

UNITED STATES **DEPARTMENT** OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Missouri River Basin Studies
P.O. Box 1381
Billings, Montana

September 4, 1953

Lt. Colonel L. J. Lincoln, District Engineer
U. S. **Engineers'** Office
Department of the Army, Corps of Engineers
601 Davidson Building
10 East 17th Street
Kansas, City 8, **Missouri**

Dear Colonel Lincoln:

Transmitted herewith for your information and files are copies of "**A Preliminary** Report on Fish and Wildlife Resources in Relation to the Water Development Plan for the TUTTLE CREEK DAM AND RESERVOIR, Big Blue River, Missouri River Basin, **Kansas.**"

Sincerely yours,



John L. Sypulski
Acting Supervisor

Distribution:

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UNITED STATES DEPARTMENT OF ~~THE~~ INTERIOR

FISH AND ~~WILDLIFE~~ SERVICE

Billings, ~~Montana~~

A Preliminary Report on Fish and Wildlife Resources

In Relation to the ~~Water~~ Development plan

for the

TUTTLE CREEK ~~DAM~~ AND RESERVOIR

Big Blue River

Missouri River Basin

Kansas

September 1953

For Administrative Use Only

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PREFACE

1. This report is based on the Corps of Engineers' Definite Project Report for Tuttle Creek Dam and Reservoir dated January 1952 and supplemental information. The final engineering data were supplied during 1952 by the Kansas City District Office of the Corps of Engineers, Kansas City, Missouri.

2. This report is a preliminary analysis of the probable effects of the Tuttle Creek Reservoir upon fish and wildlife resources. Subsequent to the time that the project was authorized for construction, flood control and related problems in the Kansas River Basin have been restudied by the Corps of Engineers. The project plans upon which this report is based are the results of these studies.

3. The value of the fish and wildlife resources in the reservoir area which would prevail if the reservoir were not built as well as those expected to exist with creation of the reservoir are given in monetary terms as an aid in comparing fish and wildlife with other resources affected by the project. Intangible and esthetic values have not been included in the monetary estimates. The values presented are based on long-term price projections.

4. For the purposes of this report, the area of influence on fish and wildlife is considered to be the 53,500 acres of land, the 67.1 miles of Blue River, and 95.7 miles of tributary streams located within the flood-control pool of Tuttle Creek Reservoir. In addition, the fishery of the 9.4 miles of the Blue River below the proposed dam is considered.

5. " A Preliminary Report on Fish and Wildlife Resources in Relation to Kansas River Basin Plan" was prepared by the FWS and Wildlife Service in March 1947. This report is included as Exhibit "B" of Appendix XII of the "Review of Report on the Kansas River, (Colorado, Nebraska, and Kansas) 15 March 1947," prepared by the Corps of Engineers, Kansas City District, Kansas City, Missouri.

6. The present report was prepared by the staff of the Missouri River Basin Studies, FWS and Wildlife Service, Billings, Montana, by authority of the Act of August 14, 1946 (60 Stat. 1080; 16 U.S.C. 661).

7. Staff members of the Corps of Engineers and the Kansas Forestry, Fish and Game Commission gave assistance during field investigations. Each of these agencies reviewed this report. By letter of August 4, 1953, Mr. Dave Leahy, Director, State of Kansas Forestry, Fish and Game Commission, stated, "We have read this report and concur in your findings and conclusions."

INTRODUCTION

Purpose of Project.

8. The primary purpose of the water development plan for **the** Big Blue River Basin is to provide flood protection to areas located in the flood plains of the Big Blue River, the Kansas River, and the Missouri River. The Tuttle Creek dam and reservoir is planned as a basic **feature** in a coordinated system of reservoirs in **the** Kansas River Basin, which in turn is a **sub-basin** section of a more comprehensive flood control plan for the Missouri River Basin.

Location of the project.

9. The Tuttle Creek dam site is located **9.4** miles above the mouth of the Big Blue River, about **4** miles north of Manhattan, Kansas. The main axis of the reservoir, which is 67.1 miles long, will extend into Marshall, **Pottawatomie**, and Riley Counties, Kansas. The Big Blue River Basin is bounded on **the** north by the Platte River Basin, on the east by small basins tributary to the Missouri and Kansas Rivers, on **the** west by the Republican River Basin, and on the south by the Kansas River Basin.

DESCRIPTION OF THE AREA

physical Features

10. The Big Blue River rises in ~~south-central~~ Nebraska in the vicinity of the town of Aurora. It flows in a southerly direction, dropping from an elevation of slightly ~~over~~ 1,650 feet ~~m.s.l.~~ at the ~~headwaters~~ to about ~~980 feet~~ at its point of confluence with ~~the~~ Kansas River in north-eastern Kansas. ~~The~~ total drainage area is 9,600 square miles. ~~The~~ terrain along the ~~Big~~ Blue River within the reservoir site consists primarily of gently rolling hills with relatively steep escarpments along ~~the~~ stream valley. The alluvial valley ~~is~~ ~~5,500~~ feet wide at the dam site and gradually narrows to 2,000 feet or less 60 miles above the dam site. ~~The~~ Big Blue River ~~has~~ a gradient of slightly less than 2 ~~feet~~ per mile through ~~the reser-~~voir area while some of the tributaries draining into ~~the~~ main stream have much steeper gradients.

11. Major tributaries emptying into ~~the~~ reservoir area are the Little Blue River, Black Vermillion River, and Fancy Creek, with drainage areas of 3,497; 510; and 290 square miles, respectively. These larger tributaries often carry turbid waters, ~~especially~~ during periods of flooding. ~~Streams~~ of lesser importance entering ~~the~~ main stem in the reservoir area ~~are~~ Tuttle, Carnahan, McIntyre, Baldwin, ~~Mill~~, Shannon, Swede, and Spring Creeks. Their channels are characterized by sand, gravel, and limestone beds. ~~Water~~ in these smaller tributaries is usually clear except for short periods following heavy run-off.

12. No ~~lakes~~ or ~~overflow~~ areas of any significance exist in the

reservoir area, but three **railroad borrow** areas south of Frankfort in the flood plain of Black **Vermillion** River create a total water area of 14 acres. A small power **dam** at Rocky Ford, 1.7 miles below Tuttle Creek dam **site**, backs water **3** miles upstream. Another small power **dam** at **Marysville** is just above the flood **limits** of the **reservoir**.

13. The U. S. Geological Survey has maintained continuous stream flow records since April 1918 at Randolph, Kansas, 20 miles above the **pro-**
posed Tuttle Crock dam site. Records for 31 years show an average daily **dis-**
charge of **1,510 second-foot**, with average mean monthly flows of 476 **second-**
foot occurring in December and 4,440 **second-foot** occurring in June. **Maximum**
and minimum instantaneous **flows** of 98,000 and 31 **second-foot**, respectively,
have occurred.

14. The reservoir **area** is located in the extreme southwestern por-
tion **of the** Dissected Till Plain, with the Smoky Hills **escarpment** to **the**
west and the northern portion of **the** Flint Hills extending to the upper limits
of **the** main axis of the reservoir. **The** most common outcropping rocks **are**
shales and **limestones**, but some isolated areas of igneous and sandstone rocks
are found. The most recent alluvial deposits in the river bottoms consist
predominantly of sand, gravel, silt, and clay.

15. Most of the soils **were** developed from flinty or **cherty** lime-
stones and shales and constitute a major portion of the agricultural area
known as the Kansas-Oklahoma Blue stem Region. Soils which **are** suitable for
cultivation generally **are** dark brown to almost black, granular, silty clay
loam overlying heavy, dark clay or **claypan-like** subsoil. In some of the

wider **bottomlands**, and farther from the stream channel, the soils are relatively black, heavy plastic clays. These drain slowly and frequently remain too wet for seeding.

16. The climate of the reservoir area is somewhat more humid than that found along the smoky **Hill** and Republican Rivers and other important tributaries of the Kansas River. Rainfall varies between 23 inches per year in the extreme northwest portion of the Big Blue River Basin to 32 inches per year at Manhattan, Kansas. Temperatures have varied between **116** F. and **-32** F. The average for January is about 29° F. and the average for July is approximately **80** F. A normal growing season of about 171 days is expected each year.

Commercial Features

17. In **1950** the population for Pottawatomie, Marshall, and Riley Counties was **63,675**. Of these about **8,500** people live within the area that will be subjected to flooding. Manhattan, with a population of **19,056** is the largest city near the project area. Other population centers located in or adjacent to the project area are Blue Rapids, 1,430; Frankfort, 1,237; and **Marysville**, 3,866.

18. Two railroads, the Union Pacific and the Missouri Pacific, traverse the reservoir area. U. S. Highway No. 77 parallels the western **side** of **the** proposed reservoir. Four State highways, Nos. 13, **16**, **113**, and 116 provide highway **connections** for several small communities located in the reservoir area. A network of county **highways** adds to the transportation system. The principal highway routes in the reservoir **area are** in the valley

proper and will be affected by the pool.

19. Agricultural activities constitute the major source of income to the population of the project area. Crops grown in order of importance are corn, wheat, alfalfa, sorghum, and red clover. The raising and feeding of livestock is important in this area. The manufacture of agricultural commodities comprises a minor industry in the three counties adjacent to the reservoir. A few sand and gravel plants are located along the Little Blue and Big Blue Rivers. One gypsum mine and preparation plant is located north of the Big Blue River near Blue Rapids, Kansas,

PLAN OF DEVELOPMENT

Engineering Features

20. The engineering features of the Tuttle Creek Reservoir project will be the dam and reservoir. The dam will be an earth-fill structure having an over-all length of 7,500 feet and an average height of 135 feet above the valley floor. The 904-foot, chute-type spillway, located near the left abutment, will be equipped with twenty, 40 by 20-foot Taintor gates. Release of water from the reservoir will be accomplished through two, 20-foot diameter tunnels, invert elevation 998 feet m.s.l., located at the right end of the dam. At full pool level, capacity of these outlets will be 45,000 second-feet; however, releases not in excess of 35,000 second-feet are planned. Channel improvement below the dam will be made at one restricted point 2.2 miles above the mouth of the Big Blue River so that at bankful capacity the channel would accommodate a flow of 35,000 second-feet. The necessary controls for releasing water to the stilling basin will be provided. The dam will have a combined surcharge and freeboard of 23 feet above elevation 1,136.

21. Pertinent reservoir data based on design data, reservoir stage graph, and other source materials made available by the Corps of Engineers is summarized below.

Table 1. Tuttle ~~Creek~~ Reservoir Data

Item	Elevation (ft. m. s. l.)	Capacity (acre-feet)	Surface Area (acres)	Shoreline Length (miles)	River Length (miles)
Top of Flood Control pool	1,136.0	2,280,000	53,500	368	67.1
Average Annual Maximum pool	1,053.8	129,000	8,500	67	29.5
Average Annual Minimum pool	1,010.0	--	--	--	--
Stream Bed Elevation at Dam Site	1,010.0	--	--	--	--
Lowest Outlet (Invert)	998	--	--	--	--

Operation

22. Tuttle ~~Creek~~ Reservoir will ~~be~~ operated as a detention basin for the purpose of alleviating floods along the ~~small~~ section of the Big Blue River below the dam, the Kansas River, and the Missouri River. Water supply ~~studies~~ covering the ~~period~~ 1895 through 1951 were used in ~~projecting~~ the operation. During this period, impoundment would have occurred about 10 ~~per-~~
~~cent~~ of the time and the reservoir would have been drawn to or remained at dry ~~bed~~ for varying periods every year. The operation study indicates that no flood storage would have occurred during 9 of the 57 years of record. ~~Maximum~~ range in pool level would have been 126 feet, and average annual range would have ~~been~~ 43.8 feet. During about 50 percent of the years, the ~~reser-~~
voir would have been ~~above~~ elevation 1,050 feet ~~m.s.l.~~ at some time during the ~~year~~. Flood ~~storage~~ below this elevation ~~may~~ occur ~~more~~ times during a given year because of smaller ~~and~~ more frequent floods. The larger floods require considerably ~~more~~ time to ~~empty~~ the ~~pool~~, and as a consequence

sustained, high reservoir elevations would result. Following periods of ~~im-~~
~~poundment~~, the reservoir would be emptied as soon as practicable. Rates of
pool fluctuation ~~would~~ be rapid and relatively constant. It would ~~be~~ possible
to empty the full pool in ~~40 days~~ if downstream conditions on ~~the~~ Kansas and
Missouri Rivers permitted. periods of highest stage would occur during the
~~months~~ of May through July, and dry.bcd conditions would occur during ~~the~~
period November through January. During impoundment periods no ~~minimum sus-~~
~~tained~~ releases are indicated. Normal stream flows would be passed through
the ~~dam~~ at all other ~~times~~.

FISHERY

Without the project

23. The Big Blue **River** within the project area supports a catfish fishery that is notable throughout most of the State of Kansas and in **some** neighboring states. It is not unusual to find parties **coming** from distances as **great** as 100 miles, and overnight fishing parties **from** local and distant towns frequent sections of the Little Blue and Big Blue Rivers. Large catfish contribute to the **fame** of this river fishery.

24. The most **sought-for** species are **the** channel and flathead **cat-**fish. Channel catfish comprise about 70 percent and **flathead** catfish five percent of all fish taken. Carps, buffaloes, bullheads, and freshwater drum account for most of the remainder. On the clearer tributaries and infrequently on the main stem, an occasional yellow pikeperch or sunfish is taken.

25. The usual **type** of fishing is by **means** of bank lines and throw lines. Active fishing by use of rod and reel or bamboo poles occurs from the bridges, along Fancy **Creek**, and at readily accessible points such as Rocky **Ford** dam. **Boats are used** for raising throw lines and for boat fishing below and on Rocky Ford power pool. County and state roads and a railroad bed provide numerous access points to the stream **channels.**

26. **Pool** areas and undercut banks **are numerous** along the main **stem** of the Big Blue River and **the** principal tributaries. For the most part, the channels are natural, and **the banks** support heavy growths of deciduous trees and shrubs, which are helpful **in** attracting insects that contribute to the diet of the stream **fish.** **These** trees also aid in stabilizing the stream

banks and provide shade for the pool. Numerous small tributaries, many of which do not support a fishery of any importance, abound with minnows and aquatic insects, These streams contribute to the food and nursery ~~require-~~ments of the fish of the main stem. ~~Stream~~ flow on the main stem has seldom been less than 100 second-feet for any extended period. Springs originating in outcrops along the tributaries account in part for this desirable flow ~~con-~~dition, which has been sufficient to sustain a dependable fish ~~population.~~

27. Channel bottoms of the Big Blue River and its larger tributaries consist of silt, gravel, and rubble. The flow is frequently turbid even following periods ~~of~~ moderate ~~run-off.~~ Aquatic plants are absent except for growths of green algae and moss occurring in the clearer tributary waters. Significant pollution results from untreated domestic and industrial wastes, and is particularly apparent below Marysville, Blue Rapids, and Frankfort.

28. The Big Blue River and ~~tributaries~~ account for the preponderance of the fishing in the project area, A ~~few~~ farm ponds provide fishing for limited ~~numbers~~ of fishermen. Stocking of fish in the project area by the Kansas Forestry, Fish and Game Commission has been limited to farm ponds, some of which have lost fish to the streams in periods of ~~flooding.~~

29. Besides the Big Blue River main stem, there are four tributaries in ~~the~~ project area which support fisheries of significance. The Little Blue River supports a fishery characteristically very much like that of the Big Blue River in that it provides a "big" river type of ~~fishery,~~ which entices many fishermen seeking out the large channel and flathead ~~cat-~~
~~fish.~~ Fancy Creek is normally a clear-water stream ~~except~~ for short periods

following high run-off, Although green sunfish, crappies, and an occasional largemouth black bass are reported, the channel catfish remains the chief attraction. Black Vermillion River receives high utilization in the spring, and provides good fishing for channel catfish, bullheads, and carp. Mill Crock is the smallest of the tributary fisheries of any importance. During dry periods the flow may not be sufficient to support a significant fishery, but generally the lowermost section, within the project area, is utilized.

30. The Big Blue River above the proposed Tuttle Crock dam supports a fishery estimated to be worth \$27,000 annually. The tributaries support a fishery with an annual value of \$9,500.

31. The Big Blue River below the Tuttle Crock dam site supports a much-utilized fishery. The short reach of stream immediately below the existing Rocky Ford Dam is the most intensively fished section of stream in the project area. Large numbers of fishermen concentrate there at the height of the fishing season. It has been estimated that during an average year 2,500 fisherman-days are expended on this section. The remainder of the river below the proposed Tuttle Crock dam, including the Rocky Ford power pool receives above average fishing pressure, The annual value of the fishery of this total downstream reach is estimated to be \$8,300.

With the Project

32. Construction and operation of the Tuttle Crock Reservoir will have an adverse effect upon the 67.1 miles of Big Blue River and 63.8 miles of tributaries within the reservoir area. Consideration is also given to the effect of operation of this project upon the 9.4 miles of good stream

fishing existing below the dam.

33. Since the resulting impoundment will be drawn to, or remain at channel level every year, no reservoir fishery can develop. Because of the recurrent flood storage, there will be a decreased accessibility to the streams in the reservoir area. A permanent loss of access roads will also occur, in an amount dependent on frequency and times of inundation. Storage in the reservoir is expected to result in considerably reduced utilization.

34. The effects of impounded water on habitat will be adverse and cumulative, with the lowermost portion of the streams undergoing greatest losses. Following a few years of average inundation, it is expected that most of the woody bank vegetation will be killed below elevation 1,050 feet m.s.l., with the eventual loss of overhanging tree roots that provide for undercut banks and desirable catfish habitat. Siltation is expected to cause the loss of many existing channel pools. The construction of the dam will result in a barrier to upstream movement of fish, and it is believed that the velocity of release through the tubes will exceed that with which channel and flathead catfish might contend. However, the existing Rocky Ford Dam also acts as a barrier preventing upstream movement of fish except during periods of high water.

35. When due consideration is given to all of these effects, it is estimated that the annual value of the fishery of the Big Blue River above the dam will be reduced to 18,400 and the annual value of the tributary fishery will be reduced to

36. The fishery below Tuttle Creek Dam will not be changed materially. The annual value is expected to remain at \$8,300. Table 2 summarizes the

without-the-project and with-the-project annual fishery values.

Table 2. Summary of Annual Fishery Values

Item	Without the Project	With the Project	Difference
Big Blue River in the Reservoir Area	\$ 27,000	18,400	- \$ 8,600
Tributaries in the Reservoir Area	9,500	8,500	- 1,000
Big Blue River below Tuttle Creek can site	8,300	8,300	--
Totals	44,800	\$ 35,200	\$ 9,600

WILDLIFE

Without the project

37. Cover Types. The climax vegetation in and adjacent to the Tuttle Creek Reservoir area consists of tall grasses on the prairies and hardwood forests adjacent to the river and in the riverbreaks. A major portion of the land within the flood plain section of the full pool area is cultivated. The principal crop is corn. Alfalfa, sorghums, red clover, and wheat and other small grains are also grown in lesser quantities.

38. Along the main stem of the Big Blue River, there is a narrow band of cottonwoods, am, ash, and willow. All of the main tributaries are heavily wooded with oak, am, maple, hickory, willow, black walnut, box elder, cottonwood, and sycamore. These strips of timber usually extend back into the riverbreaks. In addition, there are a few wood lots scattered throughout the flood plain.

39. The flood plain is bordered by relatively steep slopes covered by native bluestem grasses interspersed with dogwood, sumac, plum, and some red cedar. On the higher rolling prairies adjacent to the Big Blue River flood plain, the principal grasses found are big bluestem, little bluestem, Indian grass, sideoats gramma and hairy gramma, bluegrass, and sand dropseed. There is little cultivation on these prairies, which are utilized mainly as grazing areas for cattle.

40. A large number of different types of weeds including the sunflower, thistle, croton, pennygrass, and broomweed are present almost everywhere. Other shrubs present are chokecherry, elderberry, black raspberry,

prairie rose, and ~~gooseberry~~.

41. Osage orange ~~hedgerows~~ border some of the cultivated fields in the bottoms. ~~These~~, along with ~~stream-bank~~, roadside, and railroad ~~cut-~~
~~bankment vegetation~~, and the low brush on the slopes, furnish adequate cover for bobwhite and cottontail populations. In addition, there are a few former oxbows that have become heavily vegetated with native grasses and weeds, which provide good ~~upland-game~~ bird cover.

42. ~~Attempts~~ have been made in the past to cultivate parts of the grassland prairies. However, most of ~~these~~ undertakings have been unsuccessful, and ~~the~~ land has reverted to the native grasses. It appears that the land use is now established.

Table 3. Cover Types on Tuttle Creek Reservoir Area
(Furnished by the Corps of Engineers)

Type Cover	Top of Flood-Control pool (Elevation 1,136')	
	Acreage	percent
Cropland	35,100	65
Pasture	10,000	19
Timber and Waste	3,600	7
Towns and Rights-of-Way	2,100	4
River Channels	2,700	5
Totals	53,500	100

43. Big ~~Game~~. A ~~small~~ number of white-tailed ~~deer~~ are present within the Tuttle Creek Reservoir area, especially along the wooded

tributary streams, but the small population has not yet warranted an open hunting season. However, more and more residents of the valley area are re-
porting deer annually. If the trend in deer populati ns in this part of Kansas follows that of the neighboring States of Nebraska and Missouri, it is conceivable that at least a limited harvest could be expected in the future. No monetary value is assigned to big game, without the project.

44. Upland Game. Bobwhites, cottontails, mourning doves, fox squirrels, prairie chickens, and pheasants are present within the reservoir area. The bobwhite is the most popular upland-game species from the hunterst viewpoint. There is good quail cover in the bottom lands and abundant cover in the breaks along the Big Blue River flood plain. Cottontails are common and receive moderate hunting pressure. Mourning doves nest in the timber stands near the main channels, in the wood lots, and in the riverbreaks. Pheasants and prairie chickens are present in such limited numbers that no open season has been warranted. Food for upland-game birds and animals is abundant in the agricultural portion of the flood plain.

1 . An annual value of 21,600 is assigned to upland game, with-
out the project.

46. Fur Animals. Muskrats, minks, beavers, raccoons, opossums, skunks, and a few badgers and red foxes are found within the reservoir area, The Big Blue River and its tributaries provide donning areas for a good popula-
tion of muskrats. Minks are taken along the Big Blue and in particular along the smaller tributary streams. An open season was declared on beavers in Kansas in 1951-52, and it is probable that the Big Blue and its tributaries

are capable of supporting an annual harvest of beavers.

47. Raccoons are extremely numerous and are second only to muskrats in the take of Kansas trappers. In addition, raccoon hunting is a popular sport, and most of the raccoon hunters defray a part of their hunting expenses through the sale of pelts. Many raccoons and skunks are taken by local residents in protecting their poultry. Trapping is an important source of extra income to farm boys in the Blue River Basin.

48. An annual fur-animal value of 14,200 is assigned to the Tuttle Creek Reservoir area, without the project.

49. Waterfowl. The Big Blue River serves as a resting place for waterfowl during the migration periods. Occasional concentrations of ducks and geese use this area and the nearby Kansas River in the spring. During the fall migration, the waterfowl do not appear to make extensive use of the comparatively small Big Blue River, preferring the larger Kansas and Missouri Rivers. A few hunters have blinds along the Big Blue but most of the waterfowling is confined to jump shooting, and the hunting is relatively poor.

50. A few wood ducks nest in the area, but no other waterfowl are known to nest along this portion of the Big Blue Basin.

51. The ~~without-the-project~~ waterfowl value is estimated to be \$200 annually.

With the Project

52. Cover Types. With the advent of periodic inundation, important changes will take place which will adversely affect the cover in the reservoir area. Land use will be seriously altered depending on the duration

and frequency of flooding.

53. In the lowermost reaches of the reservoir area, flooding will be frequent enough to eliminate all permanent wildlife habitat; although in extended dry periods, this lower area may become vegetated with woods and brush. Based on operational data, it appears that very little land will be cultivated below the 1,060-foot contour. It is expected that trees will be eliminated completely below the 1,050-foot contour. Between the 1,050-foot and 1,090-foot contours the less water-tolerant species of trees and shrubs will be replaced by more tolerant species. Even in this area, a flood of serious proportions could completely inundate and eliminate all cover regardless of its water tolerance. Several successive years of no-flood conditions would then be necessary before this woody vegetation would be re-established.

54. The loss of cropland, timber, brush, and grass cover in much of the reservoir area will be detrimental both to the wildlife resources and to the utilization of these resources.

55. Final decisions on the land management plan for the reservoir area are not yet formulated. The expected land-use pattern, based on operational data, may be altered by the adoption of the final land management plan.

56. Big Game. Some white-tailed deer habitat along the tributary streams may be lost through periodic inundation. Loss of any habitat in this area is likely to be detrimental to expansion of the present deer population. It is anticipated that much of the loss will be counterbalanced by removal of the local populace, creation of large blocks of waste land, and general loss

of accessibility to the lower reservoir area. However, the resident deer population is low at present and is not expected to be seriously affected by the project.

57. No monetary evaluation of big game has been made, with the project.

58. Upland Game. Upland-game habitat will be adversely affected within the project area depending on time, duration, and frequency of flooding. The most serious losses will accrue to the lowermost reaches of the reservoir area. There the land use will be seriously and permanently changed. Much land will no longer be farmed. Utilization of the remaining wildlife resources will be greatly curtailed through loss of roads and bridges and through the removal of the local residents from the reservoir area. Most of the flooding will occur in the spring and early summer during the breeding and nesting seasons of upland game, thereby disrupting the normal reproductive activities. Loss of much of the timber below the 1,090-foot contour lines will virtually eliminate fox squirrels from much of the reservoir area. The lands lying below the 1,030-foot contour line are expected to be devoid of cover much of the time due to frequent inundation. Those lands less frequently inundated, but often enough to prevent farming, are expected to become vegetated with a relatively heavy growth of weeds and brush. Although weeds and brush are necessary adjuncts to well-rounded wildlife habitat, a large expanse of this type of cover will not be beneficial to upland game and will likely curtail hunting activities.

59. The with-the-project upland-game value is estimated at \$14,200 annually.

60. Fur Animals. The fur-animal habitat will decrease in a manner similar to the decrease in upland-game habitat. The aquatic fur animals, beavers, minks, and muskrats, will be adversely affected by the periodic inundation of the stream channel of the Big Blue River and its tributaries. Donning areas will be destroyed and pools and backwaters filled with sediment. The land-use changes will have an effect on all fur animals, similar to the effect on upland game. Loss of access roads and bridges and the removal of the local residents will be particularly harmful from the utilization standpoint, since most of the trapping is done by the local people.

61. It is estimated that fur animals will have an annual value of 9,500, with the project.

62. Waterfowl. The Big Blue River is used mainly as a resting area by waterfowl during the spring and fall migrations. It is not expected that construction and operation of the project will alter significantly the present, light waterfowl use, and no change in waterfowl values is anticipated. In the years when flooding occurs during the spring waterfowl migration period, ducks and geese will undoubtedly use the Tuttle Creek Reservoir as a resting area. However, resting areas for waterfowl are not critical at this time of year and since this resting habitat will not be of dependable nature, there can be no benefit assigned. The with-the-project annual waterfowl value is estimated to remain at 1,200.

63. Table 4 summarizes the wildlife values both with and without the project.

Table 4. summary of Annual Wildlife Values

Item	Without the Project	With the Project	Difference
Big Game			—
Upland Game	21,600	14,200	7,400
Fur Animals	14,200	9,500	4,700
Waterfowl	200	200	
Totals	\$ 36,000	23,900	12,100

DISCUSSION

64. The construction and operation of Tuttle Creek Dam and Reservoir, as now planned, will be detrimental to both fish and wildlife. The creation of extensive waste areas due to recurrent inundation, the loss of habitat, and general loss of accessibility will adversely affect both the fish and wildlife resources and the utilization of those resources. Within a 25-mile periphery of the proposed reservoir, there is a population of about 100,000 people, many of whom fish and hunt in the area which will be flooded by the reservoir. A distinct need for hunting and fishing areas already exists in the general project area. With the loss of an appreciable amount of the existing fish and game habitat, the needs, with the project, will be even greater than at present.

65. It is desirable that operation of the proposed reservoir give consideration to the maintenance of the valuable fishery existing below the dam site. Occasionally during impoundment, when flows on the Kansas River are not high and local run-off below the dam is low, dewatering of portions of the stream might occur. During such times of impoundment, a sufficient flow to maintain the fishery should be maintained below the dam.

66. Sudden changes in releases from reservoirs generally have detrimental effects upon the downstream fishery by causing displacement of fish below the dam and by causing greater turbulence with greater physical injury to the fish. Sudden fluctuations also discourage bank and boat fishing below the dam. Therefore, it is desirable, from the maintenance and utilization standpoints of the fishery, that changes in rates of releases

from the ~~reservoir~~ be made gradually ~~whenever~~ practicable.

67. It is expected that a potentially valuable fishery will develop ~~immediately below~~ the dam, since many fish congregate at ~~the~~ point of release of ~~impounded~~ waters. It is desirable that provision be made for safe ~~utili-~~ zation of this fishery.

68. Due to the frequency and duration of flooding, the lowermost reaches of the reservoir ~~area~~ are expected to ~~be~~ permanently retired from use. An additional resting and feeding ~~area~~ for migrating waterfowl could ~~be~~ provided by flooding approximately 1,000 acres ~~of~~ land each year during the months of October through December. ~~Since the preponderance~~ of flood water storage will occur during ~~the~~ spring and early ~~summer~~ months, seasonal storage during ~~the~~ fall for ~~waterfowl~~ usage appears ~~feasible.~~

69. One of the primary reasons for ~~the~~ present high value of the ~~proposed reservoir~~ area for hunting and fishing is its excellent ~~accessibility.~~ It is important that all roads and bridges within the reservoir area, ~~where~~ practicable, ~~be~~ maintained ~~in~~ order to promote all possible public use of the ~~area~~ for hunting and fishing.

RECOMMENDATIONS

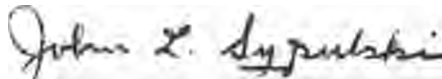
70. It is recommended that:
- (1) During periods of ~~impoundment~~, a minimum *flow* of 200 ~~second-foot~~ be maintained below Tuttle Creek Dam.
 - (2) Approximately 1,000 acres of land ~~be~~ inundated each year during the months of October through ~~December~~.
 - (3) ~~Wherever~~ practicable, access roads and bridges be maintained ~~within~~ the reserv-ir ~~area~~.
 - (4) In general conformance with established procedures of the Corps of Engineers, all federally ~~owned~~ land in ~~the~~ project area be open to ~~free recreational use~~ by the public, except for such ~~portions~~ as may be reserved by ~~the~~ planning agency for purposes of safety, efficient operation, or protection of public property.
 - (5) Leases of federal land in ~~the~~ project area stipulate the ~~right~~ of public access for the purpose of hunting, fishing, and other ~~uncom-~~
~~mmercialized recreational~~ purposes.

CONCLUSIONS

71. ~~Construction~~ and perati n of Tuttle Crock Reservoir will ~~re-~~
~~sult~~ in an annual loss to the fishery ~~estimated~~ at \$9,600. An annual loss
to ~~wildlife~~ estimated at \$12,100 is expected. If Recommendation No. 2 is
carried ~~out~~ a ~~considerable value~~ to ~~waterfowl~~ would ~~result~~.

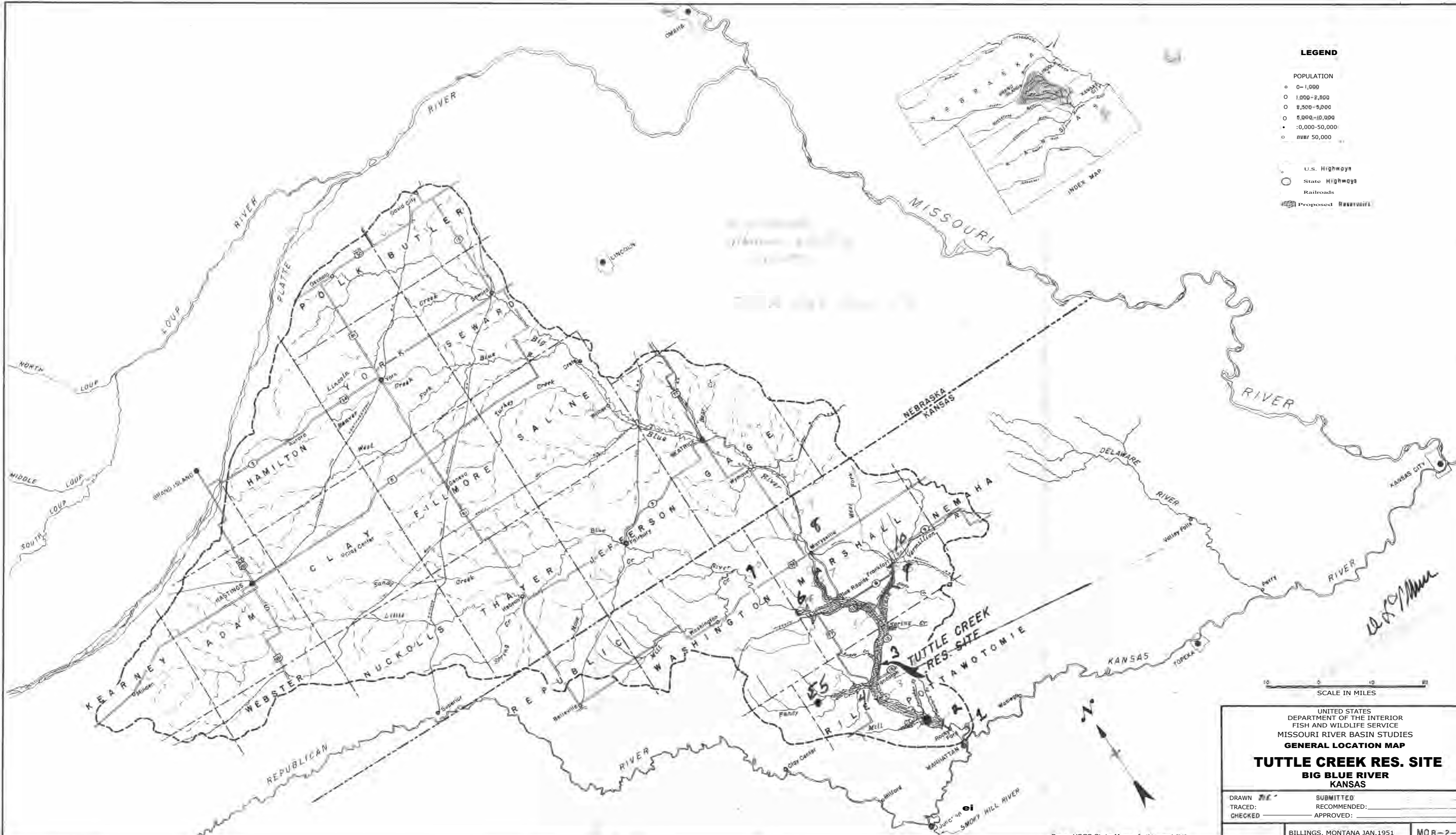
72. This report is based on the Corps of Engineers' Definite
Project Report dated January 1952, and supplemental ~~information~~. The Fish
and ~~Wildlife~~ Service should ~~be~~ advised of any change in plans of operation or
development ~~so~~ that a ~~revised report~~ may be prepared.

APPROVED:



John L. Sypulski, Acting Supervisor
Missouri River Basin Studies

September 4, 1953



LEGEND

- POPULATION
- 0-1,000
 - 1,000-2,500
 - 2,500-5,000
 - 5,000-10,000
 - 10,000-50,000
 - over 50,000

- U.S. Highways
- State Highways
- Railroads
- ▨ Proposed Reservoirs



SCALE IN MILES

UNITED STATES
 DEPARTMENT OF THE INTERIOR
 FISH AND WILDLIFE SERVICE
 MISSOURI RIVER BASIN STUDIES
GENERAL LOCATION MAP
TUTTLE CREEK RES. SITE
BIG BLUE RIVER
KANSAS

DRAWN <i>ME</i>	SUBMITTED
TRACED	RECOMMENDED
CHECKED	APPROVED

Base: USGS State Maps of Kon. and Neb.



MRBS 3016

Fig. 1. This view of the Big Blue River near Garrison, Kansas, illustrates the characteristics of the stream and of the vegetation along the banks in this vicinity. This reach of stream is in the Tuttle Creek Reservoir site. (Photo by A. S. Hale, 8-22-50)



MRBS 3019

Fig. 2. Big Blue River near Randolph, Kansas. This reach of stream lies within the Tuttle Creek Reservoir site. (photo by A. S. Hale, 8-22-50)



MRBS 3020

Fig. 3. This small power dam on the Big Blue River at Rockyford, about 3 miles below Tuttle Creek Dam site, is a barrier to upstream movement of fishes except during periods of high water. (photo by A. S. Hale, 8-23-50)



MRBS 3021

Fig. 4. This view of Tuttle Creek, a small tributary to the Big Blue River within Tuttle Creek Reservoir Site, illustrates the nature of the fish and wildlife habitats to be inundated here. (photo by A. S. Hale, 8-23-50)



MRBS 4222

Fig. 5. This view of the valley of Big Blue River immediately upstream from the Tuttle Creek Dam site illustrates typical wildlife habitat types which will be lost in the reservoir site. (Photo by A. S. Hale, 8-20-52)



MRBS 3022

Fig. 6. This view of Black Vermillion River within the upper limits of Tuttle Creek Reservoir site illustrates the fish and wildlife habitats available here before construction of Tuttle Creek Dam. (Photo by A. S. Hale, 8-23-50)