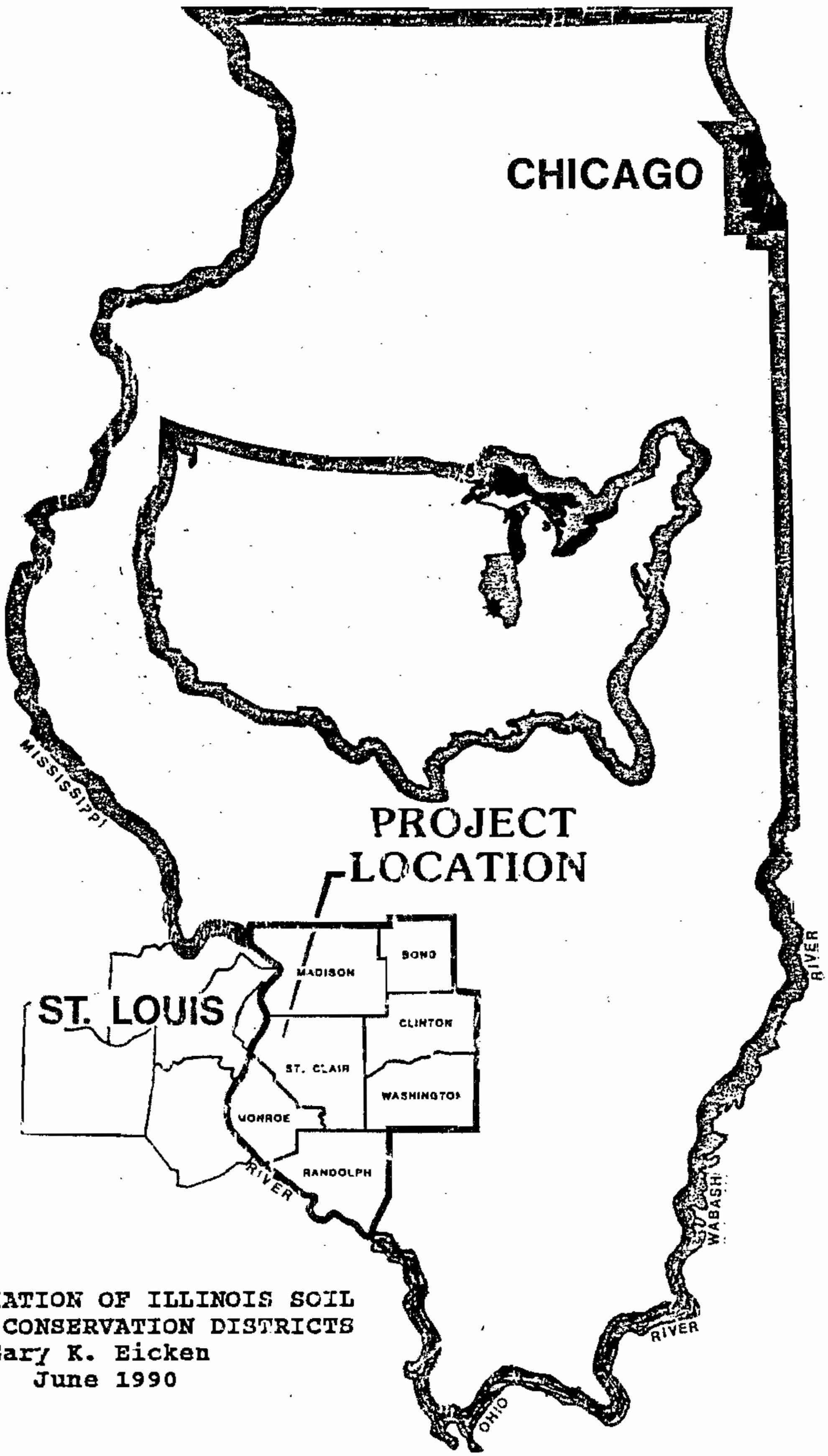
FRANK HOLTEN
LAKE WATERSHED INVENTORY



by: THE ASSOCIATION OF ILLINOIS SOIL
AND WATER CONSERVATION DISTRICTS
Gary K. Eicken
June 1990

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ACKNOWLEDGEMENTS

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The Association acknowledges the USDA Soil Conservation Service, U.S. Army Corps of Engineers, St. Louis District, the Illinois Environmental Protection Agency, the Illinois State Water Survey and the Illinois Bureau of the Budget - Illinois State Data Center for their help and the data they provided for this report.

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INTRODUCTION

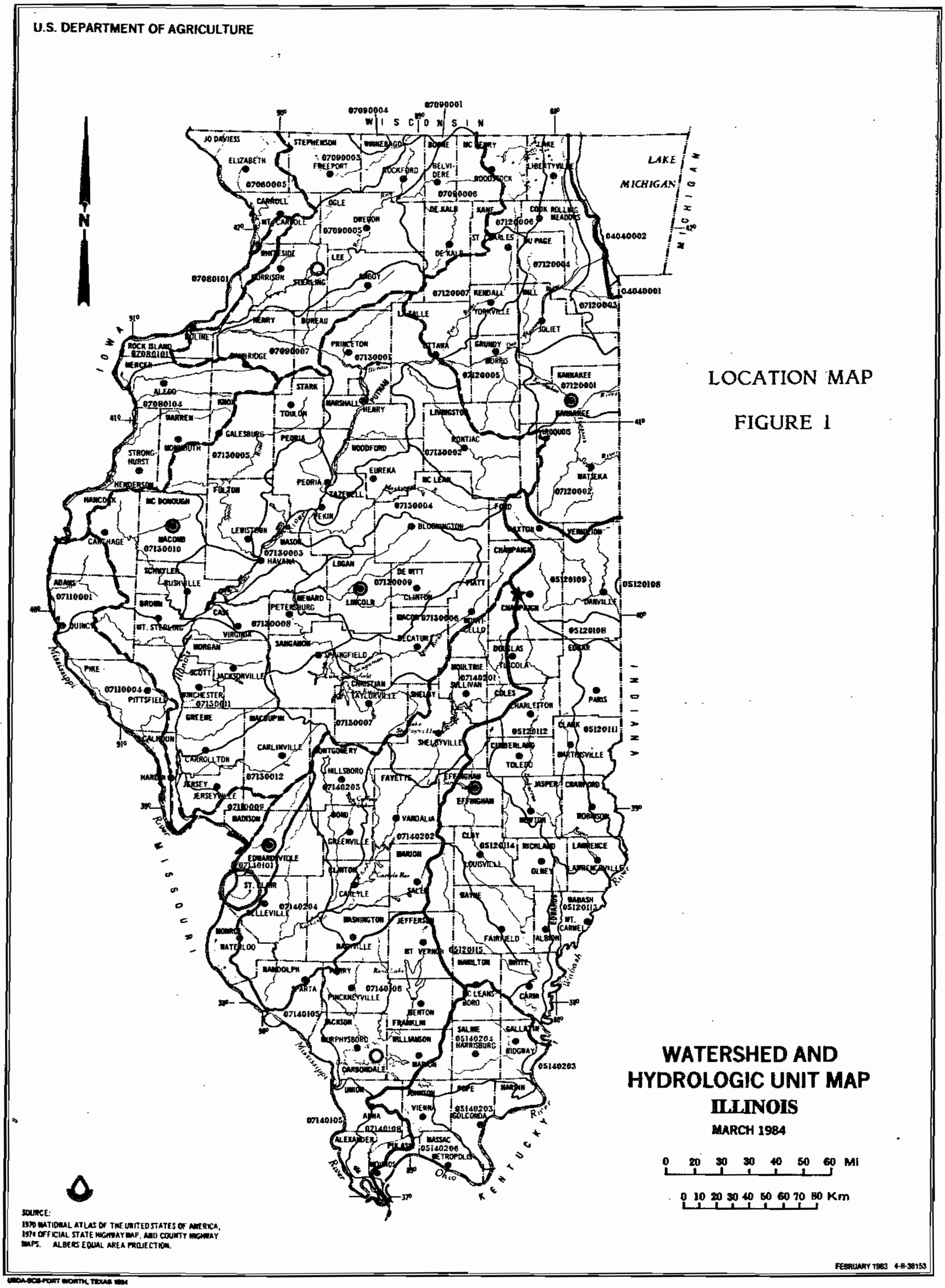
Frank Holten State Park is located near the cities of East St. Louis and Centreville in St. Clair County, Illinois. It is located in the American Bottoms adjacent to the bluffs which parallel the Mississippi River. The Frank Holten State Park watershed encompasses portions of the cities of Alorton, Belleville, Caseyville, Centreville, East St. Louis, Fairview Heights and Washington Park. The park contains three lakes that acted as natural detention basins for Harding Ditch. Harding Ditch has since been rerouted around lake number 3, and an inverted siphon has been constructed between lakes 2 and 3 so water levels will be maintained between the lakes.

Harding Ditch is a tributary to the Mississippi River and is extensively leveed and channelized. Tributaries to Harding Ditch include Little Canteen and Schoenberger Creeks. Little Canteen Creek enters Harding Ditch at the B&O Railroad bridge which is near the City of Caseyville. Schoenberger Creek is the principal tributary to Harding Ditch and enters from the east from the southern part of St. Clair Avenue. Figure 1 shows the location of the Frank Holten Watershed in Illinois.

The Frank Holten Lake watershed is located in Hydrologic River Basin Number 07140101, watershed number 050 and encompasses subwatershed number 52 and a portion of subwatershed number 51. There are approximately 37.2 square miles or 23,821 acres in Frank Holten watershed. Table 1 lists the acres in Frank Holten watershed in comparison with the River Basin, HU watershed and subwatersheds. Figure 2 shows the location of Frank Holten watershed in St. Clair County.

TABLE 1
Frank Holten Watershed Acreage Breakdown per
River Basin, Hydrologic Watershed and Subwatershed

Hydrologic Unit Numbers		Total acres in H.U.	Frank Holten W/S acres per unit.	Percent of W/S in HU's
River Basin	07140101	545,550	23,821	00.04
Watershed	050	101,090	23,821	24.00
Subwatershed	51	50,190	15,601	31.00
Subwatershed	52	8,220	8,220	100.00


U.S. DEPARTMENT OF AGRICULTURE
LOCATION MAP
FIGURE 1
WATERSHED AND
HYDROLOGIC UNIT MAP
ILLINOIS
MARCH 1984
0 20 30 30 40 50 60 MI
0 10 20 30 40 50 60 70 80 Km
N
WISCONSIN
IOWA
MISSOURI
KENTUCKY
INDIANA
LAKE MICHIGAN
MICHIGAN
SOURCE:
1970 NATIONAL ATLAS OF THE UNITED STATES OF AMERICA,
1974 OFFICIAL STATE HIGHWAY MAP, AND COUNTY HIGHWAY MAPS. ALBERS EQUAL AREA PROJECTION.
FEBRUARY 1983 4-R-38153
USDA-SCS-FORT WORTH, TEXAS 1984

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

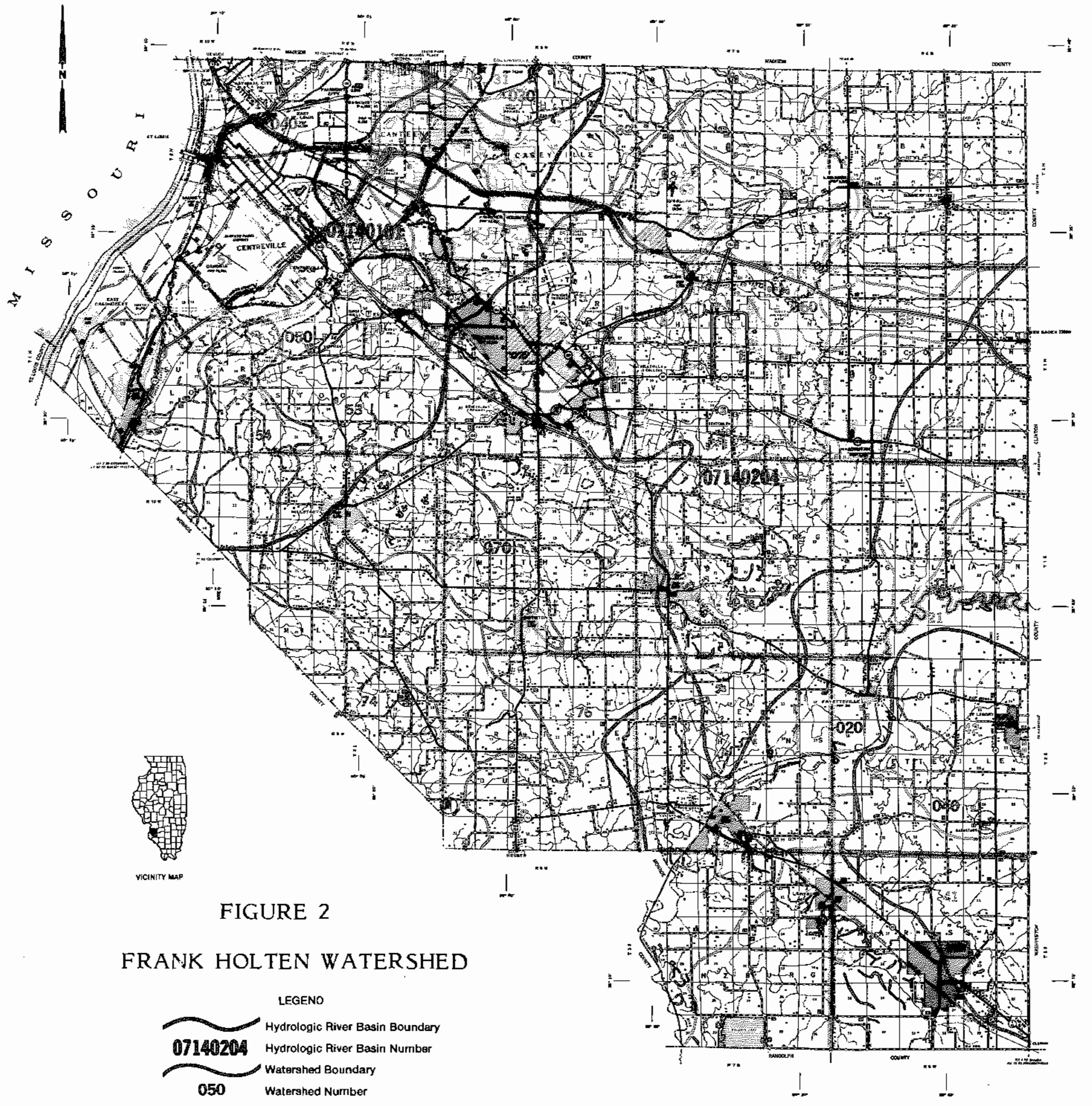


FIGURE 2

FRANK HOLTEN WATERSHED

LEGEND

Hydrologic River Basin Boundary

07140204 Hydrologic River Basin Number

Watershed Boundary

050 Watershed Number

Subwatershed Boundary

42 Subwatershed Number

HYDROLOGIC UNIT MAP

ST. CLAIR COUNTY, ILLINOIS

0 1 2 3 4 5 MILES

0 1 2 3 4 5 KILOMETERS

Source: 1982 Illinois General Highway Map And Information From SCS Field Personnel. Polyconic Projection.

JULY 1985 4-R-39364-I

USDA-SCS-NATIONAL CARTOGRAPHIC CENTER, FT. WORTH, TX.-1986

WATERSHED CHARACTERISTICS

Climate

Illinois experiences a continental climate due to its location midway between the Continental Divide and the Atlantic Ocean, and is also north of the Gulf of Mexico. A continental climate experiences cold, relatively dry winters and warm, wet summers. Three air masses dominate Illinois during the year. Illinois receives the coldest, driest air most commonly experienced in the winter from Canada. The warmest most humid air mass found in the summer originates over the Gulf of Mexico. While losing its moisture through precipitation on the windward side of the Rocky Mountains, the third air mass develops over the Pacific Ocean and brings Illinois its mild, dry air. Any one of these air masses can be found over Illinois in any season, creating the variable weather the state experiences.

Precipitation

It has been shown in studies by the Illinois State Water Survey that cities with populations of a million or more can create increased precipitation above and immediately downwind of the city. For this reason, the Frank Holten watershed may experience increased precipitation due to its immediate downwind proximity to the city of St. Louis, Missouri.

Average annual precipitation for this area is nearly 37 inches per year based on a record period from 1951 to 1980 as recorded by the weather station in Belleville, Illinois. (Source: Wayne Wendland, Illinois State Water Survey, Champaign, Illinois) Table 2 lists the mean annual precipitation by month. These figures reflect both rainfall and snowmelt.

TABLE 2
Mean Average Precipitation per Month
Belleville, Illinois - 1951-1980

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1.91	2.20	3.44	3.74	3.85	3.98	3.36	3.29	3.18	2.37	2.92	2.51

Average Annual Precipitation 36.75 inches

Growing Season

The mean length of the growing season in the Frank Holten Watershed is 195 days. This is the number of days between the last frost in the spring and the first frost in the fall which usually occurs in the latter part of October. This area experiences 3800 mean growing-degree days which is calculated by using a base temperature of 50 degrees Fahrenheit, and a maximum temperature of 86 degrees Fahrenheit. This is based on the fact that temperatures below 50 and above 86 inhibit plant growth. Figures 3 shows first fall frost and mean growing season. Figure 4 represents mean growing degree days.

Temperature

Frank Holten watershed is located in the mid-south temperature region of Illinois. Table 3 lists mean average, mean average minimum and mean average maximum temperatures for this area. The following information was collected by the weather station in Belleville, Illinois (Source: Wayne Wendland, Illinois State Water Survey, Champaign, Illinois)

TABLE 3
Mean Average, Minimum and Maximum Temperatures
(in Degrees Fahrenheit)

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
AVE	29.8	43.6	43.8	56.2	65.2	74.1	77.7	75.7	68.9	57.7	50.4	35.1
MIN	20.8	25.1	33.6	45.1	53.6	62.7	66.3	64.1	56.6	45.1	45.9	26.7
MAX	38.7	44.0	54.0	67.3	76.7	85.6	89.1	87.2	81.2	70.2	54.8	43.4

Mean Annual Temperature	55.3
Mean Min. Annual Temperature	44.5
Mean Max. Annual Temperature	66.0
Mean Annual Heating Degree Days	4818
Mean Annual Cooling Degree Days	1320

Snowfall

The mean annual snowfall for the watershed is 16.4 inches. The mean annual number of days with 3 or more inches of snow on the ground is 10. The fifty year maximum annual snowfall for this area is between 40 and 45 inches. This means that once in 50 years, this area can expect as much as 40 to 45 inches of snow. The mean average annual snowfall for this area is 4.7, 3.9, 3.7, 0.6, 1.5 and 2.0 inches for the months of January, February, March, April, November and December respectively.

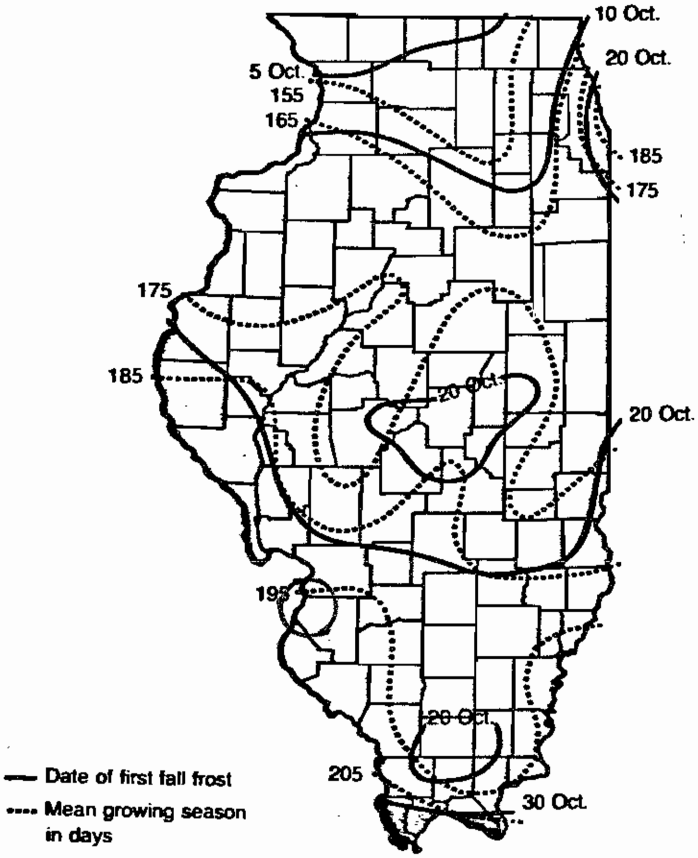
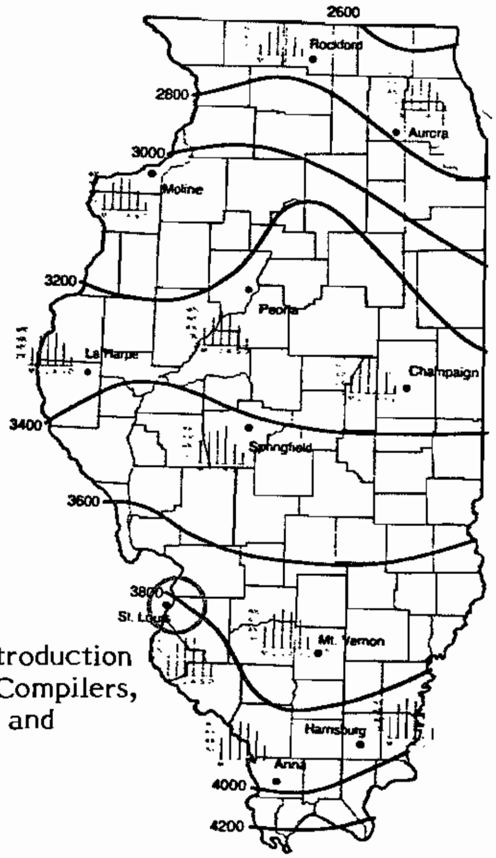


FIGURE 3

DATE OF FIRST FALL FROST AND MEAN GROWING SEASON IN DAYS.

FIGURE 4

MEAN GROWING-DEGREE DAYS FROM MAY TO OCTOBER, INCLUDING MONTHLY GROWING-DEGREE DAYS FOR SELECTED LOCATIONS.



SOURCE: The Natural Resources of Illinois, Introduction and Guide, R. Dan Neely and Carla G. Heister, Compilers, Illinois Natural History Survey, Dept. of Energy and Natural Resources, State of Illinois.

Wind

Wind direction and speed are variable. On the average, wind speed is approximately 9 miles per hour in the summer and about 12 miles per hour in the winter. Greater wind speeds are experienced due to a change in weather patterns causing such elements as thunderstorms and tornadoes. Generally, southwesterly winds (moving in a northeasterly direction) are experienced in the summer, while northwesterly winds (moving in a southeasterly direction) are most commonly experienced in the winter due to masses of Canadian air. Local wind direction and speed will vary due to topography, distance from buildings, trees and other obstructions.

Geology and Physiography

The Frank Holten Lake watershed is in the Till Plains Section of the Central Lowland Province of the United States (Figure 5). The drainage area is within the Springfield Plain Division. Cahokia Creek intersects the northwestern portion of the county and empties into the Mississippi River by St. Louis.

The geological formations that appear above the surface in this county comprise the usual Quaternary deposits (Figure 6). The lower three hundred feet or more make-up the Coal Measures, and the upper portion of about three hundred feet is Sub-carboniferous limestone. The Quaternary deposits include surface deposits of marl, clay, sand and gravel. These are found on the surface of St. Clair County in depths ranging from twenty to one hundred and fifty feet.

Cahokia Alluvial beds make up the Mississippi bottoms in which Frank Holten State Park is located. The alluvial beds consist of marly clays and sands which make up the loess that covers the river bluffs; and heavy deposits of clay, sand and gravel that cover the stratified rocks in the central and eastern portions of the county. These alluvial deposits consist of clay and sands deposited by river currents and from material washed down from the highlands by rains.

The loess which is found in St. Clair County is of variable thickness, ranging from one hundred feet on the western side of the bluffs adjacent to the American Bottoms, and thinning to about 10 feet in the southeastern corner of the county. The parent material (loess) consists of three stratigraphic units: Peoria Loess, Robein Silt and Roxana Silt. Peoria Loess and Roxana Silt are Wisconsinan in age. The Robein Silt, when found, is located between the upper layer of Peoria Loess and the lower layer of Roxana Silt.

The surface of St. Clair County is generally rolling, but becomes broken and hilly near the bluffs. There is an alluvial bottom land which ranges in width from six to eight miles between the bluffs and the Mississippi River. The soils in the bottom land are exceedingly fertile.

PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

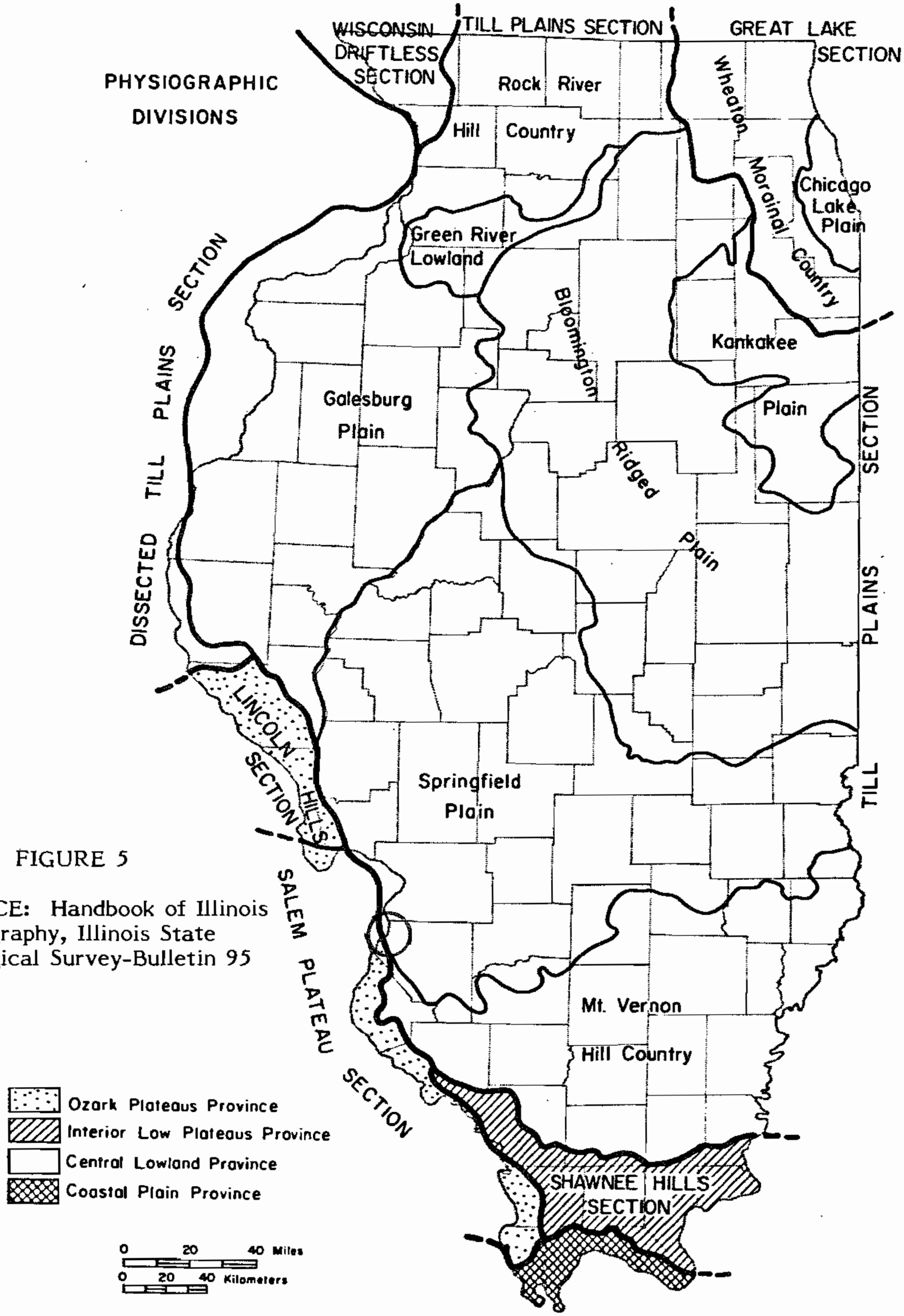


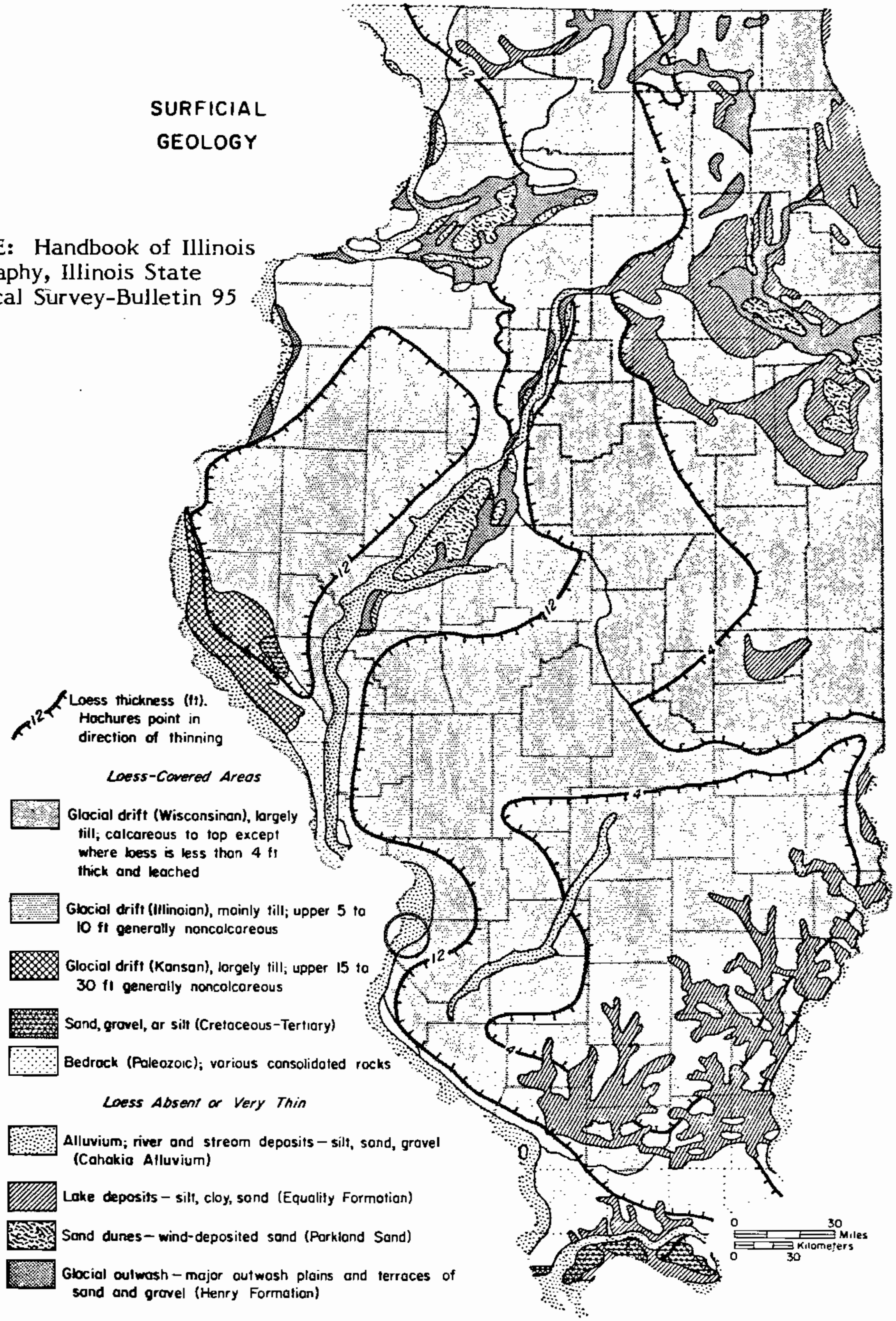
FIGURE 5

SOURCE: Handbook of Illinois Stratigraphy, Illinois State Geological Survey-Bulletin 95

—Physiographic divisions of Illinois (after Leighton et al., 1948).

FIGURE 6

SOURCE: Handbook of Illinois Stratigraphy, Illinois State Geological Survey-Bulletin 95



—Generalized surficial geology of Illinois. In uneroded areas the loess thins from 25-100 feet thick in the bluffs of the major valleys to 1-2 feet in areas farthest from the valleys.

SOILS

The soils found in the Frank Holten Lake Watershed are found within four (4) Soil Associations. The watershed is characterized by loess soils which are found in the uplands, and clayey to sandy soils which are found in the floodplains. There are approximately 12 soils represented in the four associations which are described below. For more specific information, these associations can be found in the "Soils of Illinois," Bulletin 778, which is a University of Illinois, College of Agriculture and USDA Soil Conservation Service publication. Specific information regarding the soils found in this watershed may also be obtained from the "Soil Survey of St. Clair County, Illinois," a USDA Soil Conservation Service/Illinois Agricultural Experiment Station publication.

Soil Associations:

Floodplain

Lawson-Sawmill-Darwin Association -- This association occurs in all of the major floodplains of the state, as well as in the medium and minor floodplains that drain areas of dark-colored soils. It is one of the most widespread associations in the state. The soils found in this association were formed in stratified clayey to sandy alluvium under prairie grasses or deciduous forest. Most of these soils are nearly level, but some are gently sloping. Permeability ranges from very slow to moderate. The Landes soil found in the watershed is the only soil in this association which has rapid to moderately rapid permeability. The soils in this Association are dark or moderately dark-colored, and a few have sandy textures.

The major problems with these soils are flooding and wetness. Many of the soils in the watershed have been urbanized and the soil series number so designates this by listing a "U" before the number. Corn and soybeans are the principal crops grown on the soils under cultivation. These soils respond well to good management. Erosion is not generally a problem with these soils.

Plano-Proctor-Worthen -- These dark-colored soils occur on nearly level to sloping glacial outwash plains and alluvial terraces. A few occur on sandy loam till or drift plains. The soils in the association formed under grass in various thicknesses of loess or silty material over mainly stratified silty, loamy or sandy sediments and range from very poorly drained to well drained.

The major problems with the soils of this association are drainage on wet soils and erosion of sloping soils. Restricted permeability is a problem in a few areas. Erosion control practices are needed on the sloping areas. Most of these soils are very productive with corn and soybeans being the principal crops.

Haymond-Petrolia-Karnak -- This association occurs in large and small floodplains in the southern half of Illinois, and in the western and northwestern parts of the state in floodplains draining areas of light-colored soils. They were formed in stratified clayey to sandy alluvium under deciduous forest. They are low to medium in organic matter content, and have light colored surfaces. Most are nearly level but some are gently sloping.

The major problems on these soils are flooding, wetness and low organic matter content. Permeability is slow or very slow.

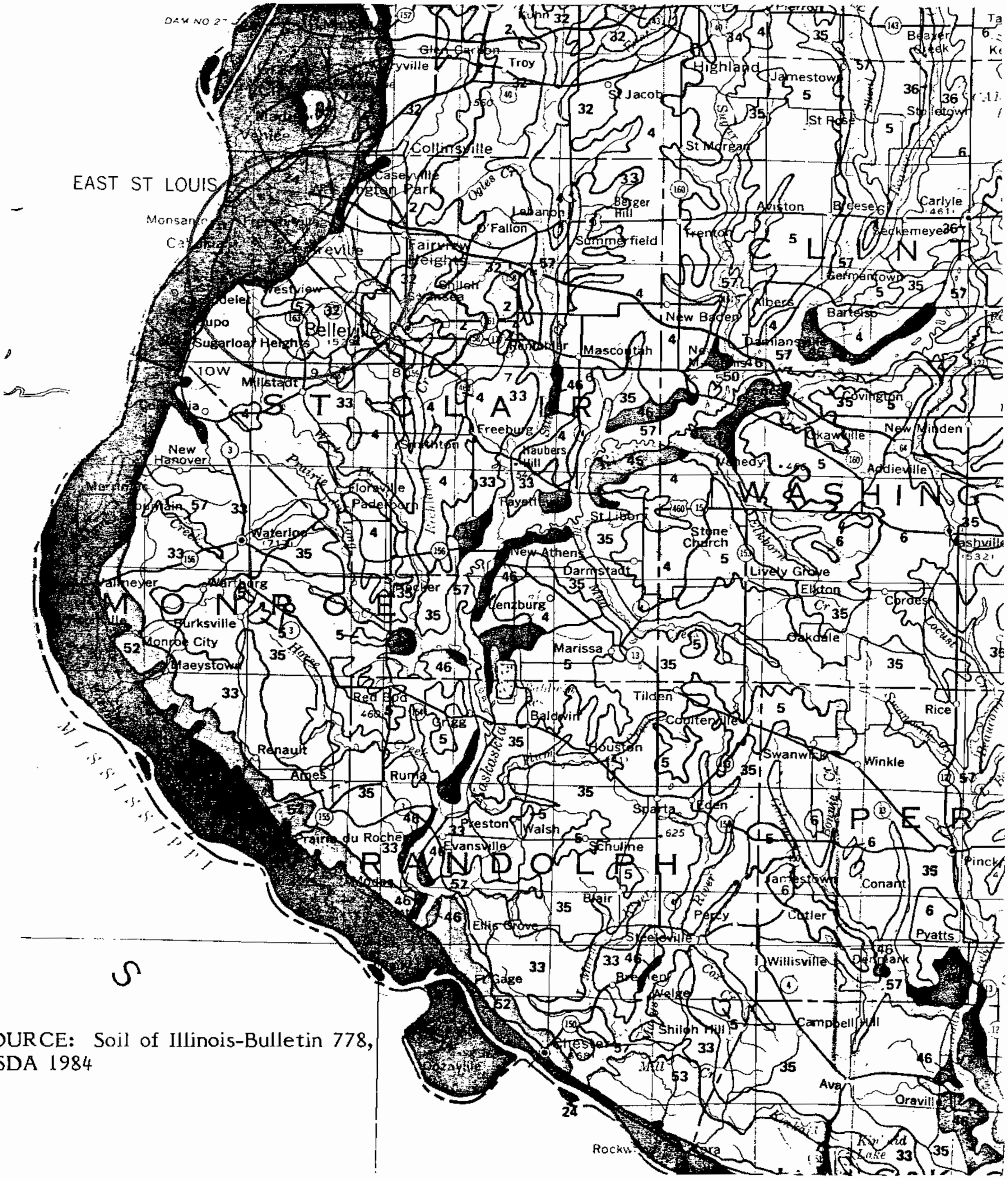
Uplands

Fayette-Rozetta-Stronghurst -- Fayette is the most prominent soil represented in this association found in the watershed. This association occurs in northwestern and western Illinois along the valleys of the Mississippi and Illinois rivers in the upland, thick loess areas. These soils occur in the bluff area adjacent to the valley. Permeability for the soils in this association range from very slow to moderate.

Erosion and fertility are two of the major problems in this association. Any sloping soil in this area will have serious erosion problems; and because of unfavorable properties in their subsoils, the sloping or steep soils that have paleosolic influence are even more vulnerable to erosion than the loess soils. Proper soil erosion control systems should be used on all sloping soil areas. These soils are not suitable for cultivation, and special considerations need to made if used for urban development. Figure 7 shows the soil associations for this area.

FIGURE 7

SOIL ASSOCIATION MAP OF FRANK HOLTEN WATERSHED



SOURCE: Soil of Illinois-Bulletin 778, USDA 1984

Soil Loss

The soils in the American Bottoms consist of Riley, Darwin, Landes, Littleton, Beaucoup, Wakeland, Dupo, Hammond and Urban. Riley and Darwin are the most prevalant soil type found in the bottom land of the watershed. The major limitation for the majority of these soils is wetness. Calculations of Universal Soil Loss Equation (USLE) using a Corn-Soybean rotation with a "P" factor of 1 (designating no conservation practices) show that these soils are eroding at rates of 2 to 3 tons per acre per year. Under normal management without applying conservation practices, these soils have an erosion rate which is below tolerable ("T") levels as so designated by the State of Illinois "T by 2000" plan. Tolerable soil loss is the amount of soil (in tons) which a soil type can lose per year and still maintain its natural productivity. A soil's natural productivity is being diminished when soil loss is above the "T" value. The "T" values established for the soils in the bottoms range from 3 to 5 tons of soil loss per acre per year.

The soils found in the upland portion of the watershed are rolling to very steep. Fayette, Sylvan-Bold and some Wakeland are the soil types found in the uplands. Erosion is a limiting factor, and control measures are needed if soil erosion is to be reduced. National Resource Inventory (NRI) data is not available on a watershed by watershed basis, nor is it accurate on a county basis. The soils in the county are not digitized. Digitizing would make them readily available for figuring exact acreages in order to arrive at figures for soil loss by soil type. For the purpose of this report, the USLE was used to calculate erosion in tons per acre per year for each soil mapping unit. Set conditions were used to give a representative example of erosion rates which may be experienced in the watershed. The "K" and "LS" factors used were taken from the materials developed by the St. Clair County Soil and Water Conservation District for the development of conservation plans to address the conservation of Highly Erodible Land (HEL) for the 1985 Food Security Act. The "T" value established for the soils in the upland is 5 tons per acre per year with exception of 962E3 (Sylvan-Bold) which has a "T" value of 4 tons per acre per year.

The USLE formula is: R x K x LS x C x P = A

R = Rainfall factor (rainfall factor for this area is 200)
K = Soil Erodibility factor
LS = Length and steepness of slope factor
C = Cropping and management factor
P = Conservation practices factor (a factor of 1 was used)
A = the computed average annual soil erosion loss in tons per acre

The erosion rates in Table 4 were computed using the above formula and a "C" factor of 0.235 which is based on a Corn-Soybean rotation using a chisel/disk system with 32% residue remaining on the surface after planting.

TABLE 4
Soil Loss Based on Erodibility of the Soil Type

Soil Type	Using C Factor	Soil Loss - Tons per acre per year	Using C Factor	Soil Loss - Tons per acre per year
962E3	.235	93	.01	4
962G	.235	255	.01	11
280B	.235	9	.12	5
280B2	.235	13	.09	5
280C2	.235	25	.05	5
280D2	.235	50	.02	4
280E	.235	100	.01	4
280G	.235	310	.01	13

962E3 & 962G - Sylvan-Bold silt loams
280B, 280B2, 280C2, 280D2, 280E and 280G - Fayette silt loam

The above table is only representative of the erosive potential these soils possess. It needs to be noted that without exact acreages of each soil type under cultivation, and the cultural and mechanical practices used on those acres, a total erosion rate for the uplands in the watershed cannot be computed.

A substantial portion of the acres in the upland are in pasture, woodland or urban development. In order to get the C, D and E slopes under cultivation to tolerable soil loss levels, a "C" value of those represented in column 4 in Table 4 would have to be established which would require a system of no-till, and a rotation of Corn-Soybeans-Wheat with a number of years of meadow. Their best suitability is for pasture or woodland.

Since the re-routing of Harding Ditch between lakes 2 and 3, the sediment delivered to lake 3 from the uplands has been reduced considerably. Flooding and the over-topping of the levees along Harding Ditch remain a source of sedimentation to the lakes.

Erosion Conditions

The following information was reproduced directly from the U.S. Army Corps of Engineers, St. Louis District Draft Reevaluation Report and Environmental Assessment - Cahokia Canal - Harding Ditch Areas; East St. Louis and Vicinity, Illinois Interior Flood Control Project; February 1984, revised August 1985 (Tables 5-7).

The following data also contains and includes Canal No. 1. Canal No. 1 is not included or incorporated into any other portion of this Frank Holten Watershed Inventory Report. This information was included in order to make the resource data base of this report as inclusive as possible.

The following conclusions and recommendation were also proposed by the Soil Conservation Service:

Conclusions:

The strongest interest in reducing erosion and sediment deliveries is in the bottom land areas where sediment damages occur. Upland interest is questionable.

A major need is to reduce peak runoff volumes and rates. The steeply sloping lands produce higher runoff volumes than the channel systems can contain. This results in channel and channel bank erosion.

The major erosion and sediment source is from the slopes in excess of "C" (over 10-12 percent) which are being cropped.

Recommendations:

Enactment by communities and/or the county of stormwater runoff detention ordinances to reduce runoff volumes and peaks, or at least not to increase these effects as a result of development.

Enactment of erosion control ordinances by communities to prevent increased erosion and sedimentation resulting from development activities.

With the Madison and St. Clair SWCDs, target activities through an ACP special project for changing land use (cropland to grass) on acreage eroding in excess of 20 tons per acre annually.

There should be no consideration given to the use of a PL-566 watershed protection project for this area due to the scattering of the problem acreages.

TABLE 5

Harding Ditch Upland Drainage - Total Watershed

Present & Future Condition Land Use - Erosion & Sediment Delivery Summary

Land Use	Present Conditions (1983)							Future (2003)1/		
	Drainage		Erosion	Gross Erosion		Sed. Delivery		Drainage	Sediment	Sediment
	Acres	%	Ton/Ac	Tons	%	Ratio	Tons	Acres	Tons	Tons
Developed Land	4,450	23.4	0.5	2,225	1.9	0.56	1,246	8,890	4,445	2,490
Woodland & Brush	8,640	45.5	0.9	7,776	6.5	0.56	4,354	6,205	5,585	3,128
Cropland-Total2/	3,940	20.7		93,603	78.5		63,143	2,480	74,804	51,336
"A" Slopes	430	-	2.4	1,032	-	0.44	453	400	960	422
"B" Slopes	1,875	-	7.6	14,250	-	0.60	8,551	770	5,852	3,511
"C" Slopes	315	-	20.1	6,333	-	0.61	3,862	115	2,313	1,409
"D" Slopes	525	-	34.2	17,955	-	0.64	11,491	460	15,732	10,068
"E" Slopes	440	-	68.1	29,964	-	0.70	20,975	380	25,878	18,115
"F-G" Slopes	355	-	67.8	24,069	-	0.74	17,811	355	24,069	17,811
Grassland-Grazed	910	4.8	8.0	7,280	6.1	0.55	4,004	635	5,080	2,784
-Ungrazed	905	4.8	2.0	1,810	1.5	0.55	996	635	1,270	700
Water Area-Ponds	130	0.7	-	-	-	-	-	130	-	-
Disturbed Land	25	0.1	60.0	1,500	1.3	0.54	810	25	1,500	810
Streambank-Channels	-	-	-	2,690	2.3	1.00	2,690	-	2,690	2,690
Roads - Roadsides	-	-	-	390	0.3	0.32	124	-	390	124
Gullies	-	-	-	1,900	1.6	0.56	1,064	-	1,900	1,064
TOTAL	19,000	100.0	-	119,174	100.0	-	78,431	19,000	97,664	65,126
						Reduction		(%)	18.0	17.0

1/Future Condition Reflects Urban Development (20 years) only.
2/Cropland - Total includes All Cropland Slopes.
Note: Erosion - Ton/Acre is Average Erosion Rate.
Erosion Rate, Sediment Delivery Ratio, and Cropland breakdown by slopes were based on data from the Cahokia Canal Study.

TABLE 6

RESOURCE PROTECTION MEASURES

COSTS:	Units	Quantity	Unit Cost $	Total Cost $
Land Use Change to Grass	Acre	1,406	$100	$140,600
Chisel Tillage and Management	Acre	1,264	15	19,000
No-till Tillage and Management	Acre	840	20	16,800
Pasture Seeding and Management	Acre	910	100	91,000
Pasture Fertilization and Management	Acre	905	50	*45,200
Water Control Measures	Acre	4,800	50	240,000
Stormwater Ordinances	(Locally adopted - noncost)			
Construction Costs				552,600
Technical Assistance	(15% of construction)			83,000
Administrative	(10% of construction)			55,400
Total Installation				$691,000

*This is a production practice need only. Thus the cost of this alternative could be reduced by $56,500.

TABLE 6 (cont.)

RESULTS:

Land Use	Acres	Present Condition Erosion Tons	Present Condition Sediment Tons	Future with Treatment Erosion Tons	Future with Treatment Sediment Tons
Developed Land	4,450	2,225	1,246	2,225	1,246
Woodland - Brush	8,640	7,776	4,354	7,776	4,354
Cropland-"A" Slopes	430	1,032	454	1,032	454
Changed to Grass	1,406	74,589	51,864	1,406	959
Other Cropland	2,104	17,982	10,825	7,791	4,470
Grassland - Reseeded	910	7,280	4,004	1,820	1,001
Other grassland	905	1,810	996	1,810	996
Water Areas - Ponds	130	-	-	-	-
Disturbed Area	25	1,500	910	1,500	810
Streambank - Gullies 1/	-	4,590	3,754	2,295	1,877
Roads - Roadsides	-	390	124	390	124
Totals	19,000	119,174	78,431	28,045	16,291
Reduction (tons)				91,129	62,140
(percent)				76.5	79.2

1/It was assumed that water control measures would reduce erosion and sediment delivery about 50%.

TABLE 7

MEASURES FOR CRITICAL ERODING AREAS

COSTS:	Units	Quantity	Unit Cost $	Total Cost $
Land Use Change				
Cropland - "B-C" Slopes	Acres	86	$100	$ 8,600
"D" Slopes	Acres	525	100	52,500
"E" Slopes	Acres	440	100	44,000
"F-G" Slopes	Acres	355	100	35,500
Critical Area Treatment				
Disturbed Land	Acres	25	300	7,500
Construction Costs				148,100
Technical Assistance	(15% of construction)			22,200
Administrative	(10% of construction)			14,800
Total Installation				$185,100

RESULTS:	Present Condition		Future W/Treatment	
Erosion Areas	Erosion Tons	Sediment Tons	Erosion Tons	Sediment Tons
Cropland (L.U.C. to grass)	74,589	51,864	1,406	959
Disturbed area (25 acres)	1,500	810	50	27
All other sources	43,085	25,757	43,085	25,757
Total	119,174	78,431	44,541	26,743
Reduction (tons)	-	-	74,633	51,688
(percent)	-	-	62.6	65.9

Capability Classification

The Land Capability Sub-Classification indicates the major hazards or limitations of that soil mapping unit to which it is associated. Within the soil capability system, soils are grouped at three levels; the capability class, the subclass and the management group. For example, a soil with the capability classification IIIe-2, the Roman numeral designates the capability class (degree of limitation), the small letter is the subclass (kind of limitation), and the Arabic numeral identifies the management group. Within the subclass, the letter e shows that the main limitation is the risk of erosion; the w shows that the limitation is wetness. A soil may have more than one limitation, but for classification purposes, the most limiting factor is listed.

The soils found in Frank Holten Lake Watershed fall within the following capability classifications: I-2, IIe-1, IIw-2, IIw-3, IIIe-1, IIIw-5, IIIs-1, IVe-2, VIe-1, VIe-2 and VIIe-1. Soils within the watershed which are designated as "urban" are not listed within a capability grouping because the groupings are based on the suitability of soils for the production of field crops.

Class I through IV land is suitable for cultivated crops. In order to maintain a sustained level of productivity, land within Class II through IV require some kind of conservation practices, be it cultural and/or mechanical. Classes V through VIII are limited to use as pasture, woodland or wildlife habitat.

The soils found in the Frank Holten Lake Watershed exhibit either erosion or wetness as their major limitation, and are almost equally divided between the two limitations. The soils in the upland are limited by the potential for erosion, while the bottom land soils possess limitations due to wetness. Land capability classes found in the watershed are described below.

<u>Land Suited for Cultivation and Other Uses:</u>

<u>Class I</u> soils have few limitations that restrict their use.

<u>Class II</u> soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

<u>Class III</u> soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

<u>Class IV</u> soils have very severe limitations that reduce the choice of plants or require very careful management, or both.

<u>Class VI</u> soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland and or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland or wildlife habitat.

LAND USE AND COVER CONDITIONS

Urban Land

Frank Holten Lake Watershed possess urbanization throughout the entire 37 square mile area. The watershed is located in the St. Louis Metropolitan East area which consists of the cities of Alorton, Belleville, Caseyville, Centreville, East St. Louis, Fairview Heights and Washington Park. Urban sprawl is rapidly moving to the east with ever increasing development which includes business, industry and housing.

The following land uses are considered urban: Airports, Cemeteries, Commercial sites, Construction sites, Golf courses, Industrial sites, Institutional sites, Playgrounds with permanent structures, Public administration sites, Railroad yards, Residences, Sanitary landfills, Sewage treatment plants, Water control structures and spillways.

The Frank Holten Watershed is dissected by many highways and interstates. The development of I-255 which runs between lakes 2 and 3 advised Lake 3 to be dredged. This was due to an agreement between the Illinois Department of Transportation and the Department of Conservation as part of a wetland mitigation effort.

Table 8 reflects the populations of the communities listed above based on information gathered from the Illinois Bureau of the Budget - Illinois State Data Center in Springfield, Illinois. Given are the figures from the 1980 census. The 1988 populations are based on estimated trends by the Illinois State Data Center which are established every two years. Information from the 1990 census is not yet available.

TABLE 8
POPULATION

	1980 Census	Estimated 1988 Census
Alorton	2,237	2,710
Belleville	41,580	44,090
Caseyville	4,308	4,480
Centreville	9,747	10,250
East St. Louis	55,200	47,260
Fairview Heights	13,862	13,250
Washington Park	8,223	8,760

Agriculture

Agricultural lands are those lands used for the production of agricultural commodities which would include corn, soybeans, small grains, vegetables, woodland, pasture and hayland. Production in the upland portion of the watershed consists of a corn-soybean-wheat rotation. Although agricultural production is present, the projected trend will be a steady increase in population accompanied by conversion of agricultural land to urban land use. Pasture, hayland and woodland are also predominate in the upland. Bottom land production is infuenced by the Metro St. Louis area and is more diversified. Corn and soybeans along with horseradish, sweet corn, tomatoes and other vegetable crops are grown in the bottom land section of the watershed.

It is projected that conversion of land from agriculture to urban land use will occur in the bottoms. It will be at a slower rate than the uplands due to a decline in population which has been experienced since about 1970. Population levels are not projected to return to those of 1970 until the year 2010.

Mining

Mining land consists of any land in which excavation has occurred for the purpose of extracting ores or minerals. Mining within the Frank Holten Watershed consists of coal mines and borrow pits. Although some surface coal mining has occurred in the upland portion of the watershed, the most significant amount of mining has been underground. The City of Belleville has been extensively undermined in the past.

WATERSHED HYDROLOGY

Floods

Flooding is a prime concern in the bottom land area of the watershed. Even though the East St. Louis area is well protected against flooding from the Mississippi River, there has been a history of flooding in the watershed. Flooding problems for the bottom land area are caused by surface water flooding and groundwater flooding. Flooding is also caused by insufficient ditch capacity and the lack of topographic relief to remove the water at a faster rate.

Flooding in the bottom land is caused by ponding during heavy rains. With a high water table, the soil's ability to hold additional water is limited. A higher water table in the bottoms is due to higher than normal precipitation, longer than normal durations of flood stages on the Mississippi River, and a decline in pumpage by industry, municipal and domestic water supplies. This interior flooding can occur whenever there is heavy rainfall, even if the Mississippi stages are not high enough to close the main system gravity drains.

Flooding due to surface water has increased because of the amount of urbanization which has and is occurring within the watershed. Increased runoff of stormwater from the uplands into the bottom lands causes overtopping of the channels or levee failures. Backwater flooding is also a problem which is caused when the volume of stormwater exceeds the capacity of the gravity outlets and pumping stations within the system.

The most recent damaging floods on record occurred in April of 1979 and April/May of 1983. The most severe flooding in this area occurred in August of 1946, June of 1957 and May of 1961. Table 9 lists the maximum rainfall and depth of flooding.

TABLE 9
Flooding due to Rainfall Events

Date of Storm	Maximum Rainfall	Average Depth
August 13-18, 1946	19.5"	15.1"
June 14-14, 1957	14.4"	8.2"
May 5-9, 1961	10.8"	8.1"

(Source: Draft Reevaluation Report and Environmental Assessment Cahokia Canal - Harding Ditch Areas; East St. Louis and Vicinity, Illinois Interior Flood Control Project, U.S. Army Corps of Engineers St. Louis District - February 1984, Revised August 1985.)

Streamflow

Data for existing stream flow can be obtained from the Illinois State Water Survey and/or the Illinois Environmental Protection agency. Table 10 lists the channel capacities of the various sections of streams in the Harding Ditch area. Table 11 lists the exceedence probabilities for Harding Ditch and Schoenberger Creek.

TABLE 10
Channel Capacities

Stream	Existing Capacity (CFS)
Little Canteen Creek 2000' Downstream of Illinois Highway 157	4,000
Little Canteen Creek Upstream of the B&O Railroad	1,500
Harding Ditch between Bunkum Road and Forest Blvd.	1,000
Harding Ditch between Forest Blvd. and Interstate 64	600
Harding Ditch between Interstate 64 and Confluence with Schoenberger Creek	1,000
Schoenberger Creek between Illinois Highway 157 and the 79th Street Bridge	4,000
Schoenberger Creek between 79th Street Bridge and the Mouth at Harding Ditch	1,600
Harding Ditch between Mouth of Schoenberger Creek and Lake Drive	2,500
Harding Ditch through Holten Park	3,900

TABLE 11
Flood Probability

Drainage Area (sq. miles)	Exceedence Probability .50	.20	.10	.04	.02	.01	.002	Standard Project Flood
Little Canteen Creek:								
7.8	1240	2300	3100	4120	4930	5780	7340	15,100
Schoenberger Creek								
12.0	1890	3450	4610	6260	7430	8680	11860	23,790

(Source: Reevaluation Report and Environmental Assessment - Cahokia Canal - Harding Ditch Areas; East St. Louis and Vicinity, Illinois Interior Flood Control Project; the Army Corps of Engineers, St. Louis District, February 1984, revised August 1985; the peak flows for Little Canteen Creek and Schoenberger Creek)

Water Quality

Frank Holten State Park has been involved in the Section 314 Clean Lakes Program since 1976. The Illinois Department of Conservation received funding through this program to re-route Harding Ditch past lake #3, to dredge lakes #2 & 3 and to build an inverted siphon under Harding Ditch between lakes #2 & 3. Phases I & II of the program have been completed. In 1989, the State of Illinois received Phase III dollars to implement monitoring programs in order to be able to determine whether or not the projects carried out during Phases I & II contributed to an improvement in water quality, recreational use and a reduction of sedimentation to the lakes. At the writing of this report, Phase III of this project had not been completed. Upon its completion, the results will be available from the Illinois Environmental Protection Agency in Springfield, Illinois.

The following information was obtained from the Illinois Water Quality Report 1986-1987, issued April 1988 by the Illinois Environmental Protection Agency. Listed is data which was obtained through the Section 314 Clean Lakes Program and the Ambient Water Quality Monitoring Network.

The problems identified under the Illinois Clean Lakes Program for Frank Holten are: Sedimentation, turbidity, nutrients, algal blooms, fish kills and degraded fisheries. Phase II of the project began 7/15/80 and was completed by 1/14/83. A total of $927,000 in Federal money was allocated to the project. The Illinois Natural History Survey conducted the monitoring, and the Illinois Department of Conservation wrote the report. Some of the protection/restoration measures were the relocation of Harding Ditch, removal of sediment and disposal and fisheries rehabilitation.

Basin assessment data on Harding Ditch from 1987 lists the degree of use support as Partial/Moderate. This means that Harding Ditch possesses partial support of the designated use with moderate impairment. The designated use for Harding Ditch is aquatic fish and wildlife. It is listed as having water quality limitations which are due to an abundance of nutrients, siltation, other habitat alterations and suspended solids which are all listed as a moderate degree of limitation. The sources of these limitations are urban runoff, channelization and nonirrigated crop production.

Assessment data for 1986-87 facility-related stream surveys lists Schoenberger Creek's designated use as aquatic fish and wildlife. It has a partial/moderate degree of use support with the water quality limitations caused by ammonia and nutrients from municipalities point sources and from nonpoint sources of surface runoff. Sediment data taken on Harding Ditch found 156.4 ppm of zinc and 7.3 ppb of Chlordane. These were due to point sources from municipalities, urban runoff and channelization.

WATER USES AND NEEDS

Groundwater

Groundwater is an important resource which is utilized by industry, municipalities, residential homes and farmers. The American Bottoms consists of a sand and gravel aquifer which possesses large quantities of groundwater. According to the Illinois Technical Advisory Committee on Water Resources, this area is estimated to have the potential of yielding 200,000 to 400,000 gallons per day per square mile. Depth to the aquifer ranges from very shallow to deep depending on location, and relation to upland or bottom land.

The levels of Lakes 1, 2, & 3 fluctuate based on the level of the water table. Ponding due to the high water table is a problem experienced in this area as has been previously discussed in the section on flooding. Because of the high water table, the amount of urbanization and the usage of groundwater by industry and agriculture, the potential for contamination is high and must be managed for protection. Contamination of the aquifer could also endanger the quality of the lakes due to their interaction.

Surface Water

Little Canteen Creek, Schoenberger Creek and Lakes #1, 2, & 3 are the bodies of surface water of concern in this watershed. Monitoring is ongoing as part of Phase III of the Section 314 Clean Lakes Program. The previous section on Water Quality lists the results of evaluations and monitoring conducted through various programs by IEPA.

The Illinois Environmental Protection Agency's publication Classification/Needs Assessment of Illinois Lakes for Protection, Restoration, and Management rank the Frank Holten Lakes in the following manner. Lake #3 is ranked #1 and scores 100 points, Lake #2 is ranked #4 and scores 85 points and Lake #1 is ranked #5 and scores 80 points for current water quality ranking of Illinois lake. Total possible points is 100 and is based on Carlson's Trophic Index; severity of the use impairment from sediment; and severity of use impairment by USEPA macrophytes.

BEST MANAGEMENT PRACTICES (BMP)

Implementation of programs on Frank Holten Lake and its watershed have been ongoing and managed by the Illinois Department of Conservation. The Illinois Department of Conservation and the USDA Soil Conservation Service have entered into a joint memorandum of understanding for the development of Hydrologic Unit Planning on watersheds above state lakes. A request has been made to the St. Clair County Soil and Water Conservation District and Soil Conservation Service for assistance.

The projects implemented through the Section 314 Clean Lake Program have made sizeable contributions to the protection of the lakes in the park, especially lake #3 due to the rerouting of Harding Ditch. Harding Ditch may still play a role in water quality degradation during flood conditions. Overtopping and levee breaks are problems which must continue to be addressed with Best Management Practices to reduce the potential for periodic input of sediment and/or nutrients to lake #3.

Ongoing efforts to reach "T" by 2000 in the upland portion of the watershed through the use of conservation practices (cultural and mechanical), special programs, land conversion and education is essential for the reduction of surface runoff to the tributaries of Harding Ditch. A reduction in the upland erosion rates will help in the reduction of levee overtopping due to less sediment being added to Harding Ditch which reduces its carrying capacity. Sediment removal would be required less often and would lower maintenance costs.

The St. Clair County Development Department and the municipalities within the watershed can play a key role in the reduction of sedimentation. The Department of Conservation and the local Soil and Water Conservation District should work towards the development of guidelines and ordinances for adoption by the county and municipalities in addressing urban construction. The use of sedimentation basins during construction and water retention and detention basins are needed to reduce runoff created by urban development. The county and municipalities should be encouraged to adopt and enforce these ordinances for the protection of the lakes.

Runoff from the Golf Course which is adjacent to the lakes could be contributing to the degradation of the lakes water quality. Management considerations should be taken in regard to the amounts of pesticides and nutrients used and the timing of their use to minimize the potential for contamination from runoff.

SUMMARY

The Frank Holten State Park Watershed consists of 23,821 acres or approximately 37.2 square miles. Little Canteen and Schoenberger Creeks outlet into Harding Ditch and are the major tributaries that drain the uplands. Harding Ditch is extensively channelized and leveed and now bypasses Lake #3 and outlets into the Mississippi River. The Frank Holten Watershed is located in Hydrologic River Basin 07140101, watershed #050 and encompasses subwatershed 52 and a portion of 51. Average annual precipitation for this area is 36.75 inches. The most common soil types found in

the bottom lands are Riley, Darwin, Landes, Littleton, Beaucoup, Wakeland, Dupo, Hammond and Urban. The uplands consist of Fayette, Sylvan-Bold and some Wakeland. Tolerable soil loss levels for these soils range from 3 to 5 tons per acre per year.

Activities relating to urban development and agriculture within the watershed are influenced by its location to the City of St. Louis. While there is a decline in the population of East St. Louis, the other municipalities are experiencing rapid growth and development. Agriculture within the watershed consists of the production of corn, soybeans, wheat, vegetable crops, woodland, pasture and hayland. Best Management Practices are needed to control erosion from agriculture, and ordinances and zoning regulations are needed to control soil erosion, sedimentation and surface runoff from urban development.

A high water table, surface runoff from urban land, insufficient ditch capacity and the lack of topographic relief in the bottoms all contribute to the flooding problems experienced in the bottom land area of the watershed. The reduction of sedimentation to the stream system is needed so that the carrying capacities of Harding Ditch are not reduced.

The Illinois Department of Conservation received funding through the Section 314 Clean Lakes Program for the implementation of monitoring, dredging and the rerouting of Harding Ditch to bypass lake #3. It has also been part of the Ambient Water Quality Monitoring Network. The problems identified for Frank Holten are: sedimentation, turbidity, nutrients, algal blooms, fish kills and degraded fisheries. The Illinois Environmental Protection Agency has assessed Harding Ditch and Schoenberger Creek and given them a designation as partial/moderate for degree for use support.

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