Impacts and Challenges of Drought in the Northwest Territories

Brian Sieben  ENR  May 2, 2018
Outline

1. Background on Northwest Territories (NWT)

2. 2014-15 Drought Impacts (in forested portion of NWT)
   – Forest Fires
   – Marine Transportation
   – Hydroelectricity

3. 2014-15 Drought Costs
Where is the Northwest Territories?
Northwest Territories (NWT)

- Population: 44,597 (Jan 18)
- 11 Official Languages
- Land 1.2 million square km
- 33 communities, many small remote communities without all season roads
- In small communities, 50% of protein derived from country foods
- Major industries: mining, oil & gas
- All season highways link southern NWT to Alberta and BC, and northern NWT to Yukon
Drought up upper portions of watershed in BC, Alberta and Saskatchewan impacts NWT
Northwest Territories (NWT)

- Population: 44,597 - small tax base
- 11 Official Languages
- Land 1.2 million square km
- 33 communities, many small remote communities without all season roads - air and water
- In small communities, 50 % of protein derived from country foods –little traditional agriculture
- Major industries: diamond mining, oil & gas
- All season highways link southern NWT to Alberta and BC, and northern NWT to Yukon
The NWT is warming much faster than other regions of the world.
Hay River & Inuvik Mean Annual Temp

Rise 3°C per century

Rise 7°C per century
Hay River & Inuvik Mean Jan Temp

Rise 6°C per century

Rise 12°C per century
Drought Impacts:

Forest Fires
Whati, Summer 2014
Forest Fires

**Number of Fires**
- Typically 245 fires a year (20 year average),
- 2014, 385 fires

**Area Burned**
- Typically 570,000 hectares a year (20 year average)
- 2014, 3.4 million hectares burned (more than any previous year)
- For reference 2.5 million ha burn in Canada annually

- 11 communities put at risk, many evacuated
Drought Code

The Canadian Forest Fire Weather Index (FWI) System

Level of moisture in deep forest fuels

Function of temperature and precipitation

In July 2014, DC reached over 900 in North and South Slave
Extremely useful product in the North where there are few high-quality climate stations
Drought Impacts

Fire Smoke
Forest Fire Smoke

Yellowknife, August 16, 2014
Smoke

- 6 weeks of smoke
- Hospital operations cancelled
- Pharmacists – 3 x use of puffers
- Raining ash
- Could not see shore when on lake,
- Indigenous fishers had to use GPS to find way back for first time
Particulate and Air quality

Hourly PM2.5 up to 700

NWT Air Quality Monitoring Network

Current Air Quality - GNWT Stations

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<th>Station</th>
<th>Date And Time</th>
<th>SO₂</th>
<th>H₂S</th>
<th>NOₓ</th>
<th>NO₂</th>
<th>NO</th>
<th>O₃</th>
<th>CO</th>
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Marine Transportation

River and Lake
Low water

• 10 communities resupplied in NWT by barge
• 2014 barge cancellations due to low water (season ended one month early)
• Adaption - Spreading loads over more barges (cost, less cargo can be moved)
• In 2014, Barges to Inuvik Fort Good Hope and Tuktoyaktuk were cancelled
2014 Water Levels approached 1981 levels
• Volvo Stern Drive – typically 4 are destroyed each year in the East Arm of Great Slave Lake due to collisions with the bottom, $5000
• 2014-15 Over 60 were destroyed due to low water
Great Slave Lake Minimum Levels

Lake level (m)

Year

Impact of warming temperature on lake levels

- Longer ice
- Free season
- More evaporation
- Lower water levels
Hydroelectricity
Hydro

- NWT is not on North American Power Grid
- 90% of electricity is hydro in capital, Yellowknife
- How do you adapt to low water levels?

Diesel Generation
Snare Reservoir, June 2015

Colin Steed, NTPC
Snare Rapids Head Gate and Intake, June 2015

Colin Steed, NTPC
Precipitation

– 2013 precipitation at Yellowknife (year before) was about 60% of normal

– Bluefish SWE in 2014 was 69 mm relative to 82 mm average, 15% below normal
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June 15 % Normal
July 36 % Normal
Year 84 % Normal
2015 Yellowknife Precipitation vs Normal

April  46% Normal
May    5 % Normal
June   59 % Normal
July   20 % Normal
Year   80 % Normal
## Other Impacts

Death of pine trees, loss of whopping crane habitat, and turbidity
Estimate of Costs of 2014 – 2015 Drought

- $56 million dollars fire fighting costs in 2014,
- $33 million dollars fire fighting costs in 2015,
  (normal about $8 million)
- $15 million was required for diesel electricity generation
- $5 million in evacuations in 2014 (estimate)

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About 76 million dollars (ignoring 2015 fire costs)
Epilogue

– Lack of climate monitoring hampered drought decision making

– As a result of the drought, there are now precipitation measurements in the watersheds that supply hydroelectricity to Yellowknife

– Dendrochronology studies are underway to place the 2014-15 drought in context

– Electric resiliency study
Thank you

Questions?

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