

# NOAA's National Weather Service River Forecast Office North Central River Forecast Center

## NCRFC Climate and Topography

The NCRFC's area of responsibility, which covers approximately 339,000 square miles, includes the Red River of the North to the Canadian border, including the Souris basin in North Dakota and the Roseau River in Minnesota. The NCRFC's area also includes the Rainy River in Minnesota, and the Mississippi River drainage from the headwaters in Minnesota to Chester, Illinois, excluding the Missouri River basin. Also included are the mouth of the Big Muddy in Illinois, and the Great Lake tributaries in Michigan, Minnesota, Wisconsin, Illinois, and Indiana except the Maumee Basin.

### CLIMATE

NCRFC's climate is affected not only by the interior continental location but also in some areas by their proximity to the Great Lakes. The states that for the most part have a continental climate include Iowa, Illinois, Minnesota, Missouri, Wisconsin, South Dakota and North Dakota.

The continental climate is characterized by extremes of temperature. In the summer the prevailing weather system comes north from the Gulf of Mexico. The air is very warm and moist and produces much of the regions yearly rainfall. In the winter the prevailing weather system is the southerly flow of cold, dry Canadian air which can cause extremely cold temperatures. The extremes of cold and hot air will vary over the area with the coldest temperatures occurring in northern Minnesota and North Dakota and the warmest occurring in southern Iowa and Missouri. Annual Precipitation ranges from around 14 inches in North Dakota up to 48 inches in Missouri. Much of this precipitation occurs during the summer months.

The states of Michigan and northwestern Indiana have climates that are dominated by the presence of the Great Lakes. In Michigan the climate is quasi-marine in spite of the mid-continental location. The state averages about 31 inches of precipitation a year. Cold air passing over the warmer lake water induces precipitation in the lee of Lake Michigan in the fall and winter. Snowfall is the greatest next to the lakes and decreases further inland. Northwestern Indiana also is affected by its proximity to Lake Michigan. Precipitation is the greatest in the counties next to the lake through which the Kankakee River runs.

Temperatures in these states are moderated by the presence of the lakes, the extremes of hot and cold are not as great.

### TOPOGRAPHY

Most of the topography of the NCRFC's area of responsibility has been formed or affected by glacial activity. In North Dakota the flat Red River Valley has deep soils which were formed under a glacial lake. There is very little change in elevation in the eastern part of North Dakota and most of the land is in agriculture. Further west in North Dakota there is a gradual rise in elevation to the Young Drift Plains and the Great Plains. The portion of South Dakota which is in the NCRFC's area has a very flat topography and is just south of the glacial lakebed which the Red River of the North drains.

Minnesota is a state with varied topography. In the northwest, the Red River Valley is very flat and like the eastern part of North Dakota, was formed from glacial lake sediments, and is mostly agricultural land. The northeastern portion of Minnesota was formed by glaciation with shallow topsoil and the bedrock close to the surface. The higher elevations of the state are found in this area with forests and numerous lakes. Central Minnesota has a rolling topography formed from glacial moraines and outwash plains. The southwestern part of the state is flat to rolling with deep glacial till while the southeastern part of the state is hillier with an unglaciated topography. There are more hills and valleys in the southeast and the soils are loess deposits from the glaciers to the north. Both the southwestern and southeastern parts of the state are largely agricultural now with original vegetation being tall grass prairie in the southwest and broadleaf forest in the southeast.

The topography of Iowa is rolling prairie and changes in elevation are small across the state varying from 1,675 feet in the northwest to 477 feet in the southeast. The topography was formed mainly from outwash plains from the glaciers to the north and east. The northeastern part of the state has some rugged terrain. Much of the rolling terrain of Iowa is in agricultural land while the eastern portion has some forested areas.

The terrain of Illinois is generally flat except for a few hills in the south and a small unglaciated area in the northeast. Illinois has deep loess soils in the north which were originally tall-grass prairie and now support very high agricultural production. Forests were present in the extreme southern and northeastern parts of the state but now have been cut down.

Missouri has three main terrain features: the rolling prairies north of the Missouri River; the Ozarks in the west-central counties; and the lowlands of the southeast. The northeastern part of the state slopes down to about 700 feet near the Mississippi River. The terrain varies from rugged areas bordering some of the larger streams, with deep valleys and steep hills, to broad, rolling uplands. Agriculture is common on the prairies of northern and west-central Missouri and in the rugged areas forestry is important.

Wisconsin's topography is varied across the state. The extreme northern part of the state was formed by glaciation so there are many lakes. This area is generally forested, has a high elevation and is the origin of most of the major streams of the state. A comparatively flat, crescent shaped lowland lies immediately south of the Northern Highlands, it is largely agricultural and includes nearly one-fourth of Wisconsin's area. The eastern ridges and lowlands to the southeast of the Central Plains are the most densely populated and have the highest concentration of industry and farms.

The NCRFC's area of responsibility includes only the extreme northwestern part of Indiana. This section of the state is the Great Lakes Plain. The Kankakee Valley is found in this part of the state and the valley slopes gently towards the west and drains what was formerly low marshland, but is now muck land farms.

The state of Michigan is divided into the upper and lower peninsulas. The Upper Peninsula is level in the east, with swampy areas, while the west is higher and more rugged. The Lower Peninsula features range from quite level terrain in the southeast to gently rolling hills in the southwest, with elevations generally between 800 and 1,000 feet. A series of sand dunes, along the Lake Michigan shoreline, rise to heights of nearly 400 feet above lake level. These are the result of the prevailing westerly winds blowing across the lake. Tablelands cover the northern part of the Lower Peninsula and reach an elevation of 1,700 feet near Cadillac, Michigan.

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