



Water Quality

Fire Retardants Used to Fight Wildfires

This brochure has been produced to answer the more frequent enquiries received by the Ministry of Environment and Climate Change Strategy on the use of fire retardants and the related effects on water quality and aquatic life.

What Are Fire Retardants?

Chemical constituents in fire retardants are primarily ammonium phosphate or sulphate-based compounds with small amounts of other chemicals used as dyes, for anti-corrosion, or for other purposes. Fire retardants are generally applied as foams that are made of proprietary mixtures of sodium and ammonium salts, alcohol, ether, and sulphates.

The colouring, which gives retardant its characteristic red colour, enables crews to see where the retardant has landed. When the retardant contacts the flames, the reaction releases a combination of water and carbon dioxide that cools and suffocates the fire.

Retardants are used most commonly in fire suppression because of their long-lasting effect on fires and are usually dropped ahead of an advancing fire by airtankers and helicopters to help contain the wildfire.

What Is Used in B.C.?

Phos-Chek is the main fire retardant used in B.C., and consists primarily of diammonium sulphate and/or ammonium sulphates, which are also used in many agricultural fertilizers and are considered safe for use.



Photo Credit - Wes McKay, Forest Protection Technician

What are the Effects on Water Quality?

The risks to water quality resulting from the potential impacts of a severe wildfire (e.g., runoff and erosion, increasing total suspended solids and turbidity, large quantities of ash, increased water temperature) would likely be higher than the potential risks posed by the prescribed use of fire retardants. When precautions and guidelines are followed correctly there is minimal risk to the environment.

Long-term fire retardant chemicals such as Fire-Trol GTS-R and Phos-Check D75-R are composed of ammonium salts, such as ammonium sulfate and ammonium phosphate, which can increase the salinity of water.

Fire retardants applied close to a water body have been shown to increase stream water ammonium, phosphate, and nitrate concentrations. These increases are usually short lived, but may re-occur in response to subsequent rainfall events.

Nutrient loading into streams and lakes can also increase the productivity and potential eutrophication of waterbodies.

Improper Use of Fire Retardants Studies show that a single retardant drop directly into a stream may cause a sufficient ammonia concentration in the water to be lethal to fish and other aquatic organisms. The severity of the effects would be different depending on the volume of the retardant that enters the water.

For information on drinking water quality, please visit the Interior Health website - <https://www.interiorhealth.ca/YourEnvironment/Emergency/Wildfires/Pages/default.aspx>

What are the Effects on Fish?

Factors that can influence the effects on fish include: location of application, retardant type, quantity, application method, weather, soil characteristics, dilution and water chemistry (water temperature, pH, hardness and dissolved carbon content). For example, fire retardants mixed in water of low hardness may induce a more robust avoidance response by fish.

Fish chemosensory systems are highly sensitive to salts. An avoidance response in fish is triggered when fire retardants are detected.

Effects on fish would likely be minimal when used per established protocols, but effects can include mortality, avoidance, startle or confusion behaviour, loss of equilibrium and gill damage. Fish recovery occurs when duration of exposure is limited.

If you observe dead or distressed animals along a shoreline where retardant is obvious, immediately contact the nearest Regional Health office or the nearest BC Ministry of Environment and Climate Change Strategy regional office.

Key Points to Remember...

- Ammonium phosphates, most common ingredient used in fire retardants, are considered safe for use.
- If fire retardant is dropped directly on a water body, fish mortality may occur due to an increase in ammonia levels. Acute toxicity would be short term, since aeration and dilution would decrease ammonia levels.
- Nutrient loading into streams and lakes can increase causing increased productivity and possibly eutrophication. If possible, natural blockages in creeks flowing into or out of the water body should be removed to encourage the free flow of water.
- The risks to water quality resulting from the potential impacts of a severe wildfire (e.g., runoff and erosion, large quantities of ash, increased water temperature) would likely be higher than the potential risks posed by the prescribed use of fire retardants. When precautions and guidelines are followed correctly there is minimal risk to the environment.



Photo Credit – BC Wildfire Service