



FIRE MANAGEMENT

Fire Suppressant and Retardant Use in National Parks

Wildfire control operations have the potential to impact national park ecosystems, facilities and visitors. Parks Canada is working to ensure that these impacts are minimized. Fire suppressants and fire retardants are two categories of fire control products requiring special care.

How fires burn

Fire suppressants, such as water and foam, are applied directly to burning fuel to extinguish the flaming, glowing and smouldering stages of combustion. They are short term in duration because they evaporate.

Water

Water suppresses fire in two ways: by cooling, which slows or prevents combustion, and by blocking oxygen from reaching wet fuel surfaces. Water is often used in initial attack, such as extinguishing lightning strikes, in direct attack of the fire perimeter, and on troublesome hot spots. It is applied by helicopter bucketing, airplane water bombing and through hoses and sprinklers.

Fire Suppressant Foam

Foam is a wetting agent containing detergents and other additives. When mixed with water by specialized equipment, it allows water to penetrate surfaces more easily. Foam adheres to surfaces better than straight water and also has some insulating capability. Fire suppressant foam can work for several hours, but loses its effectiveness when water evaporates. Foam is often used to support ground firefighters and for facility protection.



Long-term Retardants

Fire retardants are primarily chemical in nature and reduce the flammability of fuels. Long-term retardants are used mainly on fuels before they burn, such as laying down a continuous line of retardant in front of advancing fire. Retardants are generally effective until they wash away.

Fire retardants are made using specialized equipment to mix water with chemicals into a thick slurry. The primary ingredients in long-term retardants are fertilizer salts of ammonia and phosphorus, and clay. The orange colour comes from a small amount of iron oxide (rust). Its purpose is to make it easier for pilots to see where retardant has been applied. The retardant is spread by helicopters or air tankers and sticks to combustible surfaces.

While wet, the retardant cools the fire, however, the retardant is still effective after the water evaporates. When flames reach a treated tree, the heat bonds the retardant with the wood cellulose, blocking oxygen from interacting with the fuel. Treated trees are very slow to ignite.



The Impact of Fire Suppressants and Retardants on the Environment

Whenever possible, Parks Canada chooses the most environmentally friendly fire retardant products available and monitors their use to better understand their short and long term effects on the environment.

Water

Water is among the least environmentally damaging of the fire suppression tools used by Parks Canada but still has environmental impacts including:

- disturbance of water sources through withdrawal of large volumes of water;
- damage to vegetation and soil caused when large quantities of water are dropped from the air;
- sediment run-off, which may increase siltation in streams.

Fire Suppressant Foams

Traditional foams appear to be slightly more toxic to aquatic life than retardants, as they tend to reduce water surface tension. The products being used by Parks Canada do not contain components shown to be hazardous and are considered to be of low environmental concern. Overall, these chemicals may have less permanent effects on ecosystems than some physical measures used to combat fire.

Long-term Fire Retardants

Long-term fire retardants used by Parks Canada are considered to be non-toxic to most terrestrial organisms and of low to moderate toxicity to aquatic organisms. The toxic component of retardants in aquatic systems is ammonia (from the fertilizer salts). The greatest impact to aquatic ecosystems occurs when retardant is accidentally dropped into a watercourse.

Some fire retardants contain sodium ferrocyanide, a compound that increases the toxicity of the

product. The fire retardant normally used in national parks does not contain ferrocyanide.

Fire retardants are not believed to persist in the environment for long periods of time because they are taken up by vegetation and soils. Following a rainfall, there may be an increase in nitrogen and phosphorus in run-off from areas where retardant was applied. In nutrient-limited streams and lakes, this may result in measurable changes in water quality, algal growth and numbers and types of invertebrates.

Mitigations

Fire suppressant foams and long term retardants are normally used sparingly, and only when they contribute significantly to effective fire control.

Accuracy is the key to reducing the impact of retardants and foams when applied close to aquatic ecosystems. Parks Canada is particularly careful in its use of fire suppressant foams. For example, under windy conditions, suppressant foam may be applied from land rather than air to ensure that foam goes where it should.

Parks Canada will primarily apply long-term fire retardant by helicopters, as they have far greater accuracy than airplanes. Pilots are instructed not to drop retardant within 30 m of water bodies and to also consider wind speed and direction during drops because high winds can cause the chemicals to drift.

Fire managers and aquatic specialists are working to minimize the environmental effects of fire operations. Monitoring programs can provide more information about the effects of fire itself and fire suppression tactics and tools on aquatic ecosystems. Plans to rehabilitate sites impacted through fire control procedures are normally prepared and implemented at the conclusion of fire operations.

Fire suppressant foam and retardants are generally used as a last resort in order to protect the public and facilities.