Idaho State Department of Agriculture

Pesticide Residue Evaluation

For

Rock Creek Tributary to the Salmon River

Butcher Creek, Threemile Creek, Cottonwood Creek Tributaries to the South Fork Clearwater River

Lawyer Creek, Fivemile Creek, Boulder Creek, Pine Creek Tributaries to the Mainstem Clearwater River

April through September 2012

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ISDA Technical Report No. W-44

February 2013

Introduction

During the period from April 11, 2012 through September 26, 2012, the Idaho State Department of Agriculture (ISDA) in cooperation with the University of Idaho Analytical Science Laboratory (UIASL), conducted an evaluation of pesticide residues on eight tributaries located within north-central Idaho. Three of the tributaries (Butcher, Threemile, and Cottonwood Creek) discharge into the South Fork of the Clearwater River; while four of the creeks (Lawyer, Fivemile, Boulder, and Pine Creek) discharge into the mainstem of the Clearwater River (Figure 1). Rock Creek, which drains acreage west of Grangeville, Idaho and discharges to the Salmon River, was also evaluated during this program (Figure 1). With the exception of Threemile Creek, the remaining tributaries are listed as salmonid spawning tributaries to both the Clearwater River and the Salmon River. This years monitoring completed an effort, by ISDA, to evaluate the major spawning tributaries to the Clearwater River for potentially harmful pesticide residues. Combining the work from 2011 and 2012, ISDA has evaluated 13 tributaries to the mainstem and the south fork of the Clearwater River. Pesticide detections have been compared to established Environmental Protection Agencies (EPA) aquatic benchmarks for both acute and chronic pesticide concentrations for fish and invertebrates.

The Clearwater River Basin is located in north-central Idaho and covers approximately 9,645 square miles. For the 2012 study, the total acreage that drains into the Clearwater is approximately 342,350 acres, with approximately 246,821 acres involved in some type of agricultural activity (Table 1).

Table 1. Tributary acreage and salmonid spawning designation.

Monitoring Site	Watershed * Acreage	Agricultural * Acreage	% Agricultural * Acreage	Designated for Salmonid Spawning	Tributary Drainage
Rock Creek	58,138	31,918	54.9	Yes	Salmon River
Butcher Creek	10,758	6,336	58.9	Yes	S.F. Clearwater
Threemile Creek	21,312	14,194	66.6	No	S.F. Clearwater
Cottonwood Creek	124,461	103,053	82.8	Yes	S.F. Clearwater
Lawyer Creek	137,920	92,130	66.8	Yes	Clearwater Mainstem
Fivemile Creek	7,923	6,402	81	Yes	Clearwater Mainstem
Bedrock Creek	25,370	13,344	52.6	Yes	Clearwater Mainstem
Pine Creek	14,606	11,362	78	Yes	Clearwater Mainstem

*Acreage calculated using USGS StreamStat.

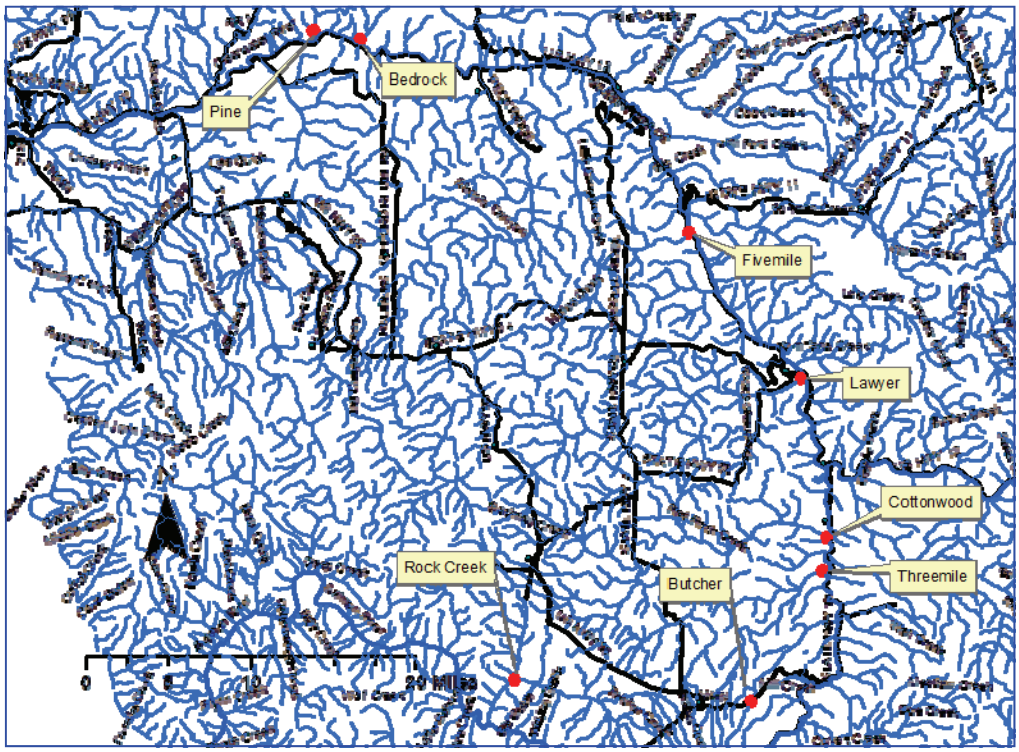


Figure 1. Monitoring Locations 2012.

Monitoring for this program was conducted on a bi-weekly schedule from April through September, 2012. All field monitoring techniques followed the protocols outlined in the Quality Assurance Project Plan (QAPP) for the Clearwater River Tributaries Pesticide Evaluation, April 2012 (on file at ISDA). All bottle blank and equipment blank samples prepared in the field were non-detectable for pesticides, indicating that both the field and laboratory activities were free from contamination.

Overall Results

The 2012 monitoring program resulted in the detection of 15 different pesticides throughout the study area. Of the 15 pesticides there were 11 herbicides, two insecticides, one fungicide, and one degradate of atrazine (Table 2).There were a combined total of 74 pesticide detections during this program. Of those 74 pesticides, 67 were herbicides, five were insecticides, one was a fungicide, and one was a degradate of atrazine. Of the herbicides, metribuzin had 14 detections followed by 2,4-D (11), MCPA (11), and bromoxynil with nine. There were four detections of the insecticide methomyl and one detection of the insecticide dimethoate. Cottonwood Creek had the highest number of detections with 19 followed by Threemile Creek (17), Pine Creek (14), and Rock Creek (10) (Table 3).

Table 2. Detected pesticides, trade names, and type of pesticide

Detected Pesticides	Type	Trade Name	Detected Pesticides	Type	Trade Name
2,4-D	Herbicide	Curtail	diuron	Herbicide	Karmex
2,4-DB	Herbicide	Butyrac	hexazinone	Herbicide	Velpar
bentazon	Herbicide	Basagran	MCPA	Herbicide	Banlene
bromoxynil	Herbicide	Buctril	metalaxyl	Fungicide	Apron
desethyl atrazine[1]	Degradate	—	methomyl	Insecticide	Lannate
dicamba	Herbicide	Brushmaster	metribuzin	Herbicide	Sencore
dimethoate	Insecticide	Dimethoate 4EC	picloram	Herbicide	Tordon
[1] degradate of Atrazine			prometron	Herbicide	Pramitol 25E

Table 3. Total pesticides and detections per monitoring location.

Pesticides	Rock	Butcher	Threemile	Cottonwood	Lawyer	Fivemile	Boulder	Pine	Total
2,4-D	2	3	1	2	1			2	11
2,4-DB			2						2
bentazon			1	1				1	3
bromoxynil			2	2		1		4	9
desethyl atrazine			1						1
dicamba	2		2	2				1	7
dimethoate								1	1
diuron				1					1
hexazinone				1			2		3
MCPA	1		2	4	2			2	11
metalaxyl				1					1
methomyl	2		1				1		4
metribuzin	1		4	4		1	1	3	14
picloram	2		1		1				4
prometron				1	1				2
Total	10	3	17	19	5	2	4	14	74

Individual Tributary Results

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 are established for pesticide effects on fish and aquatic invertebrates at acute and chronic levels and non-vascular and vascular plants at acute levels. 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 from long-term exposure or repeated low levels of exposure.

The following tables list the pesticide detections found at each tributary and compares the detection against the EPA's aquatic benchmarks. There was only one POC observed during this study and that was a bromoxynil detection at Pine Creek (Table 11).

Table 4. Rock Creek pesticide results.

Rock Creek				EPA Aquatic Benchmarks ug/L					
Collection Dates	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
5/23/2012	2,4-D	H	0.46	12,075	14,200	12,500	16,050	3,880	13.1
	dicamba	H	0.27	14,000	—	17,300	—	61	>3,250
	picloram	H	0.33	6,500	550	34,150	11,800	4,900	—
6/6/2012	2,4-D	H	0.88	12,075	14,200	12,500	16,050	3,880	13.1
	dicamba	H	0.19	14,000	—	17,300	—	61	>3,250
	MCPA	H	0.5	48,000	12,000	41,000	11,000	160	130
	picloram	H	0.2	6,500	550	34,150	11,800	4,900	—
	metribuzin	H	0.039	21,000	3,000	2,100	1,290	8.7	130
8/15/2012	methomyl	I	0.066	160	12	2.5	0.7	—	—
9/26/2012	methomyl	I	0.13	160	12	2.5	0.7	—	—

Table 5. Butcher Creek pesticide results. **Note: Butcher Creek was dry on 8/15/12**

Butcher Creek				EPA Aquatic Benchmarks ug/L					
Collection Dates	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
5/23/2012	2,4-D	H	0.56	12,075	14,200	12,500	16,050	3,880	13.1
6/6/2012	2,4-D	H	0.82	12,075	14,200	12,500	16,050	3,880	13.1
7/18/2012	2,4-D	H	0.52	12,075	14,200	12,500	16,050	3,880	13.1

Table 6. Threemile Creek pesticide results.

Threemile Creek				EPA Aquatic Bencmarks ug/L					
Collection Dates	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
4/11/2012	2,4-DB	H	0.25	1,000	—	7,500	—	932	—
	metribuzin	H	0.032	21,000	3,000	2,100	1,290	8.7	130
4/25/2012	metribuzin	H	0.056	21,000	3,000	2,100	1,290	8.7	130
5/23/2012	2,4-DB	H	0.97	1,000	—	7,500	—	932	—
	bromoxynil	H	0.17	26.5	18	48	2.5	51	—
	dicamba	H	0.12	14,000	—	17,300	—	61	>3,250
	MCPA	H	0.38	48,000	12,000	41,000	11,000	160	130
	metribuzin	H	0.42	21,000	3,000	2,100	1,290	8.7	130
6/6/2012	2,4-D	H	0.53	12,075	14,200	12,500	16,050	3,880	13.1
	bentazon	H	0.44	>50,000	—	>50,000	—	4,500	5,350
	bromoxynil	H	0.11	26.5	18	48	2.5	51	—
	dicamba	H	0.089	14,000	—	17,300	—	61	>3,250
	MCPA	H	0.55	48,000	12,000	41,000	11,000	160	130
	picloram	H	0.19	6,500	550	34,150	11,800	4,900	—
	metribuzin	H	0.077	21,000	3,000	2,100	1,290	8.7	130
9/26/2012	methomyl	I	0.066	160	12	2.5	0.7	—	—
	desethyl atrazine	D	0.028	2,650	65	360	60	1	37

Table 7. Cottonwood Creek pesticide results.

Cottonwood Creek S.F. Clearwater				EPA Aquatic Benchmarks ug/L					
Collection Date	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
4/25/2012	MCPA	H	2.3	48,000	12,000	41,000	11,000	160	130
	metribuzin	H	0.12	21,000	3,000	2,100	1,290	8.7	130
5/10/2012	MCPA	H	0.4	48,000	12,000	41,000	11,000	160	130
	metribuzin	H	0.045	21,000	3,000	2,100	1,290	8.7	130
5/23/2012	2,4-D	H	2.9	12,075	14,200	12,500	16,050	3,880	13.1
	bentazon	H	0.5	>50,000	—	>50,000	—	4,500	5,350
	bromoxynil	H	0.15	26.5	18	48	2.5	51	—
	dicamba	H	0.61	14,000	—	17,300	—	61	>3,250
	MCPA	H	0.83	48,000	12,000	41,000	11,000	160	130
	hexazinone	H	0.068	137,000	17,000	75,800	20,000	7	37.4
	metalaxyl	F	0.05	65,000	9,100	14,000	100	140,000	92,000
	metribuzin	H	0.13	21,000	3,000	2,100	1,290	8.7	130
	prometon	H	0.096	6,000	9,500	12,850	3,500	98	624
6/6/2012	2,4-D	H	1.3	12,075	14,200	12,500	16,050	3,880	13.1
	bromoxynil	H	0.2	26.5	18	48	2.5	51	—
	dicamba	H	0.5	14,000	—	17,300	—	61	>3,250
	MCPA	H	1	48,000	12,000	41,000	11,000	160	130
	metribuzin	H	0.071	21,000	3,000	2,100	1,290	8.7	130
	diuron	H	0.06	200	26	80	200	2.4	15

Table 8. Lawyer Creek pesticide results.

Lawyer Creek				EPA Aquatic Benchmarks ug/L					
Collection Dates	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
4/25/2012	MCPA	H	0.23	48,000	12,000	41,000	11,000	160	130
5/23/2012	2,4-D	H	0.22	12,075	14,200	12,500	16,050	3,880	13.1
	MCPA	H	0.22	48,000	12,000	41,000	11,000	160	130
	Picloram	H	0.32	6,500	550	34,150	11,800	4,900	—
	Prometon	H	0.053	6,000	9,500	12,850	3,500	98	624

Table 9. Fivemile Creek pesticide results.

Fivemile Creek				EPA Aquatic Benchmarks ug/L					
Collection Date	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
6/6/2012	bromoxynil	H	0.11	26.5	18	48	2.5	51	—
	metribuzin	H	0.032	21,000	3,000	2,100	1,290	8.7	130

Table 10. Boulder Creek pesticide results. **Note: Boulder Creek was dry on 8/15/12.**

Boulder Creek				EPA Aquatic Benchmarks ug/L					
Collection Dates	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
4/11/2012	metribuzin	H	0.026	21,000	3,000	2,100	1,290	8.7	130
5/10/2012	hexazinone	H	0.093	137,000	17,000	75,800	20,000	7	37.4
5/23/2012	hexazinone	H	0.076	137,000	17,000	75,800	20,000	7	37.4
7/2/2012	methomyl	I	0.1	160	12	2.5	0.7	—	—

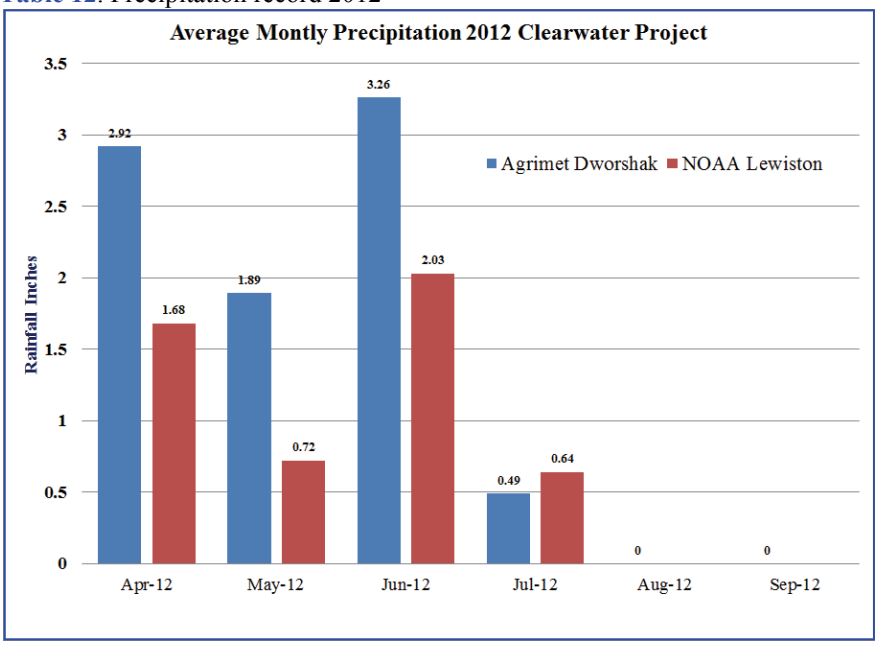
Table 11. Pine Creek pesticide results. **Note: Pine Creek was dry on 8/15/12.**

Pine Creek				EPA Aquatic Benchmarks ug/L					
Collection Date	Pesticides Detected	Pesticide Type	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	NonVascular Acute	Vascular Acute
4/11/2012	metribuzin	H	0.035	21,000	3,000	2,100	1,290	8.7	130
5/10/2012	bromoxynil	H	0.67	26.5	18	48	2.5	51	—
	MCPA	H	0.48	48,000	12,000	41,000	11,000	160	130
5/23/2012	2,4-D	H	0.21	12,075	14,200	12,500	16,050	3,880	13.1
	metribuzin	H	0.29	21,000	3,000	2,100	1,290	8.7	130
6/6/2012	2,4-D	H	0.61	12,075	14,200	12,500	16,050	3,880	13.1
	bromoxynil	H	2	26.5	18	48	2.5	51	—
	dicamba	H	0.089	14,000	—	17,300	—	61	>3,250
	MCPA	H	2.3	48,000	12,000	41,000	11,000	160	130
	metribuzin	H	0.28	21,000	3,000	2,100	1,290	8.7	130
6/20/2012	bromoxynil	H	0.11	26.5	18	48	2.5	51	—
7/2/2012	bentazon	H	0.26	>50,000	—	>50,000	—	4,500	5,350
	bromoxynil	H	0.13	26.5	18	48	2.5	51	—
7/18/2012	dimethoate	I	0.1	3,100	430	21.5	0.5	84	—

Conclusions

Overall there were 15 pesticides identified during this study which consisted of 11 herbicides, two insecticides, one fungicide, and one degradate of atrazine. A total of 92 samples were collected during this program; 80% of those samples had a positive pesticide detection. Of the 74 total detections, 67 of those were herbicides (90%), with only five insecticide detections (6%). The majority of the herbicide detections (85%) occurred in the months of May and June, with a few detections in April. According to precipitation records (Table 12), the average precipitation in April was higher than May or June, but a wet spring may have delayed pesticide applications. The five insecticide detections were all detected during the dry months of July (2), August (1), and September (2). The insecticides detected during this study were methomyl and dimethoate, which are both highly soluble in water. The fact that they were found so late in the season may be a result of the insecticides leaching into shallow ground water and then migrating through shallow springs into surface water. All of the insecticide detections were below any EPA acute or chronic benchmarks.

Table 12. Precipitation record 2012



The data collected by ISDA over the 2011 and 2012 seasons tends to indicate that pesticide residues within the Clearwater River drainage do not appear to be at concentrations that would affect salmonid spawning activities. The only POC during the 2012 monitoring was at Pine Creek for the herbicide bromoxynil that was greater than or equal to 50% of the chronic benchmark for invertebrates (Table 12).

Any future pesticide monitoring, that may be undertaken within the Clearwater Basin could focus on a more condensed monitoring schedule. A weekly schedule during the spring months (April, May, and June) or by monitoring during or just after storm events may provide a clearer picture of pesticide residues within potential spawning tributaries of the Clearwater River and Salmon River.

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