

# **Benthic Index of Biotic Integrity (B-IBI) for San Francisco Bay Area Creeks**

*Project Update*  
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# Background

- **Goal:** To develop a assessment tool that will provide an initial evaluation of the status of aquatic life uses in San Francisco Bay Area creeks, and help inform and direct our use of benthic macroinvertebrate communities as water quality indicators in the region.
  
- **Potential Users:**
  - Stormwater Programs
  - Flood Control Agencies
  - Water Districts
  - Regional Water Board
  - Local Watershed Groups
  - Resource Agencies
  
- Southern and Northern California IBIs have been developed
  
- BAMBI – IBI Work Plan developed in 2004

# B-IBI Workplan

1. Acquire and Compile Existing Data
2. Standardize and Import into Centralized Database
3. Screen Metrics Used in Southern and/or Northern Cal B-IBIs
4. Establish Preliminary Reference Conditions for Bay Area Creeks (least disturbed sites)
5. Test and Select Metrics
6. Score Metrics
7. Confirm Metrics Using Validation Dataset

# Task #1 – Acquire and Compile Existing Data

- Data from:
  - Stormwater Programs
  - SWAMP
  - Friends of Napa River
  - Sonoma Ecology Center
  - Contra Costa Citizen's Monitoring Program
  
- Spring 2000-2006
  - 2007 for Contra Costa
  
- Total of 722 Data Points from 477 Sites
  - Greatest number of sampling events at a single site = 5
  
- Data Quality Criteria- must have used CSBP



# Collaborating Programs/Organizations

Program/Organization	# of Events
Alameda Stormwater (ACCWP)	78
Contra Costa Citizens (CCCBMI)	88
Contra Costa Stormwater (CCCWP)	164
Napa River (ICARE)	66
Marin Stormwater (MCSTOPPP)	86
San Francisco Water Board	167
Santa Clara Stormwater (SCVURPPP)	72
Sonoma County (SEC)	27
San Mateo Stormwater (STOPPP)	24
<b>Total</b>	<b>722</b>

# Task #2 – Standardize Data and Enter into Database

- Most data received in Excel spreadsheets
- Cal EDAS – Access-based database
- Standardization
  - CSBP pre-2003
    - 3 riffles @ 300 each (no composite)
    - 18 ft<sup>2</sup>
  - CSBP post-2003
    - 3 riffles @ 500 composite
    - 9 ft<sup>2</sup>
  - Monte Carlo Function in Cal EDAS
    - All data standardized to post-2003 (500 composite)



# ECOLOGICAL DATA APPLICATION SYSTEM

## CaIEDAS



**Version 3.2.4**

last Modified 11/10/04

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CaIEDAS v3 is a custom database application for use with Microsoft Access XP®. Microsoft, Windows, and Access are trademarks of the Microsoft Corporation.  
This application is regularly being updated and is subject to change.

### Select the metrics you would like to include

Available

Selected

- Cumulative EPT Taxa
- Cumulative Taxa
- EPT Index (%)
- EPT Taxa
- Number Amphipoda Individuals
- Number Baetidae Individuals
- Number CF + CG Individuals
- Number CF + CG Taxa
- Number Chironomidae Individuals
- Number Chironomidae Taxa
- Number Chironominae Taxa
- Number Coleoptera Taxa
- Number Collector Filterer Individuals
- Number Collector Filterer Taxa
- Number Collector Gatherer Individuals
- Number Collector Gatherer Taxa
- Number Corbicula Individuals
- Number Crustacea + Mollusca Individuals
- Number Crustacea Individuals
- Number Diptera Individuals
- Number Diptera Taxa
- Number Elmidae Individuals
- Number Elmidae Taxa
- Number Ephemerelellidae Taxa



Description of Selected Metric:

Cancel/Done

< Back

Next >

Create Report

Stations  
Currently in  
Cal EDAS



# Step #3 – Screen Metrics Used in Southern and/or Northern Cal B-IBIs

- **Test 11 (N & S) metrics used in N. & S. California B-IBIs on Contra Costa and Santa Clara County Data**
  1. Develop pool of least disturbed sites based on qualitative PHAB scores and BPJ.
  2. Calculate and evaluate 11 metrics for:
    - Sufficient ranges to allow scoring
    - Discrimination between least disturbed and test sites
      - Visual evaluation of box-whisker plots
      - Statistical evaluation of differences in populations

# Step #3 – Screen Metrics Used in Southern and/or Northern Cal B-IBIs

## ➤ Results:

- Least disturbed sites (quasi reference)
  - Contra Costa – 11 sites (some intermittent)
  - Santa Clara – 8 sites (all perennial)
- 5 of 11 metrics had sufficient ranges and discriminatory power and were selected for Contra Costa and Santa Clara Counties
- Metric scoring differed for each County

# Comparison of California B-IBIs Metrics

Metric	N. Cal (8)	S. Cal (7)	CCC (5)	SCC (5)
EPT Richness	X	X	X	X
Coleoptera Richness	X	X		
Diptera Richness	X		X	X
Predator Richness		X	X	X
% Non-Insect Taxa	X	X	X	X
% Non-Gastropoda Individuals	X			
% Intolerant Individuals	X	X		
% Tolerant Taxa		X		
% Predator Individuals	X			
% Shredder Taxa	X			
% Collector Individuals		X	X	X

# Variations in Metric Scoring

Metric	CCC	SCC
EPT Richness	0 to >9	<2 to >21
Diptera Richness	<2 to >5	<2 to >10
Predator Richness	0 to >9	<2 to >12
% Non-Insect Taxa	>66 to <18	>74 to <12
% Collector Individuals	>99 to <79	>99 to <49

- **Greater ranges in Santa Clara County data for nearly all metrics!!**

# Step#4 Establish Preliminary Reference Conditions for Bay Area Creeks

## Northern & Southern California IBI's

1. All sites screened using GIS (ATtILA) for land use, population density and road density at four spatial scales:
  1. Entire watershed upstream (watershed scale)
  2. 1 km upstream area (local scale)
  3. 100 m riparian zone on each side of all streams in watershed upstream
  4. 100 km riparian zone in 1 km upstream area
2. Subjective thresholds established for eliminating sites
3. Sites passing thresholds then further screened based on reach-scale conditions (bank instability, dams, etc.)

# Reference Site Pilot Study

## ➤ **Contra Costa County**

- 120 sites
- Least disturbed sites specifically sought out and sampled
  - Kellogg/Mallory Creek (Intermittent)
  - Upper Marsh Creek (Intermittent)
  - Mitchell Creek (Perennial)
  - Las Trampas Creek (Perennial)

## ➤ **GIS-based approach compared to PHAB and Best Professional Judgment Approaches**

# Reference Site Pilot Study

## ➤ Results

- **GIS Approach (20 sites)**
  - < 2.5% upstream urban land use (5km)
  - < 25% impervious cover (5km)
  - 5km and total watershed areas nearly identical for most sites
- **PHAB Approach (11 sites)**
- **Best Professional Judgment Approach (8 sites)**
- **Total of 26 sites selected**
  
- **Agreement between approaches**
  - 3 sites selected using all 3 methods
  - 7 sites selected using 2 or 3 methods
  - 16 sites selected using only 1 method
  
- **Take home message – Use combination of methods**

# Step#4 Establish Preliminary Reference Conditions for Bay Area Creeks

## ➤ Bay Area Approach

- Similar to those used in N & S California
- Region-wide GIS and local knowledge
  1. All sites screened using GIS (ATtILA) for land use and road density at two spatial scales:
    1. Entire watershed upstream (watershed scale)
    2. 1 km upstream area (local scale)
  2. Subjective thresholds established for eliminating sites
  3. Sites passing thresholds then further screened based on local knowledge of reach-scale conditions, AND additional sites added based on local knowledge.

# Next Steps

5. Complete least disturbed site screening to develop pool of reference sites
6. Evaluate reference sites for natural variation based on geography, ecoregion, elevation, precipitation, etc..
  - Need for multiple B-IBIs?
7. Separate reference and test pools into development and validation datasets
8. Test and select metrics
  1. Redundancy (Pearson's Coefficients)
  2. Discriminatory Power
9. Score Metrics
10. Confirm Metrics Using Validation Dataset
11. Re-evaluate/modify over time

# Schedule

- Step #4 – Reference Conditions
  - Winter/Spring 2008
- Step #5 – Testing Metrics
  - Winter/Spring 2008
- Step #6- Evaluate Natural Variation
  - Spring 2008
- Remaining Steps
  - Summer/Fall 2008

