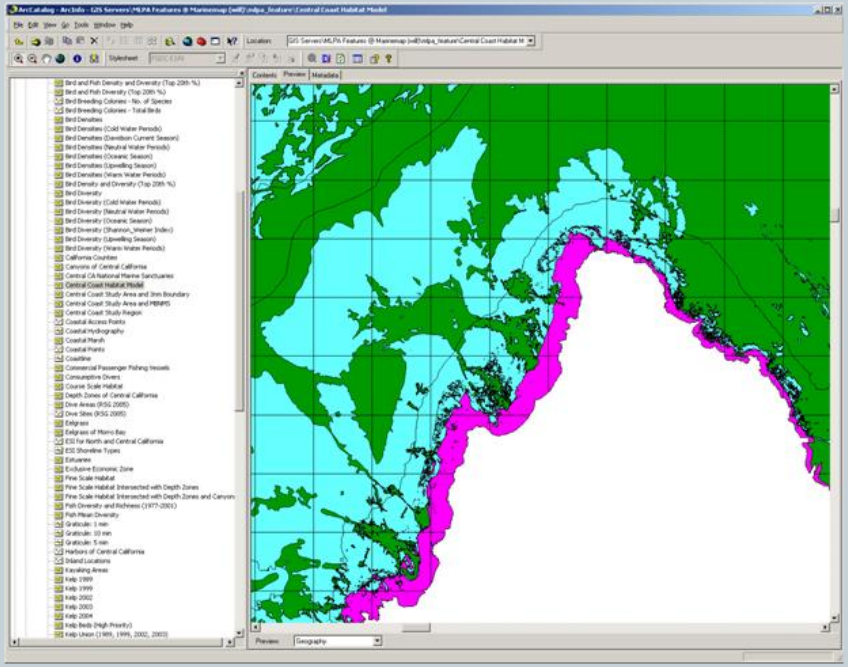
- Habitat
  - Distribution of kelp, sea grass, substrate types, bathymetry.
- Biological
  - Distribution of fish, birds, mammals, invertebrates, corals.
- Physical
  - Sea surface temperatures, upwelling, salinity, currents, impaired water bodies
- Cultural
  - Distribution of ports, coastal access points, cities
- Socioeconomic Data
  - Consumptive and non-consumptive activities (e.g., commercial and recreational fishing, recreational boating, diving, educational
- Base (reference) Layers
  - Existing MPAs, Study Area, Graticules, Nautical Charts

The Geospatial Database

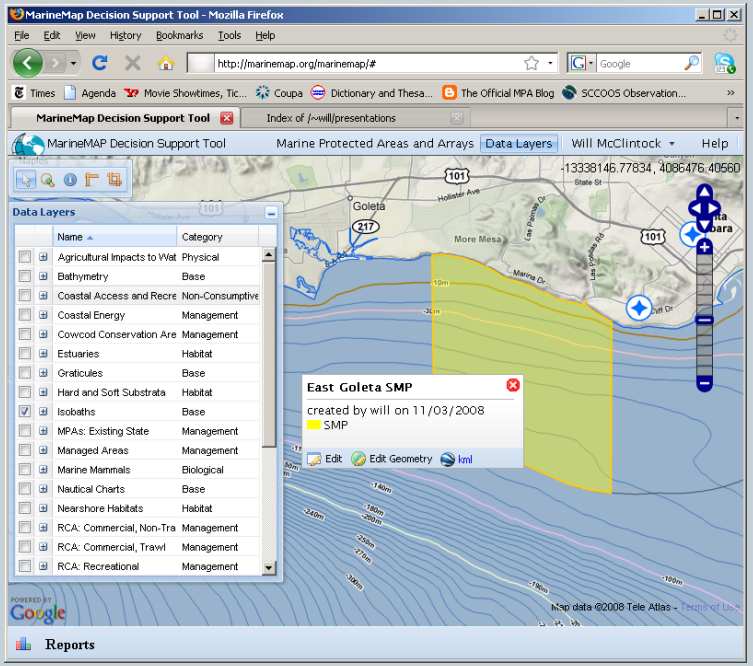


Accessing and Using the Data

- ArcGIS, QGIS, GRASS for Staff



- MarineMap for Stakeholders



Participatory Process

Stakeholders Design MPAs

At stakeholder meetings

- Real time collaboration
- High pressure environment

At home

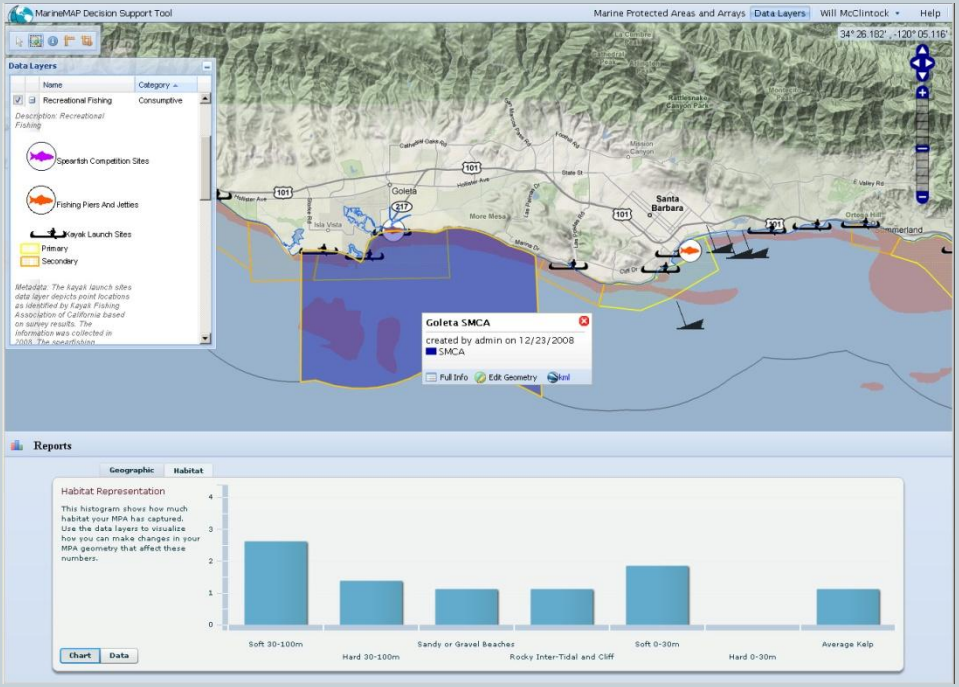
- Low pressure environment

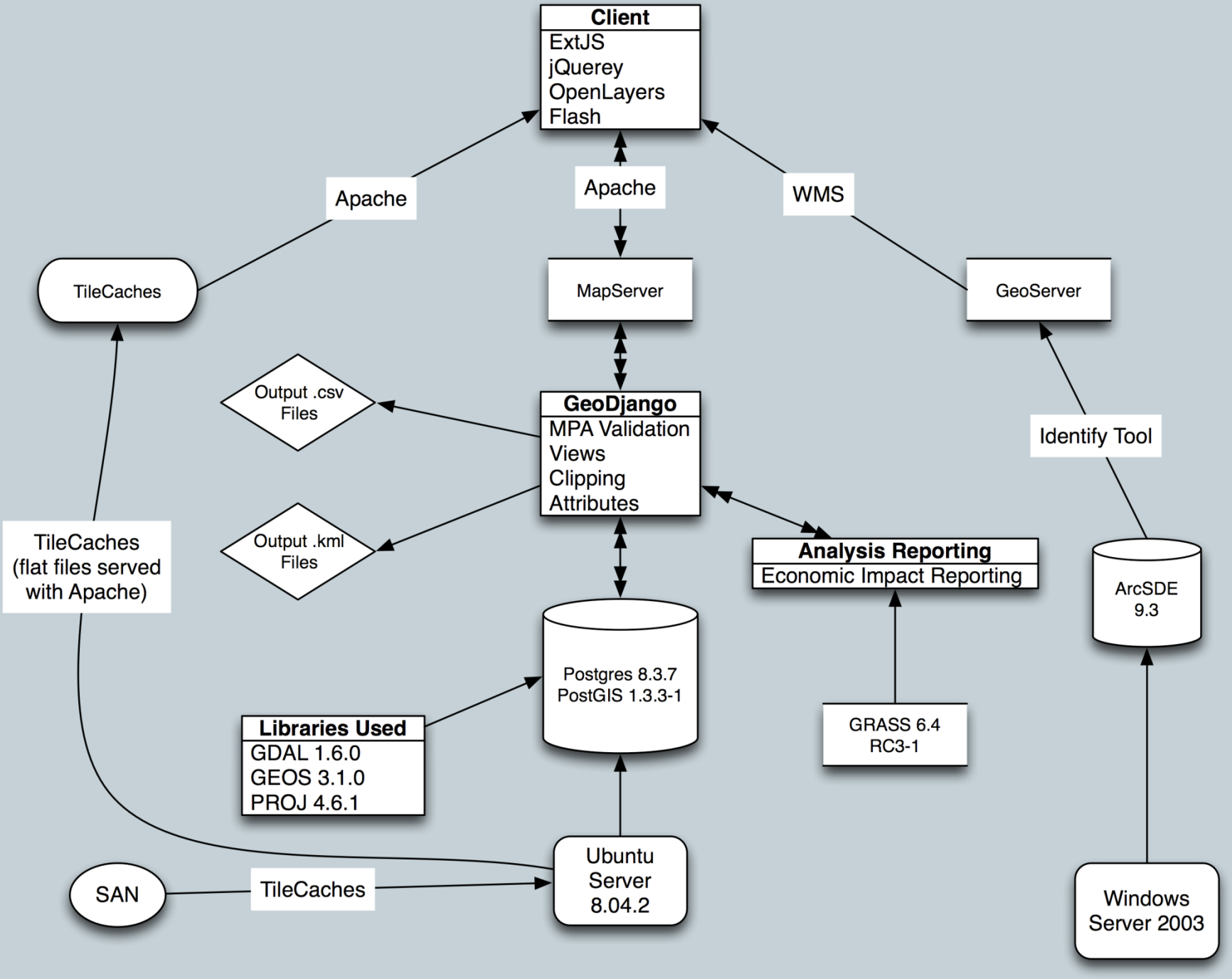
Scientific Criteria

- MPA networks are evaluated on the basis of Goals / Objectives of MLPA
  - Adequate representation of habitats
  - Habitats should be replicated within threshold distance
  - Minimize socioeconomic impact (commercial / recreational fishing and other uses)
  - Boundaries should fall on straight lines (lat/long graticule)
- Varying degrees of protection
  - Conservation Area (SMCA) vs Marine Reserve (SMR)
  - Levels of protection
    - IF fishing for species x THEN level of protection = y
    - This informs performance as network

Demonstration

WebEx Participants: http://marinemap.org/marinemap
Username and Password = marinemap




Client
ExtJS
jQuerey
OpenLayers
Flash
Apache
Apache
WMS
TileCaches
MapServer
GeoServer
Output .csv Files
GeoDjango
MPA Validation
Views
Clipping
Attributes
Identify Tool
Output .kml Files
TileCaches (flat files served with Apache)
Analysis Reporting
Economic Impact Reporting
ArcSDE 9.3
Postgres 8.3.7
PostGIS 1.3.3-1
Libraries Used
GDAL 1.6.0
GEOS 3.1.0
PROJ 4.6.1
GRASS 6.4 RC3-1
SAN
TileCaches
Ubuntu Server 8.04.2
Windows Server 2003

MarineMap Development Team

Chad Burt (UCSB)
Charles Steinback (Ecotrust)
Chris Macdonald (UCSB)
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Jared Kibele (UCSB)
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Lessons Learned

- Open source stack had many advantages
  - Great performance, flexible and extensible development, many developers like free and open source software
- Developing for a specific purpose (MLPA) focused our work
- One must have dedicated staff and resources
  - MarineMap has cost approximately $300k
- Collaborative development was fantastic.

Future Directions

- Map-based discussion forum
- Replace OpenLayers with Google Earth API
- Metadata server
- Data downloads as KML
- Merge with Open Ocean Map
  - For collecting human use data
- Add modeling tools where appropriate
  - Marxan, EDOM
- Implement MarineMap for other ocean planning efforts
  - Oregon, Florida, New Zealand, UK, the Grenadines, Madagascar.

Summary

- Large geospatial database
  - Approximately 400 data layers
  - Only ~70 published to MarineMap
- MarineMap for:
  - Viewing data
  - Drawing MPAs
  - Analyzing MPAs
  - Sharing MPAs
  - Place-based discussions
- MarineMap is extensible

Acknowledgments

- Resources Legacy Fund Foundation
- California Department of Fish and Game
  - Paulo Serpa
  - Chad Miller
- MarineMap Development Team:
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For more information: http://marinemap.org/mlpa

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