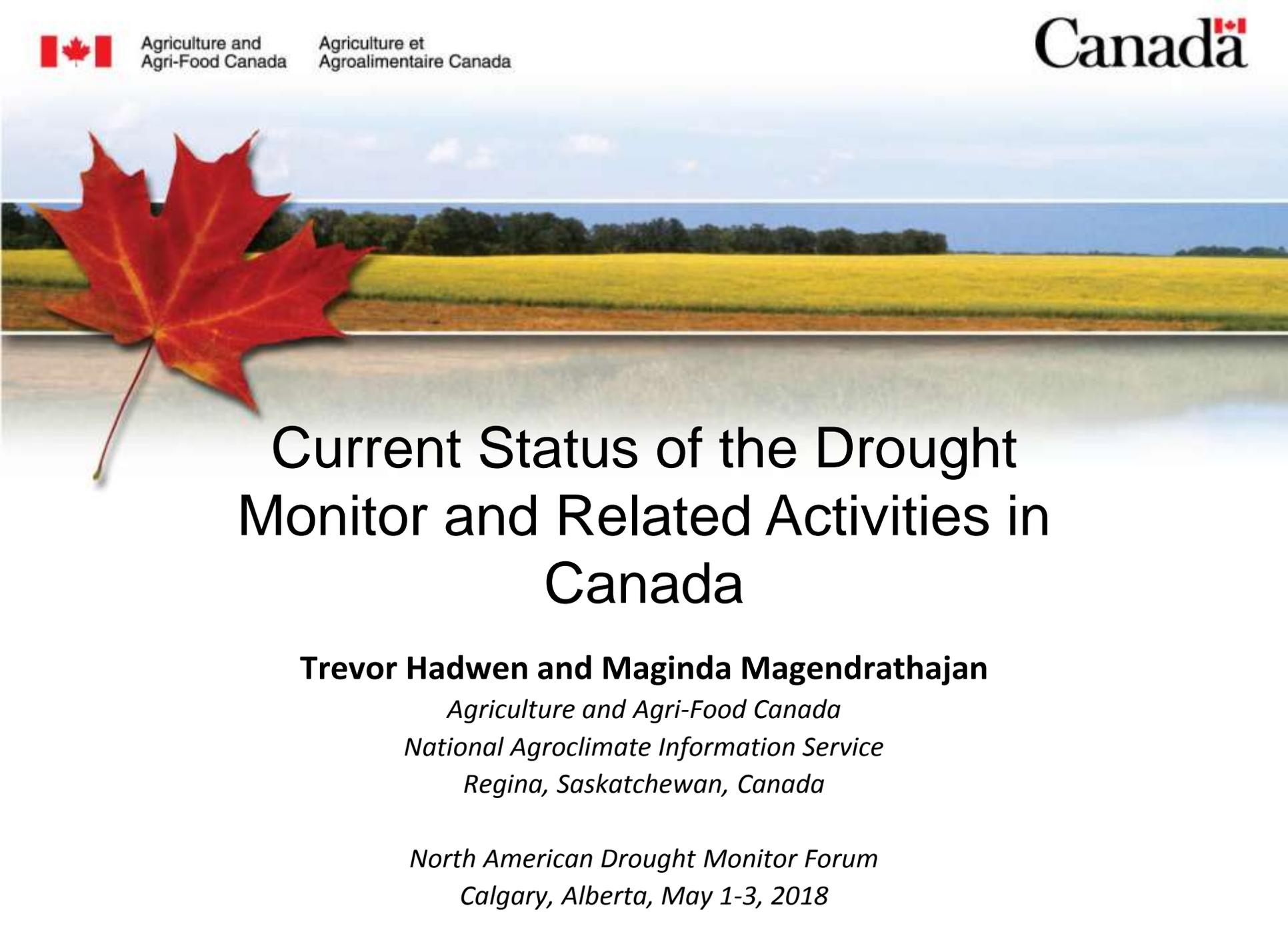




Agriculture and
Agri-Food Canada

Agriculture et
Agroalimentaire Canada

Canada



Current Status of the Drought Monitor and Related Activities in Canada

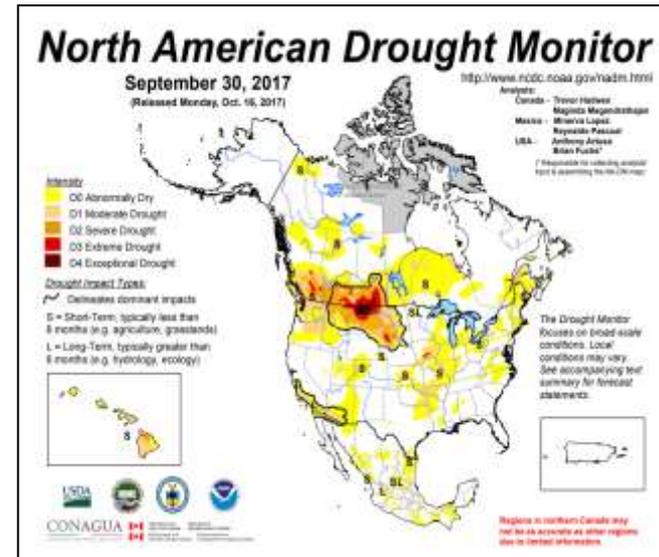
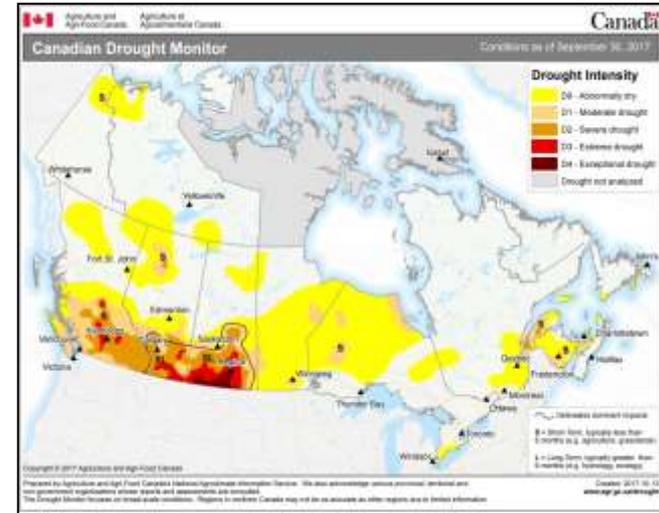
Trevor Hadwen and Maginda Magendrathajan

*Agriculture and Agri-Food Canada
National Agroclimate Information Service
Regina, Saskatchewan, Canada*

*North American Drought Monitor Forum
Calgary, Alberta, May 1-3, 2018*

Canadian Drought Monitor

- AAFC's National Agroclimate Information Service (NAIS) is responsible for drought monitoring in Canada.
- Since 2003, Canada has been providing NADM input utilizing the shared 'Drought Monitor' methodology.
- In 2016, Canada started publishing Canadian Drought Monitor maps on the Drought Watch Website.
- A variety of data and the experience of multiple experts are applied to creating monthly assessments.
- Monthly drought assessments cover all of Canada with the exception of the territory of Nunavut.
- NAIS continues to improve the online maps, narratives and interactive tools we offer on our Drought Watch web site.



Challenges Monitoring Drought In Canada

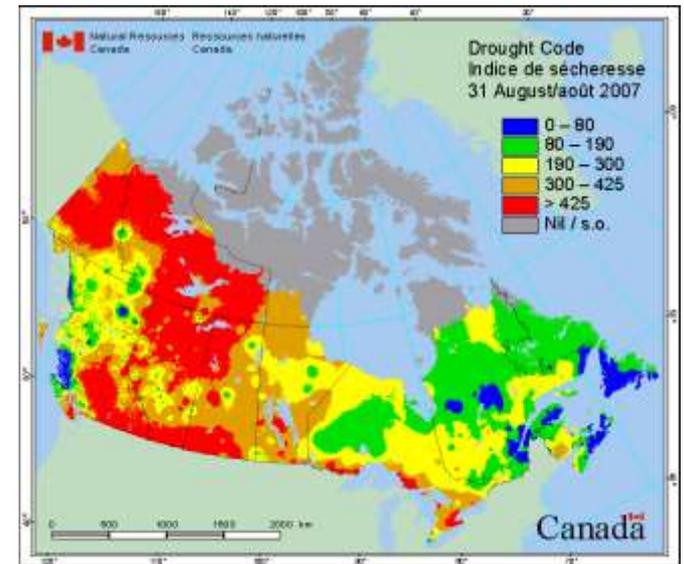
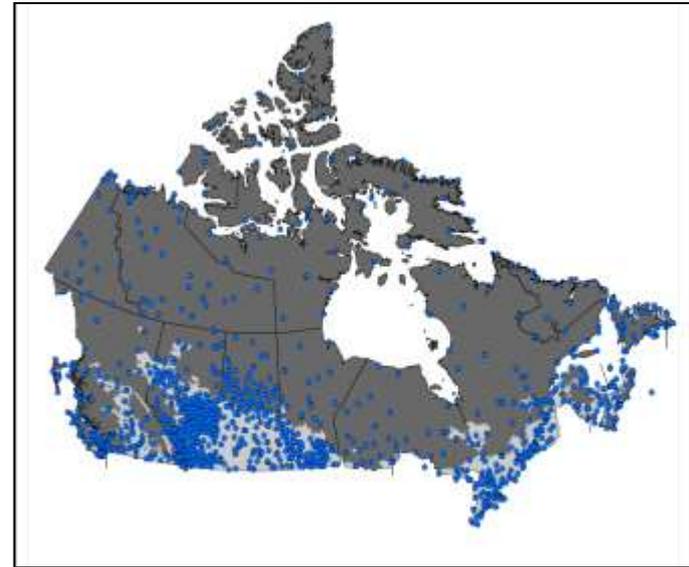
1. Canada is a big and environmentally diverse country
2. Agricultural land covers a relatively small percentage of the country; (AAFC needs to rely on input from other agencies to assess drought outside of agricultural areas)
3. Much of Canada is sparsely inhabited and lacks environmental monitoring infrastructure
 - Limited data and information; Limited Resources;
 - Heavily reliant on modeled drought indicators in some regions
4. Drought is not well understood in Northern/Arctic regions
5. Winter...
 - Much of the annual precipitation received is snow, and snow is inherently difficult to measure, and gauge reliability is poor.
 - Hydrologic gauges are of limited use as much of the year water is frozen.

2016-2018 Improvements

- Over the past two years, we have focused CDM development efforts on greater assessment efficiency
 - Utilizing ArcGIS Online tools
 - Packaging data more appropriately for extremes monitoring
- We are using more drought indicators and more complicated and powerful tools for assessment.
 - internal assessment efficiencies
 - new tools
 - improved assessment outside ag extent*
 - improved the data and indices being used *new indicators*
 - strengthened and expanded CDM web presence *web services and tools*

Monitoring Outside the Agricultural Extent

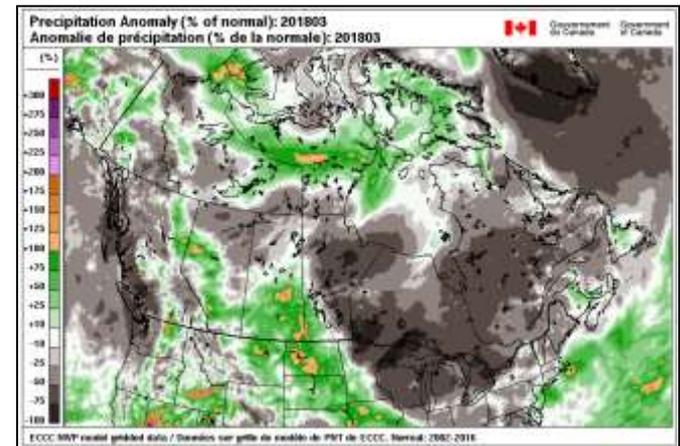
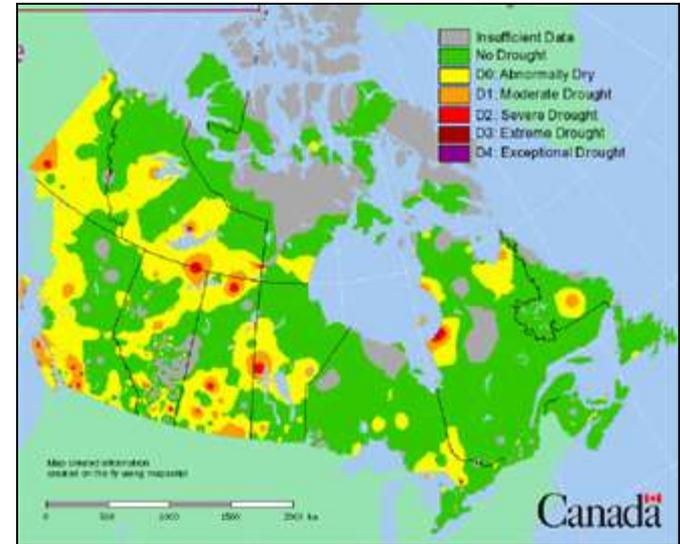
- AAFC is the lead for Drought monitoring for all of Canada however has limited knowledge of drought outside the agricultural areas.
- Limited climate stations and the lack of understanding of drought in northern regions is a significant challenge.



Monitoring Outside the Agricultural Extent

We have started to address these issues by:

- working with the Canadian Forest Service to develop a relative indicator from their Drought Code;
- using Environment Canada's Canadian Precipitation Analysis CaPA data; and
- beginning discussions on what drought means in northern environments.



New Indicators for Canada

Added in 2017:

- Evaporative Stress Index
- Canadian Precipitation Analysis (CaPA)
- **New percentile time frames**

In development - (2018):

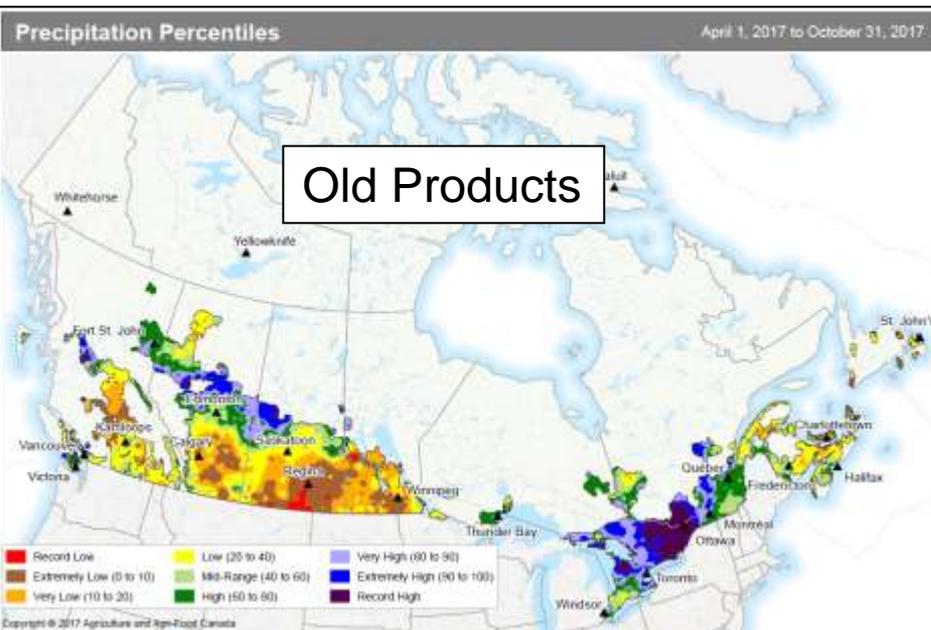
- Weekly/biweekly drought indices (SPI, PDI...)
- **VegDRI for Canada**
- ESI

Exploring:

- EDDI

Percentiles

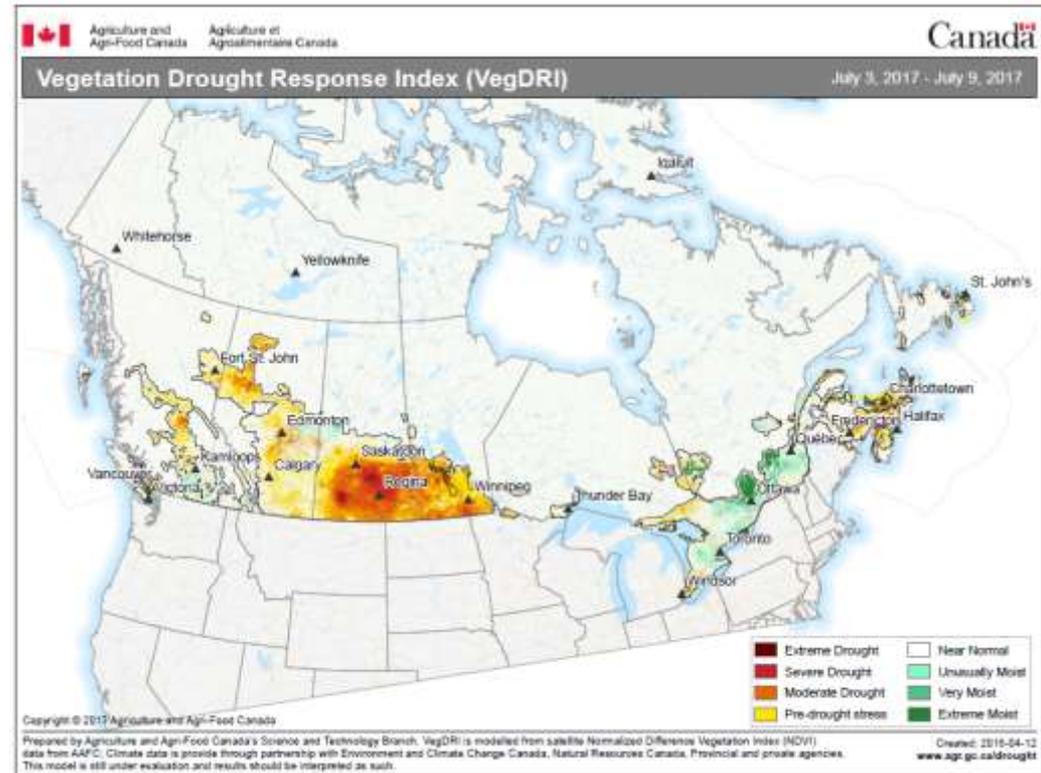
- Increased number of products
 - 30, 60 and 90-day datasets now produced
- Map legends changed to be more precise in the low and high ends.
 - now aligned with the Drought Monitor classification.
- Now includes stations outside the agricultural zone.



Canadian VegDRI Products

We have been working with the National Drought Mitigation centre and the USGS for more than 6 years to test and develop a VegDRI system for Canada.

Very recently have produced our first maps. We are continuing with testing, and anticipate regular products will be available on Drought Watch website.



Canadian Drought Monitor Tools

Significant updates since the 2016 NADM Forum:

- Created ArcGIS Web Services for our daily climate products so the data are easier to use
- Developed ArcGIS Online Editor and Review Applications to improve assessments
- Incorporated ESRI Story Map to add context to the narrative and maps
- Added Drought Analysis tools to allow users to explore the data and make it more

Web Services and our Data

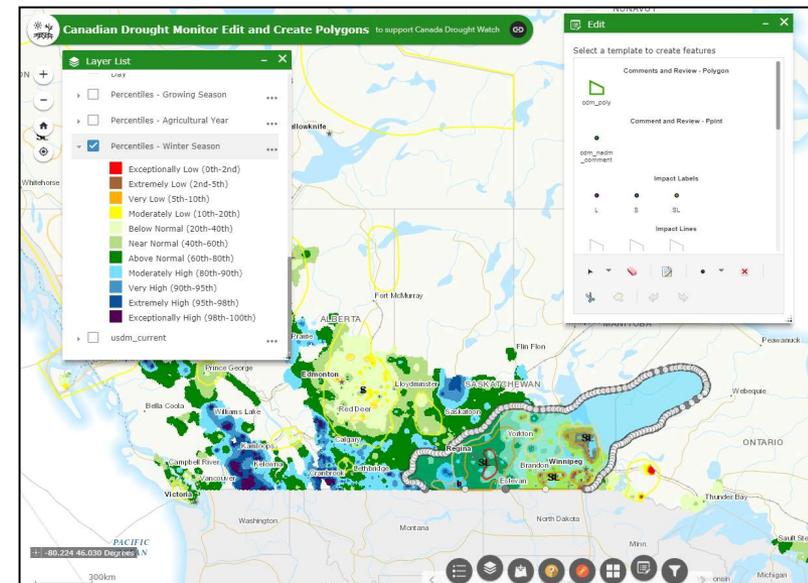
- As part of a recent upgrade of our daily agroclimate mapping system and products, we created web services of many of our daily monitoring products.
- This has enabled us to use these products in all of our different online applications significantly increasing the efficiency of our assessments.

Editor Application

- The CDM Editor Application is an ArcOnline Application that allows the CDM authors to edit the assessment of drought in a cloud-based environment.
- The application contains the CDM and may of the required maps to assess drought as Web Service layers

The benefits:

- Increased efficiency
- Increased flexibility
- Multiple editors,
- Portable
- Easily incorporate web services and outside spatial data



Review Application

- The Reviewer Application is similar to the Editor Application, but is specifically built for the Canadian team to review the draft assessments and provide comments and suggest edits.
 - Reviewers are able to draw in polygons or add points with annotations for suggested changes

The benefits

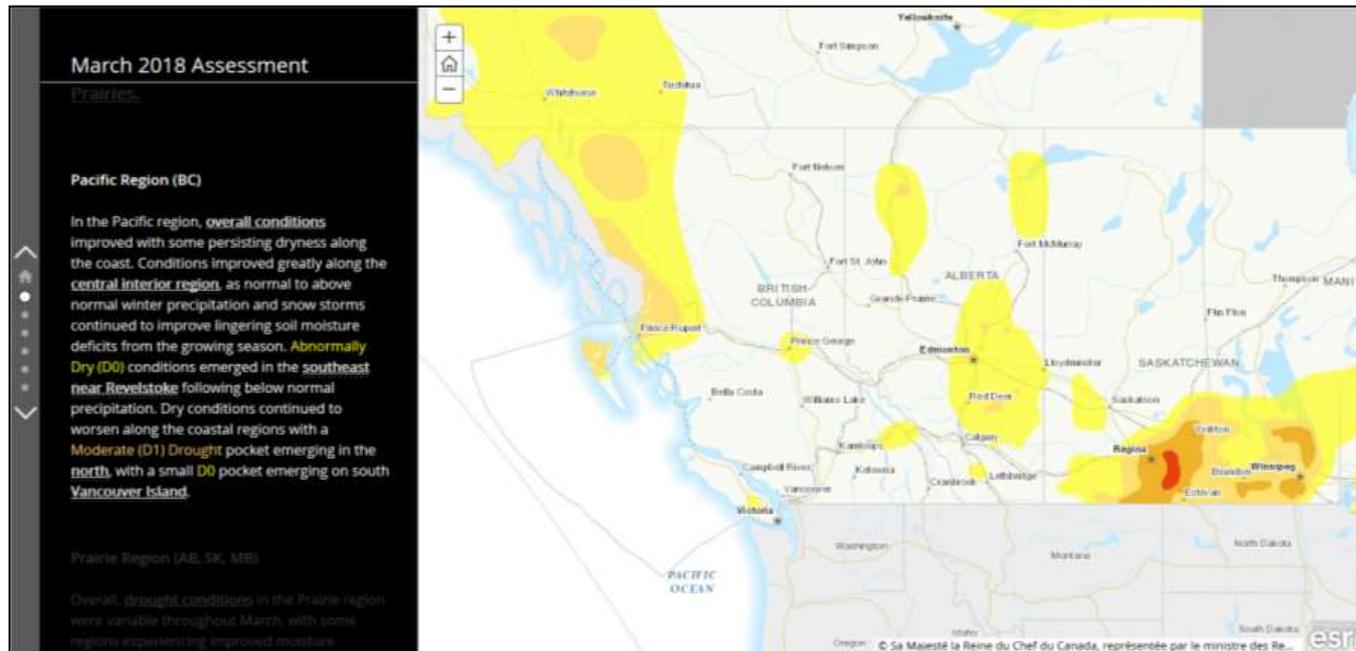
- Provides a platform for reviewers other than email
- Links directly to the Editor Application
- Increases precision and accuracy
- Increases efficiency

Drought Analysis Tools

- Various analytical tools have been developed to provide additional content, increased visibility and interactivity and use of our products and data.
 - **Time Slider:** slide through historical assessments
 - **Monthly Comparison Tool:** compare two CDM maps side by side
 - **Change Maps:** view improvement or degradation of drought over a given period of time
 - **Stats and Graphs:** allows users to interact with the current and historical CDM data looking at the impact of drought

ESRI Map Journal

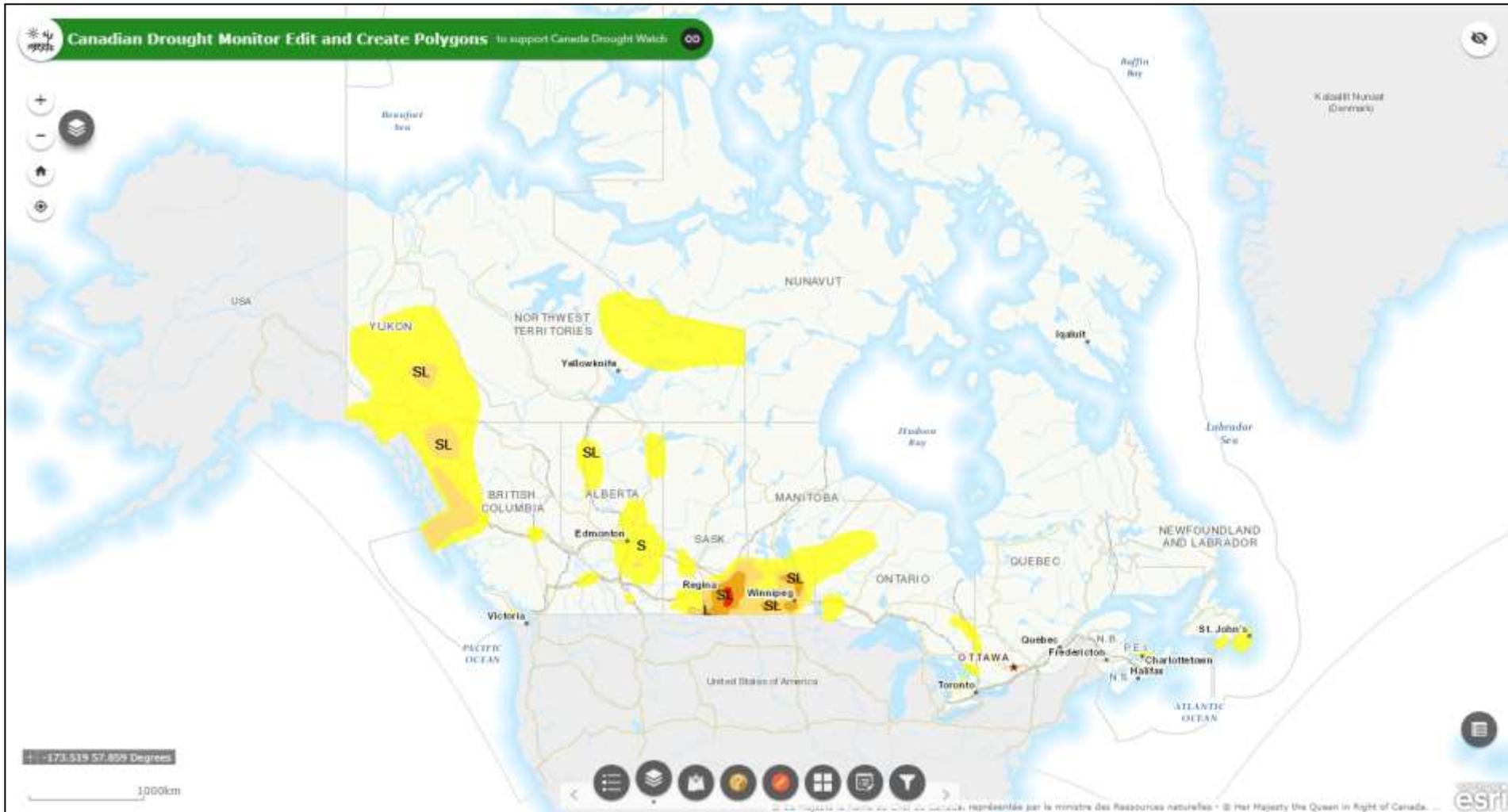
- Is an interactive application for users
- Utilizes ESRI ArcGIS Online **story map** application to display web maps with narrative text, images and multimedia content
- Allows users to view the assessment along with the narrative and provides reference to additional products.





Demonstration of The CDM Applications and Tools

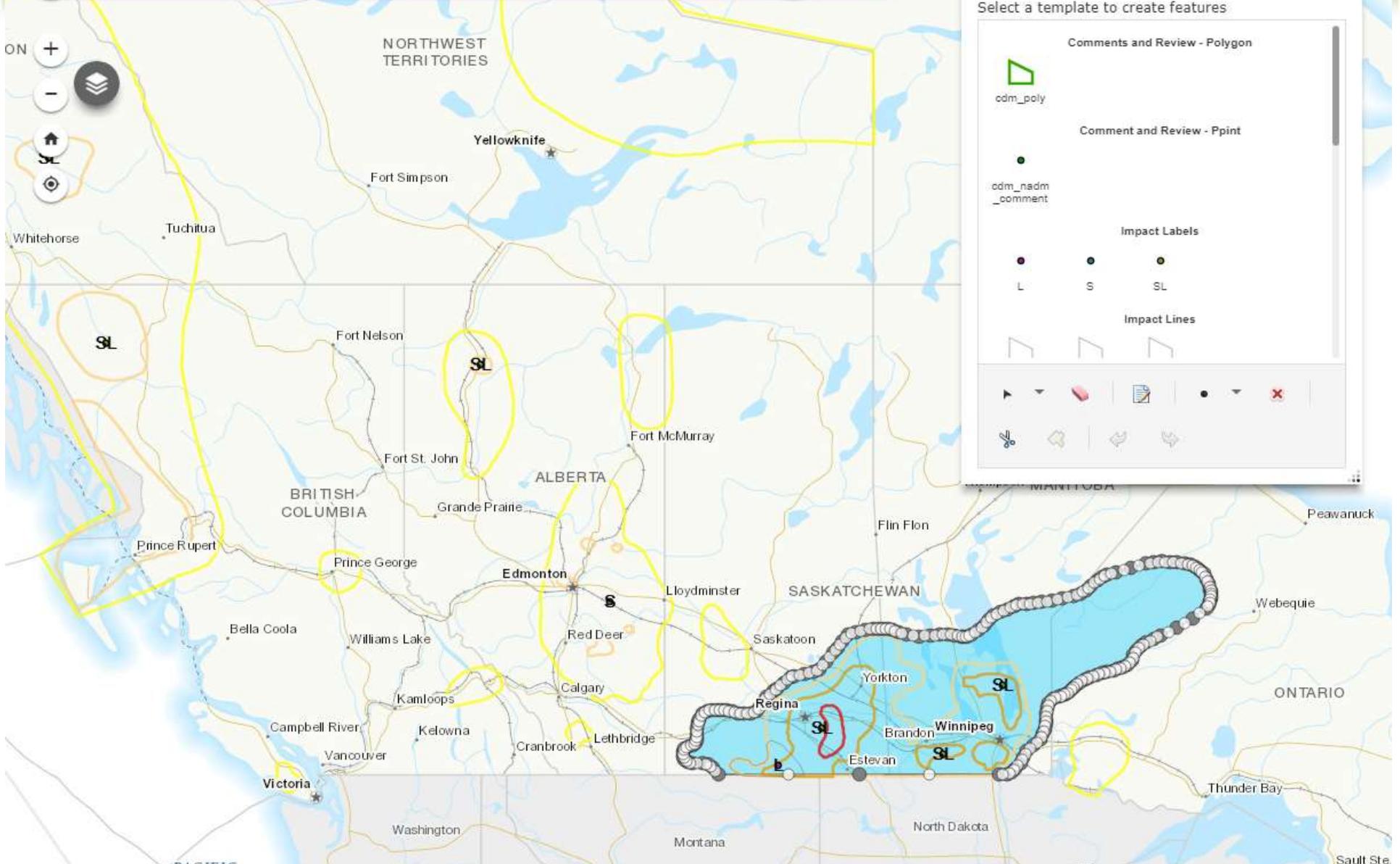
Editor Application



Edit

Select a template to create features

- Comments and Review - Polygon
 - cdm_poly
- Comment and Review - Ppoint
 - cdm_nedm_comment
- Impact Labels
 - L
 - S
 - SL
- Impact Lines



-81.542 45.602 Degrees N

300km

A horizontal navigation bar containing several circular icons: a list, a layer stack, a map, a question mark, a red location pin, a window grid, a document with a pencil, and a funnel.



Layer List

- Layer
 - Percentiles - Growing Season
 - Percentiles - Agricultural Year
 - Percentiles - Winter Season
 - usdm_current
- | | |
|---------------------------------|-------------|
| Exceptionally Low (0th-2nd) | Red |
| Extremely Low (2nd-5th) | Brown |
| Very Low (5th-10th) | Orange |
| Moderately Low (10th-20th) | Yellow |
| Below Normal (20th-40th) | Light Green |
| Near Normal (40th-60th) | Green |
| Above Normal (60th-80th) | Dark Green |
| Moderately High (80th-90th) | Light Blue |
| Very High (90th-95th) | Blue |
| Extremely High (95th-98th) | Dark Blue |
| Exceptionally High (98th-100th) | Purple |

Select a template to create features

- odm_poly
- odm_nadm_comment
- Impact Labels (L, S, SL)
- Impact Lines



Whitehorse

-80.224 46.030 Degrees N

300km



19 Michigan

Add Data

Search URL File

Type

A KML File

URL

SAMPLE URL(S)

Select a template to create features

Comments and Review - Polygon

odm_poly

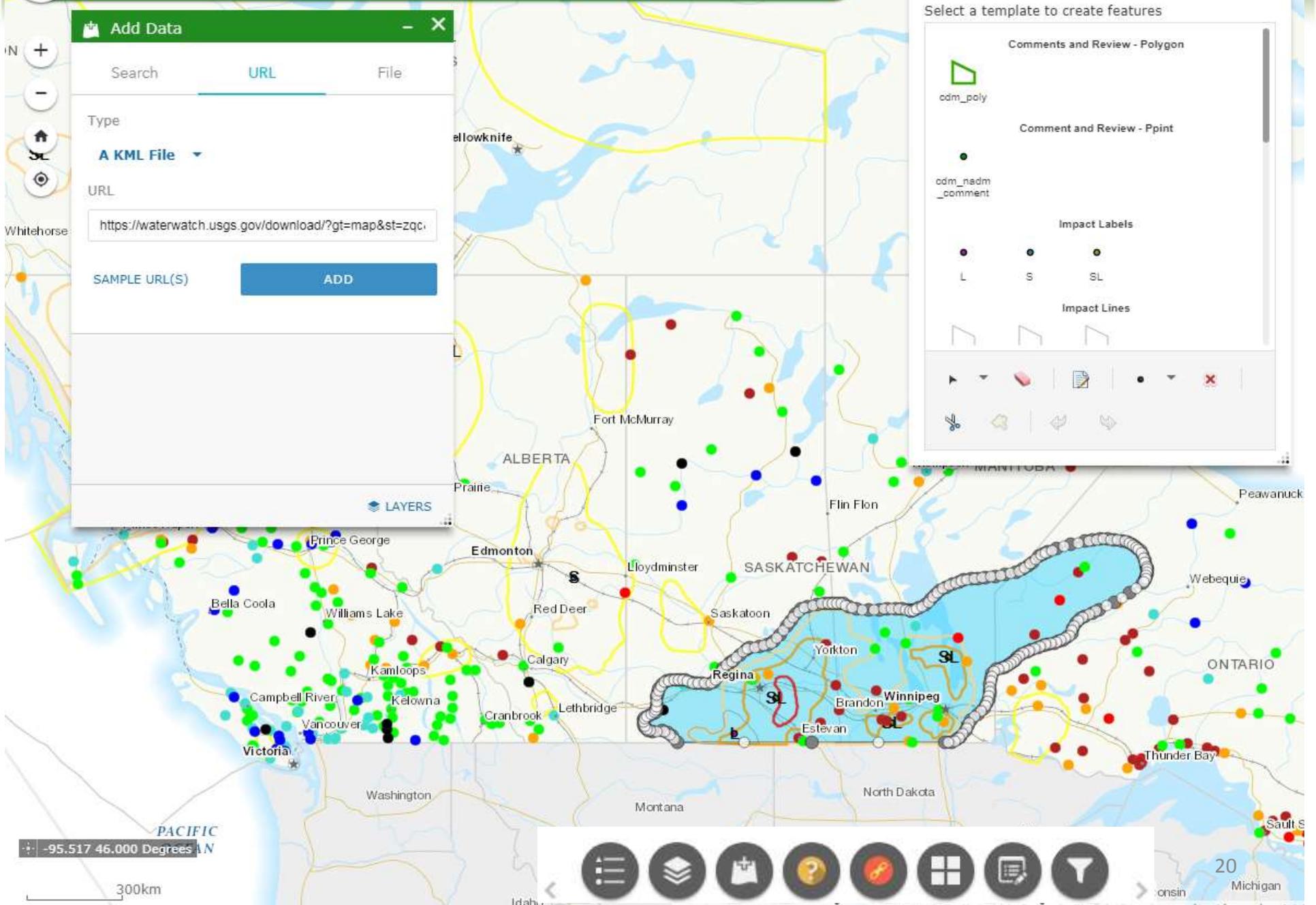
Comment and Review - Ppoint

odm_nadm_comment

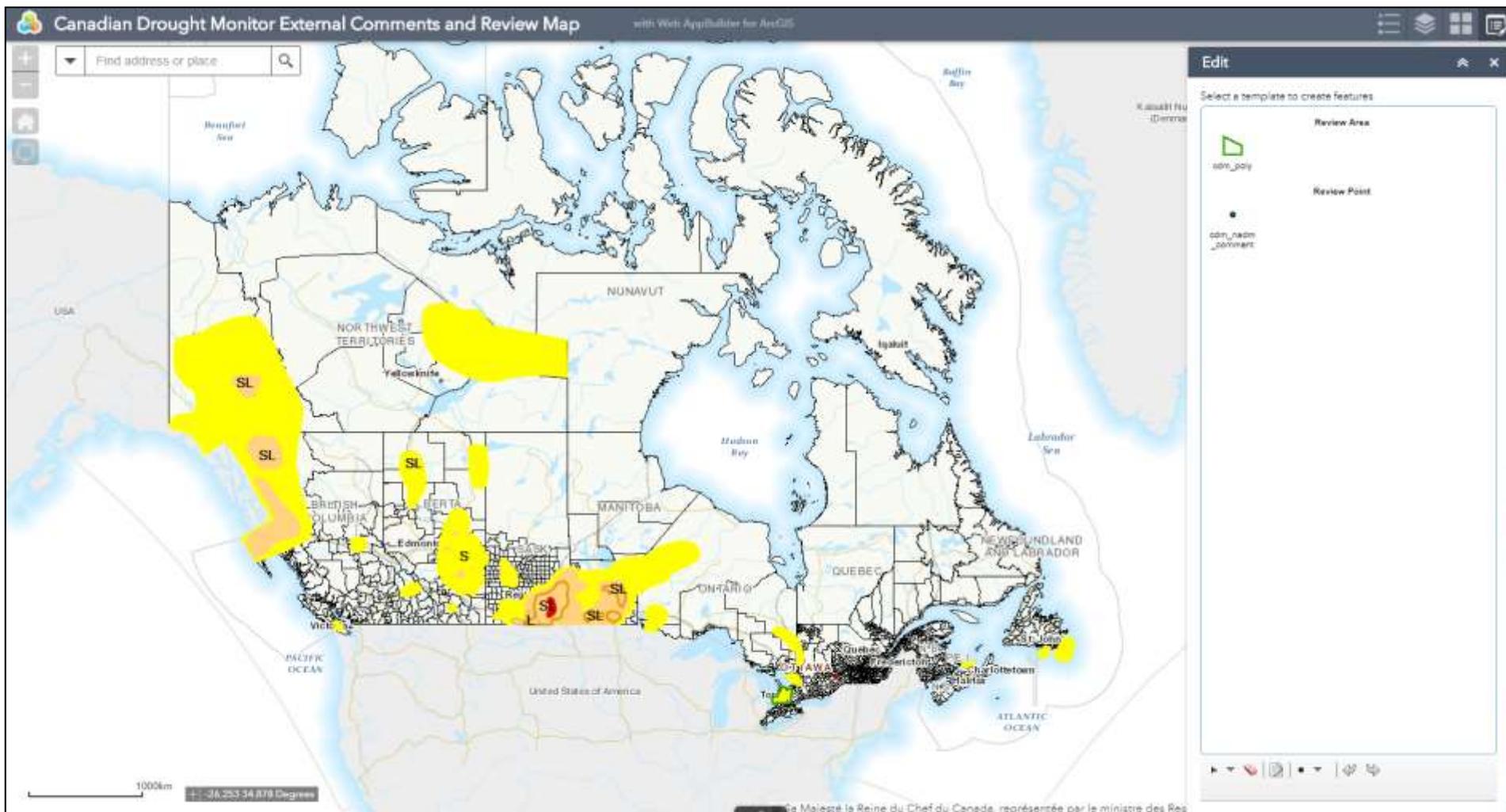
Impact Labels

L S SL

Impact Lines



Review Application



Review Application



ESRI Map Journal

March 2018 Assessment

[Back to Drought Watch](#)

Note: Click on underlines to view interactive features.

Legend

D0 - Abnormally Dry

D1 - Moderate Drought

D2 - Severe Drought

D3 - Extreme Drought

D4 - Exceptional Drought

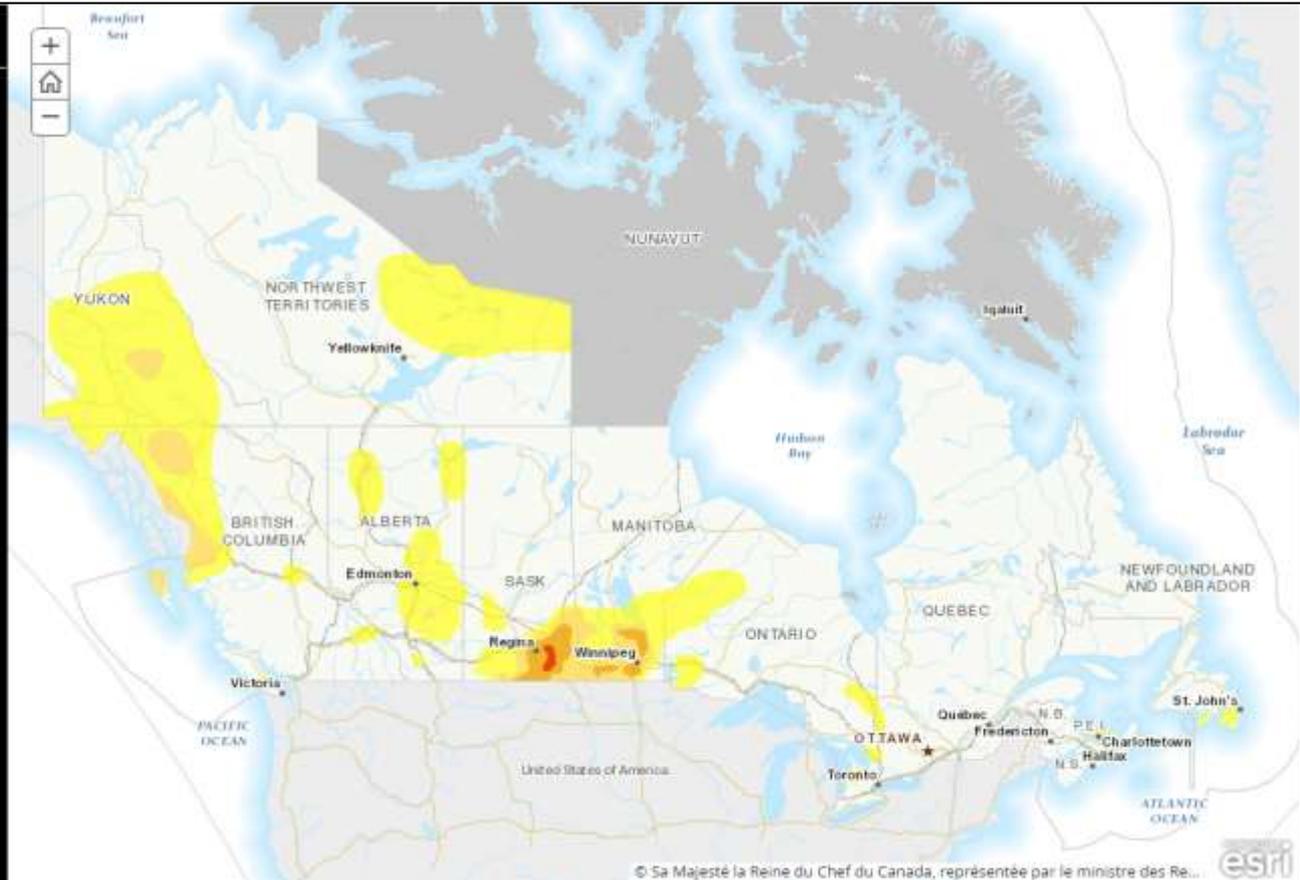
Drought Not Analyzed

[\[description of drought classifications\]](#)

Download:

[\[Map and Narrative\]](#) [\[Map Only\]](#) [\[Open Data\]](#)

National Overview



ESRI Map Journal

March 2018 Assessment

Prairies

Pacific Region (BC)

In the Pacific region, overall conditions improved with some persisting dryness along the coast. Conditions improved greatly along the central interior region, as normal to above normal winter precipitation and snow storms continued to improve lingering soil moisture deficits from the growing season. **Abnormally Dry (D0)** conditions emerged in the southeast near Revelstoke following below normal precipitation. Dry conditions continued to worsen along the coastal regions with a **Moderate (D1) Drought** pocket emerging in the north, with a small **D0** pocket emerging on south Vancouver Island.

Prairie Region (AB, SK, MB)

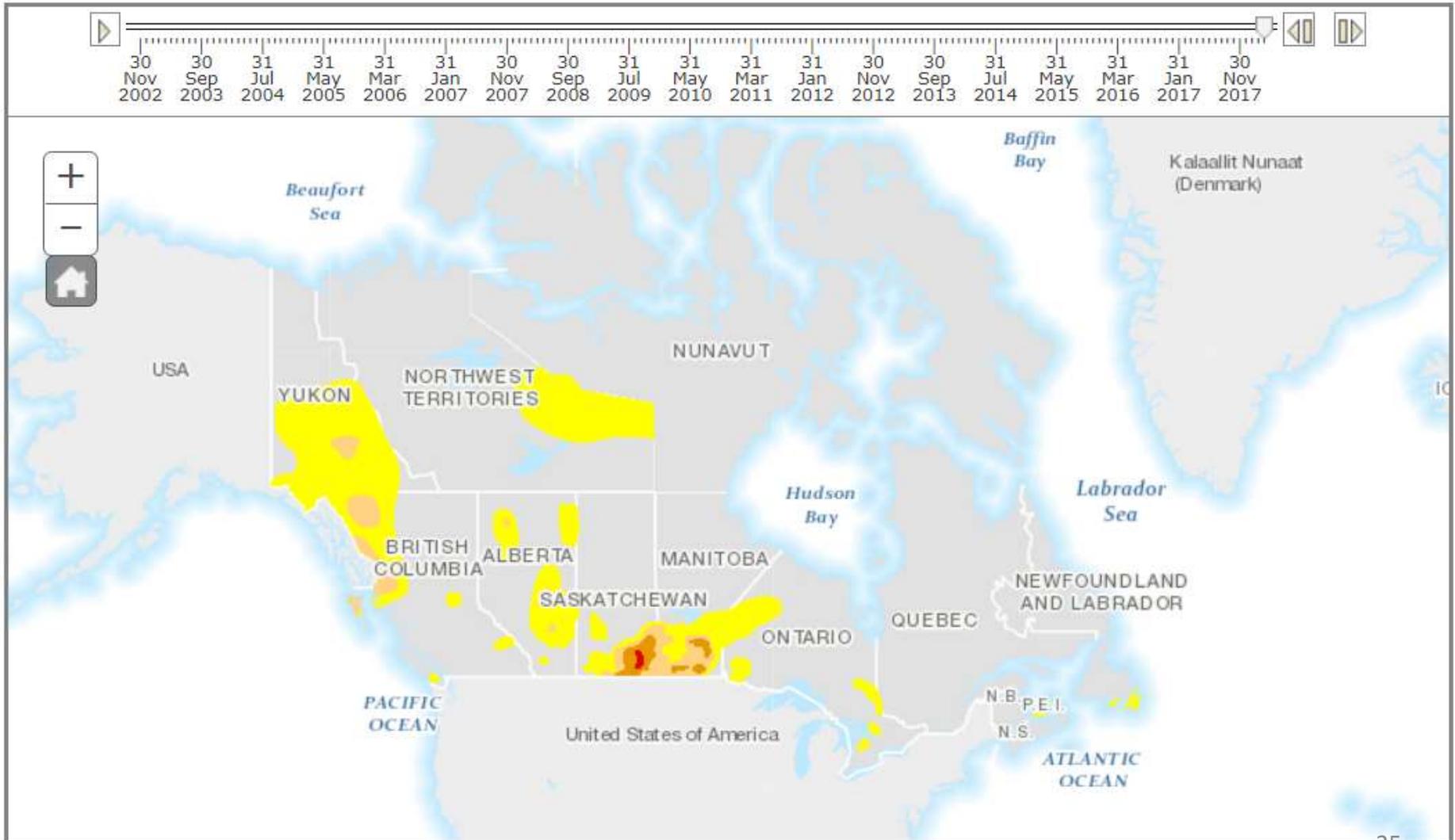
Overall, drought conditions in the Prairie region were variable throughout March, with some regions experiencing improved moisture.

Allows direct and interactive navigation to specific locations

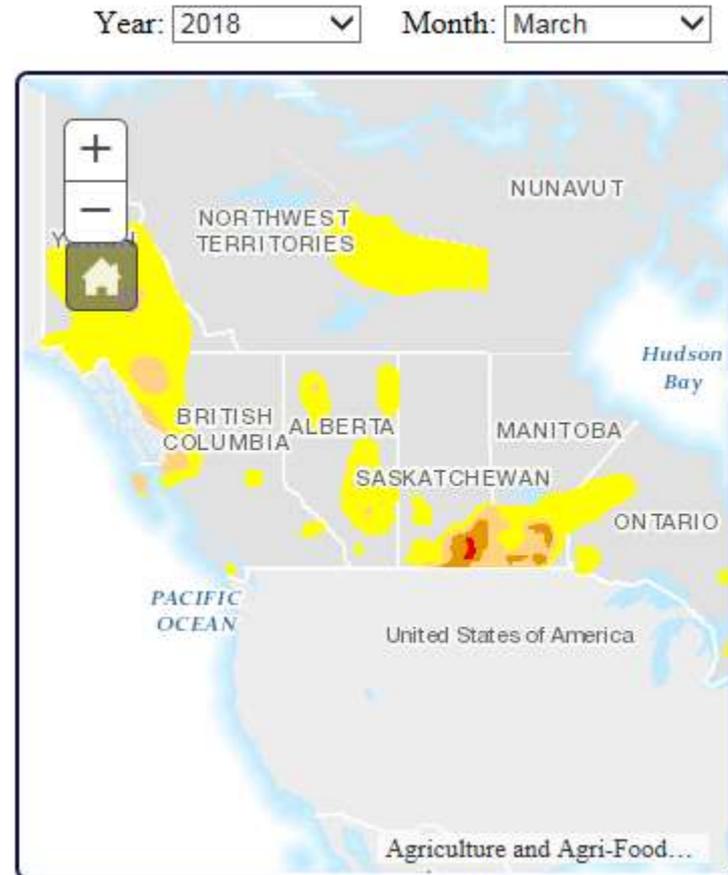
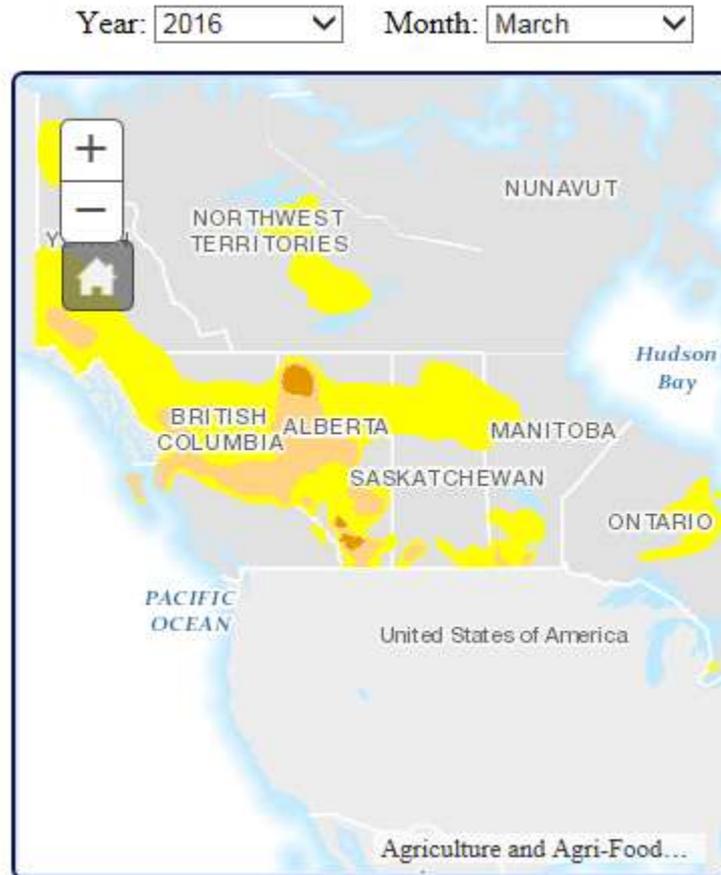
Links to additional NAIS products embedded into the Story Map text

Total Accumulated Precipitation Map
Standard Precipitation Index Map
Palmer Drought Index Map
Soil Moisture - Percent of Normal Map

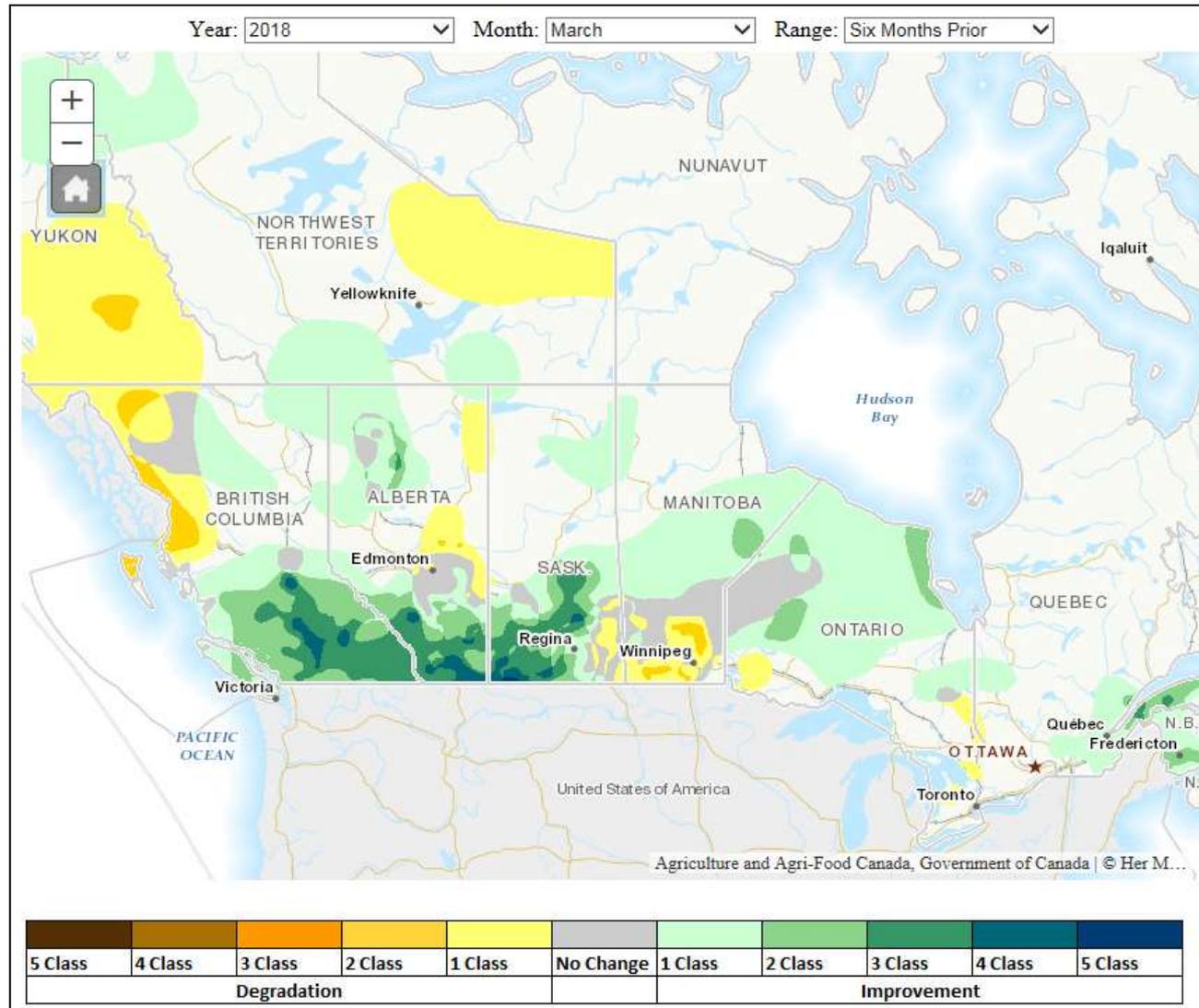
Drought Analysis Tools: Time Slider



Drought Analysis Tools: Monthly Comparisons



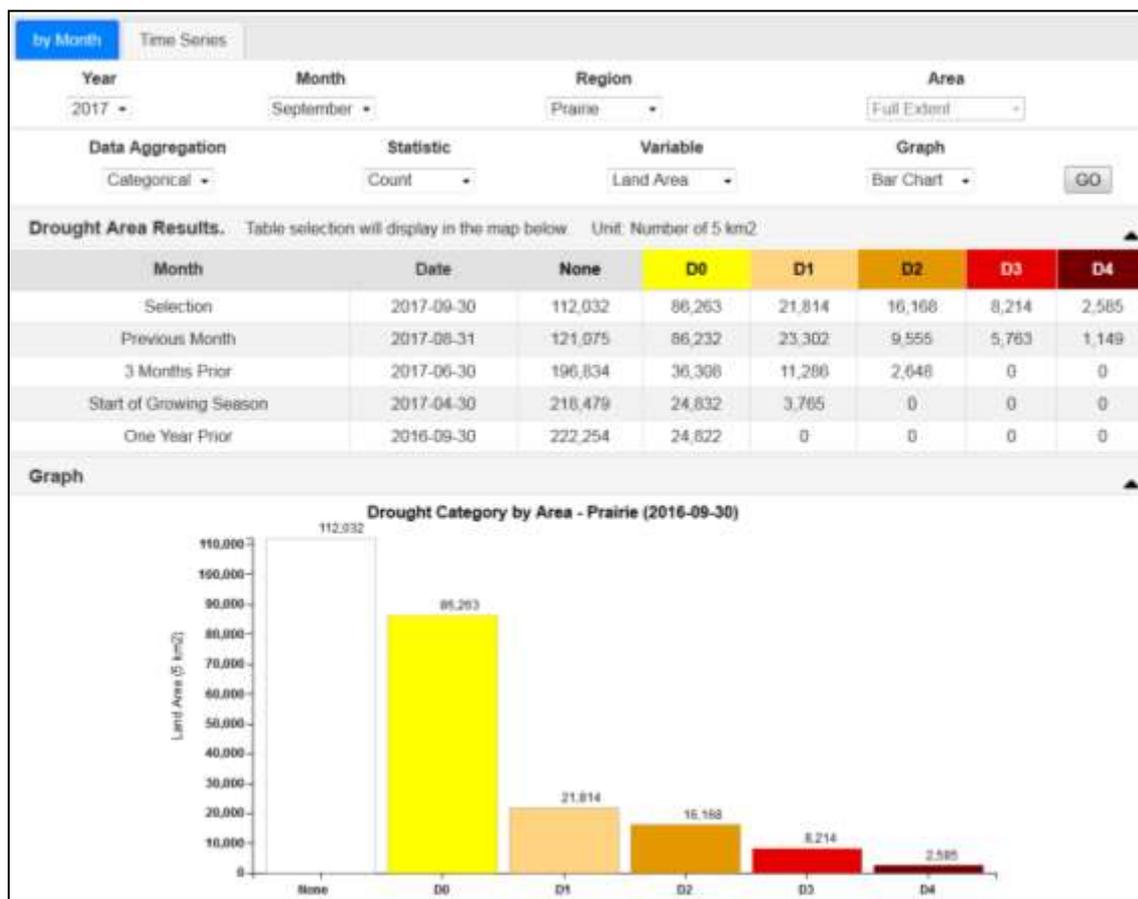
Drought Analysis Tools: Change Maps



Drought Analysis Tools: Stats and Graphs

The Stats and graphs page is currently being developed and will be released later in 2018.

This page will allow users to interact with the current and historical CDM data looking at the impact of drought on agriculture.



Next steps and future priorities

- Continue improving the communication and outreach tools
- Develop a Drought Outlook for Canada
- Improve the existing assessment with new indicators and datasets (e.g. VegDRI, EDDI, ...)
- Better define drought in northern regions in order to include Nunavut and create a cross-Canada drought assessment.

Thank you

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National Agroclimate information Service,
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