Benthic Invertebrates and Sediment Quality Objectives

Steve Weisberg
SCCWRP
BACKGROUND

• Benthic invertebrates are used extensively for integrated water quality assessments
  – Live on the bottom where contaminants accumulate
  – Lack mobility to escape
  – Integrate over typical 2-3 year life spans

• California has recently adopted Sediment Quality Objectives
  – Triad approach combining benthos, toxicity, and chemistry measures

• Developed a statewide database for these measures
  – Used those data to create 305(b) report
WHY A TRIAD APPROACH: POTENTIAL FLAWS WITH INDIVIDUAL LINES OF EVIDENCE

• **Chemistry**
  – Bioavailability poorly understood (e.g., paint chip, tar ball)
  – There may be unmeasured contaminants

• **Toxicity**
  – Confounding factors (e.g., ammonia)
  – Agitation enhanced bioavailability
  – Differing sensitivity among test species

• **Benthic infaunal assemblages**
  – Physical disturbance (anchor, dredging)
  – Oxygen stress
Three lines of evidence (LOE) needed to assess direct effects of sediment contamination.
SIX STATION ASSESSMENT CATEGORIES

- Unimpacted
- Likely Unimpacted
- Possibly Unimpacted
- Likely Impacted
- Clearly Impacted
- Inconclusive
CALIFORNIA DATABASE

- Data from about 5000 sample sites
  - 1,463 Benthos
  - 1,846 Toxicity
  - 4,575 Chemistry
  - 797 All three

- Database already available on the web

- Probability-based samples with all three indicators from 314 sites
  - Basis for 305(b) report
San Francisco Bay

SQO Sites
Assessment Category
- Unimpacted
- Likely Unimpacted
- Possibly Impacted
- Likely Impacted
- Clearly Impacted

Legend:
- Blue circle: Unimpacted
- Green circle: Likely Unimpacted
- Yellow square: Possibly Impacted
- Orange triangle: Likely Impacted
- Red triangle: Clearly Impacted

Scale:
0 2.5 5 10 Km
STATEWIDE CONDITION

- Possibly Impacted: 62%
- Likely Impacted: 20%
- Clearly Impacted: 0.5%
- Likely Unimpacted: 7%
- Unimpacted: 10%
- Inconclusive: 0.6%
REGIONAL CONDITION

North:
- 14% (Green)
- 18% (Yellow)
- 4% (Orange)
- 6% (White)

San Francisco Bay:
- 23% (Green)
- 73% (Yellow)
- 0.3% (Orange)
- 4% (White)

South:
- 24% (Green)
- 12% (Orange)
- 19% (Yellow)
- 2% (White)
- 43% (Green)
LIMITATIONS

• Not all data collected with the same gear and sieve size
  – SQOs define appropriate gear for future sampling
  – Recent gear comparison study also available

• Database and SQOs mostly limited to bay, harbor and estuarine data
  – Even larger datasets for the marine environment not yet included

• No mechanism for capturing new data
  – Many new data will become available with adoption of SQOs