

Information Technology and Visualization

Steve Steinberg

5 December 2014

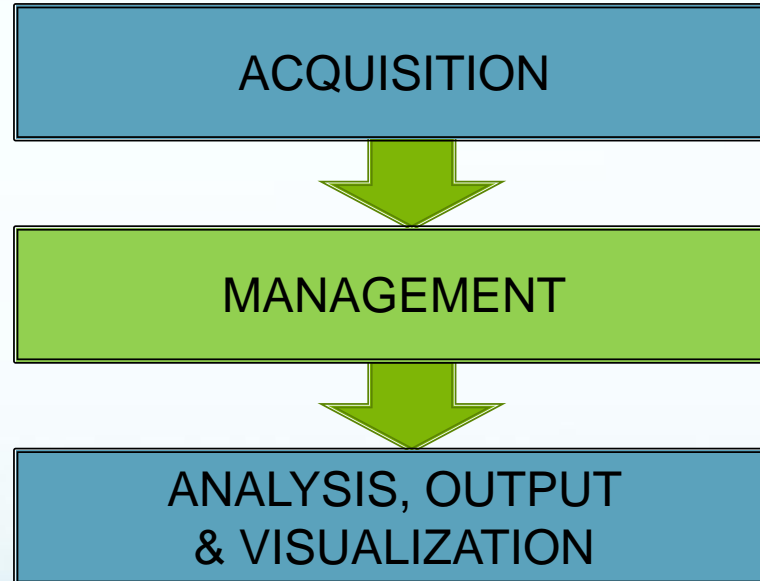
Three reasons why you should pay attention to this presentation

- We need your feedback on the relative value of information technology research
- You may want to open your wallet when you get done hearing this
 - There are some new data capture technologies you will want your staff to have
- Our new approaches to data visualization will allow you to make better use of the data you already collect

Background

- You all spend a lot on the collection and management of monitoring data
- You don't use your data to the extent you could be
- We are making advances at SCCWRP that will improve the quality and usefulness of your data

Three Components

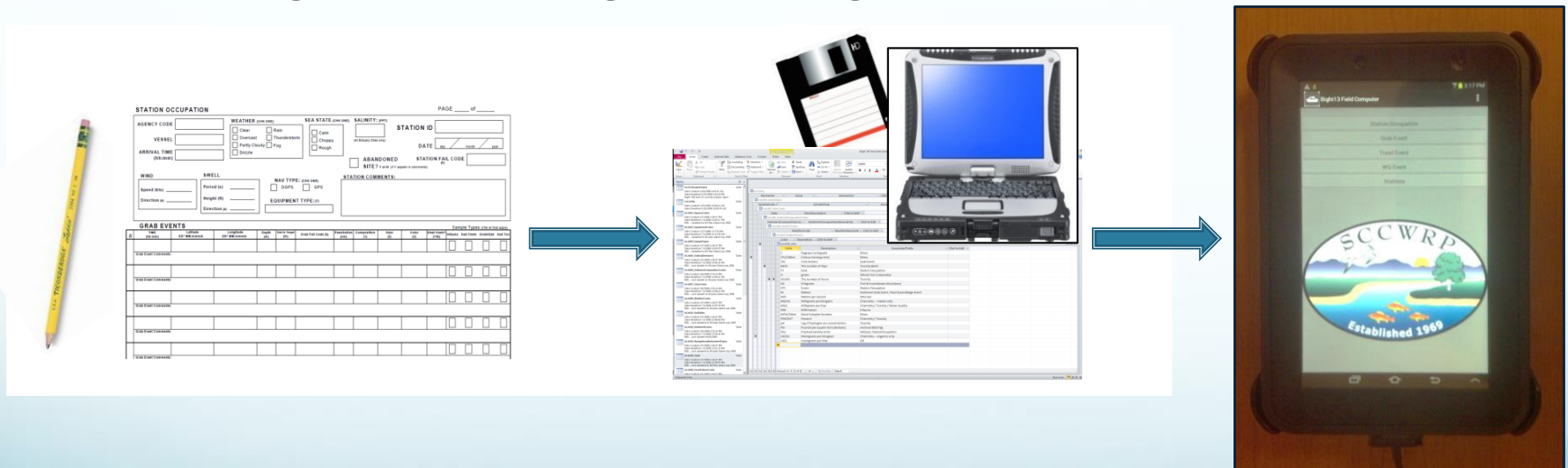


SCCWRP's success in data management

- SCCWRP has had a significant impact on data management protocols on the west coast.
- Data management protocols developed for Bight '94 became a basis for many subsequent systems:
 - A driver for water quality data in California including
 - Surface Water Ambient Monitoring Program (SWAMP)
 - California Environmental Data Exchange Network (CEDEN)
 - Also influenced regional and national programs
 - EPA's Environmental Monitoring & Assessment Program (EMAP)
 - West Coast Governors' Alliance - Ocean Data Portal (WCGA - ODP)

Data Acquisition

- How we get data in:
 - Initially, data collected on paper (some still do)
 - SCCWRP helped to move them to computers
 - For Bight '13 we began moving to mobile devices



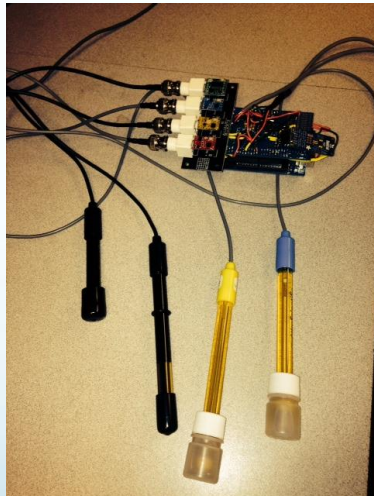
Mobile devices

- Provide an **integrating** technology
 - Everything we had with the computer, and more
 - GPS
 - Photos and Video
 - No need to transcribe data and match up data from multiple tools
 - Never lose data (sent directly back to office)
QA/OC is built into the process
- We're already doing all of these things



Adding new capabilities

- CellScope – continuing development
- WQ Probes
 - Conductivity, pH, DO, Temperature, Color, and Oxidation Redox Potential



- Additional data collection capabilities in the field
 - appended sensors, connectivity
 - Quality citizen science

Image Processing

- Imagery as means to collect and process data in multiple contexts
 - Traditional aerial and satellite imagery
 - Local/site level imagery via field cameras, mobile device or drone

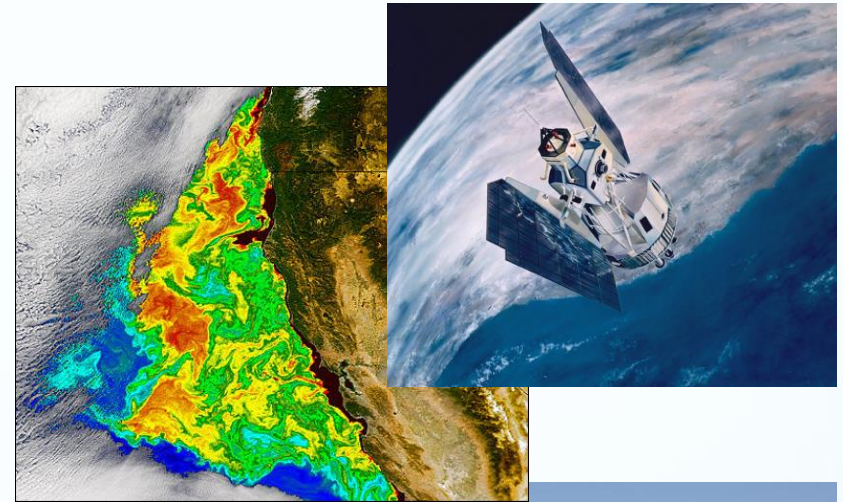


Image Processing Example

- Want to understand bird activity at the beach defined by presence and density through time
- Collect images from computer controlled cameras every 3 minutes to count birds via recognition algorithm.



Image Processing Example

- Develop an automated process to count the birds.
- Images are simplified to black and white.



Image Processing Example

- Comparing sequential images we can identify objects that appear to move over time.
- Using a color threshold only objects in a desired color range are selected.
- These are coded to white with “background data” coded to black.



Image Processing Example

- Finally, using size and shape thresholds we further simplify the image to result in countable objects (3 birds).

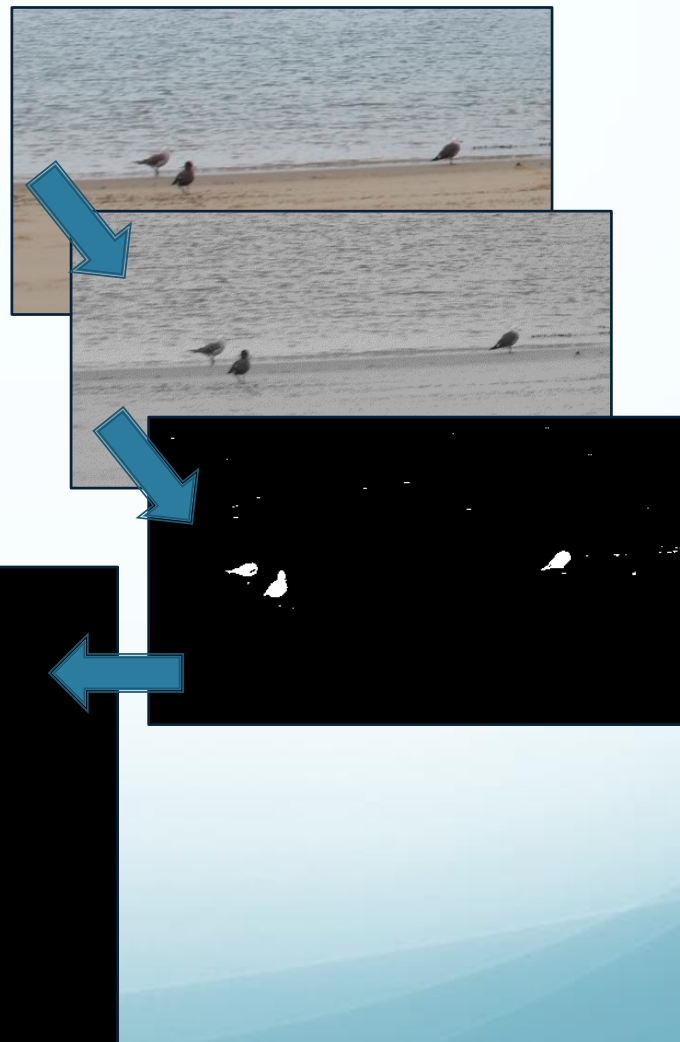


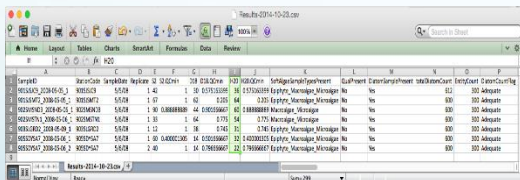
Image Processing

- We are exploring applications of this approach using video and still imagery from other sources I've already mentioned.
 - Mobile devices
 - CellScope microscope imagery
 - Aerial drones

Data to Information

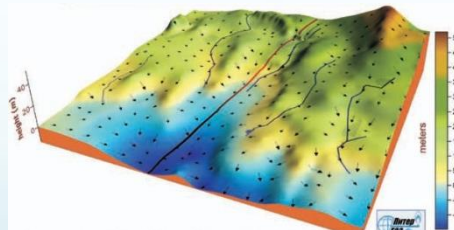
- Analysis, output and visualization is a significant focus:
 - Analysis tools (calculators)
 - Visualization (3-D)
 - Scenarios (what-if's...)

Analysis Tools

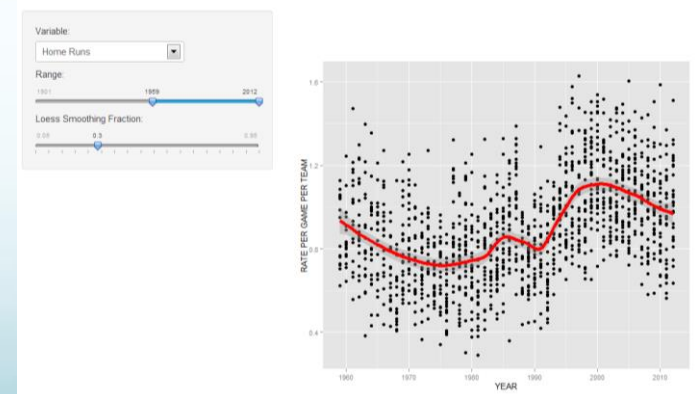


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Visualization



Scenarios



Analytical Tools

- Benefits:
 - Simple to use Drag-and-Drop tools
 - Enhances analysis consistency
 - Simplifies a complex process

BENTHIC RESPONSE INDEX

- Tool created by collaborative process with benthic ecologists
- Provides an accepted and objective measurement of benthic condition
- Abundance weighted average tolerance of species present
- Final score indicates condition

Benthic Response Index (BRI) Tool

Benthic Response Index Tool

The screenshot displays a web browser window with the URL `172.16.1.171/upload/bri_map.v3.php`. The main content area features a Google Maps interface showing a topographic map of Southern California and Northern Mexico. The map includes labels for various cities and regions such as Bakersfield, Lancaster, Los Angeles, San Diego, and San Luis Rio Colorado. The sidebar on the right contains the following elements:

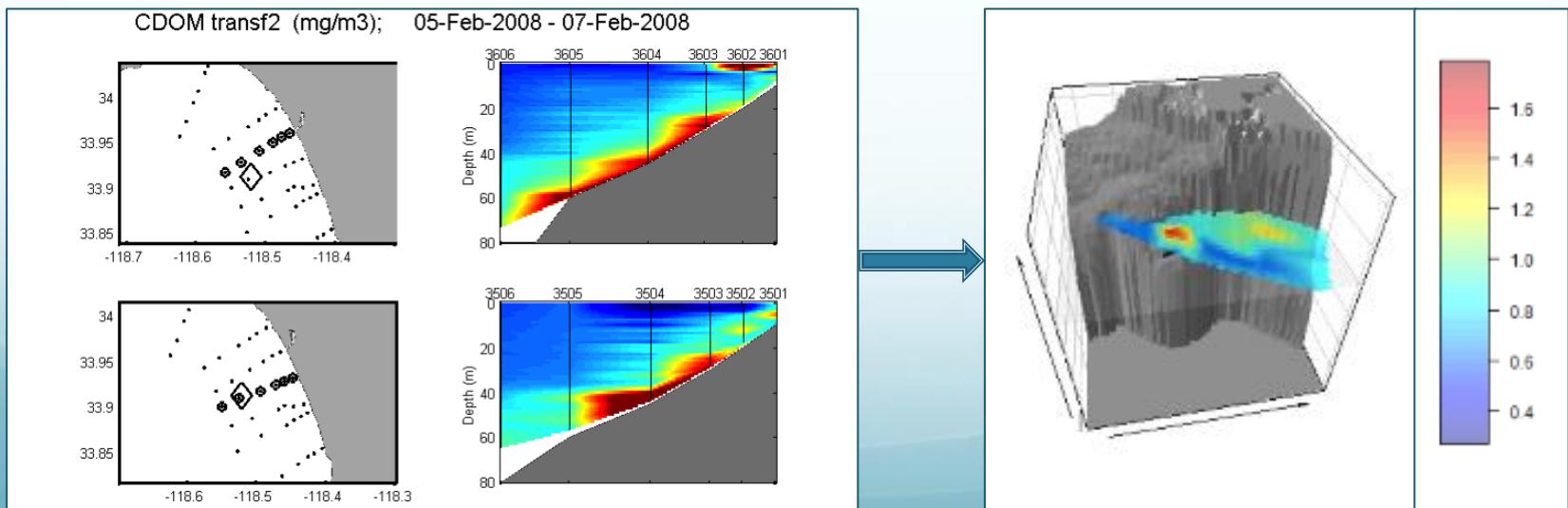
- SCAMIT** logo with the tagline "Science, Outreach & Assessment of Marine Invertebrate Monitoring Tools".
- Benthic Response Index (BRI) Tool** title.
- Links for [Instructions](#) and [Template](#).
- A **Choose File** button with the text "No file chosen" and a **Clear Map** button.

The Google logo is visible in the bottom left corner of the map area, and the text "Map data ©2012 Google, INEGI - Terms of Use" is visible in the bottom right corner of the map area.

DEMO

Visualization

- Historically the focus has been on static (printed) maps – now we're exploring interactive, 3-D objects.
- Makes complex data more accessible, understandable and useful.
- Provides means to view data from multiple perspectives

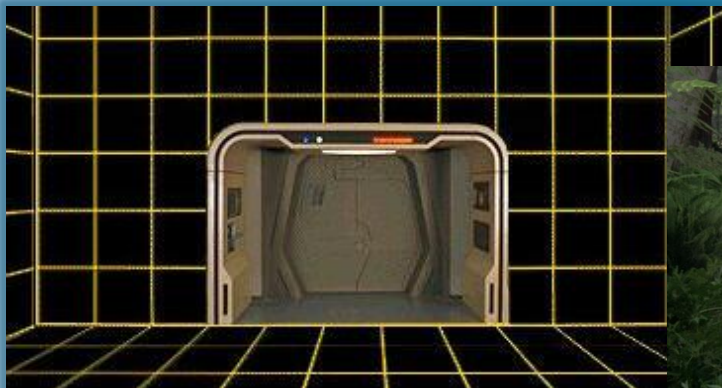
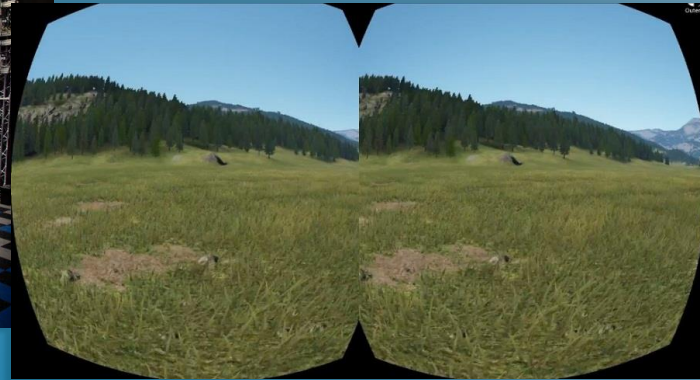


Partnering with esri

- Esri is the leading GIS software company and brings exceptional technical development capacity
- SCCWRP offers data and applications for extending these capabilities
- Our growing partnership will lead to valuable new environmental visualization capabilities within software you already own and use.



A bit further off



Scenarios

- Develop interactive tools to examine multiple options and outcomes.
 - Provides ability to change the data to see what happens (non-static)
 - Allows for examination of a broader range of options
 - Challenges people to think in creative and forward-looking terms
 - Allow us to question assumptions and examine other factors that may influence the way we look at data

Hydromod Example

GIS Analysis: Geomorphic Landscape Units

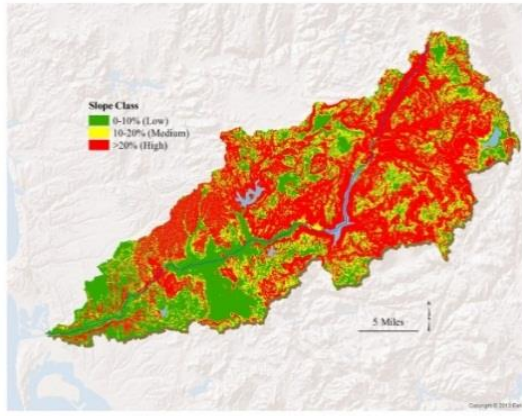
- What are the primary determinants of sediment production from hillslopes?
- How can they be identified and grouped in a watershed in a GIS environment?
- Presumptive controls on sediment yield
 - Slope
 - Geology
 - Land cover
 - Soil type

Analysis can inform site design to protect coarse sediment yield

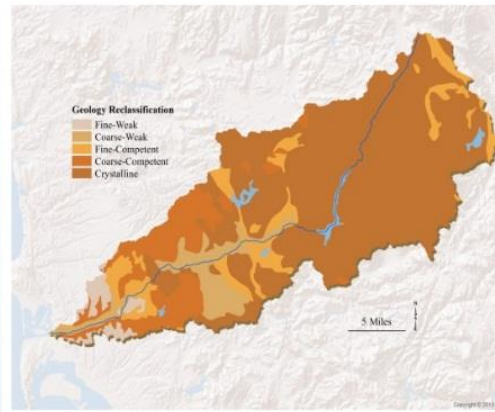
HYDROMOD EXAMPLE

Hydromod Example

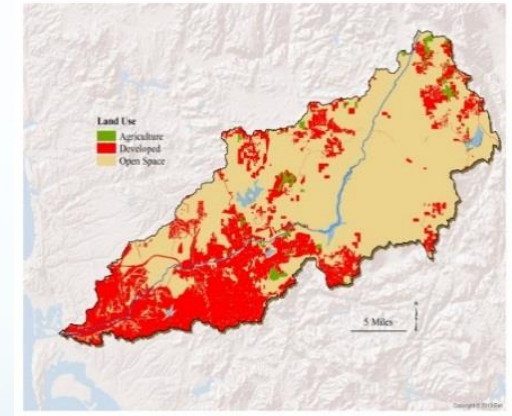
- The process is conducted as a GIS Analysis
 - Three GIS data layers
 - Tabular data for Geomorphic Landscape Units (GLU)



Slope



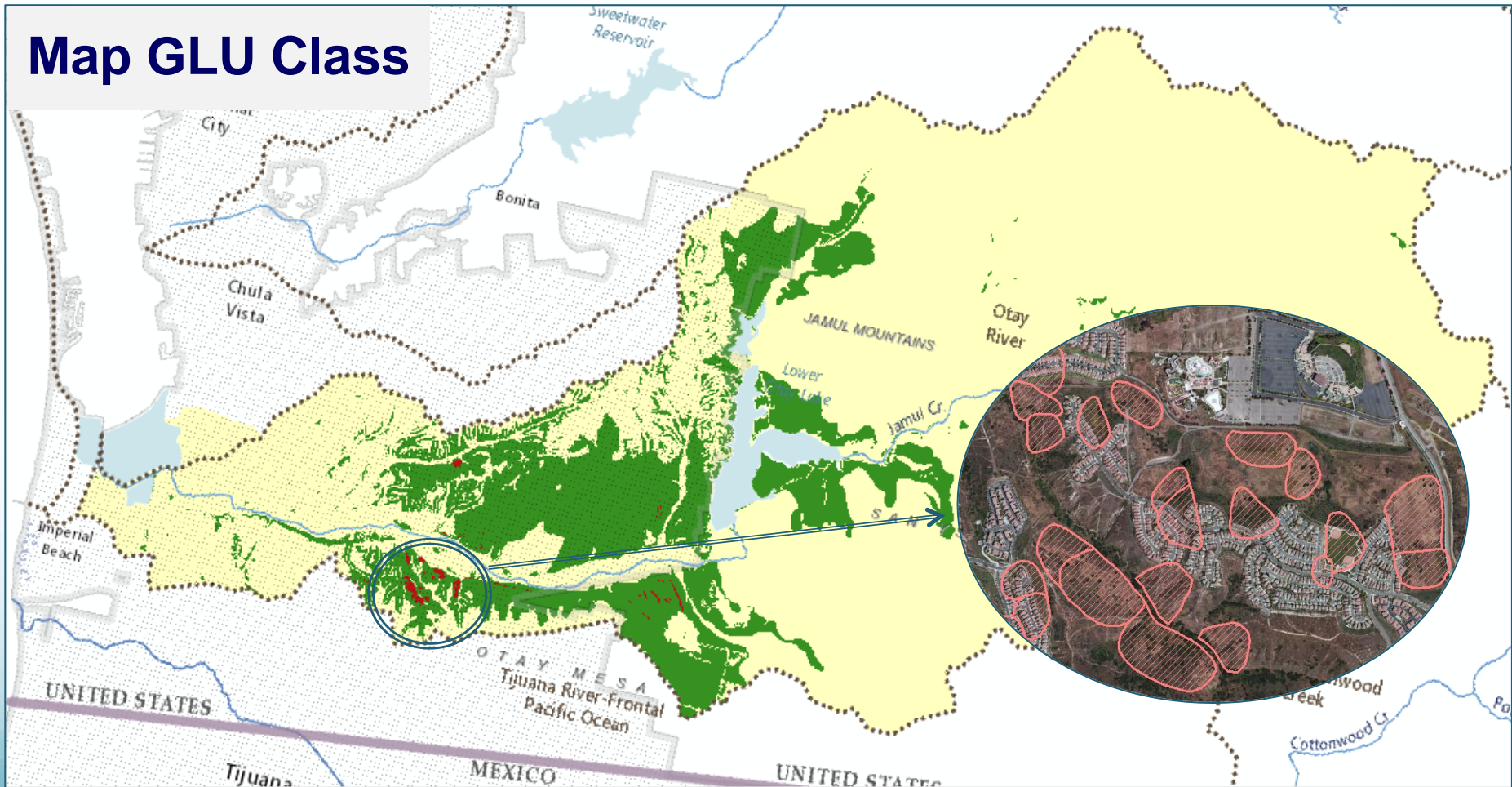
Geology



Land Use

Hydromod Example

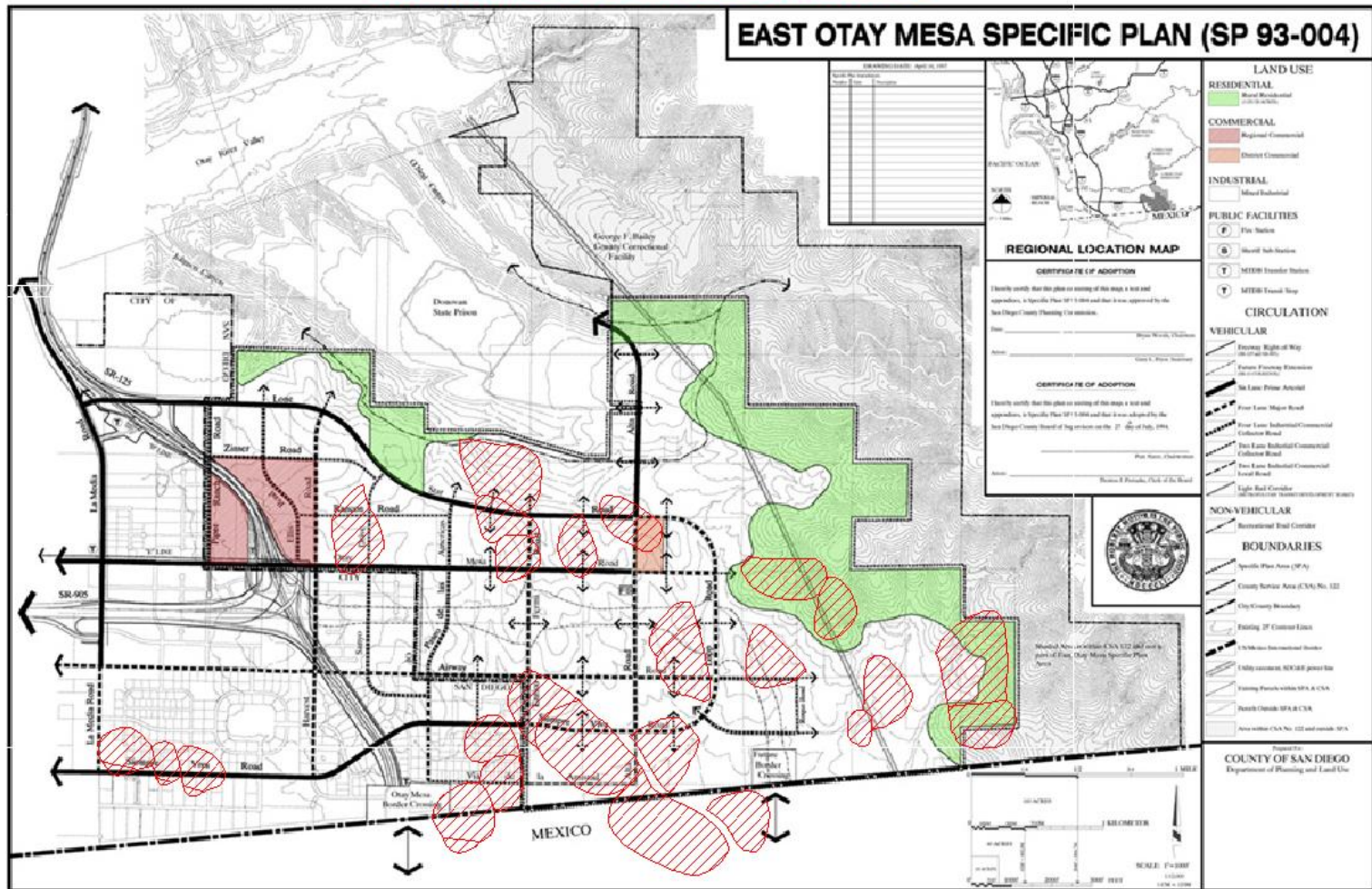
Map GLU Class



‘Medium’ areas should be focus of monitoring program
‘High’ areas should be focus of regulatory program

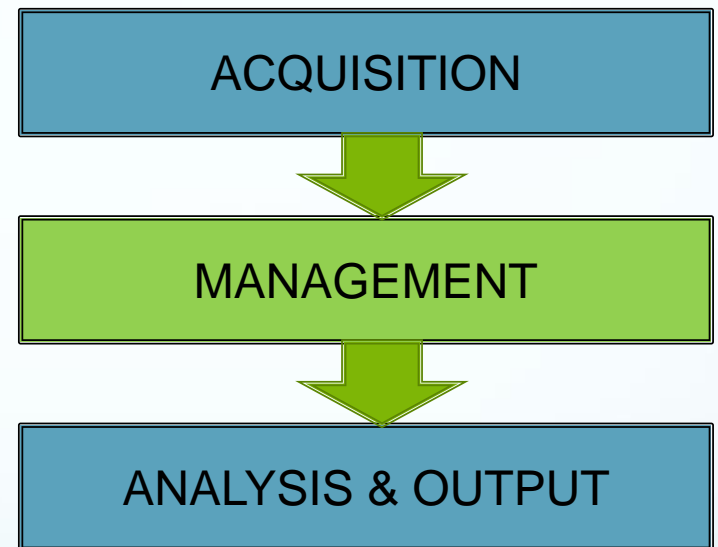
Hydromod Example

22% of proposed development lies within highly productive GLUs
*****SEDIMENT BYPASS MEASURES REQUIRED*****



SCCWRP PROVIDES A UNIQUE INTERFACE

- We are not the only group developing these technologies and applications
- But...we ARE one of the few that can connect all aspects (science, technology and user applications)
- SCCWRP is an attractive partner for others working on these technologies



THANK YOU

Questions?

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714-755-3260

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