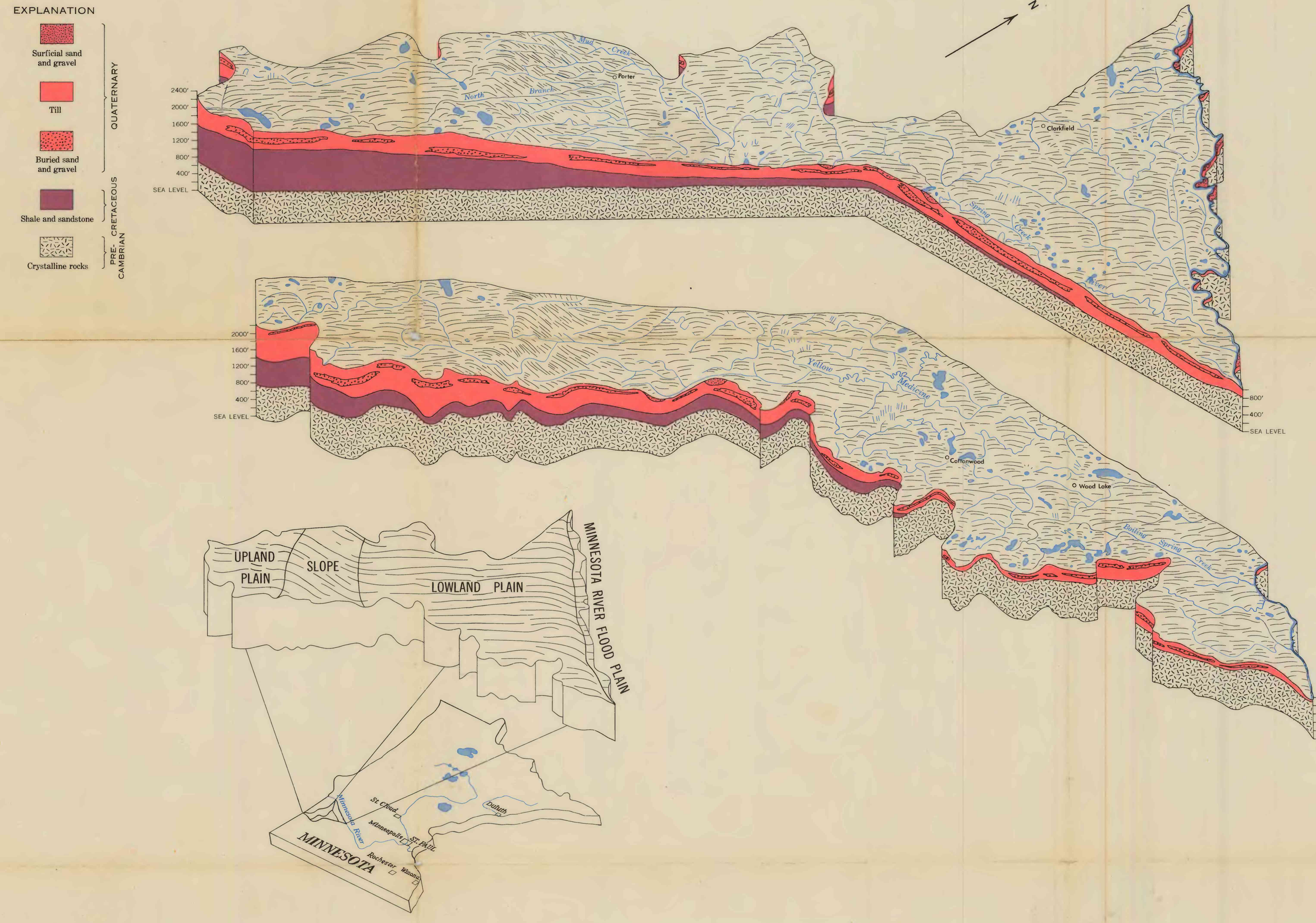
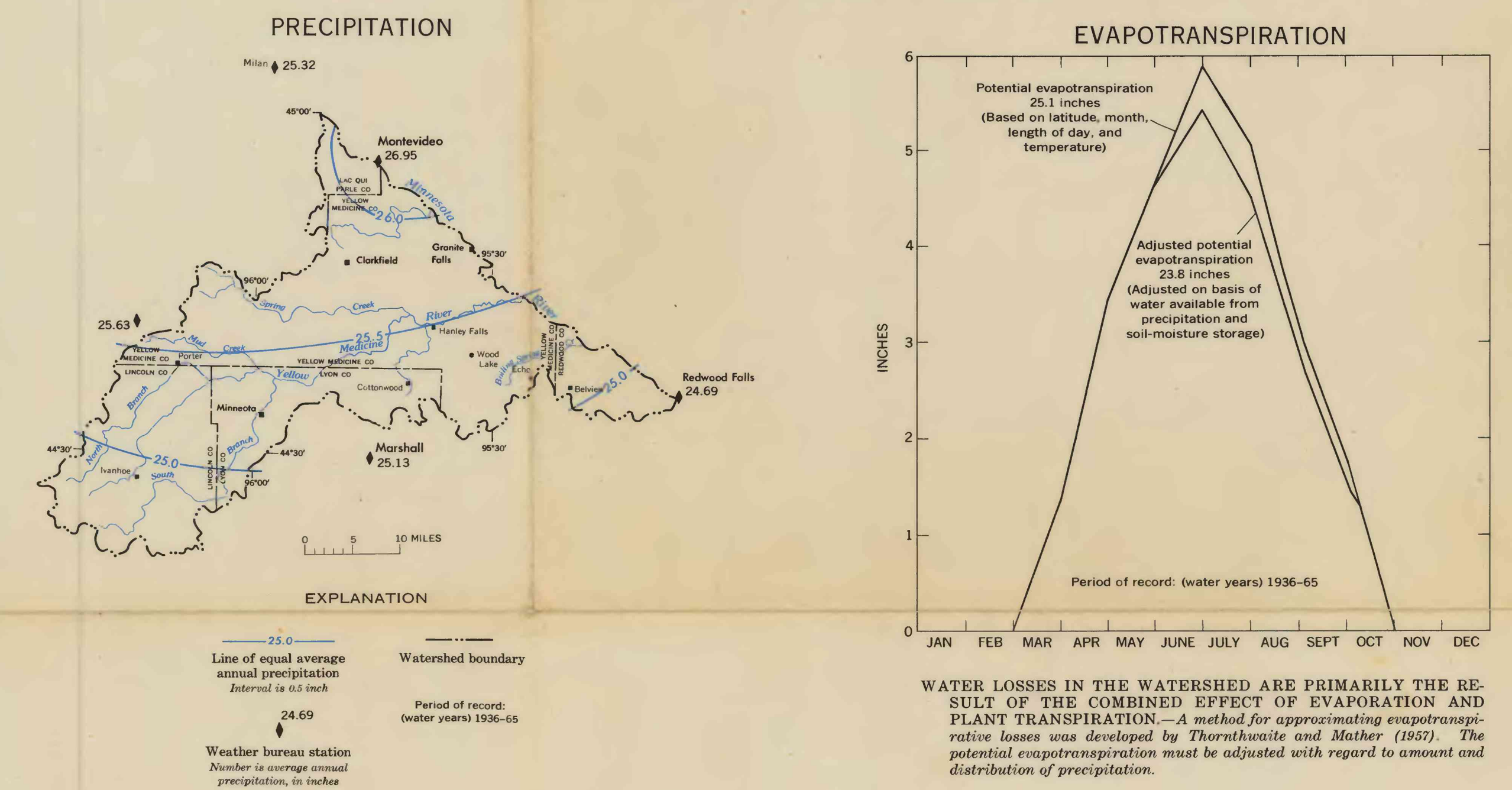


THE YELLOW MEDICINE RIVER WATERSHED

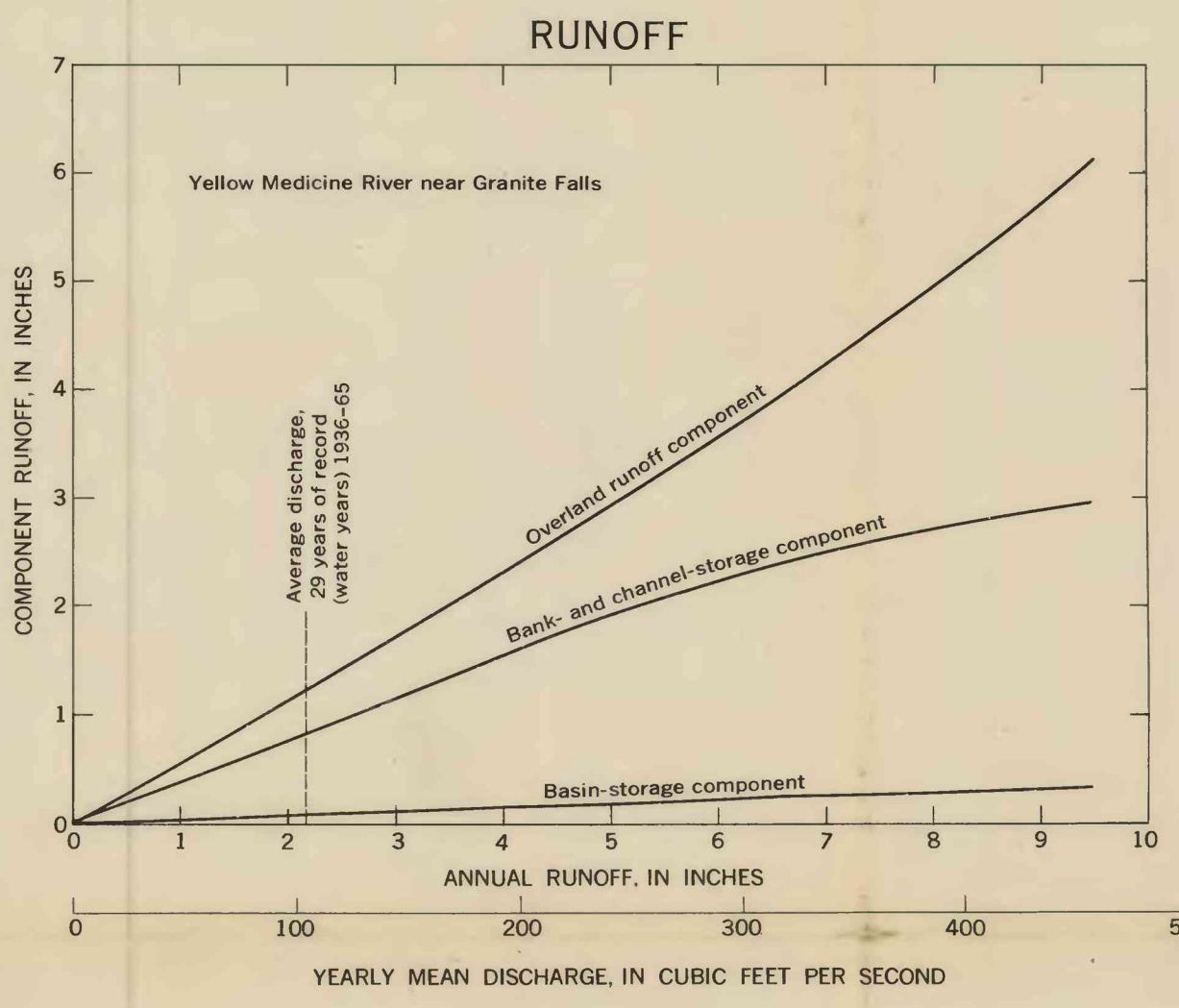


GLACIAL DRIFT AND CRETACEOUS SEDIMENTARY ROCKS ARE THE MAJOR AQUIFERS IN THE YELLOW MEDICINE RIVER WATERSHED UNIT. The watershed comprises 1070 square miles, including the drainage basin of the Yellow Medicine River (665 square miles) and 405 square miles drained by small streams tributary to the Minnesota River.

THE WATER BALANCE

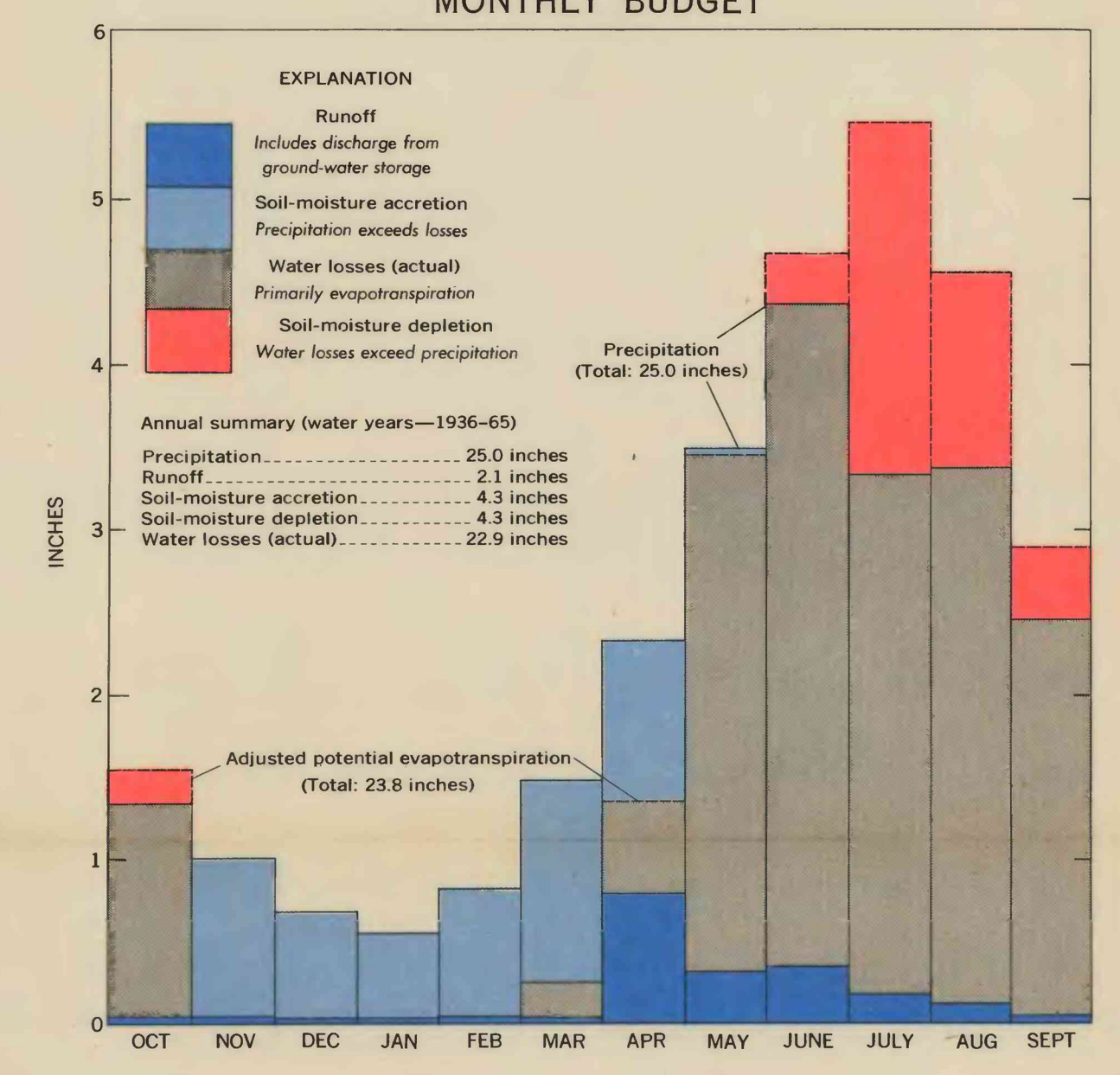


THE DISTRIBUTION OF RAINFALL IN THE WATERSHED IS COMPARATIVELY UNIFORM. Seventy percent of the average annual precipitation occurs during the growing season (May through September—the period between killing frosts). The temperatures in the watershed range from 40° to 110° F, with the mean being 45.5° F. The average temperature during the growing season is 62.5° F.



DIRECT OVERLAND RUNOFF IS THE MAJOR COMPONENT OF STREAMFLOW, BEING MOST SIGNIFICANT AT HIGHER DISCHARGES. The percentage of flow from storage in the river banks and adjacent flood plain decreases with increasing discharge, indicating that bank and channel-storage capacity is limited. This storage takes place in lakes, within the channel, on wide parts of the flood plain and within outwash sand and gravel. Discharge from basin storage, a relatively constant percentage within the normal range of annual discharge, becomes more significant at extreme low flows when it may comprise the total streamflow. The curves presented are valid only in the vicinity of the gauging station, and reflect the net effect of ground-water surface-water interchange occurring upstream.

MONTHLY BUDGET



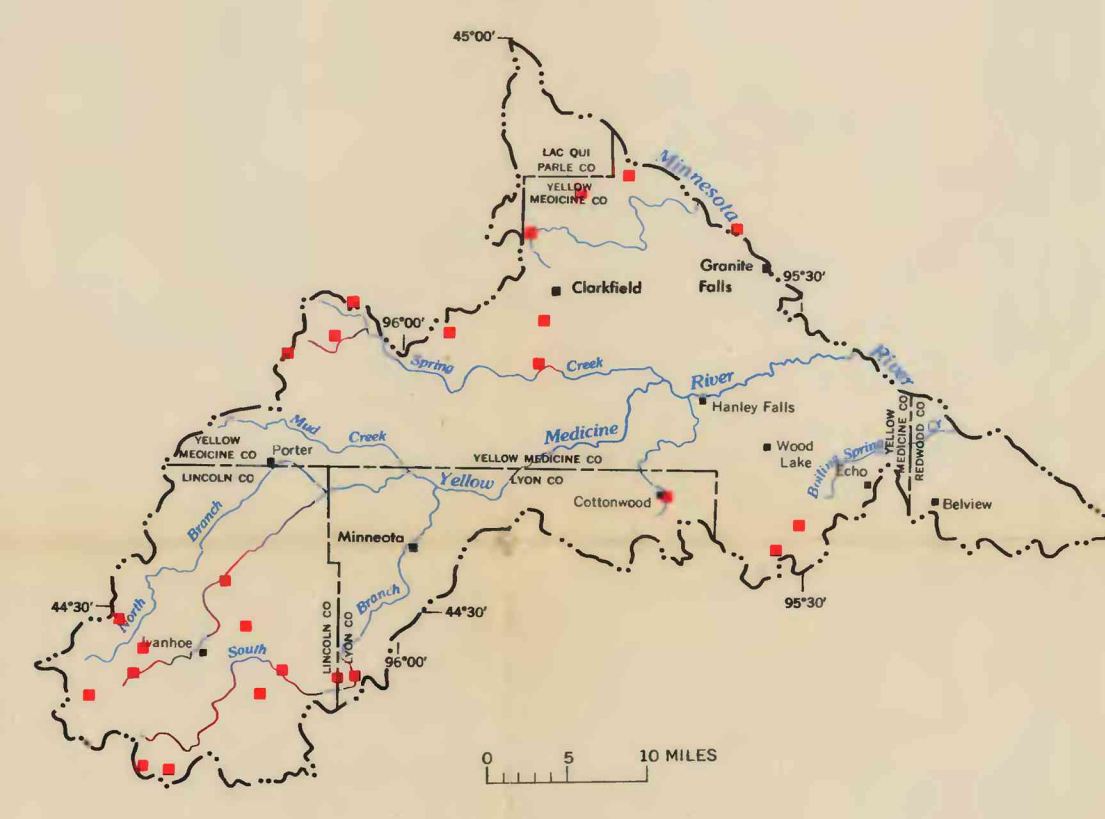
OVER 90 PERCENT OF THE PRECIPITATION IN THE WATERSHED RETURNS TO THE ATMOSPHERE AS THE RESULT OF EVAPOTRANSPIRATION. The remainder replaces water withdrawn from the ground-water reservoir, or appears as surface runoff.

RECREATION

LAKES IN THE WATERSHED ARE RELATIVELY SHALLOW, AND ARE BEST SUITED FOR HUNTING AND TRAPPING. A few of the larger lakes provide adequate fishing, as well as small pot-holes and swamps in the watershed, provide excellent wildlife habitat. The majority support only rough fish or minnows, and winter-kills are common. The lakes, however, provide excellent wildlife habitat.

Name of lake	Surface area (acres)	Shoreline	Depth (feet)		Inlet/outlet	Bottom conditions	Fish and game classification	Alkalinity	Access	Remarks
			Average	Maximum						
Burb Lake Lincoln Co.	259	3 1/2 mi.—36% wooded—muddy sand and rocky.	3 1/2	5	South Lake drains into North Lake—dam between lakes; North Lake drained by intermittent stream.	Firm—sand and some mud.	Rough fish only; fair muskrat habitat; good waterfowl habitat; area good pheasant habitat in winter.	132	Adequate public access.	Lake quite turbid.
Arb Lake Yellow Medicine Co.	117	—	5	8	No inlet, outlet, or springs.	Firm—mud.	No fish; fair to good waterfowl habitat; fair muskrat habitat.	237	No public access.	Lake clear-bottom mostly open. Waterfowl hunting is heavy.
Cottonwood Lake Lyon Co.	301	3 1/2 mi.—	6 1/2	8 1/2	Inlet from Sham Lake; outlet to Yellow Medicine River.	Firm—50% sand, 50% mud.	Some bass, rough fish, poor habitat for waterfowl and muskrats.	193	Adequate public access.	Occasional winterkill of fish, lake fairly turbid.
Curtis (Hudson) Lake Yellow Medicine Co.	388	—	5	6 1/2	No outlet.	Firm—silt, sand, and some gravel.	Rough fish only; poor waterfowl and muskrat habitat.	—	Adequate public access.	Surrounding pastures provide excellent wildlife habitat; lake quite turbid.
Gibson Lake Lincoln Co.	240	3 mi.—mostly wooded; some wild hay.	3	5	No inlet, outlet is intermittent stream; No springs.	Silt—mud 2 feet thick.	Rough fish only; fair waterfowl habitat; excellent muskrat habitat; musk family common; good pheasant habitat in winter.	153	Inadequate public access.	North lake clear; south lake quite turbid.
Rusk's Nest Lake Lincoln Co.	320	5 mi.—75% wooded.	2	3 1/2	No inlet or outlet.	Firm—muddy mud, some sand.	No fish; excellent waterfowl and muskrat habitat.	—	Adequate public access.	Annual winterkill of fish; lake clear—bottom easily seen.
Highbank (Olson) Lake Yellow Medicine Co.	114	—	3 1/2	6	Springs in east side of lake—no inlet.	Muddy mud, some sand.	Some rough fish; winterkills are common; poor waterfowl and muskrat habitat.	414	Adequate public access.	Lake mildly turbid.
Kassid Lake Yellow Medicine Co.	92	—	2 1/2	6	Outlet to Lone Tree Lake.	Muddy mud, some sand.	Muddy rough fish—winterkills are common.	153	Adequate public access.	Lake quite turbid.
Lake Sky Lincoln Co.	227	—	3 1/2	6	No springs.	Silt—mud bottom.	Parish and rough fish; waterfowl during migration—heavy hunting.	93	Adequate public access.	Lake fairly turbid; located adjacent to area.
Lone Tree (Shaggy) Lake Yellow Medicine Co.	145	—	4	8	Inlet from Kassid Lake; Outlet—stream to Minnesota River.	Muddy mud, some sand.	Some rough fish—winterkills common; poor waterfowl and muskrat habitat.	157	Adequate public access.	Lake quite turbid.
Sham Lake Lyon Co.	148	—	4	5	No inlet—outlet to Cottonwood Lake.	Firm—muddy mud.	Muddy minnows—winterkills common; good waterfowl habitat; good muskrat habitat.	472	Good public access.	Lake clear; dry 1936-1940.
Shakabak Lake Yellow Medicine Co.	1249	7 1/2 mi.—75% wooded, 25% pasture, rocks and gravel.	7	10	Inlet—short intermittent stream; Outlet—intermittent stream, flood crest dam.	Firm—gravel and mud.	Good fish; pariah, and rough fish present; good walleye lake.	152	Public access good.	Lake fairly turbid; no winterkill; fishing considered good.
Spellman Lake (South) Yellow Medicine Co.	150	—	2	5 1/2	Outlet to North Spellman Lake.	Silt—sand.	Muddy minnows; fair waterfowl habitat (heavy use during migration); poor muskrat habitat.	135	Inadequate public access.	Lake fairly turbid.
Spellman Lake (North) Yellow Medicine Co.	200	—	3	3	Outlet to South Spellman Lake.	Silt—mud.	Muddy minnows; excellent waterfowl and muskrat habitat.	145	Inadequate public access.	Lake clear; excellent hunting and trapping area.
Timon Lake Yellow Medicine Co.	240	—	1	2	Inlet—intermittent stream; Outlet—permanent lake.	Silt—mud and sand.	Minnows only; good waterfowl habitat; excellent muskrat habitat.	202	Good public access.	Lake clear.
Wood Lake Yellow Medicine Co.	586	—	7	9	Inlet from Red Lake; outlet to intermittent stream to Wood Lake Creek.	Firm—sand and gravel.	Rough fish only; poor waterfowl habitat.	142	Inadequate public access.	Lake fairly turbid.

Data from Minnesota Department of Conservation, Division of Game and Fish.



WILDLIFE PROPAGATION AND PUBLIC HUNTING IN WETLAND AREAS ARE IMPORTANT USES OF SURFACE WATER IN THE WATERSHED. The wetland wildlife management areas shown on the map are managed to provide maximum wildlife propagation and hunting areas open to the public. Lakes and pot-holes in the wildlife areas provide feeding, nesting, and resting areas for waterfowl, and swamps and drier areas provide habitat for pheasants, small game, and some deer.

SUMMARY

YIELD AVAILABLE FROM GROUND-WATER SOURCES IS ADEQUATE TO SUPPLY PRESENT DEMANDS, AND FURTHER DEVELOPMENT IS POSSIBLE. Withdrawals from surface water represent less significant potential for additional supply with than 1 percent of the annual flow in the Yellow. The development of storage, transmission, and Medicine and Minnesota Rivers, indicating a treatment facilities.

Purpose	Source	Minnesota River	Yellow Medicine River	Lakes	Sloughs	Lo-contrast sand and gravel	Outwash sand and gravel	Buried lenses of sand and gravel	Cretaceous sandstone	Weathered granite
Municipal and industrial supply	Dependable flow. Adequate supply. Favorable location.	Adequate supply. Storage sites available.	Adequate for limited use. Additional storage possible. Generally good quality. Adequate local recharge.	Adequate for limited use. Additional storage possible. Some have adequate ground water inflow.	Some additional storage possible. Wide area distribution. Some have adequate ground-water inflow.	Will yield of several hundred gallons per minute (gpm) are possible. Generally good quality. Adequate local recharge.	Will yield of several hundred gpm possible. Generally adequate yields. Adequate recharge.	Well yields of a few hundred gpm possible. Wide area distribution. Suitable quality.	Water may be soft.	Insufficient well yields. Limited areal extent. Quality may be unsuitable. May be only source available.
Rural domestic and stock supply	Adequate supply.	Adequate for stock.	Adequate capacity. Adequate recharge.	Adequate for stock. Adequate recharge.	Adequate for stock. Wide area distribution.	Adequate well yields. Generally acceptable quality.	Adequate well yields. Suitable quality.	Adequate well yields. Available throughout most of the watershed. Suitable quality.	"Soft" water preferred by some people. Generally adequate yields.	Will yields may be adequate. Quality may be unsuitable. Limited areal extent.
Irrigation supply	Adequate supply.	Adequate with development of storage facilities.	Adequate for limited use. Additional storage possible. Some have adequate ground water inflow.	Adequate for limited use. Additional storage possible. Some have adequate ground water inflow.	Wide area distribution.	Will yield of several hundred gpm possible. Good quality. Adequate recharge.	Will yield of several hundred gpm possible. Suitable quality. Adequate recharge.	Will yields of a few hundred gpm per acre (gpa) are possible. Will area distribution. Suitable quality.	Insufficient well yields. Limited to western 1/2 of the watershed. Quality may be unsuitable to plant growth. Limited local recharge.	Insufficient well yields. Quality may be unsuitable to plant growth. Limited recharge. Limited areal extent.
Recreation	1. attractive appearance. 2. adequate flow. 3. low pollution.	Suitable for hunting, fishing, and boating. Favorable location.	Suitable for hunting, fishing, and boating. Favorable location.	Suitable for hunting, fishing, and boating. Must be permanent. Some additional shoreline development possible.	Suitable for hunting, fishing, and water sports. Wide area distribution.	Suitable for hunting, fishing, and water sports. Generally adequate yields.	Suitable for hunting, fishing, and water sports. Generally adequate yields.	Suitable for hunting, fishing, and water sports. Generally adequate yields.	Suitable for hunting, fishing, and water sports. Generally adequate yields.	Suitable for hunting, fishing, and water sports. Generally adequate yields.
Fish and wildlife habitat	1. adequate depth. 2. permanence. 3. low turbidity. 4. suitable quality.	Suitable for wildlife along banks.	Suitable for wildlife along banks.	Excellent wildlife habitat. Must be permanent. Must have adequate inflow.	Excellent wildlife habitat. Must be permanent. Must have adequate inflow.	Excellent wildlife habitat. Must be permanent. Must have adequate inflow.	Excellent wildlife habitat. Must be permanent. Must have adequate inflow.	Excellent wildlife habitat. Must be permanent. Must have adequate inflow.	Excellent wildlife habitat. Must be permanent. Must have adequate inflow.	Excellent wildlife habitat. Must be permanent. Must have adequate inflow.

POTENTIAL FOR INCREASING MUNICIPAL SUPPLIES IS GENERALLY GOOD. Some increase in yield can be obtained by further development of existing sources, and additional supplies may be obtained from new sources of ground water or from surface water. However, extensive test drilling may be required to locate new sources of ground water, with additional testing necessary to determine quality and amount of water available.

Municipality	Description of present water supply				Estimated potential for obtaining additional water							
	Well location	Year completed	Depth (feet)	Flow (cfs)	Water quality	Water source	Ground water	Surface water				
Bellevue	1 1950	221	4	—	80	1960	1300	2000	8.6	Buried sand and gravel.	Fair to good—some test drilling will be necessary.	Poor—no reliable source nearby.
Clayfield	1 1954	145	6	35	115	1966	1200	2190	64	Buried sand and gravel.	Good—several aquifers at different depths are in the area. Water quality with time will be a problem.	Poor—no reliable source nearby.
Cottonwood	6 1958	113	8	—	60	1966	640	2040	7.1	Sandstone.	Fair—extensive test drilling may be necessary.	Good—adjacent to Cottonwood and Sham Lakes.
Echo	1 1955	145	6	35	115	1966	1200	2190	64	Buried sand and gravel.	Good—several aquifers at different depths are in the area. Water quality with time will be a problem.	Poor—no reliable source nearby.
Granite Falls	—	—	—	—	—	—	—	—	—	Minnesota River.	Poor—basement rock is near the surface.	Very good—located on Yellow Medicine River.
Hanby Falls	—	—	—	—	—	—	—	—	—	Decomposed granite.	Good—although yields may be low.	Very good—located on Yellow Medicine River; storage may be required.
Lawrence	1 1957	310	6	—	90	1963	1100	1700	4.4	Buried sand and gravel.	Good—both aquifers can be further developed.	Fair—located within 3 miles of Frank's Nest Lake.
Minnesota	1 1957	42	120	20	67	1960	880	—	—	Sandstone.	Good—although yields may be low.	Good—located on S. R. Yellow Medicine River; storage may be required.
North	4 1968	96	6	—	41	200	1963	610	—	Sandstone.	Good—although yields may be low.	Good—located on S. R. Yellow Medicine River; storage may be required.
South	3 1955	80	6	—	40	1955	753	1000	—	Sandstone.	Good—although yields may be low.	Good—located on S. R. Yellow Medicine River; storage may be required.
Wood Lake	1 1957	195	8	30	250	1966	601	1470	1.6	Buried sand and gravel.	Fair—test drilling may be extensive.	Good—within 2 miles of Wood Lake.

WATER USED IN THE WATERSHED REPRESENTS LESS THAN 2 PERCENT OF THE TOTAL PRECIPITATION. About 75 percent of the water used is obtained from ground-water sources.

Municipality	Estimated water use (millions of gallons annually)			
	Domestic	Industrial and commercial	Livestock watering	Irrigation
Bellevue	175.0	none	none	175.0
Clayfield	125.5	none	none	125.5
Cottonwood	65.7	292.1	none	357.8
Echo	175.0	none	none	175.0
Granite Falls	125.5	none	none	125.5
Hanby Falls	175.0	none	none	175.0
Lawrence	175.0	none	none	175.0
Minnesota	175.0	none	none	175.0
North	175.0	none	none	175.0
South	175.0	none	none	175.0
Wood Lake	175.0	none	none	175.0
Totals	366.2	292.1	34	732.3

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WATER RESOURCES OF THE YELLOW MEDICINE RIVER WATERSHED, SOUTHWESTERN MINNESOTA

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