# Wildfire Resilience and Biomass Supply

## Report from Joint IEA Bioenergy Task 43 and Université Laval Workshop held on October 5, 2023

IEA Bioenergy Task 43

June 2024

Photo Credit: Natural Resources Canada, 2023


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# Executive Summary

The intensified fire season of 2023 in Canada and other countries necessitates urgent efforts to promote wildfire resilience while facilitating a sustainable and reliable biomass supply. Wildfire management involves prevention and mitigation treatments such as thinning, as well as post-fire harvest activities including the sustainable extraction of biomass from affected areas. However, the complexities and risks associated with the conditions of recently burned areas make it challenging to manage the collection of this biomass.

On October 5, 2023, a hybrid workshop titled "Wildfire Resilience and Biomass Supply," organized by IEA Bioenergy Task 43 and Université Laval, brought together experts from Canada, Europe, Australia, and the US to gather insights and best practices to promote sustainable wildfire and biomass management. The workshop commenced with introductory remarks from Dr. Vincent Roy (NRCan, Canadian Forest Service [CFS]), followed by seven presentations.

The first four presentations focused on the Canadian context and ongoing initiatives related to Wildfire Resilience and Biomass Supply, while the last three explored international best practices and lessons learned. Key takeaways from the presentations include:

- The intensifying wildfires correlate with rising temperatures linked to climate change, resulting in the expansion of pioneer species, many of which are deciduous, in Canada. This expansion has contributed to increased shortages of timber, especially softwood, and high costs associated with harvesting the wood, due to lower productivity (cubic meters per hectare) compared to hardwood.
- Enhancing forest landscapes and industrial structures' resilience, for instance, by introducing fire-resistant species like red alder and trembling aspen, is crucial. Fire salvage harvesting is also vital, with success governed by factors such as tree species, plantation age, fire intensity, and regulatory requirements.
- Sustainable forest management, incorporating fuel management and biomass removal for bioenergy, offers a mutually beneficial solution, particularly for communities susceptible to both fire risk and energy insecurity.
- Effective strategies for recovering affected trees and reaching markets can lead to success but necessitate efficient coordination across the supply chain. The use of standardized, georeferenced data on the harvesting history of forest stands and burn pattern classification for recovered wood is also important.
- The government could facilitate cost-sharing opportunities between bioenergy production and wildfire fuel management. Additionally, it is crucial to promote leadership while enhancing community-level benefits, such as job creation and revenue generation.
- Investment planning can optimize the integration of forest management alternatives and trade-offs across different scales to achieve various objectives.
- Research involving life cycle assessment and sustainability criteria, and operations cost reduction models is critical to facilitating wildfire resilience and biomass supply.

Following the presentations, a series of breakout discussions occurred, focusing on wildfire prevention and mitigation, post-fire salvage and restoration, and policy recommendations. Participants from various stakeholder groups, including research, industry, and government, engaged in in-depth discussions in each session.

In summary, the conference highlighted the importance of a holistic approach to fire management and biomass utilization globally, even in regions traditionally less affected by wildfires. Insights gained from the presentations and breakout discussions can inform policies and investment decisions for sustainable forest management, particularly in the face of increasingly intense wildfire seasons.

# Introduction

Canada and other countries face significant challenges due to annual wildfires, impacting the environment, health, economy, society, and climate (Coogan et al. 2019, Boulanger 2023, Brown 2023). Climate change has more than doubled the likelihood of extreme forest weather conditions in Eastern Canada (Tymstra 2020, Barnes 2023, Boulanger 2023). Vegetation flammability is increasing, with an annual rise in the burned area by 330,000 hectares each decade (Boulanger 2023). Given the intense fire season in 2023 in Canada and other countries, there is an urgent need to increase efforts to enhance wildfire resilience while promoting a sustainable and reliable biomass supply.

First, it is crucial to understand the broad impacts of wildfires and develop effective mitigating strategies. Rising temperatures, prolonged high-temperature periods, and droughts create ideal conditions for fires, increasing the frequency and intensity of wildfires (Wasserman and Mueller 2023). Wildfires, in turn, emit greenhouse gases (GHGs), primarily carbon dioxide and methane, into the atmosphere, exacerbating the warming effect. Additionally, wildfire smoke, containing cooling and warming aerosols, impacts climate depending on factors such as fire size and location (Tian et al. 2022). The long-term consequences of wildfires, such as reduced carbon sequestration, disrupted weather patterns, and ecosystem impacts, further affect the environment and climate. Addressing the link between wildfires and climate change requires a comprehensive approach, including GHG emission reduction and adaptation to wildfire risks through effective management, land-use planning, and preparedness strategies.

Strategies to enhance wildfire resilience should mitigate impacts by incorporating initiatives such as the FireSmart Canada program, rigorous Building Code enforcement, implementation of early warning systems, and community education (Mansuy 2023, White 2023). Sustainable land management practices, including selective logging and seeding, reduced fuel loads and wildfire risk, while supporting ecosystems, are also important. Fuel loads include organic layers such as litter, fine-woody debris, and coarse woody debris (logs) that can accumulate especially in lowland areas without fire (Hanes et al. 2022). Therefore, integrated fire management plans addressing both prevention and response are central to enabling wildfire resilience. Such plans should also promote sustainable biomass utilization, involving the salvaging and processing of burnt wood into bioproducts.

The connection between wildfire resilience and biomass supply is essential, especially in wildfire-prone regions. Harvesting biomass reduces fuel loads, and the biomass can be used as feedstock for bioenergy or other bioproducts that can substitute their fossil-based counterparts. Diverting fuel to bioproducts such as biochar can contribute to carbon sequestration while reducing wildfire risk (Nicholls et al. 2018, Rodriguez Franco and Anderson 2023). These activities can promote community resilience while diversifying bioenergy sources and strengthening local economies (Nicholls et al. 2018).

Experts convened at the workshop to discuss heightened wildfire activity and strategies for wildfire resilience and sustainable biomass supply to mitigate the impact of climate change. Workshop objectives include policy exploration to enhance community resilience through biomass utilization, sharing best practices, and assessing the financial feasibility of using recovered fibre for bioenergy and bioproducts. This report summarizes meeting outcomes and presentations, providing insights into current policies supporting wildfire resilience and sustainable biomass supply. Also, it identifies data needs to inform policy decisions and bridges the gap between research and actionable development. The report aims to serve as a valuable resource while promoting discussion on addressing wildfire challenges, enhancing resilience, and reducing GHG emissions.

## Background

Over the years, in Canada, the annual area burned by wildfires has witnessed a steady increase, with an average rise of 330,000 hectares each decade (Boulanger 2023). This concerning trend is particularly pronounced when considering warming projections from various scenarios, such as the Intergovernmental Panel on Climate Change (IPCC)'s Shared Socioeconomic Pathways (SSP), indicating a projected increase in the annual area burned by wildfires with potential consequences for sustainable forest management (Gauthier et al. 2015). The expansion of wildfires brings forth several challenges for the forest sector. Regeneration failures in burnt areas can lead to diminished and altered timber volumes available for harvest. Increased fire activity promotes the growth of pioneer species, many of which are deciduous, thereby altering the forest composition and resulting in higher costs and softwood timber shortages (Boulanger 2023).

In response to these challenges, various solutions have been proposed, including:

- **Precautionary Reserves:** Implementing precautionary reserves over a larger portion of the landscape by proactively managing and allocating resources to minimize the potential impacts of wildfires, thereby ensuring the preservation of essential forested areas.
- **Fire-Resistant Forest Landscapes**: Creating forest landscapes that are more resistant to fire by employing strategies such as selective planting for resilient species and fuel management. This approach aims to enable the forest landscapes to withstand wildfire events without extensive damage.
- **Resilient Forest Sector:** Enhancing the resilience of the forest sector and its industrial structure to adapt to the changing wildfire landscape.

While these solutions represent a complex and challenging undertaking, it is crucial to consider the costs of inaction versus adaptation. The capacity to manage landscapes in the face of wildfires and the annual funding allocated to those activities are limited, thus strategies need to be harmonized with other objectives, such as forest product manufacturing and community protection. Furthermore, addressing wildfire impacts involves considerations beyond wood supply, encompassing aspects related to wildlife, carbon sequestration, and other ecological factors. The development of regional strategies is critical to effectively manage the multifaceted challenges posed by the increasing wildfire activity.

The Wildfire Resilience Futures Initiative (WRFI) is a significant component of Canada's Adaptation Action Plan, with the primary goals of enhancing the FireSmart Canada program, building foundational wildland fire knowledge, and establishing a Centre of Excellence for Wildland Fire Innovation and Resilience. To achieve these objectives, WRFI plans to invest in projects and programs, including a cost-shared Contribution Program, supporting regional governance bodies and assisting smaller communities in implementing FireSmart Canada. Additionally, WRFI aims to enhance science and policy capacity, fostering new wildfire management approaches, technologies, and expertise to reduce risks. The initiative will establish a virtual Center of Excellence to advance wildland fire knowledge and innovation, and position Canada as a global leader in wildfire resilience.

## Pre-workshop Survey and Profile of Participants

A pre-workshop survey was conducted to gather insights into the sustainable collection of biomass from wildfire prevention, mitigation, and post-fire timber harvesting activities. Participants represented various sectors, including industry (14%), government (46%), academia (27%), non-profit organizations (4.6%), professional organizations (4.6%), and others (4.6%). The participants were mainly from different regions in Québec (86%), with a few international attendees.

The participants were asked to express their agreement levels with specific statements, and their rankings for factors impacting our understanding of biomass use from wildfire risk reduction and post-fire harvesting projects were collected. The participants indicated that biomass can be sustainably collected

from both forest fire prevention and mitigation activities (76%) and post-fire timber harvesting (82%). Additionally, a majority agreed that measures to prevent and mitigate forest fires or harvest wood after fires can serve as a reliable source of biomass, with 77% supporting forest fire prevention and mitigation and 65% supporting harvest after fires. Regarding the factors impacting the understanding of biomass utilization, participants rated evaluating biomass pre-treatment options at the harvest site and establishing demonstration projects for biomass recovery as particularly impactful. The details of the survey are provided in the Annex.

# Summary of presentations

## Introductory Remarks

Dr. Vincent Roy (NRCan, Canadian Forest Service)

The workshop's objectives align with the Government of Canada's priorities, emphasizing increased wildfire resilience efforts and promoting sustainable biomass utilization (NRCan 2020, 2022). CFS's core mandate involves scientific research on Canada's forests, with a focus on wildland fire behaviour, the ecological role of fire in different forests, assessing current fire activity, and implementing all aspects of wildland fire management. Collaborating with partners such as CanmetENERGY, the National Research Council (NRC), universities, industries, other Government of Canada departments, and IEA Bioenergy, CFS is dedicated to characterizing salvaged feedstocks, addressing research and technical gaps, and contributing to de-risking projects and investments in forest bioenergy and bioproducts.

A key value-added use of biomass from forest disturbances is conversion into lumber, followed by processing by the pulp and paper industry. Chemical and physical changes caused by fires position biomass from salvage harvesting as the ideal feedstock to produce high-quality solid and liquid biofuels. The challenge lies in mobilizing wood fibre from natural disturbances towards utilization for valuable products. Therefore, it is crucial to explore these challenges and opportunities associated with wildfire-resilient and sustainable biomass supply.

This workshop is timely given the increasing frequency and intensity of wildfires over the years. NRCan is excited to host this workshop in Canada, serving as an invitation for participants to engage in fruitful discussions and find solutions. NRCan also aims to further expand collaborations with the IEA and other organizations keen on embracing sustainable biomass and bioenergy production and supply.

## Climate Change Impacts on Wildfires on the Forest Sector in Quebec

Dr. Yan Boulanger (NRCan, Canadian Forest Service)

As evidenced by the 2023 record-breaking events, climate change has more than doubled the likelihood of extreme forest weather conditions in Eastern Canada. Vegetation flammability is increasing, with an average annual rise in the burned area of 330,000 hectares each decade. The SSP indicates a significant future increase in the annual area burned. These changes pose a threat to sustainable forest management, as regeneration failures have also been reported. Consequently, projections show a reduction in the volume of harvested wood, impacting both quantity and variety.

Furthermore, the increase in fire activity is expected to accelerate the expansion of pioneer species, many of which are deciduous, leading to higher harvesting costs and timber shortages, particularly for softwood. Potential solutions to address these challenges include establishing a precautionary reserve over a larger proportion of the territory and making forest landscapes more fire-resilient, incorporating strategies such as variable retention and favouring fire-resilient species. Enhancing the resilience of the forest sector and industrial structure is also important. Implementing these solutions requires a comprehensive analysis, including the following:

- The assessment of the costs of inaction versus adaptation and the limited capacity for managing landscapes per year.
- Harmonizing strategies, such as balancing wood production with protecting communities.
- Recognizing the multifaceted nature of challenges, encompassing wildlife, carbon, and more.
- Formulating regional strategies to address specific challenges in different areas.

## Wildfire Resilient Futures Initiative

Thomas White (NRCan, Canadian Forest Service)

The Wildfire Resilience Initiative has been announced as a key component of the Government of Canada's Adaptation Action Plan. WRFI aims to achieve the following objectives:

- Enhance and expand the FireSmart Canada program.
- Build and mobilize foundational wildland fire knowledge.
- Establish a Centre of Excellence for Wildland Fire Innovation and Resilience.

To attain these objectives, WRFI proposes to invest in projects and programs, including a cost-shared contribution program, to support regional (e.g., provincial-territorial-level) governance bodies and aid smaller and remote communities in implementing FireSmart Canada (FSC). WRFI will also invest in building science and policy capacity to develop new wildfire management approaches, technologies, and fire expertise for partners and stakeholders, thereby supporting risk reduction. Furthermore, WRFI will establish a virtual Center of Excellence to advance wildland fire knowledge and innovation, support the transformation of wildfire management, and position Canada as a global leader in wildfire resilience.

WRFI is planned to be delivered in two phases. While the first phase will focus on laying the foundation, involving stakeholder consultations and Indigenous engagement, the second phase will concentrate on implementation, spanning from October 2024 to March 2028.

## Post-Fire Salvage Logging in Canada: Assessing the Economic Value of Burnt Trees for Different Industrial Sectors

Dr. Cyriac Mvolo, Dr. Christian Hébert & Dr. Isabelle Duchesne (NRCan, Canadian Forest Service)

In the Parc des Grands Jardins, Quebec, an increase in both insects and species is observed after a fire, particularly benefiting "pyrophilic species." For instance, the abundance of beetles in standing dead trees is reported to be twice as much, ten years after a wildfire. Post-fire salvage logging is, therefore, crucial.

To maximize financial benefits and conserve biodiversity, stands that were severely damaged by *Monochamus scutellatus*, a beetle that emerged from Black spruce logs after the Chibougamau, Quebec, burns in 2005, should be avoided during harvest. Generally, for stands affected by spruce budworm or fire, the optimal time to salvage trees for lumber production is within 1-2 years after death. For pulp and paper production, salvaging trees is viable if wood moisture content remains above the fibre saturation point. However, it is not recommended after 3- or 4-years following death. Beyond this period, salvaged trees may present better opportunities for the bioenergy sector (Barrette et al. 2015a).

A study showed that dead trees exhibit significantly lower lumber stiffness and strength compared to living trees, but the lumber is still suitable for structural applications. Additionally, wood chips obtained from dead trees have lower moisture content (Barrette et al. 2015b).

At the CFS, ongoing research focuses on assessing the lumber quality and value of fire-killed trees. The research involves evaluating the effect of burn severity on lumber volume recovery, lumber visual grades, and lumber economic value through time (up to 2-3 years after tree death). The research also involves assessing the impact of burn severity on lumber mechanical properties, including modulus of elasticity (MOE), modulus of rupture (MOR), density, and humidity.

Future research includes a 5-year project that aims to answer questions about the impacts of fire severity and associated disturbances on salvaged biomass quality. The following are the specific objectives:

- Evaluating the impact of disturbance characteristics on the chemical, mechanical, and physical properties of wood.
- Assessing the impact of disturbance characteristics on the quality of solid biofuels, liquid biofuels, and biomaterials.
- Analyzing the impact of biomass characteristics on the quality of solid biofuels, liquid biofuels, and biomaterials.
- Examining the impact of chemical and physical wood properties on the quality of solid biofuels, liquid biofuels, and biomaterials.

## Biomass Potential from Canadian Forests in the Context of Climate Change

Sylvain Volpe (FPInnovations)

In 2023, about 7.5 times the 15-year average for hectares have been burned by wildfires in Canada. Long-term forecasts anticipate a greater frequency of fires over a wider geographic area. Therefore, it is crucial to explore prevention strategies, including salvage operations and how to assist the sector in recovering from incidents to ensure a sustainable environment. Such strategies involve FireSmart, sharing insights and knowledge gained from community fireproofing efforts, and salvage operations, assessing logging productivity impacts and anticipating increased maintenance costs. The strategies will also involve the evaluation of biomass availability from FireSmart treatments and burnt forests.

FPInnovations (FPI) conducts research to build resilient supply chains, gathering pre- and post-treatment fuel inventory, fire behaviour, and effects data. Results from trials on selectively harvesting for landscape-level fuel breaks, reducing wildfire intensity, and improving detection were presented. The post-harvest inventory shows favourable retention of fire-resistant species, reducing diseased or dead stems. FPI also explores efficient suppression operations for safer, high-hazard environments, as well as less dense forest stands to enhance situational awareness and movement. FireSmart treatment costs range from $125 to $5,000 per hectare.

In a cut-to-length harvesting comparative study in burnt stands, longer travel distances were noted but felling and processing were quicker. Burnt wood requires 50% more cuts for the desired quality, yielding fewer logs. Biomass recovery potential varies; BC has a higher recovery (2.5 M oven dry weight per year [odt/yr]) than AB (850k odt/yr) within 10 km fire protection rings around forest communities.

Project ideas for recovering burnt wood involve using standardized georeferenced data, such as the harvesting history of green stands, burn pattern classification, and conducting productivity studies with long-term monitoring. Canada's government priorities for ensuring a resilient fibre supply include strengthening efforts to enhance wildfire resilience and promoting the sustainable utilization of biomass.

## Firesmarting – Bioenergy Nexus in Remote and Indigenous Communities

Dr. Nicolas Mansuy (European Commission)

Approximately 80% of Indigenous communities in Canada are situated in forested areas prone to fires. A recent study focused on the integration of fuel management and biomass removal for bioenergy, presenting a potential win-win solution for communities vulnerable to fire risk and energy insecurity.

The study identified diesel-dependent communities in Canada at risk from wildfires, estimating the biomass available from fuel treatments (BAFT) and fuel treatment areas (FTA) at the community level to meet their annual energy demand (AED).

Vulnerability to fire risk is determined by having at least 90% of undisturbed forest area (i.e., forest > 30 years old) within a 10km buffer around the community. Based on these criteria, 33 communities have been identified as vulnerable to forest fires. For these communities, BAFT was calculated using a national

dataset (odt/ha) that includes branches, foliage, bark, and stem wood from trees in forest stands from 2020 at a 30 m resolution.

All 33 communities, regardless of their energy needs, can theoretically meet their AED by harvesting less than 1% of their BAFT per year. The study found that biomass removal operations for bioenergy can benefit from existing fuel treatment standards developed by FireSmart Canada.

The successful implementation of these strategies requires synergies, collaborations (between local government and fire agencies), and education. Additionally, the government should assess and facilitate cost-sharing opportunities between those in charge of bioenergy production and fuel management. Those activities should also enhance community-level benefits, including job creation, revenue generation, and leadership.

## Towards A More Holistic Approach to Fire Management and Biomass in the EU

Dr. Nicolas Mansuy (European Commission)

In the EU, the escalating threat of wildfires is attributed to rising temperatures resulting from climate change. By 2100, it is anticipated that the number of days with high wildfire danger will double, with a projected 200% increase in areas susceptible to forest fires. This heightened risk is also due to the expansion of the Wildland–Urban Interface (WUI), which refers to the area where structures, including homes and other human developments, mix with forest and other vegetative fuel types (McFarlane 2006) Even countries in central Europe, historically less affected by wildfires, now face this growing challenge.

In response to these challenges, there is a growing call for international collaboration in fire research and prevention, recognizing the need for a paradigm shift towards integrated fire risk management and a transition from a focus on suppression to prevention. The emphasis is on increasing awareness and preparedness among populations at risk.

EU policies, including the EU Biodiversity Strategy, Forest Strategy, Nature Restoration Law, and Bioeconomy Strategy aim to enhance the quantity and quality of forests (European Commission, 2023a, 2023b, 2023c, 2023d). These policies are designed to protect ecosystem services, increase biodiversity, restore degraded ecosystems, and plant at least 3 billion additional trees by 2030.

With the revised Renewable Energy Directive (REDII), sustainability criteria are set to avoid biomass harvest from primary forests, old-growth forests, “high biodiversity” forests, wetlands, peatlands, and deadwood. Member States are required to evaluate biomass supply in line with Land Use, Land-Use Change and Forestry (LULUCF) carbon objectives.

A key message emerging from these initiatives highlights the importance of synergies between the forestry and energy sectors. This involves aligning European and national policies and establishing harmonized data reporting on biomass uses and their environmental impacts at the EU level. This holistic approach aims to address the interconnected challenges of fire management, climate change, and sustainable biomass utilization.

## An Overview of US Forest Service Biomass Research

Dr. Carlos Rodriguez Franco & Dr. Nathaniel Anderson (U.S. Department of Agriculture Forest Service)

The US Forest Service is implementing a comprehensive strategy to address the wildfire crisis. Key focus areas encompass (a) utilizing advanced mapping techniques to identify fuel sources and design effective treatment plans; (b) enhancing efficiency in forest operations and logistics to improve overall wildfire management; and (c) exploring opportunities for innovation and development within the forest industry.

Currently, millions of acres consist of densely overstocked forests characterized by an increase in shade-tolerant species and various forest health problems such as drought stress, insect infestations, and diseases. Other challenges include high mortality rates and low vigour. These forests are susceptible to large and severe wildfires, with climate change exacerbating these conditions. Development in WUI,

diverse values, and ecosystem services are at risk, leading to escalating costs of wildfire management and fewer resources for all other management needs.

Management strategies involve diversification efforts to meet goals and objectives for forest landscape restoration, aiming at creating fire-resilient forests and ensuring drought resilience under climate change. The objectives also include restoring burned areas after fire, with a specific focus on post-wildfire rehabilitation. Additionally, it is crucial to protect ecosystem function, prioritizing soil conservation and recovery, watershed function, hydrology, and biodiversity. Delivering ecosystem services, including water, recreation, carbon storage, as well as timber and biomass supply, is also essential.

Several challenges are associated with biomass supply from fuel treatment. In comparison to commercial timber operations, fuel treatment poses challenges such as difficult implementation, complex residual stand conditions, higher costs, limited markets, and increased risks. Consequently, the biomass and bioproducts supply chain should explore leveraging the forest industry and the bioproducts supply chain for effective fuel treatment.

Research and development within the biomass supply chain can offer solutions related to wildfire crisis strategy, fuel mapping and treatment design, forest operations and logistics, and industry and product development. Forest operations research should focus on cost reductions, new technologies, efficiency, lifecycle analysis, machinery, systems synthesis, site impacts, and human safety. Success stories and ongoing projects encompass nanotechnology, mass-timber programs, as well as biochar production and utilization.

### Forest Operation Around Bushfire Management - Australia

Dr. Mark Brown (University of the Sunshine Coast)

In Australia, the impact of wildfires reached its peak at 5,520,000 hectares in 2019, making the 2019–20 bushfire season the worst on record in New South Wales. This event resulted from a combination of droughts, unprecedented weather conditions, and intense fire behaviour.

The “Salvage as Fast as You Can” program was initiated to preserve greenwood for the industry’s future at a minimum cost. The program focuses on key strategies such as local salvage harvesting, ensuring market access, and effective supply planning. Operational scheduling includes the development of pre-fire harvest plans, road mapping, and modelling operational requirements. Successful cooperation with customers is essential for the program’s success, facilitating storage using customer facilities. Notably, Forestry Corporation accomplished the largest post-fire salvage in the company’s history, salvaging nearly five million tonnes of softwood timber during the 2019–2020 recovery efforts. Additionally, they replanted over 14 million seedlings.

The successful recovery of forests is governed by various factors, including species, plantation age, fire intensity, and regulatory requirements. Timely dead tree harvesting within 24 months and coordinated efforts across the supply chain play a crucial role. Mechanical fuel reduction harvesting shows promise for fine fuel load management, but operational decisions should be guided by fire risk outcomes. While fire salvage areas may increase, the primary focus remains on timber product supply agreements, potentially limiting biomass availability.

## Breakout Sessions

The breakout sessions were organized into three categories: (1) Wildfire Prevention and Mitigation, (2) Post-Fire Salvage/Restoration, and (3) Policy Recommendations. Three tables were set up for each, hosting a diverse group of participants, including stakeholders from research, industry, and government. During these sessions, participants had dedicated time to deliberate on prepared questions relevant to the theme of their respective topics. Their contributions were noted on Post-it slips, which were then placed on whiteboards. Subsequently, participants presented their group’s ideas to the plenary and engaged in discussions. These collaborative deliberations proved valuable, offering insights into various opportunities

to address challenges associated with each topic.

## Session 1: Wildfire Prevention and Mitigation

Participants emphasized the importance of prevention strategies in mitigating regeneration accidents by minimizing the scale and intensity of wildfires. The activities discussed ranged from regional-level firebreak planning to local interventions and pest management to prevent the accumulation of dead wood. The role of the local community, in tasks such as establishing firebreaks, reducing fuel loads near buildings, and implementing fireproofing measures, is crucial for safety, environmental, and economic benefits.

Additionally, diversifying land use and products emerged as key considerations during the session. Opportunities in sites with existing infrastructure for cost-effective bioenergy projects were discussed, identifying potential benefits such as the reduction in the cost of harvesting trees. The session also addressed challenges, including capacity constraints and high volumes required by industrial operations.

***Potential and Opportunities***

Opportunities in wildfire prevention and mitigation include adopting a landscape-level approach that prioritizes at-risk communities for prevention activities. Adoption of these activities could result in increased biomass volumes. For instance, thinning, partial harvesting, and slash removal at delimbing areas can yield significant quantities of biomass. Utilizing biomass from prevention and mitigation efforts can generate revenue, supporting greater adoption of wildfire management practices. Locations easily accessible through existing infrastructure, including transportation and biomass processing, were highlighted as having the most potential.

The recovered biomass can be utilized by existing industrial facilities engaged in combined heat and power (CHP), wood pellet production, and pulp production. Recovered biomass can be also used for emerging applications such as bioproducts and Sustainable Aviation Fuel (SAF) to reduce GHG emissions, necessitating collaboration with the aviation industry.

The participants also discussed strategies such as planting fast-growing (e.g., willow, *Salix spp.)* or less flammable species (e.g., oak; *Quercus spp.*) in firebreaks, for their potential economic and ecosystem benefits. Diverse vegetation can improve soil health, regulate water cycles, and contribute to carbon sequestration, thereby enhancing overall ecosystem resilience. Landscape diversification, considering factors such as age and composition, is essential to create a mosaic of different habitats and vegetation types, which can enhance overall ecosystem resilience.

Furthermore, establishing 20-50 m protection strips around communities was suggested. These strips act as a barrier, helping to slow the spread of wildfires and reduce the likelihood of fires encroaching on homes and infrastructure.

***Challenges***

Challenges in wildfire prevention and mitigation strategies span various key areas. For instance, existing regulations are usually incompatible with industrial harvesting around communities. Additionally, tenures granted to companies on public land only cover merchantable trees, excluding third parties that could collect harvesting residues. Given the extensive areas to cover and the high number of communities at risk, there is currently limited capacity for widespread interventions across the country. Furthermore, wildfire prevention and mitigation activities can be costly, mainly attributed to low yields, and may result in wood fibre suitable only for low-value products. Moreover, concerns were raised about biomass characteristics not aligning with desired applications. For example, deciduous trees, despite being more fire-resistant, face a lack of applications and industrial demand for hardwood logs.

Firesmart activities near communities may face limitations in scale, generating biomass primarily for local needs rather than sustaining larger industrial operations requiring over 100,000 tonnes of biomass. Other challenges identified include labour shortages and inadequate training, especially in remote locations where these activities predominantly occur. Distance and the need for appropriate equipment are major

obstacles to profitability. Social acceptance and proximity to transport infrastructure are critical considerations, particularly in high-risk, remote areas.

Addressing concerns related to guaranteed supply and navigating economic trade-offs between establishing plantations and investing in prevention efforts are essential components of formulating a sustainable strategy. Recurrent themes include community acceptance, the necessity to simultaneously meet risk mitigation and fibre supply objectives and ensuring compatibility with sustainable forest management.

While firebreaks serve the essential purpose of mitigating wildfire risks, they might inadvertently contribute to habitat fragmentation and create corridors facilitating the movement of predatory species, impacting local ecosystems. Considering the impact on Indigenous territories, conservation efforts, and biodiversity is crucial when implementing wildfire prevention measures. This highlights the need for a comprehensive approach that prioritizes both wildfire prevention and ecological considerations on Indigenous lands.

Consideration was given to the role of coppice willow, which allows for repeated harvesting over time without replanting, contributing to a continuous and sustainable source of biomass. A holistic approach to wildfire prevention and mitigation is essential to reduce risks while fostering the health and resilience of the forest ecosystem.

**Recommendations:**

1. **Avoidance of Regeneration of Undesirable Species**
    - Implement intensive silviculture practices, such as shorter rotation cycles and planting less flammable species, to reduce the likelihood of undesirable species regeneration.
2. **Scale and Community Involvement**
    - Focus on local-scale activities involving Indigenous and other communities in partial harvesting and the collection of branch removal areas for financial benefits.
    - Target the most at-risk communities at a landscape level, involving 100 communities with a harvest area of over 50,000 hectares and implement prevention strategies considering volumes of wood fibre available within 10 km rings.
3. **Landscape Diversification**
    - Establish regional-level firebreak planning, implement local interventions, and create protection strips around communities, with a particular focus on Indigenous communities and municipalities, which are often situated in forested areas.
    - Identify optimal locations, such as near cottages, communities, windrows, non-productive irregular stands, and mixed stands, for comprehensive planning.
    - Promote diversified land use, a variety of products, and local energy use, fostering a circular economy.
4. **Biomass Supply and Utilization**
    - Explore salvaged biomass sources and develop new biomass supply locations to enhance resource availability and utilization. Biohubs can play a crucial role in processing salvaged biomass into higher-quality products, such as pellets and biochar. They also serve additional functions like storage and loading facilities, facilitating biomass preparation for transportation to various end uses (Pradhan et al. 2022). When establishing biohubs is impractical, it may be necessary to deploy mobile or semi-mobile processing units, such as portable units for biochar production.
    - Promote the utilization of salvaged biomass for CHP, pulp production, or the generation of bio-products.

- Find a balance between the long-term post-fire availability of biomass and the higher risk of pre-established regeneration associated with salvage harvesting.

5. **Finances**
    - Conduct market analyses and launch community engagement initiatives to enhance social acceptability.
    - Prioritize investments in modern and suitable equipment for effective and efficient prevention and mitigation activities.
    - Explore financial mechanisms, including subsidies and partnerships, to alleviate the financial burden of salvage harvesting on industrial consumers.
    - Facilitate the generation of new revenue streams and reinvest the funds for additional mitigation efforts.
6. **Regulations, Guidelines and Standards:**
    - Establish consistent silviculture standards or guidelines to promote standardized wildfire prevention measures.
    - Promote adaptive regulations to facilitate effective wildfire prevention strategies, particularly regarding harvesting around communities.

While there is a noticeable absence of successful projects in Canada utilizing biomass from prevention or mitigation activities in commercial-scale operations, insights gained from successful biomass utilization projects described during the session include:

1. Evaluation of alternatives to traditional firebreaks, such as the use of hardwoods or berry crops, coupled with proactive measures against pest insects.
2. Identification of optimal end-uses for insect-infected windfall stands, with insights potentially applicable to fire-affected stands for cost variations, market dynamics, and effective end-use strategies.
3. Utilization of low-grade logs and harvest residues for biomass heating, as demonstrated by initiatives in Scandinavia.
4. Exploration of diverse end uses for biomass, including bioenergy, biochar, torrefied pellets, and biocarbon, optimizing benefits such as wood stability, durability, and calorific value to enhance applicability.
5. Introduction of innovative reforestation methods through multi-species seeding using drones, as demonstrated in the Northeast USA Project.

***Concluding Remarks***

While the input was relatively consistent across tables, there were some diverging views on the magnitude of challenges and whether such activities can represent an affordable, stable source of biomass.

Mitigating wildfire risks is crucial for enhancing overall forest resilience against the impacts of climate change, especially in areas with both high wildfire risk and optimal accessibility of forest stands. Adopting a risk-based approach for location selection is imperative, focusing interventions on areas with higher vulnerability while fostering transparent communication and collaborative decision-making in the mitigation process.

## Session 2: Post-Fire Salvage/Restoration

During this session, participants explored ways to enhance post-wildfire salvage and restoration efforts. Strategies such as subsidy programs and reduced stumpage fees were discussed to lower the cost of collecting affected trees. Potential opportunities included compensation for reduced harvest volumes, treating burned areas as valuable biomass deposits, strategic harvesting timelines, collaborative fibre

utilization, addressing regeneration challenges, and exploring diverse products from salvaged resources. The concept of branding wood from fire-affected areas emerged to add value to salvaged timber.

***Potential and Opportunities***

Participants explored various avenues to enhance post-wildfire salvage and restoration efforts. Suggestions included implementing subsidies and reducing stumpage fees to incentivize efficient salvage operations, thereby aiding in the recovery process, and preventing further environmental degradation. Additionally, the concept of branding wood from fire-affected areas emerged as a strategy to add value to salvaged timber by highlighting its unique origin and commitment to sustainable forestry management practices.

Considering burnt areas as valuable "mining deposits" for biomass harvesting generates new avenues for sustainable resource extraction and promotes ecosystem recovery. The substantial volumes available in affected areas present an opportunity to initiate projects on bioenergy and diverse bioproducts from salvaged resources. Investment in improved infrastructure for processing and utilization can add value.

Implementing a strategic harvesting timeline is deemed necessary to ensure a systematic and sustainable approach to resource utilization. This involves harvesting for sawlogs in the first year, followed by pulpwood 2-3 years later, before focusing on biomass, bioenergy, and other bioproducts afterwards. Providing compensation for reduced harvest volumes serves as a financial buffer for forestry companies and helps maintain jobs in the sector. Creating job opportunities within the forestry sector through post-fire salvage and restoration efforts, while involving local communities, enhances community well-being. Additionally, research, development, and innovation strategies for burned forest restoration can further generate job opportunities.

Bringing all fibre users together with landowners, including sawmills, wood pellet producers, and government entities, was highlighted to optimize fibre utilization and redefine supply chains for greater efficiency while creating economic opportunities, and enhancing sustainability.

Establishing a standard to guide the replanting process during salvage and restoration efforts is crucial. This includes determining the types of trees to plant and adapting to future challenges for long-term reforestation success. Addressing regeneration failure post-wildfires presents an opportunity to enhance climate change resilience. Studying and adapting to regeneration challenges can lead to more robust forestry practices.

Workshop participants did not mention any success stories of salvage harvesting for bioenergy in Canada.

***Challenges***

Managing salvage wood biomass post-wildfires presents complex hurdles, including financial challenges stemming from the distance to harvest sites, increased transportation costs, and reduced productivity due to safety requirements. Furthermore, insufficient infrastructure, such as closed forest roads limiting access to salvaged wood, increases costs and reduces operational efficiency. Ensuring operational longevity is critical, further demanding robust infrastructure and processes for sustained effectiveness. The participants highlighted the need for strategic investment in comprehensive recovery networks. Moreover, the timeframe for harvesting higher-value uses, such as sawlogs and pulpwood, is narrow and requires effective salvage plans and coordination with various stakeholders.

Other challenges associated with post-fire salvage and site restoration include the unpredictability of biomass supply and environmental impacts. Heightened operational costs and potential devaluation of end-products, coupled with uncertainty about salvaged biomass's suitability for higher-value uses, create further challenges.

**Recommendations:**

1. **Biodiversity Preservation**
    - Understanding the impact of post-fire salvage/restoration activities on caribou habitat and complex ecological dynamics is crucial.

- Biodiversity recommendations should be adhered to during salvage operations, managing forest composition to facilitate regeneration processes and preserve diverse habitats.

2. **Stakeholder Engagement**
    - Entrepreneurial engagement is vital for identifying opportunities and innovative biomass utilization.
    - Engaging Indigenous communities ensures that Indigenous cultural, environmental, and social values are integrated into operation planning and practices.
3. **Operational Management**
    - Efficient coordination, safety protocols, and specialized equipment are crucial for post-fire salvage and restoration activities. Addressing labour shortages and training needs is essential to manage logistics, safety considerations, and economic viability effectively.

***Concluding Remarks***

Participants highlighted that challenges are substantial, and success depends on swift action. However, there was a consensus that given the scale of wildfires observed in recent years, salvaging all wood fibre is not feasible. The success of post-wildfire salvage projects depends on a blend of innovative strategies and an unwavering commitment to sustainable practices. Utilizing satellite images for precision, optimizing wood utilization, learning from case studies, and considering end-use scenarios contribute to a comprehensive and effective management approach. As the industry evolves, prioritizing transparency and adaptability will be paramount in addressing the unique challenges posed by post-wildfire landscapes. Addressing these challenges requires a multi-dimensional and collaborative approach, considering economic, operational, ecological, and social aspects.

## Session 3: Policy Recommendations

***Policy obstacles***

Identified challenges include political and regulatory obstacles, with government silos hindering holistic solutions across public safety, environment, forestry, industry, and innovation. Concerns arise about biomass resource accessibility, linked to tenure granted for harvesting merchantable trees on public lands, posing a challenge for third-party access to residues that constitute fuel loads for wildfire. Discussions also included the lack of roads hindering resource access and high stumpage fees reducing incentives for wood retrieval from forest fires.

Issues related to biomass integration into Canadian power utilities, notably Hydro-Québec, reveal an untapped potential for increasing renewable electricity generation, contrasting with large wood pellet volumes exported to Europe and Asia for power and heat generation. Generally, GHG reduction targets for heavy industries were considered insufficient to drive demand for underutilized biomass from wildfire prevention or mitigation activities.

Stakeholders face challenges in elevating the issue to the political forum, emphasizing the need for clear policy objectives related to biomass and the bioenergy sector. Uncertainty surrounds the government's ability to compel tenure holders to harvest fire-affected trees, especially given vast impacted areas and limited recovery potential for sawing-quality logs. Policy and regulatory obstacles involve interprovincial barriers, such as hindrances to wood fibre flow between provinces and insufficient collaboration. Provincial governments, facing multiple challenges in forest management, encounter difficulties in implementing measures concurrently, especially in a context where historical funding for silvicultural activities is not consistent with the scale of recent disturbances.

Preventing hindrances in holistic solutions requires collaboration across government departments, particularly in the context of wildfire management and salvaged wood biomass supply. Coordination among public safety, environment, forestry, manufacturing, and innovation departments can enhance

response measures, optimize salvage operations, and ensure sustainable utilization of salvaged wood biomass resources.

***Role of the Government***

Participants explored potential government interventions such as funding fire risk mapping and expanding FireSmart programs across Canada to enhance understanding and management of fire risks in different regions. The participants emphasized the need for financial support when recovering biomass from fire-affected stands, especially those that are far from processing facilities.

Suggestions also included frequent updates to biomass inventories and funding for feasibility studies, supporting stakeholders in making informed decisions on biomass availability and utilization. Governments should support pilot test units for collection, processing, or utilization to assess the viability of biomass initiatives before wider implementation.

The government should foster stakeholder collaboration by providing essential support, including access to the fibre market, cost-sharing for activities needed to restore fire-affected forests (silviculture, harvest, resource access), resource access, lowering stumpage rates, and funding for roads. Attributing harvest rights in healthy stands adjacent to fire-affected stands would distribute costs for companies and justify machinery mobilization.

Participants stressed government support for labelling wood and products from forest fires, along with promoting pilot units for converting salvaged biomass to test feasibility, profitability, and market viability. Developing a framework or plan (at the federal or provincial level) for using biomass from natural disturbances could guide the prioritization and implementation of proposed measures. Policies supporting forest bioenergy broadly would create markets for all low-value wood fibre, including that from fire-affected stands. Proposed solutions included decreasing GHG emission allowances or emissions-intensity performance standards for large industries under carbon pricing to enhance biomass value. Additionally, the government should explore and facilitate access to funding from sources like carbon offset credits for forest sector stakeholders.

The government should also promote the integration of harvesting and reforestation interventions within comprehensive wildfire management strategies. For example, by incentivizing targeted logging operations in high-risk fire zones followed by reforestation efforts, firebreaks can be created, and fuel loads reduced, ultimately decreasing the severity of wildfires and safeguarding communities and ecosystems.

***Concluding Remarks***

Effective policy recommendations involve a multi-faceted approach addressing financial, regulatory, and collaborative aspects. Governments play a crucial role in creating an enabling environment for the sustainable utilization of biomass resources. For the next steps, participants advocated for government support tailored to local actors, encouraging collaboration in business plan development and community studies. The importance of dialogues between government representatives and Indigenous communities for prevention methods, defining biomass collection rights, establishing sustainability certification, and encouraging the bioenergy sector was emphasized. Overall, the session highlighted the need for flexible, community-centric policies to effectively leverage biomass resources.

## Conclusion and Recommendations

The increasing global prevalence of wildfires presents a major challenge, necessitating intensified mitigation efforts to prevent and mitigate environmental, economic, and social impacts. This workshop brought together experts from Canada, Europe, Australia, and the US to comprehensively examine the impact of wildfires and propel mitigation strategies that can contribute to a sustainable biomass supply chain.

A holistic approach to fire management is imperative for countries, including those historically unaffected by wildfires. Thus, sustained dialogue is crucial for mitigating wildfire impacts and advancing sustainable biomass practices. Key areas of focus encompass advancing technology, promoting education and knowledge mobilization, supporting Indigenous engagement, and aligning policies at regional, national, and supranational (in the case of Europe) levels.

Future research should continue to explore strategies to facilitate biomass recovery from wildfire prevention and salvage activities, including optimizing the quality and inherent characteristics of the recovered biomass. This activity can, in turn, increase bioenergy and bioproducts generation.

Salvage activities for sawlogs and pulpwood have been undertaken historically, but the scale of wildfires in recent years means that ample biomass not suitable for such uses will remain. Analyzing how disturbances influence biomass properties and subsequently impact conversion to biofuels, biomaterials, and biochemicals is crucial. Burnt wood recovery projects should prioritize standardized data, burn pattern classification, and long-term productivity studies.

The government needs to increase efforts on wildfire resilience and sustainable biomass utilization. It may be necessary to conduct a comprehensive analysis of the costs of inaction versus adaptation, harmonizing strategies, recognizing multifaceted challenges, and developing region-specific strategies.

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# Annexes

## Pre-Workshop Survey Questions

**Question:** Can biomass be sustainably collected from wildfire prevention and mitigation activities or post-fire timber harvesting?

**Participants' Response**

| | Strongly Agree | Agree | Neither Agree nor Disagree |
|---|---|---|---|
| Forest fire prevention and mitigation | 35% | 41% | 24% |
| Harvest after fires | 35% | 47% | 18% |

**Question:** Can measures to prevent and mitigate forest fires or harvest wood after fires be a reliable source of biomass?

**Participants' Response**

| | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree |
|---|---|---|---|---|
| Forest fire prevention and mitigation | 12% | 65% | 24% | 0% |
| Harvest after fires | 6% | 59% | 18% | 18% |

**Question:** Please rank the following factors based on their impact on improving our understanding of the use of biomass from wildfire risk reduction and post-fire harvesting projects

**Participants' Response**

| Factors | Mean Rating (1 to 5) |
|---|---|
| Develop regional inventories on the potential availability of biomass | 2.7 |
| Evaluate biomass pre-treatment options at the harvest site to facilitate recovery | 3.7 |
| Study barriers to access to biomass related to policies and regulations | 3.0 |
| Develop feasibility studies for various use cases in different regions of Canada | 2.4 |
| Establish demonstration projects to test the operational feasibility of biomass recovery from fire risk reduction treatments and from fire-affected areas | 3.6 |

## Workshop Poster and Agenda

# Workshop: Wildfire Resilience and Biomass Supply

**Workshop organized by IEA Bioenergy Task 43 and Université Laval**

**Date**: Thursday, October 5, 2023. **Time**: 8:30 am to 4:00 pm (Eastern Time)

**Format:** Hybrid workshop – In-person attendance is required participate to in the full workshop. Morning sessions are available online.

**Location**: Pavillon Charles-Eugène Marchand, salle Hydro-Québec, Université Laval, 325 Rue de l'Université, Québec, QC G1V 0A6

**Online participation**: link for Zoom registration

**Admission**: Free

**Contact**: Bruno Gagnon, bruno.gagnon@nrcan-rncan.gc.ca; Évelyne Thiffault, Evelyne.Thiffault@sbf.ulaval.ca

**Workshop Description:** Given the intense fire season in 2023 in Canada and other countries, there is an urgent need to increase efforts to enhance wildfire resilience while promoting a sustainable and reliable biomass supply. Biomass recovery from wildfire prevention and mitigation treatments, such as thinnings, as well as post-fire harvest activities, involving the sustainable extraction of biomass from wildfire-affected areas, have the potential to serve as a source of biomass. Nevertheless, several factors, such as the difficulties and risks posed by terrain and conditions in recently burned areas, can be challenging to manage.

This workshop will serve to share insights and best practices that can inform policies to enhance community resilience against wildfires and promote sustainable biomass supply. The workshop will address the financial viability of collecting biomass for bioenergy/bioproducts to offset wildfire mitigation and restoration costs. Participants will explore policies and projects for wildfire resilience and a sustainable biomass supply chain that can contribute to reduced GHG emissions.

# Agenda

| **Thursday, 5 October** | |
|---|---|
| 8:30 am - 9:00 am | **Registration** |
| 9 am – 10:30 am | **Presentations: Canadian context and ongoing initiatives** |
| | **Dr. Vincent Roy** (NRCan, Canadian Forest Service): Introductory remarks<br><br>**Dr. Yan Boulanger** (NRCan, Canadian Forest Service): Climate Change Impacts on Wildfires on the Forest Sector in Quebec<br><br>**Thomas White** (NRCan, Canadian Forest Service): Wildfire Resilient Futures Initiative.<br><br>**Dr. Cyriac Mvolo, Dr. Christian Hébert & Dr. Isabelle Duchesne** (NRCan, Canadian Forest Service): Post-Fire Salvage Logging in Canada: Assessing the Economic Value of Burnt Trees for Different Industrial Sectors.<br><br>**Sylvain Volpe** (FPInnovations): Biomass Potential from Canadian Forests in the Context of Climate Change. |
| **10:30 am - 10:45 am** | **Break** |
| **10:45 am - noon** | **Presentations: International best practices and lessons learned** |
| | **Dr. Nicolas Mansuy** (European Commission): FireSmarting– Bioenergy Nexus in Remote and Indigenous Communities & Towards a More Holistic Approach to Fire Management and Biomass in the EU.<br><br>**Dr. Carlos Rodriguez Franco & Dr. Nathaniel Anderson** (U.S. Department of Agriculture Forest Service): An Overview of US Forest Service Biomass Research.<br><br>**Dr. Mark Brown** (University of the Sunshine Coast): Bushfire Salvage Harvesting in Australian Plantations. |
| **12 noon - 1 pm** | **Lunch** |
| 1:00 pm – 1:10 pm | Introduction to the Breakout Group Discussion: Bruno Gagnon (NRCan, Canadian Forest Service) |
| 1:10 pm – 2:05 pm | Breakout Group Discussion #1: Wildfire Prevention and Mitigation |
| 2:05 pm – 3:00 pm | Breakout Group Discussion #2: Post-Fire Salvage/Restoration |
| **3:00 pm - 3:15 pm** | **Break** |
| 3:15 pm – 4:00 pm | Breakout Group Discussion #3: Policy Recommendations |
| **4:00 pm - 4:05 pm** | **Closing Remarks: Bruno Gagnon** |

## Questions Discussed in Breakout Session

**Session 1: Wildfire prevention and mitigation**

1. What is the potential and opportunity?
   - What is the typical scale of wildfire prevention and mitigation activities and how much biomass can be generated?
   - Which locations offer the best opportunities, i.e., are at risk of fire, are at the wildland-human interface, represent sufficient volumes, are close to end-use, etc.?
   - Is the potential well understood and reflected in regional inventories of biomass?
2. What are the main challenges?
   - Do we have enough capacity and resources (financial, human and operational) to mobilize this type of biomass?
   - Who owns the land or has tenure and are they interested in using this type of biomass?
   - Are there risks in harvesting/collecting this type of biomass?
   - Is the biomass located close or far to conversion facilities/end users?
   - Is this type of biomass difficult to process?
3. What does a successful project look like?
   - Can you share experiences or case studies where wildfire prevention and mitigation activities have been used effectively to generate biomass?
   - Are there innovative pre-processing techniques that can be applied at the harvest site to facilitate the recovery of biomass?
   - What end-uses are best suited for biomass from wildfire prevention and mitigation activities?
   - What lessons have been learned from demonstration or commercial-scale projects?

**Session 2: Post-Fire Salvage Logging**

**1. What is the potential and opportunity?**
   - What is the typical scale of salvage logging activities and how much biomass can be generated?
   - Which locations offer the best opportunities? i.e., stems are still of sufficient quality, represent sufficient volumes, are close to end-use, etc?
   - Is the potential well understood and reflected in regional inventories of biomass?

**2. What are the main challenges?**
   - Do we have enough capacity, and resources (financial, human and operational) to mobilize this type of biomass?
   - Who owns the land or has tenure and are they interested in using this type of biomass?
   - Are there risks in harvesting/collecting this type of biomass?
   - Is the biomass located close or far to conversion facilities/end users?
   - Is this type of biomass difficult to process?

**3. What does a successful project look like?**
   - Can you share experiences or case studies where salvage logging has been used effectively to generate biomass?

- Are there innovative pre-processing techniques that can be applied at the harvest site to facilitate the recovery of biomass?
- What end-uses are best suited for biomass from salvage logging?
- What lessons have been learned from demonstration or commercial-scale projects?

**Session 3: Policy Recommendations**

**1. What are the main policy or regulatory barriers?**

- What policy and regulatory challenges are commonly encountered?
- What policy and regulatory barriers currently impede access to biomass?
- How do policy and regulatory barriers impact the willingness of stakeholders to engage in biomass recovery efforts?
- Do public authorities understand wildfire risk well enough to be able to plan and implement activities that effectively reduce risk and supply biomass?

**2. What role should different government levels play to support or facilitate projects?**

- Is there value in supporting feasibility studies that assess various biomass use cases in different regions of Canada?
- How can stakeholders across sectors collaborate to ensure the long-term success of biomass supply efforts?
- What recommendations can be made to policymakers to foster a sustainable and effective approach to biomass recovery from wildfire-affected areas?
- How can successful local initiatives be scaled up or replicated in other communities or regions?
- Are there funding sources or financial mechanisms available for implementing biomass supply projects?

## Participant List

| First Name | Last Name | Organization |
|---|---|---|
| Christophe | Aura | ArcelorMittal Exploitation Minière Canada |
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| Julie | Barrette | Ministry of Natural Resources and Forestry (MNRF) |
| Serge | Bédard | Natural Resources Canada (NRCan) |
| André | Bédard | Quebec Wood Export Bureau |
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**Further Information**

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