



Yukon Wildfire Smoke Response Guideline

Health and Social Services & the Office of the Chief
Medial Officer of Health

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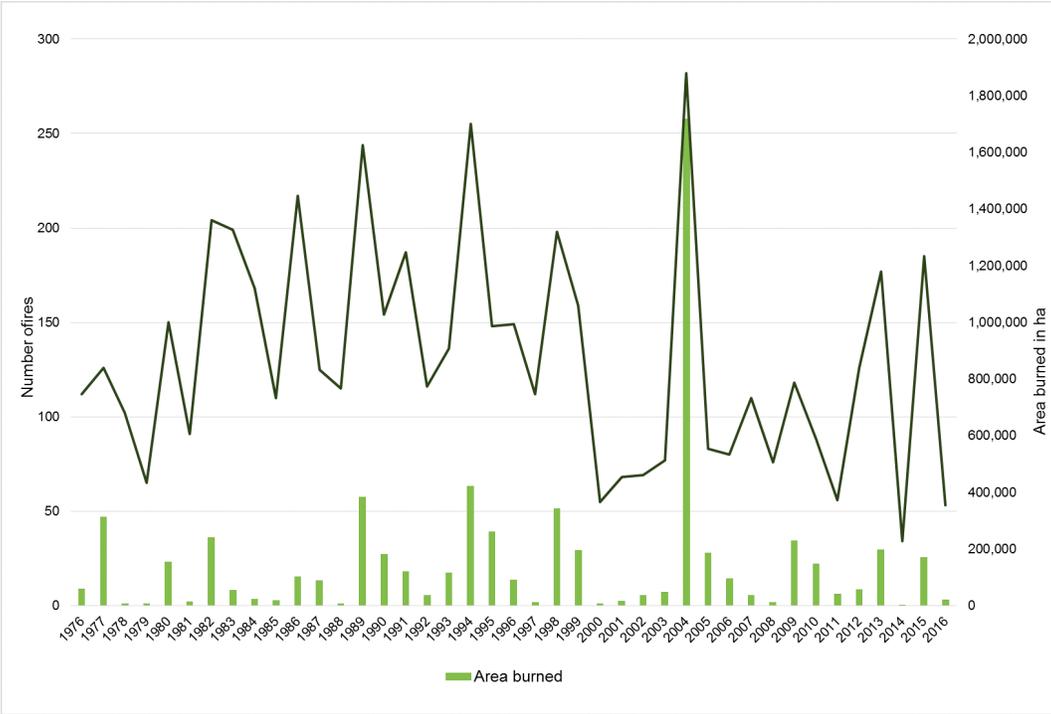
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Background

Fires in Canadian forests are naturally occurring events. In Yukon, wildfires are common and an average of 140 wildland fires each year burn a total of approximately 120,000 hectares of forest.ⁱ Climate change is resulting in reduced snowfall, lower water levels, increased summer temperatures and more lightning storms in the North which contribute to more favourable conditions for wildfires.ⁱⁱ Recent models predict that wildfire activity will increase by 25% by 2030 and 75% by the end of the 21st century.ⁱⁱⁱ Wildfires are expected to increase in size, severity and duration.^{iv} In 2019, Yukon saw one of the most ‘complex and challenging’ seasons in the past 15 years with the season starting off in mid May and lasting well into September.^v

Figure 1: Number of fires and area burnt in Yukon 1976 – 2016^{vi}



Smoke from wildfires can affect communities that are hundreds of kilometers from the source of the fire, thereby increasing the potential of wildfire smoke events in Yukon.^{vii}



Smoke from wildfires poses a health risk to the public.^{viii} While some communities in Yukon have existing emergency measures plans which may include forest fire response elements, there is no plan in place on how to mitigate and prevent exposure to wildfire smoke for the general public. It is prudent to both advise the public of the potential health risk as well as provide resources on how Yukoners can manage their individual health and reduce exposure. Wildfire smoke can have impacts on health care facilities by increasing patient loads, to mitigate this stress on the health system well-planned communications and prevention strategies may reduce this burden. The decision to order an evacuation or partial evacuation of a community due to heavy smoke is considered a last resort measure, as there are much less intrusive protective health measures that can be taken first. Evacuation can have a significant psycho-social impact to evacuees and may create additional stressors when individuals are away from support systems and resources.^{ix}

Comprehensive emergency management in Canada includes four inter-related components including prevention and mitigation, preparedness, response and recovery. The guidelines will primarily focus on preparedness and response with respect to wildfire smoke events.¹

Objective

This guideline provides guidance to assist decision makers in protecting public health and well-being before and during a wildfire smoke event. This includes planning for smoke events, communicating health risks, implementing strategies to protect people from wildfire smoke and evacuation considerations.

¹ This document is not intended to be a guideline for the management of wildfires themselves.

Scope

This document will provide an overview of the following topics:

- wildfire smoke and health effects;
- air quality monitoring;
- evidence-based recommendations to reduce smoke exposure; and,
- roles and responsibilities for preparedness, planning and response; and,
- recovery and evaluation.

Wildfire Smoke

Wildfire smoke caused by fires within the territory or in other jurisdictions, such as in BC or Alaska, may impact the air quality experienced locally.

Composition

The [composition of wildfire smoke](#) is dependent on multiple factors such as the type of vegetation or material burned, fire temperature, age of the smoke, and other weather-related factors.^x Wildfire smoke is comprised of small particles and gasses.^{xi} Gasses in wildfire smoke include carbon monoxide, nitrogen oxides, and volatile organic compounds.^{xii} Some of the compounds in wildfire smoke are known to be carcinogenic, such as polycyclic aromatic hydrocarbons (PAHs), benzene and free radicals. In addition, there are secondary pollutants that are produced by wildfire smoke.^{xiii} The concentration and composition of wildfire smoke is highly variable and can change from each fire and as the smoke plume ages.^{xiv} Of all the different pollutants in wildfire smoke, particulate matter (PM_{2.5}) poses the greatest risk to human health.^{xv} PM_{2.5} refers to all particles that measure 2.5 millionths of a meter (µm or microns) or less in diameter. These particles are so small that they can be inhaled deep into the lungs where they can cause inflammation and irritation.^{xvi}

Health Effects of Smoke

Evidence for the health effects of wildfire smoke is limited and still not completely understood.^{xvii} In particular, effects of long term exposure to smoke is still an emerging field. In comparison, urban and industrial air pollution has been studied thoroughly and there is more evidence on the negative health impacts of breathing urban air. Wildfire smoke typically has finer particulate matter than urban air pollution, and also contains a different mixture of gasses.^{xviii}

There are associations between wildfire smoke and health that have been demonstrated, such as asthma and Chronic Obstructive Pulmonary Disease (COPD) exacerbations, bronchitis, pneumonia, all-cause mortality, cardiovascular effects, adverse birth outcomes, childhood respiratory disease and anxiety.^{xix} In addition, symptoms such as: eye irritation, sore throat, wheeze and cough have been documented.^{xx} Furthermore, smoke-related health risks can be exacerbated by heat waves especially for vulnerable populations.^{xxi}

Evidence for long-term health effects of exposure to wildfire smoke is limited. Exposure to significant concentrations to wildfire smoke each summer over many years may contribute to an increased lifetime risk of heart disease, lung disease and cancer.^{xxii} However, research in this area is still evolving.

Individual susceptibility to air pollutants varies. Health effects due to air quality are determined by exposure length, quantity of air breathed, personal health status and the concentration of pollutants in the air.^{xxiii}

There are a number of factors that cause certain populations to be more susceptible to the effects of air pollution.^{xxiv} These factors include age, genetics and pre-existing conditions.^{xxv}

Populations at Risk Due to Susceptibility to Smoke

- Women who are pregnant
- Infants and small children
- Elderly people

- Populations with pre-existing respiratory conditions (e.g. asthma or COPD)
- Populations with pre-existing cardiovascular disease
- People involved in strenuous outdoor work or exercise

For more information see the [Wildfire Smoke and Health](#) Effects Factsheet.

Populations Requiring Special Care during any Emergency

- People with any condition, medical or social in nature, whose activities of daily living or health care needs require specified support in the pre-emergency environment, and in an emergency response environment those care needs cannot be maintained.
- People requiring any special care and supportive care (i.e. people who use a wheelchair, long-term care residents, people on dialysis or people who receive home care).
- People with mobility issues.
- Individuals with language, social and economic barriers.

Air Quality

Air quality is defined as the state of the air around us.^{xxvi} Poor air quality is caused by pollutants, such as those found in wildfire smoke, that in high concentrations pose a danger to human health and/or the surrounding environment.

Measuring Air Quality

In order for decision makers to make choices that protect public health and for individuals to make choices that protect their own health, it is crucial for information on air quality to be easily accessible, accurate, and current. There are a number of methods that are in place to assist with measuring the quality of air in Yukon communities. A combination of data sources is often used to measure and predict air quality in Yukon. For example, visibility readings and smoke forecast models are a combination of tools that are commonly used to predict smoke behaviour. A single source is not often sufficient for decision making due to limitations of each data source. Read more about each source below.

Air Quality Health Index (AQHI)

The Air Quality Health Index (AQHI) is an information tool available to the public from Environment and Climate Change Canada (ECCC) that assists Canadians in protecting their health from the potential effects of poor air quality.^{xxvii} In Yukon, this tool is only available for Whitehorse and provides updates on local air-quality on a 24-hour averaging period. The National Air Pollution Station, downtown Whitehorse, measures real-time ground-level ozone, particulate matter and nitrogen dioxide concentrations and uploads values in the form the AQHI index for public use on the [Environment Canada website](#).^{xxviii} The AQHI uses a scale from 1 to 10+, a higher number indicates an increased health risk. An example of the AQHI is shown in [Figure 3](#). There are corresponding health messages associated with each level of risk as seen in [Table 1](#) below. Improvements to the AQHI are underway, since this tool was originally developed for urban and industrial pollution is not ideally formulated to provide information about air quality during wildfire smoke events.^{xxix} During smoke events when levels of particulate matter are high in the air, it is possible for the AQHI reading to still be relatively low. Changes to the way we calculate AQHI are going to be implemented in the summer of 2020 and intend to address this issue.

For more information on the AQHI see: <https://www.canada.ca/en/environment-climate-change/services/weather-health/publications/guide-air-quality-index-forecasts.html>.

An AQHI Canada App is available for download for your smartphone to access hourly AQHI readings and daily updates for Whitehorse and other Canadian communities.

Figure 3: Sample AQHI for Whitehorse

Whitehorse - Air Quality Health Index

Current	Past 24 hr
Not Available	

Forecast Maximums	Next 18 hr Health Message
Issued at: 6:00 AM PST Wednesday 18 January 2017	
Wednesday	2 - Low Risk 
Wednesday night	2 - Low Risk 
Thursday	2 - Low Risk 

Who is at risk?

People with heart and lung conditions are most affected by air pollution.

To find out if you are at risk, consult [the health guide](#), or your physician.

Visit the [national AQHI Web site](#) to learn more about the AQHI.

Did you know...?

You can play a part in reducing air pollution. 1 car in 5 travels less than 1 kilometre: an average person can walk 1 kilometre in 10 minutes.



Table 1: Air Quality Health Index Messages^{xxx}

This table is a summary of air quality health messages by category			
Health Risk	Air Quality Health Index	Health Messages	
		At Risk Population*	General Population
Low Risk	1-3	Enjoy your usual outdoor activities.	Ideal air quality for outdoor activities.
Moderate Risk	4-6	Consider reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.	No need to modify your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High Risk	7-10	Reduce or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.	Consider reducing or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High Risk	Above 10	Avoid strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	Reduce or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

Visibility Index (Landmark)

For the remainder of the Yukon where AQHI is not available, it is possible to estimate the air quality by the observed visibility as seen in [Table 2](#) of this document.

This method of estimating air quality is valuable in regions that do not have continuous real-time monitoring. Visibility readings are also valuable in areas with monitoring since the concentration of smoke can vary significantly within a few kilometers.^{xxxi} Visibility readings can be a convenient tool to assess smoke levels and the corresponding health

risk for the community. Visibility can be assessed by an observer or can be assessed in some communities by looking online at the airport visibility reading. This method of measuring air quality contains uncertainty since it may be prone to user bias, smoke concentration can vary greatly over the course of a few minutes (in contrast, air monitors average smoke concentrations over a few hours), certain times of day, such as morning and evening, visibility measurements are less effective, and humidity levels can affect the accuracy of readings. For these reasons visibility readings should be used as a guide only and can complement other sources of smoke information if available.

Observer Visibility Readings

Landmarks at known distances are established before a smoke event. These distances are based on landmarks seen (or not seen) by a trained observer and then are translated to estimate the level of particulate matter concentration in the air.^{xxxii} It is prudent to identify these landmarks prior to a wildfire smoke event.^{xxxiii} The advantage of this tool is its simplicity and timeliness which allows for quick assessment of public health risk.^{xxxiv} Learn more about how to assess smoke levels using a visibility index in [Appendix 1](#).

Airport Visibility Readings

Yukon airports regularly update visibility readings that can be used to predict particulate matter concentrations. They can be found at https://weather.gc.ca/provincialsunmary_table/index_e.html?prov=yt&page=hourly. However, not all Yukon communities have airports that report visibility.

Table 2: Estimating Particulate Matter Concentrations from Visibility Assessment

Distance You Can See	Approximant PM2.5 Concentrations 1-3 hour average ($\mu\text{g}/\text{m}^3$)	Air Quality Category	At-Risk Population*	General Population	Community Level Response
35km or more	0-15	Good	Enjoy your usual activities	Ideal air quality	
8 to 35km	15-65	Moderate	Consider reducing strenuous outdoor activity if you experience symptoms	No need to modify your usual activities unless you experience symptoms	
3.5 to 8km	65-150	Unhealthy	Reduce strenuous outdoor activities	Consider reducing strenuous outdoor activities; reduce if any symptoms	Identify vulnerable people and consider operating a public cleaner air space
Less than 3.5	>150	Very Unhealthy	Avoid strenuous outdoor activities	Avoid strenuous outdoor activities	Identify vulnerable people and consider operating a public cleaner air space

Adapted from BC Wildfire Smoke Response Coordination Guidelines: <http://www.bccdc.ca/resource-gallery/Documents/BC%20Health%20Wildfire%20Smoke%20Response%20Coordination%20Guideline%202017.pdf>

*The at-risk population includes people with respiratory illness (i.e. asthma or COPD), those with cardiovascular conditions, pregnant women, small children and the elderly.



Mobile Air Monitoring Units

In some situations, mobile air monitoring equipment can be used to assist decision makers in planning. An example is the Public Health Agency of Canada's (PHAC) Emergency Air Health Monitoring Unit (EahMU) which has been used in Yukon to measure smoke concentrations where no real-time monitoring exists. However, transporting, setting up, securing and operating this equipment may be outside the capacity of community members and responders. In a review of several Canadian jurisdictions who used these units during smoke events, the expense and logistical challenges associated with deploying these mobile units made using them unjustifiable given the relatively small impact they had on overall decision making.^{xxxv}

Smoke Forecasting

Several smoke forecasting tools are available in Canada throughout the wildfire season to help predict concentrations of smoke in upcoming hours or days. The duration that the public has been exposed to wildfire smoke is pertinent to help support decision-making on how to inform the public and determine what actions need to be taken to protect public health.^{xxxvi} Weather forecasts and fuel conditions are used to predict how long wildfire smoke is expected to remain in an area and whether the exposure is continuous or sporadic.^{xxxvii} These forecast maps indicate anticipated air quality conditions, not the current air quality, by estimating the amount of pollution that will be added to the air. These forecasts still do have a certain degree of uncertainty but are improving as the models improve. Using a combination of these models is recommended to help confirm what conditions are expected.

Canada's Wildfire Smoke Prediction System ([FireWork](#))

FireWork is an air quality prediction system that indicates how smoke from wildfires is expected to move across North America over the next 48 hours. The system runs twice daily, morning and evening from early April to late October.

[FireSmoke Canada](#)

This model uses the BlueSky system and provides forecasts up to 48 hours in advance during the fire season. Smoke forecasts are published from April to September.

[Wildfire Smoke Prediction for Alaska](#)

The University of Alaska Fairbanks has a smoke prediction model for particulate matter and black carbon for up to 72 hours in advance. Although their smoke forecasting map does not capture Yukon, it is helpful to check for any large plumes of smoke that are predicted to travel across the border.

Plume Dispersion Models

In more urgent situations it is possible for emergency managers to request a model from ECCC of a specific fire plume in order to better understand how the smoke may affect nearby communities. After a request a few hours are required for the results to be finalized and a forecaster is needed for the interpretation of the model.

Small Air Sensors

Small air sensors are an emerging field of research and monitoring. It is possible that these sensors could be used in the future as an inexpensive method for collecting real-time information about concentrations of particulate matter. The air quality estimates from these sensors are not always comparable to validated government instruments and should be used with caution.^{xxxviii} The United States Environmental Protection Agency (EPA) currently has the most complete guidance on using these sensors found at <https://www.epa.gov/air-sensor-toolbox>.

Wildfire Conditions

While checking current wildfire conditions does not give an indication of the air quality in the territory, it can provide an indication of fire hotspots and wildfire danger ratings. Yukon's wildfire updates can be found [here](#). Since not all the smoke in Yukon comes from fires within the territory, it may also be beneficial to check wildfire conditions for [Alaska](#), [British Columbia](#) and [Alberta](#). In preparation for fire season it is also possible to use [monthly and seasonal forecasts](#) that predict the severity of the fire season.

Communication During Smoke Events

Special Air Quality Statements

Public weather alerts are issued by ECCC in partnership with the Chief Medical Officer of Health for all communities in the Yukon. These alerts are made available on all weather platforms. Any current alerts can be found [here](#) and include important information such as current air quality, health messaging, and the estimated duration of the event.

Health Messaging for Wildfire Smoke Events

Limit outdoor activity and strenuous activities: exercising outdoors can increase exposure to wildfire smoke. Choose lower intensity activities, reduce the amount of time spent exercising, drink lots of water and reduce the intensity of the exercise or stop if you are experiencing symptoms.

Stay indoors: spend time in a room in your home with cleaner air or in a community cleaner air space to reduce smoke exposure. Keep indoor air cleaner by avoiding smoking or burning other materials. Use a portable air cleaner if possible. If heat is also an issue, seek out a cooler space. Excessive heat exposure can also result in illness.

Filter indoor air: if you have an HVAC system make sure the filter has a MERV rating of 13 or higher. Use portable air cleaners rated for tobacco smoke, pollen and dust, with an Association of Home Appliance Manufacturers (AHAM) label that is rated for at least 2/3 of the area of the room. Do not use ozone generating air purifiers or electrostatic precipitators.

Create a contingency plan for outdoor events: create back up plans for outdoor events in case of heavy smoke. Such activities include school or camp activities, sporting or cultural events and mass gatherings.

Vehicles: drive carefully if visibility is reduced. Keep the window closed and set the ventilation system to recirculate. Vehicles should never be used as a shelter, but as a means to get somewhere.

Look out for others: if you have neighbours, friends or relatives who live alone, check on them to make sure they are okay. For any health concerns contact your health care provider.

Monitor the situation: pay attention to local smoke alerts on weather.gc.ca and changing smoke conditions on [FireWork](#) or [BlueSky](#).

Asthma and COPD: if you have [asthma](#) or [COPD](#) make an action plan for smoke events and ensure adequate supplies (e.g., medication) are available. Seek medical attention if you have any concerns.

Evacuating: evacuation is a last resort measure and involves the urgent removal of individuals from a community in order to protect them from exposure to wildfire smoke. This may be voluntary or mandatory and can start out as voluntary and progress into a mandatory order. Evacuation could include a segment of the population only, such as populations at greater risk.

Strategies to Reduce Exposure²

There are a number of interventions to consider during a wildfire smoke event. The goal of these interventions is to minimize overall exposure to wildfire smoke. Wildfire smoke events are extremely variable and multiple factors such as level of particulate matter, periods of smoke relief, transportation, and community resources need to be evaluated when prescribing an intervention.

Stay Indoors

Indoor environments can help provide relief from smoky outdoor air. Generally newer buildings are sealed tighter and are more effective at keeping smoke out than older buildings. Even by just closing windows and doors of a building or home, smoke can be reduced indoors by about 50%.^{xxxix} In particularly leaky homes or buildings or in any home when windows and doors are open air quality will be similar to what is experienced outside. Seeking cleaner air is a key public health message during smoke events. This can include advising people to go to public places with cleaner air that are able to provide temporary respite.

Often during smoky events it is also hot outside. Excessive heat can also result in illness, and can be more damaging than smoke itself especially for vulnerable populations. Most homes in Yukon do not have air conditioning systems that help to regulate the indoor air temperature. Closing up a home when it is hot outside can increase temperatures inside. Ensuring that indoor spaces are cool enough is pertinent to staying safe in the smoky season. For further recommendations about how to avoid heat illness, visit Health Canada's [website](#).

Purify Indoor Air

There are many ways to clean indoor air. Depending on the type of building and ventilation system it has, the process for cleaning the air may look different. Below is a high level overview of some crucial pieces.

² This list of strategies has been adapted from the US EPA's [Wildfire Smoke: A Guide for Public Health Officials](#) (2019)

- If there is an HVAC system, ensure that it has a filter with a MERV rating of 13 or higher. The higher the rating, the better the filter can capture smoke. Make sure the HVAC system is turned on and not left on auto since the filters will lonely trap particles in the air if they pass through the filter.
- Indoor systems that are designed to exchange indoor and outdoor air should be turned to recirculate or be turned off/ closed (ie. dryer vents).
- Central air conditioners should be set to the ‘recirculate’ mode to help keep indoor air cool. Window air conditioner units should not be used since they will pull unfiltered outdoor air in.
- Use [portable air cleaners](#) (also often called “air purifiers”). Ideally these would be purchased before a smoke event. Ensure that there is an Association or Home Appliance Manufacturers (AHAM) certification label and is sufficient for at least 2/3rds of the room’s area. The Clean Air Delivery Rates (CADR) should be listed for tobacco smoke, dust and pollen. The higher the CADR number the faster the unit will clean the air.
- Do not use high and medium-efficiency filters, electrostatic precipitators, other electronic particle cleaners or ozone generators (also sometimes called “super-oxygen” or “pure air”). These may produce some amount of ozone as a result which can irritate the lungs.

Cleaner Air Spaces

To determine whether a Home Cleaner Air Space (HCAS- [Appendix 2](#)) is recommended instead of a Community Cleaner Air Space (CCAS – [Appendix 3](#)) the following should be considered:

- Distance to a CCAS, and the level of exposure in transit;
- Mobility of residents, especially for families with small children and the elderly;
- Additional stress for individuals to try and access a CCAS;
- Benefits of accessing CCAS temporarily, with potentially more effective filtration in comparison to less effective filtering in HCAS which can be accessed for longer periods of time; and,
- Communication strategies for encouraging community members to go to CCASs and stay if extended stays are required.
- Ability to follow public health measures for a communicable disease (ie. COVID-19) in a CCAS.

Reduce Other Sources of Pollution

Indoor air can be further contaminated by people's behaviour. When trying to keep an indoor space smoke free avoid other sources of pollution, such as smoking, wood-burning, or frying or broiling meat.

Humidifiers

While humidifiers do not clean the air, they may provide some benefit by slightly reducing levels of pollutants through condensation. They also may help by keeping mucous membranes moist and reducing eye and airway irritation.^{xi} If not cleaned and maintained, it is possible for humidifiers to produce mold spores.^{xii} The usefulness of humidifiers during periods of smoke has not been studied.^{xiii}

Reduce Outdoor Activity

[Exercising outdoors](#) increases overall air intake and therefore can increase exposure to smoke. Recommending less intense physical activity, for shorter periods of time or to switch physical activity to an indoor location can help protect people during smoky periods.

Vehicles

When driving in a vehicle make sure that the windows are rolled up and the air is set to recirculate. Vehicles should never be used as a shelter and should only be used as a form of transportation between buildings with cleaner air.

Avoiding Smoky Periods

Smoke levels throughout the day typically vary significantly. Encouraging people to check smoke forecasting tools mentioned above, or by letting them know when less smoky periods are expected may help people to plan any necessary outdoor activities when air quality is anticipated to improve.

Rescheduling or Modifying Outdoor Events and Activities

In the Yukon, summers are expected to be smoky. Planning outdoor events with back up plans to move inside if smoke levels are too high or modifying high intensity activities to less vigorous exercise is recommended especially for schools and camp programs with young children who are more affected by smoke is highly recommended.

Surveillance

Monitoring smoke-related illness is necessary to evaluating the burden of the event; including improving understanding any patterns or trends. Surveillance is crucial to better prevention and management of illness.

Evacuation

The decision to evacuate is extremely complex and has the potential to cause harm due to the interruption of normal activities, social and economic factors, and health care services.^{xliii} In addition, it may increase mortality rates among those living in continuing care facilities and exacerbate mental illness in adults and children.^{xliv} Therefore, the decision to evacuate must be carefully considered with other contextual factors and may be considered after other interventions have been ineffective.

Factors that favour evacuation

- High smoke concentrations that is expected to last several days.
- Particularly toxic smoke (ie. materials that are burning are producing particularly hazardous smoke, for example, fuel).
- A particularly vulnerable population is exposed to the smoke.
- Detection of smoke-related impacts through surveillance or other means.^{xliv}

Factors that improve the success of an evacuation

- Evacuate more vulnerable people who require the most care early.
- Address factors that may deter people from evacuating (ie. financial barriers, evacuation of pets and livestock etc.)
- Ensure that there is adequate capacity and funding to safely complete an evacuation in a timely manner.

- Evacuate early if it is likely that the road or airport will not be usable later for smoke or fire.
- Coordinate the evacuation plan for smoke and fire.^{xlvi}

Roles & Responsibilities

Federal Government

Public Health Agency of Canada (PHAC)

In a national health emergency or disaster, the Office of Emergency Response Services (OERS) is responsible for supporting emergency health and social services in the provinces, territories or abroad. This office manages the National Emergency Strategic Stockpile (NESS), which includes medical, pharmaceutical and related emergency supplies. PHAC has a mobile medical clinic that can be deployed in the event of a local emergency, which is coordinated locally through Yukon's Emergency Health Services (EHS). Through PHAC it is also possible to request temporary mobile air monitoring units for locations with no current air quality data.

Environment and Climate Change Canada (ECCC)

ECCC issues long-term weather forecasts which provide vital information during a smoke event (i.e. heat, wind or rain). In addition, they issue public weather alerts for all communities in the Yukon, including air quality alerts due to wildfire smoke.

[WeatherCAN](#) is a free app that posts forecast information and can be used to receive weather forecasts air quality alerts.

In addition, ECCC issues twice-daily smoke predictions ([FireWork](#)) that show where smoke from fires in Canada and the United States is expected to spread over the next 48 hours (available April 1 to October 31 only).

Government of Yukon

Emergency Measures Organization (EMO)

The Government of Yukon, through the EMO, is responsible for coordinating the territory's prevention/mitigation, preparedness, response and recovery during emergencies and disasters.

Wildland Fire Management

The Yukon Wildland Fire Management Program is responsible for managing Yukon wildfires and enforcing the [Forest Protection Act](#).

The Fire Management Program works to prevent personal injury and loss of life, and to minimize social and economic disruption resulting from wildfires.

- Prepare people, equipment and aircraft to manage wildfires.
- Monitor weather and fuel conditions; detect, assess and manage wildland fires on a priority basis as determined by zonation policy.
- Communicate to the community about fires.
- Contact EMO or local municipality to advise alert or evacuation.
- Provide guidance on wildfire smoke as required.

Community Nursing

Community Nursing provides primary health care in 11 primary health care centres, and three public health units, in Yukon. These health facilities that are designed to meet the health needs of the community in which they are situated.

Community Nursing, as a branch of Health and Social Services Department (HSS), works in collaboration with service providers across the department and government, to support emergency preparedness messaging They also work with vulnerable individuals to assist them and their families/caregivers to develop personal emergency plans.

Yukon Hospital Corporation (YHC)

The YHC is the main provider of acute care services in Whitehorse, Dawson City and Watson Lake hospitals. The YHC works collaboratively with the Government of Yukon on all evacuation plans.

Emergency Social Services (ESS) and Emergency Health Services (EHS)

ESS is responsible for providing short-term assistance to Yukoners who are forced to leave their homes during emergencies including fires, floods, earthquakes and smoke, when regular operation of community social services are unable to support the emergency situation.

ESS:

- Coordinates or provides for the non-medical survival needs of persons affected by an emergency; and,
- Coordinates or provides public reception centres and registration and inquiry services, emergency lodging, feeding, clothing and personal services which encompasses counseling, financial assistance, coordination of alternate shelter for domestic pets, and care for people with special requirements and in special care facilities.

EHS:

- Coordinates or provide for the immediate medical and public health needs of individuals and communities.
- Communicates information, advice and direction related to health emergencies including areas such as water quality, sanitation, safe food handling, institutional hygiene, waste disposal and wildfire smoke
- In consultation with the Chief Medical Officer of Health (CMOH), health officers work to protect the health of the public through enforcement of various acts.

Regional Social Services

The Regional Social Worker or Community Social Services Worker, is an employee within HSS and fulfills the role of Social Worker and is the Emergency Social Services lead at the community level if necessary.

Chief Medical Officer of Health

The office of the Yukon Chief Medical Officer of Health is responsible for the legislated responsibility to protect and promote the public's health in a variety of areas including Emergency Preparedness and Response. They provide 24-hour public health coverage in the Yukon and are responsible for ensuring the requirements of the [Public Health and Safety Act](#) are met.

They provide medical guidance, expertise and leadership by contributing evidence-based risk assessments and helping communicate with the public about health risks. During a wildfire smoke event, they may be asked to provide guidance or input for smoke responses or interventions.

Department of Environment

The Department of Environment, in partnership with ECCC helps to maintain existing air monitors in Yukon. The Department of Environment is also responsible for setting standards for ambient air quality, including standards addressing acute vs chronic exposure to particulate matter.

Continuing Care

Continuing Care is a division of HSS. Continuing Care provides home care and therapy services for the citizens of the Yukon Territory. In general people who are a part of Continuing Care programming are likely more susceptible to the effects of smoke than other Yukoners.

Municipal Governments

Municipalities

The elected councils Municipalities are the local authority within their municipal boundaries for the purposes of the [Municipal Act](#).

Municipal governments are required to have emergency plans in place. They are also responsible for implementing emergency plans and procedures that will protect the general public and minimize property and environmental damage and loss during emergencies. The *Municipal Act* authorizes the Mayor or designed official to declare a state of emergency in the municipality. For emergencies that take place on in unincorporated communities, the Government of Yukon is the local authority.

Yukon First Nations

While partners in any response, the role of Yukon First Nations during a smoke event is not clearly defined. Where possible leadership from Yukon First Nations may serve as an essential source of information for people in their community or provide resource or personnel support.

Resources for Decision Making and Action

A variety of tools and resources should be used when making decisions about wildfire smoke events. It is imperative that much of the planning and preparation for smoke is done well ahead of time before an actual smoke event. During smoke events, resources may be limited due to response to fires in the territory and a timely response may not actually be possible. It is recommended that each community designate individuals to assess potential health risks from wildfire smoke in order to determine the best protective health measure. It is important to have a minimum of two designates to ensure availability in the event of wildfire smoke in the associated community.

In order to make an informed decision regarding the course of action air quality should be assessed, estimated duration of the smoke and the potential health effects reviewed.^{xlvii} Local support services should also be reviewed such as the availability of health care and cleaner air space for the public.^{xlviii}

Recovery

Once the smoke emergency is over it is important to review the experience to explore and share lessons learned to improve preparedness and response efforts. This includes:

- Reviewing emergency management documents/issues going forward to senior managers.
- Recommending corrective actions from a strategic and/or technical points of view.

Key questions to consider:

- What worked well? Why?
- What did not work well? Why?
- What can be improved for future wildfire smoke events?
- Are there any additional tools/resources that might be helpful in the future?
- Were there any infrastructure issues?

Community Evaluation Indicators:

- Emergency response plans are up to date and include response to wildfire smoke.
- A list of at-risk populations in the community is up to date.
- Community cleaner air spaces have been identified and communicated to the public.

- Community landmarks have been identified to be used for visibility index and person(s) responsible for emergency response has been notified.
- Transportation requirements to community cleaner air space and for evacuation for at-risk members of the community have been planned in advance.

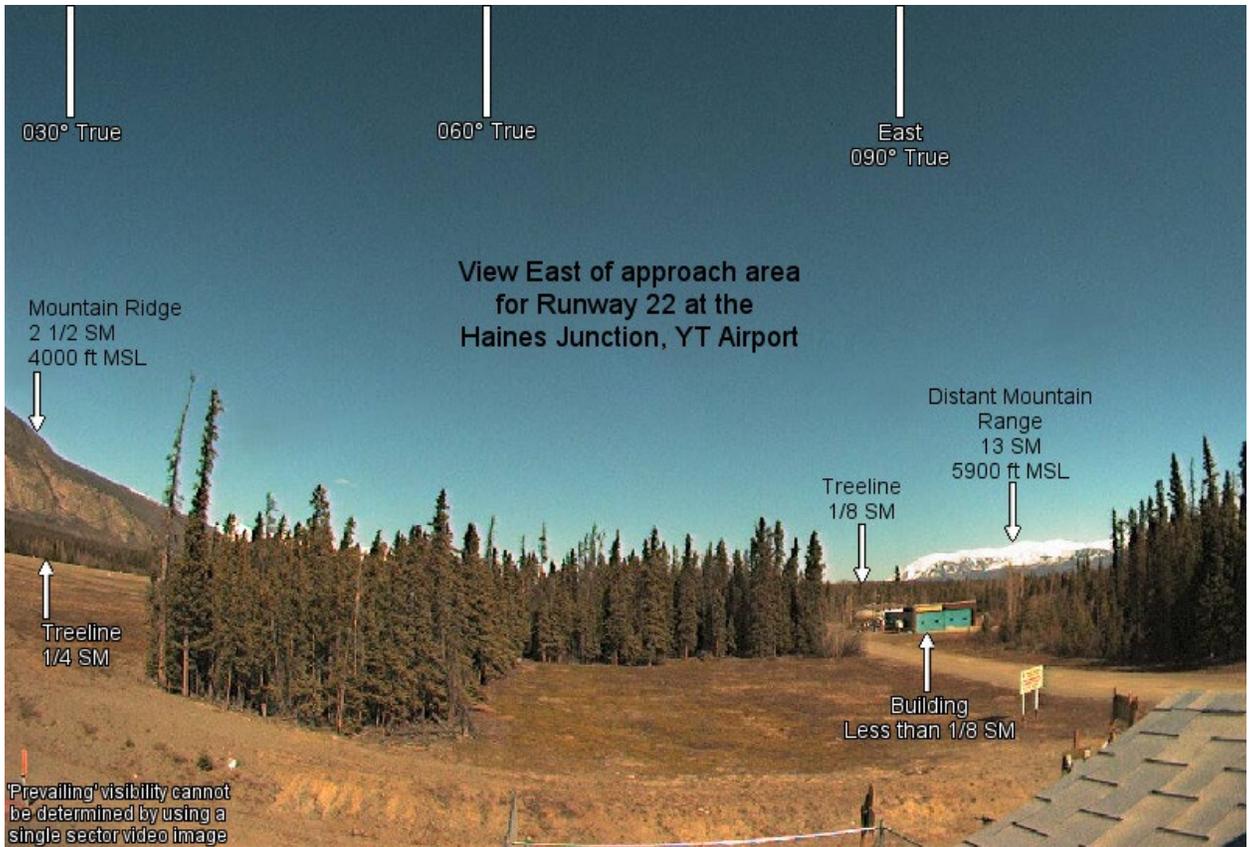
Individual Evaluation Indicators:

- Do community members know about the community cleaner air space?
- Have at-risk populations created a clean air space at home?
- Do individuals with asthma, COPD or another chronic illness have a wildfire smoke action plan?

Appendix 1: Visibility Readings

To set up visibility reading it is important that landmarks are set up before a smoke event. Visibility readings can only be taken during daylight hours and when the relative humidity is less than 65%.^{xlix} The basic method to create a visibility index is below:

- On a clear day find a spot in or near the community with a good line of sight line up to 15 km.
- Take several photographs along the line of sight.
- Record the spot on your GPS.
- Identify prominent landmarks at the following approximate straight-line distances (try to pick dark objects):
 - 3.5 km
 - 8 km
 - 35 km
- Distance to nearby landmarks may be measured by GPS, while more distant landmarks may be measured on Google Earth
- Annotate your photograph with labels depicting your landmarks, and their distance from the camera. This may be done using Microsoft Paint or other image editing software.
- On smoky days, this image may be used as a reference to estimate the PM2.5
- Example of a visibility index can be seen below from NavCanada:



Appendix 2: Creating a Cleaner Air Space in Your Home

A home “cleaner air space” is an entire home, or area of the home with filtration that is suitable for reducing wildfire smoke exposure. Use may be part-time (e.g., several hours per day) or full-time for the duration of the smoke event.

The combination of closing doors and windows and running a portable HEPA filter that is the appropriate size for the room may be sufficient to lower the smoke concentration and relieve symptoms. The objective is to seal in the good air by sealing any gaps and avoiding allowing bad air in. Air will move from high pressure areas to low pressure through any opening. Pressure differences from wind and temperature are hard to control. Appliances that remove air from the home will create a negative pressure that will pull in outside air and should not be used.

How to make a cleaner air space:

- ❑ Close all windows and doors.
- ❑ If you have portable air cleaners with HEPA filters, turn them on (make sure that they have the Association of Home Appliance Manufacturers, AHAM label). Many standard air conditioning units also have filters inserted or can have them inserted. **For portable air cleaners:** Ensure proper sizing of the unit (at least 2/3rd of the size of the room), the Clean Air Delivery Rate rating for tobacco smoke is the most relevant to wildfires
- ❑ Turn off exhaust fans, window air conditioners, clothes dryers vented outside and combustion heaters in the home. A central air conditioning system can be used, keep the fresh-air intake off to prevent smoke from getting inside.
- ❑ Tape periphery of doors, unless there are weather seals. The effectiveness of the seals can be checked by determining whether air moves through at the edges. This movement of air may be seen by observing the path of a small puff of smoke such as from a match or by observing the movement of a small strip of paper or plastic.
- ❑ Have a portable phone or cell phone for emergency communications.
- ❑ Continue to check the radio or local wildfire information source for emergency information.
- ❑ Carbon dioxide is released when we exhale and produced by some combustion appliances. Use a carbon monoxide detector in the space, especially if it is tightly sealed and the time in the space is prolonged.
- ❑ Be mindful of the heat. Cool the space to a comfortable temperature or seek shelter in a cooler place.

- Avoid producing other air pollution such as cigarette smoke, burning candles, gas stoves and heating (especially kerosene, gas, propane, or wood)
- When air quality improves, even for a short period, it is important to air out the space. Clean surfaces with a damp cloth or mop to remove settled PM and vacuum with a HEPA filter-equipped vacuum.

Supplies for cleaner air spaces:

- Portable HEPA filter that is appropriately sized for the room and spare filters.
- Duct tape for sealing doors and securing plastic over vents and windows
- Pre-cut plastic sheeting to fit over supply and return vents (may be for windows as well if not airtight)
- Cellphone
- Battery operated radio with spare batteries
- Flashlight with spare batteries
- Drinking water
- First aid kit

Appendix 3: Creating a Community Cleaner Air Space

Table 2 reviews criteria for selecting a cleaner air space in the community. The entire building can serve as protection, however a room within a building maybe sufficient and provide a higher level of protection if it is less subject to air infiltration and fits the criteria below.

Table 2: Criteria for Selecting a Cleaner Air Space

Criteria	Description
Accessibility	The space must be easily reached quickly and accessible to persons with mobility, cognitive and other impairments.
Size	Identify facilities that can comfortable hold large groups such as schools, libraries, shops and large commercial buildings.
Tightness	Newer buildings are preferable to older ones as they are usually better sealed from outdoor air. There should be a low rate of air exchange from the outdoors, with minimal doors and windows present.
Heating Ventilating and Air Conditioning (HVAC)	The space should be isolated or capable of being isolated rapidly from the HVAC system of the building so smoke does not enter. Assure that the facility can handle the increased cooling load due to high occupancy. Ductless mini split-type air-conditioner, fully enclosed air-handling unit (only if the unit and its ducts are fully within the cleaner air space) can be used. Conventional air conditioning systems must not be operated in the protective mode because the fans introduce outside air.
Ventilation	For 15 cfm per person is the desired ventilation rate; however, the minimum ventilation rate is 5 cfm per person if that rate is adequate for pressurization. Unventilated rooms are suitable only for short-duration use, because the low ventilation rate when occupied can cause carbon monoxide levels to rise.
Water and Toilets	Drinking water and a toilet should be available to occupants. Use of bottled water and portable toilets may be required.
Communications	A radio should be available to receive emergency instructions for termination of sheltering. A telephone or cell phone should be used for communication as well.
Power	Electrical power is needed for the air-filtration units and lighting. If power is lost the space it will continue to provide some protection as the room remains sealed. A backup generator is beneficial but not necessary.

Before opening any community space, a facility walkabout with the building owner/ manager to identify any potential safety hazards is necessary. Eliminate or minimize hazards and then use this checklist to conduct a safety briefing for all staff prior to start of operations.

Table 3: Site Inspection

Checklist Item	Yes	No
General Safety Information		
1. Identify fire exit(s), evacuation procedures and assembly points		
2. Location of all fire extinguishers		
3. Location of fire alarm pull stations		
4. Are first aid services in place and responders advised how to access?		
5. Are there personal safety and security issues? If so, are response procedures in place?		
Exits and Access		
1. Are all exits visible, unobstructed and marked with a visible sign that is properly illuminated?		
2. Are there sufficient exits to ensure prompt escape in case of emergency?		
3. Are there areas of the facility that should be locked, e.g. chemicals or cleaning supplies?		
Exterior		
1. Are all exterior entrances properly illuminated?		
2. Are access sidewalks clear with no uneven surfaces (trip/fall hazards)?		
3. Are the parking lots in good condition with no potholes or uneven surfaces?		
4. Are all disabled access ramps clear and equipped with proper railings?		
5. In inclement weather, are all sidewalks and parking lot areas cleared to provide proper access to the building?		
6. Any hazards for gas lines or downed electrical, telephone or other such lines?		
Walking and Working Areas		
1. Are floors and working areas clean and free of hazards, loose carpeting?		
2. Are floors slippery or wet?		
3. Are stand mats, platforms, or similar protection provided to protect people from wet floors?		
4. Are stairways well lit? Are there handrails where required (4 or more risers)?		
5. Are accessible areas of the building adequately illuminated?		

Checklist Item	Yes	No
6. Are furniture/ chairs safe to use (stable, free of sharp surfaces, etc.)?		
Kitchen		
1. Are the stove and hood free of obvious grease accumulation?		
2. Is there a properly services fire extinguisher in an accessible area?		
3. Is the floor clean, dry, and free of slip hazards?		
4. Are there proper containers available (e.g. garbage cans) for disposal of garbage?		
5. Are there any controlled substances (e.g. WHMIS controlled products)?		
6. If yes, is volunteer access restricted/prohibited? Note: "access"= store, handle, use or dispose of ?		
7. If no, do responders with access have relevant Material Safety Data Sheets (MSDS) and are WHMIS trained?		
8. Is there a risk from infectious disease/biohazards?		
9. If yes, have responders been advised on use of universal (standard) precautions?		

High-efficiency air filtration

High-efficiency air filtration can augment a cleaner air space. Filtration may remove air-borne contaminants as air circulates within the room. Filtration systems draw outside air in, therefore the level of protection received is equivalent to the efficiency of the filter (a filter with a MERV rating of at least 13 is recommended). Increasing the efficiency of the filter will add stress to the system because of the added pressure needed to force the air through the new filter. All filters have limited service life. Upgrades may be required to provide adequate electrical power, fan capacity, or structural support to handle the added airflow resistance of HEPA filtration.¹



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