

Aquatic Life Toxicity for the Los Angeles County Stormwater Runoff Samples Collected on March 25, 1998¹

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December, 1998

During the course of a study (Lee and Taylor, 1997, and Lee *et al.*, 1998) on aquatic life toxicity of stormwater runoff to Upper Newport Bay in Orange County, California, it was discovered that some toxicity tests on stormwater runoff conducted in the Los Angeles Basin by the Los Angeles County Department of Public Works were toxic. However, this toxicity was apparently not due to organophosphate pesticides. Further, it was indicated that the OP pesticides diazinon and chlorpyrifos were not being detected in the Los Angeles County samples of stormwater runoff. This was somewhat surprising, in that studies in the San Francisco Bay region; Sacramento/Stockton region; Davis, California; and Orange County have found organophosphate pesticide-associated toxicity in stormwater runoff from urban areas. In order to address this issue, cooperative arrangements were made between the Los Angeles Regional Water Quality Control Board staff (Xavier Swamikannu), the LA Department of Public Works staff, and the University of California, Davis Aquatic Toxicology Laboratory. Plans were made to collect and analyze a set of samples in order to compare the toxicity results in these samples using toxicity test procedures identical to those being used in the Orange County studies.

The Los Angeles County Department of Public Works collected a set of samples from various streams/rivers in the Los Angeles area for the March 25, 1998 storm. The results are presented in Table 1. Examination of the data presented in Table 1 shows that the samples of Ballona Creek at Beloit Street; Culver City; Project 156 at Concord Street; Glendale; and Coyote Creek at Spring Creek in Long Beach were all acutely toxic to *Ceriodaphnia* in two to six days. The land uses of the watersheds above the sampling locations for these three stations are predominantly residential.

The Malibu Creek sample taken at Piuma Rd. in unincorporated Los Angeles County, while not acutely toxic, i.e., causing mortality, did impair *Ceriodaphnia* reproduction. The watershed at this sampling point is primarily vacant land. Both the L.A. River at Wardlow in Long Beach and the San Gabriel River at the San Gabriel River Parkway in Pico Rivera showed no toxicity to *Ceriodaphnia* in the seven-day test. The land use in the L.A. River in the Wardlow watershed has substantial vacant land with about 30% of the land being residential. The San Gabriel River at San Gabriel River Parkway has over 66% vacant land. From the limited data available it appears that the residential areas in the Los Angeles region contributed higher levels of *Ceriodaphnia* toxicity to stormwater

¹ Reference as: Lee, G.F. Aquatic Life Toxicity for the Los Angeles County Stormwater Runoff Samples Collected on March 25, 1998, Report of G. Fred Lee & Associates, El Macero, CA, December (1998).

Table 1
Toxicity Test Results for Los Angeles Area Water Samples Collected
during Storm 3/25/98

7-day *Ceriodaphnia* Test^{1,2}

set up on March 26, 1998

Treatment	Reproduction ³ (neonates/adult)		% Mortality ³	Final pH @ 24 hrs
	X	Se		
Control	24.7 ^P	0.8	0 ^P	8.3
Control @ 1000µmhos/cm	23.4	0.7	0	8.3
San Gabriel River @ San Gabriel River Pkwy., City of Pico Rivera	25.6	1.5	0	8.5
Malibu Creek @ Piuma Rd., unincorporated area of Malibu	16.8	1.0	0	8.4
Ballona Creek @ Beloit St., Culver City	-	-	100(5)	8.2
Project 156 @ Concord St., City of Glendale	-	-	100(6)	7.6
LA River Wardlow @ Wardlow Rd., City of Long Beach	30.0	1.4	0	8.0
Coyote Creek @ Spring St., City of Long Beach	-	-	100(2)	8.2

P. The laboratory control met all US EPA criteria for test acceptability. 100% of the daphnids had a third brood.

1. Ten replicates with 15 mls of sample and one *Ceriodaphnia* each.
2. Standard US EPA feeding procedures were used during this test.
3. Highlighted areas indicate a significant reduction in reproduction or increase in mortality relative to the laboratory control water. The reproductive endpoint was analyzed using Dunnett's Test (p<0.05) and the mortality endpoint was analyzed using Fisher's Exact Test.

(#) Denotes days to 100% mortality.

ELISA Data for Los Angeles Area Water Samples
Collected March 25, 1998

Location	Diazinon (ng/L)	Chlorpyrifos (ng/L)
Ballona Creek @ Beloit St., Culver City	298	50
Project 156 @ Concord St., City of Glendale	375	< 50
Coyote Creek @ Spring St., City of Long Beach	586	102
San Gabriel River @ San Gabriel River Pkwy., City of Pico Rivera	ND	ND
LA River Wardlow @ Wardlow Rd., City of Long Beach	ND	ND
Malibu Creek @ Piuma Rd., unincorporated area of Malibu	ND	ND

ND means not determined because sample was non-toxic

runoff than the watersheds which primarily consist of vacant land. This would be expected since the primary uses of OP pesticides in an urban setting are associated with residential areas.

Examination of the ELISA test results for these samples (Table 1) showed that Coyote Creek had about 586 ng/L diazinon and 102 ng/L chlorpyrifos. As expected, this sample was highly toxic to *Ceriodaphnia*. Ballona Creek had 298 ng/L diazinon and about 50 ng/L chlorpyrifos. This sample would also be expected to be toxic to *Ceriodaphnia*, although less toxic than the Coyote Creek sample. The Project 156 sample contained 375 ng/L diazinon and less than 50 ng/L chlorpyrifos. No ELISA testing was done on the L.A. River at Wardlow and the San Gabriel River samples, since they were nontoxic. Therefore, there was less than one toxic unit of *Ceriodaphnia* toxicity based on ELISA-measured diazinon and chlorpyrifos in this sample. This sample, however, did show 100 percent kill of *Ceriodaphnia* in six days. It is possible that the toxicity found in this sample, as well as the other samples, may also be due, at least in part, to constituents other than diazinon and chlorpyrifos.

DePoto of the LA Department of Public Works (personal communication, 1998) helped explain some of the apparent discrepancies between the previously-reported results and the results obtained in this study. The failure to detect diazinon and chlorpyrifos in previous studies was due to the use of an analytical method for these chemicals that had detection limits for diazinon of 250 ng/L and 1,000 ng/L for chlorpyrifos. Subsequently more sensitive analytical procedures are being used for measurements of these pesticides in the LA County stormwater monitoring program. No results are available at this time using the more sensitive analytical procedures.

Both the Los Angeles River and the San Gabriel River in the Los Angeles area were monitored in the fall of 1997 for dry weather and wet weather toxicity to sea urchin fertilization by SCCWRP (1997, 1998). The fall 1997 dry weather flow sample was nontoxic to sea urchin fertilization. However, two stormwater runoff events, one occurring in November and the other in December 1997, both suppressed (were toxic to) sea urchin fertilization. The cause of this toxicity is unknown. Also, no measurements were made of OP pesticide concentrations in the runoff samples.

Overall, it is concluded that the LA County stormwater runoff is, as expected, toxic to *Ceriodaphnia*, with a toxicity at least in part due to the OP pesticides diazinon and chlorpyrifos. It should be noted that stormwater runoff in the San Diego area has also been found by Kinnetic Laboratories (1995) to be toxic to *Ceriodaphnia*, with a pattern similar to that observed for OP pesticides. The presence of these chemicals in San Diego stormwater runoff, however, was not confirmed in those studies.

Acknowledgements

We wish to acknowledge the assistance of Xavier Swamikannu, of the Los Angeles Regional Water Quality Control Board, and M. Ramos, William DePoto, and T. Grant of the LA Department of Public Works, in connection with the collection of the LA County samples that were included in this study. In addition, the assistance of the University of California, Davis Aquatic Toxicology Laboratory personnel, especially Linda Deanovic and Karen Larsen, as well as the assistance of Dr. Valerie

Connor of the Central Valley Regional Water Quality Control Board for helping to establish the arrangements for the LA County sample collection and analysis, is greatly appreciated.

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