

**Environmental and Social Risk Assessment  
for *Bacillus thuringiensis* var. *kurstaki***

**Pennsylvania Department of Conservation &  
Natural Resources, Bureau of Forestry**

**2020**

## ESRA for *Bacillus thuringiensis* var. *kurstaki*

### Management Unit Environmental Assessment

<b>Pesticide:</b>	<b><i>Bacillus thuringiensis</i> var. <i>kurstaki</i></b>		<b><u>Specific Formulation:</u></b>
<b>Hazard Status:</b>	Not designated		Foray 76B, Foray 48F
<b>Exposure Elements</b>	<b>Minimum list of values</b>	<b>Description of why/why not a risk on the Management Unit</b>	<b>Management Unit Mitigation strategies defined to minimize risk</b>
<b>Environmental</b>	Soil (erosion, degradation, biota, carbon storage)	No indication of adverse effects to soil was found with <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> when used according to label instructions in aerial forestry applications.	<p>Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Applicators or persons supervising application of restricted use pesticides are required to be certified in accordance with EPA regulations and state, territorial and tribal laws. Additional risk mitigation strategies are provided below. Organizations should take reasonable steps to avoiding environmental and social impacts by considering the mitigation strategies provided below, as well as application-, Organization-, or location-specific strategies.</p> <p><b>General consideration of exposure variables designed to mitigate risk:</b></p> <ul style="list-style-type: none"> <li>-Know and understand the specific pesticide formulation and/or tank mixture, as its unique formulation may provide a different risk characterization.</li> <li>-Understand how the mixture of active ingredients affects the pesticides risk profile.</li> <li>-Seek to minimize the frequency, interval, and amount of application.</li> <li>-Use the most efficient and effective method of application by seeking to minimize risk to environmental and social values.</li> </ul>
	Water (ground water, surface waters, water supplies)	No risk to aquatic species with or human water resources when applied and used by the manufacturer's label.	
	Atmosphere (air quality, greenhouse gasses)	No indication of adverse effects to atmosphere was found with <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> when applied and used by the manufacturer's label.	
<b>Environmental</b>	<p><b>Non-target species (vegetation, wildlife, bees and other pollinators, pets)</b></p> <p>The only organisms likely seriously affected by exposure to <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> are terrestrial insects, specifically Lepidopterans, with mortality rates among sensitive insects ranging from 80-94%. Sensitive non-target lepidoptera include larvae of the Kameron blue butterfly, two species of swallowtail butterflies, a promethea moth, the cinnabar moth, and various species of Nymphalidae, Lasiocampidae, and Saturniidae (1).</p> <p>There is no indication that oral or dermal exposure to <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> leads to any serious adverse side-effects in mammals (1).</p>		

		<p>Bacillus thuringiensis var. kurstaki shows no signs of pathogenicity or toxicity in birds (1). Bacillus thuringiensis var. kurstaki is virtually non-toxic to fish (1).</p> <p>Other strains of <i>Bacillus thuringiensis</i> appear to have low toxicity to amphibians, although Bacillus thuringiensis var. kurstaki specifically hasn't been tested (1).</p> <p>Most aquatic invertebrates are tolerant of Bacillus thuringiensis var. kurstaki (1).</p>	<p>-Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and humidity) conditions and the likely effect on risk to environmental and social values. -Have appropriate waste management systems in place.</p> <p><b>Mitigating Risk to the Environment:</b> <i>reduce contact with water resources and minimize application amounts and number of applications.</i></p> <p><i>General and non-target species:</i> -This product is toxic to certain non-target lepidopterans exposed to direct treatment. Do not apply product to known habitats of those lepidopteran species in the treatment area (1).</p> <p><i>Water:</i> -Do not spray directly over open water (2). -Do not contaminate surface or ground water by cleaning equipment or disposal of wastes, including equipment wash water (2). -Do not apply when weather conditions favor drift (2).</p> <p>All annual treatments of Bacillus thuringiensis var. kurstaki are submitted for rigorous environmental review through jurisdictional agencies in Pennsylvania. All treatments are reviewed for adverse effects to plants, wildlife, and invertebrates by the Pennsylvania Department of Conservation and Natural Resources (plants and invertebrates), the Pennsylvania Game Commission (wildlife), the Pennsylvania Boat Commission (fish, reptiles, invertebrates), and the US Fish and Wildlife Service (wildlife). All agencies provide concerns, restrictions, and mitigation measures if necessary. -Once environmental reviews are completed by the appropriate agencies, they are submitted to the USDA Forest Service for review.</p>
	<p><b>Non-timber forest products (as FSC-STD-01-001 V5-2 FSC Principles and Criteria, criterion 5.1)</b></p>	<p><b>No indication of adverse effects to non-timber forest products was found with Bacillus thuringiensis var. kurstaki when applied and used by the manufacturer's label.</b></p>	
	<p><b>High Conservation Values (particularly HCV 1-4)</b></p>	<p><b>No indication of adverse effects to High Conservation Values was found with Bacillus thuringiensis var. kurstaki when applied and used by the manufacturer's label.</b></p>	
	<p><b>Landscape (aesthetics, cumulative impacts)</b></p>	<p><b>No indication of adverse effects to landscape values was found with Bacillus thuringiensis var. kurstaki when applied and used by the manufacturer's label.</b></p>	
	<p><b>Ecosystem services (water, soil, carbon sequestration, tourism)</b></p>	<p><b>No indication of adverse effects to ecosystem services was found with Bacillus thuringiensis var. kurstaki when applied and used by the manufacturer's label.</b></p>	

## Management Unit Social Assessment

<b>Pesticide:</b>	<b>Bacillus thuringiensis var. kurstaki</b>		<b><u>Specific Formulation:</u></b>
<b>Hazard Status:</b>	Not designated		Foray 76B, Foray 48F
<b>Exposure Elements</b>	<b>Minimum list of values</b>	<b>Description of why/why not a risk on the Management Unit</b>	<b>Management Unit Mitigation strategies defined to minimize risk</b>
	High Conservation Values (especially HCV 5-6)	No indication of adverse effects to high conservation values was found with <i>Bacillus thuringiensis var. kurstaki</i> when applied and used by the manufacturer's label.	<p>Follow all pesticide label application instructions. Follow applicable criterion and indicators from the FSC US FM Standard V1.0 (e.g., Criterion 4.3 for worker safety, Criterion 7.3 for worker training, Criterion 6.5 for protecting water resources, and Criteria 8.1 and 8.2 for Monitoring). Applicators or persons supervising application of restricted use pesticides are required to be certified in accordance with EPA regulations and state, territorial and tribal laws. Additional risk mitigation strategies are provided below. Organizations should take reasonable steps to avoiding environmental and social impacts by considering the mitigation strategies provided below as well as application-, Organization-, or location-specific strategies.</p> <p><b>General consideration of exposure variables designed to mitigate risk:</b></p> <ul style="list-style-type: none"> <li>-Know and understand the specific pesticide formulation, as its unique formulation may provide a different risk characterization.</li> <li>-Understand the mixture of active ingredients.</li> <li>-Seek to minimize the frequency, interval, and amount of application.</li> <li>-Use the most efficient and effective method of application by seeking to minimize risk to environmental and social values.</li> <li>-Understand the site (e.g., soil type, topography, etc.) and climatic (e.g., wind, temperature, and</li> </ul>
	Health (fertility, reproductive health, respiratory health, dermatologic, neurological and gastrointestinal problems, cancer and hormonal imbalance)	<p>Minimal indication of adverse effects to health values was found when <i>Bacillus thuringiensis var. kurstaki</i> is used according to label instructions in forestry applications. Additional considerations are provided below.</p> <p>If one adheres to proper worker protections, there is no substantial risk for workers or members of the general public. Serious adverse health effects are implausible. (1).</p> <p><i>Bacillus thuringiensis var. kurstaki</i> and its formulations are likely to cause irritation to the skin, eyes, and respiratory tract. (1)</p>	
<b>Social</b>	Welfare	No indication of adverse effects to welfare was found with <i>Bacillus thuringiensis var. kurstaki</i> when applied and used by the manufacturer's label.	
	Food and water	No indication of adverse effects to food and water was found with <i>Bacillus thuringiensis var. kurstaki</i> when applied and used by the manufacturer's label.	

	<b>Social Infrastructure; (schools and hospitals, recreational infrastructure, infrastructure adjacent to the management unit)</b>	<b>No indication of adverse effects to schools and hospitals, recreational infrastructure and infrastructure adjacent to the management unit was found with <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> when applied and used by the manufacturer's label.</b>	<p>humidity) conditions and the likely effect on risk to environmental and social values.          -Have appropriate waste management systems in place.</p> <p><b>Mitigating Risk to Workers:</b> <i>When applying pesticides, label instructions should be followed.</i></p>
	<b>Economic viability (agriculture, livestock, tourism)</b>	<b>No indication of adverse effects to agriculture, livestock and tourism was found with <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> when applied and used by the manufacturer's label.</b>	<p>For all pesticide applications, Personal Protective Equipment (PPE) should be worn as follows:</p> <ul style="list-style-type: none"> <li>• chemical-resistant gloves,</li> <li>• overalls or long-sleeved shirt and long pants,</li> <li>• shoes/boots plus socks,</li> <li>• eye protection (goggles, or safety glasses with side shields),</li> <li>• an appropriate respirator if called for in applicable Safety Data Sheets.</li> </ul>
	<b>Rights (legal and customary)</b>	<b>No indication of adverse effects to rights was found with <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> when applied and used by the manufacturer's label.</b>	<p><i>Adhere to the below exposure controls (2):</i></p>
	<b>Others</b>	<b>No additional values were identified in this assessment.</b>	<p>-Wash hands thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, using the toilet or applying cosmetics.          -In case of skin contact: Take off contaminated clothing and shoes immediately. Wash off immediately with plenty of water for at least 15 minutes. Call a physician or poison control center immediately (2).          Use personal protective equipment. Ensure adequate ventilation. (2).</p> <p><i>Safe handling:</i>          -Maintain exposure levels below the exposure limit through the use of general and local exhaust ventilation.          -Handle and open containers and transfer hoses in a manner as to prevent spillage (2).</p> <p><i>Storage requirements:</i></p>

			<p>-Store in original container and out of the reach of children, preferably in a locked storage area (2).</p> <p><b>Mitigating Risk to Public Access/Public Welfare:</b></p> <p>-In case of accidental spillage: Isolate hazard area. Keep unauthorized people away. Avoid contact with spilled product or contaminated surfaces (2).</p> <p>-Consider effects on local communities and indigenous peoples when considering limiting access to treatment areas.</p>
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## Sources

- (1) Syracuse Environmental Research Associates, Inc. 2004. Bacillus Human Health and Ecological Risk Assessment for Bacillus Thuringiensis var. kurstaki (B.t.k) Final Report. Prepared by Syracuse Environmental Research Associates, Inc. under USDA Forest Service BPA: WO-01-3187-0150. Retrieved from <https://www.fs.usda.gov/naspf/sites/default/files/volume-III-chapters-1-8-appendixes-f-l-risk-assessments.pdf>.
- (2) Product Labels:
  - Foray 76B <https://www.valentbiosciences.com/foresthealth/wp-content/uploads/sites/5/2017/03/foray-76b-label-canada.pdf>
  - Foray 48B Current link doesn't seem to be available??