Canadian Forest Service

Environmental Impacts of Forest Biotechnology

Introduction

Biotechnology refers to the technology that uses organisms such as plants, fungi or bacteria to provide products and services. Biotechnology-derived organisms such as trees with desired characteristics or environmentally sound biological pest control products could improve the productivity of forest plantations and managed forests. The Canadian Forest Service (CFS) is generating knowledge and exploring biotechnology applications to improve forest regeneration and protection methods, while ensuring that environmental impact considerations are addressed.

The release of biotechnology-derived trees or biological pest control products into forest ecosystems must be done in an environmentally responsible manner. The potential environmental impacts of these organisms must be thoroughly evaluated before they can be commercially available. The federal government is committed to ensure the safety of Canadians and the environment through research, regulations and legislation.

What is the purpose of environmental impact assessment?

The two main purposes of environmental impact assessment of genetically modified trees and biocontrol products are:

1) to evaluate the potential adverse impacts of these products before they are released into the environment, and
2) to determine if an environmental effect has occurred after product release.

Potential impacts on the environment

Several potential impacts of the release of genetically modified trees and biocontrol products into the environment have been identified.

Genetically modified trees:

- Gene escape from the genetically modified tree to other organisms.
- Genetically modified trees becoming invasive and weed-like.
- Adverse effects on other organisms.
- A change in the interactions within the forest ecosystem.
- Impact on genetic diversity and species integrity.

Genetically modified biocontrol products:

- Adverse effects on non-target organisms.
- Gene escape from the genetically modified biocontrol organism to other organisms.
- A change in the interactions within the forest ecosystem.
- Insects developing resistance to biocontrol products.

How is the Canadian Forest Service assessing these potential environmental impacts?

The assessment of potential environmental impacts is complex. A thorough characterization of the genetically modified plant or organism, as well as the transferred gene and its products, is an essential part of the assessment. Risk assessment studies are conducted in the laboratory, then in the greenhouse, and then, after regulatory approval, in field trials in confined plots.

For example, CFS scientists have developed exhaustive microcosm studies to evaluate the potential impact of genetically modified organisms prior to any release into the environment. A microcosm is a controlled, reproducible laboratory system that contains all the necessary components and processes of the ecosystem into which the genetically modified organism will be released. Scientists analyze the microcosms to test for survival and toxicity of a novel product in forest soil and leaf litter, aquatic substrates, or various insect tissues.

In the greenhouse, CFS scientists are testing soil samples in which genetically modified trees are grown to determine whether DNA could be released into the soil from tree roots and falling leaves. The information obtained is then evaluated in regards to forest ecosystem management and is integrated in deployment strategies.

What regulations ensure the environmental safety of genetically modified trees and biocontrol products?

The Canadian Food Inspection Agency (CFIA) is the lead agency responsible for the regulation of plants with novel traits, including forest trees, to assess whether the plants derived from genetic engineering are effective and safe for humans, animals and the environment. Plants with pesticidal properties and biocontrol products are regulated by the Pest Management Regulatory Agency (PMRA) of Health Canada in accordance with the Pest Control Products Act.

CFIA: www.cfia-acia.agr.ca

PMRA: www.hc-sc.gc.ca/pmra-arla

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