Idaho State Department of Agriculture

Pesticide Residue Evaluation

Lower Snake River Tributaries

May 1, 2014 through October 2, 2014

Prepared by

Kirk Campbell

ISDA Technical Report SW-53

January 2015

Introduction

In 2014, the Idaho State Department of Agriculture (ISDA) conducted a pesticide residue monitoring program on four major tributaries to the Lower Snake River. The four tributaries consisted of the Lower Boise River (LBR-1), Sand Hollow Drain (SH-1), Payette River (PR-1), and the Weiser River (WR-1) (Figure 1). Pesticide samples were collected on a bi-weekly schedule starting on May 1, 2014 through October 2, 2014. A total of 48 samples (12 per site) were collected during this program. Samples were shipped on ice, overnight and analyzed by the University of Idaho Analytical Science Laboratory (ASL) located in Moscow, Idaho.

The Weiser watershed has the largest total acreage that drains into the Snake River followed by the Lower Boise River watershed. (Table 1). The largest agricultural acreage resides within the Boise Drainage followed by the Weiser Drainage (Table 1).

Table 1. Total drainage acreage and agricultural acreage per site.

Sites	Locations	Total Drainage	Ag Acres
LBR-1	Parma-Hexon Rd. Bridge	825,600 acres	104,026
SH-1	Fort Boise	590,520	29,760
PR-1	Payette-6th Ave. Bridge	380,000 acres	30,248
WR-1	Weiser-Cove Rd.Bridge	1,079,148 acres	67,339

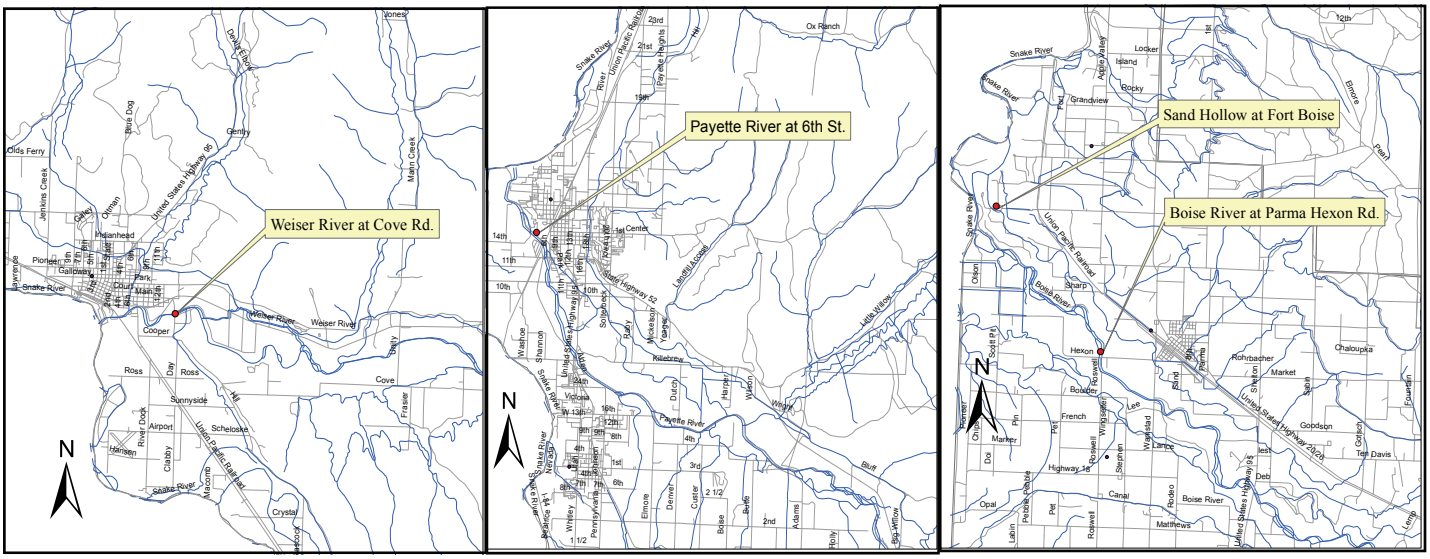

Figure 1. Monitoring locations for the four major tributaries to the Snake River.

Pesticide of Concern (POC)

ISDA defines a pesticide of concern (POC) as any pesticide that is detected at a concentration that is greater than or equal to fifty percent (≥50%) of an established Environmental Protection Agency (EPA) Aquatic Life Benchmark. These benchmarks were developed based on concentrations of pesticides and their acute and chronic effects on fish and aquatic invertebrates and acute effects on vascular and nonvascular plants. Acute toxicity of a pesticide refers to the effects from a single dose or repeated exposure over a short period of time (i.e. a few hours or a day). Chronic toxicity is the ability of a substance to cause adverse health effects resulting for long-term or repeated low levels of exposure.

Results

Overall, there was a combined total of 143 pesticide detections during this study. There were 132 herbicide detections, four insecticide detections, and seven desethyl atrazine (degradate of atrazine) detections (Table 2).

Table 2. Pesticide name, type, trade names, and number of detections. Red indicates an insecticide.

Pesticide	Type	*Trade Name	# Detects	Pesticide	Type	*Trade Name	# Detects
2,4-D	H	Weedar 64	29	diuron	H	Karmex	7
alachlor	H	Lasso	3	EPTC	H	Eptam	4
atrazine	H	Aatrex	2	hexazinone	H	Velpar	10
bromacil	H	Hyvar X	7	MCPA	H	Rhomene	1
bromoxynil	H	Buctril	7	methomyl	I	Lannate	1
chlorpyrifos	I	Lorsban	2	metribuzin	H	Sencor	2
dacthal	H	Dacthal W-75	18	metolachlor	H	Dual	16
desethyl atrazine	D		7	pendimethalin	H	Prowl	17
dicamba	H	Dicamba 4	1	permethrin	I	Permacap CS	1
H = herbicides I = insecticides D = degradate of atrazine (desethyl atrazine) * Trade Names may vary.				terbacil	H	Sinbar	8

Lower Boise River (LBR-1)

There were 12 herbicides identified and one degradate of atrazine (desethyl atrazine) at the Lower Boise site. There were 42 total detections of herbicides and four detections of desethyl atrazine (Table 3). There were no insecticides detected and no pesticides of concern were identified.

Table 3. Lower Boise River pesticide results.

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D	H	11	0.93	12,075	14,200	12,500	16,050	3,880	13.1
alachlor	H	1	0.073	900	187	1,250	110	1.64	2.3
atrazine	H	1	0.025	2,650	—	360	60	<1	0.001
bromacil	H	3	0.077	18,000	3,000	60,500	8,200	6.8	45
bromoxynil	H	2	0.11	26.5	18	48	2.5	51	—
desethyl atrazine	D	4	0.041	2,650	—	360	60	<1	0.001
dicamba	H	1	0.12	14,000	—	>50,000	—	61	>3,250
diuron	H	3	0.036	200	26	80	200	2.4	15
EPTC	H	1	0.10	7,000	—	3,245	810	1,400	5,600
hexazinone	H	2	0.14	137,000	17,000	75,800	20,000	7	37.4
metolachlor	H	7	0.11	1,600	1,000	550	1	8	21
pendimethalin	H	6	0.045	69	6.3	140	14.5	5.2	12.5
terbacil	H	4	0.16	23,100	1,200	32,500	640	11	140

Sand Hollow Drain (SH-1)

There were a total of 73 pesticide detections with 66 herbicide detections, four insecticide detections, and three degradate of atrazine (desethyl atrazine) detections (Table 4). There were 13 herbicides identified, three insecticides and one de-sethyl atrazine. Two chlorpyrifos detections were considered a POC with one exceeding both the acute invertebrate level

and the invertebrate chronic level (Table 4). The other chlorpyrifos detection was ≥50% of both the acute and chronic concentrations for invertebrates (Table 4). The other POC was a detection of permethrin which is a pyrethroid insecticide and is highly toxic to both fish and invertebrates. The permethrin detection was greater than the fish chronic benchmark, greater than the acute and chronic invertebrate benchmark and ≥50% of the fish acute benchmark (Table 4).

Table 4. Sand Hollow pesticide results. Red print indicates a POC.

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D	H	12	4.6	12,075	14,200	12,500	16,050	3,880	13.1
alachlor	H	2	0.12	900	187	1,250	110	1.64	2.3
atrazine	H	1	0.027	2,650	—	360	60	<1	0.001
bromacil	H	4	0.12	18,000	3,000	60,500	8,200	6.8	45
bromoxynil	H	5	0.17	26.5	18	48	2.5	51	—
chlorpyrifos	I	2	0.059	0.9	0.57	0.05	0.04	140	—
			0.026	0.9	0.57	0.05	0.04	140	—
dacthal	H	12	0.20	15,000	—	13,500	—	>11,000	>11,000
desethyl atrazine	D	3	0.046	2,650	—	360	60	<1	0.001
diuron	H	4	0.10	200	26	80	200	2.4	15
EPTC	H	3	0.083	7,000	—	3,245	810	1,400	5,600
hexazinone	H	3	0.14	137,000	17,000	75,800	20,000	7	37.4
MCPA	H	1	0.24	48,000	12,000	41,000	11,000	160	130
methomyl	I	1	0.11	160	12	2.5	0.7	—	—
metolachlor	H	9	0.32	1,600	1,000	550	1	8	21
pendimethalin	H	7	0.31	69	6.3	140	14.5	5.2	12.5
permethrin	I	1	0.20	0.395	0.0515	0.0106	0.0014	68	
terbacil	H	3	0.23	23,100	1,200	32,500	640	11	140

Payette River (PR-1)

The Payette River had only four herbicides identified with a total of seven detections (Table 5) and there was no POC identified (Table 5).

Table 5. Payette River pesticide results.

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D	H	2	0.38	12,075	14,200	12,500	16,050	3,880	13.1
hexazinone	H	3	0.13	137,000	17,000	75,800	20,000	7	37.4
pendimethalin	H	1	0.029	69	6.3	140	14.5	5.2	12.5
terbacil	H	1	0.074	23,100	1,200	32,500	640	11	140

Weiser River (WR-1)

There were five herbicides detected at WR-1 with a total of 17 detections (Table 6). There were no insecticides detected or pesticides of concern.

Table 6. Weiser River pesticide detections.

Pesticide Detected	Pesticide Type	Number of Detections	Highest Detection ug/L	Fish Acute ug/L	Fish Chronic ug/L	Inverts. Acute ug/L	Inverts. Chronic ug/L	Non Vasc. Acute ug/L	Vascular Acute ug/L
2,4-D	H	4	0.47	12,075	14,200	12,500	16,050	3,880	13.1
dacthal	H	6	0.22	15,000	—	13,500	—	>11,000	>11,000
hexazinone	H	2	0.12	137,000	17,000	75,800	20,000	7	37.4
metribuzin	H	2	0.054	21,000	3,000	2,100	1,290	8.7	130
pendimethalin	H	3	0.12	69	6.3	140	14.5	5.2	12.5

Conclusion

The majority of pesticide detections occurred in the Lower Boise (46) and Sand Hollow (73) waterways which indicates that both of these drainages are vulnerable to pesticide usage and residue transport. Data collected in 2013, by ISDA, at the Lower Boise site resulted in a total of 74 total detections, with 61 herbicide detections, five insecticide detections, and eight desethyl atrazine detections. The Sand Hollow site had three detections of insecticides, with two chlorpyrifos detections and one permethrin detection, that were considered POC. The variability of pesticide detections vary greatly, from year to year, and one year of data is really insufficient to define the presence and effects of pesticide residues on these systems. The low number of detections within the Weiser River and the Payette River is encouraging when compared to the Lower Boise River and the Sand Hollow Drain. As with most water quality studies, the occurrence of pesticides varies with factors, such as:

⇒ Spatial pesticide use pattern, crop and management practices, and soil and hydrological vulnerabilities.

⇒ Intensity and timing of pesticide applications and coincidence of rainfall events.

⇒ Year-to-year temporal patterns at any given location reflecting changes in cropping patterns, pesticide products used, and variation in rainfall and irrigation needs from year to year.

⇒ Duration and timing of pesticide monitoring.

Recommendations

⇒ Read and follow pesticide label directions for water protection.

⇒ Maintain and calibrate all pesticide application equipment.

⇒ Field scouting for pests, evaluate pest control needs, irrigation management, use of less toxic pesticides.

⇒ Use BMPs including buffers, filter strips, sediment basins, and setbacks from live water.

⇒ Avoid runoff due to weather events, check weather forecasts prior to pesticide applications.

⇒ Avoid overspray and drift.