

Cruise Report
2000 Regional Monitoring Program
Summer Water Cruise

A P P L I E D
*ocean*marine
S C I E N C E S

July 10-15, 17-19, 2000

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1.0 INTRODUCTION

This report describes activities associated with the second of two water sampling cruises conducted in the year 2000 as part of the Regional Monitoring Program for Trace Substances in the San Francisco Estuary. Water sampling is one component of this program that is designed to provide long-term data on concentrations of trace metals and organic compounds as well as ancillary measurements, suitable for determining trends.

All sampling except for the two watershed sites, which are sampled from shore, was conducted from the R/V *David Johnston*. Water samples were collected and distributed in the following manner:

- Samples for the analysis of arsenic and selenium were collected from 26 sites by personnel from Dr. Russ Flegal's laboratory at the University of California, Santa Cruz (Flegal) and were sent by Applied Marine Sciences Inc. personnel (AMS) to Brooks-Rand, Ltd. (BRL) in Seattle, Washington.
- Samples for the analysis of other trace elements (cadmium, copper, cobalt, manganese, lead, nickel, silver, and zinc) and cognates (salinity, dissolved organic carbon, total suspended sediments, chlorophyll a, ammonium, nitrate, nitrite, phaeophytin, silicates, and orthophosphate) were collected from 26 sites by Flegal and retained by them at the conclusion of the cruise.
- Samples for direct particulate measurement of aluminum, silver, cadmium, cobalt, chromium, copper, manganese, lead, nickel, and zinc were collected from 6 sites by Flegal and retained by them for shipment to Dr. Rob Mason at the University of Maryland Chesapeake Biological Laboratory (UMCBL).
- Samples for analysis of total mercury and methyl mercury from 26 sites and dissolved gaseous mercury (Hg⁰) from 10 sites were collected by Flegal and sent by AMS to UMCBL at the conclusion of the cruise.
- Samples for analysis of hardness were collected from 15 sites by Flegal and retained by AMS for delivery to Union Sanitary District in Union City.
- Samples for analysis of silica were collected from four sites by Flegal and retained by AMS for delivery to Sequoia Analytical Inc.
- Measurement of surface water salinity, temperature, conductivity, pH, and dissolved oxygen were conducted by Flegal at each site, and the water column at each site was profiled by AMS for conductivity, temperature, salinity, dissolved oxygen, and optical back-scatterance.
- Samples for analysis of toxicity were collected from six sites by AMS and were picked up by Pacific Eco-Risk Laboratory Inc. personnel at various locations during the cruise.

- Samples from four (south bay) sites for analysis of total suspended solids, total dissolved solids, total organic carbon, total and dissolved nickel and copper, and total mercury were collected by Flegal and delivered by hand to personnel of the city of San Jose.

2.0 CRUISE REPORT

2.1 Objectives

The objectives of this cruise were to:

1. Collect water samples from 26 sites for analysis of total and dissolved trace elements, and from six sites for particulate trace element analysis.
2. Collect water samples from 26 sites for analysis of salinity, total suspended solids, chlorophyll a, nutrients (ammonium, nitrate, nitrite, orthophosphate, silicate), and dissolved organic carbon.
3. Collect water samples for analysis of total hardness at 13 sites and any additional sites where salinity is <5ppt.
4. Collect profiles of water-column temperature, conductivity, salinity, dissolved oxygen, and optical back-scatterance at 26 sites.
5. Collect samples for analysis of silica from four sites.
6. Collect water samples for bacterial analysis from 26 sites.
7. Collect water samples for methyl mercury analysis from 26 sites, and dissolved gaseous mercury from 10 sites.
8. Collect water samples for toxicity analysis from six sites.
9. Collect water samples from four sites for the city of San Jose.
10. Document current and recent weather conditions at each site.

2.2 Personnel

The personnel and work assignments for this cruise were as follows:

Name	Affiliation	Duties
Corinne Bacon (7/17-19)	UU	Organics
Kim Bracchi (7/10-14)	UCSC	Trace Metal Chemistry
Christian Casteller (7/10-14, 17-19)	UU	Organics
Jordan Gold (7/10-14, 17-19)	AMS	Cruise Manager, Bacterial and toxicity Samples, CTD, weather
Melanie Forbes (7/17-19)	UCSC	Trace Metal Chemistry
Sharon Hibdon (7/10-14)	UCSC	Trace Metal Chemistry
Cameron Hales (7/10-14)	UU	Organics
Naree Kim (7/10-14)	UU	Organics
Allison Leungen (7/17-19)	UCSC	Trace Metal Chemistry
Jennifer Ostrowski (7/10-14)	UCSC	Trace Metal Chemistry
Paul Salop (7/14)	AMS	Training
Genine Scelfo (7/17-19)	UCSC	Trace Metal Chemistry
Gordon Smith (1/31-2/4, 2/7-2/9)	UCSC	<i>RV David Johnston</i> Skipper
Joan Smith (7/11)	Guest	none
Hillary Smith (7/19)	Guest	none
Sharon Squire (7/10-14)	UCSC	Trace Metal Chemistry
Richard Looker (7/18)	RWQCB	Observer

2.3 Sampling Activities

Date	Time	Activity
July 10, 2000	1020–1250	Sampled at Standish Dam (BW10), departed for Guadalupe River site (BW15).
	1330–1530	Sampled at Guadalupe River, departed for Emeryville to mobilize gear onto the R/V David Johnston.
	1730–1800	Mobilized gear onto the R/V David Johnston, departed for the motel.
July 11, 2000	0630–0755	Departed from the motel, mobilized additional gear onto the vessel at Emeryville marina, conducted safety briefing, and departed for Oyster Point site (BB30).
	0902–1034	Sampled at Oyster Point, departed for San Bruno Shoal site (BB15).
	1102–1150	Sampled at San Bruno Shoal, departed for Redwood Creek site (BA40).
July 11, 2000	1229–1340	Sampled at Redwood Creek, departed for South Bay site (BA20).
	1541–1649	Sampled at South Bay, departed for MARFAC (USGS Marine Facility in Redwood City).
	1808–1840	Arrived at MARFAC, demobilized gear and departed for the motel.
July 12, 2000	0700–0810	Departed from the motel, mobilized gear onto the vessel and departed for Coyote Creek site (BA10).
	0914–1024	Sampled at Coyote Creek, departed for San Jose site (C-3-0).
	1056–1206	Sampled at San Jose, departed for Sunnyvale site (C-1-3).
	1307–1409	Sampled at Sunnyvale, departed for Emeryville marina.
	1752–1915	Arrived at Emeryville marina, demobilized gear off of the vessel and departed for the motel.

Date	Time	Activity
July 13, 2000	0730–0810	Departed from the motel, mobilized gear onto the vessel at Emeryville marina and departed for Golden Gate site (BC20).
	1021–1130	Sampled at Golden Gate, departed for Richardson Bay site (BC30).
	1245–1342	Sampled at Richardson Bay, departed for Red Rock site (BC60).
	1420–1524	Sampled at Red Rock, departed for Point Isabel site (BC41).
	1600–1657	Sampled at Pt. Isabel, departed Emeryville marina.
	1729–1800	Arrived at Emeryville marina, demobilized gear off of the vessel and departed for the motel.
July 14, 2000	0730–0811	Departed from the motel, mobilized gear onto the vessel at Emeryville marina and departed for Alameda site (BB70).
	0857–1006	Sampled at Alameda, departed for Yerba Buena Island site (BC10).
	1048–1158	Sampled at Yerba Buena Island, departed for Emeryville marina.
	1218–1250	Arrived at Emeryville marina, demobilized gear off of the vessel and departed for home.
July 15, 2000	0730-1115	Captain Smith transited the vessel to Benicia marina and then departed for home.
July 17, 2000	0600–0727	Departed from the motel, mobilized gear onto the vessel at Benicia marina, conducted safety briefing and departed for Davis Point site (BD40).
	0803–0940	Sampled at Davis Point, departed for Pinole Point site (BD30).
	1018–1126	Sampled at Pinole Point, departed for San Pablo Bay site (BD20).
	1159–1307	Sampled at San Pablo Bay, departed for Petaluma River site (BD15).

Date	Time	Activity
	1350–1516	Sampled at Petaluma River, departed for Napa River site (BD50).
	1700–1811	Sampled at Napa River, departed for Benicia Marina.
	1859–1930	Arrived at Benicia marina, demobilized gear off of the vessel, delivered toxicity samples to PERL personnel and departed for the motel.
July 18, 2000	0815–0850	Departed from the motel, mobilized gear onto the vessel at Benicia marina and departed for Pacheco Creek site (BF10).
	0928–1040	Sampled at Pacheco Creek, departed for Grizzly Bay site (BF20).
July 18, 2000	1132–1305	Sampled at Grizzly Bay, departed for Honker Bay site (BF40).
	1407–1510	Sampled at Honker Bay, departed for Benicia marina.
	1645–1707	Arrived at Benicia marina, demobilized gear off of the vessel, delivered toxicity samples to PERL personnel and departed for the motel.
July 19, 2000	0730–0807	Departed from the motel, mobilized gear onto the vessel at Benicia marina, conducted safety briefing and departed for Sacramento River site (BG20).
	0928–1054	Sampled at Sacramento River, departed for San Joaquin River site (BG30).
	1132–1300	Sampled at San Joaquin River, departed for Benicia marina.
	1455–1630	Arrived at Benicia marina, demobilized gear off of the vessel and departed for home.

2.4 Discussion

Sampling was conducted at the locations documented in Table 1. Samples collected from each site are documented in Table 2. Times of sample collections are documented in Table 3. Weather collections during sampling are documented in table 4.

General Comments

lowering it to the bottom and then retrieving it at approximately 0.5 meters per second. This was done to allow analysis of changes in surface water conductivity and optical back-scatterance at each site during the duration of water sampling activities. The time of initiation of the filling of sample containers was documented to allow comparison with concurrent conductivity and optical back-scatterance data collected by the CTD. Unfortunately, full casts were not obtained at all sites, due to malfunction of the CTD.

Table 1. Coordinates of Water Samples Collected

Site Name/Code	Latitude (N)	Longitude (W)	Depth When Sampled (m)	Comments
Standish Dam/BW10	37° 27.152'	121° 55. 481'	shore	Standish Dam on E bank
Guadalupe\River/BW15	37° 25.554'	121° 58. 786'	shore	South Bay Yacht Club Dock
Oyster Point/BB30	37° 40.142'	122° 19. 725'	10	50 m W of channel marker "4"
San Bruno Shoal/BB15	37° 36.873'	122° 16. 936'	13	1 nmi NE of channel marker "8"
Redwood Creek/BA40	37° 33.529'	122° 12. 533'	3	50 m W of channel marker "12"
Dumbarton Bridge/BA30	37° 30.804'	122° 08. 057'	4	20 m E of channel marker "14"
San Jose/C-3-0	37° 27.615'	121° 58. 526'	3	Just W of railroad bridge in Coyote Creek
Sunnyvale/C-1-3	37° 26.060'	122° 00. 606'	3	Approximately 2.23 nmi up Guadalupe Slough from channel marker "1"
Coyote Creek/BA10	37° 28.102'	122° 03. 754'	6	75 m S of channel marker "18"
South Bay/BA20	37° 29.575'	122° 05. 250'	4	200 m W of channel marker "16"
Golden Gate/BC20	37° 47.493'	122° 40. 490'	30	Offshore of Golden Gate (?) miles
Point Isabel/BC41	37° 53.223'	122° 20. 540'	3	0.61 nmi from Brooks Island and 0.81 nmi from Fleming Point
Red Rock/BC60	37° 55.071'	122° 26. 140'	10	0.7 nmi SW of Red Rock
Richardson Bay/BC30	37° 51.706'	122° 28. 705'	3	30 m NW of channel marker "4"
Alameda/BB70	37° 44.514'	122° 19. 314'	10	20 m SSE of Buoy "A"
Yerba Buena Island/BC10	37° 49.290'	122° 20. 962'	8	0.25 nmi N of Bay Bridge between bridge supports K and L
Davis Point/BD40	38° 03.015'	122° 16. 667'	5	0.2 nmi SW from W end of barge pier
San Pablo Bay/BD20	38° 02.908'	122° 25. 293'	4.0	100 m S of channel marker "2"
Petaluma River/BD15	38° 06.638'	122° 29. 205'	5	50 m W of channel marker "19"
Pinole Point/BD30	38° 01.453'	122° 21. 749'	5	0.5 nmi from marker off end of pier and 0.7 nmi from channel marker "7"
Honker Bay/BF40	38° 04.021'	121° 56. 050'	2	0.65 nmi N of Simmons Point
Grizzly Bay/BF20	38° 06.975'	122° 02. 345'	1.5	100 m S of dolphin
Pacheco Creek/BF10	38° 03.065'	122° 05. 951'	10	0.2 nmi N of buoy "7"
Napa River/BD50	38° 05.793'	122° 15. 630'	4	50 m off concrete seawall and E of NE corner of Mare Island Naval Shipyard building
Sacramento River/BG20	38° 03.581'	121° 48. 604'	10	0.1 nmi W of channel marker "8"
San Joaquin River/BG30	38° 01.229'	121° 48. 310'	10	0.11 nmi E of channel marker "8"

Table 2. Samples Collected During 2000 Winter Water Cruise

COLLECTION INFORMATION		FILTERED AND UNFILTERED					FILTERED					UNFILTERED				
Site	Day	As, Se	dgHg	mmHg, Hg	OTE	Org.	Nutr.	DOC	Hard.	Sal.	Chl.	Si	TSS	Tox.	PM	Ba
Standish Dam/BW10	1	•	•	•	•	•	•	•	•	•	•		•		•	•
Guadalupe River/BW15	1	•		•	•	•	•	•	•	•	•		•		•	•
Oyster Point/BB30	2	•		•	•		•	•		•	•		•			•
San Bruno Shoal/BB15	2	•	•	•	•		•	•		•	•		•			•
Redwood Creek/BA40	2	•		•	•	•	•	•		•	•		•			•
Dumbarton Bridge/BA30	2	•		•	•1	•	•	•		•	•		•	•		•
South Bay/BA20	2	•	•	•	•1		•	•	•	•	•		•		•	•
San Jose/C-3-0	3	•	•	•	•1	•	•	•	•	•	•		•	•		•
Sunnyvale/C-1-3	3	•		•	•		•	•	•	•	•		•	•		•
Coyote Creek/BA10	3	•		•	•1	•	•	•		•	•		•			•
Golden Gate/BC20	4	•	•	•	•	•	•	•		•	•	•	•			•
Point Isabel/BC41	4	•		•	•		•	•		•	•		•			•
Red Rock/BC60	4	•		•	•	•	•	•		•	•		•			•
Richardson Bay/BC30	4	•		•	•		•	•		•	•		•			•
Alameda/BB70	5	•		•	•	•	•	•		•	•		•			•
Yerba Buena Island/BC10	5	•		•	•	•	•	•		•	•		•		•	•
Davis Point/BD40	7	•	•	•	•	•	•	•	•	•	•		•			•
San Pablo Bay/BD20	7	•	•	•	•	•	•	•	•	•	•		•		•	•
Petaluma River/BD15	7	•	•	•	•	•	•	•	•	•	•		•			•
Pinole Point/BD30	7	•		•	•	•	•	•	•	•	•		•	•		•
Honker Bay/BF40	8	•		•	•		•	•	•	•	•		•			•
Quincy	8	•		•	•		•	•	•	•	•		•			•

Table 2. Samples Collected During 2000 Winter Water Cruise (cont.)

COLLECTION INFORMATION		FILTERED AND UNFILTERED					FILTERED					UNFILTERED				
Site	Day	As, Se	dgHg	mmHg, Hg	OTE	Org.	Nutr.	DOC	Hard.	Sal.	Chl.	Si	TSS	Tox.	PM	Ba
Pacheco Creek/BF10	8	•		•	•	•	•	•	•	•	•	•	•			•
Napa River/BD50	8	•		•	•	•	•	•	•	•	•		•			•
Sacramento River/BG20	9	•	•	•	•	•	•	•	•	•	•	•	•		•	•
San Joaquin River/BG30	9	•	•	•	•	•	•	•	•	•	•	•	•	•		•

• = Sample was collected at this site.

1 = Total and dissolved (filtered and unfiltered) samples were taken for the City of San Jose at these sites.

As,Se = arsenic and selenium, dgHg= dissolved gaseous mercury, mmHg, Hg = methyl mercury, total mercury, OTE = other trace elements, Org. = organics, Nutr. = nutrients, DOC = dissolved organic carbon, Hard. = hardness, Sal. = salinity, Chl. = chlorophyll, Si. = Silica, TSS = total suspended solids, Tox. = toxicity, PM = particulate metals, Bact. = bacteria

Table 3A. Time of sample collection

COLLECTION INFORMATION		FILTERED SAMPLES			UNFILTERED SAMPLES				
Site	Day	As, Se	mmHg, Hg	OTE	As, Se	dgHg	mmHg, Hg	PM	OTE
Standish Dam/BW10	1	1136	1146	1140	1120	1122	1110	1105	1107
Guadalupe River/BW15	1	1435	1448	1443	1412		1426	1417	1425
Oyster Point/BB30	2	0946	0941	0937	0915		0922		0919
San Bruno Shoal/BB15	2	1131	1139	1136	1113	1122	1133		1121
Redwood Creek/BA40	2	1252	1257	1255	1239		1244		1240
Dumbarton Bridge/BA30	2	1450	1500	1456	1420		1425		1422
South Bay/BA20	2	1629	1635	1631	1557	1610	1613	1600	1604
San Jose/C-3-0	3	1145	1154	1150	1109	1120	1123		1115
Sunnyvale/C-1-3	3	1343	1352	1348	1321		1328		1324
Coyote Creek/BA10	3	0951	1001	1003	0932		0939		0936
Golden Gate/BC20	4	1108	1120	1111	1038	1052	1047		1044
Point Isabel/BC41	4	1631	1636	1640	1613		1617		1621
Red Rock/BC60	4	1449	1500	1456	1434		1440		1437
Richardson Bay/BC30	4	1315	1321	1325	1257		1304		1301
Alameda/BB70	5	0930	0940	0936	0910		0919		0916
Yerba Buena Island/BC10	5	1120	1127	1124	1059		1112	1103	1108
Davis Point/BD40	7	0918	0922	0928	0853	0857	0909		0904

COLLECTION INFORMATION		FILTERED SAMPLES			UNFILTERED SAMPLES				
Site	Day	As, Se	mmHg, Hg	OTE	As, Se	dgHg	mmHg, Hg	PM	OTE
Petaluma River/BD15	7	1426	1434	1431	1407	1403	1416		1412
Pinole Point/BD30	7	1049	1059	1055	1031		1040		1035
Honker Bay/BF40	8	1437	1448	1441	1417		1425		1421
Grizzly Bay/BF20	8	1212	1221	1217	1147	1151	1157		1155
Pacheco Creek/BF10	8	1006	1022	1012	0947		0956		0952
Napa River/BD50	8	1730	1738	1733	1710		1717		1714
Sacramento River/BG20	9	1010	1020	1016	0941	0946	0959	0955	0950
San Joaquin River/BG30	9	1204	1213	1209	1141	1145	1153		1150

Table 3B. Time of sample collection

COLLECTION INFORMATION		Cognates and other samples									
Site	Day	TSS	Ch.	Tox.	Si	Hard.	Sal.	Nut.	DOC	Bact.	Org.
Standish Dam/BW10	1	1100	1100			1103	1133	1130	1136	1114	1100-1234
Guadalupe River/BW15	1	1410	1404			1430	1355	1437	1450	1420	1400-1500
Oyster Point/BB30	2	0913	0912				0906	0931	0943	0920	
San Bruno Shoal/BB15	2	1112	1110				1110	1130	1142	1120	
Redwood Creek/BA40	2	1237	1235				1249	1250	1251	1240	1235-1335
Dumbarton Bridge/BA30	2	1415	1415	1430			1448	1449	1505	1440	1418-1518
South Bay/BA20	2	1553	1550			1624	1624	1625	1635	1600	
San Jose/C-3-0	3	1105	1103	1130		1139	1138	1143	1158	1137	1059-1200
Sunnyvale/C-1-3	3	1318	1317	1340		1335	1337	1319	1356	1323	
Coyote Creek/BA10	3	0931	0926				0953	0956	1000	0930	0920-1020
Golden Gate/BC20	4	1040	1036				1022	1105	1123	1035	1025-1128
Point Isabel/BC41	4	1609	1608				1644	1628	1642	1620	
Red Rock/BC60	4	1432	1430				1447	1451	1503	1440	1425-1519
Richardson Bay/BC30	4	1254	1252				1249	1312	1324	1300	
Alameda/BB70	5	0908	0907				0903	0928	0942	0914	0903-1001
Yerba Buena Island/BC10	5	1056	1054				1116	1117	1130	1101	1050-1150
Davis Point/BD40	7	0850	0848			0920	0913	0915	0930	0910	0808-0908
San Pablo Bay/BD20	7	1207	1204			1227	1225	1229	1241	1230	1201-1300

COLLECTION INFORMATION		Cognates and other samples									
Site	Day	TSS	Ch.	Tox.	Si	Hard.	Sal.	Nut.	DOC	Bact.	Org.
taluma River/BD15	7	1358	1355			1421	1400	1424	1435	1410	
Pinole Point/BD30	7	1029	1025	1042		1044	1043	1047	1100	1030	1020-1121
Honker Bay/BF40	8	1416	1413			1430	1408	1433	1448	1420	
Grizzly Bay/BF20	8	1143	1140	1202	1158	1204	1202	1207	1219	1155	1134
Pacheco Creek/BF10	8	0944	0940		0945	1001	0959	1004	1114	1030	
Napa River/BD50	8	1709	1707			1729	1522	1727	1741	1725	
Sacramento River/BG20	9	0937	0935		0939	1003	1004	1007	1023	1000	0933-1044
San Joaquin River/BG30	9	1138	1136	1205	1140	1156	1158	1202	1217	1139	1134-1245

Table 4. Weather conditions during sampling

Site	Day	Sea State	Beaufort Scale	Tide Stage	Wind Speed (knots)	Wind Direction	Cloud Cover	Precip.	Comments
Standish Dam/BW10	1	calm	0	ebb	<5	northwest	0%	none	No rain for months.
Guadalupe River/BW15	1	calm	0	ebb	<5	northwest	0%	none	No rain for months.
Oyster Point/BB30	2	calm	0	flood	0	NA	100%	none	No rain for months.
San Bruno Shoal/BB15	2	calm	0	slack	0	NA	50%	none	No rain for months.
Redwood Creek/BA40	2	1 ft. chop	1	ebb	8-10	north	5%	none	No rain for months.
Dumbarton Bridge/BA30	2	1 ft. chop	2	ebb	15	north	15%	none	No rain for months.
South Bay/BA20	2	1 ft. chop	2	ebb	15	northwest	20%	none	No rain for months.
San Jose/C-3-0	3	calm	0	flood	3	northwest	0%	none	No rain for months.
Sunnyvale/C-1-3	3	calm	0	ebb	10-15	northwest	0%	none	No rain for months.
Coyote Creek/BA10	3	calm	0	ebb	0	NA	0%	none	No rain for months.
Golden Gate/ BC20	4	2 ft swell	1	flood	4	west	95%	none	No rain for months.
Richardson Bay/BC30	4	1 ft. chop	2	ebb	8-10	west	100%	none	No rain for months.
Red Rock/BC60	4	1 ft.	2	ebb	10	southwest	0%	none	No rain for months.
Point Isabel/BC41	4	1-2 ft. chop	2	ebb	15	southwest	0%	none	No rain for months.
Alameda/BB70	5	calm	0	flood	1-2	northwest	100%	none	No rain for months.
Yerba Buena Island/BC10	5	1 ft. chop	2	flood	8	northwest	15%	none	No rain for months.
Davis Point/BD40	7	1 ft. chop	2.5	ebb	8-10	southwest	100%	none	No rain for months.
San Pablo Bay/BD20	7	1 ft.	1	flood	8	southwest	100%	none	No rain for months.

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Table 4. Weather conditions during sampling (cont.)

Site	Day	Sea State	Beaufort Scale	Tide Stage	Wind Speed (knots)	Wind Direction	Cloud Cover	Precip.	Comments
Honker Bay/BF40	8	1 ft. chop	1	flood	8-10	west	0%	none	No rain for months.
Grizzly Bay/BF20	8	1 ft. chop	1.5	flood	10	south	0%	none	No rain for months.
Pacheco Creek/BF10	8	1 ft. chop	2	ebb	12-15	west	0%	none	No rain for months.
Napa River/BD50	8	.5 ft. chop	1	ebb	5	southwest	20%	none	No rain for months.
Sacramento River/BG20	9	1-2 ft. chop	1.5	ebb	12	west	0%	none	No rain for months.
San Joaquin River/BG30	9	.5-1 ft. chop	0-1	ebb	10-12	west	100%	none	No rain for months.