

A HOUSE BUILT ON ROCK

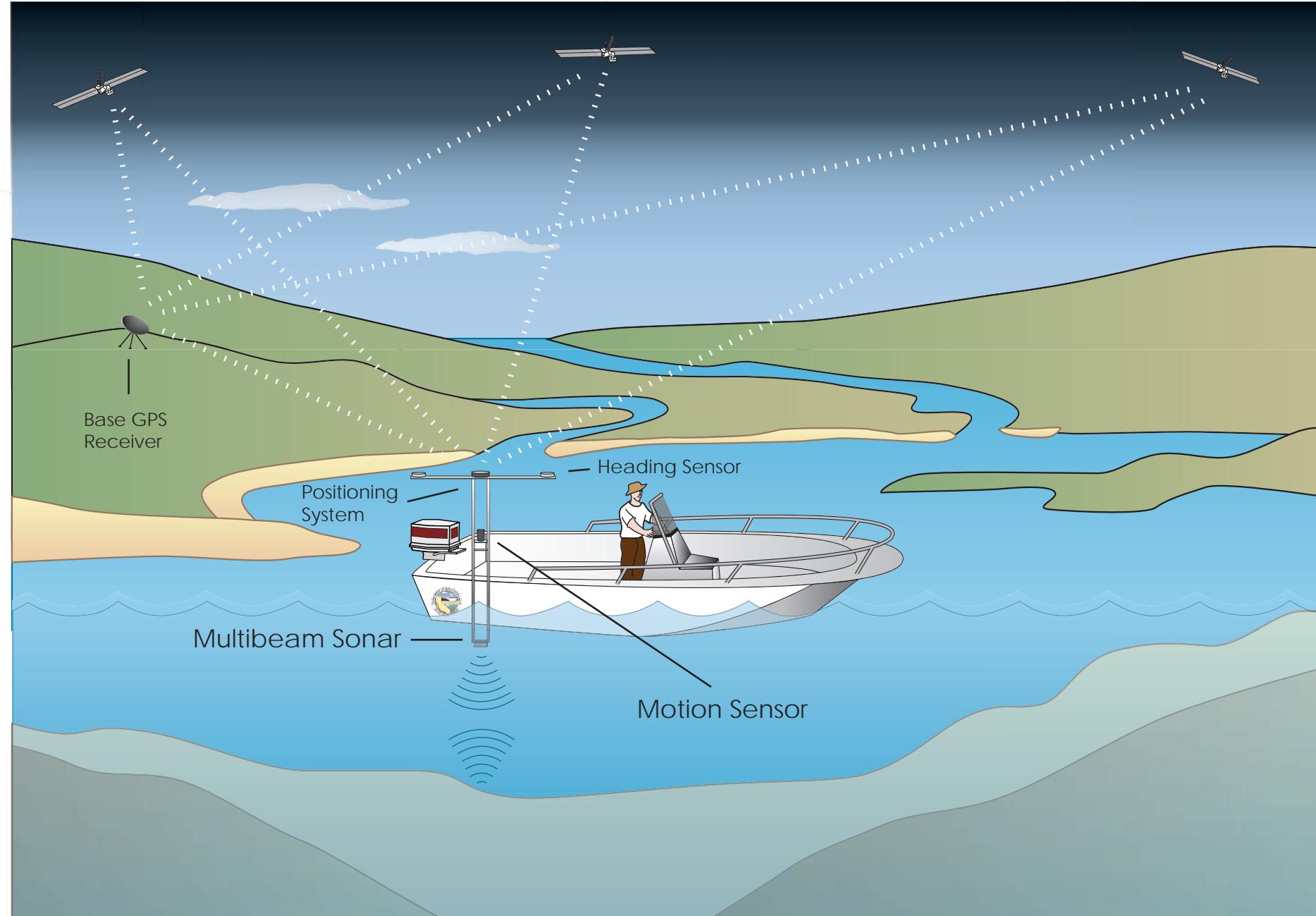
The Advanced Bathymetric Data Revolution



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What is Multibeam Bathymetry?

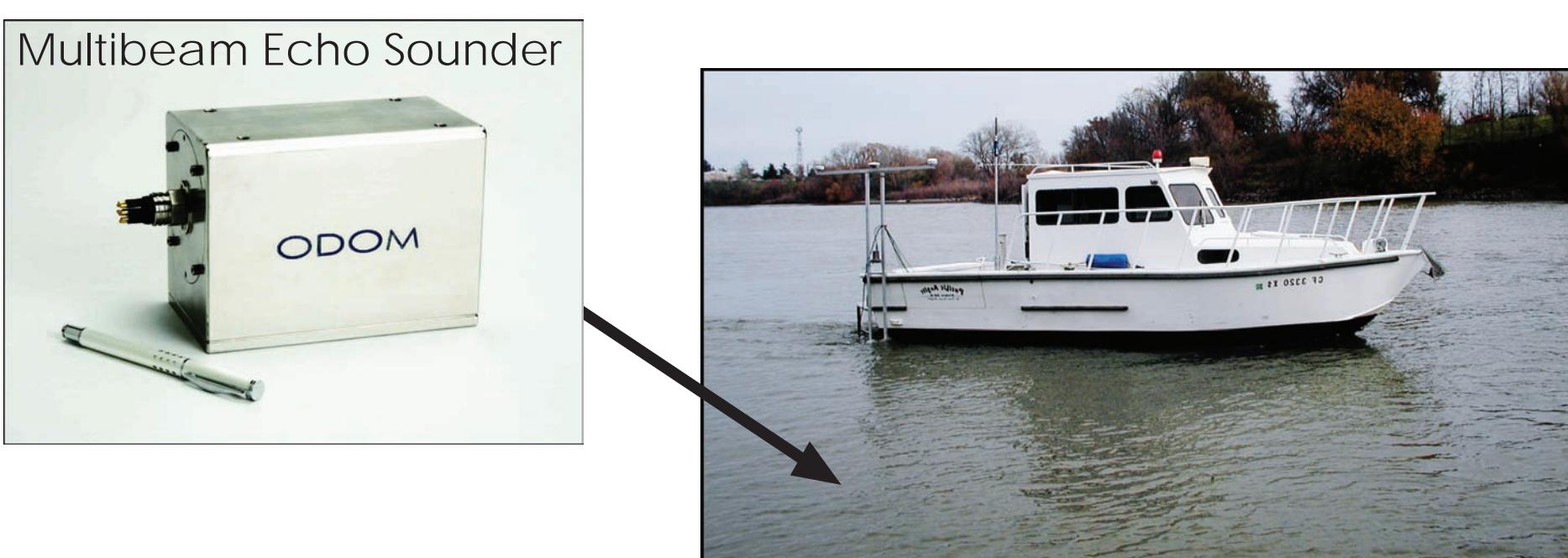


Multibeam Bathymetry is a remote sensing technique used to survey subaqueous surfaces such as riverbeds and ocean floors, along the path of a moving vessel. Beams of sound are transmitted from an instrument called an echosounder, reflected by a surface, and recorded using sophisticated bathymetry hardware and software. Spatial information is incorporated via GPS devices. Instrument movement due to pitch, roll, and heave is corrected using a specialized sensor.

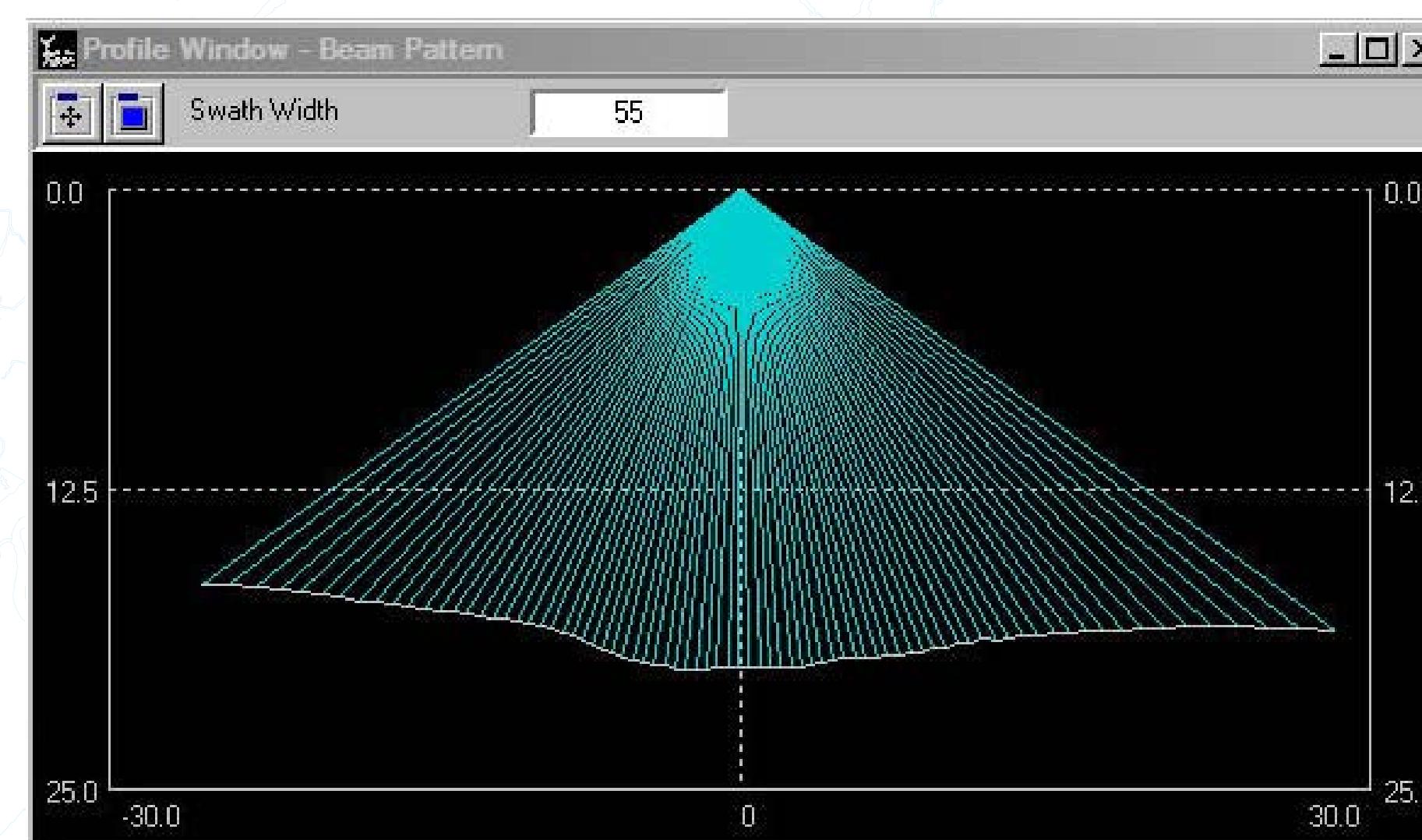
Technological and Information Innovations in Bathymetry

NCRO's Typical Bathymetry Survey Equipment Setup

Multibeam Sonar	Odom ES3 Multibeam Echosounder
Sound Speed Profiler	Odom Digibar Pro Sound Velocity Profiler
Heading Sensor	Hemisphere VS110 GPS Compass
Positioning System	Trimble 5700 RTK GPS
Motion Sensor	SMC S-108 Motion Sensor
Software	Hypack / Hysweep



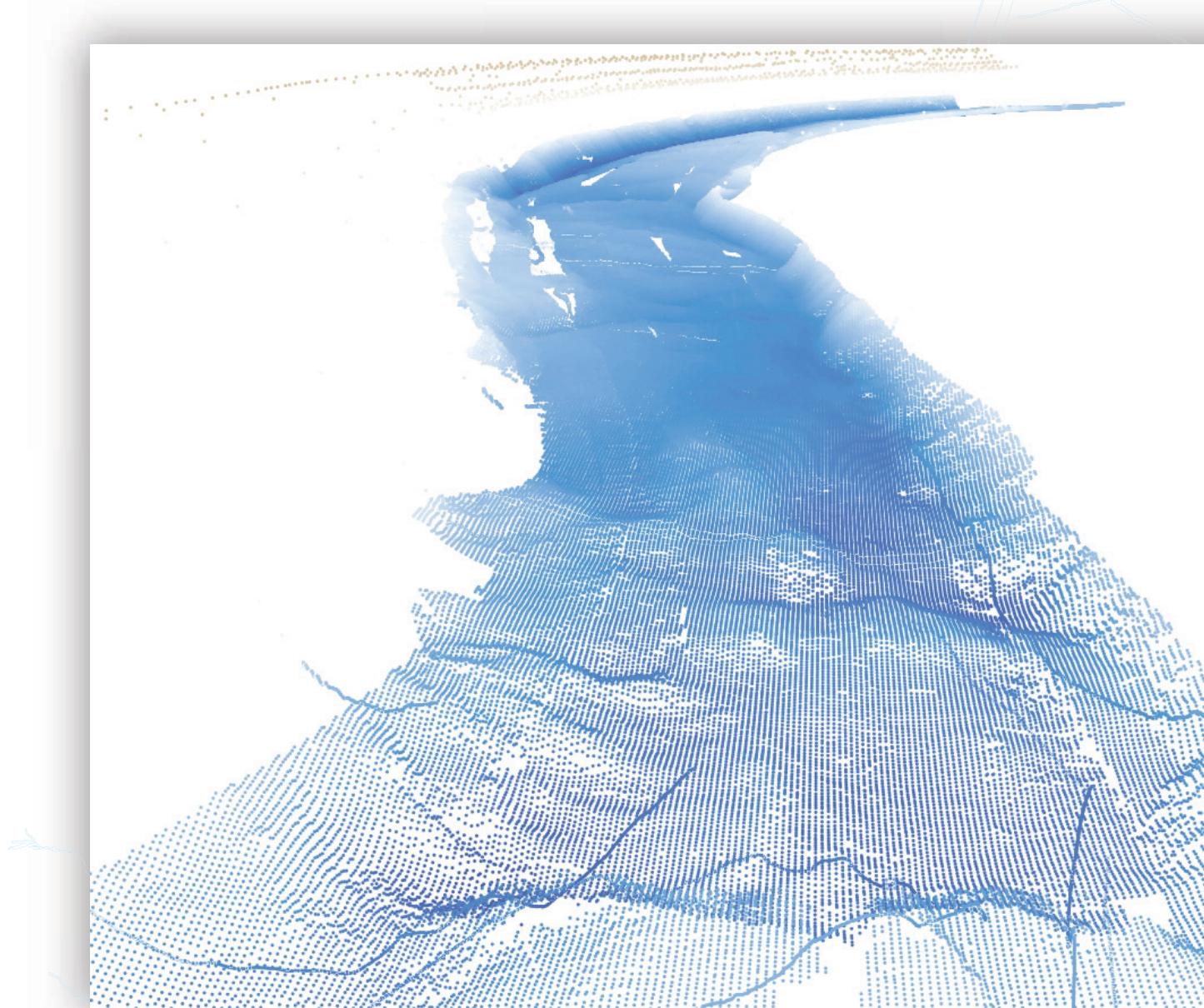
Above is an image of NCRO's state-of-the-art bathymetry survey technology, including the Odom ES3 Multibeam Echosounder, which is used to remotely detect subaqueous surface conditions. The screen shot below is an example of an echosounder beam pattern visualized using Hypack software.



Hypack screen shot illustrating a 55 ft. wide beam pattern.

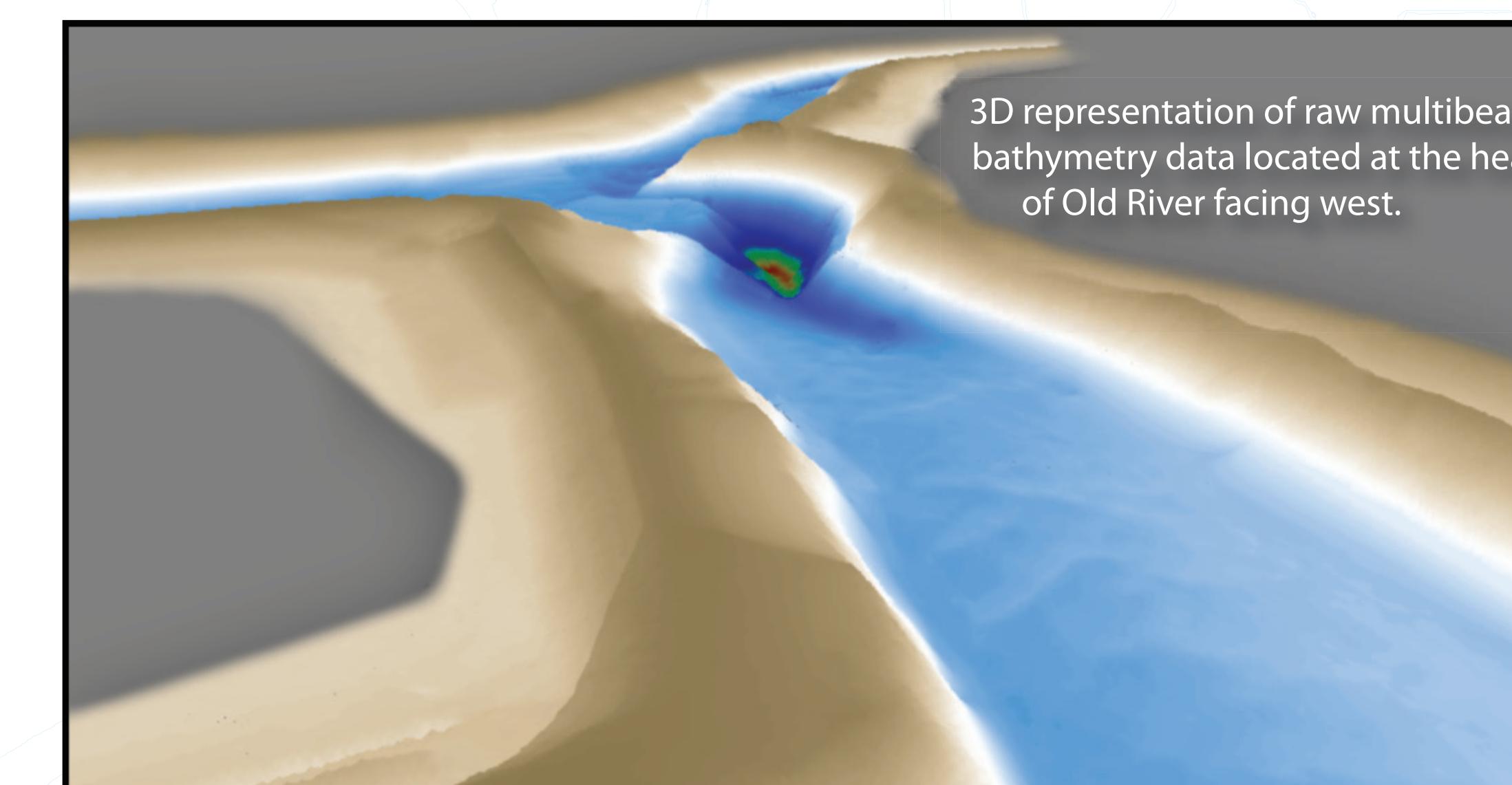
Sample Multibeam Project: Old River at Head

The Old River at Head is an important junction for fish migration in the Delta. DWR has historically placed barriers at this location to keep fish in the San Joaquin River to aid survival. To make this work, managers need three decision support tools: flow information, construction information, and biological information about this junction. Accurate bathymetry is essential for developing all three of these decision tools. NCRO has provided bathymetry data at this location since 1992.



A high-density bathymetry dataset sample.

Recently, the traditional rock fish barrier has been replaced with an experimental "fish disco" - a behavioral barrier that uses bubbles, light, and sound to guide fish. The alignment of the 2010 barrier is shown in 3D above. This multibeam bathymetry data allows fish biologists, construction engineers, and flow monitoring engineers to do an effective job of helping protect fish populations.



3D representation of raw multibeam bathymetry data located at the head of Old River facing west.

The Problem

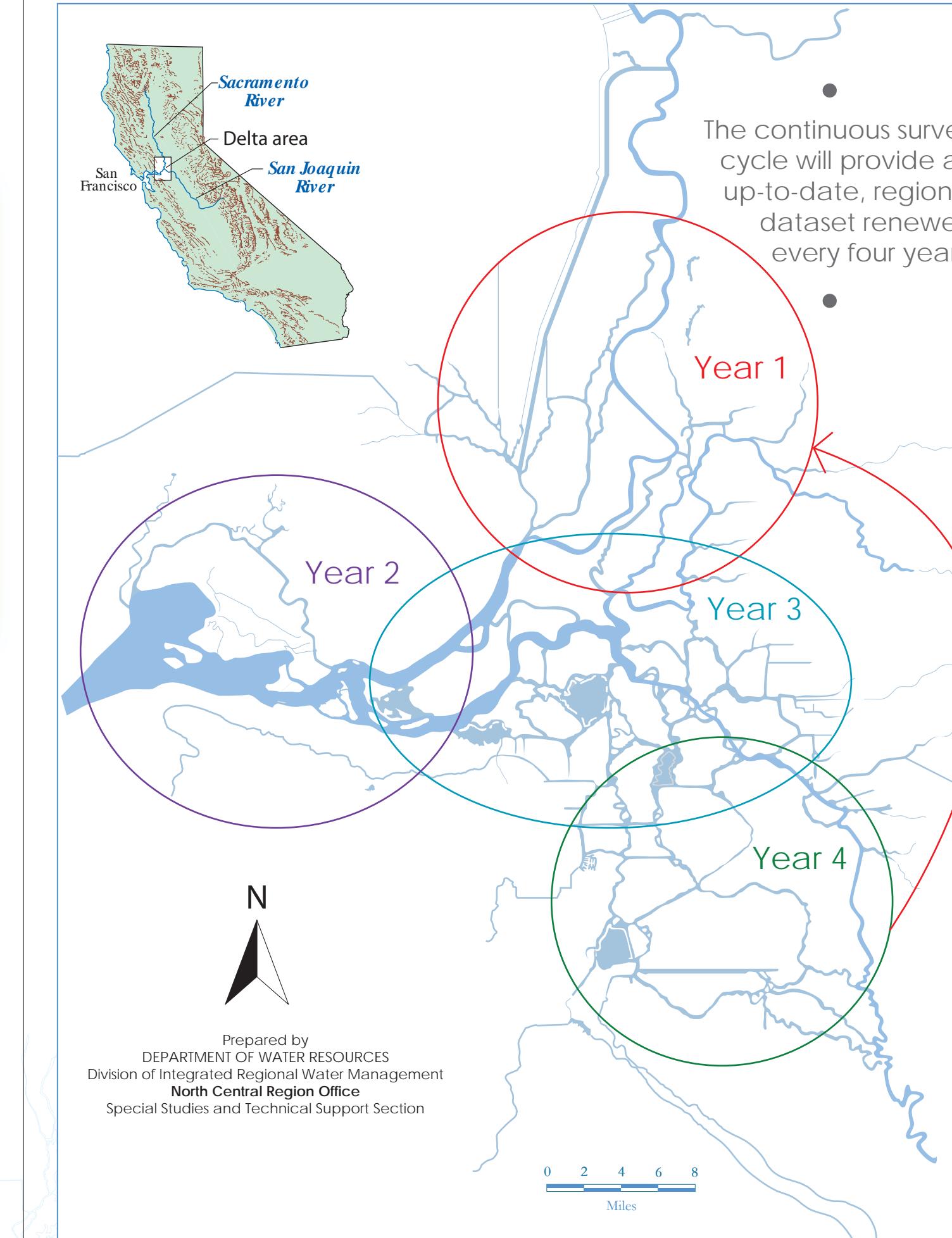
Good information about water depths and river geometry (bathymetry) is needed to understand nearly any biological or physical process in the Sacramento-San Joaquin Delta. Unfortunately most of the historical data is spotty and of variable quality, poorly shared, and not publicly available. This makes science more expensive, less certain, and leads to poorly informed management decisions.

The Revolution

Considerable investment and improvements have been made in many areas including vertical control, collection techniques, archiving, mapping, and analyzing. Within this environment, a little extra organization and investment can yield a foundational Delta-wide dataset. It will revolutionize Delta science and decision making by streamlining access to recent, accurate, and detailed data. This poster details state-of-the-art techniques the California Department of Water Resources, North Central Region Office (NCRO), is employing to collect and interpret bathymetry. The goal of the revolution is to bring together advanced technology and data user groups to develop a library of quality bathymetry data for the entire Delta.

Conceptual Plan for a Foundational Delta-Wide Bathymetry Dataset

SACRAMENTO-SAN JOAQUIN DELTA CONTINUOUS SURVEY CYCLE



A current, unified, bathymetric dataset is needed to put Bay-Delta science on a firm foundation. Conceptual elements of the plan include:

- Establishing a program to provide continuous funding for surveys and database functions.
- Developing strategies to efficiently survey the entire Delta on a regular basis (for one concept, see the image to the left).
- Developing priorities and methods of bathymetry data collection, in coordination with bathymetry data users and collectors.
- Establishing an inter-agency bathymetry advisory panel to certify a standardized Delta data set.
- Establishing data standards that will be followed and agreed upon.
- Maintaining the Delta-wide benchmark network on a regular basis.
- Developing bathymetric change detection strategies.
- Assessing and centralizing the storage of existing data sets.
- Establishing procedures for making data available.

A convergence of technological and informational improvements are helping to make the "revolution" possible:

• Multibeam Real-Time Kinematic bathymetry collection systems

These systems allow rapid collection of highly detailed data sets that are accurately tied into vertical control (NAVD '88).

• Delta-Wide Benchmark Resurvey

A recent cooperative project with the National Geodetic Survey and Ca-DWR has produced a unified Delta-wide set of bench marks the Sacramento-San Joaquin Delta. This essential system of benchmarks allows vertically consistent data to be collected over the large area of the Delta.

• Metadata Standards

Data collectors are increasing using industry standards to collect and document their data. Detailed information about collection techniques allows for quality assessments necessary for combining data from multiple data collectors for a consistent region-wide data set.

• GIS, Databases, and the Internet

The best data in the world is useless if don't you have a way to efficiently store, visualize, analyze, and share the data. Advances in GIS databases and its ability to share datasets and products over the internet are helping to fuel the "revolution."

Join the Revolution

Additional Services Planned
These services share the basic bathymetric collection platform:

- Aquatic vegetation mapping
- Sediment type mapping
- Scanning laser levee slope mapping

Contact NCRO if you need a bathymetric survey or would like more information:

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