

Prepared in cooperation with King County Department of Natural Resources

Pesticides Detected in Urban Streams in King County, Washington, 1998–2003

Scientific Investigations Report 2004-5194

U.S. Department of the Interior U.S. Geological Survey

Cover: View of Swamp Creek downstream (south) from the 175th Street bridge near Bothell Way. (Photograph taken by Sara Coughlin, King County Department of Natural Resources, 2002.)

By Lonna M. Frans

Prepared in cooperation with the King County Department of Natural Resources

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U.S. Department of the Interior U.S. Geological Survey

U.S. Department of the Interior

Gale A. Norton, Secretary

U.S. Geological Survey

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Conversion Factors and Datum

Inch/Pound to SI		
Multiply	Ву	To obtain
	Length	
mile (mi	1.609	kilometer

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L or micrograms per liter (μ g/L.

Datum

Horizontal coordinate information is referenced to the North American Datum of 1927 (NAD 27.

By Lonna M. Frans

Abstract

The U.S. Geological Survey and the King County Department of Natural Resources collected water samples from 14 sites on urban streams in King County during storms and during base flow between 1998 and 2003. The samples were analyzed for the presence of 155 pesticides and pesticide transformation products.

Thirty-nine of the compounds were detected at least once during the study: 20 herbicides, 9 insecticides, 2 fungicides, 6 pesticide transformation products, and 2 other types of compounds. The most widespread compound was 4-nitrophenol, which was detected at all 14 sampling sites. The most frequently detected compound was pentachlorophenol, a fungicide, which occurred in more than 80 percent of the samples. The most frequently detected herbicides were prometon, trichlopyr, 2,4-D, and MCPP, and the most frequently detected insecticides were diazinon and carbaryl. All of the most frequently detected herbicides and insecticides were sold for homeowner use over the timeframe of this study.

More compounds were detected during storms than during base flow, and were detected more frequently and typically at high concentrations during storms. Seven compounds were detected only during storms. Most of the compounds that were detected during storms occurred more frequently during spring storms than during autumn storms.

Introduction

A wide variety of pesticides are applied each year to urban and suburban residential areas in King County, Washington. In order to assess the occurrence and distribution of these pesticides and their transformation products, the U.S. Geological Survey (USGS) and the King County Department of Natural Resources collected water samples at 14 sites on streams in the Lake Washington drainage basin in King County between 1998 and 2003 (fig. 1 and table 1). The water samples were analyzed for 155 pesticides and pesticide transformation products (hereafter referred to as pesticides) at three laboratories using three different methods.

Twelve of the sampling sites were small streams that drain generally urban areas, and one site (site 14) was a small stream running out of an urban area with potential agricultural runoff sources. The last site (site 2, Rock Creek) was in a nonurban forested area and was used as a reference site.

The purpose of this report is to describe the types and concentrations of pesticides detected at each sampling site, the effects of storms and base flow on the distribution and concentration of pesticides at the sites, and the potential sources of the pesticides present.



Base from U.S. Geological Survey digital data, 1:100,000, 1983 Universal Transverse Mercator projection, Zone 10 Datum NAD27

Figure 1. Location of sites sampled for pesticides and pesticide transformation products on urban streams in King County, Washington, 1998–2003.

Table 1. Sites sampled for pesticides and pesticidetransformation products in King County, Washington, 1998-2003.

Site No. (see <u>fig. 1</u> for location)	USGS station No.	Site name
1	12113499	Taylor Creek
2	12117695	Rock Creek
3	12119600	May Creek
4	12119990	Kelsey Creek
5	12120480	Juanita Creek
6	12121600	Issaquah Creek
7	12121750	Lewis Creek
8	12124500	Bear Creek
9	12125500	Little Bear Creek
10	12126200	North Creek
11	12127000	Swamp Creek
12	12127290	Lyon Creek at 178th
13	12127300	Lyon Creek at Lake Forest Park
14	474243122083001	Unnamed Creek @ 124th

Methods

Water samples for the pesticide analysis were collected at the sampling sites and processed at three laboratories between 1998 and 2003.

Sample Collection and Processing

Samples were collected by either manual sampling or an automated sampler (autosampler). Manual samples were collected using a US DH-81 sampler, as described by Wilde and others (1999a), except at the irrigation return, where the sample bottle was dipped directly into the flow. The samplers can hold either a 1- or 3-liter Teflon® sample bottle, and all parts of the sampler coming into contact with sample water were made of Teflon®. Samples were collected using the equal-width-increment (EWI) method, in which a transect was established across the width of the creek. Water was collected at about 10 equally spaced intervals along the transect by lowering and raising the sampler vertically through the water column. The collected water from each interval then was composited into a glass carboy. Autosamplers were installed to sample runoff during the storms from 2000 to 2003 and were triggered during a rainstorm when the level of the creek rose. When the autosampler was triggered, the water sample was collected from a single point in the midpoint of the stream through a Teflon® tube into a glass carboy (Isco, Inc., 1992). Water in the streams was well mixed at the sampling point.

Except for the autosampler, all equipment used to collect and process samples was cleaned with a 0.2-percent nonphosphate detergent, rinsed with deionized water,

rinsed with pesticide-grade methanol, air-dried, wrapped in aluminum foil, and stored in a dust-free environment prior to sample collection (Wilde and others, 1999b). All of the autosampler parts that contacted the sample were washed in detergent, soaked in sulfuric acid for 24 hours, rinsed with deionized water, and stored in plastic bags. All bottles used to collect stream water were rinsed thoroughly with the stream water before sample collection and processing.

The samples in the glass carboys were split using a Teflon® cone splitter into individual samples for analysis at the USGS National Water Quality Laboratory (NWQL) in Lakewood, Colorado, the USGS Organic Geochemistry Research Laboratory (OGRL) in Lawrence, Kansas (2002 and 2003 samples only), and the Washington State Department of Ecology Manchester Environmental Laboratory in Manchester, Washington, (Wilde and others, 1999c). Samples were processed within 24 hours of collection. The equipment and procedures used to collect and process samples are described by Wilde and others (1999a, 1999c). Samples collected for analysis by the USGS laboratories were filtered through a 0.7-micrometer pore-size, baked glass-fiber filter into baked amber-glass bottles and shipped on ice within 24 hours of filtration. Samples for analysis by the Manchester Environmental Laboratory were collected from the cone splitter in clear glass bottles, but were not filtered. They were stored on ice and transported to the laboratory within 24 hours of processing.

Laboratory Procedures

The samples were analyzed for 155 pesticides and pesticide transformation products (hereafter referred to as pesticides) by the three laboratories. At the NWQL, known quantities of surrogate compounds were added to each water sample and then passed through a solid-phase extraction (SPE) cartridge to extract pesticide compounds. The SPE cartridge was packed with porous silica coated with a carbon-18 organic phase. Pesticides retained on the SPE cartridges were eluted with a hexane-isopropanol mixture, which was analyzed for 52 pesticides using gas chromatography/mass spectrometry (GC/MS) with selected ion monitoring (Zaugg and others, 1995, and Madsen and others, 2003) (table 2). Fipronil and its transformation products were added to the analyte list in autumn 2002, so those compounds were analyzed for only in the final sample at Little Bear Creek, North Creek, and the irrigation return, as well as all samples from May, Kelsey, and Taylor Creeks.

At the OGRL, the samples were derivatized (converted to another chemical compound for identification) with 9-fluorenylmethylchloroformate, passed through an SPE cartridge, and analyzed for three pesticides (table 2) using high-performance liquid chromatography/mass spectrometry (HPLC/MS) (Lee and others, 2002).

 Table 2.
 Analytes and laboratory reporting levels for pesticides analyzed at the U.S. Geological Survey National Water Quality

 Laboratory or the U.S. Geological Survey Organic Geochemistry Research Laboratory.

[Trade or common name(s): Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey. Type of pesticide: H, herbicide; I, insecticide; T, transformation product. –, no trade or common name or registry number; µg/L, microgram per liter]

Pesticide target analyte	Trade or common name(s)	Type of pesticide	Chemical Abstracts Service registry No.	Laboratory reporting level (µg/L)	Pesticide target analyte	Trade or common name(s)	Type of pesticide	Chemical Abstracts Service registry No.	Laboratory reporting level (µg/L)			
	National Water Qu	uality Labora	atory		National Water Quality Laboratory							
Acetochlor	Acenit, Sacenid	Н	34256-82-1	0.006	Linuron	Lorox, Linex	Н	330-55-2	0.035			
Alachlor	Lasso	Н	15972-60-8	.005	Malathion	Several	Ι	121-75-5	.027			
Atrazine	AAtrex	Н	1912-24-9	.007	Methyl parathion	Penncap-M	Ι	298-00-0	.015			
Azinphos-methyl ¹	Guthion	Ι	86-50-0	.050	Metolachlor	Dual, Pennant	Н	51218-45-2	.013			
Benfluralin	Balan, Benefin	Н	1861-40-1	.010	Metribuzin	Lexone, Sencor	Н	21087-64-9	.006			
Butylate	Sutan +, Genate	Н	2008-41-5	.004	Molinate	Ordram	Н	2212-67-1	.003			
	Plus				Napropamide	Devrinol	Н	15299-99-7	.007			
Carbaryl ¹	Sevin, Savit	Ι	63-25-2	.041	Parathion	Several	Ι	56-38-2	.010			
Carbofuran ¹	Furadan	Ι	1563-66-2	.020	Pebulate	Tillam	Н	1114-71-2	.004			
Chlorpyrifos	Lorsban	Ι	2921-88-2	.005	Pendimethalin	Prowl, Stomp	Н	40487-42-1	.022			
Cyanazine	Bladex	Н	21725-46-2	.018	cis-Permethrin	Ambush, Pounce	Ι	54774-45-7	.006			
DCPA	Dacthal	Н	1861-32-1	.003	Phorate	Thimet, Rampart	Ι	298-02-2	.011			
4,4'-DDE	_	Т	72-55-9	.003	Prometon	Pramitol	Н	1610-18-0	.005			
Desethylatrazine ¹	_	Т	6190-65-4	.006	Propyzamide	Kerb	Н	23950-58-5	.004			
Desulfinylfipronil ²	_	Т	_	.012	Propachlor	Ramrod	Н	1918-16-7	.025			
Desulfinylfipronil-	_	Т	_	.029	Propanil	Stampede	Н	709-98-8	.011			
amide ²					Propargite	Comite, Omite	Ι	2312-35-8	.023			
Diazinon	Several	Ι	333-41-5	.005	Simazine	Aquazine, Princep	Н	122-34-9	.005			
Dieldrin	Panoram D-31	Ι	60-57-1	.009	Tebuthiuron	Spike	Н	34014-18-1	.016			
2,6-Diethylanaline	-	Т	579-66-8	.006	Terbaci1 ¹	Sinbar	Н	5902-51-2	.034			
Disulfoton	Di-Syston	Ι	298-04-4	.021	Terbufos	Counter	Ι	13071-79-9	.017			
EPTC	Eptam, Eradicane	Н	759-94-4	.004	Thiobencarb	Bolero	Н	28249-77-6	.010			
Ethalfluralin	Sonalan, Curbit EC	Н	55283-68-6	.009	Triallate	Far-Go	Н	2303-17-5	.002			
Ethoprophos	Mocap	Ι	13194-48-4	.005	Trifluralin	Treflan, Trilin	Н	1582-09-8	.009			
Fipronil ²	Regent	Ι	120068-37-3	.016				· .				
Fipronil sulfide ²	_	Т	120067-83-6	.013	0	rganic Geochemistry	Research L	aboratory.				
Fipronil sulfone ²	_	Т	120068-36-2	.024	Aminomethyl-	_	Т	1066-51-9	0.1			
Fonofos	Dyfonate	Ι	944-22-9	.003	phosphonic acid	l						
alpha-HCH	_	Ι	319-84-6	.005	Glufosinate	Finale, Liberty	Н	77182-82-2	.1			
gamma-HCH	Lindane	Ι	58-89-9	.004	Glyphosate	Roundup	Н	1071-83-6	.1			

¹Concentrations for these pesticides are qualitatively identified and reported with a J code (estimated value). J codes are used to signify estimated values for all detections that are less than the method detection limit, greater than the highest calibration standard, or otherwise less reliable than average because of sample-specific or compound-specific considerations. All J-coded data are considered to be reliable detections, but with greater than average uncertainty in quantification.

²These compounds were added to the method in autumn 2002.

At the Manchester Environmental Laboratory, pesticides present in the whole-water samples were extracted using methylene chloride and analyzed for 141 targeted pesticides (table 3) using U.S. Environmental Protection Agency Method 8085, which uses capillary-column GC analysis with an atomic emission detector (AED) and ion-trap GC/MS confirmation (Norman Olson, Manchester Environmental Laboratory, written commun., 1999). This method also permitted detection of several non-target compounds on certain occasions. During 2001, a portion of the water from Bear and Issaquah Creeks was filtered at the laboratory to provide a comparison of filtered and unfiltered analyses. Some pesticides were analyzed by both NWQL and Manchester Environmental Laboratory.

Table 3. Analytes and quantitation limits for pesticides analyzed at the Washington State Department of Ecology Manchester Environmental Laboratory.

[**Trade or common name(s):** Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey. **Quantitation limit:** Limits are approximate and often are different for each sample; these values are representative of a typical sample. **Type of Pesticide:** F, fungicide; H, herbicide; I, insecticide; T, transformation product; O, other. μg/L, microgram per liter; –, none available]

Acilluor Blazer H 6377-09 2.0 Dirachin Pancarm D-31 I 0.57.1 0.035 Altrin - I 309-00-2 .055 Dimeshou Trourse, Roman I 60.57.1 .063 Antraine - H 88.41-23 .071 Diporation - H 88.85.7 .063 Attraine - H 1610-17.9 .21 Diporation - H 88.95.7 .21 Atariphon enthyl Guisaltion A I 28.22.49 .071 Disulforon Disvalforon I 28.05.44 .48 Atariphon enthyl Guisaltion A I 28.07.19 .12 Endosinian allower T 23.03.44.1 .48 Bronneinin Balan, Stance H 18.16.27.19 .13 Endosinian alutizer T 73.03.94.10 .05.3 Bronneinin Bronneinin H 169.47.49 .24 Endosinian alutizer T 73.04.94.14 .05.23.1.1 .05.23.1.1	Pesticide target analyte	Trade or common name(s)	Type of pesticide	Chemical Abstracts Service registry No.	Quantitation limit (µg/L)	Pesticide target analyte	Trade or common name(s)	Type of pesticide	Chemical Abstracts Service registry No.	Quantitation limit (µg/L)
Alachior Lasso H 15972-06.8 2.00 Dimeshoate Trounce. Roxion I 60.51-5 0.003 Ametry Fvik. Genpax H 884-12-8 071 Disoxathion - H 73.4-2 .12 Arraton - H 161-79 21 Diphenanid - H 93.75.17 .21 Arraton A Acta H 1912-24-9 071 Disafcon Disafson Disaston H 298.04-4 .045 Arraton A 14 1912-24-9 071 Disafcon Disaston H 293.94-8 .055 Breamani Bradinal Disaston H 2057-80-9 .05 Endrin alchoet - T 73.20-8 .055 Bromovynil Bromani, Embran H 208.71-89-9 .25 Endrin alchoet - T 73.49-79-0 .055 Bromovynil Bromani, Embran H 208.41-5 .14 Ethdrin ketone - T	Acifluorfen-sodium	Blazer	Н	62476-59-9	0.17	Dieldrin	Panoram D-31	Ι	60-57-1	0.035
	Alachlor	Lasso	Н	15972-60-8	.26	Dimethoate	Trounce, Roxion	Ι	60-51-5	.060
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Aldrin	-	Ι	309-00-2	.035	Dinoseb	DNBP	Н	88-85-7	.063
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Ametryn	Evik, Gesapax	Н	834-12-8	.071	Dioxathion	_	Ι	78-34-2	.12
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Atraton	-	Н	1610-17-9	.21	Diphenamid	-	Н	957-51-7	.21
	Atrazine	AAtrex	Н	1912-24-9	.071	Disulfoton	Di-Syston	Ι	298-04-4	.045
	Azinphos-methyl	Guthion	Ι	86-50-0	.12	Diuron	Karmex, Direx	Н	330-54-1	.48
Benluratin Balan, Benefin H 1861-40-1 .11 Eadosaffan II Several I 3321.65-9 .035 Bromaci, H ywr, Woprowr H 304-40-9 .28 Eadrin aldehyde - T 722.08 .035 Bromaci, Bromani, Bromani, Brohm H 1869-84-5 .042 Eadrin aldehyde - T 733494-70-5 .035 Bromachin Bromani, Brohm H 1869-84-5 .042 Eadrin ktone - T 53494-70-5 .035 Butachlor Butmox, Machete H 23184-66-9 .25 Endrin ktone - T 53494-70-5 .035 Brutachlor Butmox, Machete J 2018-66-9 .25 Endrin ktone - T 53494-70-5 .035 Brutachlor Butmox, Machete J 2018-66-9 .25 Endrin ktone - T 53494-70-5 .035 Brutachlor Butmox, Machete J 2018-66-9 .25 Endrin ktone - T 53494-70-5 .035 Brutachlor Butmox, Machete J 2018-66-9 .25 Endrin ktone - T 53494-70-5 .035 Brutachlor Butmox, Machete J 2018-66-9 .25 Endrin ktone - T 53494-70-5 .035 Brutachlor Butmox, Machete J 2018-66-9 .25 Endrin ktone - T 53494-70-5 .035 Carboin Orthocide F 1330-62 .14 Enamiphos Nemacur I 22224-92.05 Captan Orthocide F 1330-62 .14 Enamiphos Nemacur I 12214-5 .057 Carboin Orthocide F 130-62 .14 Enamiphos Nemacur I 12214-5 .057 Carboin Trithion T 786-19-6 .30 Fenaminol Rubigan F 60166.88.9 .215 Carboin Trithion T 5107-71-9 .035 Fenamion Rubigan F 60166.88.9 .215 Carboin T rithion T 5107-71-9 .035 Fenamion Baytes I 1534-02 .045 ajpha-Chlordene - I 56514-022 .043 Fenamion Baytes I 1524-04 .035 Chlorothan T H 5975-60 .17 beta-HCH - I 1319-86-7 .035 Chlorothan I 2921-88-2 .055 dupter H 0575-60 .035 Ajpha-Chlordene - I 5976-60 .035 dupter H 1522-04 .035 Chlorothan I 2921-88-2 .055 dupter H 1640-035 Chlorothan I 2924-82-6 .050 MCPA M teatone Kilsem H 94-74-6 .033 Chlorothan I 1012-13 .042 .041 H teatone Verena I 1398-86-8 .035 Aprin J 122-25-6 .050 MCPA M teatone I 1898-89-9 .035	Azinphos ethyl	Gusathion A	Ι	2642-71-9	.12	Endosulfan I	Several	Ι	959-98-8	.035
	Benfluralin	Balan, Benefin	Н	1861-40-1	.11	Endosulfan II	Several	Ι	33213-65-9	.035
Bromacil Hyvar, Woprovar H $314-40-9$ 28 Endrin Hexadin I $72-20-8$ 0.05 Bromoxylin Bromani, Embern H 1689-84-5 0.42 Endrin ladehyde – T 74219-34 0.05 Brutachlor Butanox, Machete H 23184-66-9 2.5 Endrin ktone – T 53494-70-5 0.35 Brutachlor Butanox, Machete H 23184-66-9 2.5 Endrin ktone – T 53494-70-5 0.35 Brutachlor Butanox, Machete H 2008-41-5 PN – EPTC Epran, Eradicane H 759-94-4 1.4 Butylate Geneta Plus C - O 58-08-2 – Ethorproshos Morcap I 15394-86-6 .11 Carboyin Dribotann, Foltaf F 2425-06-1 2.1 Ethorproshos Morcap I 13194-84-4 060 Captan Orthocide F 133-06-2 – Ethorproshos Morcap I 22224-226 .12 Carboyin Orthocide F 133-06-2 .21 Ethorproshos Morcap I 22224-226 .12 Carboyin Tribiton I 786-19-6 .80 Fenarimolo Rubigan F 60168-88-9 .21 Carboyin Tutivax F 5324-68-4 .78 Fenitorbion Fenitox, Rothion I 122-14-5 .055 Carboyin Tutivax F 15103-71-9 .035 Fensulfothion – I 155-90-2 .075 ragen(Orthodne – I 56634-02-2 043 Functiona – I 155-90-2 .075 ragen(Orthodne – I 156634-02-2 043 Functiona – I 159-90-2 .075 ragen(Orthodne – I 156634-02-2 043 Functiona – I 1948-22-0 .045 Chlorptoneta – I 156641-38-4 .035 Fonofos – I 19442-29 .045 Chlorptoneta – I 156641-38-4 .035 Fonofos – I 19442-29 .045 Chlorptoneta – I 1922-29 .045 Chlorptoneta – I 1922-29 .045 Chlorptoneta – I 1924-73. 0.35 Genuma-Chlorptoneta – I 319-84-5 .035 delta-HCH – I 319-84-7 .035 delta-HCH – I 319-84-7 .035 delta-HCH – I 319-84-7 .035 delta-HCH – I 319-84-7 .035 delta-HCH – I 1924-57. 035 delta-HCH – I 1924-57. 035 delta-HCH – I 1024-57.3 .035 delta-HCH – I 1924-57.3	Bentazon	Basagran	Н	25057-89-0	.063	Endosulfan sulfate	-	Т	1031-07-8	.035
Bromoxyni Bromani, Embern H [1689-84-5] 0.42 Endrin alderlyde - T 7721-93.4 (0.35) Butachlor Butanok, Mache H 2184-66-9 25 Endrin ketone - T 53494-70-5 0.035 Desphate - T 53494-70-5 0.035 Desphate - T 53494-70-5 0.035 Desphate - T 53494-70-5 0.035 Desphate - T 53494-70-5 0.035 Desphate - T 53494-70-5 0.035 Desphate - T 53494-70-6 - C 5340-2 0.05 Captofo Difolan, Folur F 242-06 - 1.2 Carborkoni Trithion I 786-19-6 .00 Fenninol Rubigan F 60166.88-9 .21 Carborkoni Trithion I 786-19-6 .00 Fenninol Rubigan F 60166.88-9 .21 Carborkoni Trithion I 786-19-6 .00 Fenninol Rubigan F 60166.88-9 .21 Carborkoni Trithion I 1803-71-2 .035 Fentionin Baytex I 55-38-9 Carborkoni Trithion I 1803-71-2 .035 Fentionin Baytex I 55-38-9 .05 diphe-Chordrene - I 56631-82- 0.03 Fentionin Baytex I 55-38-9 .05 diphe-Chordrene - I 56631-82- 0.03 Fentionin Baytex I 59-38-60-4 .13 gamma-Chlordene - I 56641-38-4 .035 Chordrahon I 20201.87-0 Par-48-6 .035 Chordrahon I 20201.87-0 Par-48-6 .035 Chordrahon I 20201.87-0 Par-48-6 .035 Chordrahon I 20201.87-0 Par-48-2 .000 Heptachlor Fennotox I 76-444.8 .035 Cyonat Np Chordrahon I 2020.18-20-2 .11 Heptachlor Fennotox I 76-444.8 .035 Cyonat S 20000 Heptachlor - T 1319-85-7 .035 district - T 1319-85-7 .035 district - T 1319-85-7 .035 district - T 1319-85-7 .035 Micharlor H 1916-25 .035 Micharlor H 1916-25 .035 Micharlor H 1916-26 .035	Bromacil	Hyvar, Woprovar	Н	314-40-9	.28	Endrin	Hexadrin	Ι	72-20-8	.035
	Bromoxynil	Bromanil, Emblem	Н	1689-84-5	.042	Endrin aldehyde	-	Т	7421-93-4	.035
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Butachlor	Butanox, Machete	Н	23184-66-9	.25	Endrin ketone	-	Т	53494-70-5	.035
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	2-Butoxy-ethanol	-	0	78-51-3	-	EPN	-	Ι	2104-64-5	.075
	phosphate ¹					EPTC	Eptam, Eradicane	Н	759-94-4	.14
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Butylate	Sutan +,	Н	2008-41-5	.14	Ethalfluralin	Sonalan, Curbit EC	Н	55283-68-6	.11
$ \begin{array}{c} Carfierie' & - & O & 58.08.2 & - & Enformalise' Norton, Tamat & H & 2622-9-9-6 & - \\ Captafol & Difolatan, Foltaf F & 2425.06-1 & 2.1 & Ethogrophos & Mocap & I & 13194-48.4 & .060 \\ Captan & Orthocide & F & 133.06-2 & .14 & Fenaringhos & Nenacur & I & 22224.92-6 & .12 \\ Carbophenthino & Trithion & Trithion & T & 58.19-6 & 80 & Fenarinol & Rubigan & F & 60168-88-9 & .21 \\ Carbophonthino & Trithion & I & 5103.71-9 & .035 & Fenarinol & Rubigan & F & 60168-88-9 & .075 \\ Carbophonthino & Terminator & I & 5103.71-9 & .035 & Fenarinol & Baytex & I & 55.38-9 & .055 \\ cis-Chlordane & Terminator & I & 56341-32- & .043 & Fenarinol & Baytex & I & .55.38-9 & .045 \\ aphne-Chlordene & - & I & 56641.38-4 & .035 & Fenation & Baytex & I & .15.90.2 & .045 \\ Chlorothalonil & Daconil, Bravo & F & 1897-45-6 & .17 & dpha-HCH & - & I & .319.85-7 & .035 \\ chloroprina & Taterpex, & H & 101-21-3 & .28 & beta-HCH & - & I & .319.85-7 & .035 \\ Couranghos & Lorsban & I & .2921.88-2 & .055 & garman-HCH & Lindane & I & .58.89-9 & .035 \\ Coumaphos & Agridip & I & .5672.4 & .090 & Heptachlor Epoxide - & T & I024-57-3 & .035 \\ Cyanazine & Bladex & H & 21725.46-2 & .11 & Heptachlor Epoxide - & T & I024-57-3 & .035 \\ Cyanazine & Bladex & H & .2172.54-6 & .11 & Heptachlor Epoxide - & T & 1024-57-3 & .035 \\ Cyanazine & Bladex & H & .94.82.6 & .050 & MCPP & Mecayonp & H & .94.72.6 & .083 \\ Ad'-DDE & - & T & .324.82.6 & .035 & Methyl paraton & - & T & .95.95.6-1 & .12 \\ 2.4-DB & Vencewed, & H & .94.82.6 & .035 & Methyl paraton & - & T & .95.95.6 & .035 \\ DMU & - & T & .72.55.9 & .035 & Methyl paraton & - & T & .12.84.5 & .035 \\ Datta & - & T & .12.22.2-6 & .035 & Methyl paraton & - & T & .12.87.64.9 & .015 \\ Demeton-S & - & T & .25.59 & .035 & Methyl paraton & - & T & .218.76.4-9 & .015 \\ DAtta & - & T & .22.2-2.6 & .035 & Methyl paraton & - & T & .95.95.4-2 & .055 \\ DDMU & - & T & .25.92.3 & .035 & Methyl paraton & - & T & .218.77.4 & .055 \\ DDMU & - & T & .25.92.9 & .035 & Methyl paraton & - & T & .218.77.4 & .055 \\ DDMU & - & T & .25.92.9 & $		Genate Plus				Ethion	Ethiosul	1	563-12-2	.055
	Caffeine ¹	-	0	58-08-2	-	Ethofumesate	Nortron, Tramat	H	26225-79-6	-
	Captafol	Difolatan, Foltaf	F	2425-06-1	.21	Ethoprophos	Mocap	I	13194-48-4	.060
	Captan	Orthocide	F	133-06-2	.14	Fenamiphos	Nemacur		22224-92-6	.12
	Carbophenothion	Trithion	Ι	786-19-6	.80	Fenarimol	Rubigan	F	60168-88-9	.21
cis-Chlordane Terminator I 5103-71-9 .035 PensultOntion – I 115-90-2 .003 rams-Chlordane Terminator I 5103-71-2 .035 PensultOntion Baytex I 55-38-9 .055 alpha-Chlordene – I 56634.02-2 .043 Fluridone Sonar H 59756-60-4 .13 gamma-Chlordene – I 56641-38-4 .035 Fonofos – I 944.22-9 .045 Chlorphonin Daconil, Bravo F 1897-45-6 .17 $alpha-HCH$ – I 319-86-8 .035 Chlorphonin Daconil, Bravo F 1897-45-6 .17 $alpha-HCH$ – I 319-86-8 .035 Chlorphonin Taterpex, H 101-21-3 .28 $beta-HCH$ – I 319-86-8 .035 Chlorphonin Bladex H 21725-46-2 .11 Heptachlor Fennotox I 76-44-8 .035 Cycloate Sabet H 1134-23-2 .14 Hexarinone Velpar H 51235-04-2 .11 Cycloate Sabet H 1134-23-2 .14 Hexarinone Velpar H 51235-04-2 .11 2.4-D Weed-B-Gon, H 94-75-7 .042 loxynil Certrol H H 1689-83-4 .042 Weedone	Carboxin	Vitavax	F	5234-68-4	.78	Fenitrotnion	Fenitox, Rothion	I	122-14-5	.055
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	cis-Chlordane	Terminator	Ι	5103-71-9	.035	Fensuiron	- Doutou	I	115-90-2 55 28 0	.075
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	trans-Chlordane	Terminator	Ι	5103-74-2	.035	Fentition	Baytex	1	50756 60 4	.055
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	alpha-Chlordene	-	Ι	56534-02-2	.043	Fluridone	Sonar	н	044 22 0	.13
	gamma-Chlordene	-	Ι	56641-38-4	.035	alpha UCU	—	I T	210 84 6	.045
	Chlorothalonil	Daconil, Bravo	F	1897-45-6	.17	heta HCH	-	I	319-04-0	.035
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Chlorpropham	Taterpex,	Н	101-21-3	.28	delta-HCH	_	I	319-85-7	.035
		Sprout Nip	_			aamma_HCH	Lindane	I	58-89-9	035
$\begin{array}{cccc} Coumaphos & Agridip & I $56-72.4 & 0.90 & Internation Terminols I $100000 & I $100000000000000000000000000000000000$	Chlorpyrifos	Lorsban	Ι	2921-88-2	.055	Hentachlor	Ennotox	I	76-44-8	035
	Coumaphos	Agridip	Ι	56-72-4	.090	Heptachlor Epoxide	-	Т	1024-57-3	035
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Cyanazine	Bladex	Н	21725-46-2	.11	Hevazinone	Velnar	н	51235_04_2	.055
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Cycloate	Sabet	Н	1134-23-2	.14	Ioxynil	Certrol H	H	1689-83-4	.11
WeedoneMCPAMetaxon, KilsemH94-74-6.0832,4-DBVenceweed,H94-82-6.050MCPPMecopropH93-65-2.083ButoxoneMcTPhos (1 & 2)FolexH150-0.5.12DCPADacthalH1861-32-1.033MethaxylApronF57837-19-1.482,4'-DDDTDEI53-19-0.035MethoxychlorMarlateI72-43-5.0352,4'-DDDTDEI72-54-8.035Methyl chorpyrifosReldanI598-13-0.0504,4'-DDE-T72-55-9.035Methyl paratoxo-T950-35-6.15DMU-T72-25-9.035Methyl paratoxinH51218-45-2.282,4'-DDTDDTI50-29-3.035Methyl parathionPenncap-MI228-00-0.055Demeton-O-I298-03-3.055MetibuzinLexone, SencorH21087-64-9.0714,4'-DDTDDTI50-29-3.055MicK264-I113-48-4.50Demeton-O-I1289-03-3.055MicK264-I1288-58-5.035Demeton-S-I12675-0.060Mirex-I2385-85-5.035Di-allate-H120-55.060Mirex-I39765-80-5.035JoichlobeniBarrier	2,4-D	Weed-B-Gon,	Н	94-75-7	.042	Malathion	several	I	121-75-5	.060
2.4-DBVenceweed,H94-82-6.050MCPPMecopropH93-65-2.083ButoxoneMerphos (1 & 2)FolexH150-50-5.12DCPADacthalH1861-32-1.033MetlaxylApronF5787-19-1.482,4'-DDDTDEI53-19-0.035MethoxychlorMarlateI72-43-5.0352,4'-DDDTDEI72-55-9.035Methyl paraxon-T93-65-2.0354,4'-DDE-T72-55-9.035Methyl paraxon-T93-65-2.035DDWU-T1022-22-6.035Methyl paraxon-T93-65-2.035DDWU-T72-55-9.035Methyl paraxon-T93-65-2.035DDWU-T1022-22-6.035Methyl paraxon-T93-86-3.055DDWU-T1022-22-6.035Methyl paraxonLexone, SencorH2108-76-4.071DDTI50-29-3.035Methyl paraxonPhosdrinI7786-34-7.075Demeton-O-I1298-03-3.055MGK264-I113-48-4.50Demeton-S-I126-75-0.060Mirex-I123-88-85-5.035Dicaltae-H2303-16-4.27MolinateOrdramH2212-67-1.14Diazinon		Weedone				MCPA	Metaxon, Kilsem	Н	94-74-6	.083
ButoxoneMerphos $(1 \& 2)$ FolexH150-50-5.12DCPADacthalH1861-32-1.033MetalaxylApronF57837-19-1.482.4'-DDDTDEI53-19-0.035MethoxychlorMarlateI72-43-5.0352.4'-DDE-T3424-82-6.035Methyl chlorpyrifosReldanI5598-13-0.0504.4'-DDDTDEI72-55-9.035Methyl paratoon-T950-35-6.154.4'-DDTDDTT72-55-9.035MetolachlorDual, PennantH51218-45-2.282.4'-DDTDDTI789-02-6.035MetolachlorDual, PennantH21087-64-9.0714.4'-DDTDDTI50-29-3.035MetolachlorDual, PennantH21218-45-2.282.4'-DDTDDTI298-03-3.055MGK264-I113-48-4.50Demeton-S-I126-75-0.060Mirex-I12385-85-5.035Di-allate-H2303-16-4.27NapropamideDevrinolH2212-67-1.14DiacinonSeveralI333-41-5.064-Nitrophenol-I100-02-7.073DicambaBarvelH1918-00-9.042cis-Nonachlor-I310-73-1.035JochobenilBarrier, CasoronH1194-65-6.16<	2,4-DB	Venceweed,	Н	94-82-6	.050	MCPP	Mecoprop	Н	93-65-2	.083
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		Butoxone				Merphos (1 & 2)	Folex	Н	150-50-5	.12
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	DCPA	Dacthal	Н	1861-32-1	.033	Metalaxyl	Apron	F	57837-19-1	.48
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2,4'-DDD	TDE	l	53-19-0	.035	Methoxychlor	Marlate	I	72-43-5	.035
4,4'-DDTDEI72-54-8.035Methyl parathion-I950-55-6.154,4'-DDE-T72-55-9.035Methyl parathionPencap-MI290-80-0.055DDMU-T1022-22-6.035Methyl parathionPencap-MH51218-45-2.282,4'-DDTDDTI789-02-6.035MetribuzinLexone, SencorH21087-64-9.0714,4'-DDTDDTI50-29-3.035MetribuzinLexone, SencorH21087-64-9.075Demeton-O-I298-03-3.055MGK264-I11348-4.50Demeton-S-I298-03-3.055MGK264-I11348-4.50Di-allate-H2303-16-4.27MolinateOrdramH2212-67-1.14DiazinonSeveralI333-41-5.06NapropamideDevrinolH15299-99-7.21DicambaBanvelH1918-00-9.042cis-Nonachlor-I5103-73-1.035DichlobenilBarrier, CasoronH1194-65-6.16trans-Nonachlor-I39765-80-5.035Jc-DichloroT2008-58-4-NorflurazonEvital, SolicamH27314-13-2.14S-Dichlorobenzoic-H51-36-5.042Oxychlordane-T27304-13-8.035Acid <t< td=""><td>2,4'-DDE</td><td>-</td><td>Т</td><td>3424-82-6</td><td>.035</td><td>Methyl chlorpyrifos</td><td>Reldan</td><td>I</td><td>5598-13-0</td><td>.050</td></t<>	2,4'-DDE	-	Т	3424-82-6	.035	Methyl chlorpyrifos	Reldan	I	5598-13-0	.050
4.4 - DDE-I1/2-35-9.055Methyl paralinonPenincap-MI298-00-0.055DDMU-T1022-22-6.035Methyl paralinonDual, PennantH51218-45-2.282.4'-DDTDDTI50-29-3.035MetribuzinLexone, SencorH21087-64-9.0714.4'-DDTDDTI50-29-3.035MetribuzinLexone, SencorH21087-64-9.075Demeton-O-I298-03-3.055MGK264-I113-48-4.50Demeton-S-I126-75-0.060Mirex-I2385-85-5.035Di-allate-H2303-16-4.27MolinateOrdramH2212-67-1.14DiazinonSeveralI333-41-5.06NapropamideDevrinolH15299-99-7.21DichobenilBarrier, CasoronH1918-00-9.042cis-Nonachlor-I5103-73-1.0352,6-DichloroT2008-58-4-NorflurazonEvital, SolicamH27304-13-8.0352,6-DichloroT2008-58-4-NorflurazonEvital, SolicamH27304-13-8.0352,6-DichloroT2008-58-4-NorflurazonEvital, SolicamH27304-13-8.035AcidT2008-55.042OxyflorfenGoalH42874-03-3 <td< td=""><td>4,4'-DDD</td><td>TDE</td><td>I T</td><td>72-54-8</td><td>.035</td><td>Methyl paraoxon</td><td>- Donnoon M</td><td>T</td><td>950-35-6</td><td>.15</td></td<>	4,4'-DDD	TDE	I T	72-54-8	.035	Methyl paraoxon	- Donnoon M	T	950-35-6	.15
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	4,4 -DDE	-	I T	12-55-9	.035	Metalachlor	Dual Dennant	1 1	298-00-0	.035
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			I	1022-22-0	.035	Metribuzin	Lexone Sencor	Н	21087-64-9	.28
4,4-DD1DD1130-29-5 0.055 MGK264-I113-48-4 50 Demeton-O-I298-03-3.055MGK264-I113-48-4.50Demeton-S-I126-75-0.060Mirex-I2385-85-5.035Di-allate-H2303-16-4.27MolinateOrdramH2212-67-1.14DiazinonSeveralI333-41-5.06NapropamideDevrinolH15299-99-7.21DicambaBanvelH1918-00-9.042.042.055Morektor-I5103-73-1.035DichlobenilBarrier, CasoronH1194-65-6.16 <i>trans</i> -Nonachlor-I39765-80-5.0352,6-DichloroT2008-58-4-NorflurazonEvital, SolicamH27314-13-2.14benzamide ¹ H51-36-5.042Oxychlordane-T27304-13-8.0353,5-Dichlorobenzoic-H51-36-5.046ParathionseveralI56-38-2.06DichloryosDDVPI62-73-7.060PebulateTillamH1114-71-2.14DicofolKelthaneI115-32-2.17PentanthalinProwl, StompH40487-42-1.11Diclofop-methylHoelonH51338-27-3.063PentachlorophenolPCP, PentaF87-86-5 <td>2,4 -DD1 4.4' DDT</td> <td>DDT</td> <td>I T</td> <td>789-02-0</td> <td>.035</td> <td>Mevinphos</td> <td>Phosdrin</td> <td>I</td> <td>7786-34-7</td> <td>.071</td>	2,4 -DD1 4.4' DDT	DDT	I T	789-02-0	.035	Mevinphos	Phosdrin	I	7786-34-7	.071
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	A,4 -DD1	DDT	I	208 02 2	.033	MGK264	_	Ī	113-48-4	.50
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Demeton S	—	I	296-03-3	.055	Mirex	_	Ι	2385-85-5	.035
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	Demeton-5	_	и И	2303-16-4	.000	Molinate	Ordram	Н	2212-67-1	.14
DiramonBernericF 5034753 500 4 -Nitrophenol $-$ T $100-02-7$ $.073$ DicambaBanvelH1918-00-9 $.042$ cis -Nonachlor $-$ I $5103-73-1$ $.035$ DichlobenilBarrier, CasoronH1194-65-6.16 cis -Nonachlor $-$ I $39765-80-5$ $.035$ $2,6$ -Dichloro- $-$ T $2008-58-4$ $-$ NorflurazonEvital, SolicamH $27314-13-2$.14 $benzamide^1$ $-$ T $51-36-5$ $.042$ Oxadiazon ¹ Ronstar, OrderH19666-30-9 $ 3,5$ -Dichlorobenzoic $-$ H $51-36-5$ $.042$ Oxychlordane $-$ T $27304-13-8$ $.035$ Acid $-$ T $27304-13-8$ $.035$ $0xyfluorfen$ GoalH $42874-03-3$ $.28$ Dichlorprop $2,4$ -DP, Seritox 50H $120-36-5$ $.046$ ParathionseveralI $56-38-2$ $.066$ DichlorvosDDVPI $62-73-7$ $.060$ PebulateTillamH $1114-71-2$ $.14$ DicofolKelthaneI $115-32-2$ $.17$ PendimethalinProwl, StompH $40487-42-1$ $.11$ Diclofop-methylHoelonH $51338-27-3$ $.063$ PentachlorophenolPCP, PentaF $87-86-5$ $.021$	Diazinon	Several	I	333_41_5	.27	Napropamide	Devrinol	Н	15299-99-7	.21
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Dicamba	Banyel	н	1918-00-9	.00	4-Nitrophenol	-	Т	100-02-7	.073
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Dichlobenil	Barrier, Casoron	Н	1194-65-6	.16	<i>cis</i> -Nonachlor	-	I	5103-73-1	.035
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2.6-Dichloro-	_	Т	2008-58-4	-	trans-Nonachlor	- -	1	39/65-80-5	.035
3,5-Dichlorobenzoic - H 51-36-5 .042 Oxychlordane - T 27304-13-8 .035 Acid - T 27304-13-8 .035 Dichlorprop 2,4-DP, Seritox 50 H 120-36-5 .046 Parathion several I 56-38-2 .066 Dichloryos DDVP I 62-73-7 .060 Pebulate Tillam H 1114-71-2 .14 Dicofol Kelthane I 115-32-2 .17 Pendimethalin Prowl, Stomp H 40487-42-1 .11 Diclofop-methyl Hoelon H 51338-27-3 .063 Pentachlorophenol PCP, Penta F 87-86-5 .021	henzamide ¹			2000 00 1		NorTiurazon	Evital, Solicam	H	2/514-13-2	.14
Acid Oxyclinotaire - 1 27504-13-8 .055 Acid Oxyfluorfen Goal H 42874-03-3 .28 Dichlorprop 2,4-DP, Seritox 50 H 120-36-5 .046 Parathion several I 56-38-2 .06 Dichlorvos DDVP I 62-73-7 .060 Pebulate Tillam H 1114-71-2 .14 Dicofol Kelthane I 115-32-2 .17 Pendimethalin Prowl, Stomp H 40487-42-1 .11 Diclofop-methyl Hoelon H 51338-27-3 .063 Pentachlorophenol PCP, Penta F 87-86-5 .021	3.5-Dichlorobenzoid	. –	н	51-36-5	.042	Oxadiazon	Kolistar, Order	н т	27304 13 9	- 035
Dichlorprop 2,4-DP, Seritox 50 H 120-36-5 .046 Parathion several I 56-38-2 .060 Dichlorprop DVP I 62-73-7 .060 Pebulate Tillam H 1114-71-2 .14 Dicolol Kelthane I 115-32-2 .17 Pendimethalin Prowl, Stomp H 40487-42-1 .11 Dicolofop-methyl Hoelon H 51338-27-3 .063 Pentachlorophenol PCP, Penta F 87-86-5 .021	Acid	-			.012	Oxychiordane	_ Goal	н	42874-03-3	.055
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	Dichlorprop	2.4-DP Seritox 50	н	120-36-5	046	Parathion	several	I	56-38-2	.26
DicofolKelthaneI115-32-2.17PendimethalinProwl, StompH40487-42-1.11Diclofop-methylHoelonH51338-27-3.063PentachlorophenolPCP, PentaF87-86-5.021	Dichloryos	DDVP	T	62-73-7	.060	Pebulate	Tillam	Ĥ	1114-71-2	.14
Diclofop-methyl Hoelon H 51338-27-3 .063 Pentachlorophenol PCP, Penta F 87-86-5 .021	Dicofol	Kelthane	Ī	115-32-2	.17	Pendimethalin	Prowl, Stomp	Н	40487-42-1	.11
	Diclofop-methyl	Hoelon	Н	51338-27-3	.063	Pentachlorophenol	PCP, Penta	F	87-86-5	.021

Table 3. Analytes and quantitation limits for pesticides analyzed at the Washington State Department of Ecology Manchester

 Environmental Laboratory.—Continued

[**Trade or common name**(s): Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. Geological Survey. **Quantitation limit:** Limits are approximate and often are different for each sample; these values are representative of a typical sample. **Type of Pesticide:** F, fungicide; H, herbicide; I, insecticide; T, transformation product; O, other. μg/L, microgram per liter; –, none available]

Pesticide target analyte	Trade or common name(s)	Type of pesticide	Chemical Abstracts Service registry No.	Quantitation limit (µg/L)	Pesticide target analyte	Trade or common name(s)	Type of pesticide	Chemical Abstracts Service registry No.	Quantitation limit (µg/L)
Phorate	Thimet, Rampart	Ι	298-02-2	0.055	Temephos	Abate	Ι	3383-96-8	0.70
Phosmet	Imidan	Ι	732-11-6	.080	Terbacil	Sinbar	Н	5902-51-2	.21
Phosphamidon	Dixon	Ι	13171-21-6	.18	Terbutryn	Ternit	Н	886-50-0	.071
Picloram	Tordon	Н	1918-02-1	.042	2,3,4,5-Tetrachloro-	2,3,4,5-Tetrachloro- Dowicide 6		4901-51-3	.023
Profluralin	-	Н	26399-36-0	.17	phenol				
Prometon	Pramitol	Н	1610-18-0	.071	2,3,4,6-Tetrachloro-	Dowicide 6	F	58-90-2	.023
Prometryn	Caparol, Gesagard	Н	7287-19-6	.071	phenol				
Propyzamide	Kerb	Н	23950-58-5	.28	Tetrachlorvinphos	Gardona	Ι	961-11-5	.15
Propachlor	Ramrod	Н	1918-16-7	.17	Triadimefon	Bayleton	F	43121-43-3	.18
Propazine	Prozinex	Н	139-40-2	.071	Triallate	Far-Go	Н	2303-17-5	.18
Propetamphos	Safrotin	Ι	31218-83-4	.15	Tribufos	DEF	Н	78-48-8	.11
Ronnel	Fenclorphos	Ι	299-84-3	.055	2,4,5-	Dowicide 2	F	95-95-4	.025
Simazine	Gesatop, Princep	Н	122-34-9	.072	Trichlorophenol				
Sulfotep	Bladafum	Ι	3689-24-5	.045	2,4,6-	Dowicide 2S	F	88-06-2	.025
Sulprofos	Bolstar	Ι	35400-43-2	.055	Trichlorophenol				
2,4,5-Т	-	Н	93-76-5	.033	Triclopyr	Garlon, Grazon	Н	55335-06-3	.035
2,4,5-TB	-	Н	93-80-1	.038	Trifluralin	Treflan, Trilin	Н	1582-09-8	.11
2,4,5-TP	Silvex	Н	93-72-1	.033	Vernolate	-	Н	1929-77-7	.14
Tebuthiuron	Spike	Н	34014-18-1	.11					

¹Non-target analyte.

Results of Quality–Control Assessment

During the study, one equipment blank, five field blanks, and one replicate were analyzed in conjunction with environmental samples to assess bias and analytical variability. Field and equipment blanks were prepared with organic-grade water obtained from the NWQL. The blanks and replicate were subjected to all the same sample handling and processing as the environmental samples.

Pesticides were not detected in the field or equipment blanks. Concentration differences in the set of replicate samples ranged from 0.88 to 4.0 percent, as measured by relative percentage of difference, for samples analyzed by the NWQL and between 0.0 and 47.8 percent for samples analyzed by the Manchester Laboratory (<u>table 4</u>). The percentage of differences seem high for certain compounds, but the concentrations are very low, so even small differences in detectable concentrations can lead to large percentage of differences. Modifications were not made to the data set on the basis of these results.

Quality-control procedures for the NWQL and Manchester Environmental Laboratory included the use of laboratory reagent blanks, spikes, surrogates, internal standards, and calibration as described by Huntamer and others (1992) and by Pritt and Raese (1995).
 Table 4.
 Concentrations and precision data for replicate samples with detections.

[**Relative percentage of difference:** Calculated as the difference between the two concentrations divided by the mean. J, estimated. µg/L, microgram per liter]

Pesticide	Concentration in replicates (µg/L)	Relative percentage of difference
U.S. Geological Surve	y National Water Quali	ty Laboratory analyses
Simazine	1.03	2.9
	1.00	
Prometon	.114	.88
	.113	
Diazinon	.194	4.0
	.202	
Carbaryl	.121J	2.5
	.118J	
Wash Manchester	ington Department of E Environmental Laborat	cology ory analyses
2,4-D	0.34	5.7
	.36	
4-Nitrophenol	.1J	42.4
	.065J	
2,6-Dichlorobenzamide	.086J	47.8
	.14J	
Diazinon	.16	37.0
	.11	
Dicamba	.027J	29.8
	.02J	
Dichlobenil	.24	28.6
	.18	
Dichlorprop	.032J	.0
	.032J	
MCPP	.57	5.4
	.54	
Pentachlorophenol	.1	.0
	.1	
Simazine	.25	38.1
	17	

Pesticide Detections

Trichlopyr

Thirty-nine pesticides and pesticide transformation products were detected in water samples from the urban streams (<u>table 5</u>) (<u>table 6</u>, at back of report). Of the 39 analytes detected, 20 were herbicides, 9 were insecticides, 2 were fungicides, 6 were pesticide transformation products (4-nitrophenol is a transformation product of methyl parathion, 2,6-dichlorobenzamide is a transformation product of

.18

.18

.0

diclobenil, aminomethylphosphonic acid is a transformation product of glyphosate, desethylatrazine is a transformation product of atrazine, 4,4'-DDE is a transformation product of 4,4'-DDT, and desulfinylfipronil amide is a transformation product of fipronil), and 2 were other types of compounds (caffeine and 2-butoxy-ethanol phosphate). However, not all compounds that were detected (table 5) were analyzed for in all samples because of changes in the analytical target lists (the addition of glyphosate, fipronil, and their transformation products) or because some of the detected compounds were non-target analytes. Therefore, for the remainder of this report, only those compounds that were analyzed for at all sites are presented in comparisons of detections between sites and the rates of compound detections. Additionally, the filtered and unfiltered results are combined, so a particular compound was counted as only one detection if it was detected in both the filtered and unfiltered samples.

The most widespread compound was 4-nitrophenol, which was detected at all sampling sites (<u>table 5</u>), but was detected in less than one-half the samples collected (<u>fig. 2</u>). The fungicide pentachlorophenol was the most frequently detected compound, and was detected in more than 80 percent of the samples and at all sites except at the forested Rock Creek reference site (site 2). The herbicides prometon, trichlopyr, 2,4-D, and MCPP were present in more than 70 percent of the samples collected and also were the most widespread herbicides, as they were detected at all sites except Rock Creek. Diazinon and carbaryl were the most widespread insecticides and were detected in 12 and 10 of the streams, respectively. They also were the most frequently detected insecticides, present in more than 60 and 30 percent of samples, respectively.

The largest number of compounds at detectable concentrations, 25, was in samples from Juanita Creek (site 5), followed by 22 in samples from the Unnamed Creek (site 14) and 21 in samples from Lyon Creek at 178th (site 12). Only two compounds were detected at the Rock Creek reference site (fig. 3). One or two fungicides and transformation products were detected at all streams except Rock Creek, where fungicides were not detected. Two to three insecticides were detected at most sites; however, five or more insecticides were detected in Juanita Creek, Lyon Creek at 178th, and the Unnamed Creek. Insecticides were not detected in Taylor (site 1) and Rock Creeks. Of the classes of compounds analyzed, the detections of herbicides varied the most among sites, ranging from one at Rock Creek to 15 at Juanita Creek. Between 6 and 12 herbicides were detected at most sites. Herbicides typically make up more than 60 percent of the compounds detected in each stream (fig. 4).

Table 5.Pesticides and pesticide transformation products detected in water samples collected at sites on urban streams in KingCounty, Washington, 1998–2003.

 $[\textbf{Sample site: } na, not analyzed; \times, detected; -, not detected]$

						S	Sample site							
Pesticide	Unnamed Creek (site 14)	Juanita Creek (site 5)	Little Bear Creek (site 9)	Lyon Creek at 178th (site 12)	Lyon Creek at Lake Forest Park (site 13)	North Creek (site 10)	Lewis Creek (site 7)	Kelsey Creek (site 4)	Bear Creek (site 8)	lssaquah Creek (site 6)	Swamp Creek (site 11)	May Creek (site 3)	Taylor Creek (site 1)	Rock Creek (site 2)
4-Nitrophenol	×	×	×	×	×	×	×	×	×	×	×	×	×	×
2,4-D	×	×	×	×	×	×	×	×	×	×	×	×	×	_
MCPP	×	×	×	×	×	×	×	×	×	×	×	×	×	_
Pentachlorophenol	×	×	×	×	×	×	×	×	×	×	×	×	×	_
Prometon	×	×	×	×	×	×	×	×	×	×	×	×	×	_
Trichlopyr	×	×	×	×	×	×	×	×	×	×	×	×	×	_
Diazinon	×	×	×	×	×	×	×	×	×	×	×	×	_	_
Dicamba	×	×	×	×	×	×	×	×	_	_	_	×	×	×
Dichlobenil	×	×	×	×	×	×	×	×	×	×	×	_	_	_
Atrazine	×	×	×	×	×	×	×	_	×	×	×	_	_	_
Carbaryl	×	×	×	×	×	×	_	×	×	×	_	×	_	_
MCPA	×	×	×	×	×	_	×	×	_	×	×	_	×	_
Simazine	×	×	×	×	×	×	×	_	×	_	×	_	_	_
Malathion	×	×	×	×	_	×	×	_	×	_	×	_	_	_
2,6-Dichlorobenzamide	×	×	×	×	na	×	×	na	×	na	na	na	na	na
Diuron	×	×	×	×	_	_	_	_	×	×	_	_	_	_
Glyphosate	×	na	×	na	na	×	na	×	na	na	na	×	×	na
Chlorpyrifos	×	×	_	×	×	_	×	_	_	_	_	_	_	_
Metolachlor	×	×	_	_	_	_	_	×	_	_	_	×	×	_
Trifluralin	×	×	_	_	×	_	_	×	_	×	_	_	_	_
Desethylatrazine	_	_	×	_	×	_	×	_	×	_	_	_	_	_
Dichlorprop	×	×	×	×	_	_	_	_	_	_	_	_	_	_
Tebuthiuron	×	_	×	_	×	×	_	_	_	_	_	_	_	_
Aminomethylphosphonic acid	l x	_	×	na	na	_	na	×	na	na	na	na	na	na
Bromacil	_	×	×	_	×	_	_	_	_	_	_	_	_	_
Caffeine	×	na	×	na	na	×	na	na	na	na	na	na	na	na
4,4'-DDD	_	×	_	×	_	_	_	_	_	_	_	_	_	_
4,4'-DDE	-	×	_	×	_	-	_	_	_	_	_	_	_	_
4,4'-DDT	-	×	_	×	_	-	_	_	_	_	_	_	_	_
EPTC	_	×	_	_	_	_	×	_	_	_	_	_	_	_
Napropamide	_	_	×	×	_	_	_	_	_	_	_	_	_	_
2-butoxy-ethanol phosphate	na	na	na	na	na	na	na	na	na	×	na	na	na	na
Carbofuran	na	na	na	na	na	na	na	_	_	_	_	_	_	_
Desulfinylfipronil amide	na	na	na	na	na	na	na	×	na	na	na	_	_	na
Ethofumesate	×	na	na	na	na	na	na	na	na	na	na	na	na	na
Fipronil	na	na	na	na	na	na	na	×	na	na	na	na	na	na
gamma-HCH	_	×	_	_	-	_	_	_	_	_	_	_	_	_
Metalaxyl	×	_	_	_	_	_	_	_	_	_	_	_	_	_
Oxadiazon	×	na	na	na	na	na	na	na	na	na	na	na	na	na



Figure 2. Percentage of samples with detections of pesticides in urban streams in King County, Washington, 1998–2003.



Figure 3. Number of compounds detected for each class of pesticides at sampling sites on urban streams in King County, Washington, 1998–2003.



Figure 4. Percentage of each class of pesticides detected at sampling sites on urban streams in King County, Washington, 1998–2003.

Effect of Storms on Pesticide Detections

More compounds were detected during storms than during base flow, and they were detected more frequently and typically at high concentrations (fig. 5). Seven of the compounds were detected only during storms and two were detected only during base flow. All other compounds were detected under both conditions. For most compounds, the percentage of samples with detections also was higher during storms than during base flow. This is likely due to the increased flushing of the pesticides into the streams during storm events.

Eighteen of 28 compounds that were detected during storms occurred more frequently during spring storms than during autumn storms (fig. 6), and six of the compounds were not detected during autumn storms at all. This pattern of detection likely reflects the timing of pesticide application, because most pesticides are applied more often in the spring as homeowners begin working in their yards.





Figure 5. Maximum concentrations of pesticides and pesticide transformation products detected during storms and during base flow at sampling sites on urban streams in King County, Washington, 1998–2003.



Figure 6. Percentage of samples with pesticide detections in urban streams in King County, Washington, during spring and autumn storms, 1998–2003.

Potential Pesticide Sources

Residential use of pesticides is a possible major source for the most frequently detected compounds in the urban streams. Homeowners typically use pesticides for lawn and shrub care and for insect control around their property. For example, dichlobenil is a commonly used herbicide for weed control around woody shrubs and trees, and the popular insecticide diazinon is used to control ants, aphids, beetles, and other insects. Six of the seven most frequently detected pesticides (2,4-D, diazinon, dichlobenil, MCPP, prometon, and triclopyr) are currently sold for residential use or, in the case of diazinon, were just recently banned (Voss and Embrey, 2000, and Phillip Dickey, Washington Toxics Coalition, written commun., 2004). The other most frequently detected pesticide, pentachlorophenol, likely does not originate from residential application. Pentachlorophenol is a common wood preservative that is used in pressure treatment of wood for uses such as utility poles and railroad ties. Several other pesticides that were detected (carbaryl, dicamba, glyphosate, malathion, MCPA, EPTC) also are sold in King County home and garden stores, and thus are available for residential use (Voss and Embrey, 2000, and Phillip Dickey, Washington

Toxics Coalition, written commun., 2004). Although their sale is now banned for homeowner use, chlorpyrifos, which was detected at five sites, was available for retail sale until 2001 and diazinon was available until 2003. Carbaryl sales increased substantially in 2002 as a replacement insecticide for chlorpyrifos and diazinon (Phillip Dickey, Washington Toxics Coalition, written commun., 2004). As a result of the phase out of chlorpyrifos and diazinon, their rates of detection likely will decrease in the future as homeowners use up any remaining stock that they have.

It is difficult to distinguish which of the pesticides detected in Unnamed Creek samples (site 14) are the result of urban application and which are the result of agricultural application because the irrigation-return water contains both urban and agricultural sources of water. The turf farm withdraws water from the Sammamish River for irrigation use and returns the water through a small stream that runs out of an urban area and then feeds into a ditch. However, of the four compounds detected only in the Unnamed Creek sample (ethofumesate, oxadiazon, carbofuran, and metalaxyl), none of them has recorded retail sales in King County and they are most often associated with agricultural applications.

Summary

The U.S. Geological Survey and the King County Department of Natural Resources assessed the occurrence and distribution in urban streams in King County, Washington, of pesticides applied in urban and suburban residential areas. Water samples collected between 1998 and 2003 from 13 sites on urban streams and 1 reference site on a stream in a forested area were analyzed for the presence of 155 pesticides and pesticide transformation products during storms and during base flow.

Samples were collected by either manual sampling or an automated sampler and were analyzed at the U.S. Geological Survey's National Water Quality Laboratory and Organic Geochemistry Research Laboratory and the Washington State Department of Ecology Manchester Environmental Laboratory.

Of the 155 compounds analyzed for, 39 were detected at least once during the study. Twenty of the compounds were herbicides, nine were insecticides, two were fungicides, six were transformation products, and two were other types of compounds. Only 4-nitrophenol was detected at all 14 sampling sites. Pentachlorophenol, a fungicide, was the most frequently detected compound, occurring in more than 80 percent of the samples. The most frequently detected herbicides were prometon, trichlopyr, 2,4-D, and MCPP, and the most frequently detected insecticides were diazinon and carbaryl. All of the most frequently detected herbicides and insecticides were sold for homeowner use over the timeframe of this study.

More compounds were detected during storms than during base flow, and seven compounds were detected only during storm events. Compounds also were detected more frequently and typically at high concentrations during storms. Most of the compounds that were detected during storms occurred more frequently during spring storms than during autumn storms.

Residential use of pesticides by homeowners is a possible major source for the most frequently detected compounds in the urban streams. Four compounds that were detected only in samples from the site on an irrigation return are most often associated with agricultural applications rather than residential use.

References Cited

Huntamer, D., Carrell, B., Olson, N., and Solberg, K., 1992, Washington State pesticide monitoring project, final laboratory report: Manchester, WA, Washington State Department of Ecology, Environmental Investigations and Laboratory Services Programs, Manchester Environmental Laboratory, 23 p. Isco, Inc., 1992, 3700 portable sampler instruction manual, Revision D: Lincoln, Nebr., Isco, Inc., variously paged.

Lee, E.A., Strahan, A.P., and Thurman, E.M., 2002, Methods of analysis by the U.S. Geological Survey Organic Geochemistry Research Group—Determination of glyphosate, aminomethylphosphonic acid, and glufosinate in water using online solid-phase extraction and highperformance liquid chromatography/mass spectrometry: U.S. Geological Survey Open-File Report 01-454, 13 p.

Madsen, J.E., Sandstrom, M.W., and Zaugg, S.D., 2003, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—A method supplement for the determination of fipronil and degradates in water by gas chromatography/mass spectrometry: U.S. Geological Survey Open-File Report 02-462, 11 p.

Pritt, J.W., and Raese, J.W., 1995, Quality assurance/quality control manual, National Water Quality Laboratory: U.S. Geological Survey Open-File Report 95-443, 35 p.

Voss, F.D., and Embrey, S.S., 2000, Pesticides detected in urban streams during rainstorms in King and Snohomish Counties, Washington, 1998: U.S. Geological Survey Water-Resources Investigations Report 00-4098, 22 p.

Wilde, F.D., Radtke, D.B., Gibs, J., and Iwatsubo, R.T., eds., 1999a, Collection of water samples, *in* National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations Book 9, chapter A4, 103 p.

Wilde, F.D., Radtke, D.B., Gibs, J., and Iwatsubo, R.T., eds., 1999b, Cleaning of equipment for water sampling, in National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations Book 9, chapter A3, 65 p.

Wilde, F.D., Radtke, D.B., Gibs, J., and Iwatsubo, R.T., eds., 1999c, Processing of water samples, *in* National field manual for the collection of water-quality data: U.S. Geological Survey Techniques of Water-Resources Investigations Book 9, chapter A5, 128 p.

Zaugg, S.D., Sandstrom, M.W., Smith, S.G., and Fehlberg, K.M., 1995, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of pesticides in water by C-18 solid-phase extraction and capillary-column gas chromatography/mass spectrometry with selected-ion monitoring: U.S. Geological Survey Open-File Report 95-181, 49 p.

Table 6. Concentrations of pesticides and pesticide transformation products detected in stream water samples during storms and during baseflow at sites on streams in King County, Washington, 1998–2003.

[Locations of sites are shown in figure 1. All concentrations are in micrograms per liter. Concentrations: J, estimated value; M, identified, but value is too low to quantify; N, there is evidence that the analyte is present. <, less than; -, not analyzed]

	Bear Creek (site 8)												
Stream	Р.(Collection	2,4	1-D,	2,6-Dichlorobenz	amide,	4-Nitrop	henol	Atrazine,	Carbaryl,			
condition	Date	method	filtered	unfiltered	unfiltered	f	iltered	unfiltered	filtered	filtered			
Storm	05-14-01	Auto sampler	0.083J	0.076J	0.036J		0.054J	0.0045NJ	0.003J	0.081J			
Storm	10-08-01	Auto sampler	<.24	.031J	-		<.18	.14J	<.007	<.041			
Base flow	06-18-01	DH-81	.14J	.15J	_		.051J	.016J	.004J	<.041			
Base flow	09-17-01	DH-81	<.21	.045J	-		.046J	<.31	<.007	<.041			
Stream	D (Collection	Desethylatra	azine,	Diazinon	Dichloben	il, Diuro	n, Malathior	n, MC	PP			
condition	Date	method	filtered	filter	ed unfiltered	filtered	filter	ed filtered	filtered	unfitered			
Storm	05-14-01	Auto sampler	0.002J	0.00	0.012J	< 0.057	0.01	1J <0.027	0.055J	0.065J			
Storm	10-08-01	Auto sampler	<.006	.00	.014J	.021J	<.20	.007J	<.49	<.51			
Base flow	06-18-01	DH-81	.002J	<.00	05 <.018	.0079J	.03	7NJ <.027	.028J	.023J			
Base flow	09-17-01	DH-81	<.006	<.00	05 <.016	<.052	<.16	<.027	<.42	<.36			
Stream	Dete	Collection	Pentachlo	rophenol	Promet	ton	5	Simazine	Trichlopyr				
condition	Date	method	filtered	unfiltered	filtered	unfiltered	filtered	unfiltered	filtered	unfiltered			
Storm	05-14-01	Auto sampler	0.009J	0.013J	0.01J	0.001J	< 0.011	< 0.031	<0.13J	0.12J			
Storm	10-08-01	Auto sampler	.1J	.015J	.004J	<.14	<.011	<.14	.02J	.015J			
Base flow	06-18-01	DH-81	.0038J	.0043J	.01J	<.022	.074	.065J	.0061J	.0086J			
Base flow	09-17-01	DH-81	<.10	<.09	.004J	<.02	.005.	<.02	<.18	<.15			

Issaquah Creek (site 6)														
Stream	Р.	Collection	2,4	4-D	2-Butoxvethanol		4-Nitro	phenol		Atrazine,	Carbary	l, Di	azinon	
condition	Date	method	filtered	unfiltered	pho	sphate	filtered	unfiltere	d	filtered	filtered	filtered	unfiltered	
Storm	05-14-01	Auto sampler	0.077J	0.082J	_	-	0.029NJ	0.024N	J	0.002J	0.018J	< 0.005	< 0.022	
Storm	10-08-01	Auto sampler	.4	.41	0.21NJ		.18J	<.46		<.007	<.041	.011	.025J	
Baseflow	06-18-01	DH-81	<.16	<.16	-	-	.029J	.056J		<.007	<.041	<.005	<.017	
Baseflow	09-17-01	DH-81	<.17	<.19	-	-	.038J	.032J		<.007	<.041	<.005	<.016	
Stream	m _D . Collection		Dic	hlobenil		D	iuron			МСРА		МСРР		
condition	Date	method	filtered	unfilter	ed	filtered	unfiltere	ed fi	ilte	red un	filtered	filtered	unfiltered	
Storm	05-14-01	Auto sampler	< 0.053	< 0.05	4	0.24NJ	0.11N	J <	:0.5	0 <	0.45	0.076J	0.057J	
Storm	10-08-01	Auto sampler	.08	.21		<.19	<.19		.0	5J	.073J	.33J	.39J	
Baseflow	06-18-01	DH-81	<.042	<.03	9	<.13	<.13		<.3	2 •	<.32	<.32	<.32	
Baseflow	09-17-01	DH-81	<.042	<.04	2	<.13	<.12		<.3	5 •	<.38	<.35	<.38	
Stream	D (Collection	Pent	achlorophen	ol Prometon			ton	on			opyr	Trifluralin,	
condition	Date	method	filtere	d unfil	tered	f	iltered	unfiltere	d	f	iltered	unfiltered	filtered	
Storm	05-14-01	Auto sampler	0.023J	0.04	4J		0.01J	0.0071J	ſ	().037J	0.04J	< 0.009	
Storm	10-08-01	Auto sampler	.06J	.07	78J		.01J	<.031			.06J	.063J	.004J	
Baseflow	06-18-01	DH-81	.0048	J .00)45J		<.01	<.021			.0045J	.0055J	<.009	
Baseflow	09-17-01	DH-81	<.087	<.09	95		<.01	<.019		<	<.15	<.16	<.009	

Table 6. Concentrations of pesticides and pesticide transformation products detected in stream water samples during storms and during baseflow at sites on streams in King County, Washington, 1998–2003.—Continued

					J	luanita Creel	k (site 5)					
Stream condition	Date	Time	Collection method	2,4-D, unfiltered	2,6-Dichloro- benzamide, unfiltered	4,4'-DDD, unfiltered	4,4'-DDE, unfiltered	4,4'-DDT, unfiltered	4-Nitrophenol, unfiltered	Atrazine, filtered	Bromacil, unfiltered	Carbaryl, filtered
Storm	04-23-98	1340	DH-81	1.0	0.005NJ	_	_	_	0.29	< 0.001	< 0.079	< 0.003
Storm	04-23-98	1930	DH-81	.63	.008NJ	_	_	_	.25	.004	<.082	.022J
Storm	04-23-98	2110	DH-81	.59	<.081	_	_	_	.22	<.001	<.081	.017J
Storm	06-24-99	0750	DH-81	.52	.1J	< 0.011	< 0.011	< 0.011	.086J	<.001	<.079	.023J
Storm	10-08-99	0930	DH-81	.64	.016J	<.011	<.011	<.011	<.14	<.001	<.082	.026J
Storm	11-16-99	1030	DH-81	.03J	_	.0028J	.0027J	.084J	.098NJ	<.001	<.081	<.003
Baseflow	08-17-99	1040	DH-81	.11	.1J	<.011	<.011	.002J	<.14	.005	.009J	<.003
Stream	Dete	Time	Chlorpyrifo	s, Di	azinon	Dicamba,	Dichlobenil,	Dichlorprop	, Diuron,	EPTC,	Lindane,	Malathion,
condition	Date	Time	unfiltered	filtered	unfiltered	unfiltered	unfiltered	unfiltered	unfiltered	filtered	filtered	filtered
Storm	04-23-98	1340	_	0.242	_	0.09	0.081J	< 0.046	<0.16J	< 0.002	< 0.004	0.087
Storm	04-23-98	1930	_	.276	_	.034J	.54	<.045	<.12J	<.010	.034	.073
Storm	04-23-98	2110	_	.309	_	.041	.18	<.045	<.12J	.009	.03	.071
Storm	06-24-99	0750	0.004NJ	.182	0.14	.025J	.31	.021J	.39NJ	<.002	<.004	<.010
Storm	10-08-99	0930	.002NJ	.179	.12	.028J	.062	<.086	<.12	<.002	<.004	.01
Storm	11-16-99	1030	<.016	.013	.015J	<.083	.039	.013NJ	<.12	<.002	<.004	<.005
Baseflow	08-17-99	1040	<.016	.014	0211	< 079	0141	< 087	< 12.1	< 002	< 004	< 005

Stream	Dete	Time	Malathion,	MCPA,	MCPP,	Metolachlor,	Pentachlorophenol,	Pro	neton	Simazine,	Trichlopyr,	Trifluralin,
condition	Dale	mile	unfiltered	unfiltered	unfiltered	filtered	unfiltered	filtered	unfiltered	filtered	unfiltered	filtered
Storm	04-23-98	1340	_	0.38	0.74	< 0.002	0.04NJ	0.05	< 0.02	< 0.005	0.037NJ	0.002J
Storm	04-23-98	1930	-	.12	.39	<.002	.076	.09	<.02	.014	.17	.003J
Storm	04-23-98	2110	-	.14	.44	.004	.077	.08	<.02	.026	.1	.003J
Storm	06-24-99	0750	0.004NJ	.025NJ	.69	.142	.11	.08	.017J	<.005	.29	.006
Storm	10-08-99	0930	<.016	.092J	.37	<.002	.11	.09	<.02	.007	.26	<.002
Storm	11-16-99	1030	<.016	<.17	.075J	<.002	.04J	.03	<.02	.056	.04J	<.002
Baseflow	08-17-99	1040	<.016	<.16	.028J	<.002	.013J	.07	.057J	.004J	.12	<.002

					Kelsey Creek (s	ite 4)				
Stream condition	Date	Collection method	2,4-D, unfiltered	4-Nitrophenol, unfiltered	Aminomethyl- phosphonic acid, filtered	Carbaryl, filtered	Desulfinyl- fipronil amide, filtered	Diazinon, filtered	Dicamba, unfiltered	Dichlobenil, unfiltered
Storm	10-16-03	Auto sampler	0.19	0.047NJ	< 0.1	< 0.041	< 0.009	< 0.005	0.014NJ	0.12
Storm	11-18-03	Auto sampler	.13J	.1NJ	<.1	.009J	.004J	.024	.012NJ	<.31J
Baseflow	07-08-03	DH-81	.021NJ	<.28	.1	<.041	<.009	<.005	.011NJ	<.065
Baseflow	08-05-03	DH-81	.15J	<.27	.1	<.041	<.009	<.005	.01J	<.063
Stream condition	Date	Collection method	Fipronil, filtered	Glyphosate, filtered	MCPA, unfiltered	MCPP, unfiltered	Pentachloro- phenol, unfiltered	Prometon, filtered	Trichlopyr, unfiltered	Trifluralin, filtered
Storm	10-16-03	Auto sampler	0.004J	0.5	0.061J	0.1J	0.042J	0.02	0.12	0.005J
Storm	11-18-03	Auto sampler	<.016	.7	.035J	.039J	.075J	.008	.091J	.006J
Baseflow	07-08-03	DH-81	<.007	.4	<.33	<.33	.02J	<.01	.031J	<.009
Baseflow	08-05-03	DH-81	<.007	<.1	<.31	.071J	.021J	<.01	.033J	<.009

Table 6. Concentrations of pesticides and pesticide transformation products detected in stream water samples during storms and during baseflow at sites on streams in King County, Washington, 1998–2003.—Continued

				Lewis Cree	k (site 7)			
Stream condition	Date	Time	Collection method	2,4-D, unfiltered	2,6-Dichloro- benzamide, unfiltered	4-Nitrophenol, unfiltered	Atrazine, filtered	Chlorpyrifos, unfiltered
Storm	04-23-98	1340	DH-81	0.027J	0.004NJ	0.069	< 0.001	_
Storm	04-23-98	1550	DH-81	<.041	.016J	.021J	.002J	-
Storm	04-23-98	2020	DH-81	.12	.039J	.048J	.002J	_
Storm	06-24-99	1110	DH-81	.54	.091J	.058NJ	<.001	0.004NJ
Stream	Date	Time	Desethylatrazine,	Dia	zinon	Dicamba,	EPTC,	Malathion,
condition	Duto		filtered	filtered	unfiltered	unfiltered	filtered	unfiltered
Storm	04-23-98	1340	< 0.002	0.238	_	< 0.04	0.005	_
Storm	04-23-98	1550	<.002	.105	_	<.041	<.002	-
Storm	04-23-98	2020	.002J	.094	-	<.04	<.002	_
Storm	06-24-99	1110	<.002	.073	0.049J	.032J	<.002	0.002NJ
Stream condition	Date	Time	MCPA, unfiltered	MCPP, unfiltered	Pentachloro- phenol, unfiltered	Prometon, filtered	Simazine, filtered	Trichlopyr, unfiltered
Storm	04-23-98	1340	0.018NJ	0.061NJ	0.016J	< 0.02	< 0.005	< 0.034
Storm	04-23-98	1550	.041J	.11	<.02	.01J	.002J	<.034
Storm	04-23-98	2020	.013NJ	.13	.021NJ	.01J	<.005	.022NJ
Storm	06-24-99	1110	.079J	.77	.024NJ	.01J	<.005	.18

					Little	e Bear Creek (s	site 9)					
Stream condition	Date	Time	Collection method	2,4-D, unfiltered	2,6-Dichloro- benzamide, unfiltered	4-Nitrophenol unfiltered	Aminomethyl ′phosphonic acid, filtered	Atrazine, filtered	Bromacil, unfiltered	Caffeine, unfiltered	Carbaryl, filtered	Desethyl- atrazine, filtered
Storm	05-03-00	1100	Auto sampler	0.23	_	< 0.14	_	0.005	< 0.081	_	0.018J	< 0.002
Storm	05-03-00	1340	DH-81	.18	_	<.15	_	<.005	<.083	_	<.020	<.002
Storm	10-09-00	1315	Auto sampler	.52	_	.25	_	<.007	<.095	-	<.041	<.006
Storm	06-28-02	2145	Auto sampler	3.3	_	<.33	0.4	<.008	<.086	0.37J	.032J	<.006
Storm	11-12-02	1230	Auto sampler	.37	_	.23J	.1	<.007	<.069	_	.007J	<.006
Baseflow	06-27-00	1130	DH-81	<.100	_	<.18	_	<.001	<.089	_	<.003	.003J
Baseflow	07-10-02	1115	DH-81	.12J	_	<.27	<.1	.002J	<.083	_	<.041	<.006
Baseflow	08-21-02	1130	DH-81	.041J	0.01J	<.29	.1	<.007	.018J	-	<.041	<.006
Stream	Dete	T	D	iazinon	Dica	mba, Dio	hlobenil, D	ichlorprop,	Diuron,	Glypl	hosate,	Malathion,

	11-4-				-	-				-
condition	Date	Time	filtered	unfiltered	unfiltered	unfiltered	unfiltered	unfiltered	filtered	filtered
Storm	05-03-00	1100	0.008	0.01J	< 0.078	0.029J	< 0.086	< 0.24	_	< 0.005
Storm	05-03-00	1340	.007	.0066J	<.083	.011J	<.092	<.25	_	<.005
Storm	10-09-00	1315	<.005	.0098J	.012J	.034J	<.12	<.21	_	<.027
Storm	06-28-02	2145	.004J	<.017J	.041NJ	.019J	.2J	<.13	2.0	.016J
Storm	11-12-02	1230	.005	<.014	.032NJ	.095	<.17	<.10	.3	<.027
Baseflow	06-27-00	1130	<.002	.0057J	<.1	.06	<.11	<.13	_	<.005
Baseflow	07-10-02	1115	.004J	.047J	<.16	<.042	<.17	<.13	<.1	<.027
Baseflow	08-21-02	1130	<.005	<.017	.0034NJ	<.043	<.18	.084NJ	.1	<.027
						D (11				

Stream condition	Date	Time	MCPA, unfiltered	MCPP, unfiltered	Napropamide, filtered	phenol, unfiltered	Prometon, filtered	Simazine, filtered	Tebuthiuron, filtered	Trichlopyr, unfiltered
Storm	05-03-00	1100	0.02NJ	0.17	< 0.003	0.092	0.01J	< 0.010	0.01	0.18
Storm	05-03-00	1340	<.17	.057J	<.003	.027J	.01J	<.005	.02	.15
Storm	10-09-00	1315	<.23	.20J	<.007	.052J	.02	<.011	<.02	.74
Storm	06-28-02	2145	<.38	.29J	<.007	.072J	.01J	.011	<.02	2.7
Storm	11-12-02	1230	<.32	.029J	.015	.058J	.01J	<.005	.03	.39
Baseflow	06-27-00	1130	<.20	<.20	<.003	<.050	Μ	.005	.01J	<.084
Baseflow	07-10-02	1115	.016J	.025J	<.007	.0063NJ	.01J	<.005	.01J	0.048J
Baseflow	08-21-02	1130	.047J	.039J	<.007	.012J	<.01	<.005	<.02	0.031J

Table 6. Concentrations of pesticides and pesticide transformation products detected in stream water samples during storms and during baseflow at sites on streams in King County, Washington, 1998–2003.—Continued

				(Replicat	Lyon Cree te sample was c	k at 178th (site ollected on 06	12) /24/99; see tabl	e 4)			
Stream condition	Date	Time	Collection method	2,4-D, unfiltered	2,6-Dichloro- benzamide, unfiltered	4,4'-DDD, unfiltered	4,4'-DDE, unfiltered	4,4'-DDT, unfiltered	4-Nitrophe unfiltere	nol, Atrazine d filtered	, Carbaryl, filtered
Storm	05-14-98	0540	DH-81	0.29	0.031J	_	_	_	0.047N	J 0.019	0.012J
Storm	05-14-98	0640	DH-81	.14	.031J	_	_	_	.036J	.021	.011J
Storm	06-24-99	0800	DH-81	.34	.086J	< 0.011	< 0.011	< 0.011	.1J	<.001	.121J
Storm	10-08-99	0940	DH-81	.69	.023J	<.012	<.012	<.012	<.14	<.001	<.020
Storm	11-16-99	1730	DH-81	.034J	_	.0021J	.0021J	.041J	.12NJ	<.001	<.003
Baseflow	08-17-99	1240	DH-81	.015J	.051J	<.011	<.011	.002J	<.15	.004	<.003
Stream	Date	Time	Chlorpyrifos,	Di	azinon	Dicamba,	Dichlober	nil, Dichle	orprop,	Diuron,	Malathion,
condition	Buto		unfiltered	filtered	unfiltered	unfiltered	unfiltere	d unfil	tered	unfiltered	filtered
Storm	05-14-98	0540	_	0.305	_	0.036J	0.061	< 0.0	43	<0.12	0.033
Storm	05-14-98	0640	_	.425	_	.02J	.063	.0	081J	<.12	.037
Storm	06-24-99	0800	0.003NJ	.194	0.16	.027J	.24	.0	32J	.007NJ	<.030
Storm	10-08-99	0940	<.017	.073	.045	.016J	.31	<.0	86	<.13	.017
Storm	11-16-99	1730	<.016	.014	.014J	<.081	.065	<.0	89	<.12	<.005
Baseflow	08-17-99	1240	<.016	<.002	<.016	<.085	.033	<.0	93	<.12J	<.005
Stream	Date	Time	Malathion,	MCPA,	МСРР,	Napro-	Pentachloro-	Prometon,	Si	mazine	Trichlopyr,
condition	Dute	TIME	unfiltered	unfiltered	unfiltered	filtered	unfiltered	filtered	filtered	unfiltered	unfiltered
Storm	05-14-98	0540	_	0.025NJ	0.15	0.016	0.036	0.03	4.73	3.3	0.13
Storm	05-14-98	0640	_	.026J	.13	.014	.042	.04	4.99	3.3	.091
Storm	06-24-99	0800	0.004NJ	<.18	.57	<.003	.1	.11	1.03	.25	.18
Storm	10-08-99	0940	<.017	<.16	.52	<.030	.066	.02	.223	<.021J	.29
Storm	11-16-99	1730	<.016	<.16	.18	<.003	.098	.02	<.005	<.020J	.058J
Baseflow	08-17-99	1240	<.016	<.17	<.17	<.003	.013J	.01J	.416	.28	.041J

	Lyon Creek at Lake Forest Park (site 13)													
Stream	Data	T :	Collection	2,4-D,	4-Nitrophenol,	Atra	azine	Bromacil,	Carbaryl,	Chlorpyrifos,				
condition	Date	lime	method	unfiltered	unfiltered	filtered	unfiltered	unfiltered	filtered	unfiltered				
Storm	05-03-00	0930	Auto sampler	0.2	< 0.15	0.017	0.0099J	< 0.081	0.207J	0.003NJ				
Storm	05-03-00	1345	DH-81	.29	<.16	.008	.014NJ	.013NJ	.164J	.003NJ				
Storm	10-09-00	1230	Auto sampler	.2	.29	<.007	<.071J	<.11	<.060	<.022				
Baseflow	06-27-00	1115	DH-81	<.11	<.19	<.001	.004NJ	.05J	<.003	<.018				

Stream	Dete	Time	Desethylatrazine,	Diazi	non	Dicamba,	Dichlobenil,	MCPA,	MCPP,	
condition	Dale	nme	filtered	filtered	unfiltered	unfiltered	unfiltered	unfiltered	unfiltered	
Storm	05-03-00	0930	< 0.002	0.059	0.054	< 0.083	0.11	0.056J	0.084J	
Storm	05-03-00	1345	<.002	.099	.13	<.089	.1	.036NJ	.18	
Storm	10-09-00	1230	<.006	.044	.031J	.026J	.071	<.22	.39	
Baseflow	06-27-00	1115	.003J	.005	.0072J	<.11	.013J	<.21	<.21	
_			Dantaahlaranhual	Promoton	Sim	azine	Tehuthiuron	Trichlonyr	Trifluralin.	
Stream	Data	T :	Pentachiorophnol,	i rometon,			robutinuron,	moniopy,		
Stream condition	Date	Time	unfiltered	filtered	filtered	unfiltered	filtered	unfiltered	filtered	
Stream condition Storm	Date 05-03-00	Time 0930	0.026J	filtered 0.03	filtered 0.033	unfiltered 0.015J	filtered <0.01	0.1	filtered	
Storm Storm	Date 05-03-00 05-03-00	Time 0930 1345	0.026J .034J	0.03 .04	filtered 0.033 .045	unfiltered 0.015J .046	<0.01 <.01	0.1 .061J	filtered <0.002 <.002	
Stream condition Storm Storm Storm	Date 05-03-00 05-03-00 10-09-00	Time 0930 1345 1230	0.026J .034J .12	0.03 .04 .02	filtered 0.033 .045 .1	unfiltered 0.015J .046 <.028	<0.01 <.01 <.02	0.1 .061J .1	filtered <0.002 <.002 <.009	

Table 6. Concentrations of pesticides and pesticide transformation products detected in stream water samples during storms and during baseflow at sites on streams in King County, Washington, 1998–2003.—Continued

				May Creek (site 3)				
Stream condition	Date	Collection method	2,4-D, unfiltered	4-Nitrophenol, unfiltered	Carbaryl, filtered	Diazinon, filtered	Dicamba, unfiltered	Glyphosate, filtered
Storm	10-16-03	Auto sampler	0.056J	0.047NJ	0.027J	0.007	<0.16	0.2
Storm	11-18-03	Auto sampler	.073J	.064NJ	<.041	<.005	.0075NJ	.2
Baseflow	07-08-03	DH-81	<.16	<.28	<.041	<.005	<.16	<.1
Baseflow	08-05-03	DH-81	<.16	<.29	<.041	<.005	<.16	<.1
Stream condition	Date	Collection method	MCPP, unfiltered	Metolachlor, filtered	Pentachlo unfil	prophenol, tered	Prometon, filtered	Trichlopyr, unfiltered
Storm	10-16-03	Auto sampler	0.047J	0.273	0.0	66J	0.01J	0.062J
Storm	11-18-03	Auto sampler	.05 J	.095	.0	37J	.01	.031J
Baseflow	07-08-03	DH-81	<.32	.011J	<.0	18	<.01	<.13
Baseflow	08-05-03	DH-81	<.33	<.013	<.0	82	<.01	<.14

	North Creek (site 10)													
Stream condition	Date	Collection method	2,4-D, unfiltered	2,6-Dichloro- benzamide, unfiltered	4-Nitrophenol, unfiltered	Atrazine, filtered	Caffeine, unfiltered	Carbaryl, filtered						
Storm	06-28-02	Auto sampler	0.47	_	< 0.32	< 0.007	0.23J	0.017J						
Storm	11-12-02	Auto sampler	<.044	-	.13J	<.007	-	.011J						
Baseflow	07-10-02	DH-81	.053J	_	<.30	.002J	_	.010J						
Baseflow	08-21-02	DH-81	<.17	0.019J	<.30	<.007	-	<.041						

Stream condition	Dete	Collection	Diazinon		Dicamba,	Dichlobenil,	Glyphosate,	Malathion,	MCPP,	
	Date	method	filtered	unfiltered	unfiltered	unfiltered	filtered	filtered	unfiltered	
Storm	06-28-02	Auto sampler	0.007	<0.020J	0.035NJ	0.021J	0.1	0.010J	0.24J	
Storm	11-12-02	Auto sampler	.011	<.014	<.19	.024	<.1	<.027	.091J	
Baseflow	07-10-02	DH-81	.009	.076J	<.17	.003J	<.1	<.027	.037J	
Baseflow	08-21-02	DH-81	<.005	.14J	<.17	<.045	<.1	<.027	.014NJ	

Stream	Data	Collection	Pentachlorophenol,	Pro	meton	Simazine,	Tebuthiuron,	Trichlopyr, unfiltered	
condition	Date	method	unfiltered	filtered	unfiltered	filtered	filtered		
Storm	06-28-02	Auto sampler	0.11	0.04	< 0.025	0.007	< 0.02	0.11J	
Storm	11-12-02	Auto sampler	.058J	.02	<.018	.008	<.02	.11J	
Baseflow	07-10-02	DH-81	.0098J	.02	.04NJ	.052	.02J	.27	
Baseflow	08-21-02	DH-81	.014J	<.01	<.022	<.005	<.02	.017NJ	

Rock Creek (site 2)										
Stream condition	Date	Collection method	4-Nitrophenol, unfiltered	Dicamba, unfiltered						
Storm	05-14-98	DH-81	< 0.071	< 0.041						
Storm	06-24-99	DH-81	.037NJ	.011J						
Storm	10-08-99	DH-81	<.14	<.081						
Storm	11-16-99	DH-81	<.15	<.083						
Baseflow	08-17-99	DH-81	<.16	<.089						

Swamp Creek (site 11)												
Stream		T :	Collection	2,4-D,	4-Nitropheno	ol, Atrazine,	Dia	zinon	Dichlobenil,	Mala	Malathion	
condition	Date	Time	method	unfiltered unfiltered		unfiltered	filtered	unfiltered	unfiltered	filtered	unfiltered	
Storm	05-03-00	1200	Auto sampler	0.058J	< 0.14	< 0.020	0.025	0.019	0.025J	0.032	0.013J	
Storm	05-03-00	1500	DH-81	.055J	<.15	<.020	.03	.021	.018J	.021	.0069J	
Storm	10-09-00	1340	Auto sampler	.12	.17J	<.023	.029	.017J	.017J .023J		<.018	
Baseflow	06-27-00	1310	DH-81	<.11	<.19	.007NJ	.004J	.0044J	.021J	<.005	<.019	
Stream condition	Date	Time	MCPA, unfiltered	u	MCPP, nfiltered	Pentachlorophen unfiltered	nol, Prometon, filtered		Simazine, filtered	Ti u	Trichlopyr, unfiltered	
Storm	05-03-00	1200	0.026J	().068J	0.02J		0.02	< 0.010	0.12		
Storm	05-03-00	1500	.031J		.066J	.014J		.02	<.010		.13	
Storm	10-09-00	1340	<.22		.14J	.079		.01J	<.011		.11	
Baseflow	06-27-00	1310	<.21	<	<.21	<.054	.01J		.007		<.09	

Table 6. Concentrations of pesticides and pesticide transformation products detected in stream water samples during storms and during baseflow at sites on streams in King County, Washington, 1998–2003.—Continued

					Taylor Cr	eek (si	te 1)								
Stream conditio	n D	Date		Collection method		2,4-D, 4-Nitropheno Infiltered unfiltered		ol,	l, Dicamba, unfiltered		Glyphosate, filtered		e,	MCPA, unfiltered	
Storm	10-	10-16-03 Auto samp		pler	ler 0.11J		0.035NJ		0.014NJ		0.2			0.027J	
Storm	11-18-03 Aut		Auto sam	Auto sampler		.049J <		<.27 .00		078NJ		.1		.023NJ	
Baseflow	07-0	08-03	DH-81		<.18		<.32		<.1	8		<.1		<.36	
Baseflow	08-05-03 DH-		DH-81		<.16		<.28		<.1	6		<.1		<.33	
Stream condition	Date		MCPP, unfiltered		Metolachlor, filtered		Penta	Pentachlorophenol, unfiltered		ol, F	, Prometon, filtered		Tri ur	Trichlopyr, unfiltered	
Storm	10-1	6-03	0.0771		0.010	0.0101		0.0291			0.19			0.061J	
Storm	11-1	8-03		.056J	.007.	ſ		.091			.03			.045J	
Baseflow	07-0	08-03	<		<.013			.011.	J		<.01			<.15	
Baseflow	08-0	05-03	<	.33	<.013			.0049	9J		.01.	ſ		<.14	
				U	Innamed Site	@ 124t	h (site 14	l)							
Stream condition	Date C	ollection method	2,4-D, unfiltere	2,6-Dichlor benzamide	o- 4-Nitro- e, phenol,	Amin phos	ometyl- phonic	Atrazi filter	ine, red	Caffeine, unfiltered	, Car I filt	baryl, tered	Car	bofuran	
				unfiltered	unfiltered	acid,	filtered						filtered	unfiltered	
Storm	06-28-02 D	ip	0.45	-	< 0.29	().5	< 0.0	07	0.31J	0.	098J	< 0.020	-	
Storm	11-12-02 D	ip	.041J	_	.23J		.5	<.0	07	.11J		047J	<.020	-	
Baseflow	09-11-00 D	ip	.28	0.21J	<.19		-	<.0	06	-	<.	003	.229	0.089NJ	
Baseflow	07-10-02 D	ip	.16J	.11J	<.30		.8	.0	03J	-		064J	<.020	-	
Baseflow	08-21-02 D	ip	.12J	.016J	<.27	1	.3	.0	04J	-		035J	<.020	-	
Stream	Date		Chlorpyrifos		Diazinon			Dicamba, Dic		Dichlo	chlobenil, Dichlor		orprop,	prop, Diuron,	
condition	Duto	filtere	ed u	nfiltered	filtered	unfiltered		unfiltered		unfiltered		unfi	ltered	unfiltered	
Storm	06-28-02	0.012	2 <	<0.016J	0.005	0.	21J	<0.	16	0.0	79	0.	033J	< 0.12	
Storm	11-12-02	.003	3	<.014	<.005	<.	014		088J	<.0	36	<.	18	<.11	
Baseflow	09-11-00	.00	5	<.019	.586		47		38	.0	41J	<.	12	.052NJ	
Baseflow	07-10-02	.01	15 .0028J		.014	.014 .19J		<.17		<.0	<.001 <.1		19	<.13	
Baseflow	08-21-02	.01	5	.0089J	<.005	<.	015	<.	<.15		.0082J		17	.075NJ	
Stream	Etho		nesate,	Glyphosate	Mala		thion			MCPA,		МСРР,		Metalaxyl,	
condition		unfil	tered	filtered	filtere	ed	unfil	tered		unfiltered		unfiltei	red	unfiltered	
Storm	06-28-02	-		1.2	0.21	6	0.1	12J		< 0.33		0.092	2J	< 0.12	
Storm	11-12-02	-	_		<.02	7	<.()14		.079J		.079	9NJ	<.11	
Baseflow	09-11-00	09-11-00 2.4NJ		_	<.00	<.005		<.019		<.22		<.22		.15	
Baseflow	07-10-02	07-10-02 –		.8	.02	.029)045J	+5J <.34		<.34			<.13	
Baseflow	08-21-02	08-21-02 –		1.3	<.02	<.027)15	5 <.31		.048		8J	<.11	
Stream condition	Date	Metola filter	chlor, (ed	Dxadiazon, unfiltered	Pentachlorop unfiltere	henol, d	Promet filter	ton, ed	Simaz filter	ine, Tel ed f	outhiuro filtered	on, Tr u	richlopyr, nfiltered	Trifluralin, filtered	
Storm	06-28-02	< 0.01	3	_	0.13		0.0	3	< 0.00)5	< 0.02		0.31	< 0.009	
Storm	11-12-02	<.01	3	_	.092		.0	1J	.0	l	.05		.12J	<.009	
Baseflow	09-11-00	.00)7	_	.029NJ		.0	1J	<.00)5	.08J		.28	.003J	
Baseflow	07-10-02	.00)4J	_	.021NJ		.0	1J	.00)7	.06		.036J	<.009	
Baseflow	08-21-02	.00)7J	0.066J	.015NJ		.0.	3	.00)7	.02		.11J	<.009	

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