Idaho State Department of Agriculture
Surface Water Pesticide Fact Sheet
Lake Lowell Agricultural Return Drains, 2016

ISDA Surface Water Fact Sheet

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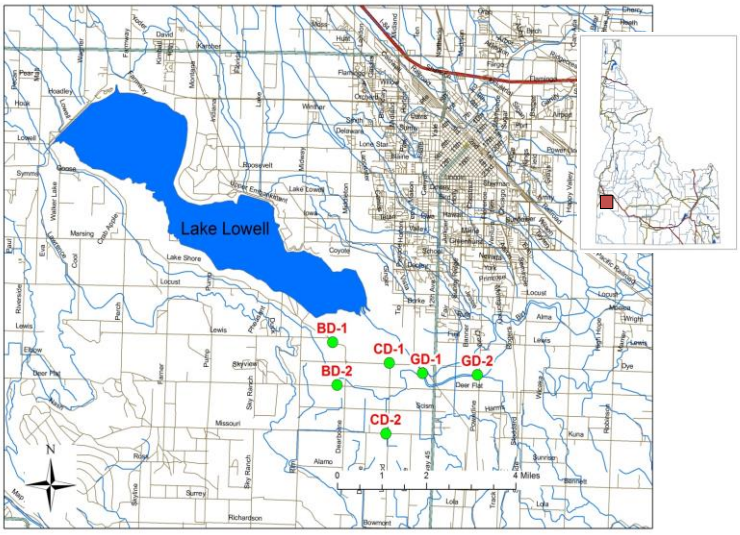
In 2016, the Idaho State Department of Agriculture (ISDA) conducted water quality monitoring for pesticide residues at three agricultural return drains that flow into Lake Lowell (Figure 1). The original study, conducted by ISDA in 2010 (with follow-up monitoring in 2014 and 2015), indicated that these three agricultural drains transport large quantities of pesticide residues and sediment into Lake Lowell. The majority of acreage serviced by these drains consists of surface irrigated agriculture that transports irrigation return wastewater, along with canal spill water, into Lake Lowell. Three drains were monitored in 2016, with each drain monitored in two locations, for upstream and downstream comparisons. The drains monitored were Bernard Drain, Coulee Drain and Garland Drain (Figure 1).



Lake Lowell is a man-made lake and is located within Canyon County, about 25 miles west of Boise, ID, and about five miles west of Nampa, ID. The Lake Lowell watershed is located primarily in Canyon County, with a smaller portion in Ada County. The Lake Lowell drainage area is approximately 62 square miles (39,680 acres). However, the primary source of water filling the reservoir is through the New York Canal, which begins east of Boise, ID. These drains are a minor portion of the waters filling the reservoir. These drains do not have designated beneficial uses other than for agriculture/irrigation purposes. ISDA uses the US Environmental Protection Agency (EPA) Aquatic Life Benchmarks to describe the water quality of these drains before reaching Lake Lowell.

Figure 1. Monitoring locations at drains flowing into Lake Lowell.

The six Lake Lowell drain locations had 60 samples collected, each sample was analyzed for nearly 110 pesticide compounds. There were 491 total detections of 28 pesticide compounds (Table 1 and Figure 2). The overall detections consisted of 272 herbicides, 74 insecticides, and 145 fungicide detections (Table 1). The general use pesticides with the greatest number of detections were the herbicides: 2,4-D (48), Diuron (44), Metolachlor (38), and Pendimethalin (38) (Figure 2). Of these, Metolachlor has the lowest concentration (1 ug/L or 1 part per billion) for chronic effects on invertebrates. Of the most often detected herbicides, Pendimethalin has a low solubility in water, whereas 2,4-D, Diuron and Metolachlor are moderately soluble.

Table 1. Overall Detections.

Location	Herbicide	Insecticide	Fungicide	Total
BD-1	57	19	30	106
BD-2	58	16	29	103
CD-1	46	13	26	85
CD-2	40	9	20	69
GD-1	33	9	20	62
GD-2	38	8	20	66
TOTAL	272	74	145	491

There were a total of 74 insecticide detections in 2016 (Table 1 and Figure 2). The organophosphate insecticide, Chlorpyrifos, was detected 31 times and all 31 detections where greater than 50% of an US EPA Aquatic Life Benchmark for invertebrate life. Additionally, 11 detections were greater than the acute levels for invertebrate life. Chlorpyrifos is a restricted use insecticide and is highly toxic to both fish and aquatic invertebrates. Chlorpyrifos, at very low concentrations, has chronic effects on invertebrates (0.04 ug/L or 40 part per trillion). Chlorpyrifos binds tightly to soil particles and is primarily transported via erosion from irrigation or weather events. Dimethoate and Methomyl had 15 and 12 detections, respectively, and have a high to moderate toxic effects on aquatic species. Dimethoate is a general use insecticide, while Methomyl is a restricted use insecticide.

All the fungicide detections were well below the aquatic life benchmarks.

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 US EPA Aquatic Life Benchmark. Table 2 lists the pesticides detected in 2016, the number of detections, POC detections, and whether those pesticides have historically been considered a POC in the surface waters of Idaho. The benchmarks are developed for acute and chronic effects on fish, 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.

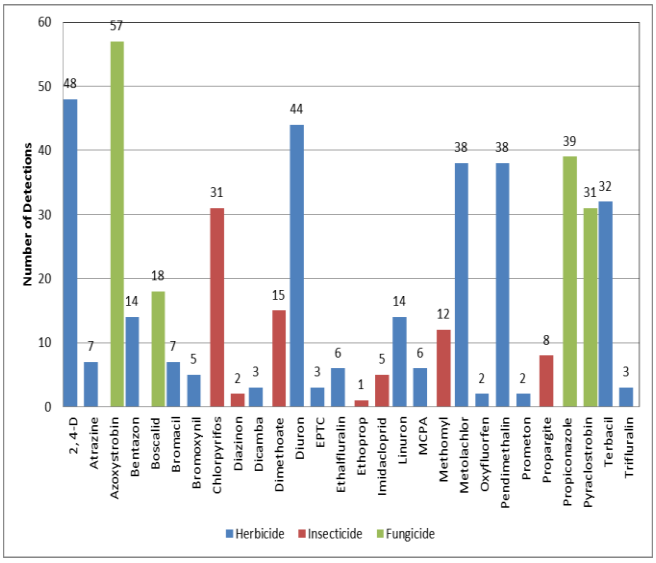


Figure 2. Pesticide detections and type.

Table 2. Lake Lowell Drains-ISDA historically identified Pesticides of Concern; red font indicates POC level detections in 2016.

Pesticide	Number of Detections	Type	ISDA POC
2, 4-D	48	Herbicide	
Atrazine	7	Herbicide	
Azoxystrobin	57	Fungicide	
Bentazon	14	Herbicide	
Boscalid	18	Fungicide	
Bromacil	7	Herbicide	
Bromoxynil	5	Herbicide	POC
Chlorpyrifos	31	Insecticide	POC
Diazinon	2	Insecticide	
Dicamba	3	Herbicide	
Dimethoate	15	Insecticide	POC
Diuron	44	Herbicide	
EPTC	3	Herbicide	
Ethalfluralin	6	Herbicide	
Ethoprop	1	Insecticide	POC
Imidacloprid	5	Insecticide	
Linuron	14	Herbicide	POC
MCPA	6	Herbicide	
Methomyl	12	Insecticide	POC
Metolachlor	38	Herbicide	POC
Oxyfluorfen	2	Herbicide	
Pendimethalin	38	Herbicide	
Prometon	2	Herbicide	
Propargite	8	Insecticide	
Propiconazole	39	Fungicide	
Pyraclostrobin	31	Fungicide	
Terbacil	32	Herbicide	
Trifluralin	3	Herbicide	

Conclusions

In 2016, the insecticide Chlorpyrifos had the highest number of detections for a POC. All 31 detections were ≥ 50% of an established US EPA Aquatic Life Benchmark for chronic and acute invertebrate benchmarks and 11 detections exceeded those criteria (Figure 2). The effects of Chlorpyrifos on the toxicity of sediment that is deposited within the shallow littoral zone in Lake Lowell are unknown. This zone is where these pesticides could potentially impair the cold-water aquatic life.

There were no consistent identifiable differences between the upstream and the downstream locations on each drain.

There are indications that there is a soil management issue (erosion) in this watershed, removed pesticides from their applied locations. Not only can these mobilized pesticides impair downstream uses, but it also means that the economic costs and effectiveness of these pesticides is limited, and adds to the costs of crop production.

The Lake Lowell Agricultural Return Drains (2014) fact sheet discusses the implications and management strategies to improve the effectiveness of pesticides and remediate soil losses. The recommendations made in that document remain relevant.

ISDA will continue to educate landowners and applicators about the potential impacts that pesticides can have on water quality and the environment. ISDA shares our data with the Idaho Department of Environmental Quality (DEQ), US EPA, our cooperators and inspectors. ISDA will continue to monitor waters near Lake Lowell that could affect water quality.

Assessment of potential impacts to the aquatic life and habitat was beyond the scope of this study. However, data are provided to the Idaho DEQ so that they can determine if there are any impairments to beneficial uses associated with the monitored locations for those instances where measured concentration exceeded either the POC or Aquatic Life Benchmark. While some benchmarks were exceeded, these instances may not meet the threshold for impairment of beneficial uses as described in the Idaho Code and DEQ's Water Body Assessment Guidance.

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For additional information about this program or projects, please contact Curtis Cooper, Idaho State Department of Agriculture at (208) 332-8597 or email at curtis.cooper@isda.idaho.gov