IOWA-CEDAR

RIVERS BASIN STUDY

INVENTORY REPORT
FLINT RIVER SUBBASIN

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

862

USDA-SCS-LINCOLN, NEBR. 1971

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,

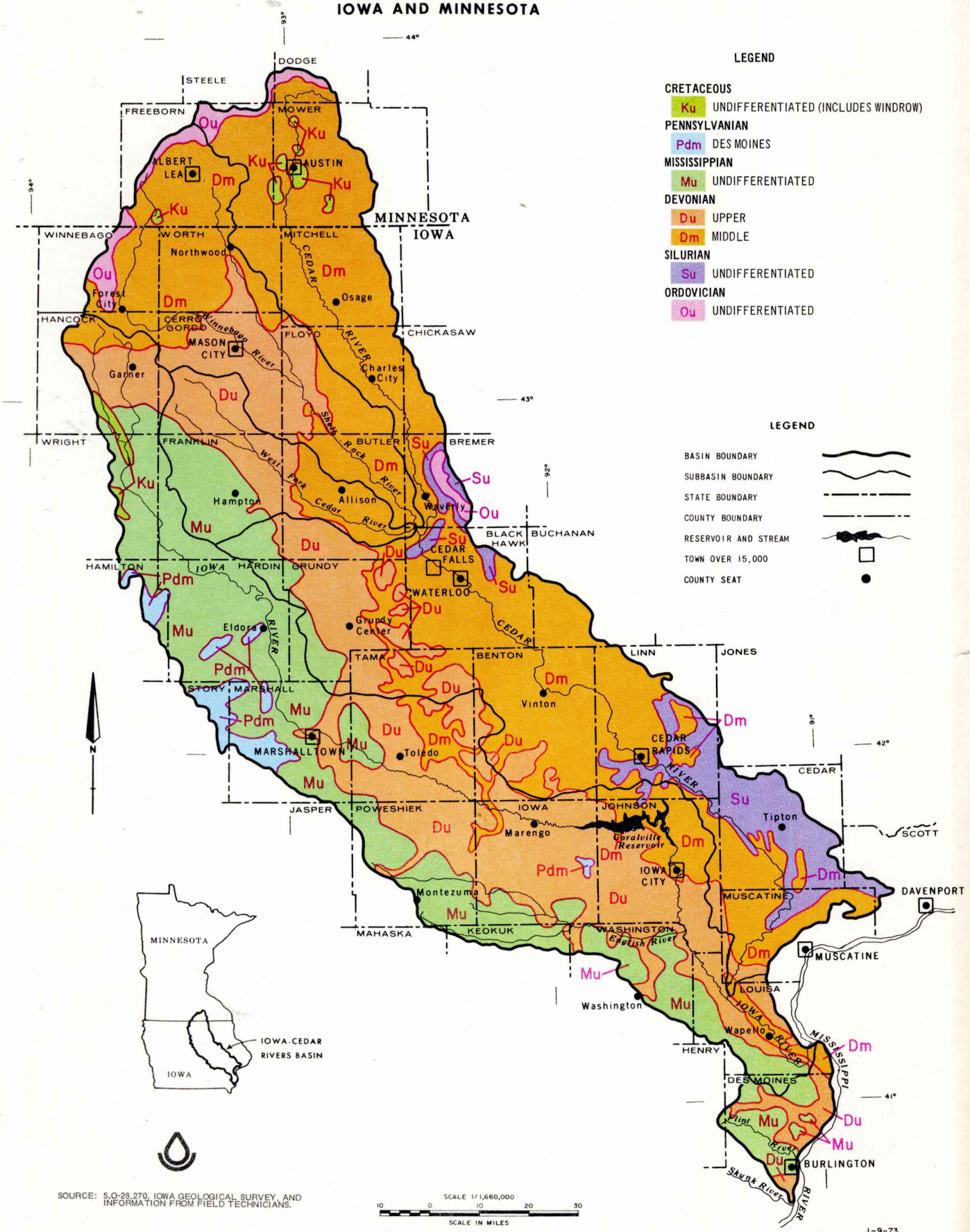
Kenneth G. McManus acty.

Wilson T. Moon
State Conservationist
Chairman
USDA Field Advisory Committee

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

BEDROCK MAP
IOWA-CEDAR RIVERS BASIN
IOWA AND MINNESOTA



INVENTORY REPORT

FLINT RIVER SUBBASIN
Iowa-Cedar Rivers Basin

I. DESCRIPTION

A. Drainage Area

The Flint River Subbasin is a somewhat triangular shaped area bordered on the east by the Mississippi River, the Skunk River Basin on the southwest, and the Iowa River Subbasin on the north (Figure 1). The Subbasin,which lies in Louisa, Henry, and Des Moines Counties, is 334 square miles, or 213,760 acres, in size.

In addition to the Flint River, the larger streams are Spring Creek, Yellow Spring Creek, and Hawkeye Creek.

The City of Burlington lies in the Subbasin.

B. Climatic Data

The climate of the Subbasin is typical continental. It is the southern most part of the Iowa-Cedar Rivers Basin and has the most precipitation and highest annual temperatures. At Burlington, the average precipitation is about 35 inches compared to 29 inches at Albert Lea, Minnesota. The mean annual snowfall is about 26 inches compared to 48 inches at Albert Lea.

The average annual temperature is about 51° F. and the frost-free season averages 179 days. These compare with Albert Lea, 46° F. and 155 days respectively.

C. Economy

The 1970 population of the Flint River Subbasin was 44,000. Of this, 84 percent lived in urban areas, nine percent are rural non-farm residents, and the remaining seven percent or 3,000 persons are rural-farm residents. The Subbasin comprises two percent of the Iowa-Cedar Rivers Basin and has five percent of its population.

Manufacturing, wholesaling and retailing, and agriculture were the three largest sources of employment in the Subbasin. Manufacturing ranked second in 1950 but increased 42 percent to first place in 1960. Wholesaling and retailing, on the other hand, decreased 9 percent during this period. Agriculture, the third largest employer, decreased 28 percent between 1950 and 1960. Similarly, transportation and utilities were down by one-fourth during this time period.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

BASE MAP

FLINT RIVER SUBBASIN

IOWA

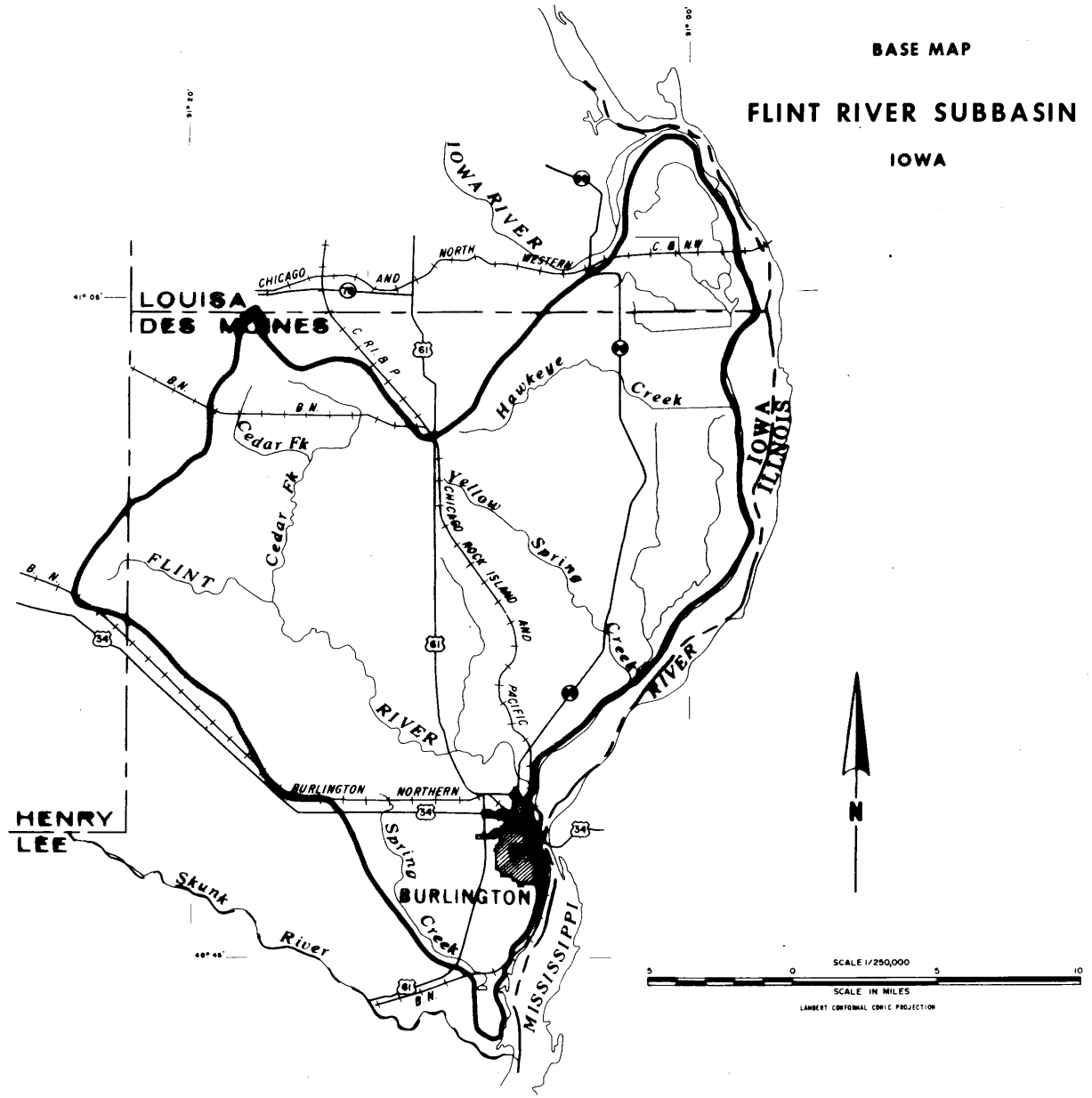


Figure 1

SOURCE:
U.S.G.S. 1:500,000 BASE MAP (IOWA).
U.S.C.G.S. 1:500,000 AERONAUTICAL CHART (DES MOINES).

Family income is distributed as follows in the Subbasin:

Income Category	Percent	
	Flint R. Subbasin	Iowa-Cedar Basin
Less than $3,000	16	27
$3,000 to $10,000	71	63
More than $10,000	13	10

The total number of farms declined from 1,521 farms in 1950 to 1,014 in 1970, a 33 percent decrease.

Livestock farms other than dairy or poultry farms represented 39 percent of the farms in 1965 compared to 50 percent in 1950. The decline in actual number of farms classified in this category was 302 farms or 40 percent from 1950. Other types of livestock farms also have decreased over this period with the possible exception of poultry farms.

Cash grain farms have increased from 241 farms in 1950 to 356 farms in 1965. This represents a 48 percent increase and a change from 16 to 30 percent of the total number of farms.

Farms classified as other farms remained about steady in numbers between 1950 and 1965. Therefore, the category increased from 17 to 22 percent of the total number of farms.

Average farm size in the Subbasin was 227 acres in 1970, an increase of 76 acres per farm from 1950. The 1970 average value of land and buildings in the Subbasin is approximately $419 per acre. This represents a value of $95,000 in land and buildings.

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

In 1950 full owners accounted for 56 percent of the farm tenure. This decreased to 55 percent of the farm tenure in 1970. At the same time the percentage of part owners has increased from 19 percent in 1950 to 26 percent in 1970. This may be explained by the consolidation of farm units and capital accumulation. The number of tenants has been steadily dropping both in number and percentage.

Crop and livestock sales in the Subbasin totaled $21.3 million in 1970. Livestock and livestock product sales accounted for 64 percent of the total crop and livestock sales. This share of total sales was down from 69 percent in 1950. Receipts from dairy products, poultry, and poultry products in the Subbasin have

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

Year	Full Owners	Part Owners	Managers	Tenants	Total
1950	846	289	1	385	1521
1954	725	284	3	382	1394
1960	701	264	-	345	1310
1964	606	314	8	256	1184
1970	559	271	-	184	1014

Source: U.S. Department of Commerce, Bureau of Census, Agriculture Census

declined sharply both in actual numbers and as a share of total livestock sales (Table 2). Other livestock and livestock products sales have increased both in numbers and as a share of total livestock sales -- increasing from 86 to 95 percent of livestock sales.

Crop sales have doubled during the period 1950-70. Field crops are by far the largest source of crop receipts accounting for 77 percent in 1950 and 97 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.

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 have declined (Table 3). The use of lime also increased by 44 percent for 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.

TABLE 2 - CROP AND LIVESTOCK SALES
FLINT RIVER SUBBASIN
Iowa-Cedar Rivers Basin
(1000 dollar)

	1950	1955	1960	1965	1970
Crop Sales	3728	3706	4185	6598	7744
Grains	2897	3523	3980	6408	7318
Field seeds and roughage					116
Other crops					88
Vegetables	27	18	17	13	D
Fruits, nuts, & berries	42	11	26	23	10
Nursery & greenhouse	171	155	163	154	D
Forest products	5	4			27
Livestock sales	8327	8213	11520	10284	13547
Poultry & poultry products	407	355	289	260	276
Dairy products	777	714	548	446	447
Dairy cattle & calves					137
Other cattle and calves					6702
Hogs, sheep and goats					5964
Other livestock and products					21
Livestock and livestock products other than dairy and poultry	7143	7145	10683	9579	12824

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

TABLE 3 - FERTILIZER AND LIME USED ON FARMS
FLINT RIVER SUBBASIN
Iowa-Cedar Rivers Basin

	1955	1960	1965	1970
Fertilizer				
Number of farms	717	809	807	636
Amount in tons	4979	5810	8980	11612
Area applied in acres	48665	60490	74240	72277
Lime				
Number of farms	310	146	247	166
Total amount in tons	13850	11239	23198	19931
Area applied in acres	6365	5413	8927	8436
Agricultural chemicals				
Control of crop insects (acres)			19092	38110
Control of weeds, grass and brush (acres)			60868	67548
Control of livestock insects (head)			76296	-

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

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

One major sawmill producing about one-half million board feet annually is located within the Subbasin. However, several other large mills including a pulp mill at Fort Madison are located adjacent to the Subbasin and utilize primarily hardwood timber resources growing in the Subbasin. The pulp mill with a mill capacity of 135 tons per 24-hours utilizes wood from standing timber and residues from other mills in the area.

In addition to these primary wood-using mills, there are four secondary wood-using plants located within the Subbasin--two furniture plants, one gun stock plant, and one millwork plant.

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

Saw log & veneer logs	53,000 board feet
Pulp wood	2,500 cords
Fence posts	1,508
Fire & fuel wood	186 cords

D. Physiography and Geology

The Flint River Subbasin is a relatively small area, confined almost entirely to Des Moines County in extreme southeast Iowa. It lies adjacent to the Mississippi River. Flint River rises in eastern Henry County at an elevation of approximately 750 feet. It flows southeastward across Des Moines County and discharges its drainage directly to the Mississippi River just north of Burlington at an elevation of 520 feet. The valley formed by Flint River is narrow and becomes quite constricted nearer the Mississippi River where downcutting has resulted in a steep gorge containing picturesque rock-lined bluffs. The upland portions of the Subbasin are level to gently rolling and are underlain by wind-blown deposits of loess, which in turn mantle glacial deposits of Illinoian Age. These upland areas are discontinuous owing to dissection of the surface by stream erosion. The streams of the eastern portion of the Subbasin, tributary to Flint River and the Mississippi River, have high gradients and have eroded down through the unconsolidated glacial deposits into resistant bedrock units, thus forming steep-sided valleys. As these valleys extend into the western part of the Subbasin, they become more shallow and merge with the uplands in more gentle slopes.

The Pleistocene glacial deposits of this area are draped over an irregular bedrock surface composed dominantly of Mississipian Age limestones. A large pre-glacial bedrock valley, now filled with glacial

deposits, trends westward across the Flint River Subbasin, but bears almost no relation to the present surface drainage. Within this bedrock channel and along the present Mississippi Valley, older shales and dolomites of Upper Devonian Age form the bedrock surface. The massive, resistant Mississippian limestones which dominate in the Subbasin are responsible for the prominent bluffs along the river valleys. These rocks also contain abundant marine fossils and silica-rich chert zones. It is likely that Flint River derived its name from the large amount of chert exposed in the valley sides and lining the stream bottom as gravel. The limestone formations are quarried throughout the Subbasin, and the deeper, Middle Devonian carbonate rocks are mined for gypsum in the vicinity of Sperry, Iowa.

E. Land Resources

The total land and water area of the Flint River Subbasin is 213,760 acres. The land use is as follows:

Land Use	Acres	Percent
Cropland	137,520	64
Pasture	24,290	11
Forest	22,750	11
Other	5,060	2
Urban	9,830	5
Federal	4,610	2
Water	9,700	5
	213,760	100

The major farm enterprises consist of grain-livestock and cashgrain operations.

Of the total 189,620 acres in cropland, pasture, forest, or other uses, 79 percent, or 150,029 acres in Land Capability Classes I, II and III are suitable for regular cultivation (Table 4 and Figure 2). Of this, 85 percent or 128,266 acres, are being cultivated. Urban and Federal land and water areas are not included in this total.

About 17,360 acres of the land in Classes I, II, and III are in pasture and woodland. Some 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 areas into cultivation. Operating farm units usually need a reasonable amount of pasture and woodlots, even on soils suitable for more intensive cultivation.

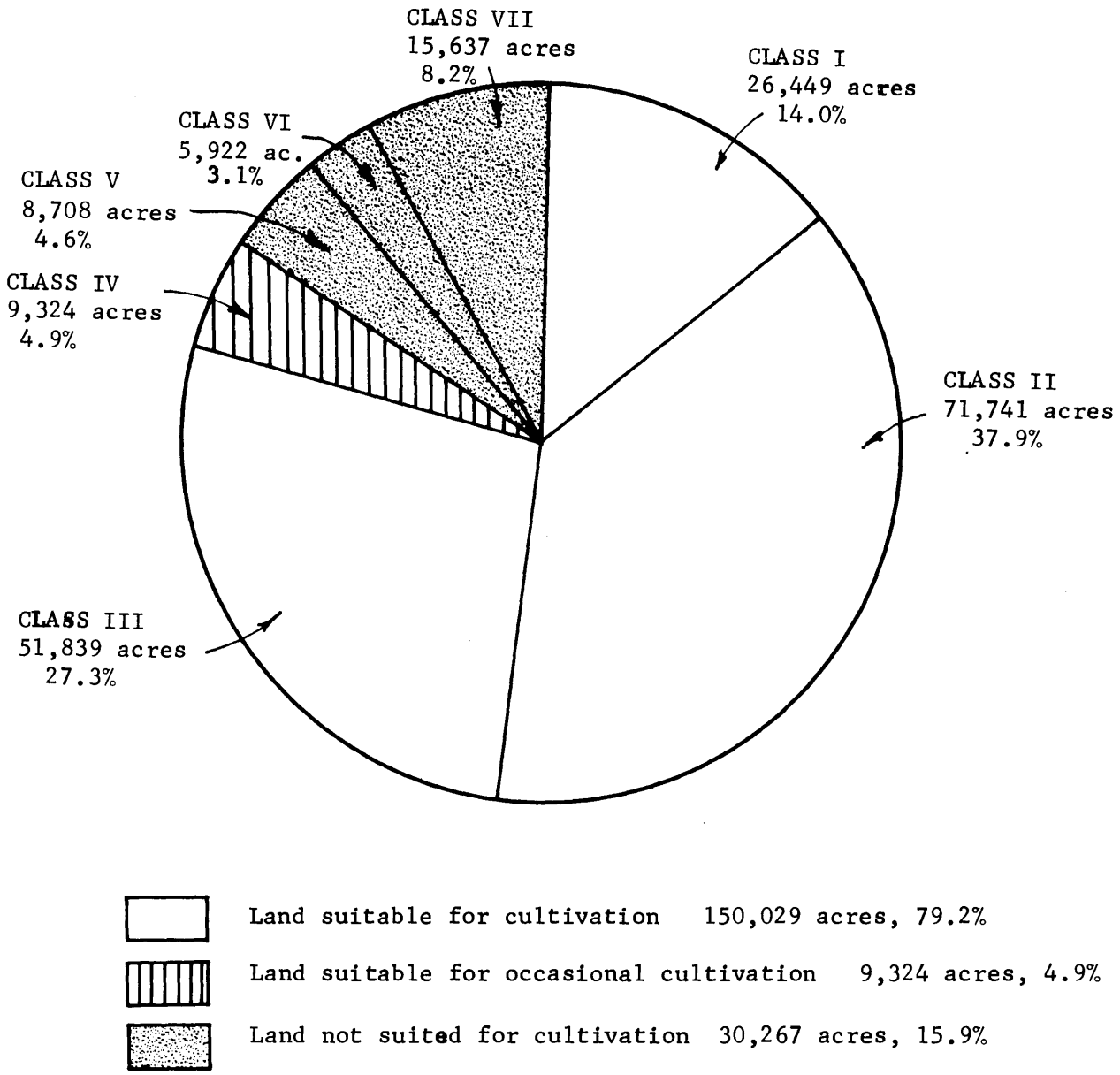
TABLE 4

LAND CAPABILITY CLASSES BY LAND USE 1/
Flint River Subbasin
Iowa-Cedar Rivers Basin
(Thousand Acres)

Class	Cropland	Pasture	Forest	Other	Total	Percent Distribution
I	25,005	560	0	884	26,449	14.0
II	61,790	7,315	1,104	1,532	71,741	37.9
III	41,471	4,850	3,534	1,984	51,839	27.3
Total I-III	128,266	12,725	4,638	4,400	150,029	79.2
IV	6,169	2,052	883	220	9,324	4.9
Total I-IV	134,435	14,777	5,521	4,620	159,353	84.1
V	1,322	1,865	5,301	220	8,708	4.6
VI	1,322	2,612	1,988	0	5,922	3.1
VII	441	5,036	9,940	220	15,637	8.2
VIII	0	0	0	0	0	0
Total V-VIII	3,085	9,513	17,229	440	30,267	15.9
TOTAL	137,520	24,290	22,750	5,060	189,620	100.0
Percent of Inventory Land	72.5	12.8	12.0	2.7	100.0	XX

1/ Total geographic area 213,760 acres; total land area 204,060 acres; total water area 9,700 acres.

Source: USDA Conservation Needs Inventory, 1967.



LAND CAPABILITY CLASSES

FLINT RIVER SUBBASIN

Figure 2

An area of about 26,450 acres, or 14 percent, is high quality Class I land with a minimum of problems as far as erosion, drainage, and continuing use are concerned. About 95 percent of this acreage is being cultivated. The 123,580 acres in Classes II and III require moderate to intensive treatment for protection, improvement, and continuing production. About 84 percent of this acreage is being cultivated.

There are 9,324 acres in Class IV land suitable for limited or occasional crop production with intensive conservation treatment. Much of it is considered marginal for the common cultivated crops but is suitable for other uses. About 66 percent of this land is being presently cultivated.

A little over 11 percent is in Classes VI and VII. About 1,763 acres in these classes being used as cropland are unsuited for cultivation. There are 30,267 acres in land capability Classes V, VI, and VII.

About eleven percent of the total Flint River Subbasin is in forest land and encompasses 22,750 acres. Various native hardwood species occur within the bottomland and upland areas of the Subbasin. Most of the forest area bears mixtures of oak and hickory or elm, ash, and cottonwood. Eastern red cedar, growing primarily on drier sites in association with several of the oaks and hickories, is an occasional tree within the forest area.

Over 95 percent of the wood land is in private holdings--primarily small individual woodlots. The remainder is essentially State and local government tracts.

F. Water Resources

Surface Water

A regional estimate of the annual runoff from the smaller internal streams is about 7.9 inches. There is one low flow stream gage located on Flint River. Direct measurement of low flows have been made on this 107 square mile drainage. These measurements show that the average discharge is 70 cubic feet per second, 8.9 inches. There was no flow at times in both 1957 and 1966. The seven day, two year flow is estimated at 0.2 cubic feet per second.

Groundwater

Precipitation falling on the surface and percolating into the soil and bedrock formations is the source of groundwater in the Flint River Subbasin. 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 re-

servoir. Some water moves into and out of the Subbasin area by lateral underflow through the 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 during the growing season when plants take up moisture or during the winter when the ground is frozen.

The surficial units of the Flint River Subbasin are unconsolidated soil,(loess, glacial drift clay and sand and gravel) while the bedrock units are indurated limestones, dolomites, shales, siltstones, and sandstones. The strata immediately underlying the glacial materials in the Subbasin are Mississippian-age and Devonian-age formations as shown on the accompanying geologic map (Figure 3) and stratigraphic column (Figure 4. The geologic sequence represented ranges from the St. Louis Formation of the Meramec Series through the Cedar Valley Formation of the Middle Devonian. Older formations of Ordovician and Cambrian age underlie these upper bedrock units for many hundreds of feet below.

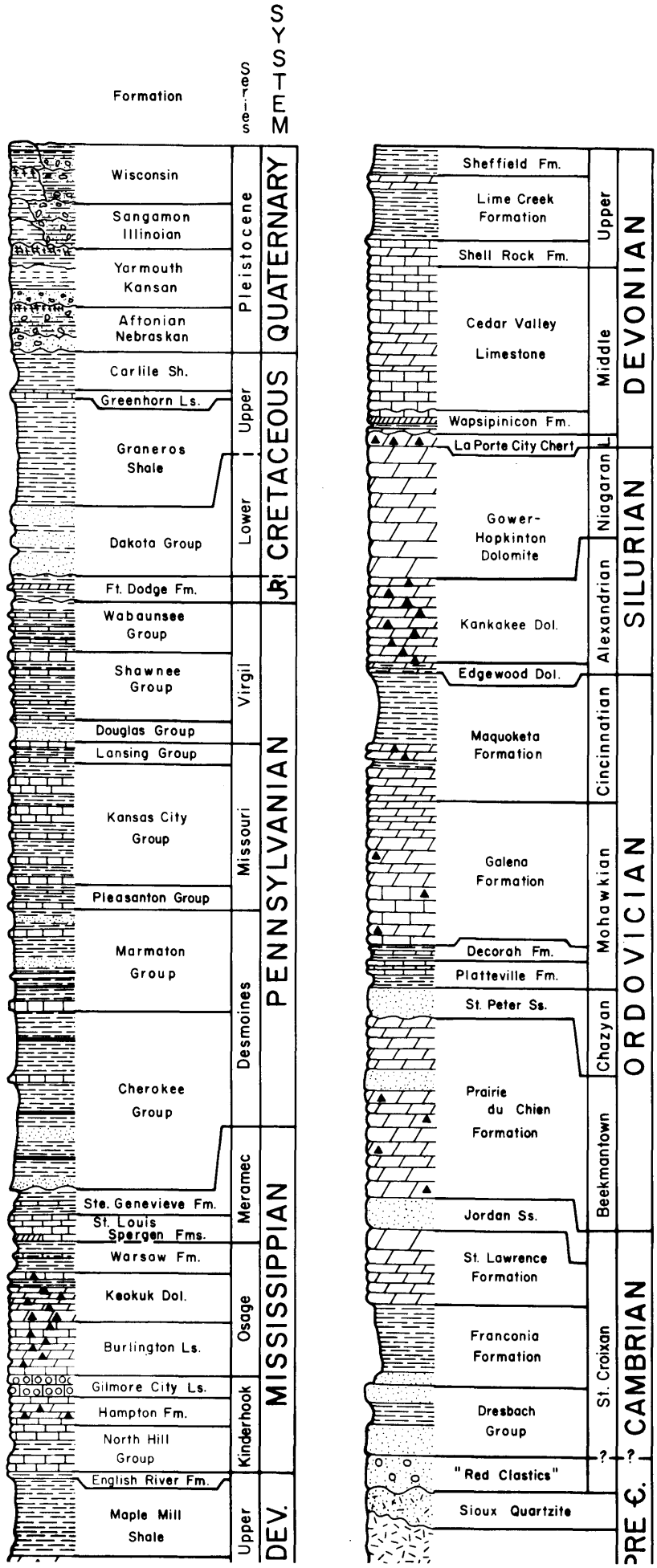
These unconsolidated and consolidated materials have varying abilities to store and transmit water. Clays and shales are relatively impermeable and have low water-yielding capacities. However, the most permeable zones in the glacial and bedrock formations make fair to good water-yielding beds. The principal aquifers from which water is recovered by wells in the Flint River Subbasin are: (1) Sand and gravel deposits within and at the base of the glacial drift including sand and gravel occupying deep bedrock channels, (2) limestones and dolomites of Mississippian age, and (3) the deeper-lying Galena-Platteville, St. Peter, Prairie du Chien, Jordan, and St. Lawrence Formations that are mainly dolomites and sandstones. In general, the alluvium beneath the narrow floodplains of the stream valleys of the Subbasin is of little importance as an aquifer.

Because the interglacial sands usually are lenticular deposits and may be completely missing in some places, they generally yield only small quantities of water for farm and domestic use. Wells finished in the shallower sands are subject to failure during droughts when the water table level declines. More dependable supplies might be obtained from sand and gravel beds in the deeper levels of the glacial drift or in buried bedrock channels in some localities.

The Mississippian-age limestones and dolomites are the most widely used aquifer across the Flint River Subbasin, supplying acceptable quality water to hundreds of farm and rural homestead wells. Yields generally are small, seldom exceeding 5-10 gpm, often with the pumping

Bedrock Map of Iowa-Cedar Rivers Basin (To be added later)

Figure 3



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

level close to the bottom of the well. Where the wells fail to intersect a good fracture in the carbonate formations, it may be difficult to develop even as much as 1-2 gpm. Moreover in some places, especially in the eastern part of the Subbasin, these rocks may be well-drained by springs that run from outcroppings along the Mississippi River bluffs and in tributary valleys and ravines.

Water from the Devonian-age carbonate rocks in this area almost always is so highly mineralized in sulfate as to be unsuitable for drinking. But regardless of this, it apparently is being used at a few wells in the northeastern and eastern parts of the Subbasin.

The aquifer potential of the Galena Formation is not too well known in the Flint River Subbasin because relatively few wells stop in this formation. Moderate yields have been developed from porous zones in the dolomite in the eastern and northeastern parts. The water probably will be acceptable for drinking but the overlying Devonian rocks should not be left uncased.

The Glenwood Sandstone at the base of the Platteville Formation and the underlying St. Peter Sandstone which have a combined thickness of 50-120 feet in this area, are a good source for moderate to large yields. Wells penetrating this interval usually must extend 900 to 1,100 feet below the upland. This water generally is of good quality.

The Jordan Sandstone and associated dolomite strata at about 500-600 feet below the St. Peter Sandstone, is the next most promising aquifer for large supplies of potable water in this area. Yields of several hundred gallons a minute are practically assured from the Jordan and by developing the well extensively as much as 1,000+ gpm can be obtained. This is the source for the public supply at West Burlington.

Additional supplies of water can be found in Cambrian-age sandstones at much greater depths, but only limited information is available on the productivity and quality of the water in these deeper beds.

Several mineral analyses of the water from the various groundwater sources in the Flint River Subbasin are summarized in Table 5.

G. Recreation and Fish and Wildlife Resources

Information provided by the Iowa State Conservation Commission indicates that there are 27 recreation, wildlife, or water access areas in the Subbasin. Much water-based activities are to be found in the Mississippi River. Lack of adequate access areas curtails additional use of the river banks and water area by those wishing to use this recreation resource.

TABLE 5 - TABULATION OF WATER ANALYSIS 1/
Flint 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.
Mediapolis - David Timmerman	5-15-67	80	Pleistocene sd, & gr.	54	503	.06	.23	120	44	0.9	13	0	593	22	11	.25	9.6	480	480	0	7.2	870
Mediapolis town No. 3 (1966)	1-16-69	133	Miss.		366	1.2	.47	91	25	1.2	19	0	410	31	4	0.5	1.1	332	332	0	7.1	650
Burlington - 8 Mi. N. R.F. Walker (1959)	2-19-59	530	Devonian		4850	.96	<.05	437	123	32	840	0	255	2660	285	2.0	<.44	1599	209	1390	7.8	5600
Sperry U.S. Gypsum Co. Mine (drip from ceiling)	5-8-68	600	Devonian		6900	.42	.13	472	117	22	1600	0	355	4000	400	2.0	0.1	1660	291	1369	7.9	7900
Oakville 5 Mi. S. Fred Hardin	5-16-67	457	Devonian	55	2070	2.0	<.05	68	32	20	600	0	426	930	200	1.9	4.1	300	300	0	7.8	3000
Latty Marion Butler (1956)	5-10-67	750	Galena	52	534	3.5	<.05	38	20	8.6	160	0	609	7.4	37	.75	0.4	180	180	0	7.7	940
Burlington John T. Jamison (1951)	5-2-67	698	Galena	52	429	<.02	<.05	82	43	2.2	14	0	440	14	7	.15	27	382	361	21	7.1	730
Mediapolis 3 Mi. SW Ed Moehle (1957)	9-27-61	805	Devonian	57	9000	16.	.06	425	127	31	2200	0	378	4770	770	2.8	<0.1	1580	310	1270	7.4	9060
Sperry U.S. Gypsum Co. (1959)	4-20-59	1063	Galena Galena Dec-Platt. Glenwood	65	1385	1.0	.05	89	41	26	282	0	293	565	145	2.2	45	392	240	152	7.8	1720
West Burlington city No. 3 (1938)	3-25-39	1101	St. Peter	61	743	0.6	Tr.	89	24	150		0	488	185	50	1.0	0	321	321	0	6.9	--
West Burlington city No. 4 (1963)	8-27-68	1810	Jordan	72	1156	.80	<.05	74	34	17	260	0	288	480	120	1.9	2.5	326	236	90	7.5	1800

NOTE: Tr. = Trace

1/ From Iowa Geological Survey

The Subbasin supports many varieties of wildlife. Waterfowl are found in high densities in a band along the Mississippi River. In the upland areas, waterfowl are in moderate amounts. Other wildlife of high density are fox squirrel, mink, racoon, opposum, striped skunk, badger, muskrat, deer and quail. The rough and wooded terrain of the Subbasin provide an excellent environment for these species. Moderate intensity includes gray squirrel, beaver, cottontail, and red fox. The species of low density are pheasant, woodcock, and muskrat.

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.

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 purpose 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 tracks, etc. This grouping includes any areas that cannot 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 State. Details concerning the facilities available, is summarized in Table 6, 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. 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

The known mineral resources within the Flint River Subbasin consist of gypsum, limestone, and dolomite.

Gypsum is presently being taken from an underground mine by the United States Gypsum Co., at a site near Mediapolis, Iowa. The gypsum occurs at a depth of 616 feet below the surface in rocks of Devonian age. This is the deepest mine in Iowa. Based upon the present rate of usage it is estimated that reserves to sustain production for 100 to 150 years are present.

TABLE 6 - RECREATION INVENTORY
Flint 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	Fishing		Hunting	Swimming	Other
			Fed.	St.	Co.	Munic.	Priv.		Land	Water	Total	Mod.	Non-Mod.	Un. dev.		Dev.	Un-dev.					Boating	Cold Water	Warm Water			
Des Moines Co	Lock & Dam No. 18	5 Mi. N. Burlington	⊠					Miss. R. Imp.														*		*			
	Ordinance Plant	2 Mi. W. Burlington	⊠					II	20		20					*		*		*							
	Long Creek Cons. Club	2 Mi. W. Burlington	O				X	Wildlife Area	10,000	135	10,135					*				*	*			*			
	Huron Slough	3 Mi. E. Huron	⊠					Wildlife Area	120		120										*			*	*		
	Casey Borrow Landing	10 Mi. N. Burlington	⊠					River Access	1		1											*		*			
	Allen Green Refuge			⊠				Wildlife Area	112	40	152																
	Putt-Putt Golf Course	Burlington					⊠	Service Unknown																			
	Girl Scout L-Kee-Ta Camp	Burlington					⊠	Service Unknown																			
	Yetter Marina	Burlington					⊠	Service Unknown																			
	Cascade Boating Assoc.	Burlington					⊠	River Access																			Hoist
	Meyers Marina	Burlington					⊠	River Access																			Hoist
	Pauls Marina	Burlington					⊠	River Access																			Hoist
	Iowa Union Electric Club	Keokuk					⊠	Service Unknown	1,300		1,300																
	Kurrle & Mattson	Burlington					⊠	Service Unknown																			

O - Ownership
X - Management
⊠ - Ownership and Management

TABLE 6 - RECREATION INVENTORY
Flint Subbasin
Iowa-Cedar Rivers Basin

County	Name	Location	Ownership and Management					Recreation Classification or Specialization	Acreage			Camping			Vacation Cabins	Picnicking		Lodges or Resort 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			
Des Moines Co.	Crystal Springs	Burlington					■	Service Unknown																			
	Burlington Outboard Club	Burlington					■	River Access																			Hoist
	Danville Gun Club	Danville					■	Service Unknown																			
	YMCA Camp	Burlington					■	III	10	73	83									*		*	*		*		
	Burlington Sportsman Club	Burlington					■	Service Unknown																			
	Mediapolis Gun Club	Mediapolis					■	Service Unknown																			
	Iowa Slough Lake	Burlington					■	Service Unknown	7	7	14																
	Tama Beach	5 Mi. NE Burlington		O	X			River Access	3		3		*			*						*	*		*		
	Franklin Twp. Artificial Lake	2½ Mi. W. Dodgeville			■			VII	411		411															*	
	Chautauqua Park	1½ Mi. E. Mediapolis			■			II	10		10	*				*											
	Edgewater Access	4½ Mi. NE Burlington		O	X			River Access	2		2					*						*	*		*		
Louisa Co.	Ferry Landing Area	4 Mi. N. Oakville	■					River Access	15		15		*			*						*	*		*		

O - Ownership
X - Management
■ - Ownership and Management

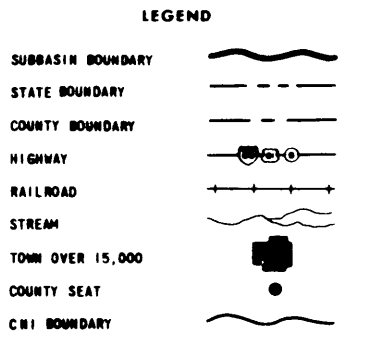
UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

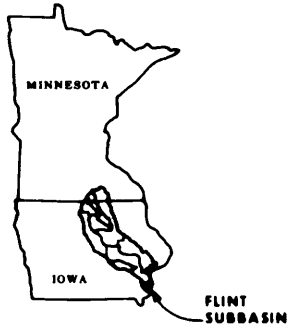
BASE MAP

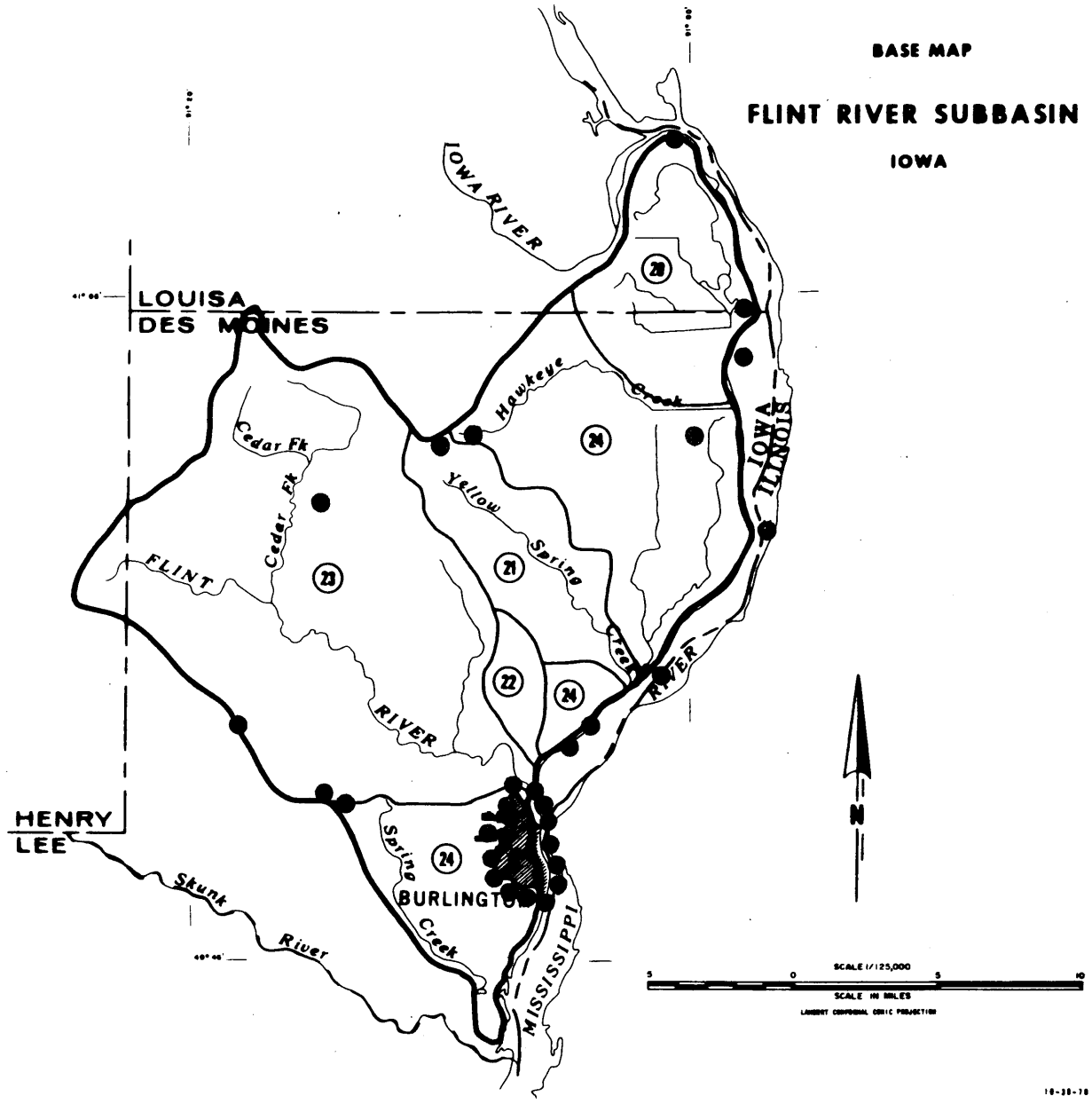
FLINT RIVER SUBBASIN

IOWA



Recreation Facilities





SOURCE:
U.S.G.S. 1:500,000 BASE MAP (1956).
U.S.C.G.S. 1:500,000 AERONAUTICAL CHART (DES MOINES).

10-30-78

0004-SCS-LINCOLN, NEBR. 1979

Figure 5

Thousands of tons of crushed gypsum are sold and shipped to Portland Cement Plants for use in the production of cement. In addition, approximately 30 types of wallboard with countless dimensional variations are manufactured at the plant adjacent to the mine.

At this time, limestone and dolomite is being quarried at six sites within the Flint River Subbasin. The rock is an important source of aggregate for road construction and maintenance, and the more finely crushed rock is used for agricultural limestone.

I. Archeologic and Historic Sites

There are 11 State historic areas, markers, and points of interest in the Subbasin. These are summarized in Table 7.

J. Early History

The Algonquin Indian tribes, the Sac and the Foxes, made their home in the area. Legend has it that the first white visitors were Father Marquette and Louis Joliet. Following them were the French traders and agents of the American Fur Company. The written history of Des Moines County began in 1805 when Lt. Zebulon Pike planted the Stars and Stripes on the high bluffs of what is now Crapo Park in Burlington.

The first permanent settlement was made in the fall of 1832 in the upland plain, three miles from the Mississippi River, on land now included in Burlington. A fur-trading post had been established here some years before. Late in the fall of 1832, there was an uprising of the Sac and Fox Indians, resulting in their expulsion. Title to this territory was acquired by the Government in 1833 under the Black Hawk purchase. Burlington was platted in 1834. Settlers from Illinois, Kentucky, Indiana, Missouri, and the eastern states began coming in rapidly. Many of the farmers were of German, Irish, and Swedish descent.

What is now Burlington was known as Shoquoquon - "Flint Hills". Here many Indian tribes made camp and secured flint from which they made their instruments of peace and war.

II. WATER AND RELATED LAND RESOURCE PROBLEMS

A. Land Resource Problems

Of the 161,810 acres of cropland and pasture in the Flint River Subbasin, 41,300 acres, or one-fourth, is considered to be adequately treated to meet the conservation problems.

TABLE 7 - STATE HISTORIC AREAS, MARKERS AND POINTS OF INTEREST
Flint River Subbasin
Iowa-Cedar Rivers Basin

Item	County	Location	Ownership	Comment
Black Hawk Spring	Des Moines	Burlington, Ia.		Bronze tablet placed by D.A.R.* This spring is located in the bluffs along the Mississippi River. Was used by Indians when camping.
Commemoration of Solar Eclipse	Des Moines	Burlington, Ia.		Bronze tablet placed by D.A.R.*
Commemoration of the Army Trail	Des Moines	Burlington, Ia.		Boulder with tablet placed by D.A.R.*
Crapo Park	Des Moines	Burlington, Ia.		Site of the first American flag to fly in Iowa. Raised by Zebulon Pike in 1805.
First Masonic Hall	Des Moines	Burlington, Ia.		Bronze plaque dedicated by the Grand Lodge of Iowa.
Grave of Chief Tama	Des Moines	N. of Burlington, Ia.	State	
Honor Monument Charles E. Perkins	Des Moines	Burlington, Ia.		Granite Shaft.
Honor Monument John M. Gorse	Des Moines	Burlington, Ia		Monument
Site of Old Zion Church	Des Moines	Burlington, Ia.		Bronze tablet placed by D.A.R.* Methodist church used as a capitol of first Legislative Assembly which met there in 1838.
Zion School Museum	Des Moines	4 Mi. S.W. of Dodgeville, Ia.		
Toolesboro Mound Group	Louisa	Immediately N. of Toolesboro	State	Hopewell Indian Culture Mounds.

Sites of State or Local Significance

Hook Mound Group, Louisa County, near Toolesboro.
Malchow Mound Group, near Kingston, Des Moines County.

*Daughters of the American Revolution

Erosion is a problem on 72,500 acres of cropland and pasture in the Subbasin. Only about 3,500 acres, or five percent, of this area are considered adequately treated to meet the erosion problem. The remaining 69,000 acres, or 95 percent, are in need of conservation treatment.

There are 55,300 acres of cropland and pasture with a wetness problem. A total of about 32,000 acres, or 57 percent, of this area are adequately treated to resolve the wetness hazard. The remaining 23,300 acres, or 43 percent, are in need of additional treatment.

The Subbasin has 83,000 acres of floodplain with floodwater and sediment damage problems. Of this total, 73,000 acres would require project action to solve the problems.

The 1967 Conservation Needs Inventory for Watersheds identified five watersheds in the Subbasin. Of these, one had potential for development. Table 8 lists the watersheds and identifies the flooding and drainage problems in each.

Sediment damage to downstream improvements is a major problem in the Subbasin.

A preliminary report on the Yellow Spring Watershed made in 1963 showed that 160,000 tons of sediment flows out of that drainage area each year. This sediment plugs up the outlet channel of the creek where it crosses the floodplain of the Mississippi River. This amount of sediment averages out to be 10 tons per acre per year from the entire drainage area. Since this is an average, certain areas of the watershed contribute much more than the 10 ton average.

It was estimated that 10 percent of this sediment comes from sheet erosion in cropland areas. The remaining 90 percent comes from gullies and rills in pasture and woodland areas.

This type of problem is quite typical of the direct Mississippi River tributaries in the Subbasin.

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 resource to the extent that recreation, water

TABLE 8
CONSERVATION NEEDS INVENTORY FOR WATERSHEDS INFORMATION, 1967
Flint River Subbasin
Iowa-Cedar Rivers Basin

WATERSHED		Drainage Area	Agric., Floodwater & Sediment Damage		Drainage	
Name	Number	Acres	Acres with Problems	Acres Needing Project Action	Acres with Problems	Acres Needing Project Action
Louisa Co. Direct Miss. Tribs.	20	15,180	10,000	10,000	10,000	9,000
Yellow Spring	21	17,250	1,200	900	5,000	1,800
Dry Branch	22	5,250	300	300	1,700	600
Flint River	23	94,720	10,900	10,900	22,700	5,600
Hawkeye - Dolbee, Spring Creek & other direct Mississippi Tribs.	24	81,360	60,700	51,100	50,300	43,400
TOTALS		213,760	83,100	73,200	89,700	60,400

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, wildlife, timber harvesting, and watershed protection.

Other uses occur which unalterably eliminate the forest resource. 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 occurs to some degree on about 70 percent of the wooded areas. Erosion from these areas contribute to downstream sediment deposition problems.

The following is a list of problems found in woodland areas. Some of the problems are found on the same acre of woodland. Therefore, these cannot be added cumulatively.

1. In need of reforestation - 7,000 acres
2. Need timber stand improvement - 8,000 acres
3. Elimination of grazing - 6,100 acres
4. Forage improvement - 4,400 acres

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

Agricultural, Rural Domestic and Livestock

In most of the river basins in Iowa, the alluvial deposits along the streams provide an excellent source of water for agricultural and domestic users located along the streams. However, within the Flint River Subbasin alluvial deposits are practically non-existent. As a result, it is necessary to drill deeper to develop a water supply.

The relatively shallow interglacial sands are usually lenticular deposits and may be missing in some places. Where present, they generally yield only small quantities of water for farm and domestic use and are subject to failure during periods of drouth when the water-table level declines. The quality of water from these shallower sands is usually quite good.

The Mississippian-age limestones and dolomites form the uppermost bedrock aquifer in the Subbasin. This aquifer supplies acceptable quality water to hundreds of farm and rural homesteads, but the yields seldom exceed 5-10 gpm and the pumping levels are often close to the bottom of the well. In some areas within the Subbasin it is difficult to obtain as much as 1-2 gpm from this aquifer.

Although the next deeper aquifer, the Devonian aquifer, yields from 20 to more than 50 gpm throughout the Subbasin, the water is always so highly mineralized in sulfate as to be unsuitable for drinking. The sulfate content in water from this aquifer ranges from about 1,000 to over 4,000 mg/l. Sulfate concentrations in this range are usually sufficient to have a laxative effect on humans and often on livestock. Nevertheless, water from this aquifer is being used in some places because a shallower supply is not available and the cost to drill to a deeper source apparently is considered too great for a domestic supply.

Few domestic wells in the Subbasin have penetrated below the Devonian aquifer. A few have gone to the next deeper aquifer, which is the Galena aquifer, and moderate yields have been reported. The few available analyses of water from this aquifer indicate that the quality of the water is reasonably good. However, it is important that any well that is completed in the Galena aquifer be cased so as to exclude all water from the Devonian aquifer.

In summary, supplies of water of satisfactory quantity and quality at shallow or intermediate depths are difficult to obtain in many parts of the Flint River Subbasin. Drilling to somewhat greater depths will

generally increase yields, but the quality of the water decreases. If drilling continues to the Galena aquifer particular care must be given to proper well construction to assure acceptable quality water.

Municipal and Industrial

Municipalities and industries within the Flint River Subbasin are confronted with the same water supply problems as are agricultural and domestic users. However, those users requiring larger supplies and with adequate financial resources have alternative sources that serve their needs. These sources are the Glenwood Sandstone and the underlying St. Peter Sandstone, and the Jordan Sandstone and associated dolomite strata. Both sources will yield moderate to large supplies of generally good quality water. For those municipalities and industries requiring large supplies, the Jordan aquifer is most often utilized because with proper well development yields of as much as 1,000 $\pm$ gpm are not unusual.

For additional information on the water resources of the Flint River Subbasin the reader is directed to Iowa Geological Survey Water Atlas No. 4, Water Resources of Southeast Iowa.

III. SUBBASIN RESERVOIR SITE INVENTORY

An inventory of potential reservoir sites was made in the upstream areas of the Flint River Subbasin. The information developed for eleven sites is shown in Table 9 and Figure 6. There are a number of other potential reservoir sites that were not listed but that could be used to provide water impoundments with surface areas of from 10 to 100 acres in size. It is felt that those that were inventoried are some of the most desirable sites and do serve to show that sites are available throughout most of the area.

These sites present opportunities for water storage in the Flint River Subbasin for floodwater control; sediment control; recreation and fish and wildlife development; 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 on-site 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 adverse effects on railroads, Federal and state highways and county roads, towns, and concentration of buildings were avoided.

TABLE 9

POTENTIAL RESERVOIR SITE INVENTORY DATA
Flint 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	
Des Moines County													
29-1	14	72N	2W	7.9	55	420	3,100	1,900	5,420	100	220	280	X
29-2	26	72N	2W	7.5	50	400	600	1,600	2,600	90	90	165	X
29-3	32	71N	3W	12.0	55	640	3,800	2,880	7,320	170	225	410	X
29-4	33	71N	3W	4.8	55	250	1,900	1,050	3,200	60	130	170	X
29-5	15	71N	2W	19.7	65	1,000	6,000	6,000	13,000	230	355	530	X
29-6	27	71N	2W	24.1	65	1,100	7,500	7,000	15,600	260	450	600	X
29-7	35	71N	2W	2.1	45	150	400	470	1,020	32	35	55	X
29-8	26	71N	2W	1.7	50	120	600	380	1,100	30	45	60	X
29-9	19	71N	3W	7.3	55	390	1,700	1,600	4,690	100	140	240	X
29-10 2/	13	71N	4W	28.5	50	1,200	11,000	6,200	18,400	360	750	1,300	
29-11 2/	21	71N	4W	23.0	50	1,000	9,000	4,900	14,900	320	600	1,100	
29-12 2/	6	72N	2W	8.0	60	430	3,200	1,920	5,550	90	195	250	

2/ Data estimated as USGS topographic coverage is not available.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

BASE MAP

FLINT RIVER SUBBASIN

IOWA

LEGEND

- SUBBASIN BOUNDARY
- STATE BOUNDARY
- COUNTY BOUNDARY
- HIGHWAY
- RAILROAD
- STREAM
- TOWN OVER 15,000
- COUNTY SEAT

Potential Reservoir Site

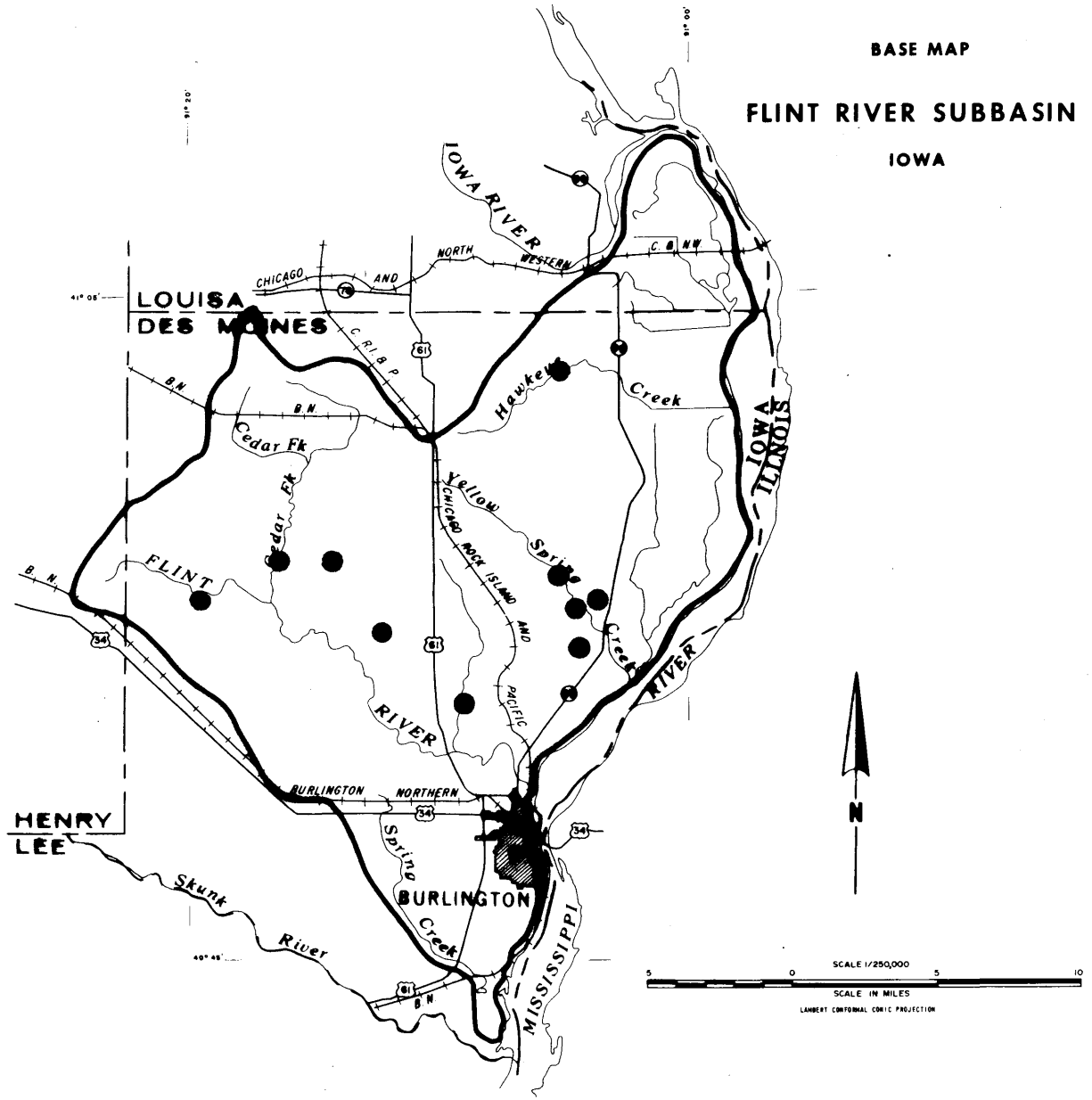


Figure 6

SOURCE:
U.S.G.S. 1:500,000 BASE MAP (IOWA).
U.S.C.G.S. 1:500,000 AERONAUTICAL CHART (DES MOINES).

Sites 5 and 6 are alternates on the same stream; use of one would eliminate the other.

A representative group of reservoir 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 9.

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.

No reservoir costs have been developed for these sites.

IV. SUBBASIN ENVIRONMENTAL QUALITY APPRAISAL

The quality of the natural environment of the Flint River Subbasin can be described as good to excellent giving consideration to such factors as climate, topography, vegetation, water, air, wildlife, recreation opportunities, and various factors of landscape character.

Rainfall in the Subbasin averages 35 inches annually and is normally adequate. The climate is generally enjoyable for those that favor four seasons and five months a year are warm enough (in the 60's or higher) for such activities as camping and other outdoor activities. Air pollution problems appear to be very minimal in this Subbasin.

Vegetation, including floral displays of wildflowers, redbud, wildplum, and other flowering trees, combined with topographic features that include high bluffs overlooking the Mississippi River, steep slopes with limestone and flint rock outcroppings along picturesque streams, provide aesthetic values and offer much in the way of recreation potential with highly scenic attractions. These natural woodland areas make up about ten percent of the Subbasin. About 64 percent of the Subbasin (137,520 acres) is cropland and a major portion of this is highly productive - 86,800 acres of Class I and II land. The bulk of the most productive cropland is in the floodplain of the Mississippi River and the western edge or uplands of the Subbasin.

No sizeable lake exists in this Subbasin. However, reservoir sites do exist for man-made lakes. The Des Moines County Conservation Board has purchased land for a 100-acre lake on a tributary of Flint Creek. Numerous privately owned farm ponds provide excellent warm water fishing. The Mississippi River is noted for excellent fishing.

Species of fish common to the area include catfish, large and small mouth bass, blue gill, walleye, and various rough fish such as carp, buffalo, and sheepshead.

Wildlife is abundant in the area in the form of rabbit, deer, squirrel, fox, mink, muskrat, beaver, quail, raccoon, opossum, skunk, badger, and waterfowl. Pheasant populations are moderate to low in numbers in relation to most of Iowa. Huge flocks of waterfowl may be seen in the spring and fall.

The area provides much recreation for rock hounds and Indian artifact hobbyists. There are several historic sites in the area including Indian mounds, a monument erected to the First Territorial Government in Iowa in the years 1839 to 1841, and many fine old historic homes.

The area has no interstate highway but does have a good network of Federal, State, and county roads. Access roads are available to nearly all areas. Improvement of some of these roads and additional access roads to the Mississippi River are needed.

Some misuse of land exists that is impairing the quality of the natural environment. Some wooded areas are being over grazed, resulting in gully erosion, land destruction, loss of wildlife cover, and loss of natural beauty. Most of these areas are unsuited for pasture and produce little economic gain. It is reported that from 50 to 100 acres of forest land are being cleared annually. For best land use, additional land should be returned to forest land. Much of the land being cleared provides little or no net return as pasture or cropland and causes severe sediment damages downstream.

The Conservation Needs Inventory (CNI) of 1967 indicates that there are approximately 6,200 acres of cropland that could be converted to pasture. In addition, the CNI data indicate that there are approximately 3,000 acres of cropland and 9,500 acres of pasture that could be converted to woodland. This 12,500 acres that could be converted to woodland is made up of Class V through VII land. This would increase the woodland acreage by more than 50 percent.

Much of the land that is suitable for cropland is relatively flat and has little sheet erosion problems. The bulk of the cropland with sheet erosion problems is in the western portion of the Subbasin. Some severe erosion occurring along minor county roads located in the steep areas of the bluffs along the Mississippi is reducing the environmental beauty of this extremely scenic area.

Multiflora rose is being allowed to spread uncontrolled in some areas, particularly in the northern portion of the Subbasin. This is impairing pasture production and the multiple use potential of some woodland areas.

Some water pollution problems exist in the Subbasin. Seventy percent of wells analyzed have not met State health standards. Monitoring of the water in Spring Creek below the sewage disposal plant of West Burlington indicates pollution of that stream by this plant. The aesthetic appearance of the Mississippi River is impaired by the many houses or cabins constructed on both sides of the levee.