THE SUMMER BUG DILEMMA

By Raye Lahti, 6/2017

Nobody likes mosquitoes, and we would all like less biting insects and ticks during "The Lake Season". Before you decide to chemically eliminate the intruders consider the following. This abbreviated document is being provided only to assist our lake owners in making decisions if we are considering whether or not to seek out a service or product to limit biting insects from our lake property. It is not meant to discredit any local companies offering mosquito/tick elimination services. Also, this is not to say that all of the chemicals used for treating our property for mosquitos, biting flies, and ticks are equally hazardous. We do realize, however, that there are service companies that are in the business to "wipe out biting insects," particularly mosquitoes and ticks, and are we fully aware of effects these chemicals may have on other living organisms of the lake, and forest habitats?

Rachel Carson wrote Silent Spring in 1962 documenting the detrimental effects on the environment of the indiscriminate use of pesticides, and the effects of pesticide use on our health and our environment. Almost fifty-five years after Carson drew attention to the health and environmental impacts of DDT, we have seen a comeback of many animal species (e.g. Bald Eagles and Loons), however, the use of equally hazardous pesticides has only increased.

The following information has been gathered from reliable sources such as Duke University, the US Geological Survey, the National Pesticide Information Center and summarized to provide basic information. References are provided below if you wish to look more into the use of chemical pesticides on your lake property.

Locally available services are currently offering application of pesticides to wipe out or repel the mosquitoes in your yard through (1) barrier spraying your yard with an insecticide and/or repellent every three weeks or so; or (2) a misting that would spray your yard with chemicals at set intervals. You may also purchase various products to control mosquitoes at your local hardware store.

A number of companies, nationwide, claim to be using chemicals that are safe and registered by the U.S. Environmental Protection Agency. But as savvy buyers in the chemical marketplace, it is important to read labels and cautions even if they claim that the chemicals are derived from natural products. Despite the emphasis on "natural," the issue is that these chemicals may have some properties that are toxic. After all, pesticides are the only toxic substances released intentionally into our environment to kill living things.

The table below offers some more specific information about products commonly available locally.

Four Products are Commonly Used by Local Companies Offering Mosquito & Tick Control Services

Pros	Cons
BIFENTHRIN (BIFENL T)	
Low in toxicity to birds.	There are potential risks for birds and mammals that eat aquatic organisms because bifenthrin can last a long time in the environment and it may accumulate in fish.
No effect on mollusks at its limit of water solubility.	Highly toxic to fish and small aquatic organisms. Very toxic to bees.
	Highly toxic to fish and aquatic arthropods and LC50 values range from 0.0038 to 17.8 µg/L. (In general, the aquatic arthropods are the most sensitive species. Care should be taken to avoid contamination of the aquatic environment).
	Only slightly toxic to both waterfowl and upland game birds (LD50 values range from 1,800 mg/kg to >2,150 mg/kg).
	A study recently completed by the USGS, https://www.usgs.gov/news/common-insecticide-identified-midwestern-streams now shows, "Exposure to bifenthrin concentrations previously thought benign caused the insect populations to become less abundant and diverse, and caused an increase in algal growth as the larvae that feed on algae decreased. The insecticide also altered the timing of insect emergence from the larval state to become adults and complete their life cycle."
PERMETHRIN	
Permethrin ("per-meth-rin") is a manmade, synthetic insecticide whose chemical structure is based on natural pyrethrum ("pie-wreath-rum"), related to certain species of chrysanthemums. Pyrethroides were developed to match or exceed the effectiveness of natural pyrethrum, but to be more stable in sunlight.	Classified by EPA as "likely to be carcinogenic to humans" based on animal studies.
The EPA concluded in 2009 that, given their knowledge at that time, permethrin was below their level of concern.	On the other hand, the National Pesticide Information Center's factsheet for permethrin shows it has a similar profile to bifenthrin for its acute effects on people and pets, and its **toxicity to bees and aquatic life**.

CYFLUTHRIN (OPTISHIELD)	
One chemical locally available in the pyrethoroids class of pest-icides (see above) and has low toxicity in birds and mammals.	But pyrethroids (above) are **highly toxic to fish and some aquatic invertebrates**, so usage is restricted near water (U.S.EPA, 2012).
	The Material Safety Data Sheet – "This Compound has been thoroughly evaluated for ecological effects." Bayer, one of the manufacturers states "As with any pesticide, this product should be used according to label directions and SHOULD BE KEPT OUT OF STREAMS, LAKES and OTHER AQUATIC HABITATS"
ESSENTRIA IC3	
It is stated to contain all "natural" ingredients (Rosemary Oil, Gar-anoil, and Pepperment oil) and no publication says it has a toxicity to humans or animals.	California requires any product containing 8.5% or more of Rosemary Oil must at a minimum bear the signal word "Caution", the phrase "Keep Out of Reach of Children", appropriate precautionary language, and a requirement for protective eyewear and gloves.
Works via an octopamine blocker mechanism, so in prin-cipal at least, it's **not** toxic to mammals or fish, and is there-fore exempted from EPA FIFRA 25(b) listing and control.	Materials Safety Data Sheet: "While specific data regarding toxicity to fish or other aquatic organisms is not available for this product, care should always be taken to prevent pesticides from entering aquifers".

Other mosquito control pesticides include:

Methoprene	(Affects the development of egg/larva) Moderately to highly toxic to fish and crustaceans; relatively non-toxic to birds; low toxicity to adult bees.
Bti (Bacillus Thuringiensis)	Not toxic to bees, however, "very high concentrations reduced longevity of honey bee adults.
Bsp (Bacillus sphaericus)	Not toxic to bees.
Temephos	Highly toxic to bees, aquatic organisms, and is mod-erately to highly toxic to birds.
Sumithrin	Extremely toxic to bees, aquatic life, and poisonous to cats and dogs.
Malathion	Highly toxic to bees, and to freshwater and estuarine aquatic organisms, moderately toxic to birds.
Chlorpyrifos	Toxic to bees, birds, freshwater fish and invert-ebrates.

The bacteria *Bacillus thuringiensis israelensis* (*Bti*) mentioned above**:** is

- Now the most commonly used microbicide to control mosquitoes worldwide and
- Is considered to be the least toxic alternative to chemical pesticides.
- But a new study has revealed adverse effects on the reproductive success of birds.

- Recent work by Brigitte Poulin, a bird ecologist at the Tour du Valat research centre in Arles, France, and her colleagues — in the *Journal of Applied Ecology* provides evidence that **mosquito control has effects further up the food chain showing that the breeding success of birds has dropped dramatically compared with that of birds living in untreated sites**.
- The fall in reproductive success was due to the loss of mosquitoes — the birds' preferred food source.

In summary: there is a lot of information out there. If you are contemplating using a barrier spray, misting system or product from your local hardware store, request from the company promoting their services, the labels on their products so you know what chemicals are being used. Find out how long the sprays are effective, typically they range from 2-21 days. **Even though it is claimed spraying isn't done close to the lake, is there the chance of runoff after a rainstorm?** Carefully check the environmental and health effects data.

References:

Duke University: http://blogs.nicholas.duke.edu or http://blogs.nicholas.duke.edu/citizenscientist/better-living-through-chemistry/

Journal of Applied Ecology:

Poulin, B., Lefebvre, G. & Paz, L. *J. Appl. Ecol.* advance online publication doi:10.1111/j.1365-2664.2010.01821.x (2010).

National Pesticide Information Center:

http://npic.orst.edu/factsheets/bifgen.html
http://www.sciencedirect.com/science/article/pii/S0160412011001668http://npic.orst.edu/pest/mosquito/mosqcides.html

US Geologic Survey: https://www.usgs.gov/news/common-insecticide-identified-midwestern-streams

Holly A. Rogers, 2015. Bifenthrin Causes Trophic Cascade and Altered Insect Emergence in Mesocosms: Implications for Small Streams

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