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California Coast Wide Snapshot Day Report 2003

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SECTION I

Introduction

On May 17th 2003, citizen monitoring groups along the entire coast of California joined forces to sample California's coastal waterbodies including bays, estuaries, rivers, streams, ocean and more. With funding from the State Water Resources Control Board and the U.S. Environmental Protection Agency, the Monterey Bay Sanctuary Foundation partnered with the California Coastal Commission and the Coastal Watershed Council, to coordinate a single day of monitoring along the entire California coast.

The objective for Snapshot Day 2003, held on Saturday, May 17th, 2003, was to get volunteers, from the Northern California border to the Southern California border, into their coastal waterways to systematically sample the surface waters flowing off the California coast and into the Pacific ocean. Participants were trained on how to monitor their watersheds using standardized protocols defined by the Snapshot Day Quality Assurance Project Plan and Monitoring Plan developed specifically for this event. Monitors measured water and air temperature, pH, conductivity or salinity, dissolved oxygen and transparency or turbidity in the field. And at many of the sites, samples were collected for laboratory analysis of bacteria and nutrients.

Figure 1. Coast Wide Snapshot Day Coastal Monitoring Coordinator's area of responsibility.

The 2003 event was orchestrated by eight Coastal Monitoring Coordinators responsible for organizing the event in each of eight sections of the coast (Figure 1). The event was supported by numerous state and local agencies. Sixty-nine individual watershed and citizen monitoring groups participated along with many new volunteers, working together to monitor water quality at 546 sites along the California Coast.

Together, 637 participants worked to answer the question: What is the quality of the water flowing to the coast on May 17th 2003? With data from this event, the Snapshot Day Coordination Team also addressed the additional questions of, "Are the coastal waters of California meeting the water quality objectives designated by the Regional Water Quality Control Boards and does citizen monitoring events encourage environmental stewardship?"

Coast Wide Organization and Design

Project Partners

A monitoring event as big as the Coast Wide Snapshot Day 2003 could not have been completed without the participation and support of the following organizations and individuals.

Coast Wide Coordination Team

The Coast Wide Coordination Team (Team) was responsible for coast wide coordination and promotion of the California Coast Wide Snapshot Day 2003. The Team was comprised of Bridget Hoover, Monterey Bay Sanctuary Foundation; Ross Clark, California Coastal Commission; and Tamara Doan, Coastal Watershed Council.

The Team was tasked with 1) building the network of Coastal Monitoring Coordinators, 2) providing technical resources and equipment and 3) ensuring comparable data was collected through the use of standardized protocols and quality assurance measures. The Monitoring Plan and Quality Assurance Project Plan were developed by the Team specifically for this event to ensure the highest quality data possible (available upon request).

Coastal Monitoring Coordinators

Eight Coastal Monitoring Coordinators (CMCs) were chosen to coordinate the event across the coast. They were responsible for overseeing implementation of Snapshot Day in the eight coastal regions (See Figure 1). The CMCs promoted Snapshot Day on a local level, recruiting existing monitoring groups and programs, encouraging new volunteers to monitor coastal waters, and ensured the implementation of the event for their area. The CMCs were the link between the citizens collecting the data and the Coast Wide Coordination Team. They formed the network of monitoring groups that spanned the entire coast of California and made this event possible.

The CMC's for the eight 2003 Snapshot Day coastal areas were as follows:

- Oregon to Navarro River, Redwood Community Action Agency (RCAA)—Nicole Murano
- Navarro River to Marin Headlands, Sotoyome Resource Conservation District (SRCD)—Sierra Cantor
- San Francisco Bay area, Friends of the San Francisco Estuary (FOE)—Steve Cochrane
- Central Coast, Monterey Bay Sanctuary Citizen Watershed Monitoring Network (MBNMS)—Bridget Hoover
- Morro Bay to Ventura, Santa Barbara Channelkeeper (SBCK)—Jessie Altstatt & Leigh Ann Grabowsky
- Los Angeles County, Santa Monica Baykeeper (SMBK)—Angie Bera
- Orange County, Orange County Coastkeeper (OCCK)—Ray Hiemstra
- San Diego to Northern Baja, Mexico, San Diego Baykeeper (SDBK)—Hiram Sarabia

Note: For ease in the Coast Wide sections of this document, we will primarily refer to the coastal areas by their names; however, most tables will reflect the organization acronym.

Technical Advisory Committee

A Technical Advisory Committee (TAC) was created to provide technical guidance and support to the Team and CMCs. The TAC was comprised primarily of representatives from state and federal agencies (a complete list of TAC members is on the Title Page). It provided information about water quality benchmarks, protocols, quality assurance requirements and data management. The TAC formed a link between the citizen groups that do the monitoring and agencies that use the data.

Project Design

What did we do?

A "snapshot" monitoring event is a quick evaluation of many water bodies across a large geographic area—in this case, coastal California. Many sites are monitored on a single day for the same water quality parameters with the purpose of evaluating the overall health of a system on that specific day.

The "Coast Wide Snapshot Day 2003" event was orchestrated by the Team using the model they had developed along the Central Coast for three prior years. As the coast of California is such a large area, it was divided into eight regions and the Central Coast model was applied in those regions by the CMCs.

The Team hosted a two-day workshop for the CMCs prior to the event. Here, the Coast Wide Snapshot Day model was presented and implementation discussed. Topics included the various parameters to be monitored, equipment and protocols to be used, the required quality assurance measures, data management, and event planning.

Calibration party at the CMC workshop.

CMC organizations then conducted trainings for volunteers in their own regions. Monitoring equipment, written protocols, laboratory analysis and event coordination were provided by the CMC. They were encouraged to network with other citizen groups in their coastal area for the purpose of accomplishing the monitoring event, as well as developing a future network of citizen monitoring groups across California.

Event day

Some CMCs organized the event day by staging one or more "HUBs" in their area. It was at the hub where the volunteers met in the morning and picked up their equipment and monitoring assignment, and where they returned with their data and samples at the end of the monitoring day. Others equipped monitoring teams prior to the event day. These monitors started in the field and then returned to the CMC to deliver their equipment, data and samples at the end of the day. Each CMC succeeded in having some samples analyzed for this project. Those CMC organizations equipped with in-house labs performed analysis themselves. The majority of the lab services were donated for the project, either by local professional laboratories or by the CMC organization itself.

Wrapping it up

In addition to organizing the monitoring on May 17th, the CMCs were also responsible for entering the field and laboratory results into a Microsoft Access database designed specifically for Snapshot Day. All the CMCs turned their result dataset over to the Team to build the coast wide dataset (See Attachment III Data Collection, Storage, and Compilation)

With guidance from the TAC, the Team and the CMCs adopted Water Quality Objectives (WQO) to apply to the three categories of parameters measured for Snapshot Day; the five field measured parameters, bacteria and nutrients. A "WQO" is the acceptable range of values for a particular parameter that constitutes healthy water quality. For example, fish and other aquatic species have a "low end" threshold requirement for dissolved oxygen (DO). If the amount of DO present is below that threshold, it stresses the organisms, compromises its food resource (aquatic insects), as well as its ability to detect and avoid predators, and ultimately could cause death.

Cheryl Van DeVeer measuring dissolved oxygen at Branciforte Creek

All of the parameters with WQOs have a significant impact on water quality and habitat value for wildlife and fish in coastal California, as well as indicate potential concerns for human health. General WQOs were set for the entire coast and then CMCs applied more locally specific WQO for their regions where appropriate. State Water Resources Control Board "Basin Plans" and other State and Federal legislation (or guidance) set the benchmarks for the WQO applied in this project. See Table 1 for the specific WQO applied to results in each coastal area.

Table 1. Water Quality Objectives applied to the eight coastal regions for Snapshot Day 2003.

	CMC/PARAMETER	RCAA	SRCD	FOE	MBNMS	SBCK	SMBK	OCCK	SDBK
Field Measurements	DO (mg/L)	≥ 7	≥ 6	≥ 7	≥ 7	≥ 7	≥ 5	≥ 7	≥ 5
	pH	≥ 6.5, ≤ 8.5	≥ 6.5, ≤ 8.5	≥ 6.5, ≤ 8.5	≥ 6.5, ≤ 8.5	≥ 6.5, ≤ 8.5	≥ 6.5, ≤ 8.5	≥ 6.5, ≤ 8.5	≥ 6.5, ≤ 8.5
	Transparency (cm)	≥ 25	≥ 25	≥ 25	≥ 25	≥ 25	≥ 25	≥ 25	≥ 25
	Turbidity (NTU)	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20	≤ 20
	Water Temp ('C)	≤ 22	≤ 22	≤ 22	≤ 22	≤ 22	≤ 22	≤ 22	≤ 27
Bacteria	*E. coli* (MPN/100-ml)		≤ 235	≤ 235	≤ 235	≤ 235	≤ 235	≤ 235	≤ 235
	Enterrococcus (MPN/100ml)						≤ 61	≤ 61	
	Fecal coliform (MPN/100 ml)	≤ 400	≤ 235						
	Total Coliform (MPN/100-ml)	≤ 10000	≤ 10000	≤ 10000	≤ 10000	≤ 10000	≤ 10000	≤ 10000	≤ 10000
Nutrients	Nitrate-N (mg/L)	≤ 2.25	≤ 2.25	≤ 2.25	≤ 2.25	≤ 2.25	≤ 10	≤ 2.25	≤ 2.25
	Ortho-phosphate-P (mg/L)	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.10	≤ 0.10	

After the monitoring was completed, and the data verified, WQOs were then applied to the results. If a result at a particular station did not meet its WQO, it was identified as having 'exceeded' its criteria. The phrase "exceedence" was adopted to discuss the values that were out of the acceptable range for "good" water quality as defined by the WQO. Based on the WQO for an individual parameter, exceedence values can be either higher or lower than the WQO.

Monitoring stations that had results from each of the three categories of parameters; field, bacteria, and nutrients, were then reviewed and stations that exceeded their water quality criteria for three or more parameters were identified as an "Area of Concern". This process identified a subset of locations that might benefit from additional study, and is best used for discussing trends in degradation. There is further discussion of the Areas of Concern later in this document.

Kat and Greg monitoring in Los Angeles County

Additionally, various Quality Assurance (QA) steps were implemented for the project to assure data results that were reliable and comparable across the coast wide data set. Using the knowledge and guidance of the TAC, the Team and CMCs conducted pre and post calibrations, or "standard comparisons", for the majority of the equipment used in the event. For the water samples taken to a laboratory for analysis, standard QA samples such as duplicates, field blanks and inter-laboratory splits were performed for each region. For a more detailed discussion of the QA for this project please see Attachment II.

Photo taken for Redwood Community Action Agency on Trinidad Creek

The following Coast Wide Data Summary reflects the highlights of what was found across the California Coast on May 17th, 2003. Please refer to the attachments in Section 3 for more detailed discussions on the study model and techniques employed, a QA report, list of donors and participants, data collection, storage and retrieval, and the table of results by station.

Coast Wide Data Summary

This year, across the entire coast of California, including areas of San Francisco Bay and northern Baja, Mexico; 637 people monitored water quality at 546 stations (see Figure 2 on following page).

Each of the eight regions produced a local Snapshot Day report that is available upon request. This section of the report summarizes the coast wide results. A table of all of the results can be found in Attachment VII.

Table 2 below provides a summary look at the coast wide statistics by parameter. This table depicts the number of stations where data was collected for each parameter, and where WQO are applicable. The number of exceedences and percentage of stations for each parameter are detailed. Also reported are the range of results for each parameter.

Table 2. Review of coast wide statistics for each parameter.

Coast Wide Data		Oregon Border to Baja Mexico							
Parameter		WQO	Number of Stations Sampled	Percent Stations monitored	Number of Exceedences	Percent of Stations with Exceedences	Minimum Result*	Maximum Result	Mean
AirTemp (Deg C)		None	478	88%			9.0	34.0	18.5
Conductivity (uS)		None	405	74%			3.2	61000	
Dissolved Oxygen (ppm)		$\geq 5^1$, $\geq 6^2$, ≥ 7	479	88%	74	15.4%	0.3	19.4	8.7
pH		≥ 6.5, ≤ 8.5	497	91%	22	4.4%	6.0	10.1	7.7
Transparency (cm)		≥ 25	176	32%	16	9.1%	2.0	130.0	98.4
Turbidity (JTU)		≤ 20	272	50%	21	7.7%	0	220	
WaterTemp (Deg C)		≤ 22, $\leq 27^3$	503	92%	21	4.2%	7.1	32.0	15.7
E. Coli (MPN/100 ml)		$\leq$ 235 MPN	337	62%	121	35.9%	1	140000	
Fecal coliform (CFU/100 ml)		$\leq$ 235 MPN, $\leq$ 400 CFU[4]	30	5%	3	10.0%	2	500	
Enterrococcus (MPN/100ml)		$\leq$ 235 MPN	71	13%	60	84.5%	10	24000	
Total coliform (MPN/100ml)		$\leq$ 10000 MPN	357	65%	101	28.3%	1	241920	
Nitrate-N (mg/L)		≤ 2.25, $\leq 10^1$	319	58%	40	12.5%	0.01	78.30	2.19
Ortho-phosphate-P (mg/L)		≤ 0.10	308	56%	107	34.7%	0.01	8.95	0.27

*Minimum result values are the lowest detected value for that parameter.

Application of specific WQO:
1: SMBK 2: SRCD 3: SDBK 4: RCAA

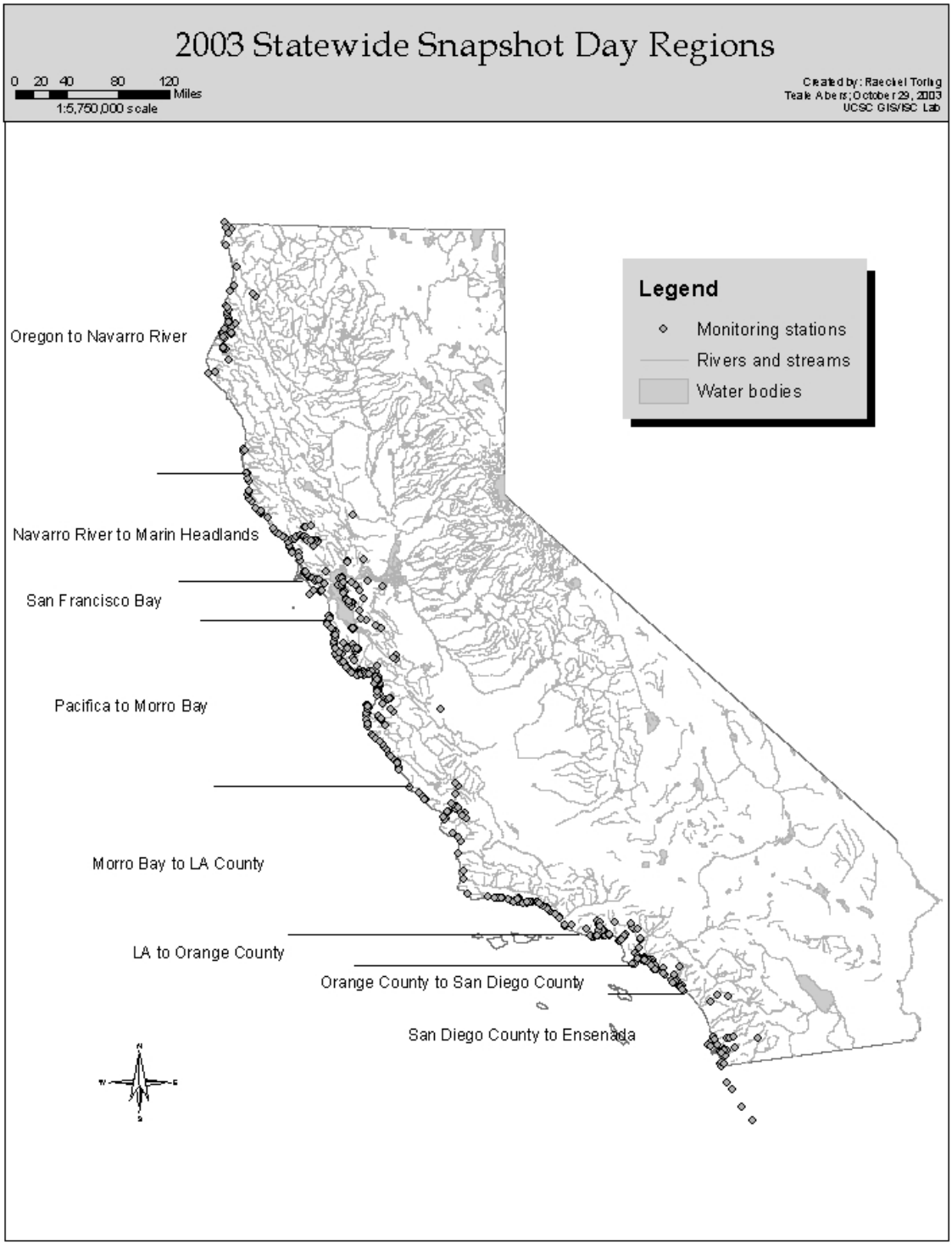

Figure 2. Coast Wide Snapshot Day Monitoring Stations.

Coast Wide Facts

Overall water quality was found to be good along the coast of California on May 17th, 2003. Our CMCs and their volunteers found:

- Throughout the coast, 265 stations (49%) met all of the water quality objectives.

- Of the 546 stations monitored, 281 stations exceeded one or more of their water quality objectives.

- The northern most region, spanning from the Northern California border to the Navarro River, reported exceedences in dissolved oxygen, pH and turbidity only. The next region to the south, (Navarro River to Marin Headlands) reported exceedences of every WQO except nitrate. The other six regions reported exceedences for all parameters with water quality objectives.

- Among the 546 stations monitored, 366 were sampled for laboratory analysis of bacteria or nutrients. A total of 277 stations (51%) reported results that included a complete set of data (field measurements, bacteria and nutrient analysis) .

    - Of the 277 stations, 33 or 6%, were identified as Areas of Concern.

    - Out of those 33 Areas of Concern, just two stations are identified as a result of field measurements alone.

A summary of the number of stations sampled in each CMC region can be found in Table 3. This table shows the number and percent of all stations monitored in each of the eight coastal areas. As well, the table provides the number of exceedences found, the percent of each area's overall stations with exceedences, and the number of Areas of Concern found in each region.

Table 3. Review of stations monitored and the WQO exceedences by region.

CMC	Number of Stations monitored	Regional % of Coastal Stations monitored	Number of Stations with Exceedences	Regional % of Stations with Exceedences	Number of Areas of Concern
RCAA	56	10%	14	25%	0
SRCD	71	13%	18	25%	0
FOE	52	10%	20	38%	1
MBNMS	155	28%	74	48%	14
SBCK	53	10%	39	74%	7
SMBK	88	16%	67	76%	6
OCCK	36	7%	31	86%	4
SDBK	35	6%	20	57%	1
Totals:	546	100%	283		33

Areas of Concern

The Snapshot Day program has identified a subset of stations as Areas of Concern. They are the stations that exceeded three or more of the seven parameters with Water Quality Objectives. This study suggests that these areas would most benefit from additional investigation and is best used for discussing trends in degradation.

For the Coast Wide Snapshot Day model, Areas of Concern require a comprehensive evaluation of a station as defined by a set of measurements that included parameters from each of the three categories—field, bacteria, and nutrients. Only stations with results from at least one of the parameters in each of these three categories were evaluated. Of the entire 546 stations across the coast, 277 stations met this criteria. Thirty-three Areas of Concern were identified between San Francisco Bay and Mexico. Figure 3, on the following page, shows a map of the Areas of Concern along the entire California coast.

Areas of Concern across the coast and the corresponding results for exceeded parameters are provided in Table 4. Shaded squares represent those measurements that exceeded the WQO. Cells with borders represent values identified as questionable based on the quality assurance requirements. Most teams sampled either turbidity or transparency, not both.

Table 4. Result values for thirty-three stations identified as Area of Concern.

CMC	StationID	WaterTemp (Deg C)	Dissolved Oxygen (ppm)	pH	Tranparency (cm)	Turbidity (JTU/NTU)	E. Coli (MPN/100 ml)	Nitrate-N (mg/L)	Ortho-phosphate-P (mg/L)	Number of Exceedences per station
FOE	205-MATAD-21	23.1				90			0.57	3
MBNMS	309-ALISA-32				14			11.9	0.6	3
MBNMS	309-TEMBL-31				9			35.5	0.7	3
MBNMS	305-STRUV-21		4.5				315		0.4	3
MBNMS	305-WATSO-21		0.3				9208		0.3	3
MBNMS	305-HARKI-21				16		3076		0.6	3
MBNMS	306-ELKHO-34			8.6				33	1.7	3
MBNMS	306-ELKHO-32		2.5				410		0.3	3
MBNMS	309-YERBA-41		4.5				987		0.2	3
MBNMS	309-ALISA-31				14		310	78.3	0.3	4
MBNMS	309-MOROC-31				18		1000	5	0.9	4
MBNMS	309-NATIV-31				15		410	16	0.8	4
MBNMS	309-TEMBL-32	24			10		1000	13.4		4
MBNMS	309-MOROC-33	26		9	6				0.2	4
MBNMS	309-MOROC-32			9	2		24192		0.9	4
SBCK	314-Synez-01		6.7					12.3	2.29	3
SBCK	310-SLuis-01						28	12.7	1.85	3
SBCK	312-Smari-01						738	27.1	0.3	3
SBCK	315-Monic-01	23		9.4				3.73		3
SBCK	315-Carne-01	25.8					359	5.95		3
SBCK	315-Frank-01	22.2		9.3			359	19.77	0.12	5
SBCK	403-BubPI-01		2.5				1860		0.11	3
SMBK	405-BETTY DAVIS PARK			8.8			1080		0.5	3
SMBK	405-GAGE			9.1			1090		2.8	3
SMBK	404-ZUMA CREEK		2				373		0.27	3
SMBK	405-DISTRICT	22.7		9.4			1480		0.2	4
SMBK	405-LA RIVER AT WILLOW	32		10.1			8520		1.36	4
SMBK	405-ARROYO SECO	24		9.3			410		0.9	4
OCCK	801lt						5470	3.1	0.16	3
OCCK	801tal2	25.7		8.7	11				0.18	4
OCCK	901segd1						20980	5	1.22	3
OCCK	901aliso3	22.4		8.7			630		0.12	4
SDBK	MEX-AEM-10		4.5			21.8	235			3
Number of exceedences		11	8	12	10	2	25	15	29	112.0
Percent of Areas of Concern		9.8%	7.1%	10.7%	8.9%	1.8%	22.3%	13.4%	25.9%	100.0%

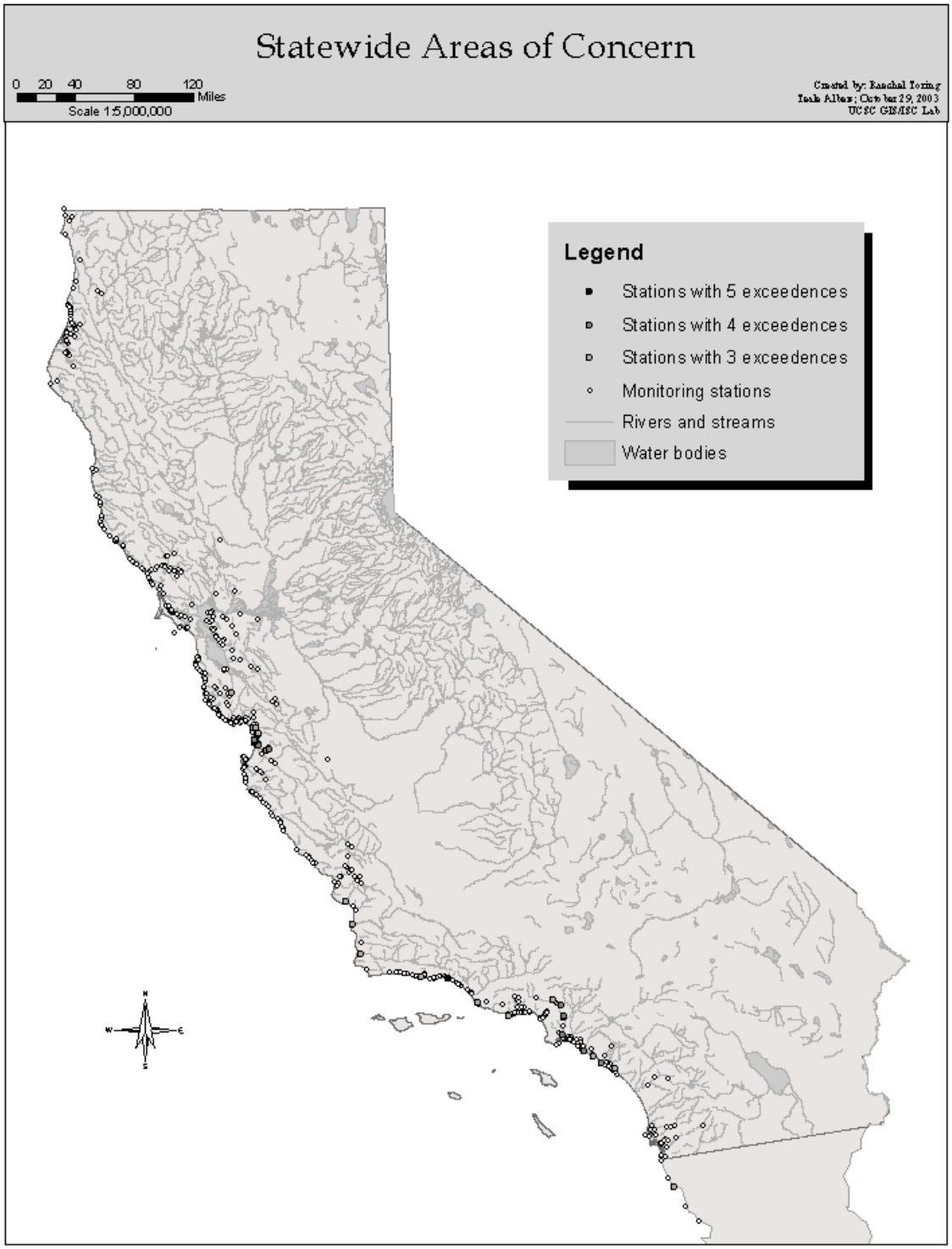

Figure 3. Areas of Concern across the entire Coast Wide Snapshot Day project Area

Area of Concern Discussion

Classification as an Area of Concern was determined primarily by the laboratory results. Twenty-four percent of these 33 stations were designated Areas of Concern based solely on the laboratory data. This demonstrated the importance of including laboratory analysis in the Snapshot Day program. For instance, if laboratory analysis had not been included, there would have been only two stations designated as Areas of Concern.

Of the 33 Areas of Concern, approximately 10% exceeded WQO of the field parameters, and between 13 and 25% exceeded WQO for the laboratory parameters.

In total, 21 stations exceeded three of the WQO, 11 stations exceeded four of the objectives, and one station on the Santa Barbara-Ventura section of the coast exceeded five of the seven objectives. While the number of exceedences does not relate directly to relative quality of the water, areas with 3 to 5 exceedences are most likely being impacted by numerous sources of input and warrant additional investigation.

Coast Wide Snapshot Day comparison with other programs

By itself, a single day sampling program can provide only a glimpse into the quality of the state's coastal creeks and rivers. This program has achieved the primary objective of identifying the quality of the water flowing to the coast on May 17th 2003. Through the regional efforts, 33 areas have been identified as a priority for further investigation. One question posed in response to identifying these 33 Areas of Concern was, how do these data reflect other water quality information?

The Central Coast area was used as an example to demonstrate how this data could be used in establishing trends for water quality information. The Central Coast program has implemented the same model applied to this year's Coast Wide Snapshot Day program for the last three years. The 14 Areas of Concern on the Central Coast were compared to the Areas of Concern identified during the two previous Central Coast Snapshot Day events. In Figure 4, all the Central Coast stations that were identified as Areas of Concern between the years 2001-2003 are represented.

Photo taken by Judd Perry at the Tembladero Slough in Salinas, Ca.

Of the 25 stations identified as Areas of Concern, during any of the three annual events, fourteen were Areas of Concern twice and three have qualified as Areas of Concern for the last three years of this program.

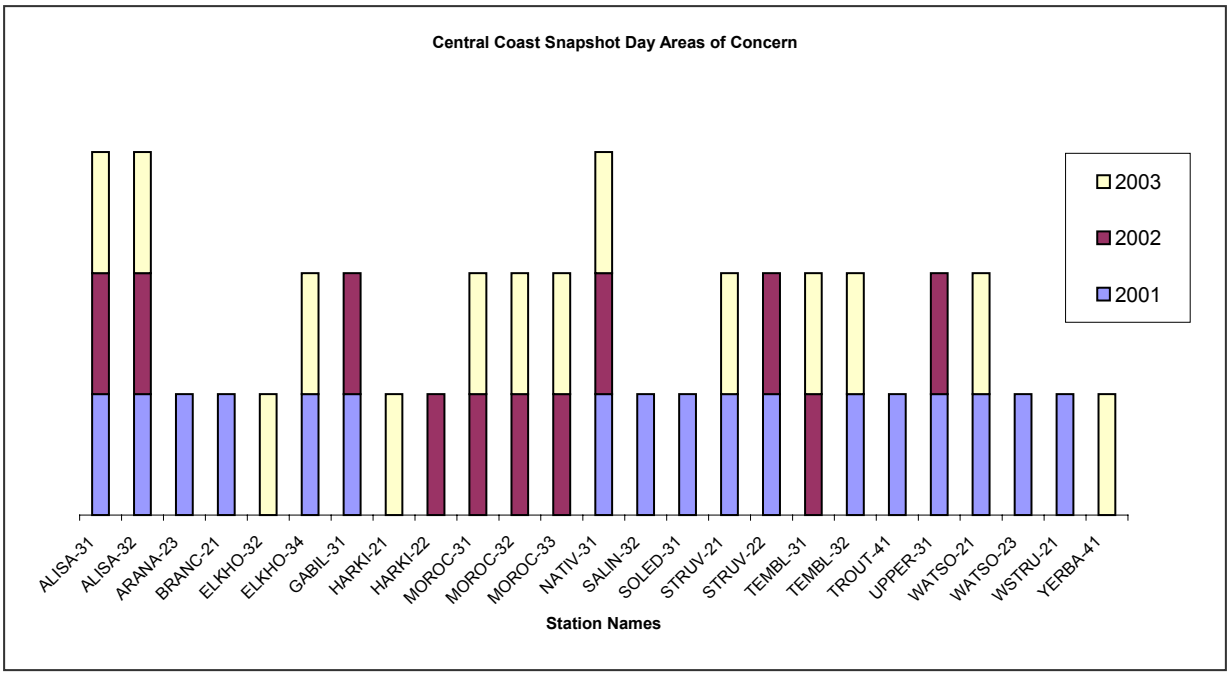

Figure 4. Areas of Concern from the three most recent Snapshot Days across the Monterey Bay area

Secondly, 2003 Central Coast Areas of Concern were compared with the California's list of impaired water bodies. This list (2002 "303(d) list") has been generated by the Regional and State Water Quality Control Board, which identifies impaired waterways. The methodology for this listing is available on the State Board web site (www.swrcb.ca.gov).

This comparison between Snapshot Day sampling events and the 303d list is intended, again, to compare Snapshot Day results with other studies to find out the representativeness of Snapshot data and to identify areas where further investigation is warranted. Of the 14 Areas of Concern on the Central Coast, all but five were identified on the 303(d) list. For nine of the listed areas, the Snapshot Day results corroborated well with the listings.

Further investigation of the five locations not presently listed on the 303d list should be a priority for future monitoring; especially the two locations, Alisal Slough and Natividad Creek, which were identified as Areas of Concern all three years of the Central Coast Snapshot Day program.

Volunteers at Stevens Creek in San Mateo County

Conclusion

Snapshot Day was a huge success. Stations were monitored from Del Norte County to Baja Mexico, all on the same day using the same protocols in order to answer a simple question. The results of the event are of known quality, represent a broad cross section of the drainages flowing to the coast of California and together make up a robust set of water quality data. Using those data, we were able to identify 33 areas as priorities for future investigation, three of which have been Areas of Concern every year sampled.

Photo taken for Santa Barbara Channelkeeper on Faria Creek.

This program enabled eight watershed groups to build a network of monitoring organizations, in cooperation with a coast wide team and technical experts, to expand and strengthen California's citizen monitoring efforts.

With a matching grant from the US EPA for Snapshot Day 2003, the Team was able to purchase $12,800.00 worth of field monitoring equipment for permanent distribution to citizen groups. Conductivity meters, thermometers, pH strips, transparency tubes, turbidity kits and dissolved oxygen kits were provided to the CMCs to use for Snapshot Day 2003 and at their discretion, to give to local citizen groups for continued monitoring throughout the year.

Although the Coast Wide Snapshot Day 2003 was a huge success and met its goals, there were unanticipated challenges and everything did not go like clockwork. The teams ability to respond quickly to CMC needs was hampered by the short time frame of the project for implementation, and unanticipated program development—which turned out to be extensive. Data management took longer and required greater resources than were allocated. Overall there were several key lessons learned.

- The Snapshot Day organization, which relied on CMCs to orchestrate the regional events, worked well.
- Laboratory analysis should be comprehensive and have greater geographic representation. Some financial support for laboratory analysis should be incorporated in future Snapshot Days to further this goal.
- The value of the Quality Assurance protocols should be reviewed for their effectiveness.
- The use of standard reporting methods, such as a single database and field datasheet, is critical to the integrity of data quality and limits data management problems.