

R54-7

## Coldest Area in the United States

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IN order to determine the part of the United States which might best be described as "coldest", consideration must be given not only to extreme and mean values such as annual, seasonal, monthly, and monthly minimal, but also to frequencies of low temperatures, and, as an indication of variability, to standard deviations.

If only absolute minimum temperature is considered, Rogers Pass, Montana, at 5,470 feet with an official low temperature of  $-69.7^{\circ}$  F, recorded 20 January 1954, would be the coldest. In considering other values of temperature, however, investigation shows that the station with the lowest mean annual temperature ( $27.0^{\circ}$ ) is Mt. Washington, New Hampshire. Pembina, North Dakota, records the lowest mean monthly temperature ( $-2.4^{\circ}$ ); Hansboro, North Dakota, has the lowest mean monthly minimum temperature ( $-12^{\circ}$ ); Hermit, Colorado, has the greatest number of days each year with temperatures at or below  $0^{\circ}$ , and Bemidji, Minnesota, the greatest number of days each year with temperatures at or below  $-20^{\circ}$ .

Data used in this study were obtained from U. S. Weather Bureau publications. All temperatures are in degrees Fahrenheit. Only those stations with 30 years of record were selected with the exception of the 21-year record at Mt. Washington.

Extremes of low temperature usually associated only with the Arctic have frequently

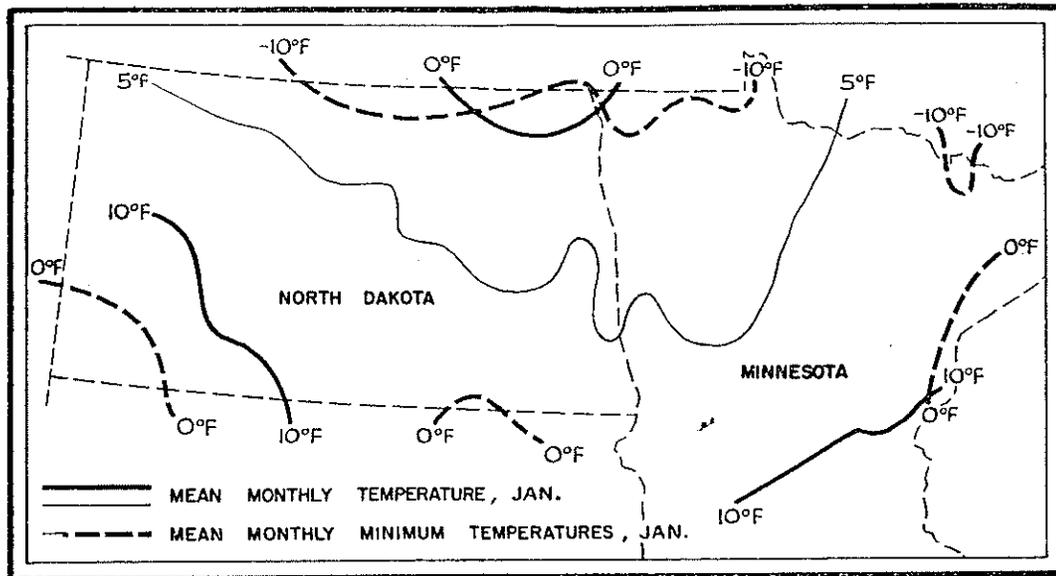
occurred in the United States. Temperatures of  $-60^{\circ}$  or below have been recorded by at least 10 stations in the United States in addition to Rogers Pass mentioned above, mostly at high elevations in the states of Montana and Wyoming and at one station each in Colorado, Idaho, and North Dakota. Fort Churchill, Canada, used by the military services of the United States, Canada, and the United Kingdom for arctic testing, has recorded an absolute minimum temperature of only  $-57^{\circ}$ .

Although the lowest temperatures recorded have occurred at mountain stations, mean annual temperatures at some lowland stations are as low as those at the highland stations. During winter mean temperatures at many lowland stations are much lower than those of the highland stations. The subfreezing mean annual temperature of  $27^{\circ}$  at Mt. Washington, New Hampshire, is unique among climatic records in the United States. Although there are stations at elevations higher than Mt. Washington (6,266 feet), the next lowest mean annual temperature is  $32.7^{\circ}$  recorded at Fraser, Colorado (8,567 feet). A comparison with stations at similar elevations indicates that Mt. Washington's mean annual temperature is from  $9^{\circ}$  to  $21^{\circ}$  lower.

Stations at even higher elevations, for example, Foxpark, Wyoming, and Leadville, Colorado, have higher mean annual temperatures. Below 2,500 feet, the lowest mean an-

TEMPERATURES OF  $-60^{\circ}$  F AND COLDER IN THE UNITED STATES

| Station                     | Elevation | Temperature F | Date        | Operation  |
|-----------------------------|-----------|---------------|-------------|------------|
| Polar River, Mont.          | 1,994     | -63           | 1 Jan 1885  | 1882-1889  |
| F. Keogh, Mont.             | 2,530     | -65           | 13 Jan 1888 | 1877-1891  |
| F. Logan, Mont.             | 4,750     | -61           | 11 Feb 1899 | 1870-1908  |
| Grayling, Mont.             | 6,700     | -60           | 12 Feb 1905 | 1904-1912  |
| Border, Wyo.                | 6,085     | -60           | 8 Feb 1929  | 1902-cont. |
| Moran, Wyo.                 | 6,770     | -63           | 9 Feb 1933  | 1911-cont. |
| Riverside Ranger Sta., Wyo. | 6,700     | -66           | 9 Feb 1933  | 1905-1933  |
| Parshall, N. D.             | 1,929     | -60           | 15 Feb 1936 | 1931-cont. |
| Island Park Dam, Ida.       | 6,300     | -60           | 18 Jan 1943 | 1943-cont. |
| Taylor Park, Colo.          | 9,206     | -60           | 1 Feb 1951  | 1942-cont. |
| Rogers Pass, Mont.          | 5,470     | -69           | 20 Jan 1954 |            |



nual temperatures are found in North Dakota, but temperatures at these stations are still about 10° warmer than Mt. Washington. Although the mean annual temperatures of mountain stations near an elevation of 6,200 ft. are similar to those of the North Dakota lowland stations, a comparison of winter (December through February) mean temperatures shows that the lowland stations are from 10° to 25° lower.

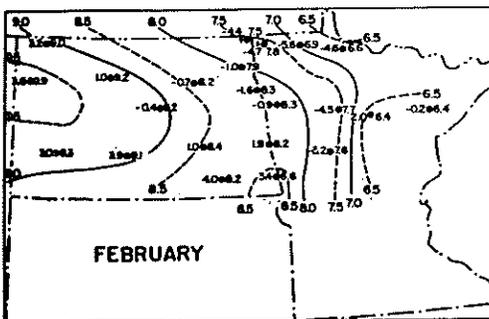
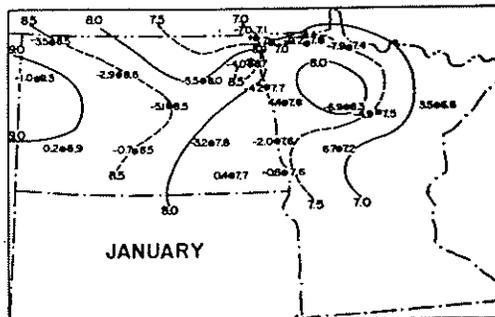
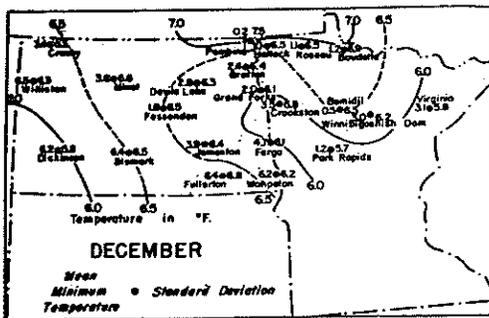
From the data presented below it may be concluded that the coldest area in the United States is located in northeast North Dakota and northwest Minnesota. In winter, lowest mean monthly temperatures and lowest mean

monthly minimum temperatures occur here, and the frequency of low temperatures below 0° and below -20° is also greatest.

North Dakota is the only state in which mean monthly temperatures less than 0° occur. During January the mean at Pembina is -2.4° and at Hannah -1.2°. Of 88 climatic stations in North Dakota, 22 or 25 per cent have January mean temperatures of less than 5°. Sixteen of 30 stations, about 53 per cent, in northern Minnesota also have January means of less than 5°. In general, these stations lie in the area north of a line drawn from the northwest corner of North Dakota southeast to Fargo, then northeast through

MEAN ANNUAL AND MEAN WINTER TEMPERATURES FOR 15 STATIONS

| Station                | Elevation | Mean Winter (Dec-Feb) Temperature | Mean Annual Temperature |
|------------------------|-----------|-----------------------------------|-------------------------|
| Pembina, N. D.         | 789       | 2.3                               | 36.0                    |
| Hannah, N. D.          | 1,568     | 3.0                               | 35.4                    |
| Hallock, Minn.         | 815       | 4.7                               | 37.3                    |
| Mt. Washington, N. H.  | 6,266     | 7.5                               | 27.0                    |
| Hegben Dam, Idaho      | 6,550     | 13.6                              | 35.8                    |
| Foxpark, Wyo.          | 9,060     | 16.1                              | 33.0                    |
| Fraser, Colo.          | 8,567     | 16.6                              | 32.7                    |
| Bedford, Wyo.          | 6,221     | 18.7                              | 38.6                    |
| Leadville, Colo.       | 10,177    | 19.0                              | 35.7                    |
| Yellowstone Park, Wyo. | 6,239     | 20.2                              | 39.6                    |
| Durango, Colo.         | 6,554     | 27.3                              | 46.0                    |
| Tropic, Utah           | 6,296     | 29.4                              | 46.9                    |
| Adaven, Nev.           | 6,250     | 30.7                              | 48.2                    |



MEAN MINIMUM TEMPERATURES  
AND STANDARD DEVIATIONS  
FOR WINTER MONTHS

Minnesota to International Falls. No regularly reporting stations in other states record monthly means as low.

Stations reporting lowest mean monthly minimum temperatures are also located in North Dakota and Minnesota, but generally farther north along the Canadian border. Four stations (Hansboro and Westhope, North Dakota, and Hallock and Warroad, Minnesota) have mean minimum temperatures of less than  $-10^{\circ}$  in January. In North Dakota, in January and February, mean monthly minimum temperatures less than  $0^{\circ}$  occur everywhere except in the southwest part of the state. In the area of Minnesota north of the 46th parallel and west of Lake Superior, mean minimum temperatures less than  $0^{\circ}$  may be expected throughout January and February.

Since mean temperatures are generally available, they are widely used in climatological work. It is realized, however, that the mean of any one year may be quite different from the long term mean. For example, the January mean monthly temperature for a 57-year period for North Dakota is  $7.0^{\circ}$ , but it has ranged from  $-8.3^{\circ}$  in 1937 to  $21.8^{\circ}$  in 1944. The mean minimum temperatures and

standard deviations from December through February for stations in Minnesota and North Dakota are shown in the accompanying table.

The frequency of occurrence of low temperatures is an indication of the coldness of a place. In this study the frequency of minimum temperatures at or below  $0^{\circ}$  and below  $-20^{\circ}$ , occurring during January and February for the period 1937-1946, was computed. Hermit, Colorado, recorded minimum temperatures at or below  $0^{\circ}$  on 433 out of 592 days; Hallock, Minnesota, recorded the second largest number, 413 days. Eighteen stations in the United States averaged at least half the days of January and February with minimum temperatures equal to or less than  $0^{\circ}$ , and all but three (Hermit, Colorado; Moran, Wyoming; and First Connecticut Lake, New Hampshire) are located in North Dakota or Minnesota.

Bemidji, Minnesota, shows the highest frequency of days with temperatures at or below  $-20^{\circ}$ , 143 out of 592, and Big Falls, Minnesota, the next highest, 139 out of 592. There are 8 stations which have at least 10 days in both January and February with minimum temperatures of  $-20^{\circ}$  or less, and

NUMBER OF DAYS WITH MINIMUM TEMPERATURES EQUAL TO OR LESS THAN 0°  
AND -20° F FOR JANUARY AND FEBRUARY, 1937-1946  
(Total Possible Days—592)

| Station                 | 0° F |     |       | -20° F |     |       |
|-------------------------|------|-----|-------|--------|-----|-------|
|                         | Jan  | Feb | Total | Jan    | Feb | Total |
| Bemidji, Minn.          | 187  | 175 | 362   | 85     | 58  | 143   |
| Big Falls, Minn.        | 196  | 157 | 353   | 76     | 63  | 139   |
| Crookston, Minn.        | 187  | 162 | 349   |        |     |       |
| Hallock, Minn.          | 211  | 202 | 413   | 81     | 51  | 132   |
| Rousseau, Minn.         | 207  | 185 | 392   | 78     | 59  | 137   |
| Virginia, Minn.         | 173  | 144 | 317   |        |     |       |
| Devils Lake, N. D.      | 183  | 152 | 335   |        |     |       |
| Fessenden, N. D.        | 176  | 153 | 329   |        |     |       |
| Grafton, N. D.          | 183  | 160 | 343   |        |     |       |
| Grand Forks, N. D.      | 193  | 175 | 368   |        |     |       |
| Langdon, N. D.          | 196  | 179 | 375   | 68     | 42  | 110   |
| Pembina, N. D. (9 yr.)  | 171  | 170 | 341   |        |     |       |
| Sharon, N. D.           | 183  | 162 | 345   |        |     |       |
| Bottineau, N. D.        | 185  | 166 | 351   | 77     | 55  | 132   |
| Wahpeton, N. D.         | 171  | 136 | 307   |        |     |       |
| First Conn. Lake, N. H. | 188  | 151 | 339   |        |     |       |
| Moran, Wyo.             | 193  | 162 | 355   | 79     | 57  | 136   |
| Hermit, Colo.           | 233  | 200 | 433   | 64     | 47  | 111   |

only Hermit and Moran are not located in North Dakota and Minnesota. It is evident, therefore, that the greatest frequencies of low temperatures in the United States are found

in the Valley of the Red River in North Dakota and Minnesota, and this area may be considered the coldest place in the United States.