IOWA-CEDAR

RIVERS BASIN STUDY

INVENTORY REPORT

SHELL ROCK RIVER SUBBASIN

U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service
Economic Research Service
Forest Service

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
823 Federal Building, Des Moines, Iowa 50309

Mr. William H. Greiner
Chairman
Iowa-Cedar Rivers Basin Coordinating Committee
Grimes Building, E. 14th and Grand Avenue
Des Moines, Iowa 50319

Dear Mr. Greiner:

The cooperating Federal and State agencies have been accumulating data for various subbasins within the Iowa-Cedar Rivers Basin since the beginning of the river basin study. Much of this data and information is useful to local decision makers in its present form. We have summarized this data in report form and are furnishing to you an Inventory Report for each subbasin.

The Inventory is not a finished report. It is merely a collection and summarization of data from many sources. We, the cooperating agencies, have recommended no action in this report.

We do not recommend widespread distribution of the Inventory Reports. We do feel that the reports will be useful to local units of government, planning agencies and others who need resource inventory information on which to base land use decisions.

Copies are being furnished so that you may make distribution as you see fit within the subbasin areas.

Sincerely,

Kenneth G. McManus acty.

Wilson T. Moon
State Conservationist
Chairman
USDA Field Advisory Committee

INVENTORY REPORT

SHELL ROCK RIVER SUBBASIN
Iowa-Cedar Rivers Basin

I. DESCRIPTION

A. Drainage Area

The Shell Rock River Subbasin extends from Freeborn County in southern Minnesota across Winnebago, Worth, Cerro Gordo, Floyd and Butler Counties in Iowa. In Butler County it joins the West Fork of the Cedar River (Figure 1). Portions of Hancock, Mitchell, Franklin, and Bremer Counties are also part of the Subbasin. The drainage area of the Shell Rock River Subbasin consists of 1,783 square miles or 1,141,120 acres.

The Shell Rock River originates in a nearly level, imperfectly drained, glacial drift region in southern Minnesota at the outlet of Lake Albert Lea. The Shell Rock flows generally in a southeasterly direction. The principal tributary is the Winnebago River which drains 700 square miles or 448,000 acres. The Winnebago also rises in Freeborn County just west of Albert Lea. Other large tributaries are Floyd Creek, 152 square miles; Coldwater Creek, 81 square miles; and Elk Creek, 60 square miles.

B. Climatic Data

The climate of the Subbasin is typical continental. At Albert Lea, the average annual temperature is about 46°F. and the frost-free season is 155 days. At Waterloo, just south of the Subbasin, the average temperature is just over 47°F. and the frost-free season is 153 days.

The average annual precipitation at Albert Lea and Waterloo is 28.7 inches and 31.5 inches respectively. For the same respective locations the mean annual snowfall is 48 inches and 29 inches.

C. Economy

The 1970 population of the Shell Rock River Subbasin was 106,000. Of this, 73 percent lived in urban areas, 12 percent are rural nonfarm residents, and the remaining 15 percent or 16,000 persons are rural-farm residents. The Subbasin comprises 14 percent of the Iowa-Cedar Rivers Basin and has 13 percent of the population.

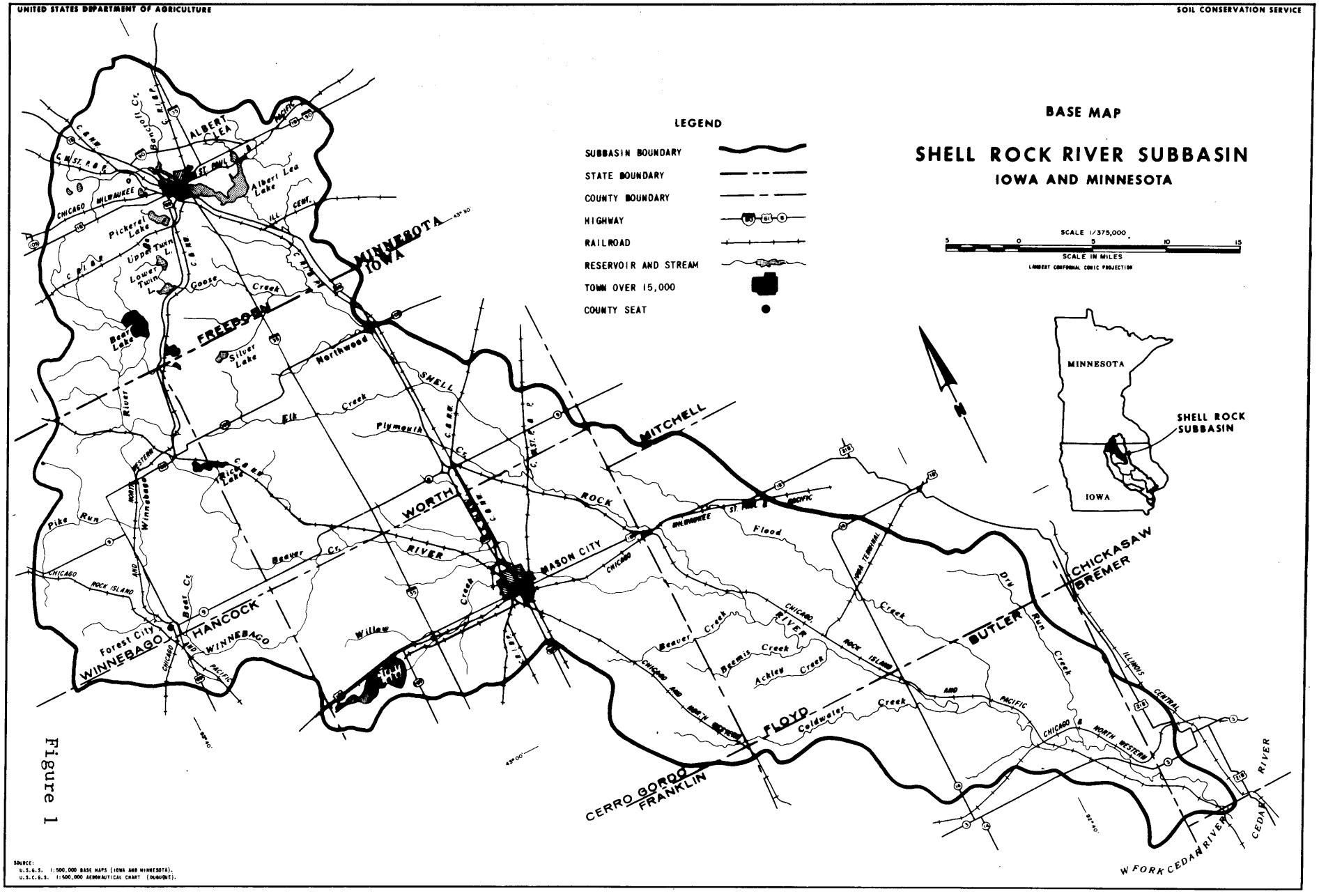

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
BASE MAP
SHELL ROCK RIVER SUBBASIN
IOWA AND MINNESOTA
LEGEND
SUBBASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
HIGHWAY
RAILROAD
RESERVOIR AND STREAM
TOWN OVER 15,000
COUNTY SEAT
SCALE 1/375,000
SCALE IN MILES
LAMBERT CONFORMAL CONIC PROJECTION
MINNESOTA
IOWA
SHELL ROCK SUBBASIN
FREEBORN
MITCHELL
WORTH
CERRO GORDO
FRANKLIN
HANCOCK
WINNEBAGO
MASON CITY
CHICKASAW
BREMER
BUTLER
FLOYD
ALBERT LEA
Albert Lea Lake
Pickerel Lake
Upper Twin L.
Lower Twin L.
Goose Creek
Bear Lake
Silver Lake
Northwood
Shell Rock River
Elk Creek
Plymouth Co.
Rice Lake
Pike Run
Beaver Cr.
Willow Creek
Forest City
Clear Lake
Flood Creek
Beaver Creek
Bemis Creek
Achley Creek
Coldwater Creek
Butler Run Creek
W FORK CEDAR RIVER
CEDAR RIVER
SOURCE:
U.S.G.S. 1:500,000 BASE MAPS (IOWA AND MINNESOTA).
U.S.C.G.S. 1:500,000 AERONAUTICAL CHART (DUBUQUE).

Figure 1

Agriculture, wholesaling and retailing, and manufacturing were the three largest sources of employment in the Subbasin. Agriculture, the largest employer, decreased 24 percent between 1950 and 1960. Wholesaling and retailing, the next largest employer, increased 5 percent during this period. Manufacturing, ranked third in employment, increased 18 percent from 1950 to 1960. Finance, insurance and real estate were up by one-fourth as a category during this time period, while transportation and utilities decreased by about 12 percent.

Family income is distributed as follows by the Subbasin:

	Percent	
Income Category	Shell Rock Subbasin	Iowa-Cedar Basin
Less than $3,000	27	27
$3,000 to $10,000	64	63
More than $10,000	9	10

The total number of farms declined from 7,413 farms in 1950 to 5,010 in 1970, a 32 percent decrease (Table 1).

Livestock farms other than dairy and poultry farms are the largest and represented 35 percent of the farms in 1965 compared to 53 percent in 1950. The decline in actual number of farms classified in this category was 1,597 farms or 22 percent from 1950. Poultry farms also decreased 37 percent over the period but dairy increased 117 percent.

Cash grain farms have increased from 828 farms in 1950 to 1,682 farms in 1965. This doubling of numbers caused a change from 11 to 29 percent of the total number of farms.

Farms classified as other farms increased from 417 to 556 farms, an increase of 33 percent between 1950 and 1965. Therefore, the category increased from 6 to 10 percent of the total number of farms.

Average farm size in the Subbasin was 239 acres in 1970, an increase of 79 acres per farm from 1950. The 1970 average value of land and buildings in the Subbasin is approximately $428 per acre. This represents an average investment of $102,460 in land and buildings by each farmer in the subbasin.

The trend in the Subbasin in farm tenure from 1950 to 1970 has been a decrease in the percentage of full-owners and tenants and an increase in the percentage of part-owners (Table 1).

TABLE 1 - FARM TENURE
Shell Rock Subbasin
Iowa-Cedar Rivers Basin
(Number)

Year	Full Owners	Part Owners	Managers	Tenants	Total
1950	3,487	1,041	15	2,867	7,410
1954	3,369	1,061	12	2,808	7,301
1960	3,069	1,235	18	2,252	6,576
1964	2,671	1,244	17	1,884	5,816
1970	2,419	1,385	-	1,208	5,012

Source: U.S. Department of Commerce, Bureau of Census, Agriculture Census: 1950, 1954, 1959, 1964, 1970.

In 1950, full-owners accounted for 47 percent of the farm tenure. This increased to 48 percent of the farm tenure in 1970. At the same time, the percentage of part-owners increased from 14 percent in 1950 to 28 percent in 1970. This may be explained by the consolodation of farm units and capital accumulation. The number of tenants has dropped 58 percent during this 20 year period and has dropped from 39 to 24 percent of total tenure.

Crop and livestock sales in the Subbasin totaled $109.6 million in 1970. Total livestock and livestock product sales accounted for 65 percent of crop and livestock sales by farmers in the Subbasin. This share of total sales was down from 76 percent in 1950. Receipts from dairy products in the subbasin have remained fairly constant in actual numbers, but has dropped from 15 to 10 percent of total livestock sales (Table 2). Receipts from poultry and poultry products have declined both in actual numbers and as a share of total livestock sales - increasing from 72 percent in 1950 to 75 percent in 1965.

Crop sales have tripled during the period 1950-1970. Field crops are by far the largest source of crop receipts accounting for 92 percent in 1950 and 92 percent in 1970.

The use of commercial fertilizers and agricultural chemicals in recent years has been one means by which the farmer could increase production without expanding the size of operation. Herbicides have, in

TABLE 2 - CROP AND LIVESTOCK SALES
Shell Rock Subbasin
Iowa-Cedar Rivers Basin
(1000 dollar)

	1950	1955	1960	1965	1970
Crop sales	12,856	23,301	26,540	30,813	38,283
Grains	12,686	22,166	25,531	16,917	35,092
Field seeds & roughage	-	-	-	-	753
Other crops	-	-	-	-	1,290
Vegetables	919	600	477	124	483
Fruits, nuts & berries	17	9	22	3	10
Nursery & greenhouse	224	519	-	-	543
Forest products	10	7	511	310	10
Livestock sales	44,098	42,075	54,796	55,247	71,299
Poultry & poultry products	5,394	5,122	5,804	5,752	4,179
Dairy products	6,774	5,630	6,582	8,005	7,220
Dairy cattle & calves	-	-	-	-	2,392
Other cattle & calves	-	-	-	-	25,091
Hogs, sheep & goats	-	-	-	-	32,287
Other livestock & products	-	-	-	-	130
Livestock & livestock products other than dairy & poultry	31,930	34,323	42,410	41,490	59,900
Total sales	57,954	65,376	81,336	86,060	109,582

Source: U.S. Department of Commerce, Bureau of Census, Agriculture Census: 1950, 1954, 1959, 1964, 1969.

certain instances, taken the place of hired labor, which at times is in short supply.

These factors have helped to make expenditures for fertilizers and chemicals a very important input to agriculture. The amount of fertilizer used in the Subbasin has more than doubled between 1955 and 1970 although the number of farms has declined (Table 3). The use of lime increased by 31 percent in this period.

The use of herbicides and insecticides has become increasingly more important to the agriculture industry. The use of chemicals is expected to be more extensive in the future. Prior to 1964, census data are not available, but an indication of current usage is given in Table 3.

The wood-using industries in and adjacent to the Subbasin, while not extensive, contribute to the total economy of the area through increased employment, income, and expenditures.

One sawmill in Freeborn County, Minnesota, producing about seventy thousand board feet annually, is located within the Subbasin. Also, several other mills are located adjacent to the Subbasin and utilize hardwood timber resources growing in the subbasin.

In addition to those primary wood-using mills, there are eight secondary plants in Iowa and three in Minnesota located inside the Subbasin producing cabinets, furniture, paneling, millwork, camper parts, boat parts, motor home parts, and bike seat parts.

The total annual timber harvest from forest land within the Subbasin includes the following:

	Iowa	Minnesota	Total
Sawlogs and veneer logs (board feet)	12,000	5,000	17,000
Fence posts (number)	1,159	173	1,332
Firewood and fuelwood(cords)	307	48	355
Christmas trees (number)	120	31	151

D. Physiography and Geology

The Shell Rock Subbasin extends from Freeborn County Minnesota, and Winnebago County Iowa, southeasterly through Worth, Cerro Gordo, Hancock, Floyd, Butler, and Bremer Counties to extreme northwest Black Hawk County. The major tributary drainage within the Subbasin is the Winnebago River, entering the Shell Rock near Rockford, Iowa. The Winnebago River was formerly known as Lime Creek and retains this name along its course north of Forest City. Elevations within the Shell Rock Subbasin range from approximately 1200 to 1250 feet in the Minnesota headwaters area to 860 feet at the junction of the Shell Rock and Cedar Rivers.

TABLE 3 - FERTILIZER AND LIME USED ON FARMS
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

	1950	1960	1965	1970
Fertilizer				
Number of farms	5,662	5,515	5,065	3,671
Amount in tons	32,552	44,627	51,600	73,409
Area applied in Acres	384,592	536,141	430,579	400,400
Lime				
Number of farms	581	384	551	423
Amount in tons	29,376	22,343	46,185	38,546
Area applied in acres	12,588	9,993	18,299	16,338
Agricultural chemicals				
Control of crop insects (acres)	-	-	83,509	108,861
Control of weeds (acres)	-	-	268,628	380,674
Control of livestock insects				
(head)	-	-	315,790	-
(farms)	-	-	2,267	931

Source: U.S. Department of Commerce, Bureau of Census, Agriculture Census: 1954, 1959, 1964, 1969.

Two major topographic districts are present within the Shell Rock Subbasin. The first of these districts occupies the northwestern third of the area. Here the landscape is irregular, with knobby, rounded hills interspersed with frequent ponds, marshes and poorly drained areas. This landscape is characteristic of the morainal topography found in the most recently glaciated, northcentral portion of Iowa known as the Des Moines Lobe. The terrain is underlain by boulder-laden glacial till of Wisconsin age.

From eastern Worth and Cerro Gordo Counties on southeast through the remainder of the Subbasin, there is a distinct change in terrain from relatively rugged to more gentle surface features. The characteristics of the more recently glaciated landscape give way to the milder relief of an older glaciated plain, the "Iowan Surface". This topographic district has undergone a considerable amount of erosion since the glacial materials were deposited. The broad, gently rolling plains are well drained. Occasionally, large glacial boulders, or "erratics" are seen protruding at the surface. Isolated, elliptical hills known as "paha", especially characteristic of the southern portion of the Iowan Surface, begin to be encountered in the southern portion of the Shell Rock Subbasin. The Iowa topography is underlain by Kansan age glacial drift which in turn is irregularly mantled by windblown silt deposits known as loess. This loess covering is absent in the Wisconsin drift area.

The mantle of glacial materials is relatively thin throughout the Subbasin and the underlying bedrock frequently is a contributing factor to the surface topography. This proximity of bedrock to the surface is especially noticeable along the valleys of the Shell Rock and Winnebago Rivers where the stream bed and channel sides are excavated into limestone bedrock. The dominance of limestone in the bedrock and its interaction with surface and groundwater over long periods of geologic time have resulted in subsurface crevice and cavern formation and the subsequent development of "sinkholes" at the land surface. Areas exhibiting this "Karst topography" are present in parts of the Subbasin.

E. Land Resources

The total land and water area of the Subbasin is 1,141,120 acres. Land use is as follows:

Land Use	Acres	Percent
Cropland	930,850	82
Pasture	79,320	7
Forest	15,410	1
Other	44,850	4
Urban	59,070	5
Federal	0	0
Water	11,620	1
	1,141,120	100.0

The major portion of the Subbasin is on farms with over four-fifths in cropland. Corn, soybeans, and other feed grains are the main cash crops.

Of the total 1,070,430 acres in cropland, pasture, forest, and other uses, more than 96 percent, or 1,029,569 acres in Land Capability Classes I, II, and III are suitable for regular cultivation (Table 4). Of this, 88 percent, or 906,286 acres, are being cultivated. Urban and Federal land and water areas are not included in the total (Figure 2).

About 81,480 acres of the land in Classes I, II, and III are in pasture and woodland. Much of this acreage would be available, if needed, for crop production, but much of it requires clearing, draining or other improvement to fit the land for cultivation. Some of this land is located in small or irregular areas which cannot be farmed efficiently with modern machinery. It would not be economically feasible in the foreseeable future to bring many of these small, irregularly shaped areas into cultivation. Operating farm units usually need a reasonable amount of pasture and woodlots, even on soils suitable for cultivation.

An area of about 163,400 acres is high quality Class I land with a minimum of problems as far as erosion, drainage, and continuing use are concerned. About 92 percent of this acreage is being cultivated. The 866,183 acres in land Classes II and III require moderate to intensive treatment for protection, improvement, and continuing production. About 88 percent of this acreage is being cultivated.

About 28,100 acrea of Class IV land is suitable for limited or occasional production with intensive conservation treatment. Much of it is considered marginal for the common cultivated crops but is suitable for other uses. Nearly 70 percent of this land is being cultivated.

About 4,900 acres being used as cropland are unsuited for cultivation. This land is in Classes V, VI, and VII, with just over half of it in Class VI.

F. Water Resources

Surface Water

The average annual runoff is about 6 inches. The measurements that are available show that the runoff amount is fairly uniform over the entire Subbasin.

There are several large natural lakes within the Subbasin. Albert Lea Lake at Albert Lea, Minnesota, and Clear Lake at Clear Lake, Iowa, are the largest and best known.

TABLE 4
LAND CAPABILITY CLASSES BY LAND USE 1/

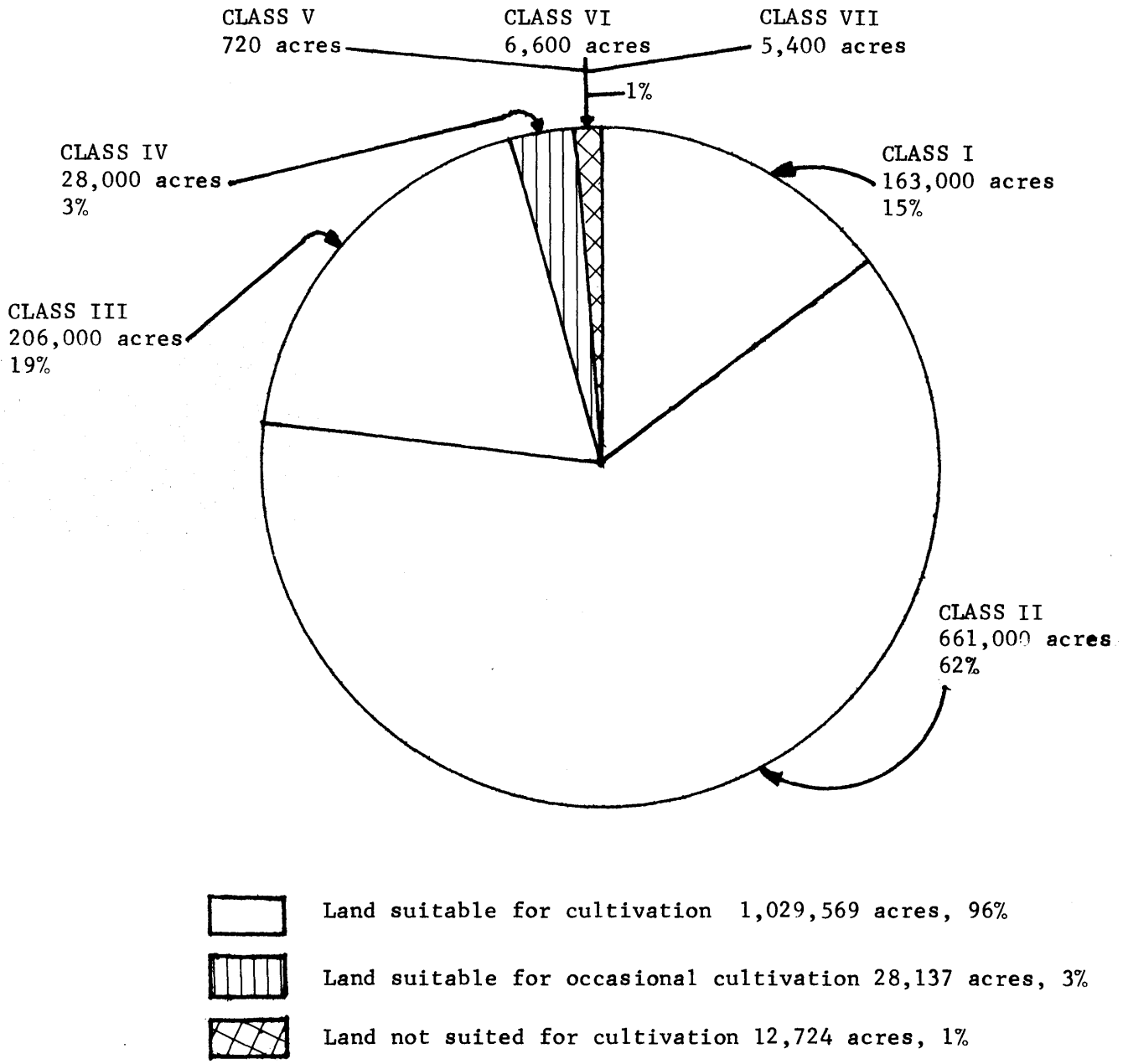
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin
(Thousand Acres)

Class	Cropland	Pasture	Forest	Other	Total	Percent Distribution
I	149,385	4,382	1,702	7,917	163,386	15.3
II	587,311	44,280	7,186	21,785	660,562	61.7
III	169,590	20,937	2,993	12,101	205,621	19.2
Total I-III	906,286	69,599	11,881	41,803	1,029,569	96.2
IV	19,678	4,712	2,056	1,691	28,137	2.7
Total I-IV	925,964	74,311	13,937	43,494	1,057,706	98.9
V	0	720	0	0	720	*
VI	3,666	1,285	886	800	6,637	0.6
VII	1,220	3,004	587	556	5,367	0.5
VIII	0	0	0	0	0	0
Total V-VIII	4,886	5,009	1,473	1,356	12,724	1.1
TOTAL	930,850	79,320	15,410	44,850	1,070,430	100.0
Percent of Inventory Land	87.0	7.4	1.4	4.2	100.0	

1/ Total geographic area 1,141,120 acres; total land area 1,129,500 acres; total water area 11,620 acres.

Source: USDA Conservation Needs Inventory, 1967

* Less than 0.1 percent.



LAND CAPABILITY CLASSES

SHELL ROCK RIVER SUBBASIN

Figure 2

The Shell Rock River from Albert Lea, Minnesota, to its mouth, has been recognized as a scenic coneing stream. Certain sections of the Winnebago River also offer opportunity for a scenic canoe trip.

The data describing the surface water availability in the Subbasin is shown in Table 5.

Groundwater

The source of the groundwater in the Shell Rock River Subbasin is precipitation that falls on the surface and percolates into the soil, loess, glacial drift and bedrock formations. Most of the water falling on the surface runs off in streams or is evaporated into the atmosphere again. Part of the water that soaks into the ground is withdrawn later by evaporation and by transpiration of plants. Only a relatively small portion of the precipitation seeps down to the water table and recharges the groundwater reservoir. Some water moves into and out of the Subbasin area by underflow through deep bedrock formations.

Recharge is determined by several factors including the amount of precipitation, the topography of the land surface, the amount and type of vegetation, the season, and the permeability of the surficial materials and bedrock. Most of the recharge occurs during the periods of heaviest precipitation in the spring and fall. Recharge seldom occurs in the growing season when plants take up most of the moisture, except during floods, or during the winter when the ground is frozen.

Unconsolidated soil, loess, alluvium and glacial drift clay, the latter two containing appreciable sand and gravel, and indurated limestones, dolomites, shales, sandstones and siltstones, comprise the surficial and bedrock units of the Shell Rock River Subbasin. These materials have varying abilities to store and transmit water. Clays and shales are relatively impermeable and have low water-yielding capacities. However, the more permeable alluvial and glacial sands and gravels, creviced limestones and dolomites, and porous sandstones make good aquifers.

The principal aquifers from which water can be recovered by wells in the Subbasin are: 1) alluvial and outwash sand and gravel, 2) sandy zones in the glacial drift, 3) Devonian-age limestone and dolomite in the upper part of the bedrock, and 4) the deeper-lying St. Peter-Prairie du Chien-Jordan sandstone and dolomite sequence of Ordovician and Cambrian age.

The alluvium and outwash sand and gravel deposits along the Shell Rock and Winnebago Rivers and their tributaries generally are thin,

TABLE 5
WATER RESOURCE AVAILABILITY

Shell Rock Subbasin
Iowa-Cedar Rivers Basin

Average Discharge 2/		Station Description	Drainage Area	Flow Availability 1/ Cfs-Percentage of Time Equaled or Exceeded					
				50% Chance		95% Chance		99% Chance	
cfs	Inch Per year		Sq.Mi.	cfs	csm	cfs	csm	cfs	csm
134	6.07	Shell Rock River Nr. Northwood	300.	46	0.153	12	0.040	2.5	0.008
229	5.91	Winnebago River at Mason City	526.	78	0.148	12	0.023	6.4	0.012
611	6.29	Shell Rock River at Marble Rock	1318.	255	0.193	48	0.036	27	0.020
799	6.21	Shell Rock River at Shell Rock	1746.	325	0.186	91	0.052	60	0.034

1/ From Iowa Natural Resources Council Bulletin No. 10

2/ From Current Water Resources Data for Iowa, U.S. Geological Survey

about 10 to 30 feet, and are restricted to the valleys. At present these materials are used mainly for small capacity domestic and stock wells. They probably have considerable potential for producing moderate to large supplies in some areas. Test drilling and test pumping will be the only way to ascertain this. Where the alluvial and outwash sands and gravels have a good hydraulic connection with adjacent streams, properly constructed screen type wells may induce infiltration of river water, resulting in large productions.

Minor water supplies are available from sand and gravel beds within or at the base of the glacial drift in many areas in the Shell Rock River Subbasin (Figure 3). However, in the middle and lower parts of the Subbasin the drift deposits generally are thin, about 50 feet or less, and most wells continue into the underlying bedrock for larger and more dependable supplies. The drift has a maximum thickness of 150-200 feet in Winnebago and northwestern Worth Counties in the upper part of the Subbasin. In this area the drift contains some thick interglacial sands that are used as a source for farm wells.

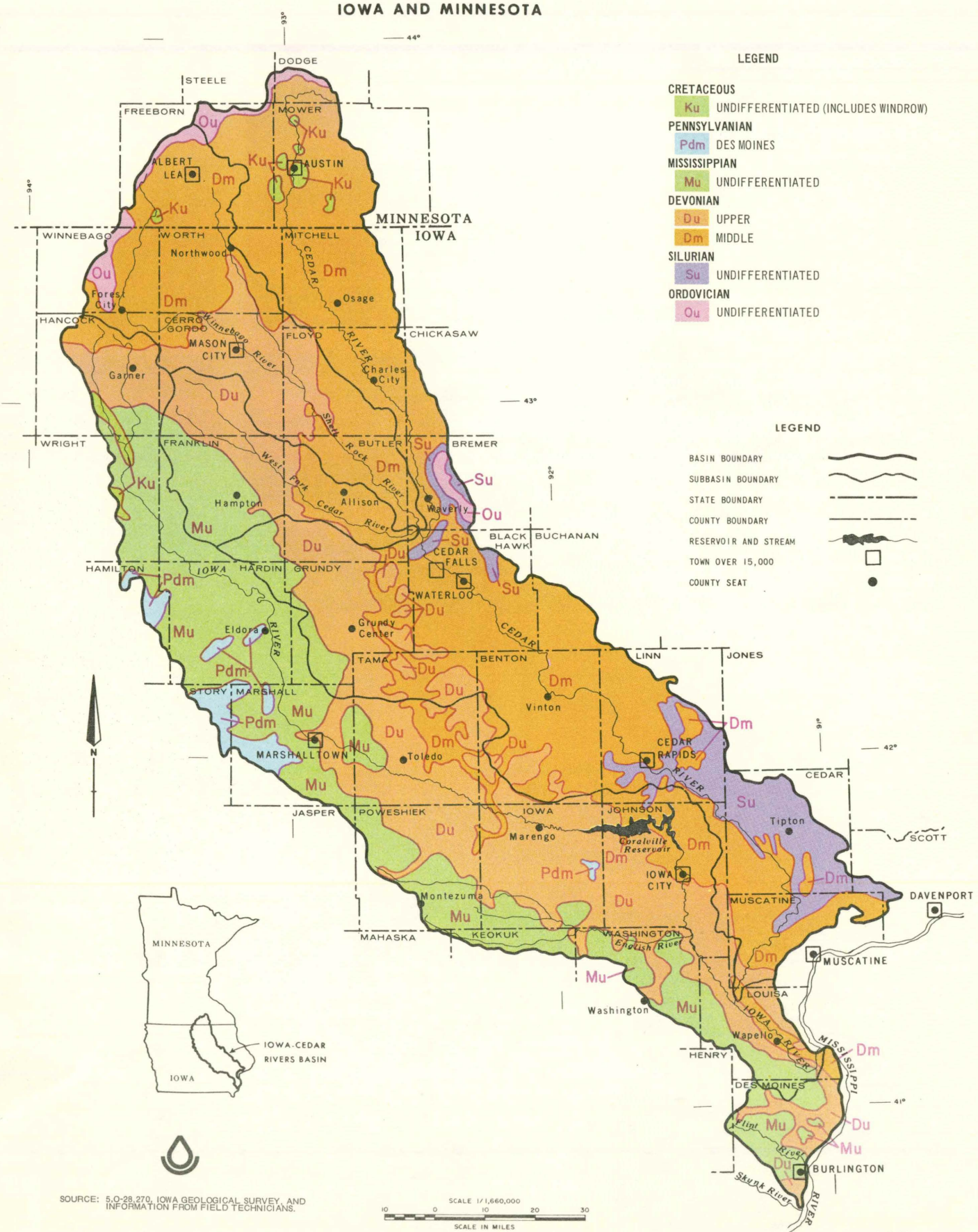
Limestones and dolomites belonging to the Devonian-age Lime Creek, Shell Rock, and Cedar Valley Formations comprise the upper bedrock aquifer in the Shell Rock River Subbasin. (Figure 4) Water is found in fractures and solution cavities in the carbonate rocks. The quantity available from a well depends on the number and size of the openings penetrated by the well bore. The Juniper Hill Shale in the Lime Creek Formation in Cerro Gordo County is an aquiclude that retards the vertical circulation of water to and from the underlying Cedar Valley Formation. The yield from the upper bedrock aquifer ranges from 10 to several hundred gallons a minute usually with small to moderate drawdown and in some cases none. For maximum yield a well should be drilled to the base of the Cedar Valley to assure that all available openings are penetrated. A few wells in Winnebago County have extended into the underlying Maquoketa Dolomite. Generally, the water from the upper bedrock aquifer is acceptable for drinking and other domestic uses, but is quite hard and contains excess iron that may require treatment to prevent staining. Where the limestones are close to surface, the aquifer may show undesirable nitrate concentration.

The next promising zone for moderate to large water supplies to wells is the deep-lying St. Peter-Prairie du Chien-Jordan sequence. The Maquoketa, Galena, and Decorah-Platteville strata at intermediate depths apparently are of minor importance as aquifers, although they probably do contain water and may yield small to moderate supplies, particularly in the upper part of the Subbasin in Winnebago County. The St. Peter generally will yield 50-100 gpm

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

BEDROCK MAP
IOWA-CEDAR RIVERS BASIN
IOWA AND MINNESOTA



SOURCE: 5,O-28,270, IOWA GEOLOGICAL SURVEY, AND INFORMATION FROM FIELD TECHNICIANS.

USDA-SCS-LINCOLN, NEBR. 1973

Figure 3

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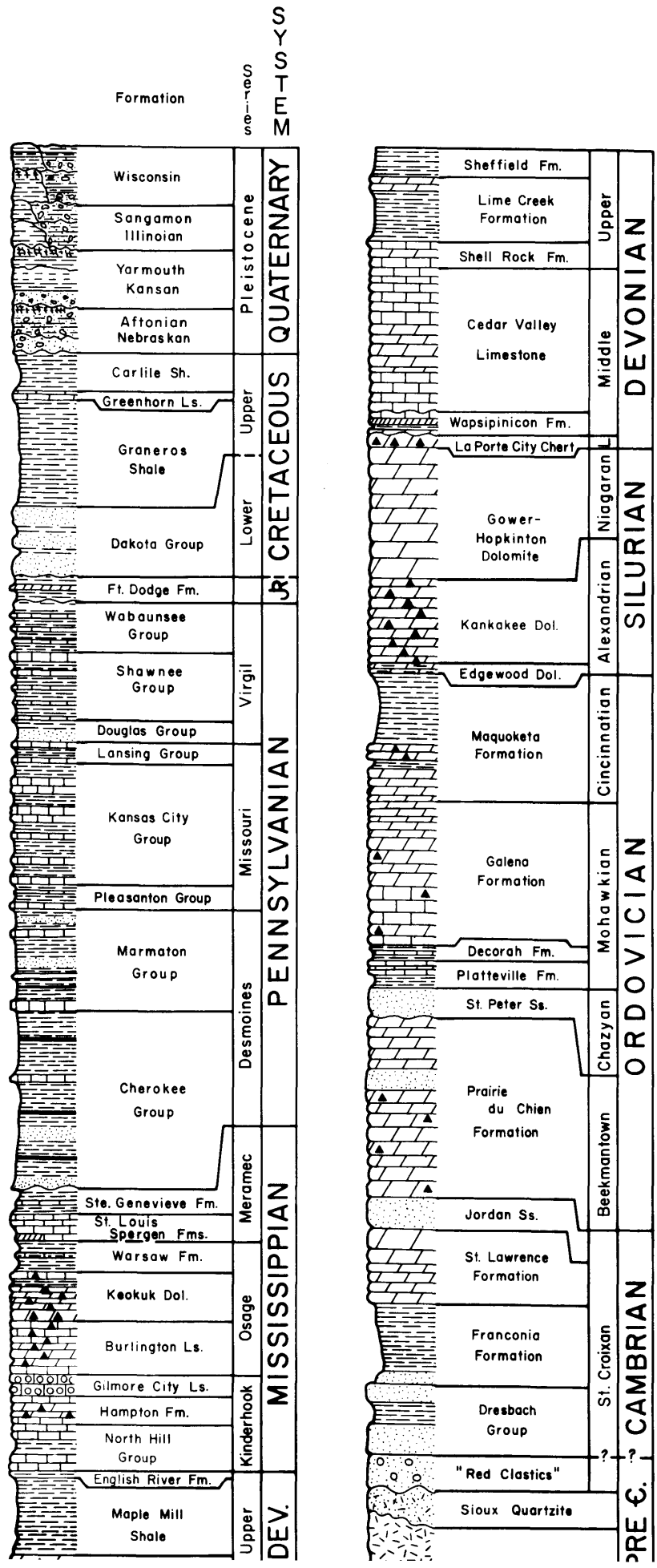
5,P-31,095



GENERALIZED GEOLOGIC COLUMN FOR IOWA

Approximate vertical scale in feet

0
50
100
200
300

LEGEND

- Soil zone
- Till
- Shale (clay-silt in Pleistocene)
- Coal
- Sandstone (Sand in Pleistocene)
- Limestone
- Limestone, oolitic
- Dolomite
- Chert
- Gypsum
- Quartzite
- Metamorphic and igneous crystalline rocks

Figure 4
IOWA GEOLOGICAL SURVEY

or so. Municipal and industrial wells at Mason City and the Rudd town well in Floyd County utilize the Jordan Sandstone as their chief source. These wells almost always yield a minimum of several hundred gallons a minute at specific capacities of 5 to 10+gpm/ft. of drawdown. Both the St. Peter and Jordan are rather poorly cemented in this part of the State and have a tendency to cave into the wells if developed too strongly causing sand pumping troubles. Mineral analyses indicate the water to be satisfactory for drinking and other general uses and little different than the water in the Devonian.

The Iowa Geological Survey in cooperation with the U.S. Geological Survey maintains a file of well logs and other hydrogeologic data on the Shell Rock River Subbasin. Computer printouts of well logs are available at a cost. Research on the hydrology of the aquifers underlying the Subbasin is an integral part of this cooperative program.

Mineral analyses of the water from the various groundwater sources in the Shell Rock River Subbasin are summarized in Table 6.

C. Recreation and Fish and Wildlife Resources

Data provided by the Iowa State Conservation Commission and various agencies of the state of Minnesota indicate that there are 110 recreation, wildlife, and water access areas in the Subbasin. Of these, 23 are State parks, recreation, or hunting and fishing areas.

The Clear Lake in Cerro Gordo County, Iowa, is one of the main points of water-based recreation such as fishing and boating in the area.

The Shell Rock River is one of northern Iowa's top canoe streams. The Cerro Gordo County Conservation Board has recognized one particular stretch of this lovely stream as an excellent conoeing and outdoor area. They have acquired nearly all of the narrow strip of land bordering the river from Rock Falls to Nora Springs.

The Subbasin has many species of wildlife. Those of high density population are raccoon, oppossum, skunk, mink, muskrat, badger, and pheasant. Those of moderate density are jackrabbit, gray and fox squirrel, red fox, ducks, and geese. The low density species are Hungarian partridge, beaver, cottontail, weasel, and deer.

The listing of all known public and private recreation facilities within the Subbasin is based upon a general statewide inventory maintained by the State Conservation Commission. The outdoor recreation area classification system developed by the Outdoor Recreation Resources Review Commission of 1962 is utilized where applicable.

TABLE 6 - TABULATION OF WATER ANALYSIS 1/
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin
(Dissolved constituents in parts per million)

Town - Well No. Owner	DATE OF COLL.	Depth (ft.)	Geol. Source	°F	Diss. Solids	Fe	Mn	Ca	Mg	K	Na	CO_3	HCO_3	SO_4	Cl	F	NO_3	Hardness cal as $CaCC_3$ tot.	Carb.	non carb.	pH	Cond.
Lake Mills Town No.2(1959)	8/21/61	425	Cedar Valley Maquoketa		462	.64	.05	102	29	3.6	19	0	456	41	2	.35	0.1	376	374	2	7.4	740
Forest City Town No.2	4/21/69	145	Cedar Valley		445	1.6	.06	101	33	3.4	17	0	468	49	0.5	.35	0.1	388	384	4	6.9	730
Northwood Town (Northwell)	6/14/71	165	" "	54	390	2.4	.23	93	28	1.6	7.8	0	381	45	8	.15	0.2	348	312	36	7.0	650
Kensett Town No.2(1956)	11/6/67	259	" "		270	.96	.05	69	17	1.3	5.9	0	289	19	0.5	0.2	0.5	240	237	3	7.5	450
Manly Town No.3 (leased fr.RR)(1956)	4/23/56	325	" "		514	.38	.05	104	28	1.5	11		278	134	21	.25	6.2	375	228	147	7.6	727
Plymouth Town No.1 (1924)	8/9/71	238	" "		402	.92	.05	86	29	3.2	16	0	410	28	5	0.4	0.5	336	336	0	7.0	650
Nora Springs Town No.2	6/16/71	386	" "	52	386	.14	.05	91	28	3.1	9.1	0	390	45	5	.85	0.1	344	320	24	7.1	660
Rockford Town	5/11/71	180	" "		326	.80	.05	76	25	1.2	3.6	0	300	49	9	0.6	0.4	291	246	45	7.2	540
Marble Rock Town No.1(1930)	4/24/71	202	" "		270	.12	.05	76	13	2.0	5.0	0	251	41	3	0.2	1.9	244	206	38	7.2	460
Greene Town (1960)	6/26/71	120	" "	53	223	.24	.05	67	13	1.4	1.8	0	246	25	1	0.2	0.1	220	202	18	7.6	430
Clarksville Town No.2	4/2/68	390	" "		267	2.3	.05	69	16	1.4	3.8	0	243	31	1.5	0.4	3.2	236	199	37	7.7	430

1/ From Iowa Geologic Survey

TABLE 6 - TABULATION OF WATER ANALYSIS 1/
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin
(Dissolved constituents in parts per million)

Town - Well No. Owner	DATE OF COLL.	Depth (ft.)	Geol. Source	°F	Diss. Solids	Fe	Mn	Ca	Mg	K	Na	CO_3	HCO_3	SO_4	Cl	F	NO_3	Hardness cal as $CaCC_3$ tot.	CARB.	non carb.	pH	Cond.
Shellrock Town No.1(West Well)	11/22/71	160	Cedar Valley		278	.32	.01	70	18	2.0	9.8	0	239	49	6	0.3	7.8	232	196	36	7.3	460
Mason City Municipal No.14(1957)	5/11/70	1297	Cedar Valley Maq-Gal.PdC-Jordan	50	473	.24	.05	104	34	5.8	16	0	420	83	17	0.8	0.2	400	344	56	7.1	780
Rudd Town No.2(1958)	10/27/60	1288	Pr.du Ch. Jordan	54	358	1.0	.05	77	23	6.0	14	0	317	55	0.5	75	0.1	288	260	28	7.5	560

1/ From Iowa Geologic Survey

General Outdoor Recreation Area Classification System

Class I. High-Density Recreation Areas

Generally located within or near urban centers, and "user-oriented" in design. Diverse and varied recreation opportunities, appropriate to the terrain and location and "mass" accomodations are provided. Intensive day or weekend type of activities.

Class II. General Outdoor Recreation Areas

The natural resource is utilized for the recreation opportunity it provides, irrespective of location. These areas are readily accessible, equipped with a wide variety of man-made facilities, and vary from the simple to the elaborate. Activities are generally of a localized nature and "mass" use is not generally a feature as in Class I.

Class III. Natural Environment Areas

Generally large areas which provide traditional outdoor recreation activities. The user is encouraged to use the area in its natural state with a minimum of man-made developments necessary for access and sanitation. Scattered use is more likely than concentrated use. The area may be used in conjunction with other resource uses.

Class IV. Unique-Natural Areas

These areas are unique in scenic splendor, natural wonder, and/or scientific importance. Recreation activities are strictly limited to those which will not affect the unique value of the natural features.

Class V. Primitive Areas

The essential characteristics of these areas are that the natural environment has not been disturbed by commercial utilization, and that mechanized transportation is non-existent. The natural, wild and undeveloped characteristics are the distinguishing factors. The area must be sufficiently large to remove the user from the sights, sounds and smells of civilization and provide the recreationist with a "feeling" of true wilderness experience.

Class VI. Historic and Cultural Sites

Sites associated with history, tradition, or cultural heritage and are of sufficient significance to merit preservation or restoration. Management is directed to restoration, preservation

and interpretation for sightseeing, enjoyment and study of the historic and cultural features. Limited day-use facilities may be provided when such facilities do not detract from nor interfere with the primary puspose and value of the site.

Class VII. Reserved Open Spaces and Undeveloped Lands

Lands and waters in the classification are those desirable recreation sites which are acquired, pending eventual development, to preserve them from loss to conflicting or undesirable uses. They may be located anywhere such areas are found and acquired through several methods from easement agreement to fee simple title. When finally developed, such areas would be reclassified under the appropriate category.

Wildlife Areas

Includes lands and waters specifically developed and managed for wildlife purposes. Areas in this class may be open to hunting or closed as in the case of refuges. In either situation the intent is for wildlife management. Other recreational facilities may be available, however, they are essentially provided to serve and facilitate the hunter.

Water Access

This category includes those relatively small areas developed to essentially provide boating or fishing access to the waters of the State. Other recreational facilities may be available, but similar to wildlife areas their original intent is specific, in this situation boating or fishing access.

Rest Areas

Highway oriented areas specifically developed to provide the highway traveller with a place for rest, relief and relaxation from driving. They are relatively small and generally not intended for overnight use, or for use as destination recreation areas. They are incidental and serve to facilitate travel to other larger destination type recreation areas.

Other

A general classification encompassing a variety of specific or specialized recreation endeavors. Areas in this category tend to be organization program or facility oriented rather than being dependent on any particular natural resource attribute. These include club areas, organizational areas, resorts, vacation farms, miniature golf, sports areas, race tracs, etc. This grouping includes any areas that can't be classed in the other categories.

General Recreation Area Listing

The General Recreation area listing is based upon a recent (1968-1970) updating of the inventory of every known category of park and recreation land in the States. Details concerning the facilities available, is summarized in Table 7 (Recreation Inventory). This list provides general information as to the type of area, size, management, ownership, and services provided. Municipal recreation areas have not been listed but are summarized by population category and by county in the list. This listing is provided as a specific aid to local and regional planning efforts.

Figure 5 shows the general location of recreation facilities in the Subbasin as well as the location of river reaches well suited for fishing and boating.

H. Mineral Resources

That the mineral resources of the Shell Rock River Subbasin are important to the economy of the area and Iowa is attested to by the fact that the value of mineral production in the Subbasin during 1969 exceeded 28 million dollars. The minerals produced in the Subbasin are limestone and dolomite, shale and clay, sand and gravel, and peat.

Although much of the limestone and dolomite quarried is crushed for use as construction aggregate, a considerable amount is used in the production of cement in the Mason City area. Locally produced limestone is also used for the production of quicklime by the American Crystal Sugar Company at Mason City for its own use in sugar refining.

Clay and shale for use in the manufacture of cement, building bricks, drain tile, etc., was produced in Cerro Gordo and Floyd Counties and was utilized in manufacturing plants in those counties. During 1970 about 49 percent of the total clay produced in Iowa was from Cerro Gordo County.

Sand and gravel for use in paving and by the building industry is rather well distributed along the major drainage ways in the Shell Rock River Subbasin. During 1970 over 1,120,000 tons of sand and gravel with a value in excess of $1,324,000 were produced in the basin.

Peat was produced in Worth and Winnebago Counties and processed at plants located in Hanlontown, Worth County. About 87 percent of the peat was sold for packing flowers, plants and shrubs, and as an ingredient for potting soils.

TABLE 7
RECREATION INVENTORY
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Boating	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Butler Co. Iowa	Wayside Hwy. #14	1½ Mi. S. Greene		O			X	RestArea								*											
	Wayside Hwy. #3	¼ Mi. W. Shell Rock		O			X	RestArea								*				*							
	Heery Woods	½ Mi. S. Clarksville		⊠				III	330	50	380					*				*	*				*		River Access
	Camp Comfort	4 Mi. S.E. Greene			⊠			VII	18	2	20																
	Greene Rec. Park	Greene			⊠			VII	1		1																
	Shell Rock Park	N. Edge of Shell Rock			⊠			VII	65	2	67																
	Lyle Maxon Boat Shop	Greene					⊠															*	*				
Cerro Gordo Co.	Gerk Rec. Area	1 Mi. N. Clear Lake			⊠			VII	70		70																
	Mallard Marsh	3 Mi. S.W. Fertile			⊠			Wildlife Area	227		227															*		
	Shell Rock R.	3½ Mi. S.E. Rock Falls			⊠			III	451	3	454		*			*					*				*	*		Riding Trails
	Kuhn Wildlife Area	5 Mi. N. Ventura			⊠			VII	78		78																
	Clear Lake	Clear Lake		⊠				Sovereign Lake		3,643	3,643												*		*		*	
	Clear Lake Access	Clear Lake		⊠				Lake Access	7		7						*					*	*		*			
	Clear Lake Hatchery & Ponds	Clear Lake		⊠				Fish Hatchery	22	22	44																	
	Clear Lake Outlet	Clear Lake		⊠				Lake Access	1		1												*	*		*		

⊡ - Ownership
⊠ - Management
■ - Ownership and Management

TABLE 7
RECREATION INVENTORY
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Boating	Fishing		Hunting	Swimming	Other
			Fed.	St	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Cerro Gordo Co.	Clear Lake State Park	Clear Lake		⊠				II	92		92	*				*		*	*	*		*	*		*			
	Lake Patrol Area	Clear Lake		⊠				Headquarters	4		4																	
	Lekwa Area	Clear Lake		⊠				Wildlife Area	14	22	36															*		
	McIntosh Woods	Clear Lake		⊠				II	60		60		*			*		*	*			*	*					
	South Shore Access	Clear Lake		⊠				Lake Access	1		1											*	*		*			
	Ventura Marsh	Clear Lake		⊠				Wildlife Area	113	360	473											*	*		*	*		
	Averydale Access	Mason City			⊠			River Access	6		6														*			
	Clay Banks Forest	8 Mi. S.E. Mason City			⊠			Wildlife Area	56		56														*	*		
	Sunset Bay	Clear Lake					⊠	Service Unknown																				
	Silver Boat Amusement Park	Clear Lake					⊠	Service Unknown																				
	All-Vets Social Center	Clear Lake					⊠	Service Unknown																				
	Pla-More Min. Golf	Clear Lake					⊠	Min. Golf																				
	IOOF P.M. Park	Clear Lake					⊠	Service Unknown																				
	Hansen's P.M. Marine	Clear Lake					⊠	Service Unknown																				
	Methodist Camp	Clear Lake					⊠	Service Unknown																				

O - Ownership
X - Management
⊠ - Ownership and Management

TABLE 7
RECREATION INVENTORY
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Boating	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Cerro Gordo Co.	Camp Gaywood	Clear Lake					⊠	Service Unknown																			
	Mason City Wayside	Mason City		O		X		RestArea								*											
	Hwy. 65 Wayside	3½ Mi. S. Mason City		O			X	RestArea								*											
	Willow Inn	Ventura					⊠	II	3		3	*															
	Mason City YM & YWCA	Mason City					⊠	Service Unknown																			
	Open Bible Conference	Ventura					⊠	Service Unknown																			
	Ventura Gun Club	Ventura					⊠	Service Unknown																			
	Hesser's Dock	Ventura					⊠	Service Unknown																			
	Fin & Feather Resort	Ventura					⊠	Service Unknown																			
	Elm Bend Resort	Ventura					⊠	Service Unknown																			
	Kaster's Kove	Ventura					⊠	Service Unknown																			
	J & M Fishermen's Wharf	Clear Lake					⊠	Service Unknown																			
	Clear Lake Rifle & Pistol Club	Ventura					⊠	Service Unknown																			

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TABLE 7
RECREATION INVENTORY
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Hunting	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un-dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Cerro Gordo Co.	Kemmerer Marine	Clear Lake					⊠	Service Unknown																			
	Regular Baptist Camp	Ventura					⊠	Service Unknown																			
	Outing Club	Clear Lake					⊠	Service Unknown																			
	Tourist-ville	Clear Lake					⊠	Service Unknown																			
Floyd Co.	Rudd Way-side	Rudd			⊠			RestArea	6		6					*											
	Hwy. 14 Wayside	6 Mi. W. Charles City		O			X	RestArea								*											
	Paradise CampGrounds	Nora Springs					⊠	II	35		35	*															
	Winnebago Boy Scout Camp	Marble Rock					⊠	Service Unknown																			
	Nora Springs Mill Dam	Nora Springs			⊠			River Access	24	3	27					*						*	*		*		
	Rockford Park	Rockford			⊠			River Access	16	2	18					*									*		
	Gates Bridge	2 Mi. S.E. MarbleRock			⊠			River Access	4		4		*			*									*		
	Marble Rock Access	MarbleRock			⊠			River Access	3		3											*	*		*		
	Mathers Forest	Nora Springs			⊠			III	49	1	50		*			*					*	*	*		*		Outdoor Classroom
	Ackley Ck. Park	2 Mi.S.W. MarbleRock			⊠			II	40		40	*				*											Playfield

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TABLE 7
RECREATION INVENTORY
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Boating	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Hancock Co.	Wild Goose Park	3½ Mi. N.E. Miller			X		O	VII	62		62																	
	Pilot Knob Park	5 Mi. S.E. Forest City		■				III	349	20	369		*			*				*	*							Historic Int.
Winnebago Co.	Dahle Pond	4 Mi. N.W. Lake Mills			■			III	7	2	9					*									*			
	Winnebago River Rec. Area	2 Mi. N.E. Leland			■			VII	47		47																	
	Leland Wayside	Leland		O	X			RestArea								*				*								Play Equip.
	Forest City Wayside	Forest City		O			X	RestArea								*												
	Thorpe Bros.	Forest City					■	III	20	35	55		*												*	*		
	Nobb Hill Ski Area	ForestCity					■	Ski Area																				
	Rice Lake Izaak Walton League	Lake Mills					■	Service Unknown																				
	Lake Mills Archer Club	Lake Mills					■	Service Unknown																				
	Hogsback Area	3 Mi. N.W. Lake Mills			■			III	149		149		*			*										*		Archery and Rifle Range
	Harmon Lake	4 Mi. W. Scarville		■				Wildlife Area & Sovereign Lake	411	72	483															*		
	Rice Lake Area	2½ Mi. S.E. Lake Mills		■				Wildlife Area & Sovereign Lake	369	702	1,071											*	*		*	*		

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TABLE 7

RECREATION INVENTORY

Shell Rock Subbasin

Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Boating	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Winnebago Co.	Rice Lake Rec. Area	2½ Mi. S.E. Lake Mills		⊠				II	47		47					*				*		*			*		*	Golf
	Ambroson Park	3 Mi. N. Forest City			⊠			III	12	6	18					*									*	*		Handicapped Fac.
Worth	Silver Lake Access	Silver Lake			⊠			VII	9		9																	
	Stime Forest	8 Mi. S.W. Northwood			⊠			Wildlife Area	165		165															*		
	Turvold Timber	6 Mi. S.W. Northwood			⊠			Wildlife Area	32		32															*		
	Worth Co. Lake	2 Mi. N.E. Kensett			⊠			II	5	3	8					*									*		*	
	Brights Lake	1 Mi. S.E. Emmons, Minn		⊠				Sovereign L.		122	122															*		
	Elk Creek	3 Mi. N. Joice		⊠				Wildlife Area	1,035	523	1,558					*									*	*		
	Hwy. 9 Wayside	1 Mi. E. Fertile		O			X	RestArea								*				*								
	Izaak Walton League	Kensett					⊠	Service Unknown																				
	Hansen Pond	Northwood					⊠	Service Unknown																				
	Silver Lake Area	12 Mi. N.W. Northwood		⊠				Wildlife Area & Sovereign L.	109	339	448															*		
	Brunsvold-Haugen Timber	3 Mi. N.W. Fertile			⊠			Wildlife Area	19		19															*		

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TABLE 7
RECREATION INVENTORY
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Hunting	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Worth Co.	Christian-son Taylor W. L.	7 Mi. NW Northwood			⊠			Wildlife Area	25		25														*		
	Fertile Mill Park	Fertile			⊠			II	4	6	10					*					*	*		*		*	
	Hartland Forest	6 Mi. N.W. Northwood			⊠			III	40		40														*		Outdoor Classroom
	Helgeland Wildlife Area	1 Mi. S. Northwood			⊠			Wildlife Area	5		5													*	*		
	Myre Timber	6 Mi. S.W. Northwood			⊠			Wildlife Area	3		3														*		
	Ochee Yahola Park	4 Mi. N.W. Northwood			⊠			VII	160		160																

O - Ownership
M - Management
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TABLE 7
RECREATION INVENTORY
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Boating	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.							Cold Water	Warm Water			
Freeborn Co. Minn.	Bear Lake	10 Mi. SW Albert Lea		■				Wildlife	76	1560	1636														*	*		
	Arrowhead Golf Course	10 Mi. SW Albert Lea					■	Golf																				
	State Line Lake Park	Emmons				■			2		2					*												
	Fountain Lake Site II	3 Mi. E. Albert Lea				■			277		277																	
	American Holiday Inc.	8 Mi. E. Albert Lea					■		100		100																	
	Camp Hiawatha Campground	Hayward					■		5		5	*																Golf
	Albert Lea City Parks	Albert Lea				■		Service	39		39																	
	Edgewater Bay Park	Albert Lea				■			40		40																	
	Albert Lea City Park	Albert Lea				■			82		82																	
	Albert Lea Country Club	Albert Lea					■	Golf	90		90																	
	Helmer Myre State Park	Albert Lea		■					987	2625	3612	60		*		*				1		*	*		*	*	*	
	Pickeral Lake Public Access	Albert Lea		■					3	563	566					*									*	*		
	Freeborn County Fair Grounds	Albert Lea			■				44		44																	

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TABLE 7
RECREATION INVENTORY
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Modern Comfort Station	Showers	Shelters	Trails	Boat Access	Hunting	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	In-dev.							Cold Water	Warm Water			
Freeborn Co. Minn.	Halls Lake Wildlife Mgt. Area	5 Mi. E. Alden		⊠					174		174																
	Halls Lake Wildlife Mgt. Area	5 Mi. E. Alden		⊠					154	144	298																
	School Sec Lake	Manchester Twp.					⊠	Wildlife		59															*		
	Lake Chapeau	Albert Lea Pickeral Twp.					⊠	Wildlife		144															*		
	Sugar Lake	Manchester Twp.					⊠	Wildlife		130															*		
	Eberhart Lake	Pickeral Lake Twp.					⊠	Wildlife		140	140														*	*	
	Upper Twin Lake & Lower Twin Lake	Nunda & Pickeral Lake Twp.			⊠		⊠	Wildlife	150	689 406	556					*	*			*	*				*		
	Goose Lake	Albert Lea Twp.					⊠	Wildlife		65															*		

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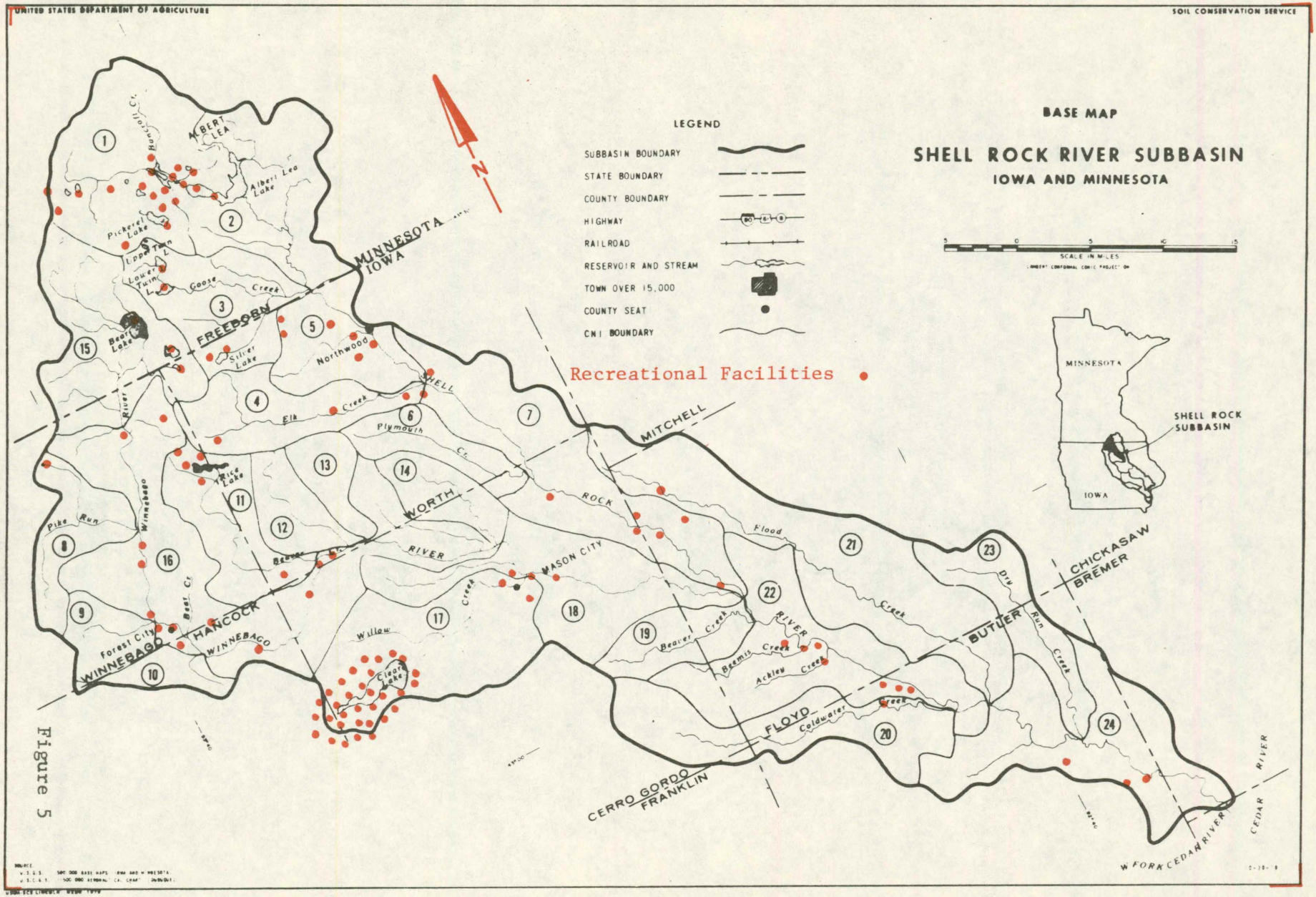
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
BASE MAP
SHELL ROCK RIVER SUBBASIN
IOWA AND MINNESOTA
LEGEND
SUBBASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
HIGHWAY
RAILROAD
RESERVOIR AND STREAM
TOWN OVER 15,000
COUNTY SEAT
CNI BOUNDARY
Recreational Facilities
SCALE IN MILES
MINNESOTA
IOWA
SHELL ROCK SUBBASIN
MINNESOTA
IOWA
FREEBORN
MITCHELL
WORTH
HANCOCK
WINNEBAGO
CERRO GORDO
FRANKLIN
FLOYD
BUTLER
CHICKASAW
BREMER
ALBERT LEA
MASON CITY
Forest City
Albert Lea Lake
Pickerel Lake
Upper Twin L.
Lower Twin L.
Goose Creek
Bear Lake
Silver Lake
Northwood
Elk Creek
Plymouth Ct.
Rice Lake
Pike Run
Winnebago
Beaver Cr.
Bass Cr.
Willow Creek
Clear Lake
Shell Rock River
Rock River
Flood Creek
Dry Run Creek
Beaver Creek
Beemis Creek
Acklew Creek
Coldwater Creek
W. FORK CEDAR RIVER
CEDAR RIVER

Figure 5

I. Archeological and Historic Sites

Table 8 identifies State historical areas, markers, and points of interest found in the Subbasin.

J. Early History

The first known white settlers entered the Subbasin in 1850, settling in Floyd and Butler Counties. A short time later, Joseph Kelly arrived from Monroe, Wisconsin, and settled in Floyd County on the East bank of the Cedar River opposite a Winnebago village of about 150 wigwams.

In 1851, two white settlers camped on the shore of Clear Lake. Mason City was laid out in 1853. The first white men reached Worth County in 1854 and settled along the Boone and Iowa Rivers.

The first permanent settlers arrived in Winnebago County in 1856 and settled on the banks of the Winnebago River at Forest City. Forest City was platted in 1856.

Until after the end of the Civil War, the settlers were native white Americans. Following the war, many foreign born settlers arrived from Europe.

II. WATER AND RELATED LAND RESOURCE PROBLEMS

A. Land Resource Problems

There are 1,010,000 acres of crop and pasture land in the Shell Rock River Subbasin with only 223,000 acres, or 22 percent, that are considered to be adequately treated to meet conservation problems.

Erosion is a problem on about 388,000 acres of crop and pasture land. Of this, only 28,000 acres or 7 percent, are considered adequately treated to control soil erosion according to present standards. The remaining 360,000 acres, or 93 percent, are in need of conservation treatment. Erosion by wind and water is a critical land and water problem in the Subbasin. Expanding use of fertilizers and insecticides may make erosion and even greater problem in future years. Sediment from erosion is a carrier of water pollutants such as insecticides and phosphates that can damage our lakes and streams.

The Subbasin has 422 thousand acres of cropland and pasture with a wetness hazard. A total of 204 thousand acres or 48 percent, are adequately treated to solve this drainage problem. The remaining 218 thousand acres, or 52 percent, needs to be treated for optimum production.

TABLE 8
STATE HISTORIC AREAS, MARKERS AND POINTS OF INTEREST
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin

Item	County	Location	Ownership	Comment
Site of first settlement in Freeborn County	Freeborn	Albert Lea Twp on County Road #19		Rock with metal marker, site of St. Nicholas established in 1855
Site of Luther Academy	Freeborn	Albert Lea - Fourth St. & Frank Hall Ave.		Stone marker
Site of first dwelling in Freeborn County	Freeborn	Shellrock Twp - Iowa line		Stone marker S.E. of Gordonsville designating first dwelling in 1853
Legend Board	Freeborn	Bancroft Twp near Minn. Hwy #13		Near site of old Itasca cemetery located in S.W. corner of Bancroft Twp. Board tells story of the old Itasca Village and Pioneer Trail going West.
Stone Marker	Freeborn	Shellrock Twp - U.S. Hwy #65		Tells about cemetery which lies beneath pavement.
Art Johnson Rock Garden	Freeborn	Bancroft Twp - on old Wilson Hwy		Near site of Itasca Village
Site of Freeborn Co. Historical Society	Freeborn	Albert Lea on Bridge Street		Museum of Pioneer displays and Village.
Indian Village	Freeborn	Albert Lea		No development
Indian Dwellings	Freeborn	Albert Lea		No development
Indian Burial Grounds	Freeborn	Hayward Twp		No development
Site of oldest Sioux Indian Village	Freeborn	Nunda Twp. Sec. 28 & 33		No development
Old site of Indian Village	Freeborn	North shore of Bear Lake		No development
Old site of Indian Village	Freeborn	North at Lower Twin Lakes		No development
Herb Niebuhr	Freeborn	Mansfield Twp. Sec. 17	Private	Existing house, stop over for stage lines.
K. J. Petersen	Freeborn	Manchester Twp. Sec. 35	Private	Existing house, stop over for stage lines.
Stage Road	Freeborn	Hayward, Sec. 16		A Southeast, Northwest stage road through center of Sec. 16.

TABLE 8
STATE HISTORIC AREAS, MARKERS AND POINTS OF INTEREST
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin

Item	County	Location	Ownership	Comment
Clarksville Indian mounds	Butler	Near Clarksville, Ia.		Indian mound area.
Charles H. MacNider Museum	Cerro Gordo	303 2nd St. S.E. Mason City, Ia. 50401		Permanent collection of art and travel exhibits.
Kinney Pioneer Museum	Cerro Gordo	Located between Mason City & Clear Lake on U.S. Hwy. 18	Pioneer Museum & Hist. Soc. of N. Ia.	North central Iowa heritage.
Lincoln Statue	Cerro Gordo	Clear Lake Cemetery		Replica of famous Augustus Saint-Gaudens statue of Lincoln.
Glacial Rock	Floyd	3 mi. W. of Nashua on Ia. 54 & 3/4 mi. S.	Private	Largest glacial rock in the Midwest.
Indian Mounds	Floyd	Sec. 6 Twp. 94N, R. 18W.		
Fertile Mill Park	Worth	S. edge of Fertile, Ia.	Worth County Cons. Bd.	Mill and dam site, built in 1879 by William Rhodes.

There are 54,000 acres of upstream floodplain with floodwater and sediment damage problems. All of these acres will require project action for solving these floodwater and sediment problems. This does not mean, however, that these projects could be economically justified, but rather that group action is required for the problem solution.

In addition, there are 24,300 acres of floodplain along the main streams which also have floodwater and sediment damage problems. These would also require project action for solving the problems.

The following urban areas have been identified as having some degree of floodwater and sediment problems: Mason City and Greene in Iowa, and Albert Lea and Glenville in Minnesota.

The 1967 Conservation Needs Inventory for Watersheds identified 24 watershed areas in the Shell Rock River Subbasin. Table 9 lists these watersheds and identifies the flooding and drainage problems of each.

B. Forest Resource Problems

Numerous uses are made of the forest resource including recreation, wildlife, livestock grazing, timber harvesting, and watershed protection. In many instances, several of these land uses can and do occur on the same piece of land simultaneously. However, in other cases, because of land use intensities and other factors, some uses are not compatible. For instance, excessive grazing of forest land can damage the forest resources to the extent that recreation, water quality, long-term timber harvesting, and wildlife values deteriorate. New subdivisions within a forested setting, while quite desirable from the owners standpoint, can effectively modify or eliminate other uses including various recreational activities.

Other uses occur which unalterably eliminate the forest resources. Conversion to cropland or pasture, municipal-industrial development, transportation and utility rights-of-way, and water developments are probably the most significant uses contributing to a decline in forest acreage.

Grazing of forest land occurs to some degree on approximately 73 percent of the Subbasin's forested areas. Excessive grazing will continue to detrimentally affect the land's capability to provide desirable wildlife habitat, long-term timber harvesting, related recreational experiences, and good quality water. Erosion from these areas will contribute somewhat to downstream sedimentation and deposition lands.

TABLE 9
WATERSHED INFORMATION
Shell Rock River Subbasin
Iowa-Cedar Rivers Basin Study

Watershed		Drainage Area (acres)	Agric. FW and Sediment Damage		Drainage	
			Acres with Problems	Needing Project Action	Acres with Problems	Needing Project Action
Name	No.					
Fountain Lake	1	63,680	6,000	3,000	24,000	18,000
Shell Rock River(Minn.)	2	61,890	15,472	8,000	24,000	18,000
Goose Creek - (Iowa	3	5,380)	130)	130)	1,000)	1,000)
(Minn.		32,450)	5,130)	2,630)	17,600)	11,500)
Elk Creek	4	37,630	1,500	1,500	15,700	8,000
Main & Tribs. Shell Rock - R.1	5	38,980	1,580	1,580	20,100	12,200
Rose Creek	6	18,180	600	600	10,400	7,100
Main & Tribs " - R2	7	80,380	2,700	2,700	36,700	18,200
Pike Run	8	26,750	1,500	1,500	17,300	13,400
Twister Branch Winnebago	9	14,140	500	500	900	0
Main & Tribs. Ia. - R.1	10	11,900	50	50	7,700	0
Beaver Creek	11	41,470	2,400	2,400	22,600	16,800
Winans Creek	12	16,130	400	400	7,000	4,000
Willow Creek	13	15,550	200	200	7,500	5,500
Spring Creek	14	21,630	300	300	8,800	4,200
Lime Creek - (Iowa	15	9,860)	600)	600)	5,400)	400)
(Minn.		46,400)	5,190)	3,090)	26,120)	16,400)
Main & Tribs.Winnebago R.2	16	114,110	9,400	9,400	54,400	28,500
Willow Creek	17	67,200	4,100	4,100	42,600	17,800
Main & Tribs.Winnebago R.3	18	62,850	3,600	3,600	26,600	6,400
Beaver Creek	19	22,910	700	700	10,500	2,500
Coldwater Creek	20	51,780	3,300	3,300	31,400	29,800
Flood Creek	21	97,280	2,700	2,700	63,900	45,200
Main & Tribs. Shell Rock R. 3	22	71,870	1,800	1,800	34,300	19,800
Dry Run Creek	23	33,220	400	400	22,500	18,000
Main & Tribs. Shell Rock R. 4	24	77,500	5,200	5,200	46,700	26,800

The following forest land treatments are currently needed for enchancement of multiple-use values:

	Iowa	Minnesota	Total
		-Acres-	
Reforestation	4,714	714	5,428
Timber stand improvement	2,321	2,550	4,871
Grazing reduction or elimination	4,315	255	4,570
Forage improvement	1,918	765	2,683

Any change in land use from woodland to some other use reduces the useful multiple purpose of these wooded areas. Changes in use include conversion to cropland, pasture, urban subdivision developments, recreational developments, transportation, and the like. Each of these land use conversions either eliminate the wooded areas or reduces its effectiveness for multiple-use purposes.

C. Water Problems--Quality and Quantity (Groundwater)

Agricultural, Rural Domestic and Livestock

There appear to be few problems in attaining satisfactory supplies for these uses throughout the Subbasin. In the lower part of the Subbasin the glacial drift deposits are thin and it is generally necessary to drill most wells into the underlying bedrock for larger and more dependable supplies. In this area where the limestone bedrock is close to the surface the upper aquifer may have undesirable concentrations of nitrate.

Municipal and Industrial

Most of the water for use by municipalities and industry in the Subbasin is derived from groundwater sources and there are no major Subbasin-wide problems. However, in the immediate area of Mason City where municipal and industrial withdrawals of water from the Jordan Sandstone total about 8 to 9 million gallons per day, water levels have declined significantly from the time of earliest reliable records. At the present withdrawal rates the decline appears to have reduced, indicating that the cone of drawdown is approaching stability at that rate. However, increased withdrawals will cause additional drawdowns to occur throughout the area.

If future development of the Jordan aquifer is to be to the best economical advantage, careful consideration should be given to the location, capacity, and pumping schedules of proposed wells and nearby existing wells so that local overdevelopment or excessive interferences do not occur.

III. SUBBASIN RESERVOIR SITE INVENTORY

Introduction

This is an inventory of potential reservoir sites in the upstream area of the Shell Rock River Subbasin. This report contains information on six sites based upon information gathered by the Soil Conservation Service. It is felt that those that were inventoried are some of the most desirable sites. Sites are very limited in this Subbasin in which drainage is a major water management problem (Figure 6).

The purpose of this report is to present the opportunities for water storage in the Shell Rock River Subbasin for floodwater storage; sediment control; recreation; water supply for rural domestic, livestock, municipal and industrial uses, and other beneficial uses. The inventory reflects only physical potential for storage in the Subbasin and economic justification of sites is not implied. More intensive investigations should be made to substantiate topographic and geologic data before sites are selected for detailed planning and development.

In general, sites were limited to drainage areas of under 50 square miles. Sites having significant effects on railroads, main state highways and county roads, towns, and concentration of buildings were avoided.

Areas inundated and the available storage for each site were determined from USGS topographic quad maps.

A representative group of sites in the Iowa-Cedar Rivers Basin were studied in detail to establish reservoir storage requirements for floodwater detention. In general maximum storage available for beneficial uses was based on anticipated annual water yield from the contributing drainage area. Reservoir storage includes sediment, beneficial use, and temporary floodwater. Beneficial storage includes all permanent storage, except for sediment, for any desired purpose. Structure data appears on Table 10.

Sediment volume needed was estimated for a 50-year period. Temporary flood storage required in this area is normally about four to five inches of runoff from the contributing watershed.

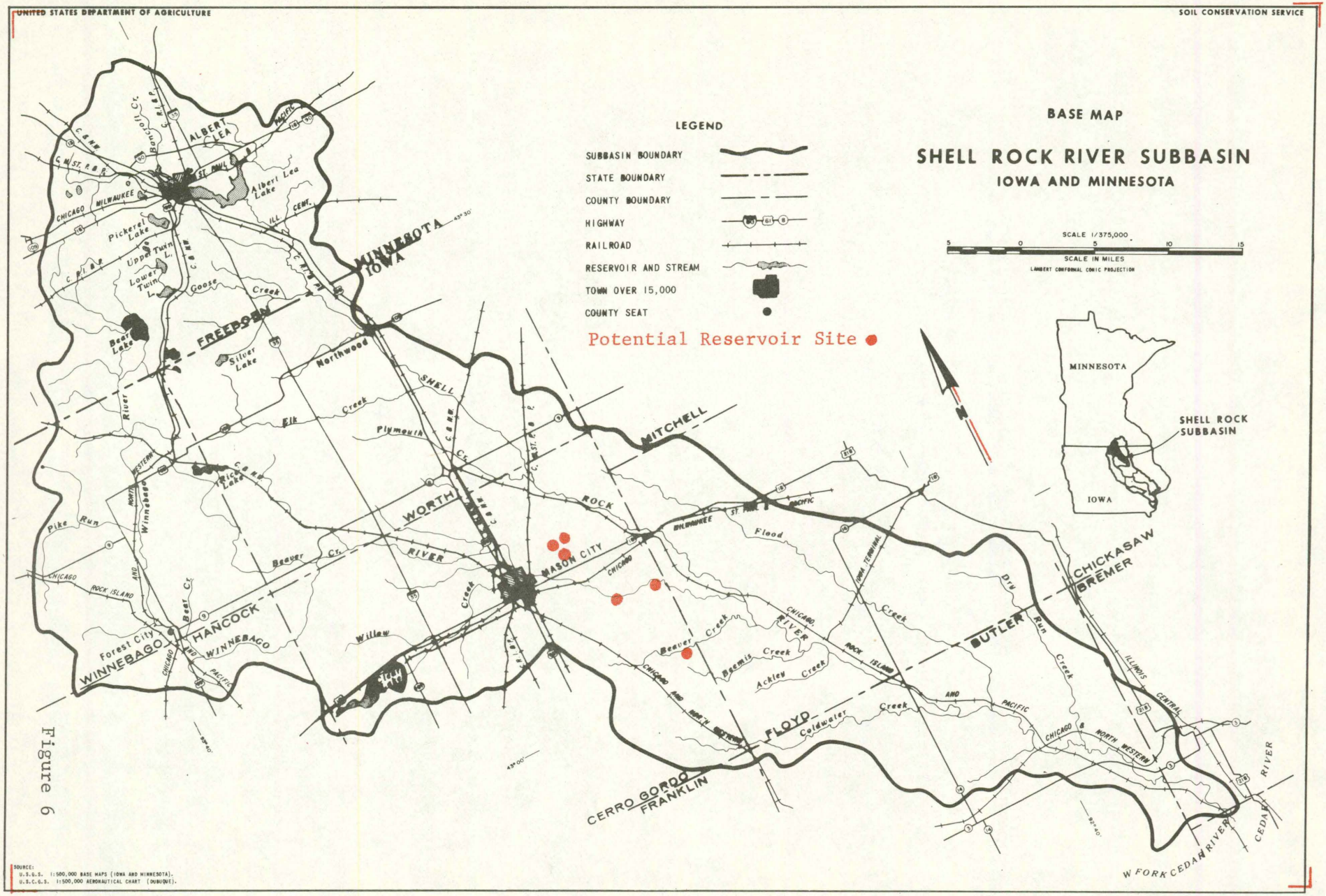
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
BASE MAP
SHELL ROCK RIVER SUBBASIN
IOWA AND MINNESOTA
LEGEND
SUBBASIN BOUNDARY
STATE BOUNDARY
COUNTY BOUNDARY
HIGHWAY
RAILROAD
RESERVOIR AND STREAM
TOWN OVER 15,000
COUNTY SEAT
Potential Reservoir Site
SCALE 1/375,000
SCALE IN MILES
LAMBERT CONFORMAL CONIC PROJECTION
MINNESOTA
IOWA
SHELL ROCK SUBBASIN
ALBERT LEA
Albert Lea Lake
Pickerel Lake
Upper Twin L.
Lower Twin L.
Goose Creek
Bear Lake
Silver Lake
FREEBORN
MINNESOTA
IOWA
Northwood
Elk Creek
Plymouth
SHELL ROCK RIVER
MITCHELL
Rice Lake
WORTH
Pike Run
Beaver Cr.
MASON CITY
Willow Creek
Flood
Dry Run Creek
CHICKASAW
BREMER
BUTLER
Beaver Creek
Beemis Creek
Achley Creek
Coldwater Creek
FLOYD
Forest City
WINNEBAGO
HANCOCK
CERRO GORDO
FRANKLIN
W FORK CEDAR RIVER
CEDAR RIVER
43°30'
43°00'
93°40'
SOURCE:
U.S.G.S. 1:500,000 BASE MAPS (IOWA AND MINNESOTA).
U.S.C.G.S. 1:500,000 AERONAUTICAL CHART (DUBUQUE).

Figure 6

TABLE 10

POTENTIAL RESERVOIR SITE INVENTORY DATE
Shell Rock Subbasin
Iowa-Cedar Rivers Basin

Site No.	Location			Drainage Area	Est. Dam Height	Storage Capacity				Water Surface			Map Available in Report
						Sediment (50 yr.)	Beneficial Use	Temporary Floodwater	Total	Multi-purpose Pool		Temporary Floodwater	
										Minimum	Maximum		
	Sec.	Twp	Range	Sq. Miles	Ft.	Ac. Ft.	Ac. Ft.	Ac. Ft.	Ac. Ft.	Acres	Acres	Acres	
Cerro Gordo County													
17-1	36	97N	20W	3.7	40	200	990	890	2,080	60	150	260	X
17-2	31	97N	19W	1.6	35	90	430	385	905	30	60	100	X
17-4	6	96N	19W	0.8	40	50	215	195	460	15	25	35	X
17-5	32	96N	19W	8.8	55	470	2,350	2,120	4,940	125	210	330	X
17-6	35	96N	19W	5.5	60	300	1,470	1,320	3,090	70	105	150	X
17-7	22	95N	19W	11.0	50	590	2,940	2,640	6,170	160	275	465	X

No reservoir costs have been developed for these sites.

Some potential for farm ponds does exist in this Subbasin but no attempt was made to inventory these sites. An existing farm pond inventory was made through the Soil Conservation District Field Offices. This inventory of existing ponds indicates 43 existing farm ponds from 1 to 5 surface acres, 5 between 5 and 10 acres, and 3 with over 10 surface acres. These are spread over the Subbasin with an almost equal number in Freeborn County, Minnesota, Butler and Winnebago Counties.

IV. SUBBASIN ENVIRONMENTAL QUALITY APPRAISAL

Environmental quality problems in the Shell Rock River Subbasin include some that have already been mentioned. The most severe one is wind and sheet erosion from water that is resulting in pollution and sediment problems. Damages occurring as a result of this erosion include siltation of lakes, farm ponds, floodways, drainage ditches, road and highway ditches and culverts. Wind erosion pollutes the air. This erosion also reduces the water quality of streams and lakes by being a carrier of pollutants. Other environmental quality problems include inadequate wildlife cover and over-grazing of some of the existing woodland cover and over-grazing of some of the existing woodland cover. Some streambank erosion exists along the Shell Rock and Winnebago Rivers and one area was found where many old automobiles were being used to stabilize the banks. This tends to impair the scenic values of these rivers. Many abandoned automobiles were found in the wooded areas and other areas of the Subbasin creating sight pollution and tending to destroy the aesthetic values of the Subbasin.

In addition to air pollution by soil particles due to wind, much air pollution was noted in the vicinity of Albert Lea and Mason City apparently from certain industries.

Ground water is the almost exclusive source of water supply in the Subbasin. No water supply problems are projected in the Subbasin through 2020. Through some of the subbasin, the mantle of consolidated material is quite thin which makes the upper bedrock aquifer vulnerable to contamination from surface material. This is particularly true in Floyd and Butler Counties.

The Minnesota Pollution Control Agency (MPCA) presented a Water Quality Management Plan in 1971. In this report, MPCA has stated that it is the intention to require removal of nutrients from all sources to the fullest practicable extent wherever sources of

nutrients are considered to be actually or potentially harmful to preservation or enhancement of designated water uses. It was also noted that this automatically applies to all lakes and reservoirs, and may be applied to other designated waters. This agency in this report includes the following water quality problems: Low flow conditions of the Shell Rock River at Albert Lea can post serious problems in view of the relatively high industrial and municipal waste loadings; Albert Lea Lake, which drains into the Shell Rock, has had a history of high nutrient values with effluent discharge of secondary treatment still being drained into the Lake from three communities; and three other small communities were without sewers and treatment plants as of 1971. Two of these were recommended by the MPCA to have sewers and treatment plants by the fall of 1973. In addition the Wilson & Co. Packing Plant at Albert Lea had entered into a stipulation with the agency to expand their treatment plants with phosphorus reduction in 1973 and ammonia reduction treatment plant in 1977. The MPCA have also recommended that three creameries at Twin Lakes, Congor, and Myrtle expand their treatment plants.

The Minnesota Pollution Control Agency reported that relatively limited recreational usage is made of various lake and streams in the Minnesota portion of the Subbasin because of their shallowness, low flow, and reduced water quality resulting from algae and aquatic weed conditions. Dissolved oxygen values are intermittently very low, and recurrent winter kills of fish life have resulted from oxygen depletion. Many of the lakes in the subbasin, including Albert Lea, Fountain, and Pickerel, average only 4-8 feet in depth; and thus are particularly prone to winter kill conditions.

In addition to Albert Lea, Mason City, Iowa, has a large waste load discharge into a local stream with a low base flow. Water flow augmentation is a need at both communities.

Besides the 3600 acre Clear Lake and the 2600 acre Albert Lea Lake, there are seven other lakes from 300 to 1600 acres in size and four others with more than one hundred surface acres each. These other eleven natural lakes are all too shallow to offer much recreational activities in the way of fishing and boating activities. Pressure on the existing facilities of Clear Lake undoubtedly will be increased with the completing of the Interstate Highway system. Additional water based recreational facilities are undoubtedly going to be needed. Sites for artificial lakes are very limited.