Prospectus

Applied Biomonitoring is an environmental consulting firm with unique expertise to design, plan, conduct, and interpret *in-situ* assessments using caged bivalves. Specialties include biological monitoring, mapping, and remediation. The company has extensive experience and expertise gained through more than 20 transplant studies with several different bivalve species. These studies have been conducted in a variety of environments (marine - estuarine - freshwater), depths (intertidal to 70 meters), and media (water - sediment). Applied Biomonitoring has integrated this unique capability with extensive experience in more traditional laboratory bioassays and field monitoring to help clients interpret the results of all studies that include assessments of bioaccumulation and bioeffects.

Applied Biomonitoring: Consulting Services Triad

- **Innovation**
- **Communication**
- **Credibility**

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Applied Biomonitoring

Caged Bivalve Services

Have Mussels, Will Travel

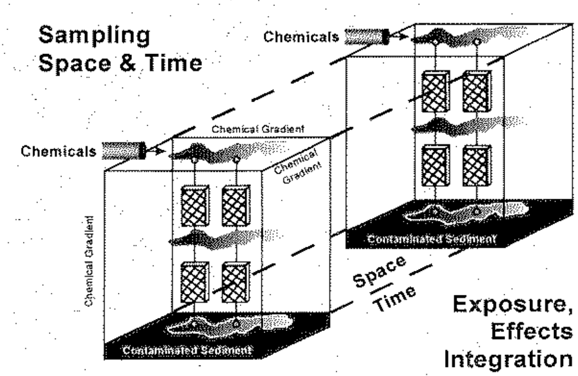
WHY BIVALVES?
Bivalves concentrate and integrate chemicals from water & sediment in their tissues

WHY TRANSPLANTS?
Caging bivalves combines the advantages of experimental control from laboratory bioassays with the environmental realism from traditional field monitoring

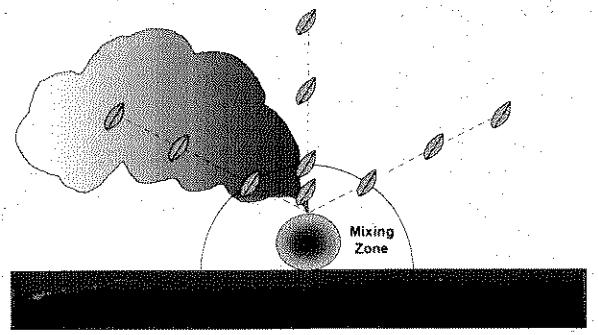
WHY BIOACCUMULATION?
A single chemical analysis of bivalve tissue provides an integrated record of bioavailable chemicals that cannot be defined with analyses of water or sediment samples

WHY GROWTH?
- Bivalve growth is easily measured & understood
- Growth represents an integration of all internal processes
- Bivalve growth can be quantified as a dose-response and related to population effects

WHY INTEGRATION?
Measuring bioaccumulation and growth in caged bivalves facilitates the integration of exposure and effects measurements



Time-Averaged Plume Mapping



- Strategic bivalve transplants along chemical gradients facilitates more environmentally representative descriptions of chemical distribution over space and time than water or sediment samples
- Tissue residue data can be used to estimate water and sediment concentrations and associated biological effects during the exposure period
- The integrating power of bivalve filtration normalizes the following:

  - intermittent discharges
  - variability in the direction and velocity of water currents
  - storm events, episodic sedimentation, and runoff

Applications

Generic	Industry
• Effluents • Point sources • Non-point sources • Contaminated sediment • Dredging & disposal • Oil rigs, refineries, spills • Risk assessments	• Pulp & paper • Mining • Manufacturing • Oil • Forestry • Agriculture • Aquaculture

Transplant Experience

Site	Dates	# Sites	Species	Initial (mm)	Total #	% Survival
San Diego Bay, CA	1974-75	5	*Mytilus galloprovincialis*	35-45	1500	90
Hood Canal, WA	1975-77	4	*Mytilus trossulus*	35-45	600	90
San Diego Bay, CA	1987- 90	18	*Mytilus galloprovincialis*	10-12 50-70	2000 200	93 80
San Diego Bay, CA	1993	6	*Mytilus galloprovincialis*	26-29 60-65	704 800	90 80
Harbor Island, WA	1991 - 92	14	*Mytilus trossulus*	24-30	432 3300	90 80
Tampa Bay, FL	1993	4	*Crassostrea virginica*	17-18	324 360	91 98
Delaware Bay, DE	1994	11	*Mytilus edulis,* *C. virginica*	40-51 50-100	1650 1420	0 97
Sinclair Inlet, WA	1994	8	*Mytilus galloprovincialis*	32-38	1500	99
Sudbury River, MA	1994	8	*Elliptio complanata*	57-63	840	90
San Diego Bay, CA	1995	6	*Mytilus galloprovincialis* *Macoma nasuta*	35-39 30-43	900 900	95 10
Hylebos Waterway, WA	1995	2	*Mytilus galloprovincialis*	44-49	300	91
Ward Cove, AK	1996a 1996b	7 7	*Mytilus trossulus* *Mytilus trossulus*	29-37 30-35	2100 2100	95 86
Port Valdez, AK	1997	7	*Mytilus trossulus*	31-36	2100	Ongoing

Transplant Expertise

- Developed compartmentalized cage methodology to facilitate growth measurements
- Refined the use of minimum size ranges to minimize the effects of size on bioaccumulation and growth
- Integrated an automated measurement system with portable analytical balance, digital calipers and portable PC
- Conceived the *exposure-dose-response* triad emphasizing the importance of chemical tissue burdens in assessing and predicting environmental effects