North Dakota Annual Climate Summary

2024

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North Dakota State Climate Office

From the Office of the State Climatologist

The North Dakota State Climate Office runs in conjuction with the North Dakota Agricultural Weather Network, to bring high quality climate data to citizens and businesses in North Dakota. NDSCO is located within the School of Natural Resource Sciences at the North Dakota State University. If you have any questions, comments, or concerns, please contact the State Climate Office.

2024 Summary

2024 was a year of extremes, weather and climate varied excessively across the state throughout the seasons. Severe weather, though infrequent, caused extensive damage by hail, tornadoes, drought, and even wildfires. Several rain storms battered the Northeast during the late summer, while the majority of the state failed to acquire a few tenths of an inch of precipitation. Severe Drought plagued a large portion of the state as summer transitioned into autumn. Above average temperatures for most of the year also aided in drying out vegetation and the top layers of the soil, further exacerbating the drought conditions. The exception being mid-summer, when temperatures across the state were slightly below average, and in spring precipitation was plentiful.

Severe weather came in many forms in 2024, bringing flooding, drought, tornadoes, destructive hail, and wind. Wildfires that broke out in Western North Dakota were the biggest weather story of the Fall, burning over 100,000 acres and sadly taking two lives. Ground conditions were optimal for fire danger, and a high wind event in early October was the strike of a match. Flames were able to spread quickly, and the North Dakota Monitor reported 190 fires, and estimate $7.7 million in damages.

Figure 1: Wildfire smoke can be seen from the Pick City NDAWN station camera in Mercer County on October 5, 2024. A majority of the fires began in Dunn and McKenzie Counties, just West of Mercer County

Precipitation Summary

2024 Statewide Average: 17.92”

Normal Statewide Precipitation: 17.34”

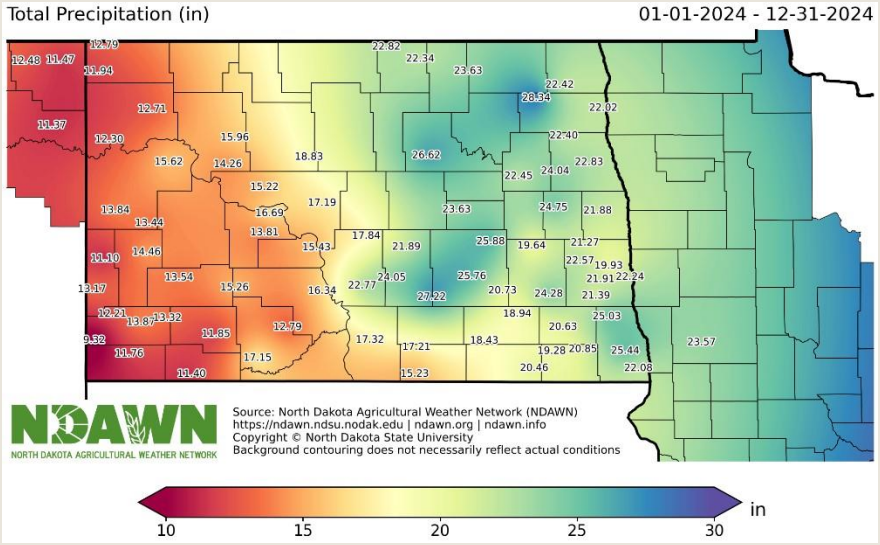
Precipitation varied greatly across the state throughout the year, as it typically does in the state of North Dakota. Oftentimes, the cut-off from a rain shower or storm was very tight. One example of this is the Streeter NDAWN station in Kidder County recording over 27 inches in 2024, whereas the neighboring Linton and Wishek stations in Emmons and McIntosh Counties, respectively, recorded 17 inches.

Northeast North Dakota was continuously battered by rain throughout the year. Multiple heavy rain events brought a few inches at a time, especially in the early fall, and totalled over 28 inches at the Adams NDAWN Station. Above average precipitation encompassed the Devils Lake Basin, the James River Valley, and the Missouri Coteau. It was a different story west of the Missouri River, where year-round below average precipitation reached thresholds that prompted Extreme Drought conditions. NDAWN Stations in the Western portion of North Dakota got anywhere between 3 to 8 inches below average precipitation.

The Southern Red River Valley, though it had excessive rainfall in the spring and summer, received very little precipitation in the fall. Fargo NDAWN saw its second driest September on record (1990-) with just 0.11 inches of rain. It was also the warmest September on average.

Precipitation maps from NDAWN include winter precipitation ensuring an accurate measurement of the liquid water content year round. 57 all-season precipitation guages were added to the network in 2024, increasing the accuracy of precipitation measurements in the Northern Plains.

*All-season precipitation gauges added in 2024 are not included on this map as they were not in operation throughout the entire year



Total Precipitation recorded throughout 2024 by NDAWN

U.S. Drought Monitor

Various locations in North Dakota received well over average precipitation, including Central and Northeast ND, but overall the Adams NDAWN station in Walsh County received the greatest amount of precipitation in 2024, 28.34 inches. That is 7.60 inches above average for the year, multiple locations in the area recorded similarly. On the dry Western side of North Dakota, the Marmarth NDAWN station in Slope county recorded just 9.32 inches, which is 7.12 inches *below* average precipitation. This area has been classified as drought conditions since January 16, 2024, worsened in May to Moderate Drought, and throughout October conditions rapidly turned into Extreme Drought with a major lack of precipitation in the fall.

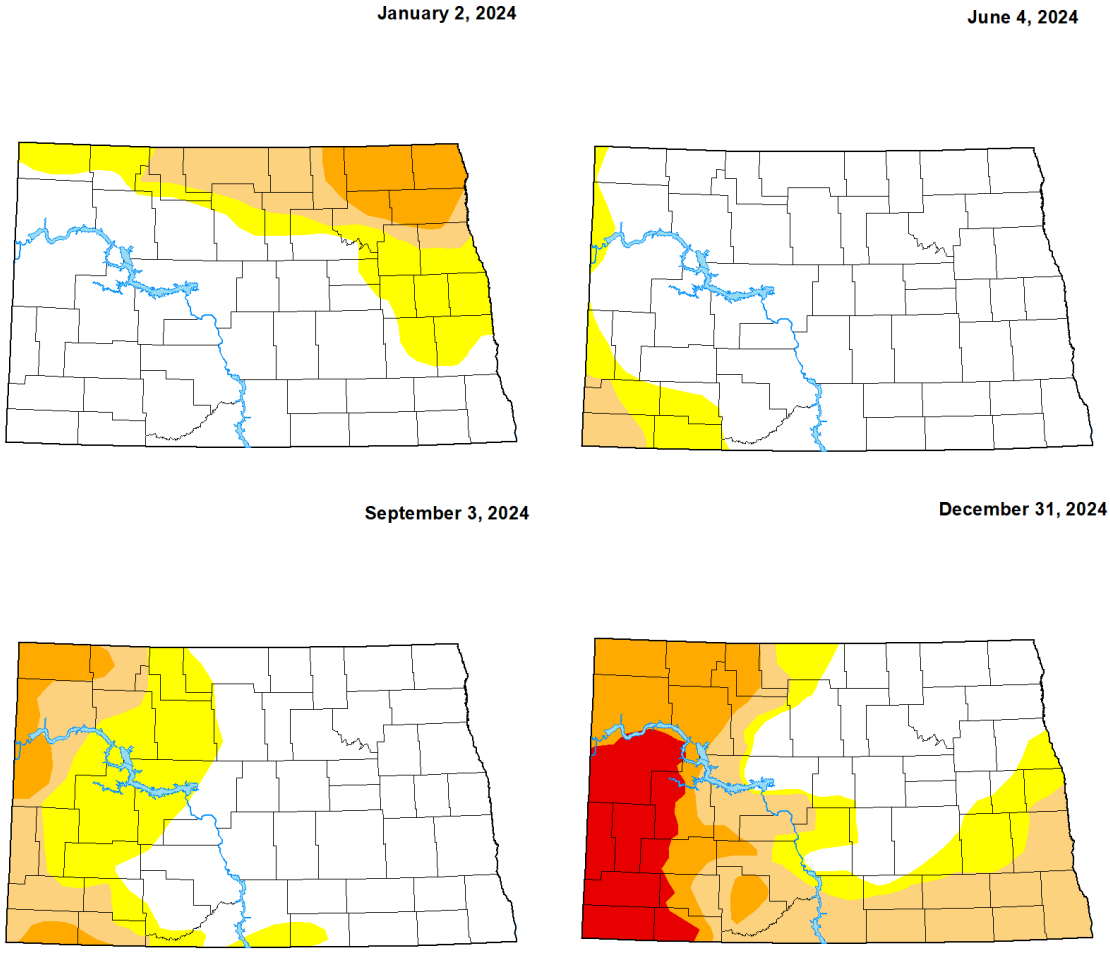


Figure 2: U.S. Drought Monitor Conditions at the beginning of each season in 2024

Temperature Summary

2024 Statewide Average: 43.41°F

Normal Statewide Precipitation: 41.25°F

Temperature varied greatly throughout the year and across the state. From a well above average winter, to a normal spring, cool summer, and hot fall, North Dakota temperatures were classically all over the board. Overall, the statewide average temperature was recorded as 43.41°F, just 2.2°F warmer than normal. The seasons varied dramatically, Winter (December 2023-February 2024) temperatures averaged 8.5°F above normal, whereas spring (March-May) and summer (June-August) came up normal, along with some variation between the months. Autumn ranked as the 6th warmest statewide, as dry and hot weather dominated the Northern Plains.

In 2024, NDAWN recorded its hottest temperature in the history of the mesonet, 111°F at the Banks station in McKenzie County on July 25 2024. Several stations in the dense coverage in the West recorded temperatures over 100°F, typically along and west of the Missouri River where atmospheric and soil conditions were the driest. Temperatures East of the river were typically milder, with some stations in East-Central ND maximum temperatures did not reach 90°F. Contrarily during the cold seasons, the coldest temperature recorded by NDAWN occurred at the Grenora NDAWN station in Divide County, where a temperature of -36°F was recorded on January 14, 2024.

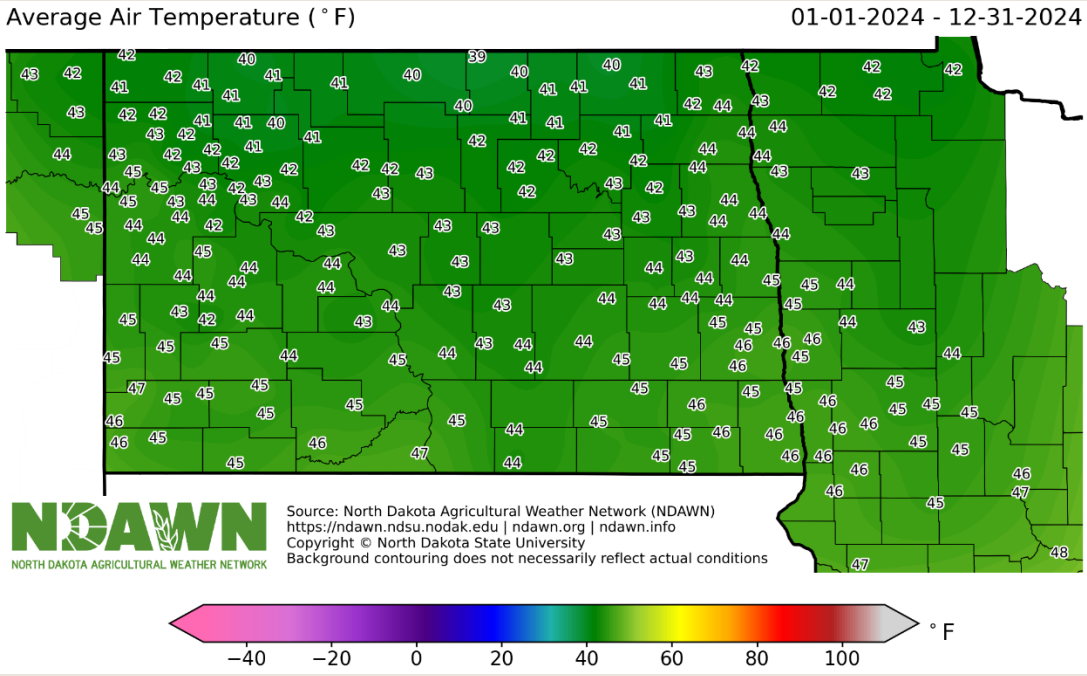


Figure 3: Average air temperature at all NDAWN stations from 1/1/2024-12/31/2024

Temperature Summary

North Dakota has a robust climate record dating back 130 years. The warmest year on record is 1987, where the average temperature measured as 45.0°F, 1.6°F warmer than the average temperature in 2024. Additionally, the coldest year on record was 1950, where the average temperature only reached 34.9°F, 6.4°F below normal. The average temperature in 2024 is tied with 2015 for the 7th warmest year on record according to NCEI climate records.

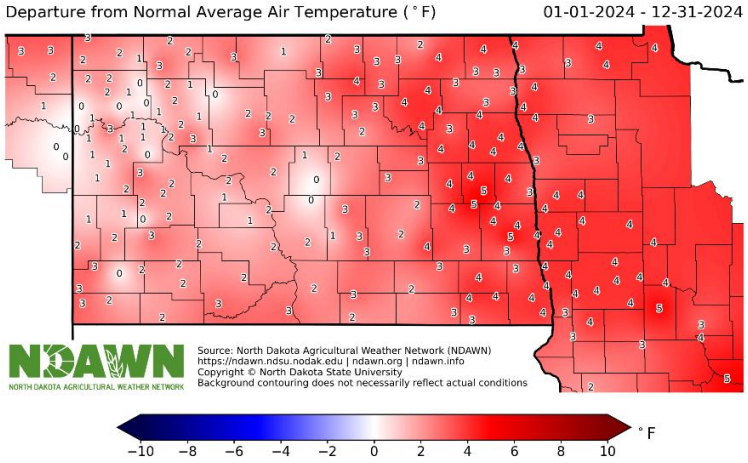


Figure 4: Departure from Average temperature at all NDAWN Stations. Western North Dakota had the most variation in temperature due to dry conditions

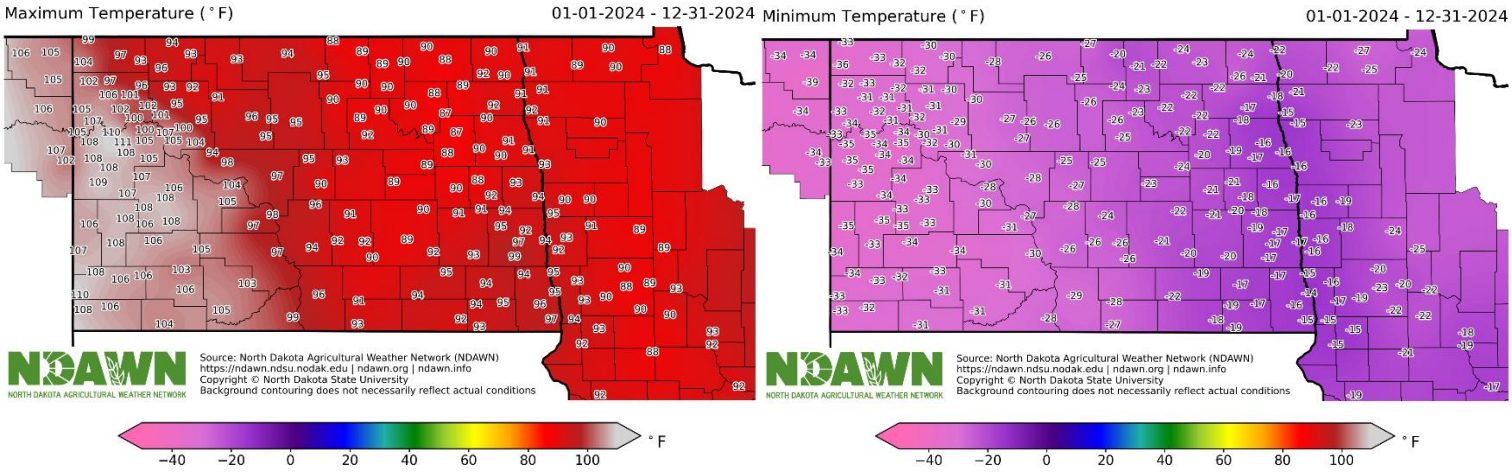


Figure 5: Maximum (Left) and minimum (Right) temperatures at each NDAWN station

Notable Weather Events

2024 had in store quite a few extreme events, from tornadoes and flash floods, to drought and wildfires, the weather never seems to dull. In mid-January, the long-lasting above average temperatures met their match when Arctic air made its way into the Northern Plains. Air temperatures dropped into the minus 30s, widespread across western North Dakota. Eastern North Dakota, where there was little snow, reached the minus teens. Wind chills were brutal, with maximum wind speeds anywhere from 25 to almost 40 mph. The minimum wind chill during this cold snap was -70°F at the Fairfield NDAWN station. BRR!

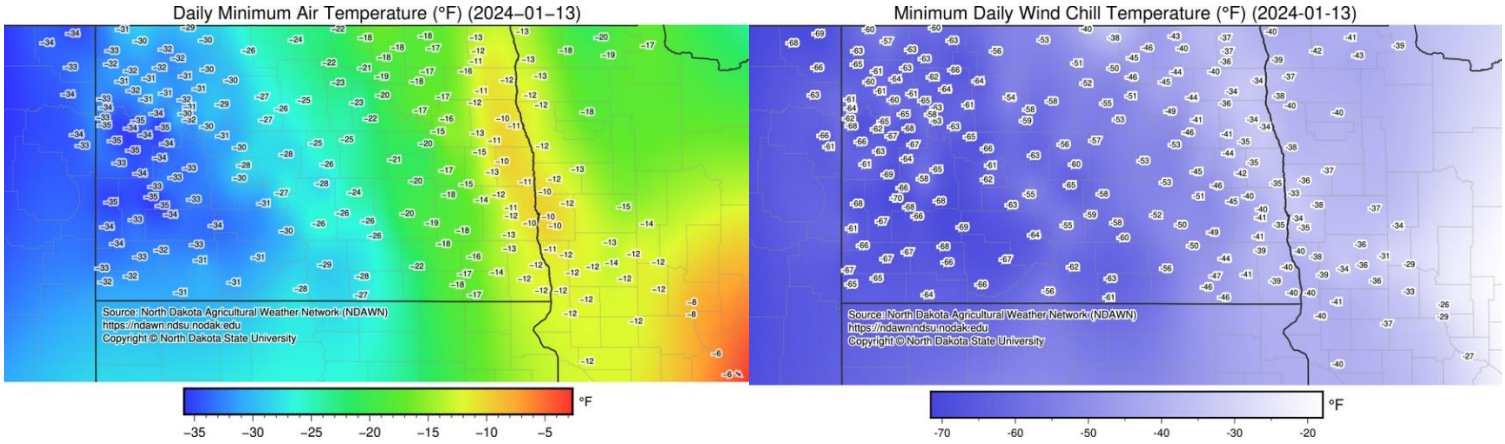


Figure 6: Minimum Temperature (Left) and Wind Chill (Right) at all NDAWN stations on January 13, 2024

Throughout the winter season warm temperatures dominated, meaning snow was little to be found. The greatest snow event of the winter occurred at the tail end of February, when a strong cold front brought a heavy band of snow to East Central North Dakota and strong winds, prompting the National Weather Service to issue a Blizzard Warning across eight Counties in North Dakota.

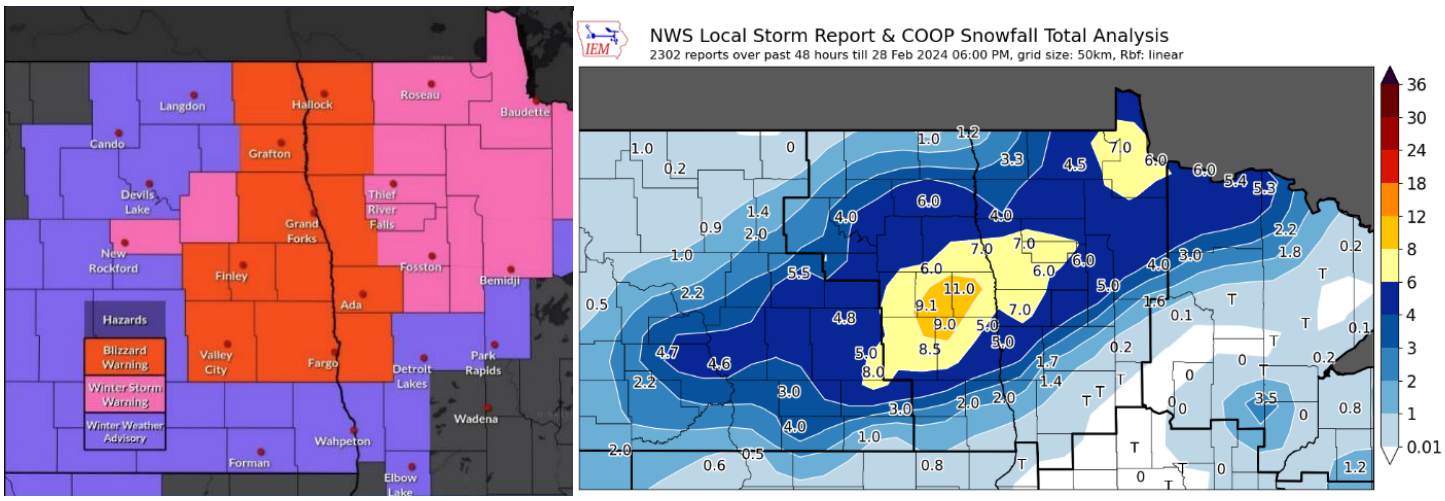


Figure 7: Snowy conditions, wind, and low visibility prompted a blizzard warning issued by the Grand Forks NWS. Snow totals for the event totaled up to 11 inches

Notable Weather Events

As summer approached so did the severe weather. In June, two major severe weather events brought strong winds as well as tornadoes to the area. The first of which occurred on June 2, 2024, when pockets of severe storms dominated South Central North Dakota. The most severe supercell began its life around Stutsman County, where it produced a tornado near Woodworth, fortunately no damage was reported. It then stalled around the Jamestown area, causing flash flooding that closed the interstate west of Jamestown. It continued to strengthen as it trudged south, becoming more linear. hail up to 2” was reported in the area, and a wind gust of 79 mph was recorded by the Marion NDAWN station.

Figure 8: Ominous shelf cloud at the Ypsilanti NDAWN station (left) and the tornado produced near Woodworth, ND, taken by Cody Mack (right) (NWS Bismarck)

Later in the month of June, a severe storm produced funnel clouds in Western ND. Two brief tornadoes were reported from these severe storms. On June 27, 2024 the camera at the Sentinel butte NDAWN station in Golden Valley County captured a funnel cloud from one of the severe storms that was associated with a tornado that touched down near Trotters, ND. Large hail and winds up to 81 mph were measured by NDAWN stations.

Figure 9: Funnel cloud captured on the Sentinel Butte NDAWN camera on 6/27/2024

Notable Weather Events

In July, the Bismarck area had a slough of severe weather and the governor declared a disaster due to the amount of damage from large hail. Many people recovered baseball sized hailstones after the storm. Torrential rainfall continued eastward and the highest reported total rainfall from NDAWN occurred at the Edgeley station with 1.96 inches.

August was similar in terms of severe weather, once again nailing the Bismarck area just one month after the previous large hail event. This storm produced large hail as well, 1-2 inches reported near Lincoln, but up to 2.75 inches near St. Anthony. According to the NWS Bismarck, straightline winds caused significant damage to crops and powerlines near Sterling, and a brief tornado touched down just south of Steele and derailed train cars. The highest rain total recorded by NDAWN for this event was 2.14” at the Jamestown station.

Figure 10: Derailed train caused by a tornado near Steele ND on August 28, 2024

The latter months of 2024 were generally quiet, as most severe weather had halted and a dry pattern took over. A large rain event occurred in the Devils Lake Basin along with some sub-severe storms, the Crary NDAWN station had a one-day rain total of 3.96 inches on September 13th, 2024. This happened again just a few days later on the 16th, but in a line from Lake Sakakawea to just north of the Basin; the highest daily total was recorded at Langdon with 3.36”. Northern ND received a decent amount of rain, ending the year well over average precipitation. Western, and Southeastern ND continued the dry pattern into the winter months, also maintaining the above average temperatures with it.

Notable Weather Events

In early October 2024, prolonged dry weather proved dangerous when a front brought with it gusty winds, up to 69 mph in Williams County at the Hanks NDAWN station. Statewide, wind gusts were in the 50-60 mph range. Burning restrictions were quickly broadcast to the public, but a combination of natural causes and oil pad flares ignited wildfires in Williams, McKenzie, and Dunn Counties. Extensive damage occurred from these wildfires, burning in total 111,000 acres of farmland and pasture. Fortunately, no towns were affected by these wildfires, but two people tragically lost their lives. North Dakota firefighters worked hard to put out the blaze, battling the extreme winds, but were able to have the fires under control by October 10, 2024.

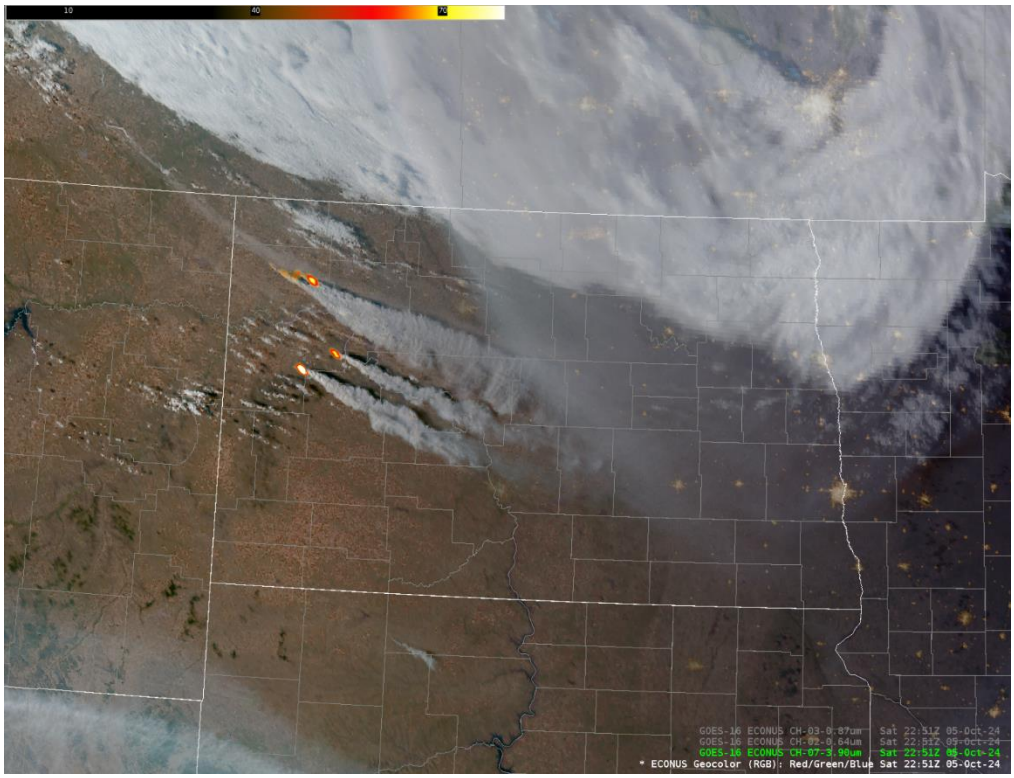


Figure 11: Satellite imagery of the active wildfires in Western North Dakota, fueled by dry vegetation and high winds

Sources

North Dakota Agricultural Weather Network

NWS Grand Forks Event Summary

NWS Bismarck Event Summary

Iowa Environmental Mesonet

U.S. Drought Monitor

National Centers for Environmental Information

KFYR: https://www.kfyrtv.com/2024/07/31/burgum-declares-summer-storm-disaster-central-north-dakota-following-severe-weather/

North Dakota Monitor: https://northdakotamonitor.com/2024/10/10/110000-acres-burned-multiple-agencies-will-investigate-north-dakota-wildfires/