



Drought Monitoring

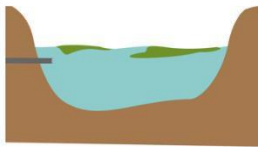
Periods of drought can happen in the north and climate change could make them happen more often. Monitoring for drought events is one way that communities can be prepared for drought and its impacts.

How will climate change impact drought?

Climate change could mean that drought events and dry periods will happen more often than they did in the past especially in summer and fall¹. Warmer temperatures brought on by climate change will increase evaporation from the land and water, leading to drier land and lower water levels. Already, many people in First Nation communities in the north say that periods of dry weather are happening more often.

What are the impacts of drought?

Drought and dry conditions can impact people, communities, and the land.



Low water levels can impact drinking water quality



Drought can affect our food



Drought can increase the chance of wildfire

How can drought monitoring help?

Drought and dry conditions come about slowly. The drying of the land and lower water levels in lakes and rivers happen gradually over time. This slow onset means that it is important to monitor to provide an early warning system of climate, as well as land and water conditions that can lead to drought. Ideally, early warning systems have both a monitoring component and a forecasting component (weather, for example).

Drought monitoring is most effective if it is paired with a community drought response plan that is triggered when drought indicators reach a certain threshold. A drought response plan would outline actions the community could take like water conservation or fire restrictions. Monitoring is especially important in a slow-onset hazard like drought to reduce impacts.

What are some ways to create a monitoring program?

Community-based monitoring

Knowing how drought conditions have been observed in the past could help communities know what areas to monitor for future drought. Traditional Knowledge might also provide traditional indicators for drought in the area, like water levels in local lakes or rivers, the loss of certain plants, or dry conditions on the land.

A community-based monitoring program begins with choosing what to monitor. There isn't one "right way" to monitor for drought. Different drought indicators measure drought in different ways, and which indicators are most appropriate to use will vary. Deciding which indicators work best in your area will take time and possibly some trial and error. Some things to consider when choosing indicators could include:

- How easy is the indicator to measure?
- Is historical data available for this indicator?
- Is the indicator sensitive enough to detect when drought starts or stops?
- Will the same indicator(s) be used to detect moving into drought AND moving out of drought?

Communities may choose to measure indicators like rain or snow amounts, temperature, water flow in streams, soil moisture, or snowpack. Measuring these indicators over time should allow communities to see trends and prepare when a drought is coming. These indicators are sometimes also measured by Environment Canada with data available online.

¹Tam, B. Y. et al. CMIP5 drought projections in Canada based on the Standardized Precipitation Evapotranspiration Index. *Can. Water Resour. J.* 44, 90–107 (2019)



Drought indicators are sometimes used to create drought indices. The **Handbook of Drought Indicators and Indices** has compiled information on drought indicators and indices in use around the world and could be a useful resource. The handbook classifies drought indicators by type (meteorological, hydrological, etc.) and gives an idea of how easy or difficult each indicator or indice might be to use.

https://www.droughtmanagement.info/literature/GWP_Handbook_of_Drought_Indicators_and_Indices_2016.pdf

Drought indicators or drought indices are often used to track drought

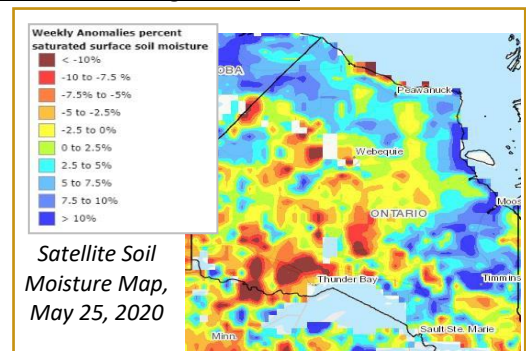
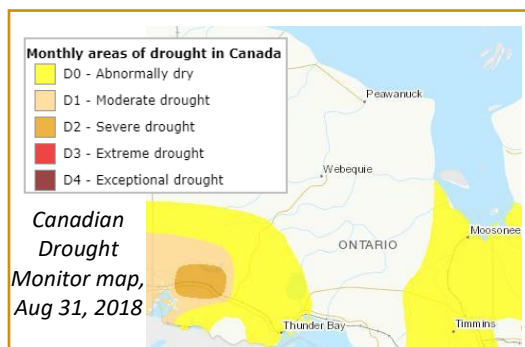
Drought Indicators are the measurements used to see if drought is occurring and describe drought conditions

Drought Indices use calculations to examine one or more measured indicators as well as modeling to assess drought severity and probability to anticipate drought-related impacts

| Examples of Drought Indicators | Examples of Drought Indices |
|---|---|
| <ul style="list-style-type: none"> - Rain or snow amounts - Temperature - Water flow in streams - Soil moisture - Snowpack | <ul style="list-style-type: none"> - Standardized Precipitation Index (SPI) - based on precipitation - Aridity index (AI) -based on precipitation and temperature - Vegetation Drought Response Index (VegDRI) - based on Satellite imagery, precipitation, temperature, available water content, land cover, ecoregion) |

Online drought monitoring tools

Your community drought monitoring program can be supplemented with some online tools. Agriculture and Agri-Food Canada hosts the **Canadian Drought Monitor** (CDM) which combines data from federal, provincial, and regional sources and looks at a number of drought indicators and indices including temperature and precipitation, vegetation indices, stream flow values, and the Palmer Drought Index. Agriculture and Agri-Food Canada also shares data on other drought parameters including **Satellite Soil Moisture** (SSM) levels. CDM and SSM are available online at www.agr.gc.ca/eng/agriculture-and-climate/drought-watch/.



Online tools for surface water are also available. Real-time water levels for a number of stations can be found at EC's **Water Office** https://wateroffice.ec.gc.ca/google_map/google_map_e.html?map_type=real_time. The **Surface Water Monitoring Centre** also provides information on low water levels and average precipitation for Ontario. Data is gathered from a number of stream gauge stations maintained throughout the province and can be found online at www.ontario.ca/page/surface-water-monitoring-centre#.

