

A system analysis of the economic, environmental and socio-cultural impacts of wildfires

Joanne Nellas Devan Parmar Michael Simoes Vanessa Sun

SFU

EXPERT INTERVIEWS

We have been approved by the SFU Ethics Board. Refer to Appendix.

- Burch, Gerry (Retired Vice President of Forestry, B.C. Forest Products Ltd.). Interviewed by Devan Parmar, March 24, 2019.
- Lafarge Employees in Edmonton. Interviewed by Devan Parmar, March 15, 2019.
- McMartin, Jim (Retired from BC Forest Products). Interviewed by Devan Parmar, March 16, 2019.
- Stacey, Jocelyn (Assistant Professor, Peter A. Allard School of Law, University of British Columbia). Interviewed by Vanessa Sun at University of British Columbia, March 29, 2019
- Interviewee 0001. Ministry of FLNRORD representative. Interviewed by Vanessa Sun, March 15, 2019.
- Interviewee 0002. Volunteer with St. John Ambulance. Interviewed by Vanessa Sun, March 8, 2019.
- Interviewee 0003. Land and Resource Coordinator for Ministry of FLNRORD. Interviewed by Vanessa Sun, March 14, 2019.
- Interviewee 0004. Volunteer with Emergency Social Services. Interviewed by Vanessa Sun, March 15, 2019.
- Interviewee 0005. General Manager of Forestry for the Council of Forestry Industry. Interviewed by Joanne Nellas, March 26, 2019.
- Interviewee 0006. First Nations Emergency Social Services. Interviewed by Joanne Nellas, March 21, 2019.
- Interviewee 0007. Integrated Resource Operations Division BC Wildfire Service & FLNRORD. Interviewed by Vanessa Sun, March 17, 2019.
- Interviewee 0008. Communications Director. Association of BC Forest Professionals. Interviewed by Devan Parmar, March 15, 2019.
- Interviewee 0009. Export Market Sales. Weyerhaeuser. Interviewed by Joanne Nellas, March 12, 2019.
- Interviewee 0010. Community member of Prince George. Interviewed by Vanessa Sun, March 6, 2019.
- Interviewee 0011. Municipal New Westminster Fire Department. Interviewed by Michael Simoes, March 11, 2019.
- Interviewee 0012. BC FireSmart. Interviewed by Devan Parmar, March 11, 2019.
- Interviewee 0013. Penticton Fire Department. Interviewed by Michael Simoes, March 11, 2019.

EXPERT INTERVIEWS

Interviewee 0014. Restaurant Owner in Fort McMurray. Interviewed by Devan Parmar, March 28, 2019.

Interviewee 0015. Emergency Management BC (Prince George). Interviewed by Michael Simoes, March 4, 2019.

Interviewee 0016. Forest Professional, Forestry Ltd. Interviewed by Devan Parmar, March 25, 2019.

Interviewee 0017. Office of the Fire Commissioner. Interviewed by Michael Simoes, March 13, 2019.

Interviewee 0018. BC Wildfires. Interviewed by Michael Simoes, March 17, 2019.

Interviewee 0019. Community member in Penticton. Interviewed by Devan Parmar, March 12, 2019.

Nellas, Joanne, Devan Parmar, Michael Simoes, Vanessa Sun. *How do you feel about Wildfires?* March 30, 2019. Distributed by Survey Monkey. https://www.surveymonkey.com/r/HHSJJSW.

- Alam, Hina. "Inhaling wildfire smoke potentially equal to smoking a few packs of cigarettes a day: researcher." *CTV News*, Published February 6, 2019. https://bc.ctvnews.ca/inhaling-wildfire-smoke-potentially-equal-to-smoking-a-few-packs-of-cigarettes-a-day-researcher-1.4285032.
- Anguiano, Dani. "Rebuilding Paradise: California town devastated by fire looks to future." *The Guardian*. Published November 18, 2018. https://www.theguardian.com/us-news/2018/nov/18/rebuilding-paradise-california-town-devastated-by-fire-looks-to-future.
- Azpiri, Jon. "2018 wildfire season now the worst on record for hectares burned." *Global News*. Published August 29, 2018. https://globalnews.ca/news/4417276/2018-wildfire-season-worst-record-hectares-burned/.
- Boynton, Sean. "It's way too early': Officials, residents scramble as B.C. wildfires spread sooner than expected." *Global News*, Published May 12, 2019. https://globalnews.ca/news/5269194/bc-wildfires-early-start/.
- Brend, Yvette. "Forget Smokey the Bear: How First Nation fire wisdom is key to megafire prevention." *CBC News*, Published July 15, 2017. https://www.cbc.ca/news/canada/british-columbia/fire-fighting-first-nations-firekeepers-annie-kruger-penticton-bc-wildfire-mega-fire-1.4205506.
- Brown, Liz. "How B.C.'s wildfires are impacting transportation lines." *KelownaNow*, Published July 13, 2017._
 https://www.kelownanow.com/watercooler/news/news/Provincial/How_B_C_s_wildfires_are_impacting the transporting of goods and services/#fs 73487.
- Cain, Patrick. "Unusable' radios plagued troops fighting 2017 B.C. wildfires." *Global News*, Published August 8, 2018. https://globalnews.ca/news/4364688/bc-wildfire-2017-radios-military/?fbclid=IwAR1c7s_LjihhmFrqvkwEwYkRSXSkWoCz97jLJQ0D-RetSH36q_CJ-1bBSFo.
- CBC News. "Tahltan First Nation faces many more months away from home after wildfire devastation." *CBC News*, Published September 28, 2018. https://www.cbc.ca/news/canada/british-columbia/tahltan-first-nation-wildfire-1.484255.
- Climate Atlas of Canada, "Forest Fires and Climate Change," *Climate Atlas of Canada*, (Accessed April 20, 2019). https://climateatlas.ca/forest-fires-and-climate-change.
- Crawford, Tiffany. "B.C. Wildfires 2018: Provincial state of emergency ends, some campfire bans lifted." *Vancouver Sun*, Published September 7, 2018. https://vancouversun.com/news/local-news/b-c-wildfires-2018-government-ends-provincial-state-of-emergency.
- CTV News. "B.C. wildfires top Environment Canada list of 2018 weather events." *CTV News*, Published December 27, 2018. https://bc.ctvnews.ca/b-c-wildfires-top-environment-canada-list-of-2018-weather-events-1.4233087.

- CTV News. "British Columbia wildfire season now second worst in province's history." *CTV News*, Published August 26, 2018. https://www.ctvnews.ca/canada/british-columbia-wildfire-season-now-second-worst-in-province-s-history-1.4068551.
- Daniels, Lori Robert Gray and David Bowman, "We created BC's wildfire problem and we can fix it." *The Globe and Mail*, Published July 13, 2018. https://www.theglobeandmail.com/opinion/we-created-bcs-wildfire-problem-and-we-can-fix-it/article35686104/.
- DH Vancouver Staff. "Breathing Vancouver air right now equal to smoking more than 7 cigarettes." *Daily Hive Vancouver*, August 22, 2017. https://dailyhive.com/vancouver/wildfire-smoke-app-cigarettes-vancouver-air-quality.
- Doerr, H. Stefan, and Dr. Cristina Santin. "Why wildfires are breaking out in the 'wrong' countries." *BBC News*, Published July 31, 2018. https://www.bbc.com/news/world-44941999.
- Ferreras, Jesse. "BC wildfire smoke isn't just floating across Canada." *Global News*, Published August 25, 2018. https://globalnews.ca/news/4406758/bc-wildfire-smoke-canada-ireland/.
- Gerster, Jane. "Forest Fires Forest Management." *Global News*, Published August 26, 2018. https://globalnews.ca/news/4406900/forest-fires-forest-management/.
- Henning, Clare. "Stressed and tired? It may be lingering mental health impacts from 2017 wildfires." *CBC News*, Published July 28, 2018. https://www.cbc.ca/news/canada/british-columbia/wildfires-2017-mental-health-impacts-1.4764269.
- Irfan, Umair. "California has 149 million dead trees ready to ignite like a matchbook." *Vox News*, Published February 15, 2019. https://www.vox.com/2019/2/13/18221822/california-149-million-dead-trees-wildfire.
- Kane, Laura. "Disjointed' communication hinders B.C. First Nations in wildfire light, leaders say." *CBC News*, Published August 19, 2018. https://www.cbc.ca/news/canada/british-columbia/bc-first-nations-wildfires-1.4790962.
- Kane, Laura. "225 Canadian Armed Forces members headed to B.C." *Global News*, Published July 20, 2017. https://globalnews.ca/news/3613115/225-canadian-armed-forces-members-headed-to-b-c/?fbclid=IwAR3XXFS-yMTGVAB19Hj6gmk79PZxaE9n3r7XTBjU_5en2PpzFvI-hcMtXDY.
- Kane, Laura. "B.C. First Nations carry huge debts after fighting to save homes from wildfires." *CBC News*, Published November 28, 2018. https://www.cbc.ca/news/canada/british-columbia/b-c-first-nations-carry-huge-debts-after-fighting-to-save-homes-from-wildfires-1.4923807.
- Karstens-Smith, Gemma. "B.C. wildfires have destroyed 300-plus buildings." *Vancouver Sun*, Published August 1, 2017. https://vancouversun.com/news/local-news/b-c-wildfires-have-destroyed-300-plus-buildings.

- Khalip, Andrei. "At peak of European heatwave, Portugal battles wildfire, power outage." Reuters, August
 - 4, 2018. https://www.reuters.com/article/us-europe-weather/at-peak-of-european-heatwave-portugal-battles-wildfire-power-outage-idUSKBN1KP0CT.
- Lindsay, Bethany. "2018 now worst fire season on record as BC extends state of emergency." *CBC News*, Published August 29, 2018, https://www.cbc.ca/news/canada/british-columbia/state-emergency-bc-wildfires-1.4803546.
- Lindsay, Bethany. "The future looks grim after 2 years of devastating B.C. Wildfires." CBC News, Published August 28, 2019. https://www.cbc.ca/news/canada/british-columbia/the-future-looks-grim-after-2-years-of-devastating-b-c-wildfires-1.4801181.
- Lovgreen, Tina. "It was just one whole ugly year" *CBC News*, Published August 26, 2018. https://newsinteractives.cbc.ca/longform/it-was-just-one-whole-ugly-year.
- Markusoff, Jason. "Why Fort McMurray residents were the real heroes of the fire crisis." *Macleans*, Published June 9, 2017 .https://www.macleans.ca/news/why-fort-mcmurray-residents-not-authorities-were-the-real-heroes-of-the-fire-crisis/.
- National Geographic. "Climate 101: Wildfires." *National Geographic*, (Accessed April 20, 2019). https://www.nationalgeographic.com/environment/natural-disasters/wildfires/.
- Noack, Rick. "Why Finland is so good at handling forest fires. Hint: It's not because of raking." *The Washington Post*, November 19, 2018. https://www.washingtonpost.com/world/2018/11/19/why-finland-is-so-good-handling-forest-fires-hint-its-not-because-raking/?utm_term=.bd17607eab79.
- O'Brien, Kristy and Neda Vanovac, "Arnhem Land rangers blending traditional and high-tech methods to earn carbon credits." *ABC News*, Published September 09, 2017. https://www.abc.net.au/news/2017-09-10/aboriginal-rangers-using-fire-to-create-carbon-credits/8742550.
- Plumer, Brad. "There's a better way to tame large forest fires. So why don't we do it?" *Vox News*, Published September 17, 2015. https://www.vox.com/2015/9/17/9347361/wildfire-management-prescribed-burn.
- Schmunk, Rihanna. "We're not leaving': Tempers flare between First Nations, RCMP amid wildfire evacuation order." *CBC News*, Published July 11, 2017. https://www.cbc.ca/news/canada/british-columbia/refuse-to-leave-evacuation-order-bc-wildfires-1.4200279.
- Sudbury. "Recent forest fire season unlike any Ontario has seen in a decade: MNRF." *CBC News*, December 27, 2018. https://www.cbc.ca/news/canada/sudbury/cost-2018-fire-season-mnrf-1.4959274.
- Shield, Charli and Ruby Russell. "Climate change sets the world on fire." *DW*, Published August 24, 2018. https://www.dw.com/en/climate-change-sets-the-world-on-fire/a-40152365.

- Smith, Alistair and Crystal Kolden. "How to survive a wildfire: let's copy tactics from nature." *The Guardian*, Published November 14, 2018. https://www.theguardian.com/environment/2018/nov/14/wildfire-survival-california-nature-trees.
- Sullivan, Zoe. "Record Amazon fires, intensified by forest degradation, burn indigenous lands." *Mongabay News*, Published January 18, 2018. https://news.mongabay.com/2018/01/record-amazon-fires-intensified-by-forest-degradation-burn-indigenous-lands/.
- Taylor-Coleman, Jasmine. "Wildfires around the world: The photos that explain the flames." *BBC News*, July 25, 2018. https://www.bbc.com/news/world-44943143.
- The Globe and Mail. "Communities still recovering one year after worst wildfire season on record in B.C." *The Globe and Mail*, Published July 8, 2018. https://www.theglobeandmail.com/canada/british-columbia/article-communities-still-recovering-one-year-after-worst-wildfire-season-on/.
- Thom, Shelby. "More money in BC budget for wildfire response as natural disaster costs soar." *Global News*, Published February 20, 2019. https://globalnews.ca/news/4981568/bc-budget-wildfire-costs/.
- Vaughan, Adam. "The UK has already had more wildfires in 2019 than any year on record." *NewScientist*, Published April 23, 2019. https://www.newscientist.com/article/2200502-the-uk-has-already-had-more-wildfires-in-2019-than-any-year-on-record/.
- Yeung, Lien. "How firefighters battling BC's wildfires equip against flames and fatigue." *CBC New*, Published July 19, 2017. https://www.cbc.ca/news/canada/british-columbia/how-firefighters-battling-b-c-s-wildfires-equip-against-flames-and-fatigue-1.4213056.

ACADEMIC LITERATURE

- Association of BC Forest Professionals and desLibris Documents. "Forest Fires in British Columbia: How Policies and Practices Lead to Increased Risk." *Association of BC Forest Professionals*, 2005.
- British Columbia Forest Association. "Community Forest Indicators 2018: Measuring the Benefits of Community Forestry." *British Columbia Community Forest Association*, September 2018.
- Burch, W. Gerald. "Still Counting the Rings: W.G. Burch: An Autobiography." Vancouver: W.G. Burch, 2006.
- B.J. Stocks Wildfire Investigations Ltd. "Evaluating Past, Current and Future Forest Fire Load Trends in Canada." *B.J. Stocks Wildfire Investigations Ltd.*, January, 2013. https://www.ccfm.org/pdf/2%20Fire%20Load%20Trends.pdf.
- Camp, Philip E. and Meg A. Krawchuk. "Spatially Varying Constraints of Human-Caused Fire Occurrence in British Columbia, Canada." *International Journal of Wildland Fire* 26, no. 3 (2017): 219.
- Edward A. Keller, Duane E. DeVecchio and Jon J. Clague, "Natural Hazards: Earth's Processes as Hazards, Disasters and Catastrophes." *Third Canadian Edition, New York: Taylor and Francis*, 2014, 446-450.
- Emily S. Hope, Daniel W. McKenney, John H. Pedlar, Brian J. Stocks, and Sylvie Gauthier. "Wildfire Suppression Costs for Canada Under a Changing Climate." *Plos One* 11, no. 8 (2016): e0157425_https://doi.org/10.1371/journal.pone.0157425
- Hoberg, George and Leah Malkinson. "Challenges in the Design of Performance-Based Forestry Regulations: Lessons from British Columbia." *Forest Policy and Economics* 26, (2013): 54-62.
- Hoberg, George, Detmar Schwichtenberg. "Getting More Benefits from BC Forest Lands: The Intensive Zoning Option." *British Columbia Government EBook Collection and British Columbia. Ministry of Forests*. Victoria: British Columbia, Ministry of Forests, 1999.
- ---. Hoberg, George. Leap of Faith: Overcoming Political Obstacles to Climate Action. 2012.
- Lindenmayer, David B. Malcolm L. Hunter, Philip J. Burton, and Philip Gibbons. "Effects of logging on fire regimes in moist forests." *Conservation Letters* 2 (2009), 271–277. doi:10.1111/j.1755-263X.2009.00080.x
- Lui, Y., John Stanturf, & Scott Goodrick. "Trends in global wildfire potential in a changing climate." *Elsevier*, September 1, 2019. https://www.srs.fs.fed.us/pubs/ja/2010/ja 2010 liu 001.pdf.
- Peterson St-Laurent, Guillaume, Shannon Hagerman, Robert Kozak, and George Hoberg. "Public Perceptions about Climate Change Mitigation in British Columbia's Forest Sector." *PloS One* 13, no. 4 (2018): e0195999.

ACADEMIC LITERATURE

- Pew, K. L. and C. P. S. Larsen. "GIS Analysis of Spatial and Temporal Patterns of Human-Caused Wildfires in the Temperate Rainforest of Vancouver Island, Canada." *Forest Ecology and Management* 140, no. 1 (2001): 1-18.
- Stone, Carter and Andrew Hudak and Penelope Morgan. "Forest Harvest Can Increase Subsequent Forest Fire Severity." *Proceedings of the Second International Symposium on Fire Economics, Planning, and Policy: A Global View.* (2004), 531.
- The University of Lethbridge. "The McLure Fire 2003." UoL, The Faculty of Health Science, August 2010.
- Thompson, Jonathan R., Thomas A. Spies, and Lisa M. Ganio. "Reburn Severity in Managed and Unmanaged Vegetation in a Large Wildfire." *Proceedings of the National Academy of Sciences of the United States of America* 104, no. 25 (2007): 10743-10748.

GOVERNMENT & NGO DOCUMENTS&REPORTS

- British Columbia Government. "Provincial state of emergency ended for B.C." *BCG*, September 7, 2018. https://news.gov.bc.ca/releases/2018PSSG0067-001719.
- Canadian Mental Health Association. "Talk in Tough Times." *CMHA*, May 24, 2018. <u>https://cmha.bc.ca/programs-services/talk-in-tough-times/</u>.
- Center for Climate and Energy Solutions. "Wildfire and Climate Change." *Center for Climate and Energy Solutions*, (Accessed April 17, 2019). https://www.c2es.org/content/wildfires-and-climate-change/.
- Cohen, S., Bush, E., Zhang, X., Gillett, N., Bonsal, B., Derksen, C., Flato, G., Greenan, B., Watson, E. "Synthesis of Findings for Canada's Regions" *Chapter 8 in Canada's Changing Climate Report, (eds.) E. Bush and D.S. Lemmen; Government of Canada, Ottawa, Ontario,* (2019)p. 424-443. https://changingclimate.ca/CCCR2019/chapter/8-0/.
- FireSmart. "FireSmart Communities: British Columbia." *Firesmart*,(Accessed February 28, 2019_https://www.firesmartcanada.ca/firesmart-communities/british-columbia/.
- Forest Steward Guild. "Increasing Wildfire Awareness and Reducing Human-Caused Ignitions in Northern New Mexico." *Forest Steward Guild*, March, 2018. http://www.forestguild.org/publications/research/2018/Wildfire_awareness_2018.pdf.
- George Abbott and Chief Maureen Chapman. "Addressing the New Normal: 21st Century Disaster Management in British Columbia." Government of British Columbia, April 30, 2018._
 https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/bc-flood-and-wildfire-review-addressing-the-new-normal-21st-century-disaster-management-in-bc-web.pdf.
- Government of BC. "BC Wildfire Service." *Government of BC*, (Accessed March 11, 2019)_ https://www2.gov.bc.ca/gov/content/safety/wildfire-status.
- ---. "About the BC Wildfire Service." *Government of B.C.*, (Accessed March 11, 2019)_ https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws.
- ---. "Employment." *Government of B.C.*, (Accessed March 11, 2019)_ https://www2.gov.bc.ca/gov/content/safety/wildfire-status/employment-and-contracts/employment.
- ---. "Governance" *Government of B.C.*, (Accessed March 11, 2019). https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/governance.
- ---. "Prescribed Burning." *Government of B.C.*, (Accessed March 11, 2019). https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/prescribed-burning.
- ---. "Response." *Government of B.C.,* (Accessed March 13, 2019). https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response.

GOVERNMENT & NGO DOCUMENTS & REPORTS

- ---. "Statistics & Geospatial Data." *Government of B.C.,* (Accessed March 11, 2019)._ https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-statistics.
- ---. "Wildfire Prevention." *Government of B.C.*, (Accessed March 11, 2019)_ https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention.
- ---. "Wildfire Season Summary." *Government of B.C.*, (Accessed February 25, 2019). https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history.
- Government of BC. Emergency Management BC. "Emergency Social Services" *Government of B.C., EMBC,* (Accessed February 26, 2019) https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/volunteers/emergency-social-services.
- Government of BC. "Budget and Fiscal Plan." *Government of B.C.*, February 16, 2016. https://bcbudget.gov.bc.ca/2016/bfp/2016 budget_and_fiscal_plan.pdf.
- Government of BC. Environmental Reporting BC. "Trends in B.C.'s Population & Size Distribution." *Government of BC*, March 2018. http://www.env.gov.bc.ca/soe/indicators/sustainability/bc-population.html.
- Government of BC. Emergency Management BC. "Emergency Social Services" *Government of B.C., EMBC,* (Accessed February 26, 2019) https://www2.gov.bc.ca/gov/content/safety/emergency-preparedness-response-recovery/volunteers/emergency-social-services.
- Government of BC. Emergency Management British Columbia and Ministry of Forests, Land, Natural Resource Operations and Rural Development. "Government's Action Plan: Responding to wildfire and flood risks." *Government of B.C., EMBC, FLNRORD,* October 31, 2018. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/action_plan.pdf.
- Government of BC. Forestry Analysis and Inventory Branch Office of the Chief Forester British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development. "Impacts of 2017 Fires on Timber Supply in the Cariboo Region." *Government of B.C., FLNRORD*, February, 2018. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/action_plan.pdf.
- Government of BC. Major Historical Wildfires. "Wildfire History." *Government of B.C.* (Accessed March 01, 2019) https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-history/major-historical-wildfires.
- Government of BC. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. "Government to review recommendations on 2017 floods, wildfires." *Government of B.C.*, *FLNRORD*, May 10, 2018. https://news.gov.bc.ca/releases/2018FLNR0114-000880.

GOVERNMENT & NGO DOCUMENTS & REPORTS

- Government of BC. Ministry of Forests, Lands, Natural Resource Operations and Rural Development. "Provincial Strategic Threat Analysis: 2017 Update." *Government of B.C., FLNRORD,* (Assessed March 07, 2019).
 - http://www.llbc.leg.bc.ca/public/pubdocs/bcdocs2018_2/688580/provincial_strategic_threat_analysis_2017_update.pdf.
- Government of Canada. "Changes in Temperature." *GOC*, (Accessed April 16, 2019)_ https://www.canada.ca/en/environment-climate-change/services/climate-change/canadian-centre-climate-services/basics/trends-projections/changes-temperature.html.
- Government of Canada. "Helping small businesses get loans." *GOC*, (Accessed March 04, 2019). http://www.ic.gc.ca/eic/site/csbfp-pfpec.nsf/eng/h_la02855.html.
- Government of Canada. "Indicator: Forest Fires." *GOC*, (Accessed April 20, 2019)_ https://www.nrcan.gc.ca/forests/report/disturbance/16392.
- Global Forest Watch Fires. "Fire Report for All." *Global Forest Watch Fires*, May 12, 2019. https://fires.globalforestwatch.org/report/index.html#aoitype=ALL&reporttype=globalcountryreport&dates=fYear-2018!fMonth-8!fDay-1!tYear-2019!tMonth-5!tDay-12.
- Insurance Bureau Canada. "British Columbia wildfires cause more than \$127 million in insured damage." *Insurance Bureau Canada*, September 27, 2017. http://www.ibc.ca/bc/resources/media-centre/media-releases/british-columbia-wildfires-cause-more-than-127-million-in-insured-damage.
- Insurance Information Institute. "Facts + Statistics: Wildfires." IIT, (Accessed April 20, 2019). https://www.iii.org/fact-statistic/facts-statistics-wildfires.
- Nasa Earth Observatory. "How much more would will Earth Warm?" *Nasa Earth Observatory*. June 3, 2010. https://earthobservatory.nasa.gov/features/GlobalWarming/page5.php.
- Nasa Earth Observatory. "World of Change: Global Temperatures." *Nasa Earth Observatory*, (Accessed April 17, 2019). https://earthobservatory.nasa.gov/world-of-change/DecadalTemp.
- National Aeronautics and Space Administration, *Fire Information for Resource Management System* [map]. Scale not given. NASA, Retrieved May 13, 2019 https://firms.modaps.eosdis.nasa.gov/map/#z:6;c:-4.3,54.1;t:adv-points;d:2014-02-01..2014-02-28;l:dark_gray,firms_viirs.
- Small Business BC. "BC Wildfire Resources For Small Business." *Small Business BC*, August 22, 2017. https://smallbusinessbc.ca/article/bc-wildfire-resources-for-small-business/#Q2.

GOVERNMENT & NGO DOCUMENTS & REPORTS

Union of B.C. Municipalities. "Community Wildfire Protection Plan & CWPP Update Program."

Strategic Wildfire Prevention Initiative: UNBC, FNES, January 2018. https://www.ubcm.ca/assets/Funding~Programs/LGPS/SWPI/Applications2017/swpi-2017-update-cwpp-program-guide.pdf.

Zhang, X., Flato, G., Kirchmeier-Young, M., Vincent, L., Wan, H., Wang, X., Rong, R., Fyfe, J.,

Li, G., Kharin, V.V. "Changes in Temperature and Precipitation Across Canada." Chapter 4 in Bush, E. and Lemmen, D.S. (Eds.) Canada's Changing Climate Report. Government of Canada, Ottawa, Ontario, (2019). pp 112-193. https://changingclimate.ca/CCCR2019/chapter/4-0/.

DESIGN

Brend, Y. "Forget Smokey the Bear: How First Nation fire wisdom is key to megafire prevention." *CBC News*, 2017. https://www.cbc.ca/news/canada/british-columbia/fire-fighting-first-nations-firekeepers-annie-kruger-penticton-bc-wildfire-mega-fire-1.4205506.

Fireweb. "FireSmart in nine easy steps." *Gabriola Volunteer Fire Department*, 2015 http://gabriolafire.ca/2015/07/firesmart-nine-steps/.

Pexels. Pexels, 2019. https://www.pexels.com/.

- ---. "Forest on Fire." *Pexels*, February 25, 2019. https://www.pexels.com/photo/forest-fire-smoke-burning-51951/.
- ---. "Forest with Sunlight." *Pexels*, August 28 2015." https://www.pexels.com/photo/forest-with-sunlight-158251/.
- ---. "Silhouette of Bare Trees Surrounded Fire at Daytime." *Pexels*, February 22, 2019. https://www.pexels.com/photo/forest-tree-fire-hot-50700/.

Porter K. "PG&E Is Cleared in Deadly Tubbs Fire of 2017." *New York Times*, 2019. https://www.nytimes.com/2019/01/24/business/energy-environment/pge-tubbs-fire.html.

Noun Project. Noun Project, 2015. https://thenounproject.com/search/?q=wildfires.

Vecteezy. "Abstract Forest Landscape." *Vecteezy*, 2019. <a href="https://www.vecteezy.com/vector-art/181748-abstract-forest-landscape." *Vecteezy*, 2019. <a href="https://www.vecteezy.com/vector-art/181748-abstract-forest-for

APPENDIX

ETHICS BOARD APPROVAL

PANEL ON RESEARCH ETHICS Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Joanne Nellas

has completed the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans Course on Research Ethics (TCPS 2: CORE)

Date of Issue:

26 February, 2019