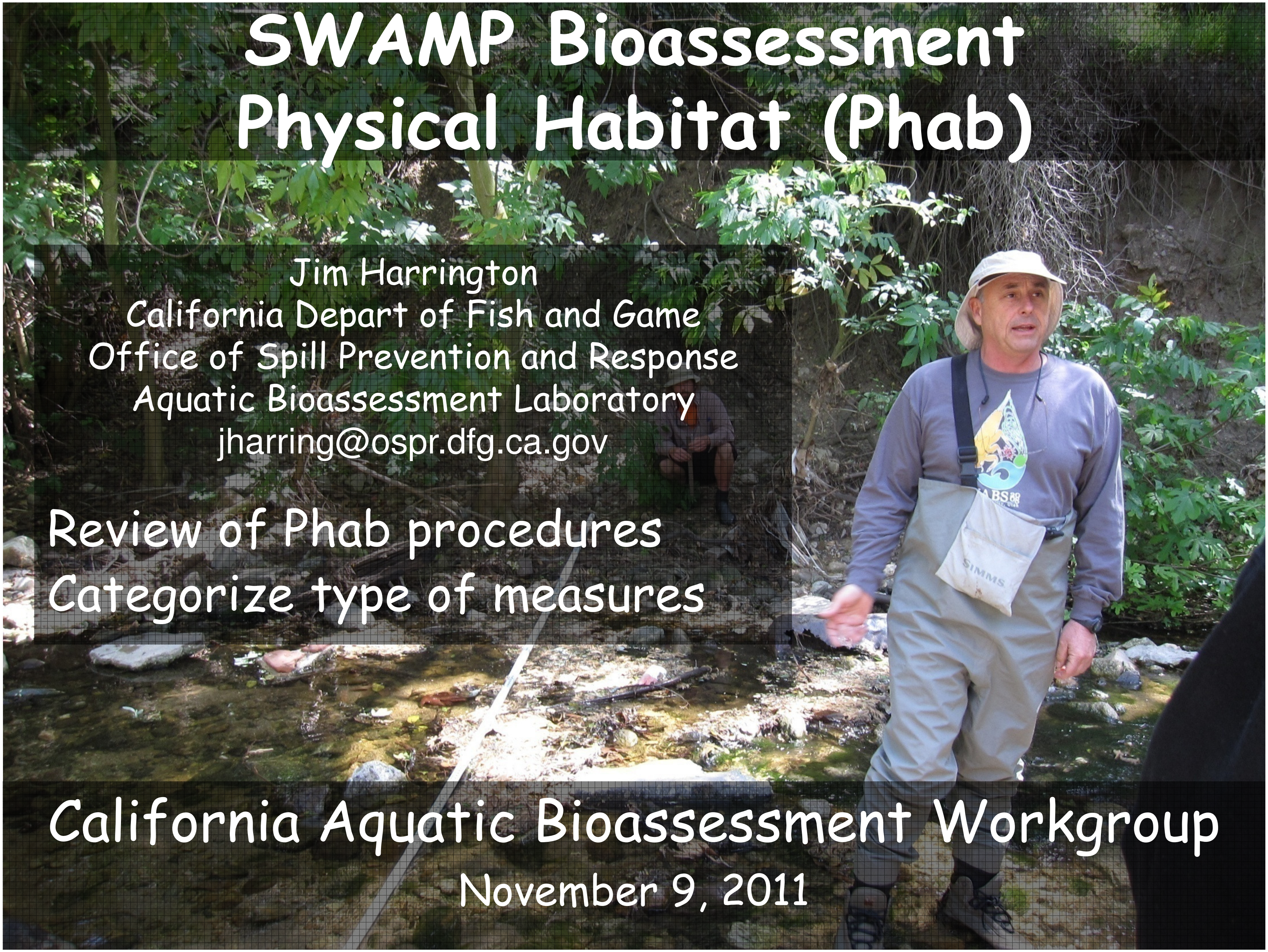


SWAMP Bioassessment Physical Habitat (Phab)

Jim Harrington
California Depart of Fish and Game
Office of Spill Prevention and Response
Aquatic Bioassessment Laboratory
jharring@ospr.dfg.ca.gov

Review of Phab procedures
Categorize type of measures

California Aquatic Bioassessment Workgroup

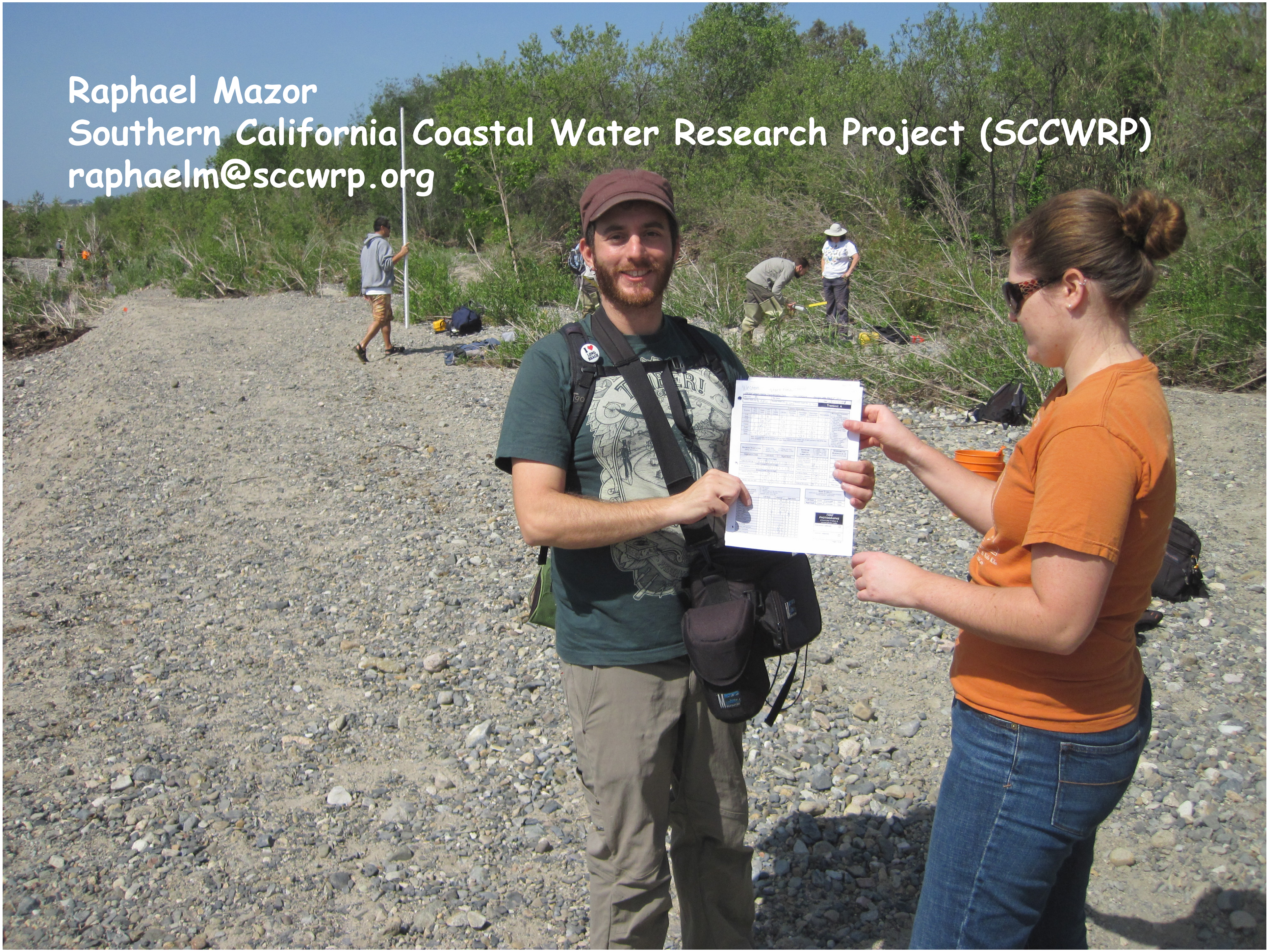
November 9, 2011


Shawn McBride, CDFG/ABL
smcbride@ospr.dfg.ca.gov

Managing a large-scale probabilistic bioassessment program

Complicating factors involved

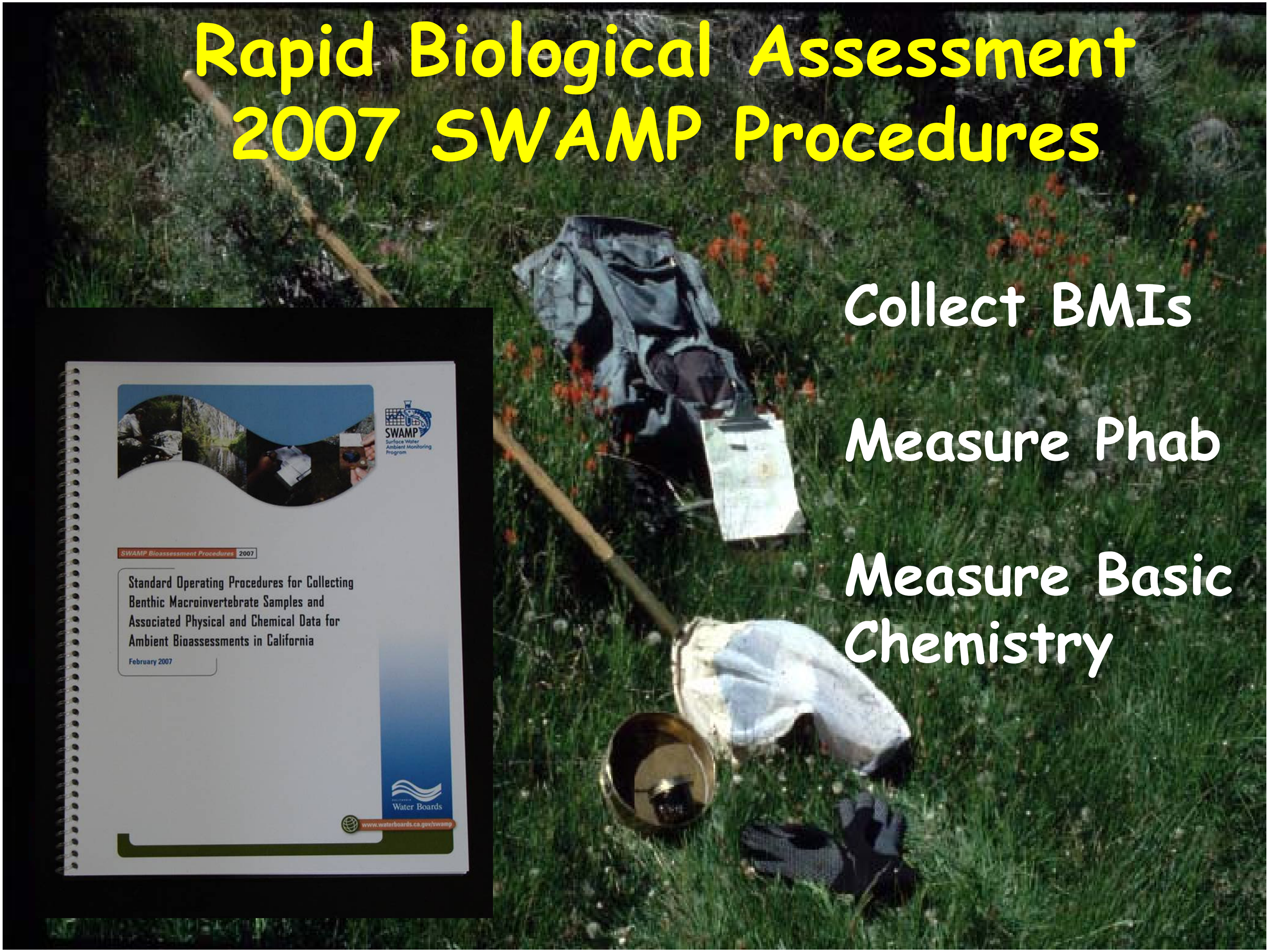
Keys to success


Raphael Mazor
Southern California Coastal Water Research Project (SCCWRP)
raphaelm@sccwrp.org

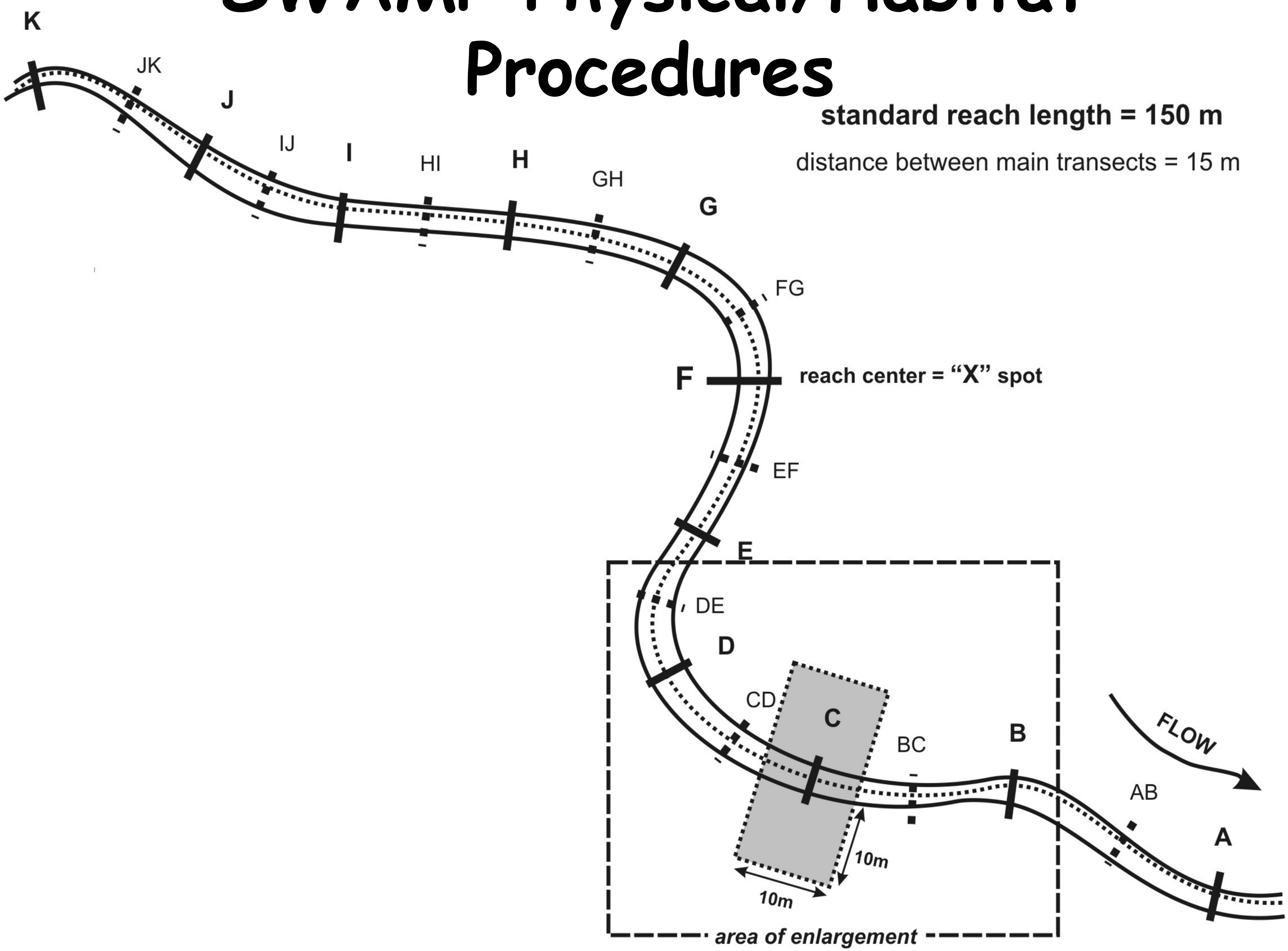
Working with Phab data

Applications for Phab data

Needs for Effectively using Phab data


Rapid Biological Assessment
2007 SWAMP Procedures
Collect BMIs
Measure Phab
Measure Basic Chemistry
SWAMP
Surface Water Ambient Monitoring Program
SWAMP Bioassessment Procedures 2007
Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California
February 2007
Water Boards
www.waterboards.ca.gov/swamp

SWAMP Physical/Habitat Procedures

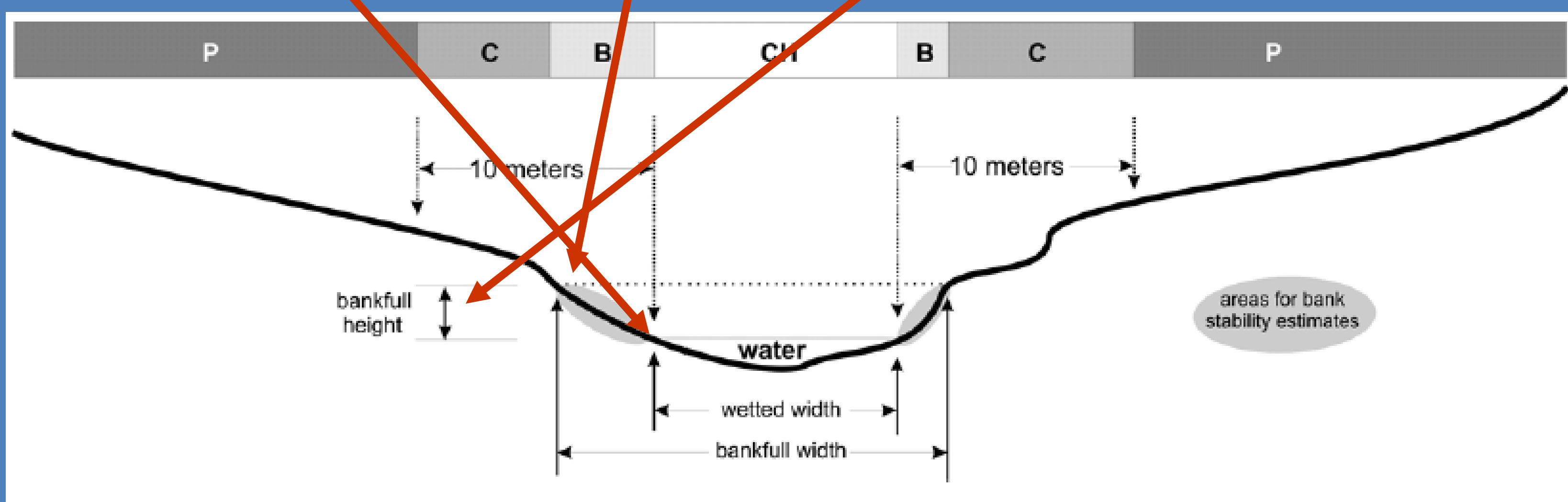


ode 2006

SWAMP BIOASSESSMENT FIELD FORMS

CHANNEL DEMENTIONS ON TRANSECTS

Site Code:	Site Name:	Date: __ __ / __ __ / __ __ __ __
Wetted Width (m):	Bankfull Width (m):	Bankfull Height (m):	**Transect A**




Slope and Sinuosity

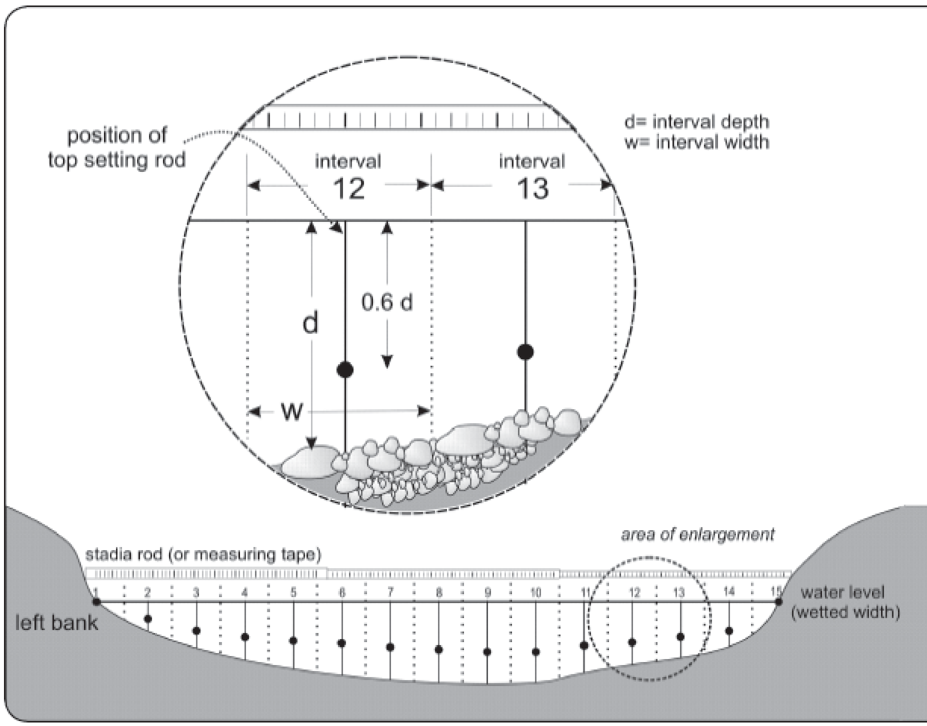
SWAMP BIOASSESSMENT FIELD FORMS

MEASURING FLOW HABITAT TYPES

Flow Habitat Type	DESCRIPTION
Cascades	Short, high gradient drop in stream bed elevation often accompanied by boulders and considerable turbulence
Falls	High gradient drop in elevation of the stream bed associated with an abrupt change in the bedrock
Rapids	Sections of stream with swiftly flowing water and considerable surface turbulence. Rapids tend to have larger substrate sizes than riffles
Riffles	Shallow sections where the water flows over coarse stream bed particles that create mild to moderate surface turbulence; (< 0.5 m deep, > 0.3 m/s).
Runs	Long, relatively straight, low-gradient sections without flow obstructions. The stream bed is typically even and the water flows faster than it does in a pool; (> 0.5 m deep, > 0.3 m/s). A **step-run** is a series of runs separated by short riffles or flow obstructions that cause discontinuous breaks in slope
Glides	A section of stream with little or no turbulence, but faster velocity than pools; (< 0.5 m deep, < 0.3 m/s)
Pools	A reach of stream that is characterized by deep, low-velocity water and a smooth surface; (> 0.5 m deep, < 0.3 m/s)

SWAMP BIOASSESSMENT FIELD FORMS

Preferred Method for Discharge Measurements

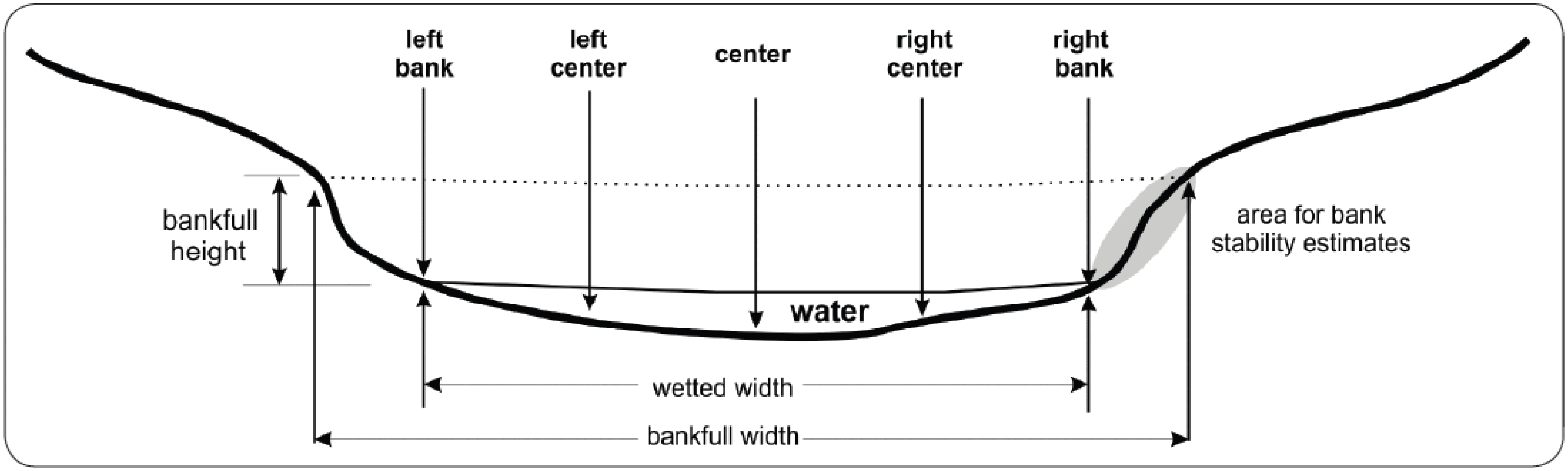


Velocity Area Method

Stream Morphological Description

Average Wetted Width
Average Depth
Average Bankfull Width
Average Bankfull Height
Reach Slope and Sinuosity
Stream Flow Habitats
Stream Discharge

Substrate Composition and Algal Cover

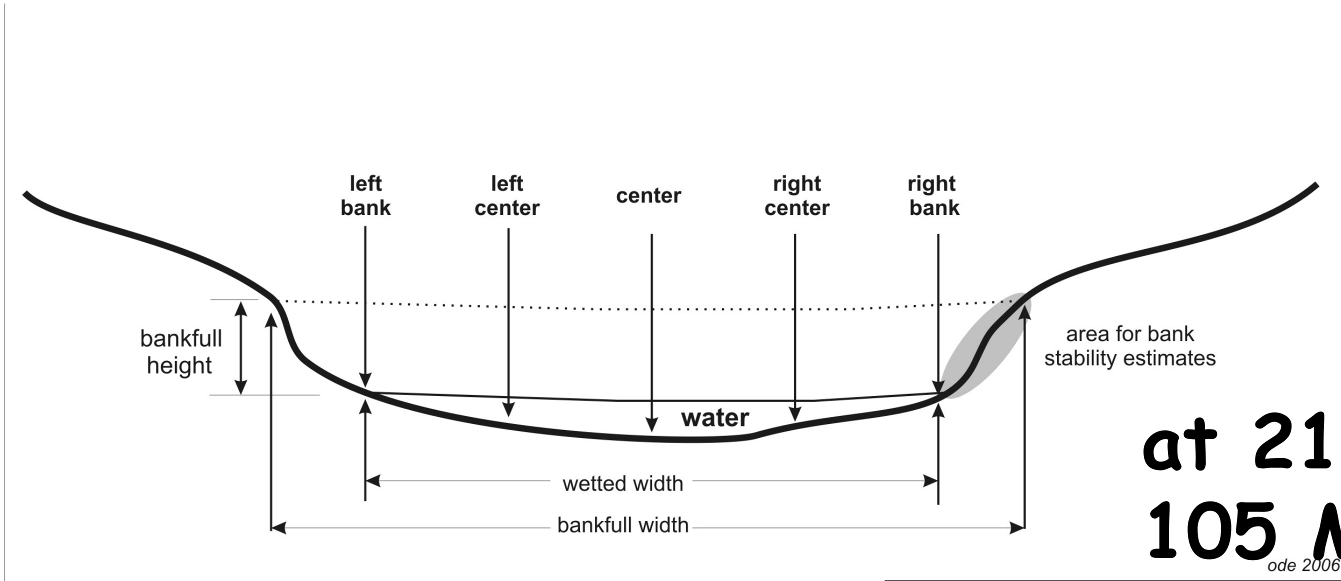


Transect Substrates

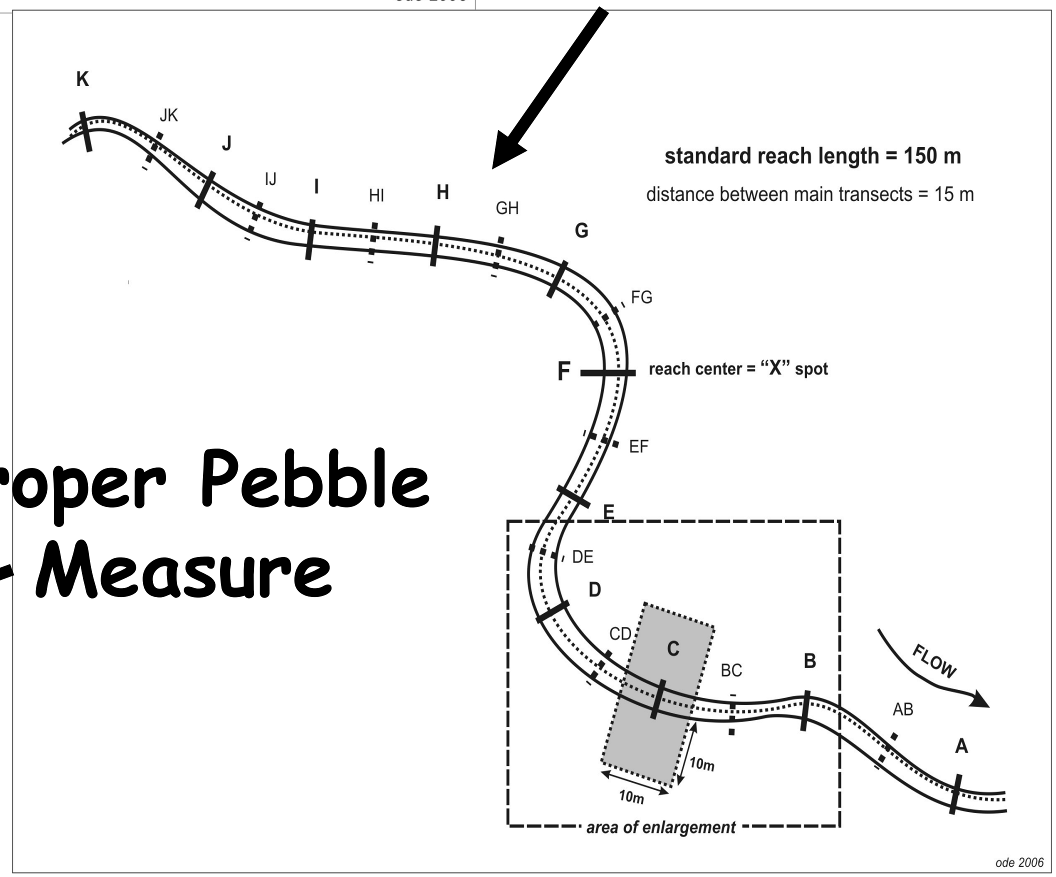
Position	Dist from LB (m)	Depth (cm)	mm/ size class	% Cobble Embed.	CPOM	Microalgae Thickness Code	Macroalgae Attached	Macroalgae Unattached	Macrophytes
Left Bank					P A		P A D	P A D	P A D
Left Center					P A		P A D	P A D	P A D
Center					P A		P A D	P A D	P A D
Right Center					P A		P A D	P A D	P A D
Right Bank					P A		P A D	P A D	P A D
	Note: Substrate sizes can be recorded either as direct measures of the median axis of each particle or one of the size class categories listed on the supplemental page (direct measurements preferred)								

Microalgae Thickness Codes

0 = No microalgae present, Feels rough, not slimy;
1 = Present but not visible, Feels slimy;
2 = Present and visible but <1mm; Rubbing fingers on surface produces a brownish tint on them, scraping leaves visible trail.
3 = 1-5mm;
4 = 5-20mm;
5 = >20mm;
UD = Cannot determine if microalgae present, substrate too small or covered with silt (formerly Z-code).
D = Dry, not assessed

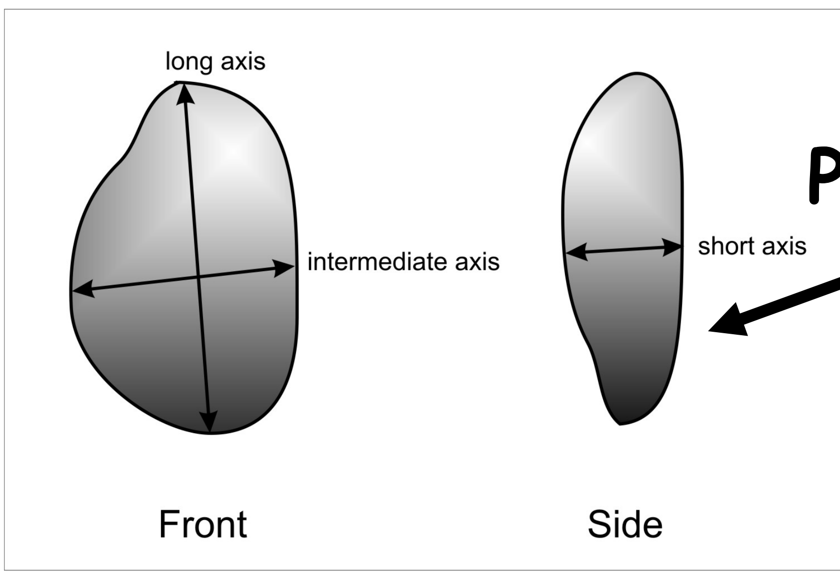


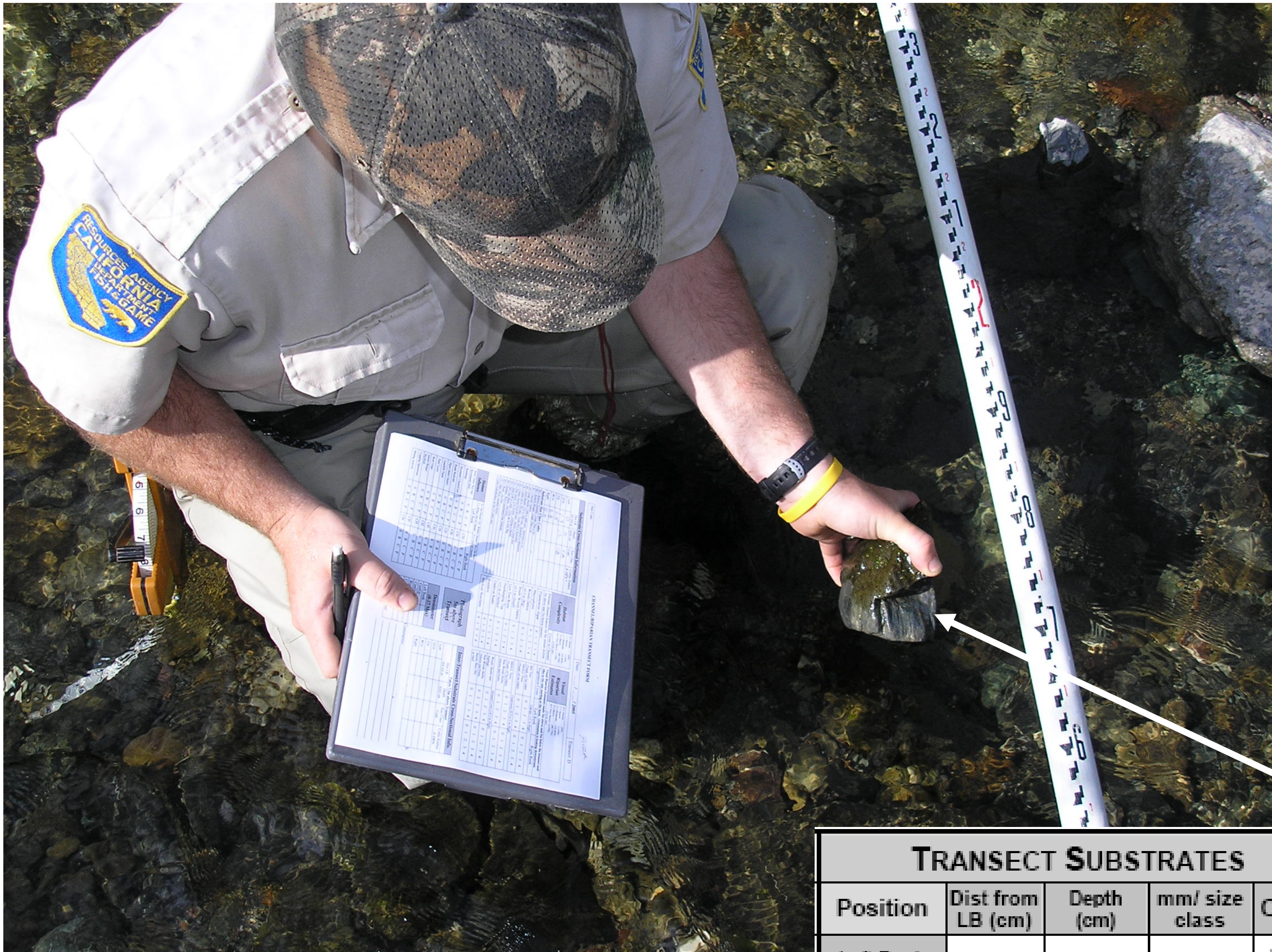
at 21 Transects for 105 Measures Total



Pebble Counts for Substrate Composition

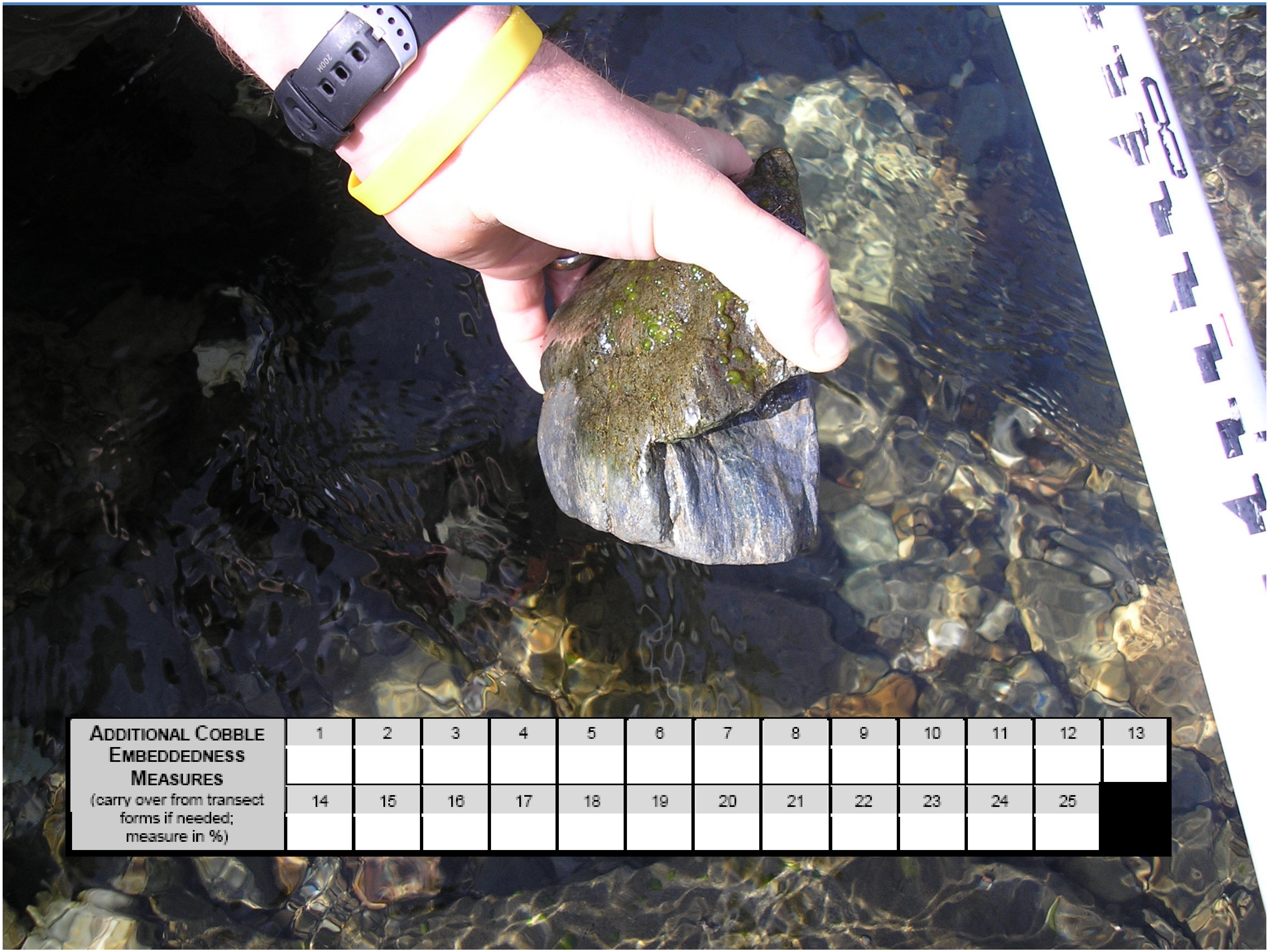
Proper Pebble Measure



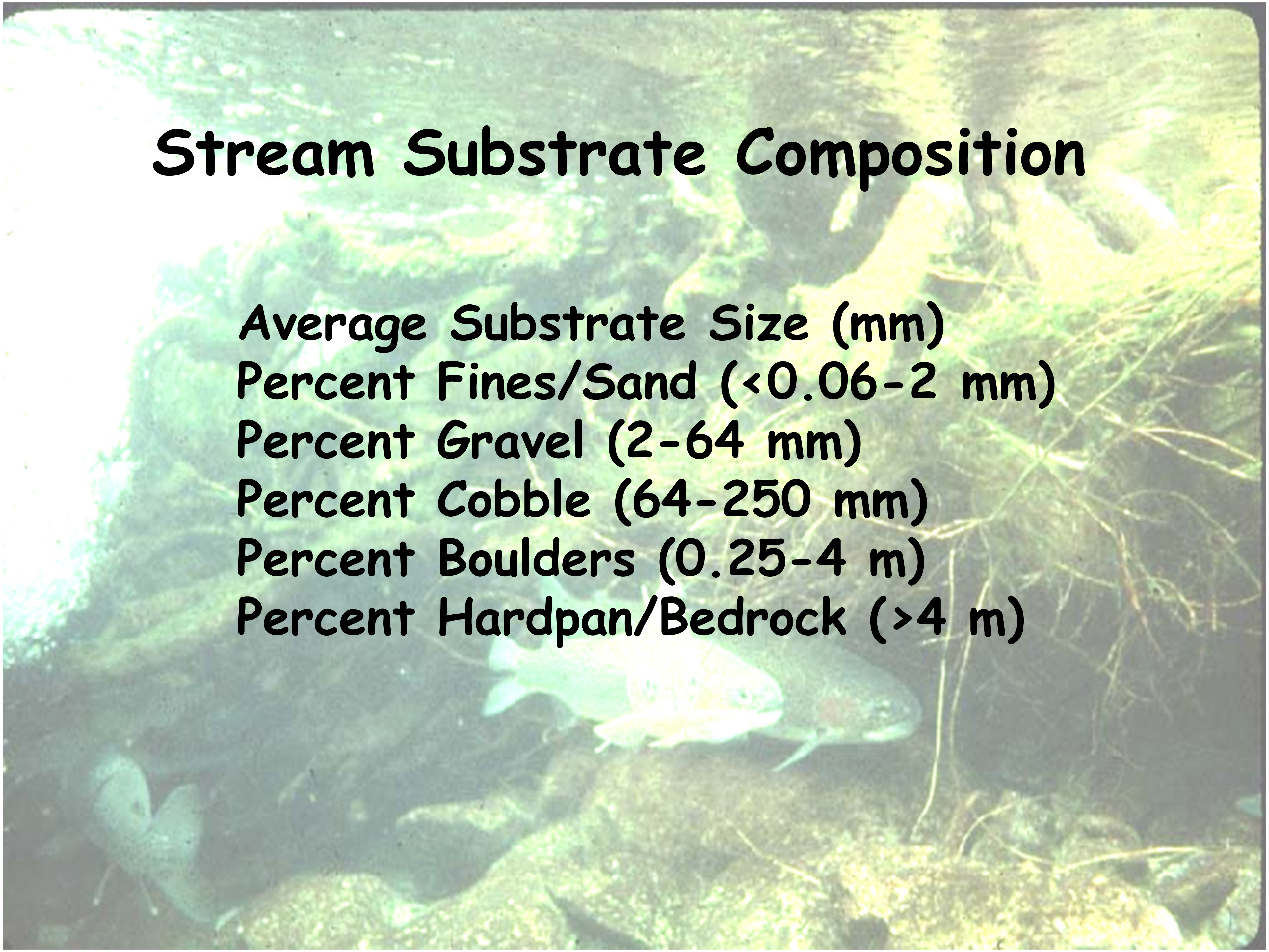


Cobble Embeddedness

Transect Substrates					Cobble Embed-dedness (%)
Position	Dist from LB (cm)	Depth (cm)	mm/ size class	CPOM	
Left Bank				P A	
Left Center				P A	
Center				P A	
Right Center				P A	
Right Bank				P A	



Additional Cobble Embeddedness Measures (carry over from transect forms if needed; measure in %)	1	2	3	4	5	6	7	8	9	10	11	12	13
	14	15	16	17	18	19	20	21	22	23	24	25	

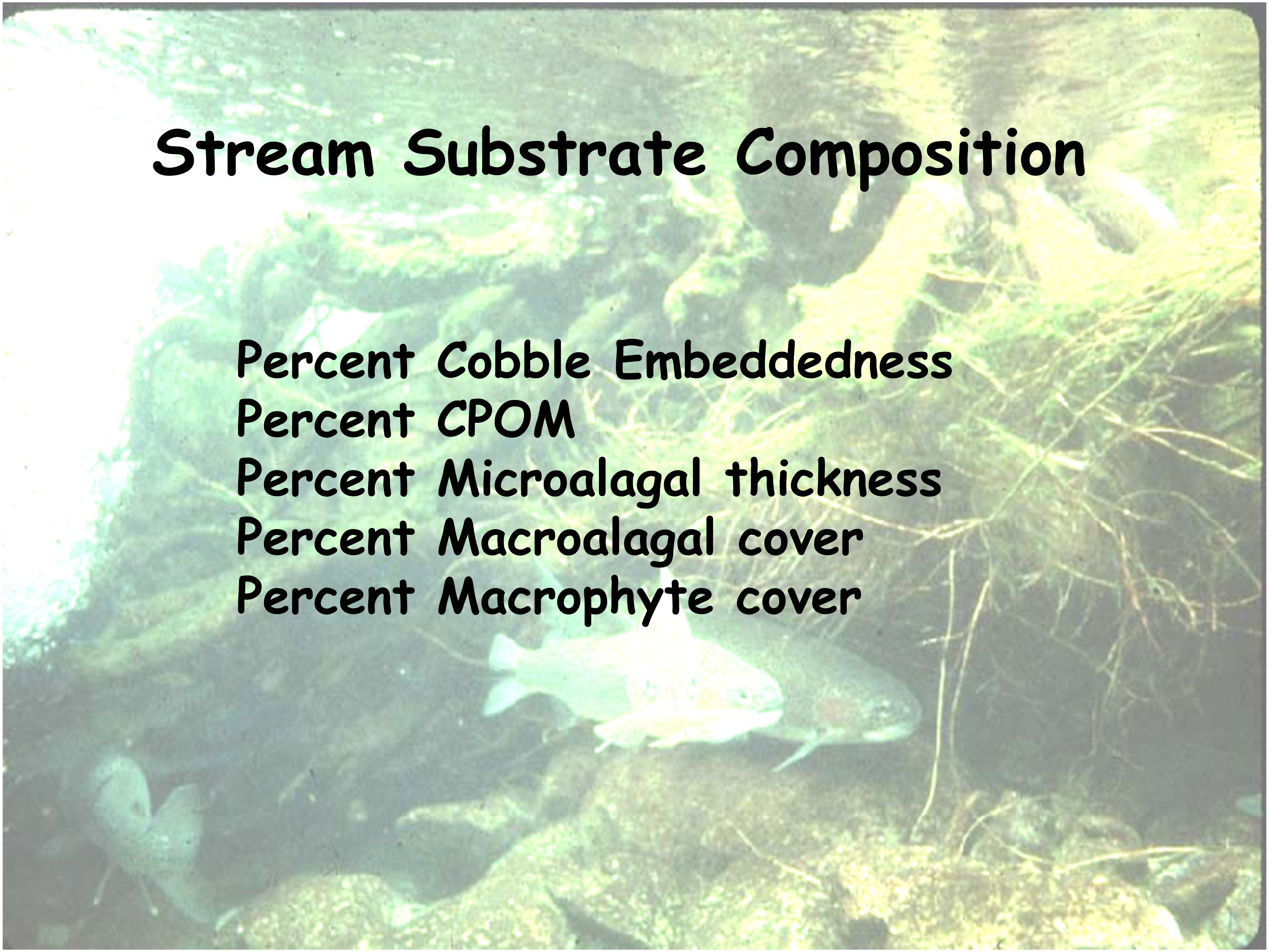


Stream Substrate Composition

- Average Substrate Size (mm)
- Percent Fines/Sand (<0.06-2 mm)
- Percent Gravel (2-64 mm)
- Percent Cobble (64-250 mm)
- Percent Boulders (0.25-4 m)
- Percent Hardpan/Bedrock (>4 m)

Stream Substrate Composition

Percent Cobble Embeddedness
Percent CPOM
Percent Microalagal thickness
Percent Macroalagal cover
Percent Macrophyte cover



SWAMP BIOASSESSMENT FIELD FORMS

MEASURING HUMAN INFLUENCE

HUMAN INFLUENCE (circle only the closest to wetted channel)	0 = Not Present B = On Bank C = Between Bank and 10 m from Channel P = >10 m + <50 m from Channel Channel (record Yes or No)									
	Left Bank				Channel		Right Bank			
Walls/ Rip-rap/ Dams	P	C	B	0	Y	N	0	B	C	P
Buildings	P	C	B	0	Y	N	0	B	C	P
Pavement/ Cleared Lot	P	C	B	0			0	B	C	P
Road/ Railroad	P	C	B	0	Y	N	0	B	C	P
Pipes (Inlet/ Outlet)	P	C	B	0	Y	N	0	B	C	P
Landfill/ Trash	P	C	B	0	Y	N	0	B	C	P
Park/ Lawn	P	C	B	0			0	B	C	P
Row Crops	P	C	B	0			0	B	C	P
Pasture/ Range	P	C	B	0			0	B	C	P
Logging Operations	P	C	B	0			0	B	C	P
Mining Activity	P	C	B	0	Y	N	0	B	C	P
Vegetation Management	P	C	B	0			0	B	C	P
Bridges/ Abutments	P	C	B	0	Y	N	0	B	C	P
Orchards/ Vineyards	P	C	B	0			0	B	C	P

SWAMP BIOASSESSMENT FIELD FORMS

MEASURING RIPARIAN VEGETATION

RIPARIAN VEGETATION (facing downstream)	0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy>75%) **circle one**	
Vegetation Class	**Left Bank**	**Right Bank**
Upper Canopy (>5 m high)		
Trees and saplings >5 m high	0 1 2 3 4	0 1 2 3 4
Lower Canopy (0.5 m-5 m high)		
All vegetation 0.5 m to 5 m	0 1 2 3 4	0 1 2 3 4
Ground Cover (<0.5 m high)		
Woody shrubs and saplings <0.5 m	0 1 2 3 4	0 1 2 3 4
Herbs/ grasses	0 1 2 3 4	0 1 2 3 4
Barren, bare soil/ duff	0 1 2 3 4	0 1 2 3 4

SWAMP BIOASSESSMENT FIELD FORMS

MEASURING HABITAT COMPLEXITY
MEASURING BANK STABILITY
MEASURING CANOPY COVER

INSTREAM HABITAT COMPLEXITY	0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate (10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Filamentous Algae	0 1 2 3 4
Aquatic Macrophytes/ Emergent Vegetation	0 1 2 3 4
Boulders	0 1 2 3 4
Woody Debris >0.3 m	0 1 2 3 4
Woody Debris <0.3 m	0 1 2 3 4
Undercut Banks	0 1 2 3 4
Overhang. Vegetation	0 1 2 3 4
Live Tree Roots	0 1 2 3 4
Artificial Structures	0 1 2 3 4

BANK STABILITY (score zone 5m up and 5m downstream of transect between bankfull - wetted width)			
Left Bank	eroded	vulnerable	stable
Right Bank	eroded	vulnerable	stable

DENSIOMETER READINGS (0-17) *count covered dots*	
Center Left	
Center Upstream	
Center Downstream	
Center Right	
Left Bank (optional)	
Right Bank (optional)	


a
b
bubble level
ode 2006


Stream Habitat Characteristics
Instream Habitat Complexity
Riparian Vegetation
Human Disturbance
Percent Bank Stability
Percent Canopy Cover

Chemical Stressors

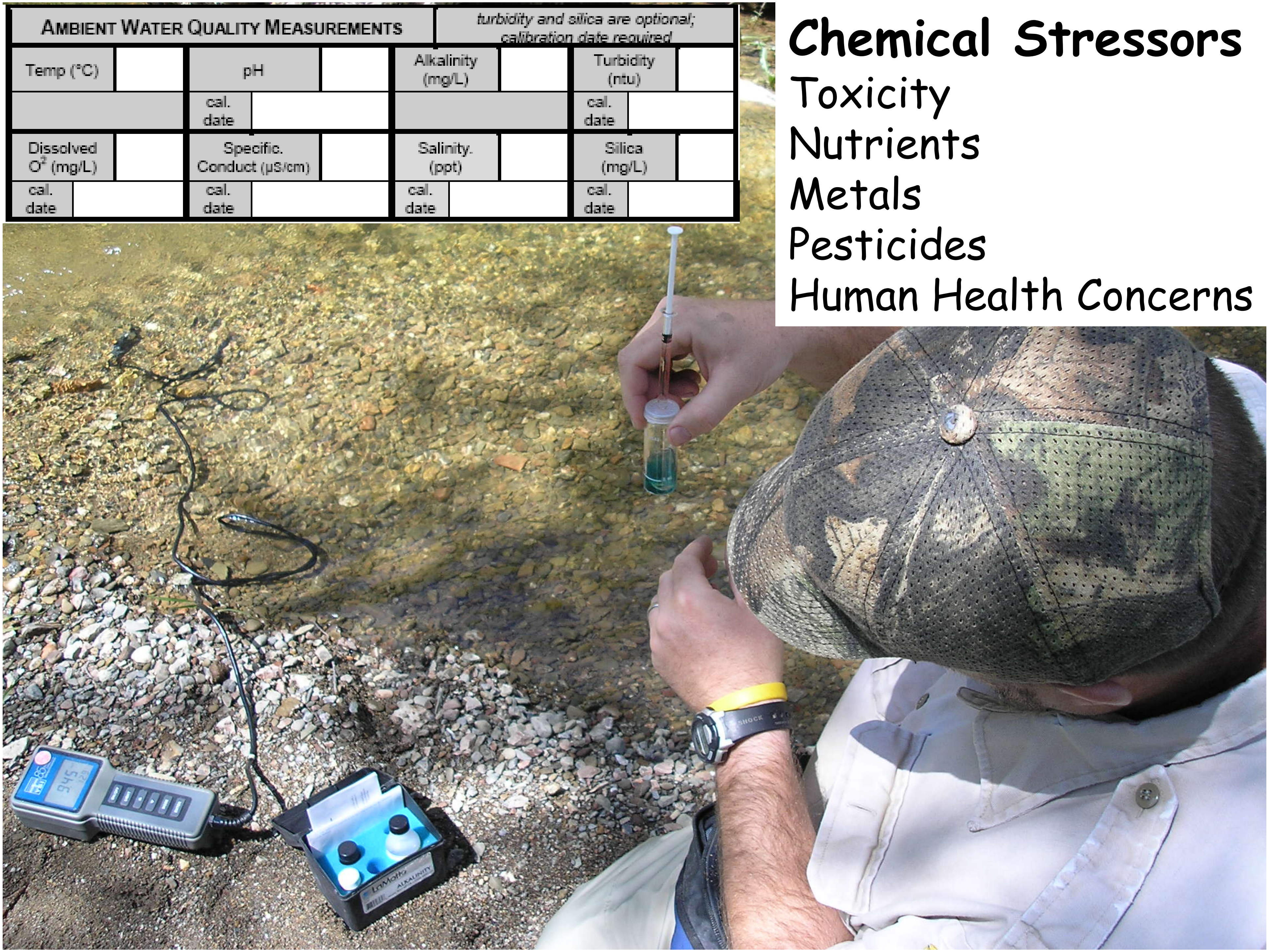
Toxicity

Nutrients

Metals

Pesticides

Human Health Concerns



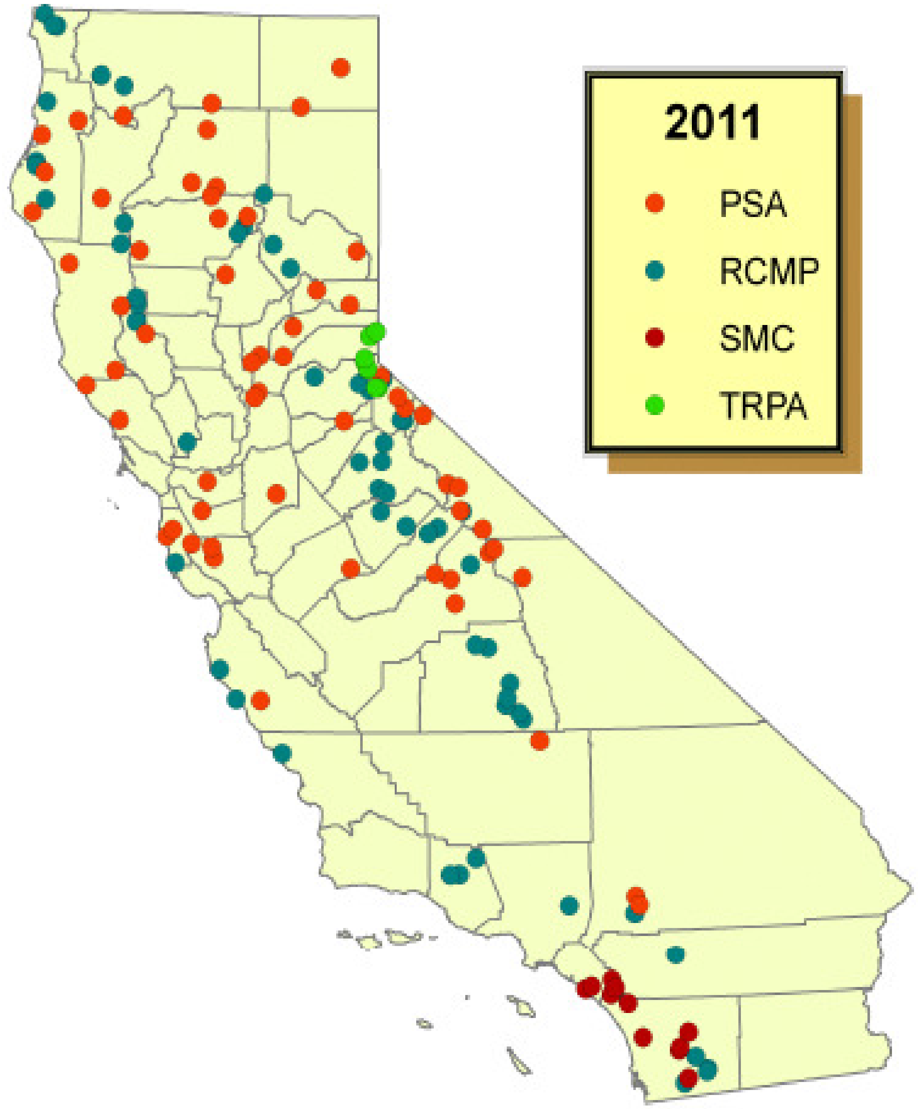
Ambient Water Quality Measurements				*turbidity and silica are optional; calibration date required*			
Temp (°C)		pH		Alkalinity (mg/L)		Turbidity (ntu)	
		cal. date				cal. date	
Dissolved O^2 (mg/L)		Specific. Conduct (µS/cm)		Salinity. (ppt)		Silica (mg/L)	
cal. date		cal. date		cal. date		cal. date	

PREPARING AND MANAGING SAMPLING ACTIVITIES

CABW 2011

Shawn McBride, CDFG/ABL

smcbride@ospr.dfg.ca.gov



152 probabilistic site visits

- Full Physical habitat
- Bioassessment
- Algae
- Chemistry
- CRAM

Efficient sampling is necessary because?

- Large scale programs are expensive, 47 to 68% of all probabilistic project costs are field costs
- Overall project success is entirely dependent on sample collection
- Efficient sampling allows flexibility for unexpected problems or delays

Complications affecting project completion and efficiency

- Field computers
- Holding times (e.g. Chemical, Algal)
- Invasive species decontamination
- Poor site evaluation/recon techniques
- Variable environmental conditions
- Inadequate project resources

Keys to success

- Planning and organizing
- Setting realistic goals
- Anticipate problems
- Fix errors/ mistakes immediately
- Hire capable personnel and provide comprehensive training
- Experience counts

WORKING WITH PHAB DATA

CABW 2011

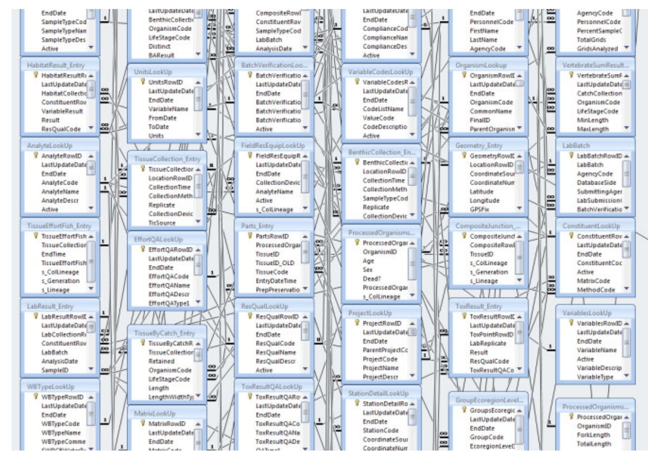
Raphael Mazor

raphaelm@sccwrp.org

PHAB data is underutilized

Four major obstacles:

- Challenges in the field
  - Time consuming
  - Ambiguous conditions
  - Redundancies (esp. with CRAM)
- Data management
  - Data entry, export is challenging (see Marco Sigala's talk for SWAMP's progress)
- No framework for interpretation
  - E.g., no IBI equivalent
  - No QA
- Multiple roles/applications
  - Stressor *and* condition indicator



PHAB data is undervalued

- Dollar-per-datapoint, one of the cheapest tools we have.
- Enhances value of most (all?) other indicators
- Great stand-alone value too
  - Measures management endpoints
  - Describes natural variability in stream types
  - Quantifies stress
  - Assesses overall condition of habitat

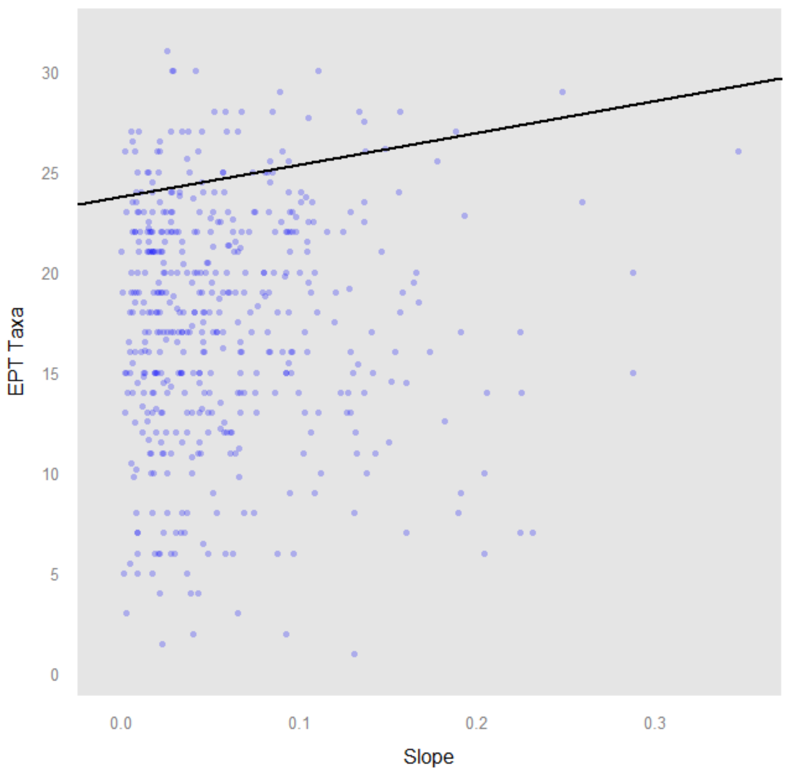
Three major applications of PHAB

- Explanatory variable (e.g., for benthic macroinvertebrates)
- Stressor indicator
- Condition indicator
  - Single-component indicator
  - Integrative indicator

Three major applications of PHAB

- Explanatory variable (e.g., for benthic macroinvertebrates)

Slope

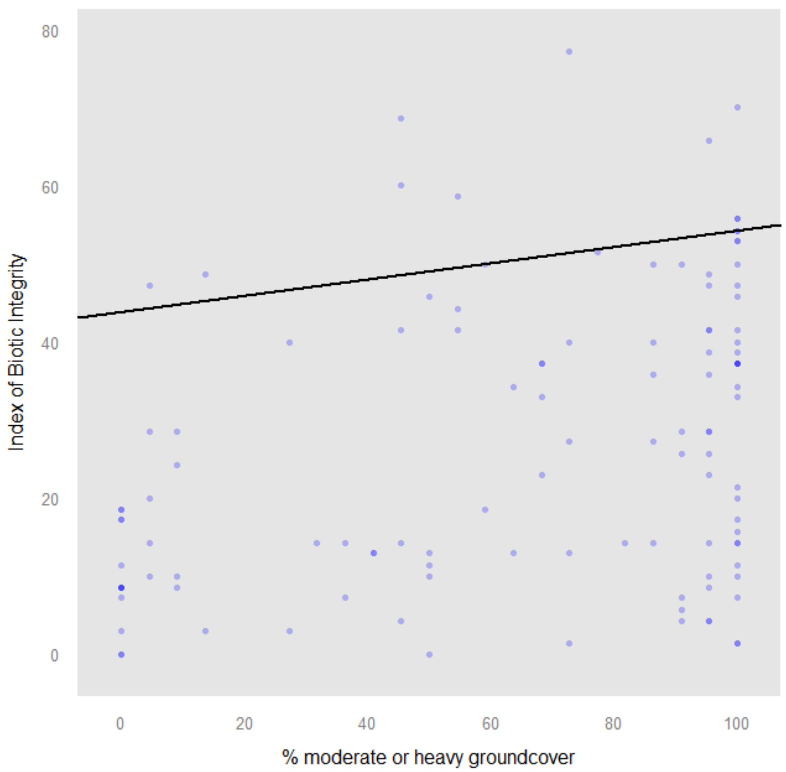


PHAB metrics can account for the effects of natural variability in bioassessment metrics

Three major applications of PHAB

- Stressor indicator

% moderate or heavy groundcover

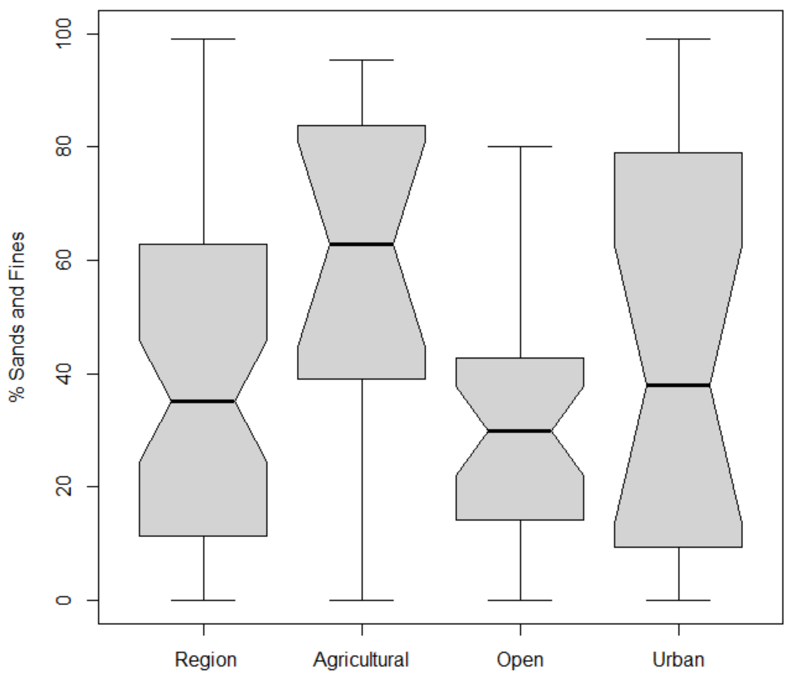


PHAB metrics can characterize stressors that affect biological endpoints

Three major applications of PHAB

- Condition indicator: Single stressor

% Sands and Fines

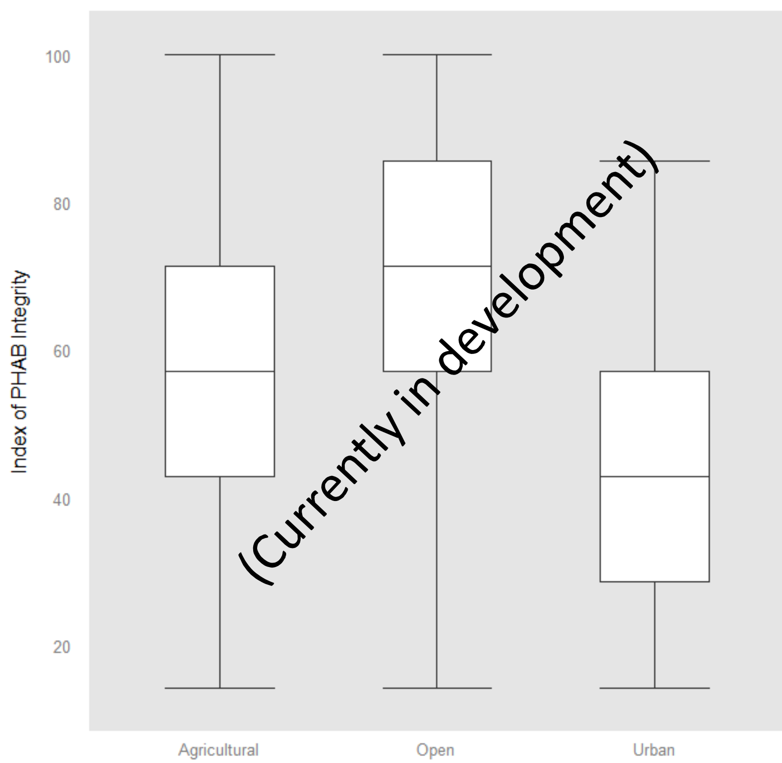


PHAB metrics can show the effects of land use and management on specific components of stream habitat condition

Three major applications of PHAB

- Condition indicator: Integrated assessments

Index of PHAB Integrity



PHAB metrics can be combined to provide an integrated assessment of condition.

What is needed?

Protocol refinement

- Intercalibration exercises (SWAMP, SMC) to highlight problem areas for improved training, SOP modification
- Streamlining with CRAM

Improvements in PHAB data infrastructure:

- Reporting tools
  - Like BMI metric calculations
- Data entry facilitation
  - Simpler, faster, field-based tools

Interpretive framework

- QA development
- Index development
- Guidelines for analysis
- Reference data/benchmarks

What is needed?

Demonstrations!

- Fire impacts
- BMPs
- Restorations
- Etc.

We are looking for applications to demonstrate use of PHAB data for management objectives.

If you are interested in seeing your data analyzed, contact me! (raphaelm@sccwrp.org)


Thank you!
Questions?