

Stream Health Assessment and Index Development in Malibu Creek



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Heal the Bay

Sponsored by the California Coastal Conservancy and the SMBRC



Malibu Creek Watershed

- 35 miles West of Los Angeles
- Second largest watershed draining to the Santa Monica Bay.
- Only 12% of the area has been developed





3-Pronged Program Design



Water Chemistry



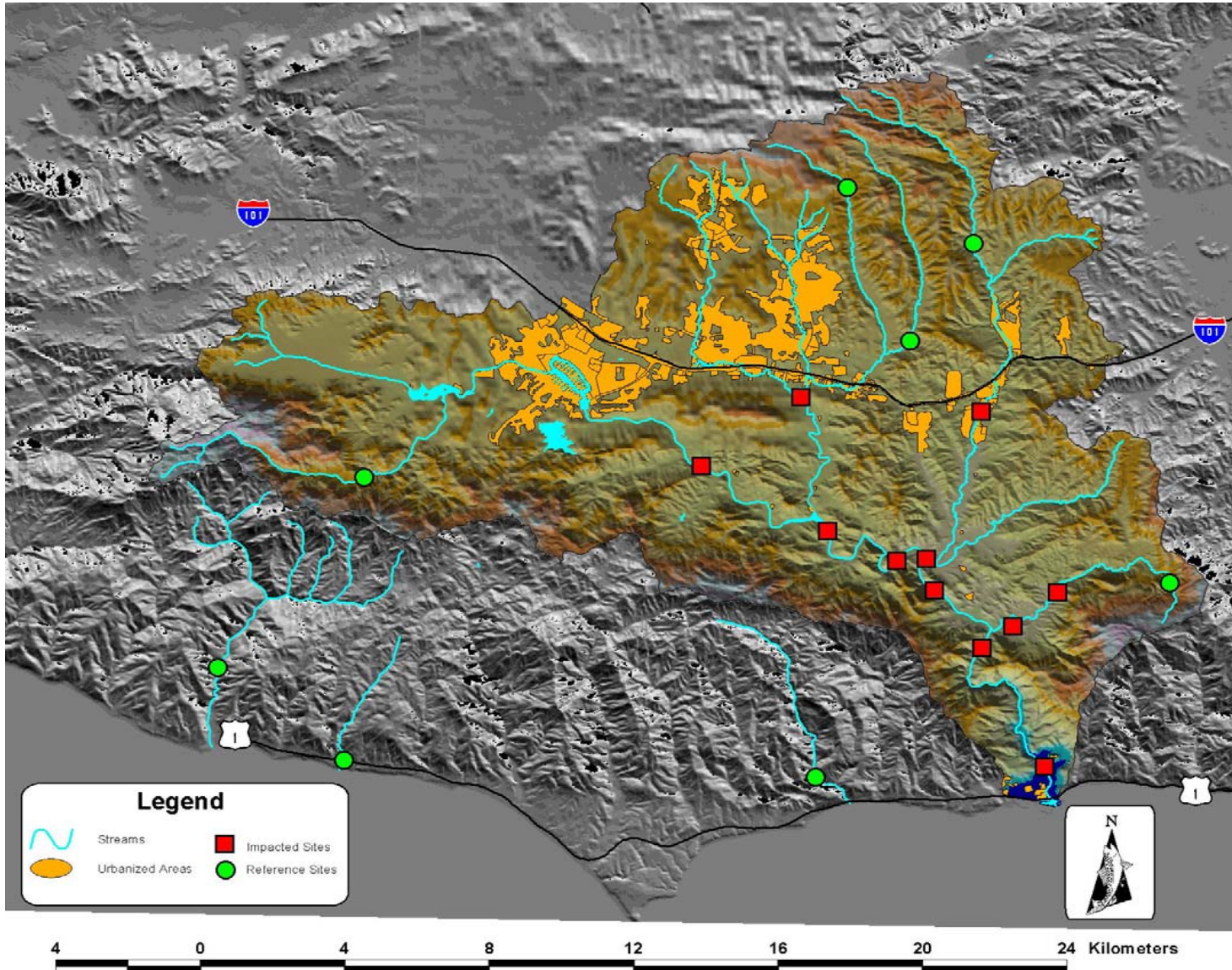
Stream Walk

**Benthic
Macroinvertebrates**





Water Chemistry & BMI Sampling





Stream Walk Surveys

- **Unstable Stream Banks**
- **Stream Bank Modifications**
- **Fish Barriers**
- **Dump Sites**
- **Exotic Invasive Vegetation**
- **Impacting Land Uses**
- **Discharge Points and Outfalls**
- **Algae & Fine Sediment**
- **In-stream pool habitat (Level 4 CDFG)**



Discharge Points and Outfalls



Unstable Stream Banks

Data are recorded with a Global Positioning System, field sheets and digital images

Stream Walker mapping unstable stream bank and associated field sheet.



Date: 10 NOV 2000 Stream Name: COLD CREEK
 Time: 12:30 PM Recorder: Aquaticum
 (GPS) Location Latitude: 32°41'40" Longitude: 118°11'27"
 Side of Stream (left or right looking downstream) Lf Rt
 Photo #(s) 17, 18
Streambanks Description
 Streambanks Type Left: C Right: A

A: shallow slope	B: steeply sloped	C: undercut banks
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% Vegetative Cover of Streambanks Left: 25 % Right: 50 %

0-25%	25-50%	50-75%	75-100%
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Landuse Associated with Unstable Bank (if identifiable):
 SFR MFR AG OV AH EQ IND COM V
 SFR = houses MFR = condos, apartments, townhouses
 AG = agriculture OV orchards/vineyards
 AH = livestock EQ = horses IND = manufacturing
 COM = retail/shopping V = undeveloped open space

Conditions of Streambanks (circle A if apparent, B if severe)

- A B loss of vegetative cover
- A B collapsing vegetation
- A B stream banks collapsed
- A B stream banks eroding

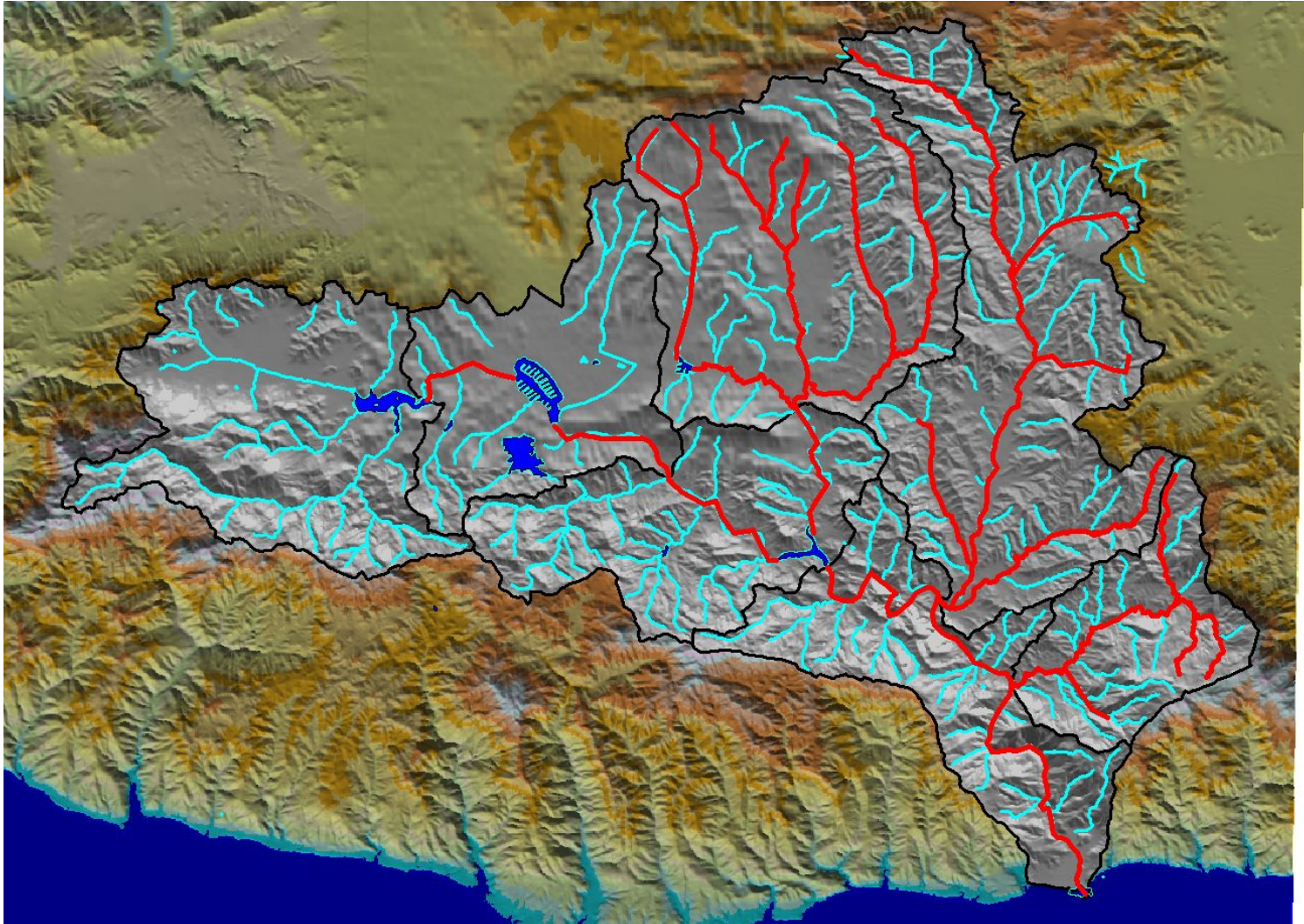
Stream Conditions (circle A if apparent, B if severe)

- A B mud/silt/sand entering the stream
- A B vegetation collapsing into stream
- A B slope collapsing into stream

Describe Area on Backside of this Field Sheet



70 Miles Mapped





Mapped Impairments

**Unstable stream banks: 18.7
(27%)** linear miles of eroding stream
banks



**Streambank Modifications: 19.8
(28%)** linear stream miles are
armored





Mapped Impairments

171 separate fish barriers



636 illegal dump sites





Mapped Impairments

- **Invasive Vegetation: 16.9 (24%)** linear miles of riparian zone impaired
- **20** different types of invasive veg



- **736** discharge points mapped, many causing bank erosion



Mapped Impairments



- **21.7** linear miles (**30.8%**) of streams impaired by algae
- **22.1** linear miles (**31.3 %**) of streams impaired by sediment



A Typical Day's Data





Benthic Macroinvertebrates





Benthic Index of Biotic Integrity

- Developed by CDFG
- Southern coastal California specific
- Monterey to Mexico, to eastern edge of the southern coast ranges
- 72 reference sites, based on land use and local conditions
- 166 test sites
- Divided into development and test sites

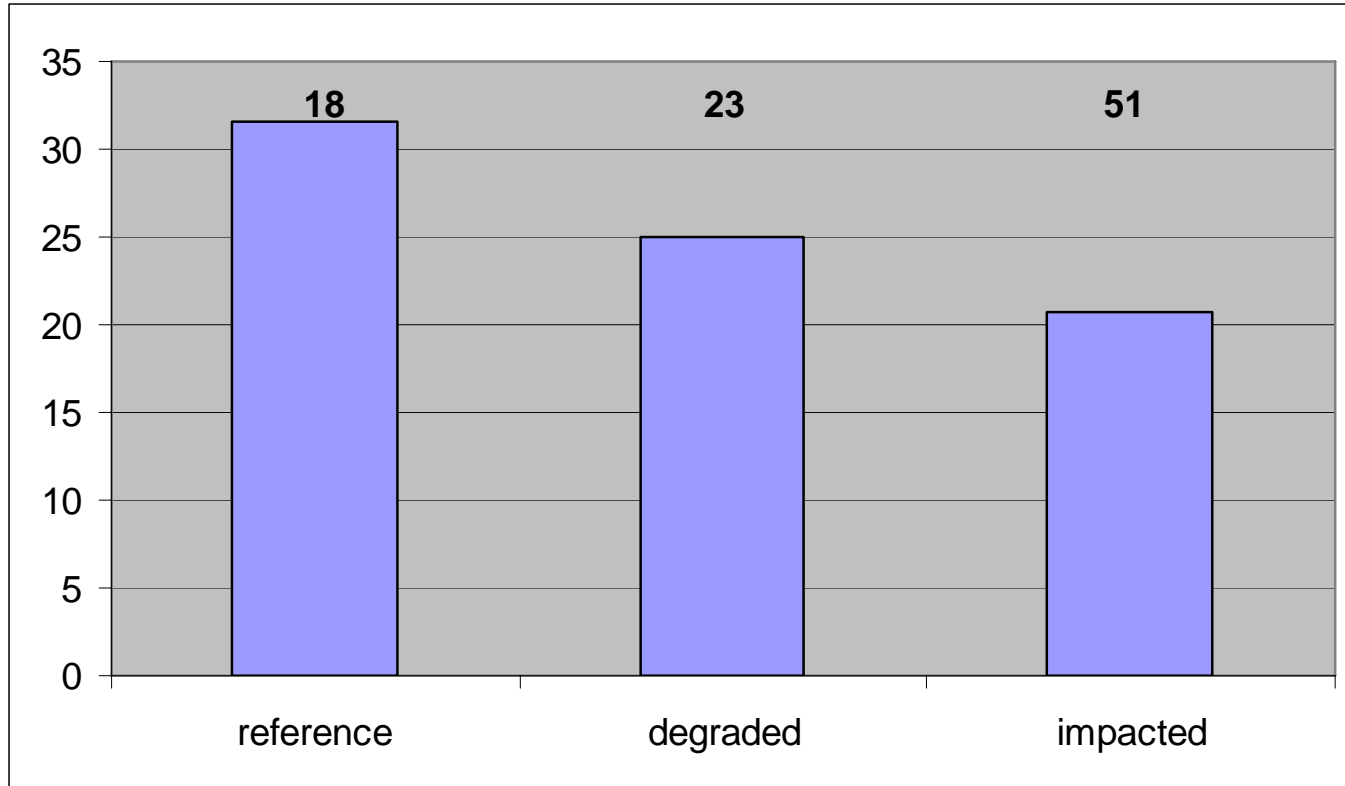


Benthic Index of Biotic Integrity

- Percent collector-gatherer + collector-filterer taxa
- Percent tolerant taxa
- Percent intolerant taxa
- Percent non-insect taxa
- EPT richness
- *Coleoptera* richness
- Predator richness



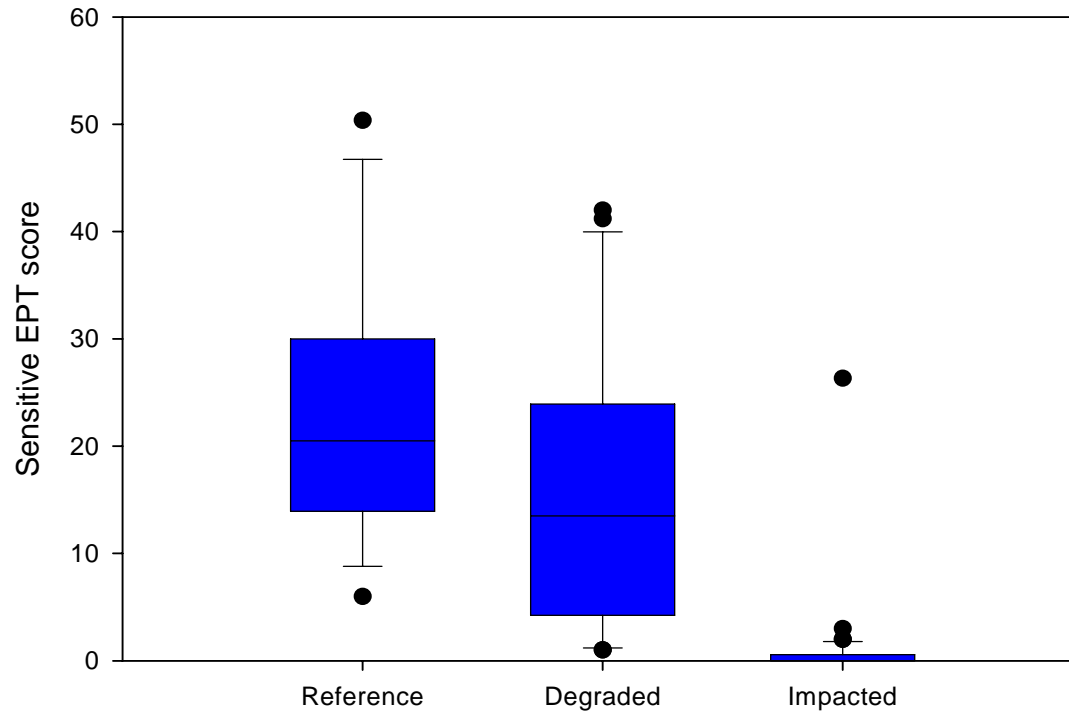
Average IBI Scores



	SE	min	max
reference	9.25	54	92
degraded	11.38	26	72
impacted	11.44	4	73



Benthic Index of Biotic Integrity



Sensitive EPT index was one of the most sensitive metrics in the Malibu watershed.

Also taxa richness, percent intolerant species and percent shredders.



Which aspects of urbanization degraded the BMI community?

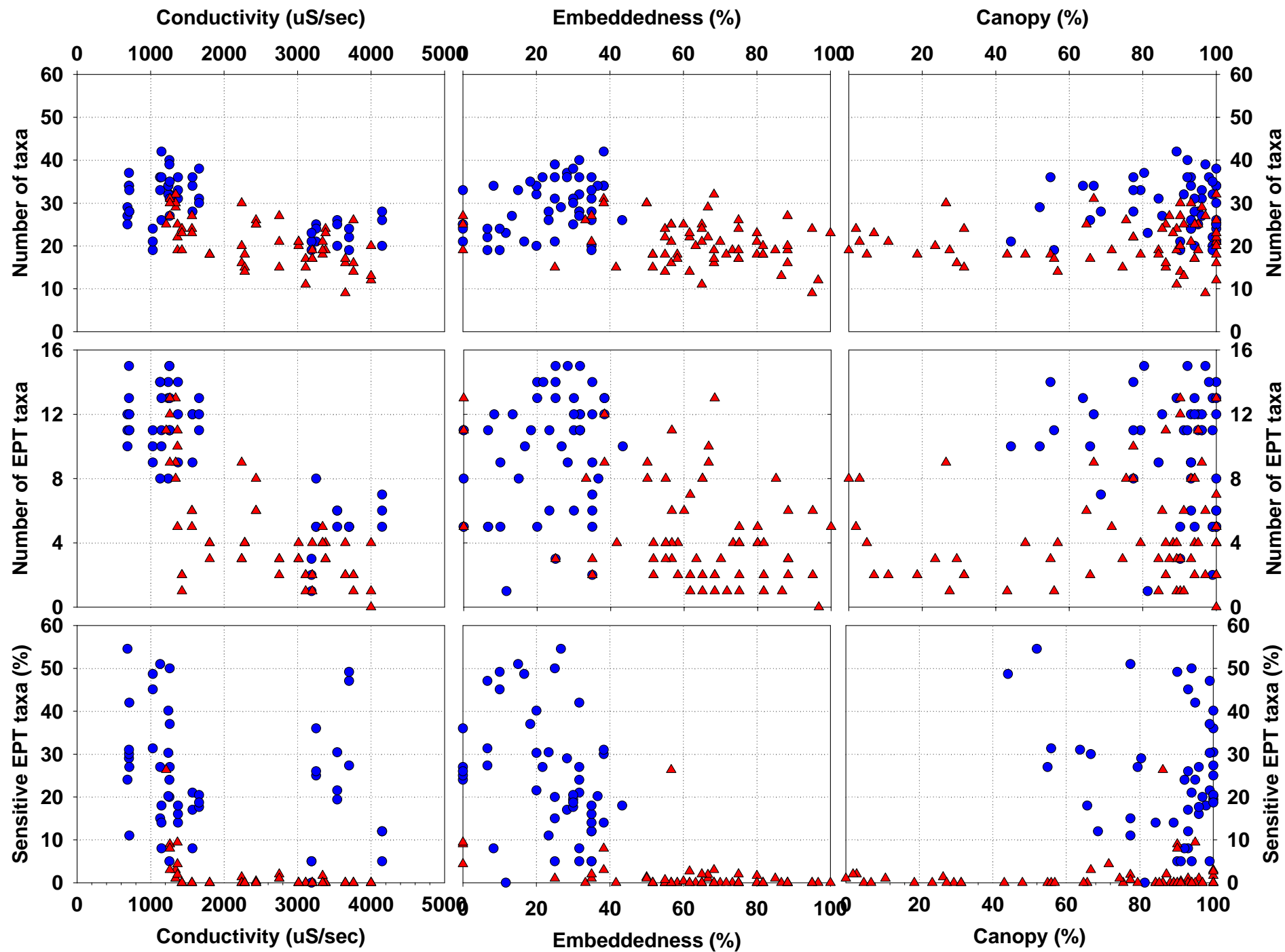
Standardized coefficients of multiple regressions ($p < 0.1$):

	Canopy Cover	Embeddedness	Conductivity	r-squared
TAXA RICHNESS	0.196	-0.287	-0.574	0.673
EPT RICHNESS	0.296	-0.310	-0.656	0.805
SENSITIVE EPT INDEX	0.162	-0.577	-0.173	0.536

Also:

- diatom cover
- velocity
- nutrients
- algal cover
- % fines





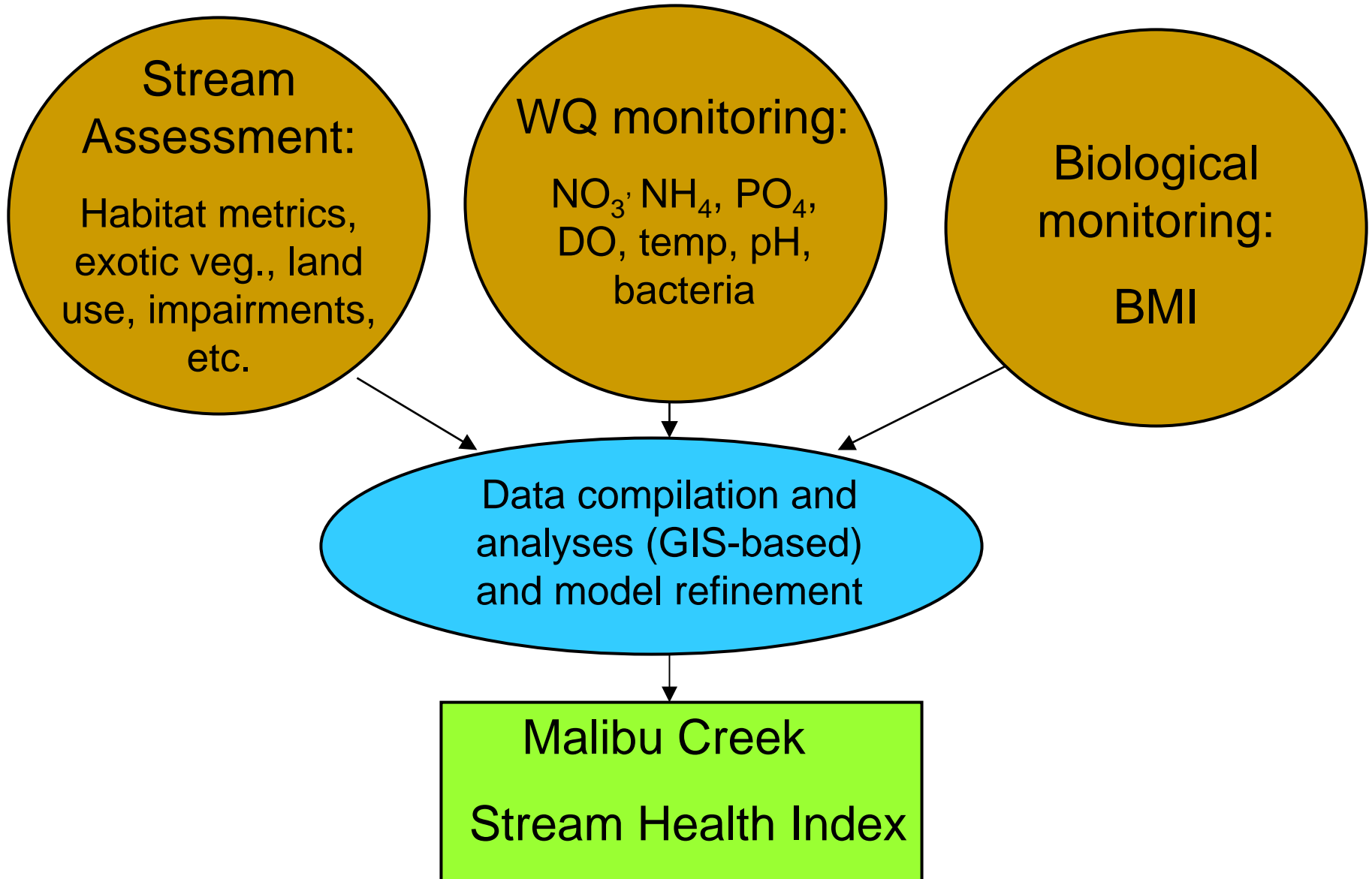


Making Connections

- Impervious surfaces: GIS analysis of upstream percent impervious cover
- Algae, sediment and other habitat measurements: relation to IBI scores
- Recommendations: restoration and protection
- Stream Health Index



Building a Stream Health Index





Stream Health Index

- Water chemistry: nitrate, phosphate, conductivity
- Habitat:
 - Riparian: canopy cover, invasive species
 - Instream: overhanging vegetation, undercut banks
 - Sediment size
- Hydrology: flow velocity
- Biological: BMI, algal cover



What should we do now?

- Stream ordinance: No development within 100 feet of riparian canopy.
- New developments need storm water controls (BMPs) to capture, treat, and infiltrate run off – no excess discharge leaves the site.
- Control nutrient levels in creeks.
- Strategically acquire property, focus on streams.
- Implement Stream Team programs in other watersheds.



Contact information Stream Team

Malibu Cree

m Manager



Email: streamt

Website: www.

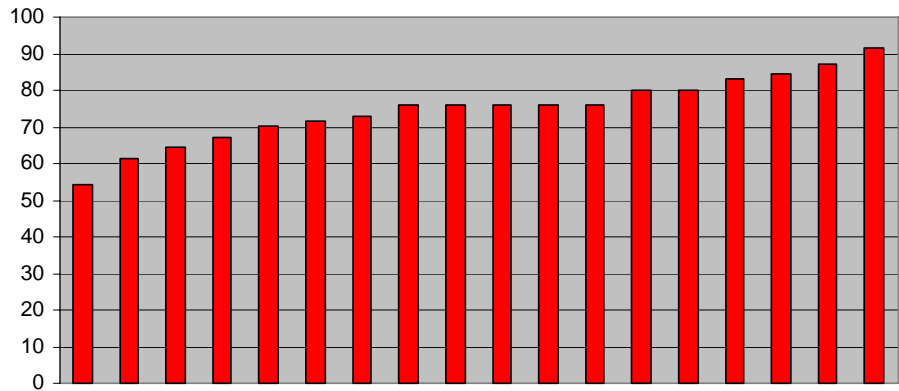
Benthic Index of Biotic Integrity Scores

Site	Spring 2000	Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003	Fall 2003
Solstice Creek SC14				87	76	76	67	70
CC3	80	76	92	76	83	80	84	64
Lachusa Creek LCH18				73	72	76	54	61
Arroyo Sequit AS19				70	72	66	72	70
Cheeseboro Creek CH6			59	57	64		49	
Cold Creek								
CC11	54	46	56	54	49		40	
Las Virgenes Creek								
LV9			72	53	59	26	46	
Palo Comado Canyon PC16			60					
W. Carlisle Creek WC10			57				51	
Stokes Creek STC16					34			
CC2	36		46	73	53		44	
LV13			21	40	26	24	21	27
LV5	29	34	33	33	39	26	20	29
MC1	16	24	26	39	19		26	23
MC12		23	20	37	33	27	21	31
MC15	33	17	24	43	40	24	34	23
Medea Creek MD7	23	26	19	34	23	17	9	9
Triunfo Creek TR17	20		19		19		4	

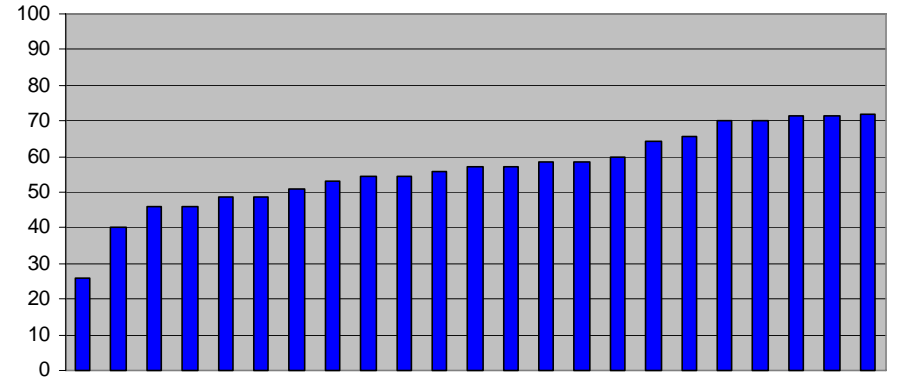


IBI Scores

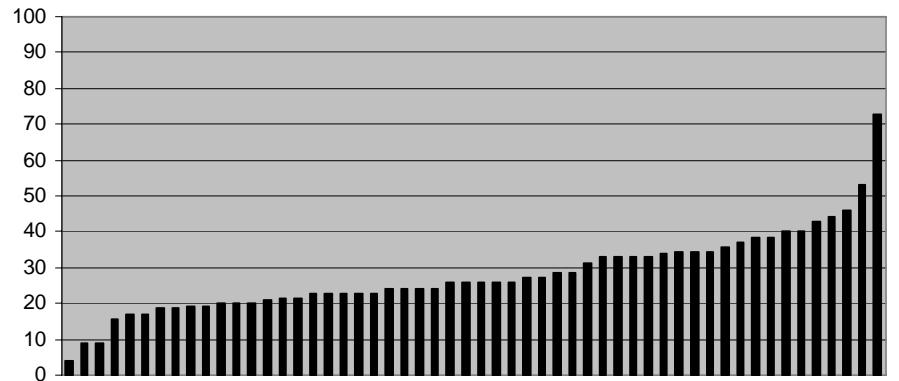
Reference IBI Scores



Intermediate IBI Scores



Impacted IBI Scores



	Sensitive EPT	% intolerant species	% tolerant species	% shredders
Reference sites				
3	35	41	4	30.6
14	17.8	21.3	2.7	11
18	16.4	14.3	2.5	9.9
Degraded sites				
6	27.4	25.6	12	27.5
8	0.6	0.5	0.3	0.4
9	16.1	16.1	17.6	16.5
10	3	2.6	9.9	0
11	6.2	10	4.7	3.5
19	22.8	28.7	4.7	5.4
Impacted sites				
1	0.3	0.8	34.1	0.2
2	8.2	8.3	9	2.7
5	0.1	0.2	23.8	0.5
7	0	0	13.5	0
12	0.3	1.4	6.5	0.3
13	0	0	24.7	0.6
15	0.7	1	15	0.1
17	0	0	7.7	0