



# CLACKAMAS

## Pesticide Stewardship Partnership 2015-17 Biennial Summary

► **History:** The Clackamas Pesticide Stewardship Partnership was initiated in 2005, after the completion of a 5-year monitoring study of the watershed's streams and drinking water by U.S. Geological Survey (USGS) which showed the presence of a significant number of current use pesticides in streams and finished drinking water. The use of Clackamas River water as a drinking water source for approximately 400,000 people coupled with the USGS monitoring results provided the Oregon Department of Environmental Quality (DEQ) with an impetus to explore the feasibility of establishing a PSP in the watershed. Several partners expressed a strong interest in initiating a PSP in the watershed. These included the Clackamas River Basin Council (CRBC), Clackamas Soil and Water Conservation District (SWCD), Clackamas River Water Providers, Oregon State University Extension (OSU), and USGS. Water quality monitoring was begun by the state in the spring of 2005.



**Water Quality Monitoring Locations 2015-17**

► **Land Use:** The Clackamas PSP encompasses 943 sq.-mi and is dominated by public and private forest lands which account for 76% of the area within the watershed. Forested areas are located in the upper middle portions of the watershed. Urban and semi-urban areas (18%) and agricultural lands (7%) constitute a majority of the northern portions. Major population centers within the watershed are areas of Oregon City with a population of 36,000, Happy Valley with a population of 19,000 and City of Clackamas with a population of 7,000 (2017 Portland State University estimates). Agricultural activities include commercial nurseries, Christmas trees, grass hay, row crops, and limited orchards.

► **Pesticide Monitoring:** As part of the PSP program water quality is monitored for pesticide residues beginning in March and continuing through June and again in September and continuing through mid-October. During the period July 1, 2015 through June 30, 2017 water quality samples were collected from six locations.

### WATER QUALITY MONITORING STATIONS 2015-17 BIENNIUM

Station ID	Map Number	Description	Predominate Land Use	No. Detections	BM* Exceedances
10868	1	North Fork Deep Creek @ Hwy 212	Agriculture	291	21
32066	2	Sieben Creek @ Hwy 212	Urban	75	0
32068	3	Noyer Creek @ Hwy 212, St. Paul Church	Agriculture	211	36
32074	4	Rock Creek @ 172, Stony Brook Ct.	Agriculture	90	1
38096	5	Eagle Creek @ Eagle Fern Park	Mixed	0	0
38826	6	Deep Creek (Crane and Gold Rd)	Agriculture	0	0

\*BM = US EPA Aquatic Life Benchmark for pesticides

## CLACKAMAS WATER QUALITY DATA SUMMARY FOR ALL SAMPLE LOCATIONS 2015-2017 BIENNIUM

Pesticide	Type	Benchmark Value µg/L	No. of Analysis	No. of Detections	Max. Conc. µg/L	Average Conc. µg/L	Percent Detections	Percent of Benchmark (Max. Conc.)
2,4-D	H	299.2	34	1	5.1	.15	2.9	2
2,4,5-tp silvex	NR		35	1	.2	.00001	2.9	
2,6-dichlorobenzamide	M	NA	140	121	.986	.16	86.4	
Acephate	I	150	36	6	3.14	.132	16.7	2
AMPA	M	249500	35	33	2.39	.577	94.3	0
Azoxystrobin	F	44	36	7	.252	.028	19.4	1
Carbaryl	I	.5	140	19	14.1	.00809	13.6	2820
Chlorpyrifos	I	.041	140	17	1.77	.0329	14.2	4317
DEET	R	37500	139	3	.088	.00122	2.2	0
Deisopropylatrazine	M	NA	140	53	.038	.00289	37.9	
Diazinon	I	.05	140	9	.545	.00916	6.4	1090
Dichlobenil	H	30	140	10	.328	.00464	7.1	1
Dieldrin	NR		140	1	.027	.0002	.7	
Dimethenamid <sup>1</sup>	H	8.9	140	26	20.9	.506	18.6	235
Diuron	H	2.4	140	83	6.03	.00041	59.3	251
Ethoprop	I	.8	140	6	2.95	.023	4.3	369
Etridiazole	F	72	140	1	.046	.0033	.7	0
Glyphosate	H	1800	34	29	5.62	.48	85.3	0
Hexazinone	H	7	140	2	.0361	.00045	1.4	1
Imazapyr	H	24	140	2	1.96	.0143	1.4	8
Imidacloprid	I	.01	140	30	.421	.0238	21.4	4210
Methiocarb	I	2.75	140	1	.165	.00118	.7	6
Metolachlor	H	1	140	11	.196	.00322	7.9	20
Metribuzin	H	8.1	140	3	.151	.00058	6.4	2
Metsulfuron methyl	H	.36	132	11	.0725	.00192	8.3	20
Napropamide	H	1100	140	3	.065	.00089	2.1	0
Oxyfluorfen	H	.33	140	28	.279	.015	20	85
Pendimethalin	H	5.2	140	9	.226	.0048	6.4	4
Prometon	H	98	140	1	.0083	.00006	.7	0
Pronamide	H	NA	140	1	.026	.00019	.7	
Propiconazole	F	21	140	21	.41	.016	15	0
Pyralostrobin	F	1.5	140	10	.034	.0009	17.1	2
Simazine	H	2.24	140	73	.32	.0128	52.1	14
Sulfometuron-methyl	H	.45	140	16	.175	.00432	11.4	39
Tebuthiuron	H	50	140	3	.0397	.00061	2.1	0
Triadimefon	F	52	140	2	.104	.001	14	0
Triclopyr	H	19	34	1	1.9	.00006	2.9	10

Pesticides highlighted in red are of high concern, pesticides highlighted in yellow are of moderate concern based upon frequency of detection and maximum detected concentration during the period July 1, 2015 through June 30, 2017 as compared to the EPA aquatic life benchmark.

F = fungicide, H = herbicide, I = insecticide, M = metabolite (breakdown product)

<sup>1</sup>Dimethenamid-P is the active ingredient registered for use in Oregon. The laboratory results for dimethenamid are inclusive of dimethenamid-P

Water quality monitoring conducted during the period July 1, 2015 through June 30, 2017 indicated the presence of numerous pesticides, six of which are present at levels of concern. The pesticides carbaryl, chlorpyrifos, diazinon, dimethenamid, diuron, ethoprop, and imidacloprid exceeded current U.S. Environmental Protection Agency (EPA) aquatic life benchmarks. A comparison of the 2015-17 data results to those of 2010-15, indicate that three pesticides of concern during the 2010-15 timeframe (atrazine, bifenthrin, and endosulfan) were not detected in 2015-17. The insecticide methiocarb was no longer detected at levels of concern. Chlorpyrifos and diazinon remain as pesticides with a high level of concern. All the pesticides indicated as high concern (with the exception of carbaryl and imidacloprid) are labeled for commercial use only (agricultural, industrial, right-of-way) and not available for home owner use. The sub-watershed areas monitored by stations 10868 and 32068 are of special concern as they have accounted for 13 benchmark exceedances for the insecticide chlorpyrifos and 21 benchmark exceedances for insecticide Imidacloprid.

► **Detection of Metabolites:** Metabolites are “breakdown” products of some pesticides. They occur generally after the original pesticide has undergone chemical change due to interactions with the environment or soil microbes. Three metabolites were detected at frequencies above 20%. during the sampling period, 2,6-dichlorobenzamide (BAM), aminomethylphosphonic acid (AMPA) and desisopropylatrazine.

2,6-dichlorobenzamide is a metabolite of the herbicide dichlobenil commonly known as Casoron. It is detected at a high frequency at a majority of the nine current PSP areas throughout the state. At this time there are no aquatic life benchmarks. The lifetime human health benchmark (HHBM) as established by the EPA is 29 µg/L the maximum detected concentration in the watershed during the period July 1, 2015 through June 30, 2017 was .986 µg/L (3.6% of the current HHBM) with an average of all detections at .16 µg/L. 2,6-dichlorobenzamide was detected in 86% of the samples analyzed.

Aminomethylphosphonic acid (AMPA) is a metabolite of the herbicide glyphosate. Glyphosate is sold under a variety of names. It has an established EPA aquatic life benchmark of 249500 µg/L (this high benchmark indicates a relatively low toxicity to aquatic life). At this time EPA has not established a human health benchmark. AMPA was detected in 94% of the samples analyzed.

Deisopropylatrazine is a metabolite of the herbicides atrazine and simazine. Atrazine is sold under the many names the most common being Aatrex. At this time there is no EPA aquatic life benchmark or human health benchmark established for deisopropylatrazine. Deisopropylatrazine was detected in 38% of the samples analyzed.

## PESTICIDES OF CONCERN DETECTED IN THE CLACKAMAS PESTICIDE STEWARDSHIP PARTNERSHIP

Pesticide	Common Trade Names	Pesticide Classification
Carbaryl	Dicarbam. Seven, Thinsec	Insecticide
Chlorpyrifos	Dursban, Lorsban , Piridane	Insecticide
Diazinon	Diazinon, Knox Out	Insecticide
Dimethenamid	Outlook, Tower	Herbicide
Diuron	Direx, Karmex	Herbicide
Ethoprop	Mocap	Insecticide
Imidacloprid	Amire, Gaucho, Premier, Provado	Insecticide
Oxyfluorfen	Goal, Koltar	Herbicide
Sulfometuron-methyl	Ally, Escort, Oust	Herbicide

► **Sediment Data:** Two sediment samples were collected in the summer and fall of 2015. These samples were obtained from the Noyer Creek at Highway 212 Station, St Paul Lutheran Church station. Three currently used pesticides (bifenthrin, oxyfluorfen, and trifluralin) and ten metabolites from the legacy compounds chlordane, DDT and dieldrin were detected. The analytical results for the detected pesticides and metabolites are presented below:

**PESTICIDES DETECTED IN SEDIMENTS AT THE NOYER CREEK AT HIGHWAY 212, ST. PAUL LUTHERAN CHURCH MONITORING STATION - CLACKAMAS PESTICIDE STEWARDSHIP PARTNERSHIP**

Pesticide/ Metabolite	Sample Date	Result µg/Kg	TOC Normalized µg/Kg	Sediment Toxicity	Estimated Pore Water Conc. µg/Kg	Benchmark or Criteria µg/Kg
2,4-DDD	6/22/15	.766	54.7	.00004	.0004	.000031 <sup>1</sup>
4,4'-DDD	6/22/15	2.12	151.4	.0001	.0011	.000031 <sup>1</sup>
2,4'-DDE	6/22/15	.291	20.8	.000003	.0042	.000022 <sup>1</sup>
4,4'-DDE	6/22/15	6.56	468.6	.00005	.0937	.000022 <sup>1</sup>
2,4'-DDT	6/22/15	2.11	150.7	.00057	.00007	.000022 <sup>1</sup>
4,4'-DDT	6/22/15	7.66	547.1	.0021	.00027	.000022 <sup>1</sup>
Bifenthrin	6/22/15	2.74	195.7	.19	.0008	.0013 <sup>2</sup>
cis-Chlordane	6/22/15	.606	43.3	NA	.0022	2 <sup>3</sup>
Dieldrin	6/22/15	4.18	298.6	.0052	.0234	.002 <sup>4</sup>
Oxyfluorfen	6/22/15	7.37	NA	NA	NA	.29 <sup>2</sup>
trans-Chlordane	6/22/15	1.02	NA	NA	NA	2 <sup>3</sup>
trans-Nonchlor	6/22/15	.836	59.7	NA	.0011	NA
Trifluralin	6/22/15	1.39	99.3	NA	.0136	1.9 <sup>2</sup>
4,4'-DDE	10/26/15	12.2	802.6	.0001	.1605	.000022 <sup>1</sup>
4,4'-DDT	10/26/15	12.8	842.1	.0032	.00042	.000022 <sup>1</sup>
Bifenthrin	10/26/15	6.71	441.4	.4286	.0018	.0013 <sup>2</sup>
Oxyfluorfen	10/26/15	37.7	2480.3	.00073	.0765	.29 <sup>2</sup>

<sup>1</sup>Oregon Department of Environmental Quality human health water quality criteria, <sup>2</sup>U.S. EPA aquatic life benchmark, <sup>3</sup>U.S. Maximum Contaminant Level (Safe Drinking Act), <sup>4</sup>U.S. Geological Survey Human Health Based Screening Level. Note the 6/22/15 Oxyfluorfen pore water concentration could not be estimated due to the lack of TOC data.

All detections were below the aquatic life toxicity level. Estimated pore water concentrations exceeded EPA's aquatic life benchmark for bifenthrin on October 26, 2015. The DEQ human health water quality criteria for DDT metabolites were exceeded in every sample analyzed.

► **Projects Funded and Improvements Made:** During the past two biennium's (2013-15 and 2015-17) the Water Quality Pesticide Management Team has awarded Oregon State University two technical assistance grants to focus on the implementation of Integrated Pest Management (IPM) practices related to raising Christmas trees. During the 2015-17 biennium an award of \$25,169.97 was made for the development, implementation, and effectiveness monitoring of these practices. In addition, the CRBC was awarded \$6,250.00 to collect in-field water quality samples used to evaluate the status of monitored waterbodies related to pesticide presence.

Progress in reducing pesticide residues in some streams has been limited. Especially challenging has been achieving reductions in areas where land use is classed as either predominately mixed or agricultural. The sub-watersheds represented by monitoring stations 10868 (North Fork Deep Creek) and 32068 (Noyer Creek) contain the bulk of the pesticide detections that are of highest concentrations. The following table provides a comparison between monitoring results obtained for pesticides determined to exist in water in the 2013-15 biennium to those obtained in the 2015-17 biennium. A five-year trend analysis of all the monitoring stations within the Clackamas PSP indicate a downward trend in concentrations for the pesticides or pesticide metabolites bifenthrin, chlorpyrifos, dimethenamid, diazinon, metolachlor, metsulfuron methyl, oxyfluorfen, and sulfometuron-methyl. An upward trend in concentration was noted for deisopropylatrazine, simazine, carbaryl, diuron, ethoprop, glyphosate, AMPA, and imidacloprid.

The results of the 2013-15 / 2015-17 comparison coupled with the results of the trend analysis support the notion that future work should be focused on the Noyer Creek and North Fork Deep Creek sub-watersheds.

## COMPARISON OF ANALYTICAL RESULTS 2013-15 AND 2015-17 BIENNIAL MONITORING

Station Number	2013-15% Detections	Number of BM Exceedances	Number of Individual Pesticides	2015-17 % Detections	Number of BM Exceedances	Number of Individual Pesticides
10868	37.6	11	19	35.7	21	25
32066	34.5	0	12	37	0	12
32068	24	18	28	28.3	36	23
32074	21.9	0	18	21	1	13
38096	0	0	0	0	0	0

During the 2015-17 biennium, the WQPMT placed emphasis on adding stream discharge monitoring to all WQ sampling stations. This all allow for a more thorough evaluation of WQ data. During the 2017-19 biennium measurements of surface water flow will begin at all WQ monitoring locations except for Rock Creek where flow data is derived via a permanent discharge meter is installed and operated by the Clackamas County Water Environment Services. These activities are conducted by the CRBC.

The Clackamas Soil and Water Conservation District (CSWCD) has also conducted several activities in support of PSP goals within the watershed. Examples of these activities conducted during the 2015-17 biennium are:

- Offering producers up to \$500 toward sprayer nozzles and other parts that make sprayers more efficient to reduce the need for repeated applications.
- Conducting sprayer calibration workshop that included pesticide certification credits.
- Worked with regional crop advisors in providing a hands-on workshop on drift-reducing spray nozzles and calibration.
- Conducted educational opportunities to producers regarding beneficial insects as natural enemies of crop pests. Classes, field days, and materials provided assisted in insect identification and habitat creation.
- Conducted focused separate classes for the Christmas tree and nursery industries addressing their specific needs regarding Integrated Pest Management.
- Calibrated windsocks that attach to a tractor or sprayer, providing location-specific information for better decisions.

Two waste pesticide collection events were held within the watershed during the 2015-17 biennium. The November 2016 event collected 12,437 lbs., the April 2017 event collected 9,150 lbs. Together these events took in over 21,000 lbs. of unusable pesticides which were legally disposed.

*Produced by the Oregon Water Quality Pesticide Management Team.*

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