Idaho State Department of Agriculture

Second Year

Indian Creek Pesticide Residue Evaluation

April through September 2013

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Introductions

In 2013, the Idaho State Department of Agriculture (ISDA) conducted a second year of pesticide residue monitoring at six locations on Indian Creek (Figure 1). For the 2013 monitoring, two of the sites were relocated with IC-2 being moved from near 21st Street to the 4th Street Bridge in Caldwell and the IC-5 site being moved further downstream to where Indian Creek crosses under Amity Road. Moving IC-2 to 4th Street helped to include additional urban activities while moving IC-5 to Amity Road allowed for some additional evaluation of agricultural activities located upstream (Table 1).

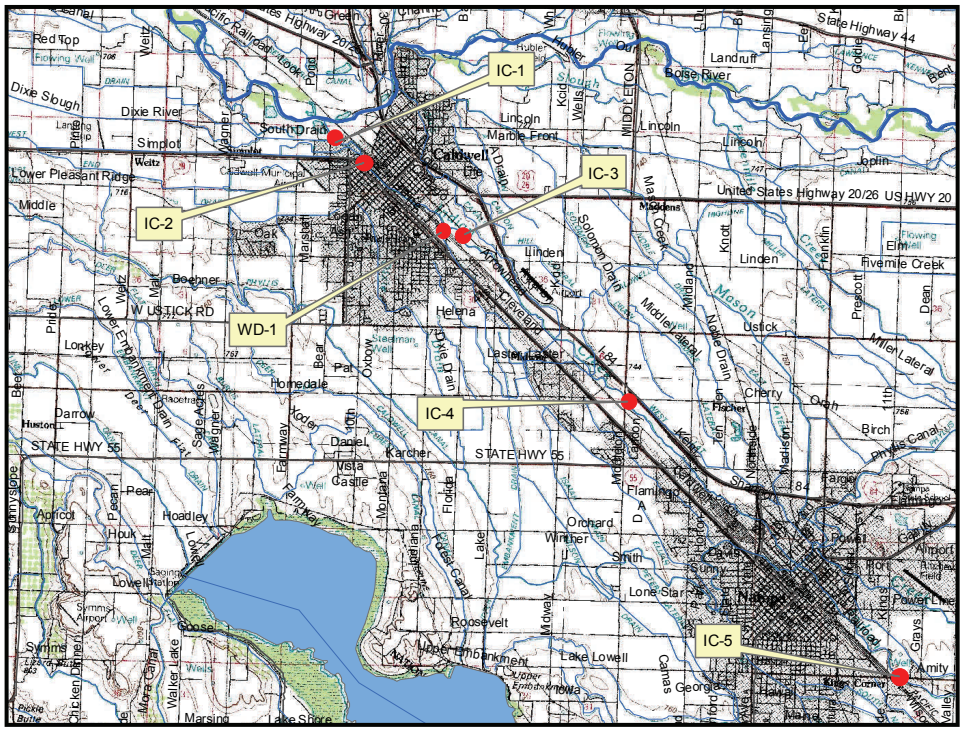

Figure 1. Indian Creek monitoring locations in the vicinity of Caldwell and Nampa, Idaho.

Table 1. Description of monitoring site locations.

Site ID	Site Locations
IC-1	At Johnson Ln. at diversion near Caldwell WWTP
IC-2	4th Street Bridge downtown Caldwell
WD-1	Wilson Drain on Stock Trail Rd.
IC-3	Upstream of Wilson Drain Chicago Ave. at Sparrow Ln.
IC-4	Middleton Rd. between Caldwell and Nampa
IC-5	Indian Creek at Amity Road.

Samples, for this program, were collected on a bi-weekly schedule from April 10 through September 24, 2013. A total of 13 samples were collected from each monitoring site: these samples were shipped to and analyzed by the University of Idaho Analytical Science Laboratory (ASL) located in Moscow, Idaho.

Results

There were a total of 19 pesticide compounds identified during this study. They consisted of 14 herbicides, four insecticides, and one degradate of atrazine (desethyl atrazine) (Table 2). Of these 19 pesticides, there were a total of 398 detections with 298 herbicide detections, 25 insecticide detections, and 75 desethyl atrazine detections. Desethyl atrazine, which is a degradate of atrazine, had the highest number of detections (75) followed by the herbicide 2,4-D (50), and the herbicide bromacil (50). The insecticide chlorpyrifos had 11 detections followed by the insecticide ethoprop with six, and bifenthrin with five (Table 2). The addition of Wilson Drain (WD-1), an extra sampling location in 2013, increased the total number of detections from 232 in 2012 to 398 in 2013. If you remove the WD-1 data, the overall detections for 2013 (332) still exceeded the 2012 study (232) by 100 detections. The significant increase in 2013 was due to the increase in herbicide detections.

Table 2. Pesticide name, type, trade names, and number of detections.

Pesticide	Type	*Trade Name	# Detects	Pesticide	Type	*Trade Name	# Detects
2,4-D	H	Curtail	50	ethoprop	I	Mocap	6
atrazine	H	Aatrex	21	hexazinone	H	Velpar	24
bifenthrin	I	Capture	5	malathion	I	Cythion	3
bromacil	H	Krovar	50	MCPA	H	Banlene	9
bromoxynil	H	Buctril	15	metolachlor	H	Dual	19
chlorpropham	H	Spud Guard	20	metribuzin	H	Sencore	14
chlorpyrifos	I	Lorsban	11	pendimethalin	H	Prowl	27
dacthal	H	DacthalW-75	4	simazine	H	Simadex	6
desethyl atrazine	D	—	75	terbacil	H	Sinbar	18
diuron	H	Karmex	21				

H=herbicide, I=insecticide, D=degradate of atrazine

*** Other Trade Names may apply**

The total number of detections and the percentage of detections for each pesticide is shown in Figure 2.

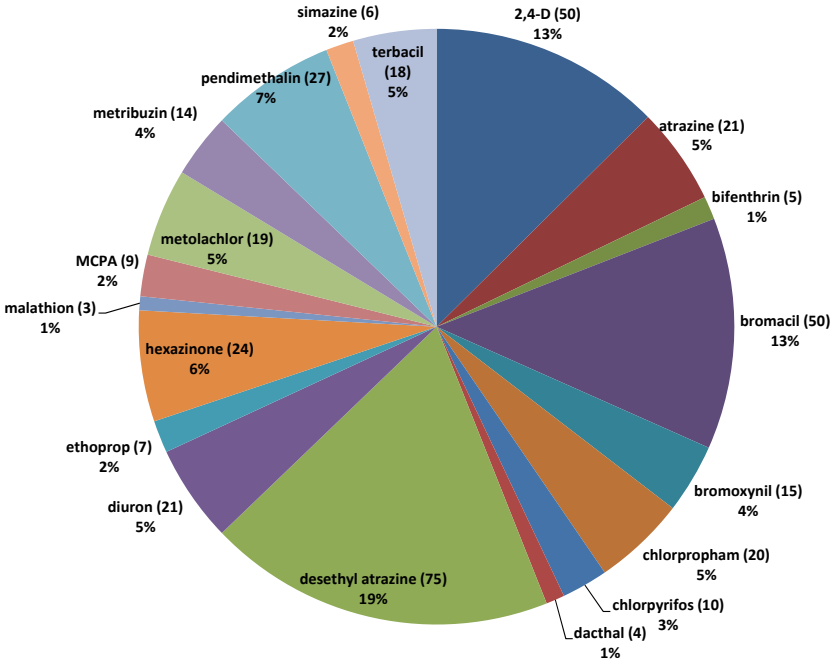

Figure 2. Percent of total detections for 2013.

As previously mentioned, the number of pesticide detections in 2013 exceeded the 2012 detections by a large margin. The majority of the increased number of detections were herbicides, while the insecticides and the degradate of atrazine (desethyl atrazine) detections stayed relatively consistent (Table 3).

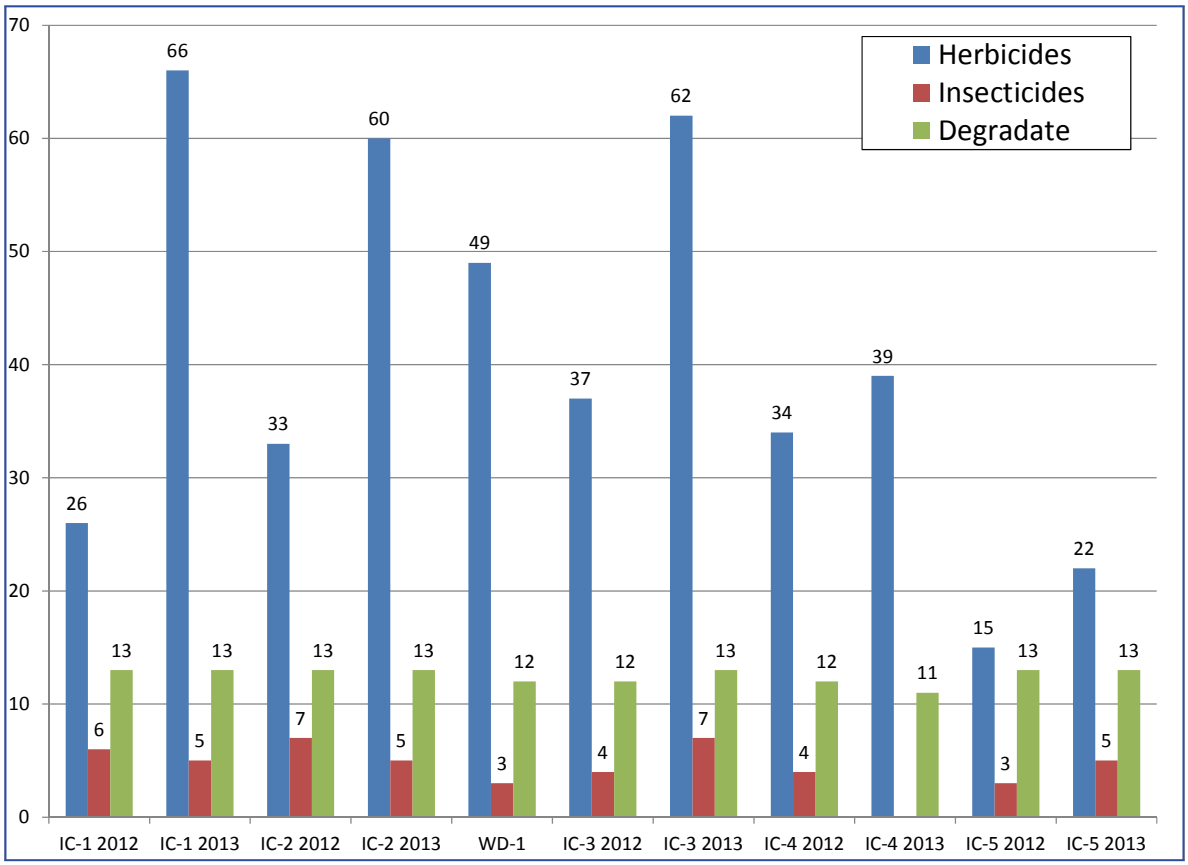

Figure 3. Total pesticide detections (2012 and 2013) for each monitoring station.

Pesticides of Concern

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 developed for 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 from long-term or repeated low levels of exposure.

There were POC detections, at all of the monitoring stations with the exception of IC-4 (Table 3). All of the POCs were insecticides with two organophosphate insecticides, chlorpyrifos and malathion, and one pyrethroid insecticide bifenthrin (Table 3). Chlorpyrifos and bifenthrin are listed as restricted use pesticides (RUP) which requires a licensed applicator. Both chlorpyrifos and bifenthrin have a high affinity adhere to soil and often migrate off site during soil erosion caused by irrigation or rain events. Malathion is a general use pesticide (GUP) and has a moderate affinity for soil but can also become soluble in water and migrate off-site within the water column. Chlorpyrifos and bifenthrin can be toxic to freshwater fish and are both highly toxic to aquatic invertebrates. Malathion can be moderately toxic to fresh water fish, but can be highly toxic to aquatic invertebrates.

Table 3. Pesticides of Concern, numbers in red under the concentration column, are considered a POC by ISDA. Other red values are EPA Aquatic Benchmarks for acute and chronic levels for fish, invertebrates, vascular and nonvascular plants.

Site	Date	POC	Concentration ug/L	Fish Acute	Fish Chronic	Inverts Acute	Inverts Chronic	Nonvascular Acute	Vascular Acute
IC-1	7/16/2013	chlorpyrifos	0.039	0.9	0.57	0.05	0.04	140	—
	7/30/2013	chlorpyrifos	0.026	0.9	0.57	0.05	0.04	140	—
	6/18/2013	malathion	0.077	16.4	8.6	0.3	0.035	2,400	—
IC-2	6/4/2013	bifenthrin	0.023	0.075	0.04	0.8	0.0013	—	—
	6/18/2013	malathion	0.067	16.4	8.6	0.3	0.035	2,400	—
	7/16/2013	chlorpyrifos	0.049	0.9	0.57	0.05	0.04	140	—
WD-1	6/4/2013	bifenthrin	0.015	0.075	0.04	0.8	0.0013	—	—
	7/16/2013	chlorpyrifos	0.11	0.9	0.57	0.05	0.04	140	—
	8/27/2013	chlorpyrifos	0.029	0.9	0.57	0.05	0.04	140	—
IC-3	6/4/2013	bifenthrin	0.032	0.075	0.04	0.8	0.0013	—	—
	7/1/2013	bifenthrin	0.015	0.075	0.04	0.8	0.0013	—	—
	7/30/2013	bifenthrin	0.025	0.075	0.04	0.8	0.0013	—	—
	6/18/2013	malathion	0.095	16.4	8.6	0.3	0.035	2,400	—
IC-5	5/7/2013	chlorpyrifos	0.044	0.9	0.57	0.05	0.04	140	—
	7/16/2013	chlorpyrifos	0.043	0.9	0.57	0.05	0.04	140	—
	7/30/2013	chlorpyrifos	0.03	0.9	0.57	0.05	0.04	140	—
	8/27/2013	chlorpyrifos	0.039	0.9	0.57	0.05	0.04	140	—
	9/10/2013	chlorpyrifos	0.036	0.9	0.57	0.05	0.04	140	—

Conclusions

Overall, for 2013, there were 19 pesticides identified with 14 herbicides, four insecticides, and one degradate of atrazine (desethyl atrazine). The total pesticide detections for all monitoring stations were 389, with 298 herbicide detections, 25 insecticide detections and 75 desethyl atrazine detections. It is not known, at this time, why there was a major increase in herbicide detections (for 2013) and will require further work and a better understanding of pesticide usage patterns within Indian Creek's subwatershed. Indian Creek continues to show vulnerability to pesticide residues from a variety of pesticide use activities (agriculture, road side spraying, urban usage, etc.), that may be negatively effecting the overall health of Indian Creek.

Recommendations

The following items are several precautions that can be taken when applying pesticides:

⇒ Read and follow Label Directions-Always follow label directions for water quality protection.

⇒ Follow chemigation law/rules-applicators must be licensed and follow state chemigation laws.

⇒ Conduct maintenance and calibration of application equipment, match application rates to pest problem.

⇒ Implementation of management strategies-Field scouting, evaluation of pest control needs, selection of proper pesticide, irrigation management, etc.

⇒ Implement BMPs, including conservation buffers, vegetative filter strips, sediment basins, and pump back systems.

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

⇒ Avoid overspray and drift, do not mix and load near water.

⇒ Consider alternative products that are not as persistent or toxic.