

# **SCVURPPP**

## **Watershed Monitoring and Assessment Program**

### **Fiscal Year 2007-08**

### **Monitoring Results and Conclusions**



**Santa Clara Valley**  
*Urban Runoff*  
**Pollution Prevention Program**

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# Multi-Year Monitoring Plan

- **Multi-Year Receiving Waters Monitoring Plan**

- NPDES Permit Provisions C.7(a) and (b)
- FY 02-03 through FY 09-10
- Multi-Year Plan Revised March 1, 2004



- **Monitoring Approach**

- Adapted from Water Board's SWAMP
- Systematic process designed to assist Program in prioritization of studies/management actions
- Based on an indicators approach
- Monitoring levels include:
  - **Tier One** (Screening/Baseline)
  - **Watershed Assessment** (Data Analysis/Problem Id)
  - **Tier Two** (Investigative/Pollutant Specific)

# Screening & Investigative Monitoring

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- **Screening-level Monitoring**

- Sediment Quality Triad (SQT) in Coyote and Lower Penitencia Creek Watersheds
  - *What is the condition of aquatic life uses in Santa Clara Basin Creeks?*

- **Investigative Monitoring**

- Water and Sediment Chemistry and Toxicity in Stevens Creek.
  - *What are the extent, magnitude and causes of toxicity in Stevens Creek?*
  - *What is the intra-annual range and variability of chemical concentrations in bedded sediments in Stevens Creek?*

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# **FY 2007-08**

# **Screening-Level Monitoring**

*Coyote and Lower Penitencia  
Creeks and Tributaries*  
(Year #6 of the Multi-Year Plan)

# Background

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- Contaminant concentrations are relatively stable and below water quality criteria/objectives during non-storm events (SCVURPPP 2007).
- Concentrations during and between storm events are highly variable and extensive resources are likely need to understand range, variability and “average” concentrations.
- Sediment Quality Triad (SQT) study in FY 2007-08 evaluated utility and challenges of using this “weight of evidence” approach.

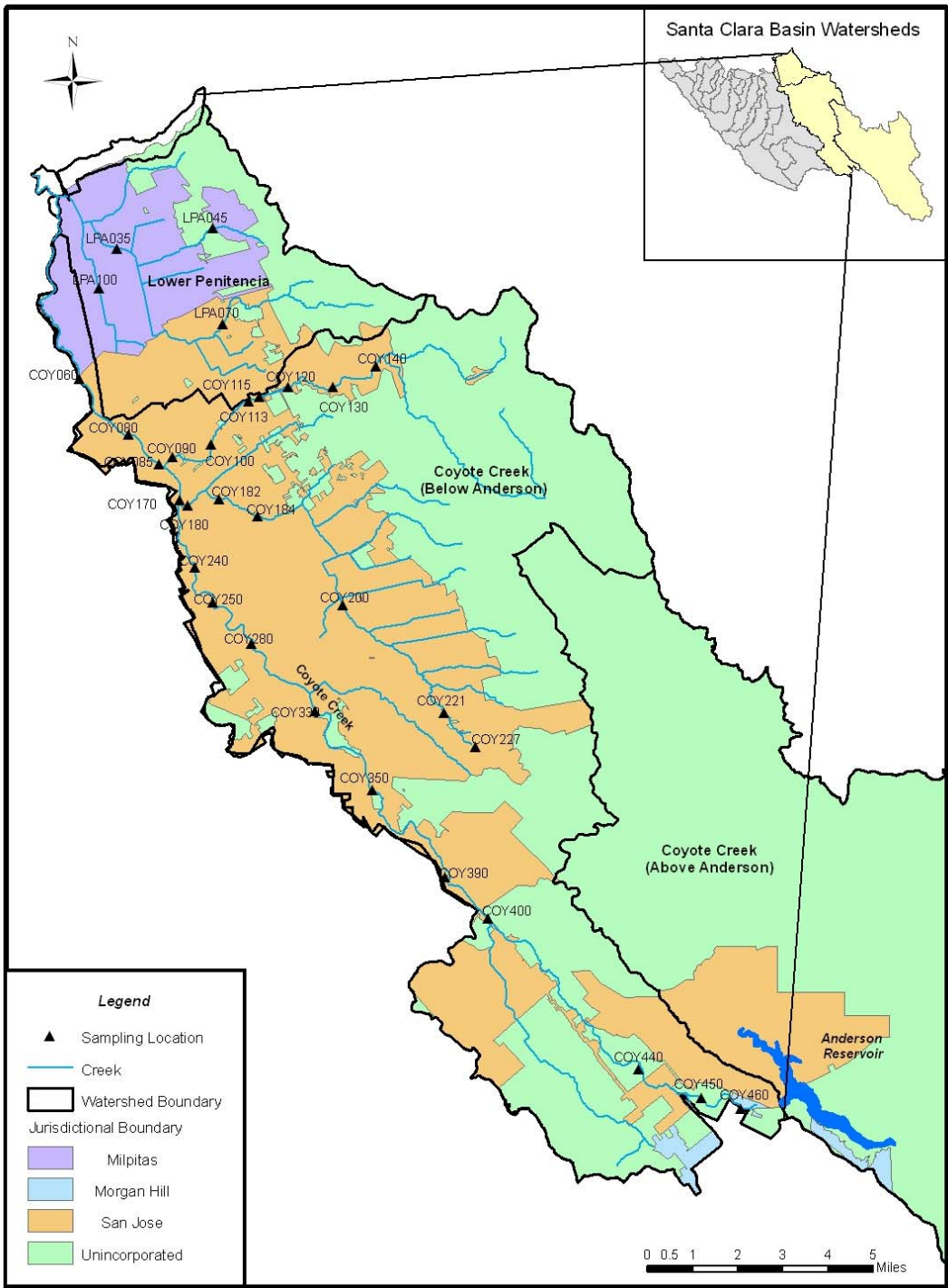
# Weight of Evidence Approach

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- Sediment Quality Triad (SQT)
  - Developed in 1980's for Lakes and Estuaries
  - Uses multiple lines of evidence
    - Stressor and response variables
  - Evaluates degree of benthic ecosystem degradation
  - Can assist in identifying likely causes of impacts

# SQT Lines of Evidence

Category	Line of Evidence	Evaluation Tool
Biological	Benthic Macroinvertebrate (BMI) Bioassessments	Draft Preliminary B-IBI for Santa Clara Basin Creeks
Sediment Toxicity	10-day Bioassays of Bedded Sediment ( <i>Hyalella azteca</i> )	% Survival
Chemistry	Chemical Analyses of Bedded Sediment for Metals, PCBs and Pyrethroids	Mean Sediment Quality Guideline Quotient
Physical Habitat	Qualitative Physical Habitat Assessments	PHAB Score

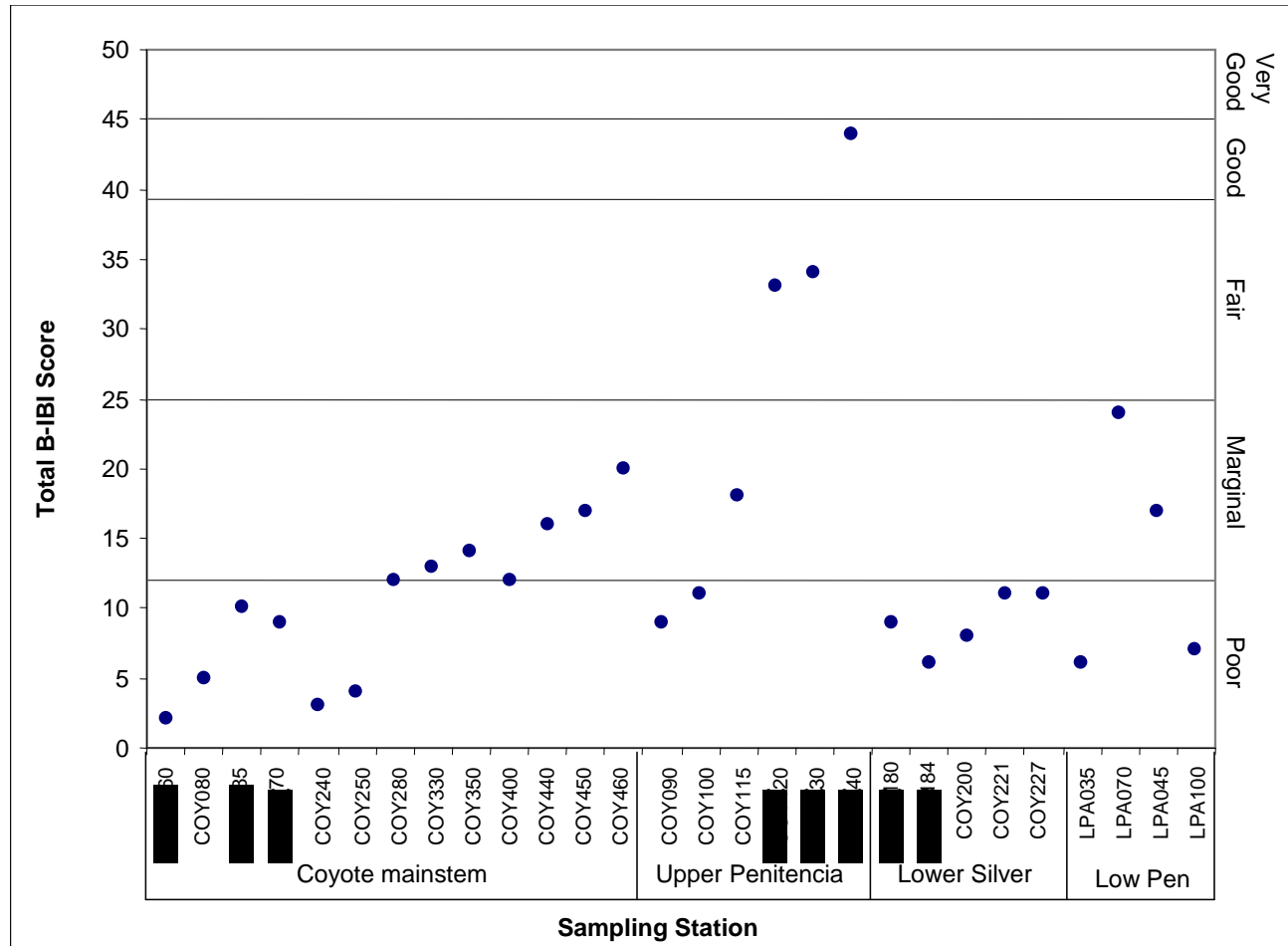


# Screening-Level Monitoring Sites

# Bioassessment Evaluation

IBI Score	# EPT Taxa	% Non-Insect Taxa	# Diptera Taxa	# Predator Taxa	% Collectors
10	≥21	0 - 11	>10	≥12	0 - 48
9	19-20	12 - 19	10	11	49 - 54
8	17-18	20 - 26	9	10	55 - 60
7	15-16	27 - 32	8	9	61 - 66
6	13-14	33 - 39	7	8	67 - 72
5	11-12	40 - 46	6	7	73 - 78
4	9-10	47 - 53	5	6	79 - 84
3	7-8	54 - 60	4	5	85 - 90
2	5-6	61 - 67	3	4	91 - 96
1	3-4	68 - 74	2	3	97 - 99
0	≤2	75 -100	<2	≤2	100
<b>Poor</b>	<b>Marginal</b>	<b>Fair</b>	<b>Good</b>	<b>Optimal</b>	
<b>0-12</b>	<b>13-25</b>	<b>26-39</b>	<b>40-45</b>	<b>46-60</b>	

# Bioassessment Results

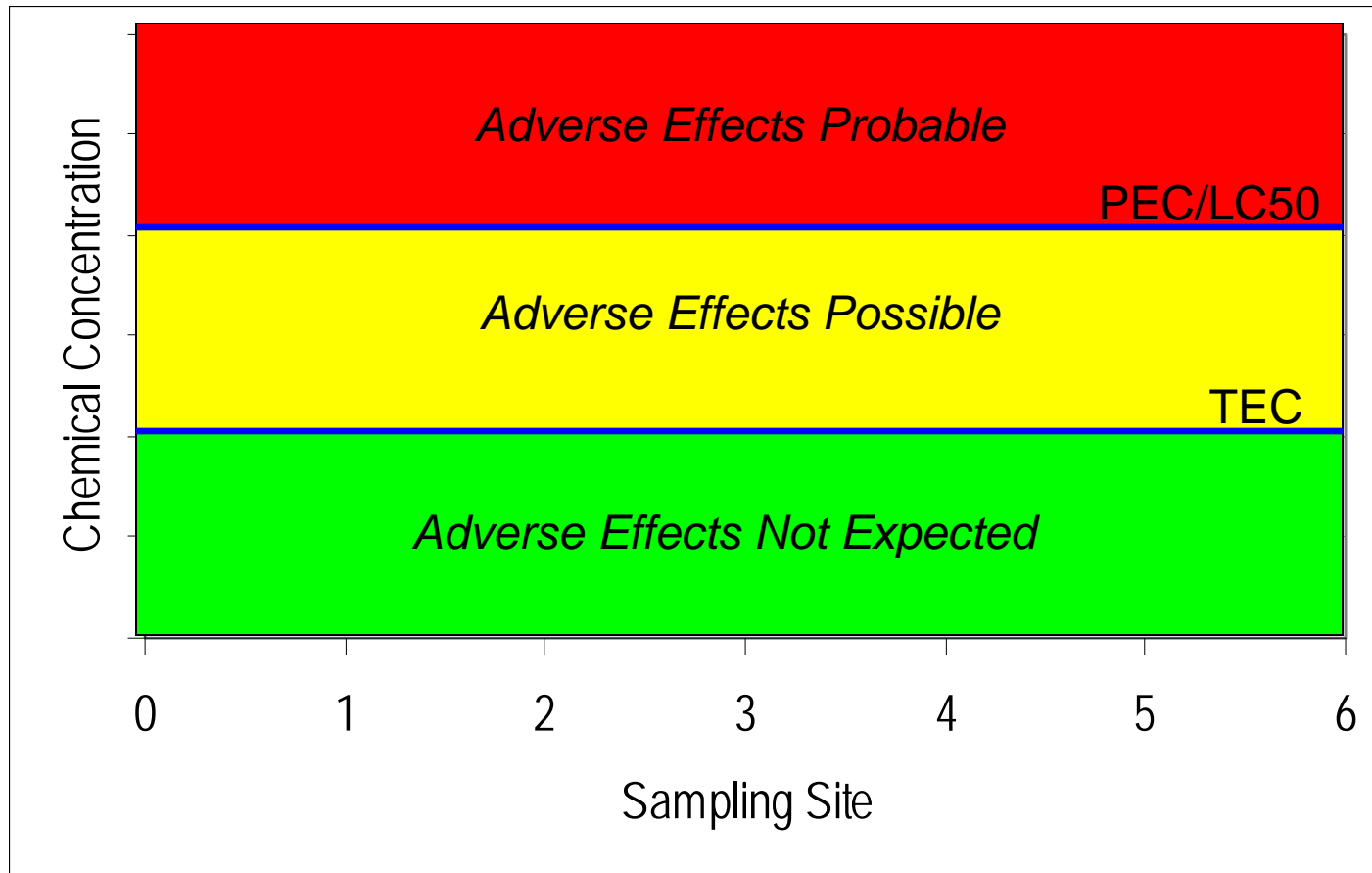


# Sediment Quality Evaluation

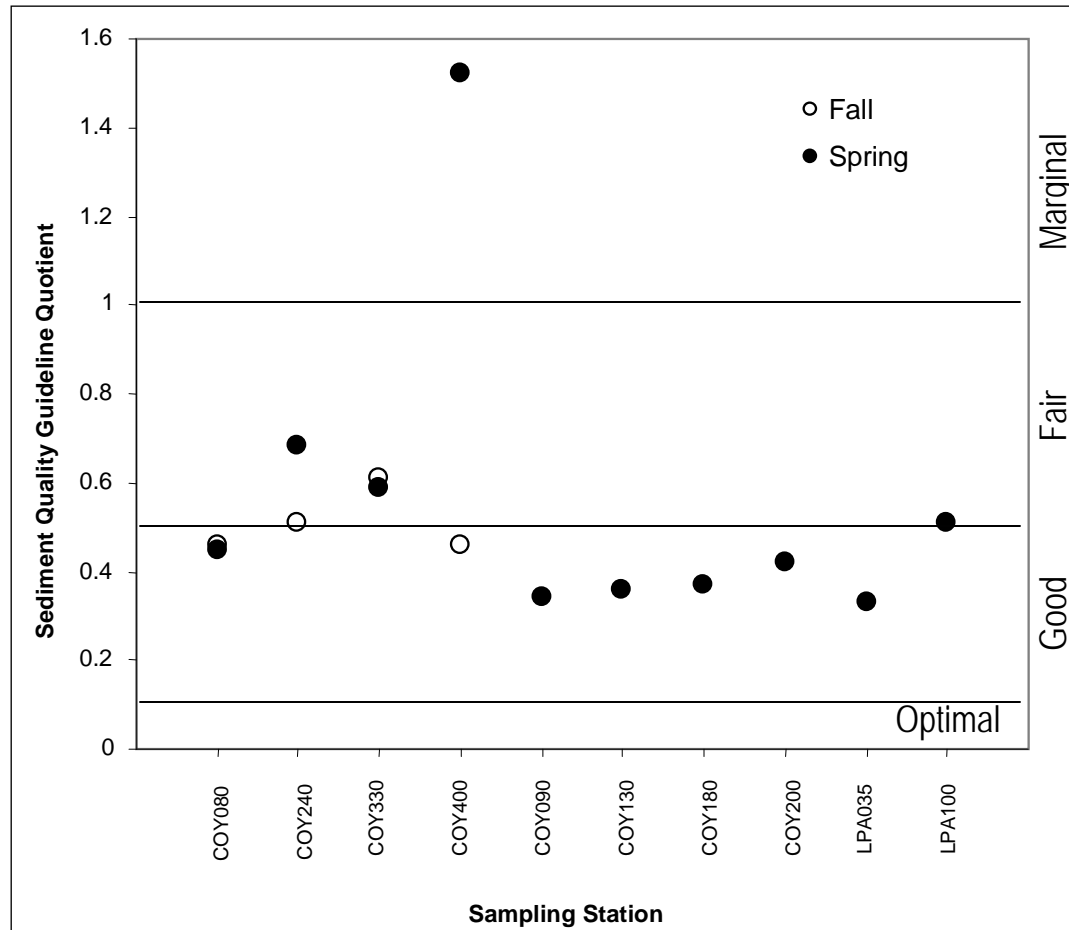
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- **Metals, PCBs and OC Pesticides**
  - **Probable Effects Concentration (PEC):** concentrations above which one would expect to observe some degree of toxic response
  - **Threshold Effects Concentration (TEC):** concentrations below which one would not expect to observe toxic responses
- **Pyrethroid Pesticides**
  - **Lethal Concentration 50 (LC50):** concentrations that are on average lethal to 50% of organisms exposed.

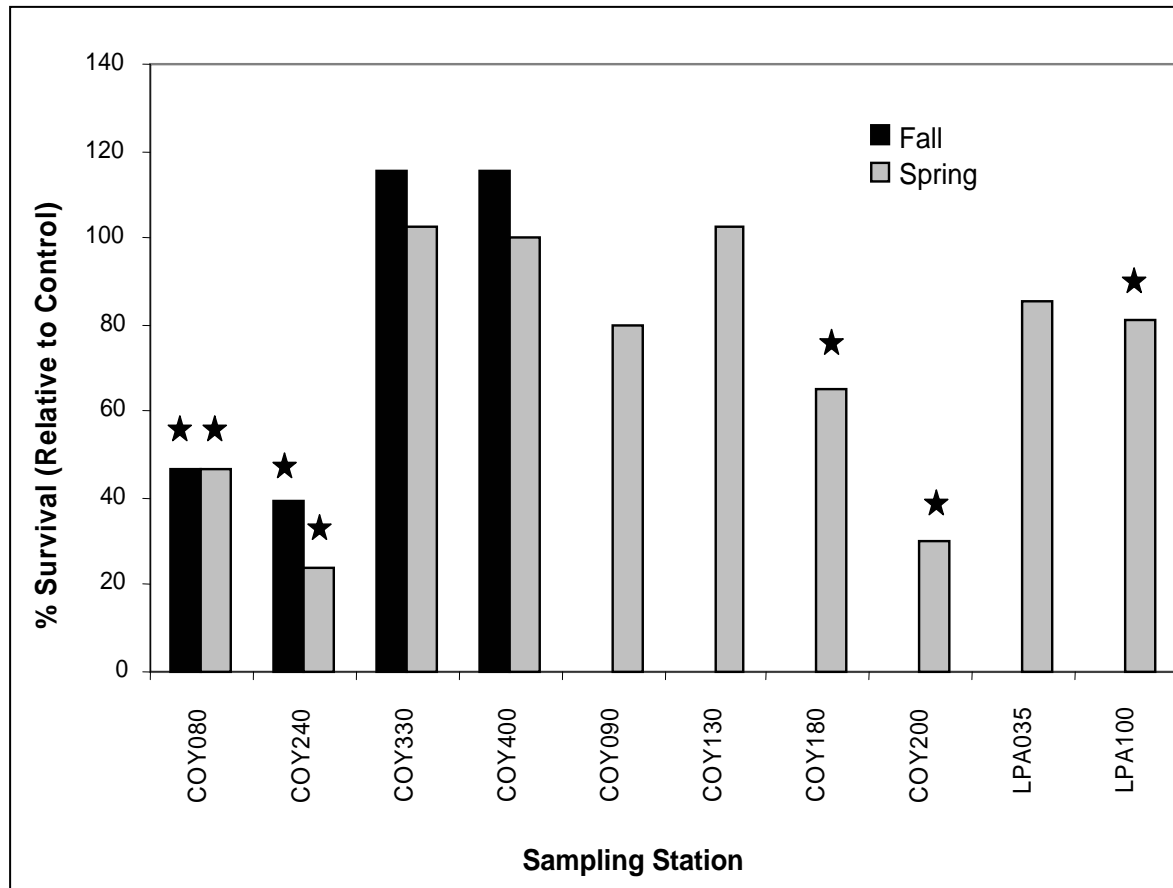
# Sediment Quality Evaluation



# Sediment Quality

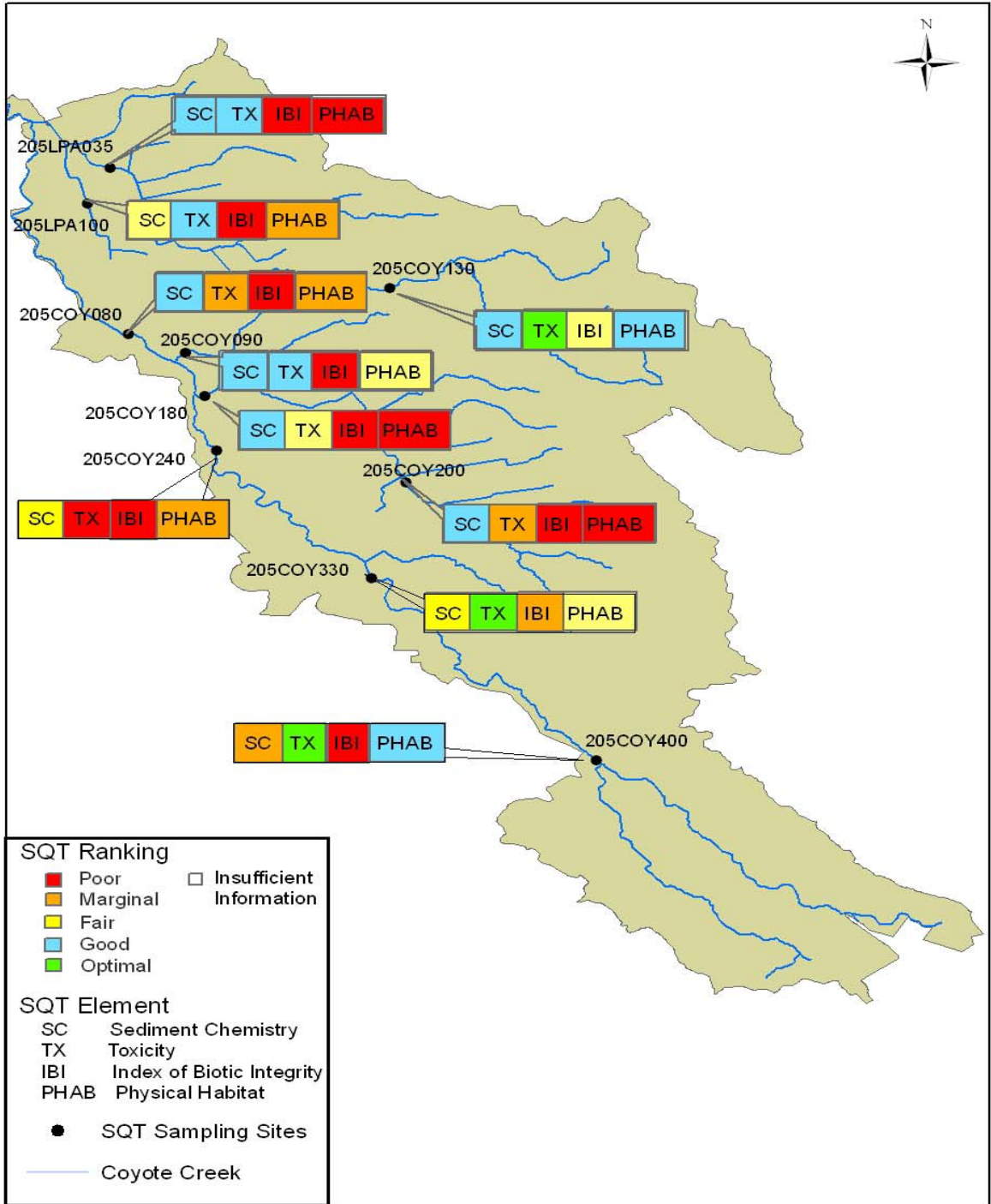


# Sediment Toxicity



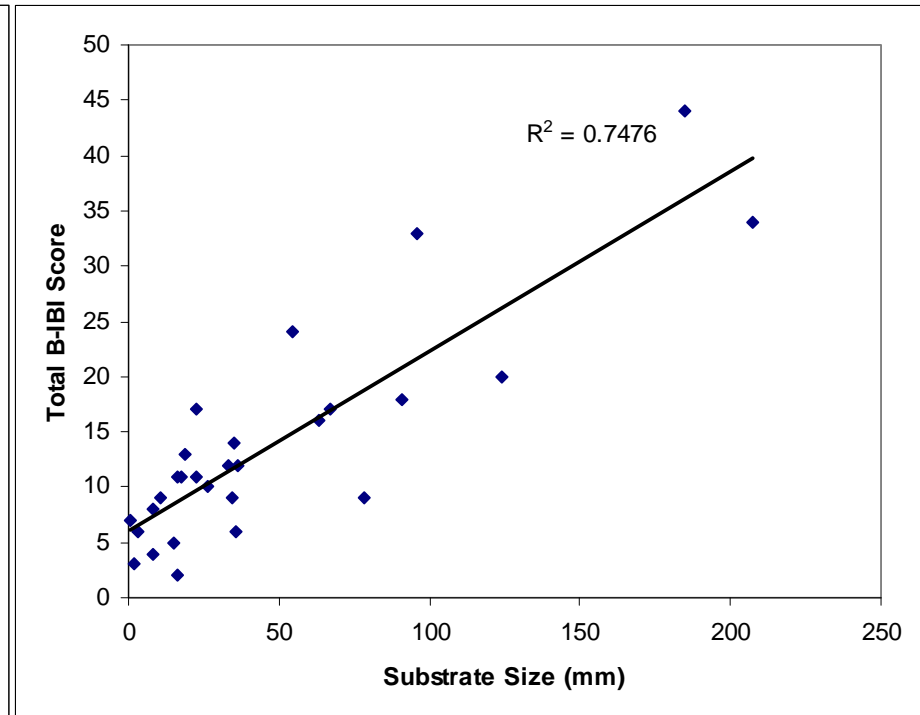
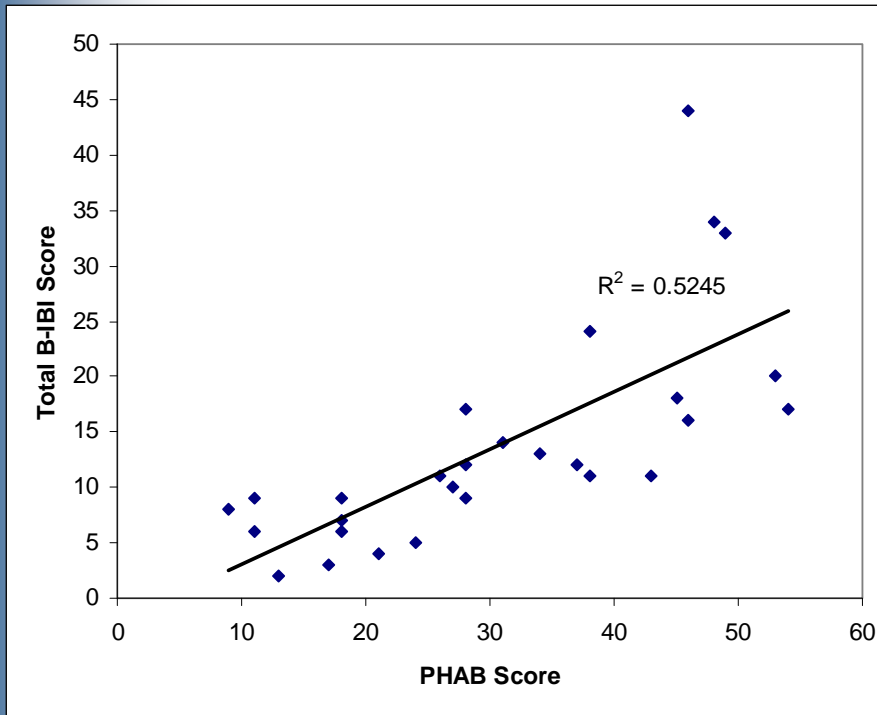


# Sediment Quality Triad Results



# Variables Explaining Biological Integrity

## Reach-scale Physical Habitat



# Potential Causes of Toxicity

Sampling Site	Sediment Toxicity (% Survival Relative to Control)	Pyrethroid Concentration Greater than PEC(SQGQ) <sup>1</sup>			
		Bifenthrin	Cyfluthrin	Cypermethrin	L-Cyhalothrin
Coyote Creek					
COY080	<b>Yes (47%)</b>	<b>Yes (1.22)</b>	-	-	-
COY240	<b>Yes (24%)</b>	<b>Yes (1.25)</b>	No (0.29)	<b>Yes (1.21)</b>	No (0.03)
COY330	No	-	-	-	-
COY400	No	-	-	-	-
Coyote Creek Tributaries					
COY090	<b>Yes (80%)</b>	No (0.61)	-	-	-
COY130	No	-	-	-	-
COY180	<b>Yes (65%)</b>	-	-	<b>Yes (1.25)</b>	-
COY200	<b>Yes (30%)</b>	No (0.96)	-	No (0.33)	-
Lower Penitencia Creek					
LPA035	No	-	-	-	-
LPA100	<b>Yes (81%)</b>	<b>Yes (1.32)</b>	-	-	-

# Inter-annual Variability

Site	Sediment Quality		Sediment Toxicity		Biological Integrity		Physical Habitat Quality	
	2007	2008	2007	2008	2007	2008	2007	2008
COY080	Good	Good	Good	Marginal	Poor	Poor	Fair	Marginal
COY240	Fair	Fair	Marginal	Poor	Poor	Poor	Marginal	Marginal
COY330	Marginal	Fair	Optimal	Optimal	Marginal	Marginal	Good	Fair
COY400	Fair	Marginal	Optimal	Optimal	Marginal	Poor	Good	Good

# Conclusions and Recommendations

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## 1. Sediment Quality

- a. Metals do not appear to be at concentrations that one would expect to observe some degree of toxic response.
- b. At least one pyrethroid pesticide was detected at a majority of the sites sampled. Bifenthrin and Cypermethrin concentrations in samples collected in Spring 2008 were above levels that one would expect to observe a significant toxic response.

***Recommendation:*** Continue to monitoring a relative small suite of metals and pyrethroid pesticides in bedded sediment. Compare to adverse effects levels to determine if concentrations may be problematic.

# Conclusions and Recommendations

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## 2. Sediment Toxicity

Toxicity was observed in sediments collected at 6 of 10 sites. The co-occurrence of pyrethroid concentrations above adverse effects levels at these sites suggests that pyrethroids may be the cause of toxicity.

***Recommendation:*** Conduct follow-up analyses at Coyote Creek and/or Lower Penitencia Creek sites to better determine the cause(s) and sources (if possible) of toxicity.

# Conclusions and Recommendations

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## 3. Biological Integrity

Biological integrity in Coyote Creek mainstem appears to be poor to marginal. Upper Penitencia sites had the highest B-IBI scores. BMIs at sites sampled in Lower Silver-Thompson Creek were in poor condition. B-IBI scores appear to be correlated with average substrate size and reach-scale physical habitat quality.

***Recommendation:*** Continue to conduct bioassessments to assess biological integrity and detect long-term changes in Santa Clara Basin creeks. Consider conducting a study (either county-wide or regionally) to determine the optimal sampling design and timeframe.

# Conclusions and Recommendations

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## 4. Sediment Quality Triad (SQT)

SQT provides a robust and holistic method to assessing the magnitude and extent of impacts on aquatic life uses in Santa Clara Valley creeks. Can assist managers in determining what creek sites/reaches have the greatest impacts, and which stressors may be causing the observed biological responses.

***Recommendation:*** As practicable, continue to collect multiple lines of evidence at specific creek sites/reaches to better assess aquatic life use impacts and evaluate causes of biological responses.

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# *Questions?*

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**FY 2007-08**

**Investigative Monitoring Project**

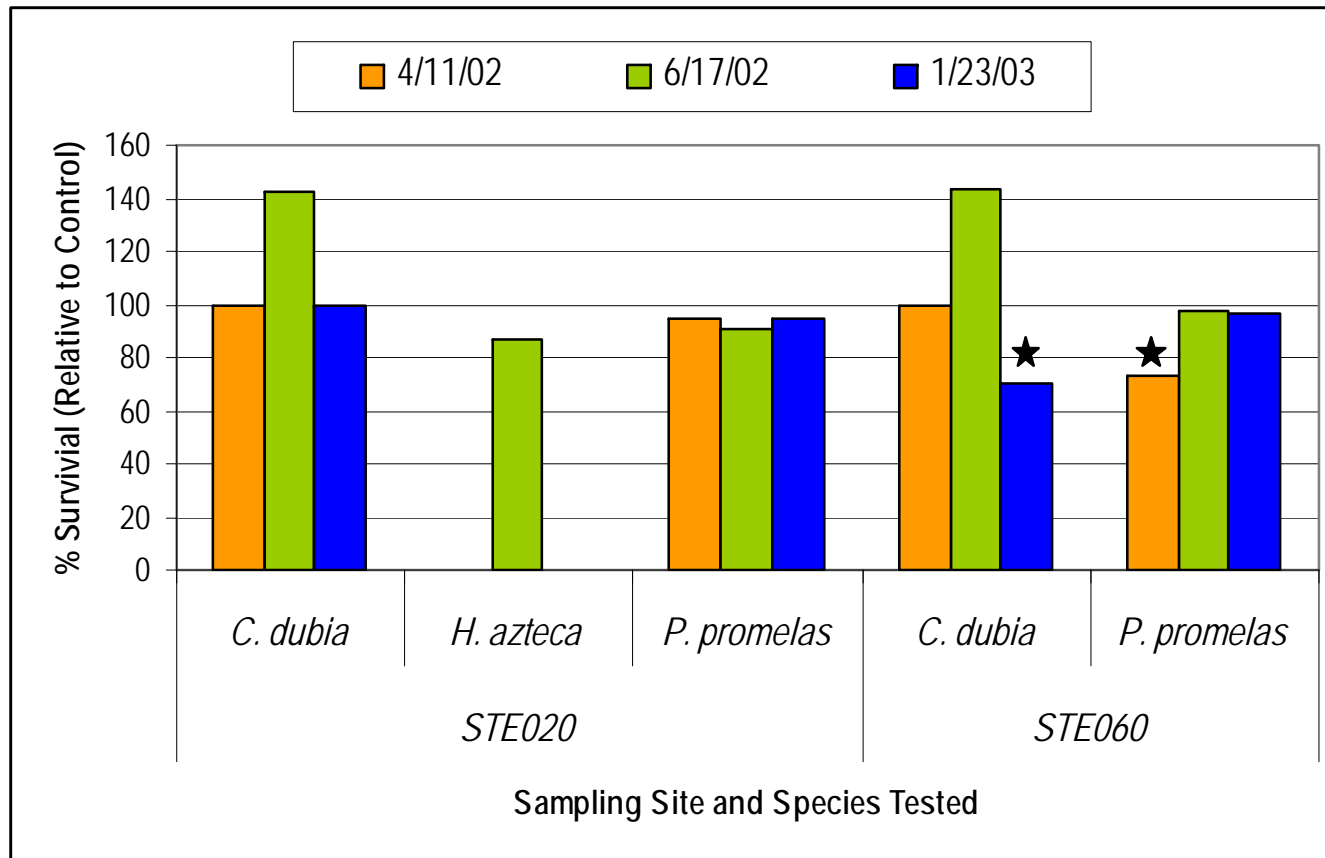
*Water and Sediment Quality and  
Toxicity in Stevens Creek*

# Background and Impetus #1

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- SCVURPPP Multi-Year Monitoring Plan
  - Investigative studies conducted to answer more specific monitoring questions developed as a result of screening-level monitoring
  
- SWAMP (Water Board) Sampling in FY 02-03
  - Significant aquatic and chronic water toxicity at site STE060 (Stevens Creek at La Barranca Rd.).
  - Stevens Creek listed on 2006 303(d) list of Impaired Water Bodies for “Toxicity”

# 2002-03 SWAMP Data



# Monitoring Question #1

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- ***What are the extent, magnitude and causes of toxicity in Stevens Creek?***

## **Attempt to identify:**

- **Magnitude:** How toxic? How frequently?
- **Extent:** How many creek sites/reaches impacted?
- **Causes:** Pesticides Metals, Ammonia, etc.
- **Sources:** Geographical area where chemicals are originating.

# Background and Impetus #2

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- Draft MRP requires bedded sediment sampling 1x per year (Spring or Fall)
- Currently little understanding of the representativeness of a single sample, and what sampling timeframes may serve as the best “index” period.

# Monitoring Questions

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- ***What is the intra-annual range and variability of chemical concentrations in bedded sediments in Stevens Creek?***

Important because:

- Potentially toxic chemicals in bedded sediments associated with other environmental conditions (Information for Management).
- Affects our ability to collect representative data and detect change overtime (Information for Monitoring Design).

# Sampling Design #1

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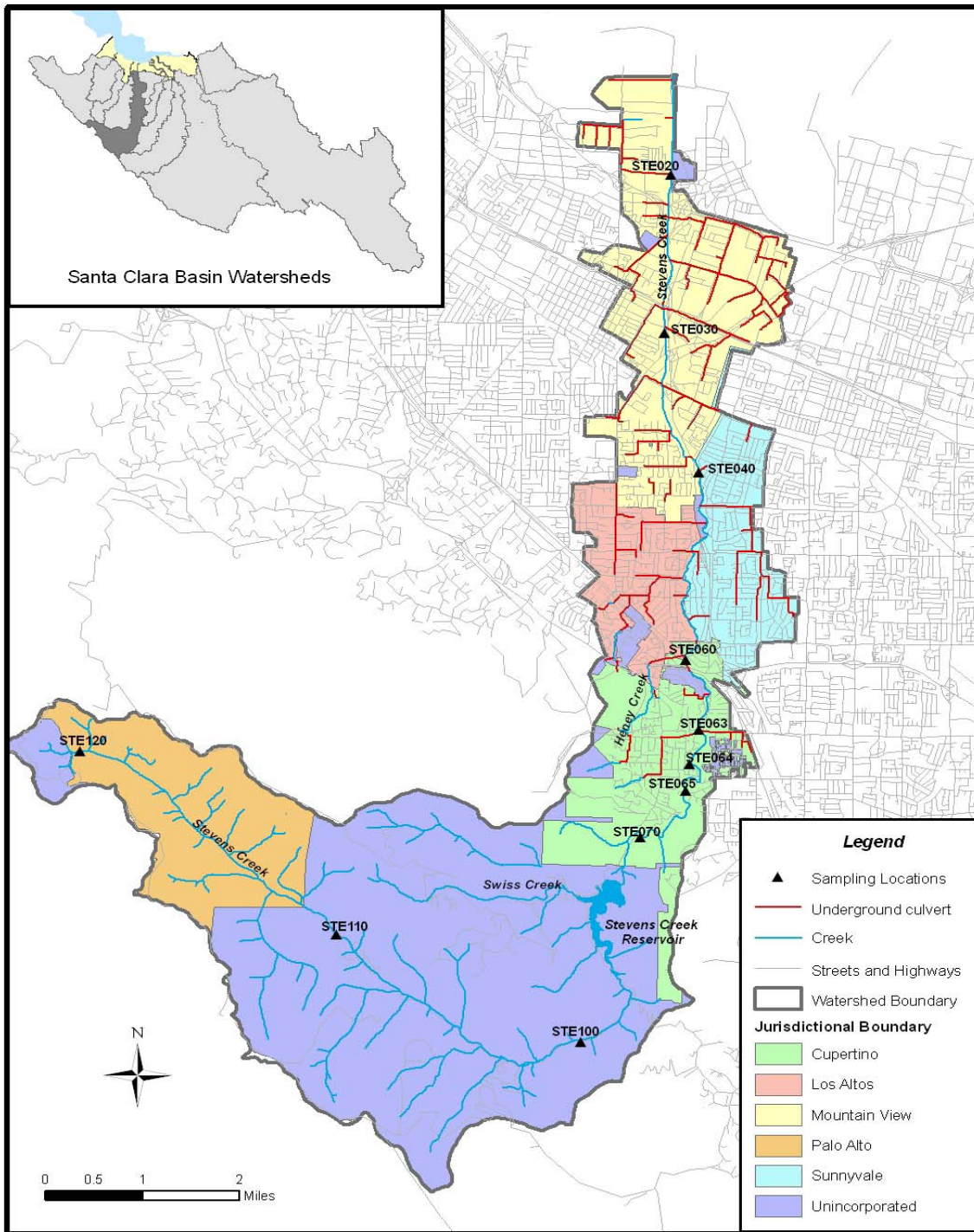
- **Site Locations**

- 1. Water and Sediment Toxicity**

- Upstream of where SWAMP found toxicity to better understand upstream extent and possible source areas
- Downstream site to examine downstream extent of toxicity

- 2. Variability in Chemical Concentrations**

- Sites draining urbanized areas
- Vary in geomorphology and hydrology (i.e. sediment transport/deposition)



# SCVURPPP and/or SWAMP Sampling Sites

# Methods

- Water Toxicity

- 7-day Static Renewal Aquatic Bioassay (*Ceriodaphnia dubia*)



- Sediment Toxicity

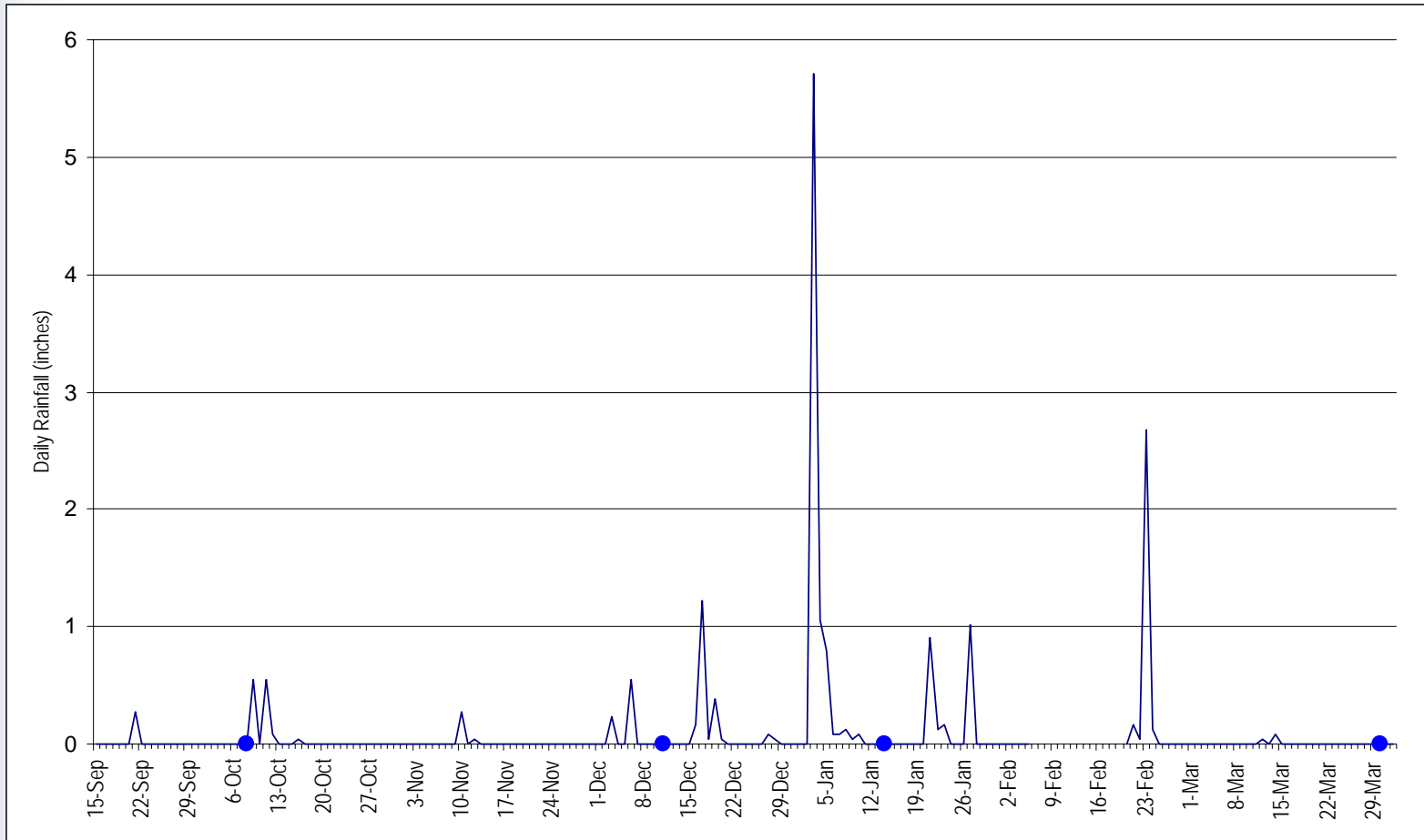
- 10-day Whole Sediment Bioassay (*Hyalella azteca*)



- Water and Sediment Chemistry

- OP pesticides and metals (if sig. toxicity) in water
- Metals and pyrethroid pesticides in sediment

# Sampling Events

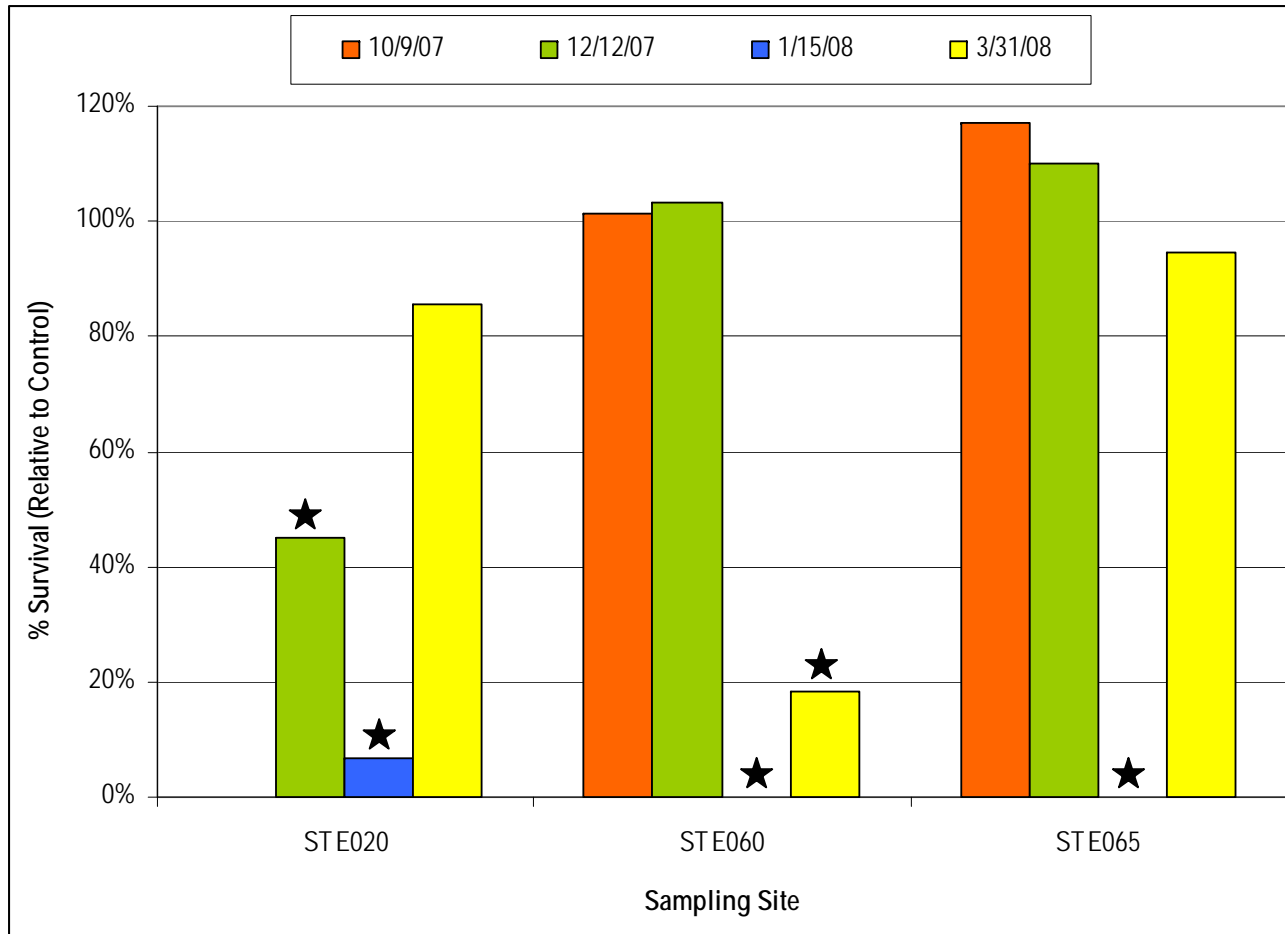


# Results

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- Water Chemistry and Toxicity
  - Good News!!
    - No detectable concentrations of OP pesticides
    - No acute OR chronic toxicity observed
    - Similar to 2002-2007 results, where only 2 of 42 samples from 17 sites in 8 watersheds exhibited acute aquatic toxicity.
- Sediment Toxicity
  - Not such good news.....

# Results - Sediment Toxicity



# What's causing the tox...

- Causes of Sediment Toxicity
  - **Not well understood**
  - **Metals:**
    - Nickel (naturally occurring)
    - Chromium (naturally occurring)
    - Copper (above TECs)
  - **Pyrethroid Pesticides**
    - Consistently below reporting limits
    - Don't appear to be the primary issue
- SF Bay Sediment Toxicity
  - PAHs and DDT
  - Possibly Ammonia (interface site)

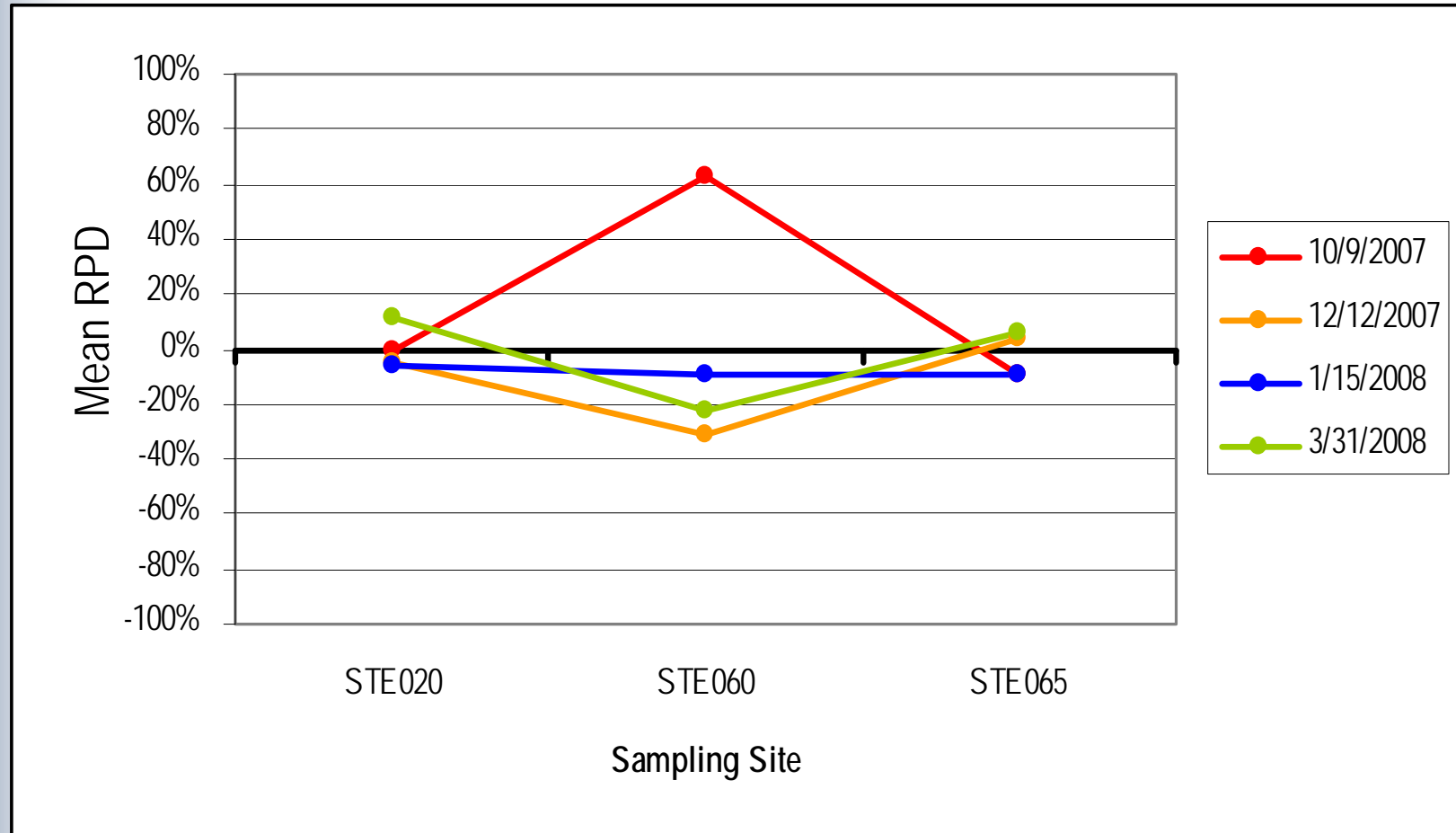


# Results (cont.)

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- **Intra-Annual Variability in Bedded Sediment Concentrations**
  - Relative Percent Difference (RPD)  
% difference between a concentration measured during one sampling event vs. the average concentration over all sampling events (during one fiscal year)
  - Mean RPD = average of all RPDs for each sampling event.

# Results (cont.)



# Conclusions and Recommendations

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1. Aquatic toxicity impacts are currently minimal in Stevens Creek.

***Recommendation:*** Additional water toxicity sampling a low priority in Stevens Creek

# Conclusions and Recommendations

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2. Significant sediment toxicity appears to be present in Stevens Creek, especially after storm events that generate runoff from primarily urban land uses. The causes of toxicity are currently unknown.

***Recommendation:*** Consider conducting follow-up investigative studies to determine the causes and (to the extent possible) sources of sediment toxicity.

# Conclusions and Recommendations

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3. Intra-annual variability of metal concentrations in bedded sediments in Stevens Creek appears to be minimal ( $\pm 20\%$ ).

***Recommendation:*** Future screening-level bedded sediment sampling should focus on measuring priority chemicals annually. Sampling should occur after a significant rainfall event or following the wet weather season (i.e., in the spring season).

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*Planned FY 08-09  
Monitoring Activities*

# FY 08-09 Work Plan

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- **Sediment Toxicity Investigative Study**
  - Stevens Creek
  - Coyote Mainstem
  
- **Bioassessment in Spring 2009**
  
- **Via MRP, continued development of SWAMP comparable:**
  - Standard Operating Procedures (SOPs)
  - Data Quality Objectives (QAPP)
  - Sampling and Analysis Plan (SAP) – Countywide or Regional?
  - Data Management System

A blue-tinted landscape of rolling hills and mountains covered in dense evergreen forests. The hills recede into the distance, creating a sense of depth. The word "Questions?" is overlaid in the center in a white, bold, italicized font.

*Questions?*