



2020

# *MINNESOTA LIGHTNING REPORT*



## ABOUT THIS REPORT

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The 2020 Lightning Report was prepared by Earth Networks using the Earth Networks Total Lightning Network (ENTLN). The following report includes in-cloud, cloud-to-ground, and total lightning data for this state and the surrounding water bodies (if any) throughout 2020. Counts, densities, rankings, Dangerous Thunderstorm Alerts (DTAs), and Thunder Days in this report are from January 1, 2020 to December 31, 2020.

## THE EARTH NETWORKS TOTAL LIGHTNING NETWORK (ENTLN)

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The lightning data in this report is derived from the Earth Networks Total Lightning Network (ENTLN), which monitors the combination of in-cloud and cloud-to-ground lightning strikes over 100 countries. With over 1,800 sensors, the ENTLN is the most extensive and technologically advanced total lightning network in the world. ENTLN has been specifically deployed to detect real-time lightning and provide advanced warning for severe weather events that could threaten public safety and operational efficiency.



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# REPORT TERMINOLOGY

To help you better understand the insights from this lightning report, we've included definitions of our frequently used report terminology below.

**Lightning Pulse:** This report measures lightning pulses. A pulse is a surge of electric current in lightning usually accompanied by a burst of light. Pulses are classified as In-cloud (IC) or Cloud-to-Ground (CG).

**Lightning Flash:** A lightning flash is a collection of pulses close in space and time that approximates the continuous ionized channels of a complete bolt of lightning.

**Cloud-to-Ground Lightning (CG):** Lightning that happens between opposite charges in a cloud and on the ground.

**In-Cloud Lightning (IC):** Lightning that occurs between opposite charges within a thunderstorm cloud.

**Total Lightning Detection:** The combination of all in-cloud and cloud-to-ground lightning activity.

**Pulse Density:** The number of lightning pulses per square mile per year.

**Dangerous Thunderstorm Alerts (DTAs):** Earth Networks patented advanced severe weather warnings that notify users of incoming storms up to 45 minutes before storm arrival.

**Thunder Days:** Any given day where lightning was detected in a certain area.

## TOTAL LIGHTNING

is the combination of cloud-to-ground (CG) and in-cloud (IC) lightning strikes



### Cloud-to-Ground lightning:

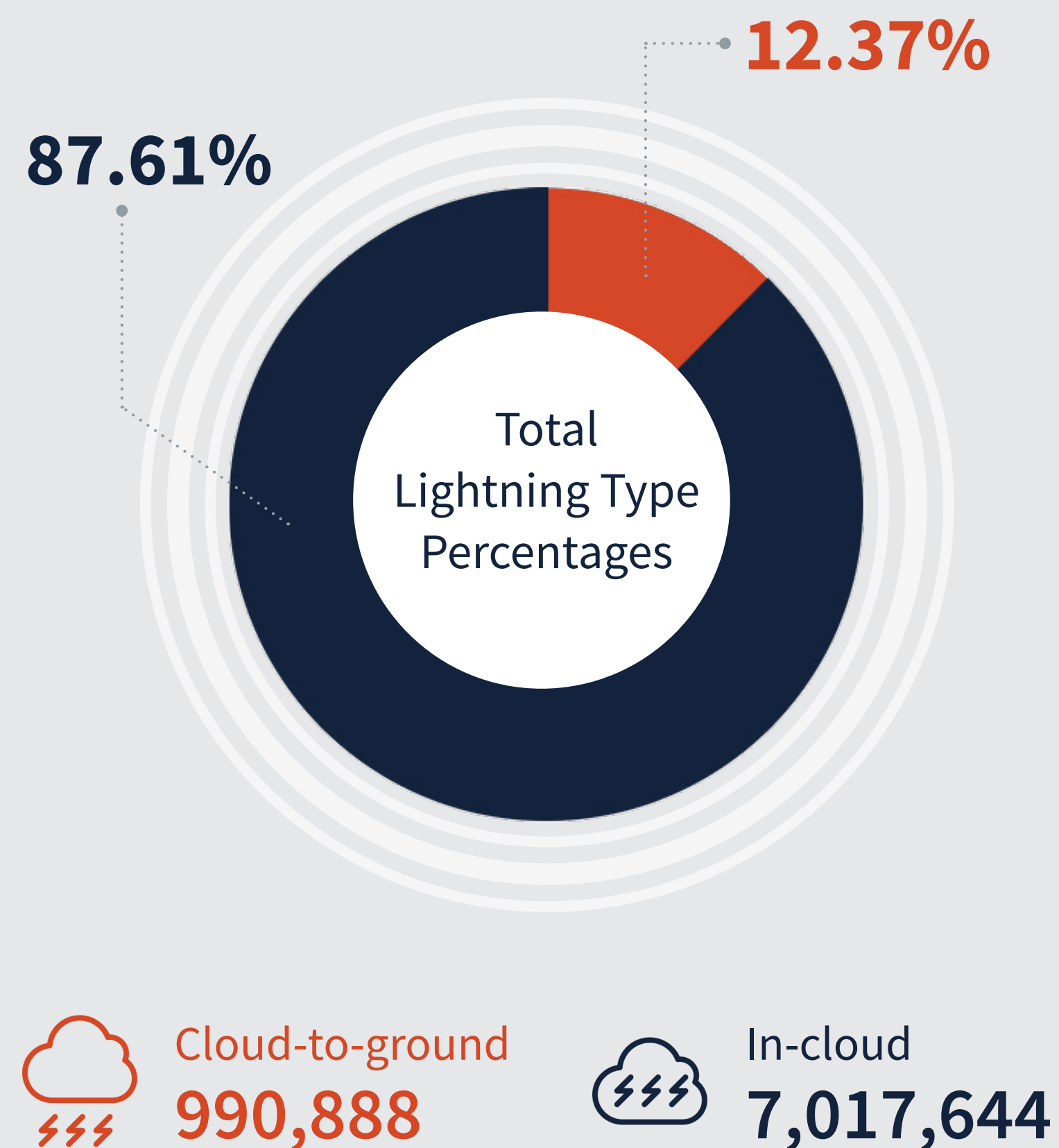
Lightning that happens between opposite charges in a cloud and on the ground

### In-Cloud lightning:

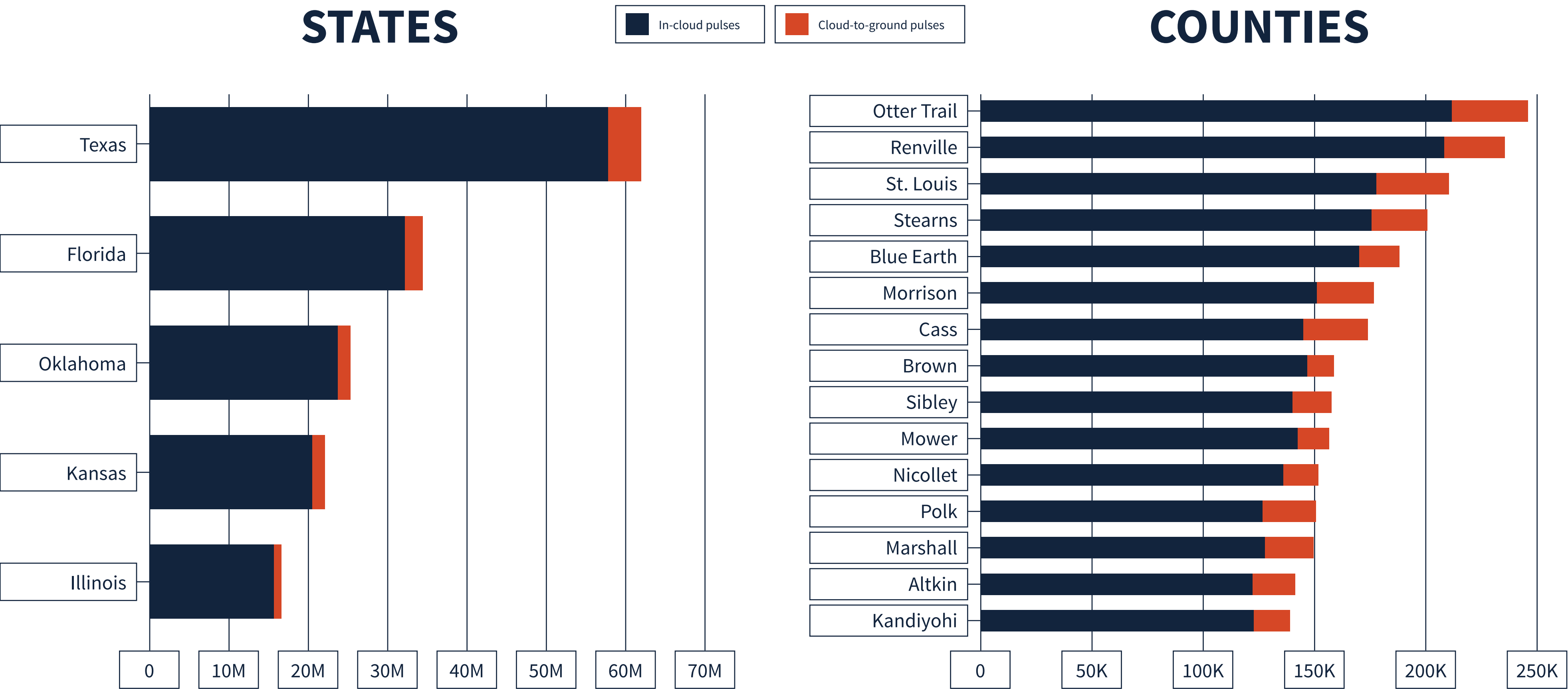
Lightning that occurs between opposite charges within a thunderstorm cloud

## MINNESOTA TOTAL LIGHTNING PULSES

# 8,009,792



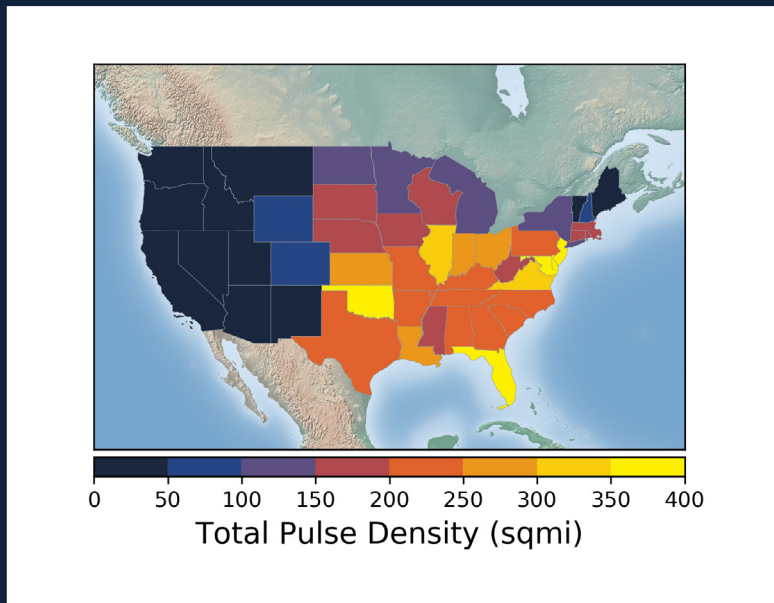
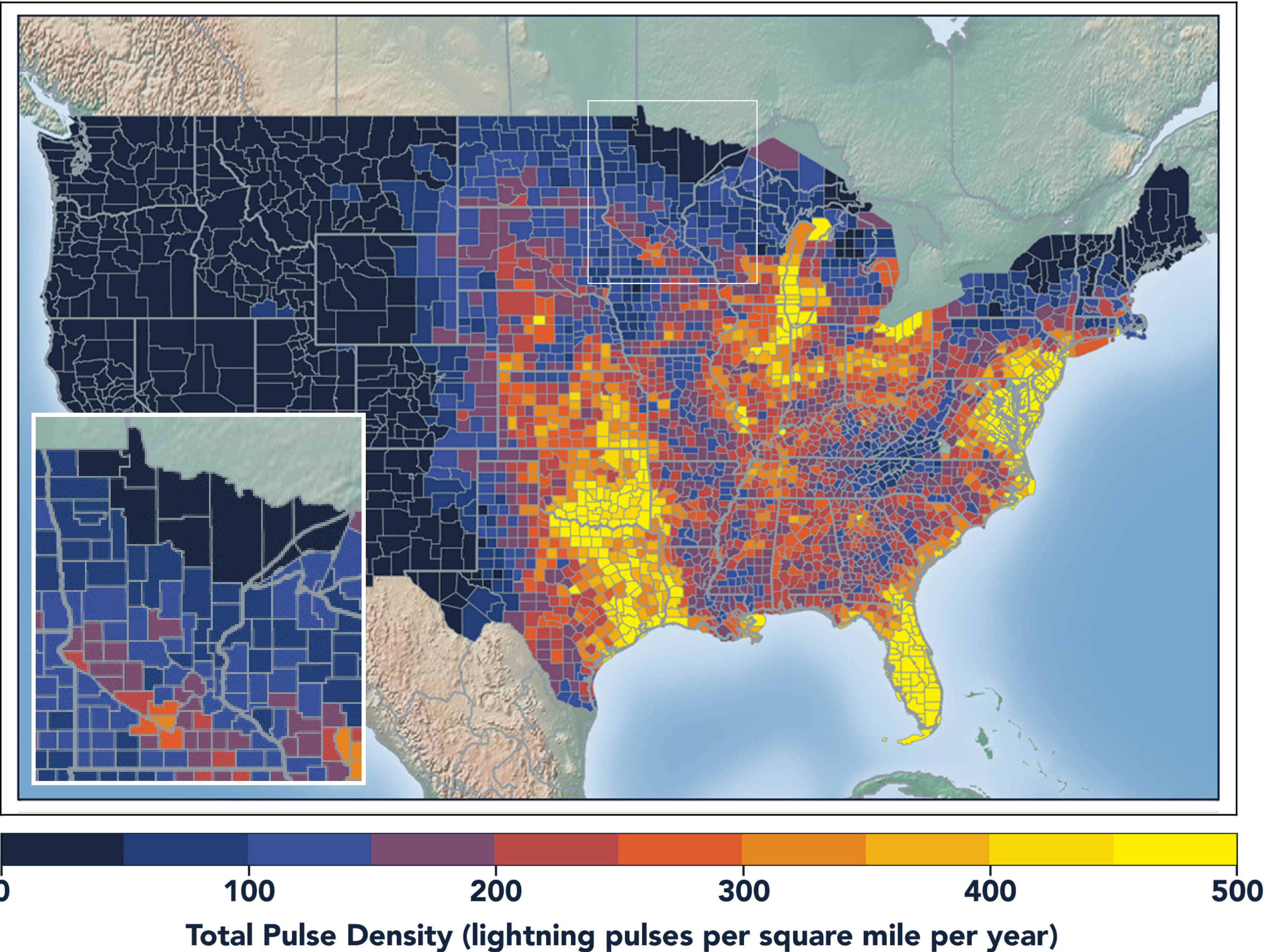
# LIGHTNING COUNT RANKINGS



Minnesota ranked 22 in total lightning pulses for 2020.



# TOTAL (CG+IC) PULSE DENSITY MAP



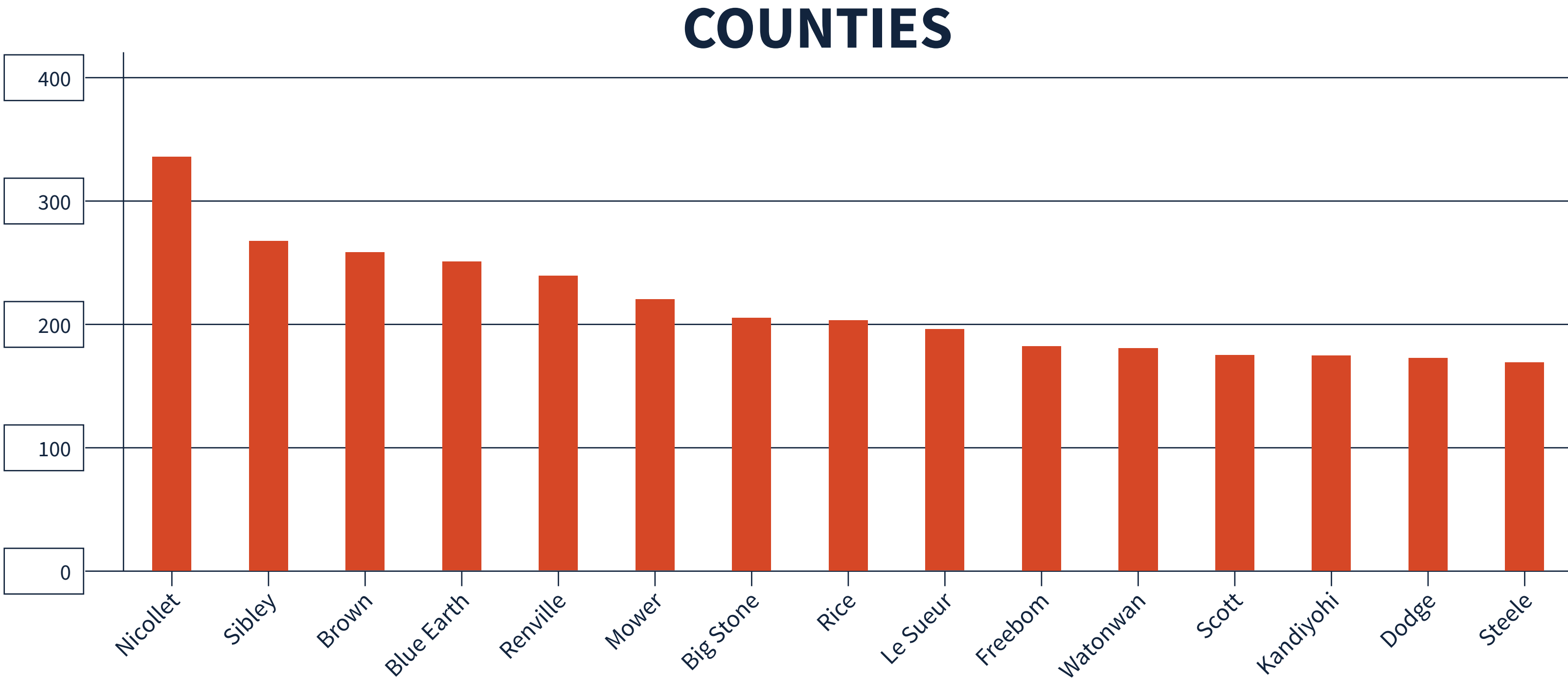
Pulse density is a better indicator of lightning activity than total lightning counts because it enables us to compare different sized areas (like states and counties) fairly.

We cluster pulses together into a flash. With every pulse we detect, we receive a more precise measure of lightning activity. At left, areas in bright yellow experienced the highest lightning pulse density per square mile in 2020.



# TOTAL PULSE DENSITY RANKINGS

This chart shows the top 15 counties in the state ranked by total pulse density, which is the total lightning divided by the area of the county (in square miles).





# DANGEROUS THUNDERSTORM ALERTS IN THE U.S.



Earth Networks issued 29,401 Dangerous Thunderstorm Alerts (DTAs) in 2020. This year's map clearly shows the persistent drought conditions that have plagued the South and Southwest.

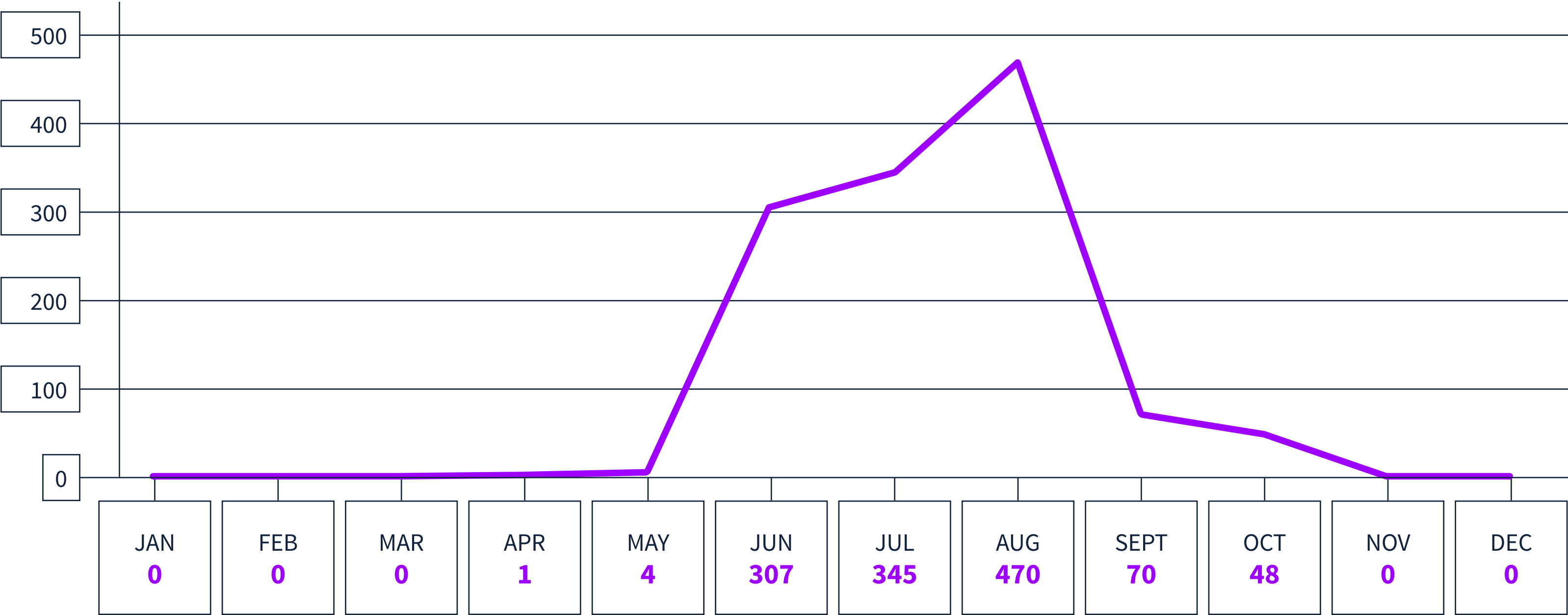
Dangerous Thunderstorm Alerts (DTAs), available exclusively to Earth Networks, provide **50% more lead time** to severe storms compared to publicly available alerts.



# DANGEROUS THUNDERSTORM ALERTS BY MONTH

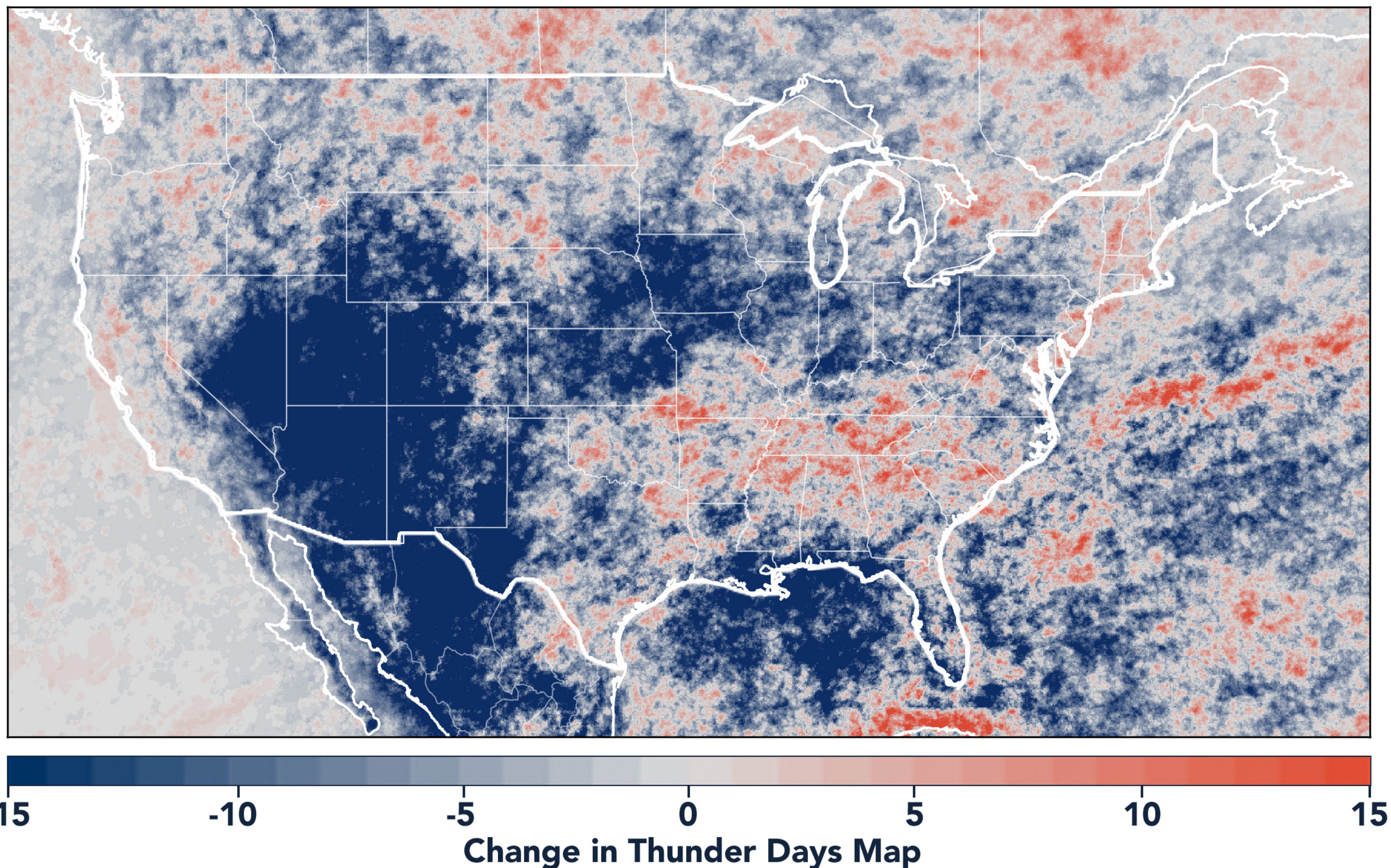
Earth Networks issued 1,245 Dangerous Thunderstorm Alerts for the state in 2020.

## MINNESOTA





## TOTAL STATE THUNDER DAYS: 148



Thunder Days are the days we detected lightning over a certain area. The map shows a deviation from our 7-year average and illustrates our overall finding that lightning decreased about 15% from 2019.

This year, the Southwest and Midwest experienced significantly less lightning than in previous years due to a persistent drought and weak monsoon. States in the Southeast experienced a substantial uptick in lightning activity this year, including Tennessee, North Carolina, South Carolina, Virginia, West Virginia, Georgia, Alabama, Mississippi, Florida, Louisiana, Arkansas, and Kentucky.





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# ***THANK YOU***

For additional insights or permission to use data or graphics from this report, please contact us at: [info@earthnetworks.com](mailto:info@earthnetworks.com) or call 1 301.250.4000





# APPENDIX

This table ranks all U.S. states by total lightning pulses, including in-cloud and cloud-to-ground from highest to lowest. Total number of thunder days in each state (the total number of days in the year when lightning was detected by ENTLN) are also included. The period covered is January 1, 2020 to December 31, 2020.

STATE	TOTAL LIGHTNING PULSES	TOTAL THUNDER DAYS
TX	63,683,799	278
FL	35,430,198	246
OK	26,159,420	205
KS	23,125,675	179
IL	16,785,149	166
NE	14,433,875	178
MO	14,081,658	184
VA	13,234,163	176
GA	13,016,803	217
OH	12,009,955	143
SD	11,940,870	156
LA	11,787,379	230
AL	11,448,621	202
AR	11,417,155	211
NC	10,666,834	203
PA	10,024,978	151
MS	9,236,279	210
IN	9,175,986	149
IA	9,121,097	140
WI	8,812,327	145
TN	8,458,373	186
MN	8,009,792	148
KY	7,974,926	166
MI	7,769,382	159
ND	7,634,287	131
SC	7,454,219	197
CO	7,360,769	185
MD	6,666,766	124
NM	5,819,550	196
MT	5,107,593	154
WY	4,951,397	166
NY	4,943,122	152
WV	4,684,226	150
AZ	3,532,759	151
NJ	3,465,297	96
UT	1,951,574	162
ID	1,518,171	172
MA	1,267,046	80
NV	1,237,862	146
DE	1,168,918	89
CA	956,187	151
OR	915,855	132
CT	802,252	70
NH	618,242	70
WA	402,333	117
ME	358,334	81
VT	354,695	75
RI	190,992	42
DC	44,204	47

# APPENDIX

This table ranks all counties in the state by total lightning pulses, including in-cloud and cloud to-ground from highest to lowest. Total number of thunder days in each county (the total number of days in the year when lightning was detected by ENTLN) are also included. The period covered is January 1, 2020 to December 31, 2020.

COUNTY	TOTAL LIGHTNING PULSES	TOTAL THUNDER DAYS
Otter Tail County	245,961	55
Renville County	235,534	46
St. Louis County	210,424	67
Stearns County	200,773	51
Blue Earth County	188,123	50
Morrison County	176,367	47
Cass County	173,747	48
Brown County	158,534	40
Sibley County	157,387	47
Mower County	156,484	55
Nicollet County	151,434	44
Polk County	150,188	52
Marshall County	149,483	45
Aitkin County	141,326	47
Kandiyohi County	139,114	41
Freeborn County	128,593	51
Swift County	123,206	44
Redwood County	117,396	52
Fillmore County	115,912	52
Todd County	114,606	42
Crow Wing County	113,076	39
Olmsted County	110,613	52
Pope County	110,207	44
Faribault County	105,319	49
Big Stone County	102,508	43
Beltrami County	100,823	45
Rice County	100,782	44
Lac qui Parle County	99,500	46
Kittson County	98,518	35
Itasca County	97,202	51
Stevens County	93,062	42
Grant County	92,987	40
Becker County	92,071	42
Goodhue County	92,052	48
Wilkin County	92,024	41
Chippewa County	90,733	43
Traverse County	90,130	42
Hennepin County	88,658	55
Le Sueur County	88,102	37
Lake County	87,926	48
Douglas County	87,814	39
Martin County	86,019	46
Hubbard County	85,836	32
Yellow Medicine County	85,381	49
Murray County	84,228	48
Norman County	81,310	39
Clay County	81,056	43

COUNTY	TOTAL LIGHTNING PULSES	TOTAL THUNDER DAYS
Winona County	80,118	51
Watonwan County	78,921	42
Pine County	78,801	51
Nobles County	78,293	49
Wright County	76,596	54
Dodge County	76,439	48
Lyon County	76,126	49
Dakota County	76,094	54
Steele County	73,159	47
Waseca County	70,306	44
Wabasha County	68,729	48
Jackson County	66,943	50
Clearwater County	63,406	44
Scott County	62,387	48
Lincoln County	60,340	41
Meeker County	60,230	42
Cottonwood County	59,951	49
Carver County	59,859	48
Mille Lacs County	59,721	47
Pipestone County	59,041	40
Roseau County	58,544	40
Houston County	57,725	45
McLeod County	57,508	47
Koochiching County	56,787	50
Rock County	52,129	41
Cook County	51,266	46
Anoka County	50,836	45
Carlton County	50,731	38
Mahnomen County	44,317	37
Washington County	43,209	49
Benton County	42,187	40
Pennington County	41,538	39
Chisago County	39,428	48
Lake of the Woods	38,278	47
Kanabec County	35,528	41
Wadena County	34,734	35
Sherburne County	30,368	44
Red Lake County	25,830	32
Isanti County	24,516	45
Ramsey County	16,193	39