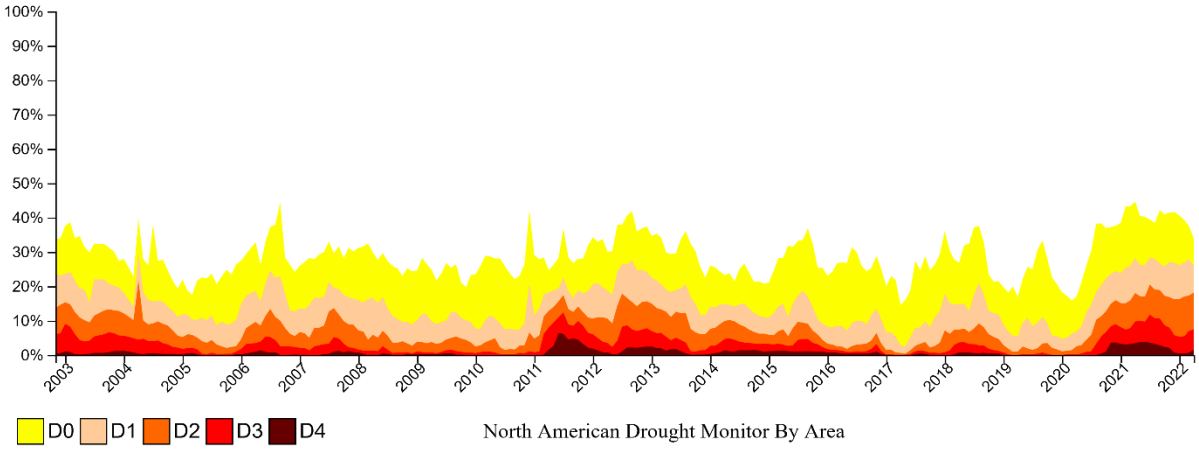
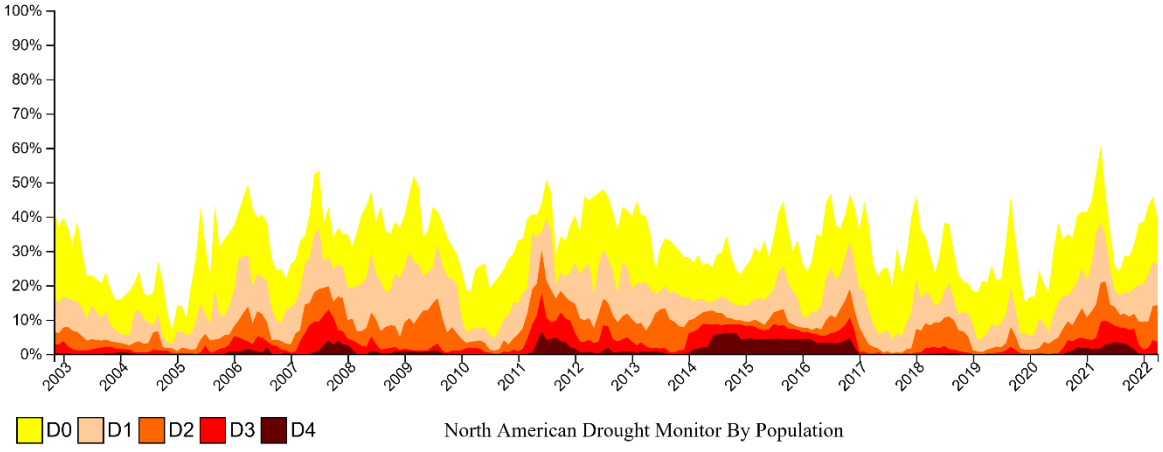
North American Drought Monitor – April 2022

At the end of April 2022, moderate to exceptional drought (D1-D4) affected 26.0% of the area and 26.1% of the population of North America. The percent area value was 1.9% less than the value for the end of March 2022. The percent population value was 0.7% less than the value for the end of March. At the end of April, 63.3% of the Columbia River Basin, 89.4% of the Rio Grande/Bravo River Basin, and 69.1% of the Great Plains were in moderate to exceptional drought, and 3.9% of the Great Lakes Basin was abnormally dry (D0). The North American Great Plains extends across the United States and into adjacent parts of northeast Mexico and the southern Prairies of Canada. The percent area value for the Rio Grande/Bravo River basin increased compared to the end of March. The percent area values for the Great Lakes and Columbia River basins and Great Plains decreased compared to the end of March.



Percent area of North America in drought, November 2002-April 2022.



Percent of the population of North America in drought, November 2002-April 2022.

CANADA:

National Overview

The month of April brought an overabundance of moisture to parts of the southeastern Prairies and Central Canada as well as both east and west coasts. Many reports of overland flooding and soil erosion came out of southern Manitoba, resulting from two late-month Colorado Lows impacting the region; this led to significant flooding occurring along the Red River south of Winnipeg. These regions experienced gradual drought improvement through the winter; however, April brought enough moisture to quickly pull the remaining regions of Manitoba out of drought. The driest area continued to be southern Alberta, where Extreme Drought (D3) persisted – soil moisture was very poor and vegetation has been extremely slow to green up. Saskatchewan experienced a mix of drought in the west and good to excess moisture in eastern regions. Despite significant improvement in moisture conditions through much of the eastern Prairies, long-term impacts from last summer's drought continue to impact vegetation and the agricultural communities. Northern Canada received near- to below-normal moisture. Temperatures were much below normal for most of the country in April, excluding Atlantic Canada and a small region in Interior B.C., where temperatures were above normal.

At the end of the month, nine percent of the country was classified as Abnormally Dry (D0) or in Moderate to Extreme Drought (D1 to D3), including forty-two percent of the country's agricultural landscape. There was no Exceptional Drought (D4) reported this month.

Pacific Region (BC)

Conditions across the Pacific Region were mixed in April: areas along the coast received ample moisture while the Interior continued to experience a drying trend. Much of the province experienced temperatures up to three degrees below normal.

Although conditions in the Interior region of the province continued to be dry in April, minimal changes were made to the drought picture. This area received sufficient moisture through the fall, which improved Exceptional Drought (D4) conditions experienced last summer, but short-term dryness re-emerged in the last 3 months. The Interior region received anywhere from 40 to 85 percent of normal precipitation since February, with the driest conditions in the Okanagan. Because of this, and the drought that occurred last summer, Moderate Drought (D1) conditions expanded slightly. Additional pockets of Abnormally Dry (D0) conditions also emerged throughout central B.C. due to limited short-term moisture and reports of low surface water levels.
In contrast, eastern parts of Vancouver Island received Moderately to Very High amounts of moisture in April, roughly equating to 115 to 200 percent of normal precipitation; this led to the removal of the Abnormally Dry (D0) pocket from Campbell River to Nanaimo.

At the end of the month, seven percent of the Pacific region was considered Abnormally Dry (D0) or in Moderate Drought (D1), including twenty-seven percent of the region's agricultural landscape.

Prairie Region (AB, SK, MB)

The Prairie Region experienced both ends of the moisture spectrum in April: Extreme Drought (D3) in the west and flooding and excessive moisture in the east. Record-breaking precipitation fell across southern Manitoba and southeastern Saskatchewan in the last half of April, which led to further reductions in drought throughout the area. Much of this moisture missed western areas of the Prairies, leading to an expansion of drought conditions, particularly in southern Alberta. Temperatures remained below normal across the Prairie Region, most notably in Manitoba with temperatures more than 5 degrees cooler than normal. Low temperatures would normally indicate reduced evaporation, however strong winds effectively reduced moisture from exposed soils through the early spring.

Southern Alberta experienced the greatest drought degradation in April. Less than 40 percent of normal precipitation fell this month, exacerbating the already dry conditions experienced over the last 6 months. Soil moisture conditions at a depth of 120 cm suggested exceptionally dry conditions (less than once in 50-year frequency) along the southern Alberta border with the U.S. as well as near the city of Brooks. Annual precipitation deficits were reported at 110 to 220 mm below normal for southern areas in Alberta. Reported drought impacts for this area include short to very short soil moisture, hay and pastures being slow to emerge or green up, dry and saline lakes, dry sloughs, and extremely limited runoff. Significant winds resulted in further evaporation and soil erosion. As a result, Extreme (D3) and Severe Drought (D2) were both expanded in the southern parts of the province.

Near-normal moisture was recorded for northern agricultural regions of the central Prairies from Alberta towards southwestern Saskatchewan in the last 6 months. However, long-term drought impacts are still being reported throughout much of this area: some dugouts filled but others did not, while producers have had to sell off some of their herd and have reported delays to seeding this spring. Drought was reduced due to near-normal short-term moisture, but pockets of Extreme Drought (D3) and Severe Drought (D2) remained in select areas due to the reported long-term impacts.

Two separate Colorado Lows brought significant snow, rain, and below-normal temperatures to southeastern Saskatchewan and southern Manitoba over the last 2 weeks of April. These storm systems, along with good winter snow cover, resulted in saturated soils and significant flooding in the Red River Valley and parts of the Interlake region. Upwards of 130 to 160 mm of precipitation fell across southern Manitoba, roughly 3 to 5 times the 30-year normal. Emerson and Morden, in southern Manitoba south of Winnipeg, both reported their wettest April on record, while Winnipeg reported its second-wettest April. Given this considerable moisture, all drought (Moderate and Extreme (D1 to D2)) was removed; only a small stretch of Abnormally Dry (D0) conditions remained along the Manitoba-Saskatchewan border. Although some areas across the southern and eastern Prairies are no longer in drought, they are still recovering from the impacts of last year's drought; this includes continued agricultural concerns for pasture recovery, feed availability, and hay shortages. These areas may in fact be dealing with both flooding and drought impacts this month.

At the end of the month, twenty-nine percent of the Prairie Region was classified as Abnormally Dry (D0) or in Moderate to Extreme Drought (D1 to D3), including sixty-three percent of the region's agricultural landscape.

Central Canada (ON, QC)

The Central Region of Canada continued to see improved moisture conditions this month. Much of the moisture occurred across northwestern Ontario and southern Quebec, while southern Ontario received slightly less than the average April precipitation. Temperatures were also reported to be slightly cooler than normal across the region, with the lowest temperatures reported in northwestern Ontario.

The two major systems that passed through the southeastern Prairies also impacted a good portion of northwestern Ontario. More than 200 percent of normal moisture fell, with some of the largest amounts falling around Thunder Bay – this area received between 150 to 200 mm of moisture, over 110 mm more than the expected precipitation in April. This significant moisture replenished soil moisture and improved streamflow levels, leading to the removal of both Moderate Drought (D1) and Abnormally Dry (D0) conditions from the area.

Southern Ontario received slightly below-normal moisture in April and over the last 2 months; however, soil moisture conditions appear to be near- to above-normal. There were reports of seeding delays for both corn and soybeans as well as grain crops in the area due to last year's cool, wet fall and this year's late spring; delays in pasture growth were also reported. As a result, no drought or Abnormally Dry (D0) pockets were added to southern Ontario, but this area will be monitored going into the summer.

Finally, southern Quebec as well as central areas of Ontario and Quebec received above-normal moisture in the last 30 days and near-normal precipitation in the last 6 months. This led to the removal of a few pockets of Abnormally Dry (D0) in central areas as well as the removal and reduction of D1 and D0 in southern Quebec.

At the end of the month, less than one percent of the Central Region was classified as Abnormally Dry (D0), including three percent of the region's agricultural landscape. There was no drought reported in the region this month.

Atlantic Canada (NS, NL, NB, PEI)

Similar to March, Atlantic Canada continued to receive above-normal moisture in April. Much of this month's moisture fell across New Brunswick and parts of Newfoundland, but the rest of the region still received ample precipitation. Over the past 6 months, much of the Atlantic region received precipitation above the 90th percentile – equal to 115 to 200 percent of average moisture. As a result, the region remained drought-free; this includes the removal of Abnormally Dry (D0) conditions in northern Labrador, given improved moisture in the area.

At the end of the month, there was neither drought nor Abnormally Dry (D0) conditions present across the Atlantic Region.

Northern Canada (YK, NWT)

Updates to Northern Canada were not significant this month, but drier conditions were reported in select areas. A pocket of Abnormally Dry (D0) conditions was expanded slightly near Yellowknife as the area reported 25 to 75 percent less moisture than normal in the last 3 months, as well as pockets near Fort Good Hope and Old Crow, Yukon. Although Old Crow received 89 percent of average precipitation since September, it remains at an Abnormally Dry (D0) designation unless conditions degrade further. Southern Yukon remained drought and Abnormally Dry (D0) free this month as the region has received adequate moisture in the past few months.

Approximately five percent of the Northern Region was classified as Abnormally Dry (D0).

UNITED STATES:

National Overview

A resurgent La Niña fueled an active storm track, resulting in cool, wet conditions across much of the nation's northern tier. April temperatures generally averaged at least 4°F (2.2°C) below normal from eastern Washington into the upper Great Lakes region and were more than 8°F (4.4°C) below normal in parts of North Dakota. The heaviest precipitation, relative to normal, fell across the northern Plains, where several rounds of heavy rain and wind-driven snow eased or eradicated drought. In fact, moderate to major flooding developed late in the month in the Red River Valley, north of Fargo, North Dakota.

Meanwhile, severe thunderstorms frequently accompanied several strong cold fronts crossing the Plains, Midwest, and South, with most of the month's more than 200 tornadoes—based on preliminary reports—occurring on April 4-6, 11-13, 22-23, and 29-30. Dozens of tornadoes were spotted on April 5 from Mississippi to South Carolina, followed by an impressive, early-season Midwestern tornado outbreak on April 12 from eastern Nebraska to southeastern Minnesota. The South endured another significant tornado outbreak on April 12-13, while severe weather across the Plains peaked on April 22 and 29.

Despite late-month thunderstorms across the nation's mid-section, drought continued to intensity across the southern half of the High Plains, amid sharp temperature fluctuations, periodic high winds, and occasional blowing dust. Nearly half (43 percent) of the nation's winter wheat was rated in very poor to poor condition on May 1, the greatest amount in those two categories at this time of year since April-May 1996. In addition, more than half (56 percent) of the U.S. rangeland and pastures were rated in very poor to poor condition on May 1, very close to the record-high value of the last quarter-century—59 percent very poor to poor for several weeks in late-summer 2012.

In fact, much of the nation's southwestern quadrant, stretching from California to the High Plains, remained mired in significant drought, with potentially serious implications for water supplies, rangeland and pastures, and rain-fed crops. By May 3, more than half the land area

within the Lower 48 States had been in drought since late-November 2021, a span of 24 weeks. Additionally, more than 40 percent of the country experienced drought each week from September 29, 2020, to May 3, 2022, an 84-week streak that has broken the *U.S. Drought Monitor*-era record (previously, 68 weeks from June 19, 2012 – October 1, 2013).

Despite the worsening Southwestern situation, which included several large, destructive wildfires, overall U.S. drought coverage decreased 4 percentage points, from 58 to 54 percent, during the 5-week period ending May 3. Most of the reduction in drought coverage occurred in the North and parts of the South, including the southeastern Plains and the Mississippi Delta. Farther west, early-season wildfires in Arizona and New Mexico burned hundreds of thousands of acres of vegetation and destroyed hundreds of homes. In northeastern New Mexico, near Las Vegas, the Calf Canyon Fire—sparked on April 19—joined with an escaped prescribed burn (the Hermits Peak Fire)—to scorch more than 200,000 acres (80,000 hectares) and destroy nearly 400 structures.

Elsewhere, cool, damp Midwestern conditions limited April fieldwork, leading to a sluggish planting pace for corn and soybeans. By May 1, topsoil moisture ranged from 24 to 40 percent surplus in all Midwestern States except Iowa, Nebraska, and South Dakota. On the same date, only 14 percent of the intended U.S. corn acreage had been planted, well behind the 5-year average pace of 33 percent. This represented the slowest planting pace since 2013, when only 8 percent of the corn had been planted by May 1.

According to preliminary data provided by the National Centers for Environmental Information, both April temperatures and precipitation were close to long-term averages, as it was the 50th-coolest, 53rd-wettest April during the 128-year period of record. The nation's April average temperature of 50.7°F (10.4°C) was 0.4°F (0.2°C) below the 1901-2000 mean, while precipitation averaged 2.58 inches (65.5 mm)—102 percent of normal.

The bigger story was the north-to-south variation in weather conditions. For example, state temperature rankings ranged from the third-coldest April in Washington to the eleventh-warmest April in New Mexico and Texas. In Washington, only April 1955 and 2011 were colder. Top-ten rankings for April cold were also observed in Minnesota, Montana, North Dakota, and Oregon.

Meanwhile, state precipitation rankings ranged from the second-driest April in New Mexico to the second wettest in North Dakota. New Mexico's only drier April occurred in 1972; North Dakota's only wetter April was observed in 1986. Kansas experienced its third-driest April, behind 1963 and 1989, while top-ten rankings for April dryness occurred in Colorado and Arizona. In contrast, top-ten rankings for April wetness extended beyond North Dakota into Minnesota, Oregon, and Washington.

Northeast: Frequent precipitation fell across the Northeast during April, although intensity was generally light. Northeastern coverage of moderate drought (D1) decreased slightly, from 3.1 to 1.4 percent, during the 5-week period ending May 3. Drought patches were limited to southern Maryland, eastern West Virginia, and western Maine.

Southeast: Significant precipitation continued to bypass portions of the southern Atlantic States during April, leaving patchy moderate to severe drought (D1 to D2) intact. The most significant D2 area covered parts of eastern North Carolina, with smaller D2 patches in southern Florida. Southeastern drought coverage decreased slightly, from 19.7 to 16.1 percent, between March 29 and May 3.

South: During April, an extraordinarily tight drought gradient further sharpened across central and eastern sections of Oklahoma and Texas, as heavy rain across the southeastern Plains and the mid-South contrasted with ongoing dryness on the southern Great Plains. Southern coverage of moderate to exceptional drought (D1 to D4) decreased from 68.5 to 53.7 percent during the 5 weeks ending May 3. However, during the same period, Southern coverage of D4 nearly tripled from 4.7 to 13.1 percent. The Great Plains' drought took a severe toll on rangeland, pastures, and winter grains in Oklahoma and Texas. By May 1, more than three-quarters (77 percent) of the winter wheat in Texas, along with 51 percent in Oklahoma, was rated in very poor to poor condition. In addition, 74 percent of Texas' rangeland and pastures were rated very poor to poor on that date. As May began, Texas reported topsoil moisture was 81 percent very short to short.

Midwest: Midwestern drought coverage shrank, from 10.2 to 1.5 percent, between March 29 and May 3. Any remaining moderate drought (D1) was confined to parts of Iowa and a tiny sliver of southern Minnesota. In fact, cool, damp conditions in much of the Midwest contributed to the slowest U.S. corn planting pace since the spring of 2013.

High Plains: Drought coverage decreased slightly, from 77.9 to 75.1 percent, between March 29 and May 3, on the strength of heavy precipitation in parts of the Dakotas. Still, much of the region continued to suffer from significant drought impacts, including soil moisture shortages and poor rangeland and crop conditions. By May 1, topsoil moisture rated very short to short ranged from 63 to 88 percent in all the region's states except the Dakotas. On the same date, rangeland and pastures rated very poor to poor ranged from 48 percent in North Dakota to 73 percent in Nebraska.

West: During April, an active storm track from the Pacific Northwest to the northern and central Rockies provided some limited drought relief. Conditions worsened, however, in the Southwest, amid windy, dry conditions and periods of early-season heat. Statistically, there was little change in Western drought (D1 to D4) coverage during the 5-week period ending May 3—a slight increase from 88.9 to 91.3 percent. Meanwhile, Western coverage of extreme to exceptional drought (D3 to D4) remained nearly steady, with coverage of the 11-state Western region standing at 30.7 percent on May 3. In the U.S. Department of Agriculture's first update of the season, dated May 1, more than half (56 percent) of the U.S. rangeland and pastures were rated in very poor to poor condition. Not only was this a 21st century spring-time record, but it was also very close to the record of 59 percent very poor to poor (set in late-summer 2012) for any time during the growing season. Arizona and Montana reported 89 percent of their rangeland and pastures rated very poor to poor on that date, tied for highest in the nation. On May 1, statewide topsoil moisture was rated more than three-quarters very short to short in New Mexico (90 percent), Colorado (88 percent), and Wyoming (76 percent).

Alaska, Hawaii, and Puerto Rico: Across most of Alaska, ample winter and early-spring precipitation has prevented the development of abnormal dryness (D0). However, D0 appeared in a small area of southwestern Alaska, including low elevations of the lower Yukon-Kuskokwim region, where the spring has been dry and relatively warm. In addition, an unusually high percentage of the region's winter precipitation fell as rain, rather than snow, leading to early elimination of low-elevation snowpack. In late April, the Kwethluk Fire burned across nearly 10,000 acres of tundra in the Yukon Delta National Wildlife Refuge—and, although spring fires in this region are not unusual, the Kwethluk Fire was Alaska's largest April wildfire in at least the last 30 years. Meanwhile in Hawaii, a sharp gradient existed during April between wetter windward locations and drier leeward slopes. Hawaiian drought coverage fell from 78.7 to 47.1 percent during the 5-week period ending May 3, according to the *U.S. Drought Monitor*. In Puerto Rico, coverage of abnormal dryness (D0) and moderate drought (D1) increased from 38.9 to 66.6 percent during April, with reported impacts ranging from low streamflow to poor pasture conditions.

MEXICO:

National Overview

April is a month of transition between the dry season and the rainy season. Cold fronts are still present, although their influence is less in comparison with previous months. April saw above-average rainfall in the Yucatan Peninsula and in some central and coastal regions of the Gulf of Mexico, as well as drier-than-normal conditions in northern and southern patches. The precipitation pattern this month was highly influenced by the passage of cold fronts and atmospheric instability, mainly during the second half of the month.

Above-average rainfall covered the Yucatan Peninsula and northern Chiapas, where the rainfall surplus was greater than 160 mm. Likewise, surplus rainfall of at least 20 mm occurred in northern Veracruz. In contrast, portions of northern, southern, and eastern regions of the country experienced below-average rainfall, with deficits greater than 20 mm covering portions of Oaxaca and central Veracruz. Throughout April, the influence of mid-atmospheric high-pressure systems promoted stable weather. National precipitation during April was 20 mm, 3.0 mm above the 1991-2020 average, and ranked as the 30th wettest April on record.

The national average temperature of 23.4 °C, which was 1.2 °C above 1991-2020 April's average, made April 2022 the second-warmest April on record. Warmer-than-normal conditions were present, mainly in the north, where temperatures were more than 2.0 °C above average. According to the National Forestry Commission (CONAFOR), during April 2022, there were 1041 forest fires, affecting a total of 54,064.78 hectares. So far this year, 3,390 forest fires have been reported, affecting an area of 122,512.57 hectares.

As of April 30, 2022, the total area with moderate to exceptional drought conditions (D1-D4) was 55.19%, an increase of 9.18% from the end of March 2022. During this month, exceptional drought (D4) emerged in the Northeast.

Northwest or Northern Pacific (Baja California, Baja California Sur, Sonora, Sinaloa, Nayarit): Rainfall was deficient by about 10 mm, mainly in Sonora and northern Baja California. Baja California and Sonora recorded their 12th and 11th driest April, but Baja California Sur reported its driest April on record. The rest of the region had conditions similar to average. Most states had warmer-than-normal conditions, mainly in Baja California and Sonora. Baja California, Baja California Sur, Sinaloa, and Sonora placed among the 15 warmest Aprils on record, ranking 5th, 11th, 8th and 13th, respectively. These conditions caused an increase of 51.9% in the severe drought category (D2), the largest increase in drought in that category (D2) compared to all other regions. For April 2022, the northwest region has a total of 93.2% of its area in moderate to severe drought (D1-D2).

Northern (Chihuahua, Coahuila, Durango, Zacatecas and San Luis Potosí): This region had a combination of drought patterns. Chihuahua, Coahuila, and portions of San Luis Potosi had drier-than-normal conditions; in contrast, some portions of Zacatecas received more moisture than expected. The northern region was the most affected by warm conditions, as all areas except southern Durango had warmer-than-normal conditions. Chihuahua and Durango reported anomalies greater than 2.0 °C. According to records, Durango had its warmest April on record, while Coahuila and Zacatecas reported their second warmest and Chihuahua and San Luis Potosi their third warmest. For April 2022, the northern region saw a 16% increase in severe to exceptional drought (D2-D4); the total area affected with moderate to exceptional drought (D1-D4) for this region is 72.2%, the second-highest value compared to all regions.

Northeast (Nuevo León and Tamaulipas): This region also had a combination of wet and dry conditions; precipitation anomalies had a magnitude of around 20 mm for both dryness and wetness. Both states were influenced by warm conditions, with temperatures 2.0 °C above average in most of the region; it was the second-warmest April in Nuevo León and the third warmest in Tamaulipas. The combination of low precipitation and high temperatures caused an increase of 12.5% in moderate to exceptional drought (D1-D4). Exceptional drought (D4) emerged during April in the region, covering 0.3% of its area. In total, the northeast had 49.1% of its area in moderate to exceptional drought (D1-D4).

Central-West (Aguascalientes, Jalisco, Guanajuato, Colima and Michoacán): This region had near-average conditions in terms of precipitation. Only in Guanajuato conditions were drier than normal. In contrast, some regions of Jalisco and Michoacán had wetter-than-normal conditions, and in the case of Aguascalientes, it was the ninth-wettest April on record. For most of the region, conditions were warmer than normal, with temperature anomalies above 1.0 °C; only in some areas in western Jalisco conditions were cooler than normal. For Aguascalientes, Guanajuato, Jalisco and Michoacán, April 2022 was among the 15 warmest Aprils on record. The combination of low precipitation and high temperatures caused the central-western region to have a 6.6% increase in the severe drought category (D2). It was the only region to have an increase (of 2.4%) in the area unaffected by drought, leaving a total of 53.1% of the total area affected by moderate to severe drought (D1-D2).

Central-South (Querétaro, Hidalgo, State of Mexico, Tlaxcala, Puebla, Morelos and Mexico City): Wetter-than-normal conditions prevailed in most of the states that make up the region; only in the extreme east of Puebla and south of Morelos conditions were drier

than normal. In particular, Mexico City recorded its eleventh-wettest April and Morelos its seventh-driest April. The entire region had warmer-than-normal conditions, with anomalies greater than 1.0 °C above average. All states except the State of Mexico placed among the top ten warmest Aprils on record. Despite the precipitation received, the south-central region showed a 6.8% increase in the moderate to severe drought category (D1-D2), as well as a 17.5% increase in the abnormally dry condition (D0), the largest increase of all the regions in this category. As of April 30, 18.5% of the region is affected by moderate to severe drought (D1- D2).

Gulf of Mexico (Veracruz and Tabasco): Drier than normal conditions prevailed in this region, mainly in central Veracruz and northern Tabasco; above-average rainfall fell in northern Veracruz and eastern Tabasco. Above-average temperature covered northern Veracruz; the rest of the region had near-normal conditions. Tabasco recorded its seventh-warmest April on record. The region had a 2.7% increase in moderate to severe drought (D1-D2), which translated into an 11.9% decrease in the unaffected area, leaving a total of 21.5% of the region in moderate to severe drought (D1-D2).

South Pacific (Guerrero, Oaxaca and Chiapas): This region received above-average rainfall in Guerrero and Chiapas, the latter receiving the highest April rainfall amounts in the country. In contrast, drier-than-normal conditions prevailed in Oaxaca. Warmer-than-average conditions prevailed in the region, mainly in Guerrero, where temperatures were about 2.0 °C above average. Guerrero recorded its tenth-warmest April and Chiapas its twelfth warmest. The region showed a 4.6% increase in moderate to severe drought (D1-D2), while the abnormally dry category (D0) only increased by 0.5%.

Yucatan Peninsula (Campeche, Quintana Roo and Yucatan): Wetter-than-normal conditions prevailed in the region's three states. For all three states, April 2022 was among the 15 top wettest Aprils. It was the second-wettest April for Campeche, eleventh for Quintana Roo, and sixth for Yucatan. Above-average temperatures (about 1.0 °C above average) dominated the region. It was the eighth-warmest April in Campeche, the tenth warmest in Yucatan, and the twelfth warmest in Quintana Roo. Abundant precipitation during the month allowed the entire region to remain without drought or dryness concerns.