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SUBJECT: Phosphorus TMDL in Lake Champlain and glyphosate herbicide use

In December 2009 I submitted comments regarding the phosphorus TMDL and possible contribution of glyphosate to the phosphorus loading and cyanobacteria in Lake Champlain; however, data on glyphosate use and research on its effects in water were limited at that time. Given the large uses of glyphosate in agriculture, landscaping, utilities, railroads and other venues, we need a clearer indication of whether glyphosate represents a useful contribution of phosphorus for the growth of cyanobacteria in Lake Champlain, as well as more data on glyphosate use in the watershed over a period of several years. In these comments, I supply new data on reported glyphosate use, new research on relationships between glyphosate, phosphorus, and cyanobacteria, recommendations and references.

GLYPHOSATE, PHOSPHORUS, PHOSPHONATE AND CYANOBACTERIA

Glyphosate is the active ingredient in herbicides including Roundup, Accord, Aquaneat, Razor and Rodeo and is used in agriculture, on railroad, highway and utility rights-of-way (reported) and on lawns in suburban areas (largely not reported). Ohio scientists began in 2009 to research connections between Roundup use on fields in springtime as corn was planted and algae blooms in Lake Erie.(Brannon, S 2009)

Some strains of cyanobacteria appear to be somewhat resistant to glyphosate, due to the presence of a resistant form of the target enzyme, and four strains were able to utilize the herbicide as a sole source of phosphorus (Forlani G et al, 2008). In another study, Roundup reduced micro- and nano- phytoplankton, while the abundance of pico-cyanobacteria increased by a factor of about 40 (Perez GL et al 2007). Scientists at Bowling Green University have identified a gene in marine and freshwater cyanobacteria enabling them to utilize phosphonates in the environment, including phosphonate herbicides (Ilikchyan IN et al 2009). Researchers at Bowling Green University can be contacted at bullerj@bgnet.bgsu.edu and mmckay@bgnet.bgsu.edu.

DATA FOR REPORTED GLYPHOSATE USE (see note 1, next page)

Franklin County has seen recent high uses of glyphosate reported by commercial applicators in 2011 (pounds of active ingredient only).

	Corn	Railroads	Utilities	Field & Forage	TOTAL
2011	5,459.25	280.00	1,630.35	30,997.00	**37,339.60**
2012	8,427.49	372.00	54.15		**8,853.64**

In Chittenden County, major reported glyphosate uses in 2011 and 2012 were as follows:

	Corn	Highway	Lawn	Ornamental	Railroad	Utilities	TOTAL
2011	341.13	36.80	184.41	394.79	358.00	2,118.65	**3396.98**
2012	900.34	227.70	579.43		325.00	181.36	**2213.80**

GLYPHOSATE USE & TOTAL STATE PESTICIDE USE *REPORTED* FOR 11 YRS TO 2012: (lbs. active ingredient)

year	glyphosate	TOTAL pesticide use
2012	57,727.87	634,407.04
2011	63,843.45	574,899.72
2010	35,033.32	410,241.81
2009	19,132.81	404,104.96
2008	4810.88	225.441.95
2007	5606.56	442,465.20
2006	12,599.13	502,209.48
2005	6699.53	388,905.28
2004	10,259.08	424,507.68
2003	8473.27	439,384.03
2002	13,164.09	840,572.89

NOTES on DATA

1. Data rely on applicator accuracy in creating, keeping and reporting data. 2011 data include over 2000 pounds of herbicide use reported from an "unknown county".

2. Reported uses are required by pesticide rules, and do NOT include personal use of glyphosate -based products purchased by non-commercial users at home & garden stores.

3. Railroads use glyphosate products up to 2' from water at bridge abutments, and visually estimated 10 feet from waters parallel to railroads.

4. Utilities can use glyphosate products 10 feet from water.

GEOGRAPHICAL CONTEXT

The Missisquoi River and tributaries wind through Franklin County where large areas devoted to corn culture and field-grown forage are treated with herbicides, and enters Missisquoi Bay at the Missisquoi National Wildlife Refuge. Missiquoi Bay has seen problematic levels of toxic cyanobacteria since 2001 (Fortin N 2010).

Chittenden County includes large areas of suburban development where glyphosate is commonly used in landscaping and can move into stormwater entering Lake Champlain. Utilities and railroads use glyphosate close to water, including railyards at Burlington's Waterfront. Lake Champlain volunteer monitors have seen blue-green algae at several shore points in Burlington.

Researchers in France found glyphosate and AMPA from urban areas, including railroads and highways, in stormwater and wastewater treatment plants and in surface waters at concentrations above drinking water quality standards. The glyphosate estimated load was 179 kg/yr (394.6 lbs) at the urban catchment outlet. (Botta F et al 2009). Researchers with the USGS monitored midwest waters and found approximately 50 streams contaminated with glyphosate at levels up to 8.7 ug/L and its degradate AMPA (USGS 2013).

RECOMMENDATIONS:

1) Prioritize scientific inquiry into phosphorus loading from large uses of glyphosate in the watershed; (2) Develop revised pesticide regulations for all development to limit glyphosate use through alternative means of weed control and Green Stormwater Infrastructures; (3) Increase monitoring for glyphosate and AMPA, and (4) increase width of buffer areas for pesticides to at least 35 feet adjacent to waters of the State.

REFERENCES

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