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# Effects of Wildfires on the Hydrologic Ecology

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## Introduction

The existing and future ability of forested watersheds to deliver water to downstream towns and sustain healthy aquatic ecosystems is increasingly threatened by a global water crisis. The benefits to humans created by terrestrial ecosystem impacts on freshwater referred to as hydrologic ecosystem services, and are a key component of the water security paradigm, ranging from drinking water to fisheries, flood mitigation to hydropower generation [1].

Upstream disruptions may alter watershed processes and functions, as well as their capacity to support the welfare of downstream users by offering diverse services and benefits, according to the HES concept. Climate change and the accompanying increase in both biotic and abiotic disturbances have damaged water supplies and reduced the resilience of temperate and boreal forests, among many other issues for long-term water security.

## Description

Changing wildfire activity, in particular, has raised the hazards to water resources in many parts of the world, particularly high latitude forests in North America. Wildfires are a regular natural occurrence in northern latitudes; however, numerous recent studies imply that climate change is already affecting burning conditions, with longer fire seasons, hotter and drier weather, and increased lightning activity leading to more frequent and catastrophic wildfires [2].

Furthermore, the increasing number of people drawn to northern regions for job and recreation has affected ignition patterns and raised the danger of fire activity to towns and watersheds. Fire, whether natural or man-made, has two effects on ecosystems' ability to benefit humans. While natural wildfires of a moderate severity can assist preserve forest ecosystem health and related services like wood supply, biodiversity, and recreational activities, larger and more severe flames can produce more harmful smoke and pollute water [3].

As a result, high-severity wildfires in wooded watersheds have the potential to disturb a wide range of eco hydrologic processes and functions, including interception, infiltration, evapotranspiration, and storage. As a result of these impacts, quicker runoff reactions, increased surface runoff, enhanced erosion and sediment delivery to streams, and higher mass movement potential can occur. These consequences might result in poor physical and chemical water quality, which could have significant and long-term implications for HES, such as community drinking water supply or recreational water usage.

The reliance on HES from wooded watersheds in many locations, particularly high latitude forests in Canada and Alaska, will continue to expand as human population and industrial activity grow. The present significant water security challenges in northern regions will be exacerbated by these expanding constraints. Water is a distinguishing biological, social, and economic feature in northern wooded regions. In Alaska, for example, there are over 12,000 rivers and streams that pour into over 3 million lakes greater than 2.5 hectares. With roughly 10% of global renewable water resources, Canada possesses the world's third biggest renewable freshwater supply. Surface water resources in Alaska contribute 75% of home, agricultural, and industrial water usage, as well as 88 % of drinking water and 68% of irrigation water [4].

The yearly value of hydrologic services provided by the boreal forest, according to Anielski and Wilson, is almost $72 billion CAD. Water is also culturally significant, particularly in northern latitudes, where it is typically linked to spiritual traditions, people's identities, and landscape aesthetic and recreational qualities. The Heritage River System in Canada preserves 12,000 km of historic and recreational rivers, while the Watermark Project, an online collection of human tales and local knowledge about people's interactions with water, provides access to hundreds of testimony from a diverse range of water users [5].

## Future Prospective

These initiatives underscore Indigenous populations' fundamental reliance on healthy aquatic environments for sustenance and spirituality, which continues to be a distinguishing characteristic of northern identity. Maintaining healthy forested watersheds that will continue to produce a diverse variety of HES is crucial in view of current changes in wildfire regimes in North American high latitude forests. This needs particular wildfire control strategies in high-risk watersheds that are based on scientific evidence. Existing study is either obsolete, narrowly focused on a subset of post-fire consequences to surface hydrology, or has only studied a specific natural region, therefore there is currently no cohesive picture of the spectrum of post-fire effects on HES. Furthermore, despite the fact that several recent studies have echoed the growing concern about wildfire risks to water security, there is no formal assessment of the current state of knowledge in post-fire hydrology and the related risks to HES in northern latitude forests that would aid in the development of viable watershed protection strategies

## Conflict of Interest

None.

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