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Climate Change: Global/Local – Past/Future; Agricultural Impacts and Opportunities; Change Management Case Study

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Okanagan Water Stewardship Council; December 14, 2017

- We've got a great lineup of speakers today – two excellent speakers plus me – to talk about climate change

- We're very pleased to welcome Dr. Francis Zwiers, the President and CEO at PCIC (the Pacific Climate Impacts Consortium) in Victoria.

- Dr. Zwiers will speak about climate change – what we've seen and what lies ahead.

- He will be followed by Dr. Scott Smith of the Pacific Agricultural Research Station in Summerland, who will talk about climate change and agriculture

- And I will follow Scott and talk about how climate change affects professionals and organizations, and about the response we've been pursuing to embed climate change awareness into our daily work at Associated Engineering for nearly three years.

- But before we go on, I wanted to provide a little bit of high level context …

- You might not need such a reminder but I sometimes add this to the start of my presentations to general audiences.

- Thanks to our big brains, humans have become the dominant predator on the earth.

- Just in my adult lifetime – 40 years - our numbers have increased by about 3 billion – we're up to 7.6 billion of us now – that's about a 70% increase in just 40 years

- in 2017 alone our numbers have increased by about 78 million – that's two more Canadas in 2017 alone.

- And we're having a **serious impact on other species and on biodiversity** …

- There's about **one-third fewer** wild animals on the planet than there were 40 years ago, and the earth is experiencing a rate of species extinction not seen for 65 million years - since the great dinosaur extinction.

- We are **cutting into the natural capital** that sustains all ecosystems on earth

- We're not just living off the regenerative power of the earth (like the interest), we're cutting into the principal

- It's the **Age of the Anthropocene**

- One of the key ways that we're influencing the earth and earth system processes is that we've learned how to harness fire for our benefit

- More specifically - burning land-based carbon for heating and cooling, moving around, generating electricity and other human activities.
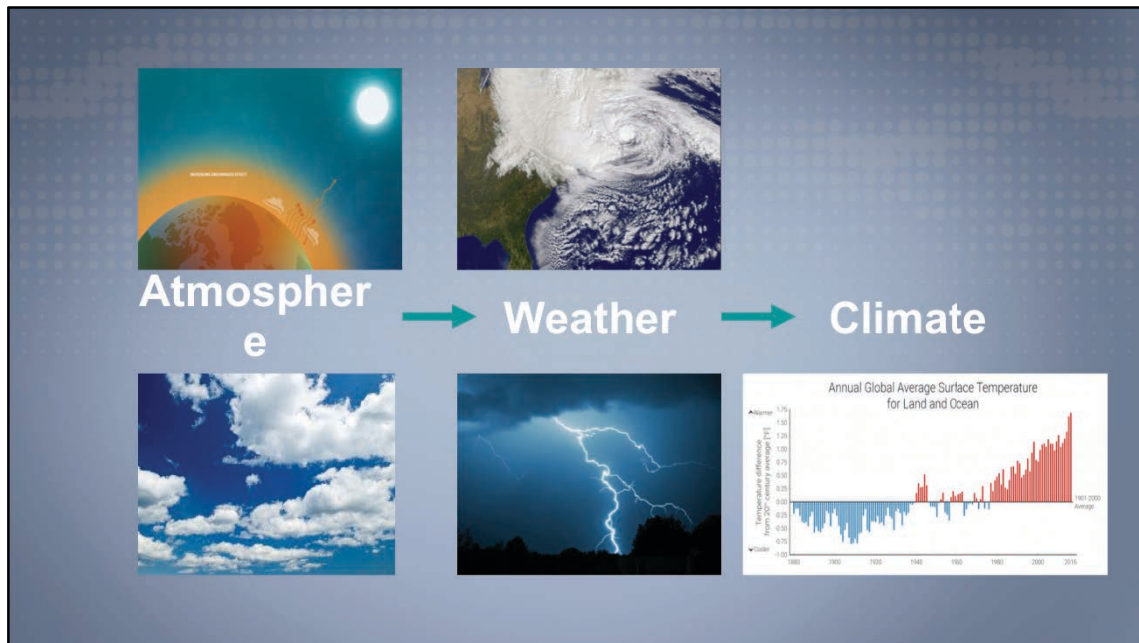
- The atmosphere is **a thin skin** of air surrounding the earth.

- Almost all of our weather occurs within the lower layers of this atmosphere – called the troposphere – about 12 km thick (40,000 feet) – about the distance from this hotel out to the airport.

- This layer contains 80% of the mass of the atmosphere.

- When you fly at 40,000 feet you are looking down at 80% of the mass of the atmosphere.

- So when the atmosphere changes (for example when it takes in more C02), the weather can change, and that's what's happening now – we're seeing not only warmer temperatures but also more extreme weather – more extreme on both ends of the spectrum – more extreme droughts and heat waves and more extreme precipitation and floods

- And finally, the sum of all the weather over a long period of time is called the climate

- The graphic on the bottom right is the recent long-term trend in global average temperature
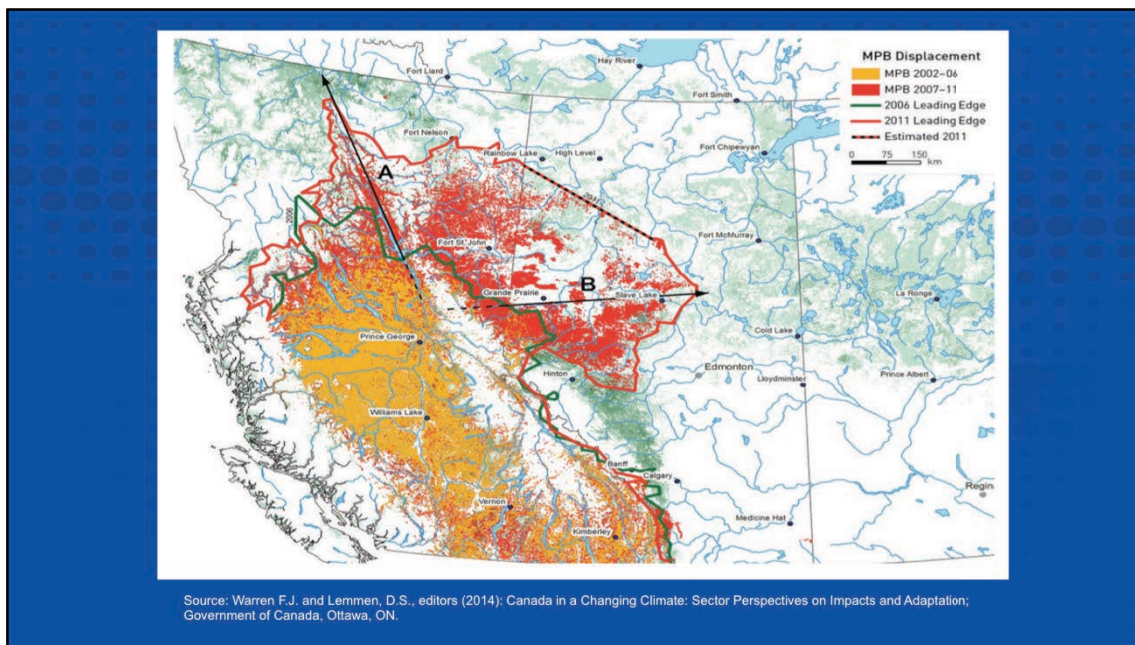
Temperature since 1880

Annual Global Average Surface Temperature
for Land and Ocean
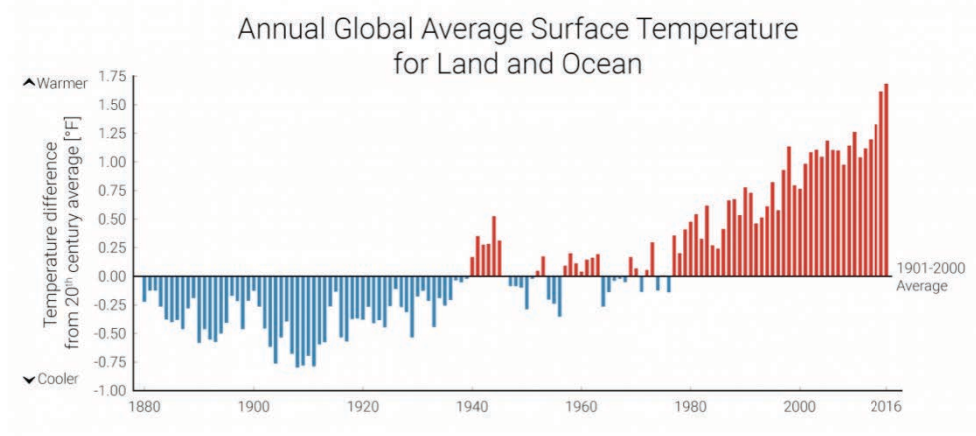
- Here's that bottom right graph in all its glory …

- It's the surface temperature trend since 1880, relative to a zero line which is the 1901 – 2000 average. It's from a US source so its in degrees Fahrenheit.

- This graph is right up to date – through 2016 – you can see how each year since 2011 has been warmer than the last, and 2014, 2015, and then 2016 each set records. In other words, we've just experienced the 3 hottest years on record. And 16 of the top 17 warmest years have occurred since the turn of the century.

- The odds of that happening randomly are extremely small, one in many millions. Somebody at the University of North Carolina I think figured out after 2013 that the odds of seeing the 21st century data to that time were 1 in 27 million.

- And by the way, the other year that rounds out the top 17 is 1998.

- And the implications of this trend are enormous, and of course they are affecting the Okanagan

- I'll leave that to Dr. Zwiers to go over, but will just quickly throw up a couple of slides of particular relevance to the Okanagan to warm you up.

- This was Kelowna in the summer of 2003.

- As we all know, 2017 was the biggest fire season in BC history – in fact 2017 was BOTH a flood year and drought year.

- And the experts are saying that fire frequency size and severity are increasing

Source: Warren F.J. and Lemmen, D.S., editors (2014): Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation; Government of Canada, Ottawa, ON.

- This is a 2011 map of the Mountain Pine Beetle extent

- It's proliferating in B.C. and Alberta because the winters are no longer cold enough to kill the larvae.

- The orange area was the affected area in 2007, the red area is the additional area affected by 2011 (a total of 18 million hectares).
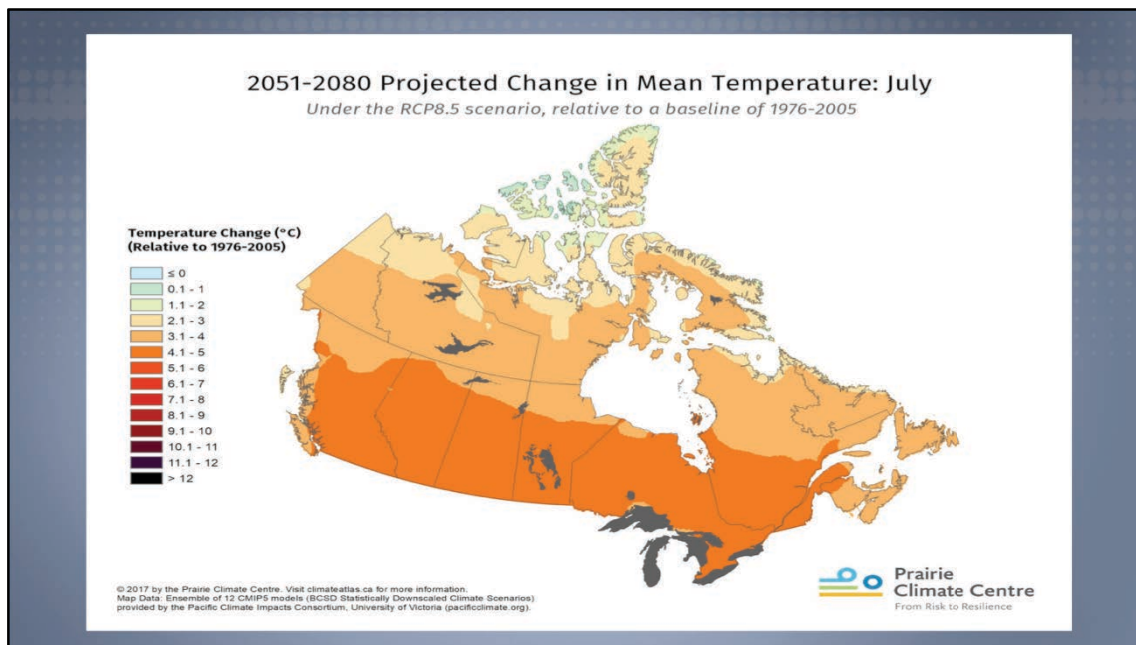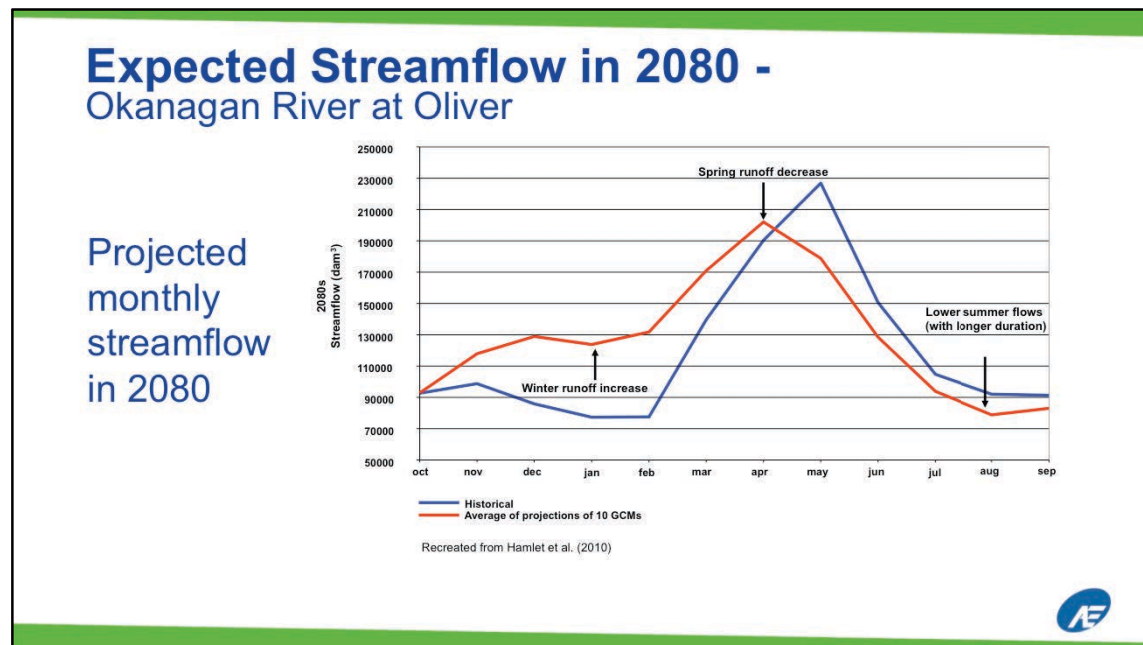
Kalamalka Lake, May 24, 2017
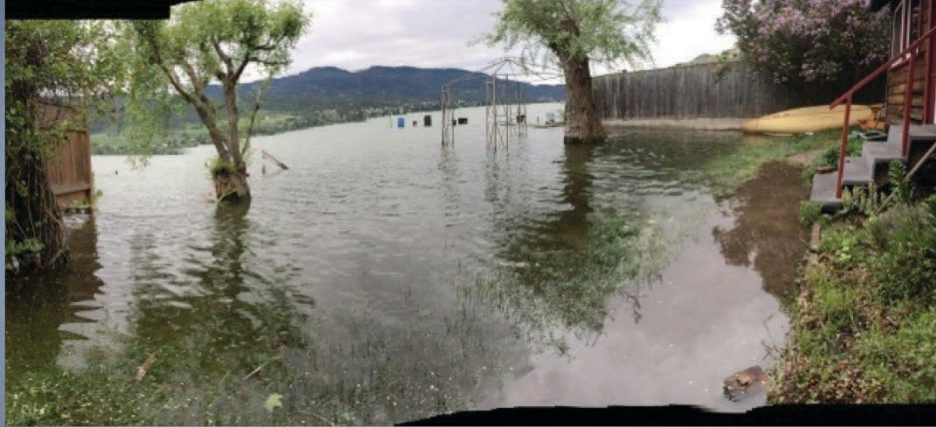
- That's the lawn of my wife's cousin's cabin on Kalamalka Lake on May 24.

- The lake is normally out beyond those trees.

- Kal Lake rose to about 70 cm above normal this spring.

- Okanagan Lake rose to 30 cm above the famous 1948 flood level, the highest level since 1894 (and 20 cm above the 20-year return period level)

- There was more inflow to Okanagan Lake in May than has ever been recorded (which means since about 1922).

2051-2080 Projected Change in Mean Temperature: January
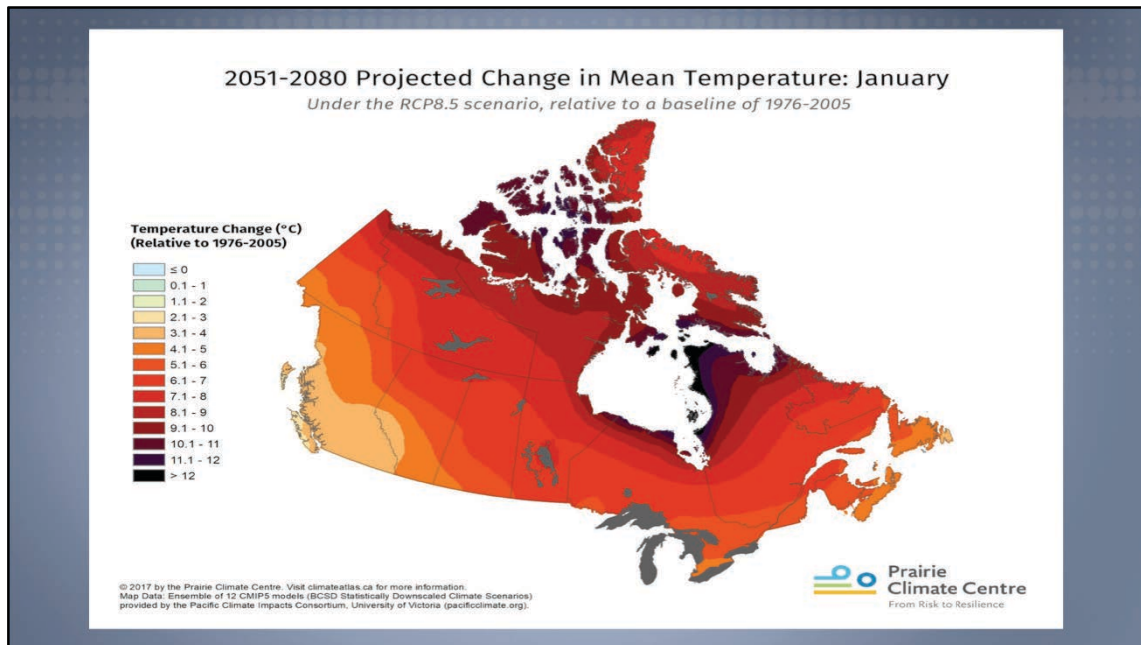
- What about the future – I'll leave this for Francis – but as a quick spoiler alert – the winters are going to continue to get a lot warmer

2051-2080 Projected Change in Mean Temperature: July
Under the RCP8.5 scenario, relative to a baseline of 1976-2005

- And the summers are going to get warmer too.

Expected Streamflow in 2080 - Okanagan River at Oliver. Projected monthly streamflow in 2080. Recreated from Hamlet et al. (2010)

- The patterns of streamflows will continue to change too.

- Water demands will continue to rise

- And there will continue to be impacts on ecosystems and human-built infrastructure.

- But all that is just a trailer, a teaser.

- Now I'd like to introduce Dr. Francis Zwiers, the President and CEO of the Pacific Climate Impacts Consortium in Victoria.

- Read his bio.

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FZ and SS to follow