THE SCENIC QUALITY AND RELATED RECREATIONAL VALUE OF SELECTED KANSAS STREAMS

by 1264

JAMES J. NIGHSWONGER

B. S., (Landscape Design), Kansas State University, Manhattan, Kansas, 1960

A MASTER'S THESIS

submitted in partial fulfillment of the

requirement for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture

KANSAS STATE UNIVERSITY

Manhattan, Kansas

1970

Approved by:

Major Professor

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INTRODUCTION

THE IMPORTANCE OF THIS STUDY

Much has been written concerning the present public demand for outdoor recreation as well as the acute need for more recreation space and facilities to meet future demands. In 1962 a significant report was published by the Outdoor Recreation Resources Review Commission (ORRRC) (10) concerning present and future outdoor recreation needs on a national scale.

In 1965 the Kansas Joint Council on Recreation (7) and in 1968 the Kansas Department of Economic Development (6) published a Comprehensive Outdoor Recreation Plan as a guide to future recreational development in this state.

Why is so much emphasis being placed on outdoor recreation? Basically, recreation is important because it provides for man's physical and mental renewal. As stated in a report by the U. S. Department of Commerce (18), recreation enhances the mental well-being of an individual by reducing tension and giving relief to job pressure and urban stress. A change in environment and the opportunity to enjoy the beauty of a stream, lake, mountain, forest or ocean provides a new recreation experience for many people. The inner strength one gains from such an experience enables him to return to daily tasks with new vigor.

This has been summarized in another way in the above mentioned report: "Man has need of a sense of space as well as freedom of movement. Although he is a gregarious animal, he is not able to adapt easily to the unremitting contacts of other individuals which characterize a swarm of bees or daily life in a modern metropolis. The incessant stimuli from numerous people, traffic and construction noise, traffic lights, neon signs and impersonal shouts and orders lead to tension and fatigue which in turn bring about physical and emotional disorders and aggrevate those already in existance.

In addition to the impact received during working hours, many of these people commute to work under equally nerve racking conditions. Even smaller cities in less urbanized areas are beginning to present the same environmental strains for all citizens."

The full importance of this situation is realized when one considers that in 1960, 63% of the nation's inhabitants lived in metropolitan areas and that by the year 2000 this figure will reach 73%.

In the 1960 census of Kansas (12), it was reported that 85% of all Kansas residents lived "off the farm" and that 61% of these people lived in metropolitan or urban areas (i.e. a community of 2,500 population or more). Indications are that the trend toward urbanization in Kansas will at least match if not exceed the national trend.

What do people want in the way of recreation? It is interesting to observe that on a nationwide basis the simple pleasures are what people seek most. For example, the U. S. Department of Commerce (18) found that 42% of the population 12 years of age and older participate in sightseeing and that 29% participate in fishing and 22% in boating. The Citizens Committee for the ORRRC Report (2) pointed out that 34% of the people interviewed either participated in boating or canoeing, or would like to do so. They reported "Water is the focal point of outdoor recreation. Wherever they live, most people seeking the outdoors look for water -- to swim in and to fish in, to boat on, to walk, picnic and camp by, and to just look at. The demand for water based recreation is increasing more rapidly than the demand for outdoor recreation in general."

The popularity of water based recreation in Kansas can be attested to by the number of visits to the state's large reservoirs. For example, the eight millionth visitor to Tuttle Creek, since its completion in 1963, was recently

honored, reported the Kansas State Park and Resource Authority (15); and while 1,069,006 visitors enjoyed recreational experiences at Milford reservoir in 1968, Kanopolis reservoir received 287,330 visitors. In total, the state's 18 federal reservoirs attracted 6,404,555 visitors last year.

Another significant water recreational resource in Kansas is the flowing streams, which represent an area of approximately 760 square miles or 485,000 acres of water surface according to the Kansas Department of Economic Development (14). These streams constitute a valuable recreational resource, particularly for fishermen who prefer a running stream to impounded water and also for hunters, canoe enthusiasts, and others.

Scenic beauty must be considered as an invaluable natural resource that can contribute greatly to the recreational value of an area. The criteria for route selection, as discussed in a national program for scenic roads and parkways (18), illustrates the importance of scenic or visual quality:

> "The basic criteria for route selection is that the route must provide people with an opportunity for an outstanding travel experience. Thus, the landscape or recreation resources within the corridor are the key to selection rather than the road itself. No matter how well the roadway is engineered or how fine the complimentary facilities are along the way, there must be a distinguishing characteristic of natural beauty or other quality that causes the location to stand out among other recreational driving opportunities.
>
> Beauty is not an easy thing to measure. It does not show up in the gross national product, in a weekly paycheck, or in profit or loss statements, but these things are not ends in themselves. They are roads to satisfaction and pleasures and

> the good life. Beauty makes its own direct contribution to these final ends. Therefore, it is one of the most important components of our national income, not to be left out simply because statisticians cannot calculate its worth."

It is evident that enjoyment of natural beauty along with activities related to water are recreational pursuits highly sought by people. If meaningful recreational experiences are to be available in the future, an inventory, analysis and evaluation of intrinsic (natural) and extrinsic (man-made) recreational resources must be considered a basic element in any recreation plan. Successful design solutions will be based upon such a resource evaluation along with a consideration of the recreational needs and desires of people. It is also imperative that recreational resources be inventoried and evaluated so that they may be preserved and not lost through "land development".

Growing demands on land and water resources are rapidly diminishing outdoor recreational opportunities. The Citizens Committee for the ORRRC Report (2) pointed out....."Many unprotected areas, rich in potential for memorable outdoor experience, are lost each year as they are taken for other uses."

THE PROBLEM AND OBJECTIVES

In response to the need previously established, this study will introduce a technique to inventory, analyze, and evaluate the specific recreational resources and broad recreational potential of a flowing stream*. The problem deals with the need to identify, evaluate, and preserve worthy stream corridors in Kansas for public recreational use and enjoyment.

In developing a workable solution to this problem, a study was initiated to accomplish the following objectives:

(a) to develop a concise, accurate technique of inventorying, analyzing and evaluating streams for their visual quality and related recreational resources;

(b) to determine the legal status of public accessibility to and usage of the state's privately owned streams for recreational purposes; and to explore procedures to improve the present situation.

Studies by Lewis (8 and 9) were found to relate significantly to this effort; however, both works dealt with broader (area or state wide) interpretations and not with areas as limited geographically as was desired in this study. Both of Lewis's works, however, made important contributions to this study, and his basic technique was modified to better suit the inventory and evaluation of landscape resources as they relate to visual quality and recreation in streams.

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*Impounded waters (except those behind low structure over-flow dams) will not be considered.

Resource material by the Bureau of Outdoor Recreation (19) re: the Wild and Scenic Rivers Act (PL 90-542)* on the "river area inventory" also contributed significantly to this study.

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*This act was approved by Congress on October 2, 1968 to provide for a National System of Wild and Scenic Rivers.

PROCEDURE

CRITERIA FOR STUDY AREA CONSIDERATION

In initial investigations it became evident that any detailed interpretation of the visual and related recreational quality of streams must be based upon a set of standards. Formulating these standards became the first step.

In Lewis's studies (8 and 9) it was determined that two factors: visual contrast and diversity were considered to be the most important criteria used to identify important recreational resources. His studies also showed that the landscape characteristics with the most potential for providing visual contrast and diversity were water, topography, and forests.

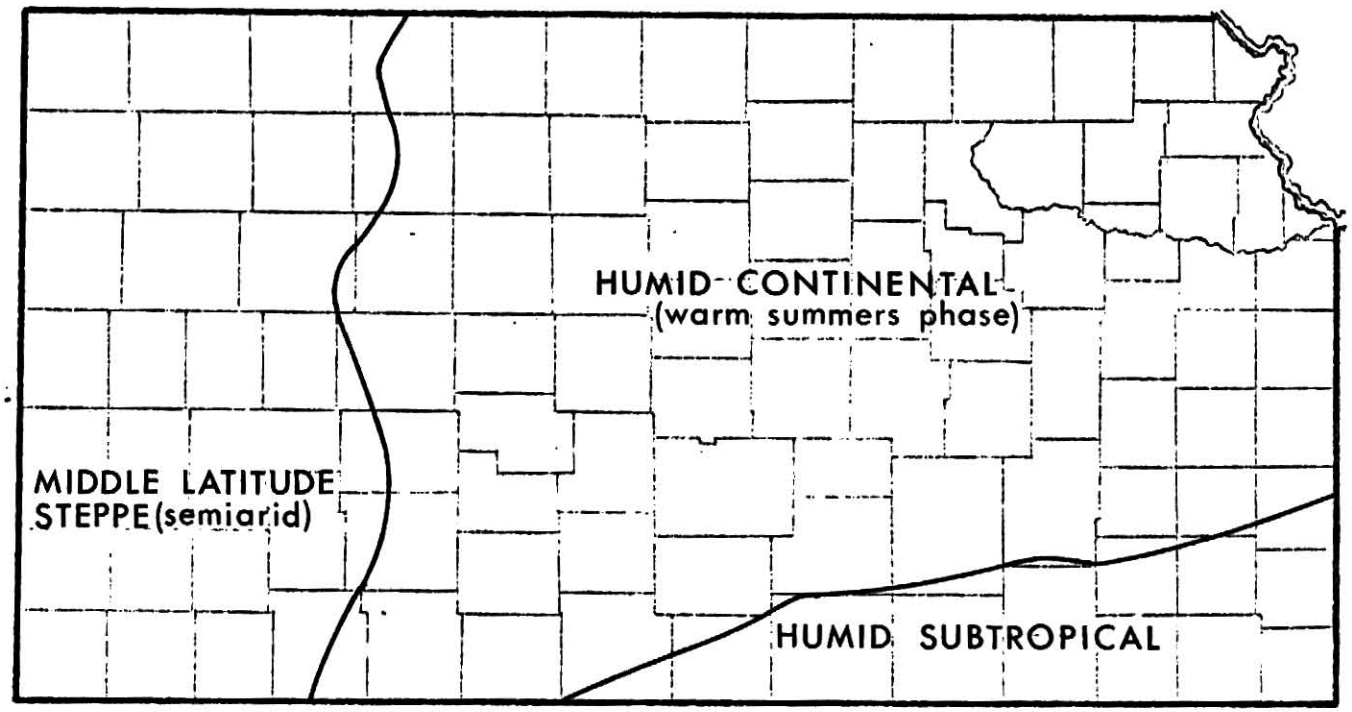
As a result of the above findings, these three landscape characteristics were considered by the author to be the most influential as criteria in the initial selection of streams for study. Their importance was based upon the following reasons:

1. Water - as this study considered only the recreational enjoyment of streams by waterway (and not by roadway), water quantity and flow rate was of utmost importance. To be usable, a given stream must normally carry a quantity of water sufficient to float a canoe or jon boat during desired recreation seasons. Water quantity, then, was the first factor to consider in determining the visual quality and related recreational potential of a stream.

   In Kansas, water quantity can be discussed from a geographic determination on a state wide basis. Geographically, according to Self (13), the state is divided into three distinct climatic areas -- the Humid Subtropical, Humid Continental and Middle Latitude Steppe.

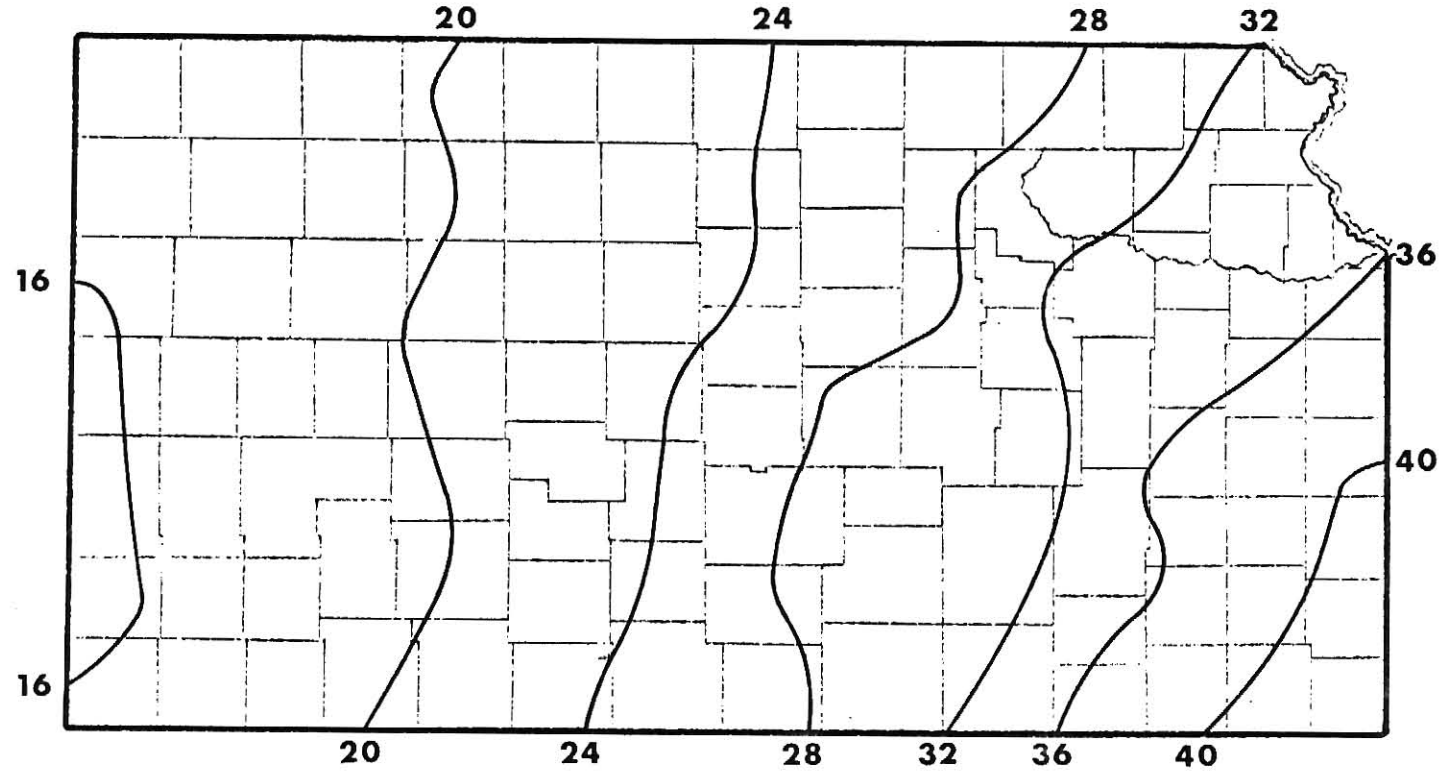
Fig 1

CLIMATES OF KANSAS



source····· Self, Huber, 1963, Geography of Kansas Syllabus and Atlas

Fig 2 AVERAGE ANNUAL PRECIPITATION IN INCHES



source····· Self, Huber, 1963, Geography of Kansas Syllabus and Atlas

The Humid Subtropical climate is located in southeastern Kansas and is characterized by an average annual precipitation of 25 inches in the western portion to 42 inches in the eastern portion of the area. Most of this precipitation falls from April through September; however, there is no dry season at any time of the year.

The Humid Continental climate is located over the eastern three-fourths of the state and extends westward to near the 100th meridian. This area is characterized by an average annual precipitation rate of from 20 inches in the western portion to about 40 inches in the eastern portion of the area. Over 50 percent of this precipitation falls during May, June, July and August in this climatic area.

The Middle Latitude Steppe climate is located in the western one-fourth of the state, west of the 100th meridian. The average annual precipitation is from less than 20 inches in the east to slightly less than 15 inches near the Colorado border. Precipitation is less reliable in this area and droughts are frequent.

There is a direct relationship between these precipitation characteristics and water quantity in streams. Streams in the western part of the state are considered ephemeral by the Kansas State Board of Water Resources (16) where base flows are low and rain runoff is infrequent. Runoff may be large in quantity at times but is usually of short duration. Many western Kansas streams are dry a good portion of the year.

Streams in the central and eastern portions of the state, except for Shoal Creek and Spring River in the extreme southeast corner, are considered intermittent. These streams are never dry but flow rates are intermittent due to rainfall variation, ground water variation, and other factors. In recent years, reservoirs have been constructed on many major streams, and variation in discharge also affects stream flow rates.

Shoal Creek and Spring River are considered permanent. The sources of both streams arise in the Ozark Plateau physiographic province of Missouri and retain relatively constant base flows.

2. Topography - Lewis (9) found that topographic variety is a most important landscape characteristic in the composition of visual quality in any outdoor recreational setting. Abrupt topographic change offers contrasting relief, welcome variety, and scenic vantage points.

Topographic variation in Kansas is considerably less than that of the neighboring states of Missouri, Oklahoma and Colorado. Only the plains states to the north are similar in topographic character. For this study, topographic change in Kansas streams was considered significant when grades exceeded 25% with variations in elevation of 30 feet or more. Such slopes, whether vegetation covered, rock outcrop, or loessial and alluvial deposits, were considered by the author to be significant landforms when viewed from a stream bed. (Lewis (9) stated that grades of 25% with elevation variations of 50 feet or more constituted significant topography in Illinois.) The strong contrast between these topographic features and horizontal

plains of water or land are a welcome aesthetic contributor to stream visual quality.

Topography of this nature, reported Self (13), is commonly observed in the Central Lowlands and Ozark Plateau physiographic provinces and the Flint Hills physiographic sub-region of Kansas. These areas comprise the eastern one-third of the state.

3. Forests - Along with water quantity and topographic variety -- forest vegetation was considered a basic contributor to visual quality in a stream.

An abundance of forest trees and native plant vegetation will provide visual variety and contrast, stream bank and soil stabilization, climate control, seasonal color variation, and, in general, will contribute greatly in developing the landscape personality of a site, Lewis (9) pointed out.

"Kansas lies within the prairie province of the United States" according to Self (13). "Broadleaf, deciduous trees are found along the shaded sides of many ridges in eastern Kansas as far west as the Flint Hills, but even in eastern Kansas, more than half of the area was originally in tall prairie grasses. Broadleaf, deciduous trees are found along the streams in central Kansas extending as far west as the 100th meridian, but beyond this, the state is treeless except for some plantings around homesteads and in a few shelter belt areas."

The only conifer native to the state is the eastern red cedar. This tree is abundant in much of the eastern one-third of Kansas in rough and rocky sites. Bluffs, outcrops and ledges

along streams in eastern Kansas are often heavily wooded with red cedar along with broadleaf, deciduous trees.

Chase and Strickler (1) found that the natural forests of the state occupy about 1.3 million acres or 2.6 percent of the state's land areas with over 80 percent of this forest area located in eastern Kansas. These forests are primarily hardwood and are composed of two major forest-type groups: oak-hickory, found mostly on the eastern uplands and elm-ash-cottonwood, abundant in the eastern lowlands and following the stream bottoms into the western areas of the state.

STUDY AREA SELECTION

Where the three broad landscape resources, water, topography, and forests are found especially in a combined role, we are likely to find the most significant potential for stream visual quality and recreation. In applying these standards to Kansas streams, it was found, that with few exceptions, those with the highest potential were in the eastern one-third of the state (see figure 3).

The criteria previously discussed were applied to a number of streams in the state for the purpose of selecting several study areas as "test cases". These test cases were required to refine and validate the technique used to accomplish the main objective in this study (see The Problem and Objectives, page 6).

Portions of the following streams were selected: Caney River, Lyons Creek, Marais des Cygnes River and the Verdigris River. Approximate locations of the study areas are shown in figure 4.

In applying the "criteria for selection" to these streams, the following procedure was used:

(a) Review Kansas Water Resources Board data regarding stream base flow, discharge rates, and depth characteristics.

(b) Review State Geological Survey topographic maps for topographic variation and forested area information along proposed study area.

(c) Make a visual reconnaissance of the proposed study areas by automobile to observe general landscape characteristics and affirm water flow, topographic, and forest area information.

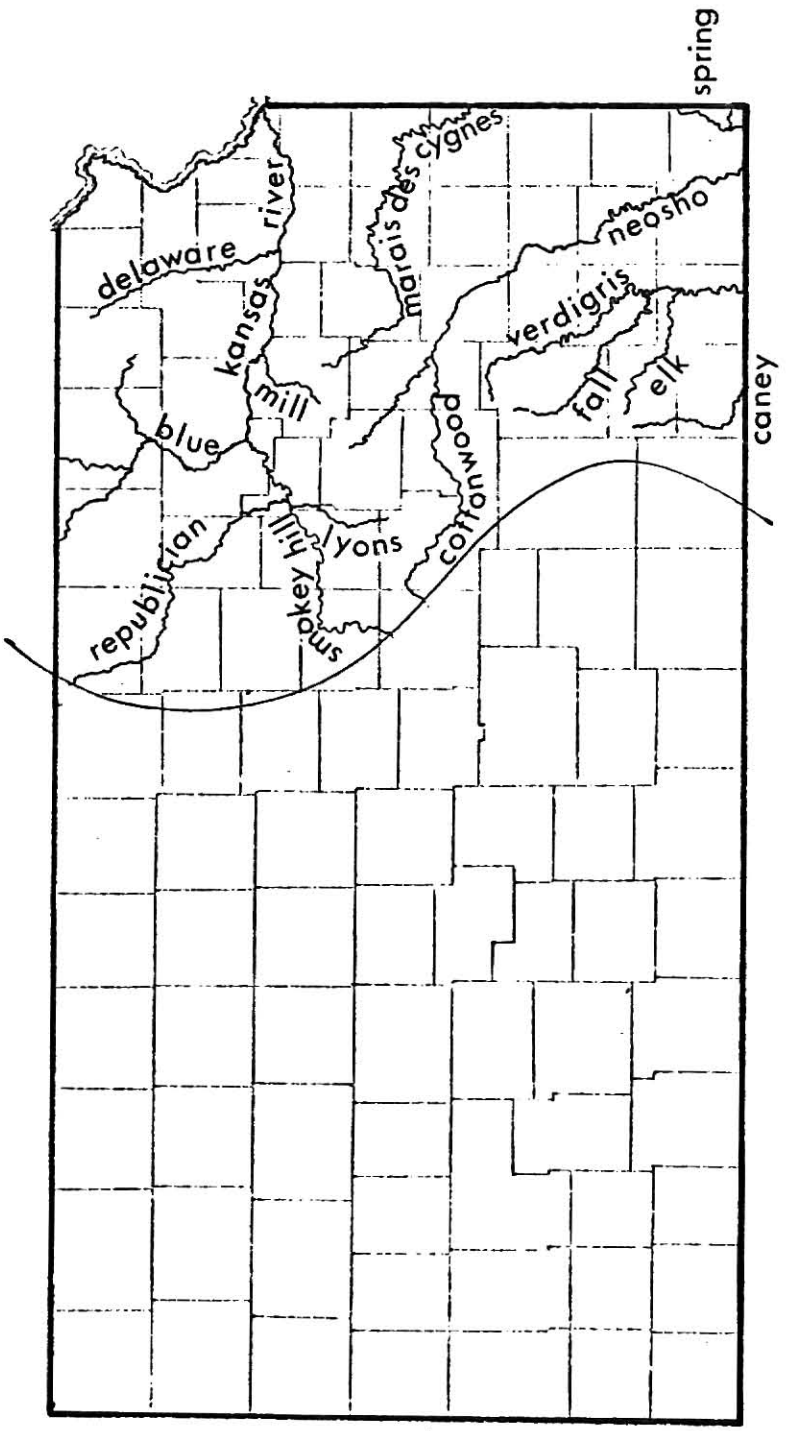


Fig 3 MAJOR STREAMS IN EASTERN KANSAS

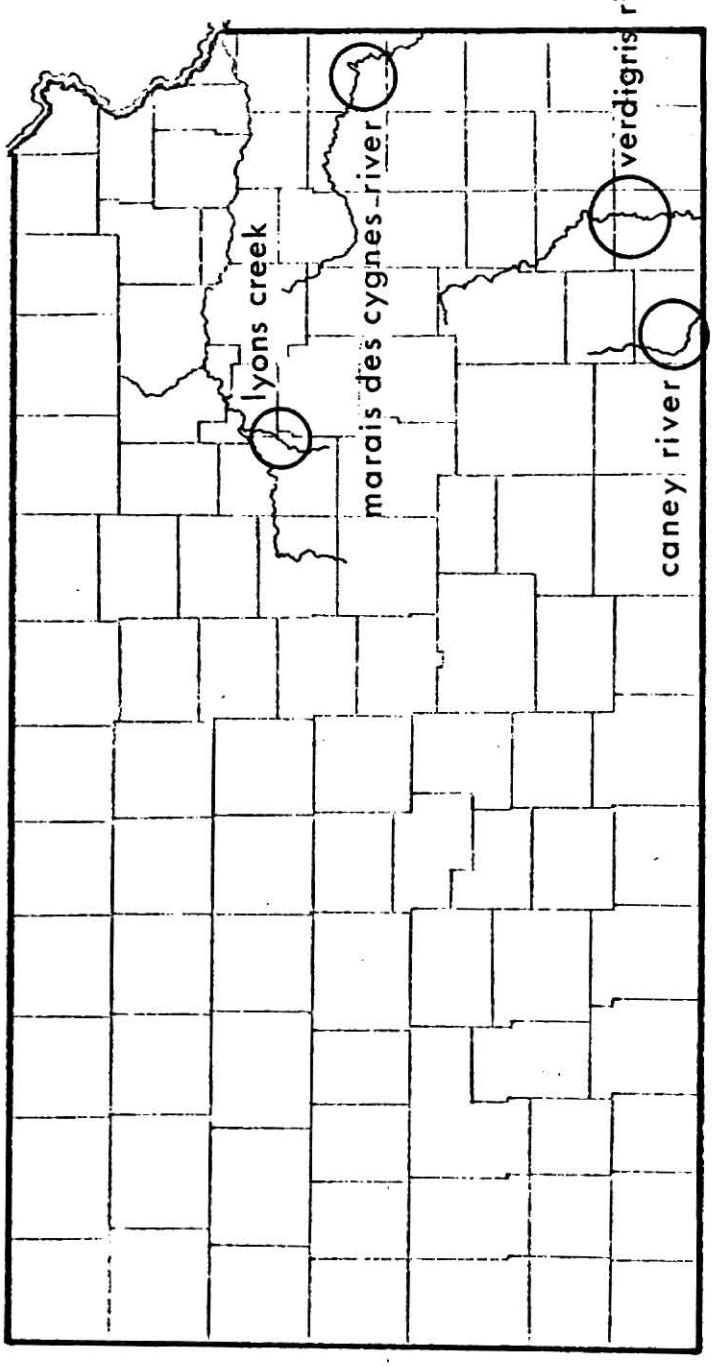


Fig 4 STUDY AREA LOCATIONS

Upon completing this procedure and making final decision as to the four study area locations, research was initiated to develop a means of acquiring an accurate and precise inventory of the recreational resources in each study area. Lewis's research (8 and 9), as well as techniques used by the Bureau of Outdoor Recreation (19), were evaluated and modified to serve as a model for this work.

THE RECREATIONAL RESOURCE INVENTORY

The author proceeded on the hypothesis that evaluations and findings would be only as good as the accuracy of the inventory. Therefore, in order to acquire the considerable detail desired -- the following procedure was used:

1. A recreational resource inventory field rating guide (see pages 22 through 26) was developed. The initial guide listed 14 resources that were expected to be found; however, after "trial runs" on the Lyons Creek study area, the guide was revised to include 20 resources. Each resource was given a code symbol to improve mapping speed and accuracy plus a rating system in cases where a rating was needed to improve inventory accuracy.
2. Each of the four study areas were floated by canoe to map and rate the resources observed.

In an effort to obtain a uniform sampling, each study area was the same approximate distance in water mileage, and inventories were taken only when streams were at or near seasonal normal flow rates for this year (1969).

A numerical evaluation of from one to 20 was given to each resource or its various ratings. These numerical values were based upon the relative contribution of a particular resource in providing visual quality and related recreational usability. Those resources contributing the most received the highest numerical rating. A resources contribution to visual quality was considered the most significant factor in establishing relative values while its contribution to recreational usability was considered less significant (ie. access, although an important resource, was given lesser values than waterfalls

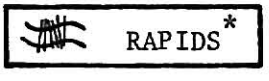
or rapids since the latter two resources make a more significant contribution toward visual quality than the first). Detriments to visual quality such as water or bank pollution were given minus (-) values according to their relative degree of harm.

Upon completing the inventories of the four study areas, total resource ratings were tabulated for each. This tabulation provided a significant basis to compare each study area for its scenic or visual quality and related recreational value. This relative comparison was followed by:

(a) An analysis of the general characteristics of each study area.

(b) An analysis of the total significance of the inventory findings regarding the visual quality and related recreational values of each study area.

RECREATIONAL RESOURCE INVENTORY . . . FIELD RATING GUIDE

RESOURCE	RATING AND DESCRIPTION
▲ ACCESS	(A) Easy access. Gently sloping grass or gravel bank adjacent to road or approach or low water bridge. Stable surface. Convenient.
	(B) Relatively easy. Gently sloping banks. Unstable surface (mud, etc.) adjacent to road or approach. Convenient.
	(C) Some difficulty experienced. Banks moderately steep and/or contain minor vertical drops. Adjacent to road or approach. Some inconvenience.
	(D) Difficult access. Banks may be too steep, surface too unstable or relatively inaccessible. Inconvenient.
 RIFFLES	(A) Good flow. Incourse maneuvering necessary and exacting! Skill required to avoid tip over.
	(B) Good flow. Incourse maneuvering necessary but relatively easy.
	(C) Floatable. Incourse maneuvering not necessary. Easy run.
	(D) Not floatable. Dragging or portage necessary.
 RAPIDS*	(AA) Hazardous. Dangerous obstacles or conditions. Inspect before running. Considerable risk involved.

*Rapids are characterized by fast water with significant "white water" observed as compared to riffles, ie.: characterized by fast water with insignificant or no "white water" observed.

Ⓐ Good flow. Incourse maneuvering necessary and exacting. Skill required to avoid tip over!

Ⓑ Good flow. Incourse maneuvering necessary but relatively easy.

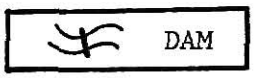
Ⓒ Floatable. Incourse maneuvering not necessary. Easy run.



Ⓐ Vertical drop. Ht. over 3'. (Not navigable.)

Ⓑ Vertical drop. Ht. under 3'. (Not navigable.)

Ⓒ Definite change in topographic elevation. Water falls in steps, not a vertical drop. (Not navigable.)



Ⓐ Water flows over top. (Not navigable.)

Ⓑ Water flows over top. (Navigable.)

Ⓒ Water flows around or through dam. (Not navigable.)

Ⓓ Water flows around or through dam. (Navigable.)



Ⓐ Considerable rock outcropping. Vertical face or strongly sloping. Usually sparce vegetation (note ht.). Very significant landform.

Ⓑ Noticeable rock outcropping, steep. Vertical face or strongly sloping. Vegetation significant (note ht.). Very significant landform.

Ⓒ Vertical face or strongly sloping. Notable for interesting rock strata or boulders in or adjacent to stream bed.

Ⓓ Strongly sloping. Some rock outcropping. Considerable vegetation (note ht.) (or) vertical face - loessial and/or alluvial deposits of significant height.

SPRING

(A) Significant flow. Origin at stream bank.

(B) Significant flow. Origin up-stream in tributary.

BRIDGE

(A) Low water - Navigable.

(B) Low water - Not navigable.

(C) Vehicular traffic - Major.

(D) Vehicular traffic - Minor.

(E) Railroad.

(F) Abandoned.

CAMPSITE (NATURAL)

(A) Good stream access with road access. Good surface with adequate but not excessive slope. Attractive site visually.

(B) Good stream access without road access. Good surface with adequate but not excessive slope. Attractive site visually.

(C) Good stream access. Fair surface and/or slope. May be rough or rocky or contain heavier vegetation than (B).

(D) Poor site but marginally suitable for overnight or rest stop.

CAMPSITE (IMPROVED)

(A) Full facilities, ie.: water, electricity, showers, etc.

(B) Some facilities. (List those present).

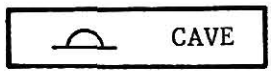
(C) No facilities, but suitable for overnight camping.

SPECIMEN PLANT

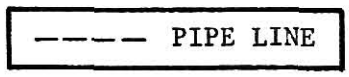
(A) Plant with unique growth pattern or growth character (name specimen).

Ⓑ Unusually large plant (name specimen).

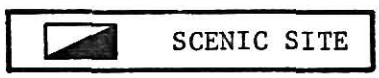
Ⓒ Uncommon genus or species (name specimen).



A site feature of significant recreational value not only from geologic and historic importance to speleology but from a contribution to overall visual quality of a site.



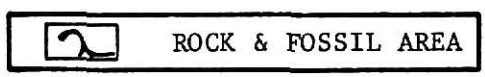
A visable feature - either below the water level or suspended above. A resource useful as a "landmark" or reference point.



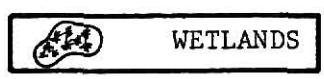
A visual resource, other than topographic, that contributes visual quality to an area, ie.: old mill, old cabin, etc.



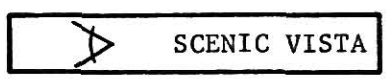
A resource of recreational value because of historic significance, ie.: trails, fords, battle fields, Indian encampments, etc.



A site that contributes recreational value to an area through a notable presence of plant and/or animal fossils or rocks of geological significance.



A resource of recreational value as a contributor of ecological, biological, and botanical variety to an area.



An outstanding view resulting in an important contribution to the overall visual quality of an area.

DETRIMENTS TO RECREATIONAL QUALITY . . . FIELD RATING GUIDE

DETRIMENT	RATING AND DESCRIPTION
bp BANK POLLUTION	(A) Discarded trash or junk in amounts significant enough to seriously harm visual quality.
	(B) Other (note).
wp WATER POLLUTION	(A) Industrial waste, ie.: oil seepage, acids, "used water", etc.
	(B) Municipal and domestic waste discharge.
	(C) Feed lot or livestock pen runoff.

CANEY RIVER STUDY AREA

I. GENERAL INFORMATION

STREAM Caney River

LOCATION OF STUDY AREA

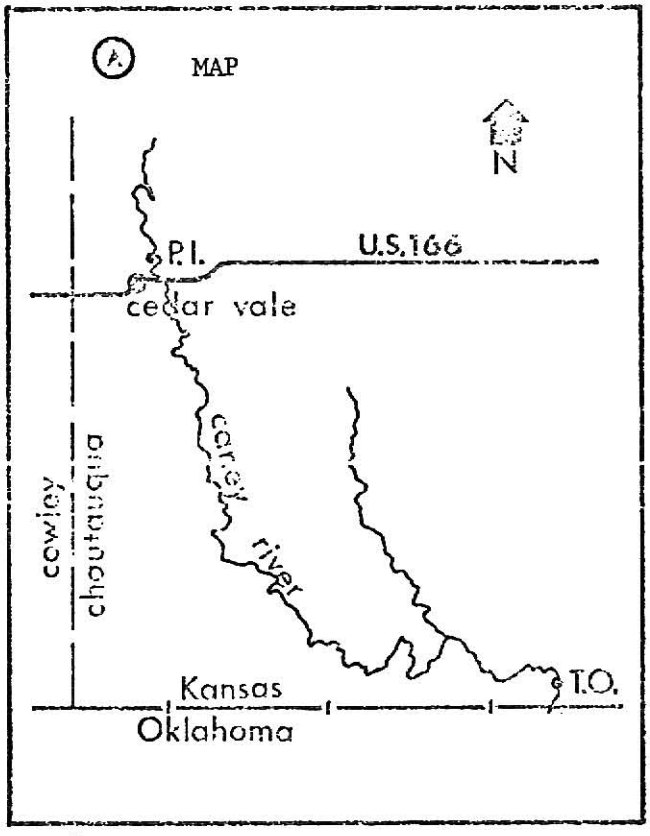


Fig 5

P.I. At dam 1/4 mile east and 1/4 mile north of Cedar Vale, Kansas (Cedar Vale East Quadrangle USGS Map)

T.O. At bridge 1 1/2 miles west of Elgin, Kansas (Elgin Quadrangle USGS Map)

P.I.= Canoe "Put-in" or beginning of study area.

T.O.= Canoe "Take-out" or ending of study area.

(B) U.S. GEOGOLOGICAL SURVEY MAP QUADRANGLES

1. Cedar Vale East, Kansas, 1962 - 7.5 minute series
2. Elgin, Kansas, 1962 - 7.5 minute series

(C) COUNTIES

Chautauqua County

MAJOR WATERSHED AREA

(A) MAP

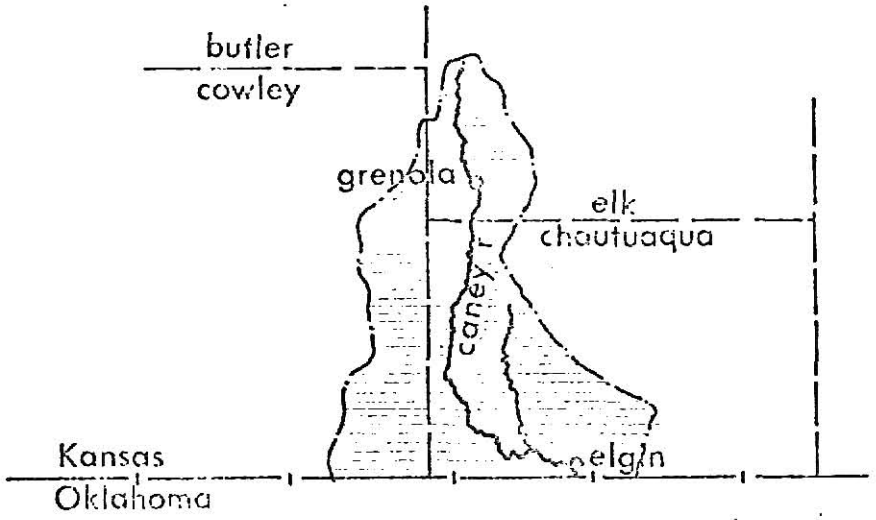


Fig 6

(B) DESCRIPTION

The Caney River Watershed covers approximately 445 square miles in Kansas and represents an area about 36 miles long and eight to 24 miles wide. The river forms in the Flint Hills of Elk County and flows in a southerly direction along the western portion of Elk and Chautaqua counties where it enters Oklahoma below Elgin, Kansas. The Hulah Reservoir in Oklahoma can back water to near Elgin, but the study area is not affected by the Reservoir and remains in a free flowing state. The only low-head overflow structure on the Caney River study area is located just above the P.I. at Cedar Vale.

According to Power (11), bed elevations range from slightly above 1,050 feet above sea level near Grenola at the headwaters to 760 feet near Elgin where the stream enters Oklahoma. The stream bed gradient is generally six to seven feet per mile, but becomes steeper near Grenola.

The Caney is a tributary of the Verdigris and it joins the mainstream about 45 miles south of the Oklahoma state line.

LENGTH OF STUDY AREA	20.6 miles
TRAVEL TIME	Approximately 14 hours (without motor)
DATES OF OBSERVATIONS	June 20, 1969 and July 1, 1969
WATER LEVEL	June 20 - Stage - 3.97, Discharge 448 Cubic Feet per Second*
	July 1 - Stage - 3.85, Discharge 400 Cubic Feet per Second*
WEATHER CONDITIONS	June 20 - Partly Cloudy, Warm and Pleasant
	July 1 - Sunny to Partly Cloudy, Warm and Pleasant

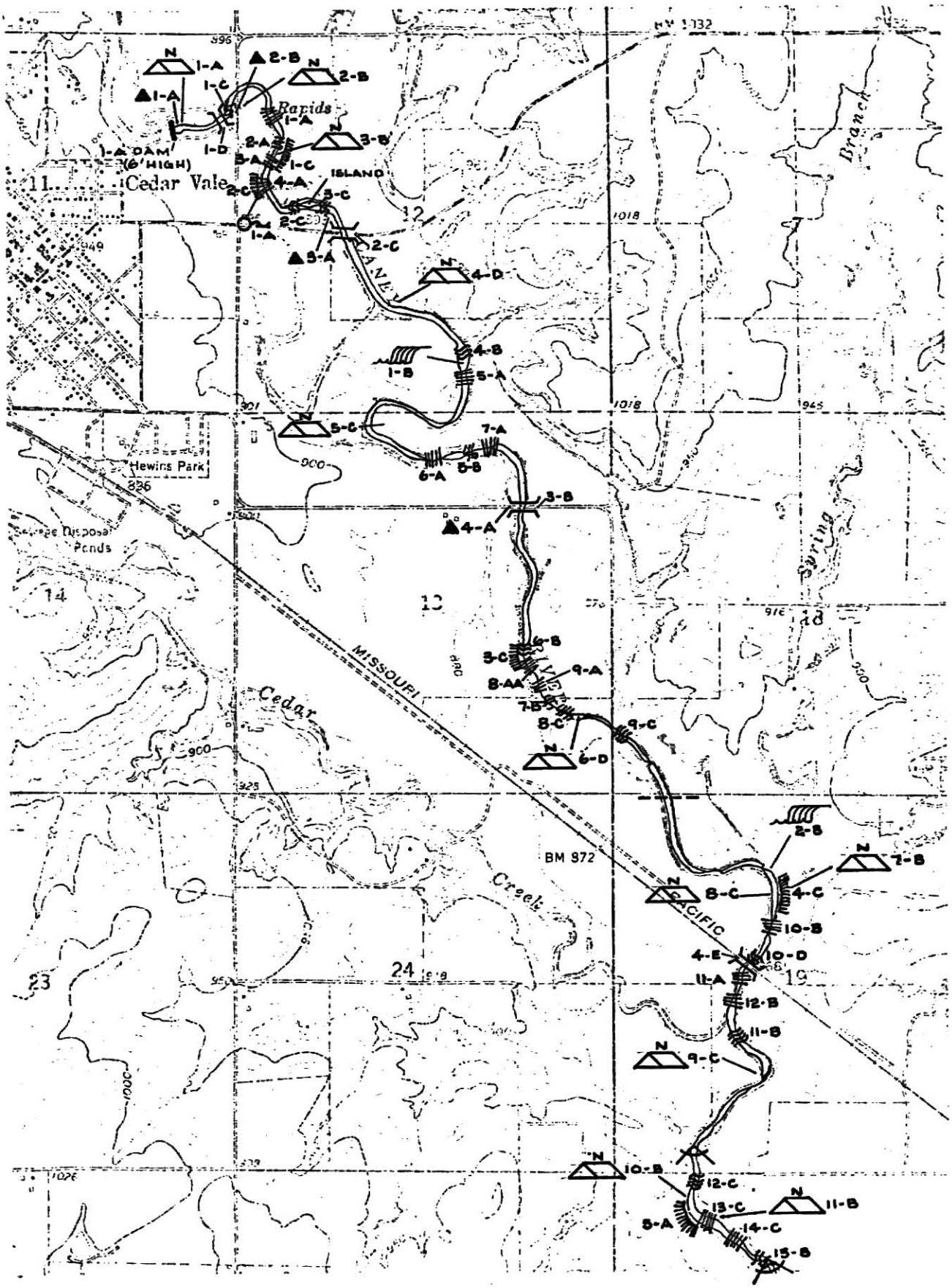
*Data taken from the Caney River gaging station near Elgin and furnished by the Kansas Water Resources Board.

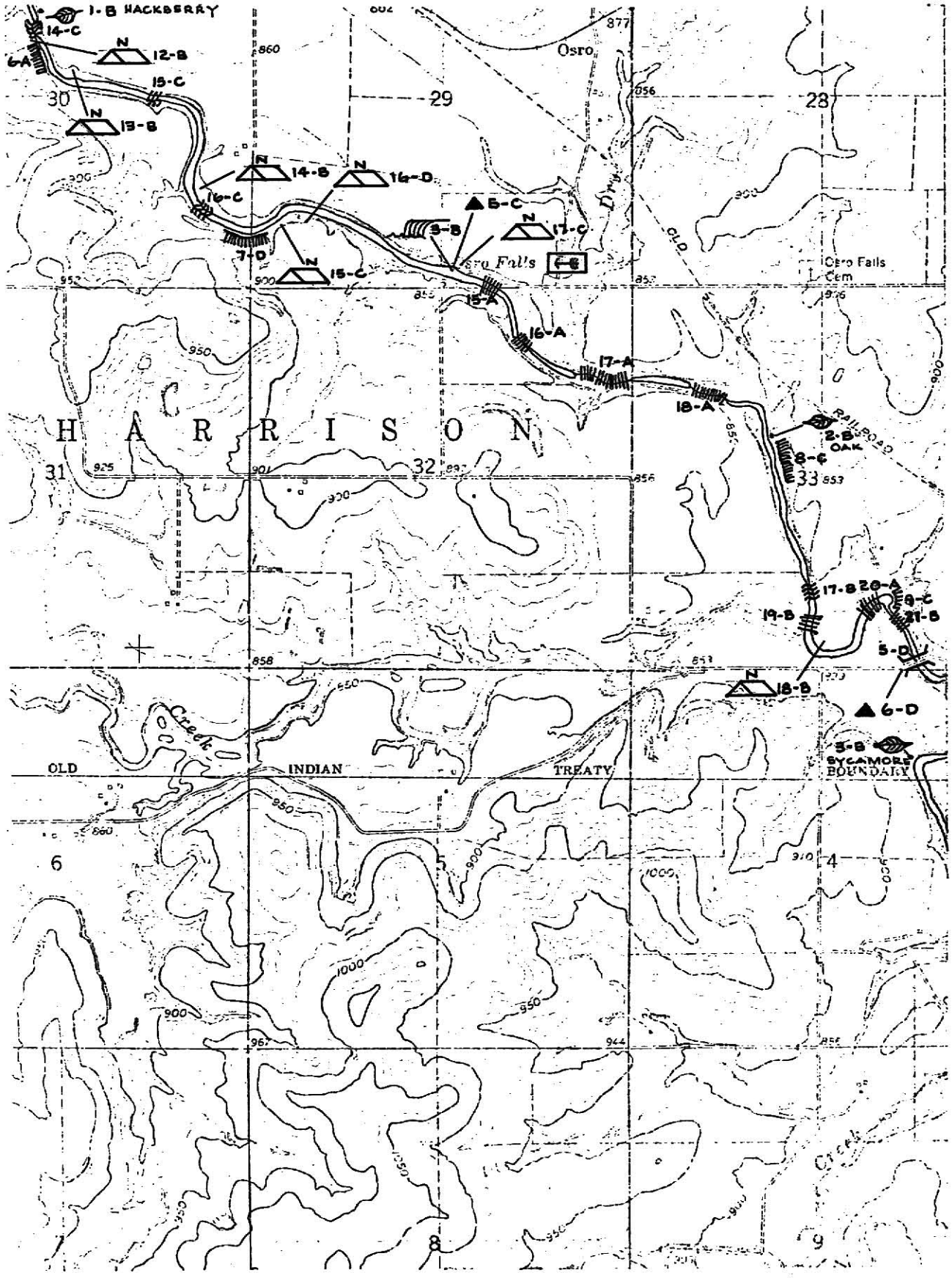
II. FIELD INVENTORY OF RESOURCES

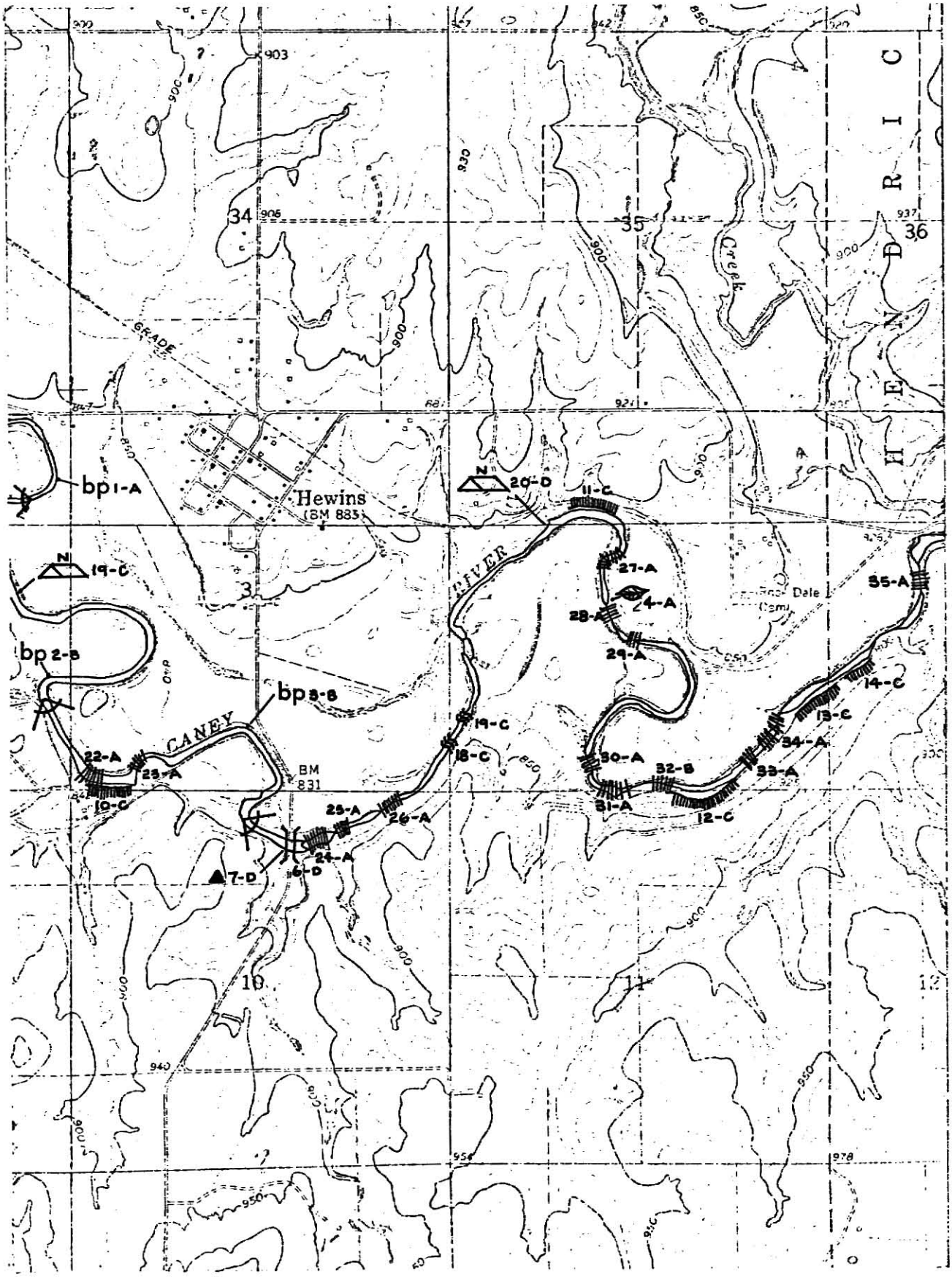
The following resource inventory includes the location, relative rating, and number (in sequence from the P.I.) of individual resources observed in the Caney River study area. For example, 

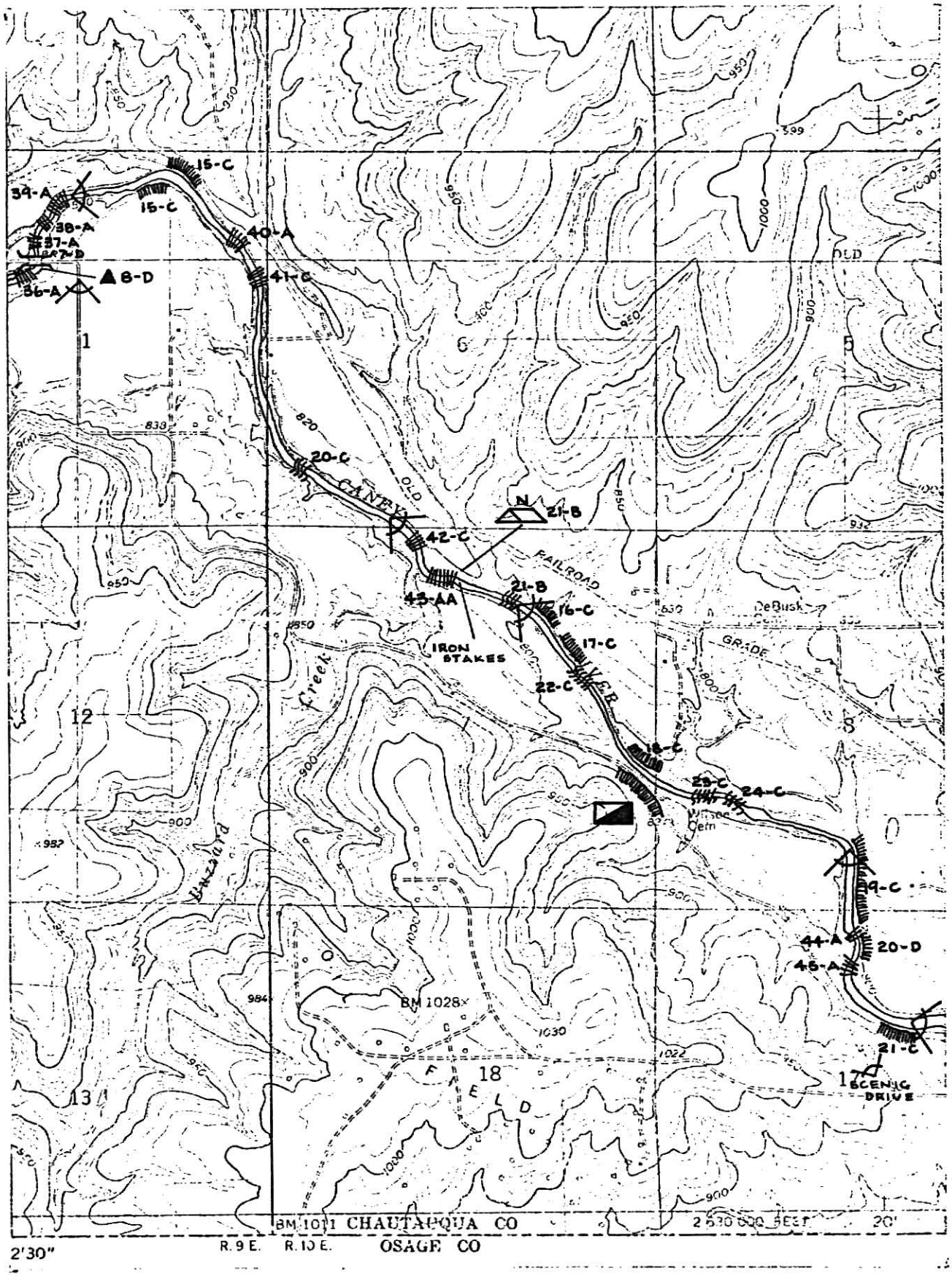
refers to the second natural campsite observed and it has a C rating; or 

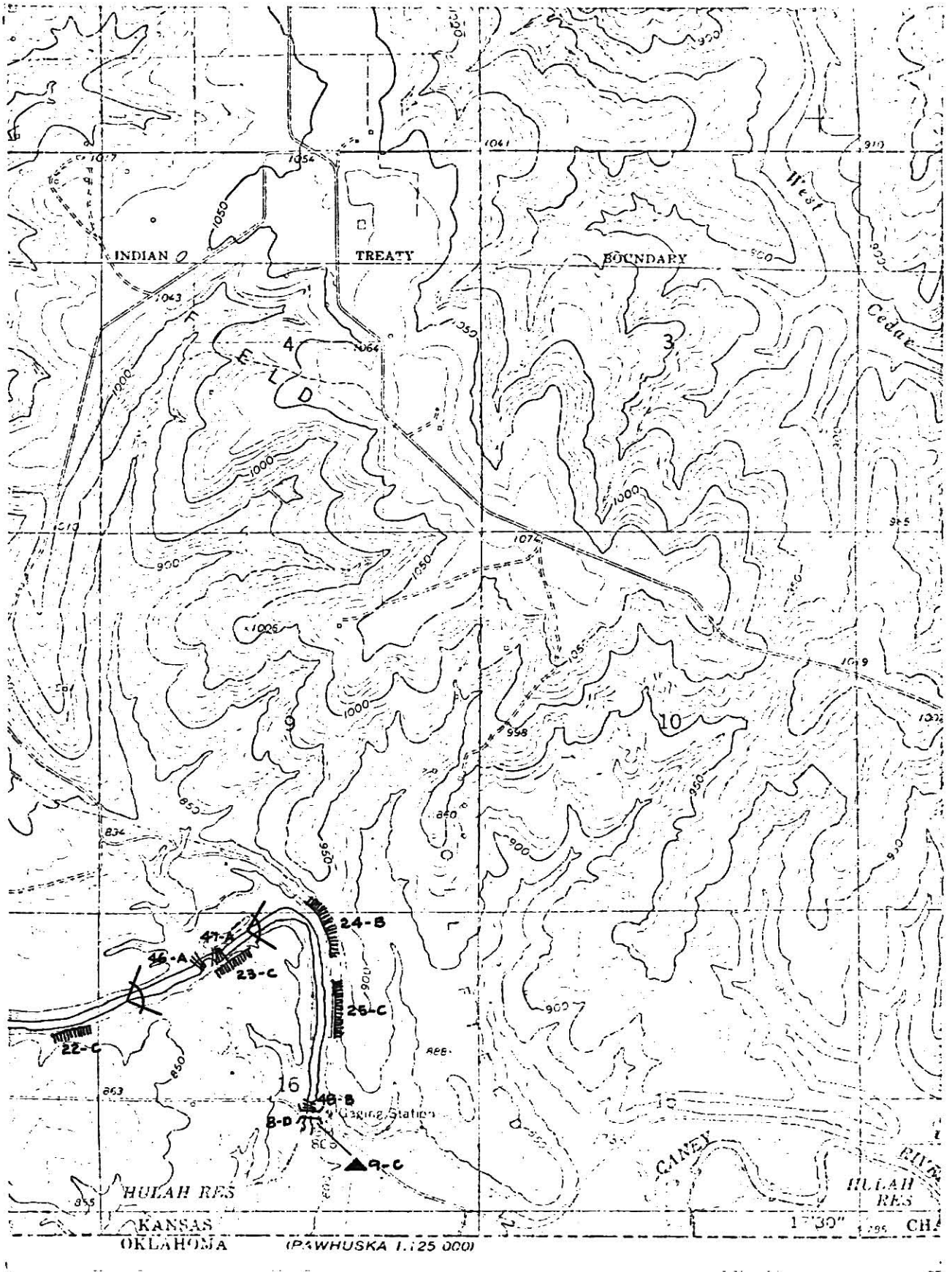
refers to the third access point observed and it has a B rating.


Cedar Vale
Rapids
ISLAND
DAM (6' HIGH)
CANAL
Hewins Park
Sewage Disposal Ponds
MISSOURI PACIFIC
Cedar Creek
Spring Branch
BM 972
11
12
13
14
23
24
1-A
1-B
1-C
1-D
2-A
2-B
2-C
3-A
3-B
3-C
4-A
4-B
4-C
4-D
4-E
5-A
5-B
5-C
6-A
6-B
6-C
6-D
7-A
7-B
8-A
8-AA
8-C
9-A
9-B
9-C
10-B
10-C
10-D
11-A
11-B
12-B
12-C
13-C
14-C
15-B


1-B HACKBERRY
14-C
6-A
12-B
15-C
13-B
16-C
14-B
16-D
7-D
15-C
5-B
5-C
17-C
15-A
16-A
17-A
18-A
2-B OAK
8-C
17-B
20-A
19-B
21-B
5-D
6-D
18-B
5-B SYCAMORE
Osro
Osro Falls
Osro Falls Cem
RAILROAD
HARRISON
OLD INDIAN TREATY BOUNDARY
Creek
30
29
28
31
32
33
6
4
8
9


Hewins
(BM 883)
CANEY
RIVER
Creek
GRADE
BM
831
bp 1-A
bp 2-B
bp 3-B
19-C
20-D
11-C
27-A
4-A
28-A
29-A
35-A
14-C
13-C
34-A
33-A
32-B
30-A
31-A
12-C
18-C
22-A
23-A
10-C
25-A
26-A
24-A
6-D
7-D
34
35
36
3
10
11
903
905
937
900
930
940
950
970


15-C
39-A
15-C
38-A
37-A
40-A
36-A
B-D
41-C
20-C
CANEY
42-C
21-B
RAILROAD
43-AA
21-B
16-C
IRON STAKES
17-C
22-C
18-C
23-C
24-C
DeBusk
GRADE
Creek
Verdigris
BM 1028
FIELD
19-C
44-A
20-D
45-A
21-C
SCENIC DRIVE
BM 1011 CHAUTAUQUA CO
OSAGE CO
R.9 E.
R.10 E.
2'30"


INDIAN
TREATY
BOUNDARY
West
Cedar
4
3
10
16
24-B
47-A
46-A
23-C
25-C
22-C
48-B
8-D
9-C
Gaging Station
HULAH RES
CANEY
HULAH RES
KANSAS
OKLAHOMA
(PAWHUSKA 1:125 000)

RECREATIONAL RESOURCE ANALYSIS . . . CANEY RIVER STUDY AREA

RESOURCE	RATING & VALUE		NO. OBSERVED	POINT VALUE
ACCESS	A	10	3	30
	B	8	1	8
	C	6	2	12
	D	2	3	6
	TOTAL		9	56
RIFFLES	A	10	-	-
	B	8	8	64
	C	6	15	90
	D	4	1	4
	TOTAL		24	158
RAPIDS	AA	18	2	36
	A	15	36	540
	B	12	6	72
	C	10	4	40
	TOTAL		48	688
WATERFALL	A	20	-	-
	B	18	3	54
	C	15	-	-
	TOTAL		3	54
DAM	A	18	1	18
	B	15	-	-
	C	15	-	-
	D	15	-	-
	TOTAL		1	18
BLUFF	A	15	2	30
	B	15	1	15
	C	15	20	300
	D	8	2	16
	TOTAL		25	361
SPRING	A	8	1	8
	B	8	-	-
	TOTAL		1	8
BRIDGE	A	10	-	-
	B	10	1	10
	C	5	1	5
	D	5	5	25
	E	2	1	2
	F	2	-	-
	TOTAL		8	42

RESOURCE	RATING & VALUE		NO. OBSERVED	POINT VALUE
CAMPSITE (NATURAL)	A	15	1	15
	B	15	10	150
	C	10	6	60
	D	8	4	32
	TOTAL		21	257
CAMPSITE (IMPROVED)	A	12	-	-
	B	11	-	-
	C	10	-	-
	TOTAL		-	-
SPECIMEN PLANT	A	10	1	10
	B	10	3	30
	C	8	-	-
	TOTAL		4	40
bp BANK POLLUTION	A	-15	1	-15
	B	-10	2	-20
	TOTAL		3	-35
wp WATER POLLUTION	A	- 8	-	-
	B	- 8	-	-
	C	- 8	-	-
	TOTAL		-	-
CAVE		10	-	-
	TOTAL		-	-
PIPE LINE		2	1	2
	TOTAL		1	2
SCENIC SITE		12	-	-
	TOTAL		-	-
HISTORIC SITE		10	1	10
	TOTAL		1	10
ROCK & FOSSIL AREA		10	-	-
	TOTAL		-	-
WETLANDS		20	-	-
	TOTAL		-	-
SCENIC VISTA		15	12	180
	TOTAL		12	180

III. DESCRIPTION AND CHARACTERISTICS OF STUDY AREA

CLIMATIC CHARACTERISTICS

The Caney River is located in the Humid Subtropical Climate according to Trewartha (17) (see figure 1). This climate system extends into the southeastern section of the state reaching as far north as central Bourbon County and as far west as Comanche County.

Self (13) stated the the Humid Subtropical Climate in Kansas is characterized by relatively mild winter temperatures as is indicated by an average temperature of above freezing for January, the coldest month. Very cold weather with temperatures falling to zero or below can occasionally occur, but such extremes are of short duration.

Lengthy periods of warm and pleasant temperatures commonly occur during the other three seasons with a frost-free period of 195 to slightly over 200 days characteristic of this climate area in Kansas.

The Independence, Kansas climate station has recorded the following temperature and precipitation averages:

Humid Subtropical Climate

Independence, Kansas - Montgomery County

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temperature (degrees F.)	35	38	48	58	67	76	80	80	73	61	47	38
Precipitation (inches)	1.4	1.6	2.5	3.9	4.7	5.3	3.7	3.1	4.4	3.3	2.3	1.5

Source: Self, Huber, 1963, Geography of Kansas Syllabus and Atlas

Seasonal averages for temperature and precipitation rates based upon the Independence, Kansas climate station data are as follows:

	Spring (Mar. - May)	Summer (June - Aug.)	Fall (Sept. - Nov.)	Winter (Dec. - Feb.)
Temperature (Average)	58°F.	79°F.	60°F.	37°F.
Precipitation (Total)	11.1 in.	12.1 in.	10.0 in.	4.5 in.

STREAM FLOW CHARACTERISTICS

As with other intermittent streams, the Caney River is subject to significant seasonal variations in base flow.* Information from the Kansas Water Resources Board (11) indicates that sufficient water for floating can normally be expected throughout the spring and summer seasons with the best base flows occurring from March through June.

*Base flow is that portion of total stream flow in c.f.s (cubic feet per second) exclusive of direct surface run-off and consisting largely of ground water contributions to the stream.

Monthly Base Flow of Selected Exceedence

Caney River near Elgin, Kansas

Month	Monthly base flow in c.f.s. chance exceedence		
	20%	50%	80%
January	80	14	1
February	89	18	2
March	120	26	3
April	160	45	7
May	142	62	16
June	89	33	4
July	53	10	0
August	27	3	0
Sepetember	22	2	0
October	99	2	0
November	67	6	1
December	71	12	1

Source: Kansas Water Resources Board report (11) for this study.

WATER CHARACTERISTICS FOR FLOATING

Hydrological data in reference to mean base flow or discharge velocity when used alone does not provide sufficient information to determine whether or not a stream has depth enough along its length for floating.* Mean base

*It is possible to relate average depth at a specific location or check point, to a minimum depth required to float a given study area. This can be determined by repeated floats through the study area, observing each time the computed or measured depth at the check point and its relationship to success in floating over the shallowest riffles. Thus it could be determined that any given check point depth there would be either sufficient or insufficient water over the shallow riffles to allow floating.

flows do, however, serve as a good indicator as to the time of year an intermittent stream can be expected to provide the best conditions, re: water quantity for floating.

It should be pointed out that surface run-off from rainfall or snow melt in the watershed can completely alter total stream flow at any given time.

In summary, a prospective floater should expect favorable conditions in reference to water quantity and depth during the spring and early summer months throughout the four study areas. It is during this period that mean base flows as well as total precipitation rates are highest. Before attempting to float a stream, however, careful consideration should be given to previous as well as current rainfall conditions and the resultant effect, if any, on total stream flow. Consideration should also be given to discharge rates from upstream reservoirs, if any, as such may alter water quantity and level.

STREAM DEPTH CHARACTERISTICS

MINIMUM OBSERVED - 10 inches

MAXIMUM OBSERVED - 13 feet

AVERAGE OBSERVED - Approximately 4 to 5 feet

STREAM WIDTH CHARACTERISTICS

MINIMUM OBSERVED - Approximately 16 feet

MAXIMUM OBSERVED - Approximately 175 feet

AVERAGE OBSERVED - Approximately 50 feet

COURSE CHARACTERISTICS AND STABILITY

The Caney River is a meandering stream with a course that varies from one stable in character where the stream runs between rock outcrop and adjacent

erosion resistant landform to one possessing some instability where banks are composed of alluvial and loessial deposits. Significant stream bank vegetation also tends to stabilize the stream course in many areas. In general, unstable conditions were seldom observed and the stream course was well defined.

The stream bed through the study area consisted of bed and/or loose rock resulting in a stable depth.

Most of the natural campsites observed and mapped were gravel deposits within the stream bed and indicate the frequency of significant deposits above the water level. Very little stream bed silting was observed.

WATER QUALITY

Any degree of water pollution present at the time of observation was not considered by the author to be detrimental to the primary purposes of this study. The water was slightly turbid, but, other than this form of mineral pollution, little evidence of "man-made" pollution was observed.

IMPORTANT WILDLIFE SPECIES

Wildlife observed in the Caney River study area included: cottontail rabbit, squirrel, muskrat, turtle, mourning dove, bobwhite quail, vulture, owl, wood-duck, crow, heron and other bird species.

Hall (5) reported that mink, fox, coyote, skunk, oppossom, raccoon and whitetailed deer are other mammals that could be observed in the area. The Caney River is also on the edge of an area that supports wild turkey.

IMPORTANT FISH SPECIES

Cross (3) reported that fish species important to this study area include: bullhead catfish, channel catfish, flathead catfish, bluegill, largemouth bass, crappie, other sunfish, carp, buffalo and sucker.

NATURE OF TOPOGRAPHY

The upper part of the Caney River study area is located in the Great Plains Physiographic Province and the Flint Hills Physiographic Sub-region. The lower portion extends into the Central Lowland Physiographic Province and the Osage Cuestas Physiographic Sub-region, reported Self (13).

The Flint Hills is the first major escarpment in eastern Kansas and is considered to be the most rugged, hilly surface feature in the state. Elevations, in general, are well above 1,000 feet with some parts above 1,500 feet. This area is characterized by grassy hill lands which are mostly in native pasture grass with native deciduous trees and eastern red cedar found in the rocky ravines. Soil on these hill lands is thin and rocky with limestone and chert outcrops appearing frequently.

The bottom land and flood plain areas are frequently cultivated except where native stands of timber remain along stream banks, on slopes, and in ravines.

The Osage Cuestas are characterized by a hilly, rolling topography consisting of a series of northeast and southwest irregular trending escarpments or ridge-like cuestas. The hills are covered by native grass pastures, but the valleys are cultivated with the exception of narrow timbered areas along streams.

TOPOGRAPHIC QUALITY

The Caney River study area is a relatively remote section of the state and population figures are low. As a result, the topography is disturbed as little as any in the state. Bank pollution in the form of litter or trash was observed at three locations throughout the study area and in only one case was the quantity such that it significantly harmed visual quality.

ECOLOGICAL TYPE AND DEVELOPMENT

Forested bottomlands and ravines in the Caney River valley as well as in much of southeast Kansas are remnants of the Deciduous Forest that extend into this area of the state. Predominate tree species observed in the study area lowlands include: red oak species, bur oak, hickory, hackberry, Kentucky coffee tree, Osage orange, ash, sycamore, mulberry, box elder, elm, catalpa, locust, willow, redbud, elderberry and walnut. Species observed on rocky ridges and slopes include: eastern red cedar, scrub oak, elm and hackberry. Several large tree specimens were noted and mapped.

PRESENT OR PLANNED WATERSHED DEVELOPMENT

The Big Caney watershed district was organized prior to February 1969 under the State Watershed District Act of 1953, according to Power (11). To date, construction on nine, small, flood water, retaining structures has been completed with five more currently under construction. When completed, the watershed will contain a total of 32 structures on tributaries of the Caney River.

Watershed management should improve the recreational potential of any stream by reducing extreme water level fluctuation, stream bed silting, and water turbidity.

CLASSIFICATION OF STUDY AREA

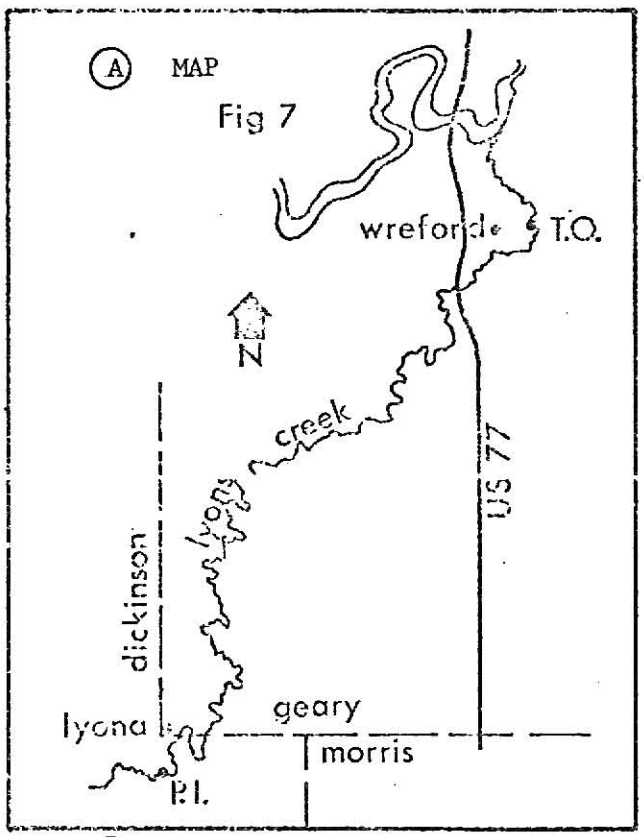
The Caney River study area is a Class III Natural Environment Area as classified and described by the ORRRC (10).

LYONS CREEK STUDY AREA

I. GENERAL INFORMATION

STREAM Lyons Creek

LOCATION OF STUDY AREA Fig 7



P.I. At bridge 1/2 mile south of Lyona (Woodbine Quadrangle USGS Map)

T.O. At bridge 3/4 mile east of Wreford (Wreford Quadrangle USGS Map)

P.I. = Canoe "Put-in" or beginning of study area.

T.O. = Canoe "Take-out" or ending of study area.

(B) U.S. GEOLOGICAL SURVEY MAP QUADRANGLES

1. Woodbine, Kansas, 1964 - 7.5 minute series
2. Kansas Falls, Kansas, 1964 - 7.5 minute series
3. Wreford, Kansas, 1964 - 7.5 minute series

(C) COUNTIES

Dickinson County

Geary County

MAJOR WATERSHED AREA

(A) MAP

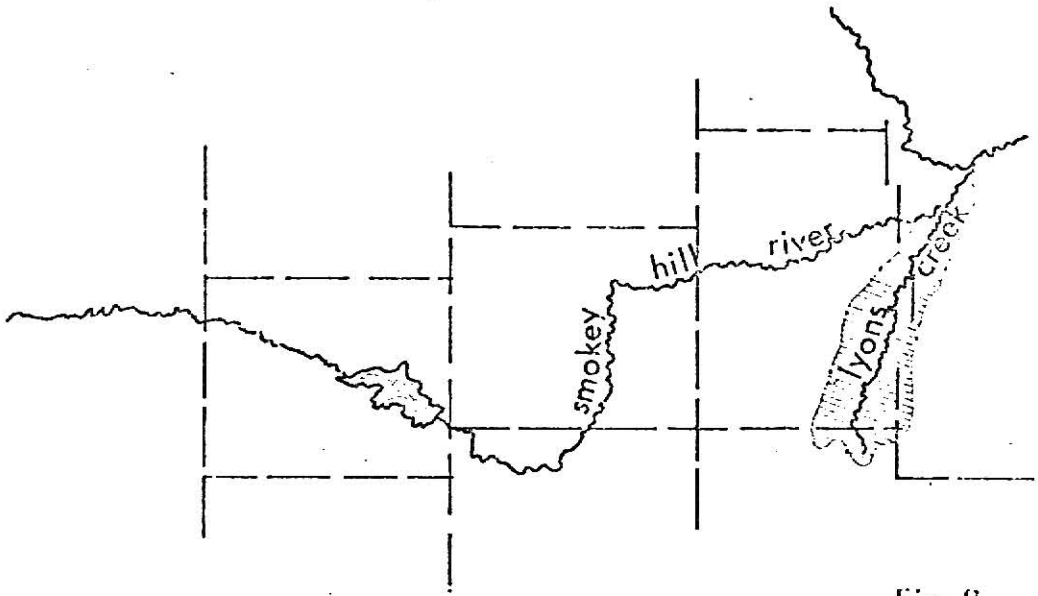


Fig 8

(B) DESCRIPTION

According to Power (11), the Lyons Creek basin lies on the south side of the Smokey Hill River in east-central Kansas. The basin includes an area of 280.9 square miles and, in total, is about 30 miles long and eight to 13 miles wide.

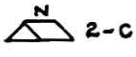
Lyons Creek heads along the northern border of Marion County and flows northeast across the corner of Dickinson County into Geary County where it enters the Smokey Hill River southwest of Junction City.

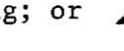
Elevations range from 1,500 feet at the headwaters to 1,050 feet at the junction with the Smokey Hill River. The stream bed in the study area has a gradient of approximately 3.7 feet per mile.

LENGTH OF STUDY AREA	20.7 miles
TRAVEL TIME	Approximately 13 hours (without motor)
DATES OF OBSERVATIONS	July 29, 1969 and July 30, 1969
WATER LEVEL	July 29 - Stage - 2.44, Discharge 55 Cubic Feet per Second*
	July 30 - Stage - 2.42, Discharge 54 Cubic Feet per Second*
WEATHER CONDITIONS	July 29 - Partly Cloudy and Warm - Very Pleasant Conditions
	July 30 - Partly Cloudy to Cloudy, Light Showers in Midafternoon. Temperatures Warm and Pleasant

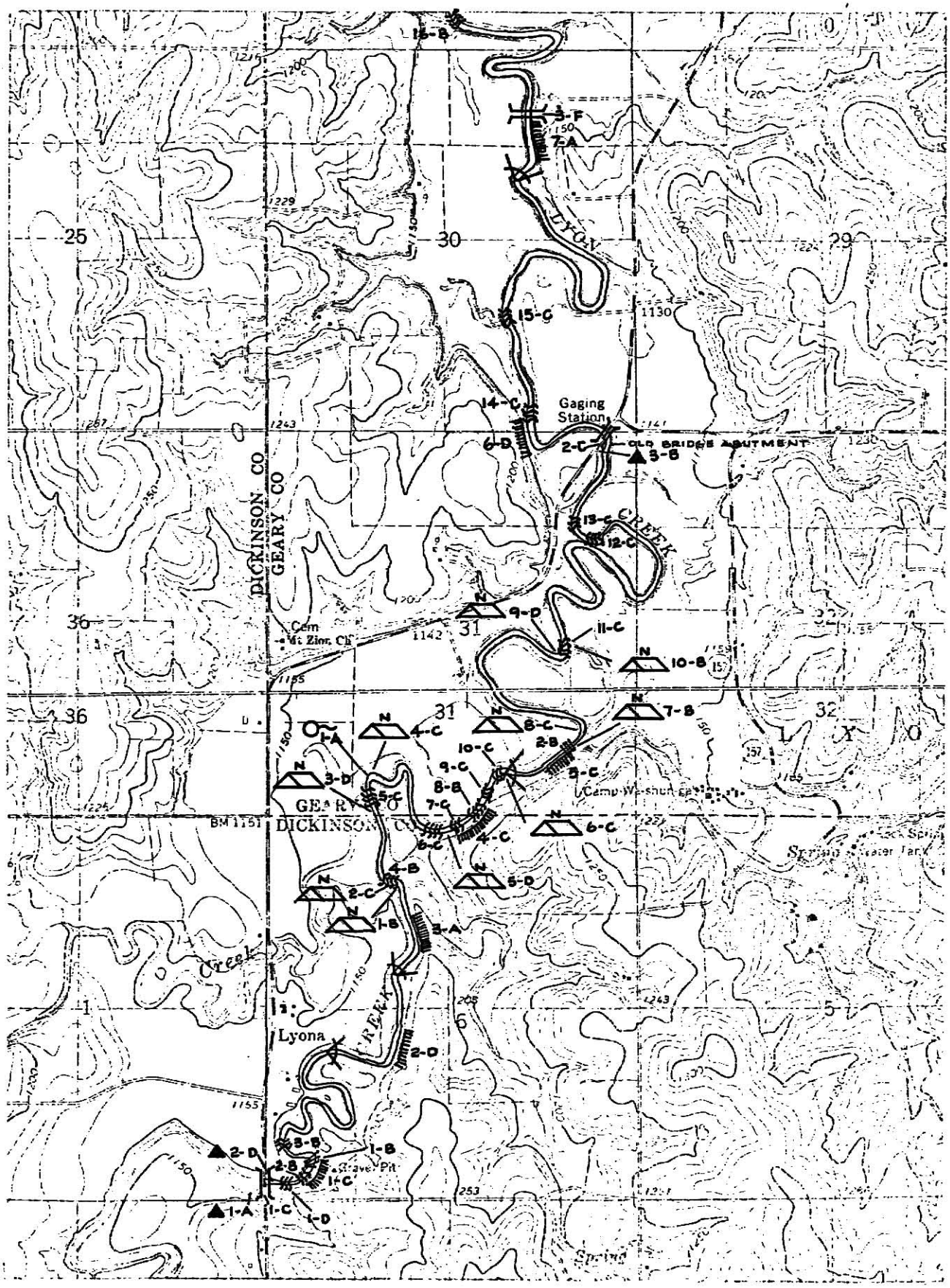
*Data taken from Lyons Creek gaging station and furnished by the Kansas Water Resources Board.

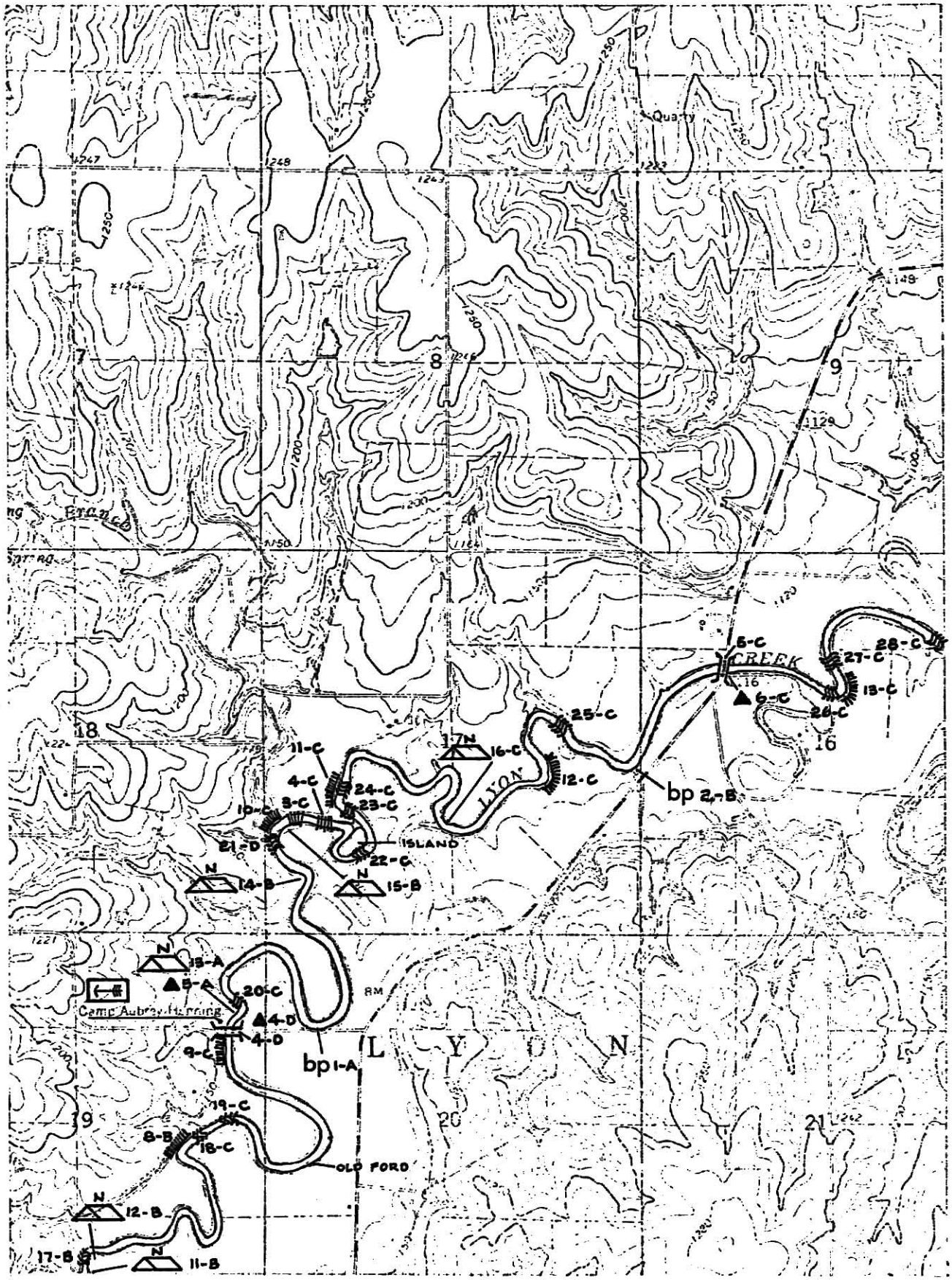
II. FIELD INVENTORY OF RESOURCES

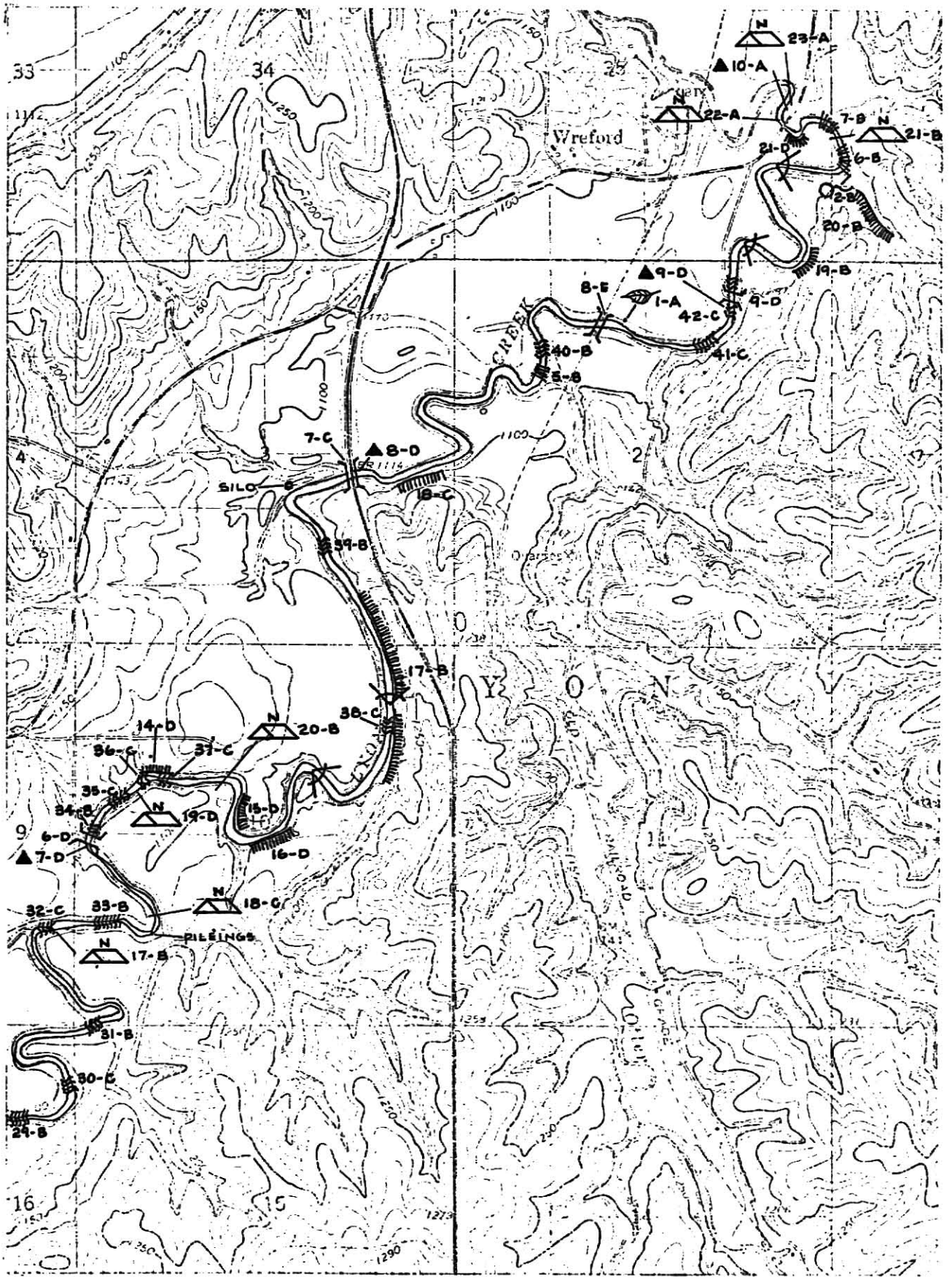
The following resource inventory includes the location, relative rating, and number (in sequence from the P.I.) of individual resources observed in the Lyons Creek study area. For example, 

refers to the second natural campsite observed and it has a C rating; or 

refers to the third access point observed and it has a B rating.


15-B
3-F
7-A
LYON
25
30
29
15-C
1130
14-C
Gaging Station
6-D
2-C
OLD BRIDGE ABUTMENT
3-B
DICKINSON CO
GEARY CO
13-C
CREEK
12-C
9-D
11-C
Cem
Mt. Zion Ch
1142
31
36
10-B
4-C
8-C
7-B
32
1-A
10-C
2-B
9-C
3-D
5-C
8-B
3-C
Camp Wa-shun-ga
7-C
GEARY CO
DICKINSON CO
BM 1151
6-C
4-C
Spring
Water Tank
5-D
4-B
2-C
1-B
3-A
Creek
Lyona
CREEK
2-D
1-B
3-B
2-B
Gravel Pit
1-C
1-A
1-C
1-D
Spring


Quarry
Ernest
Spring
CREEK
ISLAND
OLD FORD
Camp Aubrey Herring
bp 1-A
bp 2-B
LYON
7
8
9
16
17
18
19
20
21
1-D
2-C
3-C
4-C
5-A
5-C
6-C
7-C
8-B
9-C
10-C
11-B
11-C
12-B
12-C
13-A
13-C
14-B
15-B
16-C
17-B
18-C
19-C
20-C
21-D
22-C
23-C
24-C
25-C
26-C
27-C
28-C


Wreford
CREEK
SILO
PILEINGS
23-A
10-A
22-A
7-B
21-B
21-D
6-B
20-B
19-B
9-D
8-E
1-A
42-C
41-C
40-B
5-B
7-C
8-D
18-C
39-B
17-B
38-C
14-D
20-B
36-C
37-C
35-C
34-B
19-D
15-D
6-D
7-D
16-D
32-C
33-B
18-C
17-B
31-B
30-C
24-B
33
34
25
4
2
9
1
16
15

RECREATIONAL RESOURCE ANALYSIS . . . LYONS CREEK STUDY AREA

RESOURCE	RATING & VALUE		NO. OBSERVED	POINT VALUE
▲ ACCESS	A	10	3	30
	B	8	1	8
	C	6	1	6
	D	2	5	10
	TOTAL		10	54
RIFFLES	A	10	-	-
	B	8	12	96
	C	6	28	168
	D	4	2	8
	TOTAL		42	272
RAPIDS	AA	18	-	-
	A	15	-	-
	B	12	5	60
	C	10	2	20
	TOTAL		7	80
WATERFALL	A	20	-	-
	B	18	-	-
	C	15	-	-
	TOTAL		-	-
DAM	A	18	-	-
	B	15	-	-
	C	15	-	-
	D	15	-	-
	TOTAL		-	-
BLUFF	A	15	2	30
	B	15	4	60
	C	15	6	96
	D	8	9	72
	TOTAL		21	258
SPRING	A	8	1	8
	B	8	1	8
	TOTAL		2	16
BRIDGE	A	10	-	-
	B	10	-	-
	C	5	5	25
	D	5	3	15
	E	2	2	4
	F	2	2	4
	TOTAL		10	48

RESOURCE	RATING & VALUE		NO. OBSERVED	POINT VALUE
 CAMPSITE (NATURAL)	A	15	3	45
	B	15	10	150
	C	10	6	60
	D	8	4	32
	TOTAL		23	287
 CAMPSITE (IMPROVED)	A	12	-	-
	B	11	-	-
	C	10	-	-
	TOTAL		-	-
 SPECIMEN PLANT	A	10	1	10
	B	10	-	-
	C	8	-	-
	TOTAL		1	10
bp BANK POLLUTION	A	-15	1	-15
	B	-10	1	-10
	TOTAL		2	-25
wp WATER POLLUTION	A	- 8	-	-
	B	- 8	-	-
	C	- 8	-	-
	TOTAL		-	-
 CAVE		10	-	-
	TOTAL		-	-
PIPE LINE		2	-	-
	TOTAL		-	-
 SCENIC SITE		12	-	-
	TOTAL		-	-
 HISTORIC SITE		10	1	10
	TOTAL		1	10
 ROCK & FOSSIL AREA		10	-	-
	TOTAL		-	-
 WETLANDS		20	-	-
	TOTAL		-	-
 SCENIC VISTA		15	8	120
	TOTAL		8	120

III. DESCRIPTION AND CHARACTERISTICS OF STUDY AREA

CLIMATIC CHARACTERISTICS

According to Trewartha (17), Lyons Creek is located in the Humid Continental with Warm Summers Climate (see figure 1) which extends into the eastern three-fourths of Kansas and westward to near the 100th meridian.

Self (13) reported that summers in this climate are characterized by warm but pleasant temperatures with a few days actually considered "hot" when temperatures reach 95° to 100° F. or more. Fresh breezes periodically modify temperatures during this season.

Winter season temperatures in this climate will drop to well below freezing during many days and there are usually a few days when temperature extremes will fall below zero in the northern part of this climate area.

A temperature and precipitation record of averages as recorded at the Manhattan, Kansas climate station compares monthly variations:

Humid Continental (Warm Summer Phase)

Manhattan, Kansas - Riley County

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temperature (degrees F.)	29	32	44	55	65	75	80	79	71	58	44	32
Precipitation (inches)	0.7	1.2	1.6	2.7	4.4	4.6	3.7	4.2	3.9	2.3	1.8	0.9

Source: Self, Huber, 1963, Geography of Kansas Syllabus and Atlas.

Seasonal averages for temperature and precipitation rates based upon the Manhattan, Kansas climate station data are as follows:

	Spring (Mar. - May)	Summer (June - Aug.)	Fall (Sept. - Nov.)	Winter (Dec. - Feb.)
Temperature (Average)	55°F.	78°F.	58°F.	31°F.
Precipitation (Total)	8.7 in.	12.5 in.	8.0 in.	2.8 in.

The growing season averages about 195 days annually in the southeast portion of the Humid Continental with Warm Summers Climate to about 160 days in the north.

STREAM FLOW CHARACTERISTICS

Significant seasonal variation of base flow in the Lyons Creek study area can be expected. In analyzing data provided by the Kansas Water Resources Board (11), it was found that the best base flows can be expected during March, April, May and June. Mean base flows should normally provide sufficient water for floating without dragging over riffles during these spring and early summer months.

Monthly Base Flow of Selected Exceedence

Lyons Creek Near Woodbine

Month	Monthly base flow in c.f.s. chance exceedence		
	20%	50%	80%
January	55	20	3
February	62	23	5
March	70	27	7
April	80	33	9
May	78	38	11
June	62	35	10
July	45	26	6
August	35	16	5
September	30	12	0
October	40	10	0
November	45	15	0
December	50	18	0

Source: Kansas Water Resources Board Report (11) for this study.

In the month of June, for example, there is a 50% chance the base flow will equal or exceed 35 c.f.s. at the gaging station near Woodbine.

WATER CHARACTERISTICS FOR FLOATING

Refer to pages 40 and 41 for pertinent remarks relative to water quantity and stream floatability.

STREAM DEPTH CHARACTERISTICS

MINIMUM OBSERVED - 3 inches

MAXIMUM OBSERVED - 12 feet

AVERAGE OBSERVED - Approximately 3 to 4 feet

STREAM WIDTH CHARACTERISTICS

MINIMUM OBSERVED - Approximately 14 feet

MAXIMUM OBSERVED - Approximately 75 feet

AVERAGE OBSERVED - Approximately 40 feet

COURSE CHARACTERISTICS AND STABILITY

The stream bed of Lyons Creek is very meandering and in certain areas, its course is subject to change at times of high water due to unstable bank conditions. Course instability is especially noticeable where deep alluvial and loessial deposits form the stream banks. In situations where banks consist of rock outcrop or where vegetation is well established, the stream course is considerably more stable.

Much of the stream bed consists of rock or coarse gravel resulting in a stable bed depth.

The natural campsites observed and mapped are gravel deposits within the stream bed and indicate the frequency of significant deposits above the water level. Some silting was observed in the stream bed, but for the most part, such deposits can be considered insignificant to the purposes of this study.

WATER QUALITY

Little visable water pollution was observed. Some foam or "suds" was noticeable in eddies and other areas of calm or back-up water, however. The Kansas Water Resources Board report (11) for this study states: "No major sources of pollution exist in the basin which would be detrimental to the concept of this study. Following high flows, turbidity will exist from erosion of soils."

IMPORTANT WILDLIFE SPECIES

Of the four study areas floated, wildlife observed was the most abundant in the Lyons Creek area. Observations made include: cottontail rabbit, squirrel, coyote, muskrat, turtle, mourning dove, bobwhite quail, owl, heron, cardinal, crow, duck and other bird species.

As reported by Hall (5), a floater may also observe mink, fox, beaver, skunk, raccoon, and whitetailed deer in this study area.

IMPORTANT FISH SPECIES

Cross (3) pointed out that fish species important to the Lyons Creek study area include: channel catfish, flathead catfish, bullhead catfish, crappie, other sunfishes, carp, buffalo, and sucker.

NATURE OF TOPOGRAPHY

The Lyons Creek study area is located in the Great Plains Physiographic Province and the Flint Hills Physiographic Sub-region. The area is characterized by a rugged, hilly, upland, surface feature with nearly all of this surface in native grass. Limestone outcrops are frequently observed, and topsoil

layers are usually thin and rocky. Both deciduous trees and eastern red cedar are observed in ravines.

The bottom land areas are characterized by deep loess and alluvial soil with relatively little abrupt change in surface topography except at stream banks. Much of this land has been cleared of timber and is being farmed; however, significant forest vegetation does exist along stream edges, in ravines, and on slopes too steep or rocky to farm.

TOPOGRAPHIC QUALITY

The visual quality of the topography was significantly marred by bank pollution in two locations where trash had been discarded over the stream bank. These locations are noted on the inventory map (see page 51).

ECOLOGICAL TYPE AND DEVELOPMENT

Forested areas are remnants of the Deciduous Forest as its limits extend into the river valleys, creeks, and ravines in this area of Kansas. The predominate tree species observed were sycamore, elm, boxelder, ash, willow, black walnut, hackberry, locust and mulberry, with eastern red cedar commonly observed on rocky slopes and in upland ravines.

PRESENT OR PLANNED WATERSHED DEVELOPMENT

The Lyons Creek Watershed District has recently completed a plan for development. The program calls for installation of 22 flood water retaining structures on tributaries of Lyons Creek and a multi-purpose dam (Woodbine Reservoir) on the creek. The dam is approximately 1 1/2 miles below the P.I. Nearly all of the study area is located below the proposed structure.

If and when reservoirs within the watershed are constructed, their effect should tend to reduce extreme water level fluctuation, reduce stream bed silting, and result in less water turbidity.

CLASSIFICATION OF STUDY AREA

The Lyons Creek study area is a Class III Natural Environment Area as classified and described by the ORRRC (10).

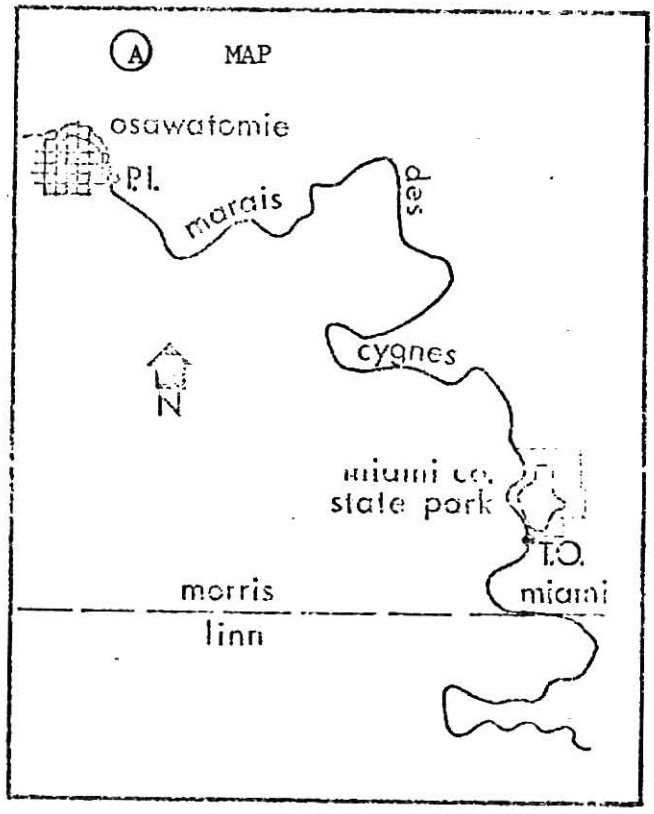
MARAIS DES CYGNES RIVER STUDY AREA

I. GENERAL INFORMATION

STREAM Marais des Cygnes River

LOCATION OF STUDY AREA

Fig 9



P.I. At bridge 1/2 mile east of Osawatomie, Kansas (Osawatomie Quadrangle USGS Map)

T.O. At south end of Miami County State Lake (Fontana Quadrangle USGS Map)

P.I. = Canoe "Put-in" or beginning of study area.

T.O. = Canoe "Take-out" or ending of study area.

(B) U.S. GEOLOGICAL SURVEY MAP QUADRANGLES

1. Osawatomie, Kansas, 1963 - 7.5 minute series
2. Paola East, Kansas, 1956 - 7.5 minute series
3. Fontana, Kansas, 1958 - 7.5 minute series

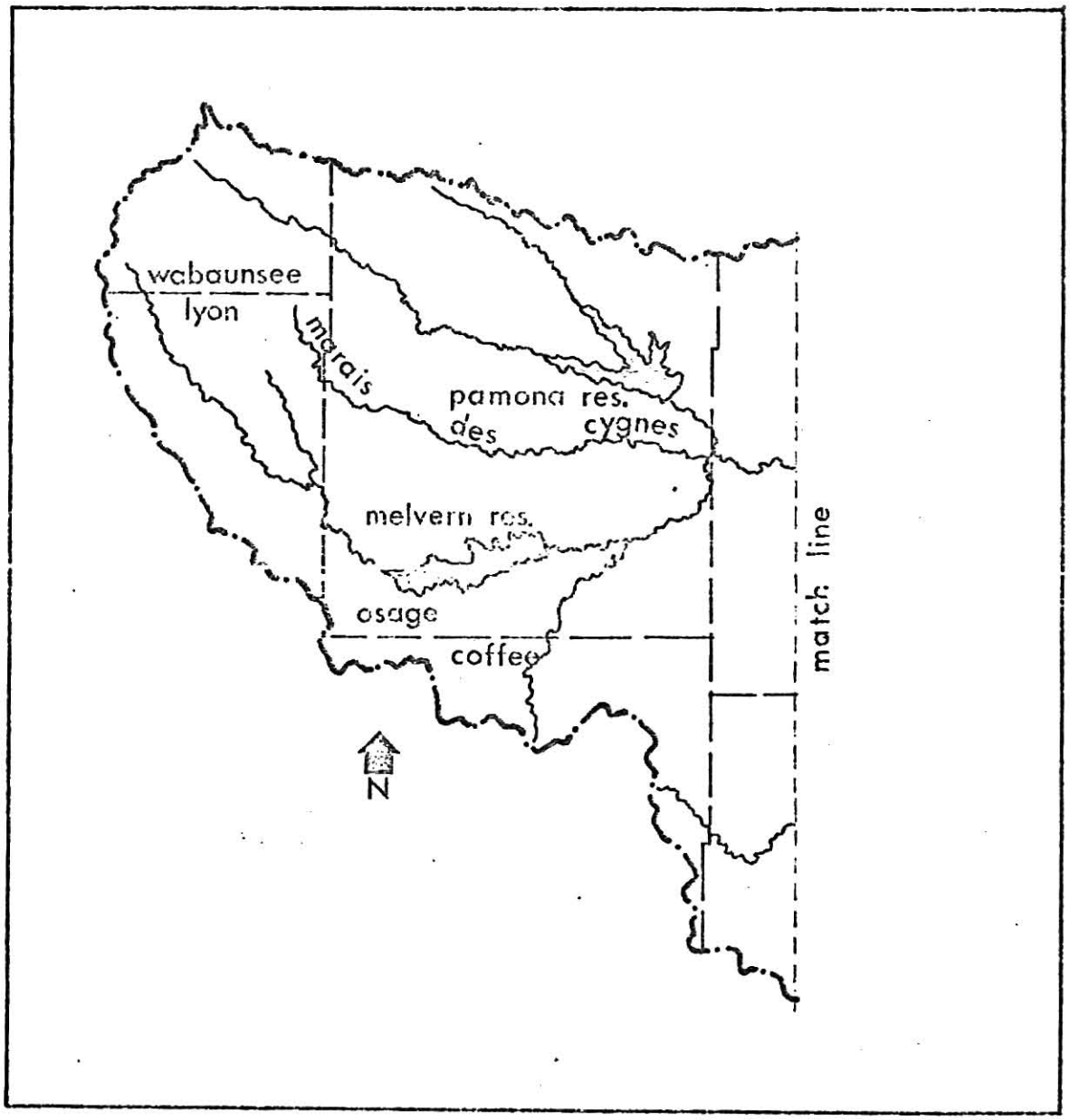
(C) COUNTIES

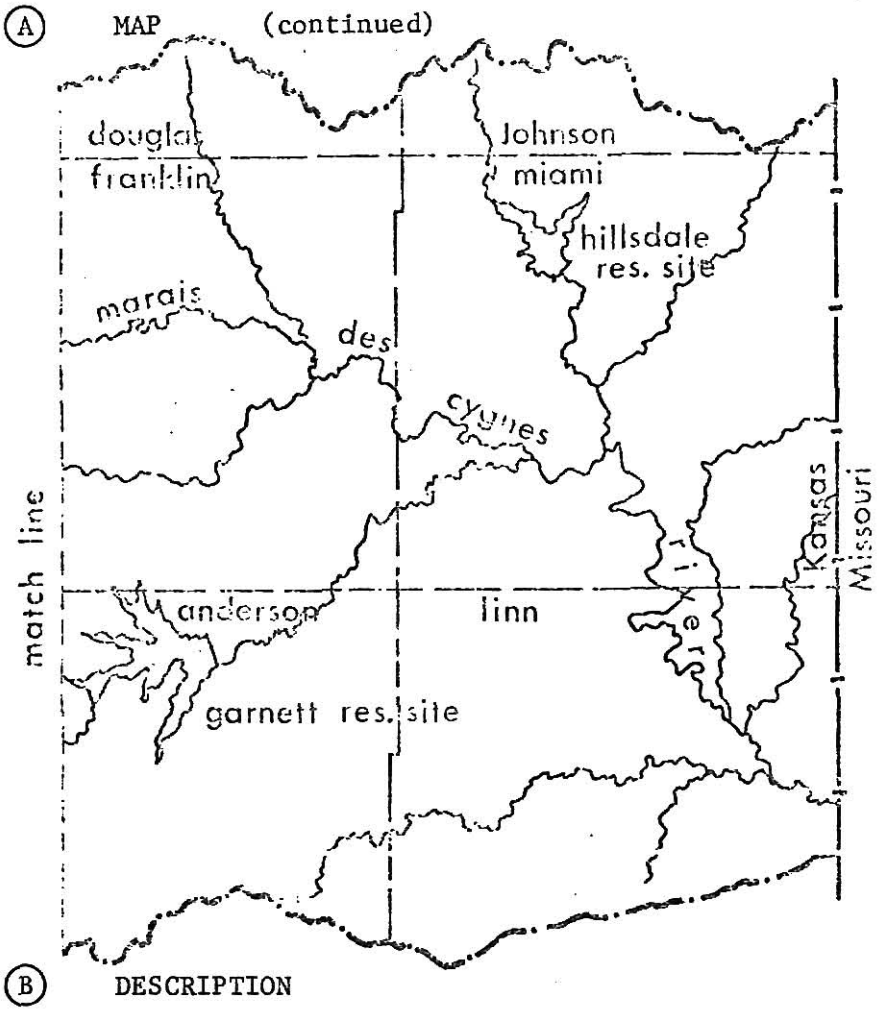
Miami County

MAJOR WATERSHED AREA

Ⓐ MAP

Fig 10





The Marais des Cygnes River begins near Eskridge, Kansas in Wabaunsee County and flows east and south to join the Little Osage River in Bates County, Missouri, according to Power (11). The river basin is a triangular shaped area of 3,240 square miles. The highest point of the outer rim in the basin, which is near Eskridge, has an elevation of 1,475 feet and the lowest point in the basin, which is the stream bed at the state line, is 740 feet in elevation.

One low-head overflow structure was observed just above the study area on the north edge of Osawatomie. No such structures are located within the study area itself.

LENGTH OF STUDY AREA	20.2 miles
TRAVEL TIME	Approximately 7 hours (with motor)
DATE OF OBSERVATIONS	August 21, 1969
WATER LEVEL	August 21 - Stage - 3.00, Discharge 780 Cubic Feet per Second*
WEATHER CONDITIONS	August 21 - Cloudy with Warm and Pleasant Temperatures

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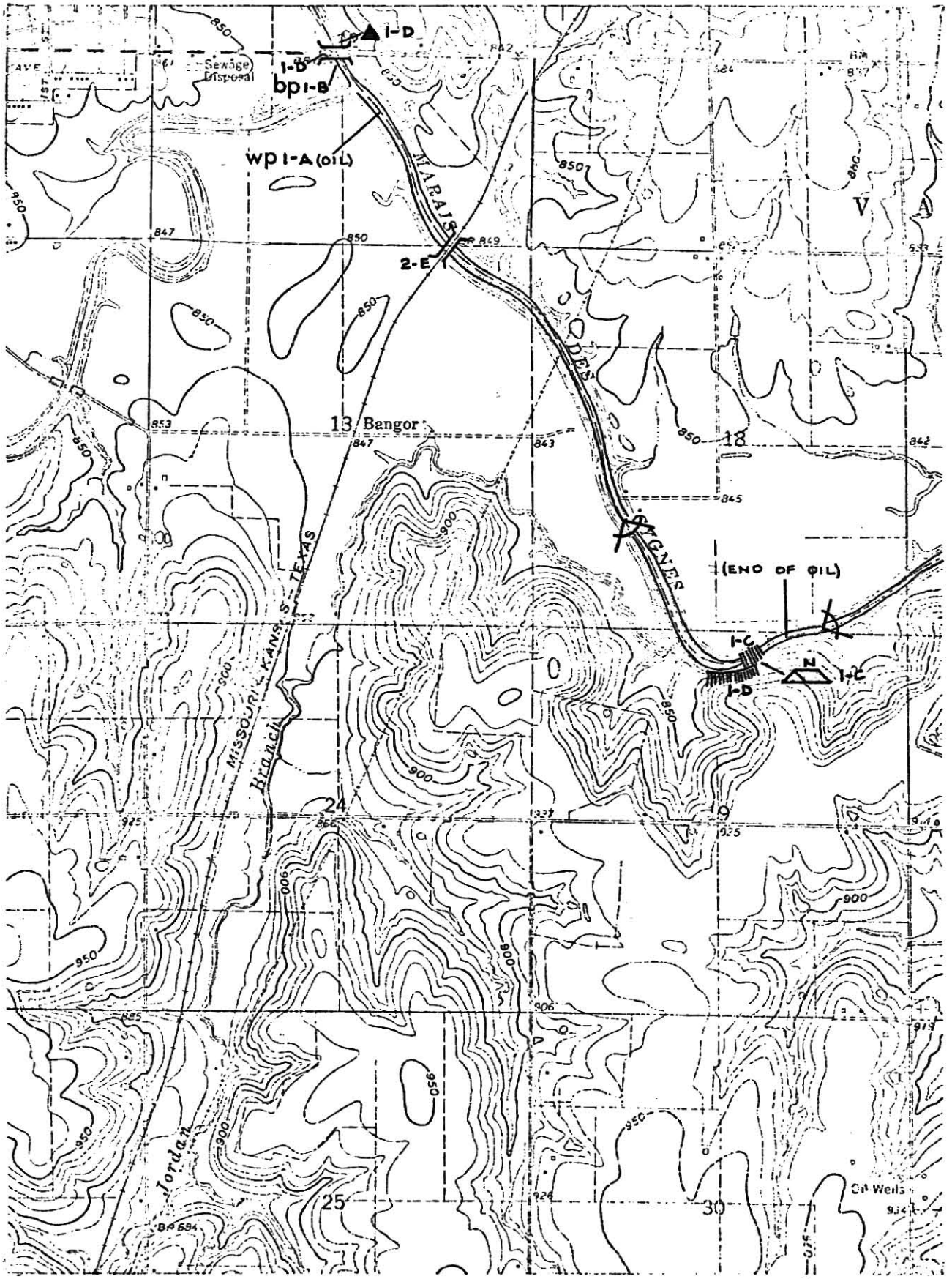
*Data taken from the Trading Post gaging station and furnished by the Kansas Water Resources Board.

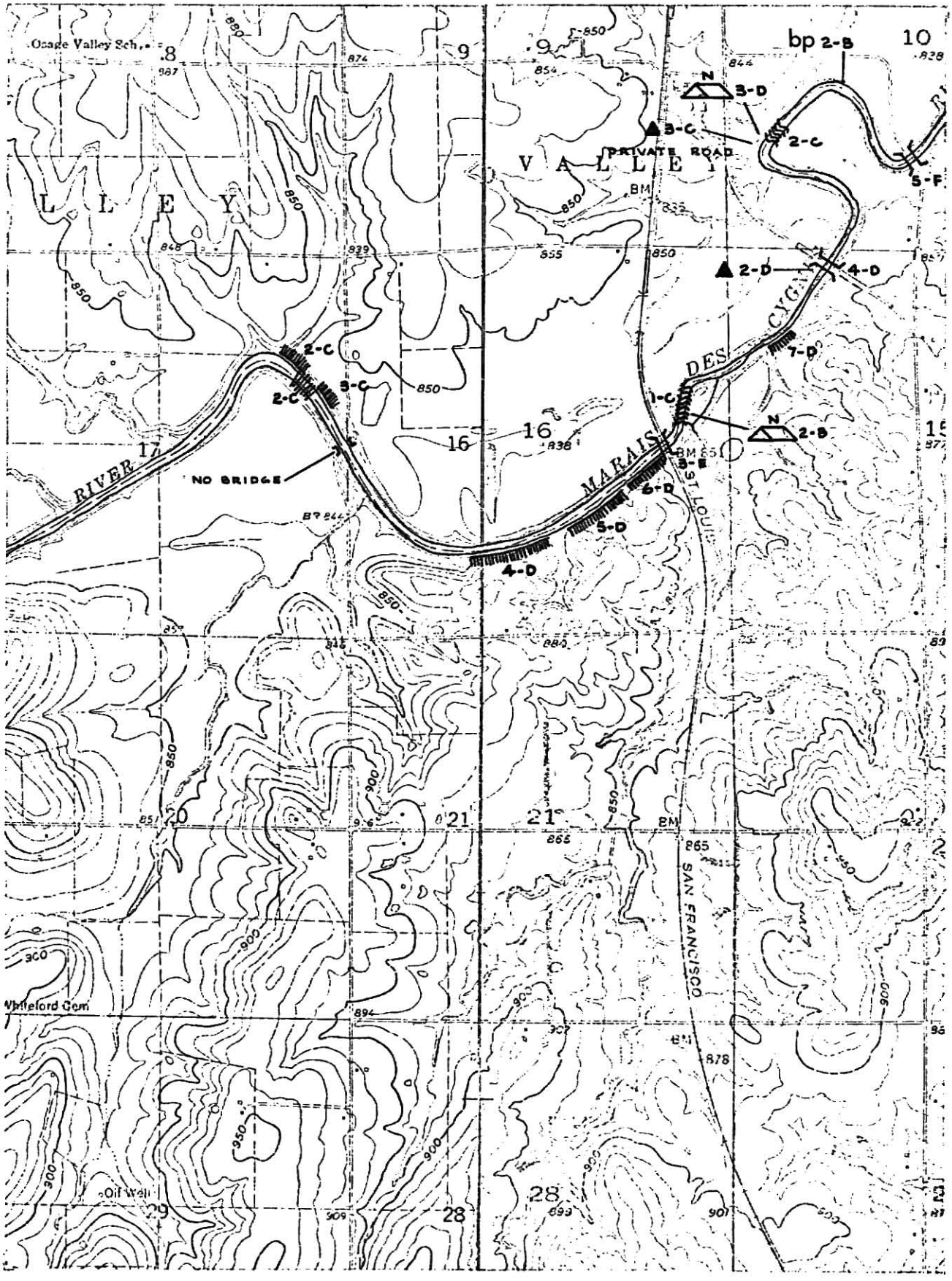
II. FIELD INVENTORY OF RESOURCES

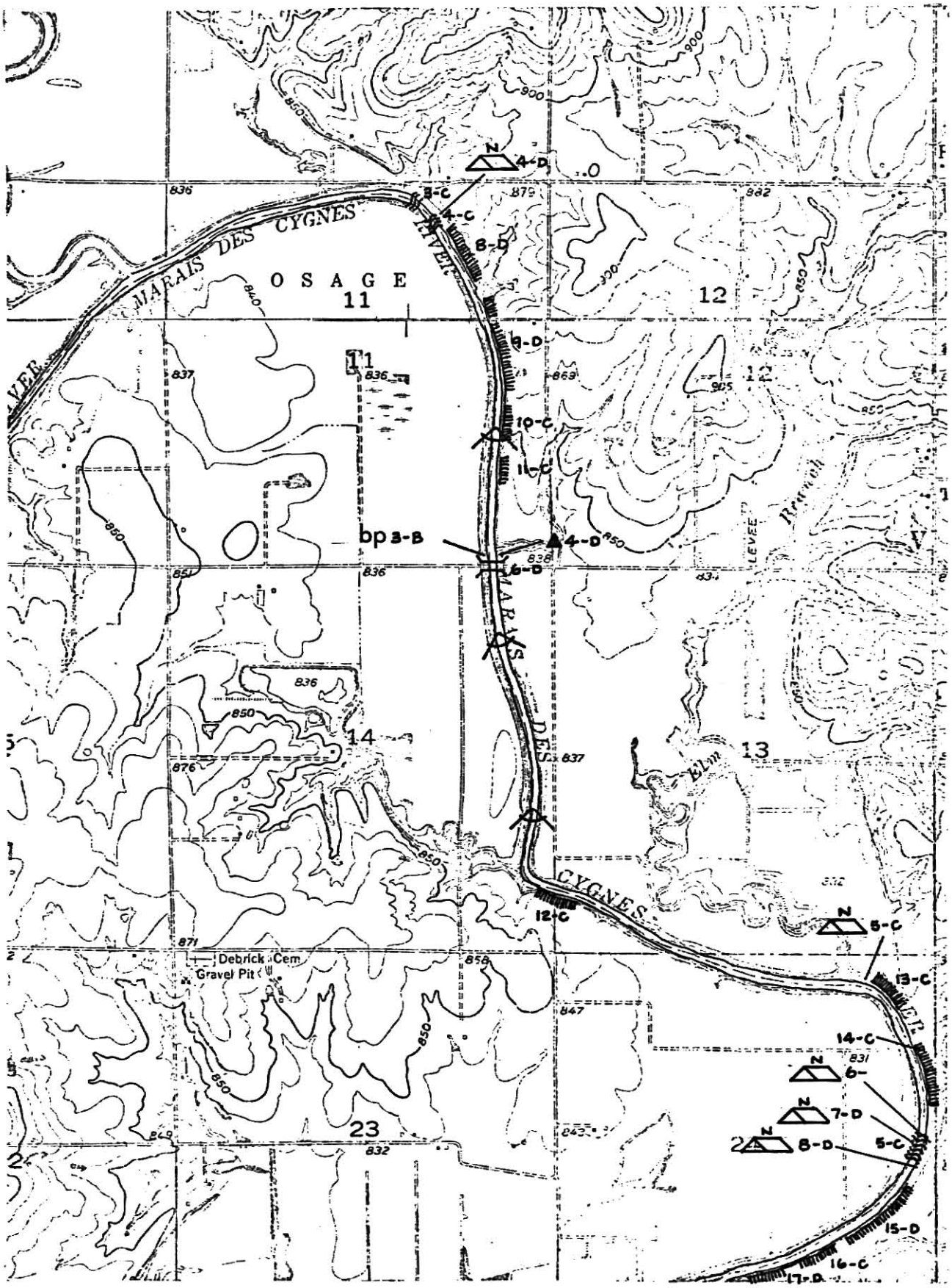
The following resource inventory includes the location, relative rating, and number (in sequence from the P.I.) of individual resources observed in the Marais des Cygnes River study area. For example, 

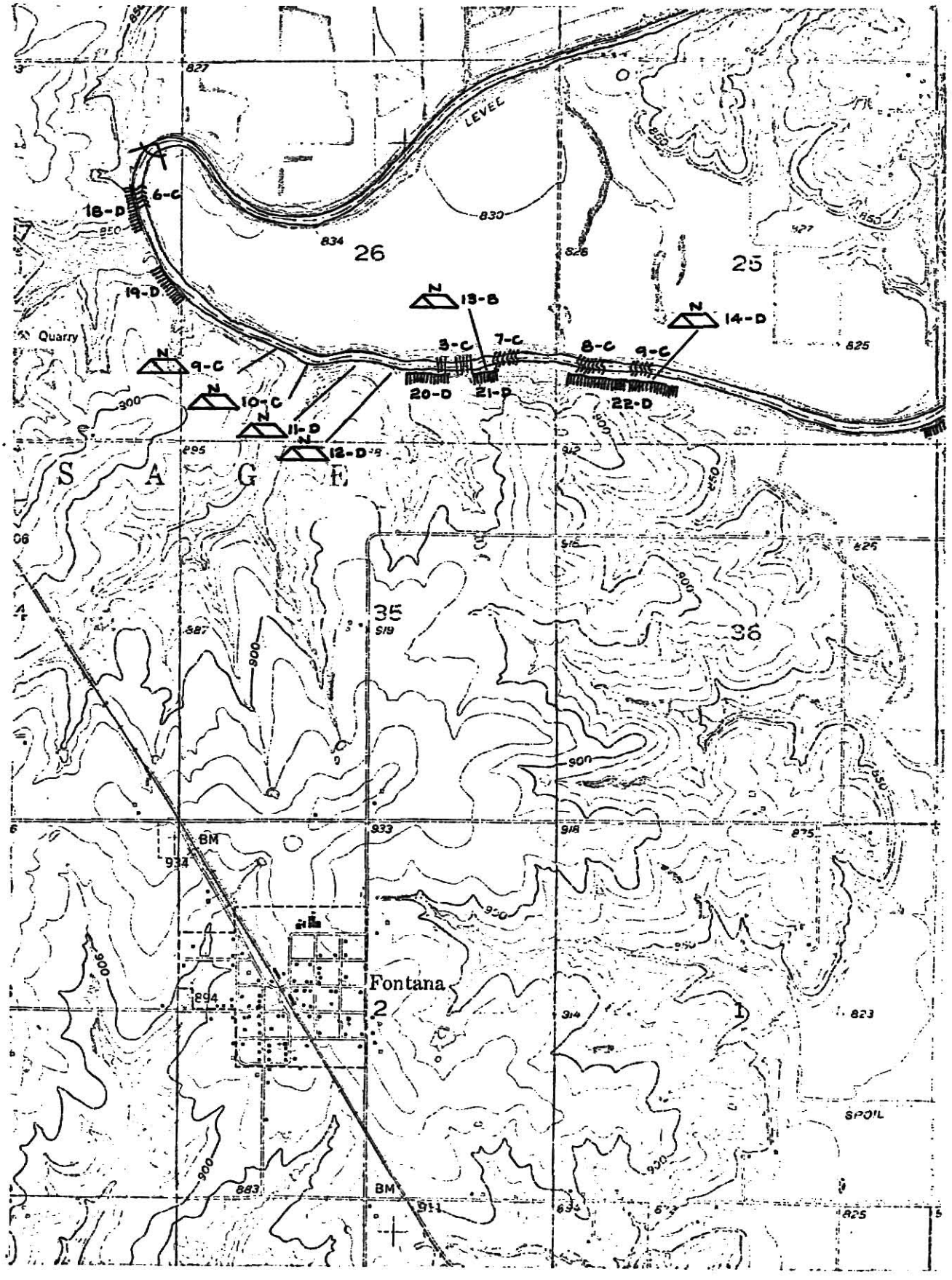
refers to the second natural campsite observed and it has a C rating; or 

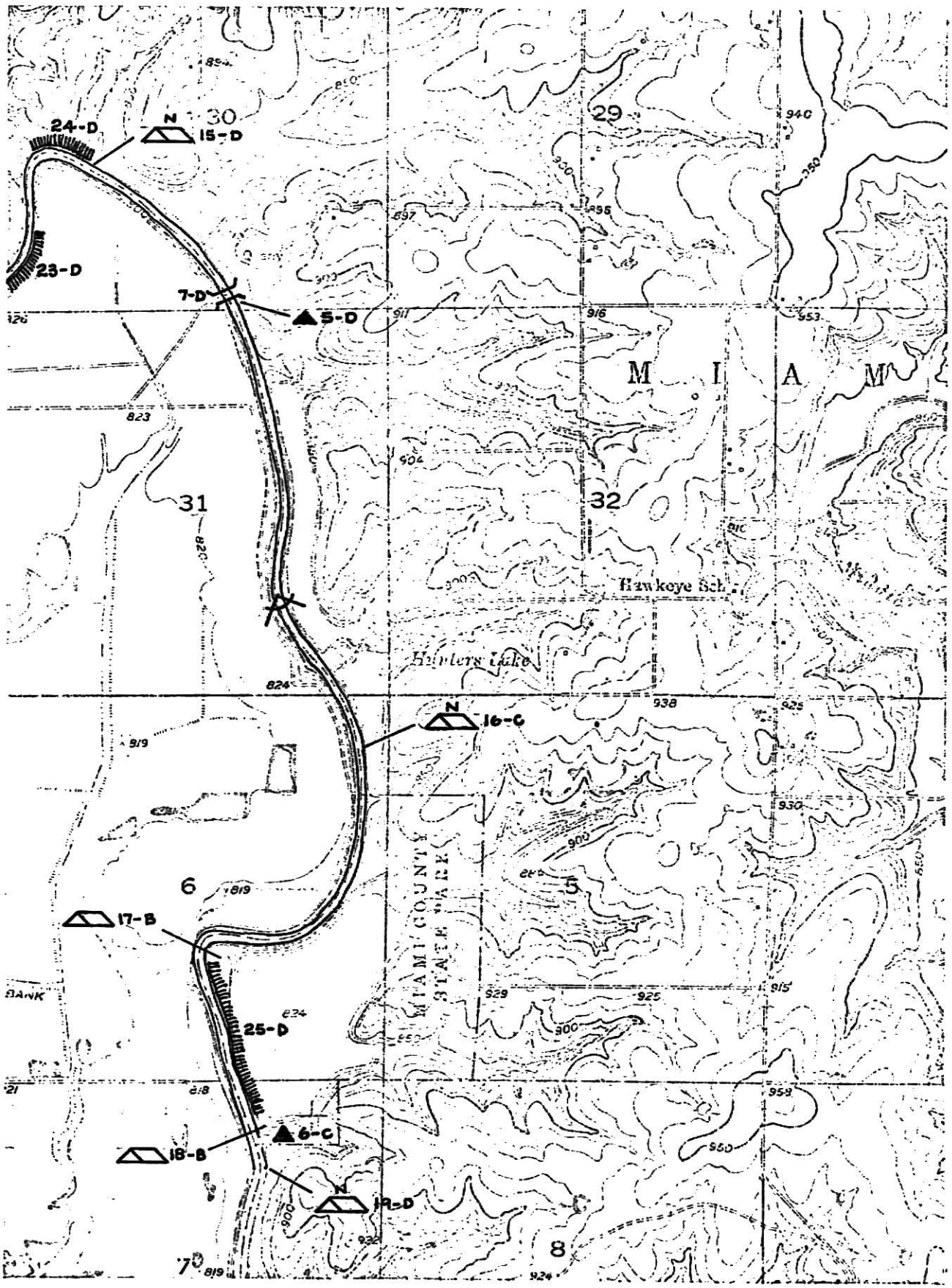
refers to the third access point observed and it has a B rating.


1-D
1-D
bp 1-B
wp 1-A (oil)
Sewage Disposal
MARAIS DES CYGNES
2-E
13
Bangor
18
24
19
25
30
(END OF OIL)
1-C
1-D
1-C
N
MISSOURI-KANSAS-TEXAS
Branch
Jordan
Oil Wells


Osage Valley Sch.
L L E Y
V A L L E Y
PRIVATE ROAD
NO BRIDGE
RIVER
DES CYGNES
MARAIS
ST LOUIS
SAN FRANCISCO
Whiteford Com
Oil Well
bp 2-B
3-D
3-C
2-C
5-F
2-D
4-D
7-D
1-C
2-B
3-E
6-D
5-D
4-D
2-C
3-C
2-C
8
9
10
16
17
20
21
28
29
BM
850
900
950


MARAIS DES CYGNES RIVER
OSAGE
11
12
14
13
23
24
Debrick Cem
Gravel Pit
LEVEE
Branch
3-C
4-C
4-D
8-D
9-D
10-C
11-C
bp 3-B
6-D
12-C
5-C
13-C
14-C
6-
7-D
8-D
15-D
16-C
17-D


LEVEE
6-C
18-D
19-D
Quarry
9-C
10-C
11-D
12-D
13-B
5-C
7-C
20-D
21-D
8-C
9-C
14-D
22-D
26
25
S A G E
35
36
Fontana
2
1
BM
BM
SPOIL


24-D
15-D
23-D
7-D
5-D
16-C
17-B
25-D
6-C
18-B
19-D
30
29
31
32
6
5
7
8
M I A M
Hawkeye Sch
Hunters Lake
MIAMI COUNTY
STATE PARK

RECREATIONAL RESOURCE ANALYSIS . . . MARAIS DES CYGNES STUDY AREA

RESOURCE	RATING & VALUE		NO. OBSERVED	POINT VALUE
▲ ACCESS	A	10	-	-
	B	8	-	-
	C	6	3	18
	D	2	3	6
	TOTAL		6	24
RIFFLES	A	10	-	-
	B	8	-	-
	C	6	9	54
	D	4	-	-
	TOTAL		9	54
RAPIDS	AA	18	-	-
	A	15	-	-
	B	12	-	-
	C	10	3	30
	TOTAL		3	30
WATERFALL	A	20	-	-
	B	18	-	-
	C	15	-	-
	TOTAL		-	-
DAM	A	18	-	-
	B	15	-	-
	C	15	-	-
	D	15	-	-
	TOTAL		-	-
BLUFF	A	15	-	-
	B	15	-	-
	C	15	7	105
	D	8	18	144
	TOTAL		25	249
SPRING	A	8	-	-
	B	8	-	-
	TOTAL		-	-
BRIDGE	A	10	-	-
	B	10	-	-
	C	5	-	-
	D	5	4	20
	E	2	2	4
	F	2	1	2
	TOTAL		7	26

RESOURCE	RATING & VALUE	NO. OBSERVED	POINT VALUE
 CAMPSITE (NATURAL)	A 15	-	-
	B 15	2	30
	C 10	5	50
	D 8	10	80
	TOTAL	17	160
 CAMPSITE (IMPROVED)	A 12	-	-
	B 11	2	22
	C 10	-	-
	TOTAL	2	22
 SPECIMEN PLANT	A 10	-	-
	B 10	-	-
	C 8	-	-
	TOTAL	-	-
bp BANK POLLUTION	A -15	-	-
	B -10	1	-10
	TOTAL	1	-10
wp WATER POLLUTION	A - 8	1	- 8
	B - 8	-	-
	C - 8	-	-
	TOTAL	1	- 8
 CAVE	10	-	-
	TOTAL	-	-
PIPE LINE	2	-	-
	TOTAL	-	-
 SCENIC SITE	12	-	-
	TOTAL	-	-
 HISTORIC SITE	10	-	-
	TOTAL	-	-
 ROCK & FOSSIL AREA	10	-	-
	TOTAL	-	-
 WETLANDS	20	-	-
	TOTAL	-	-
 SCENIC VISTA	15	7	105
	TOTAL	7	105

III. DESCRIPTION AND CHARACTERISTICS OF STUDY AREA

CLIMATIC CHARACTERISTICS

The Marais des Cygnes River is located in the Humid Continental with Warm Summers Climate (see figure 1). The characteristics of this climate area are discussed on pages 55 and 56.

STREAM FLOW CHARACTERISTICS

Stream flow in the Marais des Cygnes River is derived primarily from rainfall run-off, according to Power (11). Ground water discharge is not appreciable as there are no large ground water aquifers and the alluvial deposits in the valley, being relatively thin, can store and release only limited amounts of water. Therefore, water quantity in the Marais des Cygnes River is more reflective of rainfall patterns than are the streams in the other study areas. Ground water contributions from large alluvial deposits or other aquifers comprise a significant portion of the "normal" stream flow in the Caney River, Lyons Creek and the Verdigris River.

Because of the factors just discussed, stream flow on the Marais des Cygnes is extremely erratic. For example, an analysis of the stream flow records at Ottawa (above the P.I. of the study area) indicates than an average flow of 540 c.f.s. would be equaled or exceeded only about 15 percent of the time, while a flow as low or lower than one percent of this average could be expected to occur between 15 and 20 percent of this time. A similar pattern in run-off exists at the gaging station at Trading Post (below the T.O. of the study area), according to Power (11).

The Marais des Cygnes study area should be floatable throughout much of the time between March and September, as rainfall amounts are most favorable during this period of the year (see page 55).

Monthly Base Flow of Selected Exceedence

Marais des Cygnes River at Trading Post, Kansas

Month	Monthly base flow in c.f.s. chance exceedence		
	20%	50%	80%
January	374	156	10
February	432	216	19
March	490	271	40
April	518	279	69
May	461	204	101
June	288	124	37
July	167	66	9
August	78	25	3
September	59	23	1
October	121	35	1
November	227	63	3
December	317	106	5

Source: Kansas Water Resources Board report (11) for this study.

WATER CHARACTERISTICS FOR FLOATING

Refer to pages 40 and 41 for pertinent remarks relative to water quantity and stream floatability.

STREAM DEPTH CHARACTERISTICS

MINIMUM OBSERVED - 10 inches

MAXIMUM OBSERVED - 14 feet

AVERAGE OBSERVED - Approximately 4 to 5 feet

STREAM WIDTH CHARACTERISTICS

MINIMUM OBSERVED - Approximately 40 feet

MAXIMUM OBSERVED - Approximately 150 feet

AVERAGE OBSERVED - Approximately 85 feet

COURSE CHARACTERISTICS AND STABILITY

The Marais des Cygnes River is a meandering stream with a well defined course in a deep channel. The banks average as much as 20 to 30 feet above the stream bed and consist mostly of alluvial and loessial deposits with rock outcrop present in some areas. Recent alluvial deposits were observed in several locations throughout the study area indicating unstable conditions upstream and/or in watershed areas. Serious bank erosion was not evident, however, as the banks are generally sloping and well forested except where rock outcrop is present. The river bank was often from two to three feet higher than the valley floor. This condition is a result of build up over a long period of time by deposition of silt carried by floods. The stream bed consists of a rock bottom in some locations and a soft bottom in other areas.

Fewer above water gravel deposits were observed in the Marais des Cygnes study area than in the other streams studied and, in general, those mapped rated relatively low in value as natural campsites or rest stops (see page 99).

WATER QUALITY

Significant water pollution by oil was observed in a two mile stretch just below the P.I. The pollution source was not discovered; however, the author considered the amount of pollution observed a serious detriment to the overall scenic and recreational quality of the affected portion of the stream.

IMPORTANT WILDLIFE SPECIES

Wildlife observed in the Marais des Cygnes study area include: squirrel, turtle, red fox, owl, heron, and several other bird species.

Hall (5) stated that raccoon, cottontail rabbit, coyote, oppossom, skunk, and muskrat are some of the other mammals that may be observed in the study area.

IMPORTANT FISH SPECIES

Cross (3) reported that fish species important to the Marais des Cygnes River study area include: channel catfish, flathead catfish, bullhead catfish, largemouth bass, other sunfish, carp, buffalo, and sucker.

The river is well known as excellent for catfishing.

NATURE OF TOPOGRAPHY

The Marais des Cygnes River study area is located in the Central Lowlands Physiographic Province and the Osage Cuestas Physiographic Sub-region. Self (13) reported that the area is characterized by a series of northeast, southwest irregular escarpments or ridge-like cuestas resulting in a hilly to rolling topography. Hill-lands are usually in native grass pasture with the lowlands and stream valleys cultivated except for narrow timbered areas along streams.

TOPOGRAPHIC QUALITY

The only significant bank pollution was in the form of discarded trash. This was observed near the bridge at the P.I. In general, the study area was found to be free of such detriments to visual or recreational quality.

ECOLOGICAL TYPE AND DEVELOPMENT

Tree species commonly observed in the Marais des Cygnes River study area include: willow, cottonwood, sycamore, ash, soft maple, boxelder and elm with some black walnut, oak, hard maple and hickory also being noted. As with much of eastern Kansas, this area was once heavily wooded; however, most of the land that is good for farming has been cleared. Timbered areas remain on steep slopes, in ravines, along the streams, and in individual woodlots. Chase and Strickler (1) reported that Miami County, in which the study is located, remains as one of the most heavily forested areas in the state.

PRESENT OR PLANNED WATERSHED DEVELOPMENT

A highly fluctuating water supply is a major problem in the Marais des Cygnes River basin. This problem can be traced to erratic precipitation amd stream flow patterns, reported Power (11). The major water control program in the basin is that of controlling floods.

Congress has authorized the U. S. Army Corps of Engineers to construct five major flood control reservoirs in the watershed (see figure 10) at Pomona, Melvern, Garnett, Hillsdale and Fort Scott, stated Power (11). Construction has been completed on the Pomona Reservoir and the Melvern Reservoir is under construction. Pre-construction planning is either complete or nearing com-

pletion for the Fort Scott and Hillsdale Reservoirs and pre-construction planning has not been initiated for Garnett.

The objectives of these reservoirs are to reduce downstream flooding, provide for conservation storage of water, and to allow sediment deposition.

The study area will be affected by four of the above mentioned reservoirs. They should provide for a more stable downstream water supply with less fluctuation, and reduce stream bed silting.

CLASSIFICATION OF STUDY AREA

The Marais des Cygnes River study area is a Class III Natural Environment Area as classified and described by the ORRRC (10).

VERDIGRIS RIVER STUDY AREA

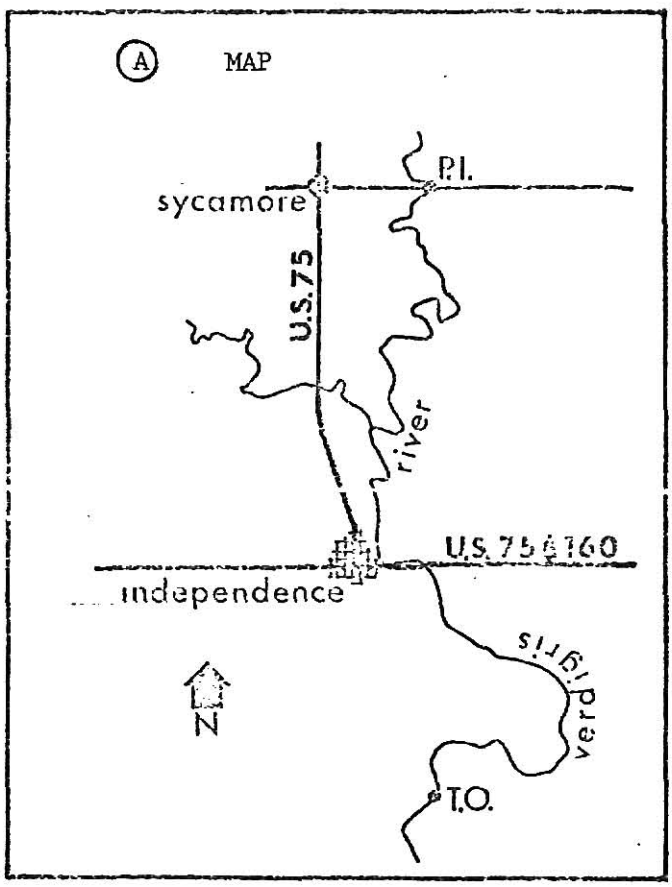
I. GENERAL INFORMATION

STREAM Verdigris River

LOCATION OF STUDY AREA

Fig 11

Ⓐ MAP



P.I. At bridge 2 miles east of Sycamore, Kansas (Sycamore Quadrangle USGS Map)

T.O. At bridge 1 1/2 miles south of Forty School (Independence Quadrangle USGS Map)

P.I. = Canoe "Put-in" or beginning of study area.

T.O. = Canoe "Take-out" or ending of study area.

Ⓑ U.S. GEOLOGICAL SURVEY MAP QUADRANGLES

1. Sycamore, Kansas, 1959 - 7.5 minute series
2. Independence, Kansas, 1959 - 7.5 minute series

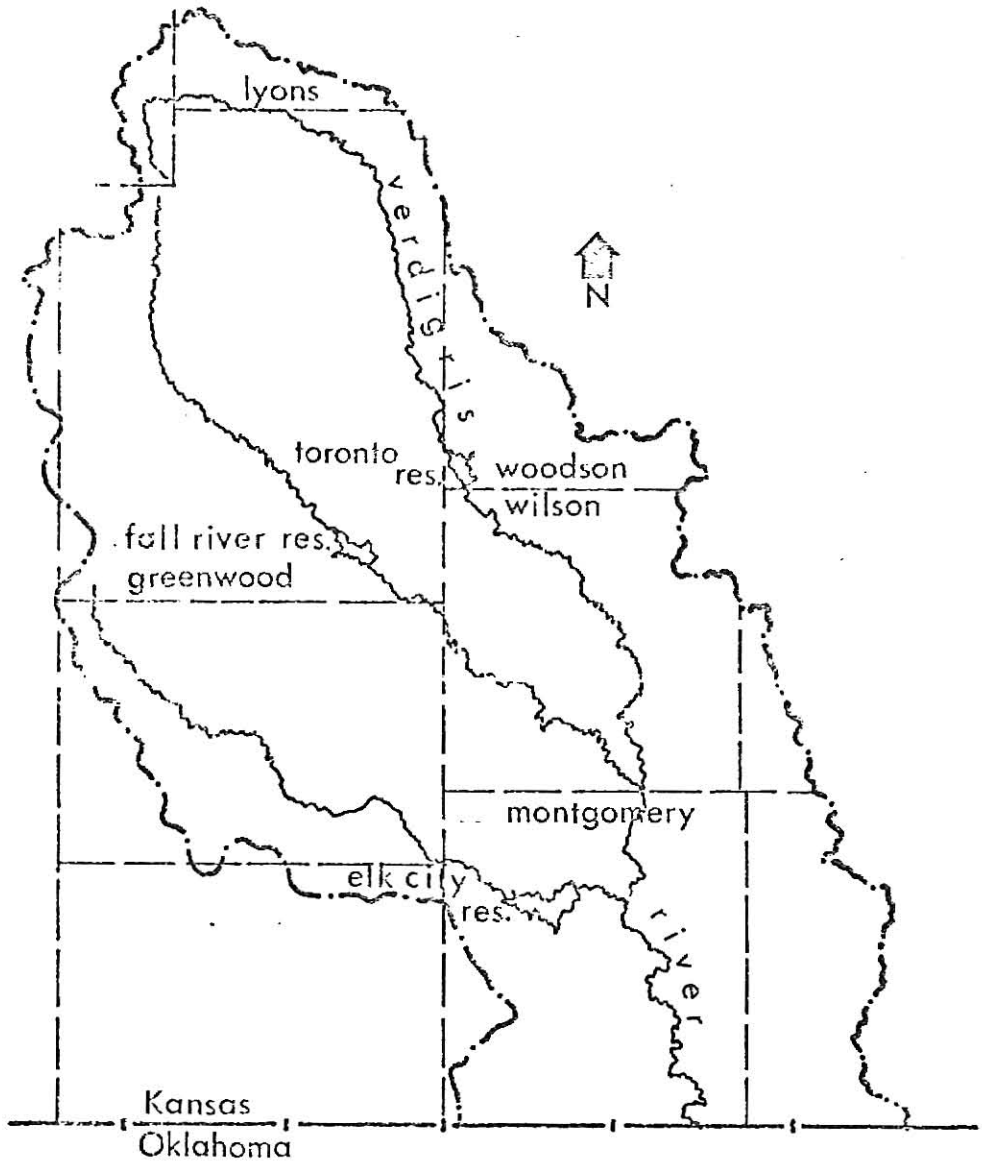
Ⓒ COUNTIES

Montgomery County

MAJOR WATERSHED AREA

Fig 12

(A) MAP



(B) DESCRIPTION

The Verdigris River begins in the Flint Hills in Lyons and Chase counties and flows in a southeasterly direction through Greenwood, Woodson, Wilson and Montgomery counties to the Kansas - Oklahoma state line near Coffeyville, Kansas, according to Powers (11).

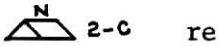
The drainage basin above the T.O. totals approximately 3,300 square miles and represents an area approximately 100 miles in length and from about 28 to 48 miles in width.

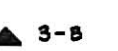
Elevations range from 1,350 feet at the stream's source (near Madison, Kansas) to 670 feet at the state line which is the lowest point in the state of Kansas, stated Powers (11). This represents a water distance of 147 miles and an average stream bed gradient of 2.6 feet per mile in the upper Flint Hills reaches (from Madison to Coyville) to two feet per mile from Coyville to the state line.

LENGTH OF STUDY AREA	20.4 miles
TRAVEL TIME	Approximately 12 hours (with motor)
DATES OF OBSERVATIONS	August 16, 1969 and August 17, 1969
WATER LEVEL	August 16 - Stage - 3.09, Discharge 259 Cubic Feet per Second*
	August 17 - Stage - 2.75, Discharge 181 Cubic Feet per Second*
WEATHER CONDITIONS	August 16 - Partly Cloudy to Cloudy. Light Showers in the A.M. Warm and Pleasant Temperatures.
	August 17 - Partly Cloudy to Sunny. Warm and Pleasant Temperatures.

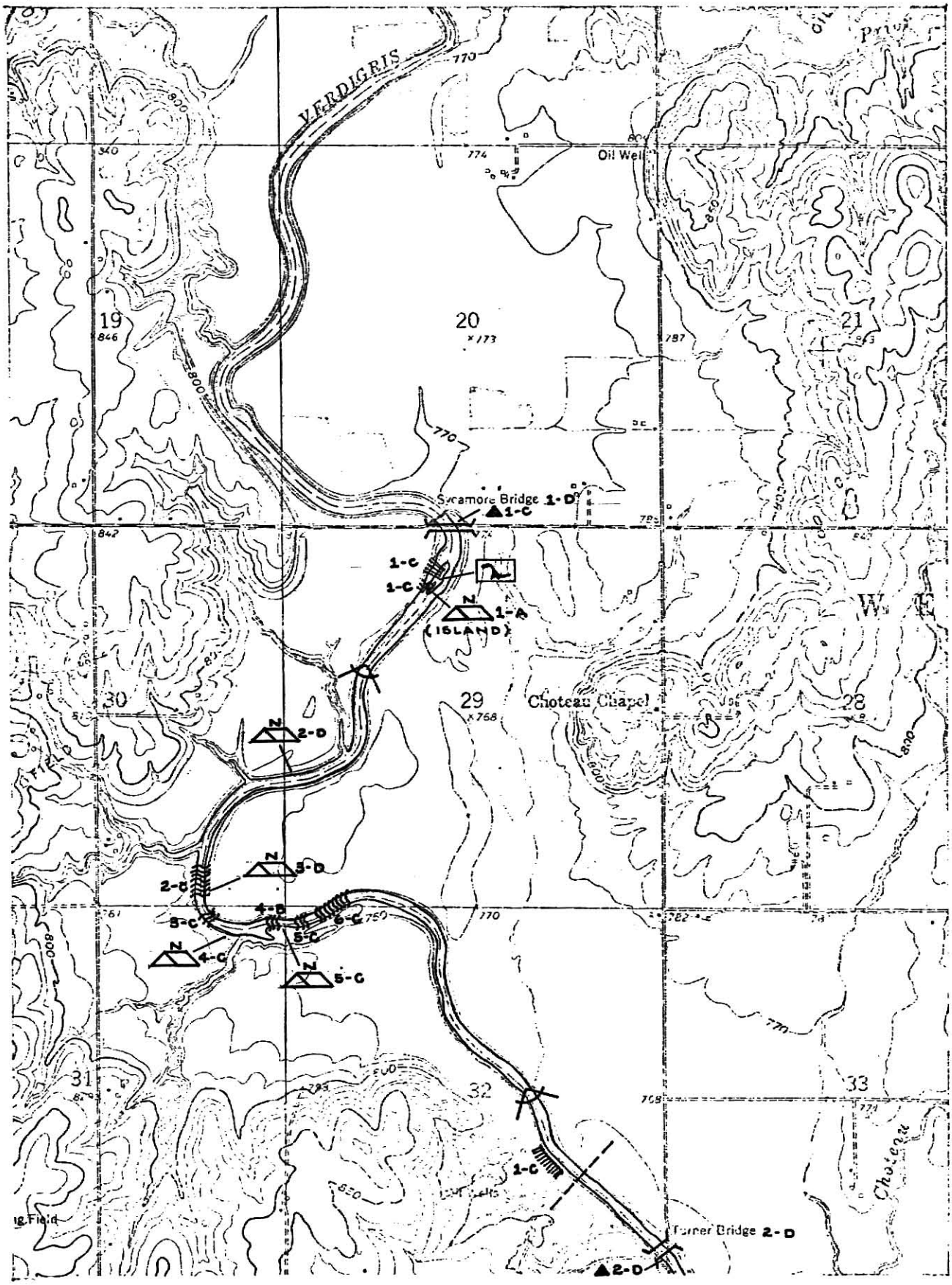
* Data taken from the Independence, Kansas gaging station and furnished by the Kansas Water Resources Board.

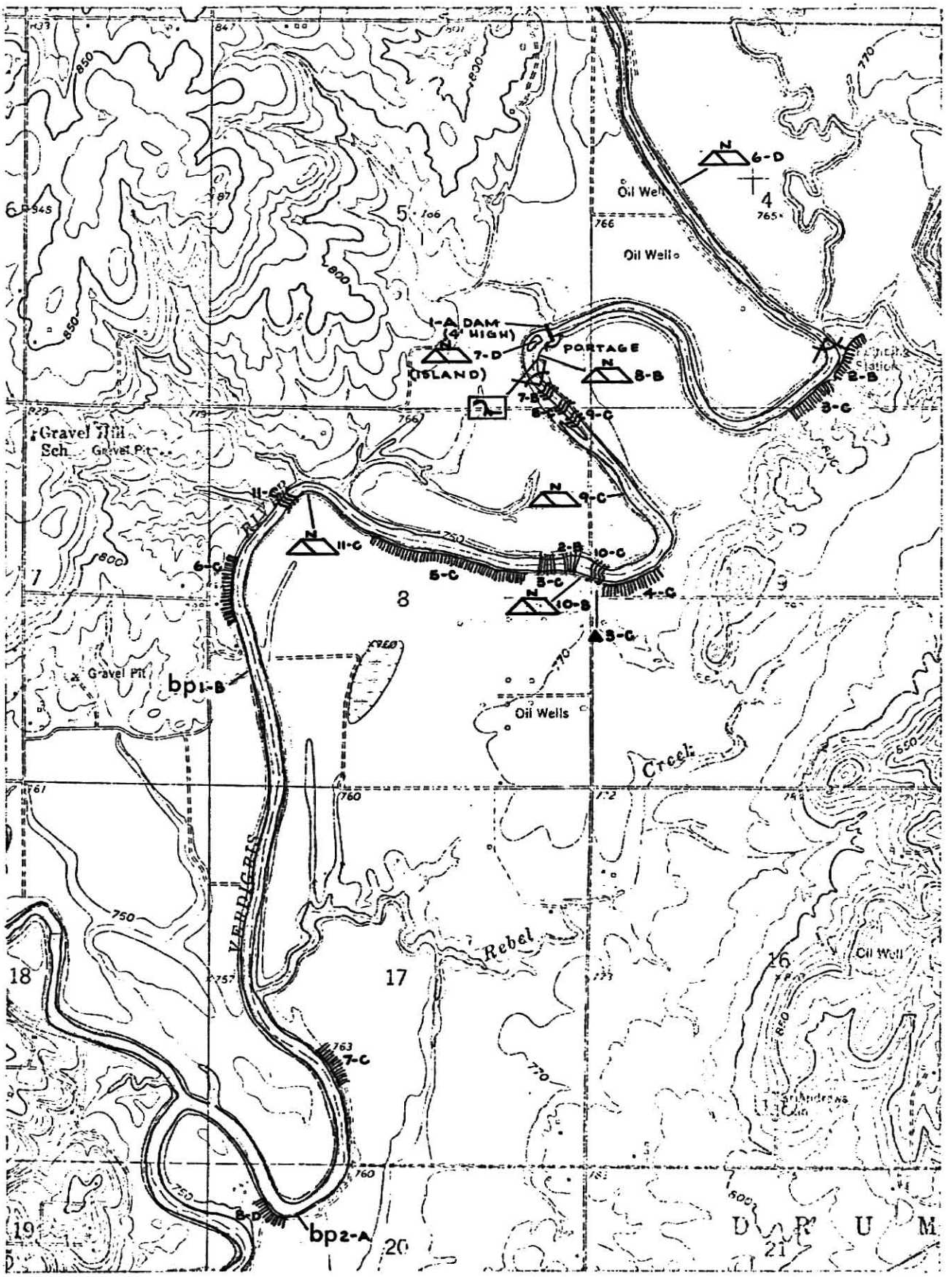
II. FIELD INVENTORY OF RESOURCES

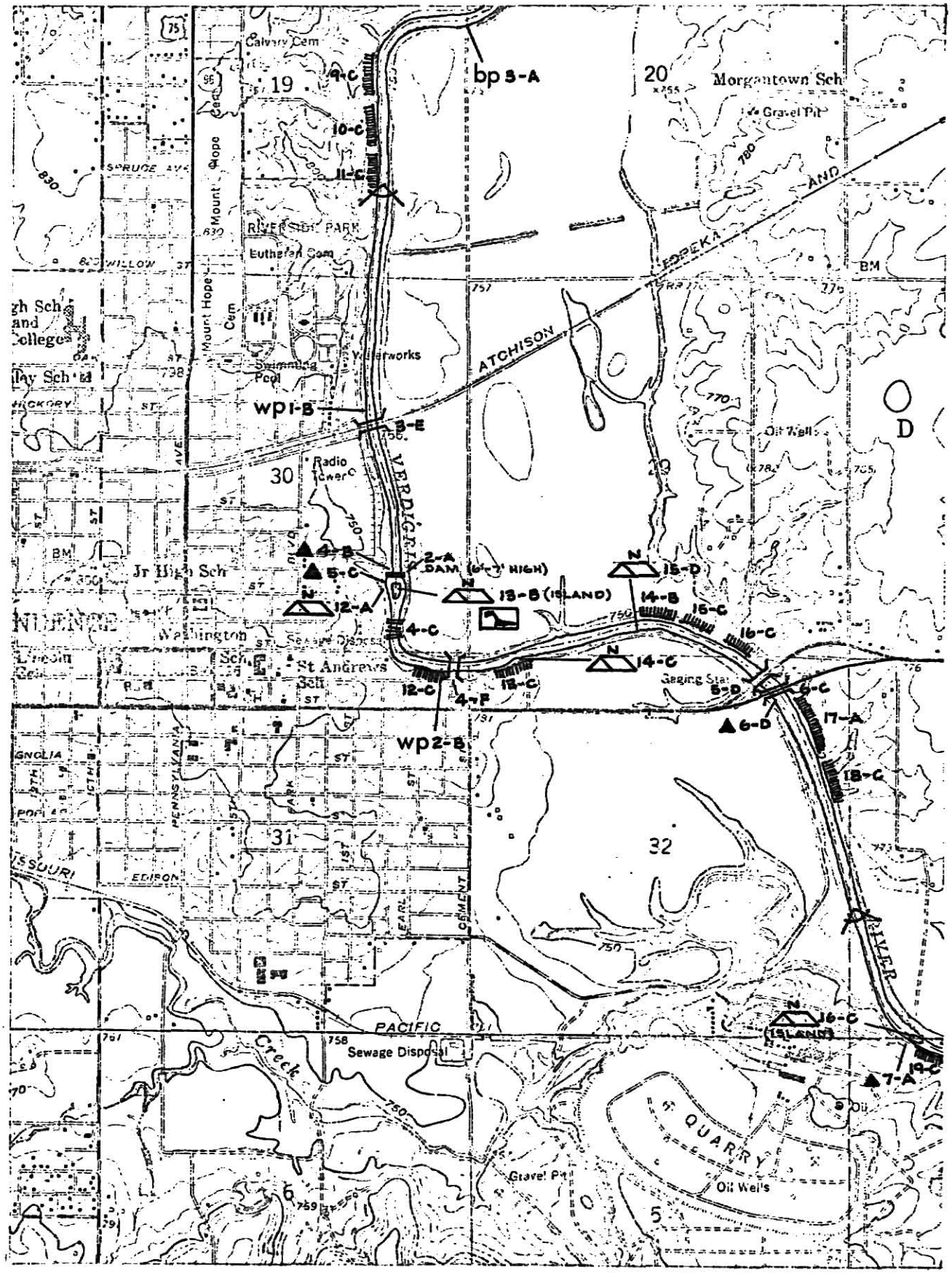
The following resource inventory includes the location, relative rating, and number (in sequence from the P.I.) of individual resources observed in the Verdigris River study area. For example, 

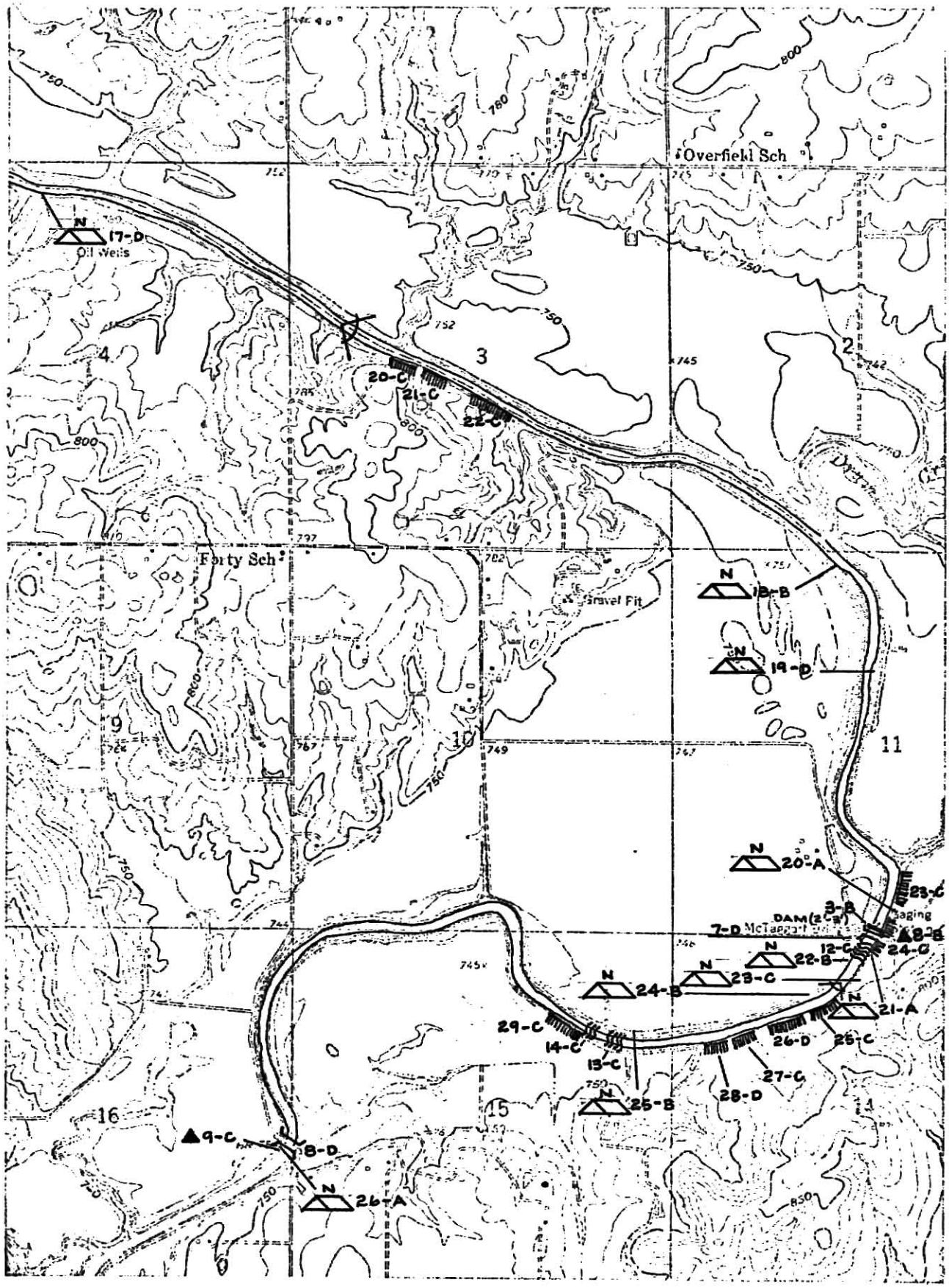
refers to the second natural campsite observed and it has a C rating; or 

refers to the third access point observed and it has a B rating.


VERDIGRIS
Oil Well
19
20
21
29
30
31
32
33
Sycamore Bridge 1-D
1-C
1-C
1-C
1-A
(ISLAND)
2-D
3-D
2-C
4-D
3-C
5-C
6-C
4-C
5-C
1-C
Turner Bridge 2-D
2-D
Choteau Chapel


1-A DAM (4' HIGH)
7-D
(ISLAND)
PORTAGE
8-B
6-D
Oil Well
Oil Well
Gravel Pit
Gravel Pit
bp1-B
bp2-A
Oil Wells
Creek
Rebel
VERMILION
Oil Well
DUPUM
5
6
7
8
9
16
17
18
19
20
21
4
770
750
760
800
850


bp 3-A
wp1-B
wp2-B
2-A
DAM (6'-7' HIGH)
3-E
4-B
5-C
4-C
4-F
12-A
12-C
13-B (ISLAND)
13-C
14-B
14-C
15-D
16-C
17-A
18-C
6-D
5-D
7-A
19-C
9-C
10-C
11-C
Calvary Cem
Mount Hope Cem
RIVERSIDE PARK
Eutheran Cem
Swimming Pool
Waterworks
Radio Tower
Jr High Sch
Washington Sch
St Andrews Sch
Morgantown Sch
Gravel Pit
Oil Wells
Gaging Sta
Sewage Disposal
ATCHISON
TOPEKA
AND
SANTA FE
VERDIGRIS
RIVER
PACIFIC
Creek
QUARRY
SPRUCE AVE
WILLOW ST
HICKORY ST
PENNSYLVANIA AVE
EDISON
CEMENT
EARL
30
31
32
5
6
19
20
D


Overfield Sch
Forty Sch
Gravel Pit
Oil Wells
17-D
20-C
21-C
22-C
18-B
19-D
20-A
23-C
3-B
Gaging
DAM(2 Ca)
7-D McTappert
8-B
12-C
24-C
22-B
23-C
24-B
21-A
29-C
14-C
15-C
26-D
25-C
27-C
28-D
25-B
9-C
8-D
26-A
2
3
4
9
10
11
15
16

RECREATIONAL RESOURCE ANALYSIS . . . VERDIGRIS RIVER STUDY AREA

RESOURCE	RATING & VALUE		NO. OBSERVED	POINT VALUE
ACCESS	A	10	1	10
	B	8	2	16
	C	6	4	24
	D	2	2	4
	TOTAL		9	54
RIFFLES	A	10	-	-
	B	8	2	16
	C	6	12	72
	D	4	-	-
	TOTAL		14	88
RAPIDS	AA	18	-	-
	A	15	-	-
	B	12	1	12
	C	10	3	30
	TOTAL		4	42
WATERFALL	A	20	-	-
	B	18	-	-
	C	15	-	-
	TOTAL		-	-
DAM	A	18	2	36
	B	15	1	15
	C	15	-	-
	D	15	-	-
	TOTAL		3	51
BLUFF	A	15	1	15
	B	15	3	45
	C	15	22	330
	D	8	3	24
	TOTAL		29	414
SPRING	A	8	-	-
	B	8	-	-
	TOTAL		-	-
BRIDGE	A	10	-	-
	B	10	-	-
	C	5	2	10
	D	5	5	25
	E	2	1	2
	F	2	-	-
	TOTAL		8	37

RESOURCE	RATING & VALUE		NO. OBSERVED	POINT VALUE
 CAMPSITE (NATURAL)	A	15	5	75
	B	15	7	105
	C	10	7	70
	D	8	7	56
	TOTAL		26	306
 CAMPSITE (IMPROVED)	A	12	-	-
	B	11	-	-
	C	10	-	-
	TOTAL		-	-
 SPECIMEN PLANT	A	10	-	-
	B	10	-	-
	C	8	-	-
	TOTAL		-	-
bp BANK POLLUTION	A	-15	2	-30
	B	-10	1	-10
	TOTAL		3	-40
wp WATER POLLUTION	A	- 8	-	-
	B	- 8	2	-16
	C	- 8	-	-
	TOTAL		2	-16
 CAVE		10	-	-
	TOTAL		-	-
PIPE LINE		2	1	2
	TOTAL		1	2
 SCENIC SITE		12	-	-
	TOTAL		-	-
 HISTORIC SITE		10	-	-
	TOTAL		-	-
 ROCK & FOSSIL AREA		10	3	30
	TOTAL		3	30
 WETLANDS		20	-	-
	TOTAL		-	-
 SCENIC VISTA		15	8	120
	TOTAL		8	120

III. DESCRIPTION AND CHARACTERISTICS OF STUDY AREA

CLIMATIC CHARACTERISTICS

The upper Verdigris River is located in the Humid Continental with Warm Summers Climate and the lower part extends into the Humid Subtropical Climate where the study area is located, according to Trewartha (17) (see figure 1). Characteristics of both climates are discussed on pages 38, 39, 55 and 56.

Temperature and precipitation averages as they relate to the Verdigris River study area are as follows:

Humid Subtropical Climate

Independence, Kansas - Montgomery County

Month	J	F	M	A	M	J	J	A	S	O	N	D
Temperature (degrees F.)	35	33	48	58	67	76	80	80	73	61	47	38
Precipitation (inches)	1.4	1.6	2.5	3.9	4.7	5.3	3.7	3.1	4.4	3.3	2.3	1.5

Source: Self, Huber, 1963, Geography of Kansas Syllabus and Atlas

Seasonal averages of temperature and precipitation rates for the Verdigris River study area, based upon the Independence, Kansas climate station data, are as follows:

	Spring (Mar. - May)	Summer (June - Aug.)	Fall (Sept. - Nov.)	Winter (Dec. - Feb.)
Temperature (Average)	58°F.	79°F.	60°F.	37°F.
Precipitation (Total)	11.1 in.	12.1 in.	10.0 in.	4.5 in.

STREAM FLOW CHARACTERISTICS

The Verdigris River is an intermittent stream and is subject to significant base flow variation. Total water flow at any given time is influenced by discharge from the Toronto Reservoir on the upper Verdigris, the Fall River Reservoir, and the Elk City Reservoir on the Elk River. The Fall River discharges into the Verdigris above the study area, and the Elk River joins the mainstream within the study area.

Water quantity within the study area should be sufficient for floating the year around. The highest base flow, however, can be expected from December through July as indicated by the following table.

Monthly Base Flow of Selected Exceedence

Verdigris River at Independence, Kansas

Month	Monthly base flow in c.f.s. chance exceedence		
	20%	50%	80%
January	405	121	14
February	434	139	16
March	492	156	24
April	521	243	43
May	492	208	67
June	434	150	26
July	202	90	5
August	98	26	2
September	98	19	3
October	174	16	4
November	275	49	7
December	376	93	10

Source: Kansas Water Resources Board report (11) for this study.

WATER CHARACTERISTICS FOR FLOATING

Refer to pages 40 and 41 for pertinent remarks relative to water quantity and stream floatability.

Relatively quiet "back-up" water was frequently encountered due to three low-structure overflow dams within the study area. This factor resulted in relatively few riffles and rapids and it also allowed the floater to use an outboard motor throughout much of the study area.

STREAM DEPTH CHARACTERISTICS

MINIMUM OBSERVED - 8 inches

MAXIMUM OBSERVED - 14 feet

AVERAGE OBSERVED - Approximately 5 feet

STREAM WIDTH CHARACTERISTICS

MINIMUM OBSERVED - Approximately 35 feet

MAXIMUM OBSERVED - Approximately 300 feet

AVERAGE OBSERVED - Approximately 150 feet

COURSE CHARACTERISTICS AND STABILITY

The Verdigris River is meandering but less so than the Caney River and Lyons Creek and its channel is the widest of the four streams that were studied. The Verdigris River banks are high, generally stable, and range from about 10 to 40 feet above the stream bed. Even though the stream banks are mostly stable, serious bank erosion was observed in various areas. Some reaches of the stream are closely confined by hills on one or both sides and offer some striking scenery in the form of rock outcropping. The stream bed generally consists of gravel or rock and appeared to be stable in depth. Occassionally gravel bars and small islands with gravel or rock surfaces were observed. Some of these bars and islands offer some excellent natural campsites.

In general, the stream banks are heavily wooded and outstanding scenic vistas were numerous.

WATER QUALITY

Municipal and/or domestic water discharge into the stream was observed in two locations and both were adjacent to the city of Independence. In site number one (see map, page 86), the discharge gave off a strong odor that the author judged to be chlorine.

Pollution problems in the Verdigris River basin are described in the Water Resources Board's publication, "A Study of Water Quality Control Needs".

Power (11) reported that natural mineral and sediment pollution is low in the Verdigris River basin.

IMPORTANT WILDLIFE SPECIES

Mammals that may be observed in the Verdigris River study area include: mink, fox, coyote, skunk, oppossum, raccoon, whitetailed deer, squirrel, muskrat, and cottontail rabbit, reported Hall (5). Numerous bird species including heron, duck, owl, wild turkey, mourning dove, bobwhite quail and others may be observed. The author observed cottontail rabbit, squirrel, muskrat, duck, owl, and other bird species during the study.

IMPORTANT FISH SPECIES

Cross (3) stated that fish species in the Verdigris River include: bullhead catfish, flathead and channel catfish, bluegill, largemouth bass, crappie, carp, buffalo and sucker. Walleye and white bass may also be found as up-stream reservoirs have been stocked with these species.

NATURE OF TOPOGRAPHY

The Verdigris River study area is located in the Central Lowlands Physio-

graphic Province and the Osage Cuestas Physiographic Sub-region, stated Self (13). The area is characterized by a series of northeast, southwest irregular escarpment or ridge-like cuestas resulting in a hilly to rolling topography. Hill lands are usually in native grass pasture with the lowlands and stream valleys cultivated except for narrow timbered areas along streams, Self (13) reported.

Rock outcrops are Pennsylvanian in age and composed mostly of shale and limestone with some sandstone present.

TOPOGRAPHIC QUALITY

Throughout the 20 plus mile length of the Verdigris River study area, bank pollution in the form of trash or litter was observed in only three instances. This factor seemed especially noteworthy considering the close proximity of the study area to the city of Independence.

ECOLOGICAL TYPE AND DEVELOPMENT

Deciduous trees commonly observed include: elm, willow, silver (soft) maple, boxelder, sycamore, cottonwood, red oak species, white oak, bur oak, hackberry and walnut. Stream bank woodlands along the study area are remnants of the Deciduous Forest that extend into southeast Kansas in stream bottoms and ravines.

PRESENT OR PLANNED WATERSHED DEVELOPMENT

As of February 1969, ten watershed districts have been organized in the Verdigris basin under the State Watershed District Act of 1953, reported Power (11). Five of these districts are above the study area, but they will have only an indirect effect on the river itself as all are above major

reservoirs. One of these watershed districts is on the upper reaches of the Verdigris above the Toronto Reservoir and the other four are on tributaries.

The Toronto, Fall River, and Elk City reservoirs serve as a major influence on the Verdigris River study area. These reservoirs have been constructed as flood control structures by the U. S. Army Corps of Engineers and possess large capacities for collecting excessive water run-off and sediment.

Another reservoir, the Neodesha, is proposed for construction on the upper Verdigris below the Toronto Reservoir.

The following table illustrates the storage allocations of these reservoirs:

Existing and Authorized Corps of Engineers

Reservoirs in the Verdigris Basin

		Storage Allocations		
	Drainage Area	Flood Control	Conservation and Sediment Reserve	Total
Reservoir	Sq. Miles	Acre Feet	Acre Feet	Acre Feet
Fall River	585	236,000	27,000	263,000
Toronto	730	171,000	24,000	195,000
Elk City	634	230,000	60,300	291,000
Neodesha	422 [1/]	80,000	10,000 [2/]	90,000
	2,371			

Source: U. S. Army Corps of Engineers, Tulsa District

[1/] Interviewing area below Toronto.
[2/] Sediment storage only.

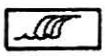
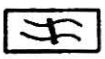
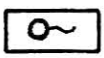
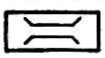
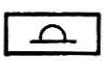
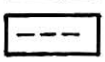
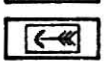
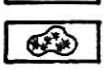
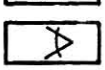
These structures should lessen extreme water level flucuation, reduce silting or sediment deposits, and decrease water turbidity. This influence will tend to enhance and preserve the Verdigris River study area.

CLASSIFICATION OF STUDY AREA

The Verdigris River study area is a Class III Natural Environment Area as classified and described by the ORRRC (10).

FINDINGS AND EVALUATIONS

STUDY AREA RESOURCE EVALUATION SUMMARY

RESOURCE	CANEY RIVER		LYONS CREEK		MARAIS DES CYGNES RIVER		VERDIGRIS RIVER	
	NO.	VALUE	NO.	VALUE	NO.	VALUE	NO.	VALUE
	9	56	10	54	6	24	9	54
	24	158	42	272	9	54	14	88
	48	688	7	80	3	30	4	42
	3	54	-	-	-	-	-	-
	1	18	-	-	-	-	3	51
	25	361	21	258	25	249	29	414
	1	8	2	16	-	-	-	-
	8	42	10	48	7	26	8	37
	21	257	23	287	17	160	26	306
	-	-	-	-	2	22	-	-
	4	40	1	10	-	-	-	-
	-	-	-	-	-	-	-	-
	1	2	-	-	-	-	1	2
	-	-	-	-	-	-	-	-
	1	10	1	10	-	-	-	-
	-	-	-	-	-	-	3	30
	-	-	-	-	-	-	-	-
	12	180	8	120	7	105	8	120
DETRIMENT								
bp	3	-35	2	-25	1	-10	3	-40
wp	-	-	-	-	1	- 8	2	-16
EVALUATION								
NUMBER	158		125		76		105	
VALUE		1839		1130		652		1088

DISCUSSION AND CONCLUSIONS

The ORRRC (10) has recommended that additional outdoor recreation areas should be acquired and protected. These recommendations include the preservation of rivers with a high scientific, aesthetic, or recreational value in their free-flowing state and natural setting.

Protection of the scenic quality of worthy streams should receive a high priority; a stream will contribute little as a recreational resource if visual quality is lost.

Scenery can be lost through ignorance by not realizing what intrinsic and extrinsic values exist in a site and by losing the values through "misuse" of the land. Such loss can occur through environmental pollution, through "over use" of a site, and through indifference on the part of landowners and the public.

It is in this interest that this study has explored the development of a means of inventorying, analyzing, and evaluating Kansas streams for their visual quality and related recreational resources. Upon applying the experimental procedure to four study areas as test cases, it became evident that the technique accomplishes the primary objective in two ways:

(a) It provides an accurate and specific method of inventorying the intrinsic and extrinsic stream related resources with scenic contribution receiving primary consideration.

(b) It provides for a relative comparison of the total number of resources related to a stream and establishes relative values for these resources.

From such information, various streams can be compared for their scenic and recreational contributions and priorities for protection and preservation of

worthy streams can be established.

In a comparative ranking of the four study areas, the Caney River must be considered the most significant in total scenic value and inherent recreational potential. This study area earned the highest score in both total resource numbers and total point value -- with the most significant resource contributions occurring in: (a) overall topographic quality, (b) low waterfalls, (c) numerous rapids and riffles, (d) outstanding plant specimens, and (e) scenic vistas.

The Caney River study area ranked considerably above the other streams studied in total number and quality of rapids and low waterfalls and was exceeded only by the Lyons Creek area in the number of riffles encountered.

The Caney River and Marais des Cygnes River study areas were equal in the number of significant topographic features (ie. bluffs, rock outcrops, and interesting landforms), but the quality of those found in the Caney area rated considerably higher.

The overall recreational value of the Caney River study area can be considered high in outstanding scenery that is rugged in character and little spoiled. The river offers excellent canoeing that is challenging to an experienced canoeist, fine flathead and channel catfishing, outstanding wildlife, and large plant specimens for observation.

The comparative quality of the area, and the fact that it is still free-flowing and little disturbed by man, indicates that a high priority should be given to the preservation of the Caney River in Kansas.

The Lyons Creek study area ranked second in total resources and total point value. This study area rated highest of the four in total number of riffles and springs and was exceeded only by the Verdigris River area in number and quality of natural stream bed campsites.

The recreational value of Lyons Creek can be considered high in canoeing that is relatively easy*, stream bed camping, good scenery, and wildlife observation.

The Verdigris River study area ranked third in total resources and total point value. This area rated highest of the four in significant topographic features (ie. bluffs, rock outcrops and interesting landforms) and highest in stream bed campsites.

Several areas were noted to provide abundant plant and animal fossils. The stream is easy to float with no "demanding" riffles or rapids, and this fact, coupled with excellent scenic variety and numerous natural campsites, provides conditions for outstanding family floating and camping. The recreational value of the Verdigris River study area can also be considered high in flathead and channel catfishing.

The Marais des Cygnes River study area ranked last in both total recreational resources and point value. Two improved campsites were observed adjacent to the river in the Miami County State Park at the T.O. The area offers some good scenery and a few good campsites.

Because of the relatively few resources observed and the very erratic stream flow (see page 74), the recreational value of this study area may be considered highest in fishing and fox and raccoon hunting for which the area is well known by local and area residents.

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*It should be noted that high winds had blown several trees over in the stream bed on the upper reaches of the study area just prior to making observations. This resulted in some difficulty in floating through or portaging around these obstacles. This author does not consider such an obstacle a permanent site feature, and, therefore, did not consider the same in rating the study area. Normally the upper study area would be easy and enjoyable to float as was the case with the lower portion.

LEGAL FACTORS LIMITING PUBLIC ACCESS TO STREAMS IN KANSAS

Initial investigation by this author revealed that confusion and, in some cases, actual discrepancies exist as to the legal public right or lack of right to use streams in Kansas for recreation. Whether or not the public has a right to use such water for floating, sightseeing, and enjoyment of natural surroundings is fundamental to the second objective of this study (objective b, page 6) and of considerable importance to persons seeking such forms of recreation. It is with these factors in mind that consideration was given to the exploration of the present legal situation in Kansas.

A detailed discussion of public Fishing Rights in Kansas was prepared for the Kansas Water Resources Board by Earl B. Shurtz, Special Assistant Attorney General in 1965. His report explores the situation as based upon previous court cases and legal opinions. Although the report by Shurtz does not deal with the exact objectives of this study, his findings regarding public fishing rights will probably have a close relationship to public rights to float a stream for sightseeing and enjoyment of natural beauty.

The public right or lack of right to fish or float streams in Kansas has not been clearly established; however, there seems to be little problem in the case of "navigable streams". Difficulties do arise with regard to fishing rights in the smaller, so called "non-navigable streams".

> Shurtz (14) reported that a "navigable stream" is recognized in Webb v. Bond of County Comm'rs, 124 Kan. 38, 257 Pac. 966 (1927) as a stream "susceptible to use for the purpose of transporting people and commerce. The mere fact that over a certain portion of a stream a small boat, such as used for fishing, can travel, does not make the stream navigable."
>
> In cases of (Wood v. Fowler, 26 Kan. 682, 688)...and (Dana, supra, 86 Kan. at 950) Justice West on behalf of a majority of the court concluded: "The general test of navigability is well stated in the lan-

> guage quoted with approval in Kregar v. Fogarty, supra, which in effect is, that any water to be navigable should be susceptible of use for purposes of commerce or possess the capacity for valuable floatage in transportation to market of the products of the country through which it runs, and should be of practical usefulness to the public as a public highway in its own state and without the aid of artificial means; that a theoretical or potential navigability, or one that is temporary, precarious, and unprofitable, is not sufficient. But present navigability must not be confused with past navigability or setting apart for highway purposes, for we cannot conceive or concede that the title to the bed of a navigable stream today in the state will tomorrow be in the riparian owner because the river had in the meantime filled up or ceased to flow. If when this land was granted to the patentee the title to the bed of the stream was in the state, it is in the state now, regardless of present navigation or present navigability."

Navigable Streams

In the absence of special statute or grant, most jurisdictions recognize that the public may fish in "navigable streams", not withstanding objections thereto by landowners riparian to these streams, reported Shurtz (14).

Kansas has only two so called "navigable streams", the Arkansas River (as determined by Dana v. Hurst, 86 Kan. 947, 122 pac. 1041 (1912)) and the Kansas River (as determined by Wood v. Fowler, 26 Kan. 682 (1882)). Both streams were found "navigable" by court decision for the purposes of the case and did not deal directly with fishing or recreation rights. As these streams have been declared navigable, privately owned land extends only to their banks. Legal history indicates that the public has as much rights as the riparian owner to "use the water" within the stream bed of these rivers. In the case of Wood v. Fowler ((26 Kan. 682 (1882)) which involved the taking of ice from the Kansas River, the court held that a riparian owner, who owns only to the banks of a navigable stream did not have any more right than the public to the ice formed in the river. ""He did not have," said the court, "any more right to the ice formed in the river than he did to the fish swimming in it.""

Due to the before mentioned factors, it is the author's interpretation that the public has the legal right to float within the stream bed of the Kansas and Arkansas Rivers in this state. Access to these streams will be either by public road right-of-way or through privately owned land. In the latter case, permission to trespass for access should be secured by the floater.

Non-Navigable Streams

In regard to "non-navigable" streams, Shurtz (14) states: "merely in terms of stated rules, and without regard to underlying rationale, an impressive number of courts of other jurisdictions assert that in "non-navigable streams" the riparian owners adjacent to those streams have exclusive fishing rights and the public has no license to fish in them."

This seems to have been the conclusion of past Attorney General, William M. Ferguson, in a letter dated February 1, 1962 in Opinions - Rulings - Regulations (4):

"LANDOWNERS OF BOTH BANKS OF NON-NAVIGABLE STREAM CAN ERECT A FENCE ACROSS STREAM TO KEEP OUT PERSONS FISHING BY BOAT, BUT KAN. G.S. 1961 SUPP., 32-139, A CRIMINAL STATUTE, DOES NOT APPLY TO FISHING FROM A BOAT."

Question: 1. Does the owner of land through which a non-navigable stream flows have the right to construct a fence across the stream?

2. Assuming there is no fence constructed, do Kan. G.S. 1949, 32-138, -143 and Kan. G.S. 1961 Supp., 32-139, apply to a person who is fishing from a boat on a stream flowing through the lands of another?

Answer: 1. Yes.

2. Yes, as to Kan. G.S. 1949, 32-138, and -143. We do not think the terms of Kan. G.S. 1961 Supp., 32-139 are applicable.

"I do not find where the courts of this state have approached the exact question posed," reported Ferguson (4), "however, there is an extensive annotation in 47 A.L.R. 2d 381 (1956), which covers this question. It is my conclusion that despite the differences expressed therein as to the definition of navigable, the rights of the public to travel through and fish in a stream are determined by a test similar to that of this state for navigability. Therefore, I would conclude that on a non-navigable stream in this state the public has no right except by permission of the owner of the stream bank and stream bed to travel over and fish in a non-navigable stream. Therefore, the owner or owners of both banks of a stream could erect a fence across the stream and prevent passage of a boat into their land.

With the above conclusion in mind, it appears that those portions of Kan. G.S. 1949, Chap. 32, Art. 1, which prohibit a person from entering upon the occupied premises of another for hunting, fishing or loitering without permission of the owner or person in possession of the land do apply to entry by boat upon a stream passing through the land. Kan. G.S. 1961 Supp., 32-139, however, pertains to hunting from a road or railroad right-of-way and fishing in any posted private lake from such. Since a criminal statute must be strictly construed, it would not apply to fishing in a stream from a boat."

In an analysis it is suggested that the bed and banks of a navigable stream are owned by the state; therefore, the land and water therein is available for public recreation. In a non-navigable stream a riparian owner owns to the center of the stream bed, therefore, he can legally control public recreational use of water over his portion of the stream bed.

Other findings indicate, however, that courts do not uniformly use bank and bed ownership as criteria for determining the existance of public fishing,

rights. They have, at times, recognized such public rights not withstanding bank and bed ownership by private parties.

Shurtz (14) reported: "In a rather early Wisconsin case, for example, state law premised stream bed ownership on legal principles other than on concepts of navigability. As a result, riparian proprietors held title to the bed and banks of a stream that the Supreme Court of Wisconsin found to be navigable. But the land title determination did not preclude public rights. According to the Court, stream bed title in private ownership did not carry along exclusive private fishing rights to the exclusion of the public. Rather, it was the navigability in fact of the stream that controlled, according to the Court, navigability in fact that justified recognition of public fishing rights. ((Willow River Club, supra, 76 N.W. at 275.)) In denying the importance of stream bed ownership on the problem of fishing rights, the Chief Justice went on to say, ""The plaintiff certainly has no property in the particles of water flowing in the stream, any more than it has in the air that floats over its land. Its rights in that respect are confined to their use and in preserving their purity while passing. . . . So, the fish in the stream were not the property of the plaintiff at common law, any more than the birds that flew over the land.""

Another most significant case in this area is the 1954 Missouri Supreme Court decision of Edler v. Delcour ((364 Mo. 835, 269 S.W. 2d 17, 47 A.L.R. 2d 370 (1954))). "There, a small stream ran through a farmer's premises. Although it recognized the farmer's ownership of the stream bed and the non-navigability of the stream, the Court held that the river was a public way in which members of the public had an easement for fishing and floating. The state's title and ownership of fish in streams, the Congressional Act providing for the govern-

ment of the territory of Missouri, and the size and use of the stream all played a part in the Court's decision. "Navigability" and bed and bank ownership were not the decisive factors in the decision."

"The cases reflect considerable differences as to what constitutes navigability for purposes of determining fishing rights," stated Shurtz(14). "On the one hand, it has been established by a showing that rowboats and motorboats could be operated upon a certain stream, (Knudson v. Hull, 46 Utah 114, 148 Pac. 1070 (1915))) and by a showing that logs could be floated on a stream during high water although the stream averaged about 30 to 32 feet in width and, though varying, about one foot in depth, making the stream unavailable even for boating, fishing being possible only by wading into the stream. ((Rushton, ex. rel., Hoffmaster v. Taggart, 306 Mich. 432, 11 N.W. 2d 193 (1943))). On the other hand a Washington court denied public fishing rights in holding non-navigable a stream 40 feet wide and four feet deep at its maximum because it was neither used nor capable of being used for navigation by anything larger than rowboats. ((Griffith v. Holman, 23 Wash. 347, 63 Pac. 239 (1900))). Such references show the difficulty in using such concepts as "navigability" without reference to precise, local definition and meaning."

A number of jurisdictions apparently, for fishing purposes, equate "navigability" with commercial water travel susceptibility under natural stream conditions and deny public fishing rights in the absence of such a showing. ((See Anno. 47 A.L.R. 2d 381 (1956))). At the same time a respectable number of cases employ the concept of "floatability" in recognizing public fishing rights in the smaller streams which would not meet the requirements of a more rigid definition. (See in addition to the cases cited in the paragraph above, Edler v. Delcour, 364 Mo. 835, 269 S.W. 2d 17, 47 A.L.R. 2d 370 (1954) and Willow River Club v. Wade, 100 Wis. 86, 76 N.W. 273 (1898))). These cases tend to

emphasize a kind of "navigability in fact" as something apart from both "navigability" and "non-navigability" in more strict senses. A right correlation is observable between floatability and public fishing easements on the one hand and a stricter non-navigability and absolute private title and exclusive private fishing rights on the other.

The doctrine of prior appropriation is basic to the water law philosophy of all the western states and to many of the eastern states, reported Shurtz (14). Under this doctrine the waters within the state are recognized or declared to be dedicated to the use of the people of the state, subject to appropriation for beneficial use as provided for by law. Such beneficial uses include domestic, municipal, irrigation, industrial, recreation, and water power uses. Under this approach appropriators do not acquire title to specific water but acquire rights to use the water. This latter proposition was no less true under the riparian doctrine, which was premised upon the location of riparian lands, rather than upon industry, as in the case of the appropriation doctrine.

"It is somewhat surprising that courts have not more often emphasized appropriation use principles in treating the question of fishing rights. If for example, a prior appropriator could become entitled to divert the entire supply of a surface stream for irrigation or recreational purposes over the objection of the owners riparian to the stream, it seems strange that the riparian owners could insist upon exclusive fishing rights in the "public waters" as they passed through their premises. It would seem strange, that is, if the non-private nature of the water received careful consideration. It would also seem strange in the absence of a sound demonstration of how the presence of a member of the public on "public waters" could constitute a trespass on the lands of a riparian owner whether or not that owner held title

to the beds underlying the stream. It is inconceivable that our present laws recognize unlimited property rights to air space above privately owned lands. At the same time, why our present laws would recognize unlimited property rights to the "water space" above privately owned lands is not immediately comprehensible."

A New Mexico Supreme Court in State, ex rel. State Game Commission v. Red River Valley ((51 N.M. 207, 182 P. 2d 421 (1945))) held that riparian owners in New Mexico did not have exclusive fishing rights.

Shurtz (14) found "the court majority insisted that the state constitution provided that all waters in the state were public waters and refused to recognize exclusive riparian fishing rights. The New Mexico Supreme Court denied motions for rehearing in 1946 and again in 1947. The court insisted that stream bed ownership does not necessarily determine fishing rights. Under the laws of New Mexico, said the court, the unappropriated water of every natural stream belongs to the public, subject to beneficial use in accordance with the law of prior appropriation, and beneficial uses include uses for fishing and recreation as well as uses for other beneficial purposes such as irrigation. Such unappropriated waters, "public waters" in New Mexico, need not, the court reasoned, be appropriated by the public for public uses before they could be rightfully used by the public. Of course, members of the public, observed the court, could not rightfully gain access to such waters through private property without the owners consent, but fishing in the waters from a boat should not be regarded as a trespass on the property of the owner of the underlying stream bed."

Although the Attorney General's opinion in Kan. G.S. 1949, 32-138, -143 concerns the problem of public access to private property, the point of diffi-

culty lies in determining whether criminal trespass as it applies to the entering upon the lands of another without sufficient permission extends to waters upon privately owned lands. As has been previously suggested, private individuals in Kansas do not own the waters of natural flowing streams, Fishing upon such waters then might not be the same as fishing upon private lands, just as shooting birds from an airplane over private lands would probably be other than hunting upon private lands.

In Kansas, private rights have never been recognized in all nontidal waters, as in England, reported Shurtz (14). Moreover, the corollary of the English rule, ie. the recognition of exclusive private fishing rights because of private stream bed ownership on nontidal waters, either capable of navigation or not capable of navigation, have never been recognized in Kansas. As a result, Kansas should be regarded as completely empowered to recognize public fishing rights to small streams, not capable of "commercial navigation" and perhaps should do so for a number of reasons. Some of these reasons are:

1. The common law of Kansas has never recognized exclusive private fishing rights in natural rivers and streams flowing through private property.
2. Private stream bed ownership does not give the owner the right to control the flow of natural streams or the fish or other components in those streams.
3. Stream bed ownership for purposes of determining sand and gravel ownership in stream beds is the use of an ownership concept for determining title to the components of the stream bed. Water in a flowing river or stream is not a separable component of the flowing river or stream.

4. Kan. G.S. 1949, 82a-702 provides, "All water within the state of Kansas is hereby dedicated to the use of the people of the state, subject to the control and regulation of the state in the manner herein prescribed."
5. A landowner riparian to a flowing stream has no title to and no ownership of such water that has not been reduced to possession. ((Wallace v. City of Winfield, 98 Kan. 651, 159 Pac. 11 (1916))).
6. Kansas statutes prohibiting persons from entering upon premises of others without permission of owners for fishing do not provide that entering in the waters of unowned flowing streams, which waters flow over premises of others, constitutes "entering upon" the premises of others, and the Supreme Court of Kansas has never so held.
7. If navigability in fact should be held to determine public fishing rights, navigability in fact need not be confined to "commercial navigability", but could well include "floatability" or "navigability for fishing purposes", as it has in some of the other jurisdictions.
8. The power to determine the scope and extent of fishing rights as a manner of state law is vested in the state of Kansas.
9. The public character of water should be determinable by reference to the public necessity for its use.

Recommendations

As the foregoing discussion indicates, the problem of what fishing rights exist in the smaller Kansas rivers and streams has not as yet been resolved.

If the Kansas Water Resources Board should wish to consider the problem and to take action with regard to it, a number of possibilities are open, suggested Shurtz (14).

1. The Board could refrain from affirmative action and leave the problem for resolution by the courts when and if specific disputes arise.
2. The Board could recommend new legislative action establishing and defining those fishing rights in the state. The unquestionable validity of any such legislation would depend, of course, upon an ultimate judicial determination that the provisions of such legislation did not deprive persons of property rights that had rested prior to its enactment under the property laws of Kansas.
3. The Board could recommend to the Attorney General of Kansas that a test case be brought in the courts to determine the question. This might be done in addition to the action suggested by number 2 above.
4. The Board could recommend the amendment of existing Kansas statutes relating to appropriations for beneficial use, criminal trespass, stream obstructions, and the like.

Such amendments might range in coverage from establishing and defining fishing rights to regulating the building of fences across Kansas streams. Problems of constitutionality would vary with the type of amendment involved.*

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* The above concludes a report, in part, regarding public Fishing Rights in Kansas by Earl B. Shurtz, Special Assistant Attorney General in 1965.

RECOMMENDATIONS FOR FURTHER STUDY

In developing and implementing this study, it became apparant that further research is needed in several related areas:

(a) An inventory and evaluation of the visual quality and recreational resources should be carried out on all Kansas streams that meet the criteria set forth in the procedure for this study. Such information should serve as a guide in establishing overall values and priorities in the preservation and conservation of worthy streams in the state for recreational use by the public.

(b) Research into occurrences of historic significance related to individual streams in the state would add value to an inventory, as many Kansas streams are rich in history. Such information should be mapped, described and used as part of the intrinsic and extrinsic recreational resources in stream evaluation.

(c) A detailed study should be implemented relative to an inventory and evaluation of stream bed sites that yield significant plant and/or animal fossils or other rocks of geological significance. Such information could be of considerable value in an overall inventory of a given stream's recreational potential.

(d) A concentrated effort to make Kansas streams legally usable for public recreation should be initiated. Reasons for such action are stated in the report on "Legal Factors Limiting Public Access to Streams in Kansas" in this study.

The accuracy of the inventory system in this study is based upon the use of an adequately detailed field rating guide. This high degree of detail was

consideration necessary to reduce the need for personal judgment in making resource evaluations. Thus, personal bias should be reflected very little in the analysis.

A researcher working in a geographic region with topographic, climatic, and forest characteristics differing from those found in eastern Kansas may find it helpful to revise the resource value system used in this study. The procedure used in this study was designed around Kansas conditions and a researcher could not expect the same to apply in northern Idaho, for example, without appropriate modification. In the author's opinion, however, the basic technique used could be successfully applied in other geographic areas with appropriate modification relating to specific resources and their individual contributions to visual quality and recreational usability of a stream.

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THE SCENIC QUALITY AND RELATED RECREATIONAL VALUE OF SELECTED KANSAS STREAMS

by

JAMES J. NIGHSWONGER

B. S., (Landscape Design), Kansas State University, Manhattan, Kansas, 1960

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

Department of Landscape Architecture

KANSAS STATE UNIVERSITY

Manhattan, Kansas

1970

Outdoor recreation has been established as an important factor in enhancing the well-being of an individual. Opportunities for mental and physical renewal through outdoor recreation will become increasingly important as people experience mounting demands and pressures from population growth, urbanization, and technological growth.

A large segment of outdoor recreation seekers desire water oriented or water related activities. People enjoy being in the water, on it or near it, thus surface water and adjacent land areas are becoming an increasingly important recreational resource. Such areas suitable for recreation are limited in Kansas and as conflicting demands are made of these areas, recreational potential is too ofetn sacrificed to the bulldozer and land developer.

While considerable effort is being given to the development of recreational potential and preservation of natural beauty in lake and reservoir areas in the state, similar efforts with streams and rivers have been nearly non-existant. The objectives of this study were to:

(a) develop a technique of inventorying, analyzing and evaluating Kansas streams for their visual quality and related recreational resources;

(b) determine the legal status of public accessability to and usage of the state's privately owned streams for recreational purposes and explore procedures to improve the situation.

Criteria was established to determine the location of streams in the state that excel in visual quality and recreational potential. A field rating guide was developed as an inventory method. This guide identified, numbered in sequence, and classified resources as they were encountered while floating selected study areas by canoe. Information gathered during an inventory was

evaluated numerically with those resources contributing the most receiving the highest numerical rating. A resources contribution to visual quality received primary consideration while contribution to recreational usability received consideration, but of a lesser nature.

Portions of four streams (Caney River, Lyons Creek, Marais des Cygnes River and Verdigris River) were selected as study areas to validate and refine the inventory and evaluation techniques. Upon completing inventories of each study area, the information collected was tabulated to provide a relative comparison of resource types, total numbers of resources inventoried and classified, and total point values.

An analysis of the general characteristics of each study area was also developed and from this analysis plus the inventory information, a comparative evaluation of the visual quality and related recreational value of the four study areas was made. This study established an accurate and specific method of inventorying Kansas streams for their visual quality and related intrinsic and extrinsic recreational resources. It also provided for a relative comparison of the total number of resources. From such information, streams in the state can be compared for their scenic and recreational contributions and priorities for protection and preservation of worthy streams can be established. In a comparative ranking of the four study areas, the Caney River rated highest in total scenic value and inherent recreational potential. This study area was followed by Lyons Creek, the Verdigris River and the Marais des Cygnes River in that order.

The second objective of the study was accomplished through an interpretation of a report entitled Fishing Rights in Kansas prepared for the Kansas Water Resources Board by Earl B. Shurtz, Special Assistant Attorney

General in 1965. He explores the legal status regarding public use of streams in the state for fishing. His report is based upon court cases and legal interpretations and even though his findings do not deal with the exact objective of this study, they should have a close correlation to public rights to float a stream for sight-seeing and natural beauty.