Understanding Wildfires

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A Case Study for British Columbia

RALUCA RADU AND AUBREE A. MCATEE

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Land Acknowledgement

The authors are grateful for having the honor to write this case study on the traditional, ancestral and unceded territory of the Coast Salish Peoples, including territories of the xwməθkwəy̓ əm (Musqueam), Sḵwx̱ wú7mesh (Squamish), and the səlilwətaɬ (Tsleil-Waututh Nations). We commit to advocate for reconciliation in our daily lives and through the work that we undertake.

As this case study is finalized, there are concurrent crises that are testing our capacity to withstand adversity and to build upon our resilience in the face of trauma-inducing events. Amidst destructive climate change-driven phenomena, a global pandemic, and disrupted peace, we are called upon to ensure equity is a part of all spaces that can contribute to transformational change in our societies. For us that current change starts with this work through which we hope to inspire you to become acquainted with climate change and wildfires alongside the impacts these carry for individuals and communities. How we plan for a future where a warming climate will contribute to various detrimental impacts on individual livelihood, communities, and the broader governmental level is critical. If we are to act upon the largest crisis of the 21st century as declared by the World Health Organization, then we must do so collectively, to ensure the protection and promotion of the most sacred relationship that exists, specifically between humans and ecosystems. When we deepen our bonds to our natural surroundings we create a path toward living in harmony with one another and building a future that can sustain all species.

Raluca Radu | Project Lead

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Authors

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Raluca is a dedicated nursing professional with a deep passion for promoting planetary health and advancing knowledge in this realm. She has worked in both the public and private sectors as a clinical resource surgical nurse as well as in occupational health and safety locally and for a short duration in Northern British Columbia. In addition, she has been very fond of working in various educator roles, especially in that of Lecturer at the UBC School of Nursing in Vancouver, where she thoroughly enjoys being the lead for the Health Impacts of Climate Change course (Nursing 290). Raluca values a learning environment conducive of positive behaviours as one that is inviting, safe to participate in, and a key determinant of success in education. Overtime, Raluca has increased her understanding of the critical role served by health professionals to integrate the social determinants of health and apply an equity lens at each level of decision-making, in order to ensure all voices and stories of individuals who experience marginalization are lifted and included. This is even more critical as we face the largest crisis of the 21st century, climate change, which will only further exacerbate inequities. Her deep commitment to advocating for practice and education to include such topics in their curricula inspired Raluca to propose this case study project in order to further innovate the current Nursing 290 course. She hopes to make this case study available as an open-education resource that can be accessed by other universities, organizations, and clinical settings, such that the care of populations in the midst of a warming climate can be ensured. Raluca hopes that through her roles as an emerging

planetary health expert sitting on countless provincial and national committees, mentor, and educator she will inspire others to integrate sustainable principles into their practices and daily lives, such that we can ensure a Planet where biodiversity is protected and where future generations can thrive.

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Aubree is passionate about facilitating connections to place through education, community building and systems change work. With a background in place-based learning, Aubree spent five years in the field of education program development and land conservation in Chile, before moving to Canada, where she completed a master of education for sustainability and worked for both UBC's Sustainability Initiative and B.C. GreenCare, leading programs and engaging stakeholders in sustainability. Aubree leads the development and implementation of innovation projects across Western Canada as the regional project coordinator, working within the Planetary Healthcare Lab at The University of British Columbia. Alongside this work, she is a lecturer with the UBC Climate Teaching Connector program where she integrates climate justice-related content into undergraduate courses.

Her motivation to work on this case study reflects her own experiences and relations with wildfire in her home state of California and through this case study, she hopes that it will invite students to reflect on the challenging realities that we face, both to inspire and lead to systems-level action and a commitment to improving health for people and the planet. In her free time, she

enjoys cooking with friends, going on bikepacking adventures, and tending to her garden.

CASE STUDY

History of Notable Wildfires in British Columbia

The current 10-year average, taken from 2011 to 2020, is 1,352 **wildfires** from April 1st to March 31st the following year. On average, 42% of these are human-caused and 58% are lightning- caused.

The following table shows general statistics of wildfire activity in B.C. since 2008.

British Columbia Wildfire Activity Since 2008

Year	Total Fires	Total Hectares	Total Cost (Millions)	Person-caused (%)	Lightning-caused (%)
2020	670	14,536	$193.7	392 (59%)	275 (41%)
2019	825	21,138	$182.5	450 (55%)	375 (45%)
2018	2,117	1,354,284	$615.0	628 (30%)	1,489 (%70)
2017	1,353	1,216,053	$649.0	580 (43%)	773 (%57)
2016	1,050	100,366	$129.0	564 (54%)	486 (46%)
2015	1,858	280,605	$277.0	621 (33%)	1,237 (67%)
2014	1,481	369,168	$297.9	664 (45%)	817 (55%)
2013	1,861	18,298	$122.2	564 (30%)	1,297 (70%)
2012	1,649	102,122	$133,6	708 (43%)	941 (57%)
2011	653	12,604	$53.5	444 (68%)	209 (32%)
2010	1,672	337,149	$212.2	680 (41%)	992 (59%)
10 Year Average	**1,352**	**348,917**	**$265.3**	**562 (42%)**	**790 (58%)**
2009	3,064	247,419	$382.1	881 (29%)	2,183 (71%)
2008	2,023	13,240	$82.1	848 (42%)	1,175 (58%)
Average since 2008	**1,560**	**314,383**	**$256.1**	**617 (40%)**	**942 (58%)**

Source: Wildfire Averages Service from Province of British Columbia, licensed under Open Government License

BC Wildfire Services commences tracking of wildfire activity (season) in April of every year until the following year in March. Note that the causes for these fires were natural, human, or undetermined.Refer to this list of significantly damaging wildfires in BC: Wildfire Season Summary

What are Wildfires?

According to the World Health Organization (WHO), “a wildfire is

an unplanned fire that burns in a natural area such as a forest, grassland, or prairie."[1]

Wildfires can occur on any continent and in any environment. Additionally, they may burn in vegetation areas that are located deep within soil as well as above soil. These are often referred to as 'ground fires', which may erupt in the kind of soil that is composed of organic matter, which nourishes the fire, to grow larger. This makes it a unique type of fire because as it burns deep within the ground it can 'smolder' for prolonged periods of time just up until the point environmental conditions may support its transition to a surface (also known as 'crown') fire. In comparison, when we look at 'crown fires', these are typically present in dead or dry vegetation areas, where they are usually resorted to burning among leaves and tree canopies.[2]

Mount Eneas Wildfire (2017) by Andreas Rutkauskas, All Rights Reserved

1. World Health Organization (WHO). (2022). Wildfires. Retrieved from: https://www.who.int/health-topics/wildfires#tab=tab_1>
2. National Geographic Society. (2019). Wildfires. Available at: https://www.nationalgeographic.org/encyclopedia/wildfires/

Mount Eneas Wildfire (2017) by Andreas Rutkauskas, All Rights Reserved – The magnitude of wildfires is highly dependent on weather conditions that may either further fuel their growth or suppress it.

It is important to note two distinct risk factors contributing to the incidence of wildfires: (1) naturally occurring (often referred to as ecological), mostly due to lightning strikes, forest type, tree age, topography and weather; (2) human-made, due to improper use of forested areas especially where the climate is very dry and where substantial logging occurs – with more people exploring the forested back country for recreational purposes, any lack of attention can potentially contribute to starting a forest fire.[3] [4]

The magnitude of wildfires is highly dependent on weather conditions that may either further fuel their growth or suppress it. Equally, the topography also known as the physical feature of a certain geographical area, contributes to the direction in which a

3. Natural Resources Canada. (2020). Protecting communities. Retrieved from: https://www.nrcan.gc.ca/our-natural-resources/forests/wildland-fires-insects- disturbances/forest-fires/protecting-communities/13153
4. National Geographic Society. (2019). Wildfires. Available at: https://www.nationalgeographic.org/encyclopedia/wildfires/

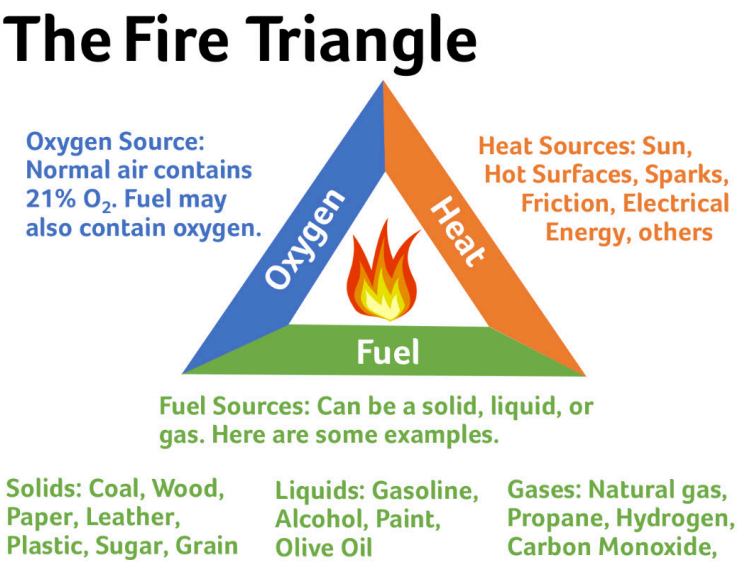
wildfire's flames burn, specifically by either burning faster uphill or slower downhill.[5]

Wildfires can play an important role in maintaining balance among certain ecosystems, especially around the elimination of insects and diseases that can be deadly to various tree species. Similarly, they also provide a chance for survival and restoration of plant species. When wildfires burn "at a low intensity, flames can clean up debris and underbrush on the forest floor, add nutrients to the soil, and open up space to let sunlight through to the ground [...] [which can in turn] nourish smaller plant and give larger trees room to grow and flourish."[6]

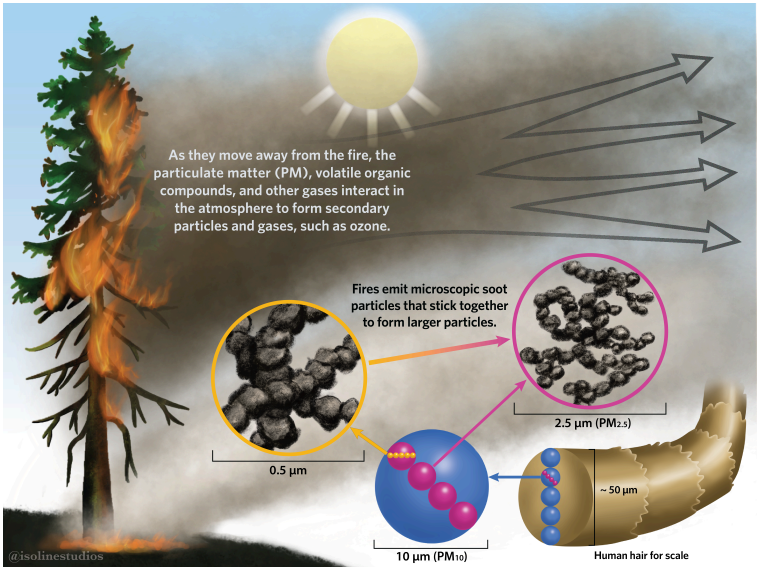
With a changing climate it is hence important to understand how the disruption to these ecosystems and natural pathways to manage homeostasis has played a role in more wildfires occurring, especially as a result of warmer temperatures that lead to drought and highly dry forested areas.

To start a wildfire, the following three components must be present, specifically:

5. Ibid
6. Ibid



The Fire Triangle Source: Fishcenternicole/PsychonautWiki Licensed under CC By Share-Alike 4.0



Wildfire Smoke Composition Source: Jen Burgess/IsolineStudios for BCCDC
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Climate Change and Wildfires

It is well recognized that with a warming climate the magnitude and frequency of wildfires increases significantly, especially in areas that experience drier than normal conditions, less precipitation, and high winds. This will directly affect how often and how severe wildfires will be, especially when climate change and climate variability can accelerate the behaviour and magnitude of these events. In particular, climate change and climate variability underline how a change in the state of the climate – one that is identifiable by shifts in mean of climate properties, such as temperature and precipitation, can persist over a long period of time (i.e. usually 30 years or longer). Moreover, climate variability points to the naturally occurring processes over which humans have no control (i.e. solar output, ocean currents, volcanic activity). Notably, with the accelerated warming of our planet we can expect to see more fires in a vast amount of boreal forests in Canada and around the world, with detrimental impacts on biodiversity and human livelihood.[1] [2]

Canada is home to roughly 9% of the world's entire forests. Since the 1990s, **wildland** fires have accounted for 2.5 million hectares burnt each year. In the last decade alone, Canada spent between $800 million to $1.5 billion per year on efforts to suppress fires. Markedly, the current and ongoing fire-prone conditions across Canada are predicted to lead to the doubling of how much area is burned by 2100, which is of grave concern looking forward.20 Wildland fires in Canada take place in forests, shrub lands, as well

1. World Health Organization (WHO). (2022). Wildfires. Retrieved from: https://www.who.int/health-topics/wildfires#tab=tab_1
2. Natural Resources Canada. (2020). Climate change and fire. Retrieved from: https://www.nrcan.gc.ca/our-natural-resources/forests/wildland-fires-insectsdisturbances/climate-change-fire/13155

as grasslands. It is important to outline that a small percentage of wildfires are **prescribed** as a result of having been authorized by forest managers with the aim of maintaining healthy ecosystems. However, the majority of wildfires that become uncontrolled are either due to lightning (natural causes) or due to human carelessness.[3] [4]

The impacts seen from climate change on forests across Canada will be both gradual and sudden in nature. From alterations in growth patterns, to distribution of trees in the face of calamities, it is worth noting the interconnectedness between how forests will respond to the complex effects caused by climate change.[5] [6]

The Natural Resources of Canada outlines that the most visible impacts from climate change on forests include: infestation by the mountain pine beetle in British Columbia (BC), higher fire activity in western boreal forest, and higher aspen dieback in the Prairies; in addition, we have seen earlier arrival of spring and longer summers which in turn directly impact these ecosystems. We are called upon to understand how the "forest management activities such as harvesting, tree planting, and efforts to fight forest fires and insects have an impact on the forest carbon balance".[7] [8]

We ought to consider how the ecosystems in these habitats will be impacted following wildfires. When forests suffer disruption because of various species burning down from wildfires such as timber, this directly translates into devastating losses for the communities who depend upon them. Specifically, those who for economic reasons rely on forestry to make ends-meet and the

3. Natural Resources Canada. (2020). Impacts. Retrieved from: https://www.nrcan.gc.ca/climate-change-adapting-impacts-and-reducingemissions/climate-change-impacts-forests/impacts/13095
4. Natural Resources Canada. (2021). Forest fires. Retrieved from: https://www.nrcan.gc.ca/our-natural-resources/forests/wildland-fires-insectsdisturbances/forest-fires/13143
5. Ibid.
6. Ibid.
7. Ibid.
8. Ibid.

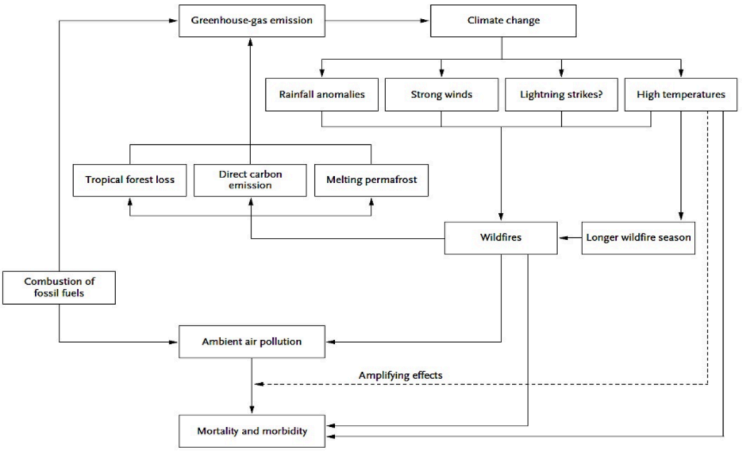
Indigenous Peoples whose livelihoods have been interconnected with forests over the last hundreds of years.

Moreover, the large number of people who nowadays live in closer proximity to forests need to learn about the high risks that wildfires pose on their health, homes, businesses, and livestock. As the impacts felt will be significant, we must consider how these communities can be supported in the face of such adversity.[9] [10]

The figure below illustrates how climate change contributes to wildfire occurrence and further indicate the aftermath of these on human livelihood.

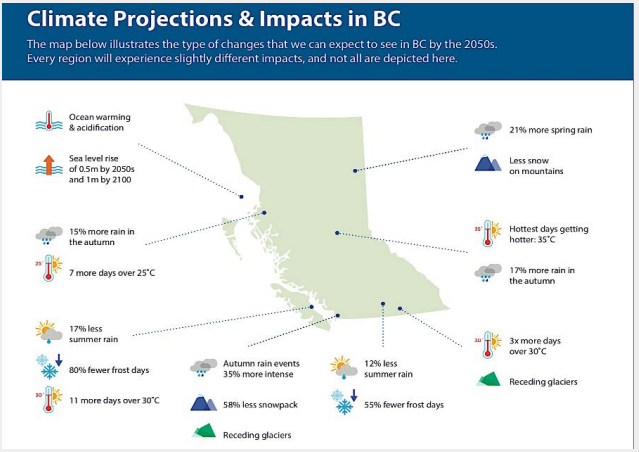
Wildfires by courtesy of the Colorado Health Institute licensed under a CC BY-ND license.

9. Ibid.
10. Ibid.



The dashed line indicates that high temperatures could amplify, or enhance, the effects of ambient air pollution on mortality and morbidity.
From N Engl J Med, Rongbin Xu, M.B., B.S., Pei Yu, M.B., B.S., Michael J. Abramson, , et. al. , Wildfires, Global Climate Change, and Human Health, November 26, 2020. Copyright © 2020, Massachusetts Medical Society. Reprinted with permission from the author.

The following image is a map created by the Government of BC, outlining the kind of changes we can expect in British Columbia by 2050s.



Climate Projections & Impacts in BC Licensed under a non-commercial use license.

Health Impacts of Wildfire Smoke Exposure

Wildfires can be devastating for individuals and communities causing both direct and indirect health impacts, specifically those which can lead to the disruption of essential services such as healthcare, transportation, communication, power, and water supply, among many others.[1]

Morbidity and mortality as a result of wildfire smoke is possible depending on the level of exposure, proximity to the fire itself, whether or not individuals have access to safe shelters, and are given sufficient notice to evacuate the areas in imminent danger.

When individuals are exposed to wildfire smoke, they are in peril to the concoction of air pollutants that make up the smoke, whereby particulate matter (PM) is the most concerning.

Wildfire smoke exposure can lead to short and long-term health impacts that can leave lasting physical and psychological scars on individuals:

- Physical trauma (i.e. burns) Eye irritation
- Runny nose
- Sore throat or general irritation
- Increased phlegm production
- Headaches

1. World Health Organization (WHO). (2022). Wildfires. Retrieved from: https://www.who.int/health-topics/wildfires#tab=tab_1

- Decreased lung function resulting in excessive coughing and wheezing which can lead to shortness of breath
- Inflammation of upper and lower respiratory tracts that can contribute to pneumonia, bronchitis, asthma and chronic obstructive pulmonary disorder (COPD) exacerbation, among several other lung diseases
- Exacerbation of cardiovascular diseases such as a heightened risk for stroke and myocardial infarct, all of which can produce various symptoms (i.e. arrhythmias, palpitations, chest pain)
- Increased emergency room visits and hospitalization
- Post traumatic stress disorder (PTSD)
- Exacerbation of mental illnesses
- Premature death

People with chronic lung/heart disease, pregnant people, infants, young children, and older adults are at higher risk of short and long-term health impacts from wildfire smoke exposure.[2]

Additional effects to consider are how displacement due to property loss will affect individuals in the short and long-term with respect to their ability to cope with these traumatic experiences, especially taking into account whether they have access to adequate social supports. We must therefore approach all care with individuals impacted by wildfire smoke through a Social Determinants of

2. BC Centre for Disease Control (BCCDC). (2022). Wildfire smoke. Retrieved from: http://www.bccdc.ca/health-info/prevention-public-health/wildfire-smoke

Health (SDoH) lens – one that allows us to understand where inequities are prevalent such that the necessary policies and supports can be implemented.

Heat and health: Who is affected? by WHO licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Intergovernmental Organization license.

Indigenous Sovereignty and Wildfire Management

Over the course of history, Indigenous Peoples have built intricate relationships with the environment in ways that are not only sacred for their existence but also that give back to Mother Earth. The use of fire in Indigenous history can be seen dating back well over 7000 years ago, however over the last 200 years Anthropogenic fire has been almost entirely removed from BC's Indigenous communities.[1] Historically, **Indigenous Fire Stewardship (IFS)** has been used by Indigenous Peoples as a means to "survive, adapt to local, environmental conditions, promote desired habitats and species and to increase the abundance of favoured resources and landscape conditions."[2] (p1) Moreover, when we promote Indigenous knowledge we also uplift the stories and lessons that have been passed on from generation to generation which aligns with the "broader aspects of individual, family, and community's cultural learning, understanding, and beliefs regarding metaphysical and biophysical relationships of people and their environment."[3] This is supported by work undertaken by Dodd et al. (2018) who learned from speaking with Indigenous Peoples affected by the 2014 wildfire season in the Northwest Territories how "it was the lost summer…the attachment to the land and place, what it does, and when you get alienated, you know, from that place…it takes a deep, emotional toll, if not a spiritual toll."[4] (p332) Therefore, it is instrumental to create an understanding of how the sanctified connection between maintaining traditional practices during a

1. Lewis, M., Christianson, A., & Spinks, M. (2018). Return to flame: Reasons for burning in Lytton First Nation, British Columbia. Journal of Forestry 116(2), p.143-150. doi: 10.1093/jofore/fvx007
2. Lake, F. K & Cardinal Christianson, A. (2019). Indigenous fire stewardship. In: Manzello S.(eds) Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires. Springer, Cham. https://doi.org/10.1007/978-3-319-51727-8_225-1
3. Ibid.
4. Dodd, W., Scott, P., Howard, C., Scott, C., Rose, C., Cunsolo, A., & Orbinski, J. (2018). Lived experience of a record wildfire season in the Northwest Territories, Canada. Canadian Journalof Public Health 109, p.327-337. doi: https://doi.org/10.17269/s41997-018-0070-5

wildfire event and Indigenous Peoples leads to a direct disruption to activities which give them purpose and a sense of belonging, something that will become a greater threat with a changing climate.

Image from Canva under a Free Media License

There are a plethora of benefits that stem from ensuring Indigenous Peoples maintain their sovereignty with respect to their lands and to how they manage fires. Notably, "**Indigenous sovereignty** is linked with identity and right to self-determination [...][and] self-determination should be understood as power of 'peoples' to control their own destiny. Therefore, for Indigenous Peoples, right to self-determination is instrumental in the protection of their human rights and struggle for self-governance."[5] (p79) To further outline benefits, we must first look through a sociocultural and environmental lens, when we integrate different types of burning we see a "greater protection from high-intensity wildfires,

5. Shrinkal, R. (2021). "Indigenous sovereignty" and right to self-determination in international law: A critical appraisal. AlterNative 17(1), p.71-82. https://doi.org/10.1177/1177180121994681

increased natural production of socially and culturally valued plants and foodstuff (edible plants), and increased opportunities for tradition-based education on ecosystem management, burning of common areas and support for community cohesion."[6] (p144) Moreover, we would also see overall health improvement of native tree species and a decreased risk for pathogen resistance.[7] This in turn can not only increase the sense of belonging to the lands where Indigenous Peoples have a rooted connection with, but it also contributes to the upholding of knowledge and passing it down from Elders to younger generations, hence ensuring the continuity of connection to land and to self as an Indigenous person. Doing so will ensure Indigenous Peoples continue to feel connected to the land and to feeling their belonging to their ancestors, where their identity stems from.[8]

If these unique **adaptation** practices enable people to co-exist with their surroundings and is effective at reducing wildfires, then Western societies have a moral responsibility to dismantle the harmful colonial practices that have greatly impacted Indigenous Peoples' ability to exercise their stewardship and hence maintain their sovereignty in fire management. This entails creating platforms where Indigenous Peoples' knowledge has visibility, and most importantly that policy platforms exist that support Indigenous governance over lands that will result in increased protection of all life among diverse ecosystems. In turn, through decolonization, we learn that fire management at the **wildland urban interface** can lead to a more meaningful participation of Indigenous Peoples in practices that result in better management, hence healthier outcomes for the environment.[9][10]

6. Lewis, M., Christianson, A., & Spinks, M. (2018). Return to flame: Reasons for burning in Lytton First Nation, British Columbia. Journal of Forestry 116(2), p.143-150. doi: 10.1093/jofore/fvx007
7. Ibid.
8. Eriksen, C. & Hankins, D. L. (2015). Colonisation and fire: Gendered dimensions of Indigenous fire knowledge retention and revival. In A. Coles, L. Gray & J. Momsen (Eds.), The Routledge Handbook of Gender and Development (pp.129-137). New York, United States: Routledge.
9. Lake, F. K & Cardinal Christianson, A. (2019). Indigenous fire stewardship. In: Manzello S. (eds) Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires. Springer, Cham. https://doi.org/10.1007/978-3-319-51727-8_225-1
10. Lewis, M., Christianson, A., & Spinks, M. (2018). Return to flame: Reasons for burning in Lytton First Nation, British Columbia. Journal of Forestry 116(2), p.143-150. doi: 10.1093/jofore/fvx007

The call to restore fire stewardship practice by Indigenous Peoples would translate into the promotion of a cultural custom that has been undertaken over time with successful protection of highly biodiverse areas. Moreover, in a Canadian context, it would uphold our moral obligation to align with Truth and Reconciliation and the United Nations Declaration on the Rights of Indigenous Peoples, by ceasing the promotion of colonial practices such as the Western means of managing fire, and working to integrate Indigenous knowledge in these processes. Lastly, we are also reminded to work towards a 'cross-cultural fire stewardship' where we combine Western practices with Indigenous knowledge in a way that is equitable and one that amplifies the historical ties to the lands that expect us to protect them, for a more positive impact on fire management for all ecosystems to thrive.[11][12][13]

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11. Lake, F. K & Cardinal Christianson, A. (2019). Indigenous fire stewardship. In: Manzello S.(eds) Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires. Springer, Cham. https://doi.org/10.1007/978-3-319-51727-8_225-1
12. Lewis, M., Christianson, A., & Spinks, M. (2018). Return to flame: Reasons for burning in Lytton First Nation, British Columbia. Journal of Forestry 116(2), p.143-150. doi: 10.1093/jofore/fvx007
13. Eriksen, C. & Hankins, D. L. (2015). Colonisation and fire: Gendered dimensions of Indigenous fire knowledge retention and revival. In A. Coles, L. Gray & J. Momsen (Eds.), The Routledge Handbook of Gender and Development (pp.129-137). New York, Unitated States: Routledge.

Lived Experiences

The Lytton Creek Fire in Lytton, British Columbia, Canada (June 2021)

Camchin, also known as the Village of Lytton is located at the confluence of the Fraser River and the Thompson River and is home to the Lytton First Nation. Camchin, meaning the river meeting, is a place where over 250 residents once called home before the wildfire swept through the valley on the last day of the month in June 2021. The day before, the highest temperature ever recorded in Canada, at 49.6 °C sparked concern for local inhabitants.[1]

Following this record setting day and 71km/h winds that pushed the fire north into the community of Lytton, it quickly burned down the village. On top of this tremendous disaster, residents were given a mere "15 minutes to gather their belongings and evacuate the town", fleeing in all directions to find a safe place for the night and coming days.[2] It is important to note that "First Nations account for 40 per cent of evacuations in Canada, yet make up only four per cent of Canada's overall population" and this highlights the systemic inequalities in this country–a place where environmental racism is present in the height of the climate crisis.[3]

Members of the community are still struggling to get back on their feet after this blaze tore through their town. 90% of structures were burnt down, leaving little for people to call this place their home.[4] Five months later, the provincial government decided to allocate $1

1. List of extreme temperatures in Canada. (2021, December 3). In Wikipedia. https://en.wikipedia.org/wiki/List_of_extreme_temperatures_in_Canada
2. Romer, A. (2021, July 8). On the ground with Lytton wildfire evacuees. https://thenarwhal.ca/lytton-bc-wildfire-evacuees/
3. Struzik, E. (2021, July 5). The future of fire in Canada. https://thetyee.ca/Analysis/2021/07/05/The-Fire-Future-In-Canada/
4. Hurst, A. & Kotyk, A. (2021, July 1). Lytton fire: Residents unaccounted for; most of BC village destroyed, officials say. https://bc.ctvnews.ca/lytton-fire-90-per-cent-of-b-c-villagehas-burned-in-devastating-blaze-local-mp-says-1.5493293

million dollars in the shape of a grant that can support the Village of Lytton throughout an economic recovery that can be used towards efforts for operational activities and the local economy.[5] Under this recovery grant, key areas are addressed such as temporary housing, a First Nations account for 40% of evacuations recovery team, and safe return; however, is it enough to address all the ailments that this wildfire has caused for this community? How can they prepare for the next flood, fire, and heat wave?

5. BC Government News. (2021, December 8). Grant to support Lytton's wildfire recovery. https://news.gov.bc.ca/25913

Emergency Response Capacity and Preparedness

> Seeking refuge: The dispatcher spoke with an elderly couple as they called regarding the wildfire that was quickly approaching them. At this point, there was no way in or out to reach this distraught couple, and he kindly recommended that they move quickly to the closest body of water on their property; a small pond – where they should wait for help and for the fire to pass. The call then dropped.

Preparing for wildfire begins long before an evacuation notice goes in place and before one dials 9-1-1. Whose responsibility is it to be prepared for the changing of these landscapes and how does one learn what steps to take to be ready for evacuation?

To set the context, let us keep in mind the ways in which colonization has impacted cultural burning, the changing climate of our home, and where people are choosing to inhabit and build their homes. In the past 10-20 years, we have seen an influx among city dwellers switching their urban lifestyles for forest living, moving further into the Wildland Urban Interface (WUI). The US Forest Service defines the WUI "as a group of homes and other structures with basic infrastructure and service within or adjacent to deferral land that is an at-risk community."[1] With these impacts in mind, there is an increased responsibility for inhabitants, stewards and

1. Ward, A. (Host). (2021, August 10). Fire Ecology (WILDFIRES) with Gavin Jones (No.213) [Audio podcast episode]. In Ologies with Alie Ward. Retrieved from: https://www.alieward.com/ologies/fireecology

community members to prepare for any wildfire event, regardless of whether the risk is minimal or not.

Currently, the responsibility to prepare for wildfire relies heavily on the individual to take action, a micro approach, to educate oneself and ultimately to make a decision in the face of an emergency event, either to stay put or to evacuate. With respect to building capacity and preparing individuals for wildfires, the Government of BC supports individuals by providing before, during and after wildfire resources. Let us take a closer look at the tool that is currently available to residents in BC.

Of the public safety and emergency services offered by the BC Government under emergency management, one of them is Public Preparedness and Recovery. Here resources cover hazards from earthquakes, avalanches, to floods and fire. When it comes to preparing for a wildfire, the public is encouraged to take additional precaution especially if they live in areas that are at a higher risk of a wildfire.[2]

This educational approach is broken into three categories: (1) Get Prepared, (2) Stay Safe, and (3) Recover. This information comes directly from the provincial emergency management department on public preparedness and recovery efforts.[3]

2. Government of British Columbia. (n.d.). Get prepared for a wildfire. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/emergencymanagement/preparedbc/know-your-hazards/wildfires
3. Ibid.

No. 01 — Get Prepared

If you're in an area that is prone to wildfire, or you just want to be proactive, there are a number of activities you can complete to prevent or prepare for a wildfire.

No. 02 — Stay Safe

You can stay safe during a wildfire by knowing your trusted sources of information, understanding evacuation stages, and looking out for your health and safety.

No. 03 — Recover

Returning home after a wildfire can be overwhelming, but if you use caution and take things one-step at a time, it is possible to recover and return your home to normal.

Image from Canva under a Free Media License

More information available at: BC Public Safety and Emergency Services – Get Prepared for a Wildfire

In addition to the information offered by the Provincial Emergency Management Department, it is key to also highlight a program such as FireSmart Canada, which was initiated in 1990 by the Alberta Forest Service. This incredible service is meant to not only improve how stakeholders communicate during wildfire events but also to put programs in place that support homeowners, communities, and neighbourhoods in getting prepared for and managing during **wildfire seasons**.[4]

More efforts should be geared toward understanding these public awareness resources and learning how to apply them in communities in order to minimize the risk and dangers posed by wildfires.

This is supported by the work of Dodd et al. (2018) whereby there was agreement among all those interviewed that "comprehensive adaptation planning to mitigate the impact of future wildfire seasons" is imperative.[5] (p334) Furthermore, "there is a need for community-based adaptation and education initiatives in this context to address the different stages of a prolonged wildfire and smoke event."[6] (p335)

4. FireSmart Canada. (2022). About FireSmart. Available at: https://firesmartcanada.ca/about-firesmart/?doing_wp_cron=1673027879.9937579631805419921875
5. Dodd, W., Scott, P., Howard, C., Scott, C., Rose, C., Cunsolo, A., & Orbinski, J. (2018). Lived experience of a record wildfire season in the Northwest Territories, Canada. Canadian Journal of Public Health 109, p.327-337. doi: https://doi.org/10.17269/s41997-018-0070-5
6. Ibid.

Kettle River Recreation Area– (2018) by Andreas Rutkauskas, All Rights Reserved

The Meso: Municipal & Community Response to the Lytton Wildfire

In the case of the Lytton fire, residents were given only a minute's notice to evacuate the village, offering them limited time to grab their belongings and leave town before the fire engulfed their homes. Community members departed in all directions, fleeing from their homes to seek shelter. Those heading north to the town of Kamloops experienced more than one evacuation, as Kamloops "was under threat of intense lightning storms, which would set the city on fire that same evening."[7]

7. Romer, A. (2021, July 8). On the ground with Lytton wildfire evacuees. https://thenarwhal.ca/lytton-bc-wildfire-evacuees/

In some places, people were met with food, housing and spiritual healing by outside community members supporting the wildfire evacuees. Members of the Siska First Nation in Siska, located 10 kilometres south of the village of Lytton served as a place of welcome. Food, water and basic materials were dropped off for the firefighters.[8] One community member, Tyrell Kenworthy, highlightighted the importance of communication when it comes to responding to these wildfires for her community and province stating that "they need that Indigenous community drive work ethic that we have because we know so many people and we know how to communicate."[9] Kenworthy who is an elected Councillor and emergency response manager for Shxwhá:y Village, shed light on how community must prioritize communication during emergencies: "as First Nations People, we know the importance of their wellbeing and with a lot of people being traumatized from having to leave their homes, we wanted to be here to support all of the families in any way that we can [...]we want to take care of their spirit, take care of their wellbeing — try to heal them a little bit [...] I know that it's a long road to healing, but we're here to uplift them in any way that we can" Kenworthy said.[10]

Keeping Communities Safe

As communities continue to expand in forested areas, it is vital to consider how wildland fire can impact individuals living in high risk areas, given the likelihood

8. Ibid.
9. Ibid.
10. Ibid.

of damage to property and life. Therefore, evacuation plans need to be put in place by various municipalities and firefighting services must have adequate funding from the government to ensure a comprehensive response. Moreover, we are reminded that at the micro level homeowners have the responsibilities to come up with an emergency evacuation plan and to understand the potential danger they may face when living in forested areas. It is also critical to have individuals living in these areas know how to prevent the start and spread of fires, and generally what they can undertake to minimize the risk to their communities and personal properties.[11]

The Macro: Provincial Response to Wildfire Events

At the overarching policy and governmental level, how disastrous events such as wildfires are managed is critical as it can make a substantial difference in whether individuals have the opportunity to overcome the adversities that ensue. Intricate planning of costs and resources are both key aspects that should be accounted for when we consider the growing number of climate change-driven wildfires that we will see in the near future. To highlight this, looking at the recent wildfire season of 2021, we learn that the

11. Natural Resources Canada. (2020). Protecting communities. Retrieved from: https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/wildland-fires-insectsdisturban/ forest-fires/protecting-communities/13153

Government of BC's budget costs for firefighting expenditures was raised to $881 million in September 2021 – this is after the initially allocated budget back in February 2021 of only $136 million. The additional costs that need to be allocated for rebuilding damaged infrastructure and supporting those who have lost homes is important to include, therefore a financial response that is adequately planned is one that ensures better chances of addressing the magnitude of increasing wildfires across the province.[12]

As an illustration, when we talk about costs we need to look no further than the Lytton wildfire of 2021. The Insurance Bureau of Canada (IBC) estimated the Lytton wildfire has led to $78 million in insured damages alone. The IBC underlined that "governments at all levels must do more to prioritize investments that build our resilience and better protect our families and communities."[13] However, we must not forget there is no price one can place on lost life (human and wild) or the co-morbidities that may emerge in the aftermath. We are therefore urged to embrace an interdisciplinary collaborative approach across all agencies, communities and individuals in order to minimize the harms posed by wildfires.

An additionally important aspect that continues to surface in the wildfire literature and governmental responses is that of trust and communication.[14][15] For instance, the Natural Resources of Canada highlighted that "citizen trust in management agencies is a significant factor in gaining public support for management activities such as prescribed burning or thinning forest."[16] Notably, when we consider the wildfire in Lytton that was presented earlier, the BC government was scrutinized for an inadequate response as

12. Lee, M. (2021). Five lessons from BC's horrific wildfire season. Available at: https://www.policynote.ca/horrific-wildfires/
13. Insurance Bureau of Canada (IBC). (2021). Lytton wildfire causes $78 million in insured damage. Available at: http://www.ibc.ca/bc/resources/media-centre/mediareleases/lytton-wildfire-causes-78-million-in-insured-damage
14. Howard, C., Rose C., Dodd, W., Kohle, K., Scott, C., Scott, P., Cunsolo, A., & Orbinski, J. (2020). SOS! Summer of Smoke: A retrospective cohort study examining the cardiorespiratory impacts of a severe and prolonged wildfire season in Canada's high subarctic. BMJ Open 11: e037029. doi: 10.1136/bmjopen-2020-037029
15. Dodd, W., Scott, P., Howard, C., Scott, C., Rose, C., Cunsolo, A., & Orbinski, J. (2018). Lived experience of a record wildfire season in the Northwest Territories, Canada. Canadian Journal of Public Health 109, p.327-337. doi: https://doi.org/10.17269/s41997-018-0070-5
16. Natural Resources of Canada. (2020). Social aspects of wildfire management. Available at: https://www.nrcan.gc.ca/our-natural-resources/forests-forestry/wildland-fires-insectsdisturban/ forest-fires/protecting-communities/social-aspects-wildfire-management/14444

a result of “gaps in protocols” as per the province’s public safety minister. According to First Nations leaders whose community was completely destroyed, the lack of communication with the Nlaka’pamux Nation Tribal Council and the Oregon Jack Creek Band lead to an insufficient evacuation response. It is observed in the media that Chief Matt Pasco, chair of the Nlaka’pamux Nation Tribal Council, mentioned how despite his request for assistance, the emergency authorities’ response was delayed, highlighting how “ it was left to those Indigenous communities to arrange everything themselves without any additional funding to save people, to give them anything they’re needing”. Chief Pasco further added, “This province does not recognize our governance systems, what we bring, and how we can protect our people.”[17] Hence, a key takeaway from the Lytton fire and others that have preceded it is that of the ethical and moral responsibility of governments to recognize Indigenous Peoples as stewards of these lands, in order to ensure better land management and hence more positive outcomes when faced with extreme weather events.

Looking ahead, the BC Government’s 2022 Budget may offer the promise and hope necessary to overcome some of the future climate change-fuelled events that will continue to impact the health and wellbeing of all British Columbians. Efforts will be geared toward (1) strengthening educational programs and partnerships; (2) enhancing community climate resilience; (3) working toward ensuring the protection of species and ecosystems while promoting their resilience; (4) and investing the necessary funds into building an economy and infrastructure which can withstand climate change events.[18]

17. Canadian Broadcasting Company (CBC). (2021). BC admits communications with First Nations during Lytton fire ‘didn’t live up to expectations.’ Available at: https://www.cbc.ca/news/canada/british-columbia/bc-first-nations-communicationsgaps- 1.6089869
18. Government of British Columbia. (2022). Climate preparedness and adaptation strategy. Available at: https://www2.gov.bc.ca/gov/content/environment/climatechange/ adaptation/cpas

Climate Preparedness and Adaption Strategy by Government of British Columbia, All Rights Reserved

Conclusion

As we bring this case study to a close, we prepare ourselves for the start of wildfire season here on the West Coast. This case study is a starting place for students to reflect on the interconnections between our health and our changing climate and to understand how wildfires affect our communities. Moving forward, we hope to see more resources dedicated to supporting community resilience, continued efforts to bring fire back to the landscape through cultural burning and tools that will help communities and cities be prepared in the face fire or smoke. With this resource, students and faculty can begin to understand key stakeholders, actions that need be taken and propose solutions to support the health of people, place and planet.

Aftermath of the Kenow Fire, Waterton Lakes National Park – by Andreas Rutkauskas, All Rights Reserved

CASE STUDY USER GUIDE

Learning Outcomes

In this case study learners will:

- Examine ways in which individuals and communities are impacted by wildfire events.
- Apply problem-based and upstream approaches toward addressing the challenges faced by communities impacted by climate change events, such as those caused by wildfires.
- Present their perspectives on equitable solutions with respect to climate change adaptation efforts using sound, evidence-based rationales.

This case study explores the ways in which wildfire events impact individual health and livelihood from a micro, meso, and macro level. The case study walks the learner through an introduction to how climate change further exacerbates wildfire occurrence, alongside the myriad health impacts that stem from wildfire smoke exposure. Notable importance is given to the need to advocate for Indigenous Sovereignty and traditional ways of knowing around wildfire management. Lastly, through the sharing of a case example from the lived experiences of individuals who fled the 2021 Lytton, British Columbia wildfire, the learner is challenged to consider

upstream approaches to emergency preparedness in the face of foreseeable future calamities.

This case study can be used as part of courses focused on sustainability, public and community health, climate change, forest management, or environmental health. It is hopeful that this case study is adopted into health professional curricula for a deeper awareness on how environmental changes impact human health.

Kettle River Recreation Area (fire occurred in 2015, photographed in 2018) by Andreas Rutkauskas, All Rights Reserved

Learning Activity

Prior to completing this case study assignment, learners should be introduced to the topic of Health Impacts associated with Degraded Air Quality as it relates to Climate Change. Thereafter, they should be instructed to read the accompanying "Understanding Wildfires: A case study."

Additional recommended readings to supplement knowledge include:

- Howard, C., Rose, C., Dodd, W., Kohle, K., Scott, C., Scott, P., Cunsolo, A., & Orbinski, (2021). SOS! Summer of smoke: A retrospective cohort study examining the cardiorespiratory impacts of a severe and prolonged wildfire season in Canada's high subarctic. BMJ Open 11, p.1-10. Available here.
- The Global Climate and Health Alliance. (2021). The limits of livability: The emerging threat of smoke impacts on health from forest fires and climate change. Available here.

Overview of the Assignment

This assignment has two individual components and one group component. It is intended to give learners the optimal opportunity to engage with the content and use their diverse skillset to complete the work. It will allow learners to use their critical thinking and analysis via the written components, while also offering the chance to practice their presentation and interdisciplinary skills through the collaborative group component. Please note the following are suggestions for how you may integrate this into your course.

Students can be divided into groups of 4 – 5 members. Each student will then be assigned any one of the following reflective questions within their teams.

Reflective Questions

1. Why is the protection of forests important? Consider the roles of forests and in what ways these are being disrupted by anthropogenic activities.
2. The BC Government states that "wildfire prevention is everyone's responsibility" – how do you think this applies at the micro level? Consider socio-cultural factors that may influence the public's perception of how to respond to wildfire events.
3. What public health measures should be in place during a wildfire season? Consider how these measures would differ in a rural/remote vs. urban setting.

4. What are some essential post-wildfire supports/tools for impacted individuals/communities? Provide one example of how your selected support/tool can enhance individual health and well-being.
5. Why is it important to ensure Indigenous peoples are involved at all levels of planning when addressing wildfire preparedness? Consider what you have learned about Indigenous sovereignty and how this applies to this context.

Assignments

Part I – Individual Summary

Write up a summary not exceeding 500 words (including in-text citations) that addresses the case study and the question you are assigned. Be sure your summary utilizes at least two recent (within 10 years), peer reviewed (research) articles to support your answer. Post your summary in your designated group discussion forum (virtual platform).

Part II – Individual Reply

In no more than 300 words (including in-text citations), post a reply to 1 other member's write-up in your group discussion forum (virtual platform). Make sure to utilize at least one recent (within 10 years), peer reviewed (research) article to support your response. Your response to your colleague should be comprehensive and it should address relevant aspects of the case study. Through your response to your colleague you should showcase your perspective and support it with relevant evidence from the case study and peer-reviewed literature.

Mount Eneas Wildfire (2017) by Andreas Rutkauskas, All Rights Reserved

Part III – Group presentation

This component may be tailored to the context where learners are situated. As the accompanying case study is on a Canadian example, we recommend either:

- Completing this part of the assignment by focusing on what was learned from the Wildfires in British Columbia example or
- Choosing a climate change and health topic that relates to the context/area of interest that resonates the most with learners. Some topics to consider include: extreme weather events (i.e. floods, tsunamis, hurricanes), heat domes, vector- borne diseases and pandemics, biodiversity loss, food access, climate migration, mental health effects of climate change, sea level rise, etc. Therefore, a global vs. local lens is encouraged as it can enrich the discussions and takeaways provided by the students.

For additional resources, check out these options: PHA Case Studies and the Canadian Climate Institute Case Studies

In the assigned groups, students are encouraged to reflect on what they have learned either from the case study or from any other topic they have selected. A particular emphasis should be placed on the health impacts experienced by individuals who are affected by the respective climate-driven events.

Instructions

As a group students can compile their top three takeaways from either the Wildfires case study or the climate change topic they have selected to present on. These takeaways should support the student group to collate two solutions that they would propose to any community who may be affected by similar climate-driven events in the future. Students should support their solutions with evidence-based rationales.

In the presentation students should be sure to:

- Clearly identify concepts related to the Wildfires case study or to the climate change event/impact selected
- Underline integral relationships among these concepts
- Consider how health equity plays a role in coming up with solutions that are upstream and that account for the social determinants of health
- Consider the kind of challenges that one may encounter when implementing the solutions proposed
- Support work with evidence-based rationales (i.e. peer-reviewed, recent research articles within 10 years)

Aftermath of the Kenow Fire, Waterton Lakes National Park (fire occurred in 2017, photographed in 2018) by Andreas Rutkauskas, All Rights Reserved

Terminology

Adaptation

Adjusting to actual or expected future climate by focusing on the reduction of vulnerability to harmful effects of climate change (such as sea-level rise, extreme weather events, food insecurity).

National Aeronautics and Space Administration (NASA). (2022). *Responding to climate change. Retrieved from: https://climate.nasa.gov/solutions/adaptation-mitigation/*

Fire season

The period(s) of the year during which fires are likely to start, spread, and damage values-at-risk sufficient to warrant organized fire suppression; a period of the year set out and commonly referred to in fire prevention legislation.

Government of British Columbia. (n.d.) Wildfire glossary. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary#W

Fuel

Any organic matter, living or dead, in the ground, on the ground, or in the air that can ignite and burn.

Government of British Columbia. (n.d.) Wildfire glossary. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary#W

Indigenous fire stewardship (IFS)

Use of fire by various Indigenous, Aboriginal, and tribal peoples

to: (1) modify fire regimes, adapting and responding to climate and local environmental conditions to promote desired landscapes, habitats, species, and (2) to increase the abundance of favoured resources to sustain knowledge systems, ceremonial, and substance practices, economies, and livelihoods.

Lake, F. K & Cardinal Christianson, A. (2019). Indigenous fire stewardship. In: Manzello S.(eds) Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires. Springer, Cham. https://doi.org/10.1007/978-3-319-51727-8_225-1

Indigenous sovereignty

An attempt towards claiming autonomy and legitimacy as sovereign authority within the realm of State; it aims to perpetuate notion of cultural and legal pluralism; it is source of Indigenous Peoples' right to self-determination.

Shrinkal, R. (2021). "Indigenous sovereignty" and right to self-determination in international law: A critical appraisal. AlterNative 17(1), p.71-82. https://journals.sagepub.com/doi/abs/10.1177/1177180121994681

Mitigation

Undertaking all efforts to reduce and prevent greenhouse gas emissions into the atmosphere, by reducing sources of these gases or creating alternative storage for these gases; main goal focuses on avoiding significant human interference with the climate system.

National Aeronautics and Space Administration (NASA). (2022). Responding to climate change. Retrieved from: https://climate.nasa.gov/solutions/adaptation-mitigation/

Notable wildfires

Wildfires that were highly visible, and, in some cases, posed a threat to public safety.

Government of British Columbia. (n.d.). Wildfire Season Summary. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/wildfire-season-summary

Prescribed fire

The knowledgeable and controlled application of fire to a specific area to accomplish planned resource management objectives. These fires are managed in such a way as to minimize the emission of smoke and maximize the benefits to the site.

Government of British Columbia. (n.d.) Wildfire glossary. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary#P

Volatile organic compounds (VOCs)

Along with nitrogen oxides, precursor compounds of ozone, a major component of smog.

Luber, G. & Lemery, J. (2015). Global Climate Change and Human Health: From Science to Practice. John Wiley & Sons, San Francisco, CA.

Wildfire

An unplanned fire – including unauthorized human-caused fires – occurring on forest or range lands, burning forest vegetation, grass, brush, scrub, peat lands, or a prescribed fire set under regulation which spreads beyond the area authorized for burning.

Government of British Columbia. (n.d.) Wildfire glossary. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary#W

Wildland

An area in which development is essentially non-existent, except for roads, railroads, power lines, and similar transportation facilities. Structures, if any, are widely scattered.

Government of British Columbia. (n.d.) Wildfire glossary. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary#W

Wildland urban interface (WUI)

Any area where combustible forest fuel is found adjacent to homes, farm structures or other outbuildings. This may occur at the interface, where development and forest fuel (vegetation) meet at a well-defined boundary, or in the intermix, where development and forest fuel intermingle with no clearly defined boundary.

Government of British Columbia. (n.d.) Wildfire glossary. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/glossary#F

Versioning History

We are always seeking to improve our open textbooks. For any queries about the use of this guide, please don't hesitate to connect with its developer, Raluca Radu by email at: *raluca.radu@alumni.ubc.ca*

This page lists major changes to this book with major changes marked with a 1.0 increase in the version number and minor changes marked with a 0.1 increase.

Version	Date	Change
1.0	January 2023	Pressbook Created