

Bay Area macroinvertebrates: improving tools for stream assessment and management

Concept proposal for CALFED Watershed (Proposition 50) funding by the Association of Bay Area Governments (ABAG), acting for the Bay Area Macroinvertebrate Bioassessment Information Network (BAMBI).

Purpose: Support regional and local partnerships in integrating regional data on benthic macroinvertebrate communities and habitat quality in streams and provide resources to assist watershed managers creek groups in using standardized protocols to assess watershed health and monitor creek restoration projects in the San Francisco Bay Area.

Planning context: Monitoring water quality requires evaluation not only of chemical or human health risks, but also of the ecological health of the stream. Benthic macroinvertebrates (BMIs), the insects and other small animals that live in the bottom substrate of a stream, are an important indicator of stream function because they recycle nutrients and are a major component of the riparian food web. Using guidance developed by the US Environmental Protection Agency (USEPA), the State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCBs) are working to incorporate BMI indices into their water quality assessment programs. and the CALFED Ecosystem Restoration Program has listed BMI assemblages among the indicators to be monitored along with habitat quality.

The San Francisco Bay RWQCB (SFBWRQCB) is the lead agency for implementing watershed assessment in the Bay Area under the 1993 Comprehensive Conservation and Management Plan developed by the San Francisco Estuary Project with the assistance of over 100 stakeholders. In 1999 SFBWRQCB drafted a Regional Monitoring and Assessment Strategy (RMAS) that is based on collaboration with local agencies in the Bay Area Stormwater Management Agencies Association (BASMAA; see map, page 5). As part of this strategy SFBWRQCB, BASMAA members and other agencies are collecting data for BMIs in Bay Area watersheds using the California Stream Bioassessment Procedure developed under the guidance of the Department of Fish and Game's Aquatic Bioassessment Laboratory (ABL) the statewide resource for bioassessment information and coordination.

Problems to be addressed: The RMAS needs to implement a comprehensive, scientifically sound framework for filling data gaps and integrating BMI data from diverse sources. Effective benchmarks for biological indicators, or "biocriteria", must be tailored to the specific climatic and physical conditions in the Bay Area. USEPA and ABL recommend at least two years of biological survey data be available from a range of representative sites, with adequate representation of "reference" or unimpaired conditions, before conducting comprehensive data analyses.

Some local watershed stewardship groups are using simplified protocols for BMI surveys but vary in their access to guidance in interpreting and using the data. Local groups and municipal or county agencies also are working to implement creek restoration projects for habitat, channel stabilization or flood control purposes, but lack tools to relate their project goals to broader watershed processes. Since BMIs are found in practically all stream environments, they are a valuable educational tool to illustrate connections between stream condition and pollution or land use change elsewhere in the watershed and can be useful for tracking performance after restoration.

Overall Project Description: the Bay Area Macroinvertebrate Bioassessment Information Network (BAMBI) includes scientists, agency representatives and community-based monitors interested in promoting the use of BMI bioassessment and sharing experiences and information. With support from BASMAA and SFBRWQCB, a series of background issue papers was developed and presented at BAMBI's second annual meeting in January 2003, identifying several key needs for improving the usefulness of bioassessment throughout the region:

1. Monitoring of additional sites to fill data gaps, especially reference sites, and statistical analyses of the resulting pooled regional dataset based on established methodologies.
2. Refinement of existing rapid habitat assessment protocols and guidance on their use in conjunction with BMI data.
3. Standardization of data management formats and quality control practices to facilitate analyses of regional data, and support stream classification, metric validation and other aspects of the biocriteria development process
4. Guidance on using BMI data for addressing watershed management questions.

BAMBI participants are continuing their local data collection and other in-kind contributions. Products that will contribute to regional knowledge in FY2003/04 include SFBWRQCB's draft report of BMI and other assessment data from its Surface Water Ambient Monitoring Program and a BASMAA agency's literature review of BMI studies in relation to management questions.

Activities for which funds are requested: Through the San Francisco Estuary Project of ABAG (a local public agency), BAMBI is requesting \$649,000 to implement biocriteria development and support of watershed assessment in the Bay Area through:

1. **Identification of candidate reference sites and standardized sampling for 2 years.** Sites with reference conditions have been underrepresented in sampling efforts to date for two reasons: a) extensive and early urbanization and other land use changes; and b) the focusing of assessment efforts on watersheds that are priorities for management action. SFBWRQCB is completing preliminary GIS map identification of areas likely to contain reference streams; Grant funds would be used for establishing relations with landowners and reconnaissance of approximately 70 sampling sites to meet target data objectives. Field and taxonomic laboratory protocols, including QA/QC will conform to ABL standards. Intensive habitat surveys of up to 40 of these sites will be conducted during one of the two sampling seasons, using protocols from USEPA's Environmental Mapping and Assessment Program (EMAP). To complete two April-May sampling seasons within grant timeline, funding for this task should begin no later than January 2005.
2. **Dataset consolidation and analysis using accepted methods for biocriteria development.** BASMAA is reviewing tasks needed for dataset conversion to a common format used by the ABL. Grant funding would help complete this process and support analyses of the pooled dataset to confirm reference conditions and identify community indices or metrics for incorporation in a preliminary Index of Biological Integrity, following procedures similar to those recently used by the San Diego RWQCB. A variety of exploratory analyses will identify the expected attributes of the BMI community in varying types of streams and conditions of impairment and may support other scientific or regulatory efforts of the SWRCB such as an Aquatic Life Use framework for stream typing.
3. **Stakeholder meetings and information exchange.** Annual meetings of BAMBI are a local adaptation of the California Aquatic Bioassessment Workgroup meetings sponsored by ABL. Requested funds would support: a) logistical support for two to three annual BAMBI

meetings, depending on timing, and posting of products on a BAMBI website;
b) administrative support for an Advisory Work Group (AWG) to carry on work between annual meetings (see below); and c) facilitation for consensus development among stakeholders and technical advisers regarding technical and regulatory aspects of biocriteria development in the region.

4. **Refined approaches for relating habitat assessment to BMI community data.** Linkages of BMI community data and habitat parameters are complex and require coordinated studies in multiple watersheds. Grant funds would permit systematic pilot inventories of selected reaches using supplemental habitat assessment parameters ranging from indices of watershed land use and imperviousness, channel type, riparian corridor conditions and indicators of fragmentation to measures of instream habitat structure. Watershed selection and design of the inventory plan will be overseen by the AWG and may incorporate approaches or volunteer participation currently being used by local watershed inventories.
5. **Case studies on BMI monitoring for creek restoration projects.** SFBRWQCB guidelines for projects to restore or rehabilitate stream channels place increasing emphasis on consideration of geomorphic process and habitat quality. This grant-supported pilot would test BMI indicators for monitoring performance of the new generation of projects, by reviewing up to 4 local projects addressing channel function or instream habitat. Activities would include sponsoring discussions with project managers and stakeholders to identify long-term objectives and resources for the watershed, and preparation of case study reports with recommendations for further collection and integration of bioassessment data. Candidate watersheds will be selected by the AWG based on several criteria: a) representative of urban or mixed land use; b) opportunities for participation by community stakeholders; and c) past or planned BMI monitoring activities in the pre-project phase. Eligible example projects include Sausal, Mission and Novato Creeks.
6. **Guidance for local managers and educational or creek groups.** In addition to disseminating the above documents through meetings and the BAMBI website, funded outreach and assistance activities will include: a) workshops and trainings, using models already developed by the Sustainable Stewardship Land Institute for the citizen-level CSBP, or by the Watershed Assessment Resource Center (WARC) for the CA Streamside Biosurvey developed by SWRCB; b) technical assistance sessions with watershed managers or creek groups already using BMI assessment, tailored to the needs of the stakeholders and watershed conditions as suggested in WARC's 2003 Implementation Plan.

All tasks will be directed by the BAMBI AWG comprising representatives of SFBRWQCB, BASMAA, other local stakeholders and the ABL (see table below). Other interested agencies, university or community representatives will be invited to participate in planning and review of the workplan and products. Case studies and other watershed-based activities will be coordinated with WARC for best use of available funds and to avoid duplication of effort. Advisor participation, continuation of existing sampling programs by BASMAA agencies, and participation in annual meetings would be in-kind contributions during the project period.

Relation to CALFED goals and objectives: Proposed BAMBI activities will promote the following objectives of the CALFED Watershed Program:

- Refinement of standardized and regionally appropriate protocols
- Improved assessment coverage of watersheds in the San Francisco Bay region

- Improved abilities of local communities to assess and manage watersheds
- Enhanced education and outreach efforts incorporating information about resident BMIs and their dependence on watershed processes

Information sharing and collaboration among agencies, researchers and watershed groups
The project will also support CALFED water quality and ecosystem restoration objectives by developing examples and guidance for using BMI data to assess aquatic life support and the performance of restoration projects.

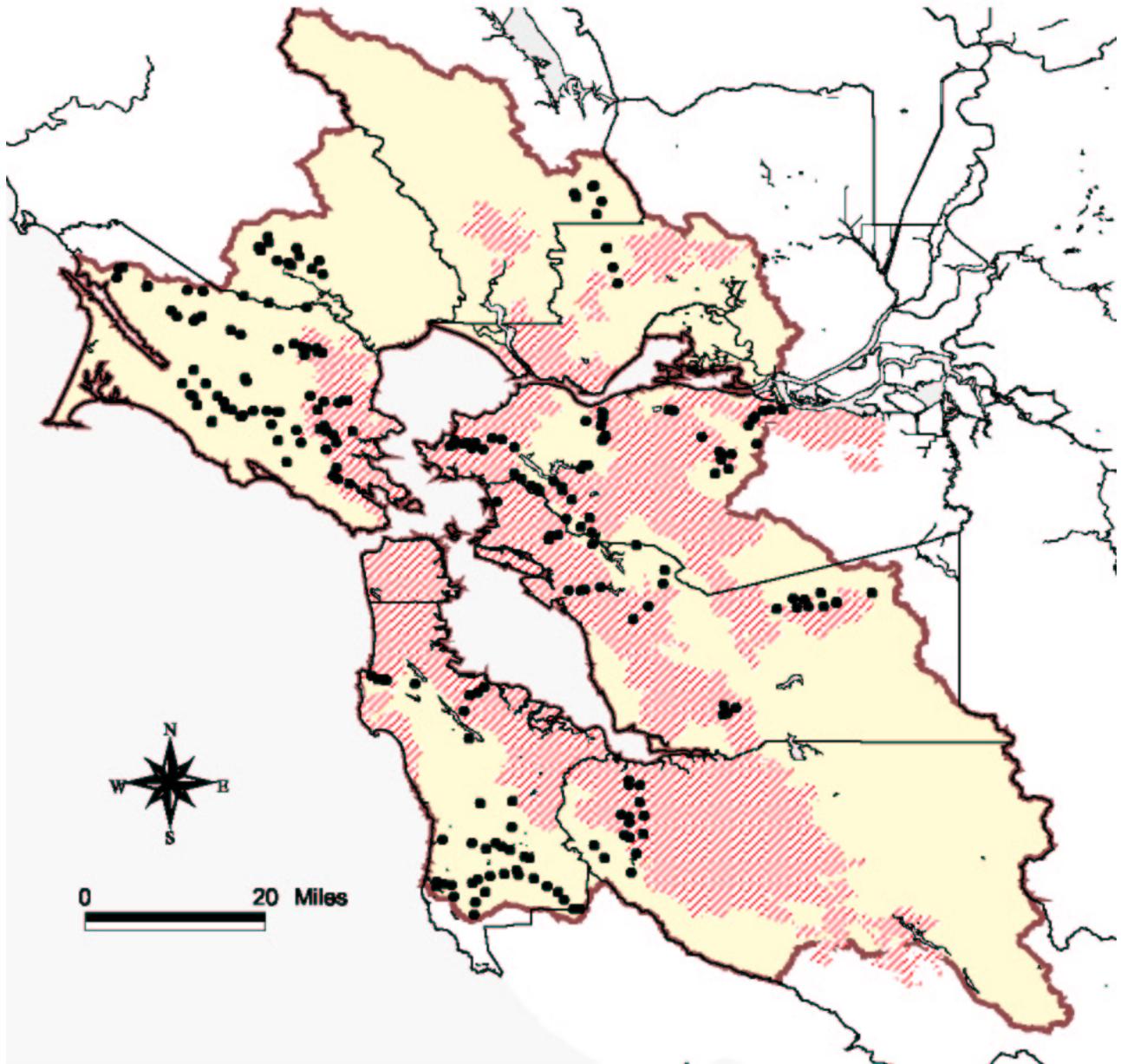
Expected benefits of project and proposed measures of effectiveness:

- Scientifically supported biocriteria framework, measured by production of draft IBI report, habitat correlates report, and supporting data analyses accepted by AWG and technical advisors.
- Stakeholder consensus and active participation in biocriteria development and implementation, as measured by participants in BAMBI meetings and review of reports, and interest in incorporating recommendations in further watershed assessments.
- Toolkits for local managers, measured by positive response of partners in watershed case studies and production of guidance materials on conducting bioassessment studies and interpreting data.
- Dissemination of information and models for using BMIs in ongoing monitoring of stream restoration projects, measured by completed case studies, participation of watershed managers in workshops or consultation sessions, or BAMBI meetings, and website posting.
- Wider community understanding of how microhabitat and stream processes interact to provide suitable homes for “critters”, measured by volunteer participation in inventories and workshops, and dissemination of training materials and web-based information to diverse communities.

Cooperating agencies and stakeholders: Active project participants will include:

Entity	Role and contributions	Contacts
ABAG	Contract administration	Marcia Brockbank
BASMAA	BAMBI coordination, annual meetings, website	Geoff Brosseau
SFBRWQCB	Reference site identification, development of Index of Biological Integrity	Glynnis Collins, Steve Moore
ABL	Field sampling; data analysis and standards for database and QA/QC; technical advisors	James Harrington, Peter Ode
BASMAA member agencies (see map)	Local watershed monitoring, restoration projects, partnerships with creek groups	Arleen Feng, Chris Sommers, others
WARC	Local workshops, consultation and training for local managers & groups	Steve Cochrane, Laurel Marcus
USGS	Technical advisor	James Carter
UC Davis	Technical advisor	Michael Johnson

Other BAMBI participants include water supply agencies (see map), educational and volunteer groups (Friends of the San Francisco Estuary, North Bay Riparian Station, Sonoma Ecology Center, and Math/Science Nucleus), and other resource agencies including the Alameda NRCS/RCD, USDA Forest Service and the National Park Service.



 **Project area (SFBRWQCB)**

 **Sampling sites 2000-2003
(except VSFCD)**

 **Urban areas**

Water agency participants in BAMBI:

East Bay Municipal Utility District
Marin Municipal Water District
San Francisco Public Utilities Commission
Santa Clara Valley Water District

BASMAA agencies:

Alameda Countywide Clean Water Program
Contra Costa Clean Water Program
Fairfield-Suisun Urban Runoff Management Program
Marin County Stormwater Pollution Prevention Program
San Mateo Countywide Stormwater Pollution Prevention Program
Santa Clara Valley Urban Runoff Pollution Prevention Program
Vallejo Sanitation and Flood Control District