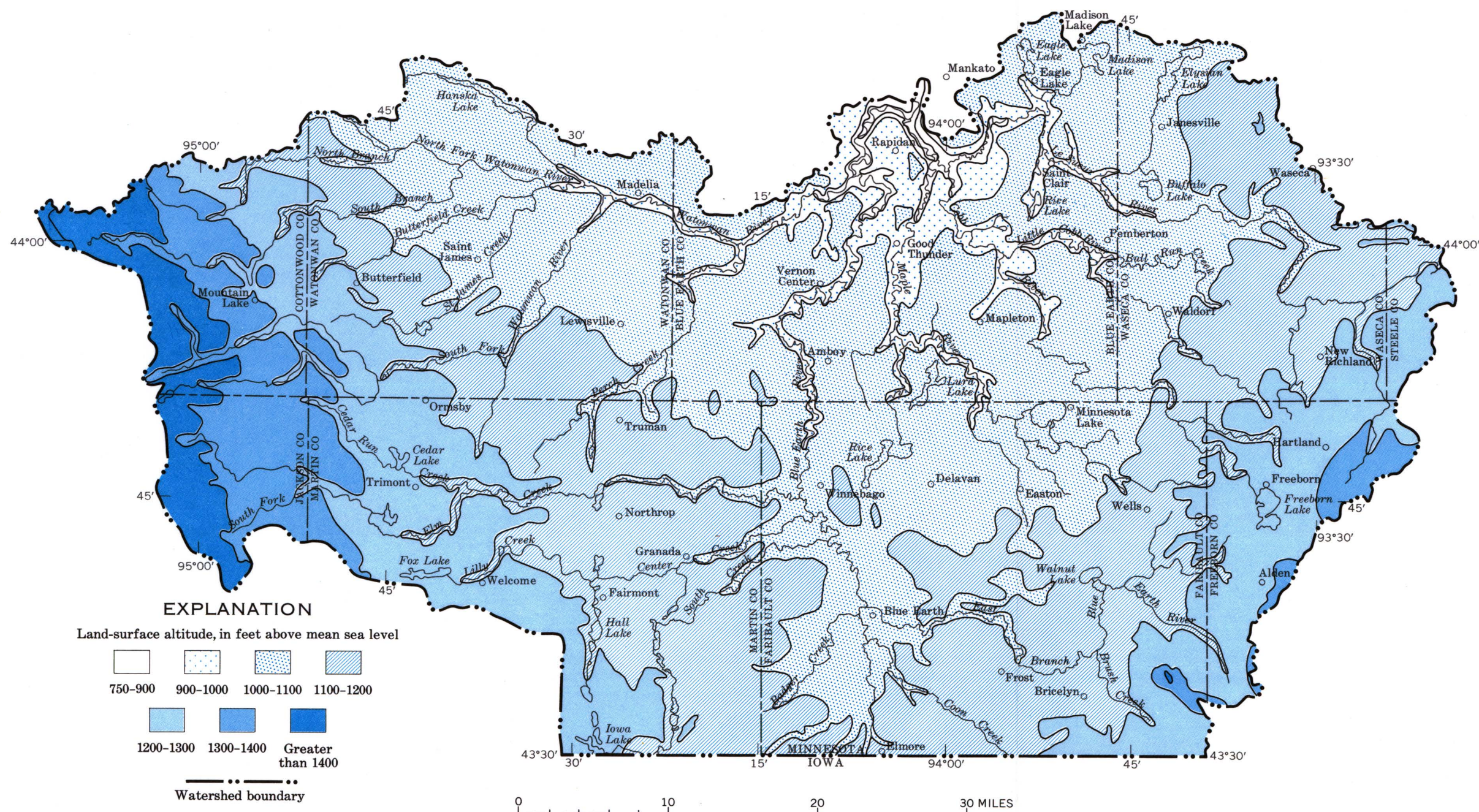
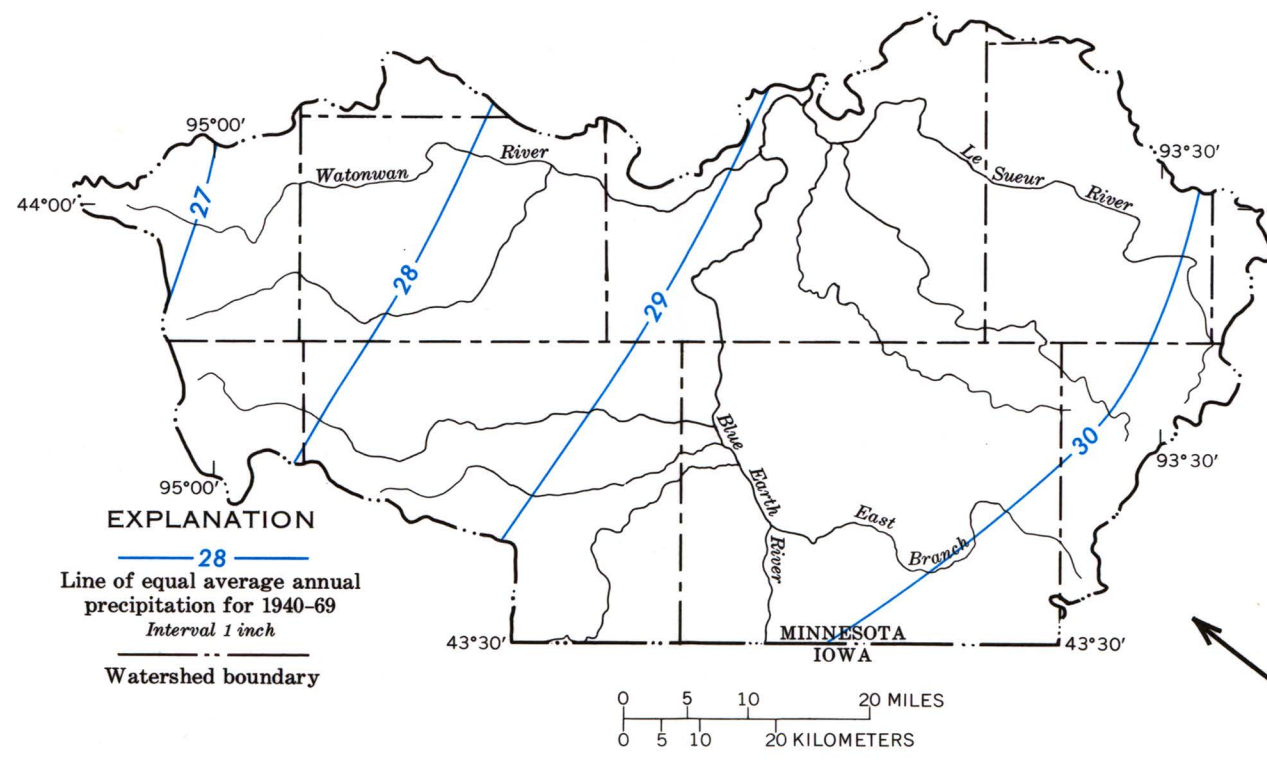


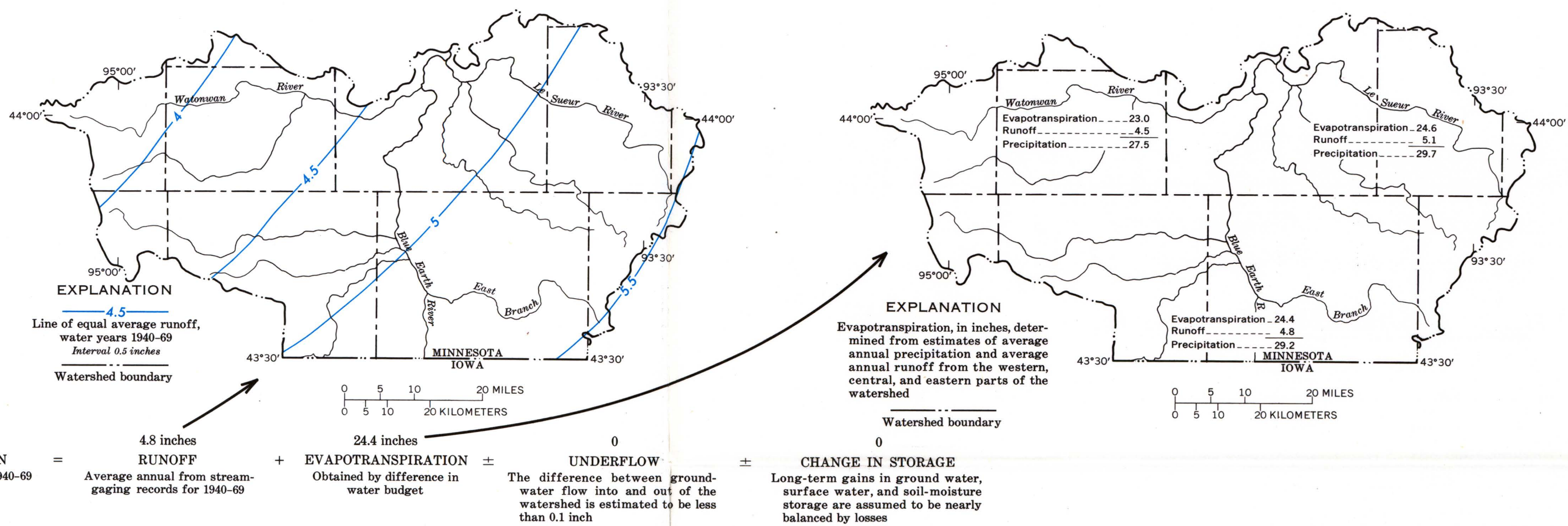
## INTRODUCTION



THE BLUE EARTH RIVER WATERSHED IN MINNESOTA INCLUDES 3,106 SQUARE MILES OF LAND SURFACE, WHICH VARIES FROM FAIRLY FLAT TO GENTLY ROLLING. The drainage area extends south to include an additional 140 square miles in Iowa. The western, southern, and eastern boundaries are and surmounts formed by Pleistocene glaciers. Major streams have eroded channels 10 to 75 feet deep in headwater regions and 100 to 200 feet deep near the mouth of the Blue Earth River at Mankato. In their lower reaches major streams have cut through glacial deposits and into underlying bedrock (described on ground-water sheet).



## WATER BUDGET



THE AMOUNT OF WATER ENTERING THE WATERSHED AS PRECIPITATION IS APPROXIMATELY EQUAL TO SURFACE RUNOFF PLUS EVAPOTRANSPIRATION. UNDERFLOW AND CHANGES IN STORAGE OF GROUND WATER AND SURFACE WATER ARE RELATIVELY SMALL. Precipitation is the source of virtually all recharge in the water budget. The amount of precipitation increases from west to east across the watershed. About 16 percent of the water leaves the watershed as runoff in streams. The amount of runoff also increases from west to east. Almost all the remaining 84 percent of the water is taken up by evaporation and by transpiration from plants. A small amount leaves the watershed as underflow moving through the ground toward the north, less moving toward the southeast. The underflow that leaves the watershed is estimated to be only slightly more than the underflow that enters from the west and south. No areas of ground-water decline are known; therefore, any net change in the amount of ground water in storage during the period of record (1910-49) is assumed to be insignificant.

## SUMMARY

| EVALUATION OF WATER RESOURCES   |   |  |   |  |   |   |  |   |   |  |  |  |  |
|---|---|--|---|--|---|---|--|---|---|--|--|--|--|
| Surface water   |   |  |   |  | Ground water  |   |  |   |   |  |  |  |  |
| Purpose   | Considerations  | Blue Earth, Le Sueur, and Watowen Rivers                   | Large lakes   | Small lakes and minor streams  | Geological and hydrological conditions  |   |  |   |   |  |  |  |  |
|   |   |  |   |  | Pleistocene   | Cretaceous  | Maquokette, Dubuque, and Galena Formations   | Decorah, Plattville, and Glenwood Formations  | St. Peter Sandstone   | Prairie du Chien Group   | Cambrian   | Precambrian  |  |
|   |   |  |   |  | Glacial sand and gravel   | Sandstone and shale   | Maquokette, Dubuque, and Galena Formations   | Decorah, Plattville, and Glenwood Formations  | St. Peter Sandstone   | Prairie du Chien Group   | Jordan Sandstone   | St. Lawrence and Franconia Formations and Dresbach Group   | Crystalline rocks  |
| Municipal and industrial<br>supply  | For a moderate supply, principal needs are:<br>Quantity<br>Minimum available surface water supply of 1 cfs or wells yielding 250 gpm.<br>Quality<br>Dissolved-solids content less than 500 mg/l.<br>Hardness less than 180 mg/l.  | Adequate supply.   | Adequate supply from some lakes for restricted use.   | Many adequate with development of storage facilities.  | Locally adequate supply.  |   | Generally adequate supply.   |   | Generally adequate supply.  | Generally adequate supply from limestone and dolomite. Locally New Richmond sandstone yields adequate supply.  | More than adequate supply throughout area of occurrence.               | Adequate supply from sandstone layers.                     |  |
|   |   |  |   |  |   |   |  |   |   |  |  |  |  |
|   |   | Would require treatment.                                   | Would require treatment.  | Would require treatment.   | Considerable local variation in yield.<br>Very hard water, iron, sulfate, and dissolved solids high.  | Inadequate yield.<br>Very hard water, iron, sulfate, and dissolved solids high. | Yield varies from place to place because of distribution of fractures.<br>Very hard water, iron high, sulfate and dissolved solids high locally. | Inadequate yield. Very hard water, iron high. | Locally low yields due to very fine sand.<br>Very hard water, iron high, sulfate and dissolved solids high locally. | Yield varies because of distribution of fractures. Susceptible to pollution requires treatment where near the surface.<br>Very hard water, iron and dissolved solids high. | Very hard water, iron and dissolved solids high, sulfate high locally. | Very hard water, iron, sulfate, and dissolved solids high. | Inadequate supply. Very hard water, iron high, sulfate and dissolved solids very high.   |
|   |   |  |   |  |   |   |  |   |   |  |  |  |  |
| Rural domestic and stock supply   | For an adequate farm supply, needs are:<br>Quantity<br>Minimum of 5 gpm.<br>Quality<br>Dissolved-solids content less than 1,000 mg/l.   | Adequate supply.   | Adequate supply.  | Adequate for stock.  | Adequate supply in most of watershed.   | Adequate supply where present.  | Adequate supply, generally acceptable quality.   | Adequate supply locally.                      | Adequate supply throughout area of occurrence, generally acceptable quality.  | Adequate supply, generally acceptable quality.   | Adequate supply, generally acceptable quality.                         | Adequate supply, generally acceptable quality.             | Adequate supply in west end of watershed where Cambrian and Ordovician rocks are absent. |
|   |   |  |   |  |   |   |  |   |   |  |  |  |  |
|   |   | Available only to riparian lands. Would require treatment. | Available only to riparian lands. May require treatment.  | Available only to riparian lands. May require treatment.                                       | Thin or absent in some areas.<br>Very hard water, iron, sulfate, and dissolved solids generally high. | Very hard water, iron, sulfate, and dissolved solids high.                      | Very hard water, iron high.  | Very hard water, iron high.                   | Very hard water, iron high, sulfate high locally.   | Very hard water, iron high.  | Very hard water, iron high, sulfate high locally.                      | Very hard water, iron and sulfate high.                    | Very hard water, iron high, sulfate and dissolved solids very high.                      |
|   |   |  |   |  |   |   |  |   |   |  |  |  |  |
| Irrigation supply   | For an average farm needs are:<br>Quantity<br>Minimum available surface water supply of 2 cfs during growing season or wells yielding 250 gpm.<br>Quality<br>Dissolved-solids content less than 2,000 mg/l.<br>Suitability of water quality for agriculture as indicated by classification of U.S. Dept. of Agriculture (Wilcox 1955) | Adequate supply.   | Adequate supply from some lakes restricted use from others.   | Adequate supply for restricted use from some.  | Locally adequate supply, generally acceptable quality.  |   | Generally adequate supply, acceptable quality.   |   | Generally adequate supply, acceptable quality.  | Adequate supply, acceptable quality.   | Adequate supply, acceptable quality.                                   | Adequate supply, acceptable quality.                       |  |
|   |   |  |   |  |   |   |  |   |   |  |  |  |  |
|   |   | Available only to riparian lands.                          | Available only to riparian lands.   | Available only to riparian lands.  | Test drilling needed because of local variation in yield.   | Inadequate yield. Borens may be high.   | Yield varies considerably from place to place because of distribution of fractures and solution cavities.  | Inadequate yield.                             |   |  |  |  | Inadequate yield.  |
|   |   |  |   |  |   |   |  |   |   |  |  |  |  |
| Fish and wildlife habitat   | Adequate depth and quality of water for fish in lakes and streams.<br>Adequate cover for wildlife habitat is provided by: Wetlands - lakes or potholes surrounded by marsh areas. Stream - marsh and woodland along banks.  | Suitable for wildlife along banks. Suitable for fish.      | Excellent migratory waterfowl nesting and feeding areas. Excellent wildlife habitats in marsh areas and along shores. Some suitable for fish. | Good migratory waterfowl nesting and feeding areas. Excellent habitats along shores and banks. |   |   |  |   |   |  |  |  |  |
|   |   | Occasional floods.   | Wintertkill.  | Fluctuating Low water stage Wintertkill  |   |   |  |   |   |  |  |  |  |
| Recreation  | Adequate access to lakes and streams.<br>Availability of areas suitable for hunting, fishing, and other water sports.<br>Available moorls, like cottages, and campgrounds.<br>Aesthetic values and absence of pollution.  | Suitable for hunting and fishing.                          | Suitable for hunting, fishing, and water sports widely distributed.   | Many suitable for hunting and trapping widely distributed.<br>May go dry.                      |   |   |  |   |   |  |  |  |  |
|   |   | Occasional floods.   |   |  |   |   |  |   |   |  |  |  |  |
| <div><div><div>EXPLANATION</div><div><div><div></div><div>Good</div></div><div><div></div><div>Fair</div></div><div><div></div><div>Poor</div></div></div><div><div>Adequate supply, generally acceptable quality.</div><div>Advantages</div></div><div><div>Very hard water, iron high, sulfate high locally.</div><div>Disadvantages</div></div><div><div>Overall evaluation for purpose and considerations indicated</div></div></div></div> |   |  |   |  |   |   |  |   |   |  |  |  |  |