

# Creating the North American Drought Monitor

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**CARIWIN Regional Seminar**  
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# Overview

- NADM Participants & Responsibilities
- National Drought Depictions
  - USDM
- NADM Procedure & Deadlines

# NADM Participants & Responsibilities

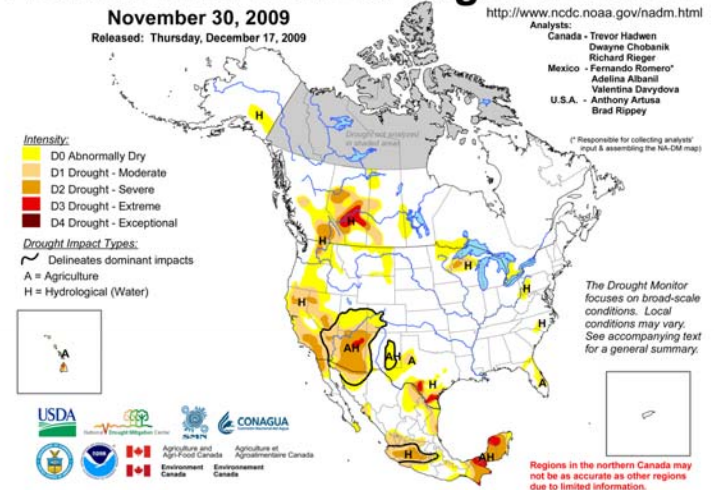
## Participants

- Canada: Agriculture & Agri-Food Canada, Environment Canada
- U.S.: NOAA, USDA, National Drought Mitigation Center
- Mexico: National Meteorological Service (SMN)

## Responsibilities

- Each country determines drought depiction & narrative within their national boundaries
- NADM lead authorship rotates amongst the participants
- NADM lead author integrates national drought assessments from each country, prepares continental monthly map & narrative
- All participants peer review product

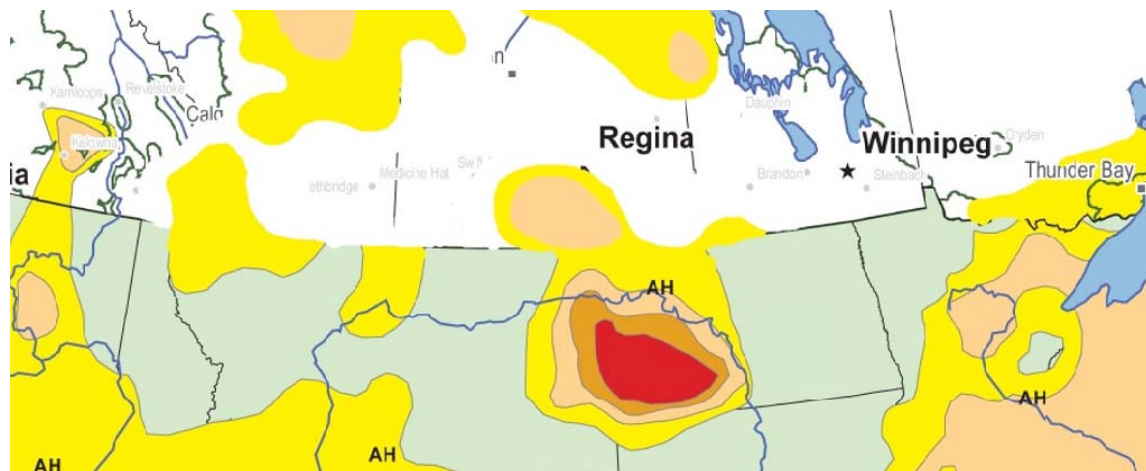
## North American Drought Monitor



<http://www.ncdc.noaa.gov/oa/climate/monitoring/drought/nadm/index.html>

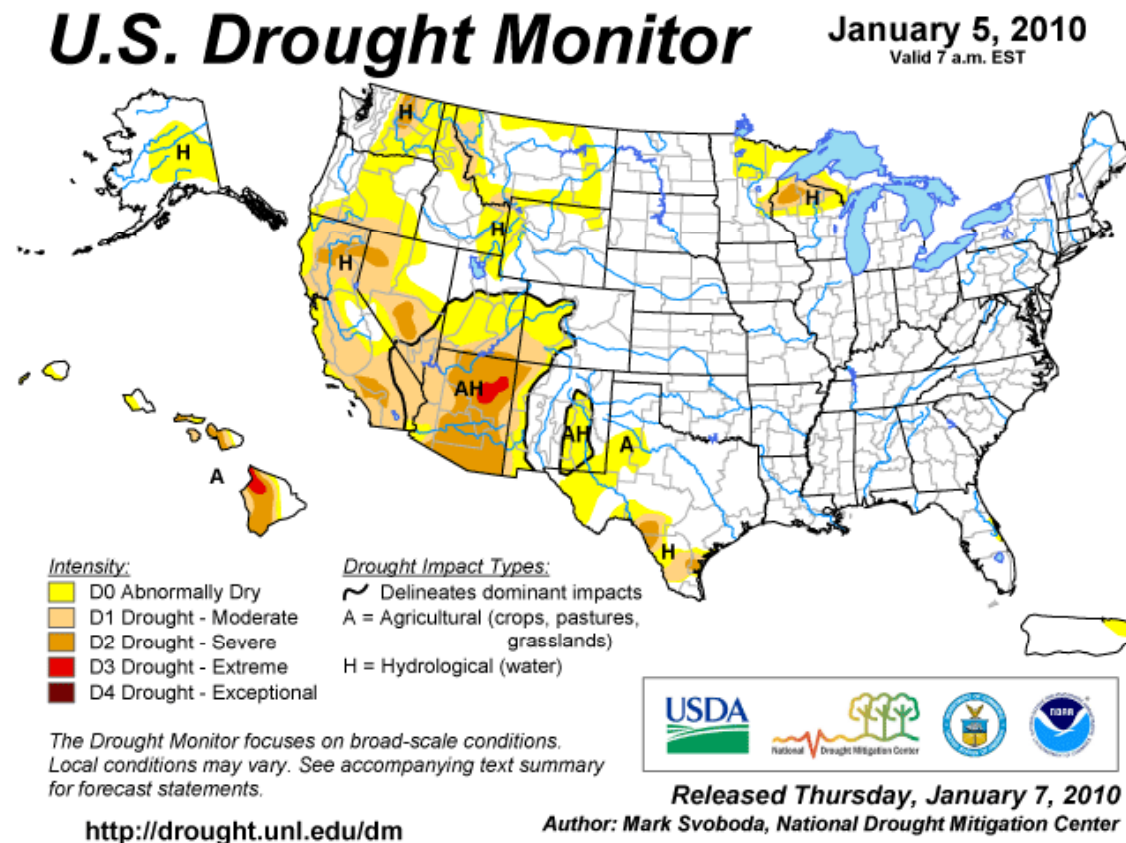
# National Drought Depictions

- The NADM map is actually 3 maps merged into one. Each country (Canada, U.S., Mexico) prepares the drought depiction within their own borders
- The three maps are merged into one map addressing any border discrepancies through discussion and reanalyzing the data.



# The U.S. Portion of NADM is based on the U.S. Drought Monitor






Since the U.S. Drought Monitor is produced weekly, the NADM authors take the ArcGIS shapefiles from the weekly USDM map that best represents U.S. drought conditions at the end month.

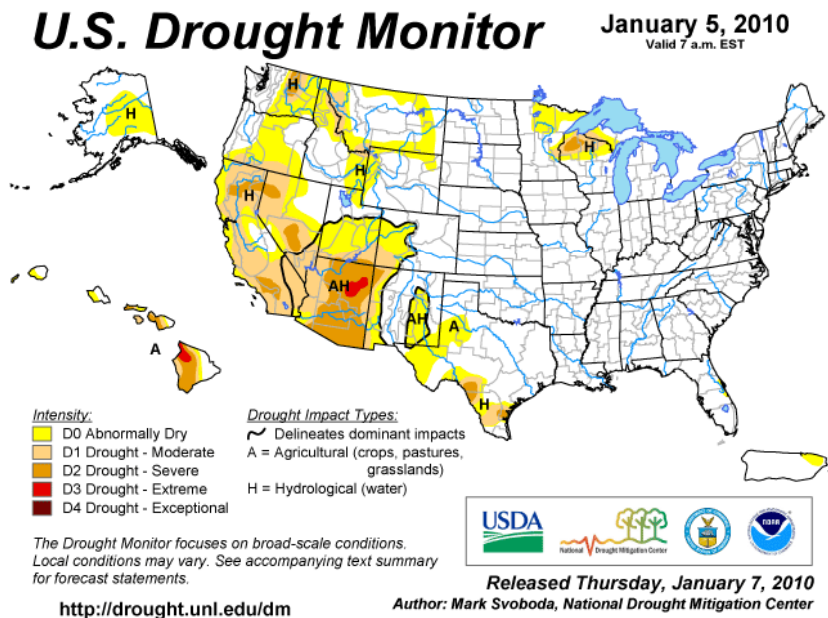


# U.S. Drought Monitor (USDM)

- ✓ A *partnership* between the National Drought Mitigation Center, USDA/JAWF, NOAA's CPC, NCDC, & WRCC – *Authors*
- ✓ USDM is an operational product issued weekly and provides a general up-to-date summary of current drought conditions across the Lower 48 States, Hawaii, Alaska, & Puerto Rico; first issued in 1999.
- ✓ 4 drought categories (D1-D4) plus abnormally dry (D0) category, based on percentile rank

Percentile Rank:

21-30		D0 Abnormally Dry
11-20		D1 Drought – Moderate
6-10		D2 Drought – Severe
3-5		D3 Drought – Extreme
0-2		D4 Drought – Exceptional



# USDM Drought Severity Classification

The USDM depiction was designed to reflect the consensus of key indicators.

Drought Severity Classification Table

		Ranges					
Category	Description	Possible Impacts	Palmer Index	CPC Soil Moisture Percentiles	Weekly Streamflow Percentiles	SPI	Drought Indicator Blends Percentiles
D0	Abnormally dry	Slowed planting, lingering water shortages	-1 to -1.9	21-30	21-30	-0.5 to -0.7	21-30
D1	Moderate drought	Some crop damage, water supplies low	-2 to -2.9	11-20	11-20	-0.8 to -1.2	11-20
D2	Severe drought	Crop losses likely, water shortages common	-3 to -3.9	6-10	6-10	-1.3 to -1.5	6-10
D3	Extreme drought	Major crop losses, widespread water shortages	-4 to -4.9	3-5	3-5	-1.6 to -1.9	3-5
D4	Exceptional drought	Exceptional and widespread crop losses, water emergencies	-5 or less	0-2	0-2	-2 or less	0-2



# Pros and Cons of the USDM Methodology

## Pros

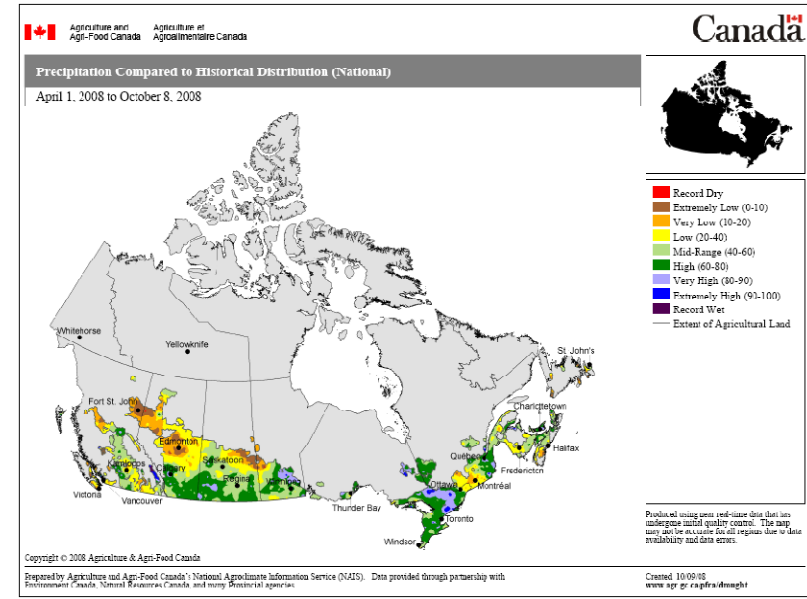
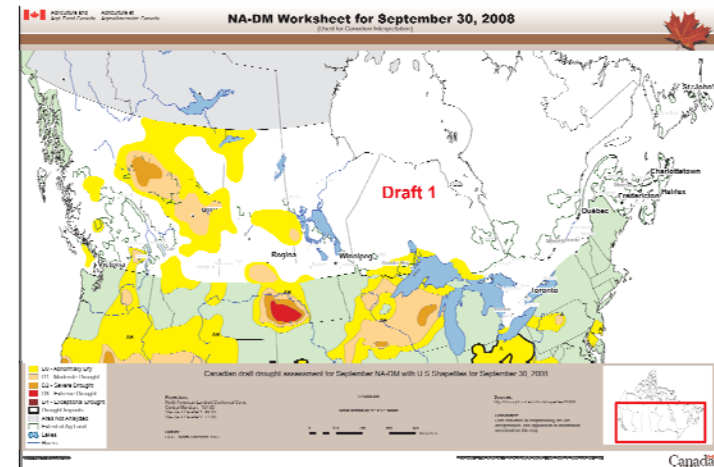
## Cons

Incorporates numerous drought indicators	Authors do not necessarily follow the indicators, and each one interprets and weights them differently. Subjectivity introduced.
***Draft maps elicit feedback from “the field.”***	Feedback may not follow guidelines for assigning drought intensity levels... DM authors reluctant to oppose advice even when suspect.
Diversification of drought authors, offering fresh perspectives	9 authors among 5 agencies results in inconsistencies.
Ground truth/impacts considered	Impacts difficult to quantify
Each DM author has considerable flexibility when creating the DM maps.	No standards/rules followed on minimum size of areas, assignment of D levels, training of authors, removal of authors. No verification or audits of results. No final arbiter of results. No method of arbitrating disputes.



# Assessment for Canada

- The Canadian drought contours are analyzed by the NAIS of AAFC. Then the shapefiles are produced & merged with the U.S. drought contours, and provided to the NADM author.
- The monthly assessments are based on a wide range of products at national, provincial and regional scales.
- The data consist of near real time monitoring maps, maps from the national drought model, and a wide variety of provincial/regional products.
- Assessments also use conditions & reports from other agencies including provincial crop reports, stream flow reports, low water level advisories.

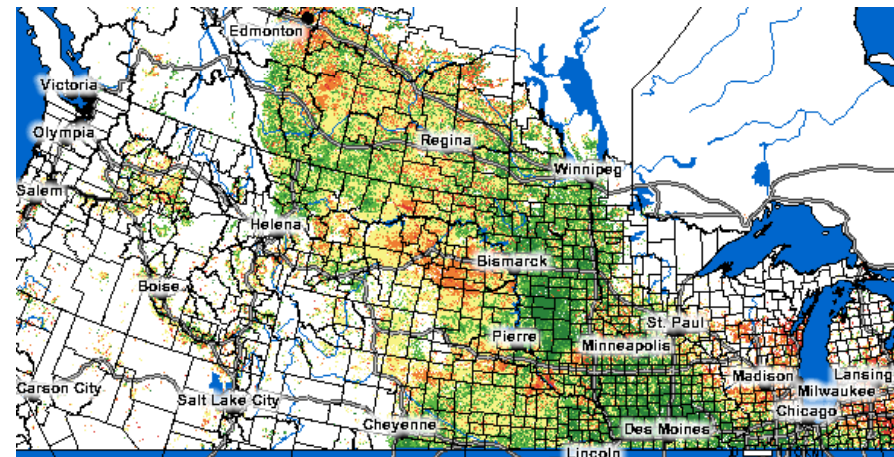
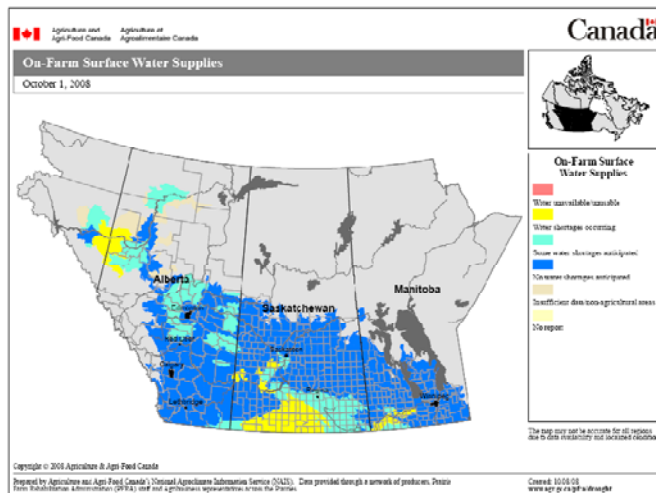
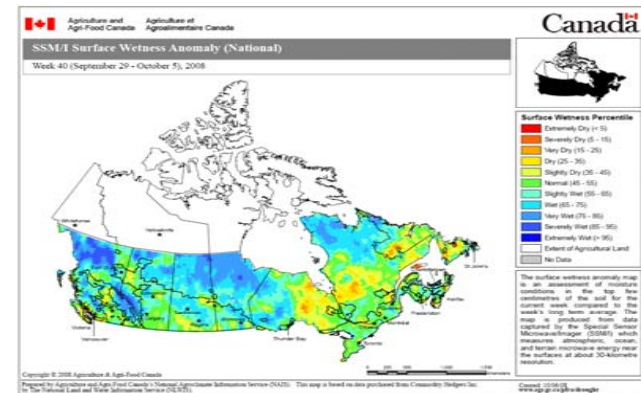
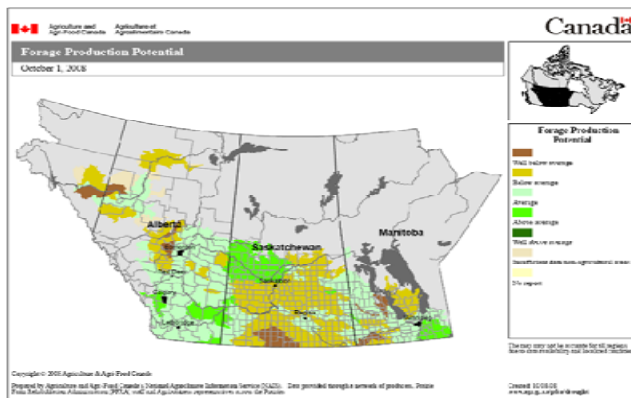


# Canadian Analysis

## Other Supplemental Indicators for Canada

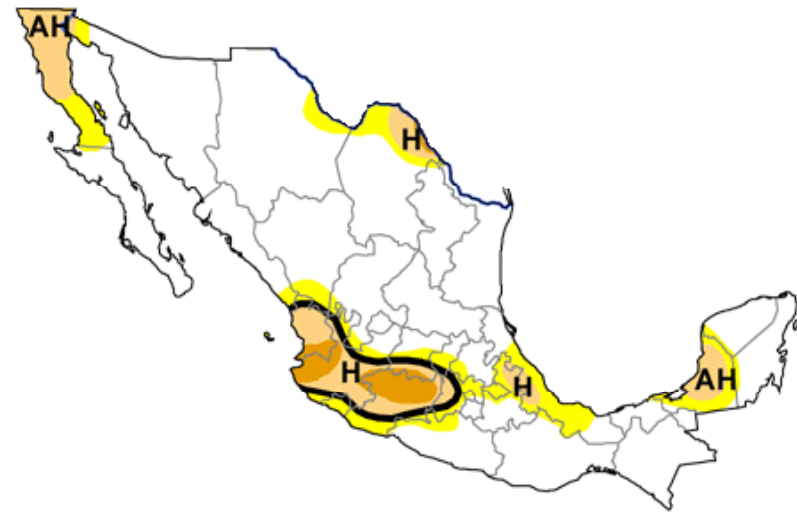
Data gathered through  
monthly producer surveys

Remotely Sensed Data



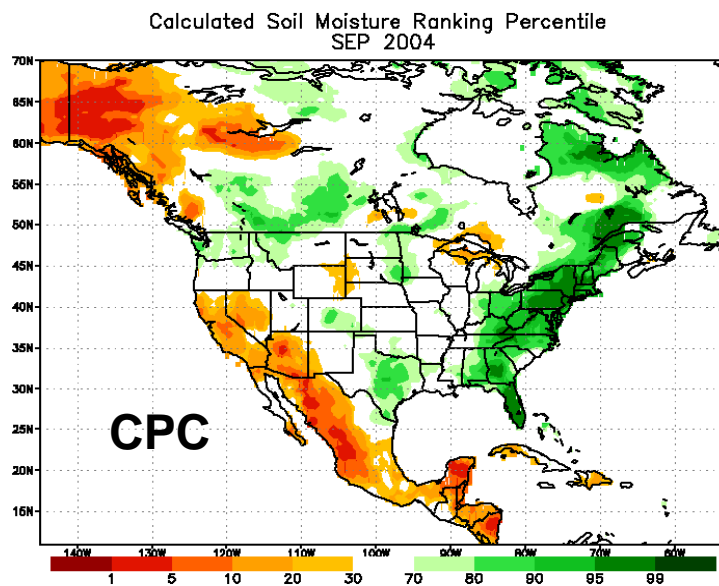
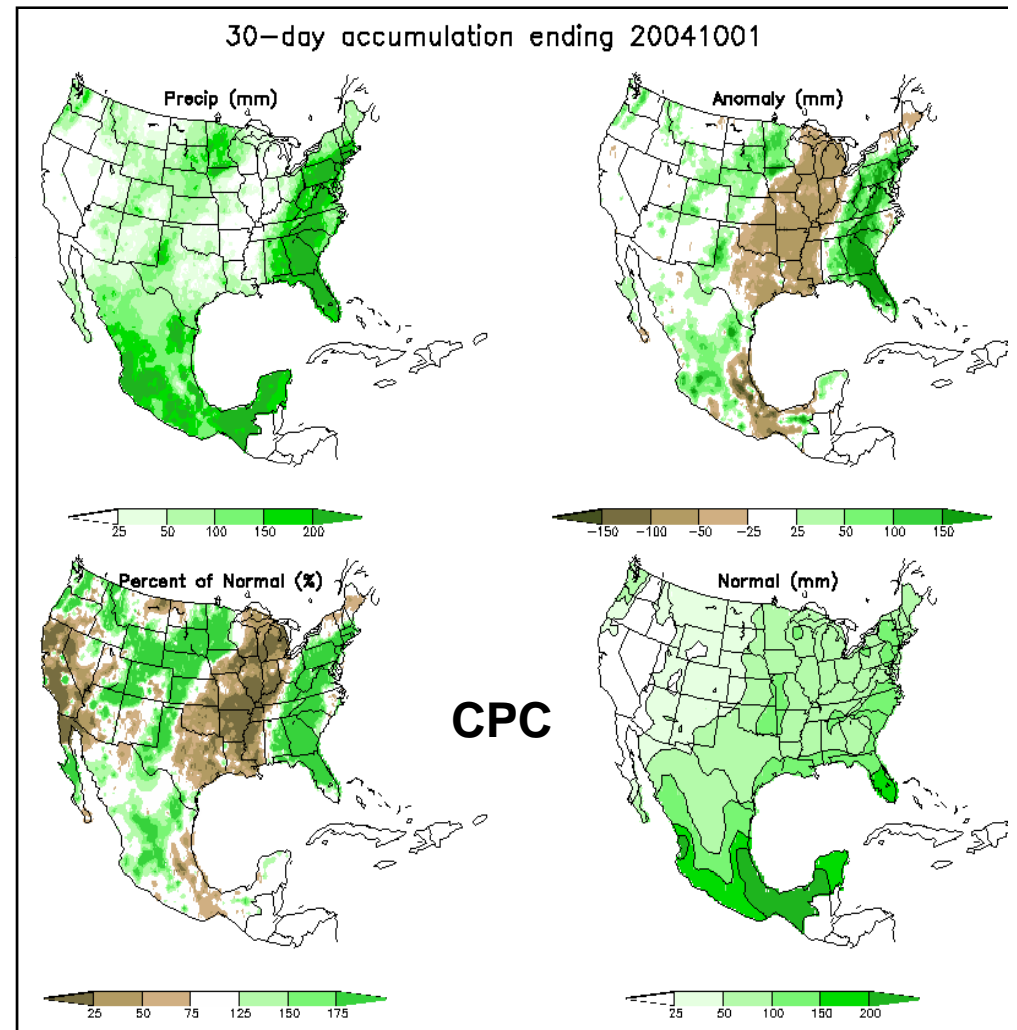
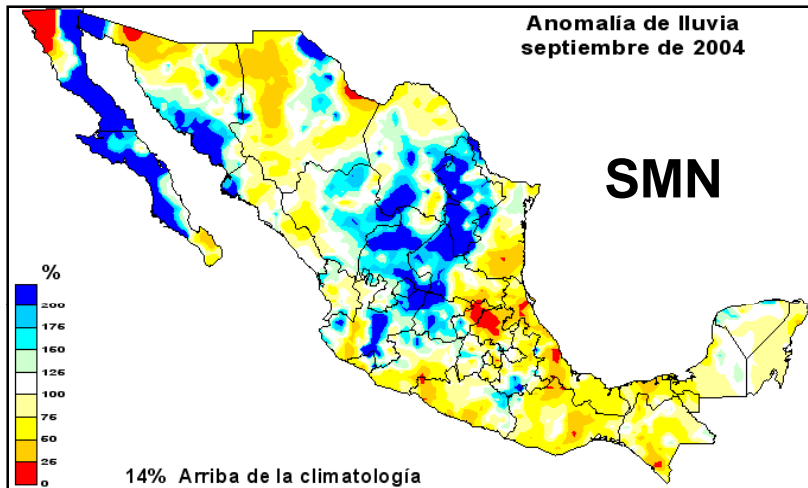
# Assessment for Mexico

- ✓ Mexico performs internal drought assessment and provides shapefiles for the country by the 8th of each month.
- ✓ A number of inputs are utilized, such as station precipitation data, Palmer drought indices, SPI, reservoir information (when available), NDVI imagery and other sources of climate/hydrological data.



# Mexican Analysis

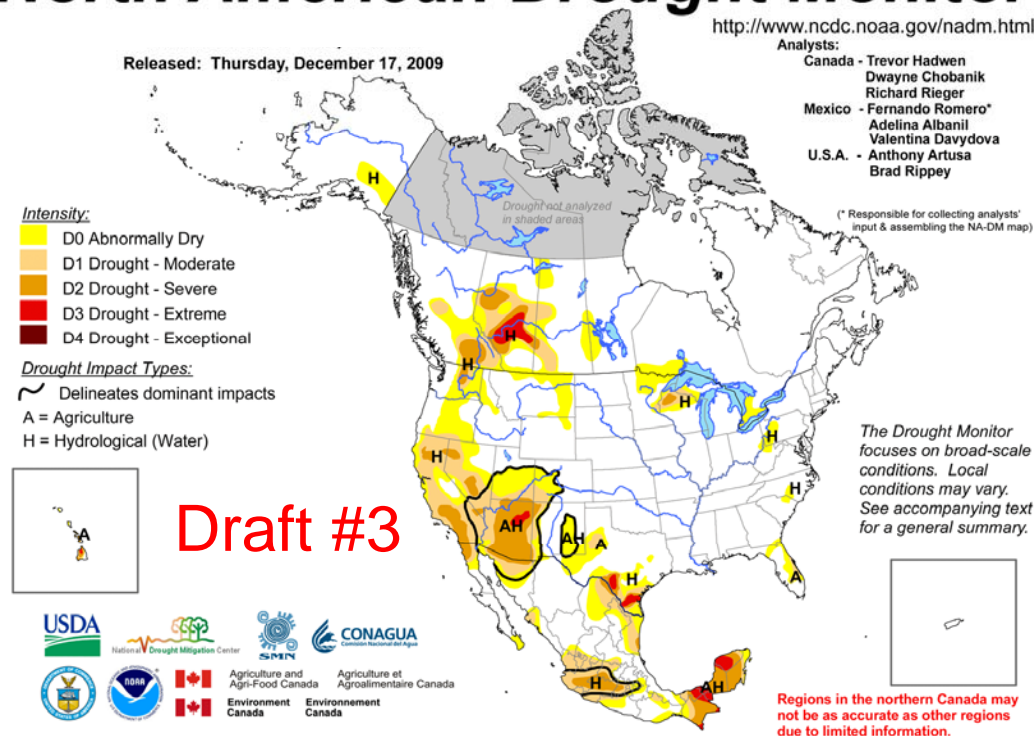
## Other Supplemental Indicators for Mexico



The map drafts are distributed via email and any user comments are considered for possible modifications, mainly along the international borders.

However, since all 3 countries' drought analyses had been previously reviewed internally, there is usually little or no feedback at this point.

## North American Drought Monitor



# Text Summaries

**Each country writes their own summaries and sends the text to the NADM lead author.**

**The U.S. summary is often a condensed version of the 4 to 5 weekly U.S. Drought Monitor summaries, or from the monthly U.S. summary in NCDC's monthly drought report or JAWF's *Weekly Weather and Crop Bulletin*, or a combination.**

**The combined draft text summary is disseminated via email, and any user comments are considered for possible modifications.**

**When finalized, the text summary is translated into French & Spanish then sent back to NCDC for Web inclusion.**

## August 2004 North American Drought Monitor **DRAFT#1**

**CANADA:** Cool and wet conditions characterized the weather that dominated the agricultural landscapes in much of Canada during August. Northern Boreal regions in western Canada continued to experience drier than average conditions or did not receive enough precipitation to improve the overall drought status. Data is very sparse for the northern Territories including the Yukon, Northwest Territories and Nunavut, and drought definitions are not established; but, precipitation amounts were reported to be below 70 percent of average for the past 12 months and near 50 percent of average for the past five months.

Much of British Columbia, with the exception of the northeast Peace River region and Skeena Basin, has recovered from drought conditions that began in the spring of 2003. The extreme northeast region of BC remained in a severe drought rating as does northern Alberta and much of the northwest boreal region of Saskatchewan. Abnormally dry to moderate drought conditions continued in some eastern locations of Alberta, which are remnants of the prolonged drought conditions in the region and slightly below average precipitation during the past growing season. These conditions are reflected by groundwater, some surface water, and forage supply issues. Most natural runoff volumes in Alberta ranked between the ninth and 30<sup>th</sup> lowest in 91 years of record this growing season; however, water storages in most major reservoirs were average or above average.

In agricultural regions of Saskatchewan and Manitoba, warm dry weather is needed to complete this year's harvest. Drought is not a factor impacting crop production. The northern regions of Manitoba range from abnormally dry to moderate drought.

Most agricultural regions of Ontario and Quebec reported average or better moisture conditions, and harvest will be late this year.

Abnormally dry conditions continued to categorize parts of New Brunswick, Prince Edward Island, Newfoundland and eastern and Annapolis Valley regions of Nova Scotia, although there were no reports of adverse impacts.

**UNITED STATES:** Several major events occurred during August that affected the drought and dryness areas across the United States. The month saw a new August record of eight "named" tropical cyclones in the North Atlantic, Caribbean Sea, and Gulf of Mexico (breaking the old record of seven set in 1933 and 1995), and several of these storms affected the eastern United States. Hurricane Alex passed within 10 miles of Cape Hatteras, NC, on August 3; Tropical Storm Bonnie moved onshore near Appalachicola, FL, on August 12; Hurricane Charley struck the west coast of Florida north of Fort Myers on August 13, came ashore again near Cape Romain and North Myrtle Beach, SC, on August 14; and Tropical Storm Gaston moved onshore near McClellanville, SC, on August 29. Hurricane Frances was located northeast of Puerto Rico when August ended. As a result of the rains associated with these storms, much of the East Coast had above-normal precipitation during August. The exception to this Anchorage included). Unfortunately, August capped an already dry summer with many areas reporting near-record (Valdez and Yakutat) or record low (Fairbanks) totals for the month. The prevalent heat and dryness have been responsible for a very active fire season this year across Alaska. As of early September, a record number 6.4 million acres have burned so far this year.

**MEXICO:** Although August total precipitation was very close to the long term national average (137.7 mm vs 137 mm, respectively) according to preliminary data from the National Meteorological Service (SMN), an increase in drought conditions was observed in most of the southeastern and western parts of the country. During August, showery weather with some heavy rainfall events were concentrated across northern and central Mexico, while abnormally dry (D0) to moderate drought (D1) conditions in Baja California spread southward into Baja California Sur. Abnormally dry conditions (D0) also increased along the Pacific coast from Nayarit southward into Guerrero. This dryness along the southwest coast of Mexico was due, in part, to decreased tropical storm activity near the coast and a southward suppressed ITCZ. Along the Gulf of Mexico watershed, an abnormally dry region developed near Campeche Bay last month, and this dryness spread all along the Gulf coast, from central Tamaulipas through Veracruz and

# Final Product

## North American Drought Monitor

November 30, 2009

Released: Thursday, December 17, 2009

<http://www.ncdc.noaa.gov/nadm.html>

Analysts:

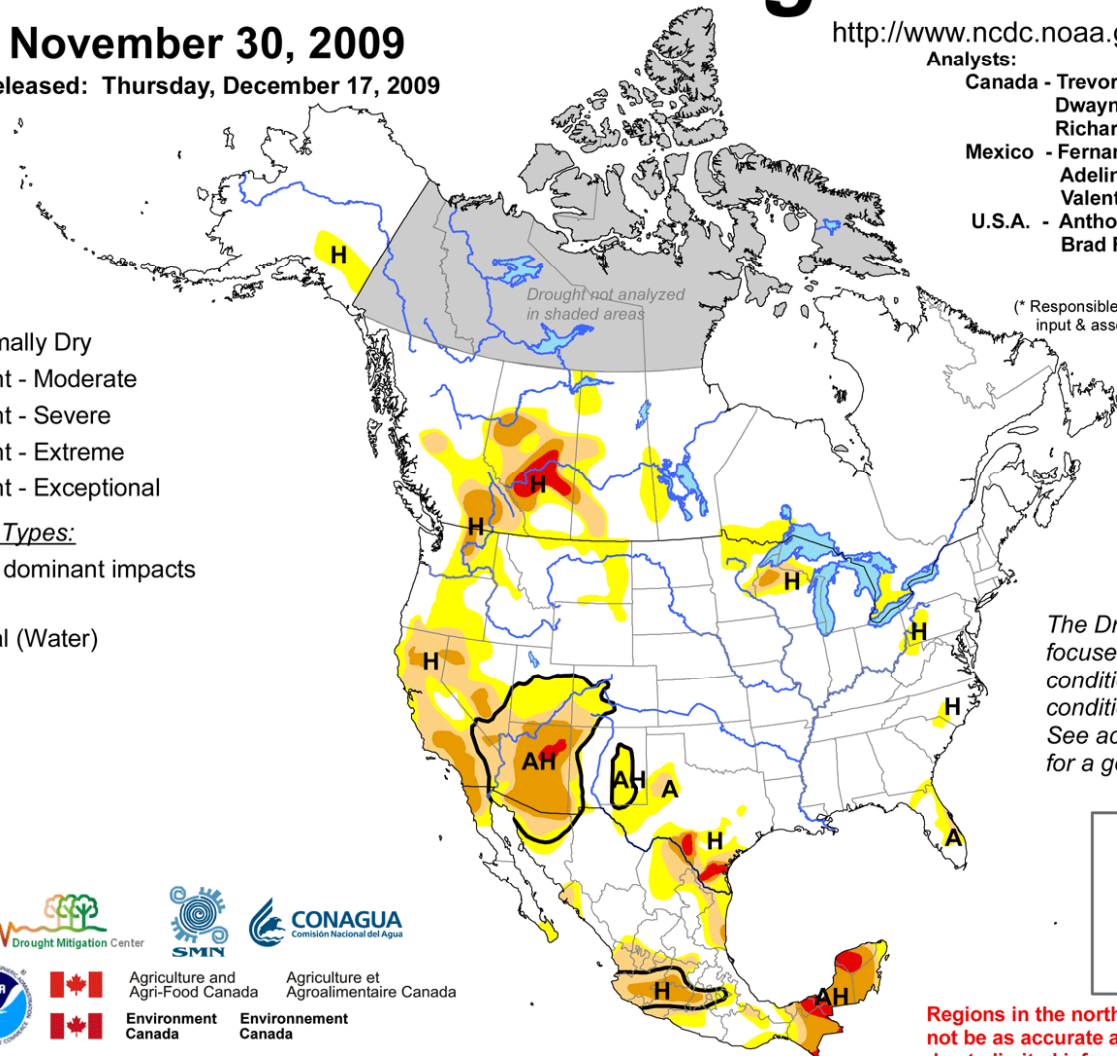
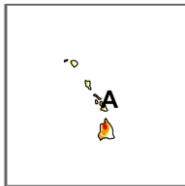
Canada - Trevor Hadwen  
Dwayne Chobanik  
Richard Rieger  
Mexico - Fernando Romero\*  
Adelina Albanil  
Valentina Davydova  
U.S.A. - Anthony Artusa  
Brad Rippey

Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

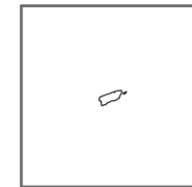
Drought Impact Types:

- Delineates dominant impacts
- A = Agriculture
- H = Hydrological (Water)



(\* Responsible for collecting analysts' input & assembling the NA-DM map)

*The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text for a general summary.*



**Regions in the northern Canada may not be as accurate as other regions due to limited information.**



Agriculture and Agri-Food Canada



Agriculture et Agroalimentaire Canada



Environment Canada



Environnement Canada



# NADM Procedure & Deadlines

- By 5<sup>th</sup> of the Month:
  - NCDC receives international (station) data from Mexico and Canada
  - NADM author decides which weekly U.S. Drought Monitor depiction will be used for the U.S., sends USDM shapefiles to Canada
- By 7<sup>th</sup> of the Month:
  - NCDC produces (and puts online) continent-scale indicator maps from the Canadian, Mexican, Alaska, and contiguous U.S. data
- By 8<sup>th</sup> of the Month:
  - Mexico provides shapefiles of Mexican depiction to lead author
  - Canada provides shapefiles of Canadian depiction to lead author
  - Lead author merges all shapefiles to create continental shapefiles/map





# NADM Procedure & Deadlines

- By 10<sup>th</sup> of the Month:
  - NADM lead author adjusts drought depiction along international boundaries, distributes NADM map to all participants for peer review, produces additional drafts as necessary per peer review comments
- By 12<sup>th</sup> of the Month:
  - Each country provides the narrative text to the lead author, who integrates all text & distributes the continental narrative for peer review
  - NADM continental map depiction finalized
- By 14<sup>th</sup> of the Month:
  - Each country gives final approval of NADM map & narrative to lead author
  - Lead author receives final merged shapefiles



# NADM Procedure & Deadlines

- By 15<sup>th</sup> of the Month:
  - Lead author distributes final continental map depiction & narrative
  - Final operational NADM map, narrative, and shapefiles made available to NCDC by close of business on the 15<sup>th</sup>
- By 16<sup>th</sup> of the Month:
  - NCDC places NADM map and narrative product online by 0900 Eastern time

**Objective: Release NADM by 16th of each month, sooner if possible**



# Summary

- Good

- Example of international/interagency cooperation and commitment
- Benefits drought monitoring in participating countries

- Bad

- Differing drought analyses techniques
- Challenges in meeting deadlines