Developing a comprehensive watershed-wide monitoring program for surface waters

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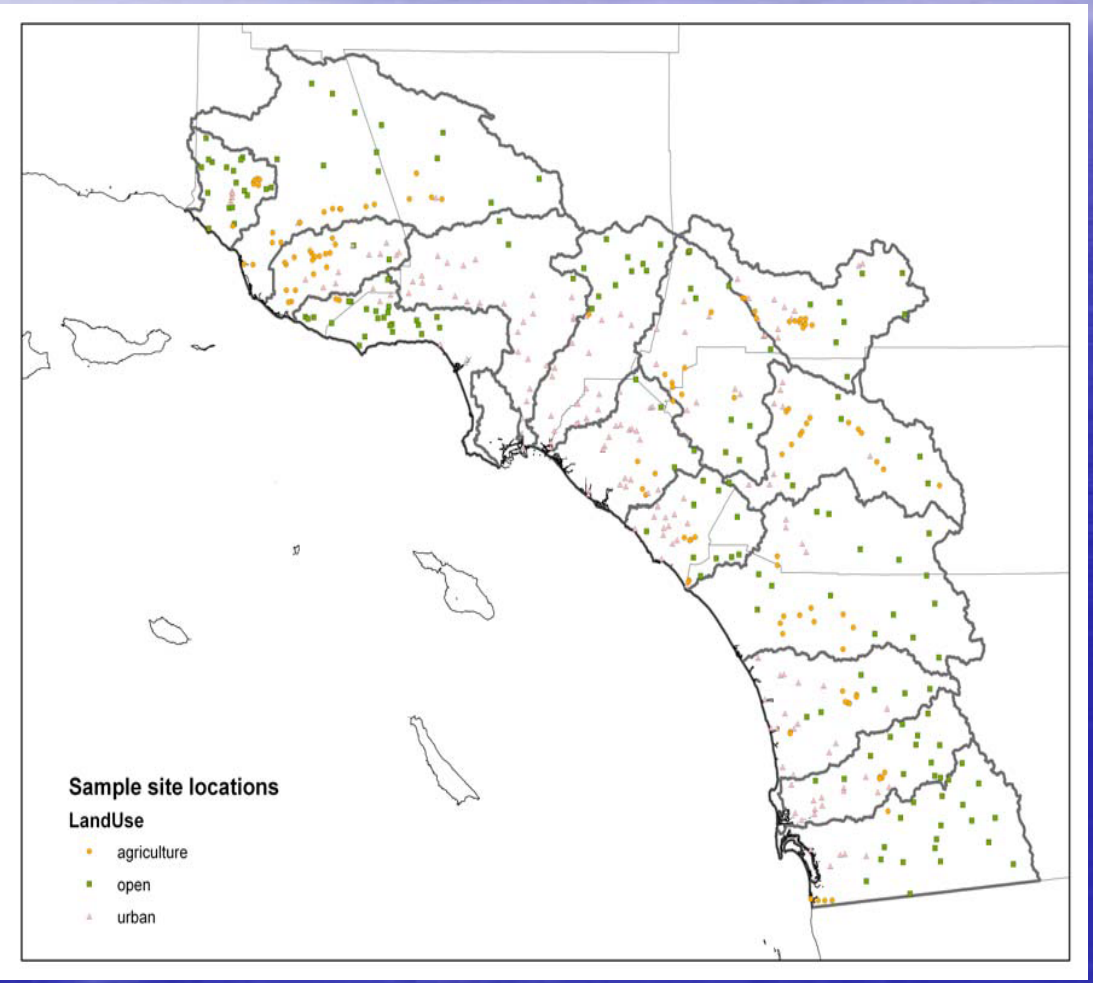
Watershed Regulatory Program

September 29, 2010

Monitoring Program Design 101



- Elements to consider:
  - Objectives
  - Station locations
  - Indicators
  - Assessment thresholds
  - Data analysis

About Me

- 23 years - LA Regional Board
- SWAMP coordinator
- NPDES permitting
- Marine Biologist

Bruges

Why Monitor ?

- Compliance with permit limits
- TMDL requirements
- BMP effectiveness
- Protection of beneficial uses
- Condition of resource

Where to Monitor ?

- Coastal ocean waters
- Bays & estuaries
- Lakes & reservoirs
- Rivers & streams
- Wetlands

- Groundwater

FOCUS ON FRESHWATER STREAMS

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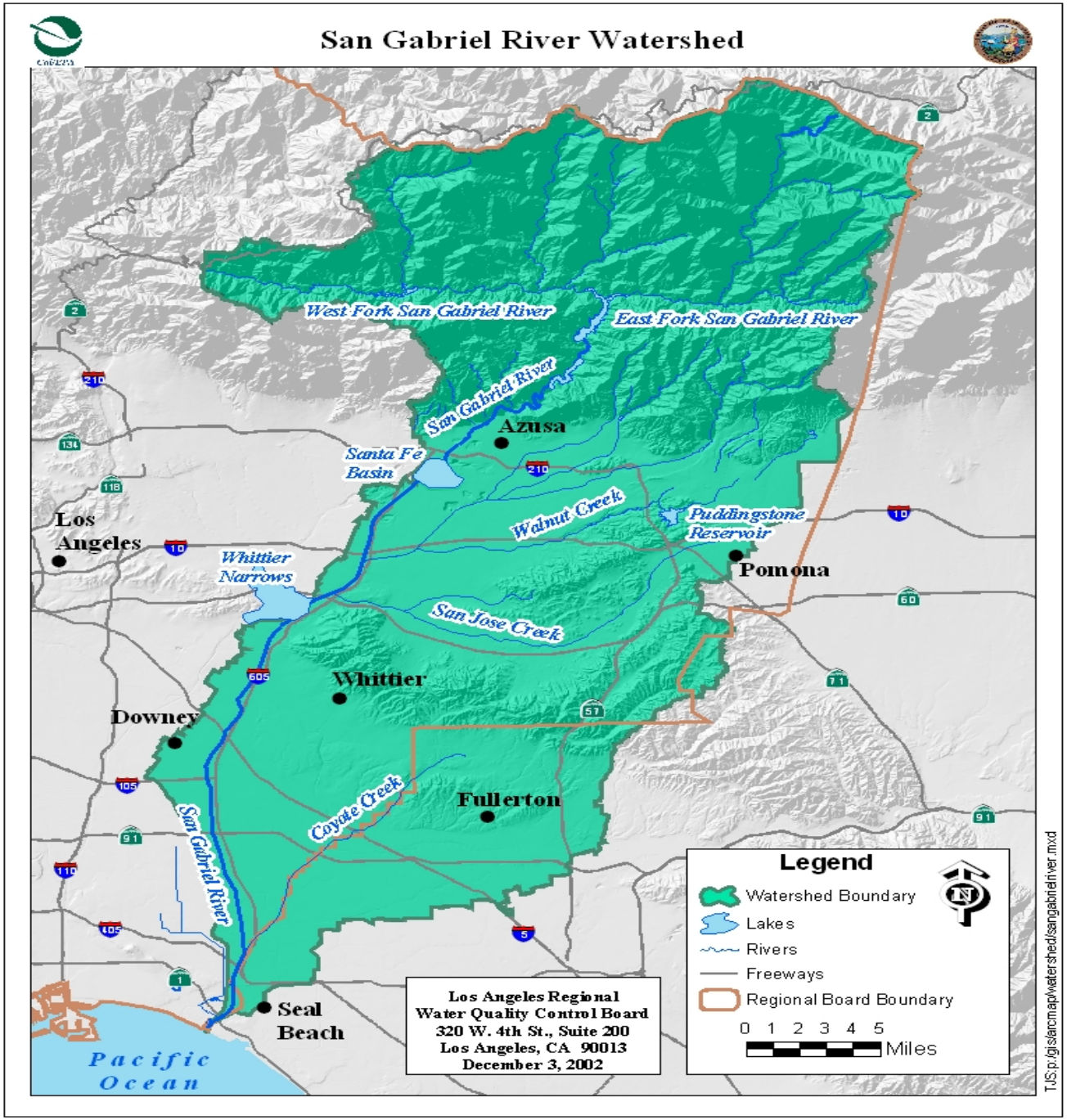
San Gabriel River Watershed
West Fork San Gabriel River
East Fork San Gabriel River
San Gabriel River
Azusa
Santa Fe Basin
Walnut Creek
Puddingstone Reservoir
Pomona
Los Angeles
Whittier Narrows
San Jose Creek
Whittier
Downey
Fullerton
Coyote Creek
San Gabriel River
Seal Beach
Pacific Ocean
Legend
Watershed Boundary
Lakes
Rivers
Freeways
Regional Board Boundary
0 1 2 3 4 5
Miles
Los Angeles Regional
Water Quality Control Board
320 W. 4th St., Suite 200
Los Angeles, CA 90013
December 3, 2002
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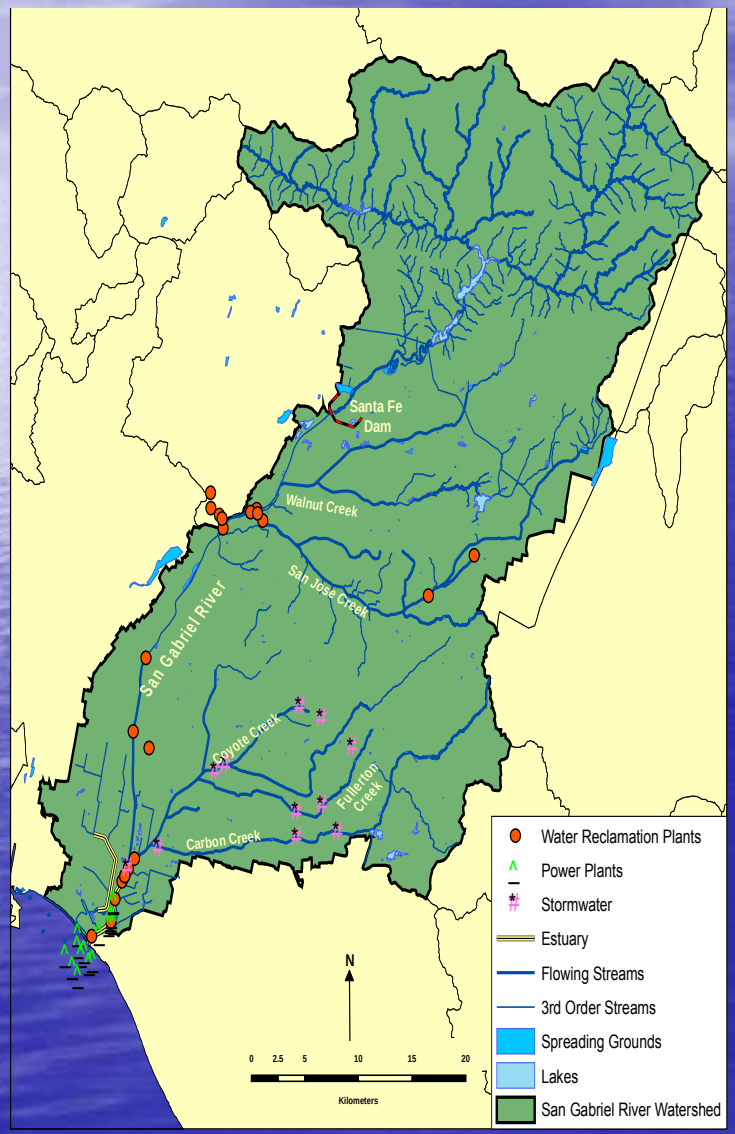
Starting Point

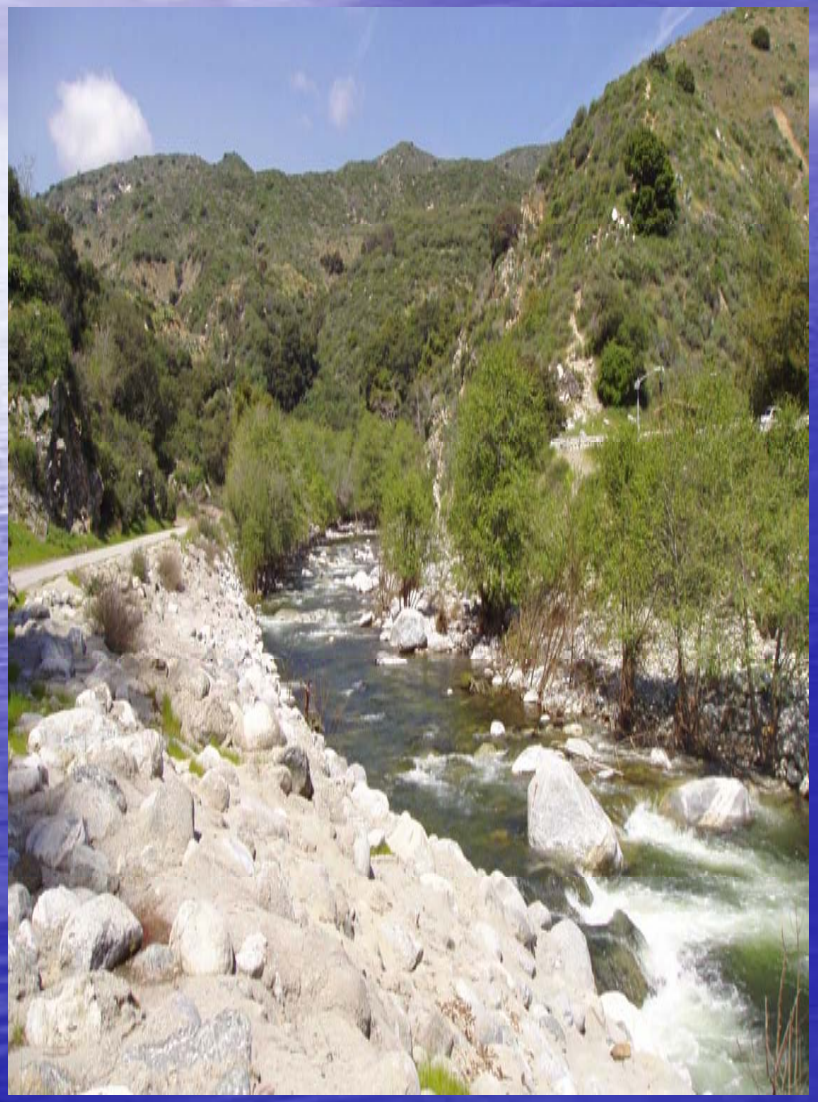


- 2005
  - Most monitoring in lower watershed
  - No monitoring in upper watershed
- LA County San District's NPDES monitoring
- LA County DPW stormwater monitoring
- SWAMP monitoring
- Other stakeholder monitoring

Integrated Monitoring Plan
Meet with Stakeholders

- Los Angeles Reg Bd
- USEPA
- So Cal Coastal Water Research Project
- Santa Ana Reg Bd
- LA County San
- LA/SG River Watershed Council
- LA Co Dept Public Works
- LA Co Dept Water & Power
- AES
- US Forest Service
- City of Downey
- Friends of SG River
- Orange Co Stormwater Prog
- Rivers & Mountains Conserv
- SG Mountains Reg Conserv
- US Army Corps of Engineers

DEFINE MONITORING OBJECTIVES

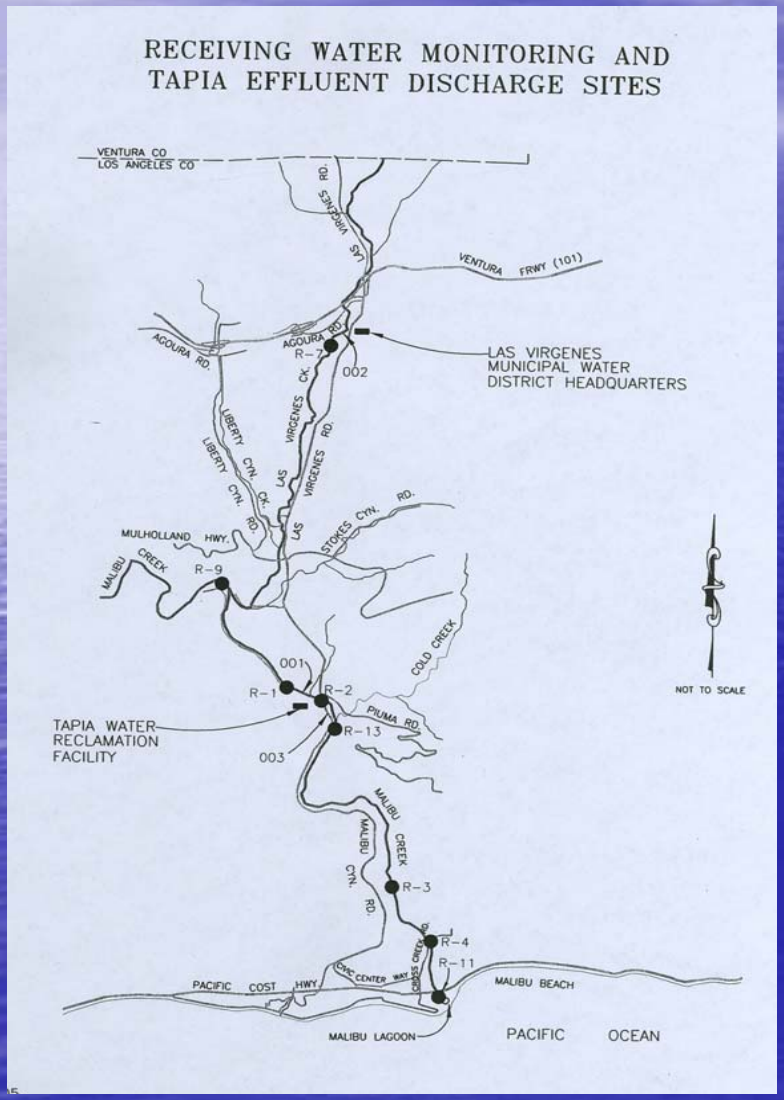


1. What is the overall condition of streams in the watershed?
2. Are local fish safe to eat?
3. Is it safe to swim?
4. Are conditions getting better or worse in the watershed?
5. Are receiving waters near discharges meeting water quality objectives?

1. What Is the Overall Condition of Streams in the Watershed ?

- Targeted sampling
  - Areas of special interest or unique sites
    - Major tributaries
    - High quality habitat
    - Endangered species
    - Known sources of pollution
- Probabilistic sampling
  - Overall condition
  - Unbiased monitoring locations
  - Percentage of stream affected

Targeted Sampling

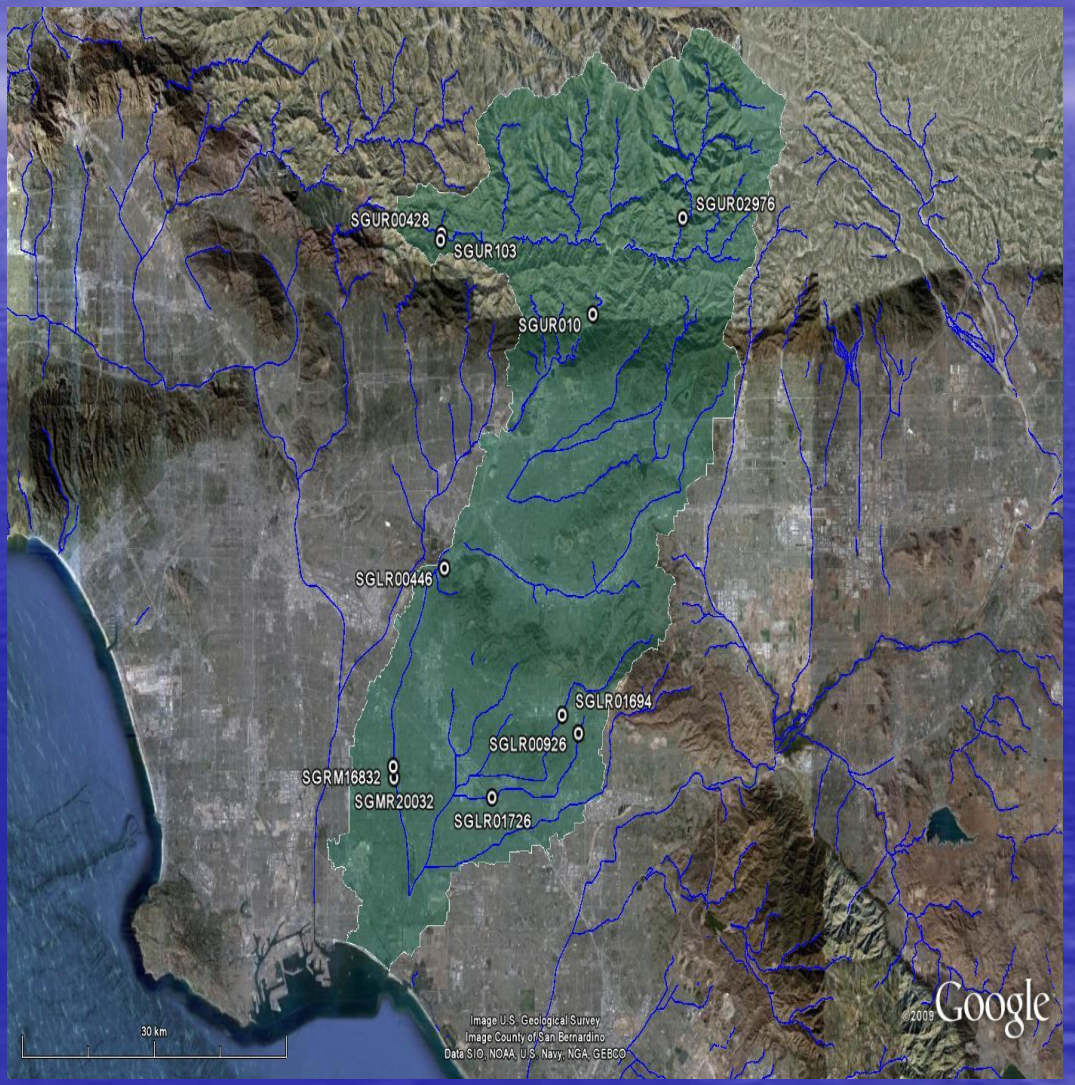


- Good for tracking conditions at specific sites of interest
- Good for trend monitoring
- Poor for determining overall health of watershed
- Number of stations depends

  (interest vs $$)

Probabilistic Sampling

- Good for determining overall health of watershed
- Good for trend monitoring
- Poor for tracking conditions at specific sites of interest
- Number of stations (n = 30)



San Gabriel River Watershed

- Targeted sampling @ 12 stations in streams + 4 in estuary
- Randomized sampling @ 30 stations in 2005
- Randomized sampling @ 10 stations per year in 2006, 2007, 2008, 2009, 2010, etc

Indicators of Stream Health

- Biological community
- Habitat condition in the stream
- Toxicity (water column or sediment)
- Chemical measurements
  - Nutrients
  - Metals
  - Organics

Biological Community Field Sampling

Biological Community Bioassessment Monitoring

- Bioassessment monitoring
- EPT taxa = good
  - Ephemeroptera (mayfly)
  - Plecoptera (stonefly)
  - Trichoptera (caddisfly)

Biological Community Bioassessment Monitoring

- Pollution tolerant species = bad
  - Midges (chironomidae)
  - Worms (oligochaeta)
  - Flies (diptera)

Toxicity Testing

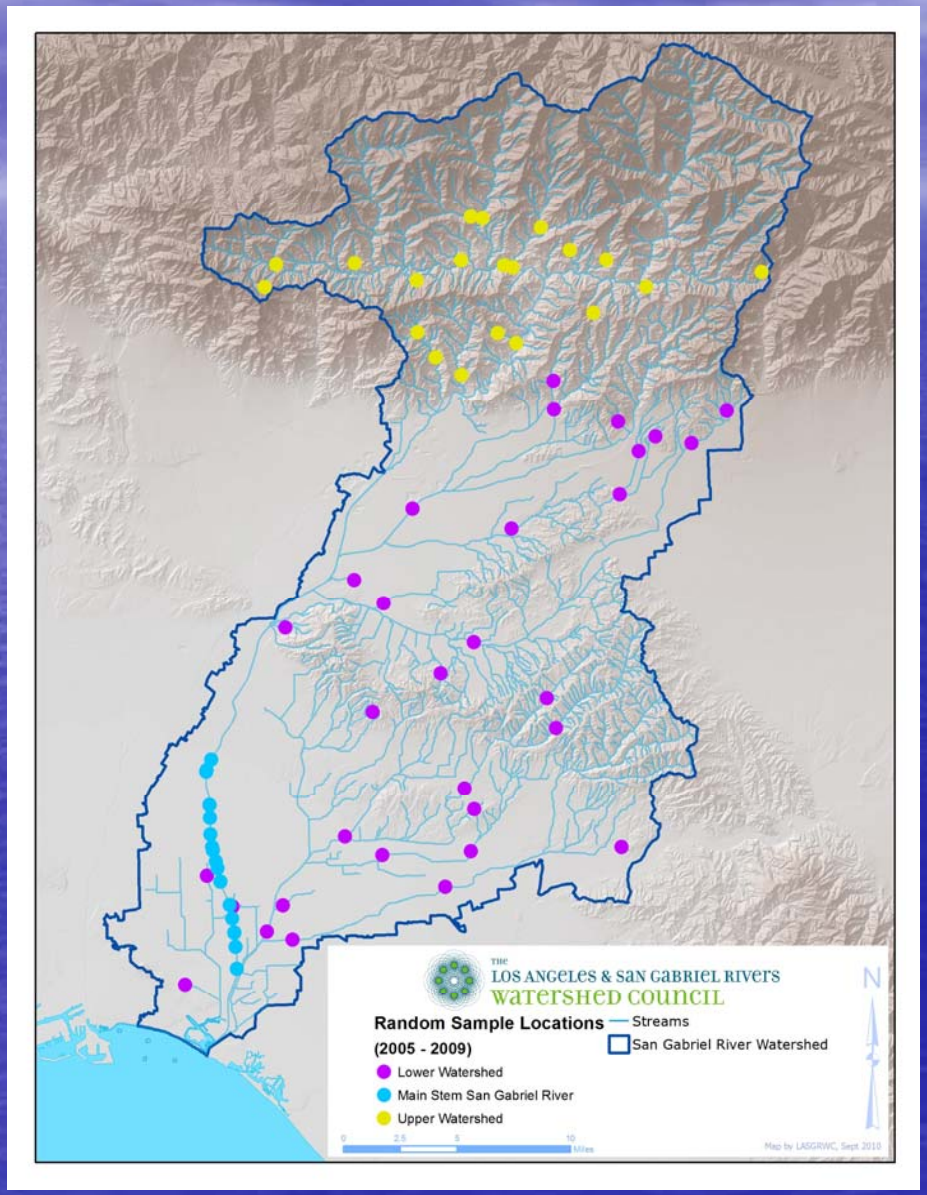
- Acute toxicity = mortality
- Chronic toxicity = impaired growth or reproduction
- Toxic (high, moderate, low)

  vs Non-toxic

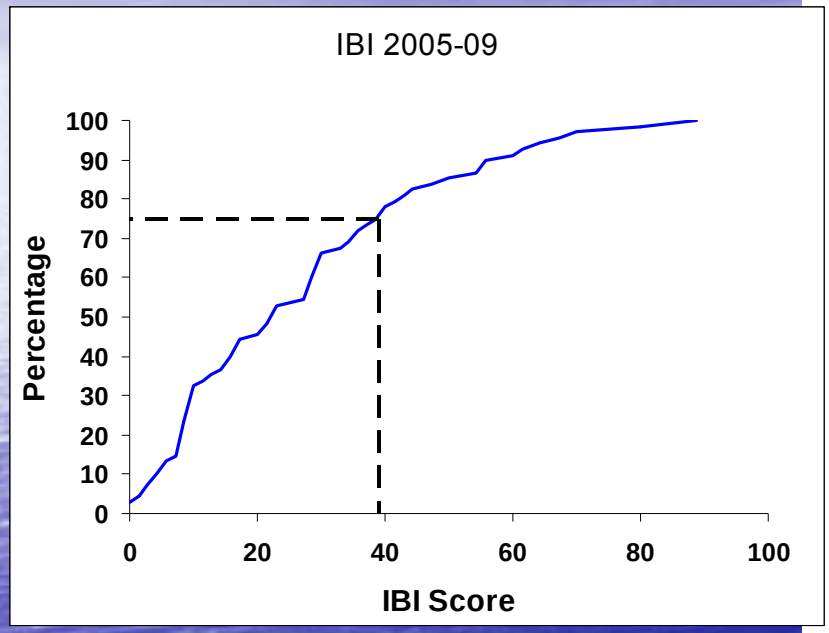
Chemical Monitoring

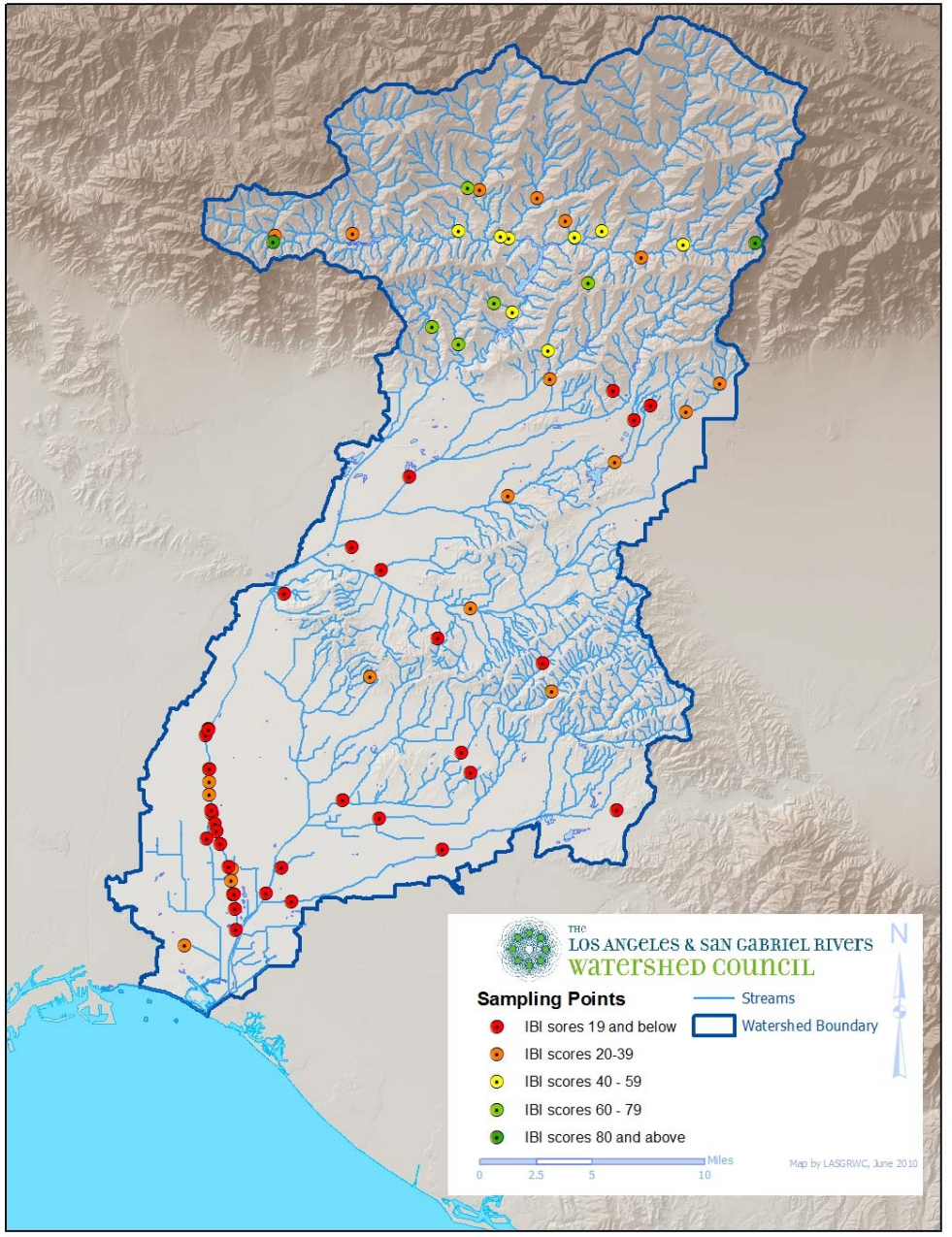
- Nutrients (ammonia, nitrate, phosphate)
  - Comparison to Basin Plan objectives
- Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Zn)
- Organics (DDTs, PCBs, PAHs, pyrethroid pesticides)
  - Comparison to CTR and/or Basin Plan

San Gabriel River Watershed

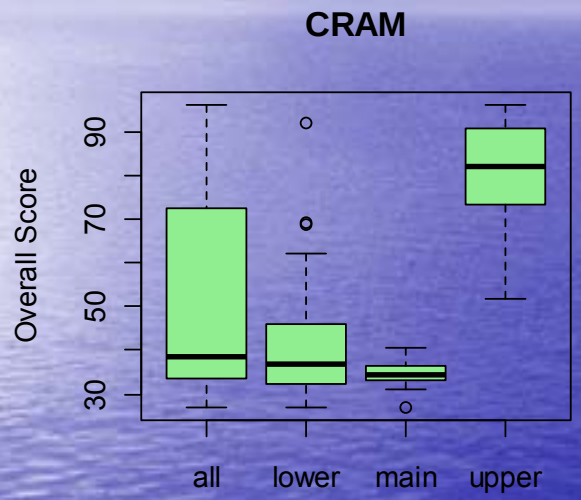


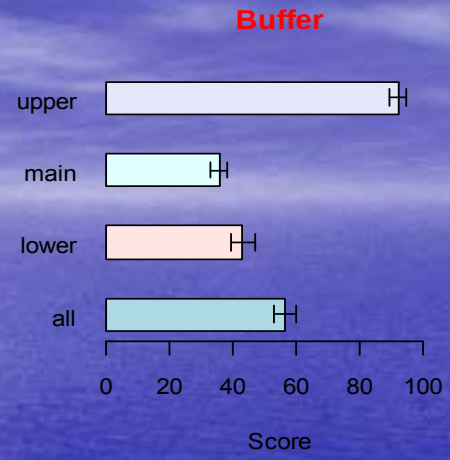
Assessment Threshold Biological Community IBI = Index of Biotic Integrity

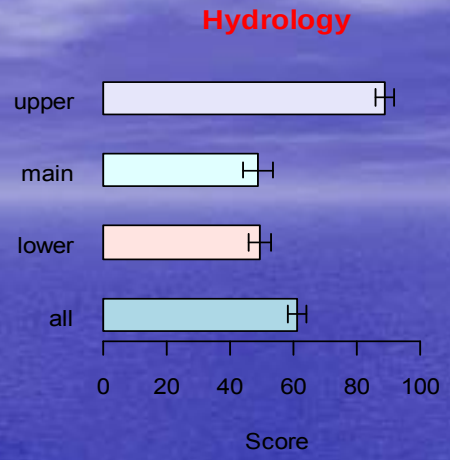


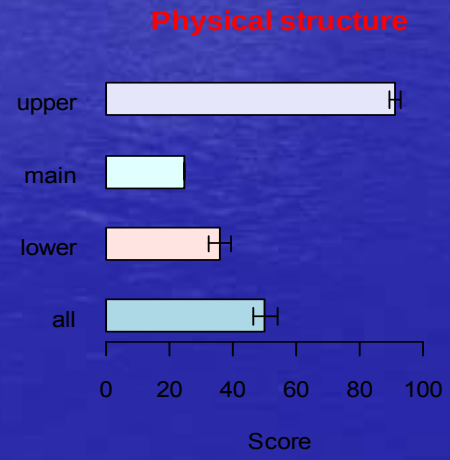


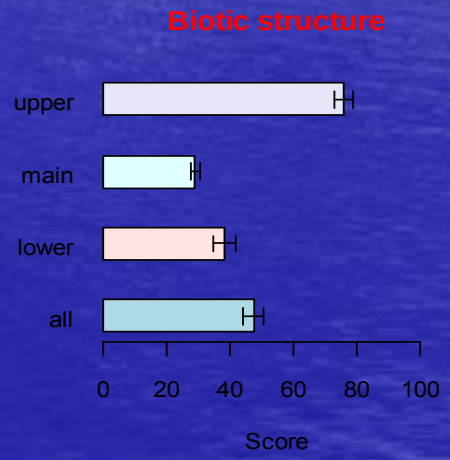
Habitat


CRAM
Overall Score
30
50
70
90
all
lower
main
upper


Buffer
upper
main
lower
all
0
20
40
60
80
100
Score


Hydrology
upper
main
lower
all
0
20
40
60
80
100
Score

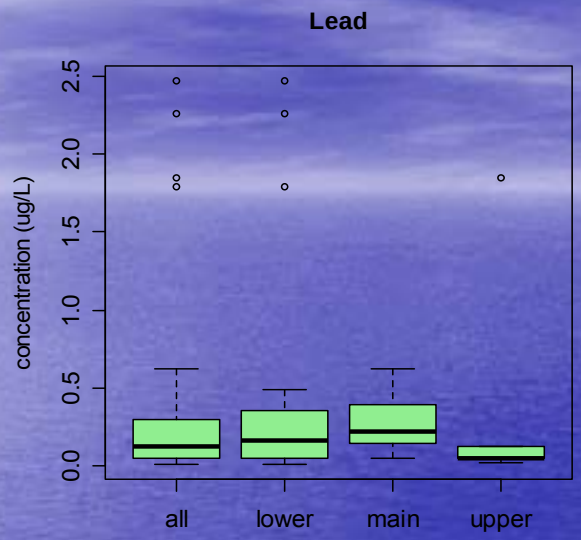

Physical structure
upper
main
lower
all
0
20
40
60
80
100
Score

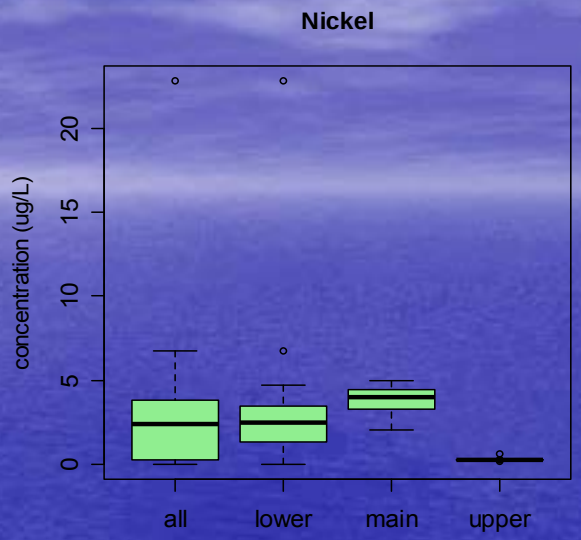

Biotic structure
upper
main
lower
all
0
20
40
60
80
100
Score

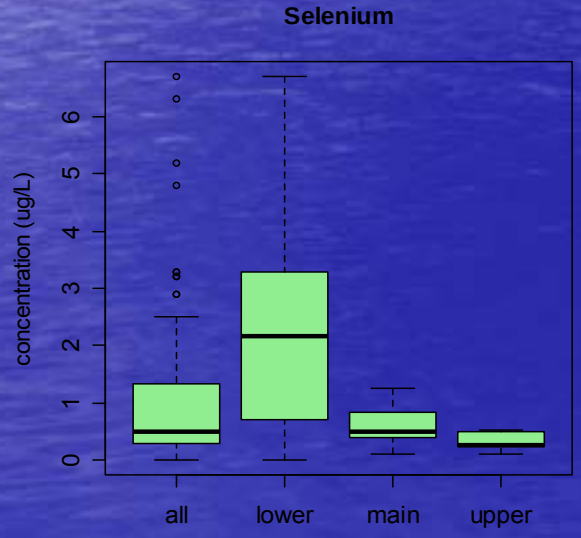
Toxicity

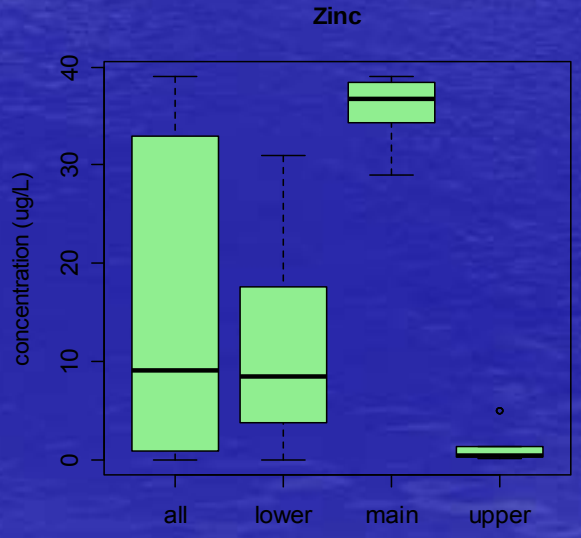
	Significant Endpoints		Significant Response by Sub-Region		
	n =	Sig Tox	Mainstem	Lower Rand	Upper Rand
2005 Ceriodaphnia					
Survival	23	1	0	0	1
Reproduction	23	5	0	2	3
2006 Ceriodaphnia					
Survival	10	0	0	0	0
Reproduction	10	0	0	0	0
2007 Ceriodaphnia					
Survival	9	0	0	0	0
Reproduction	9	2	0	1	1
2008 Ceriodaphnia					
Survival	9	2	0	1	1
Reproduction	9	2	0	1	1
2009 Ceriodaphnia					
Survival	10	0	0	0	0
Reproduction	10	1	0	1	0
TOTALS	122	13	0	6	7
%		11%	0%	5%	6%

Chemical Monitoring

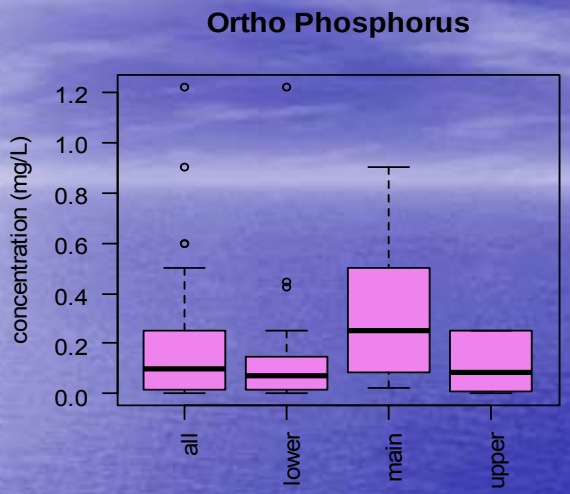


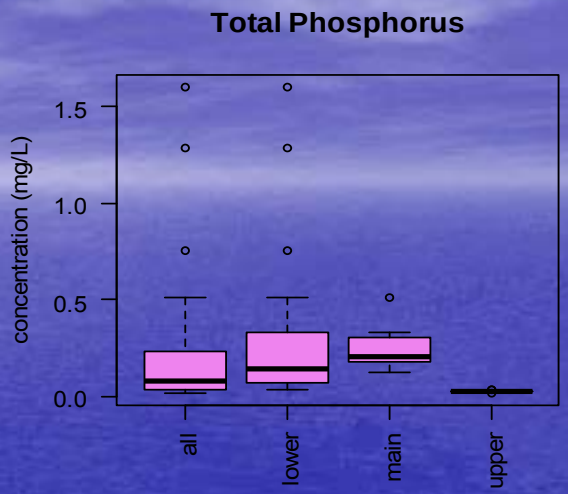


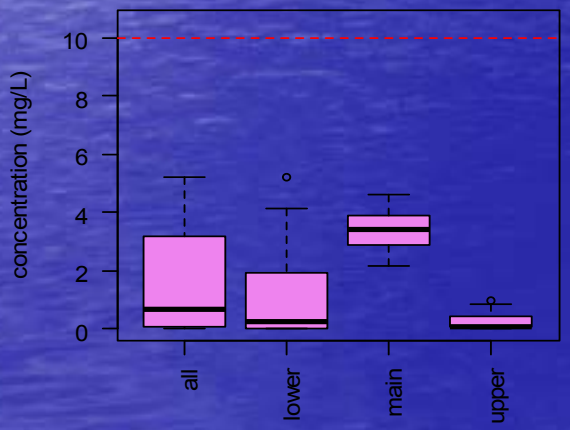


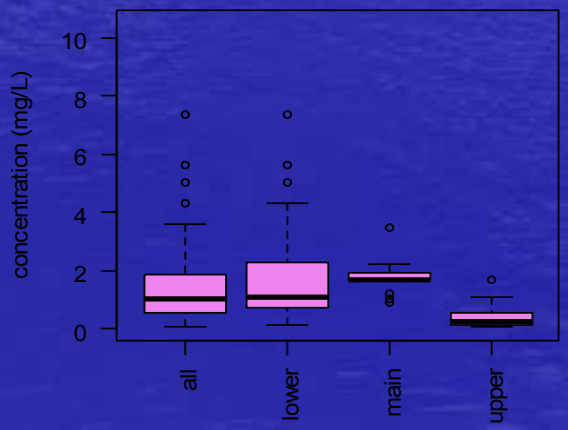


Chemical Monitoring









Are Local Fish Safe to Eat ?

- Targeted popular fishing areas
  - La Mirada Lake
  - Puddingstone Reservoir
  - Santa Fe Dam Reservoir
  - San Jose Creek (2 locations)
  - San Gabriel River (2 locations)
  - Estuary (2 locations)
- Sample every 1-3 years

Are Local Fish Safe to Eat ?

Mercury (ppb)	Common Carp	Large Mouth Bass	Catfish	Striped Mullet	Tilapia	Redear Sunfish	Bluegill
Lakes							
La Mirada Lake-06			ND				
La Mirada Lake-08			10				
Puddingstone Lake 2004	54	**320**					
Puddingstone Lake 2006		**327**					
Puddingstone Lake 2007		**223**					
Puddingstone Lake 2008		160				10	
Puddingstone Lake 2009	20	**290**	40			20	20
Puddingstone Lake 2009		**210**				20	
Puddingstone Lake 2009		40					
Santa Fe Dam 2006	81	**448**					
Santa Fe Dam 2007	162						
Rivers							
San Jose Creek-06	22						
San Jose Creek-07	40				21		
SGR at Alondra Blvd-07					ND		
SGR at Alondra Blvd-08					ND		
Estuaries							
Upper Estuary-06				ND			
Upper Estuary-07	40			ND			
Upper Estuary-08	10			ND	10		
Upper Estuary-09				ND			
Lower Estuary-07					ND		

Is It Safe to Swim ?

- Targeted popular recreational areas + sentinel sites
  - Note that “swim” means REC 1 (swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities and fishing)
- 8 popular rec areas + 5 sites above major confluences + 1 estuary site
- E. coli at rec & sentinel sites (weekly May-Sept)
- Total & fecal coliform + enterococcus in estuary (twice a week year-round)

Is It Safe to Swim?

Sentinel Sites	Year	Geometric Mean May	June	July	August	September	Single Sample Exceedances n =	No.	%
San Gabriel (R9W)	2007	257	181	417	260	239	19	12	63%
	2008	58	167	130	71	237	21	9	43%
	2009	52	232	102	273	203	24	9	38%
Coyote Creek (RA1)	2007	444	305	173	350	326	19	13	68%
	2008	455	296	341	416	357	21	9	43%
	2009	270	187	75	74	24	24	5	21%
Coyote Creek (Valley View)	2007	130	98	51	77	107	19	5	26%
	2008	162	29	29	48	199	21	2	10%
	2009	139	125	168	58	13	24	7	29%
San Jose Creek (C1)	2007	457	4481	1224	1495	929	19	17	89%
	2008	1337	3797	1339	4946	1228	21	19	90%
	2009	10140	4827	720	1477	2992	24	24	100%
Walnut Creek	2007	2281	322	378	468	407	16	9	56%
	2008	210	29	12	20	21	21	1	5%
	2009	171	33	49	51	128	24	8	33%
						Totals	317	149	47%

E. coli

30 day standard – 126 MPN/100 mL

Single sample standard – 235 MPN/100 mL

Is It Safe to Swim ?

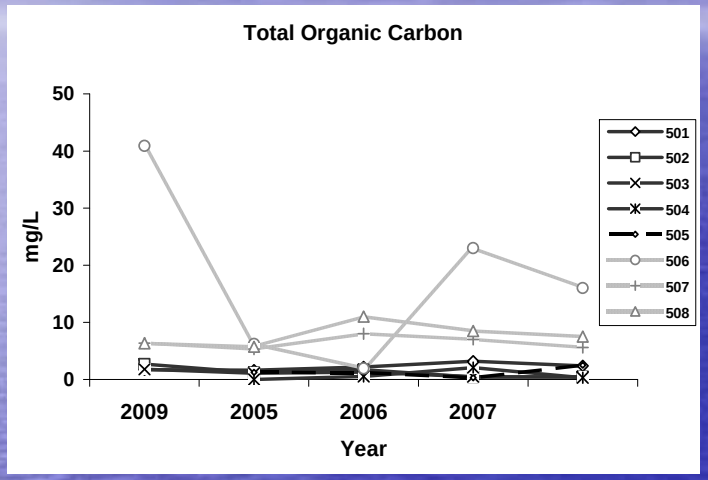
Bacteria Sampling Location	5/21/10	5/29/10	6/1/10	6/10/10	6/16/10	6/26/10	6/28/10	7/3/10	7/6/10	7/15/10	7/21/10	7/26/10	Exceedances of REC 1 Std.
E. Fork @ Cattle Canyon	< 10	< 10	< 10	52	31	**228**	<10	135	<10	30	75	31	**0**
E. Fork @ Graveyard Canyon	<10	<10	<10	<10	<10	63	41	<10	<10	350	41	20	**1**
N. Fork above W. Fork Confluence	< 10	41	20	<10	<10	85	185	41	20	144	31	**281**	**1**
Upper Cattle Canyon	< 10	< 10	< 10	<10	<10	<10	<10	<10	<10	<10	<10	<10	**0**
Upper East Fork	< 10	< 10	< 10	20	20	<10	20	<10	20	<10	<10	109	**0**
Upper North Fork	< 10	< 10	20	<10	<10	<10	<10	41	<10	86	31	<10	**0**
Upper West Fork	< 10	< 10	< 10	<10	<10	<10	<10	20	<10	<10	20	41	**0**
W. Fork above N. Fork Confluence	< 10	< 10	< 10	<10	41	<10	20	31	<10	121	<10	20	**0**
Exceedances of REC 1 Std.	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	

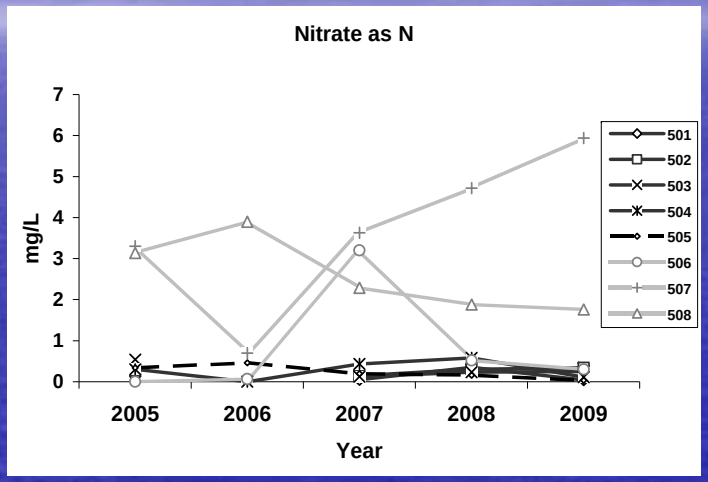
Holiday

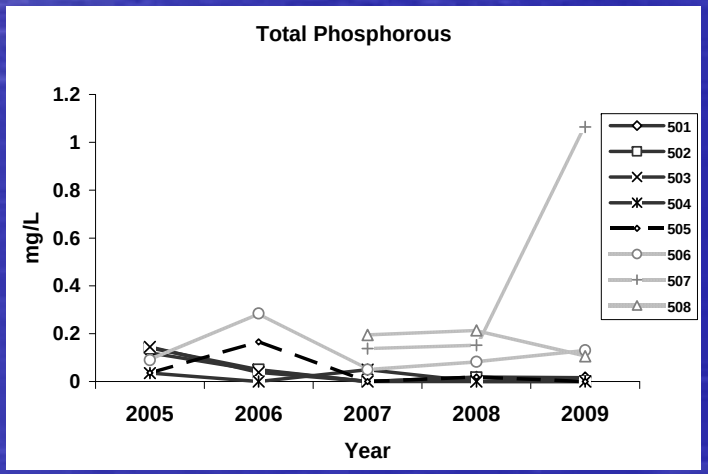
Weekend

WQO for single sample E.coli: 235 MPN/100mL

Are Conditions Getting Better or Worse Over Time ?







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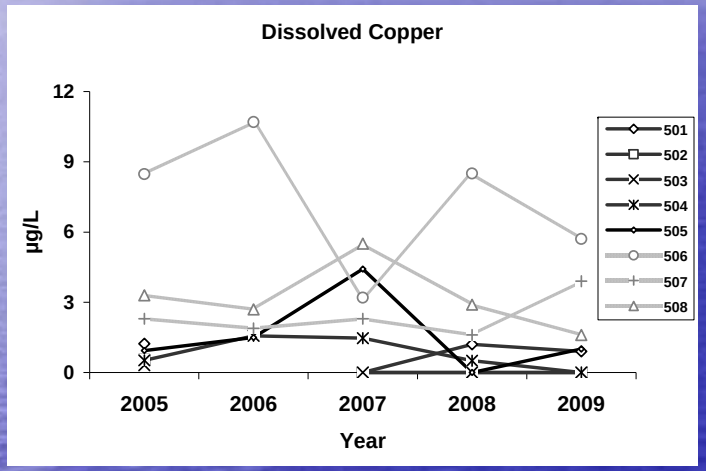
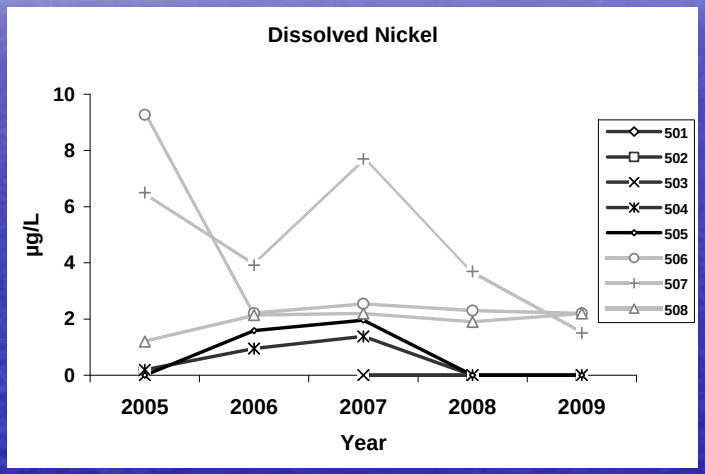
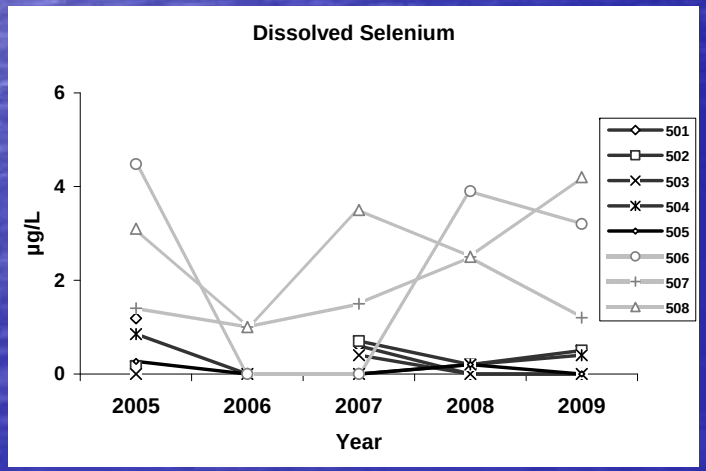
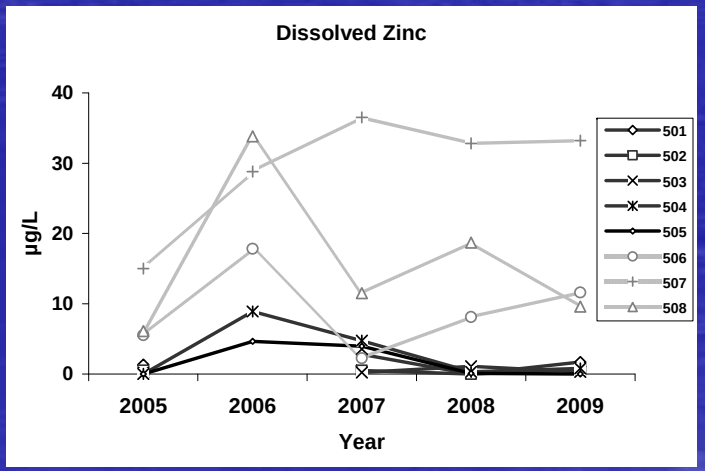
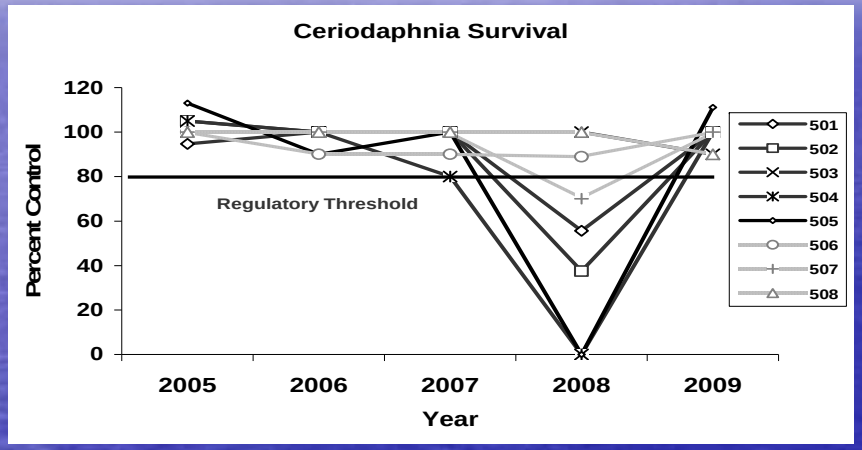


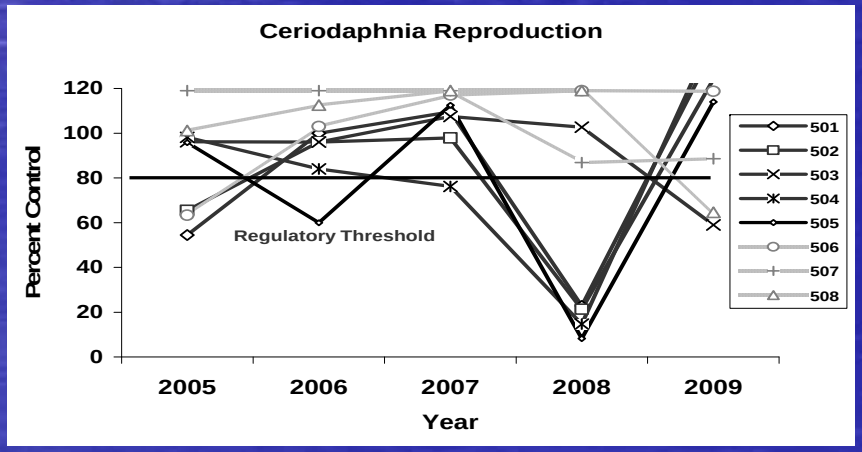






Are Conditions Getting Better or Worse Over Time ?





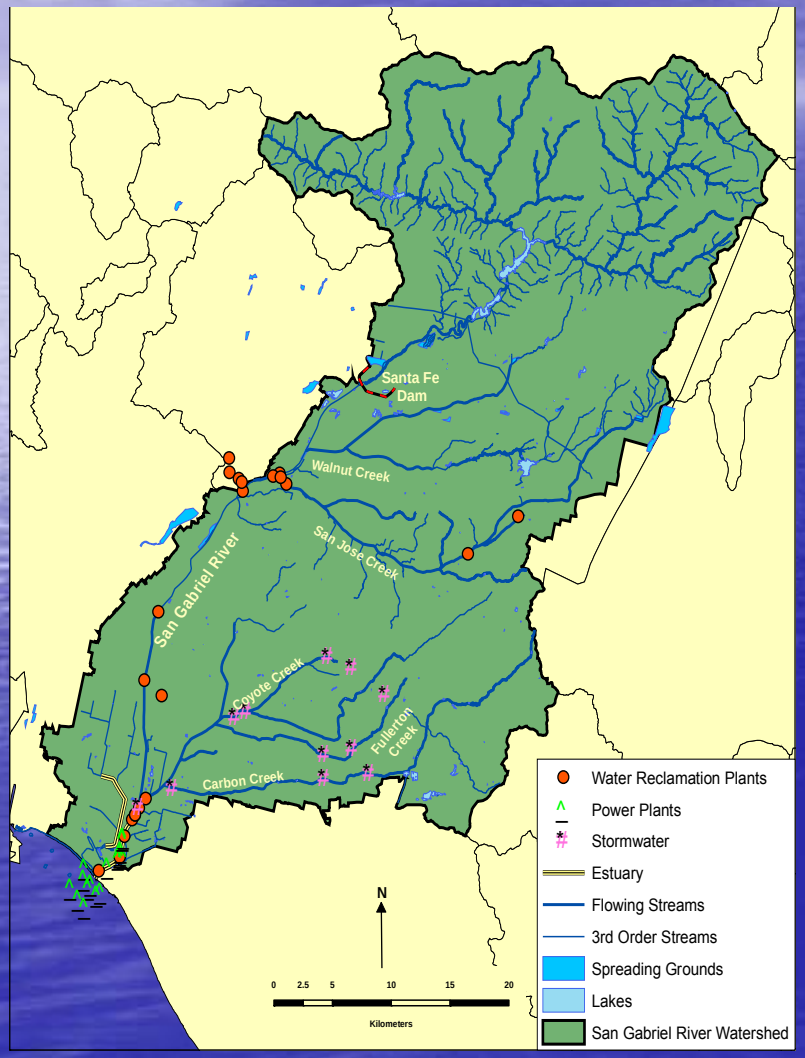
Are receiving waters near discharges meeting water quality objectives ?

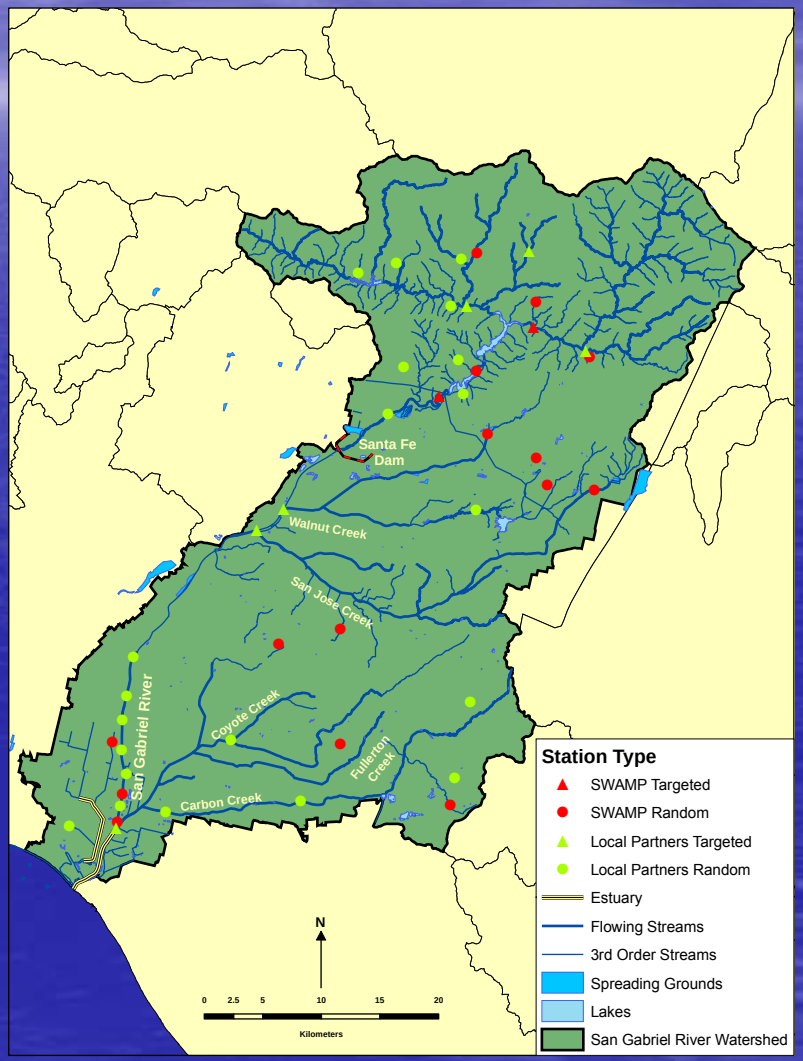
Table 14. Exceedances of water quality objectives for parameters measured at receiving water sites below NPDES discharges from 2005 to 2008.

Constituent	Total No Measurements	Below Chronic WQO	%	Exceeded Chronic WQO	%	Exceeded Acute WQO	%
Ammonia	948	917	97%	29	3%	2	0.2%
Diazinon	203	184	91%	10	5%	9	4%
Arsenic	228	228	100%	0	0%	0	0%
Copper	305	304	100%	1	0.3%	0	0%
Cadmium	189	189	100%	0	0%	0	0%
Chromium (VI)	190	190	100%	0	0%	0	0%
Lead	294	292	99%	2	0.7%	0	0%
Mercury *	279	279	100%	0	0%	0	0%
Nickel	234	234	100%	0	0%	0	0%
Selenium	247	246	100%	1	0.4%	N/A	-
Silver	262	262	100%	0	0%	N/A	-
Zinc	256	256	100%	0	0%	0	0%

* Comparison against human health threshold

SAN GABRIEL RIVER WATERSHED PRE- & POST-COLLABORATION






RMC