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November 22, 2021

Email: Richard.mostyn@yukon.ca

Hon. Richard Mostyn  
Minister of Community Services and Minister responsible for  
the Yukon Workers' Compensation Health and Safety Board  
Yukon Legislative Assembly  
Whitehorse, Yukon  
Y1A 2C6

Dear Minister Mostyn,

**Re Amending Bill 8 (Workers' Safety and Compensation Act) to extend occupational cancer presumptions to wildland forest firefighters**

We understand you are currently debating significant changes to your workers' compensation legislation in the Yukon Legislative Assembly. This is an excellent opportunity to create legislation that is evidence-based and fair for workers in your territory. As such, we are writing to urge you to amend Bill 8 (Workers' Safety and Compensation Act) to include wildland forest firefighters under the cancer presumption for firefighters.

The British Columbia General Employees' Union (BCGEU) is one of the largest and most diverse unions in British Columbia. We represent over 82,000 members in 550 bargaining units in the private sector and public services. The union represents workers across many industries, including the provincial government, healthcare, community social services, education, highways maintenance, casinos, credit unions, municipalities, and regional districts.

Our membership includes more than 1,500 wildfire fighters in the B.C. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Our members regularly travel to the Yukon to support forest firefighting efforts, and your firefighters have done the same for British Columbia over the years. We also know that a number of former BCGEU members now work as wildfire fighters in the Yukon. As a leading trade union, and because of the many connections within the wildfire community, our union wants wildfire fighters everywhere to be valued for the critically important work they do, and to be treated fairly.

After many years of advocacy, presumptions for occupational cancers, heart disease and psychological injuries were finally extended to wildfire fighters in British Columbia in the spring of 2019. Achieving these changes was the result of extensive research and lobbying efforts by the BCGEU. Our union reviewed existing research about the health impacts of being a wildfire fighter, and provided convincing evidence to support cancer presumption for wildfire fighters to our Minister of Labour. We want to share this information with

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**BCGEU Headquarters**

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We are located on the unceded and shared traditional territory of the x̱m̱əθḵ'əyəm (Musqueam), Skxwú7mesh (Squamish) & Sałı́łwətaʔ (Tsleil-Waututh) peoples.



you, and have attached a copy of a 2018 BCGEU memorandum on this issue. In this document, we made several arguments in support of extending the cancer presumption to BC wildfire fighters:

- As first responders, wildfire fighters regularly risk their own lives to protect the lives and property of their fellow British Columbians, our infrastructure, and our natural resources. As such, they deserve to be treated equally to other firefighters.
- Wildfire fighters are regularly exposed to known carcinogenic substances, often at levels above occupational exposure limits. These substances include benzene, formaldehyde, black carbon, crystalline silica, and polycyclic aromatic hydrocarbons (PAHs).
- Wildfire fighters do not wear respiratory protection. Compared to municipal firefighters, their exposures to smoke and other substances are both unprotected and occur for significantly longer periods of time, increasing the risk of negative health impacts.
- Researchers have shown that based on these exposures, an elevated risk for cancer is expected among wildfire firefighters, especially among long-serving workers.
- As the number of interface and large project fires increases, wildfire firefighters will face more exposure to more toxic smoke. This growing risk to their long-term health deserves to be acknowledged.
- Wildfire fighters are a very small group of workers, and many only spend a few seasons on the job. As such, extending coverage under Section 6.1 to wildfire fighters represents a negligible additional cost to government.
- B.C.'s wildfire fighters are widely respected by British Columbians, and changing the legislation offers a tremendous opportunity for your government to demonstrate its appreciation for the risks taken and sacrifices made by these workers.

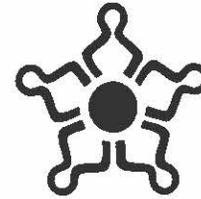
We believe that these arguments are equally relevant to wildfire fighters in the Yukon. In short, we urge you to accept the amendments proposed by Yukon's NDP on this issue, and extend the firefighters' cancer presumptions to include wildfire fighters. In British Columbia, this change was a simple and low-cost legislative change that enjoyed broad public support, and we believe that this will also be the case for the Yukon.

Sincerely,

Stephanie Smith  
President

Cc: Currie Dixon, Leader, Yukon Party, Leader of the Official Opposition, and MLA for Copperbelt North,  
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# BRIEFING NOTE



August 24, 2018

**TO:** Stephanie Smith, President

**FROM:** Megan Scott, Researcher, RIS

**cc:** Rob Davis, Vice President, Component 20  
Emet Davis, Director, RIS  
Simon Kelly, A/Coordinator, RIS

**SUBJECT:** Wildfire Brief: The case for extending occupational disease presumption for cancer to wildfire fighters

## I. Executive Summary

BCGEU members that work as wildfire fighters are dedicated first responders that protect the lives and property of British Columbians, our infrastructure and our natural resources. Yet B.C.'s wildfire fighters do not enjoy the same benefits afforded to other firefighters under the Workers' Compensation Act (WCA), as they are excluded from the firefighters' occupational disease "presumption" for more than a dozen types of cancer under Section 6.1 of the Act. Wildfire fighters were also excluded from this spring's changes to Section 5.1 of the Act that established a presumption for mental disorders for firefighters. We believe this situation is unfair, and that the Act's "presumption" for both cancer and mental disorders should be extended to wildfire fighters. In short, it is time that wildfire fighters are treated equally to other firefighters.

Focused on the issue of occupational disease presumption for cancer, this paper provides background information about the existing legislation, and about the nature of the work of wildfire fighters employed by the BC Wildfire Service. It describes the exposures to harmful substances – especially smoke - that these workers face on the job, and outlines research about the potential health impacts of those exposures. All of this serves to make the case for extending the firefighters' occupational disease presumption for cancer to include wildfire fighter. The arguments presented are summarized below:

***Like B.C.'s municipal, federal and volunteer firefighters, wildfire fighters are first responders.***

- B.C.'s wildfire fighters are firefighters and first responders that regularly risk their own lives to protect the lives and property of their fellow British Columbians, our infrastructure, and our natural resources.
- The risks taken and sacrifices made by B.C.'s wildfire fighters should be acknowledged by the province equally to other firefighters.
- Many NDP MLAs – including Premier John Horgan – also recognized the need to include wildfire fighters when the firefighters' occupational disease presumption legislation was first introduced in 2005, and spoke about the issue in the legislature.

***B.C.'s long-serving wildfire fighters – those most at risk for disease - are a very small group of workers who deserve to be recognized.***

- As a small group of seasonal workers dispersed in smaller communities across the province, it is easier for the potential long-term health impacts of being a wildfire fighter to be ignored.
- Each year, there are only about 1,000 frontline BCWS wildfire firefighters employed, and we estimate that in a given year, less than 100 of these workers have spent more than ten years on the job. In comparison, annually there are almost 12,000 municipal and volunteer structural firefighters working in B.C., more than ten times the number of BCWS firefighters.<sup>1</sup>
- Because most forest firefighters have short careers in the occupation (1-5 years), extending coverage under Section 6.1<sup>2</sup> to forest firefighters would capture a very small cohort of the longest-serving workers. In short, making the change would represent a negligible additional cost to government.

***In their work, wildfire fighters are exposed to carcinogenic substances, periodically at levels above occupational exposure limits.***

- To our knowledge, neither Worksafe BC nor the B.C. Wildfire Service (BCWS) has studied the type, duration or intensity of exposures to wildfire smoke or other toxic substances among B.C.'s wildfire fighters.
- However, studies of wildland firefighters from other jurisdictions have shown that during their work, wildland firefighters are exposed to carcinogenic and other toxic substances, periodically at levels above occupational exposure limits.
- These substances include formaldehyde, benzene, polycyclic aromatic hydrocarbons, crystalline silica, respirable particulate matter, and black carbon.
- Compared to municipal and volunteer firefighters, wildfire firefighters' exposure to smoke and other substances is both unprotected and occurs over significantly longer periods of time.

***The potential health impacts of these exposures include cancer.***

- Although research documenting the long-term health outcomes of wildfire firefighters is not currently available, researchers have shown that based on their exposures to harmful substances, an elevated risk for cancer is expected among wildland firefighters, especially among long-serving frontline workers.

***As population growth increases in BC, and the effects of climate change intensify, we can only expect wildfire firefighters to face increased health risks.***

- As the number of interface fires and large project fires increases, we can only expect wildfire fighters to have more unprotected exposures to more toxic smoke. As such, wildfire fighters face an ongoing and increasing risk to their long-term health, which deserves to be acknowledged.

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<sup>1</sup> According to Canadian Association of Fire Chiefs Data from 2012, there were 460 fire departments, 3,800 full time firefighters and 8,100 volunteer firefighters in BC. Reported in Ramsden, Smith, Turcotte, Kunz, Maxim, Thomas & Pike, "Determinants of Injury and Death in Canadian Firefighters," February 2018. Available at <https://cjr.ufv.ca/determinants-of-injury-and-death-in-canadian-firefighters-a-case-for-a-national-firefighter-wellness-surveillance-system/>

<sup>2</sup> The Workers' Compensation Act is available at: [http://www.bclaws.ca/EPLibraries/bclaws\\_new/document/ID/freeside/96492\\_00](http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/96492_00).

For all of these reasons, we urge the provincial government to take steps to extend the occupational disease presumption for cancer to wildfire fighters as soon as possible. In addition, more effort – including research and monitoring - is needed to better understand the long-term health impacts of being a forest firefighter, to ensure workers understand the hazards they face, and to find effective ways to protect these workers from adverse health outcomes.

## II. Introduction

BCGEU members that work as wildfire fighters are dedicated first responders that protect the lives and property of British Columbians, our infrastructure and our natural resources. Just like municipal and volunteer structural firefighters, their work is extremely dangerous and could have significant negative long-term impacts on their health. In particular, working on the frontlines of fires in the forest and in the wildland-urban interface, wildfire fighters face significant and unprotected exposures to smoke and other known carcinogens.

Yet, today B.C.'s wildfire fighters do not enjoy the same benefits afforded to other firefighters under the Workers' Compensation Act. Occupational disease "presumption" included in sections 5.1 and 6.1 of the Act relieves municipal, federal and volunteer firefighters of the burden of having to go through the process of proving that their illness was a result of their work. Subject to some conditions, if a structural firefighter becomes ill or dies as a result of heart disease, heart injury, mental disorder or more than a dozen different types of cancer, it is presumed that their illness was a result of their occupation, and they are entitled to compensation. As one representative of municipal firefighters commented last year, this legislation makes a big difference for these workers: "They're covered right away and can get treatment sooner. It's support for them after so many years of giving to the community."<sup>3</sup>

Wildfire fighters are eligible for the presumption for heart disease and heart injury, but they are excluded from the coverage for cancers and mental disorders. We believe this situation is unfair, and that the Act's "presumption" for both cancer and mental disorders should be extended to wildfire fighters. In short, it is time that wildfire fighters are treated equally to other firefighters.

The following paper is focused on the issue of occupational disease presumption for cancer, and makes the case for extending the cancer presumption to wildfire fighters. It begins with background information about the existing legislation, and about the nature of the work of wildfire fighters employed by the BC Wildfire Service. It then describes the exposures to harmful substances – especially smoke - that these workers face on the job. Finally, current research about the potential health impacts of those exposures is outlined.

## III. Background: WCA Section 6.1- Firefighters personal injury and disease presumption

The firefighters' occupational disease presumption legislation (Bill 11) was introduced in 2005 by the former BC Liberal government. Initially, brain cancer, bladder cancer, colorectal cancer, kidney cancer, ureter cancer, non-Hodgkin's lymphoma and leukemia were recognized as presumed work-related diseases for structural firefighters. Wildfire fighters were specifically excluded from this coverage, as the presumption only applies to a worker that "has been regularly exposed to the hazards of a fire scene, other than a forest fire scene."<sup>4</sup>

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<sup>3</sup> Mike Rispin, then president of the Nanaimo Professional Firefighters Local 905, quoted in Katie DeRosa, "Changes to Workers Compensation Act help firefighters," *Times Colonist*, March 6<sup>th</sup>, 2017.

<sup>4</sup> Workers' Compensation Act, Section 6.1 (3).

At the time, opposition NDP MLAs supported the legislation. However, during debate on the bill, several NDP MLAs spoke in the legislature about the need to extend the coverage to wildfire fighters. For example, at the time, NDP MLA John Horgan said:

*Also, those who risked their lives and their limbs in the Okanagan fighting forest fires are not included in this legislation. I know from comments of other members that it was argued that one firefighter in one season on the line fighting forest fires may well be exposed to more toxins in a summer than some firefighters are exposed to in a career. So this is another area where I think that over time, certainly, the government will want to consider expanding the scope of this legislation to include those that volunteer to go into harm's way on our behalf for the benefit of all British Columbians.<sup>5</sup>*

Since the initial legislation came into force, additions were made to expand the scope of occupational disease presumption for firefighters. Testicular cancer and lung cancer were added to the list of cancers presumed to be occupational diseases for structural firefighters in 2008, followed by esophageal cancer in 2011. In 2014, heart disease and heart injury were restored as occupational diseases for firefighters. In this case, the new language also covered wildfire fighters. In March 2017, breast cancer, prostate cancer and multiple myeloma were added to the list of firefighters' occupational cancers.

Most recently, Section 5.1 (Mental disorder) of the Workers' Compensation Act was amended this April so that if firefighters who are exposed to a traumatic event at work develop a mental disorder, it is presumed to be a result of their occupation. At the same time, the language of Section 6.1 (Firefighters' occupational disease or injury presumption) was changed to include federally employed structural firefighters under the presumptive coverage for cancer. Wildfire fighters were not included in the new mental disorder presumption for firefighters, and also remain excluded from the presumption for cancer.

In 2005, the government said that it chose to exclude wildfire fighters based on the belief that wildfire fighters do not face the same health risks as structural firefighters, and that similar legislation from other provinces had excluded wildfire fighters. In the legislature, government MLA Kevin Krueger explained:

*The non-inclusion of forest firefighters in the presumption is consistent with what other provinces have done thus far. Forest firefighters generally don't have the same exposures as firefighters who deal with structural fires, car fires, chemical spills and all of those things. But as some of the members opposite mentioned, there are fire retardants. There are various chemicals. They may well be dealing with a burning building as a result of a forest fire. Those things are all possible. Forest firefighters, again, are not barred from presenting claims to the Workers Compensation Board. They don't come under the scope of the presumption as this legislation's drafted.<sup>6</sup>*

This spring, the current government did not provide an explanation for the exclusion of wildfire fighters from the mental disorder presumption, but justified the continued exclusion of wildfire fighters from the

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<sup>5</sup> British Columbia. Legislative Assembly. Debates, 38<sup>th</sup> Parliament, 1<sup>st</sup> Session, 2005, vol.4, no.2, November 1<sup>st</sup>, 2005. Available at: <https://www.leg.bc.ca/documents-data/debate-transcripts/38th-parliament/1st-session/20051101pm-Hansard-v4n2#1470>.

<sup>6</sup> British Columbia. Legislative Assembly. Debates, 38<sup>th</sup> Parliament, 1<sup>st</sup> Session, 2005, vol.4, no.2, November 1<sup>st</sup>, 2005. Available at: <https://www.leg.bc.ca/documents-data/debate-transcripts/38th-parliament/1st-session/20051101pm-Hansard-v4n2#1470>.

cancer presumption on the same grounds that the BC Liberals did in 2005. A backgrounder attached to a government news release about the legislation read:

*Municipal fire departments combat structural fires that potentially expose them to more carcinogens than other firefighters, such as those dealing with forest fires. This change recognizes that firefighters from military bases may also be exposed to dangerous substances during structural fires, and frequently assist municipalities at off-base incidents.<sup>7</sup>*

Notably, a research paper commissioned by the Workers' Compensation Board about firefighters and cancer preceded the 2005 legislation.<sup>8</sup> Focused on municipal firefighters, that research did not draw conclusions about wildfire fighters and cancer specifically. Since that time, Worksafe BC has not conducted any further studies or research relating to wildfire fighters and work-related cancer.

#### **IV. Background: BC Wildfire Service wildfire fighters and their work**

##### **Who are our wildfire fighters?**

The BCGEU represents about 1,400 seasonal auxiliary staff and 200 regular full-time staff in the BC Wildfire Service (BCWS). Among these members, our most recent provincial seniority list (November 2017) included just over 1,000 frontline wildfire fighters (fire crew members and fire crew leaders).<sup>9</sup> They form the BCWS's highly trained and professional Type 1 wildland firefighting crews, equivalent to U.S. interagency "hotshot" crews.

BCWS crews are mostly male. Women make up 16 per cent of BCWS fire crews overall, and 9 per cent of fire crew leaders. There are also many Indigenous firefighters in our membership. In particular, Indigenous workers make up a significant proportion of our most senior auxiliary firefighters (those with more than ten years of experience).

A commonly held perception is that forest firefighting is a short-term job that young people do for a few summers while attending university. Certainly, it is true that a significant proportion of this workforce only stays in the job for a few seasons. According to our most recent member data, more than 85 per cent of frontline firefighters started in their current position within the last five years, reflecting ongoing turnover.<sup>10</sup> In terms of age, BCGEU auxiliary firefighters are relatively young compared to the rest of the public service. Our frontline firefighters range in age from 19 to 63, with 36 per cent (368/1,034) being under the age of 25, 33 per cent aged 25-29 (340/1,034), and 31 per cent (326/1,034) 30 years old or more.

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<sup>7</sup> Government of British Columbia, "News Release: Province to eliminate barriers for first responders to access compensation for mental trauma," April 12, 2018, [https://archive.news.gov.bc.ca/releases/news\\_releases\\_2017-2021/2018LBR0008-000611.htm](https://archive.news.gov.bc.ca/releases/news_releases_2017-2021/2018LBR0008-000611.htm).

<sup>8</sup> Chaudhry, R., Marrett, L., Kreiger, N., and Sullivan, T., "The Occupation of Firefighting and Cancer Risk: Assessment of the Literature – Report to the Workers' Compensation Board of British Columbia," June 15, 2004, *Division of Preventive Oncology, Cancer Care Ontario*.

<sup>9</sup> In November 2017, the Public Service Agency provided the BCGEU with a provincewide auxiliary seniority list for the BC Wildfire Service. Also, the BCGEU receives quarterly seniority lists for regular BCGEU members from the Public Service Agency. These lists include information about our members' work location, classification and position title.

<sup>10</sup> While this certainly reflects significant ongoing turnover among seasonal firefighters, it must be emphasized that the nature of this data (an auxiliary seniority list) significantly underestimates the length of service for these workers. This is because it is based on the time spent in their current position only. So, an individual that became fire crew leader in the past five years is likely to have already had years of experience as a fire crew member. As such, it should be assumed that a higher proportion of seasonal firefighters have been in the job for more than five years.

Despite many forest firefighters leaving the job after a relatively short time, some have chosen it as their long-term career. We have BCGEU members that have been frontline wildfire fighters since 1992 – that is more than two and a half decades on the fireline. Based on seniority list data, 41 (4%) of our auxiliary members have more than ten years in their current position, and another 84 people (8%) have logged between five and ten years on the job.

Beyond those that are currently working on a frontline fire crew, BCGEU members also occupy specialty and leadership roles in the BC Wildfire Service (e.g. air attack officers, forest protection assistants, and forest protection officers). In most cases, these members started their careers as frontline fire crew members, and spent many years working directly on the fireline before moving into their present position.

### **What do wildfire fighters do?**

Like municipal firefighters, wildfire fighters are first responders that regularly risk their own lives to protect the lives and property of their fellow British Columbians, our infrastructure, and our natural resources.

Frontline wildfire fighters employed by the BC Wildfire Service are hired into seasonal, auxiliary positions. Depending on their location, position and the demands of the fire season, they are employed for about 4 to 8 months each year, roughly between March and October. As auxiliary workers, they do not have the same access to employment benefits like paid sick days, vacation time, or maternity and parental leave benefits. Further, unlike regular BC Public Service employees, most of these workers do not have long-term disability coverage.

BCWS wildfire firefighters engage in direct fire suppression activities in many different contexts. They action fires in every corner of the province, across a tremendous range of terrain, weather, fuel and soil conditions. Certainly, many wildfires occur in remote areas, and primarily involve the combustion of trees and brush.

However, a significant and increasing proportion of the work of forest firefighters in BC occurs in the wildland-urban interface (WUI). On average over the past decade, close to half of all wildfires in BC have been person-caused.<sup>11</sup> As such, BCWS firefighters regularly attend structure fires, vehicle fires, railway fires, and dump fires. Just as federal firefighters do, they often work side-by-side with municipal and volunteer fire departments. They also action fires where all manner of debris and garbage are burning. Certainly, BCWS crews were on the frontlines as over 300 buildings were destroyed in the Cariboo last summer, as they were when more than 200 hundred homes were lost in Kelowna in 2003. BCWS forest firefighters do not use respiratory protection, nor do they follow decontamination procedures as municipal firefighters do.

The actual number of days on the fireline varies among wildfire crews and between seasons. In general, unit crew members spend the most time directly on the fireline. On large project fires, unit crews work 12-14 hour shifts for up to 14 days at a time. Most seasons, these crews will spend at least 40 days on the fireline.

In comparison, municipal and volunteer structural firefighters spend much less time exposed to the hazards of a fire scene. The number of structure fires is declining, and in general, these fires are

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<sup>11</sup> BC Wildfire Service, Wildfire Season Averages 2007-2017, available at: <https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-statistics/wildfire-averages>.

extinguished within a few hours. Provincially, about 12,000 B.C. municipal and volunteer firefighters responded to 6,676 fires in 2013, with the 5-year average (2009-2013) being 7,220 fires per year.<sup>12</sup> A 2007 national study of municipal fire departments in the U.S. estimated that structural firefighters spent between 20 and 100 hours on a fire scene responding to an average of 1.7 to 7.0 fire incidents per year.<sup>13</sup> In contrast, data showed that Quebec wildfire fighters spent an average of 755 hours each on fires in 2005.<sup>14</sup>

Beyond their fire suppression duties, BCWS crews assist with other emergencies, including flood response, search and rescue operations, providing first aid and transportation from remote areas, and BCWS crews even assisted with the response to the devastating avian flu outbreak in the Fraser Valley in 2004.

## V. Wildfire fighters' occupational exposures

### What substances are B.C. forest firefighters exposed to in their work? At what levels and for how long?

Wildfire fighters are exposed to a wide range of substances in the course of their work that may be toxic, including smoke, ash, dust, diesel and aviation fuel exhaust, diesel fuel, engine oil, gasoline, solar radiation, fire retardant, and fire foam. Besides attending fires where strictly natural materials are burning, wildfire fighters regularly attend fires in the wildland-urban interface, where structures, vehicles, rail ties and/or all manner of garbage are burning.

To our knowledge, neither WorkSafe BC nor the BC Wildfire Service have formally studied the type or extent of exposures to smoke or other toxic substance experienced by BCWS firefighters.

However, research from other jurisdictions has characterized the substances to which wildfire fighters are exposed, and assessed the intensity and duration of those exposures. The following provides a brief summary of the available information about substances that wildfire fighters are exposed to in their work.

#### ***Wildland (biomass) Smoke***

Smoke from a wildfire is a complex mixture of gases and particulate matter. The belief that wood smoke is relatively harmless is common, but false. As one group of authors wrote over a decade ago, "it is now well established, that...wildland and agricultural fires emit significant quantities of known health-damaging pollutants, including several carcinogenic compounds."<sup>15</sup> Below is a table outlining some of the main health-damaging components of biomass smoke taken from a recent paper about the public health risks associated with exposure to wildfire smoke.<sup>16</sup>

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<sup>12</sup> BC Office of the Fire Commissioner Annual Statistical Report, 2013, p.1. Available at [https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/fire-safety/fire-reporting/annual\\_report\\_2013.pdf](https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/fire-safety/fire-reporting/annual_report_2013.pdf).

<sup>13</sup> Kales, S., Soteriades, E., Christophi, C., Christiani, D., "Emergency duties and deaths from heart disease among firefighters in the United States," *New England Journal of Medicine*, 356 (2007): 1207-1215.

<sup>14</sup> Austin, C., Wildland firefighter health risks and respiratory protection, *IRSSST Studies and Research Projects*, Report R-572, 2008. Available at: <http://www.irsst.qc.ca/media/documents/PubIRSSST/R-572.pdf>.

<sup>15</sup> Naeher, L., Brauer, M., Lipsett, M., Zelikoff, J., Simson, C., Doenig, J., and Kirk R. Smith, "Woodsmoke Health Effects: A Review," *Inhalation Toxicology*, 19 (2007): 67-106, p.67.

<sup>16</sup> Table from Reisen, F., Duran, S., Flannigan, M., Elliott, C. and Rideout, K. "Wildfire smoke and public health risk," *International Journal of Wildland Fire*, 24 (2015): 1029- 1044, p. 1034.

Table 2. Major health-damaging pollutants from biomass combustion; recommended concentrations by the WHO and the Ambient Air Quality Criteria (AAQC) are indicated for each component

Source: Naeher *et al.* 2007; WHO 2006; Ontario Ministry of the Environment 2012

Compound	Examples	Concentration allowed by WHO and AAQCs	Mode of toxicity
Particulate matter (PM)	Fine particles (PM <sub>2.5</sub> )	25 µg m <sup>-3</sup> (24-h)	Can cause or aggravate cardiovascular and lung diseases, heart attacks and arrhythmias, affect the central nervous system and the reproductive system and cause cancer. The outcome can be premature death.
Inorganic gases	Carbon monoxide (CO)	30 mg m <sup>-3</sup> (1-h)	Can lead to heart disease and damage to the nervous system and cause headaches, dizziness and fatigue.
	Ozone (O <sub>3</sub> )	120 µg m <sup>-3</sup> (8-h)	Can decrease lung function, aggravate asthma and other lung diseases. Can lead to premature mortality.
	Sulfur dioxide (SO <sub>2</sub> )	20 µg m <sup>-3</sup> (24-h)	Aggravates asthma and can reduce lung function and inflame the respiratory tract. Can cause headache, general discomfort and anxiety.
	Nitrogen dioxide (NO <sub>2</sub> )	200 µg m <sup>-3</sup> (1-h)	Can affect the liver, lung, spleen and blood. Can aggravate lung diseases, leading to respiratory symptoms and increased susceptibility to respiratory infection.
Hydrocarbons	Unsaturated, e.g. 1,3-butadiene	10 µg m <sup>-3</sup> (24-h)	Irritant, carcinogenic, mutagenic
	Saturated, e.g. <i>n</i> -hexane	2500 µg m <sup>-3</sup> (24-h)	Irritant, neurotoxic
	Polycyclic aromatic hydrocarbons (PAH)	5 × 10 <sup>-5</sup> µg m <sup>-3</sup> (24-h)	Carcinogenic. Other effects may be irritation of the eyes, nose, throat and bronchial tubes.
	Benzene	2.3 µg m <sup>-3</sup> (24-h)	A human carcinogen, which can cause leukaemia and birth defects. Can affect the central nervous system and normal blood production, and can harm the immune system.
	Styrene	400 µg m <sup>-3</sup> (24-h)	Carcinogenic, mutagenic
Oxygenated organics	Aldehydes, e.g. Acrolein	0.4 µg m <sup>-3</sup> (24-h)	Irritant, carcinogenic, mutagenic
	Formaldehyde	65 µg m <sup>-3</sup> (24-h)	
	Organic alcohols and acids, e.g. Methanol	4000 µg m <sup>-3</sup> (24-h)	Irritant, teratogenic
	Acetic acid	2500 µg m <sup>-3</sup> (24-h)	
	Phenols, e.g. cresol	75 µg m <sup>-3</sup> (24-h)	Irritant, carcinogenic, mutagenic, teratogenic
	Quinones	15 µg m <sup>-3</sup> (24-h)	Irritant, allergenic, causes oxidative stress and inflammation, redox-active, possibly carcinogenic
Chlorinated organics	Methylene chloride	220 µg m <sup>-3</sup> (24-h)	Central nervous system depressant (methylene chloride), possible carcinogens
	Methyl chloride	320 µg m <sup>-3</sup> (24-h)	
Mercury		1 µg m <sup>-3</sup> (annual)	Toxic effects on the nervous, digestive and immune systems, and on lungs, kidneys, skin and eyes
Free radicals	Semiquinone-type radicals		Redox-active, causes oxidative stress and inflammatory response, possibly carcinogenic

When forest fuels burn, the harmful substances produced in the largest amounts are carbon monoxide, aldehydes (formaldehyde and acrolein), benzene, and respirable particulates less than 3.5 microns. Biomass smoke is dominated by smaller particles, and as such is comparable to particles in traffic exhaust or smoke from other sources. It also contains black carbon, which is associated with negative effects on cardiovascular and respiratory health.<sup>17</sup> Through smoke and dust, wildfire fighters can also be exposed to sulphur dioxide, herbicides, pesticides, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and crystalline silica.

The type, intensity and duration of exposure depends on a wide variety of factors, including firefighter task (chainsaw operation versus digging handguard versus mop-up, etc.), ventilation conditions, soil composition, the composition of the burning material, and fire behaviour. Overall, studies of firefighters' exposure to biomass smoke have found that the intensity and duration of exposure is highly variable, but that firefighters are periodically exposed to carbon monoxide, respirable particulates, benzene, and formaldehyde at levels that exceed various occupational exposure limits. Further, a number of researchers in this area note that occupational exposure limits are developed for sedentary workers. Given that

<sup>17</sup> Amanda Curry Brown, "Health Effects of Particulates and Black Carbon," Presentation to US EPA Transport and Clean Air Seminar, December 2013. Available at: <https://www.epa.gov/sites/production/files/2014-05/documents/health-effects.pdf>.

wildfire fighters work without respiratory protection at a more intense level and have higher breathing rates, they are at an increased risk of inhaling more air pollutants.<sup>18</sup>

In the early 1990s, the US Forest Service conducted 5 years of breathing zone exposure monitoring of wildland firefighters, measuring exposure to carbon monoxide, carbon dioxide, acrolein, benzene, formaldehyde and respirable particulate matter (PM<sub>3.5</sub>). On a shift-average basis, most exposures to these substances did not exceed the recommended exposure limits from the American Conference of Governmental Industrial Hygienists (ACGIH). However, three to five per cent of exposures (depending on the pollutant) on wildfires, and 14 per cent at prescribed burns did go over the exposure limits. Overall, the exposures varied significantly, depending on task, terrain, fire behaviour, and wind direction. The authors observed that firefighters often faced one or more instances of brief but very intense exposures above short-term exposure limits, but that the time crews spent mobilizing and demobilizing lowered their shift-average exposure to pollutants in smoke.<sup>19</sup>

In a subsequent project by the U.S. Department of Agriculture, exposures of wildland firefighters to smoke and dust were again measured between 2009 and 2011. Overall, the findings were similar to the previous study, although in some cases unsafe exposures were even more severe than observed in the initial project. The summary data showed that 8-hour time weighted average exposures to carbon monoxide were over the US Occupational Safety and Health Administration's (OSHA) occupational exposure limit of 50ppm<sup>20</sup> between 1.5 and 7.2 per cent of the time, depending on the activity (prescribed fire, wildfire, prescribed natural fire, or initial attack). Exposure to particulate matter less than 4 microns (PM<sub>4</sub>) was observed at levels above the U.S. Smoke Exposure Task Group's (SETG) interim occupational exposure limit of 0.7mg/m<sup>3</sup> (14 hr shift TWA) in between 6.3 and 33.0 per cent of observed exposures, depending on the activity.<sup>21</sup>

Exposure studies of wildland firefighters from other jurisdictions have yielded similar results as the U.S. studies outlined above. To our knowledge, no similar large multi-year smoke exposure study of wildland firefighters has been conducted in Canada.

### ***Crystalline Silica***

Although not a result of the burning of biomass, crystalline silica poses a health concern to wildfire fighters since exposure is linked to the development of silicosis, COPD and lung cancer. Crystalline silica is a basic component of soil, and quartz is the most common form. Exposure occurs when it is present in the soil and firefighter activity makes it airborne when traveling on dusty roads, hiking on trails or through burned areas, digging fire guard, and especially during mop-up. In the U.S. Department of Agriculture study described above, the OSHA permissible exposure limit of 0.1 mg/m<sup>3</sup> for crystalline silica was exceeded in between 0 and 43 per cent of observed exposures, depending on the worker's activity.<sup>22</sup> Similarly, industrial hygiene measurements of wildland firefighters in northern California measured exposures to silica near or higher than occupational exposure limits.<sup>23</sup>

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<sup>18</sup> See, in particular, Reisen, F., Hansen, D. and Meyer, C., "Exposure to bushfire smoke during prescribed burns and wildfires: Firefighters' exposure risks and options," *Environment International*, 31 (2011): 314-321, p. 321.

<sup>19</sup> Reinhardt, T. & Ottmar, R., "Baseline Measurements of Smoke Exposure Among Wildland Firefighters," *Journal of Occupational and Environmental Hygiene*, 1 (September 2004): 593-606.

<sup>20</sup> In this case, it is worth noting that WorkSafe BC's 8-hour time weighted average limit for carbon monoxide exposure is 25ppm, significantly lower than the OSHA limit. WorkSafe BC, Table of Exposure Limits.

<sup>21</sup> George Broyles, *Wildland Firefighter Smoke Exposure*, United States Department of Agriculture, October 2013.

<sup>22</sup> *Ibid.*

<sup>23</sup> Materna, B., Jones, J., Sutton, P., Rothman, N. and Harrison, R., "Occupational Exposures in California Wildland Firefighting," *American Industrial Hygiene Association Journal*, 53, no.1 (1992): 69-76.

### **Formaldehyde**

Formaldehyde is a known carcinogen, which causes leukemia and nasopharyngeal cancer. A three-year study of Australian wildfire fighters found highly variable exposures to formaldehyde, including instances where occupational exposure limits were exceeded. Fifteen per cent of the samples in the study were above the occupational exposure limit of 0.3 ppm for formaldehyde. The authors concluded that depending on the nature of a firefighters' career, the observed exposures to respirable particulates and formaldehyde could pose a chronic health risk.<sup>24</sup> Adetona et al.'s recent review of the health effects of wildfire smoke noted that in studies of wildfire fighters from the U.S. and Australia, most average occupational time weighted average (TWA) exposures were below the OSHA permissible exposure limit (0.75ppm), but many exceeded the U.S. National Institute for occupational Safety and Health (NIOSH) occupational exposure limit (OEL) of 0.016ppm. In fact, the highest reported average TWA was 3700 per cent above this level.<sup>25</sup> WorkSafeBC's 8-hour TWA exposure limit for formaldehyde is 0.3ppm.<sup>26</sup>

### **Acrolein**

Acrolein is an aldehyde found in both biomass smoke and diesel exhaust that causes eye and respiratory irritation at low levels, and can cause lung injury at high levels. For acrolein, wildfire fighter exposures in the literature have generally been found to be below occupational exposure limits (OELs).<sup>27</sup> However, one study measured a 0.15 ppm time-weighted average exposure for an Australian firefighter, much higher than the California OSHA OEL of 0.1 ppm.<sup>28</sup>

### **Benzene**

Benzene is a carcinogen that causes myeloid leukemia, and is also associated with multiple myeloma and non-Hodgkin lymphoma. In the U.S. Forest Service smoke exposure study from the 1990s, benzene exposures for wildland firefighters did not exceed occupational exposure limits. Notably, the highest exposures to benzene were observed when workers were operating chainsaws, engines and drip torches.<sup>29</sup> A more recent review found five studies that assessed firefighter exposure to benzene from wildfire smoke. Among these studies, average exposures were below levels at which adverse effects are expected. However, one study included in the review measured a maximum exposure nearly four times the NIOSH recommended exposure limit, which is based on benzene's carcinogenic effects.<sup>30</sup> It is also notable that benzene is considered a "non-threshold toxicant," where adverse effects may occur at any exposure level.<sup>31</sup>

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<sup>24</sup> Reisen et al., "Exposure to bushfire smoke during prescribed burns and wildfires," 320.

<sup>25</sup> Adetona, O., Reinhardt, T., Domitrovich, J., Broyles, G., Adetona, A., Kleinman, M., Ottmar, R., and Naeher, L., "Review of the health effects of wildland fire smoke on wildland firefighters and the public," *Inhalation Toxicology*, 28(3): 95-139, 2016.

<sup>26</sup> Worksafe BC, Table of Exposure Limits.

<sup>27</sup> Adetona et al., "Review of the health effects of wildland fire smoke," 100-101.

<sup>28</sup> DeVos, A., Reisen, F., Cook, A., et al., "Respiratory irritants in Australian bushfire smoke: air toxics sampling in a smoke chamber during prescribed burns," *Archives of Environmental Contamination and Toxicology*, 56 no.3 (2009): 380-388.

<sup>29</sup> Reinhardt & Ottmar, "Baseline Measurements of Smoke Exposure Among Wildland Firefighters," 604.

<sup>30</sup> Adetona et al., "Review of the health effects of wildland fire smoke," 101.

<sup>31</sup> CAREX Canada, *Firefighters Occupational Exposure Summary Package*, January 2016. Available at: [https://www.carexcanada.ca/CAREX\\_Firefighters\\_Package\\_Jan-26-2016.pdf](https://www.carexcanada.ca/CAREX_Firefighters_Package_Jan-26-2016.pdf).

### ***Polycyclic Aromatic Hydrocarbons***

A handful of studies have examined the degree to which wildfire fighters are exposed to polycyclic aromatic hydrocarbons (PAHs). PAHs make up a small part of the gases and particulate matter (<5%) in woodsmoke, but they are important because they are known mutagens and carcinogens. Exposure to PAHs has also been associated cardiopulmonary mortality and immunotoxicity.<sup>32</sup> A US NIOSH Health Hazard Evaluation Report from 1994 measured low levels of a number of PAHs in the breathing zone of wildland firefighters,<sup>33</sup> and Robinson et al. also found low exposures during pile burns in Arizona in 2007.<sup>34</sup>

In 2016, Navarro et al. gathered personal air samples from California wildfire fighters working on wildland and prescribed fires, and off-duty at base camps, and assessed their exposure to PAHs. They detected measurable concentrations of 17 different PAHs, including many carcinogenic PAHs. Naphthalene, retene and phenanthrene were the most abundant substances measured. Exposure varied by job task, with holding and patrol at wildfires and firing/ holding at prescribed fires having the highest measured concentrations. The study explains that compared to structural firefighters conducting overhaul (similar to mop-up), the wildland firefighters were exposed to lower PAH concentrations, but for longer durations. Overall, the observed levels of exposure were well below occupational exposure limits. However, the authors noted that “firefighters are continually exposed to PAHs from smoke over the course of many wildfire and prescribed fire assignments throughout a firefighter’s career, which could contribute to higher cumulative PAH exposure that could lead to adverse health effects.”<sup>35</sup>

Recent research on structural firefighters has explored the significance of dermal exposure and absorption of PAHs. Studies have found PAHs on the skin of structural firefighters, even when they wore full turnout gear.<sup>36</sup> Dermal exposure to PAHs or other chemicals has not yet been studied in wildfire fighters. Given that wildfire fighters do not wear protective clothing similar to turnout gear and their working conditions mean that chemical substances cannot be washed off in a timely manner, dermal uptake of PAHs and/or other chemicals may be an important route of exposure that could pose a health risk to wildland firefighters.

### ***Structural/ “Other” Smoke***

As already noted, BCWS firefighters regularly attend fires in the wildland-urban interface where structures, vehicles, railway ties or garbage may be burning. In these situations, wildland firefighters can be exposed to smoke that contains additional harmful substances. They may also be involved in digging up or otherwise handling these materials.

The composition of fuel and the resulting smoke from structural fires is more complex and unpredictable than biomass smoke. Substances in structural smoke include carcinogens like asbestos, benzene, styrene, PAHs, and certain heavy metals, as well as ultrafine respirable particles (less than 0.1 micron). It is likely the exposures faced by wildland firefighters in these situations are analogous to those of structural

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<sup>32</sup> Navarro, K., Cisneros, R., Noth, E., Blames, J. and Hammond, S., “Occupational Exposure to Polycyclic Aromatic Hydrocarbon of Wildland Firefighters at Prescribed and Wildland Fires,” *Environmental Science and Technology*, 51 (2017): 6461-6469.

<sup>33</sup> NIOSH, *Health Hazard Evaluation Report HETA 90-0365-2415*, U.S. Department of the Interior, National Park Service, Yosemite National Park, California, 1994.

<sup>34</sup> Robinson, M., Anthony, T., Littau, S., Herckes, P., Nelson, X., Poplin, G. and Burgess, J., “Occupational Exposures during Prescribed Pile Burns,” *Annals of Occupational Hygiene*, 52 no.6 (2008): 497-508.

<sup>35</sup> Navarro et al., “Occupational Exposure to Polycyclic Aromatic Hydrocarbons of Wildland Firefighters,” 6467.

<sup>36</sup> See for example, Fent, K., Eisenberg, J., Snawder, J., Sammons, D., Pleil, J., Steigel, M., Mueller, C., Horn, G., and Dalton, J., “Systemic Exposure to PAHs and Benzene in Firefighters Suppressing Controlled Structure Fires,” *Annals of Occupational Hygiene*, 58 no. 7 (2014): 830-845.

firefighters conducting overhaul operations without their respiratory protection equipment on. However, to our knowledge, no research has been done that specifically characterizes wildfire fighter exposures during interface fires.

### ***Fire Retardant and Fire Foam***

Wildfire fighters are also exposed to fire retardant and fire foam in the course of their work. Long term fire retardants are applied from aerial or ground equipment and include inorganic salts (ammonium sulfates and diammonium phosphates), clays and gums, bactericides and dyes to color the liquid. Firefighters may walk through and/or work in an area where vegetation has been treated with retardant, they may be involved in mixing foams, gels and/or retardants, or they could be accidentally covered in retardant from an aerial drop. Generally, there is a delay of several hours before the chemicals can be washed off and workers' clothes changed.

In 2013, a health risk assessment of fire retardants was prepared for the U.S. Forest Service, which concluded that for typical exposures, these products pose a negligible health risk to wildland fire-fighting personnel. However, the authors noted some gaps in the data needed to fully assess the products' toxicity, including a lack of long-term toxicity tests for the products as a whole and the absence of dermal penetration rates for most of the chemicals.<sup>37</sup>

## **VI. Potential health impacts for wildfire fighters**

There are a number of studies documenting acute and chronic health impacts of exposure to woodsmoke and other toxic substances for wildland firefighters, which range from respiratory irritation and temporary dizziness to measurable cross-shift and cross-season declines in lung function.<sup>38</sup> However, currently the longer-term health outcomes of being a wildland firefighter are, according to one group of authors, "largely unknown."<sup>39</sup>

Still, epidemiological and other evidence clearly links chronic exposure to woodsmoke, crystalline silica, and diesel exhaust with adverse health outcomes, including cancer. In addition, two studies have used information about firefighters' exposures to harmful substances to estimate the potential disease risk for these workers, concluding that there is an elevated risk for both cancer and heart disease among long-term wildfire fighters.

### ***Cancer***

Today, cancer is the leading cause of death in Canada. Certainly, many different factors contribute to developing the disease, it has a long latency period, and pinpointing causality is challenging. Genetics, environment, medical history, lifestyle and chance all play a role. However, occupational exposures are significant, and in Canada, there is a substantial and unacceptable burden of occupational cancers. Cancer

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<sup>37</sup> Labat Environmental, Human Health Risk Assessment of Wildland Fire-fighting Chemicals: Long-term fire retardants, prepared for Fire and Aviation Management, US Forest Service, Boise, ID, 2013. Available at [https://www.fs.fed.us/rm/fire/wfcs/documents/HHRA-Ret\\_2014.pdf](https://www.fs.fed.us/rm/fire/wfcs/documents/HHRA-Ret_2014.pdf).

<sup>38</sup> Adetona et al., "Review of the health effects of wildland fire smoke," 122-124.

<sup>39</sup> Domitrovich, J., Broyles, G., Ottmar, R., Reinhardt, T., Naeher, L., Kleinman, M., Navarro, K., Mackay, C., and Adetona, O., *Final Report: Wildland Fire Smoke Health Effects on Wildland Firefighters and the Public*, US Joint Fire Science Program, June 2017, p.1.

is now the leading cause of compensated workplace deaths in Canada,<sup>40</sup> and occupational exposures may account for 20 to 30 per cent of all cancers among Canadian blue-collar workers.<sup>41</sup>

In the preceding section, wildland firefighters' exposures to substances that are known to be carcinogenic were outlined. Studies from other jurisdictions have shown that forest firefighters are regularly exposed to respirable particulates including crystalline silica, benzene, PAHs and formaldehyde through vegetative smoke, periodically at levels above occupational exposure limits. Compared to municipal firefighters, their exposures are somewhat different and generally less intense, but they are unprotected and occur over significantly longer durations. As already noted, the exposures of wildfire fighters to structural and other kinds of smoke and/or burning materials in the wildland-urban interface have not yet been specifically characterized. In a 2010 monograph reviewing all of the available evidence about the relationship between firefighting and cancer (including wildfire fighting), the International Agency for Research on Cancer (IARC) concluded that "overall, exposures of wildland firefighters to "low" levels of smoke appear to be comparable to those experienced by municipal firefighters during overhaul."<sup>42</sup>

The potential for these exposures to cause cancer in wildfire fighters was examined in a 2004 study. The U.S. researchers identified 15 substances of potential concern, including formaldehyde, benzene, several polycyclic aromatic hydrocarbons (PAHs), and respirable particulate matter (PM3.5). Using past exposure studies, they estimated cancer and non-cancer health risks among wildfire fighters. The study concluded that wildland firefighters face an elevated risk of developing cancer from exposure to carcinogens at wildfires and prescribed burns, primarily from exposure to benzene and formaldehyde.<sup>43</sup>

More recently, US Joint Fire Science Program researchers estimated wildland firefighters' lifetime disease risk for lung cancer from exposure to particulate matter. Their estimate combined measurements of wildfire fighters' exposures with information gleaned from U.S. epidemiological data about the relative risk of developing lung cancer and heart disease from exposure to fine particulate matter. In their results, the risk for lung cancer mortality increased nearly linearly with exposures over time. Overall, the authors calculated an increased relative risk for lung cancer ranging from +2 per cent to +39 per cent, depending on the nature and length of a wildland firefighter's career. Compared to fire managers or initial attack firefighters, long-serving (20 years) frontline fire crew members were estimated to have the highest risk for developing lung cancer.<sup>44</sup>

Lung inflammation is one mechanism for the development of lung cancer, and evidence of both acute and chronic lung inflammation has been documented in several studies of wildfire fighters. For example, cross-seasonal declines in FEV<sub>1</sub> (the forced expiratory volume in one second, a spirometry measure) and increased airway responsiveness were found in western U.S. wildfire fighters in a 1992 study.<sup>45</sup> In addition, researchers documented an inflammatory response in the lungs of a sample of British Columbia wildfire fighters after they were exposed to wildfire smoke.<sup>46</sup> In its comprehensive 2010 review, the International

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<sup>40</sup> Bianco, A., and Demers, P., "Trends in compensation for deaths from occupational cancer in Canada: a descriptive study," *CMAJ Open*, 1 no.3 (2013).

<sup>41</sup> Occupational Cancer Research Centre, 2018, <http://www.occupationalcancer.ca/aboutocrcc/>.

<sup>42</sup> IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, "Painting, firefighting and shiftwork," *IARC Monographs on the evaluation of carcinogenic risks to humans*, vol. 98 (2007), p.436.

<sup>43</sup> Booze, T., Reinhardt, T., Quiring, S. and Ottmar, R., "A Screening-Level Assessment of the Health Risks of Chronic Smoke Exposure for Wildland Firefighters," *Journal of Occupational and Environmental Hygiene*, vol. 1, no.5 (2004): 296-305.

<sup>44</sup> Domitrovich, J., Broyles, G., Ottmar, R., Reinhardt, T., Naeher, L., Kleinman, M., Navarro, K., Mackay, C., and Adetona, O., *Final Report: Wildland Fire Smoke Health Effects on Wildland Firefighters and the Public*, US Joint Fire Science Program, June 2017.

<sup>45</sup> Liu, D., Tager, I., Balmes, J., Harrison, R., "The effect of smoke inhalation on lung function and airway responsiveness in wildland fire fighters," *American Review of Respiratory Disease*, 146 (1992): 1469.

<sup>46</sup> Swiston, J., Davidson, W., Attridge, S., Brauer, M. and vanEeden, S., "Wood smoke exposure induces a pulmonary and systemic

Agency for Research on Cancer (IARC) wrote that “there is clear evidence of chronic and acute inflammatory respiratory effects in firefighters, which provides a potential mechanism for carcinogenesis.”<sup>47</sup>

## VII. Conclusion

This paper argues for extending the occupational disease presumption for cancer to wildfire fighters. First, wildfire fighters are a small group of seasonal workers, but they make a big contribution to protecting the lives and property of British Columbians, our infrastructure and our natural resources. Their work as first responders is very dangerous, and the risks taken and sacrifices made deserve to be recognized equally to other firefighters.

Not only are wildfire fighters exposed for long periods to biomass smoke without respiratory protection, they also regularly attend vehicle fires, dump fires, structure fires and fires where all manner of debris or garbage are burning. While existing research on the long-term health impacts of being a wildfire fighter is very limited, it is clear that B.C.’s wildfire fighters are regularly exposed to many known carcinogens, often at levels above occupational exposure limits. Given these exposures, there is little reason to expect that wildfire fighters will experience health impacts that are significantly different from structural firefighters.

Today, structural firefighters in B.C. are attending fewer fires, wearing respiratory protection equipment more consistently than ever, and following strict decontamination procedures. These trends stand in stark contrast to our wildfire fighters, who do not wear any respiratory protection or follow decontamination procedures, and who we expect to face more exposures to more toxic smoke as population growth and the effects of climate change intensify. Going forward, the ongoing and increasing risk to their long-term health deserves to be recognized.

Given the small number of firefighters that would be covered, extending the cancer presumption to wildfire fighters would put them on equal footing with their municipal counterparts, at a negligible additional cost to government.

For all of these reasons, we urge the provincial government to take steps to extend the occupational disease presumption for cancer to wildfire fighters as soon as possible. In addition, more effort – including research and monitoring - is needed to better understand the long-term health impacts of being a wildfire fighter, to ensure workers understand the hazards they face, and to find effective ways to protect them from adverse health outcomes.

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inflammatory response in firefighters,” *European Respiratory Journal*, vol. 32, no.1 (2008): 129-138.  
<sup>47</sup> IARC, “Painting, firefighting and shift work,” 557.