Appendixes A–J

Appendix A. Catchment Area and Upstream Land Use for Water Sampling Sites in the Hood River Basin, Oregon.

[**Abbreviations:** ODEQ, Oregon Department of Environmental Quality; ODFW, Oregon Department of Fish and Wildlife; km^2, square kilometers; RM, river mile; Ppl, Pacific Power and Light]

Map ID	ODEQ station ID	Site name (full)	Site name (short)	Catchment area (km^2)	Percentage[1]					
					Forest	Urban	Orchard	Non-orchard agriculture	Water	Other
1	13181	Baldwin Creek at end of Baldwin Creek Road	Baldwin	15.01	73	1	17	8	0	1
2	25133	Dog River below Puppy Creek confluence	Dog	32.76	99	0	0	0	0	0
3	25124	Evans Creek at bridge (Baseline Road)	Evans	5.81	70	0	15	14	1	1
4	13138	East Fork Hood River at County Gravel Pit (River Mile 0.75)	Hood, East Fork	265.9	80	0	6	6	2	6
5	13139	Middle Fork Hood River at River Mile 1.0 (ODFW Smolt Trap)	Hood, Middle Fork	106.39	89	0	1	3	2	6
6	13158	Hood River downstream of Ppl Powerdale Powerhouse	Hood, mouth	879.41	81	0	8	6	1	3
7	12012	Hood River at footbridge downstream of I-84	Hood, mouth	879.41	81	0	8	6	1	3
8	10681	West Fork Hood River at mouth	Hood, West Fork, mouth	264.93	96	0	0	1	1	1
9	34787	West Fork Hood River at Moving Falls (RM 2.5)	Hood, West Fork, RM 2.5	264.93	96	0	0	1	1	2
10	13140	West Fork Hood River at Lost Lake Road (River Mile 4.7)	Hood, West Fork, RM 4.7	178.55	96	0	0	1	2	2
11	21634	Indian Creek near mouth	Indian	16.86	19	4	40	34	0	1
12	11972	Lenz Creek at mouth	Lenz	8.63	12	1	56	26	0	1
13	31499	Middle Neal Creek at Hwy 35	Neal, middle	66.77	89	0	6	4	0	1
14	13141	Neal Creek at mouth (upstream of bridge)	Neal, mouth	85.93	75	0	15	8	0	1
15	25123	Upper Neal Creek above agri-culture diversion	Neal, upper, above diversion	20.95	97	0	0	2	0	0
16	30174	Upper Neal Creek, downstream	Neal, upper, below diversion	52.88	95	0	1	2	0	1
17	34788	Rogers Spring Creek at Red Hill Driver (RM 0.25)	Rogers	0.58	9	0	4	10	0	76

[1]Percentages may not total 100 due to rounding or the exclusion of minor land use categories from this table.

Appendix B. Number of Samples Collected in the Hood River Basin, Oregon, 1999–2009, by Site, Month, and Year

[**Abbreviations:** –, no samples collected]

Site and year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual total
Baldwin	–	–	7	5	5	15	4	3	11	2	–	–	52
2003	–	–	–	4	–	3	4	3	3	2	–	–	19
2004	–	–	–	–	3	5	–	–	4	–	–	–	12
2005	–	–	7	1	1	5	–	–	4	–	–	–	18
2006	–	–	–	–	1	2	–	–	–	–	–	–	3
Dog	–	–	9	11	3	10	4	–	4	–	–	–	41
2001	–	–	8	1	–	2	–	–	–	–	–	–	11
2002	–	–	1	6	–	–	–	–	–	–	–	–	7
2003	–	–	–	4	–	3	4	–	–	–	–	–	11
2004	–	–	–	–	3	5	–	–	4	–	–	–	12
Evans	–	–	18	13	5	21	10	3	11	2	–	–	83
2001	–	–	9	2	–	3	–	–	–	–	–	–	14
2002	–	–	1	6	–	2	6	–	–	–	–	–	15
2003	–	–	1	4	–	3	4	3	3	2	–	–	20
2004	–	–	–	–	3	5	–	–	4	–	–	–	12
2005	–	–	7	1	1	6	–	–	4	–	–	–	19
2006	–	–	–	–	1	2	–	–	–	–	–	–	3
Hood, East Fork	–	1	9	10	1	4	6	–	–	1	–	–	32
1999	–	–	–	–	–	–	–	–	–	1	–	–	1
2000	–	1	8	4	1	2	–	–	–	–	–	–	16
2002	–	–	1	6	–	2	6	–	–	–	–	–	15
Hood, Middle Fork	–	–	8	4	1	3	–	–	–	1	–	–	17
1999	–	–	–	–	–	–	–	–	–	1	–	–	1
2000	–	–	8	4	1	3	–	–	–	–	–	–	16
Hood, mouth	–	1	24	18	15	18	–	–	9	3	1	1	90
1999	–	–	3	–	–	–	–	–	–	1	–	–	4
2000	–	1	1	–	2	1	–	–	–	–	–	–	5
2001	–	–	4	2	1	4	–	–	–	–	–	–	11
2002	–	–	4	3	–	–	–	–	–	–	–	–	7
2005	–	–	5	–	–	6	–	–	4	–	–	–	15
2006	–	–	–	–	1	2	–	–	4	–	–	–	7
2007	–	–	2	3	4	1	–	–	–	1	1	1	13
2008	–	–	3	5	4	–	–	–	–	–	–	–	12
2009	–	–	2	5	3	4	–	–	1	1	–	–	16
Hood, West Fork, mouth	–	–	4	9	3	3	–	–	1	1	–	–	21
2008	–	–	2	4	–	–	–	–	–	–	–	–	6
2009	–	–	2	5	3	3	–	–	1	1	–	–	15
Hood, West Fork, RM 2.5	–	–	–	1	4	1	–	–	–	–	–	–	6
2008	–	–	–	1	4	–	–	–	–	–	–	–	5
2009	–	–	–	–	–	1	–	–	–	–	–	–	1
Hood, West Fork, RM 4.7	–	–	12	4	1	2	–	–	–	1	–	–	20
1999	–	–	3	–	–	–	–	–	–	1	–	–	4
2000	–	–	8	4	1	2	–	–	–	–	–	–	15
2001	–	–	1	–	–	–	–	–	–	–	–	–	1
Indian	–	–	4	–	1	–	–	–	–	–	–	–	5
1999	–	–	3	–	–	–	–	–	–	–	–	–	3
2000	–	–	1	–	1	–	–	–	–	–	–	–	2

Appendix B. Number of samples collected in the Hood River basin, Oregon, 1999–2009, by site, month, and year.—Continued

[**Abbreviations:** –, no samples collected]

Site and year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual total
Lenz	–	–	29	13	15	35	2	3	13	4	–	–	114
2001	–	–	9	1	2	5	–	–	–	–	–	–	17
2002	–	–	6	2	1	5	2	–	–	–	–	–	16
2003	–	–	2	2	–	8	–	3	3	2	–	–	20
2004	–	–	5	–	3	5	–	–	4	–	–	–	17
2005	–	–	5	–	1	6	–	–	5	1	–	–	18
2006	–	–	–	–	1	2	–	–	–	–	–	–	3
2008	–	–	–	3	4	–	–	–	–	–	–	–	7
2009	–	–	2	5	3	4	–	–	1	1	–	–	16
Neal, middle	–	–	12	13	13	18	–	–	13	2	1	1	73
2004	–	–	–	–	–	5	–	–	4	–	–	–	9
2005	–	–	5	–	1	6	–	–	4	–	–	–	16
2006	–	–	–	–	1	2	–	–	4	–	–	–	7
2007	–	–	2	3	4	1	–	–	–	1	1	1	13
2008	–	–	3	5	4	–	–	–	–	–	–	–	12
2009	–	–	2	5	3	4	–	–	1	1	–	–	16
Neal, mouth	–	1	45	23	22	41	3	3	17	5	1	1	162
1999	–	–	3	–	–	–	–	–	–	1	–	–	4
2000	–	1	8	4	2	6	1	–	–	–	–	–	22
2001	–	–	8	1	2	5	–	–	–	–	–	–	16
2002	–	–	6	3	1	5	2	–	–	–	–	–	17
2003	–	–	3	2	1	7	–	3	3	2	–	–	21
2004	–	–	5	–	3	5	–	–	4	–	–	–	17
2005	–	–	5	–	1	6	–	–	5	–	–	–	17
2006	–	–	–	–	1	2	–	–	4	–	–	–	7
2007	–	–	2	3	4	1	–	–	–	1	1	1	13
2008	–	–	3	5	4	–	–	–	–	–	–	–	12
2009	–	–	2	5	3	4	–	–	1	1	–	–	16
Neal, upper, above diversion	–	–	32	9	13	31	6	3	15	3	1	–	113
2001	–	–	9	1	2	5	–	–	–	–	–	–	17
2002	–	–	6	2	1	5	6	–	–	–	–	–	20
2003	–	–	3	2	1	7	–	3	3	2	–	–	21
2004	–	–	5	–	3	5	–	–	4	–	–	–	17
2005	–	–	7	1	1	6	–	–	4	–	–	–	19
2006	–	–	–	–	1	2	–	–	4	–	–	–	7
2007	–	–	2	3	4	1	–	–	–	1	1	–	12
Neal, upper, below diversion	–	–	15	15	17	25	–	3	16	4	1	1	97
2003	–	–	3	2	1	7	–	3	3	2	–	–	21
2004	–	–	–	–	3	5	–	–	4	–	–	–	12
2005	–	–	5	–	1	6	–	–	4	–	–	–	16
2006	–	–	–	–	1	2	–	–	4	–	–	–	7
2007	–	–	2	3	4	1	–	–	–	1	1	1	13
2008	–	–	3	5	4	–	–	–	–	–	–	–	12
2009	–	–	2	5	3	4	–	–	1	1	–	–	16
Rogers	–	–	5	10	7	3	–	–	1	1	–	–	27
2008	–	–	3	5	4	–	–	–	–	–	–	–	12
2009	–	–	2	5	3	3	–	–	1	1	–	–	15
Total - all sites and years	–	3	233	158	126	230	35	18	111	30	5	4	953

Appendix C. Pesticide Products Suitable for the Major Land Uses of the Hood River Basin, Oregon

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable for the listed application; – pesticide not suitable for the listed application, not analyzed in this project, or example product names not provided]

Pesticide	Product names	Blueberries	Forestry	Grapes	Household	Orchards	Pasture, hay, range	Rights-of-way	Years analyzed
Coddling moth mating disruption									
(Z)-I I-Tetradecen-I-yl Acetate	Nomate	–	–	–	–	X	–	–	–
E-11-Tetradecen-1-yl Acetate + (E,E)-9,11-Tetradecadien-1-yl Acetate	Isomate	–	–	–	–	X	–	–	–
MCPA ester	Checkmate	–	–	–	–	X	–	–	–
Products for disease control									
1,3 dichloropropene	Telone II	X	–	X	–	–	–	–	–
Azoxystrobin	Abound	X	–	X	–	–	–	–	–
Bicarbonate products	Armicarb, Kaligreen, MilStop, Monterey Bi-Carb	–	–	X	–	X	–	–	–
Calcium polysulfide	lime sulfur	X	–	–	X	X	–	–	–
Chloropicrin	–	–	–	–	–	X	–	–	–
Dazomet	Basamid G	X	–	X	–	–	–	–	–
Dichloran	Botran	–	–	X	–	–	–	–	–
Dimethyl phenol	Gallex	X	–	–	–	–	–	–	–
Iprodione	Iprodione	X	–	X	–	–	–	–	–
Kaolin	Surround	–	–	X	X	X	–	–	–
Mancozeb	–	–	–	X	–	X	–	–	–
Metam sodium	Vapam, Sectagon 42, Metam CLR	–	–	X	–	X	–	–	–
Methyl bromide	–	–	–	X	–	X	–	–	–
Methyl phenol	Gallex	X	–	–	–	–	–	–	–
Mono- and dipotassium salts of phosphorous acid	Agri-Fos	X	–	–	–	–	–	–	–
Monopotassium phosphite + dipotassium phosphite	Fosphite	X	–	–	–	X	–	–	–
Sulfur products[1]	–	–	–	X	X	X	–	–	–
Fungicides									
Boscalid	Endura, Pristine	X	–	X	–	X	–	–	–
Captan	Captan, Captec	X	–	X	–	X	–	–	–
Chlorothalonil	Bravo Weather Stik	–	–	–	X	X	–	–	2009
Copper products	–	X	–	X	X	X	–	–	2000–01
Cyprodinil	Vangard, Switch	X	–	X	–	–	–	–	–
Dodine	Syllit	–	–	–	–	X	–	–	–
Fenarimol	Rubigan	–	–	X	–	X	–	–	2009
Fenbuconazole	Indar	X	–	–	–	X	–	–	–
Fenhexamid	Elevate, CaptEvate	X	–	X	–	X	–	–	–
Fludioxinil	Switch	X	–	–	–	–	–	–	–
Fosetyl-aluminum	Aliette	X	–	–	–	X	–	–	–
Kresoxim-methyl	Sovarn	–	–	X	–	–	–	–	–
Metalaxyl	Ridomil Gold	X	–	–	–	X	–	–	–
Metconazole	Quash	–	–	–	–	X	–	–	–
Myclobutanil	–	–	–	X	–	X	–	–	–
Potassium bicarbonate	Remedy	–	–	–	X	–	–	–	–
Propiconazole	Tilt	–	–	–	X	X	–	–	2009

Appendix C. Pesticide products suitable for the major land uses of the Hood River basin, Oregon.—Continued

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable for the listed application; – pesticide not suitable for the listed application, not analyzed in this project, or example product names not provided]

Pesticide	Product names	Blueberries	Forestry	Grapes	Household	Orchards	Pasture, hay, range	Rights-of-way	Years analyzed
Fungicides (Continued)									
Pyraclostrobin	–	X	–	–	–	X	–	–	2009
Pyrimethanil	Scala	–	–	X	–	–	–	–	–
Quinoxyfen	Quintec	–	–	X	–	X	–	–	–
Sodium, potassium, and ammonium phosphites	Phostrol	X	–	–	–	–	–	–	–
Sodium tatrathiocarbonate[1]	Enzone	–	–	X	–	–	–	–	–
Streptomycin	Agrimycin	–	–	–	–	X	–	–	–
Tebuconazole	Elite, Orius	–	–	X	X	X	–	–	–
Terramycin	Mycoshield	–	–	–	–	X	–	–	–
Thiophanate-methyl	–	–	–	X	X	X	–	–	–
Trifloxystrobin	–	–	–	X	–	X	–	–	–
Triflumizole	–	–	–	X	–	X	–	–	–
Triforine	Funginex	–	–	–	X	–	–	–	–
Ziram	–	X	–	X	–	X	–	–	–
Products to prevent fruit drop									
Aminoethoxyvinylglycine hydrochloride	Retain	–	–	–	–	X	–	–	–
Napthalene acetic acid (NAA)	NAA	–	–	–	–	X	–	–	–
Herbicides									
2,4-D	Crossbow, Curtail, Weedmaster, Pasturemaker, Cimarron Max	X	X	–	X	–	X	X	2009
2,4-D amine	Saber, Weed-Rhap A4d, Dri-Clean Herbicide	–	–	X	–	X	–	–	2009
2,4-D ester	Crossbow	–	–	–	–	–	–	X	2009
Aminopyralid	Milestone	–	–	–	X	–	X	–	–
Atrazine	–	–	X	–	–	–	–	–	1999–09
Bromacil	Krovar	–	–	–	–	–	–	X	2009
Carfentrazone	Aim	X	–	–	–	–	X	–	–
Chlorsulfuron	Telar	–	X	–	–	–	X	–	–
Clethodim	Envoy, Prism, Select	X	–	X	–	X	–	–	–
Clopyralid	–	–	X	–	X	X	X	–	–
Dicamba	Banvel, Vanquish, Clarity, Weedmaster, Pasturemaker, Latigo	–	–	–	X	–	X	–	–
Dichlobenil	Casoron	X	–	X	X	X	–	–	–
Diquat	Reglone	–	–	X	–	–	–	–	–
Diuron	–	X	–	X	–	X	–	X	2009
Fluazifop	Flusilade	X	–	X	–	X	–	–	–
Flumioxazin	Chateau	X	–	X	–	X	–	–	–
Fluroxypyr	Starane, Surmount, PastureGard	–	–	–	X	–	X	–	–
Glufosinate ammonium	Rely	X	–	X	–	X	–	–	–
Glyphosate	–	X	X	X	X	X	X	X	–
Halosulfuron	Sandea	–	–	–	–	X	–	–	–

Appendix C. Pesticide products suitable for the major land uses of the Hood River basin, Oregon.—Continued

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable for the listed application; – pesticide not suitable for the listed application, not analyzed in this project, or example product names not provided]

Pesticide	Product names	Blueberries	Forestry	Grapes	Household	Orchards	Pasture, hay, range	Rights-of-way	Years analyzed
Herbicides (Continued)									
Hexazinone	–	X	X	–	–	–	X	–	2009
Imazapic	Plateau	–	X	–	–	–	X	–	–
Imazapyr	–	–	X	–	–	–	–	–	2009
Isoxaben	Gallery or Gallery T&V, Showcase, Snapshot	X	–	X	–	X	–	–	–
MCPA	–	–	–	–	X	–	X	–	–
Mesotrione	Callisto	X	–	–	–	–	–	–	–
Metsulfuron methyl	Cimarron Max, Escort	–	X	–	X	–	X	X	–
Napropamide	Devrinol	X	–	X	–	X	–	–	2009
Norflurazon	Solicam	X	–	X	–	X	–	–	2009
Oryzalin	–	X	–	X	–	X	–	–	–
Oxyfluorfen	–	X	–	X	–	X	–	–	–
Paraquat	Gramoxone Inteon, Firestorm, Cyclone	–	–	X	–	X	X	–	–
Pendimethalin	Prowl H2	–	–	X	–	X	–	–	2009
Picloram	–	–	X	–	–	–	X	–	–
Pronamide	–	X	–	X	–	X	–	–	2009
Rimsulfuron	Matrix	–	–	X	–	X	–	–	–
Sethoxydim	Poast	X	X	X	–	X	–	–	–
Simazine	–	X	–	X	–	X	–	–	2009
Sulfometuron methyl	–	–	X	–	–	–	–	X	–
Tebuthiuron	Spike	–	–	–	–	–	X	–	2009
Terbacil	Sinbar	X	–	–	–	X	–	–	2009
Triasulfuron	Amber	–	–	–	–	–	X	–	–
Triclopyr	–	–	X	–	X	–	X	X	2009
Triclopyr ester	–	–	X	–	–	–	X	–	–
Trifluralin	Showcase, Snapshot, Treflan	X	–	X	–	X	–	–	2009
Insecticides									–
Abamectin	–	–	–	X	–	X	–	–	–
Acephate	–	–	–	–	X	–	–	–	–
Acetamiprid	Assail	X	–	X	X	X	–	–	–
Azadirachtin	Azatin, Neemix	X	–	X	–	–	–	–	–
Azinphos methyl	Guthion	–	–	–	–	X	–	–	1999–09
Bifenazate	Acramite	–	–	X	–	–	–	–	–
Bifenthrin	Brigade	–	–	X	X	–	–	–	–
Buprofezin	Applaud, Centaur	–	–	X	–	X	–	–	–
Carbaryl	Sevin	–	–	X	X	X	X	–	1999–00, 2009
Chlorantraniliprole	Voliam Flexi	–	–	X	–	–	–	–	–
Chlorpyrifos	Lorsban	–	–	X	–	X	–	–	1999–09
Clothianidin	–	–	–	–	–	X	–	–	–
Cyfluthrin	Baythroid	–	–	–	X	–	X	–	–
Deltamethrin	–	–	–	–	–	X	–	–	–
Diazinon	Diazinon	X	–	–	–	X	–	–	1999–09
Dicofol	Kelthane	–	–	X	–	X	–	–	–
Diflubenzuron	Dimilin	–	–	–	–	–	X	–	–
Dimethoate	Dimethoate	–	–	–	–	X	–	–	1999–09
Disulfoton	–	–	–	–	X	–	–	–	2009

Appendix C. Pesticide products suitable for the major land uses of the Hood River basin, Oregon.—Continued

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable for the listed application; – pesticide not suitable for the listed application, not analyzed in this project, or example product names not provided]

Pesticide	Product names	Blueberries	Forestry	Grapes	Household	Orchards	Pasture, hay, range	Rights-of-way	Years analyzed
Insecticides (Continued)									–
Dormant oil	–	–	–	–	X	–	–	–	–
Emamectin benzoate	Proclaim	–	–	–	–	X	–	–	–
Endosulfan	–	–	–	X	–	X	–	–	2009
Esfenvalerate	Asana	X	–	–	X	X	–	–	2003–09
Fenbutatin oxide	Vendex	–	–	X	X	X	–	–	–
Fenpropathrin	–	X	–	X	–	X	–	–	–
Gamma-cyhalothrin	–	–	–	–	–	X	–	–	–
Imidacloprid	–	X	–	X	X	X	–	–	2009
Indoxacarb	Avaunt	–	–	–	–	X	–	–	–
Insecticidal soap	M-Pede, others	X	–	X	X	–	–	–	–
Iron phosphate	–	–	–	–	X	–	–	–	–
Lambda-cyhalothrin	–	–	–	–	X	X	X	–	–
Malathion	Malathion	X	–	X	X	X	X	–	1999–09
Metaldehyde	–	–	–	–	X	–	–	–	–
Methidathion	Supracide	–	–	–	–	X	X	–	–
Methomyl	Lannate	X	–	X	–	–	–	–	2009
Methoxyfenozide	Intrepid	X	–	–	–	X	X	–	–
Methyl parathion	Methyl 4EC	–	–	–	–	–	X	–	1999–02, 2009
Novaluron	Rimon	–	–	–	–	X	–	–	–
Oxamyl	Vydate	–	–	–	–	X	–	–	2009
Permethrin	–	–	–	–	X	X	–	–	2009
Petroleum or paraffinic oil	Horticultural mineral oil	X	–	X	X	X	–	–	–
Phosmet	Imidan	X	–	X	–	X	–	–	2000–09
Pyrethrins/pyrethrum	–	–	–	–	X	–	–	–	–
Pyriproxyfen	–	X	–	–	–	X	–	–	2003–09
Rotenone	–	–	–	–	X	–	–	–	–
Rynaxypyr	–	–	–	–	–	X	–	–	–
Spinetoram	–	X	–	X	–	X	–	–	–
Spinosad	Entrust, Success	X	–	X	X	X	X	–	–
Spirodiclofen	Envidor	–	–	X	–	X	–	–	–
Spirotetramat	–	–	–	X	–	X	–	–	–
Tebufenozide	Confirm	X	–	–	–	–	–	–	–
Thiacloprid	–	–	–	–	–	X	–	–	–
Thiamethoxam	Axtara, Platinum, Voliam Flexi, Actara	X	–	X	–	X	–	–	–
Zeta cypermethrin	Mustang Max	X	–	–	–	–	X	–	–
Miticides									–
Acequinocyl	Kanemite	–	–	–	–	X	–	–	–
Bifenzate	Acramite	–	–	–	–	X	–	–	–
Clofentezine	Apollo	–	–	–	–	X	–	–	–
Etoxazole	Zeal	–	–	–	–	X	–	–	–
Fenpyroximate	Fujimite	–	–	–	–	X	–	–	–
Formetanate hydrochloride	Carzol	–	–	–	–	X	–	–	–
Hexythiazox	Onager, Savey	–	–	–	–	X	–	–	–
Propargite	Omite	–	–	–	–	X	–	–	–
Pyridaben	Nexter	–	–	–	–	X	–	–	–

[1] Also used as an insecticide.

Appendix D. U.S. Environmental Protection Agency and Oregon Water-Quality Criteria and U.S. Environmental Protection Agency Aquatic Life Benchmarks for Detected Pesticides

[**Source:** Oregon Department of Environmental Quality, 2004; U.S. Environmental Protection Agency, 2005a, 2009b. Concentrations in micrograms per liter; **Abbreviations:** USEPA, U.S. Environmental Protection Agency; CAS, Chemical Abstracts Service; CMC, criteria maximum concentration; CCC, criterion continuous concentration; –, no water-quality standard; <, less than; >, greater than]

Pesticide	CAS number	USEPA Office of Pesticide Programs Aquatic Life Benchmarks				USEPA Office of Water Aquatic Life Criteria		Oregon Water Quality Criteria (freshwater)	
		Fish		Invertebrates					
		Acute	Chronic	Acute	Chronic	Maximum Concentration (CMC)	Continuous Concentration (CCC)	Acute	Chronic
Atrazine	1912249	2,650	65	360	60	–	–	–	–
Azinphos-methyl	86500	0.18	0.055	0.08	0.036	–	–	–	0.01
Carbaryl	63252	110	6.8	0.85	0.5	–	–	–	–
Chlorpyrifos	2921882	0.9	0.57	0.05	0.04	0.083	0.041	0.083	0.041
DEET	134623	–	–	–	–	–	–	–	–
Diazinon	333415	45	< 0.55	0.105	0.17	0.17	0.17	–	–
Diuron	330541	355	26	80	160	–	–	–	–
Endrin	72208	–	–	–	–	0.086	0.036	0.18	0.0023
Fluometuron	2164172	320	–	110	–	–	–	–	–
Hexazinone	51235042	137,000	17,000	75,800	20,000	–	–	–	–
Imidacloprid	105827789	> 41,500	1,200	35	1.05	–	–	–	–
Malathion	121755	0.295	0.014	0.005	0.000026	–	0.1	–	0.1
Methomyl	16752775	160	12	2.5	0.7	–	–	–	–
Norflurazon	27314132	4,050	770	> 750	1,000	–	–	–	–
Phosmet	732116	35	3.2	1	0.8	–	–	–	–
Propiconazole	60207901	425	95	2,400	–	–	–	–	–
Propoxur	114261	1,850	–	5.5	–	–	–	–	–
Pyraclostrobin	175013180	–	–	–	–	–	–	–	–
Simazine	122349	3,200	960	500	2,000	–	–	–	–

Appendix E. Use and Environmental Fate Summaries for Detected Pesticides

Pesticide use, toxicity, and ecological transport and fate information provided below is from USEPA pesticide Reregistration Eligibility Decisions and other cited sources. USEPA toxicity classifications are assigned to fish and aquatic invertebrates based on reported acute toxicity (LC_{50} or EC_{50}) values and are summarized in table E1.

Table E1. U.S. Environmental Protection Agency toxicity classifications for fish and aquatic invertebrates.

[**Source:** U.S. Environmental Protection Agency, 2010b. **Abbreviations:** LC_{50}, 50 percent lethal concentration; EC_{50}, 50 percent effective concentration; mg/L, milligrams per liter; <, less than; >, greater than]

Toxicity Category	LC_{50} or EC_{50} (mg/L)
Very highly toxic	<0.1
Highly toxic	0.1–1
Moderately toxic	>1 <10
Slightly toxic	>10 <100
Practically nontoxic	>100

Atrazine (herbicide)

Atrazine is a triazine herbicide that targets grasses and broadleaf weeds (U.S. Environmental Protection Agency, 2006b). Statewide, it was the second most common pesticide applied for forestry in 2007 and 2008, although it is not commonly used in forests in the Hood River basin (Oregon Department of Agriculture, 2008, 2009; Doug Thiesies, Oregon Department of Forestry, oral commun., 2010). It is also approved for use on range grasses in Oregon under the U.S. Department of Agriculture's Conservation Reserve Program (U.S. Environmental Protection Agency, 2006b). It is mobile and persistent in the environment, with anaerobic half-lives of 330 and 578 days in water and sediment, respectively (U.S. Environmental Protection Agency, 2006b). Aerobic half-lives are estimated as 30 and 87–146 days in water and soil, respectively (U.S. Environmental Protection Agency, 2006b; California Environmental Protection Agency, 2010). In water and soils, it breaks down more slowly under neutral than acidic or basic conditions (U.S. Environmental Protection Agency, 2006b). Microbial metabolism is the main degradation pathway in aerobic environments (U.S. Environmental Protection Agency, 2006b). Atrazine easily washes off of foliage and commonly enters surface waters during the first precipitation event following application (U.S. Environmental Protection Agency, 2006b). Because it does not sorb strongly to soils, it is highly mobile in the environment and has potential to contaminate groundwater (U.S. Environmental Protection Agency, 2006b; California Environmental Protection Agency, 2010). Due to its potential to contaminate surface and groundwaters, atrazine is a Restricted Use Pesticide. It is moderately toxic to fish and moderately to highly toxic to freshwater invertebrates (U.S. Environmental Protection Agency, 2006b). Reductions in fish populations are estimated to occur at 62 µg/L (species not specified) (U.S. Environmental Protection Agency, 2006b).

Azinphos-methyl (insecticide)

Azinphos-methyl is an organophosphate insecticide used on fruit, nut, and vegetable crops, with no residential or public health uses (U.S. Environmental Protection Agency, 2006a). Historically, it has been widely used on orchards in the Hood River basin, but its use on all crops, including tree fruits and blueberries, will be phased out by September 30, 2012 (U.S. Environmental Protection Agency, 2009c; Steve Castagnoli, Oregon State University Extension Service, oral commun., 2010). Major pathways to surface waters are spray drift, runoff, and foliar wash-off (U.S. Environmental Protection Agency, 2006a). Azinphos-methyl is relatively insoluble in water, mobile and moderately persistent in soils, and like other organophosphates, degrades relatively quickly in water (U.S. Environmental Protection Agency, 2006a; Oregon State University, 1996a). Field studies indicate that degradation products are less toxic than the parent product (U.S. Environmental Protection Agency, 2006a). It is very highly toxic to freshwater fish and invertebrates and is a Toxicity Category I (highly toxic) pesticide, labeled as a Restricted Use Product (U.S. Environmental Protection Agency, 2006a).

Carbaryl (insecticide)

Carbaryl is a broad-spectrum carbamate insecticide. Orchard uses are primarily in apples and cherries. It is also a fruit thinning agent for apples. It is the active ingredient in several pesticide products registered for nonagricultural uses including turf, ornamental, and residential use. Carbaryl is moderately soluble in water and does not bind strongly to soils (it is mobile), but its adsorption tendency depends on the soil organic matter content (National Marine Fisheries Service, 2009). Half-lives for microbial metabolism are 4–5 days in aerobic soil and water (National Marine Fisheries Service, 2009). Carbaryl hydrolyzes quickly, with half-lives ranging from 3.2 hours to 12 days at basic and neutral pH (9 and 7, respectively) (National Marine Fisheries Service, 2009). The mean pH ranged from 7.1 to 8.0 in Hood River basin streams during the months when carbaryl was detected in those streams in 2009, so half-lives of carbaryl in the basin are expected to be in that range. In rivers of that pH range, it has been shown to degrade completely within 2 weeks (National Pesticide Information Center, 2003). Carbaryl's persistence in the environment is prolonged under acidic or anaerobic conditions (National Marine Fisheries Service, 2009). Its major degradation product is 1-napthanol, which further degrades to carbon dioxide (National Marine Fisheries Service, 2009). Carbaryl can be very highly toxic to fish (rainbow trout) and aquatic invertebrates. The USEPA and National Marine Fisheries Service are looking into its effects on endangered salmon (National Marine Fisheries Service, 2009). The major degradation product, 1-napthanol, ranges from moderately to highly toxic to aquatic organisms (National Marine Fisheries Service, 2009). As of May 2010, the USEPA is implementing new restrictions on the use of carbaryl and other n-methyl carbamate pesticides to protect threatened or endangered Pacific salmon and steelhead (U.S. Environmental Protection Agency, 2010a).

Chlorpyrifos (insecticide)

In the last decade, chlorpyrifos was one of the most commonly used organophosphate insecticides in the United States, with applications in food crops, cattle ear tags, containerized baits, wood treatments, golf courses, Christmas trees, and public health (mosquito and fire ant control). Its use has been phased out for structural control of termites and most residential applications (U.S. Environmental Protection Agency, 2006c). It can be used in the late winter and early spring on pears, cherries, and apples in the Hood River basin, with use patterns fluctuating annually (Steve Castagnoli, Oregon State University Extension Service, oral commun., 2010; Oregon State University Extension Service, 2010). The USEPA is currently planning to implement new restrictions on the use of chlorpyrifos near salmon-bearing streams (U.S. Environmental Protection Agency, 2010a). Chlorpyrifos has low mobility, strong sediment binding capacity, and low water solubility (U.S. Environmental Protection Agency, 2006c). It is moderately persistent in soils (U.S. Environmental Protection Agency, 2006c). Spray drift during application and adsorption to eroding soil are major pathways into surface waters (U.S. Environmental Protection Agency, 2006c). Its persistence in water depends on the formulation and environmental conditions, with faster degradation rates with increasing temperature and pH (Oregon State University, 1996b). Volatilization seems to be the main pathway of loss from water (Oregon State University, 1996b). Its major degradation product, TCP (3,5,6-trichloropyridinol), is more mobile and persistent than chlorpyrifos, making it more likely to be found in the dissolved phase and available for aqueous runoff to streams (U.S. Environmental Protection Agency, 2006c). TCP was not analyzed for this project.

Chlorpyrifos is highly toxic to fish and very highly toxic to aquatic invertebrates (U.S. Environmental Protection Agency, 2006c). Because of its toxicity to prey items for threatened and endangered Pacific salmon and steelhead, the USEPA expressed "significant concern" over considerable use of chlorpyrifos where it can enter salmonid habitats (National Marine Fisheries Service, 2008). In salmon-bearing basins, reduced salmonid prey availability has been correlated to organophosphate use (National Marine Fisheries Service, 2008). Sublethal concentrations of chlorpyrifos have been shown to inhibit swimming and olfactory-mediated behaviors in salmonids (National Marine Fisheries Service, 2008; Tierney and others, 2010). Containers less than 15 gallons (liquid) or 25 pounds (dry) and all emulsifiable concentrate end-use products are labeled as Restricted Use Pesticides (U.S. Environmental Protection Agency, 2006c).

DEET (insecticide)

DEET is an insect and acarid (mite and tick) repellent in the N,N-dialkylamide chemical family (National Pesticide Information Center, 2008). It is approved for use in households, on the human body, and on pets (U.S. Environmental Protection Agency, 1998a). It is moderately mobile in soils and is stable to hydrolysis in soils at common pH ranges (National Pesticide Information Center, 2008). DEET is practically insoluble in water and has been detected in streams that receive wastewater, as most DEET absorbed through the skin is excreted through urine (U.S. Environmental Protection Agency, 1998a; National Pesticide Information Center, 2008). DEET is slightly toxic to freshwater fish (rainbow trout) and invertebrates (U.S. Environmental Protection Agency, 1998a).

Diazinon (insecticide)

Diazinon has been one of the most commonly used organophosphate insecticides in the United States for agricultural and household uses, although residential uses were phased out in 2004 (U.S. Environmental Protection Agency, 2006d, 2008). It can be used in the spring and summer in the Hood River basin on orchard crops and blueberries (Hollingsworth, 2009; Oregon State University Extension Service, 2010). It is moderately persistent in soils. Its persistence in surface waters varies with pH; its hydrolysis half-life is an order of magnitude higher (more slowly degrading) at pH 7 than at pH 5 (U.S. Environmental Protection Agency, 2006d). Due to diazinon's mobility, runoff is a common pathway to surface waters. Diazinon is very highly toxic to fish and even more so to aquatic invertebrates after acute or chronic exposures (U.S. Environmental Protection Agency, 2006d). Diazinon has also been shown to increase vulnerability to predation (U.S. Environmental Protection Agency, 2006d) and impair swimming, olfaction, and olfactory-mediated behaviors of salmonids at sublethal concentrations (National Marine Fisheries Service, 2008). Because of diazinon's potential to harm salmonids, the USEPA is implementing new restrictions on the use of diazinon near streams (National Marine Fisheries Service, 2008; U.S. Environmental Protection Agency, 2010a).

Diuron (herbicide)

Diuron is a substituted urea herbicide that is used to control emerging and young broadleaf weeds, grasses, and mosses on a variety of agricultural crops and in dry irrigation canals, and to control algae in ponds (U.S. Environmental Protection Agency, 2003). It is commonly used in the early spring through early summer in the Hood River basin for orchard and rights-of-way weed control (Steve Castagnoli, Oregon State University Extension Service, oral commun., 2010; Brian Walker, Oregon Department of Transportation, oral commun., 2010). Diuron has potential to contaminate groundwater and is persistent in soils, with soil half-lives ranging from 1 month to 1 year (Oregon State University, 1996c; U.S. Environmental Protection Agency, 2003; Peachey, 2009). It is generally stable in surface waters, with microbial degradation as the main mode of loss (Oregon State University, 1996c; U.S. Environmental Protection Agency, 2003). Toxicity to salmonids ranges from slightly toxic (coho salmon) to highly toxic (Chinook salmon and cutthroat trout) (U.S. Environmental Protection Agency, 2003, 2007). Diuron is moderately to highly toxic to aquatic invertebrates (U.S. Environmental Protection Agency, 2003).

Endrin (insecticide)

Endrin is an organochlorine insecticide, rodenticide, and avicide for which all uses have been cancelled in the United States since 1991. Among other uses, it was used to control rodents in orchards (U.S. Environmental Protection Agency, 2009a). It binds strongly to soils and has been shown to persist for 14 years or more (Agency for Toxic Substances and Disease Registry, 1996; California Environmental Protection Agency, 1999; U.S. Environmental Protection Agency, 2009a). It can reach surface waters through erosion of contaminated soils (U.S. Environmental Protection Agency, 2009a). Because endrin is very insoluble in water, detections in surface water are rare (California Environmental Protection Agency, 1999). Endrin has been associated with fish and bird kills. It is very highly toxic to fish, including salmonids, and highly to very highly toxic to aquatic invertebrates (U.S. Environmental Protection Agency, 2007).

Fluometuron (herbicide)

Fluometuron is a substituted urea herbicide used to control broadleaf weeds and annual grasses. It is currently only approved for use on cotton, although it was registered for use on sugarcane until 1998 (U.S. Environmental Protection Agency, 2005e). No Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 24(c) Special Local Needs permits for fluometuron are registered in Oregon, so its presence in the basin is unexpected. It is mobile and persistent in soils, with an aerobic soil half-life of 181 days (U.S. Environmental Protection Agency, 2005c). It is stable to hydrolysis and photolysis, so it also persists in surface and groundwaters (U.S. Environmental Protection Agency, 2005e). Based on its toxicity to rainbow trout (*Oncorhynchus mykiss*), fluometuron is moderately toxic to freshwater fish, although it ranges from slightly to highly toxic to non-salmonid fish species (U.S. Environmental Protection Agency, 2005c).

Hexazinone (herbicide)

Hexazinone is a triazine herbicide registered for use in forestry, pasture and rangeland, rights-of-way, and on blueberries (U.S. Environmental Protection Agency, 1994; Peachey, 2009). In the Hood River basin, it is commonly used in forests (Doug Thiesies, Oregon Department of Forestry, oral commun., 2010). It has high potential to contaminate surface- and groundwaters from spray drift, runoff (even months after its application), and leaching (U.S. Environmental Protection Agency, 1994). It requires rainfall or irrigation for activation and is mobile due to its high solubility in water and low soil adsorption tendency (U.S. Environmental Protection Agency, 1994; Oregon State University, 1996d; U.S. Department of Agriculture, 2009). It is also persistent in soil and water. Microbial degradation is the primary breakdown mechanism; photodegradation and hydrolysis are relatively unimportant (U.S. Environmental Protection Agency, 1994). Half-lives in nonsterile aerobic soils have been shown to range from 216 to 228 days and can be greater than 2 months in nonsterile aerobic waters (U.S. Environmental Protection Agency, 1994). Hexazinone is practically nontoxic in acute exposures to rainbow trout (LC_{50} >320 mg/L) (U.S. Environmental Protection Agency, 1994). Sublethal effects of hexazinone exposure on salmonids are unknown. It is practically nontoxic to slightly toxic to aquatic invertebrates (U.S. Environmental Protection Agency, 1994; Oregon State University, 1996d).

Imidacloprid (insecticide)

Imidacloprid is a neonicotinoid (chloro-nicotinyl) insecticide for use on structures, orchards, grapes, blueberries, and soil and seeds, and for residential use to control sucking insects and some chewing insects (National Pesticide Information Center, 2010; Oregon State University Extension Service, 2010). Neonicotinoid insecticides have become common replacements for some organophosphate insecticides, many of which are being phased out by the USEPA due to their toxicity. Soil half-lives for imidacloprid range from 40 days on unamended soil to 124 days on soil enriched with organic fertilizer (National Pesticide Information Center, 2010). Soil sorption of imidacloprid increases with increasing soil organic matter content, imidacloprid concentration, and time (National Pesticide Information Center, 2010). Its moderate soil binding capacity and water solubility lend it to being more mobile in porous, gravelly, or cobbly soils (Oregon State University, 1996e). In water, imidacloprid breaks down primarily by photolysis, although hydrolysis occurs increasingly with increasing pH and temperature (National Pesticide Information Center, 2010). Imidacloprid is a general use pesticide that is slightly toxic to rainbow trout, but highly to very highly toxic to aquatic invertebrates (Oregon State University, 1996e; National Pesticide Information Center, 2010).

Malathion (insecticide)

Malathion is a broad-range organophosphate insecticide and miticide with agricultural, industrial, public health, and residential applications (U.S. Environmental Protection Agency, 2009d). It is registered for use on orchards, grapes, blueberries, rangeland and hay, and in residences, and has been used to control the western cherry fruit fly in the Hood River basin (Hollingsworth, 2009; Joe McCanna, the Confederated Tribes of Warm Springs, oral commun., 2010). Malathion is relatively nonpersistent in the environment, with aerobic soil half-lives on the order of hours to days, decreasing with increasing soil moisture, microbial activity, or pH (U.S. Environmental Protection Agency, 2009d). Half-lives in surface water range from 1 day to 2 weeks, but malathion has potential to contaminate groundwater due to its solubility and moderate soil-adsorption factor, although it is expected to have low persistence in anaerobic waters (Oregon State University, 1996f; U.S. Environmental Protection Agency, 2009d). Malathion reaches streams through off-target drift, agricultural runoff, and urban runoff from residential and public health or quarantine uses over broad areas (U.S. Environmental Protection Agency, 2009d). Malathion is a general use pesticide that is highly toxic to fish and aquatic invertebrates (Oregon State University, 1996f; U.S. Environmental Protection Agency, 2009d). Sublethal concentrations of malathion can impair swimming and reproduction or growth of salmonids and survival of their prey (National Marine Fisheries Service, 2008). Effects on olfaction and olfactory-mediated behaviors in salmonids exposed to malathion have not been assessed (National Marine Fisheries Service, 2008). The USEPA is imposing new limitations on the use of malathion near salmon-bearing streams because of its potential to harm salmonids (National Marine Fisheries Service, 2008; U.S. Environmental Protection Agency, 2010a).

Methomyl (insecticide)

Methomyl is a carbamate insecticide registered for control of a broad range of insect pests on a wide variety of food (including orchard) and feed crops, in livestock feedlots and sleeping quarters, food processing facilities, and other commercial settings (U.S. Environmental Protection Agency, 1998b). It is not known to be in common use in the Hood River basin (Steve Castagnoli, Oregon State University Extension Service, written commun., 2010). It can reach surface waters via runoff, erosion, or spray drift and can leach to groundwater (U.S. Environmental Protection Agency, 1998b; National Marine Fisheries Service, 2009). Because it is highly mobile and moderately persistent in the environment, it can be available for runoff for days to weeks following application (U.S. Environmental Protection Agency, 1998b). It is not expected to persist in shallow, clear waters due to its susceptibility to photolysis, but lasts relatively longer in aerobic soils, with half-lives ranging from 11 to 45 days (U.S. Environmental Protection Agency, 1998b; National Marine Fisheries Service, 2009). Methomyl is moderately to highly toxic to freshwater fish and highly to very highly toxic to aquatic invertebrates (U.S. Environmental Protection Agency, 1998b). The USEPA has designated it as a Restricted Use Pesticide because of its toxicity to humans (Oregon State University, 1996g).

Norflurazon (herbicide)

Norflurazon is a selective herbicide in the fluorinated pyridazinone chemical class that targets broadleaf weeds, grasses, and sedges (U.S. Environmental Protection Agency, 1996). It is used on a variety of food crops, including pears, apples, and cherries, on rights-of-ways, uncultivated agricultural and nonagricultural areas, and in outdoor industrial areas (U.S. Environmental Protection Agency, 1996). Norflurazon can contaminate surface waters via spray drift and runoff, which can occur several months after application (U.S. Environmental Protection Agency, 1996). In surface waters, the primary mode of loss is photodegradation, which has a half-life of less than 3 days (U.S. Environmental Protection Agency, 1996). In soils, it breaks down more slowly, with half-lives of 130 days and 6–8 months under aerobic and anaerobic conditions, respectively. It is mobile to highly mobile in soil (U.S. Environmental Protection Agency, 1996). Norflurazon is moderately toxic to rainbow trout and slightly toxic to freshwater invertebrates (U.S. Environmental Protection Agency, 1996).

Phosmet (insecticide)

Phosmet is a broad-range organophosphate insecticide with various agricultural and forestry uses. Household use for ornamental or tree fruits and dogs was cancelled in 2001 (U.S. Environmental Protection Agency, 2001). Use is still allowed on apples, cherries, blueberries, grapes, evergreen trees, pears, and many other crops (U.S. Environmental Protection Agency, 2001). Phosmet binds moderately to soils and has low water solubility so is not highly mobile (Oregon State University, 1996h; U.S. Environmental Protection Agency, 2006e). It degrades rapidly in aerobic soils, chiefly due to microbial degradation and hydrolysis (Oregon State University, 1996h; U.S. Environmental Protection Agency, 2006e). Phosmet can reach surface waters from drift due to aerial or ground surface spray (U.S. Environmental Protection Agency, 2006e). Dissolved-phase phosmet can contaminate surface waters through runoff if precipitation or irrigation occur soon after its application (U.S. Environmental Protection Agency, 2006e). However, it does not persist in water; it degrades by hydrolysis and photolysis, with half-lives ranging from 16 hours at pH 9 to 9 days at pH 5 (Oregon State University, 1996h). Phosmet toxicity to salmonids ranges from moderately toxic (rainbow trout) to highly toxic (Chinook salmon) (U.S. Environmental Protection Agency, 2007). It ranges from moderate to very highly toxic for macroinvertebrates and zooplankton (U.S. Environmental Protection Agency, 2007).

Propiconazole (fungicide)

Propiconazole is a broad-range systemic foliar fungicide used to control powdery mildews, rust, and leaf spots on cherries and household crops (U.S. Environmental Protection Agency, 2006f). It is highly persistent in soil, but photodegrades rapidly in water (U.S. Environmental Protection Agency, 2006f). It is relatively immobile in highly organic soils and moderately mobile in soils low in organic matter (U.S. Environmental Protection Agency, 2006f). It is considered very highly toxic to freshwater fish.

Propoxur (insecticide)

Propoxur is a carbamate insecticide that targets ants, bees, cockroaches, fleas, mosquitoes, spiders, and wasps for use in homes, on pets, and on pavement and commercial structures (U.S. Environmental Protection Agency, 1997). Because it is mostly used indoors, the USEPA requires less rigorous testing of environmental fate and transport compared to pesticides that are primarily used outside (U.S. Environmental Protection Agency, 1997). Although limited environmental fate data exist, some conclusions can be made. It is highly mobile and has transport characteristics similar to other pesticides that are known to leach to groundwater (U.S. Environmental Protection Agency, 1997). It is expected to be moderately persistent in soils, with a half-life of several months (U.S. Environmental Protection Agency, 1997). In water, its expected half-life is 13 days (U.S. Environmental Protection Agency, 1997). It is more stable under acidic and neutral than alkaline conditions (U.S. Environmental Protection Agency, 1997). Propoxur is moderately toxic to fish, but very highly toxic to aquatic invertebrates (U.S. Environmental Protection Agency, 1997). It is a General Use Pesticide.

Pyraclostrobin (fungicide)

Pyraclostrobin is a strobilurin fungicide used to kill blights, mildews, molds, and rusts and is registered for use on many crops, including cherries and several berry crops. It is moderately persistent in aerobic soils (half-life = 136 days), but less persistent in anaerobic soils (3 days) (California Environmental Protection Agency, 2010). In aerobic water, its half-life ranges from 1 to 4 days (New York State Department of Environmental Conservation, 2004). Its high organic-carbon partitioning coefficient (K_{oc}) and low solubility in water indicate that it will strongly bind to soil organic matter, so it is largely immobile in soils (California Environmental Protection Agency, 2010). Although few ecotoxicological data exist for pyraclostrobin, it is considered very highly toxic to aquatic organisms, particularly rainbow trout (BASF Corporation, 2010).

Simazine (herbicide)

Simazine is a selective triazine herbicide used to control annual grasses and broadleaf weeds, usually applied to the soil either before emergence or after removal of weed growth (U.S. Environmental Protection Agency, 2006g). It is widely used in Hood River basin orchards and is also registered for use on blueberries and vineyards (Peachey, 2009; Steve Castagnoli, Oregon State University Extension Service, oral commun., 2010). Its main pathways to surface waters on the Pacific coast are spray drift and runoff (U.S. Environmental Protection Agency, 2006g). Simazine is highly mobile, particularly in soils with low organic matter content, where its potential for groundwater contamination is high (U.S. Environmental Protection Agency, 2006g). It is also persistent in the environment, with half-lives in soil ranging from 22 to 664 days, depending on sunlight and oxygen availability, and aqueous half-lives ranging from 12 to 700 days (U.S. Environmental Protection Agency, 2006g). Simazine is practically nontoxic to salmonids and slightly to moderately toxic to aquatic invertebrates (Oregon State University, 1996i; U.S. Environmental Protection Agency, 2007). Sublethal concentrations of simazine have been shown to impact reproduction and olfaction in Atlantic salmon (*Salmo salar*), swimming in rainbow trout (*O. mykiss*), and reduce the survival of various invertebrates that are potential salmonid prey items (U.S. Environmental Protection Agency, 2007; Tierney and others, 2010).

Appendix F. Pesticides Analyzed in Samples Collected in the Hood River Basin, Oregon, 1999–2009

[Oregon Department of Environmental Quality method numbers are in parentheses. Detected pesticides are shown in bold print. Pesticides analyzed before 2009 are shown in italicized print.]

2,4-D (SM 6640)
4,4’-DDD (p,p’-DDD) (8270C)
4,4’-DDE (8270C)
4,4’-DDT (8270C)
Alachlor (8321)
Aldrin (8270C)
alpha-BHC (benzene hexachloride) (8270C)
Ametryn (8270C)
Aminocarb (8321)
Atraton (8270C)
Atrazine (8270, 8141B)
Azinphos-methyl (8270C)
Azinphos-methyl oxon (8141A)
bentazon (bentazone) (6640B)
beta-BHC (benzene hexachloride) (8270C)
Bromacil (8270C)
Butachlor (8270C)
Butylate (8270C)
Carbaryl (8321B)
Carbofuran (8321B)
Carboxin (8270C)
Chlorobenzilate (a) (8270C)
Chloroneb (8270C)
Chlorpyrifos (8321B, 8270C, 8141B)
Chlorpyrifos oxon (8141A)
Chlorothalonil (8270C)
Chlorpropham (8270C)
Cis-Chordane (8270C)
Cyanazine (8270C)
Cycloate (8270C)
Dacthal (DCPA) (Chlorthal-Dimethyl) (8270C)
DEET/N,N-Diethyl-meta-toluamide (8321, 8270C)
delta-BHC (benzene hexachloride) (8270C)
Diazinon (8321B)
Dichlorvos (8270C)
Dieldrin (8270C)
Dimethoate (8270C)
Diphenamid (8270C)
Disulfoton (8270C)
Diuron (8321)
Endosulfan 1 (8270C)
Endosulfan 2 (8270C)
Endosulfan Sulfate (8270C)
Endrin Aldehyde (8270C)
Endrin (8270C)
EPTC (Eptam) (8270C)
Ethoprophos (Ethoprop) (Prophos) (8270C)
Etridiazole (8270C)
Fenamiphos (8270C)
Fenarimol (8270C)
Fenvalerate + Esfenvalerate (8270C)
Fluometuron (8321)
Fluridone (8270C)
Heptachlor (8270C)
Hexachlorobenzene (8270C)
Hexachlorocyclopentadiene (8270C)
Hexazinone (8270) (8270C)
Imazapyr (8321)
Imidacloprid (8321B)
Lindane (gamma-BHC) (benzene hexachloride) (8270C)
Linuron (8321)
Malathion (8270) (8270C)
Malathion oxon (8141A)
Methiocarb (8321)
Methomyl (8321)
Methoxychlor (8270C)
Methyl paraoxon (8270C)
Methyl parathion (8270C)
Metolachlor (8270, 8270C, 83213)
Metribuzin (8270C)
Metribuzin (8321)
Mexacarbate (8321)
MGK-264 (N-octyl bicycloheptane dicarboximide) (8270C)
Molinate (8270C)
Napropamide (8270C)
Neburon (8321)
Norflurazon (8270C)
Oxyamyl (8321)
Pebulate (8270C)
Pendimethalin (8270C)
Pentachlorophenol (8270C)
Permethrin (8270)
Phosmet (8270C)
Phosmet oxon (8141A)
Prometon (8270C, 8321)
Prometryn (8270C, 8321)
Propoxur (8321)
Pronamide (Propyzamide) (8270C)
Propachlor (8270C)
Propazine (8270C, 8321)
Propiconazole (8321)
Pyraclostrobin (8321)
Pyriproxyfen (8270C)
Siduron (8321)
Simazine (8270, 8270C, 8321)
Simetryn (8270C, 8321)
Tebuthiuron (8270C)
Terbacil (8270C)
Terbufos (8270C)
Terbutryne (8270C, 8321)
Terbutylazine (8321)
Tetrachlorvinphos (8270C)
Trans-Chordane (8270C)
Trans-Nonachlor (8270C)
Triadimefon (8270C)
Triclopyr (8321) (6640B)
Tricyclazole (8270C)
Trifluralin (8270C)
Vernolate (8270C)

Appendix G. Sample and Detection Counts by Pesticide in Samples Collected from the Hood River Basin, Oregon, 1999–2009

Data in the following tables were screened to the reporting limit indicated in the caption. Data were screened so that differences in reporting limits from year to year would not skew the assessment of detection trends (refer to the Methods section for more information on data screening).

Table G1. Atrazine sample and detection counts, Hood River basin, Oregon, 1999–2009, using data screened at 0.027 micrograms per liter.

[**Abbreviations:** d, number of samples with detections at the screening level (0.027 micrograms per liter); n, number of samples; RM, river mile; –, not sampled]

Atrazine	1999		2000		2001		2002		2003		2004	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	–	–	–	–	–	–	–	–	0	19	0	12
Dog	–	–	–	–	0	11	0	7	0	11	0	12
Evans	–	–	–	–	0	14	0	15	0	20	0	12
Hood, East Fork	0	1	0	12	–	–	0	15	–	–	–	–
Hood, Middle Fork	0	1	0	11	–	–	–	–	–	–	–	–
Hood, mouth	0	3	0	2	0	11	0	7	–	–	–	–
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 4.7	0	3	0	11	0	1	–	–	–	–	–	–
Indian	0	2	–	–	–	–	–	–	–	–	–	–
Lenz	–	–	–	–	0	14	1	15	1	20	0	17
Neal, middle	–	–	–	–	–	–	–	–	–	–	0	9
Neal, mouth	0	3	0	12	0	16	0	17	0	21	0	17
Neal, upper, above diversion	–	–	–	–	0	17	0	20	0	21	0	17
Neal, upper, below diversion	–	–	–	–	–	–	–	–	0	21	0	11
Rogers	–	–	–	–	–	–	–	–	–	–	–	–
Total	0	13	0	48	0	84	1	96	1	133	0	107

Atrazine	2005		2006		2007		2008		2009		Total	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	0	18	0	3	–	–	–	–	–	–	0	52
Dog	–	–	–	–	–	–	–	–	–	–	0	41
Evans	0	19	0	3	–	–	–	–	–	–	0	83
Hood, East Fork	–	–	–	–	–	–	–	–	–	–	0	28
Hood, Middle Fork	–	–	–	–	–	–	–	–	–	–	0	12
Hood, mouth	0	15	0	7	0	13	0	10	0	12	0	80
Hood, West Fork, mouth	–	–	–	–	–	–	0	5	0	12	0	17
Hood, West Fork, RM 2.5	–	–	–	–	–	–	0	5	0	1	0	6
Hood, West Fork, RM 4.7	–	–	–	–	–	–	–	–	–	–	0	15
Indian	–	–	–	–	–	–	–	–	–	–	0	2
Lenz	0	17	0	3	–	–	0	7	0	12	2	105
Neal, middle	0	16	0	6	0	13	0	10	0	13	0	67
Neal, mouth	0	17	0	7	0	13	0	10	0	12	0	145
Neal, upper, above diversion	0	19	0	7	0	12	–	–	–	–	0	113
Neal, upper, below diversion	0	16	0	7	0	13	0	10	0	13	0	91
Rogers	–	–	–	–	–	–	0	10	0	12	0	22
Total	0	137	0	43	0	64	0	67	0	87	2	879

Table G2. Azinphos-methyl sample and detection counts, Hood River basin, Oregon, 1999–2009, using data screened at 0.03 micrograms per liter.

[**Abbreviations:** d, number of samples with detections at the reporting level (0.03 micrograms per liter); n, number of samples; RM, river mile; –, not sampled]

Azinphos–methyl	1999		2000		2001		2002		2003		2004	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	–	–	–	–	–	–	–	–	0	19	0	12
Dog	–	–	–	–	0	11	0	7	0	11	0	12
Evans	–	–	–	–	2	14	0	15	0	20	0	12
Hood, East Fork	0	1	0	12	–	–	0	15	–	–	–	–
Hood, Middle Fork	0	1	0	12	–	–	–	–	–	–	–	–
Hood, mouth	0	1	0	2	0	11	0	7	–	–	–	–
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 4.7	0	1	0	11	0	1	–	–	–	–	–	–
Indian	–	–	–	–	–	–	–	–	–	–	–	–
Lenz	–	–	–	–	0	17	3	15	14	20	5	17
Neal, middle	–	–	–	–	–	–	–	–	–	–	0	9
Neal, mouth	1	1	1	15	1	16	4	17	11	21	2	17
Neal, upper, above diversion	–	–	–	–	0	17	0	20	0	21	0	17
Neal, upper, below diversion	–	–	–	–	–	–	–	–	0	21	0	11
Rogers	–	–	–	–	–	–	–	–	–	–	–	–
Total	1	5	1	52	3	87	7	96	25	133	7	107

Azinphos–methyl	2005		2006		2007		2008		2009		Total	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	0	18	0	3	–	–	–	–	–	–	0	52
Dog	–	–	–	–	–	–	–	–	–	–	0	41
Evans	0	19	0	3	–	–	–	–	–	–	2	83
Hood, East Fork	–	–	–	–	–	–	–	–	–	–	0	28
Hood, Middle Fork	–	–	–	–	–	–	–	–	–	–	0	13
Hood, mouth	0	15	0	7	0	13	0	9	0	15	0	80
Hood, West Fork, mouth	–	–	–	–	–	–	0	5	0	14	0	19
Hood, West Fork, RM 2.5	–	–	–	–	–	–	0	4	0	1	0	5
Hood, West Fork, RM 4.7	–	–	–	–	–	–	–	–	–	–	0	13
Indian	–	–	–	–	–	–	–	–	–	–	–	–
Lenz	6	18	1	3	–	–	0	6	0	15	29	111
Neal, middle	2	16	0	7	0	13	0	9	0	15	2	69
Neal, mouth	3	17	4	7	1	13	0	9	0	15	28	148
Neal, upper, above diversion	1	19	0	7	0	12	–	–	–	–	1	113
Neal, upper, below diversion	0	16	0	7	0	13	0	9	0	15	0	92
Rogers	–	–	–	–	–	–	0	9	0	14	0	23
Total	12	138	5	44	1	64	0	60	0	104	62	890

Table G3. Chlorpyrifos sample and detection counts, Hood River basin, Oregon, 1999–2009, using data screened at 0.03 micrograms per liter.

[**Abbreviations:** d, number of samples with detections at the reporting level (0.03 micrograms per liter); n, number of samples; RM, river mile; –, not sampled]

Chlorpyrifos	1999		2000		2001		2002		2003		2004	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	–	–	–	–	–	–	–	–	0	19	0	12
Dog	–	–	–	–	0	11	0	7	0	11	0	12
Evans	–	–	–	–	1	14	0	15	0	20	0	12
Hood, East Fork	0	1	0	12	–	–	0	15	–	–	–	–
Hood, Middle Fork	0	1	0	11	–	–	–	–	–	–	–	–
Hood, mouth	1	3	0	2	1	11	0	7	–	–	–	–
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 4.7	0	3	0	11	0	1	–	–	–	–	–	–
Indian	2	2	–	–	–	–	–	–	–	–	–	–
Lenz	–	–	–	–	4	17	2	15	2	20	1	17
Neal, middle	–	–	–	–	–	–	–	–	–	–	0	9
Neal, mouth	2	3	5	12	5	16	3	17	1	21	1	17
Neal, upper, above diversion	–	–	–	–	0	17	0	20	0	21	0	17
Neal, upper, below diversion	–	–	–	–	–	–	–	–	0	21	0	11
Rogers	–	–	–	–	–	–	–	–	–	–	–	–
Total	5	13	5	48	11	87	5	96	3	133	2	107

Chlorpyrifos	2005		2006		2007		2008		2009		Total	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	0	18	0	3	–	–	–	–	–	–	0	52
Dog	–	–	–	–	–	–	–	–	–	–	0	41
Evans	1	19	0	3	–	–	–	–	–	–	2	83
Hood, East Fork	–	–	–	–	–	–	–	–	–	–	0	28
Hood, Middle Fork	–	–	–	–	–	–	–	–	–	–	0	12
Hood, mouth	0	15	0	7	0	13	0	10	1	11	2	68
Hood, West Fork, mouth	–	–	–	–	–	–	0	5	0	9	0	5
Hood, West Fork, RM 2.5	–	–	–	–	–	–	0	5	0	1	0	5
Hood, West Fork, RM 4.7	–	–	–	–	–	–	–	–	–	–	0	15
Indian	–	–	–	–	–	–	–	–	–	–	2	2
Lenz	2	18	0	3	–	–	0	7	3	13	11	97
Neal, middle	2	16	0	7	0	13	0	10	1	13	2	55
Neal, mouth	3	17	0	7	0	13	0	10	4	13	20	133
Neal, upper, above diversion	0	19	0	7	0	12	–	–	–	–	0	113
Neal, upper, below diversion	0	16	0	7	0	13	1	10	0	14	1	78
Rogers	–	–	–	–	–	–	0	10	0	14	0	10
Total	8	138	0	44	0	64	1	67	9	88	40	797

Table G4. Diazinon sample and detection counts, Hood River basin, Oregon, 1999–2009, using data screened at 0.1 micrograms per liter.

[**Abbreviations:** d, number of samples with detections at the reporting level (0.1 micrograms per liter); n, number of samples; RM, river mile; –, not sampled]

Diazinon	1999		2000		2001		2002		2003		2004	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	–	–	–	–	–	–	–	–	0	19	0	12
Dog	–	–	–	–	0	11	0	7	0	11	0	12
Evans	–	–	–	–	0	14	0	15	0	20	0	12
Hood, East Fork	0	1	0	16	–	–	0	15	–	–	–	–
Hood, Middle Fork	0	1	0	15	–	–	–	–	–	–	–	–
Hood, mouth	0	4	0	3	0	11	0	7	–	–	–	–
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 4.7	0	4	0	15	0	1	–	–	–	–	–	–
Indian	0	3	0	2	–	–	–	–	–	–	–	–
Lenz	–	–	–	–	0	17	0	16	0	20	0	17
Neal, middle	–	–	–	–	–	–	–	–	–	–	0	9
Neal, mouth	0	4	1	17	0	16	0	17	0	21	0	17
Neal, upper, above diversion	–	–	–	–	0	17	0	20	0	21	0	17
Neal, upper, below diversion	–	–	–	–	–	–	–	–	0	21	0	12
Rogers	–	–	–	–	–	–	–	–	–	–	–	–
Total	0	17	1	68	0	87	0	97	0	133	0	108

Diazinon	2005		2006		2007		2008		2009		Total	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	2	18	0	3	–	–	–	–	–	–	2	52
Dog	–	–	–	–	–	–	–	–	–	–	0	41
Evans	0	19	0	3	–	–	–	–	–	–	0	83
Hood, East Fork	–	–	–	–	–	–	–	–	–	–	0	32
Hood, Middle Fork	–	–	–	–	–	–	–	–	–	–	0	16
Hood, mouth	0	15	0	7	0	13	0	12	0	11	0	83
Hood, West Fork, mouth	–	–	–	–	–	–	0	6	0	10	0	16
Hood, West Fork, RM 2.5	–	–	–	–	–	–	0	5	0	1	0	6
Hood, West Fork, RM 4.7	–	–	–	–	–	–	–	–	–	–	0	20
Indian	–	–	–	–	–	–	–	–	–	–	0	5
Lenz	0	18	0	3	–	–	0	7	0	14	0	112
Neal, middle	0	16	0	7	0	13	0	12	0	13	0	70
Neal, mouth	0	17	0	7	0	13	0	12	0	14	1	155
Neal, upper, above diversion	0	19	0	7	0	12	–	–	–	–	0	113
Neal, upper, below diversion	0	16	0	7	0	13	0	12	0	14	0	95
Rogers	–	–	–	–	–	–	0	12	0	14	0	26
Total	2	138	0	44	0	64	0	78	0	91	3	925

Table G5. Malathion sample and detection counts, Hood River basin, Oregon, 1999–2009, using data screened at 0.03 micrograms per liter.

[**Abbreviations:** d, number of samples with detections at the reporting level (0.03 micrograms per liter); n, number of samples; RM, river mile; –, not sampled]

Malathion	1999		2000		2001		2002		2003		2004	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	–	–	–	–	–	–	–	–	0	19	0	12
Dog	–	–	–	–	0	11	0	7	0	11	0	12
Evans	–	–	–	–	0	14	0	15	0	20	0	12
Hood, East Fork	0	1	0	12	–	–	0	15	–	–	–	–
Hood, Middle Fork	0	1	0	11	–	–	–	–	–	–	–	–
Hood, mouth	0	3	0	2	0	11	0	7	–	–	–	–
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 4.7	0	3	0	11	0	1	–	–	–	–	–	–
Indian	0	2	–	–	–	–	–	–	–	–	–	–
Lenz	–	–	–	–	0	17	0	15	0	20	1	17
Neal, middle	–	–	–	–	–	–	–	–	–	–	0	9
Neal, mouth	0	3	1	14	1	16	0	17	0	21	1	17
Neal, upper, above diversion	–	–	–	–	0	17	0	20	0	21	0	17
Neal, upper, below diversion	–	–	–	–	–	–	–	–	0	21	0	11
Rogers	–	–	–	–	–	–	–	–	–	–	–	–
Total	0	13	1	50	1	87	0	96	0	133	2	107

Malathion	2005		2006		2007		2008		2009		Total	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	0	18	0	3	–	–	–	–	–	–	0	52
Dog	–	–	–	–	–	–	–	–	–	–	0	41
Evans	0	19	0	3	–	–	–	–	–	–	0	83
Hood, East Fork	–	–	–	–	–	–	–	–	–	–	0	28
Hood, Middle Fork	–	–	–	–	–	–	–	–	–	–	0	12
Hood, mouth	0	15	0	7	0	13	0	10	0	13	0	81
Hood, West Fork, mouth	–	–	–	–	–	–	0	5	0	12	0	17
Hood, West Fork, RM 2.5	–	–	–	–	–	–	0	5	0	1	0	6
Hood, West Fork, RM 4.7	–	–	–	–	–	–	–	–	–	–	0	15
Indian	–	–	–	–	–	–	–	–	–	–	0	2
Lenz	0	18	0	3	–	–	0	7	0	15	1	112
Neal, middle	0	16	0	7	0	13	0	10	0	14	0	69
Neal, mouth	0	17	0	7	0	13	0	10	0	14	3	149
Neal, upper, above diversion	0	19	0	7	0	12	–	–	–	–	0	113
Neal, upper, below diversion	0	16	0	7	0	13	0	10	0	15	0	93
Rogers	–	–	–	–	–	–	0	10	0	15	0	25
Total	0	138	0	44	0	64	0	67	0	99	4	898

Table G6. Phosmet sample and detection counts, Hood River basin, Oregon, 1999–2009, using data screened at 0.05 micrograms per liter.

[**Abbreviations:** d, number of samples with detections at the reporting level (0.05 micrograms per liter); n, number of samples; RM, river mile; –, not sampled]

Phosmet	1999		2000		2001		2002		2003		2004	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	–	–	–	–	–	–	–	–	0	19	0	12
Dog	–	–	–	–	0	11	0	7	0	11	0	12
Evans	–	–	–	–	0	14	1	15	0	20	0	12
Hood, East Fork	–	–	0	14	–	–	0	15	–	–	–	–
Hood, Middle Fork	–	–	0	15	–	–	–	–	–	–	–	–
Hood, mouth	–	–	0	2	0	11	0	7	–	–	–	–
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 4.7	–	–	0	14	0	1	–	–	–	–	–	–
Indian	–	–	0	2	–	–	–	–	–	–	–	–
Lenz	–	–	–	–	0	17	1	16	2	20	1	17
Neal, middle	–	–	–	–	–	–	–	–	–	–	0	9
Neal, mouth	–	–	0	15	0	16	0	17	0	21	0	17
Neal, upper, above diversion	–	–	–	–	0	17	0	20	0	21	0	17
Neal, upper, below diversion	–	–	–	–	–	–	–	–	0	21	0	11
Rogers	–	–	–	–	–	–	–	–	–	–	–	–
Total	–	–	0	62	0	87	2	97	2	133	1	107

Phosmet	2005		2006		2007		2008		2009		Total	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	0	18	0	3	–	–	–	–	–	–	0	52
Dog	–	–	–	–	–	–	–	–	–	–	0	41
Evans	0	19	0	3	–	–	–	–	–	–	1	83
Hood, East Fork	–	–	–	–	–	–	–	–	–	–	0	29
Hood, Middle Fork	–	–	–	–	–	–	–	–	–	–	0	15
Hood, mouth	0	15	0	7	0	13	0	12	0	12	0	79
Hood, West Fork, mouth	–	–	–	–	–	–	0	5	0	11	0	16
Hood, West Fork, RM 2.5	–	–	–	–	–	–	0	5	0	1	0	6
Hood, West Fork, RM 4.7	–	–	–	–	–	–	–	–	–	–	0	15
Indian	–	–	–	–	–	–	–	–	–	–	0	2
Lenz	3	18	0	3	–	–	1	7	0	12	8	110
Neal, middle	1	16	0	7	0	13	0	12	0	12	1	69
Neal, mouth	0	17	0	7	0	13	0	12	0	12	0	147
Neal, upper, above diversion	0	19	0	7	0	12	–	–	–	–	0	113
Neal, upper, below diversion	0	16	0	7	0	13	0	12	0	12	0	92
Rogers	–	–	–	–	–	–	0	12	0	11	0	23
Total	4	138	0	44	0	64	1	77	0	83	10	892

Table G7. Simazine sample and detection counts, Hood River basin, Oregon, 1999–2009, using data screened at 0.027 micrograms per liter.

[**Abbreviations:** d, number of samples with detections at the reporting level (0.027 micrograms per liter); n, number of samples; RM, river mile; –, not sampled]

Simazine	1999		2000		2001		2002		2003		2004	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	–	–	–	–	–	–	–	–	0	19	0	12
Dog	–	–	–	–	0	11	0	7	0	11	0	12
Evans	–	–	–	–	0	14	0	15	1	20	0	12
Hood, East Fork	0	1	1	14	–	–	0	15	–	–	–	–
Hood, Middle Fork	0	1	0	11	–	–	–	–	–	–	–	–
Hood, mouth	0	3	2	4	0	11	0	7	–	–	–	–
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	–	–	–
Hood, West Fork, RM 4.7	0	3	0	11	0	1	–	–	–	–	–	–
Indian	1	2	–	–	–	–	–	–	–	–	–	–
Lenz	–	–	–	–	8	15	14	16	17	20	8	17
Neal, middle	–	–	–	–	–	–	–	–	–	–	1	9
Neal, mouth	2	3	12	20	5	16	8	17	11	21	7	17
Neal, upper, above diversion	–	–	–	–	0	17	0	20	0	21	0	17
Neal, upper, below diversion	–	–	–	–	–	–	–	–	0	21	0	11
Rogers	–	–	–	–	–	–	–	–	–	–	–	–
Total	3	13	15	60	13	85	22	97	29	133	16	107

Simazine	2005		2006		2007		2008		2009		Total	
	d	n	d	n	d	n	d	n	d	n	d	n
Baldwin	1	18	0	3	–	–	–	–	–	–	1	52
Dog	–	–	–	–	–	–	–	–	–	–	0	41
Evans	0	19	0	3	–	–	–	–	–	–	1	83
Hood, East Fork	–	–	–	–	–	–	–	–	–	–	1	30
Hood, Middle Fork	–	–	–	–	–	–	–	–	–	–	0	12
Hood, mouth	1	15	0	7	0	13	0	10	1	9	4	79
Hood, West Fork, mouth	–	–	–	–	–	–	0	5	0	11	0	16
Hood, West Fork, RM 2.5	–	–	–	–	–	–	0	5	0	1	0	6
Hood, West Fork, RM 4.7	–	–	–	–	–	–	–	–	–	–	0	15
Indian	–	–	–	–	–	–	–	–	–	–	1	2
Lenz	5	18	2	3	–	–	5	7	4	10	63	106
Neal, middle	1	16	0	6	4	13	0	10	0	13	6	67
Neal, mouth	5	17	1	7	4	13	0	10	1	12	56	153
Neal, upper, above diversion	0	19	0	7	0	12	–	–	–	–	0	113
Neal, upper, below diversion	0	16	0	7	0	13	0	10	1	13	1	91
Rogers	–	–	–	–	–	–	0	10	0	11	0	21
Total	13	138	3	43	8	64	5	67	7	80	134	887

Appendix H. Number of Samples Collected at Sites in the Hood River Basin, Oregon, by Site and Year

[Sample size includes all (unscreened) samples. **Abbreviations:** –, no samples collected]

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Baldwin	–	–	–	–	19	12	18	3	–	–	–	52
Dog	–	–	11	7	11	12	–	–	–	–	–	41
Evans	–	–	14	15	20	12	19	3	–	–	–	83
Hood, East Fork	1	16	–	15	–	–	–	–	–	–	–	32
Hood, Middle Fork	1	16	–	–	–	–	–	–	–	–	–	17
Hood, mouth	4	5	11	7	–	–	15	7	13	12	16	90
Hood, West Fork, mouth	–	–	–	–	–	–	–	–	–	6	15	21
Hood, West Fork, RM 2.5	–	–	–	–	–	–	–	–	–	5	1	6
Hood, West Fork, RM 4.7	4	15	1	–	–	–	–	–	–	–	–	20
Indian	3	2	–	–	–	–	–	–	–	–	–	5
Lenz	–	–	17	16	20	17	18	3	–	7	16	114
Neal, middle	–	–	–	–	–	9	16	7	13	12	16	73
Neal, mouth	4	22	16	17	21	17	17	7	13	12	16	162
Neal, upper, above diversion	–	–	17	20	21	17	19	7	12	–	–	113
Neal, upper, below diversion	–	–	–	–	21	12	16	7	13	12	16	97
Rogers	–	–	–	–	–	–	–	–	–	12	15	27
Total	17	76	87	97	133	108	138	44	64	78	111	953

Appendix I. Season of Use for Pesticide Ingredients in the Hood River Basin, Oregon

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable during the listed season; – pesticide not suitable during the listed season or example product names not provided]

Pesticide	Product names	Spring	Summer	Fall	Winter
Coddling moth mating disruptors					
(Z)-I I-Tetradecen-I-yl acetate	Nomate	X	–	–	–
E-11-tetradecen-1-yl acetate + (e,e)-9,11-tetradecadien-1-yl acetate	Isomate	X	–	–	–
MCPA ester	Checkmate	X	–	–	–
Products for disease control					
1,3 Dichloropropene	Telone II	X	–	X	–
Azoxystrobin	Abound	X	X	–	–
Bicarbonate products	Armicarb, Kaligreen, MilStop, Monterey Bi-Carb	X	X	–	–
Calcium polysulfide	lime sulfur	X	–	X	–
Chloropicrin	–	–	–	X	–
Dazomet	Basamid G	X	–	–	–
Dichloran	Botran	X	–	–	–
Dimethyl phenol	Gallex	–	–	–	–
Iprodione	Iprodione	X	–	–	–
Kaolin	Surround	X	–	–	–
Mancozeb	–	X	–	–	X
Metam sodium	Vapam, Sectagon 42, Metam CLR	X	–	X	–
Methyl bromide	–	–	–	X	–
Methyl phenol	Gallex	–	–	–	–
Mono- and dipotassium salts of phosphorous acid	Agri-Fos	X	X	–	–
Monopotassium phosphite + dipotassium phosphite	Fosphite	X	X	–	–
Sulfur products[1]	–	X	X	X	–
Fungicides					
Boscalid	Endura, Pristine	X	X	X	–
Captan	Captan, Captec	X	X	X	–
Chlorothalonil	Bravo Weather Stik	X	–	–	–
Copper products	–	X	–	X	–
Cyprodinil	Vangard, Switch	X	X	–	–
Dodine	Syllit	X	–	–	–
Fenarimol	Rubigan	X	X	–	–
Fenbuconazole	Indar	X	X	–	–
Fenhexamid	Elevate, CaptEvate	X	X	X	–
Fludioxinil	Switch	X	X	–	–
Fosetyl-aluminum	Aliette	X	X	X	–
Kresoxim-methyl	Sovarn	X	X	–	–
Metalaxyl	Ridomil Gold	X	X	X	–
Metconazole	Quash	X	X	–	–
Myclobutanil	–	X	X	–	–
Potassium bicarbonate	Remedy	–	–	–	–
Propiconazole	Tilt	X	X	–	–
Pyraclostrobin	–	X	X	X	–
Pyrimethanil	Scala	X	–	–	–
Quinoxyfen	Quintec	X	X	–	–
Sodium, potassium, and ammonium phosphites	Phostrol	X	X	–	–
Sodium tatrathiocarbonate[1]	Enzone	X	–	–	–
Streptomycin	Agrimycin	X	–	–	–

Appendix I. Season of use for pesticide ingredients in the Hood River basin, Oregon.—Continued

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable during the listed season; – pesticide not suitable during the listed season or example product names not provided]

Pesticide	Product names	Spring	Summer	Fall	Winter
Fungicides—Continued					
Tebuconazole	Elite, Orius	X	X	–	–
Terramycin	Mycoshield	X	–	–	–
Thiophanate-methyl	–	X	X	X	–
Trifloxystrobin	–	X	X	X	–
Triflumizole	–	X	X	–	–
Triforine	Funginex	–	–	–	–
Ziram	–	X	X	X	–
Products to control fruit drop					
Aminoethoxyvinylglycine hydrochloride	Retain	X	X	–	–
Napthalene acetic acid (NAA)	NAA	–	X	–	–
Herbicides					
2,4-D	Crossbow, Curtail, Weedmaster, Pasturemaker, Cimarron Max	X	X	X	–
2,4-D amine	Saber, Weed-Rhap A4d, Dri-Clean Herbicide	X	–	–	–
2,4-D ester	Crossbow	X	–	–	–
Aminopyralid	Milestone	X	X	X	–
Atrazine	–	X	–	–	–
Bromacil	Krovar	X	–	–	–
Carfentrazone	Aim	X	–	–	–
Chlorsulfuron	Telar	X	–	X	–
Clethodim	Envoy, Prism, Select	–	–	–	–
Clopyralid	–	X	X	X	X
Dicamba	Banvel, Vanquish, Clarity, Weedmaster, Pasturemaker, Latigo	X	X	–	–
Dichlobenil	Casoron	–	–	–	X
Diquat	Reglone	–	–	–	–
Diuron	–	X	X	X	X
Fluazifop	Flusilade	–	–	–	–
Flumioxazin	Chateau	–	–	X	–
Fluroxypyr	Starane, Surmount, PastureGard	X	–	–	–
Glufosinate ammonium	Rely	–	–	–	–
Glyphosate	–	X	X	X	X
Halosulfuron	Sandea	–	–	–	–
Hexazinone	–	X	X	X	X
Imazapic	Plateau	–	X	X	–
Imazapyr	–	–	X	–	–
Isoxaben	Gallery or Gallery T&V, Showcase, Snapshot	X	X	X	–
MCPA	–	X	–	X	–
Mesotrione	Callisto	X	–	–	–
Metsulfuron methyl	Cimarron Max, Escort	X	X	X	–
Napropamide	Devrinol	X	–	X	X
Norflurazon	Solicam	X	–	X	X
Oryzalin	–	X	–	X	–
Oxyfluorfen	–	X	–	X	X
Paraquat	Gramoxone Inteon, Firestorm, Cyclone	X	–	X	X
Pendimethalin	Prowl H2	X	–	X	X

Appendix I. Season of use for pesticide ingredients in the Hood River basin, Oregon.—Continued

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable during the listed season; – pesticide not suitable during the listed season or example product names not provided]

Pesticide	Product names	Spring	Summer	Fall	Winter
Herbicides (Continued)					
Picloram	–	X	X	X	X
Pronamide	–	–	–	X	X
Rimsulfuron	Matrix	X	–	–	–
Sethoxydim	Poast	–	–	–	–
Simazine	–	X	–	X	X
Sulfometuron methyl	–	–	–	X	–
Tebuthiuron	Spike	X	X	X	X
Terbacil	Sinbar	X	–	X	–
Triasulfuron	Amber	–	–	–	–
Triclopyr	–	X	X	–	–
Triclopyr ester	–	X	X	–	–
Trifluralin	Showcase, Snapshot, Treflan	–	–	–	X
Insecticides					
Abamectin	–	X	X	–	–
Acephate	–	–	–	–	–
Acetamiprid	Assail	X	X	–	–
Azadirachtin	Azatin, Neemix	X	X	–	–
Azinphos methyl	Guthion	X	X	–	–
Bifenazate	Acramite	–	X	–	–
Bifenthrin	Brigade	X	X	–	–
Buprofezin	Applaud, Centaur	X	X	–	–
Carbaryl	Sevin	X	X	–	–
Chlorantraniliprole	Voliam Flexi	X	X	–	–
Chlorpyrifos	–	X	–	–	X
Clothianidin	–	X	X	–	–
Cyfluthrin	Baythroid	–	–	–	–
Deltamethrin	–	X	X	–	–
Diazinon	Diazinon	X	X	–	–
Dicofol	Kelthane	–	X	–	–
Diflubenzuron	Dimilin	–	–	–	–
Dimethoate	Dimethoate	X	X	–	–
Disulfoton	–	–	–	–	–
Dormant oil	–	–	–	–	–
Emamectin benzoate	Proclaim	X	X	–	–
Endosulfan	–	X	X	–	–
Esfenvalerate	Asana	X	–	–	–
Fenbutatin oxide	Vendex	X	X	–	–
Fenpropathrin	–	X	–	–	X
Gamma-cyhalothrin	–	X	–	–	X
Imidacloprid	–	X	X	–	–
Indoxacarb	Avaunt	X	X	–	–
Insecticidal soap	M-Pede, others	X	X	–	–
Iron phosphate	–	–	–	–	–
Lambda-cyhalothrin	–	X	–	–	X
Malathion	Malathion	X	X	–	–
Metaldehyde	–	–	–	–	–
Methidathion	Supracide	X	–	–	–
Methomyl	Lannate	X	–	–	–
Methoxyfenozide	Intrepid	X	X	–	–
Methyl parathion	Methyl 4EC	–	–	–	–
Novaluron	Rimon	X	X	–	–

Appendix I. Season of use for pesticide ingredients in the Hood River basin, Oregon.—Continued

[**Source:** Hollingsworth, 2009; Peachey, 2009; Pscheidt and Ocamb, 2009; Oregon State University Extension Service, 2010. **Abbreviations:** X, pesticide suitable during the listed season; – pesticide not suitable during the listed season or example product names not provided]

Pesticide	Product names	Spring	Summer	Fall	Winter
Insecticides (Continued)					
Oxamyl	Vydate	X	X	–	–
Permethrin	–	X	–	–	X
Petroleum or paraffinic oil	Horticultural mineral oil	X	X	X	–
Phosmet	Imidan	X	X	–	–
Pyrethrins/pyrethrum	–	–	–	–	–
Pyriproxyfen	–	X	X	–	X
Rotenone	–	–	–	–	–
Rynaxypyr	–	X	X	–	–
Spinetoram	–	X	X	–	–
Spinosad	Entrust, Success	X	X	–	–
Spirodiclofen	Envidor	X	X	–	–
Spirotetramat	–	X	X	–	–
Tebufenozide	Confirm	–	–	–	–
Thiacloprid	–	X	X	–	–
Thiamethoxam	Axtara, Platinum, Voliam Flexi, Actara	X	X	–	–
Zeta cypermethrin	Mustang Max	–	–	–	–
Miticides					
Acequinocyl	Kanemite	X	X	–	–
Bifenzate	Acramite	X	X	–	–
Clofentezine	Apollo	X	X	–	–
Etoxazole	Zeal	X	X	–	–
Fenpyroximate	Fujimite	X	–	–	–
Formetanate hydrochloride	Carzol	X	–	–	–
Hexythiazox	Onager, Savey	X	X	–	–
Propargite	Omite	–	X	–	–
Pyridaben	Nexter	X	X	–	–

[1]Also used as an insecticide

Appendix J. Pesticide Products Known to be Used in the Hood River Basin, Oregon, but not Analyzed for this Study

[**Source:** John Buckley, East Fork Irrigation District, oral commun., 2010; Steve Castagnoli, Oregon State University Extension Service, oral commun., 2010; Nate Lain, Hood River County Weed and Pest Division, oral commun., 2010; Brian Walker, Oregon Department of Transportation, oral commun., 2010]

Pesticide	Product names	Known use in the Hood River basin
Products used for disease control		
Mancozeb	Dithane, Mancozeb	Commonly used in orchards (Feb/Mar)
Sulfur products	Thiolux, Microthiol Disperss, Kumulus	Commonly used in orchards (Feb/Mar or Sept/Oct)
Fungicides		
Myclobutanil	Rally, Spectracide Immunox	Commonly used in orchards
Thiophanate-methyl	Topsin M, Halt	Orchard use is expected to increase (Sept/Oct)
Trifloxystrobin	Flint, Gem	Commonly used in orchards
Triflumizole	Procure	Commonly used in orchards
Ziram	Ziram	Commonly used in orchards (Sept/Oct)
Herbicides		
Clopyralid	Stinger, Transline, Curtail, Redeem R&P	Commonly used in forests
Glyphosate	Roundup	Commonly used in orchards and forests, along canals, roads, and railroads
Metsulfuron methyl		Commonly used in forests and along railroads
Oryzalin	Surflan	Commonly used in orchards
Oxyfluorfen	Goal, Showcase	Commonly used in orchards
Sulfometuron methyl	Oust	Commonly used in forests
Triclopyr ester	Remedy	Commonly used in forests
Insecticides		
Abamectin	Agri-Mek	Common use in orchards (late Apr - early Jun)
Acetamiprid	Assail	Neonicotinoid - class expected to be more common in orchards
Clothianidin	Clutch	Neonicotinoid - class expected to be more common in orchards
Deltamethrin	Battalion	Pyrethroid - class commonly used in orchards (Feb-Mar)
Fenpropathrin	Danitol	Pyrethroid - class commonly used in orchards (Feb-Mar)
Gamma-cyhalothrin	Proaxis	Pyrethroid - class commonly used in orchards (Feb-Mar)
Lambda-cyhalothrin	Warrior, Warrior II	Pyrethroid - class commonly used in orchards (Feb-Mar)
Rynaxypyr	Altacor	New product likely to have widespread use in orchards
Spinetoram	Delegate	New product likely to have widespread use in orchards
Thiacloprid	Calypso	Neonicotinoid - class expected to be more common in orchards

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