Our shifting seasons

A Western Perspective of Climate Change in the Eastern First Nations
Today's lesson

1) How Earth's climate works
2) How it is changing
3) Why we're seeing changes
Our Mother Earth is sick
She “has a temperature” – that’s getting worse!

20th Century average

1 °F warmer

1880

2015

... why?
The “Greenhouse Gases” – Her “blanket”

without ‘em, life could not exist!

Earth’s temperature with greenhouse gases: 59 °F

Earth’s temperature without greenhouse gases: 0 °F
Her blanket is gaining insulation...
Is this normal?
Historically, gas levels were “just right” to maintain livable conditions on the planet. AND... they were **in balance**.
Ice core measurements – Her “medical record”

Climate scientists are seriously crazy dedicated.

Trapped air bubbles from thousands of years ago!
Her Medical Record

CO₂ concentration, ppmv

Antarctic temperature, °C

Years before present
First surpassed 400 ppm in May 2013. May 2016: 408 ppm.
So, what happened??

We invented some really useful technology.
That technology requires burning fuel. The exhaust? **Greenhouse gases.**
Historically, gas levels were “just right” to maintain livable conditions on the planet.

AND... they were in balance.

Now, new gas is being added.
We made Her sick…

Earth’s Temperature (°F)

With us

Without us
... in more ways than one.
...and Her illness will worsen until we stop using fuel.
Warming has not been the same everywhere
Less snow means darker surfaces

Dark surfaces absorb more sunlight
Temperature trends

Warming “hole”
Warming varies by place, year-to-year...

...yet, the global trend is toward warming
2014 Breaks Heat Record, Challenging Global Warming Skeptics
Precipitation changes have not been the same either.
Precipitation trends
Model projections agree...

...warmer and wetter toward the poles
A bigger concern: More frequent extremes!
A bigger concern: More frequent extremes!
Heavy precipitation trends
Flood intensity trends

Heavier

Weaker

%/decade
Rain events will get heavier …

… but may occur less frequently
Stronger hurricanes
“Cold things” are warming faster than “warm things”
Less snow...
... more rain
Warming can have its benefits... (for some)

Longer growing seasons
Ocean levels are rising
... and becoming more acidic
<table>
<thead>
<tr>
<th>Trend</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmer</td>
<td>Definitely</td>
</tr>
<tr>
<td>Heavier precipitation</td>
<td>Very likely</td>
</tr>
<tr>
<td>Less snow</td>
<td>Very likely</td>
</tr>
<tr>
<td>Higher, more acidic seas</td>
<td>Likely</td>
</tr>
<tr>
<td>Stronger hurricanes</td>
<td>Likely</td>
</tr>
<tr>
<td>More droughts</td>
<td>Possibly</td>
</tr>
</tbody>
</table>
Planning for the future...
Uncertainty grows over time ... plan for many futures!
Don’t forget about El Niño et al!