

US EPA ARCHIVE DOCUMENT

10. Appendix

Figures A-1 to A-12

Tables A-1 to A-4

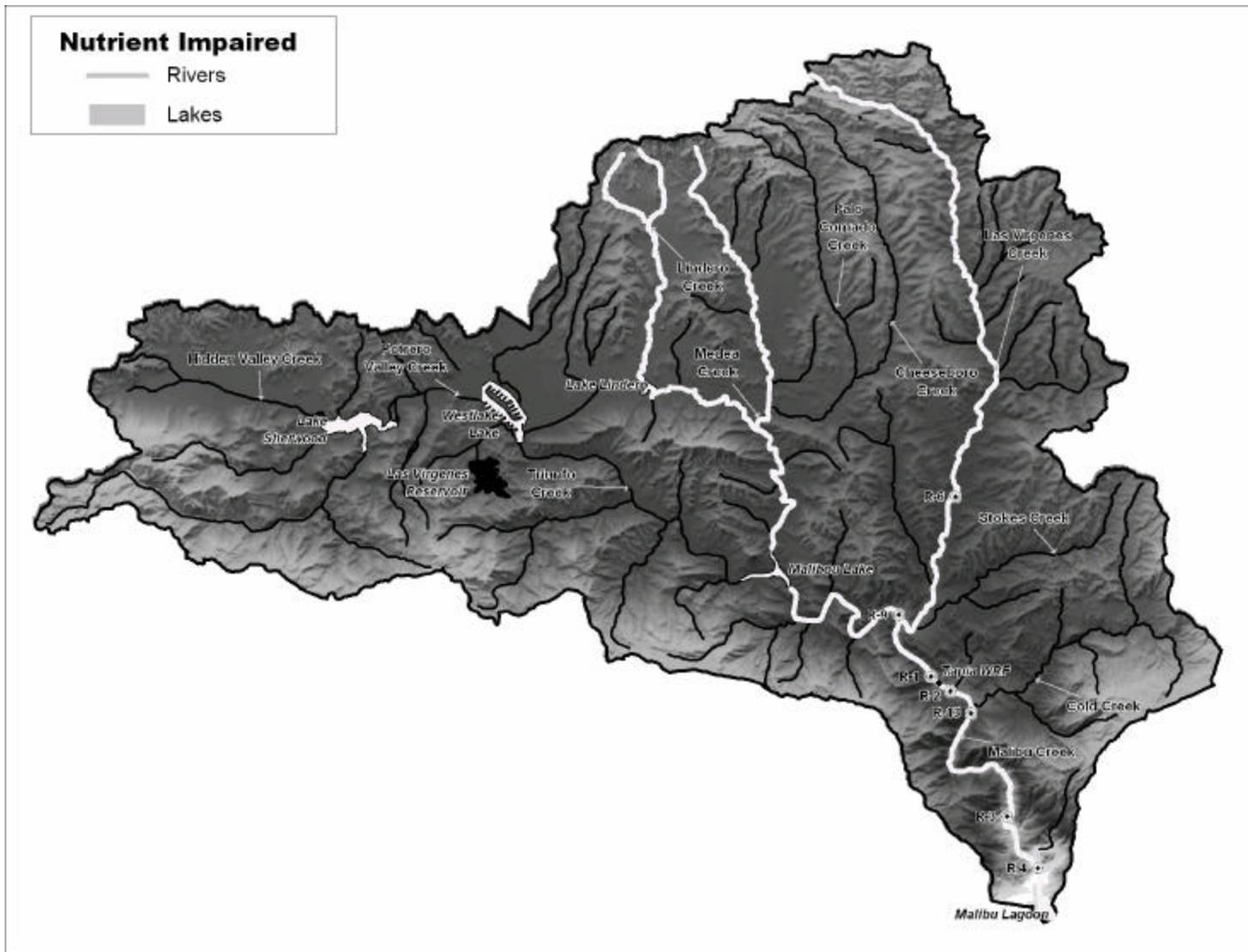


Figure A-1. Nutrient Impaired Waters of Malibu Creek
 Also shown: Tapia WRF (square) and 6 monitoring sites along Malibu Creek (open circles with squares).

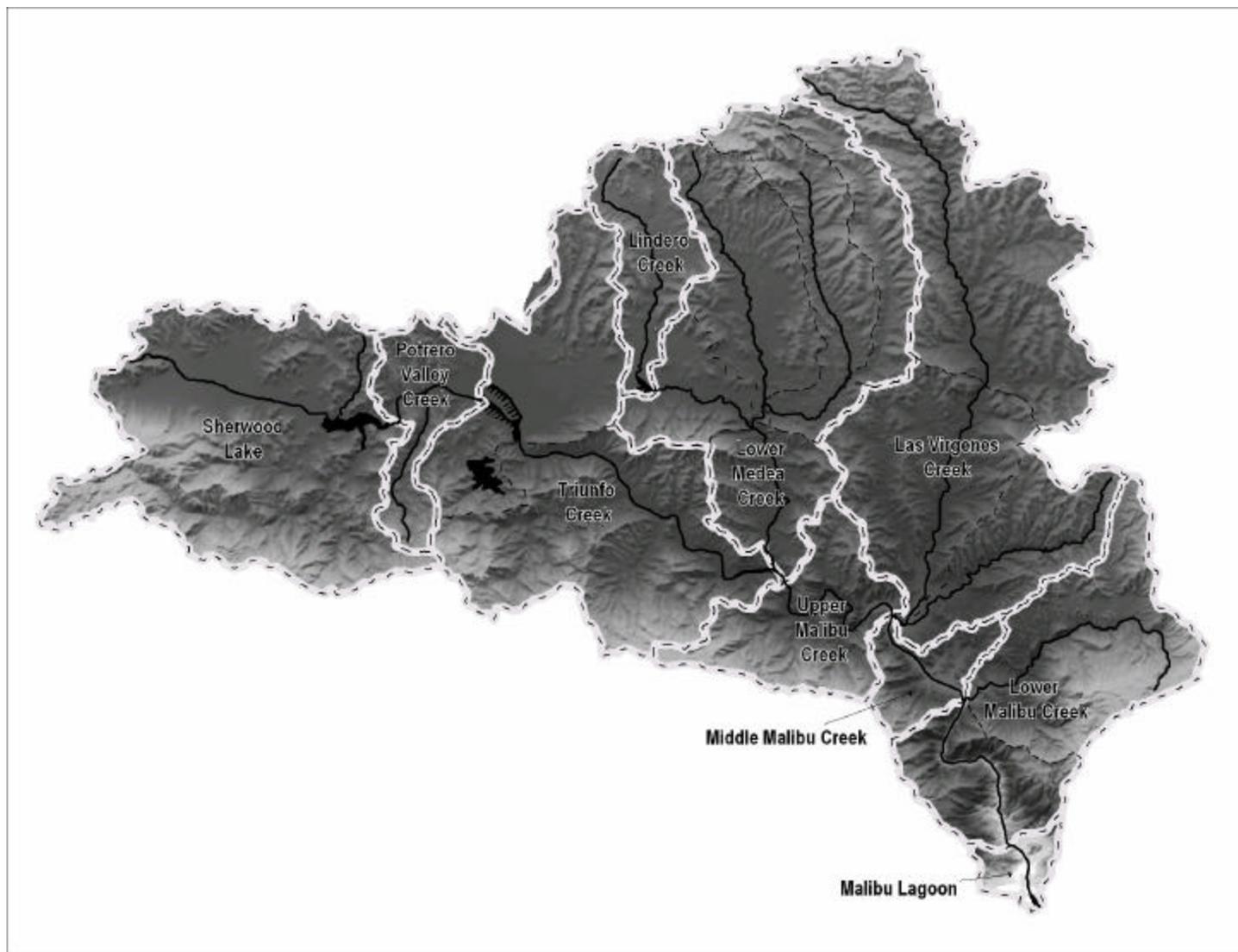


Figure A-2. Subwatersheds for Malibu Creek Nutrient TMDLs
(source: Tetra Tech report, 2002)

Mean and standard deviation of percent algal cover during summer (Tapia 1983-1999)

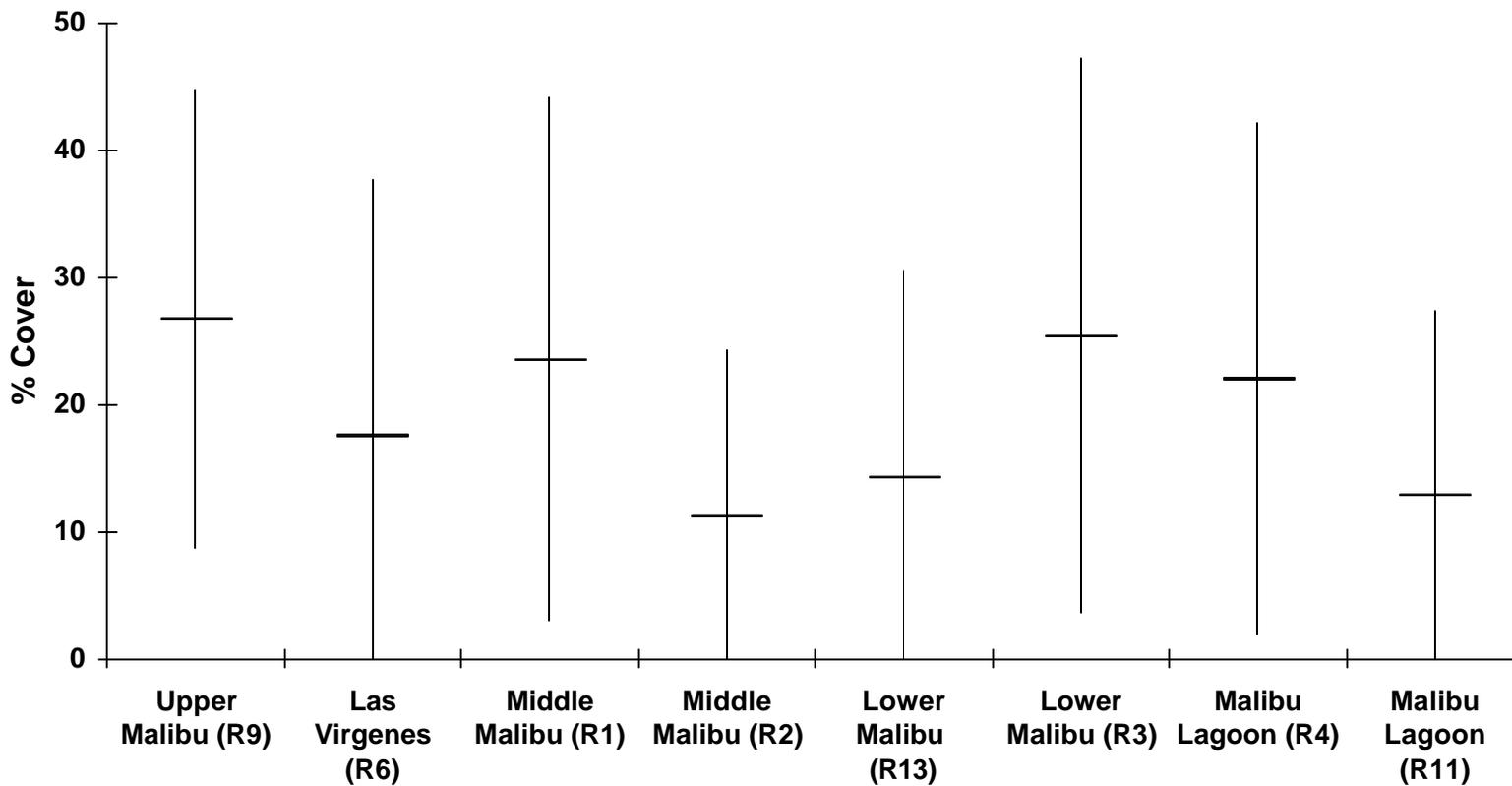


Figure A-3. Percent coverage of floating algae in Malibu Creek watershed and tributaries during the summer months. (source: Tapia, 1983 to 1999)

Mean and standard deviation of percent algal cover during winter (Tapia 1983 - 1999)

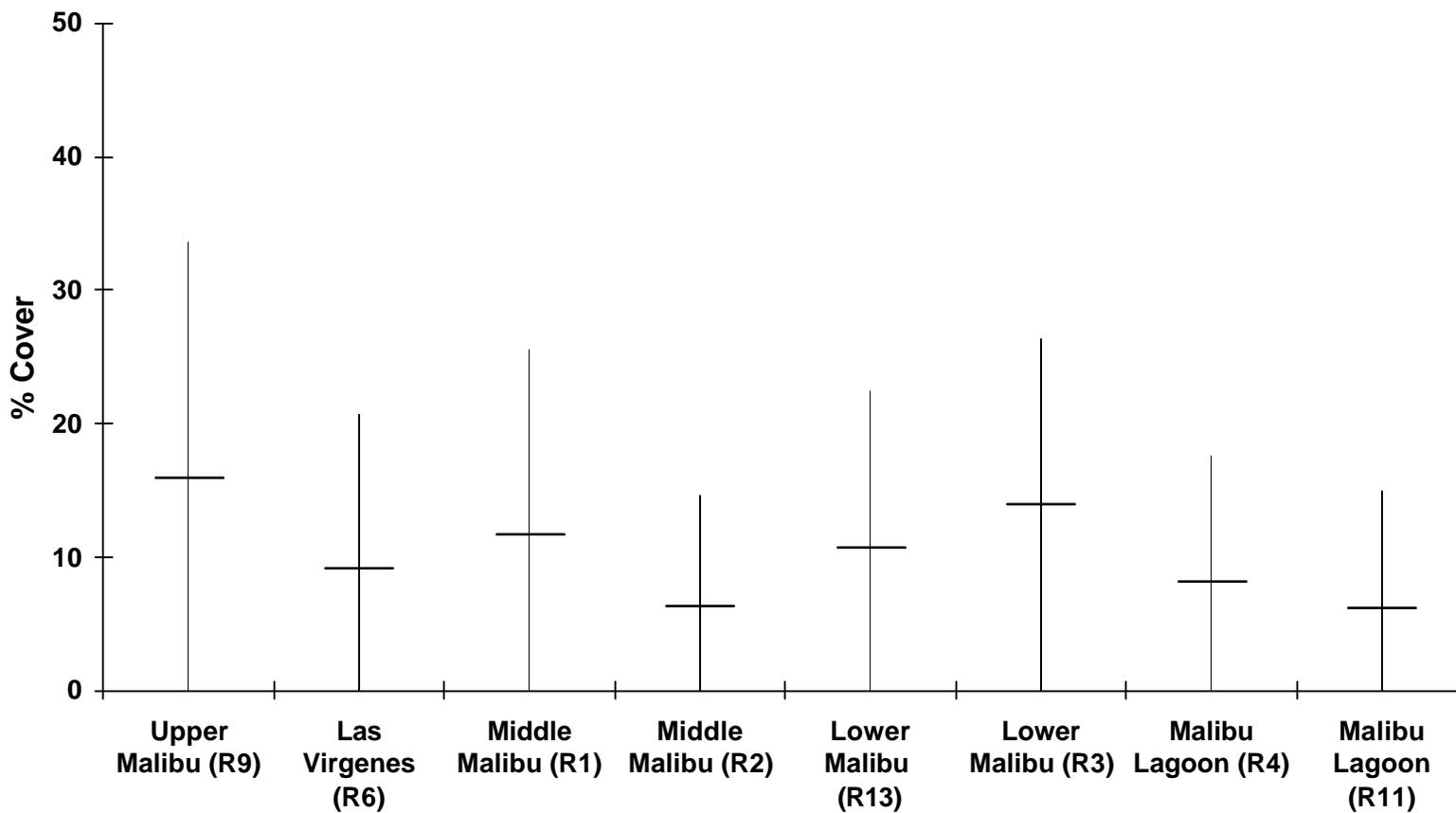


Figure A-4. Percent coverage of floating algae in Malibu Creek watershed and tributaries during the winter months. (source: Tapia, 1983 to 1999)

Mean and standard deviation in floating algal cover during summer (Heal the Bay, 1999-2002)

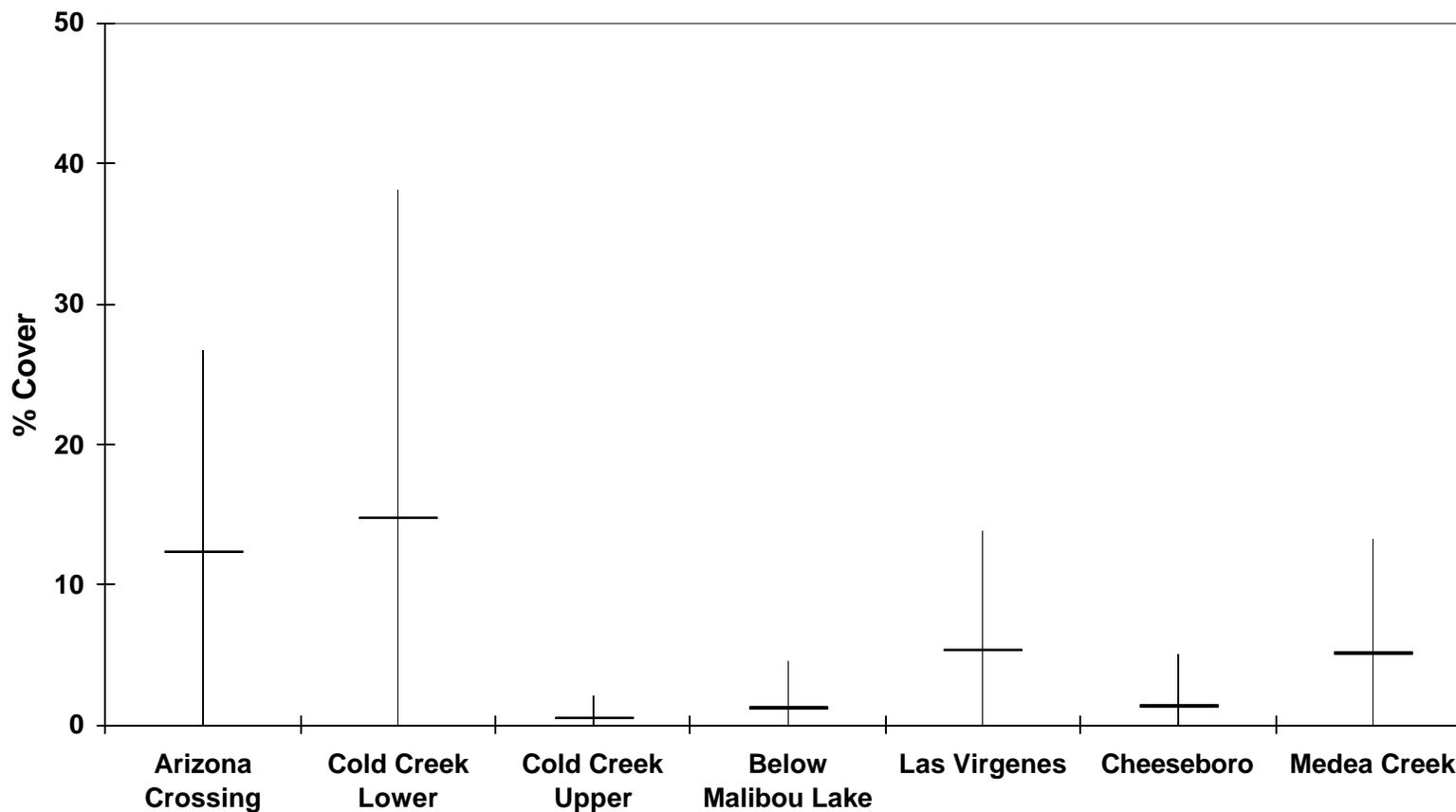


Figure A-5. Percent coverage of floating algae in Malibu Creek watershed and tributaries during the summer months. (source: Heal the Bay data, 1999 to 2002)

Mean and standard deviation in floating algal cover during winter (Heal the Bay, 1999-2002)

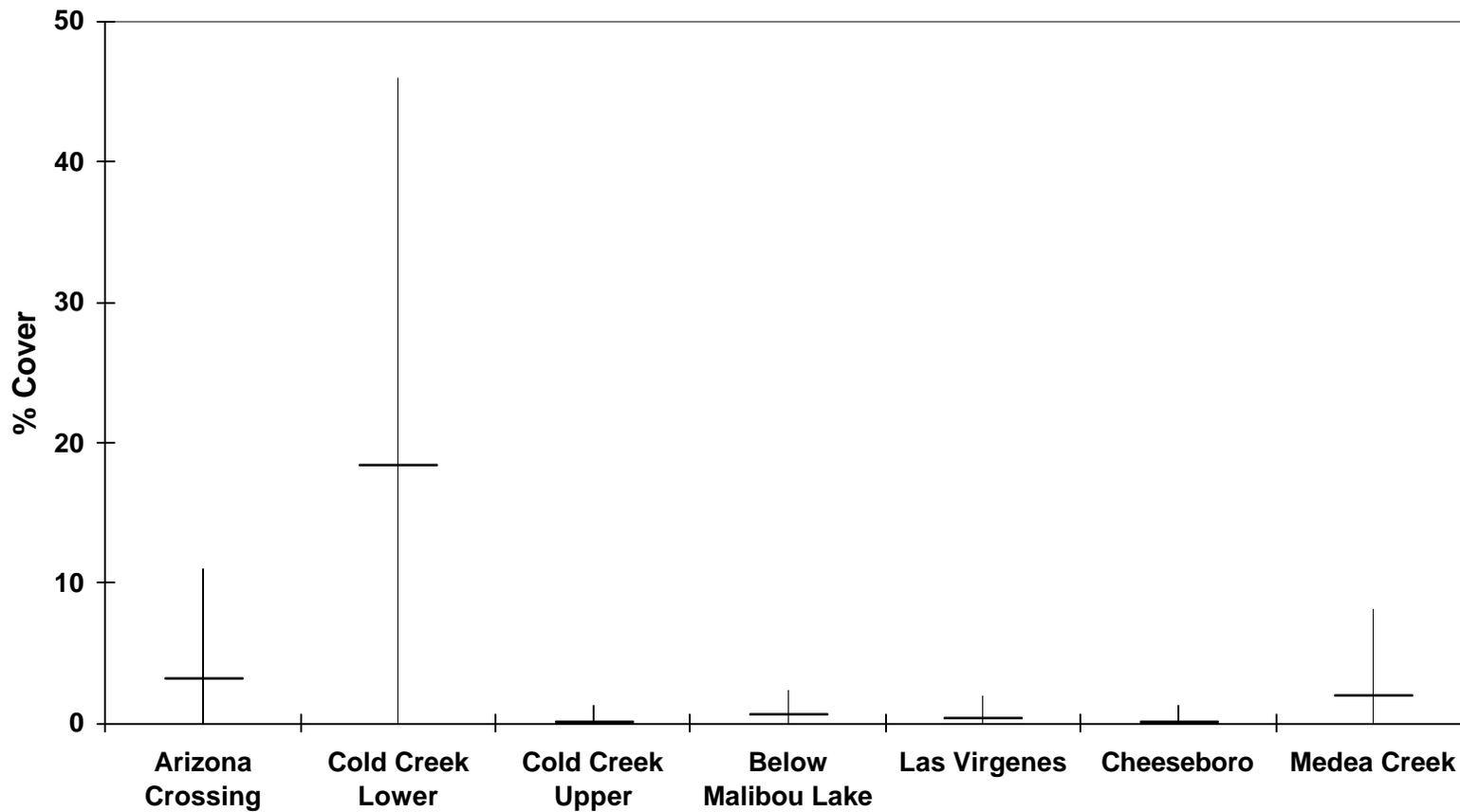


Figure A-6. Percent coverage of floating algae in Malibu Creek watershed and tributaries during winter months. (source: Heal the Bay data, 1999 to 2002)

Mean and standard deviation in percent algal cover of mat algae during summer (Heal the Bay, 1999-2002)

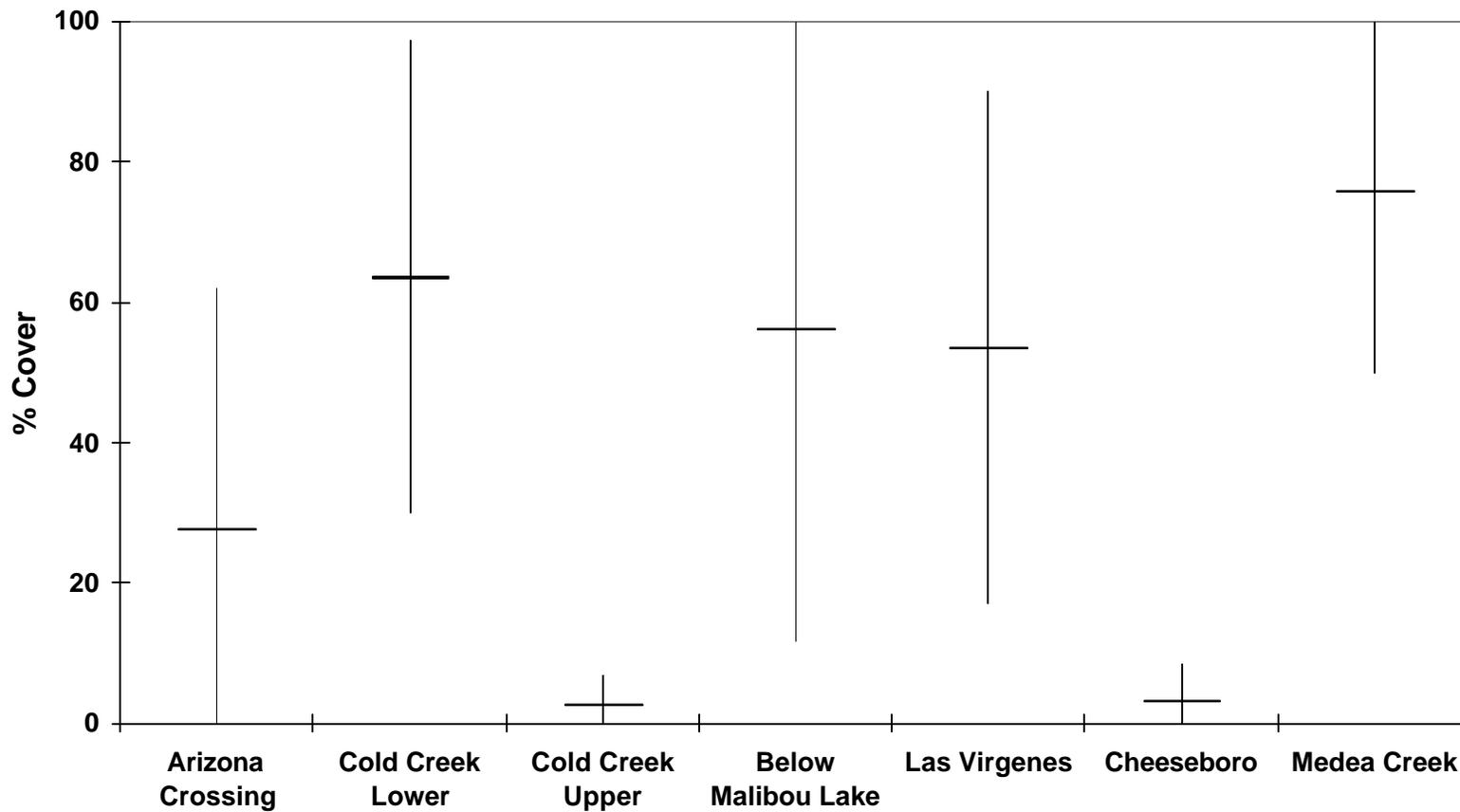


Figure A-7. Percent coverage of mat algae in Malibu Creek watershed and tributaries during summer months. (source: Heal the Bay data, 1998 to 2000)

Mean and standard deviation in percent algal cover of mat algae during winter (Heal the Bay, 1999-2002)

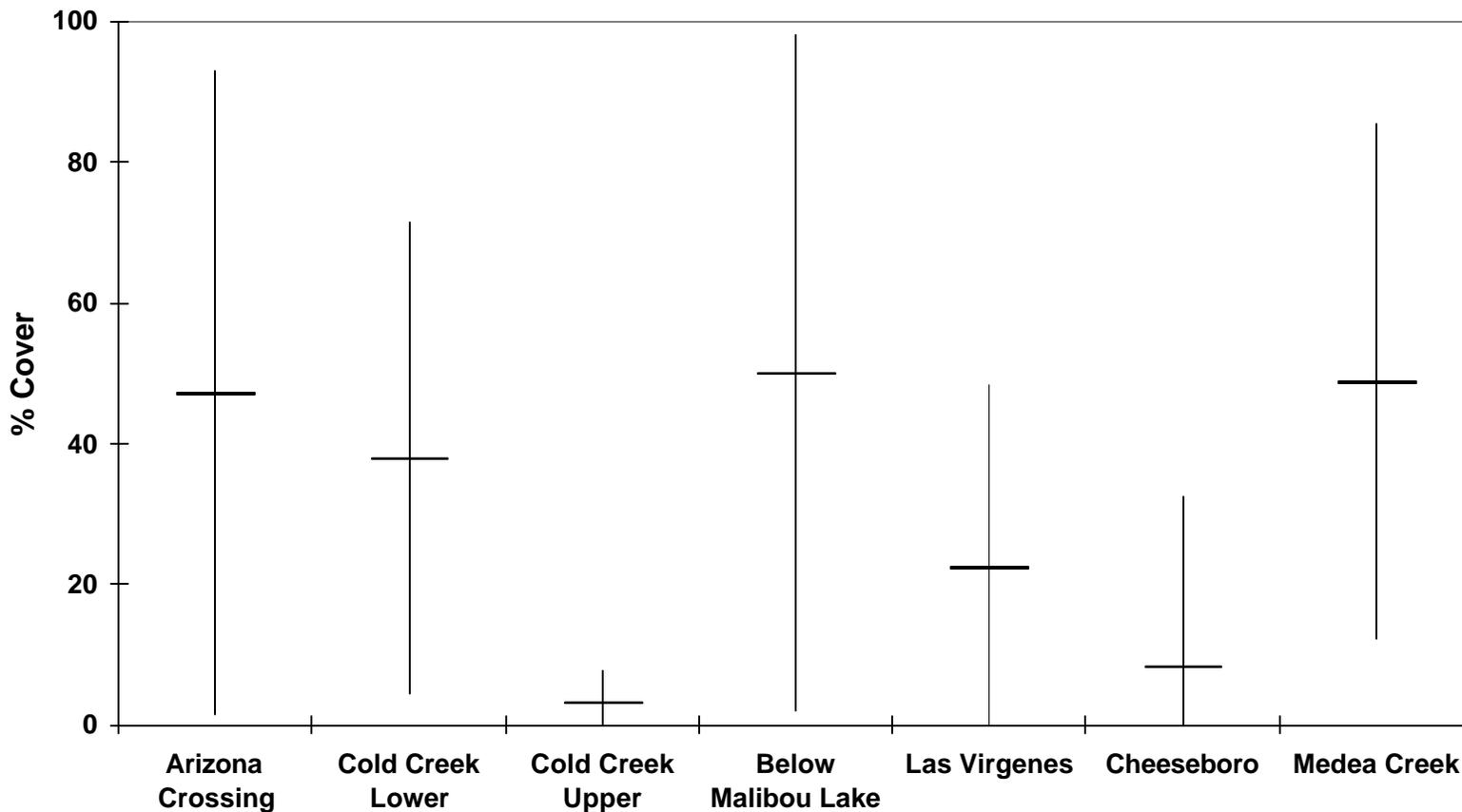


Figure A-8. Percent coverage of mat algae in Malibu Creek watershed and tributaries during winter. (source: Heal the Bay data, 1998 to 2000)

Algal Biomass in Malibu Creek Watershed at 11 stations measured in August

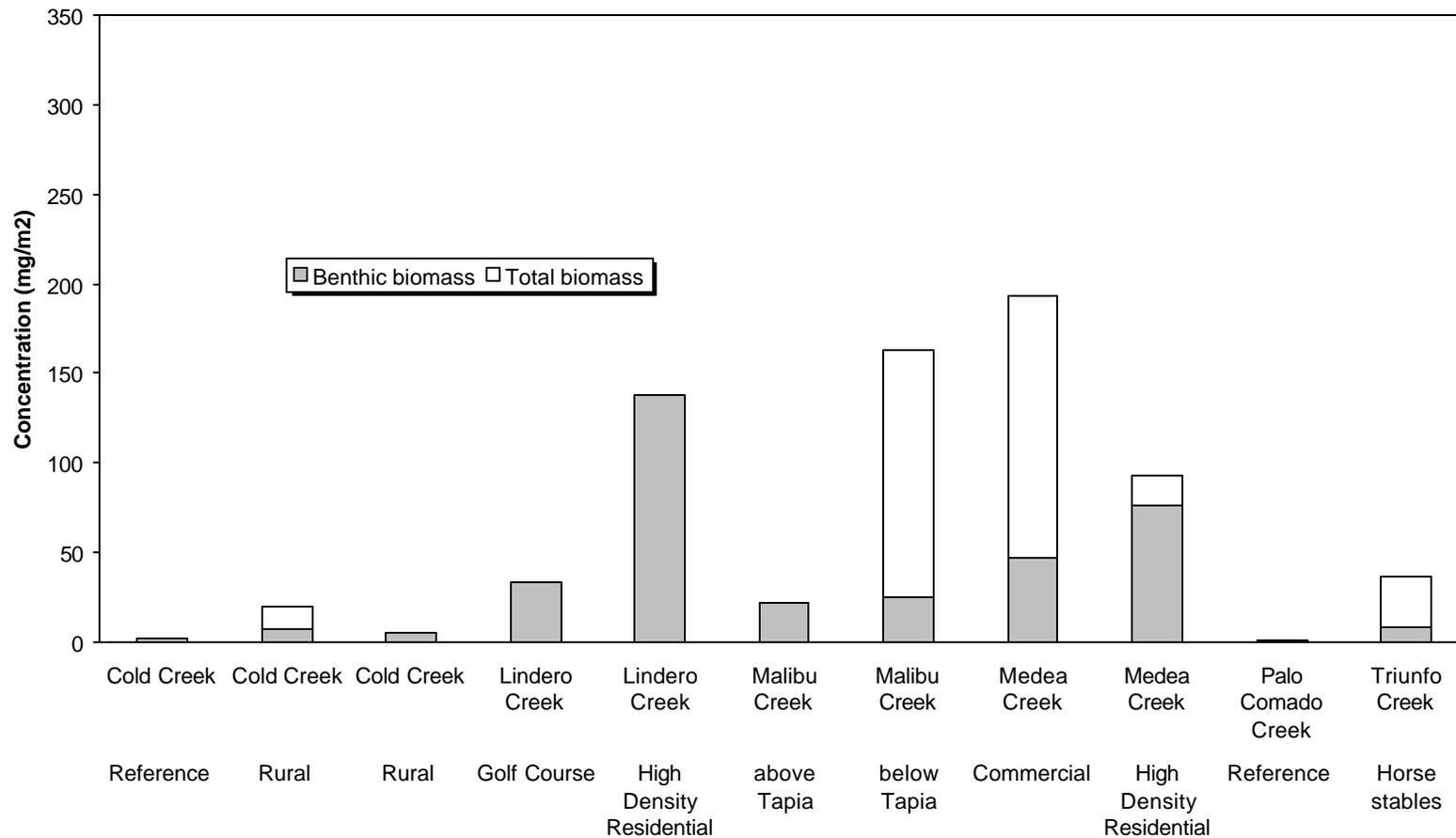


Figure A-9. August 2001 measurements of Algal biomass concentrations (mg/m²) at 11 stations in Malibu Creek watershed. (Source: Kamer et al., 2002)

Algal biomass measurements at 11 Stations in Malibu Creek Watershed in October 2001 (from Kamer et al, 2002)

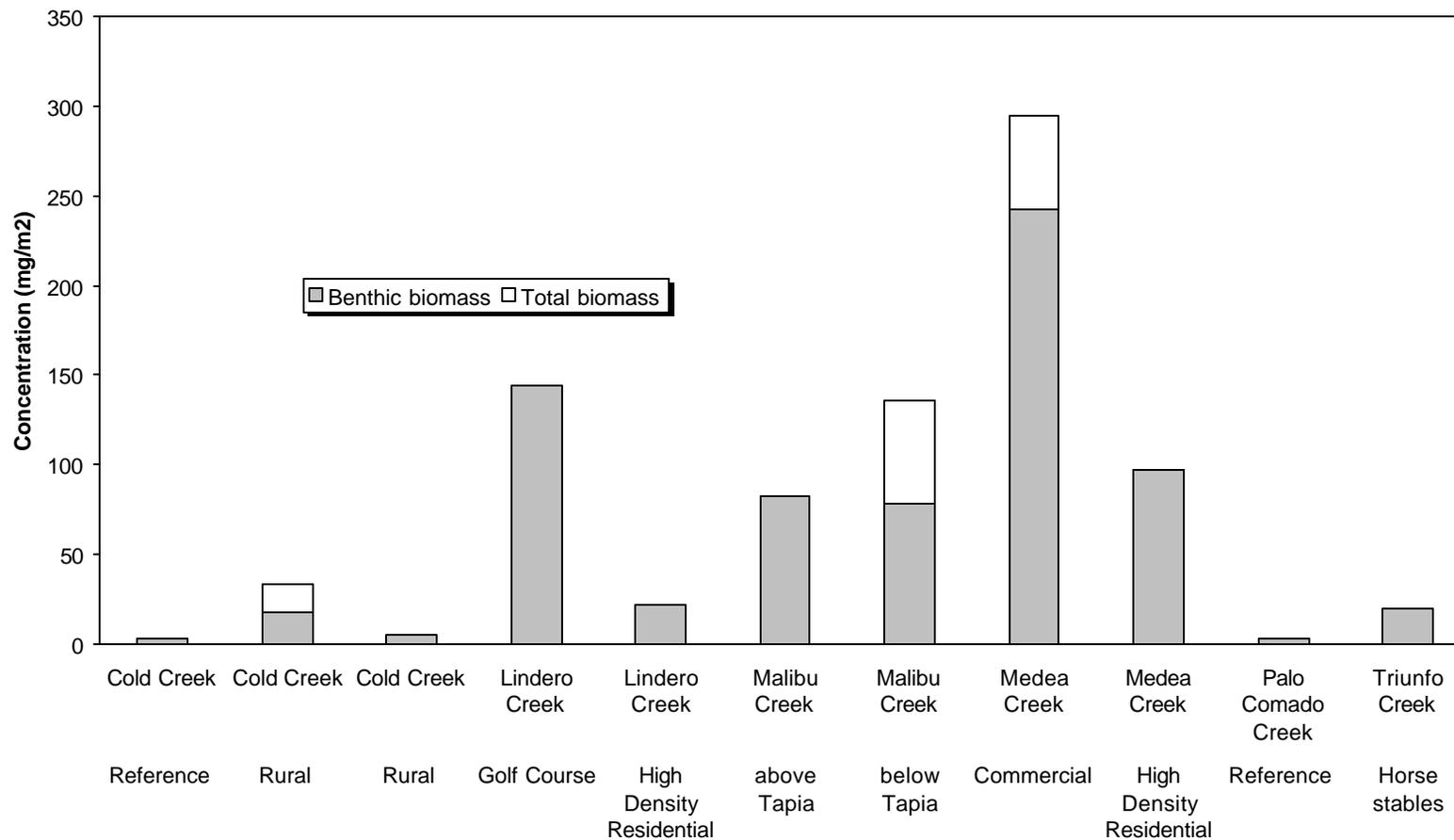


Figure A-10. October measurements of algal biomass concentrations (mg/m^2) at 11 stations in Malibu Creek watershed. (Source: Kamer et al., 2002)

Estimated annual nitrogen and phosphorus loadings to the Malibu Creek Watershed

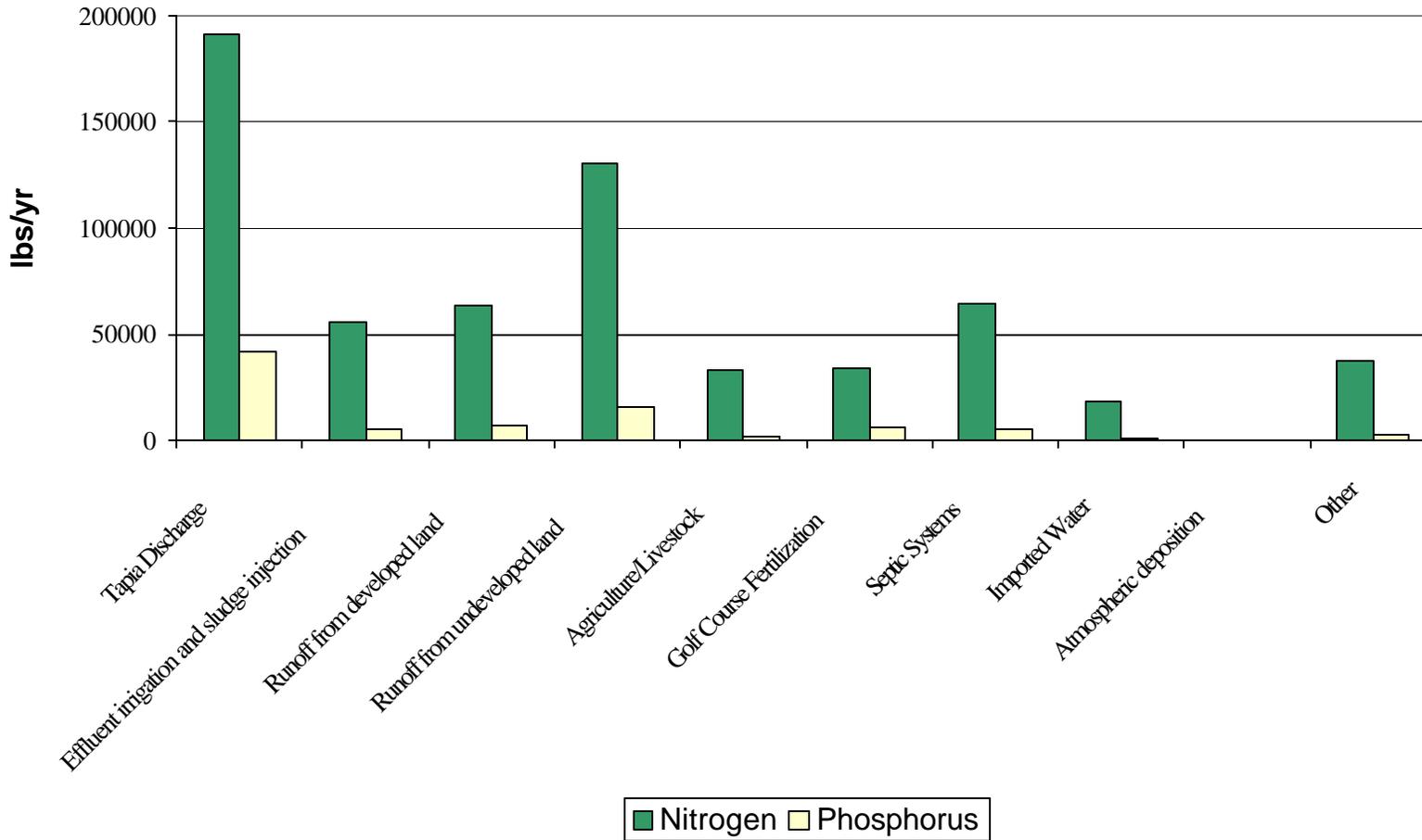


Figure A-11. Annual N (dark) and P (light) loads in pounds per year to Malibu Creek watershed by source category. (source: Tetra Tech Report, 2002)

Estimated dry-weather nitrogen and phosphorus loadings to the Malibu Creek Watershed

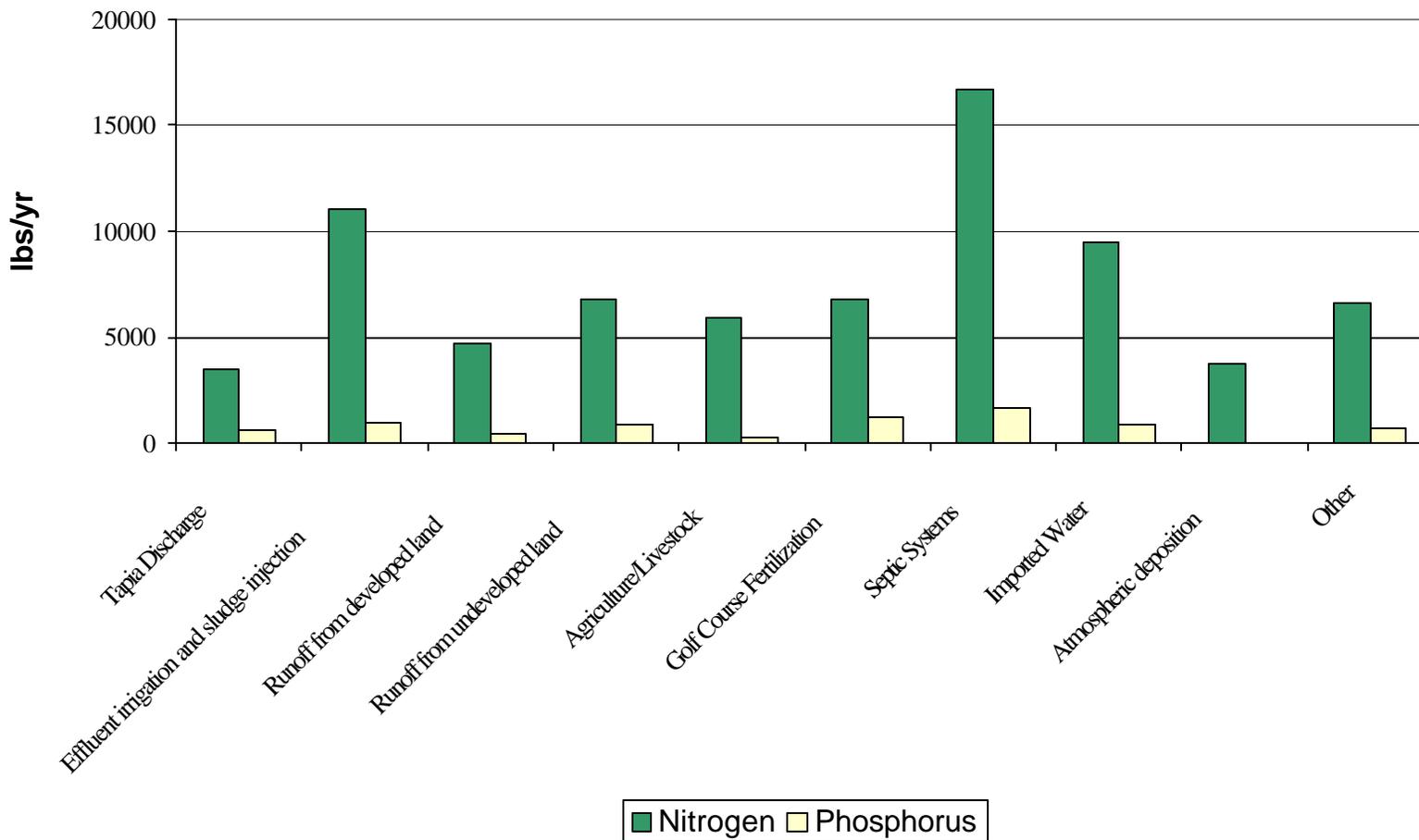


Figure A-12. Summer N (dark) and P (light) loads in pounds per year to Malibu Creek watershed by source category. (source: Tetra Tech Report, 2002)

Table A-1. Distribution of Summer Total Nitrogen Loads by Watershed and Source 1993 – 1995

	Commercial/Industrial	High/Medium Density Res.	Low Density Residential	Rural Residential	Agriculture/Livestock	Vacant	Chaparral/Sage	Grasslands	Woodlands	Golf Courses	Septic	Sludge	Effluent Irrigation	Tapia	Imported Water	Lagoon drains	Birds	Tidal Inflow	Atmospheric Deposition	Sediment Release	Total
Hidden Valley	0.0%	0.0%	0.1%	0.1%	5.6%	0.1%	1.0%	0.1%	0.4%	4.3%	3.7%								3%		18%
Potrero Canyon Creek	0.0%	0.3%	0.0%	0.0%	0.1%	0.1%	0.2%	0.0%	0.0%						2%						3%
Westlake	1.1%	0.7%	0.0%	0.1%			0.2%	0.1%	0.0%	3.5%	0.4%				4%				1%		11%
Upper Lindero Creek	0.1%	0.4%	0.0%			0.0%	0.1%	0.0%	0.0%	1.5%					1%				0%		4%
Lower Lindero Creek	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%						1%						1%
Upper Medea Creek	0.2%	0.7%	0.0%		0.1%	0.0%	0.2%	0.0%	0.1%				1%		2%						4%
Palo Comado Creek	0.2%	0.0%	0.1%		0.3%		0.2%	0.0%	0.1%						1%						2%
Cheeseboro Creek	0.1%				0.0%		0.1%	0.0%	0.1%												0%
Lower Medea Creek	0.0%		0.1%	0.0%	0.4%	0.0%	0.2%	0.0%	0.0%		0.7%		6%		0%						8%
Triunfo Creek	0.0%	0.0%	0.1%	0.1%	0.5%	0.0%	0.8%	0.0%	0.3%		4.9%				0%				1%		8%
Upper Malibu Creek			0.0%	0.0%			0.5%	0.0%	0.3%		0.6%										1%
Upper Las Virgenes Creek	0.1%	0.1%	0.0%		0.2%	0.0%	0.5%	0.2%	0.3%						1%						2%
Lower Las Virgenes Creek	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.1%		0.3%	1.7%	4%		1%						9%
Stokes Creek	0.0%		0.0%	0.0%	0.2%	0.0%	0.4%	0.0%	0.1%		0.5%										1%
Middle Malibu Creek	0.0%		0.0%	0.0%	0.1%	0.2%	0.0%	0.2%					2%	0%							3%
Cold Creek	0.0%		0.1%	0.1%	0.4%	0.0%	0.7%	0.0%	0.1%		1.8%				0%						4%
Lower Malibu Creek	0.0%		0.0%	0.0%	0.0%		0.3%	0.0%	0.1%		0.0%										0%
Malibu Lagoon	0.1%	0.0%	0.1%		0.3%	0.0%	0.0%	0.0%	0.0%	0.2%	10.1%				0%	1%	5%	0%	3%		20%
Total	2.9%	2.8%	0.6%	0.4%	8.2%	0.4%	6.0%	1.1%	1.9%	9.5%	23.0%	1.7%	14%	0%	13%	0%	1%	5%	5%	3%	100%

(source: Tetra Tech report, 2002)

Table A-2. Distribution of Summer Total Phosphorus Loads by Watershed and Source 1993 – 1995

	Commercial/Industrial	High/Medium Density Res.	Low Density Residential	Rural Residential	Agriculture/Livestock	Vacant	Chaparral/Sage	Grasslands	Woodlands	Golf Courses	Septic	Sludge	Effluent Irrigation	Tapia	Imported Water	Lagoon drains	Birds	Tidal Inflow	Atmospheric Deposition	Sediment Release	Total
Hidden Valley	0.0%	0.0%	0.1%	0.1%	3.0%	0.1%	1.3%	0.1%	0.5%	8.2%	2.0%								0.3%		15.7%
Potrero Canyon Creek	0.0%		0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	0.0%		0.4%				1.6%						2.8%
Westlake	1.1%	0.7%	0.0%			0.1%	0.3%	0.1%	0.0%	5.6%	0.2%				3.3%				0.2%		11.6%
Upper Lindero Creek	0.1%	0.4%	0.0%			0.0%	0.1%	0.1%	0.0%	2.8%					1.3%				0.0%		4.9%
Lower Lindero Creek	0.3%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%						0.6%						1.4%
Upper Medea Creek	0.3%	0.7%	0.0%		0.0%	0.0%	0.2%	0.0%	0.1%				1.0%		1.7%						4.1%
Palo Comado Creek	0.2%	0.0%	0.1%		0.2%		0.3%	0.1%	0.1%						0.5%						1.5%
Cheeseboro Creek	0.1%				0.0%		0.2%	0.1%	0.1%												0.5%
Lower Medea Creek	0.0%		0.1%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%		0.4%		5.8%		0.4%						7.2%
Triunfo Creek	0.0%	0.0%	0.1%	0.1%	0.3%	0.0%	1.1%	0.0%	0.3%		2.7%				0.4%				0.1%		5.1%
Upper Malibu Creek			0.0%	0.0%			0.6%	0.0%	0.3%		0.3%										1.3%
Upper Las Virgenes Creek	0.1%	0.2%	0.0%		0.1%	0.0%	0.6%	0.3%	0.3%						0.8%						2.4%
Lower Las Virgenes Creek	0.5%	0.3%	0.0%	0.0%	0.0%	0.0%	0.5%	0.2%	0.2%		0.2%	1.7%	3.6%		0.9%						8.2%
Stokes Creek	0.1%		0.0%	0.0%	0.1%	0.0%	0.5%	0.1%	0.1%		0.3%										1.2%
Middle Malibu Creek	0.0%		0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.3%				1.6%	0.2%							2.4%
Cold Creek	0.0%		0.1%	0.1%	0.2%	0.0%	0.9%	0.0%	0.1%		1.0%				0.4%						2.8%
Lower Malibu Creek	0.0%		0.0%	0.0%	0.0%		0.4%	0.0%	0.1%		0.0%										0.6%
Malibu Lagoon	0.1%	0.0%	0.1%		0.2%	0.0%	0.0%	0.0%	0.0%	0.3%	15.8%					0.0%	2.0%	3.5%	0.0%	4.4%	26.5%
Total	2.9%	2.6%	1.0%	0.4%	4.3%	0.4%	7.9%	1.3%	2.8%	16.9%	23.2%	1.7%	12.0%	0.2%	11.9%	0.0%	2.0%	3.5%	0.6%	4.4%	100.0%

(source: Tetra Tech report, 2002)

Table A-3. Distribution of Average Annual Total Nitrogen Loads by Watershed and Source 1993 – 1995

	Commercial/Industrial	High/Medium Density Res.	Low Density Residential	Rural Residential	Agriculture/Livestock	Vacant	Chaparral/Sage	Grasslands	Woodlands	Golf Courses	Septic	Sludge	Effluent Irrigation	Tapia	imported Water	Lagoon drains	Birds	Tidal Inflow	Atmospheric Deposition	Sediment Release	Total
Hidden Valley	0.0%	0.0%	0.2%	0.1%	3.6%	0.2%	2.9%	0.1%	0.1%	2.5%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	12.5%
Potrero Canyon Creek	0.0%	0.5%	0.0%	0.0%	0.1%	0.2%	0.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%
Westlake	1.2%	1.2%	0.0%	0.0%	0.0%	0.2%	0.6%	0.2%	0.0%	2.0%	0.2%	0.0%	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.3%	0.0%	6.6%
Upper Lindero Creek	0.1%	0.6%	0.0%	0.0%	0.0%	0.1%	0.2%	0.1%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%
Lower Lindero Creek	0.3%	0.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%
Upper Medea Creek	0.3%	1.2%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%
Palo Comado Creek	0.3%	0.0%	0.2%	0.0%	0.2%	0.0%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%
Cheeseboro Creek	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
Lower Medea Creek	0.0%	0.0%	0.2%	0.0%	0.3%	0.0%	0.6%	0.1%	0.0%	0.0%	0.4%	0.0%	3.7%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%
Triunfo Creek	0.0%	0.1%	0.2%	0.3%	0.3%	0.0%	2.4%	0.0%	0.1%	0.0%	2.8%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.2%	0.0%	6.5%
Upper Malibu Creek	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%	0.1%	0.1%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%
Upper Las Virgenes Creek	0.1%	0.2%	0.0%	0.0%	0.1%	0.1%	1.0%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%
Lower Las Virgenes Creek	0.6%	0.4%	0.0%	0.0%	0.0%	0.0%	1.1%	0.4%	0.0%	0.0%	0.2%	1.0%	2.5%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	6.4%
Stokes Creek	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	1.2%	0.1%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%
Middle Malibu Creek	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.6%	0.0%	0.1%	0.0%	30.4%	0.0%	1.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	32.4%
Cold Creek	0.0%	0.0%	0.3%	0.3%	0.2%	0.0%	2.3%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	4.3%
Lower Malibu Creek	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
Malibu Lagoon	0.1%	0.0%	0.1%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.1%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	3.8%	0.0%	0.7%	8.1%
Total	3.2%	4.7%	1.4%	0.9%	5.3%	0.9%	17.5%	1.7%	0.8%	5.4%	40.4%	1.0%	7.8%	0.2%	2.9%	0.0%	0.3%	3.8%	1.2%	0.7%	100.0%

(source: Tetra Tech report, 2002)

Table A-4. Distribution of Average Annual Total Phosphorus Loads by Watershed and Source 1993 – 1995

	Commercial/Industrial	High/Medium Density Res.	Low Density Residential	Rural Residential	Agriculture/Livestock	Vacant	Chaparral/Sage	Grasslands	Woodlands	Golf Courses	Septic	Sludge	Effluent Irrigation	Tapia	Imported Water	Lagoon drains	Birds	Tidal Inflow	Atmospheric Deposition	Sediment Release	Total
Hidden Valley	0.0%	0.0%	0.1%	0.1%	1.7%	0.2%	2.4%	0.1%	0.1%	3.4%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	9.1%
Potrero Canyon Creek	0.0%	0.5%	0.0%	0.0%	0.0%	0.2%	0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%
Westlake	0.9%	1.0%	0.0%	0.0%	0.0%	0.1%	0.5%	0.2%	0.0%	2.3%	0.1%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%
Upper Lindero Creek	0.1%	0.5%	0.0%	0.0%	0.0%	0.1%	0.2%	0.1%	0.0%	1.2%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	2.3%
Lower Lindero Creek	0.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Upper Medea Creek	0.2%	1.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%
Palo Comado Creek	0.2%	0.0%	0.2%	0.0%	0.1%	0.0%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%
Cheeseboro Creek	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%
Lower Medea Creek	0.0%	0.0%	0.2%	0.0%	0.1%	0.0%	0.5%	0.1%	0.0%	0.0%	0.1%	0.0%	2.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%
Triunfo Creek	0.0%	0.1%	0.2%	0.2%	0.2%	0.0%	2.0%	0.0%	0.1%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%
Upper Malibu Creek	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.6%
Upper Las Virgenes Creek	0.1%	0.2%	0.0%	0.0%	0.0%	0.1%	0.9%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%
Lower Las Virgenes Creek	0.4%	0.4%	0.0%	0.0%	0.0%	0.0%	0.9%	0.3%	0.0%	0.0%	0.1%	0.7%	1.5%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%
Stokes Creek	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	1.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.5%
Middle Malibu Creek	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.1%	0.0%	48.3%	0.0%	0.7%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	49.7%
Cold Creek	0.0%	0.0%	0.3%	0.3%	0.1%	0.0%	2.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%
Lower Malibu Creek	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
Malibu Lagoon	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.1%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	1.8%	0.0%	0.7%	6.5%
Total	2.3%	4.0%	1.3%	0.7%	2.5%	0.7%	14.8%	1.5%	0.7%	7.0%	53.9%	0.7%	4.9%	0.1%	1.5%	0.0%	0.7%	1.8%	0.1%	0.7%	100.0%

(source: Tetra Tech report, 2002)