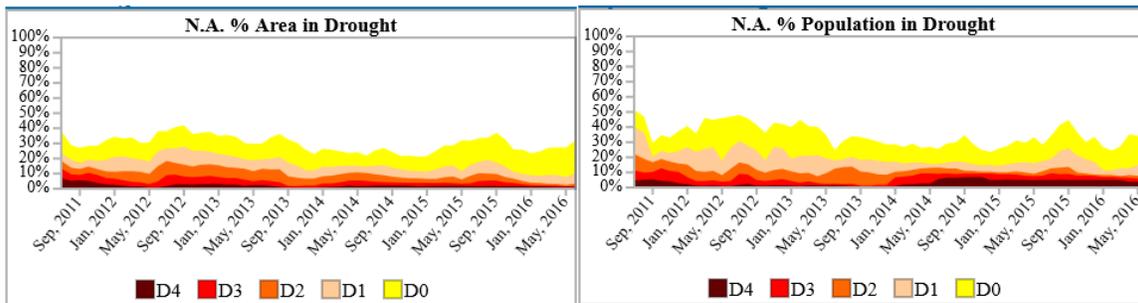


North American Drought Monitor – June 2016

At the end of June 2016, moderate to exceptional drought (D1-D4) affected approximately 9.3% of the area and 21.9% of the population of North America. These percentages are an increase of 2.2% for area and 7.6% for population compared to the values for the end of May 2016.



CANADA: The month of June brought an abundance of rain across much of western Canada, alleviating many of the drought woes across parts of central Alberta and Saskatchewan. The province of British Columbia, however, saw persisting dry conditions, leading to the development and expansion of Moderate Drought (D1) across both southern and northwestern regions. Southern parts of central Canada remained of particular concern, especially southern Ontario, where a lack of rainfall and high temperatures resulted in the deteriorating conditions and led to the development of Severe Drought (D2) in some areas. Snowmelt in British Columbia continued to be ahead of normal conditions, as rivers started to transition into the declining limb of the spring freshet in June. Over the past month, B.C. saw an overall reduction in Abnormally Dry (D0) conditions. The Peace River region received significant precipitation in mid-June, causing some major flooding in the area, but nonetheless alleviating dry conditions in the eastern part of the province. The D0 and D1 area on the Queen Charlotte Islands stayed in place, while the D0 on the mainland was reduced in terms of lateral extent, now excluding Prince George; this D0 area has also shifted to cover a significant portion of northwestern B.C. The D1 from May in this region also shifted northwestward, now stretching towards a region between Dease Lake and Terrace. Southern parts of the province saw a slight shift in drought conditions; the area of D0 was reduced as the southern interior region experienced higher levels of precipitation compared to last month. On the other hand, conditions deteriorated across Vancouver Island, which led to an increase in D0. Given the province's designation of a drought-level 4 to Vancouver Island, an area from the southern end of the island running up along the eastern edge was given a D1 designation; this pocket of D1 was further extended into the lower mainland toward the interior, including Penticton, Kelowna, and Ashcroft. A small pocket of D1 has also emerged around Salmon Arm as a result of particularly low precipitation in June, with D0 conditions extending slightly northeastward toward Revelstoke.

Drought conditions in the Prairies were greatly reduced for June; in Alberta, all D0 and D1 conditions north of Edmonton were removed as a result of extremely heavy precipitation throughout the month. Conditions in northern Saskatchewan also improved; given normal

to above-normal streamflow conditions and sufficient rainfall, the D0 area was greatly reduced to encompass only the northwestern part of the province from Stony Rapids to La Loche, extending westward to Fort McMurray. Other parts of the Prairies, however, continued to experience dry conditions over the past month. Severe Drought (D2) conditions emerged in southwestern Alberta surrounding Calgary as a result of persistent dryness and low precipitation. As well, the D0 area around Saskatoon remains as a result of lingering dry conditions, though the pocket of D1 shrunk and shifted slightly southward around North Battleford. Contrasting conditions existed across Manitoba; while the southern portion received ample, if not excessive, moisture during the month of June, areas of dryness increased in northern parts of the province. The pocket of D0 at the northern end of Lake Winnipeg was expanded into northeastern Manitoba, stretching westward across the province towards Reindeer Lake, Saskatchewan; this was mainly a result of extremely low stream flows as well as severely low precipitation around Gillam in the past few months.

Across northern Ontario, D0 conditions were reduced as the region received adequate moisture over the previous 90 days. A much different story was seen in southern areas of the province, as the drying trend from last month continued and increased in extent and severity. Nearly 50% of the agricultural region of Ontario was considered to be under the 10th percentile as of June 26, 2016, impacting roughly 714,000 cattle and 10,000 farms in the region. As such, D0 conditions increased to cover all of southern Ontario, toward Sault Ste. Marie and past Sudbury. An area of D1 roughly mirrored the D0 area, excluding Kitchener, Ontario, but extended north and eastward into the Ottawa Valley and southern Québec. Additionally, precipitation over the last 3 months was more than 100 mm below normal around Toronto to Peterborough as well as the Ottawa Valley; as a result, two pockets of D2 emerged. The D0 was also expanded to cover a much larger portion of southern Québec as compared to May, extending from La Sarre to the St. Lawrence River. The D0 area in northern Québec remained from last month; however, adequate precipitation did alleviate the dryness along the upper St. Lawrence. Low precipitation and low stream flow levels during the month of June in the Atlantic Provinces resulted in the extension of abnormally dry conditions seen in Moncton and P.E.I. last month to southern Nova Scotia and a tiny sliver in New Brunswick along the U.S. border.

A variety of conditions existed in the Northern region for the month of June. The deterioration in northwestern B.C. extended into the Yukon Territory, where an area of D0 remained in place. Some slight improvement was seen around the Whitehorse area, however, given adequate precipitation and conditions as suggested by the Drought Code. A pocket of D0 remained in southeastern Northwest Territories as a result of a persisting patch of low precipitation over the past 3 months. The remainder of the region saw improvement in June; the area of abnormally dry conditions in the far north of the Northwest Territories was removed and the pocket of D0 around Yellowknife was reduced.

UNITED STATES: The nation experienced its warmest June on record, according to preliminary climate data provided by the National Centers for Environmental Information (NCEI), although periods of extreme heat were mostly confined to the West and portions of the nation's southern tier. Above-normal temperatures covered the Midwest, accompanied

by pockets of dryness, leading to patchy drought development in several Midwestern States—including parts of South Dakota, Iowa, and Michigan. Nevertheless, crops primarily grown in the Midwest were overall in better condition on July 3, 2016, than the same time a year ago, with three-quarters of the U.S. corn and 70 percent of the soybeans rated good to excellent.

Dry conditions extended eastward from the lower Great Lakes region into parts of the Northeast. Meanwhile, intensifying drought across the interior Southeast led to increased crop stress and diminishing soil moisture reserves. Between Northeastern and Southeastern drought areas, a late-month deluge triggered deadly flooding in southern West Virginia. Farther west, most of the Plains remained free of drought, despite a warm June, courtesy of scattered showers and thunderstorms and the lingering benefits of a wet spring.

Elsewhere, hot weather dominated the western U.S., with record-setting high temperatures occurring at times in the Southwest. However, the Southwestern monsoon arrived a few days early, leading to a late-month increase in shower activity. Prior to the monsoon's arrival, wildfires were a problem in parts in the Southwest. Southern California, completing a fifth consecutive year of drought, also contended with several large fires.

During the 5-week period ending on July 5, 2016, contiguous U.S. drought coverage increased to 17.77%—up 5.04 percentage points. There were several areas of emerging, short-term drought during June, most notably across the interior Southeast and from the lower Great Lakes region into the Northeast. Patchy drought also developed across the northern Plains and upper Midwest, and returned to the Northwest.

Central and southern California remained the center of long-term drought, as Los Angeles completed its driest 5-year period (July 1, 2011 – June 30, 2016) on record. Statewide, 84% of California was in drought (D1 or worse) on July 3, while 43% of the state was considered to be in extreme to exceptional drought (D3 to D4). California's coverage of exceptional drought (D4) has fallen from 46 to 21% since October 1, 2015. Elsewhere in the West, drought (D1 or worse) coverage on July 5 included 59% in Arizona, 50% in Oregon, and 34% in Nevada. Across the Plains and Midwest, drought coverage on July 5 stood at 38% in South Dakota, 18% in Iowa, and 16% in Michigan. In the Northeast, drought covered more than half (55%) of Massachusetts, along with 43% of Connecticut, 42% of New Hampshire, 41% of New York, and 40% of New Jersey. Finally, in the Southeast, July 5 coverage of drought included 43% in Alabama, 42% in Mississippi, 40% in Tennessee, and 34% in Georgia.

Outside of the mainland U.S., coverage of abnormal dryness (D0) in Alaska increased from 16 to 22% during the 5-week period ending July 5. Alaska's increase was due to warm, mostly dry conditions across the northwestern mainland. Meanwhile, rainfall mainly in Hawaii's windward locations continued to reduce drought coverage. Only 21% of Hawaii was considered to be in drought by July 5, down from 57% at the end of May. Hawaii's coverage of severe to extreme drought (D2 to D3) dropped sharply from 38 to 6%. Elsewhere, Puerto Rico's drought situation was unchanged during June, with moderate drought (D1) coverage steady at 5%.

Historical Perspective: According to preliminary information provided by NCEI, the contiguous U.S. experienced its hottest June during the 122-year period of record. The nation's monthly average temperature of 71.8°F (22.1°C) was 3.3°F (1.8°C) above the 20th century mean, clipping the June 1933 standard of 71.6°F (22.0°C). Meanwhile, June precipitation averaged just 2.46 inches (62.5 mm), 84 percent of normal. Despite late-month flooding in southern West Virginia, the nation experienced its 14th-driest June—and driest since 2012.

Statewide temperature rankings ranged from the 54th-warmest (69th-coolest) June in Maine to the hottest June on record in Arizona and Utah. In addition to Arizona and Utah, top-ten values for June heat occurred in Florida and eleven other states scattered across the Plains, Midwest, and West. Meanwhile, state precipitation rankings ranged from the tenth-driest June in Wyoming to the 14th-wettest June in West Virginia. Top-fifteen rankings for June dryness also occurred in Missouri and seven states scattered across the Plains, West, and New England.

Agricultural and Hydrological Highlights: During June, the portion of both the U.S. corn and soybean production areas in drought increased from less than 1% to 7%. Among the major production states, Michigan led with 31% of its corn production area in drought by July 5. Nearly one-third of the soybean production area was in drought by July 5 in Mississippi (31%) and Michigan (29%). Still, U.S. crops were mostly growing well, with 75% of the corn and 70% of the soybeans rated in good to excellent condition on July 3, according to the U.S. Department of Agriculture. Among Midwestern States, Michigan led with 12% of both corn and soybeans rated in very poor to poor condition on July 3. Across the South, Arkansas led major production states on July 13 with 13% of its soybeans rated very poor to poor.

On July 5, drought was affecting 15% of the U.S. cattle inventory, up from 10% at the end of May. Similarly, 14% of the nation's hay area was in drought, up from 8% on May 31. Nevertheless, 59% of the U.S. rangeland and pastures were rated good to excellent on July 3, while only 12% were rated very poor to poor. States reporting at least one-fifth of their rangeland and pastures in very poor to poor condition on July 3 included Vermont (62%), Connecticut (39%), California (35%), Massachusetts (33%), Oregon (28%), Georgia (28%), Arizona (27%), Michigan (23%), Tennessee (23%), Montana (22%), Alabama (21%) and New Mexico (20%).

On July 1, 2016, reservoir storage as a percent of average for the date was significantly below average in several Western States. Specifically, statewide storage was less than 75 percent of average in Arizona, Nevada, and New Mexico. Meanwhile in northern California, partial recovery from long-term drought was evident in reservoir storage. However, California's recovery was uneven, with a trend toward lower storage (and drought persistence) in southern watersheds. By the end of June, California's surface water storage was 87% of the historic average for the date, compared with 52% on November 30, 2015. Elsewhere, reservoir storage by July 1 declined to less than 90% of average in Oregon and Washington, partly due to a premature end to the snow-melt season.

MÉXICO: Three tropical cyclones affected the country in June 2016—one in the Pacific and two on the Atlantic side. From June 6-8, Tropical Depression One-E brought only a little rainfall in the Gulf of Tehuantepec coastal areas of Oaxaca and Chiapas. On the Atlantic side, considerable rain fell on June 5-6 in the southern Yucatan Peninsula due to a low-pressure system which subsequently became Tropical Storm Colin that was active from June 5-7. However, the cyclone that left the most important precipitation was Tropical Storm Danielle from June 19-21. Danielle made landfall in northern Veracruz and tracked to Hidalgo, and brought beneficial rainfall to the Huasteca region that helped the recovery of dry areas. Above-normal rainfall also fell in the northwest, while slightly above-normal rainfall in the west (coastal Jalisco and Nayarit) was mainly due a low-pressure system located from Chihuahua to central Mexico—related to the onset of the monsoon in North America. However, more than half of the country had rainfall deficits; the most worrying were the southern Pacific coast of Mexico (from Colima to Oaxaca), as well as southern Veracruz and Tabasco. The scarce precipitation was related to the southward position on the ITCZ, as winds were not carrying enough moisture from the Pacific toward the southern part of the country. At the national level, the average precipitation of 110.8 mm was 6.0 percent above the long-term mean, and ranked as the 29th rainiest June over the 1941-2016 period of record.

Based on the previous information, the main changes in drought were observed in southern Veracruz. For the second time this year, extreme drought (D3) developed in Veracruz, while moderate drought (D1) expanded in Sinaloa and between Michoacán and Guerrero. In contrast, abnormally dry conditions (D0) were reduced in the Yucatan Peninsula. On June 30, the moderate to extreme drought (D1-D3) covered the 14.9% of the country, an increase of 0.7% from one month ago. The situation in northern Sinaloa became a concern because of the development of moderate drought (D1); the state only received 62 percent of its normal precipitation in the first half of the year and most of the main reservoirs are below 40% capacity; in addition, the seasonal rainfall forecast does not indicate recovery.

Above-normal temperatures were recorded in the northwest and the Baja California Peninsula; these regions also accounted for the highest number of days with maximum temperatures above 40°C; temperatures above this threshold also covered Sinaloa, Nayarit, and Michoacan, as well as northern Chihuahua and Coahuila, and to a lesser extent Campeche and Yucatan. The national average temperature of 26.3°C was 2.1°C above the June normal and was classified as the third-warmest June based on the 1971-2016 records. Baja California and Campeche experienced their warmest June, whereas Colima and Chiapas were third warmest. In contrast, the State of Mexico had its seventh-coolest June.

According to the Information Service for Agri-Food and Fishing (SIAP), the yield of the main grain crops such as corn, wheat, oat and sorghum increased by 16.6% compared to the same period last year, with better production in the states of Sinaloa, Sonora, Tamaulipas, and Guanajuato—which together accounted for 61.6% of the national production. However, there were also delays in planting due to the lack of rain, resulting in a reduction of 12.5% of the area sown for the 2016 spring-summer season with respect to the previous year. At the end of the first half of 2016, the livestock sector reported positive figures; the production of poultry egg and meat was highlighted by its growth, registering 2.9 and 4.6%, respectively—motivated by a growing demand and high productivity.