

Gypsy Moth Treatment

Gypsy moth (*Lymantria dispar*) treatment is happening in Lafayette County, beginning mid-May through August. The day before receiving this announcement, I discovered a rusty-patched bumble bee (*Bombus affinis*) on our property, a federally endangered insect. While this was a new find, our land supports a number of classified insects (endangered, threatened, and special concern, also referred to as T&E), along with herptiles and birds. Needless to say, I was concerned and had to nail down the details.



An adult gypsy moth.



Ilona Loser

The larva or caterpillar of the gypsy moth

If you received a notice about spraying in your county, you can check to see the target sites with the Department of Agriculture (DATCP) interactive [map](#).

What is the killing agent?

Bacillus thuringiensis serotype *kurstaki* (Btk) is a group of bacteria which makes it a biological control agent. This bio-control agent is different from those where a non-native insect is brought in to kill off a non-native plant. All bio-control measures need a healthy dose of skepticism applied to them – two non-natives don't make a native. Since Btk is commonly found in our soils, it does not introduce a foreign entity into our ecosystems.

How does Btk work?

I went in search of how Btk does the “dirty deed.” Btk is not a contact insecticide; the insect must ingest it. It is a stomach poison and will only effect the larval feeding stage (i.e., when it is a caterpillar). Andrea Diss-Torrance,

Invasive Forest Insects Program Coordinator for the Wisconsin DNR, tells me that “among moths and butterflies, the effect can vary: about a third of species tested are sensitive, about a third are not [a]ffected at all, and about a third have an intermediate level of sensitivity. Btk is degraded by sunlight and very sensitive caterpillars, such as the Eastern tent caterpillar, are no longer [a]ffected about 11 days after application to foliage”(Andrea Diss-Torrance, personal communication, May 3, 2018).

“When Btk is ingested by a susceptible caterpillar, the highly alkaline environment of the caterpillar’s gut triggers the Btk bacterium to release a crystalline protein called an “endotoxin” that poisons the insect’s digestive system. The endotoxin acts by killing cells and dissolving holes in the lining of the insect’s gut. When a mixture of food, Btk spores, and digestive juices leaks through these holes into the insect’s blood, it causes a general infection that kills the caterpillar. Humans and other mammals have highly acidic environments in their stomachs that destroy Btk before it causes infection” (Ellis 2018).

Two types of Btk mixtures

There are two commercial brands of bio-control mixtures being used against the Gypsy Moth: Foray48® and Gypchek®. The DNR determines which to use based on insects listed in the Natural Heritage Inventory. I have repeatedly expressed my concern with this methodology. Current lists for Lafayette County will be insufficient to ascertain if classified species exist because our county is incredibly undersurveyed for insects (and plants for that matter). I suspect few counties have insect surveys covering the county.

Christopher Foelker, Gypsy Moth Unit Supervisor for DATCP, tells me Gypchek® is used in habitats having known T&E species that are in a vulnerable life stage during the treatment

times. (Christopher Foelker, personal communication, May 3, 2018). DATCP considers Gypchek® to be less effective than Btk because it deteriorates quickly and has a much shorter window of efficacy. It is a viral insecticide that is specific to the gypsy moth but it is costly to produce and there are limited amounts. It is manufactured by raising and infecting gypsy moth caterpillars with a virus (NPV-gypsy moth). These infected caterpillars are ground up and suspended in a liquid solution. This solution is Gypchek® and it is applied to the tree canopy.

Since it is a limited resource, state and federal governments agree to use Gypchek® only where rare species are known and not on every area proposed for Btk treatment. Unless a T&E insect is known, Foray48® is used.

Foelker says all the DATCP treatment plans are reviewed by the US Fish and Wildlife and US Forest Service for any potential effects on T&E species. They present any concerns for areas these species might be impacted.

Who else is affected?

Since I seldom take info from just one source, I continued my sleuthing on this topic. Jay Watson, who works in the Bureau of Natural Heritage Conservation, confirmed my suspicions, "Really, the impacts from Btk on other insects is very poorly understood. I don't know of any research that has looked at what impact this might have on insects like bumble bees." (Jay Watson, personal communication, May 3, 2018). He specifically mentioned bumble bees because of our recently discovered rusty-patched bumble bee on our property.

There are two sides to every issue; this one is no different. Diss-Torrance stated, "the effect, or in this case non-effect, of Btk on a wide range of other creatures is very well known as this bacterially based insecticide has been used extensively in agriculture and forestry since the '80's."

In general, sunlight and other microbes destroy Btk applied to foliage within three to five days, so Btk does not multiply or accumulate in the environment (Ellis 2018). Yet, in a 1998 study, Btk was added to different types of soil in order to determine how the type of soil affected the persistence and concentration of Btk. The results of the study showed insecticidal activity started to decline after a month in one soil, while in another, toxicity was high after six months. The authors of the study noted that even though Btk is considered non-toxic to non-target species, the accumulation and persistence of the Btk toxins could eventually lead to environmental hazards or the selection of Btk-resistant lepidopterans (Wikipedia 2018).

The EPA has studies demonstrating a small level of toxicity to certain fish, a slight toxicity to honey bees at high level doses, and “practically non toxic” at low level doses. It is slightly toxic to the convergent lady beetle (*Hippodamia convergens*) (EPA 1998). Caterpillars that become ill or die after ingesting Btk are not considered dangerous to birds or other animals that feed on them (Ellis 2018).

I wasn't thinking there would be a moral to this story when I began researching it, but I believe that there it. The value of citizen science is priceless and saves lives. Wisconsin DNR's decision-making about gypsy moth treatments relies solely on the information at the Natural Heritage Inventory. The information behind many decisions that mitigate impacts to our natural community and our T&E community originates from citizen scientists.

Sources:

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