

GUADALUPE RIVER WATERSHED RESERVOIR SEDIMENT SAMPLING

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A total of 55 sediment samples were collected from three reservoirs in the Guadalupe River watershed on March 1-3, 2005. The samples were collected using an Eckman grab sampler from a non-metallic Zodiac boat. The Eckman grab sampler is appropriate for soft bottom sediments. (For additional information on the sampler, go to <http://www.rickly.com/as/bottomgrab.htm>.) For each sample, one person (“dirty hands”) wearing gloves operated the Eckman grab sampler, and opened the sediment into a clean, plastic dissecting tray. Another person (“clean hands”) wearing clean room gloves used a pre-cleaned stainless steel spatula from the laboratory to fill a glass sample bottle from the middle portion of the sediment, away from the edges touched by the grab sampler. The glass bottles had been pre-cleaned using acids in the laboratory. The samples were placed in glass bottles in a cooler until shipment to the laboratory. After collecting each sample, the Eckman grab sampler, the spatula, and the tray were scrubbed to clean them, and then rinsed several times with reservoir water from the sampling location. The water has much lower total mercury concentrations than the sediment. One replicate sample was collected in each reservoir.

Laboratory QA/QC included analysis of method blanks, duplicate samples, matrix spike samples, and analysis of a standard reference material. The sediment samples were digested using aqua regia (8 mL HCl and 2 mL HNO₃); the mercury was analyzed using ultra-clean procedures as prescribed for EPA Method 1631. The estimated method detection limit was determined to be 0.54 ng/g (0.00054 mg/kg) from analysis of eight blanks. The QA/QC results were acceptable. The relative percent difference (RPD) for the duplicate samples ranged from 13.9 to 16.3 percent; the percent recovery for the matrix spike samples ranged from 92.5 to 100.5 percent with a RPD for the spike duplicates of 1.9 to 6.4 percent. The results for analysis of the reference material (NIST-2709) varied from 94.6 to 105.3 percent of the certified value of 1,400 ng/g; the relative standard deviation was 5.5 percent.

A summary of the results for each reservoir is provided in Table 1. Lexington Reservoir sediment samples had the lowest mercury concentrations, all less than 0.2 mg/kg, consistent with the lack of mining or mineralization. Guadalupe Reservoir sediment samples had the highest mercury concentrations. One sediment sample from nearshore, consisting of sand and grit, near a former mine had much higher mercury concentrations than the other sediment samples (337.9 mg/kg in this sample versus 0.4 to 7.2 mg/kg in the other Guadalupe Reservoir sediment samples. The nearshore sample from near the mine was not included in the statistics. The data tables and location maps are included in the appendix to this report.

Table 1. Statistical Summary of Total Mercury, mg/kg in Reservoir Sediment Samples from 2005

	Lexington Reservoir	Calero Reservoir	Guadalupe Reservoir
Mean	0.11	0.42	3.32
Median	0.10	0.39	2.82 (2.95)*
Minimum	0.07	0.10	0.42
Maximum	0.18	0.84	7.29 (337.9)*
Number of Samples	20	18	16

*One sample was not included in statistical analyses; the median value shown in parentheses includes all samples from Guadalupe Reservoir.

Most of the samples were fine-grained silts and clays (less than 63 microns). Lexington reservoir sediments had the highest percent of silts and clays. A few nearshore samples had sand. One of the Calero sediment samples had clam shells, and two nearshore samples from Guadalupe had coarse sand and grit. A comparison of percent fines and total mercury concentrations for each reservoir is shown in Figure 1. In general, the total mercury did not correlate to percent fines; there were samples with less percent fines, but higher mercury in all three reservoirs. This lack of a relationship is consistent with the form of mercury as cinnabar in some samples, particularly near the former mining area.

The finding of low total mercury concentrations in Lexington Reservoir sediments is consistent with the hypothesis that this watershed represents background conditions. The total mercury concentrations in the sediment were less than 0.2 mg/kg, which lends support to consideration of this value as a target for particulate mercury.

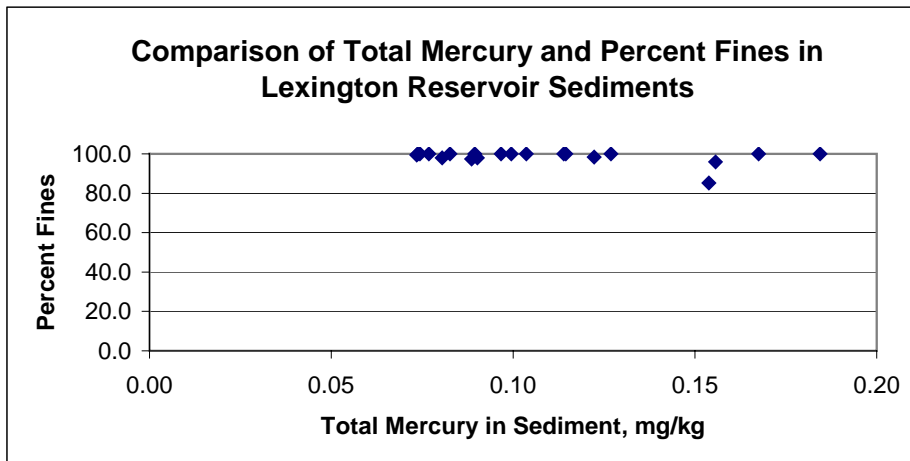
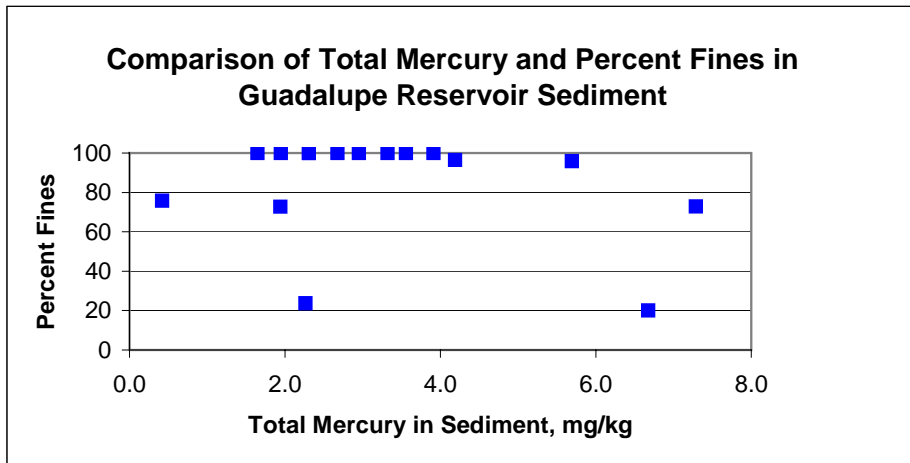
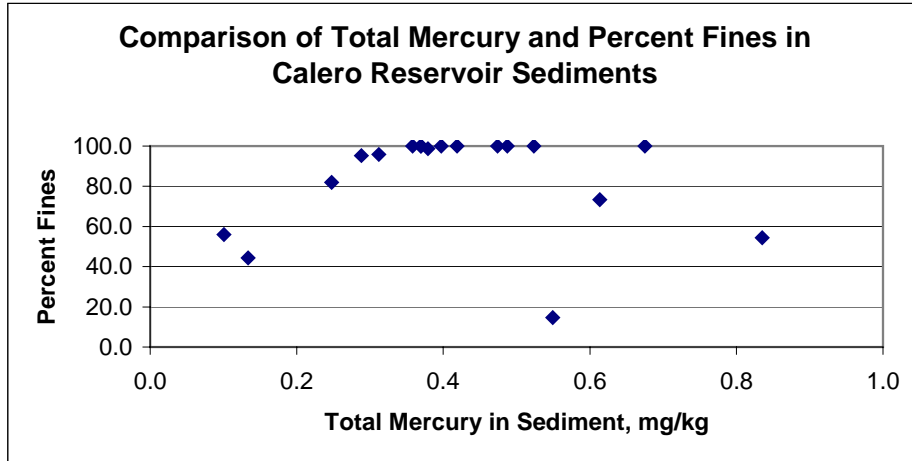


Figure 1. Comparison of Total Mercury in Sediment and Percent Fines at Calero, Guadalupe, and Lexington Reservoirs (Total mercury is expressed on a dry basis. Percent fines are less than 63 microns.)

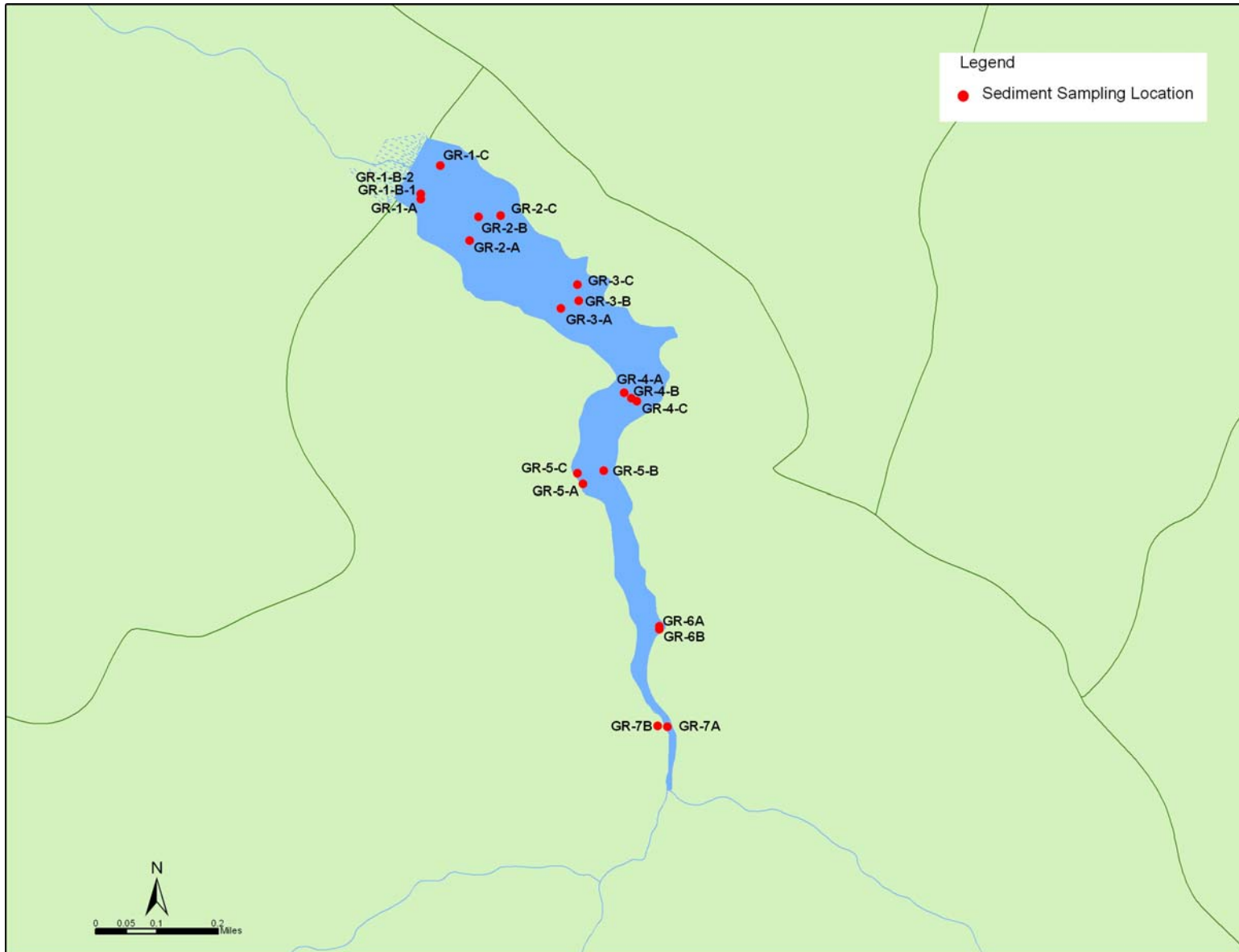
APPENDIX

Table 1. Reservoir Sediment Mercury and Percent Fines

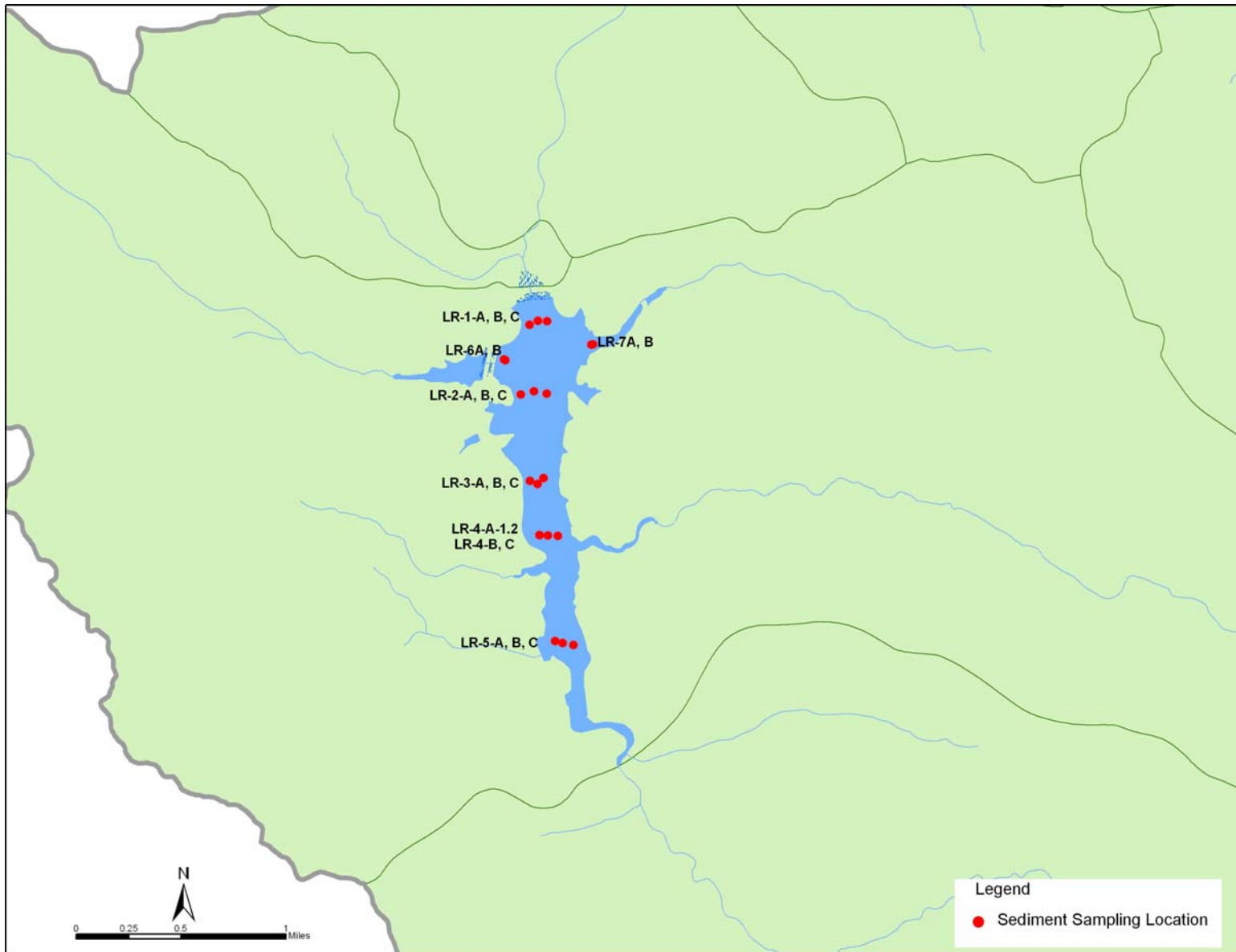
Sample ID	Total Mercury mg/kg (dry basis)	Percent Fines*
CR-1-A	0.13	44.3
CR-1-B	0.47	100.0
CR-1-C	0.36	100.0
CR-2-A	0.68	100.0
CR-2-B	0.52	100.0
CR-2-C	0.49	100.0
CR-3-A	0.37	100.0
CR-3-B	0.37	100.0
CR-3-C	0.40	100.0
CR-4-A	0.38	98.8
CR-4-B-1	0.42	100.0
CR-4-B-2	0.31	95.9
CR-4-C	0.29	95.3
CR-5-A	0.25	81.9
CR-5-B	0.55	14.7
CR-5-C	0.10	56.0
CR-7-A	0.61	73.3
CR-7-B	0.84	54.4
GR-1-A	3.32	100.0
GR-1-B-1	3.91	100.0
GR-1-B-2	3.56	100.0
GR-1-C	4.19	96.5
GR-2-A	1.65	100.0
GR-2-B	1.95	100.0
GR-2-C	2.68	100.0
GR-3-A	2.31	100.0
GR-3-B	2.31	100.0
GR-3-C	2.95	100.0
GR-4-A	6.67	20.1
GR-4-B	1.94	72.7
GR-4-C	5.69	96.0
GR-5-B	2.27	23.7
GR-5-C	7.29	72.9
GR-6-A	337.90	29.3
GR-7-A	0.42	75.8
LR-1-A	0.12	98.4
LR-1-B	0.11	100.0
LR-1-C	0.07	100.0
LR-2-A	0.15	85.2
LR-2-B	0.16	95.8
LR-2-C	0.13	100.0
LR-3-A	0.11	100.0
LR-3-B	0.10	100.0
LR-3-C	0.10	100.0
LR-4-A-1	0.10	100.0
LR-4-A-2	0.07	100.0
LR-4-B	0.08	100.0
LR-4-C	0.09	100.0
LR-5-A	0.08	100.0
LR-5-B	0.07	99.5
LR-5-C	0.08	98.0
LR-6-A	0.09	97.3
LR-6-B	0.09	97.9
LR-7-A	0.18	100.0
LR-7-B	0.17	100.0

*Percent Fines means less than 63 microns

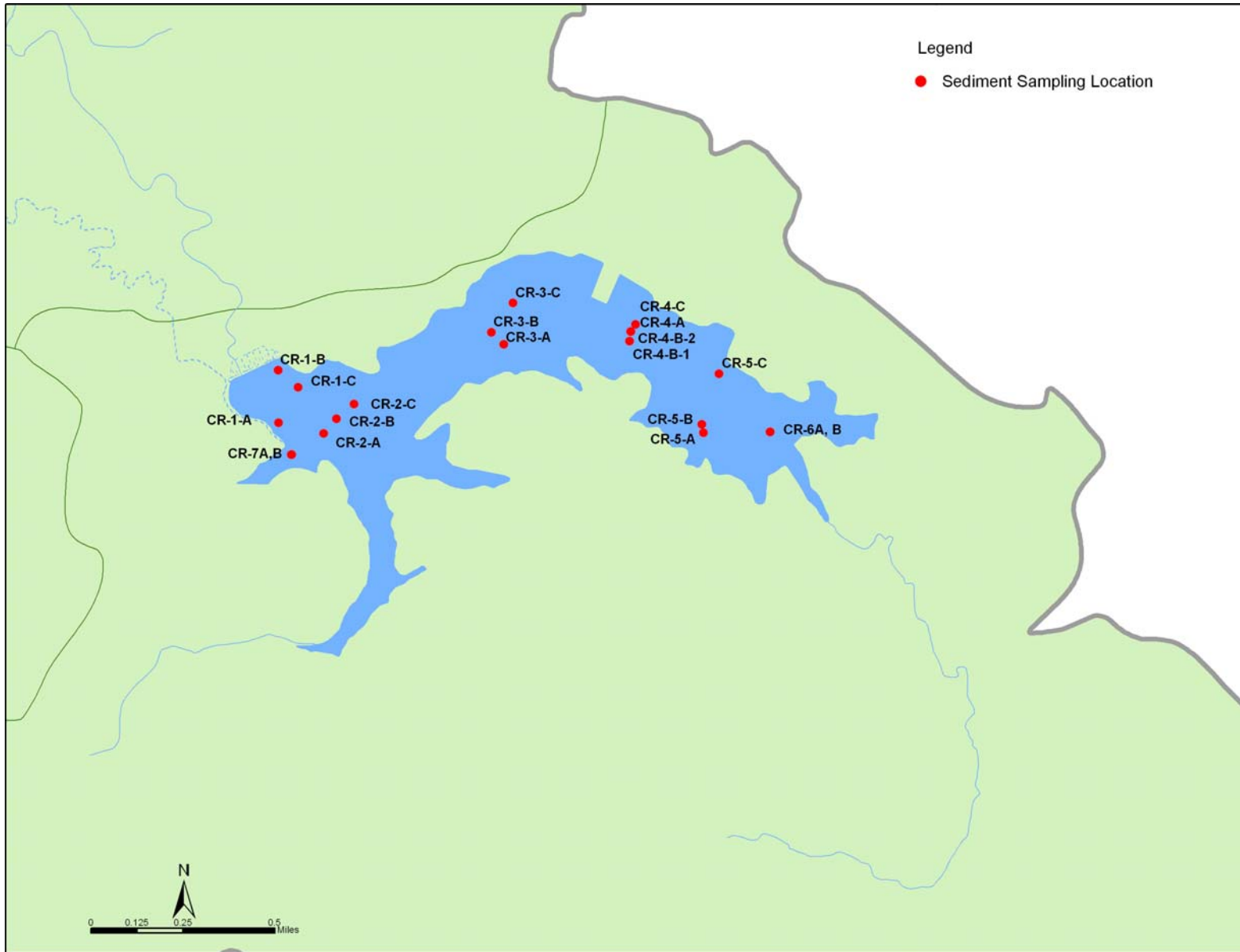
Reservoir	Date	Site ID	Depth (ft)	Latitude	Longitude	Comments
Calero						
A = Hillside; "B" = Mid-channel; "C" = McKean Road side						
	3/1/2005	CR-1-A	74	37°10.867'	121°47.463'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-1-B	76	37°10.992'	121°47.466'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-1-C	75	37°10.952'	121°47.406'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-2-A	65	37°10.843'	121°47.328'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-2-B	65	37°10.878'	121°47.291'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-2-C	64	37°10.914'	121°47.240'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-3-A	45	37°11.061'	121°46.799'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-3-B	45	37°11.089'	121°46.836'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-3-C	41	37°11.159'	121°46.773'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/1/2005	CR-4-A	25	37°11.072'	121°46.426'	Fine-sandy sediment, some clam shell debris, predominantly light brown sediment (perhaps because the sampler didn't penetrate as deeply into this substrate as it did at sites -1, -2, and -3)
	3/1/2005	CR-4-B-1	24	37°11.095'	121°46.423'	Fine-sandy sediment, some clam shell debris, predominantly light brown sediment (perhaps because the sampler didn't penetrate as deeply into this substrate as it did at sites -1, -2, and -3. Duplicates collected
	3/1/2005	CR-4-B-2	24	37°11.095'	121°46.423'	Fine-sandy sediment, some clam shell debris, predominantly light brown sediment (perhaps because the sampler didn't penetrate as deeply into this substrate as it did at sites -1, -2, and -3. Duplicates collected
	3/1/2005	CR-4-C	23	37°11.112'	121°46.410'	Fine sandy sediment with several large live clams and shell debris (photo). Gravely bottom at several locations in vicinity. We were able to collect a sample after trying 6+ grab sampler drops at 2 separate sites in the near vicinity. Collected sample contained little shell debris and fine sand.
	3/1/2005	CR-5-A	12	37°10.857'	121°46.204'	Sandy bottom with lots of shell debris and small rocks (1-3 cm). Sample collected on the 9th grab sampler drop at 4 separate sites in the near vicinity.
	3/1/2005	CR-5-B	11	37°10.877'	121°46.209'	Fine sand/silt with some black streaks.
	3/1/2005	CR-5-C	18	37°10.998'	121°46.160'	No sample collected. Bottom is covered with either macrophytes, peat, twigs, or leafy debris, which impeded the sampler from working properly. Made 9+ grab sampler drops at 4 separate sites in the near vicinity and came up with nothing.
	3/1/2005	CR-6A	5, 10, 12	37°10.861'	121°46.007'	No sample collected. Bottom is covered with either macrophytes, peat, twigs, or leafy debris, which impeded the sampler from working properly. Made 9+ grab sampler drops at 4 separate sites in the near vicinity and came up with nothing.
	3/1/2005	CR-6B	5, 10, 12	37°10.861'	121°46.007'	Fine sand, significant leafy debris. Samples collected approx. 50' from where Almaden-Calero Canal enters the reservoir
	3/1/2005	CR-7A	49	37°10.792'	121°47.423'	Fine sand, significant leafy debris. Samples collected approx. 50' from where Almaden-Calero Canal enters the reservoir
	3/1/2005	CR-7B	49	37°10.792'	121°47.422'	Fine sand, significant leafy debris. Samples collected approx. 50' from where Almaden-Calero Canal enters the reservoir
Lexington						
A = HWY 17 side; "B" = Mid-channel; "C" = Alma Bridge Road side						
	3/2/2005	LR-1-A	83	37°11.943'	121°59.388'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/2/2005	LR-1-B	84	37°11.960'	121°59.344'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/2/2005	LR-1-C	87	37°11.960'	121°59.297'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/2/2005	LR-2-A	70	37°11.653'	121°59.427'	High sand content w/some organic matter (e.g., small, hair-like roots). No odor.
	3/2/2005	LR-2-B	73	37°11.668'	121°59.360'	Bottom is consolidated clay and hard. Grab sample comprised of small clumps of clay-like material (grey color and no odor)
	3/2/2005	LR-2-C	70	37°11.658'	121°59.294'	Sandy content w/some organic matter (e.g., small, hair-like roots) and small rocks (~1 cm). No odor.
	3/2/2005	LR-3-A	74	37°11.295'	121°59.374'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/2/2005	LR-3-B	76	37°11.283'	121°59.334'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/2/2005	LR-3-C	73	37°11.308'	121°59.304'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.
	3/2/2005	LR-4-A-1	55	37°11.073'	121°59.320'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-4-A-2	55	37°11.073'	121°59.320'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-4-B	57	37°11.071'	121°59.275'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-4-C	54	37°11.071'	121°59.223'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-5-A	25	37°10.635'	121°59.229'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-5-B	25	37°10.626'	121°59.190'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-5-C	25	37°10.619'	121°59.134'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-6A	54	37°11.795'	121°59.512'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor. Duplicate samples.
	3/2/2005	LR-6B	54	37°11.797'	121°59.517'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor.
	3/2/2005	LR-7A	64	37°11.866'	121°59.057'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor.
	3/2/2005	LR-7B	64	37°11.865'	121°59.067'	Soft, fine sediment. Light brown surface (<3 cm) over darker grey-black sediment >3 cm). No odor.
Guadalupe						
A = Hicks Road side; "B" = Mid-channel; "C" = Hillside						
	3/3/2005	GR-1-A	65	37°11.909'	121°52.740'	Soft, fine sediment with some small (<1 cm) gravel. Light brown surface (<3 cm) over darker grey-brown sediment >3 cm). No odor.



Locations for Guadalupe Reservoir Sediment Samples



Locations for Lexington Reservoir Samples



Locations for Calero Reservoir Samples