The Importance of Quality Assurance/Quality Control in Bioassessment and Physical Habitat Protocols

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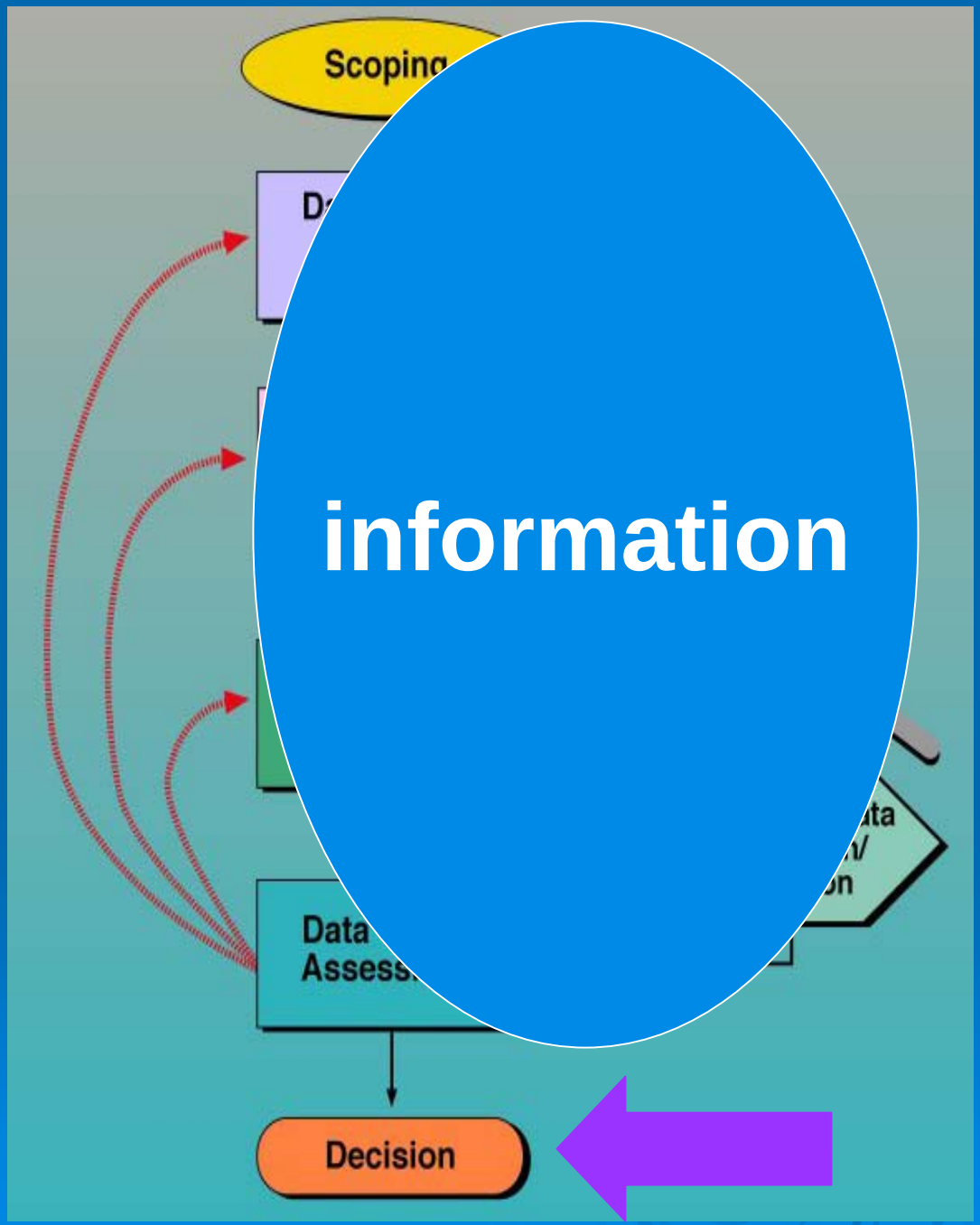
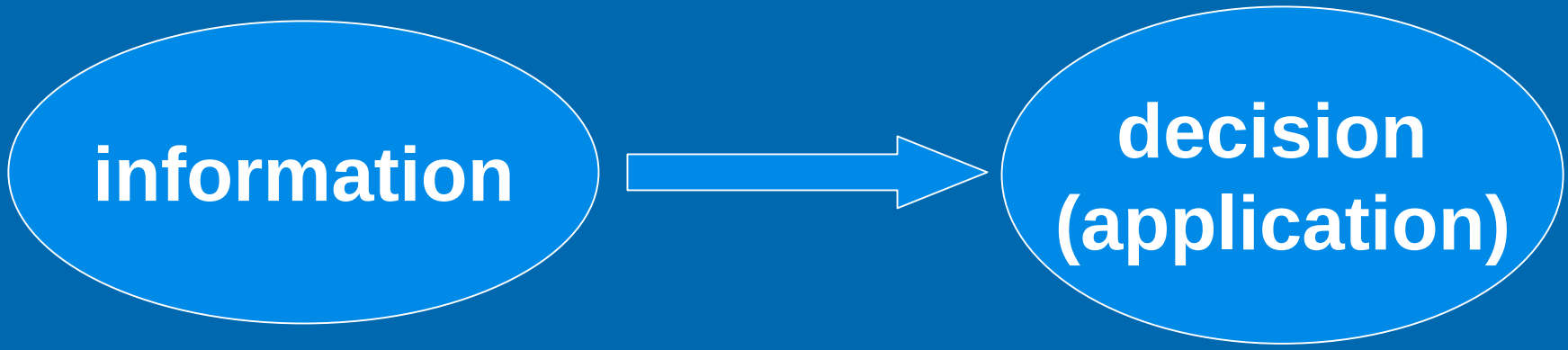
The Quality Assurance Research Group
Moss Landing Marine Laboratories



EPA Decision Making Process

QA/QC Role in Information



- Information = Data
- QA/QC helps define the type of information
- QA/QC asks:
  - What type of information do we need to make a decision?
  - What application will we use?
- In other words: What are our information needs?

Applications for Bioass nt and Physical Hab

- Surface Water Ambient Monitoring Pro
  - Status and Trends
  - Identifying Problems
  - Evaluating Restoration (before ar
  - Futur
- Establish num ts for Tota
- Measure and do success o Practi
- Biochemi use

What type of information will support these?

FOR EXAMPLE:

t type of information do we need sess status and trends?

e of information do we need to assess a discharge point?

Are the information needs similar or unique?

Sta PLE:
May require er to assess season t annual

bias

D E:
May require c stry samples in order to ry context

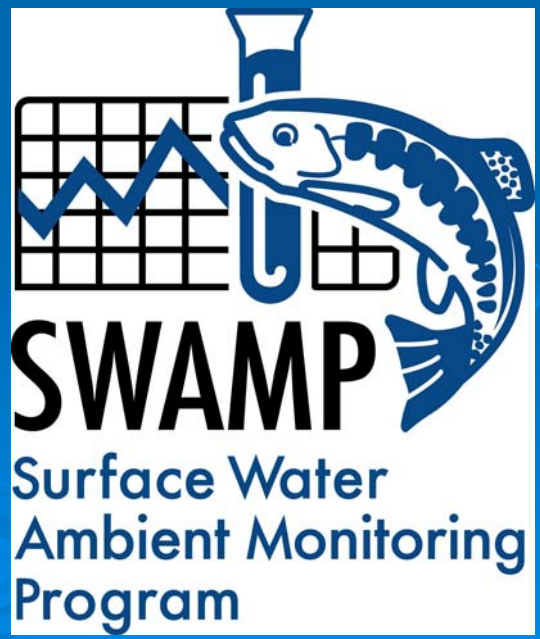
bias

Is QA/QC important in chemistry protocols?

- Scientific
  - Interferences, precision, bias (accuracy), sensitivity, representativeness, completeness, comparability
- What do QC samples provide in terms of data interpretation?
  - QC grounds the data in a useful, documented manner - e.g., replication helps us assess homogeneity issues, representativeness, equipment, bias
- What does QA provide in terms of applications?
  - Systems for limiting error – e.g., training programs and auditing of success/failure
- Application in California – Comparability Mandate
  - Assembly Bill 982 - Comparable data of known and documented quality
  - Allows state to leverage data

State of California's Surface Water Ambient Monitoring Program (SWAMP)

- SWAMP QA Team assisting SWAMP Bioassessment Committee in development of comprehensive QA program - Comparability
- Sample Collection and Analysis Protocols
- Measurement Quality Objectives
- System for Assessment of Training
- System for Assessment of Data



What Others Have Found

- Majority of errors result from taxa being missed during sample sorting (Dines & Murray-Bligh 2000)
- Importance of identifying exact location of sampling area (Murray-Bligh 1999)
- “very little information…concerning QA/QC for collection of habitat data” (AusRivAS 2004)
- Seasonality more important than protocol or method (Lorenz & Clarke 2006)

Examples of QC in Protocols

Example Measurement Quality Objectives – Bioassessment Protocols		
Field	**Frequency**	**Performance Criteria**
Field Duplicates	A minimum of 10% replication at the reach scale, randomly distributed throughout the sampling period within each project year	The precision of physical habitat scores and periphyton measurements should have a RPD $\leq$ 25%.
Subsampling	**Frequency**	**Performance Criteria**
Organism Recovery	Taxonomist evaluates recovery at the end of sample processing for all samples.	Organism Recovery $\geq$ 95% (475 BMIs).
Remnant Evaluation	All samples are evaluated	The remnant should contain fewer than 10% of the total organisms sampled.

Examples of QC in Protocols

Parameters	Performance Criteria
Reach Length	A minimum of 50% of the reach length must be accessible
Area Sampled	A minimum of 50% of the total sampling area must be accessible for BMI and periphyton collections
Mesh Size of Sampling Net	500 micron
Number of Organisms Per Sample	A minimum of 250 BMI must be collected for each reach

QA/QC Issues in Protocols

- Expertise of field crew and laboratory
- The protocols are somewhat subjective and have more variables that may introduce bias or error
- There has been a lot written on QA/QC in bioassessment and physical habitat
  - implementation does not appear comprehensive
  - check-box approach

"Clean hands" then submerges the sample bottle, and allows the bottle to partially fill with sample. "Clean hands" screws the cap on the bottle, shakes the bottle several times, and empties the rinsate away from the site. After two more rinsings, "clean hands" holds the bottle under water and allows bottle to fill with sample. After the bottle has filled (i.e., when no more bubbles appear), and while the bottle is still inverted so that the mouth of the bottle is underwater, "clean hands" replaces the cap of the bottle. In this way, the sample has never contacted the air.

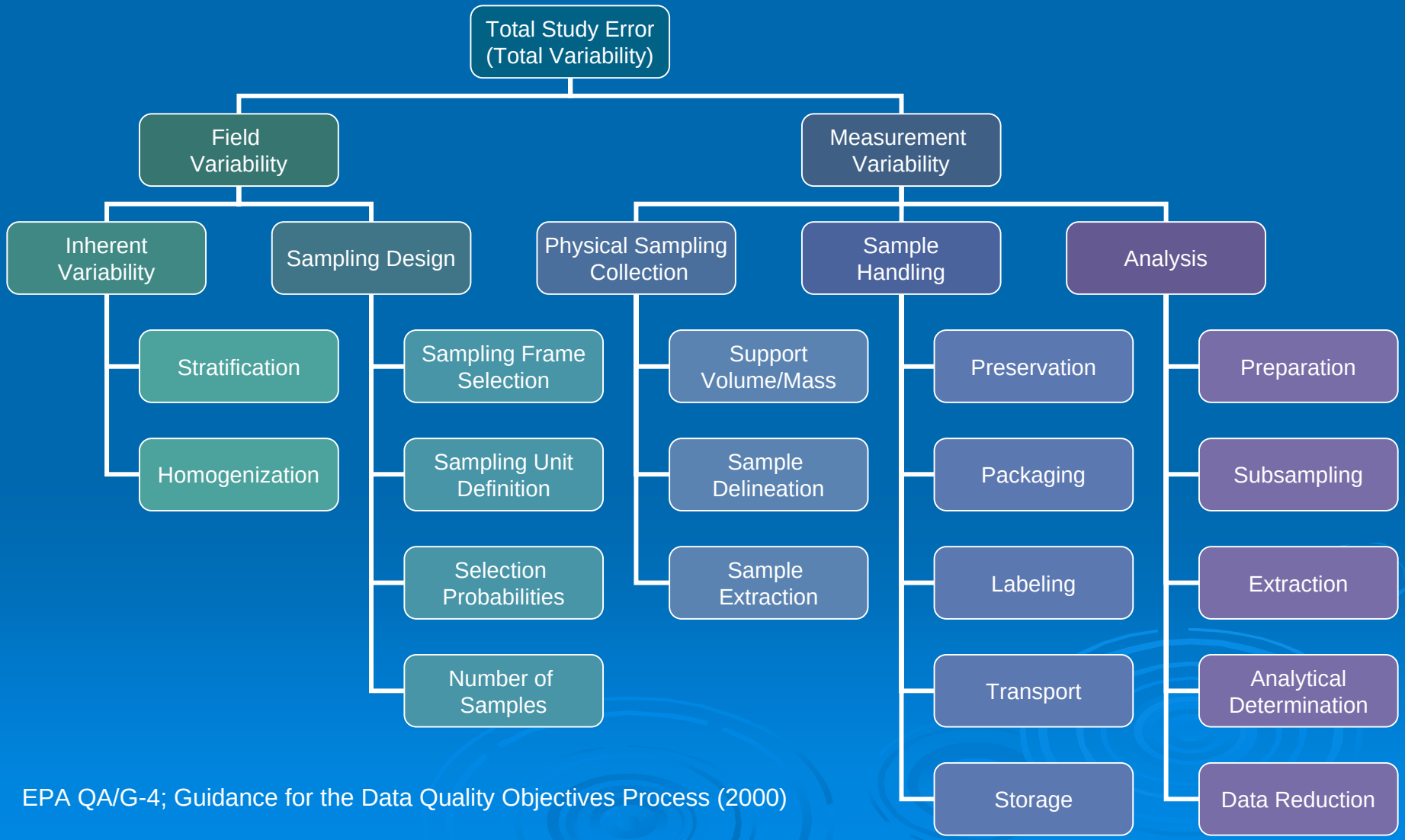
Bioassessment Physical Habitat Examples

- Excavate the area by **kicking** or using a tool to loosen the substrate…**prevent** substrate from filling net…maintain a **consistent** sampling effort at each area
- Holding the net in position on the substrate, **visually define** a square quadrant that is one net width wide and one net width long upstream of the net opening
- Sometimes the net will become so full of material from the streambed that it is **no longer effective** at capturing benthic macroinvertebrates

Summary

- Define information needs and use QA/QC
- QA/QC is an important component of bioassessment and physical habitat protocols because:
  - Our protocols are subjectively written
  - Our protocols require expertise
  - Our applications for data require that we assess implications of bias, interferences, precision, representativeness
  - We need a documented process in order to use data in decisions
- SWAMP QA Team assisting SWAMP Bioassessment Committee in developing comprehensive QA program

Components of Total Study Error



EPA QA/G-4; Guidance for the Data Quality Objectives Process (2000)

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