

# A CHANGING CLIMATE

SPECIAL EDITION  
COMMUNITY TRENDS REPORT 2017

Prepared by the City of Kelowna



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# INTRODUCTION

Kelowna is not immune from the impacts of global climate change. At the same time that Kelowna takes steps to reduce greenhouse gases by encouraging more sustainable forms of transportation and promoting a larger urban forest through programs like Neighbourwoods, there is a need to prepare or adapt to the changing climate. While climate change trends at a global level may dominate the news, Kelowna residents will feel very local impacts.

Given the extreme weather events of 2017 this year's Special Edition of the Community Trends report examines the effects of climate change on Kelowna, and looks ahead to what we might expect in the future. The report provides community groups, local businesses and residents a glimpse of what they should expect as our region experiences the impacts of climate change now and in the future.

Kelowna will continue to be one of the most desirable places to live work and play. But, changes in climate will create a new normal in terms of how the city builds infrastructure, plans development, manages resources and prepares for extreme events. Not every year is expected to result in new record temperatures, but the broader trends will make the region hotter and drier and more likely to experience major rain events.

In 2017 Kelowna experienced several major weather events similar to those we expect to occur more regularly in a future influenced by climate change.\* By understanding how climate change is impacting our community, it is possible to understand how the City and community should respond to this emerging issue to complement the city's efforts on Climate Action.

\*Note: Due to the complexity of the weather system, it is very difficult to prove causality for any one specific weather event.

Wherever possible, the information provided in this document refers to the city of Kelowna. Some data, however, is only available for the Kelowna Census Metropolitan Area (CMA), which includes the entire Central Okanagan Regional District from Peachland to Lake Country.

# EXECUTIVE SUMMARY

In Kelowna, 2017 is a year defined by extremes: a community in the midst of an economic boom, and a community challenged by extreme weather events that are expected to become more regular.

## Booming economy

Our population is growing rapidly – estimated at 129,500 – with over 12,000 new residents in the past six years alone. Our economy is thriving, with significant job creation fueled by the tech and housing sectors, a low unemployment rate of 5.2%, and increasing incomes (18% increase over 2011). The city's appeal is broadening its reach and attracting more and more young families from the Lower Mainland. Our educational institutions are continuing to grow and to invest with more students choosing to stay in the Okanagan after graduation. At the same time our airport is busier than ever, with 1.73 million passengers in 2016.

## Summer of extremes

Despite a banner year for many sectors, the spring and summer of 2017 were largely defined by extreme weather events and our community's responses to them. Starting with a wet spring that led to exceptional volumes of water entering Lake Okanagan, Kelowna was faced with serious flooding. And while the lake level was still elevated and the cleanup effort was underway, the drought began in many parts of the province, setting up ideal conditions for forest fires. The Emergency Operations Centre finally closed its doors in September, marking its longest continuous operation.

Through the four lenses of Our Environment, Our People/Health, Our Economy and Our Infrastructure, this year's Community Trends Report looks at these extreme weather events, using the best available information, to help us understand what we can expect in the years to come and what we might be able to do to prepare.

The impacts – both positive and negative – could be far-reaching, from changing what crops to grow and to challenging the capacity of our infrastructure to deal with spring storm events.

The City is already taking positive action, protecting green infrastructure like our valuable agricultural lands and watercourses, and undertaking wildfire mitigation work in our interface areas.

## Taking Action

Looking ahead, further action is needed in a few key areas:

- Develop a Community Climate Adaptation Strategy
- Update the 2040 Official Community Plan and 20 Year Servicing Plan from a resiliency lens and have a responsive growth strategy, that helps the City adapt to new realities
- Look for opportunities to create more green infrastructure
- Examine infrastructure design and enforcement standards and enforcement (e.g.: 1 in 200-year flood standards) to see if they need to be updated
- Ensure a sustainable and dynamic emergency response model remains in place

2017 POPULATION 129,500



MEDIAN HOUSEHOLD INCOME



**\$68,627** Up \$6,000 from 2014

AIRPORT



Up 9.0%

UNEMPLOYMENT RATE >>> 5.2%

HOUSING

2016  
VACANCY  
RATE  
0.6%



MEDIAN SINGLE  
DETACHED HOUSE PRICE

**\$580,000**

MEDIAN STRATA  
CONDO PRICE

**\$270,000**



**\$537 MILLION**

Value in 2016 of  
Building Permits



MAY INFLOW TO LAKE WAS 229% ABOVE AVERAGE

3200 CITIZENS IMPACTED BY FLOOD EVENT IN 2017



ZERO RAIN IN JULY/AUGUST  
CAUSED LEVEL 3 DROUGHT



215,000 HECTARES OF  
WILDFIRES IN REGION

25 DAYS WHEN AIR QUALITY POSED A HEALTH RISK



131 DAYS OF EMERGENCY  
OPERATIONS CENTRE



2 MILLION  
SANDBAGS



## OUR ENVIRONMENT

The Pacific Climate Impacts Consortium (PCIC) has used the most recent climate change modeling to determine implications for British Columbia. Based on their projections a 1.9 Celsius increase in global temperature is expected by 2050.<sup>i</sup> The increase in average temperature increases the likelihood of major weather events and will also result in hotter and drier summers in Kelowna. At first glance a two-degree increase may seem harmless, but a closer look reveals the opposite. In fact, a two degrees increase will mean significant heatwaves and periods of unseasonably warm temperatures to boost the annual average temperature.

By 2050, PCIC also projects shorter winters with up to 14 per cent less snowfall, impacting the region's snowpack.<sup>i</sup> Despite warmer, drier temperatures and less snow, the model actually predicts a 10 per cent increase in overall annual precipitation with major rain events occurring more frequently.<sup>i</sup> Kelowna is expected to see much wetter winters (where precipitation will fall as rain instead of snow) and springs. These projections paint the picture of a changing climate where increased spring precipitation will contribute to increased risk of flooding and hotter drier summers will increase the risk of droughts and wildfires.

### 2050 Climate Projections



**1.9 CELSIUS INCREASE**



**10% ANNUAL INCREASE**



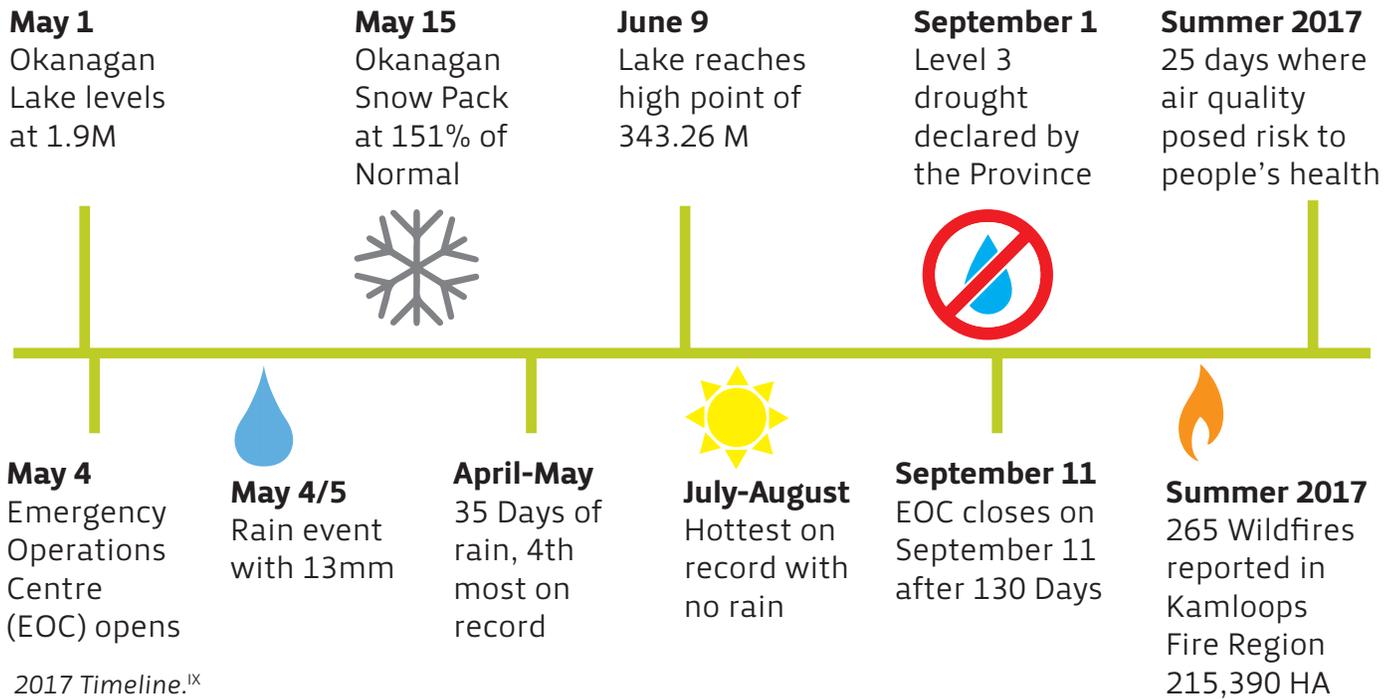
**14% ANNUAL DECREASE**

In 2017, Kelowna experienced one of its most extreme weather years on record. While climate change cannot be said to have caused these events to occur, events such as the flooding, wildfires, and droughts in 2017 are all projected to become more severe and more frequent with climate change. In 2017, the city experienced an historic flooding of Lake Okanagan, Mission Creek and Mill Creek. The 2017 flood event was the result of several factors, including the record levels of precipitation from March to May 2017 (135.3 mm, fourth highest on record) a trend that is expected to continue as global temperatures continue to rise.<sup>ii</sup>

A major rain event on May 4/5th produced 13 mm of rain, that when combined with the melt of the snowpack, resulted in a significant spring freshet and a record inflow to Lake Okanagan.<sup>iii</sup> The 2017 flood event impacted roughly 3,200 residents in Kelowna alone.<sup>iv</sup> With roughly 23 per cent of residents living in flood plains in Kelowna, these types of flooding events pose a threat to the community. Climate change is expected to make these types of flooding events more frequent and more severe, reinforcing the need for the City to focus on adaptation as well as mitigation moving forward.

### Areas for Action

- Continue to require larger setbacks for development in flood zones /sensitive areas
- Expand Neighbourwoods and explore other opportunities to increase the tree canopy on private property
- Continue to develop linear parks along creeks (e.g. Mill Creek)
- Continue to work with regional partners on flood mapping and risk identification
- Develop community climate adaptation plan to prepare for extreme flood events
- Enhance green infrastructure in flood zones to increase groundwater recharge



## Trend | Risks of Changing Climate

As the earth has warmed over the last 65 years, we have witnessed roughly a one-degree increase in global temperatures. Since the 1970s the number of natural disasters has quadrupled, with flooding, wildfires, and storm events becoming more and more common.<sup>v</sup> In 2016 alone, insured losses associated with North American natural catastrophes were estimated at \$30 billion.<sup>vi</sup> Over the last 20 years North American costs related to natural catastrophes have increased dramatically with major hurricane and flooding events representing a larger share of insured and uninsured damages.

Based on the number of major storm and flooding events that have occurred over the last 15 years under a one-degree increase, experts are increasingly concerned by the risks posed by a two-degree increase. 80% of Canadians are living in cities, many of which are located in coastal areas and flood plains, and it is these same areas that will bear the greatest share of the impacts of climate change.<sup>vii</sup> For example, roughly 40 per cent of Kelowna residents live in a flood plain

or wildfire interface area. Recent events, such as the 2013 flooding in Calgary and the 2016 wildfire in Fort McMurray, have had devastating impacts on personal property, costing \$1.9billion and \$3.7billion respectively in damage.<sup>viii</sup>

Although the risks of Climate Change are grave, Kelowna will continue to be an attractive location for people to live and work. Climate change projections reflect the long-term climatic trends, but there will continue to be years, months, or days that will buck the trend. For example, Kelowna could see years that are cooler with a higher snowpack and fewer wildfires or more summer rain, but the evidence of a long-term shift in climate is very strong.



## OUR PEOPLE/HEALTH

As we consider the impacts of climate change, we tend to focus our attention on infrastructure. We gloss over the human impacts of climate change; however, it is these impacts that are the most critical for us to grapple with.

If the summer of 2017 is any indication of what we can expect more frequently in years to come, we begin to see the toll that changing climate can take on residents. For residents and visitors alike, the wildfire season of 2017 brought on rapidly declining air quality. Based on preliminary data from 2017, there were 25 days during the summer where there was a risk associated with the air quality. The province's air quality advisory level of PM2.5 measures tiny particles in the air that reduce visibility and cause the air to appear hazy when levels are elevated. In 2017 there were 25 days where PM2.5 levels exceeded the province's air quality threshold for public health. This is substantially above the average since 2003 (4.5 days).<sup>x</sup> For elderly residents, children and those with any respiratory issues, air quality problems like this can have very real health impacts.

Research indicates that there is a direct link between poor air quality from forest fires and health care costs from related hospitalizations for respiratory and cardiovascular issues.<sup>xi</sup>

Looking beyond poor air quality, more frequent extreme weather events can have more direct effects on residents by impacting people's day to day routines. For example, the high stream and creek flows resulted in high turbidity forcing the City water utility to issue a water quality advisory for a month and a half, forcing many people to buy bottled water for July. This was the first water advisory issued by the City of Kelowna water utility in over 21 years.



Smoke in Kelowna affected visibility and air quality in 2017 with 25 days not meeting the provincial air quality objective.

## Trend | Long emergencies

Also, the Wildfires and floods can force evacuations, displacing families in the short-term, and property damage from these extreme weather events can displace them for the long-term. During the flood event this past summer, over 3,200 Kelowna residents were placed under evacuation order.<sup>xii</sup>

For those most vulnerable in our community, such as those with diverse abilities or with low to moderate income, these crises are even more challenging to handle. For those with mobility challenges or mental health issues, finding new housing in the short or long-term can be very difficult.

Volunteers and service providers also face extreme pressure during these crises. A key example of this is the Central Okanagan Emergency Operations Centre (EOC). Created with the intention of responding to brief crises, the EOC was active this year for a continuous period of 130 days.

As we look ahead to a future with more extreme weather events like wildfires and flooding, the robustness and resilience of our emergency social services functions will be tested.

### Areas for Action

- Community Wildfire Protection plan is underway and will add development tools in interface zones
- Water integration project underway will improve water quality for Kelowna residents
- City can continue to work with community partners to enhance resiliency preparedness in extreme weather events

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According to the Canadian Red Cross, “Those who experience crisis situations are very likely to experience extreme stress – this is entirely normal. However, extreme stress can seriously affect your health and daily life.” (...).

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## OUR ECONOMY

The population of Kelowna continues to expand with a growing number of young professional and families choosing Kelowna and more students staying in Kelowna after graduating. Recent labour market data paints the picture of a rapidly expanding economy. Job growth in construction and manufacturing in 2016-17 translated into significant gains in full-time employment. At the same time growth in the service, public administration and the technology sectors contributed to the broader shift to a knowledge-based economy. Also, major economic drivers such as the UBCO, OK College, Kelowna General Hospital and the Airport all showed continued signs of growth.

However, as extreme weather events become more common, there could be a risk for the Kelowna economy. Every time a flood or wildfire occurs there is significant damage to private and public property and the damage disrupts the community, stealing resources and productivity from other sectors of the economy. The 2017 flood events alone, resulted in nearly \$10.7 million in City damages and that does not take into account

significant staff costs or private property damages due to flooding of basements and other structural issues. City staff estimate 500 parcels were impacted in Kelowna by the 2017 flooding event and 1,250 docks will need to be repaired or replaced.<sup>xiii</sup>

These impacts are felt beyond personal and public property. The flooding event also had an impact on the City's tourism sector and general economic activity. For the early part of the summer, lake access was limited with boat launches shutdown and parks and beaches closed, impacting Kelowna's most important recreation and tourism asset - Lake Okanagan. Canada Day fireworks, which usually attract upwards of 60,000 residents and tourists, were rescheduled due to the flooding of parks and beaches. Tourism Kelowna reported a decrease of 7 per cent in Hotel Occupancy for July 2017 compared to Summer 2016.<sup>xiv</sup> As a community that relies heavily on Lake Okanagan for recreation and tourism, the flooding and fire in 2017 had considerable impacts on the local economy.



## Trend | Smokey Summers

As Kelowna's climate changes to hotter and drier summers, the risk of wildfires increases for BC. The warmer and drier climate has also extended the length of wildfire season by 2.5 months over the past 30 years, a trend that will likely continue.<sup>xv</sup> The increased maximum temperatures, low humidity and strong gusting winds can also make it harder to contain the spread of fires in some instances. As average temperatures increase over time the number of wildfires could increase by 5 or 6 times.<sup>xvi</sup> In 2017, there were over 1.2 million hectares of wildfires costing the provincial government roughly \$500 million to contain.<sup>xvii</sup> The Kamloops fire area, which includes Kelowna, reported 213,000 hectares of wildfires.<sup>xviii</sup>

When you consider Kelowna currently attracts 1.9 million visitors annually, the risk of wildfires compromising Kelowna's summer appeal is a risk.<sup>xix</sup> For example, early reports from Thompson Okanagan Tourism Association indicate that roughly 15% of businesses in the tourism sector reported cancellations in July due to Wildfires.<sup>xx</sup>

Agriculture is another major sector of the economy that will need to respond to shifts in climate. Currently, the agricultural sector in Kelowna accounts for over \$100 million in gross farm receipts. Based on the increases in average temperature Kelowna could see a significant increase in the number of growing degree days and could allow for new higher value crop varieties to be grown.<sup>xxi</sup> However, due to the drier summers and reduced snowfall, improved water conservation among agricultural users will be key. Also, higher temperatures could bring new pests that farmers will need to manage. As shifts in climate occur farmers in the region will need to respond by taking on new approaches in irrigation and management of their lands. The changing climate will create a new normal for Kelowna presenting a risk, but also new opportunities for crops.

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**Due to an elevated risk of wildfires The BC government declared a state of emergency for over two months, the longest in the history of the province.**

**Anecdotal reports from the Thompson Okanagan Tourism Association suggest some operators had major losses in revenue from cancellations due to wildfires in July e.g. 40 cancellations per day.**  
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## OUR INFRASTRUCTURE

In 2017, Kelowna experienced a major spring freshet that translated into an historic flood event. Due to a changing climate, major spring rain events are expected to become more common and more severe. Given the significant amount of the city located on floodplains, flood events are a serious threat to the community at-large and the City's infrastructure. The 2017 flood events, damaged City stormwater systems, parks, roads and other public property. For example, Mill Creek's historic stream flows resulted in significant damage to three key culverts in the Mill Creek corridor, representing \$200,000 in damages with another concrete flume completely destroyed causing \$5 million in damages. The flooding events had serious impact on the city infrastructure and a corresponding impact on residents' properties in flood zones.

The record inflow to Lake Okanagan from the snowpack and rain events contributed to the historically high lake levels that pushed the City's infrastructure to its breaking point with many systems

at full capacity.<sup>xxi</sup> For example, Civic Operations installed pumps at six different locations along the lakefront to guard against a full backup of the City Stormwater System at a substantial cost to the City. Also, during the flood event in June and July lakefront parks were closed with damages to signage, public docks, walking paths, retaining walls and other park features. Due to high lake levels, key recreational and commuter paths and bridges through City parks were also closed for several months impacting residents and tourists. Overall, the historic flooding event tested the City's key infrastructure systems and impacted key parts of the city's community recreation infrastructure for much of the summer. The major flooding events associated with climate change will put increasing pressure on city infrastructure and asset management in the coming years, requiring greater adaptation efforts.



## Trend | Green Infrastructure Response

To prepare for the increasing number of extreme weather events, cities across Canada are investing in networks of green infrastructure. “Green infrastructure” describes the various ways a city can manage lands at a city, neighbourhood, and site scale to reduce runoff and limit the amount of water that ends up in the city’s stormwater infrastructure.

At a city scale this includes limiting development on the city’s agricultural lands (55% of the City) to increase the amount of permeable surfaces in floodplains. From a neighbourhood perspective, green infrastructure includes development of parks or urban creeks that can improve livability and act as detention ponds during major rain or flood events. At the site scale, the use of rain gardens, permeable pavers, bio-retention planters and other features can mitigate the amount of runoff by close to 50 per cent.<sup>xxii</sup> Green infrastructure improves water quality and increases groundwater recharge, while also offering a recreational amenity to the community that enhances resiliency in major flood events.

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“Every dollar spent on climate resiliency saves \$4 to boost local economies.”

(Next City)

.....  
“Annual flooding costs in Canada are \$750 million with stormwater management challenges accounting for roughly 25% of the costs”

Government of Canada

.....  
*Taking Action*

- Continue to support the Mission Creek Restoration Initiative, re-naturalizing for environmental benefit and adding flood capacity
- Look for opportunities to create more green infrastructure
- Examine infrastructure design standards (e.g.: 1 in 200-year flood standards) to see if they need to be updated



## Charting a Path Forward

After coming to grips with the projected impacts of climate change in Kelowna, thinking about what we can do appears to be a daunting task. Fortunately, Kelowna is not alone in wrestling with this issue. Communities across Canada are struggling with how best to address the impacts of a changing climate. International, national, provincial and local initiatives to reduce our greenhouse gas (GHG) emissions are an important start, with a goal of preventing more rapid and extreme climate change. Kelowna's Corporate and Community Climate Action Plans demonstrate our local commitment to reducing our contribution to global climate change. Despite our efforts to continue to reduce carbon pollution, we need to ensure Kelowna is prepared for the impacts of a changing global climate.

With that in mind, communities are also looking at building adaptation strategies – plans that accept that some impacts are going to occur and consider how to limit impacts and to take advantage of opportunities. Looking in more detail at the micro level, Kelowna has made significant green infrastructure investments through:

- Protecting agricultural land, which acts as a major environmental and stormwater benefit
- Supporting the Mission Creek Restoration Initiative, re-naturalizing for environmental benefit and adding flood capacity
- Enforcing riparian protection and protection of natural areas
- Partnering to undertake wildfire mitigation in interface areas to reduce the risk of future wildfires
- Continuing to develop and refine Kelowna's Community Wildfire Protection Plan

Each of these individual actions makes important progress towards ensuring that we are more prepared for the changes coming. Moving forward, several key actions could be undertaken to coordinate our efforts and to ensure that we are taking action where it will prove most effective:

- Develop a Community Climate Adaptation Strategy
- To update the 2040 Official Community Plan and 20 Year Servicing Plan from a resiliency lens and have a responsive growth strategy
- Look for opportunities to create more green infrastructure
- Examine infrastructure design and enforcement standards to see if they need to be updated
- Ensure a sustainable and dynamic emergency response model remains in place

Global climate change is not optional, and Kelowna residents will feel its effects locally in a wide variety of ways. From disruptions in food security and pricing, water availability, and energy supplies to local infrastructure and personal property damage, climate change is no longer a future trend, but instead requires our community to respond today. Our infrastructure, our economy and our residents themselves will need to consider how best to adapt to the coming changes.

# Notes

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