Btk was not an immediate success in terms of effectiveness and cost, but intensive research and development has resulted in a product that now meets all of these criteria. Foray (first registered in 1986) is now the product of choice in the majority of forest protection programs in North America and western Europe due to its formulation science, unique strain, and superior quality. This product has gained an unprecedented level of public acceptance and as a result, Foray is the most widely used biological larvicide in the world to protect trees from insect infestations in both rural and urban settings. The foundation of Foray's success is simple and two-fold: it is both highly effective and ecologically friendly. In fact, some formulations of Foray are approved for use in the production of certified organic products, such as maple syrup.

## Performance

Because of its high efficacy and environmental friendliness, Foray is the product of choice in local pest eradication efforts in North America and many other locations around the world–particularly to control invasive species, such as Gypsy Moth.

### 5.9 HOW EFFECTIVE IS FORAY?

Foray efficacy has been proved to be comparable to chemical applications in controlling many lepidopteran pests when pest population densities are low to moderate. As it is not systemic and requires ingestion, Btk is less likely to be as effective as chemicals when pest populations are extremely high unless multiple applications are conducted.

However, a forest pest control strategy does not have to kill all the target insects in order to be successful. In fact, studies indicate that there are benefits to maintaining some pest insects in an area to support the population of natural enemies.

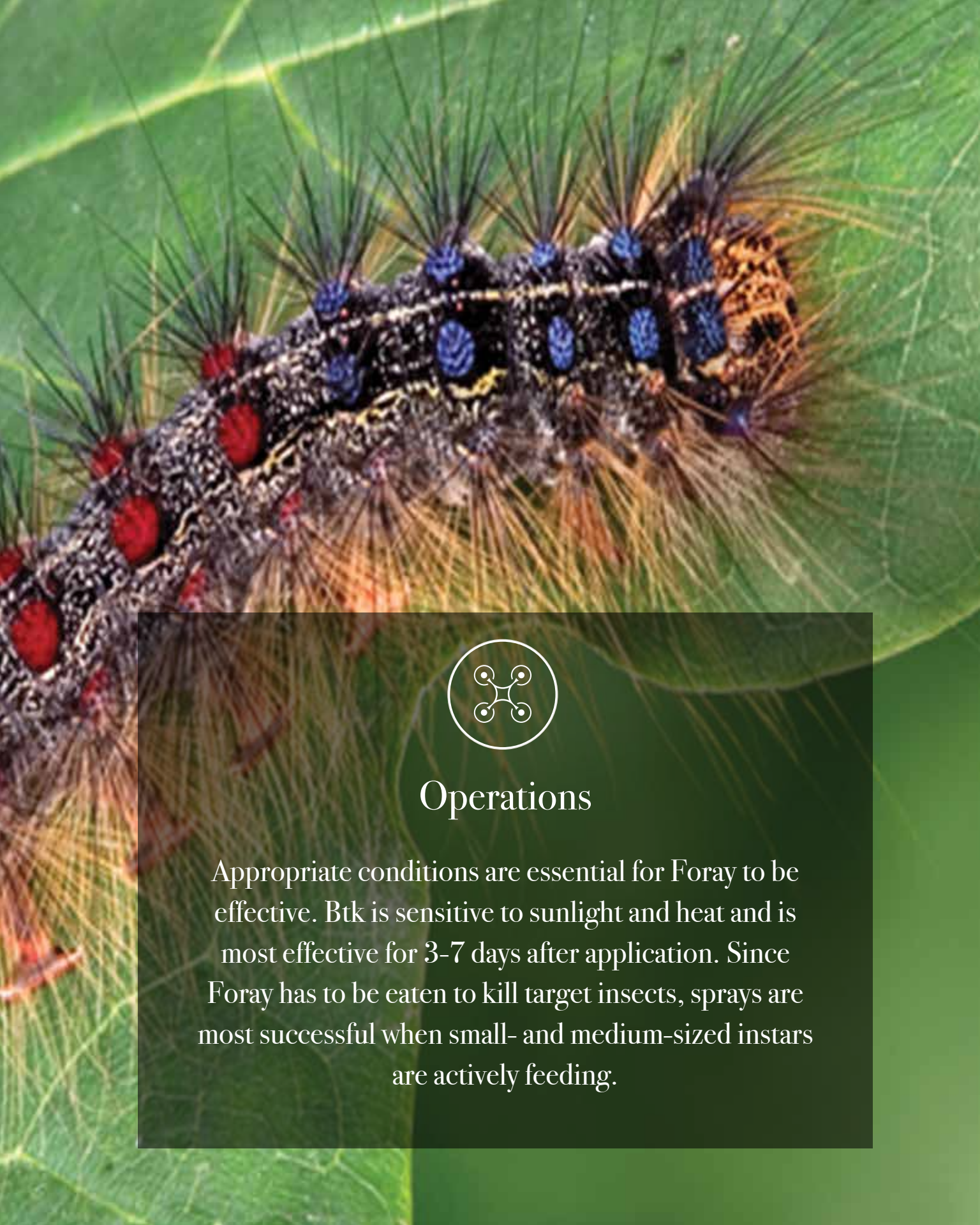
Because it can take up to a few days for larvae to die after a Foray application, there is not an immediate reduction in the pest population. When using Foray, it is important that forest health managers understand that Lepidoptera feeding cessation occurs within minutes of ingesting Foray, and that death to affected larvae is imminent.

Depending on the life cycle of the pest and climatic conditions, more than one application of Btk may be necessary to achieve the desired level of control.

When eradication is the goal of a control program, a single application of Btk may be somewhat less effective than some chemical insecticides in reducing the population to zero. However, because of its low impact on non-target organisms, Btk is the product of choice for most forest pest control programs (including eradications) conducted in North America and around the world.

### 5.10 IS FORAY HARMFUL TO HUMANS AND ANIMALS?

As required by the United States Environmental Protection Agency (EPA) and the Pest Management Regulatory Agency (PMRA) of Health Canada, extensive oral and intravenous animal studies have been conducted with



## Operations

Appropriate conditions are essential for Foray to be effective. Btk is sensitive to sunlight and heat and is most effective for 3-7 days after application. Since Foray has to be eaten to kill target insects, sprays are most successful when small- and medium-sized instars are actively feeding.

Foray. No evidence of any poisonous, infectious or disease-causing effects were found. In inhalation tests with Btk, there were no mortalities and Btk was shown to have a low pathogenic potential.

Feeding, skin, breathing, and eye irritation animal studies were also carried out with Foray. No toxic effects were seen when significant quantities of Foray were fed or inhaled. Very mild, temporary skin irritation and moderate, temporary eye irritation was observed in the tests when Foray were applied directly to the skin and into the eyes. These effects were totally reversible.

In addition, EPA and PMRA have determined that Foray is exempt from residue tolerance. Due to this exemption, there is no required interval before re-entering a sprayed area during government-sponsored pest control programs.

Finally, Btk has been used extensively in commercial urban and rural forest pest management for over 40 years. A solid record of safety and health has been amassed over this time.

## Sustainability

Foray is based on the ubiquitous, naturally-occurring soil dwelling bacterium, Bacillus thuringiensis spp. kurstaki (Btk). While highly effective against various species of Lepidoptera, Btk has little to no impact on non-target species and the surrounding environment. In fact, Btk and other common microbes are frequently found in blood, urine, and other samples from healthy people.

### 5.11 WHAT EFFECT WILL Btk HAVE ON PEOPLE, ESPECIALLY THOSE WITH IMMUNODEFICIENCY, ASTHMA OR ALLERGIES?

Bt is a common bacterium found in soils throughout the world. People are exposed to Bt and many other microbes every day. Many of the microbes we encounter, including Btk, do not produce any toxins which affect humans. Btk and other common microbes are frequently found in blood, urine, and other samples from healthy people. It has been shown that the presence of Btk in patient specimen samples is not indicative of pathological or toxic effects. As with many other microbes naturally present in the environment, it can be detected as an insignificant contaminating organism among infection-causing organisms isolated from patient samples.

Individuals with an immuno-deficient condition are somewhat more likely to be affected by microbes that are normally controlled by a healthy immune system. Such microbes are referred to as opportunistic pathogens, and Bt is not considered an opportunistic pathogen.

Exposure to a Btk spray program is not likely to result in the development of new allergies, asthma or other hypersensitive reactions. Individuals with pre-existing allergies, asthma or hypersensitive individuals, especially those sensitive to normal exposure to soil or smoke and pollutants, could feel some temporary effects. Note that in studies conducted by public health agencies in Canada and in New Zealand, there was no increased incidence of asthma in children living within a treatment area compared to children living outside of the treatment area.

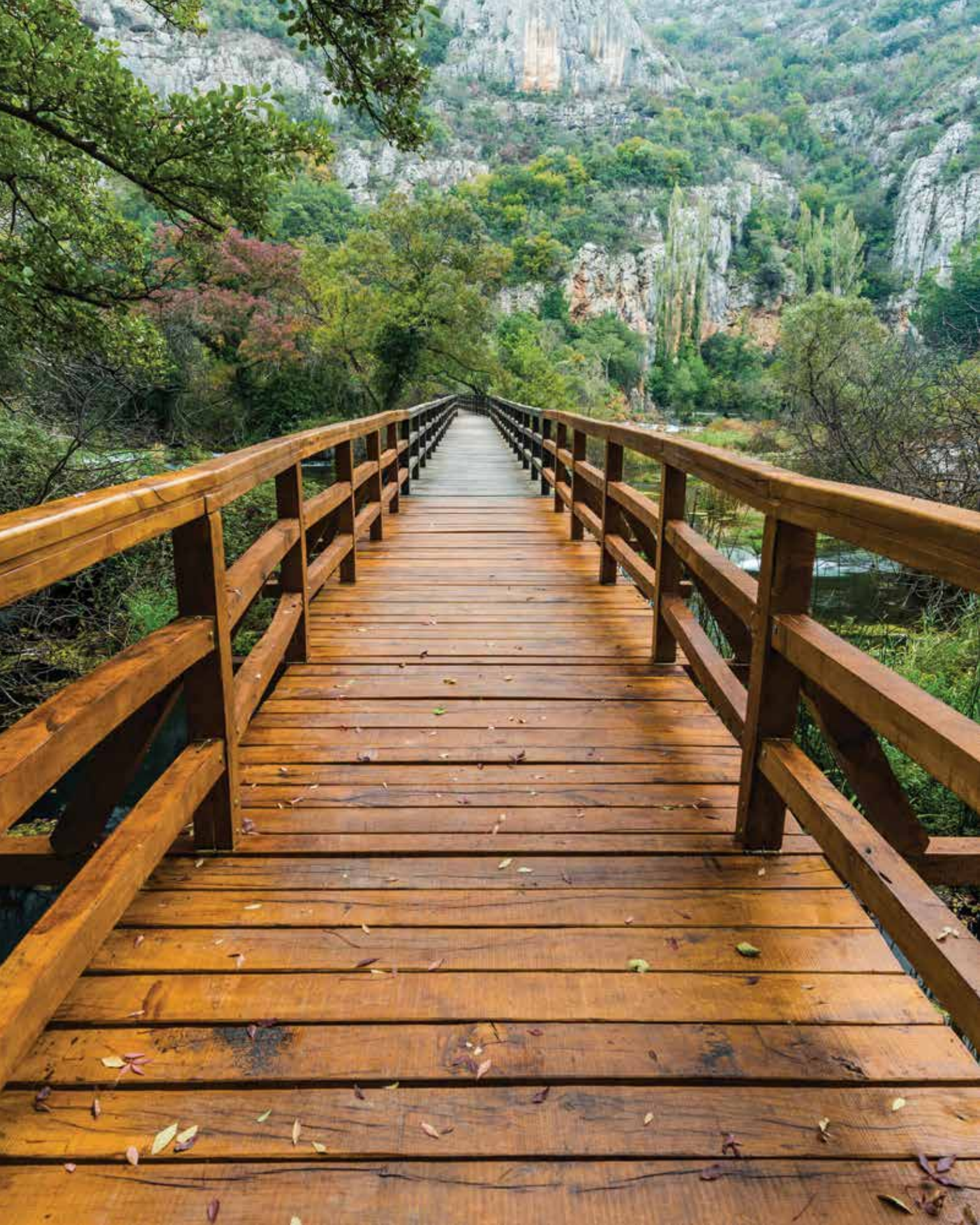



Photo Courtesy of U.S. Forest Service

It is wise for Forest Health managers and applicators to make proactive communication with the public part of their application strategy.

The exposure level to Btk from an aerial spray program is very low in comparison to the levels applied in safety and health related testing. Btk has been shown to be of low risk to residents of forested residential areas when aerially applied to control forest defoliators. That safety record has been confirmed in over 40 years of use in urban and rural applications.

While it may be true that applications of Foray do not pose risks to human health, it is wise for Forest Health managers and applicators to make proactive communication with the public part of their application strategy. Individuals with any of the particular medical conditions described above should consider seeking the advice of their physician prior to the start of the spraying program. Furthermore, residents of the treatment areas may wish to remain indoors during the actual time of treatment to allow the fine droplets to deposit on the foliage.

### 5.12 WILL FORAY INJURE PLANTS?

Foray has been sprayed on millions of acres of trees and other plants. There have been no reports of any plant damage. Foray and other Bt products produced by Valent BioSciences are commonly used in commercial agriculture, market gardens and in greenhouses.

### 5.13 IS FORAY HARMFUL TO NON-TARGET ANIMALS, BIRDS AND BENEFICIAL INSECT POPULATIONS?

No. Foray has been tested against mammals, birds and other insects. In all cases, when Foray was tested at doses far in excess of the levels to which these organisms would be exposed during a routine