Appendix A. Evaluation of Quality-Control Results for Pesticides and Degradates, 2000–2005

QC blank samples—Fifteen quality-control blank samples were analyzed in 2000–2005 for up to 190 pesticides. No pesticides or degradates were detected.

QC spike samples—Some compounds—CIAT [deethylatrazine], benomyl, bromacil, propiconazole and others—had low or 0 percent recovery in one or more spike samples (appendix D, table D1), so concentrations for these compounds may be underestimated in this report. Some compounds had relatively high recoveries, including azinphos-methyl, imazaquin, terbacil, and carbaryl, ranging from 150 to about 300 percent (appendix table A2), which indicates a high bias.

Although the high recoveries for carbaryl in spike samples suggests a positive bias, it was not detected in any of the 15 equipment blank samples, which suggests that contamination at the lab is not an issue. Carbaryl is widely used, and its moderately high detection frequency (18 percent) is not unexpected, but the concentrations in this report could be higher than actual concentrations. Carbaryl was often analyzed by two schedules 2010/2001 and 2060, with the latter having a more reliable (or preferred) method. When both methods were used, schedule 2001 data were on average 500 percent higher than 2060 data (ranged from 250–800 percent). Schedule 2060 detections of carbaryl (PCODE 49310), therefore, superseded the schedule 2001 (PCODE P82680) values in the carbaryl data compilation and analyses. Six samples had carbaryl concentrations exceeding an aquatic-life benchmark, four of which had detections of carbaryl by both methods. In two cases where carbaryl concentrations exceeded the NAS/NAE aquatic-life benchmark (table 6), 2060 data were either not available (mainstem Clackamas River in November 2002) or carbaryl was not detected using the preferred schedule (for September 2005 sample from Cow Creek). Carbaryl was, however, detected in Cow Creek with both methods in May 2005, so its detection by the nonpreferred method alone in September 2005 does not appear to be a false positive. Correcting for the apparent positive bias in carbaryl concentrations (for POCODE 82680 values), however, could result concentrations that would not have exceeded the aquatic-life benchmark.

QC surrogate pesticide compounds—Surrogate pesticide compound percent recoveries were within an acceptable range of between 60 and 140 percent, with a few exceptions (appendix A, table A3). The surrogates 2,4,5-T and barban had some exceedingly high percent recovery values—up to 318 percent and 245 percent, respectively, in some of the tributary samples collected during the September 2005 storm. These same surrogates had 0 percent recoveries for some of the other samples collected during this storm: Carli Creek, for example, had a 0 percent recovery for the 2,4,5-T surrogate, but a 318 percent recovery for the barban surrogate—and the alpha-HCH-d6 and diazinon d-10 surrogates were 80 percent and 106 percent, respectively, in this same sample. These results from Carli Creek show the sample matrix difficulties and range of surrogate recoveries possible when samples contain multiple pesticides, in this case at least nine pesticides. Zero percent recoveries were also obtained for the pesticide surrogates barban and 2,4,5-T in spiked samples from Sieben and Trillium Creeks during the September 2005 storm. On a few occasions, diazinon d-10 surrogate recoveries were also zero for spiked samples of raw and finished drinking water. Note that in general, the finished drinking water samples collected during 2000–2001 that were not quenched with the dechlorinating agent had lower recoveries for the diazinon d-10, barban, and 2,4,5-T surrogates. The continuing action of chlorine in those samples could have resulted in the oxidation of those compounds into degradates that were not analyzed for, such as the diazinon degradate diazinon-oxon. In the above samples, where the percent recoveries were zero, the possibility of false negatives for certain compounds increases, and where detections occurred, it is possible that the actual concentrations were higher than those reported in this report. Conversely, samples showing unusually high recoveries may produce results that have a high bias, which are discussed individually in the report.

In addition, four pesticide samples for schedule 2001 collected from Cow, Dolan, Tickle, and North Fork Deep Creeks during the September 2005 storm were extracted onto the resin columns after a delay of about 12 days. These storm-runoff samples probably contained high levels of dissolved organic carbon that may have enhanced bacterial activity and degradation of some compounds. Therefore, the parent compound results for these 4 samples may be lower than actual concentrations due to degradation during holding. These four samples were specially tested for a additional pesticide degradates. One compound (3,4-dichlorophenyl isocyanate)—a degradate of diuron—was identified in each of the four affected samples (table 3). At the time, the analysis for 3,4-dichlorophenyl isocyanate was not an approved method, so its presence as reported by the lab chemist is preliminary, but noteworthy because diuron was frequently detected during this study, and 3,4-dichlorophenyl isocyanate was found at relatively high levels (5.4 µg/L in North Fork Deep Creek, for example). Some degradation of certain chemicals such as endosulfan to endosulfan sulfate may have occurred in these four samples during holding despite being filtered and refrigerated. A carbaryl degradate (1-naphthol) was detected in two of the affected samples from Cow and Dolan Creeks (appendix table C1), possibly from the decay of carbaryl—but other degradates, such as malaoxon and azinphos-methyl-oxon were examined but not detected.

Table A1. Quality-control results for pesticides and degradates in field blank samples, 2000–2005.

[Includes 15 blank samples. Abbreviations: USGS, U.S. Geological Survey; PCODE, USGS parameter code]

Pesticide or degradate	USGS PCODE	Number of analyses	Number of detections
1,4-Naphthoquinone	61611	1	0
1-Naphthol	49295	8	0
2-(2-Ethyl-6-methylphenyl)-amino-1-propanol	61615	5	0
2-(4-tert-butylphenoxy)-cyclohexanol	61637	1	0
2,4,5-T	39742	2	0
2,4-D	39732	8	0
2,4-D methyl ester	50470	6	0
2,4-DB	38746	8	0
2,5-Dichloroaniline	61614	1	0
2,6-Diethylaniline	82660	11	0
2-Amino-N-isopropylbenzamide	61617	1	0
2-Chloro-2,6-diethylacetanilide	61618	8	0
2-Ethyl-6-methylaniline	61620	8	0
3-(4-Chlorophenyl)-1-methyl urea	61692	6	0
3,4-Dichloroaniline	61625	8	0
3,5-Dichloroaniline	61627	1	0
3-Hydroxycarbofuran	49308	8	0
3-Ketocarbofuran	50295	6	0
3-Trifluoromethylaniline	61630	1	0
4,4´-Dichlorobenzophenone	61631	1	0
4-Chloro-2-methylphenol	61633	8	0
4-Chlorobenzylmethyl sulfone	61634	1	0
Acetochlor	49260	11	0
Acifluorfen	49315	8	0
Alachlor	46342	11	0
Aldicarb	49312	8	0
Aldicarb sulfone	49313	8	0
Aldicarb sulfoxide	49314	8	0
alpha-HCH	34253	4	0
AMPA	62649	1	0
Atrazine	39632	11	0
Azinphos-methyl	82686	11	0
Azinphos-methyl-oxon	61635	8	0
Bendiocarb	50299	6	0
Benfluralin	82673	11	0
Benomyl	50300	6	0
Bensulfuron-methyl	61693	6	0
Bentazon	38711	8	0
Bifenthrin	61580	1	0
Bromacil	4029	12	0
Bromoxynil	49311	8	0
Butylate	4028	4	0
CAAT	4039	6	0
Carbaryl	82680	15	0
Carbaryl1	49310	8	0
Carbofuran	49309	8	0
Carbofuran	82674	4	0
CEAT	4038	6	0
Chloramben methyl ester	61188	8	0
Chlorimuron-ethyl	50306	6	0
Chlorothalonil	49306	8	0
Chlorpyrifos	38933	15	0
Chlorpyrofos-oxon	61636	8	0
CIAT	4040	11	0
cis-Permethrin	82687	11	0
Clopyralid	49305	8	0
Cyanazine	4041	4	0
Cycloate	4031	6	0
Cyfluthrin	61585	8	0
Cyhalothrin (*lambda*)	61595	1	0
Cypermethrin	61586	8	0
Dacthal (DCPA)	82682	11	0
Dacthal monoacid	49304	8	0
DEET	62082	8	0
Desulfinylfipronil	62170	8	0
Desulfinylfipronil amide	62169	8	0
Diazinon	39572	15	0
Diazinon-oxon	61638	8	0
Dicamba	38442	8	0
Dichlobenil	49303	2	0
Dichlorprop	49302	8	0
Dichlorvos	38775	12	0
Dicofol	61587	1	0
Dicrotophos	38454	8	0
Dieldrin	39381	11	0
Dimethenamid	61588	1	0
Dimethoate	82662	8	0
Dimethomorph (*e*)	79844	1	0
Dimethomorph (*z*)	79845	1	0
Dinoseb	49301	8	0
Diphenamid	4033	6	0
Disulfoton	82677	4	0
Disulfoton sulfone	61640	1	0
Disulfoton sulfoxide	61641	1	0
Diuron	49300	8	0
DNOC	49299	2	0
Endosulfan I	34362	1	0
Endosulfan II	34357	1	0
Endosulfan ether	61642	1	0
Endosulfan sulfate	61590	1	0
EPTC	82668	4	0
Ethalfluralin	82663	4	0
Ethion	82346	8	0
Ethion-monoxon	61644	8	0
Ethoprop	82672	4	0
Fenamiphos	61591	8	0
Fenamiphos sulfone	61645	8	0
Fenamiphos sulfoxide	61646	8	0
Fenthion	38801	1	0
Fenthion sulfone-oxon	62851	1	0
Fenthion sulfoxide	61647	1	0
Fenthion-sulfone	61648	1	0
Fenuron	49297	8	0
Fipronil	62166	8	0
Fipronil sulfide	62167	8	0
Fipronil sulfone	62168	8	0
Flumetralin	61592	1	0
Flumetsulam	61694	6	0
Fluometuron	38811	8	0
Fonofos	4095	11	0
Fonofos-oxon	61649	7	0
Glufosinate	62721	1	0
Glyphosate	62722	1	0
Hexazinone	4025	5	0
Imazaquin	50356	6	0
Imazethapyr	50407	6	0

Table A1. Quality-control results for pesticides and degradates in field blank samples, 2000–2005.—Continued

[Includes 15 blank samples. Abbreviations: USGS, U.S. Geological Survey; PCODE, USGS parameter code]

Pesticide or degradate	USGS PCODE	Number of analyses	Number of detections
Imidacloprid	61695	6	0
Iprodione	61593	8	0
Isofenphos	61594	8	0
Lindane	39341	4	0
Linuron[1]	38478	8	0
Linuron	82666	4	0
Malathion	39532	11	0
Malathion-oxon	61652	8	0
MCPA	38482	8	0
MCPB	38487	8	0
Metalaxyl	50359	10	0
Metalaxyl[1]	61596	8	0
Methidathion	61598	8	0
Methiocarb	38501	8	0
Methomyl	49296	8	0
Methyl 3-(2,2-dichlorovinyl)-2,2-dim (*cis*)	79842	1	0
Methyl 3-(2,2-dichlorovinyl)-2,2-dim (*trans*)	79843	1	0
Metolachlor	39415	15	0
Metribuzin	82630	11	0
Metsulfuron methyl	61697	6	0
Molinate	82671	4	0
Myclobutanil	61599	8	0
Naled	38856	1	0
Napropamide	82684	4	0
Neburon	49294	8	0
Nicosulfuron	50364	6	0
Norflurazon	49293	8	0
O-Ethyl-O-methyl-S-propylphosphorothioate	61660	1	0
OIET	50355	6	0
Oryzalin	49292	8	0
Oxamyl	38866	8	0
Oxyfluorfen	61600	1	0
p,p´-DDE	34653	4	0
Paraoxon-ethyl	61663	1	0
Paraoxon-methyl	61664	8	0
Parathion	39542	4	0
Parathion-methyl	82667	11	0
Pebulate	82669	4	0
Pendimethalin	82683	11	0
Phorate	82664	11	0
Phorate-oxon	61666	8	0
Phosmet	61601	8	0
Phosmet-oxon	61668	7	0
Picloram	49291	8	0
Profenofos	61603	1	0
Prometon	4037	15	0
Prometryn	4036	8	0
Pronamide	82676	11	0
Propachlor	4024	4	0
Propanil	82679	4	0
Propargite	82685	4	0
Propetamphos	61604	1	0
Propham	49236	8	0
Propiconazole	50471	6	0
Propiconazole (*cis*)	79846	1	0
Propiconazole (*trans*)	79847	1	0
Propoxur	38538	8	0
Siduron	38548	6	0
Silvex	39762	2	0
Simazine	4035	11	0
Sulfometuron-methyl	50337	6	0
Sulfotepp	61605	1	0
Sulprofos	38716	1	0
Tebuconazole	62852	1	0
Tebupirimphos	61602	1	0
Tebupirimphos-oxon	61669	1	0
Tebuthiuron	82670	11	0
Tefluthrin	61606	1	0
Temephos	61607	1	0
Terbacil[1]	4032	6	0
Terbacil	82665	4	0
Terbufos	82675	11	0
Terbufos sulfone	63773	1	0
Terbufos sulfone-oxon	61674	8	0
Terbuthylazine	4022	8	0
Thiobencarb	82681	4	0
Triallate	82678	4	0
Tribufos	61610	1	0
Triclopyr	49235	8	0
Trifluralin	82661	11	0

[1]These PCODES are the preferred method code (shown for compounds that were analyzed by more than one schedule).

Table A2. Quality-control results for spike samples receiving known additions of pesticides and degradates, 2000–2005.

[Data include only those compounds detected during the study. **No dechlorinating agent:** pertains to 2–5 samples of finished drinking water. **Abbreviations:** USGS, U.S. Geological Survey; PCODE, USGS parameter code; µg/L, microgram per liter; nd, no data]

Pesticide or degradate	USGS PCODE	Amount of spike (µg/L)	Number of samples spiked	Percent recovery			
				Minimum	Maximum	Average	No dechlorinating reagent
1-Naphthol	49295	0.1	3	14	21	18	9
2(2-Ethyl-6-methylphenyl)-amino-1-pro	61615	.1	2	85	92	88	nd
2,4,5-T (surrogate)	99958	.25	2	71	120	96	83
2,4-D	39732	.25	2	112	120	116	109
2,4-D methyl ester	50470	.25	1	63	63	63	72
2,4-DB	38746	.25	2	61	229	145	77
2,6-Diethylaniline	82660	.1	5	89	152	107	0
2-Chloro-2,6-diethylacetanilide	61618	.1	3	96	116	107	41
2-Ethyl-6-methylaniline	61620	.1	3	86	103	95	0
3(4-Chlorophenyl)-1-methyl urea	61692	.25	2	74	90	82	0
3,4-Dichloroaniline	61625	.1	3	65	76	72	0
3-Hydroxycarbofuran	49308	.25	2	74	94	84	91
3-Ketocarbofuran	50295	.1	1	120	120	120	49
4-Chloro-2-methylphenol	61633	.1	3	50	70	60	0
Acetochlor	49260	.1	5	83	116	102	114
Acifluorfen	49315	.25	2	61	126	93	84
Alachlor	46342	.1	5	87	116	101	107
Aldicarb	49312	.25	2	0	38	19	0
Aldicarb sulfone	49313	.25	2	44	58	51	20
Aldicarb sulfoxide	49314	.25	2	74	105	89	0
alpha-HCH	34253	.1	2	97	102	99	nd
alpha-HCH-d6 (surrogate)	91065	.1	2	87	107	97	nd
alpha-HCH-d6 (surrogate)	99995	.1	3	80	100	91	87
Atrazine	39632	.1	5	100	124	111	113
Azinphos-methyl	82686	.1	5	87	159	118	0
Azinphos-methyl-oxon	61635	.1	3	50	91	77	119
Barban (surrogate)	90640	.25	2	70	112	91	112
BDMC (surrogate)	99835	.1	1	79	79	79	nd
Bendiocarb	50299	.25	2	72	72	72	79
Benfluralin	82673	.1	5	58	93	75	88
Benomyl	50300	.25	1	69	69	69	0
Bensulfuron-methyl	61693	.25	2	105	182	144	0
Bentazon	38711	.25	2	52	121	87	37
Bromacil	4029	.25	2	50	71	60	0
Bromoxynil	49311	.25	2	65	68	67	64
Butylate	4028	.1	2	102	106	104	nd
CAAT	4039	.25	2	0	0	0	0
Carbaryl	82680	.1	5	90	304	164	121
Carbaryl[1]	49310	.25	2	84	94	89	91
Carbofuran	82674	.1	2	111	275	193	nd
Carbofuran	49309	.25	2	79	92	85	97
CEAT	4038	.25	2	40	57	49	122
Chloramben methyl ester	61188	.25	2	23	41	32	0
Chlorimuron-ethyl	50306	.25	2	70	246	158	33
Chlorothalonil	49306	.1	1	63	63	63	175
Chlorpyrifos	38933	.1	5	86	110	98	0
Chlorpyrofos-oxon	61636	.1	3	13	52	32	113
CIAT	4040	.25	5	14	33	23	21
cis-Permethrin	82687	.1	5	29	63	51	73
Clopyralid	49305	.25	2	70	100	85	62
Cyanazine	4041	.1	2	103	115	109	nd
Cycloate	4031	.25	2	80	96	88	0

Table A2. Quality-control results for spike samples receiving known additions of pesticides and degradates, 2000–2005.—Continued

[Data include only those compounds detected during the study. **No dechlorinating agent:** pertains to 2–5 samples of finished drinking water. **Abbreviations:** USGS, U.S. Geological Survey; PCODE, USGS parameter code; µg/L, microgram per liter; nd, no data]

Pesticide or degradate	USGS PCODE	Amount of spike (µg/L)	Number of samples spiked	Percent recovery			
				Minimum	Maximum	Average	No dechlorinating reagent
Cyfluthrin	61585	0.1	3	49	66	60	81
Cypermethrin	61586	.1	3	50	62	55	78
Dacthal (DCPA)	82682	.1	5	104	118	109	108
Dacthal monoacid	49304	.25	1	75	75	75	91
DEET	62082	.8	1	252	252	252	13
Desulfinylfipronil	62170	.2	4	52	58	56	24
Desulfinylfipronil amide	62169	.2	4	48	63	55	37
Diazinon	39572	.1	5	89	111	101	0
Diazinon-d10 (surrogate)	91063	.1	2	101	113	107	nd
Diazinon-d10 (surrogate)	99994	.1	3	94	109	100	0
Diazinon-oxon	61638	.1	3	68	95	83	157
Dicamba	38442	.25	1	73	73	73	100
Dichlorprop	49302	.25	2	73	100	86	91
Dichlorvos	38775	.1	3	30	44	39	73
Dicrotophos	38454	.1	3	24	31	26	29
Dieldrin	39381	.1	5	70	125	95	97
Dimethoate	82662	.1	3	21	38	29	0
Dinoseb	49301	.25	2	65	116	90	61
Diphenamid	4033	.25	2	88	98	93	97
Disulfoton	82677	.1	2	56	86	71	nd
Diuron	49300	.25	2	85	99	92	48
EPTC	82668	.1	2	96	128	112	nd
Ethalfluralin	82663	.1	2	67	90	78	nd
Ethion	82346	.1	3	79	101	92	0
Ethion-monoxon	61644	.1	3	78	96	86	0
Ethoprop	82672	.1	2	99	104	102	nd
Fenamiphos	61591	.1	3	80	103	95	0
Fenamiphos sulfone	61645	.1	3	68	124	100	243
Fenamiphos sulfoxide	61646	.1	3	49	98	70	0
Fenuron	49297	.25	2	75	96	85	80
Fipronil	62166	.1	4	83	136	111	0
Fipronil sulfide	62167	.2	4	47	55	53	2
Fipronil sulfone	62168	.2	4	45	49	47	0
Flumetsulam	61694	.25	2	152	166	159	148
Fluometuron	38811	.25	2	86	100	93	96
Fonofos	4095	.1	5	85	108	97	8
Fonofos-oxon	61649	.1	3	73	89	83	170
Hexazinone	4025	.1	2	83	95	89	106
Imazaquin	50356	.25	2	165	428	297	37
Imazethapyr	50407	.25	2	125	129	127	115
Imidacloprid	61695	.25	2	127	142	134	133
Iprodione	61593	.1	3	11	81	51	15
Isofenphos	61594	.1	3	94	116	105	0
Lindane	39341	.1	2	94	102	98	nd
Linuron	82666	.1	2	52	164	108	nd
Linuron[1]	38478	.25	2	87	100	94	100
Malathion	39532	.1	5	82	122	106	0
Malathion-oxon	61652	.1	3	64	105	86	177
MCPA	38482	.25	2	70	89	79	89
MCPB	38487	.25	2	61	79	70	79
Metalaxyl	50359	.25	2	87	106	96	98
Metalaxyl[1]	61596	.1	3	97	101	99	105

Table A2. Quality-control results for spike samples receiving known additions of pesticides and degradates, 2000–2005.—Continued

[Data include only those compounds detected during the study. **No dechlorinating agent:** pertains to 2–5 samples of finished drinking water. **Abbreviations:** USGS, U.S. Geological Survey; PCODE, USGS parameter code; µg/L, microgram per liter; nd, no data]

Pesticide or degradate	USGS PCODE	Amount of spike (µg/L)	Number of samples spiked	Percent recovery			
				Minimum	Maximum	Average	No dechlorinating reagent
Methidathion	61598	0.1	3	87	102	97	0
Methiocarb	38501	.25	2	87	90	89	0
Methomyl	49296	.25	2	74	94	84	0
Metolachlor	39415	.1	5	102	119	109	111
Metribuzin	82630	.1	5	80	119	89	5
Metsulfuron-methyl	61697	.25	2	41	78	60	0
Molinate	82671	.1	2	99	106	103	nd
Myclobutanil	61599	.1	3	82	102	94	108
Napropamide	82684	.1	2	110	120	115	nd
Neburon	49294	.25	2	85	102	94	64
Nicosulfuron	50364	.25	2	153	247	200	2
Norflurazon	49293	.25	2	88	104	96	81
OIET	50355	.25	1	5	5	5	4
Oryzalin	49292	.25	2	75	100	87	50
Oxamyl	38866	.25	2	71	86	78	74
p,p´-DDE	34653	.1	2	31	61	46	nd
Paraoxon-methyl	61664	.1	3	57	88	72	167
Parathion	39542	.1	2	110	129	120	nd
Parathion-methyl	82667	.1	5	72	103	93	0
Pebulate	82669	.1	2	103	106	104	nd
Pendimethalin	82683	.1	5	77	119	98	100
Phorate	82664	.1	5	57	82	72	0
Phorate oxon	61666	.1	3	57	81	71	0
Phosmet	61601	.1	3	0	26	11	0
Phosmet oxon	61668	.1	2	8	27	17	0
Picloram	49291	.25	1	73	73	73	41
Prometon	4037	.1	5	99	112	103	108
Prometryn	4036	.1	3	105	119	113	0
Pronamide	82676	.1	5	93	109	101	98
Propachlor	4024	.1	2	118	119	118	nd
Propanil	82679	.1	2	117	118	117	nd
Propargite	82685	.1	2	100	130	115	nd
Propham	49236	.25	2	90	102	96	96
Propiconazole	50471	.25	2	84	104	94	109
Propoxur	38538	.25	2	78	91	84	95
Siduron	38548	.25	2	100	110	105	82
Simazine	4035	.1	5	95	117	107	116
Sulfometuron-methyl	50337	.25	2	112	157	135	35
Tebuthiuron	82670	.1	5	77	123	106	121
Terbacil	82665	.1	2	86	311	198	nd
Terbacil[1]	4032	.25	1	61	61	61	0
Terbufos	82675	.1	5	72	92	82	0
Terbufos oxygen analog sulfone	61674	.1	3	65	115	96	109
Terbuthylazine	4022	.1	3	105	124	114	118
Thiobencarb	82681	.1	2	111	118	115	nd
Triallate	82678	.1	2	99	101	100	nd
Triclopyr	49235	.25	2	66	102	84	97
Trifluralin	82661	.1	5	64	93	78	95

[1]These PCODES are the preferred method code (shown for compounds that were analyzed by more than one schedule).

Table A3. Comparison of quality-control results for pesticide surrogate compounds in samples of spiked blank water, native water from tributaries and the lower Clackamas River/source water, and chlorinated drinking water, 2000–2005.

[Abbreviations: UNQ, unquenched drinking-water samples]

Sample	Sample type	Pesticide surrogate	Number of samples	Percent recovery		
				Minimum	Maximum	Median
Finished drinking water-UNQ	QA-replicate	Diazinon-d10	5	0	112	0
Finished drinking water	QA-blank	Diazinon-d10	1	139	139	139
Stream sample	QA-blank	Diazinon-d10	10	85	127	94
Finished drinking water	QA-replicate	Diazinon-d10	18	67	122	93
Finished drinking water	QA-spike	Diazinon-d10	2	0	96	48
Stream sample	QA-spike	Diazinon-d10	5	94	113	101
Stream sample	Regular	Diazinon-d10	108	0	129	98
Stream sample	QA-blank	BDMC	2	74	81	77
Stream sample	QA-spike	BDMC	1	79	79	79
Stream sample	Regular	BDMC	17	72	102	80
Finished drinking water-UNQ	Regular	Barban	3	27	89	71
Finished drinking water	QA-blank	Barban	1	88	88	88
Stream sample	QA-blank	Barban	5	85	114	93
Finished drinking water	QA-replicate	Barban	16	82	127	101
Finished drinking water	QA-spike	Barban	2	99	112	105
Stream sample	QA-spike	Barban	2	70	112	91
Stream sample	Regular	Barban	66	0	318	88
Finished drinking water-UNQ	QA-replicate	alpha-HCH-d6	5	81	112	105
Finished drinking water	QA-blank	alpha-HCH-d6	1	94	94	94
Stream sample	QA-blank	alpha-HCH-d6	10	80	104	93
Stream sample	QA-blank	alpha-HCH-d6	8	74	114	91
Finished drinking water	QA-spike	alpha-HCH-d6	2	87	90	89
Stream sample	QA-spike	alpha-HCH-d6	5	80	107	92
Stream sample	Regular	alpha-HCH-d6	107	72	122	88
Finished drinking water	Regular	alpha-HCH-d6	19	76	117	92
Finished drinking water-UNQ	Regular	2,4,5-T	2	62	72	67
Finished drinking water	QA-blank	2,4,5-T	1	80	80	80
Stream sample	QA-blank	2,4,5-T	5	71	126	96
Finished drinking water	QA-replicate	2,4,5-T	16	62	124	100
Finished drinking water	QA-spike	2,4,5-T	2	83	92	87
Stream sample	QA-spike	2,4,5-T	2	71	120	96
Stream sample	Regular	2,4,5-T	66	0	245	90

Table A4. Quality-control results for pesticides and degradates detected in replicate water samples, 2000–2005.

[Unrounded pesticide concentrations in micrograms per liter (µg/L). Data include only those compounds detected during the study. **Abbreviations:** PCODE, USGS parameter code; Percent diff, percent relative difference between replicate samples. **Symbols:** _, pesticide degradate; <, less than]

Pesticide or degradate	Maximum percent difference	Replicate samples											
		Clackamas River (source water)			Clackamas River (source water)			North Fork Deep Creek at Barton			Deep Creek near Sandy (upper)		
		12-10-02			04-29-03			01-14-04			08-17-04		
		Rep 1	Rep 2	Percent diff	Rep 1	Rep 2	Percent diff	Rep 1	Rep 2	Percent diff	Rep 1	Rep 2	Percent diff
2,4-D	7	<	<										
_3,4-Dichloroaniline	19	<	<					0.0613	0.0508	19	<	<	
Atrazine	[1]100	<	<					.0297	.0273	8.4	<0.007	0.0023	100
Carbaryl	7	<	<					.0068	.0073	7.1	<	<	
Chlorpyrifos	6	<	<		<	<		.0134	.0126	6.2	<	<	
_CIAT	35	<	<					.004	.0035	13	.001	.0007	35
Cycloate	18	<	<										
Dacthal	29	<	<					<	<		<	<	
Diazinon	17	<	<					<	<		<	<	
_Diazinon-oxon	6	<	<					<	<		<	<	
Dieldrin	26	<	<					.0023	.003	26	<	<	
Dimethenamid	0												
Diuron	46	0.005	0.003	46									
Ethoprop	4												
Fenuron	2	<	<										
Glyphosate	18												
Hexazinone	16							.0159	.0149	6.5	.0172	.0147	16
Metalaxyl	8	<	<		<	<		.0045	.0045	0	<	<	
Methiocarb	29	<	<										
Metolachlor	[1]100	<	<		<	<		.0288	.0253	13	<	<	
Myclobutanil	1	<	<					.013	.0131	.8	<	<	
Napropamide	8												
Prometon	46	<	<		<	<		.0023	.0019	19	<	<	
Pronamide	[1]100	<	<					<	<		<	<	
Propiconazole (*cis*)	21												
Propiconazole (*trans*)	9												
Simazine	9	<	<					.0113	.0105	7.3	<	<	
Triclopyr	1	<	<										
Trifluralin	1	<	<					.005	.005	0	<	<	

Table A4. Quality-control results for pesticides and degradates detected in replicate water samples, 2002–2005.—Continued

[Unrounded pesticide concentrations in micrograms per liter (µg/L). Data include only those compounds detected during the study. **Abbreviations:** PCODE, USGS parameter code; Percent diff, percent relative difference between replicate samples. **Symbols:** _, pesticide degradate; <, less than]

Pesticide or degradate	Maximum percent difference	Replicate samples											
		Finished drinking water			NF Deep Creek at Boring			Clackamas River (source water)			Finished drinking water		
		09-23-04			09-30-05			09-30-05			09-30-05		
		Rep 1	Rep 2	Percent diff	Rep 1	Rep 2	Percent diff	Rep 1	Rep 2	Percent diff	Rep 1	Rep 2	Percent diff
2,4-D	7	<	<		0.8403	0.8529	1.5	0.1768	0.1799	1.7	0.0751	0.0809	7.4
_3,4-Dichloroaniline	19	<	<					<	<		<	<	
Atrazine	[1]100	<	<		.0088	.0078	12	<	<		<	<	
Carbaryl	7	<	<		<	<		<	<		<	<	
Chlorpyrifos	6	<	<		.171	.162	5.4	<	<		<	<	
_CIAT	35	<	<		<	<		<	<		<	<	
Cycloate	18	<	<		<	<		.0186	.0155	18	<	<	
Dacthal	29	<	<		<	<		.0052	.0039	29	<	<	
Diazinon	17	<	<		.045	.0465	3.3	.0156	.0132	17	<	<	
_Diazinon-oxon	6	<	<					<	<		.0103	.0097	6.0
Dieldrin	26	<	<		<	<		<	<		<	<	
Dimethenamid	0							.0054	.0054	0.0	<		
Diuron	46	0.0205	0.0204	0.5	1.8616	2.0079	7.6	.0187	.0153	20	<	<	
Ethoprop	4				.0162	.0159	1.9	.0087	.0086	1.2	.0055	.0057	3.6
Fenuron	2	<	<		.0661	.0648	2.0	<	<		<	<	
Glyphosate	18				1.56	1.5	3.9	.1	.12	18	<	<	
Hexazinone	16	<	<					<	<		<	<	
Metalaxyl	8	<	<		.2189	.203	7.5	<	<		<	<	
Methiocarb	29	<	<		.0311	.0232	29	<	<		<	<	
Metolachlor	[1]100	<	<		.0464	.0458	1.3	.0048	.0032	40	.0022	<.006	100
Myclobutanil	1	<	<					<	<		<	<	
Napropamide	8				.0139	.0128	8.2	<	<		<	<	
Prometon	46	<	<		<	<		.0043	.0027	46	<	<	
Pronamide	[1]100	<	<		<	<		<.005	.0046	100	<	<	
Propiconazole (*cis*)	21							.0032	.0026	21	.0014	.0013	7.4
Propiconazole (*trans*)	9							.0061	.0056	8.5	.0047	.0045	4.3
Simazine	9	<	<		<	<		.0178	.0162	9.4	.0204	.0211	3.4
Triclopyr	1	<	<		.5337	.5311	.5	.2289	.2265	1.1	<	<	
Trifluralin	1	<	<		.0194	.0193	.5	<	<		<	<	

[1]In all three cases where a pesticide was detected in just one of the replicate samples, the detection was at or below the reporting level, at concentrations having a 50 percent chance of being detected.

Appendix B. List of Pesticide Compounds Analyzed, Schedules and Detection Levels, and Compounds Not Detected During 2000–2005

Table B1. Pesticides and degradates analyzed in water samples collected from the lower Clackamas River basin, Oregon, 2000–2005.

[**Abbreviations:** USGS, U.S. Geological Survey; NWQL, National Water-Quality Laboratory; µg/L, microgram per liter]

Pesticide compound	2000–2005 laboratory method detection limit range (µg/L)	USGS NWQL schedule
1,4-Naphthoquinone	0.005	2002
1-Naphthol	0.09	2002; 2003
2-(4-tert-butylphenoxy)-cyclohexanol	0.01	2002
2,4-D	0.04 – 0.09	2060
2,4-D methyl ester	0.016 – 0.009	2060
2,4-DB	0.02 – 0.1	2060
2,5-Dichloroaniline	0.01	2002
2,6-Diethylaniline	0.002 – 0.006	2001; 2003
2-[(2-Ethyl-6-methylphenyl)-amino]-1-propanol	0.1	2002
2-Amino-N-isopropylbenzamide	0.005	2002
2-Chloro-2,6-diethylacetanilide	0.005	2002; 2003
2-Ethyl-6-methylaniline	0.004	2002; 2003
3(4-Chlorophenyl)-1-methyl urea	0.02 – 0.04	2060
3,4-Dichloroaniline	0.004	2002; 2003
3,4-Dichlorophenyl isocyanate	–	–
3,5-Dichloroaniline	0.004	2002
3-Hydroxycarbofuran	0.008 – 0.11	2060
3-Ketocarbofuran	0.01 – 0.02	2060
3-Trifluoromethylaniline	0.01	2002
4,4’-Dichlorobenzophenone	0.007	2002
4-Chloro-2-methylphenol	0.006	2002; 2003
4-Chlorobenzylmethyl sulfone	0.01	2002
Acetochlor	0.002 – 0.006	2001; 2003
Acifluorfen	0.007 – 0.09	2060
Alachlor	0.002 – 0.005	2001; 2003; 2060
Aldicarb	0.04 – 0.21	2060
Aldicarb sulfone	0.02 – 0.2	2060
Aldicarb sulfoxide	0.008 – 0.022	2060
alpha-HCH	0.002 – 0.005	2001
AMPA	0.31	2052
Atrazine	0.001 – 0.007	2001; 2003; 2060
Azinphos-methyl	0.001 – 0.05	2001; 2003
Azinphos-methyl-oxon	0.02 – 0.07	2002; 2003
Bendiocarb	0.02 – 0.03	2060
Benfluralin	0.002 – 0.01	2001; 2003
Benomyl	0.004 – 0.022	2060
Bensulfuron-methyl	0.02	2060
Bentazon	0.04 – 0.01	2060
Bifenthrin	0.005	2002
Bromacil	0.03 – 0.5	2060
Bromoxynil	0.02 – 0.07	2060
Butylate	0.002 – 0.004	2001
CAAT	0.04	2003
Carbaryl	0.003 –1	2001; 2003
Carbofuran	0.003 – 0.29	2001
CEAT	0.01 – 0.08	2003
Chloramben methyl ester	0.02 – 0.14	2060
Chlorimuron-ethyl	0.01 – 0.032	2060
Chlorothalonil	0.04 – 0.48	2060
Chlorpyrifos	0.004 – 0.5	2001; 2003
Chlorpyrofos-oxon	0.06	2002; 2003
CIAT	0.002 – 0.006	2001; 2003; 2060
Clopyralid	0.01 – 0.42	2060
Cyanazine	0.004 – 0.018	2001
Cycloate	0.005 – 0.01	2002; 2060
Cyfluthrin	0.008 – 0.027	2002; 2003
Cyhalothrin (*lambda*)	0.009	2002
Cypermethrin	0.009	2002; 2003
Dacthal (DCPA)	0.002 – 0.003	2001; 2003
Dacthal monoacid	0.01 – 0.07	2060
DEET	0.5	1433
Desulfinylfipronil amide	0.009 – 0.031	2001; 2003
Diazinon	0.002 – 0.5	2001; 2003
Diazinon-oxon	0.01 – 0.04	2002; 2003
Dicamba	0.01 – 0.04	2060
Dichlobenil	0.05 – 0.07	2050
Dichlorprop	0.01 – 0.05	2060
Dichlorvos	0.01 – 1	2002; 2003
Dicofol	0.02	2002
Dicrotophos	0.08	2002; 2003
Dieldrin	0.001 – 0.009	2001; 2003
Dimethenamid	0.01	2002
Dimethoate	0.006	2002; 2003
Dimethomorph (*e*)	0.02	2002
Dimethomorph (*z*)	0.05	2002
Dinoseb	0.01 – 0.09	2060
Diphenamid	0.01 – 0.03	2060
Disulfoton	0.02	2001
Disulfoton sulfone	0.01	2002
Disulfoton sulfoxide	0.036 – 0.01	2002
Diuron	0.01 – 0.06	2060
DNOC	0.25 – 0.42	2050
Endosulfan I	0.005	2002
Endosulfan II	0.01	2002
Endosulfan ether	0.007	2002
Endosulfan sulfate	0.014	2002
EPTC	0.002 – 0.004	2001
Ethalfluralin	0.004 – 0.009	2001
Ethion	0.004	2002; 2003
Ethion-monoxon	0.002 – 0.03	2002; 2003
Ethoprop	0.003 – 0.005	2001
Fenamiphos	0.03	2002; 2003
Fenamiphos sulfone	0.008 – 0.049	2002; 2003
Fenamiphos sulfoxide	0.03 – 0.04	2002; 2003
Fenthion	0.02	2002
Fenthion sulfone	0.01	2002
Fenthion sulfone-oxon	0.01	2002

Table B1. Pesticides and degradates analyzed in water samples collected from the lower Clackamas River basin, Oregon, 2000–2005.—Continued

[**Abbreviations:** USGS, U.S. Geological Survey; NWQL, National Water-Quality Laboratory; µg/L, microgram per liter]

Pesticide compound	2000–2005 laboratory method detection limit range (µg/L)	USGS NWQL schedule
Fenthion sulfoxide	0.008	2002
Fenuron	0.02 – 0.07	2060
Fipronil	0.007 – 0.016	2001; 2003
Fipronil sulfide	0.005 – 0.013	2001; 2003
Fipronil sulfone	0.005 – 0.024	2001; 2003
Flumetralin	0.003	2002
Flumetsulam	0.01 – 0.04	2060
Fluometuron	0.02 – 0.06	2060
Fonofos	0.003	2001; 2003
Fonofos-oxon	0.002 – 0.003	2002
Glufosinate	0.14	2052
Glyphosate	0.15	2052
Hexazinone	0.013	2002; 2003
Imazaquin	0.02 – 0.04	2060
Imazethapyr	0.02 – 0.04	2060
Imidacloprid	0.007 – 0.02	2060
Iprodione	0.387 -1	2002; 2003
Isofenphos	0.003	2002; 2003
Lindane	0.004	2001
Linuron	0.002 – 0.09	2001
Malathion	0.005 –0.027	2002; 2003
Malathion-oxon	0.008 – 0.03	2001; 2003
MCPA	0.02 –0.17	2060
MCPB	0.01 – 0.13	2060
Metalaxyl	0.005 – 0.5	2002; 2003
Methidathion	0.006	2002; 2003
Methiocarb	0.008 – 0.07	2060
Methomyl	0.004 – 0.02	2060
Methomyl oxime - removed from schedule 9060		9060
Methyl *cis*-3-(2,2-dichlorovinyl)-2,2-dim	0.02	2002
Methyl *trans*-3-(2,2-dichlorovinyl)-2,2-d	0.01 – 0.02	2002
Metolachlor	0.002 – 0.5	2001; 2003
Metribuzin	0.004 – 0.006	2001; 2003
Metsulfuron-methyl	0.03	2060
Molinate	0.002 – 0.004	2001
Myclobutanil	0.008	2002; 2003
Naled	0.4	2002
Napropamide	0.003 – 0.007	2001
Neburon	0.01 – 0.07	2060
Nicosulfuron	0.01 – 0.04	2060
Norflurazon	0.02 – 0.04	2060
O-Ethyl-O-methyl-S-propylphosphorothioate	0.005	2002
OIET	0.008 – 0.032	2060
Oryzalin	0.01 – 0.31	2060
Oxamyl	0.01 – 0.03	2060
Oxyfluorfen	0.007	2002
p,p´-DDE	0.003 – 0.006	2001
Paraoxon-ethyl	0.016	2002
Paraoxon-methyl	0.03	2002; 2003
Parathion	0.004 – 0.01	2001
Parathion-methyl	0.006 –0.015	2001
Pebulate	0.002 – 0.004	2001
Pendimethalin	0.004 – 0.022	2001; 2003
cis-Permethrin	0.005 – 0.006	2001; 2003
Phorate	0.002 – 0.011	2001; 2003
Phorate-oxon	0.1	2002; 2003
Phosmet	0.008	2002; 2003
Phosmet oxon	0.05 – 0.06	2002; 2003
Picloram	0.02 – 0.09	2060
Profenofos	0.006	2002
Prometon	0.01 – 0.5	2001; 2003
Prometryn	0.005	2002; 2003
Pronamide	0.003 – 0.004	2001; 2003
Propachlor	0.007 – 0.025	2001
Propanil	0.004 – 0.011	2001
Propargite	0.01 – 0.02	2001
Propetamphos	0.004	2002
Propham	0.01 – 0.09	2060
Propiconazole	0.01 – 0.02	2060
cis-Propiconazole	0.008	2002
trans-Propiconazole	0.01	2002
Propoxur	0.008 – 0.12	2060
Siduron	0.02	2060
Silvex	0.03 – 0.06	2050
Simazine	0.005 – 0.011	2001; 2003
Sulfometuron-methyl	0.009 – 0.038	2060
Sulfotepp	0.003	2002
Sulprofos	0.02	2002
Tebuconazole	0.01	2002
Tebupirimphos	0.005	2002
Tebupirimphos-oxon	0.006	2002
Tebuthiuron	0.01 – 0.02	2001; 2003; 2060
Tefluthrin	0.008	2002
Temephos	0.3	2002
Terbacil	0.007 – 0.034	2001
Terbufos	0.01 – 0.02	2001; 2003
Terbufos sulfone	0.02	2003
Terbufos sulfone-oxon	0.07	2002
Terbuthylazine	0.01	2002; 2003
Thiobencarb	0.002 – 0.01	2001
Triallate	0.001 – 0.006	2001
Tribufos	0.004	2002
Triclopyr	0.02 – 0.25	2060
Trifluralin	0.002 – 0.009	2001; 2003

Table B2. Pesticides and degradates not detected in the lower Clackamas River basin, Oregon, 2000–2005.

Pesticide or degradate	Number of analyses
1,4-Naphthoquinone	3
2-(2-Ethyl-6-methylphenyl)-amino-1-propanol	21
2-(4-tert-butylphenoxy)-cyclohexanol	3
2,4,5-T	16
2,4-DB	94
2,5-Dichloroaniline	3
2,6-Diethylaniline	113
2-Amino-N-isopropylbenzamide	3
2-Chloro-2,6-diethylacetanilide	61
2-Ethyl-6-methylaniline	61
3(4-Chlorophenyl)-1-methyl urea	78
3,5-Dichloroaniline	3
3-Hydroxycarbofuran	95
3-Ketocarbofuran	78
3-Trifluoromethylaniline	3
4,4'-Dichlorobenzophenone	3
4-Chloro-2-methylphenol	61
4-Chlorobenzylmethyl sulfone	3
Acetochlor	113
Acifluorfen	94
Alachlor	113
Aldicarb	94
Aldicarb sulfone	95
Aldicarb sulfoxide	94
alpha-HCH	55
Azinphos-methyl-oxon	61
Bendiocarb	78
Benfluralin	113
Bensulfuron-methyl	78
Bifenthrin	3
Bromoxynil	94
Butylate	55
CAAT	78
Carbofuran	94
Carbofuran	55
CEAT	78
Chloramben methyl ester	94
Chlorimuron-ethyl	78
Chlorpyrofos-oxon	62
cis-Permethrin	114
Clopyralid	94
Cyanazine	55
Cyfluthrin	62
Cyhalothrin (*lambda*)	3
Cypermethrin	62
Dacthal monoacid	94
Desulfinylfipronil	93
Desulfinylfipronil amide	93
Dicamba	93
Dicofol	3
Dicrotophos	62
Dimethoate	62
Dimethomorph (*e*)	3
Dimethomorph (*z*)	3
Diphenamid	78
Disulfoton	55
Disulfoton sulfone	3
Disulfoton sulfoxide	3
DNOC	16
Endosulfan ether	3
EPTC	55
Ethalfluralin	55
Ethion	62
Ethion-monoxon	62
Fenamiphos	62
Fenamiphos sulfone	62
Fenamiphos sulfoxide	60
Fenthion	3
Fenthion sulfone-oxon	3
Fenthion sulfoxide	3
Fenthion-sulfone	3
Fipronil	93
Fipronil sulfide	93
Fipronil sulfone	93
Flumetralin	3
Flumetsulam	78
Fluometuron	94
Fonofos-oxon	53
Glufosinate	34
Imazethapyr	78
Isofenphos	62
Lindane	55
Linuron	94
Malathion-oxon	62
MCPB	94
Methidathion	62
Methomyl	94
Methomyl oxime	1
Methyl *cis*-3-(2,2-dichlorovinyl)-2,2-dim	3
Methyl *trans*-3-(2,2-dichlorovinyl)-2,2-dim	3
Metribuzin	114
Molinate	55
Naled	3
Neburon	94
Nicosulfuron	78
O-Ethyl-O-methyl-S-propylphosphorothioate	3
Oxamyl	94
Oxamyl oxime	1
Paraoxon-ethyl	3
Paraoxon-methyl	62
Parathion	55
Parathion-methyl	114
Pebulate	55
Phorate	114
Phorate-oxon	62
Phosmet	57
Phosmet-oxon	52
Picloram	94

Table B2. Pesticides and degradates not detected in the lower Clackamas River basin, Oregon, 2000–2005.—Continued

Pesticide or degradate	Number of analyses	Pesticide or degradate	Number of analyses
Profenofos	3	Tebupirimphos	3
Prometryn	62	Tebupirimphos-oxon	3
Propachlor	55	Tefluthrin	3
Propanil	55	Temephos	3
Propargite	55	Terbufos	114
Propetamphos	3	Terbufos sulfone	3
Propham	94	Terbufos sulfone-oxon	62
Siduron	78	Terbuthylazine	62
Silvex	16	Thiobencarb	55
Sulfotepp	3	Triallate	55
Sulprofos	3	Tribenuron-methyl	2
Tebuconazole	3	Tribufos	3

Appendix C. Pesticide, Turbidity, and Streamflow Data for Sites Sampled in the Lower Clackamas River Basin, Oregon, 2002–2005

Table C1. Concentrations of pesticides and degradates in the lower Clackamas River basin, Oregon, May and September 2005.

[Pesticide concentrations in micrograms per liter (µg/L). May 2005 data are shaded. **Abbreviations:** e, estimated value (see Glossary); Ct, Court; ds, downstream; Hwy, highway; Rd, road; Pkwy, parkway; trib, tributary; ft^3/s, cubic foot per second; g/d, gram per day; mi^2, square mile; nd, no data. **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections	Maximum concentrations	Finished drinking water	Clackamas River (source water)		Tributary sites, in upstream order													
						Cow Creek at mouth		Carli Creek near mouth		Sieben Creek near Hwy 224		Sieben Creek ds Sunnyside Rd	Rock Creek near mouth	Trillium Creek at Anderegg Pkwy		Rock Creek at Stoneybrook Ct		Rock Creek at 172nd Ave	Rock Creek ds Foster Rd
			09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05
2,4-D	26	6.1	0.08	<	0.18	0.36	e1.9	0.09	<	0.52	e2.4	e0.92	1.3	0.52	0.23	0.34	<	e0.04	e1.09
2,4-D methyl ester	2	.73	<	<	<	<	<	<	<	<	<	<	<	<	<	.043	<	<	<
2,4-DP	1	.13	<	<	<	<	<	<	<	<	<	e.13	<	<	<	<	<	<	<
Atrazine	19	.08	<	e 0.003	<	.023	<	.021	e.014	e.007	<	<	e.006	e.005	<	e.004	0.007	e.005	<
_CIAT	6	.012	<	<	<	<	<	<	<	<	<	<	<	<	<	<	e.003	<	<
_OIET	5	.18	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Azinphos-methyl	1	.21	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Benomyl	4	5.7	<	<	<	<	<	<	<	<	<	<	<	<	<	.05	.063	e5.7	<
Bentazon	1	.164	<	<	<	<	<	<	<	<	<	.164	<	<	<	<	<	<	<
Bromacil	1	.12	<	<	<	<	<	<	<	.12	<	<	<	<	<	<	<	<	<
Carbaryl	14	.15	<	<	<	e.009	e.023	e.01	e.064	.094	e.074	e.026	e.01	e.004	<	e.019	<	e.052	<
_1-Naphthol	2	.01	<	nd	<	nd	.01	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Chlorothalonil	1	.26	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Chlorpyrifos	11	.17	<	<	<	<	<	<	<	<	<	<	<	.005	<	<	<	<	<
Cycloate	2	.024	<	<	.017	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Dacthal (DCPA)	9	.02	<	.004	e.005	.003	<	.008	.004	e.003	<	<	.02	e.003	.003	<	<	<	<
Diazinon	11	.25	<	<	.014	<	<	<	.25	.012	<	<	<	.01	<	<	<	.17	<
_Diazinon-oxon	1	.01	e .01	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dieldrin	4	.024	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Dimethenamid	1	.005	<	nd	.005	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dinoseb	1	.03	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Diuron	18	2.26	<	.06	.017	.5	<	<	<	.19	e.10	e.12	.26	.03	<	.03	<	<	.03
_3,4-Dichlorophenyl isocyanate	4	5.4	nd	nd	nd	nd	e1.52	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Endosulfan I	1	.067	<	nd	<	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Endosulfan II	1	.04	<	nd	<	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
_Endosulfan sulfate	2	.036	<	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Ethoprop	16	.13	.006	<	.009	<	e.093	<	e.055	<	e.087	e.13	e.017	<	.043	<	<	.014	e.012
Fenuron	3	.12	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Glyphosate	24	45.8	<	<	e.12	.38	e3.9	.29	.76	.58	1.5	1.1	.54	.18	<	.34	<	45.8	.23
_AMPA	8	2.4	<	<	<	<	.32	<	<	<	<	<	<	<	<	<	<	e1.7	<
Imidacloprid	2	4.5	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	e1	<
Iprodione	1	.056	<	nd	<	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Malathion	1	.047	<	<	<	<	<	<	<	<	<	<	.047	<	<	<	<	<	<
MCPA	1	.067	<	<	<	<	<	<	<	.067	<	<	<	<	<	<	<	<	<
Metalaxyl	7	1.5	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	e1.5	<
Methiocarb	3	.086	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	.086	<
Metolachlor	26	.11	.002	<	.004	.04	.03	<	.056	<	.058	.07	.007	<	.027	<	.009	.007	e.006
Napropamide	16	.40	<	.004	<	<	<	<	<	.40	.022	.016	<	<	<	<	<	<	<
Norflurazon	3	.11	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Oryzalin	1	.29	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<

Table C1. Concentrations of pesticides and degradates in the lower Clackamas River basin, Oregon, May and September 2005.—Continued

[Pesticide concentrations in micrograms per liter (µg/L). May 2005 data are shaded. **Abbreviations:** e, estimated value (see Glossary); Ct, Court; ds, downstream; Hwy, highway; Rd, road; Pkwy, parkway; trib, tributary; ft^3/s, cubic foot per second; g/d, gram per day; mi^2, square mile; nd, no data. **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections	Maximum concentrations	Finished drinking water	Clackamas River (source water)		Tributary sites, in upstream order													
						Cow Creek at mouth		Carli Creek near mouth		Sieben Creek near Hwy 224		Sieben Creek ds Sunnyside Rd	Rock Creek near mouth	Trillium Creek at Anderegg Pkwy		Rock Creek at Stoneybrook Ct		Rock Creek at 172nd Ave	Rock Creek ds Foster Rd
			09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05
Oxyfluorfen	1	0.023	<	nd	<	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Pendimethalin	5	.35	<	<	<	<	<	<	0.08	<	0.046	0.033	<	<	<	<	<	<	<
Prometon	15	.11	<	<	e0.004	0.06	0.11	<	<	<	<	<	0.02	0.01	<	e0.007	e0.005	0.02	0.01
Propiconazole	6	.51	e0.006	<	e.009	<	<	0.04	<	<	<	<	<	<	<	<	<	<	<
Propoxur	1	.005	<	<	<	e.005	<	<	<	<	<	<	<	<	<	<	<	<	<
Simazine	25	.96	.02	<	.017	.11	<	.021	.96	0.054	.019	<	.007	<	0.007	.016	.01	.023	.016
Sulfometuron-methyl	5	.2	<	<	<	.10	<	<	<	0.2	<	<	<	<	<	<	<	<	.043
Tebuthiuron	3	.08	<	<	<	.08	e.024	<	<	<	<	<	.08	<	<	<	<	<	<
Triclopyr	16	5	<	<	.23	<	e1.2	<	<	<	e.83	e.59	1.0	e.21	<	.22	<	<	e.83
Trifluralin	11	.17	<	<	<	<	<	<	<	e.004	<	e.004	<	e.003	<	<	<	.056	<
Number of pesticides detected			6	4	13	12	11	7	9	13	10	12	13	11	5	10	6	15	9
Total pesticide concentration (µg/L)			.12	.07	.62	1.7	9.1	.48	2.2	2.2	5.1	3.3	3.3	1.0	.3	1.1	.1	56.1	2.3
Streamflow (ft^3/s)			1,200	3,000	1,200	12	4.4	21	11	10	4.8	2.3	20	.3	.3	10	1.7	1.8	1.5
Instantaneous pesticide load (g/d)			360	506	1,810	49	99	24	62	53	60	18	167	1	.2	25	.4	253	9
Basin area (mi^2)			942	942	942	1.3	1.3	.6	0.6	1.7	1.7	.7	9.5	.1	.1	7.3	7.3	5.3	2.2
Instantaneous pesticide yield (g/d/1,000 acres)			.6	.8	3.0	60.9	123.8	62.8	159.5	48.4	55.3	37.7	27.5	9.7	2.5	5.3	.1	74.1	6.0
Instantaneous water yield (ft^3/s/1,000 acres)			2.0	5.0	2.0	15.0	5.5	53.6	29.0	8.9	4.4	4.7	3.4	4.0	3.3	2.0	.4	.5	1.1

Table C1. Concentrations of pesticides and degradates in the lower Clackamas River basin, Oregon, May and September 2005.—Continued

[Pesticide concentrations in micrograms per liter (µg/L). May 2005 data are shaded. **Abbreviations:** e, estimated value (see Glossary); Ct, Court; ds, downstream; Hwy, highway; Rd, road; Pkwy, parkway; trib, tributary; ft^3/s, cubic foot per second; g/d, gram per day; mi^2, square mile; nd, no data. **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections	Maximum concentrations	Tributary sites, in upstream order																
			Richardson Creek at Hwy 224	Noyer Creek at mouth		Noyer Creek ds Hwy 212		Deep Creek at Barton	NF Deep Creek at Barton	NF Deep Creek nr Boring (ds weir)	NF Deep Creek at Boring	NF Deep Creek trib at 312th Ave	NF Deep Creek trib at Church Rd	Dolan creek at Orient Rd	Doane Creek ds Hwy 212	Tickle Creek near Boring	Tickle Creek trib at Orient Rd	Tickle Creek trib at Colorado Rd	Tickle Creek at 362nd Ave
			09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05
2,4-D	26	6.1	e1.1	<	e0.7	<	e0.14	e0.1	<	0.13	e0.85	e6.1	e0.20	<	e0.11	0.07	e0.17	<	e0.2
2,4-D methyl ester	2	.73	<	<	<	<	<	<	<	<	<	0.73	<	<	<	<	<	<	<
2,4-DP	1	.13	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Atrazine	19	.08	<	e0.004	<	0.017	<	<	<	.013	.008	e.003	.08	<	.008	<	.035	<	e.003
_CIAT	6	.012	<	e.003	<	e.004	<	<	<	e.008	<	<	e.012	<	<	<	e.007	<	<
_OIET	5	.18	<	<	<	<	<	<	<	e.028	<	<	.18	<	.07	.06	.15	<	<
Azinphos-methyl	1	.21	<	<	<	<	<	<	<	<	<	<	<	<	e.21	<	<	<	<
Benomyl	4	5.7	<	<	<	<	<	<	<	.04	<	<	<	<	<	<	<	<	<
Bentazon	1	.164	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Bromacil	1	.12	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Carbaryl	14	.15	<	e.004	<	e.01	.15	<	<	<	<	<	<	<	<	<	<	<	<
_1-Naphthol	2	0.01	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	nd	e0.004	nd	<	nd	nd	nd
Chlorothalonil	1	.26	<	e.26	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Chlorpyrifos	11	.17	<	.03	<	.042	.14	<	0.018	.03	.17	.005	e.004	<	.008	.021	<	<	<
Cycloate	2	.024	<	<	<	<	<	<	<	<	<	.024	<	<	<	<	<	<	<
Dacthal (DCPA)	9	.02	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Diazinon	11	.25	<	<	<	<	<	<	.015	.044	.05	<	.007	<	.02	.046	<	<	<
_Diazinon-oxon	1	.01	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dieldrin	4	.024	<	e.005	<	.012	.024	<	<	<	<	.01	<	<	<	<	<	<	<
Dimethenamid	1	.005	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Dinoseb	1	.03	<	e.03	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Diuron	18	2.26	<	.82	<	<	<	<	.52	e1.16	e1.9	.04	<	<	e2.26	<	<	0.57	.11
_3,4-Dichlorophenyl isocyanate	4	5.4	nd	nd	nd	nd	nd	nd	e5.4	nd	nd	nd	nd	.26	nd	.60	nd	nd	nd
Endosulfan I	1	.067	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	nd	<	nd	.067	nd	nd	nd
Endosulfan II	1	.04	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	nd	<	nd	e0.04	nd	nd	nd
_Endosulfan sulfate	2	.036	nd	nd	nd	nd	nd	nd	e.012	nd	nd	nd	nd	nd	nd	.036	nd	nd	nd
Ethoprop	16	.13	0.028	<	<	.01	e.021	<	<	<	e.016	e.014	<	<	e.016	<	<	<	<
Fenuron	3	.12	<	<	<	<	<	<	.032	<	.07	<	<	<	.12	<	<	<	<
Glyphosate	24	45.8	.5	.07	<	.18	12.5	1	<	.16	1.5	4.8	e1.2	<	<	3.2	e.13	<	<
_AMPA	8	2.4	<	.17	<	.39	1.7	<	<	<	<	<	2.4	<	<	.44	.62	<	<
Imidacloprid	2	4.5	<	<	<	<	4.5	<	<	<	<	<	<	<	<	<	<	<	<
Iprodione	1	.056	nd	nd	nd	nd	nd	nd	e.056	nd	nd	nd	nd	<	nd	<	nd	nd	nd
Malathion	1	.047	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
MCPA	1	.067	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Metalaxyl	7	1.5	<	.02	<	.09	<	<	.11	.03	.21	<	<	<	<	.11	<	<	<
Methiocarb	3	.086	<	<	<	<	<	<	<	<	.027	<	<	<	<	.027	<	<	<
Metolachlor	26	.11	.011	.005	e.005	e.005	.02	<	.006	.11	.05	.013	e.005	.008	.10	<	.006	<	e.006
Napropamide	16	.40	<	.016	<	.09	.031	<	.008	.05	.013	.015	.02	.009	.02	.017	.02	<	<
Norflurazon	3	.11	<	.018	.03	<	<	<	<	<	<	<	<	<	<	<	<	.11	<
Oryzalin	1	.29	<	<	<	<	<	<	<	0.29	<	<	<	<	<	<	<	<	<

Table C1. Concentrations of pesticides and degradates in the lower Clackamas River basin, Oregon, May and September 2005.—Continued

[Pesticide concentrations in micrograms per liter (µg/L). May 2005 data are shaded. **Abbreviations:** e, estimated value (see Glossary); Ct, Court; ds, downstream; Hwy, highway; Rd, road; Pkwy, parkway; trib, tributary; ft^3/s, cubic foot per second; g/d, gram per day; mi^2, square mile; nd, no data. **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections	Maximum concentrations	Tributary sites, in upstream order																
			Richardson Creek at Hwy 224	Noyer Creek at mouth		Noyer Creek ds Hwy 212		Deep Creek at Barton	NF Deep Creek at Barton	NF Deep Creek nr Boring (ds weir)	NF Deep Creek at Boring	NF Deep Creek trib at 312th Ave	NF Deep Creek trib at Church Rd	Dolan creek at Orient Rd	Doane Creek ds Hwy 212	Tickle Creek near Boring	Tickle Creek trib at Orient Rd	Tickle Creek trib at Colorado Rd	Tickle Creek at 362nd Ave
			09-30-05	05-09-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05	05-09-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05	09-30-05
Oxyfluorfen	1	0.023	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	nd	<	nd	e0.023	nd	nd	nd
Pendimethalin	5	.35	<	<	<	0.041	0.35	<	<	<	<	<	<	<	<	<	<	<	<
Prometon	15	.11	e0.006	<	<	e.004	<	<	<	e.004	<	<	e0.003	<	e0.01	<	<	<	0.006
Propiconazole	6	.51	<	0.34	<	.51	.32	<	<	<	<	<	<	<	<	<	<	<	<
Propoxur	1	.005	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Simazine	25	.96	.007	.01	0.01	.013	.023	<	<	.034	<	0.015	.141	0.011	.022	<	0.01	0.013	<
Sulfometuron-methyl	5	.2	<	<	<	.09	<	<	<	.07	<	<	<	<	<	<	<	<	<
Tebuthiuron	3	.08	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Triclopyr	16	5	e.66	<	e.39	<	<	e1.2	<	e.19	e0.53	e5.0	<	.19	<	e1.8	<	<	<
Trifluralin	11	.17	<	e.002	<	.03	.011	<	<	.17	.02	<	<	<	e.003	.026	<	<	<
Number of pesticides detected			7	17	5	17	14	3	10	18	14	13	12	6	14	16	9	3	5
Total pesticide concentration (µg/L)			2.4	1.8	1.1	1.5	19.9	2.4	6.2	2.6	5.5	16.7	4.2	0.5	3.0	6.5	1.1	.7	.33
Streamflow (ft^3/s)			4.7	5	.7	5	2.4	45	20	36	10	.1	0.1	0.1	2.9	9.2	.2	.6	29
Instantaneous pesticide load (g/d)			27	21	1.8	20	116	259	303	224	131	4.0	1.1	0.1	21	146	.6	1.1	23
Basin area (mi^2)			3.9	3.1	3.1	2.1	2.1	32	14	11	10	.2	.7	2.6	6.5	13	1.3	2.1	3.6
Instantaneous pesticide yield (g/d/1,000 acres)			10.6	10.6	.9	14.5	85.9	12.5	33.2	32.1	20.3	27.5	2.5	.07	5.1	17.7	.7	.8	10.0
Instantaneous water yield (ft^3/s/1,000 acres)			1.8	2.4	.3	3.9	1.8	2.2	2.2	5.1	1.5	.7	.2	.06	.7	1.1	.2	.5	12.4

Table C2. Pesticides and degradates detected in the Deep Creek basin during the EUSE urbanization study, 2003–2004.

[Pesticide concentrations in micrograms per liter (µg/L). **Abbreviations:** EUSE, Effects of Urbanization on Stream Ecosystems (USGS NAWQA study); NAWQA, National Water-Quality Assessment Program; USGS, U.S. Geological Survey; ft^3/s, cubic foot per second; g/d, gram per day. **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections	Maximum concentrations	Sample and date																	
			North Fork Deep Creek at Barton						Tickle Creek near Boring						(upper) Deep Creek near Sandy					
			11-04-03	01-14-04	03-09-04	05-04-04	06-29-04	08-17-04	11-04-03	01-15-04	03-09-04	05-04-04	06-29-04	08-17-04	11-04-03	01-14-04	03-09-04	05-04-04	06-29-04	08-17-04
Atrazine	12	0.03	0.01	0.03	0.017	0.026	0.018	0.014	e0.005	e0.003	e0.004	e0.0004	e0.004	e0.004	<	<	e0.003	e.005	e0.003	e0.002
_CIAT	12	.01	e.004	e.004	e.004	e.005	.01	e.005	e.004	e.003	e.003	e.003	e.006	e.003	e.002	e.003	e.002	e.002	e.005	e.001
Hexazinone	10	.03	<	.015	.026	.02	.017	e.008	<	.03	.03	e.011	.02	e.006	.015	.03	.034	.028	.03	.016
Metalaxyl	12	.02	.02	e.005	.007	.006	.017	.02	.01	e.006	.009	e.007	.02	.02	<	<	e.005	e.003	<	<
Simazine	12	.18	.05	.01	.18	.068	.032	.04	.014	.008	.007	e.016	.012	.008	<	<	e.003	<	<	<
Metolachlor	9	.03	.022	.027	.028	.025	.02	e.007	e.002	<	<	e.002	<	e.002	<	<	e.004	e.002	<	<
Trifluralin	9	.02	.009	e.005	.02	e.005	<	<	e.006	.006	e.008	e.004	<	e.005	<	<	<	<	<	<
Chlorpyrifos	8	.022	<	.013	.022	.009	0.006	<	<	e.003	e.005	e.002	<	e.003	<	<	<	<	<	<
_3,4-Dichloroaniline	8	.15	.10	.056	.15	.07	0.02	.05	<	.007	.012	<	<	<	<	<	<	<	<	<
Myclobutanil	6	.016	<	.013	.016	e.014	<	e.01	<	.01	.012	<	<	<	<	<	<	<	<	<
Prometon	5	.005	<	e.002	<	.005	<	e.004	<	e.003	<	<	<	e.003	<	<	<	<	<	<
Diazinon	5	.03	.03	<	<	e.003	<	.007	<	<	e.004	<	<	.006	<	<	<	<	<	<
Dieldrin	2	.003	<	e.003	.002	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Carbaryl	1	.007	<	e.007	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Number of pesticides detected			8	13	11	12	8	10	6	10	10	8	5	10	2	2	6	5	3	3
Total pesticide concentration (µg/L)			0.25	.189	.470	.253	.140	.160	.041	.075	.093	.049	.057	.057	.017	.031	.050	.039	.039	.019
Streamflow (ft^3/s)			1.7	70.2	32.5	3.7	2.4	2.0	3.1	73.5	33.8	7.2	4.9	2.9	2.3	56.4	33.4	5.1	4.0	1.3
Instantaneous pesticide load (g/d)			1.0	32.5	37.4	2.3	.8	.8	.3	13.5	7.7	.9	.7	.4	.1	4.3	4.1	.5	0.4	.06
Instantaneous pesticide yield (g/d/1,000 acres)			.11	3.6	4.1	.3	.1	.1	.0	1.6	.9	.1	.08	.05	.00	.21	.20	.02	.02	.00
Instantaneous water yield (ft^3/s/1,000 acres)			.0002	.0077	.0036	.0004	.0003	.0002	.0004	.0089	.0041	.0009	.0006	.0004	.0001	.0027	.0016	.0002	.0002	.0001

Table C3. Concentrations of pesticides and degradates in source water (2002–2005) and finished drinking water (2004–2005) from the study water treatment plant on the lower Clackamas River, Oregon.

[Pesticide concentrations in micrograms per liter (µg/L). See p. 3 for more information on the study plant's water-treatment process. **Abbreviations:** FNU, Formazin Nephelometric Unit; e, estimated value (see Glossary); ft^3/s, cubic foot per second; g/d, gram per day; nd, no data; **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections		Maximum concentration		Source water																
					2002					2003											
	Source water	Finished drinking water	Source water	Finished drinking water	10-29	11-13	11-18	12-10	12-18	01-14	01-28	02-11	03-11	04-08	04-29	05-13	05-28	06-10	06-24	07-15	08-19	09-11
Diuron	14	4	0.22	0.18	<	<	e0.012	e0.004	0.06	0.09	0.034	e0.008	e0.004	<	nd	e0.006	<	<	<	<	nd	<
Simazine	11	4	.017	.021	<	0.005	e.005	<	e.003	e.003	.007	e.003	<	e0.003	e0.003	e.003	<	<	<	<	nd	<
Dacthal	5	2	.005	.005	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	nd	<
Hexazinone	4	2	.022	.017	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	e.008	e0.005	<	<	<	nd	<
Atrazine	7	1	.023	.006	<	<	<	<	<	e.002	e.003	e0.002	<	<	.023	e.004	<	<	<	<	nd	<
_CIAT	4	1	.005	.005	<	<	<	<	<	e.002	e.002	<	<	<	e.002	<	<	<	<	<	nd	<
Metolachlor	5	1	.005	.002	<	e.003	<	<	e.002	<	<	<	<	e.003	nd	<	<	<	<	<	<	<
2,4-D	3	1	.18	.08	<	<	<	<	<	<	<	<	<	<	e.018	<	<	<	<	<	nd	<
Trifluralin	3	1	.006	.005	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	nd	<
DEET	3	1	.074	.078	<		<	<	<	<	<	<	<	<	nd	<	<	<	<	e0.066	<	<
Ethoprop	1	1	.009	.006	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Propiconazole	1	1	.009	.006	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<		<
Diazinon	4	0	.014	<	<	.005	<	<	<	<	<	<	<	<	e.002	<	<	<	<	<	<	<
_Diazinon-oxon	0	1	<	.010	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	nd	<
Metsulfuron methyl	0	1	<	.06	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	nd	<
Pronamide	0	1	<	.005	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	nd	<
Carbaryl	3	0	.041	<	<	.041	<	<	e.004	<	<	<	<	<	e.004	<	<	<	<	<	<	<
Chlorpyrifos	2	0	.006	<	<	.005	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	<	<
Prometon	2	0	.015	<	<	.015	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	<	<
Bromacil	1	0	.033	<	<	.033	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	<	<
_OIET	1	0	.014	<	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	nd	<
Cycloate	1	0	.017	<	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	nd	<
Dichlorvos	1	0	.012	<	<	.012	<	<	<	<	<	<	<	<	nd	<	<	<	<	<	<	<
Dimethenamid	1	0	.005	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Glyphosate	1	0	.11	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Metalaxyl	1	0	.02	<	<	.02	<	<	<	<	<	<	<	<		<	<	<	<	<	<	<
Napropamide	1	0	.004	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Triclopyr	1	0	.23	<	<	<	<	<	<	<	<	<	<	<		<	<	<	<	<	nd	<
Number of pesticides detected					0	9	2	1	4	4	4	3	1	2	6	4	1	0	0	1	0	0
Total pesticide concentration (µg/L)					0	0.139	0.017	0.004	0.067	0.096	0.046	0.013	0.004	0.006	0.053	0.020	0.005	0	0	0.066	0	0
Streamflow (ft^3/s)					831	1,600	1,465	788	3,080	4,912	7,400	3,220	9,370	4,523	4,057	2,750	2,287	1,390	1,230	818	758	901
Turbidity (FNU)					0.7	1.7	1.6	0.4	6.4	4.7	16.3	2.3	7.4	2.3	1.8	1.0	11.3	0.6	0.4	0.3	0.2	0.2
Instantaneous pesticide load (g/d)					0	546	61.3	8.0	506	1,153	835	105	98.6	60.9	527	137	29.7	0	0	132	0	0

Table C3. Concentrations of pesticides and degradates in source water (2002–2005) and finished drinking water (2004–2005) from the study water treatment plant on the lower Clackamas River, Oregon.—Continued

[Pesticide concentrations in micrograms per liter (µg/L). See p. 3 for more information on the study plant's water-treatment process. **Abbreviations:** FNU, Formazin Nephelometric Unit; e, estimated value (see Glossary); ft^3/s, cubic foot per second; g/d, gram per day; nd, no data; **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections		Maximum concentration		Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water
	Source water	Finished drinking water	Source water	Finished drinking water	07-07-04		07-21-04		08-12-04		08-25-04		09-09-04		09-23-04		10-20-04		11-10-04	
Diuron	14	4	0.22	0.18	<	<	<	<	<	<	<	<	<	<	0.023	0.020	0.06	0.04	<	<
Simazine	11	4	.017	.021	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Dacthal	5	2	.005	.005	<	<	0.005	0.005	<	<	0.003	<	<	<	<	<	<	<	<	<
Hexazinone	4	2	.022	.017	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Atrazine	7	1	.023	.006	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
_CIAT	4	1	.005	.005	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Metolachlor	5	1	.005	.002	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
2,4-D	3	1	.18	.08	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Trifluralin	3	1	.006	.005	<	<	<	<	<	<	e.005	<	<	<	<	<	e.004	<	<	<
DEET	3	1	.074	.078	<	<	<	<	<	<	e0.1	0.078	<	<	<	<	e.010	<	<	<
Ethoprop	1	1	.009	.006	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Propiconazole	1	1	.009	.006	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Diazinon	4	0	.014	<	<	<	<	<	<	<	.007	<	<	<	<	<	<	<	<	<
_Diazinon-oxon	0	1	<	.010	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Metsulfuron methyl	0	1	<	.06	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Pronamide	0	1	<	.005	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Carbaryl	3	0	.041	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Chlorpyrifos	2	0	.006	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Prometon	2	0	.015	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Bromacil	1	0	.033	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
_OIET	1	0	.014	<	<	<	<	<	<	<	e.013	<	<	<	<	<	<	<	<	<
Cycloate	1	0	.017	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Dichlorvos	1	0	.012	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Dimethenamid	1	0	.005	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Glyphosate	1	0	.11	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Metalaxyl	1	0	.02	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Napropamide	1	0	.004	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Triclopyr	1	0	.23	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<	<
Number of pesticides detected					0	0	1	1	0	0	5	1	0	0	1	1	3	1	0	0
Total pesticide concentration (µg/L)					0	0	0.005	0.005	0	0	0.103	0.078	0	0	0.023	0.020	0.069	0.036	0	0
Streamflow (ft^3/s)					1,050	nd	861	nd	748	nd	1,363	nd	912	nd	1,729	nd	1,920	nd	1,750	nd
Turbidity (FNU)					0.8	0.8	0.5	0.4	0.7	0.7	4.2	nd	0.7	nd	0.9	nd	1.1	nd	1.2	nd
Instantaneous pesticide load (g/d)					0	nd	10	nd	0	nd	345	nd	0	nd	96	nd	326	nd	0	nd

Table C3. Concentrations of pesticides and degradates in source water (2002–2005) and finished drinking water (2004–2005) from the study water treatment plant on the lower Clackamas River, Oregon.—Continued

[Pesticide concentrations in micrograms per liter (µg/L). See p. 3 for more information on the study plant's water-treatment process. **Abbreviations:** FNU, Formazin Nephelometric Unit; e, estimated value (see Glossary); ft^3/s, cubic foot per second; g/d, gram per day; nd, no data; **Symbols:** _, pesticide degradate; <, less than laboratory method detection limit]

Pesticide or degradate	Number of detections		Maximum concentration		Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water	Raw water	Finished drinking water	Source water	Finished drinking water	Source water	Finished drinking water
	Source water	Finished drinking water	Source water	Finished drinking water	01-05-05		02-09-05		03-02-05		03-09-05		04-06-05		05-09-05		05-18-05		09-30-05	
Diuron	14	4	0.22	0.18	<	<	0.06	0.06	nd	nd	<	<	<	<	0.06	nd	0.22	0.18	0.017	<
Simazine	11	4	.017	.021	<	<	<	.005	nd	nd	<	e0.003	<	<	<	nd	.005	e.004	.017	0.021
Dacthal	5	2	.005	.005	<	<	<	<	nd	nd	<	<	<	<	e.004	nd	e.002	e.002	.005	<
Hexazinone	4	2	.022	.017	<	<	<	<	nd	nd	<	<	e0.011	e0.012	nd	nd	.022	.017	<	<
Atrazine	7	1	.023	.006	<	<	<	<	nd	nd	<	<	<	<	e.003	nd	.007	e.006	<	<
_CIAT	4	1	.005	.005	<	<	<	<	nd	nd	<	<	<	<	<	nd	e.005	e.005	<	<
Metolachlor	5	1	.005	.002	<	<	<	<	<	<	<	<	<	<	<	nd	e.005	<	e.004	e.002
2,4-D	3	1	.18	.08	<	<	<	<	nd	nd	<	<	<	<	<	nd	e0.01	<	.178	.08
Trifluralin	3	1	.006	.005	<	<	<	<	nd	nd	<	<	<	<	<	nd	e.005	e.005	<	<
DEET	3	1	.074	.078	<	<	<	<	<	<	<	<	<	<	nd	nd	<	<	nd	nd
Ethoprop	1	1	.009	.006	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	e.009	.006
Propiconazole	1	1	.009	.006	<	<	<	<	nd	nd	<	<	<	<	<	nd	<	<	.009	e.01
Diazinon	4	0	.014	<	<	<	<	<	<	<	<	<	<	<	<	nd	<	<	.014	<
_Diazinon-oxon	0	1	<	.010	<	<	<	<	nd		<	<	<	<	nd	nd	<	<	<	e.01
Metsulfuron methyl	0	1	<	.06	<	<	<	<	nd	nd	<	<	<	<	<	nd	<	e.06	<	<
Pronamide	0	1	<	.005	<	<	<	<	nd	nd	<	<	<	<	<	nd	<	.005	nd	<
Carbaryl	3	0	.041	<	<	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<
Chlorpyrifos	2	0	.006	<	<	<	<	<	<	<	<	<	<	<	<	nd	.006	<	<	<
Prometon	2	0	.015	<	<	<	<	<	<	<	<	<	<	<	<	nd	<	<	e.004	<
Bromacil	1	0	.033	<	<	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<
_OIET	1	0	.014	<	<	<	<	<	nd	nd	<	<	<	<	<	nd	<	<	<	<
Cycloate	1	0	.017	<	<	<	<	<	nd	nd	<	<	<	<	<	nd	<	<	.017	<
Dichlorvos	1	0	.012	<	<	<	<	<	nd	nd	<	<	<	<	nd	nd	<	<	<	<
Dimethenamid	1	0	.005	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	e.005	<
Glyphosate	1	0	.11	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	<	nd	nd	nd	e.110	<
Metalaxyl	1	0	.02	<	<	<	<	<	<	<	<	<	<	<	<	nd	<	<	<	<
Napropamide	1	0	.004	<	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.004	nd	nd	nd	<	<
Triclopyr	1	0	.23	<	<	<	<	<			<	<	<	<	<	nd	<	<	0.228	<
Number of pesticides detected					0	0	1	2	0	0	0	1	1	1	4	nd	10	9	13	6
Total pesticide concentration (µg/L)					0	0	0.064	0.067	0	0	0	0.003	0.011	0.012	0.069	nd	0.289	0.282	0.616	0.123
Streamflow (ft^3/s)					1,570	nd	1,743	nd	1,370	nd	1,217	nd	3,340	nd	3,000	nd	3,926	nd	1,200	nd
Turbidity (FNU)					1.1	nd	1.3	nd	.5	nd	0.4	nd	2.0	nd	2.5	nd	8.7	nd	97	nd
Instantaneous pesticide load (g/d)					0	nd	273	nd	0	nd	0	nd	93	nd	506	nd	2,773	nd	1,810	nd

Table C4. Instantaneous streamflow and turbidity values for samples collected in the lower Clackamas River basin, Oregon, 2002–2005.

[Discharge in cubic feet per second. Turbidity values (in Formazin Nephelometric Units, [FNRUs]) for the Clackamas River obtained from the continuous monitor in the Clackamas River near Oregon City. Turbidity values for May and September 2005 samples obtained with a Hach 2001 N benchtop turbidity analyzer. See Glossary for more details. **Abbreviation:** ft^3/s, cubic foot per second]

Site name	Sampling date	Time	Discharge (ft^3/s)	Turbidity (FNRU)
2002–2005 SWQA sampling				
Clackamas River near Oregon City (at the water-quality monitor)	10-29-2002	1050	830	0.7
	11-13-2002	1200	1,600	1.7
	11-18-2002	1220	1,465	1.6
	12-10-2002	1110	790	.4
	12-18-2002	1100	3,080	6.4
	01-14-2003	1140	4,910	4.7
	01-28-2003	1200	7,400	16
	02-11-2003	1130	3,220	2.3
	03-11-2003	1130	9,370	7.4
	04-08-2003	1140	4,520	2.3
	04-29-2003	1210	4,060	1.8
	05-13-2003	1230	2,750	1.0
	05-28-2003	1140	2,290	11
	06-10-2003	1400	1,390	.6
	06-24-2003	1150	1,230	.4
	07-15-2003	1140	820	.3
	08-19-2003	1220	760	.2
	09-11-2003	1230	900	.2
	07-07-2004	1050	1,050	.8
	07-21-2004	1130	860	.5
	08-12-2004	1100	750	.7
	08-25-2004	1050	1,360	4.2
	09-09-2004	1410	910	.7
	09-23-2004	1100	1,730	.9
	10-20-2004	1100	1,920	1.1
	11-10-2004	1110	1,750	1.2
	01-05-2005	1100	1,570	1.1
	02-09-2005	1140	1,740	1.3
	03-02-2005	1100	1,370	.5
	03-09-2005	1100	1,220	.4
	04-06-2005	1100	3,340	2.0
	05-09-2005	1220	3,000	2.5
	05-18-2005	1100	3,930	8.7

Table C4. Instantaneous streamflow and turbidity values for samples collected in the lower Clackamas River basin, Oregon, 2002–2005.—Continued

[Discharge in cubic feet per second. Turbidity values (in Formazin Nephelometric Units, [FNRUs]) for the Clackamas River obtained from the continuous monitor in the Clackamas River near Oregon City. Turbidity values for May and September 2005 samples obtained with a Hach 2001 N benchtop turbidity analyzer. See Glossary for more details. **Abbreviation:** ft^3/s, cubic foot per second]

Site name	Time	Discharge (ft^3/s)	Turbidity (FNRU)
May 9, 2005 storm event sampling			
Carli Creek upstream of mouth, near Clackamas	1200	21	19
Cow Creek at mouth, near Gladstone	1230	12	43
North Fork Deep Creek upstream of weir, near Boring	1300	36	50
Noyer Creek at mouth, near Barton	1340	4.8	140
Noyer Creek downstream of Highway 212, near Damascus	1040	5.2	670
Rock Creek at Stoneybrook Court downstream of 172nd Avenue	920	10	23
Sieben Creek at Highway 224	1110	10	50
Trillium Creek at Anderegg Parkway, near Damascus	1010	.3	29
September 30, 2005 storm event sampling			
Carli Creek upstream from mouth, near Clackamas	1130	11	25
Clackamas River at DWTP (source water)	2000	1,200	100
Cow Creek at mouth, near Gladstone	1520	4.4	58
Deep Creek at Camp Kuratli, near Barton	1640	45	90
Doane Creek downstream from Highway 212, near Boring	1510	3	120
Dolan Creek downstream of Orient Road, near Boring	1415	.1	11
North Fork Deep Creek at Barton	1700	20	110
North Fork Deep Creek at Boring	1700	10	72
North Fork Deep Creek tributary at 312th Avenue, near Boring	1130	.1	44
North Fork Deep Creek tributary at Church Road, near Boring	1240	.1	75
Noyer Creek at mouth, near Barton	1630	.7	55
Noyer Creek downstream of Highway 212, near Damascus	1110	2.4	2,500
Richardson Creek near Highway 224	1710	5	150
Rock Creek at 172nd Avenue	1820	1.8	40
Rock Creek at Foster Road	1850	1.5	36
Rock Creek at Stoneybrook Court, downstream from 172nd Avenue	1130	1.7	15
Rock Creek near mouth	1750	20	230
Sieben Creek at Highway 224	1240	4.8	260
Sieben Creek downstream of Sunnyside Road	1120	2.3	270
Tickle Creek at 362nd Avenue, near Sandy	1210	29	330
Tickle Creek near Boring	1320	9	36
Tickle Creek tributary at Colorado Road, near Sandy	1420	.6	18
Tickle Creek tributary at Orient Road, near Sandy	1110	.2	28
Trillium Creek at Anderegg Parkway, near Damascus	1115	.3	82

Appendix D. Toxicity Values Used in the Pesticide Toxicity Index (PTI) and Maximum Benchmark Quotients for Pesticides Detected in the Lower Clackamas River Basin, Oregon, 2000–2005

Table D1. Toxicity values used for the Pesticide Toxicity Index (PTI) and maximum benchmark quotients for pesticides detected in the lower Clackamas River basin, 2000–2005.

[PTI values from Munn and Gilliom (2006). Pesticide toxicity values (96-hour LC_{50}) given in micrograms per liter (µg/L). Max benchmark quotient is the ratio of the maximum concentration detected divided by the minimum toxicity value. **Abbreviations;** N, number of laboratory tests; Min, minimum; Max, maximum; Med, median. **Symbols:** _, pesticide degradate; –, no data]

Pesticide or degradate	Maximum concentration	Maximum benchmark quotient	Pesticide toxicity values											
			Minimum value (all taxa)	Benthic invertebrates				Fish				Cladocerans			
					Toxicity values				Toxicity values				Toxicity values		
				N	Min	Median	Max	N	Min	Median	Max	N	Min	Median	Max
2,4-D	6.1	0.004	1,400	4	1,600	8,700	144,100	43	1,400	44,500	358,000	3	3,200	4,900	25,000
2,4-D methyl ester	.73	.005	145	–	–	–	–	–	–	–	–	2	145	1,423	2,700
2,4-DP	.13	.0003	500	–	–	–	–	18	500	1,450	6,100	2	5,400	5,825	6,250
Atrazine	.30	.003	94	9	94	9,000	14,900	33	2,000	15,000	69,000	4	6,900	41,500	115,000
_CIAT	.021	–	–	–	–	–	–	–	–	–	–	–	–	–	–
_OIET	.18	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Azinphos-methyl	.21	2.1	0.1	31	.10	1	56	107	.36	23	4,270	4	1.10	1.55	4.40
Benomyl	5.7	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bentazon	.16	.0000002	978,000	–	–	–	–	2	978,000	2,426,000	3,874,000	–	–	–	–
Bromacil	.27	.00001	36,000	–	–	–	–	5	36,000	127,000	186,000	1	–	121,000	–
Carbaryl	.15	.09	1.7	51	1.70	16	6,933	165	140	4,330	290,000	16	2.77	6.93	7,100
_1-Naphthol	.011	.00001	1,460	–	–	–	–	7	1,460	3,570	4,630	–	–	–	–
Chlorothalonil	.26	8	7.6	–	–	–	–	25	7.6	51	430	4	70	97	172
Chlorpyrifos	.17	4.2	0.04	31	.04	0.57	83	53	.58	38	806	3	.10	.40	1.70
Cycloate	.024	.00001	2,600	4	2,600	2,600	2,600	11	4,500	6,000	10,000	2	24,000	24,000	24,000
Dacthal (DCPA)	.46	.00007	6,200	1	–	6,200	–	2	6,600	18,300	30,000	2	27,000	82,500	138,000
DEET	.074	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Diazinon	.25	8.4	0.03	19	.03	25	6,160	79	22	602	10,300	17	.50	1.22	1.80
_Diazinon-oxon	.010	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dichlobenil	17	.005	3,700	10	6,600	10,500	35,000	20	4,930	8,850	6,200,000	6	3,700	5,800	6,200
Dichlorvos	.012	.56	0.02	16	.02	37	400,000	32	2.50	1,145	180,000	5	.07	.26	1,000
Dieldrin	.024	.05	0.5	30	0.50	24	6,710	83	.62	10	10,000	7	130	240	251
Dimethenamid	.005	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dinoseb	.028	.001	28	1	–	1,800	–	42	28	97	1,400	–	–	–	–
Diuron	2.3	.014	160	8	160	950	15,500	30	500	5,400	84,000	7	1,400	2,000	8,400
_3,4-Dichloroaniline	.15	.045	3.4	8	3.40	6.40	7,400	13	53	7,700	9,960	10	54	709	2,254
_3,4-Dichlorophenyl isocyanate	5.4	.002	2,700	–	–	–	–	–	–	–	–	1	–	2,700	–
Endosulfan I[1]	.11	.6875	.16	–	–	–	–	3	.16	.33	1	–	–	–	–
Endosulfan II [1]	.11	.6875	.16	–	–	–	–	3	.16	.33	1	–	–	–	–
_Endosulfan sulfate	.012	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Ethoprop	.13	.003	43.9	–	–	–	–	13	180	2,070	13,800	3	43.9	93	690,000
Fenuron	.12	.000001	204,000	–	–	–	–	1	–	204,000	–	–	–	–	–
Fonofos	.007	.003	2.0	–	–	–	–	16	5	20	2,800	3	2	8.37	15.50
Glyphosate	46	–	–	–	–	–	–	–	–	–	–	–	–	–	–
_AMPA	2.4	.0003	7,200	–	–	–	–	–	–	–	–	3	7,200	8,200	14,000
Hexazinone	.034	.0000004	85,000	–	–	–	–	25	100,000	317,000	1,964,000	2	85,000	118,300	151,600
Imazaquin	.047	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table D1. Toxicity values used for the Pesticide Toxicity Index (PTI) and maximum benchmark quotients for pesticides detected in the lower Clackamas River basin, 2000–2005.—Continued

[PTI values from Munn and Gilliom (2006). Pesticide toxicity values (96-hour LC_{50}) given in micrograms per liter (µg/L). Max benchmark quotient is the ratio of the maximum concentration detected divided by the minimum toxicity value. **Abbreviations;** N, number of laboratory tests; Min, minimum; Max, maximum; Med, median. **Symbols:** _, pesticide degradate; –, no data]

Pesticide or degradate	Maximum concentration	Maximum benchmark quotient	Pesticide toxicity values											
			Minimum value (all taxa)	Benthic invertebrates				Fish				Cladocerans			
					Toxicity values				Toxicity values				Toxicity values		
				N	Min	Median	Max	N	Min	Median	Max	N	Min	Median	Max
Imidacloprid	4.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Iprodione	.06	0.00002	3,060	–	–	–	–	6	3,060	3,950	7,800	–	–	–	–
Linuron	.6	.005	120	–	–	–	–	8	890	6,100	16,400	4	120	240	1,100
Malathion	.047	.25	.19	68	0.50	12	50,000	146	.19	200	52,200	15	.59	1.80	100
MCPA	.067	.000003	25,000	–	–	–	–	6	25,000	75,000	97,000	–	–	–	–
Metalaxyl	1.5	.0001	12,500	–	–	–	–	9	18,400	100,000	150,000	3	12,500	29,300	121,000
Methiocarb	.086	.11	.75	12	5	62	8,800	12	.75	538	4,700	1	–	19	–
Metolachlor	.11	.00003	3,900	–	–	–	–	8	3,900	8,200	10,000	3	23,500	25,100	26,000
Metsulfuron-methyl	.058	.000001	100,000	–	–	–	–	6	100,000	150,000	150,000	–	–	–	–
Myclobutanil	.016	.00001	2,400	–	–	–	–	2	2,400	3,300	4,200	1	–	11,000	–
Napropamide	1.3	.0001	9,400	–	–	–	–	6	9,400	12,650	14,000	2	14,300	19,500	24,700
Norflurazon	.11	.00001	8,100	–	–	–	–	3	8,100	9,580	16,300	–	–	–	–
Oryzalin	.3	.002	190	2	190	295	400	3	2,880	3,260	3,450	1	–	1,500	–
Oxyfluorfen	.023	.0001	200	–	–	–	–	3	200	400	410	–	–	–	–
_*p,p'*-DDE	.002	.00008	32	1	–	1,050	–	3	32	96	240	–	–	–	–
Pendimethalin	.35	.003	138	–	–	–	–	12	138	960	90,400	2	280	2,690	5,100
Prometon	.11	.00001	12,000	–	–	–	–	13	12,000	19,600	47,300	3	25,700	38,000	59,800
Pronamide	.17	.000002	72,000	–	–	–	–	3	72,000	150,000	350,000	–	–	–	–
Propiconazole	.5	.001	830	11	900	1,200	49,000	27	830	5,500	506,000	3	3,200	4,800	11,300
Propoxur	.005	.0005	11	13	13	50	146,000	34	1,300	6,970	180,000	2	11	19	27
Simazine	1.0	.011	90	3	1,900	13,000	13,000	32	90	56,000	822,000	2	1,100	1,100	1,100
Sulfometuron-methyl	.16	.00001	12,500	1	–	12,174,000	–	4	12,500	80,250	150,000	3	12,500	150,000	1,000,000
Tebuthiuron	.082	.000001	106,000	–	–	–	–	2	106,000	124,500	143,000	1	–	297,000	–
Terbacil	.026	.000001	46,200	–	–	–	–	6	46,200	90,950	112,000	1	–	65,000	–
Triclopyr	5.0	.019	260	–	–	–	–	19	260	1,300	9,700	–	–	–	–
Trifluralin	.17	.020	8.4	13	37	2,800	26,000	28	8.4	96	12,000	7	240	625	900

[1]Toxicity tests for endosulfan did not distinguish between endosulfan I and endosulfan II.

Appendix E. Physical Properties of Pesticides and Degradates Detected in the Lower Clackamas River Basin, Oregon, 2000–2005

Table E1. Physical properties of pesticides and degradates detected in the lower Clackamas River basin, Oregon, 2000–2005.

[Pesticide movement rating is derived from empirical data on pesticide half-life and soil Koc from the Oregon State University Extension Pesticide Properties Database (Vogue and others, 1994). Pesticide properties data from Hornsby, Wauchope, and Herner (1996). Soil Koc: Organic carbon adsorption coefficients. Compounds with higher values have relatively greater affinity to adhere to sediment than those with lower values. **Abbreviations:** CAS, Chemical Abstracts Service; F, fungicide; H, herbicide; I, insecticide; HD, herbicide degradate; ID, insecticide degradate; N, nematocide; USGS, U.S. Geological Survey; PCODE, USGS parameter code. **Symbols:** _, pesticide degradate; –, no data]

Pesticide or degradate	Type	USGS PCODE	CAS No.	Water solubility (mg/L)	Soil Koc	Soil half-life (days)	Pesticide movement rating
_1-Naphthol	HD/ID	49295	–	–	–	–	–
2,4-D	H	39732	94-75-7	890	20	10	Moderate
2,4-D methyl ester	H	50470	1928-38-7	100	100	10	Moderate
2,4-DP	H	49302	120-36-5	50	1,000	10	Low
_3,4-Dichloroaniline	HD	61625	–	–	–	–	–
_3,4-Dichlorophenyl isocyanate	HD	63145	–	–	–	–	–
_AMPA	HD	62649	–	–	–	–	–
Atrazine	H	39632	1912-24-9	33	100	60	High
Azinphos-methyl	I	82686	86-50-0	29	1,000	10	Low
Benomyl	F	50300	17804-35-2	2	1,900	67	Low
Bentazon[1]	H	38711	25057-89-0	500	–	<14	–
Bromacil	H	4029	314-40-9	700	32	60	Very high
Carbaryl	I	49310	63-25-2	120	300	10	Low
Chlorothalonil	F	49306	1897-45-6	.6	1,380	30	–
Chlorpyrifos	I	38933	2921-88-2	.4	6,070	30	Very low
_CIAT	HD	4040	–	–	–	–	–
Cycloate	H	4031	1134-23-2	95	430	30	Moderate
Dacthal	H	82682	1861-32-1	.5	5,000	100	Very low
DEET	I	62082	–	–	–	–	–
Diazinon	I	39572	333-41-5	60	1,000	40	Low
_Diazinon-oxon	ID	61638	–	–	–	–	–
Dichlobenil	H	49303	1194-65-6	21	400	60	Moderate
Dichlorvos	I/F	38775	62-73-7	10,000	30	0.5	Extremely low
_*p*,*p*´-DDE	ID	34653	72-55-9	.1	50,000	1,000	Extremely low
Dieldrin	I	39381	60-57-1	0	12,000	1,000	Extremely low
Dimethenamid	H	61588	87674-68-8	1,174	160	20	–
Dinoseb	H	49301	88-85-7	52	30	30	High
Diuron	H	49300	330-54-1	42	480	90	Moderate
Endosulfan	I	34362	959-98-8	.32	12,400	50	Extremely low
_Endosulfan sulfate	ID	61590	–	–	–	–	–
Ethoprop	I/N	82672	13194-48-4	750	70	25	High
Fenuron	H	49297	101-42-8	3,850	42	60	Very high
Fonofos	I	4095	944-22-9	17	870	40	Low
Glyphosate	H	62722	1071-83-6	900,000	24,000	47	Extremely low
Hexazinone	H	4025	51235-04-2	33,000	54	90	Very high
Imazaquin	H	50356	81335-37-7	60	20	60	Very high
Imidacloprid[1]	I	61695	13826-41-3	510	–	48-190	–
Iprodione	F	61593	36734-19-7	13.9	700	14	Low
Linuron	H	82666	330-55-2	75	400	60	Moderate
Malathion	I	39532	121-75-5	130	1,800	1.0	Extremely low

Table E1. Physical properties of pesticides and degradates detected in the lower Clackamas River basin, Oregon, 2000–2005.—Continued

[Pesticide movement rating is derived from empirical data on pesticide half-life and soil Koc from the Oregon State University Extension Pesticide Properties Database (Vogue and others, 1994). Pesticide properties data from Hornsby, Wauchope, and Herner (1996). Soil Koc: Organic carbon adsorption coefficients. Compounds with higher values have relatively greater affinity to adhere to sediment than those with lower values. **Abbreviations:** CAS, Chemical Abstracts Service; F, fungicide; H, herbicide; I, insecticide; HD, herbicide degradate; ID, insecticide degradate; N, nematocide; USGS, U.S. Geological Survey; PCODE, USGS parameter code. **Symbols:** _, pesticide degradate; –, no data]

Pesticide or degradate	Type	USGS PCODE	CAS No.	Water solubility (mg/L)	Soil Koc	Soil half-life (days)	Pesticide movement rating
MCPA	H	38482	94-74-6	866,000	20	25	High
Metalaxyl	F	61596	57837-19-1	8,400	50	70	Very high
Methiocarb	I	38501	2032-65-7	24	3000	30	Very low
Metolachlor	H	39415	51218-45-2	530	200	90	High
Metsulfuron methyl	H	61697	74223-64-6	9,500	35	30	High
Myclobutanil	F	61599	88671-89-0	142	500	66	Moderate
Napropamide	H	82684	15299-99-7	74	400	70	Moderate
Norflurazon	H	49293	27314-13-2	28	700	30	Low
_OIET	HD	50355	–	–	–	–	–
Oryzalin	H	49292	19044-88-3	2.5	600	20	Low
Oxyfluorfen	H	61600	42874-03-3	0.1	100,000	35	Extremely low
Pendimethalin	H	82683	40487-42-1	.3	5,000	90	Very low
Prometon	H	4037	1610-18-0	720	150	500	Very high
Pronamide	H	82676	23950-58-5	15	200	60	Low
Propiconazole	F	50471	60207-90-1	110	650	110	Moderate
Propoxur	I	38538	114-26-1	1,800	30	30	High
Simazine	H	4035	122-34-9	6.2	130	60	High
Sulfometuron-methyl	H	50337	74222-97-2	70	78	20	Moderate
Tebuthiuron	H	82670	34014-18-1	2,500	80	360	Very high
Terbacil	H	82665	5902-51-2	710	55	120	Very high
Triclopyr	H	49235	55335-06-3	435	27	155	Very high
Trifluralin	H	82661	1582-09-8	.3	8,000	60	Very low

[1]Extension Toxicological Network (Extoxnet) (1996).

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