

# AQUABACxt

Kill Mosquitoes, Midge Flies, and Black Flies

AQUABACxt is a highly effective, US EPA-registered biological larvicide containing a naturally occurring species of bacteria called *Bacillus thuringiensis* var. *israelensis*. Bti is considered an environmentally friendly alternative to chemical pesticides since it is highly specific to nuisance insects and has no toxicity to humans. AQUABACxt maximizes exposure of the toxic spore produced by Bti to the larval stage of aquatic midges.

Aquatic midges can restrict recreational activities, destroy light fixtures, and damage property paint, stucco, and other wall finishes. They also exacerbate water quality issues by increasing sediment nutrient recycling, depleting oxygen in the bottom waters, and accelerating methane and ammonia release.

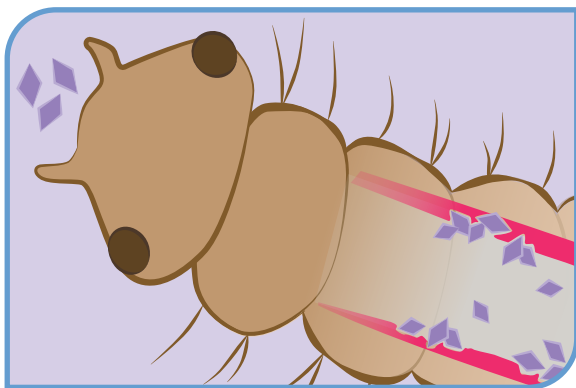


Diagram shows a larva ingesting the Bti crystals in AQUABACxt, which attack the gut membrane resulting in larvae death before maturing into adult mosquitoes.

## KEY BENEFITS & HIGHLIGHTS

- Highly potent with immediate results
- Environmentally friendly
- Only targets nuisance insects
- Reduces nutrient recycling caused by midges
- Balances food by restoring zooplankton populations
- Improves lake water quality

## AQUABACXT DOSAGE - APPLY DILUTED WITH WATER AND REPEAT AS NEEDED

Nuisance Pest	Location	Dose Rate per Acre
Mosquitoes	Standing Freshwater	0.25 - 1 pint
Mosquitoes	Standing or Tidal Saltwater	0.5 - 1 pint
Mosquitoes	Highly Polluted Water	1 - 2 pints
Midge Flies	Shallow lakes/ponds per sewage oxidation ponds (<1 acre, 6ft deep)	1 gallon

- AQUABACxt is available in multiple container sizes: 5, 135, and 250 gallons
- Apply in conventional aerial and ground application equipment with sufficient water to provide thorough coverage of the target area
- The amount of water needed depends on weather, type of spray equipment and mosquito habitat
- For black flies and other nuisance flies, reference label instructions

### USES AND APPLICATIONS:

- Mosquitoes
- Black flies
- Fungus gnats
- Midge flies

### THE SCIENCE BEHIND IT

Naturalake's AQUABACxt product contains *Bacillus thuringiensis* subsp. *israelensis* (Bti), a naturally occurring bacterium that exhibits larvicidal properties. Bti was first discovered in 1976 and extracted from the soil of a stagnant pond located in the Nahal Besor Desert River Basin of Israel (Barjac & Sutherland, 1990). Since its discovery, Bti has been found to be an extremely effective, safe, and target specific biological larvicide. Bti's larvicidal ability comes from toxin producing spores that **specifically target the larvae of mosquitoes, black flies, fungus gnats, and midge flies** (Ben-Dov, 2014).

Bti's mode of action begins during its spore forming stage which involves the production of a protein crystal, or a parasporal body. This parasporal body consists of six  $\delta$ -endotoxins (Ben-Dov, 2014). When target species such as mosquito larvae consume Bti, the  $\delta$ -endotoxins bind to epithelial cells within their stomach lining where the internal stomach alkalinity activates the parasporal body toxins. The toxins are then released, causing the stomach to burst and eventually result in the death of the target larvae (Hughes et al., 2004).

Bti can be applied into waterbodies such as lakes, ponds, and other smaller areas of collected water. Once in contact with target species such as mosquito larvae, Bti will produce activated toxins and restrict larvae development from entering the pupa and adult mosquito life stage. Fortunately, target species resistance to Bti toxins have not been observed since its discovery and Bti has remained an extremely effective control mechanism for the proliferation of mosquito larvae (Ben-Dov, 2014).

**Bti has been proven to be a safe and easy to apply biological larvicide with no toxicity risk for humans.** Bti has also been shown to have no toxicity or adverse negative effects on fish, insects, mammals, and aquatic microorganisms.

Barjac, H.D. & Sutherland, D. J. (Eds.) (1990). *Bacterial control of mosquitoes & black flies: Biochemistry, genetics, & applications of bacillus thuringiensis israelensis and bacillus sphaericus*. Rutgers.

Ben-Dov, E. (2014). *Bacillus thuringiensis* subsp. *israelensis* and its Dipteran-specific toxins. *Toxins*, 6, 1222-1243.

Hughes, P.A., Stevens, M.M., Park, H., Federici, B.A., Dennis, E.S., & Akhurst, R. (2005). Response of larval *Chironomus tepperi* (Diptera: Chironomidae) to individual *Bacillus thuringiensis* var. *israelensis* toxins and toxin mixtures. *Journal of Invertebrate Pathology*, 88, 34-39.

