MOLALLA-PUDDING

Pesticide Stewardship Partnership
2015-17 Biennial Summary

Water Quality Monitoring Locations 2015-17

History: The Molalla-Pudding Pesticide Stewardship Partnership began in 2005, after a review of water quality impairment listings indicated that streams in the Molalla-Pudding were water quality limited for current use pesticides. At that time, a Total Maximum Daily Load (TMDL) was being developed for the Pudding River, which created an opportunity to pursue voluntary stewardship actions through a PSP in lieu of short-term Clean Water Act measures through the TMDL. In addition, USGS was conducting regular monitoring of Zollner Creek as part of its National Water Quality Assessment program, and these monitoring results underscored the need for engagement with pesticide applicators in the watershed. Local partners, including Marion Soil and Water Conservation District (SWCD), Oregon State University Extension (OSU), US Geological Survey (USGS)S and Wilco, expressed a strong interest in establishing a PSP in the watershed. Beginning in 2015 partners began a renewed effort to assess and address pesticide residues within the watershed.

Land Use: The Molalla-Pudding PSP encompasses 529 sq.-mi and is dominated by agricultural land use. The largest city within the watershed is Woodburn with a population of 26,000 (2017 Portland State University estimates). Based on 2011 National Land Coverage Data (NLCD) the land use in the watershed is 52% agriculture, 23% forest, 16% other, and 9% urban. Agricultural activities include tree fruit, grains, grass seed, and row crops.

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 November. During the timeframe July 1, 2015 through June 30, 2017 water quality samples were collected from three locations.

WATER QUALITY MONITORING STATIONS 2015-17 BIENNIUM

Station ID	Map Number	Description	Predominate Land Use	No. Detections	BM* Exceedances
10917	1	Pudding R. @ Hwy 99E	Ag, Urban	106	0
11516	2	Zollner Ck @ Dominic Rd	Ag	232	6
31875	3	Little Pudding R. @ Rambler Rd	Ag	209	5

**BM = US EPA Aquatic Life Benchmark for pesticides*

A majority of pesticide detections occurred in predominately agricultural areas monitored by stations 11516 and 31875 these sites are also responsible for all U.S. Environmental Protection Agency (EPA) pesticide aquatic life benchmark exceedances.

WATER QUALITY DATA SUMMARY FOR ALL SAMPLE LOCATIONS 2015-17 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	18	8	.4	.1	44.4	0
2,4-DB	H	1000	18	2	1.3	.123	11.1	0
2,6-dichlorobenzamide	M	NA	51	49	.234	.1012	96.1	
AMPA	M	249500	18	18	2.15	.442	100	0.0
Atrazine	H	1	51	33	.0867	.0185	64.7	9
Azoxystrobin	F	44	14	7	.512	.071	50	1
Carbaryl	I	.5	51	1	.00741	.0015	2	1
Chlorothalonil	F	.6	51	1	.0567	.001	2	9
Chloropyrifos	I	.041	51	3	.054	.00256	5.9	133
Cycolate	H	200	51	1	.0266	.00052	2	0
DEET	R	37500	51	3	.0827	.00366	5.9	0
Deisopropylatrazine	M	NA	51	44	.0828	.0159	86.3	
Desethylatrazine	M	NA	51	26	.0262	.0056	52	NA
Diazinon	I	.05	51	1	.0819	.00163	2	164
Dicamba	H	61	18	1	.6	.0003	5.6	1
Dichobenil	H	30	51	10	.118	.0101	19.6	0
Dichloroprop	H	77	18	1	.5	.0003	5.6	1
Dimethenamid	H	8.9	5	33	8.96	.44	64.7	101
Dimethoate	I	.5	51	1	.0264	.00052	2	5
Diuron	H	2.4	51	51	15.2	.625	100	633
EPTC	H	800	51	3	.208	.0069	5.9	0
Ethoprop	I	.8	51	2	.0387	.0013	3.9	13
Fenarimol	F	100	51	2	.0387	.0013	3.9	0
Glyphosate	H	1800	18	14	3.13	.852	77.8	0
Hexazinone	H	7	51	3	.077	.0028	5.9	1
Imazapyr	H	24	51	7	3.2	.077	13.7	13
Imidacloprid	I	.01	51	6	.316	.011	11.8	3160
Linuron	H	.09	51	4	.0265	.00098	7.8	29
Methiocarb	I	2.75	51	1	.0567	.00011	2	2
Methomyl	I	.7	51	13	.356	.0237	25.5	51
Methoxychlor	I	.7	51	1	.089	.00178	2	13
Metolachlor	H	1	51	36	.498	.105	70.6	50
Metribuzin	H	8.1	51	9	.0671	.00305	41.2	1
Metsulfuron methyl	H	.36	51	3	.00649	.00036	5.9	2
Napropamide	H	1100	51	6	30.6	.608	11.8	3
Oxyfluorfen	H	.33	51	8	.096	.0077	15.7	29
Norflurazn	H	9.7	51	11	.501	.252	21.6	5
Pendimethalin	H	5.2	51	21	.995	.0514	41.2	19
Pentachlorophenol	F	25	18	1	.1	0000	5.6	0
Pronamide	H	NA	51	1	.023	.00045	2	
Propiconazole	F	21	51	11	.151	.0175	21.6	1
Pyralostrobin	F	1.5	51	4	.0163	.00091	7.8	1
Simazine	H	2.24	51	47	.591	.0561	92.2	26
Sulfometuron-methyl	H	.45	51	9	.0237	.0021	17.6	5
Terbacil	H	11	51	8	.0623	.0062	15.7	1
Triadimefon	F	52	51	2	.044	.00136	3.9	0
Triclopyr	H	19	18	1	.5	.0003	5.6	3
Trifluralin	H	2.4	51	1	.0439	.00086	2	2

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)

Water quality monitoring conducted from July 1, 2015 through June 30, 2017 indicated the presence of 48 pesticides or pesticide metabolites, five of which were found at concentrations and frequencies that are of high concern and four of which are of moderate concern. Based on the sampling results the areas of greatest concern are the Zoller Creek sub-watershed and the mid-Little Pudding River. Pesticide residue concentrations in the Pudding River are of low concern at this time.

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 .234 µg/L (.8% of the current HHBM) with an averge of all detections at .1012 µg/L. 2,6-dichlorobenzamide was detected in 96% 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 realitively low toxicity to aquatic life). At this time EPA has not established a human health benchmark. AMPA was detected in 100% samples analyzed.

Deisopropylatrazine and desethylatrazine 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 and desethylatrazine. Deisopropylatrazine and desethylatrazine were detected at frequencies of 86% and 53% respectively.

PESTICIDES OF CONCERN DETECTED IN THE PUDDING-MOLALLA PESTICIDE STEWARDSHIP PARTNERSHIP

Pesticide	Common Trade Names	Pesticide Classification
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
Methomyl	Kipsin, Lannate	Insecticide
Metolachlor	Bicep, Dual, Pennant	Herbicide
Oxyfluorfen	Goal, Koltar	Herbicide
Sulfometuron-methyl	Ally, Escort, Oust	Herbicide
Simazine	Primatol, Princep, Simadex, Simanex	Herbicide

Sediment Data: One sediment sample was collected in the fall of 2015. Three currently used pesticides were detected, the insecticides bifenthrin, and chlorpyrifos, and the herbicide oxyfluorfen. Several metabolites for the legacy pesticides DDT and chlordane were detected.

PESTICIDES DETECTED IN SEDIMENTS AT THE ZOLLNER CREEK AT MONITOR-MCKEE BRIDGE MONITORING STATION – MOLALLA-PUDDING 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	10/26/15	.412	24	.000018	.00019	.000031[1]
2,4'-DDE	10/26/15	1.45	84.3	.000016	.00258	.000022[1]
2,4'-DDT	10/26/15	.448	26.05	.0001	.000013	.000022[1]
Bifenthrin	10/26/15	1.26	73.3	.071122	.00031	.00132
Chlorpyrifos	10/26/15	2.28	132.6	.0491	.01335	.042
cis-Chlordane	10/26/15	.25	14.5	NA	.0022	23
Oxyfluorfen	10/26/15	2.16	125.6	.000037	.00388	.292
trans-Nonchlor	10/26/15	.283	16.5	NA	.00029	NA

[1]Oregon Department of Environmental Quality human health water quality criteria, 2) U.S. EPA aquatic life benchmark, 3) U.S. Maximum Contaminant Level (Safe Drinking Act), 4) U.S. Geological Survey Human Health Based Screening Level

Analytical results indicate no likely impact to aquatic life due to sediment toxicity for either current or legacy pesticides. The DEQ human health water quality criteria of .000031 and .000022 µg/L was exceed in the estimated pore water analysis for each of the DDT metabolities. No benchmark or criteria was exceeded for pore water estimates for metabolites of chlordane.

Projects Funded and Improvements Made: Progress in reducing the frequency of pesticide residues in stream has been limited; however, significant progress has been made in reducing the magnitude of detections as evidenced by the decline in the benchmark exceedances from the 2013-15 biennium to the 2015-17 biennium. A five-year trend analysis indicates a downward trend in concentrations for the following pesticides or pesticide metabolites: deisopropylatrazine, simazine, carbaryl, chlorpyrifos, dimethoate, diuron, ethoprop, and oxyfluorfen. Trends have remained steady for atrazine and desethylatrazine. Trends for dimethenamid, glyphosate, AMPA, imidacloprid, metolachlor, and propiconazole are up indicating the need for more focused education and outreach and/or management measures.

Additional efforts are needed to reduce the overall number of pesticides detected at the three monitoring stations. Future monitoring will be expanded to include stream flow data which will allow for determinations of pesticide loading in addition to concentrations determinations.

WATER QUALITY DATA SUMMARY FOR ALL SAMPLE LOCATIONS 2015-17 BIENNIUM

Station Number	2013-15% Detections	Number of BM Exceedances	Number of Individual Pesticides	2015-17 % Detections	Number of BM Exceedances	Number of Individual Pesticides
10917	35	0	22	38.6	0	16
11516	42.8	27	36	37.8	6	39
31875	36.8	19	38	36.8	5	33

In the sampling period spanning the 2013-15 biennium 22 samples were collected and analyzed, during the 2015-17 biennium 18 samples were collected and analyzed

During the 2015-17 biennium local efforts have been focused on engaging the watersheds diverse communities through conversations at local events, such as the Woodburn Public Works Field Day and by presenting information via local Spanish language radio. The PRWC has also been engaged in filling gaps in local school programs by sharing the stewardship message through hands on educational programs and conducting field day streamside demonstrations about aquatic macroinvertebrates and water quality.

Initially in 2015, early partnership development focused on identifying and acquiring academic and conservation district support. Focus has been directed towards gaining the public's attention in relaying the need for clean streams to be a critical part of a healthy community. Substantial efforts have made to promote partnerships between businesses and the community. This has resulted in partnerships with nursery businesses donating trees to improve impaired riparian corridors on private agricultural property thus reducing he potential for pesticide movement from fields to waterbodies.

Through a combination of cold-calling and emailing, the PRWC communicated with people on a list of licensed nursery operators and Christmas tree growers. As credibility of the organization has evolved, so has its potential to make inroads with streamside landowners. The PRWC is collaborating with both Clackamas and Marion SWCDs to enhance riparian buffers on private lands.

Produced by the Oregon Water Quality Pesticide Management Team.
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