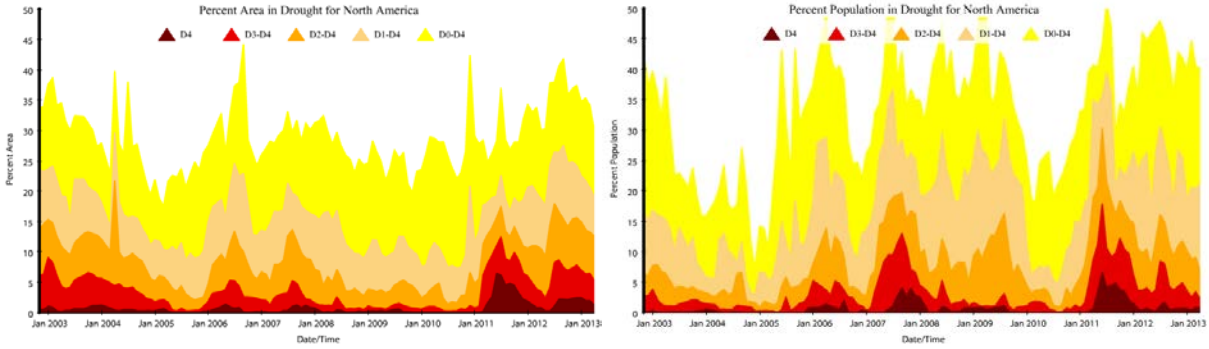
North American Drought Monitor – April 2013

At the end of April 2013, moderate to exceptional drought (D1-D4) affected approximately 19.0% of the area and 21.0% of the population of North America. These percentages are a decrease of 1.6% for area and an increase of 0.5% for population compared to the values for the end of March.



CANADA: The extent and severity of drought across Canada remained low in April with many dry regions recharged by spring snow melt. There are no large regions of drought concern and very few that are assessed abnormally dry (D0). The majority of these areas occurred in British Columbia; however there were some other isolated areas in Manitoba, Ontario, Quebec and New Brunswick. Snow remained in central and northern regions of the Prairies as well as northern regions of Ontario and Quebec. For the Prairie Provinces the snow pack extended much further south than normal at the end of April.

Across the Prairie Provinces, abnormally low temperatures extended winter into late April which resulted in a delayed and extremely slow snow melt. Southern Saskatchewan experienced the largest departures from normal temperatures, and the snowpack was maintained to much later in the season. That also reduced soil moisture loss and decreased the chance for dryness or drought. British Columbia had normal temperatures in April. Temperatures from eastern Ontario to the Atlantic Provinces were above normal, but paired with high precipitation most of the region will have no concern for dryness or drought.

Drought conditions in the Thunder Bay region on the north shore of Lake Superior decreased in both size and severity to a small region classified abnormally dry (D0). This was due to increased precipitation in April, combined with higher temperatures that promoted thawing and runoff as well. The abnormally dry (D0) area in southwest Ontario was eliminated as a result of higher precipitation in March and April.

Other areas marked abnormally dry (D0) included the Montreal and Quebec City regions, and a small region of New Brunswick. These areas had below 60 percent of normal precipitation in April, which, combined with the higher than normal temperatures, brought about dryness in isolated areas. However at the time of this report, there are no significant concerns.

The large portion of interior British Columbia that was abnormally dry (D0) in March diminished by the end of April. Over the course of the month precipitation in the northwest

region of British Columbia was over 200 percent of normal, while other areas such as Victoria received less than 40 percent of normal. As a result, Victoria, Vancouver Island and the south coast of western British Columbia were classified as D0 (abnormally dry). An area just west of the Fraser River in the Caribou municipal district had low amounts of precipitation and very low soil moisture due to reduced snow pack, and was classified as D0 (abnormally dry) as well.

Spring thawing and runoff brought average levels for all of the Great Lakes higher compared to March, though overall water levels remained below the long-term average in April. Lakes Superior and Michigan continued to be close to record low levels; Lake Michigan in particular was only 20 mm (0.79 in) above the record low set in 1964. However some lakes began to rise because of the additional precipitation and spring runoff.

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- B.C. Ministry of Forests & Range, Wildfire Management Branch
- B.C. Ministry of Agriculture
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- Manitoba Water Stewardship
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- New Brunswick River Watch
- Ontario Ministry of Natural Resources – Surface Water Monitoring Centre
- Ontario Ministry of Natural Resources – Aviation, Forest Fire and Emergency Services
- Ontario Ministry of Agriculture, Food, and Rural Affairs
- Ontario Ministry of Environment
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- La Financière agricole (Québec)
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- Saskatchewan Water Security Agency
- Saskatchewan Ministry of Environment Wildfire Management

UNITED STATES: **Synoptic Overview:** April is the middle month of the Northern Hemisphere's climatological spring (March-May), which puts it in the midst of the period of transition for the atmospheric circulation when the circumpolar vortex contracts to the north with warm southerly air masses beginning to dominate over cold northerly air masses. During April 2013, however, the polar jet stream (which marks the edge of the circumpolar vortex and the boundary between the cold polar air masses to the north and the warmer sub-tropical air masses to the south) lingered over the U.S., favoring an upper-level trough over the central part of North America. Upper-level systems moving in this very active flow intensified over the central U.S., sending a series of low pressure and frontal systems across the central and southeastern parts of the country. They triggered outbreaks of tornadoes, mostly in the South; but, for the most part, the circulation inhibited tornado formation with the monthly preliminary tornado count being about half of normal for April. The dominant upper-level flow funneled cold air masses across the Plains and into the East and South, giving seven Plains and north central states April

temperatures ranking in the top ten coldest for April and leaving only the southwestern U.S. and parts of the eastern U.S. warmer than normal. With temperatures below freezing, these cold northerly air masses combined with humid southerly air masses to produce intense spring snowstorms across the Plains, raising national snow coverage to a peak of 29 percent of the contiguous U.S. before the snow cover quickly melted.

Monthly Drought Conditions: Beneficial precipitation resulting from the April weather systems shrank drought areas in the eastern Plains, Midwest, and Southeast, with extreme to exceptional drought virtually eliminated from the Southeast. But the systems largely missed the Southwest and Northeast, with these regions ending the month generally drier than normal and drought expanding in the West. By the end of the month, the core drought areas in the U.S. included:

- a large area of moderate (D1) to exceptional (D4) drought stretching from the West, across the Northern and Southern Plains, with the most intense drought centered in the Southwest to Plains states;
- an area of moderate to severe (D2) drought lingering in the Upper Midwest;
- a contracting area of moderate to severe drought in the Southeast; and
- much of Hawaii, where moderate to extreme (D3) drought largely persisted.

Monthly precipitation totals exceeded ten inches (254 mm) in parts of Louisiana, Tennessee, and Indiana, which were already drought-free. Five inches (127 mm) or more of precipitation fell across much of the Mississippi and Tennessee Valleys and southern Great Lakes, parts of the Southeast, and into the eastern sections of the central Great Plains drought area. The Southeast drought area shrank from 19.2% in D1-D4 at the end of March to 6.1% at the end of April. Much of the Plains remained in the grip of drought, but the D1-D4 area shrank from 91.7% at the end of March to 85.0% at the end of April for the central and northern Plains, and from 60.2% to 56.1% for the southern Plains. The D1-D4 area in the West expanded from 63.5% at the end of March to 66.7% at the end of April. A small area of D1 remained in the Koyukuk Basin of Alaska where the water content of the snowpack and water-year-to-date (October-present) precipitation were low. Hawaii ended the month with about 40.4% D1-D4 coverage, an improvement compared to last month.

April precipitation over the drought areas helped reduce the moderate-to-exceptional national (contiguous U.S.) drought footprint from 51.9% at the end of March to 46.9% at the end of April, based on the U.S. Drought Monitor. According to the Palmer Drought Index, which goes back to the beginning of the 20th century, 41.8% of the contiguous U.S. was in moderate to extreme drought at the end of April, a decrease of about 7% compared to last month.

Historical Perspective: According to preliminary information provided by the NOAA National Climatic Data Center (NCDC), the contiguous U.S. experienced its 23rd coolest and 19th wettest April on record (since 1895). The Nation's average temperature of 49.7°F (9.8°C) was 1.4°F (0.8°C) below the 1901-2000 mean, while the nationally-averaged precipitation of 2.90 inches (73.7 mm) was 0.47 inch (11.9 mm) above the long-term mean (119% of the long-term mean). Seven states in the northern and central Plains and Upper Midwest had April temperatures that were among their ten coolest on record, including North Dakota which had the coldest April in the 119-year record. In the West, California had the 12th warmest April on record. April 2013 was the sixth driest April for Connecticut, eleventh driest for Rhode Island and twelfth driest for

New Mexico. Nine other states ranked in their driest third of the historical record. At the other extreme, Iowa and Michigan had the wettest April in the 1895-2013 record, and four other states (in the Great Lakes to Tennessee Valleys) had April precipitation which ranked in the top ten wettest category.

For the year-to-date (January-April 2013), temperature and precipitation for the contiguous U.S. was near the long-term mean, ranking 59th warmest and 57th driest. Dryness was centered in the West and Northeast, where 22 states ranked in the driest third of the historical record. Eight of these states (four in the West and four in the Northeast) had a top ten driest January-April, with California having the driest January-April in the 1895-2013 record. Six states (from the Mid-Mississippi Valley to the Great Lakes) had a top ten wettest January-April, with two (Michigan and Wisconsin) ranking wettest on record. The last twelve months were the driest May-April on record for Nebraska and New Mexico, second driest for Wyoming, third driest for Kansas, and fourth driest for Colorado. Three other states (California, Oklahoma, and South Dakota) fell in the top ten driest category, while an additional eleven ranked in the driest third of the historical record for May-April. Nebraska and New Mexico also had the driest June-April. The dryness was so prolonged in New Mexico that the state also had the driest 24-month period (May 2011-April 2013), and the Palmer Drought Severity Index for New Mexico's Central Highlands (climate division 6) continued to hover near the record low levels set only a couple years ago.

Agricultural and Hydrological Highlights: According to the U.S. Department of Agriculture (USDA), April 28 reports indicated that 94% of the topsoil moisture in New Mexico was rated short or very short (dry or very dry), while the percentages were 68% in Texas and 57% in Connecticut. As of April 30, 54% of winter wheat, 54% of cattle, 41% of hay, 39% of corn, and 31% of soybeans were in drought. These percentages are less than the corresponding percentages from a month ago. May 5 USDA statistics revealed that 39% of the U.S. winter wheat crop was rated in poor to very poor condition, with statewide percentages as high as 74% in Texas, 62% in South Dakota, and 56% in Colorado. The values were below 50%, but still high, in Nebraska (49%), Oklahoma (45%), and Kansas (40%). May 5 statistics also reveal 36% of the nation's pasture and rangeland rated in poor to very poor condition, with statewide values as high as 91% in New Mexico, 76% in Colorado, 70% in Nebraska, 62% in Kansas, 58% in South Dakota, 55% in Wyoming, 54% in Montana, and 53% in Texas. The statewide percentages were above average from Texas to Montana and from Wisconsin to California. As noted by the USDA, the national percentage of pasture and rangeland in poor to very poor condition for 2013 was the lowest spring start for this statistic in the 1995-2013 record due, in part, to 2012 ending at a very low value.

Monthly streamflow levels for April were much below normal (in the lowest tenth percentile) for several basins in the Southern Plains, Southwest, Intermountain Basin, California, and Hawaii, and a couple basins in the east (Florida and northern Minnesota). Mayl 1 snowpack was below normal across much of the West and less than 70% of normal in many California, Southern Rockies, Intermountain, and Pacific Northwest basins. . Reservoir storage was below average in several states in the Southwest (Arizona, Colorado, New Mexico) and Great Basin (Nevada) but near to above average in the other states. New Mexico and Arizona reservoirs were significantly low, with the Elephant Butte Reservoir in New Mexico's chile agricultural belt at 10% of capacity, the lowest amount of water available for irrigation in almost 100 years. Integrated

satellite and ground observations of vegetation condition (VegDRI) indicated widespread stress on vegetation across the West.

MEXICO: Nationwide April 2013 was the tenth driest since 1941; monthly rainfall of 9.0 mm (0.35 in) was 52% below the long-term average. The scant rainfall was distributed across northeastern, southern and southeast regions mainly by five frontal systems combined with moist air moving in the jet stream flow and westerly winds. The lack of rain increased the areas classified moderate (D1) to exceptional drought (D4) from 14.75% in March to 19.63% in April. All federal states are experiencing some level of drought (D1-D4) or abnormal dryness (D0) except for Aguascalientes, Colima, Morelos and Guerrero.

The dry season in April ranked in the top 10 driest for eight states. Chiapas with 26.9 mm received only 52% of normal and was ranked as the tenth driest. Baja California, Guanajuato, Jalisco and Puebla received only 3%, 7.5%, 2% and 45% of normal precipitation, respectively; all were classified as the ninth driest April. Durango and Hidalgo had no better luck with only 5% and 25% of normal being, and were classified as the eighth driest. The lowest rainfall occurred in San Luis Potosi, where just 2.7 mm was recorded. That is the third driest on record, surpassed only the records of 1.3 mm in 1955 and 1.7 mm in 2005. The long-term average for the state in April is 34.6 mm, so April's rainfall was only 4.9% of normal.

From February to April the country has experienced the driest period since 1941. This year only 22.4 mm (0.88 in) of rain was received, and broke the previous low records of 28 mm in 2009 and 1975. Over the past three months as well, Hidalgo suffered the lack of rain receiving only 26.9 mm or 34% of normal, the smallest amount on record. The long-term average is near to 78 mm. Due to the significant precipitation deficit in April, the states of Aguascalientes, Campeche and Jalisco fell from the twentieth wettest from January-March to the twentieth driest from February-April; abnormal dryness (D0) was not evident yet for Aguascalientes and Jalisco.

Nationally, the average temperature for April 2013 was 31.4 °C (88.5 °F), 1.2 °C above the normal and was the seventh warmest since 1971. At least thirteen states were classified in the top five warmest. Oaxaca averaged 26.8 °C (+3.4 °C anomaly) and was ranked as the fourth warmest. Chiapas (26.9 °C and +1.7 °C), Hidalgo (20.7 °C and +2.8 °C), San Luis Potosi (25.2 °C and +2.7 °C) and Yucatan (28.8 °C and +1.7 °C) each experienced the third warmest April. Another four states had their second warmest: Morelos (25.1 °C and +1.4 °C), Puebla (20.6 °C and +1.4 °C), Quintana Roo (27.9 °C and +1.6 °C) and Tlaxcala (17.4 °C and +1.2 °C). April was the warmest in two states, Campeche and the Federal District, which averaged 29.9 °C (+2.2 °C anomaly) and 20.5 °C (+3.0 °C), respectively. Near normal temperatures were noted in Jalisco (averaging 22.1 °C and +0.6 °C anomaly), Sonora (21.3 °C and +0.8 °C) and Aguascalientes (19.4 °C and +0.7 °C). While Guerrero (26.0 °C, equal to the normal), Michoacán (21.3 °C and -0.4 °C) and Sinaloa (23.5 °C, as normal) ranged normal to below normal.

Long-term drought remained in northeastern Mexico, despite some showers in the later part of April. The percentage of exceptional drought (D4) there reduced, but it persisted in northern Coahuila, Nuevo Leon and Tamaulipas. Main reservoirs "El Cuchillo" and Marte R. Gómez had

low storage levels, 21.5% and 23.5%, respectively, after providing water for irrigated agriculture in the lower basin of the Rio San Juan. Drought worsened in the northwest where the moderate (D1) developed to the extreme drought (D3), between Sonora and Chihuahua.

The combination of lower frequency cold fronts in the winter and poor rains in April resulted in below normal precipitation in the south and the southeastern of the country. This led to loss of soil moisture and increased dry areas (D0) in southern Veracruz, Tabasco, Chiapas, Oaxaca and Campeche coastal.

The latest SIAP's report (the Information System for Agri-Food and Fishering) noted that most of the seeding in the Spring-Summer 2013 season is doing under rainfed conditions (83%), because below normal rainfall forecast and the likelihood of drought continue. The corn and bean crops have not been seeded yet in the State of Mexico, Puebla, Hidalgo and Tlaxcala because the rains have been delayed and this region remains classified as abnormally dry. Tamaulipas reported around 171 thousand hectares with losses in sorghum due to extreme and exceptional drought in the past two months.

From January to May 3th this year, 7,289 wildfires were reported, nearly double the number reported in the same period one year ago. At least 170,312 hectares were burned, and 72.86% of this amount was reported in Oaxaca, Baja California Sur, Guerrero, Jalisco, San Luis Potosí, Durango, Michoacán, Chiapas, Mexico and Puebla.