

# Forests and Water

## What is a watershed?

A watershed is a basin or catchment for the land, streams, lakes and groundwater that contribute water to a geographical point – usually on a stream, river, lake, reservoir or ocean.

## What influences the flow of water in a watershed?

Water yield and the timing and magnitude of seasonal flows (floods and low flows) are influenced by climate, geology, soils, groundwater contributions, topography, vegetation cover and land use.

## How do forests influence watersheds?

A healthy forest supports a healthy watershed, which in turn provides water for aquatic ecosystems that support recreational and economic activities, irrigation for agricultural use and clean water for drinking. Trees intercept rain and snow, and provide shade to moderate snowmelt rates. Tree roots help reduce soil erosion and increase the infiltration capacity of soils. Trees also transpire - effectively removing water from the soil and releasing it back into the air, which further improves the soil's capacity to accept more water. But these hydrological benefits of forests can also count as costs. Like all plants, trees use water. Tree canopies intercept snowfall. These processes can reduce water yield and late summer low flows.

## Role of natural disturbance

Natural disturbances, such as fire and insects and disease, are normal occurrences in forest ecosystems. They are the natural processes through which trees are killed, forests are renewed and forest ecosystems are maintained.

When natural disturbances are suppressed, forests age and become more susceptible to a large, catastrophic disturbance. Catastrophic disturbance such as wildfire and large-scale insect outbreaks can affect the timing and magnitude of seasonal flows and the amount of sedimentation, nutrients and contaminants in the water. This can affect large areas of watersheds that Albertans rely on for drinking water, recreation, economic health and other ecological goods and services. Once watershed processes have been impacted or changed, watershed recovery can be slow and can result in undesirable outcomes (e.g., water quality issues). Ultimately, a catastrophic disturbance to the forest means increased cost to treat drinking water and changes to water availability.

## Planned disturbance: small scale, short-term

Planned disturbance such as harvesting and prescribed fire will also affect watershed processes, but only at the stand or site level and only temporarily. As the new forest grows, these site-level effects recover. This is known as Stand Hydrological Recovery. Forest Practitioners aim to keep the cumulative watershed-scale disturbance low, so that the watershed level processes will not be negatively affected.

## Climate change, forests and water

Climate change is predicted to affect global temperatures and precipitation patterns. Forest ecosystems will adapt. However, where there are already aging and stressed populations of trees, climate change is one more pressure increasing the likelihood of catastrophic disturbance.



## Working together for healthy watersheds

Management of public lands and watersheds is the responsibility of many Alberta ministries. Supporting legislation and processes such as Water for Life and Land-use Framework are the platforms for collaboration and cooperation during planning, monitoring and enforcement.

## Forestry and watershed health

Forestry is the science (and art) of managing forests. Forest Practitioners are those who design, plan and supervise timber harvesting, silviculture, ecological restoration and management of protected forests. Forestry on public lands follows the internationally recognized management structure of Sustainable Forest Management, which identifies criteria that plans and operations must meet. These criteria ensure that Albertans will enjoy the sustainable environmental, economic, and social benefits of our forested landscapes, including water values.

## Protecting the watershed from poor forestry practices

Improper or careless forestry practices can adversely affect watershed processes. Governments, forest practitioners and forest hydrologists encourage activities that support watershed protection and healthy forests. These include:

### Planning

Many levels of forest management and operational plans have to be prepared by professionals and approved by government before authority to conduct forestry operations is granted to companies holding forest management agreements or timber quotas in the forest.

### Monitoring

Forestry operations must follow local Operating Ground Rules, which restrict or prohibit operations in vulnerable areas such as streams, riparian areas, steep slopes and sensitive soils. Operators must also install, maintain, manage and reclaim stream crossings in accordance with approved government standards. Government Forest Practitioners use the ISO 9001 registered Forest Operations Monitoring Program to ensure that operational plans, forestry operations and regeneration meet current standards.

### Enforcing

Forestry on public land is governed by both provincial and federal Acts that have provisions for protecting water resources. When required, government agencies can take appropriate enforcement action to deal with activities that adversely effect watersheds.

## Research, innovation and adaptive management

Forestry is science-based and adaptive. Forest Hydrology, for example, is based on over 100 years of experimental science. As new challenges arise, gains in knowledge and new technologies enable continually-evolving management techniques. The Government of Alberta and industry have partnered with many university and institute researchers to understand how to improve forest management practices and reduce the risk that catastrophic disturbances pose to Alberta's water resources.