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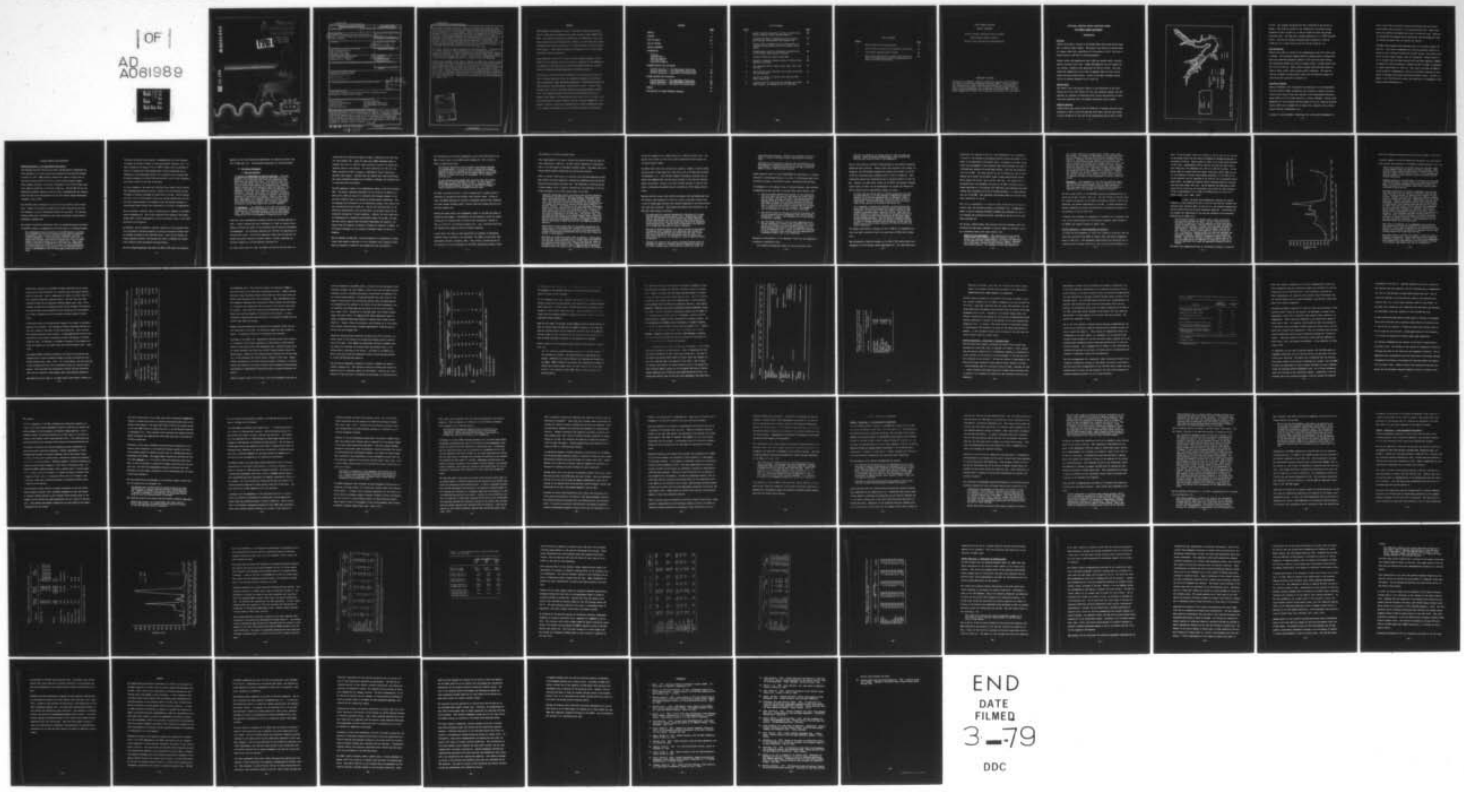

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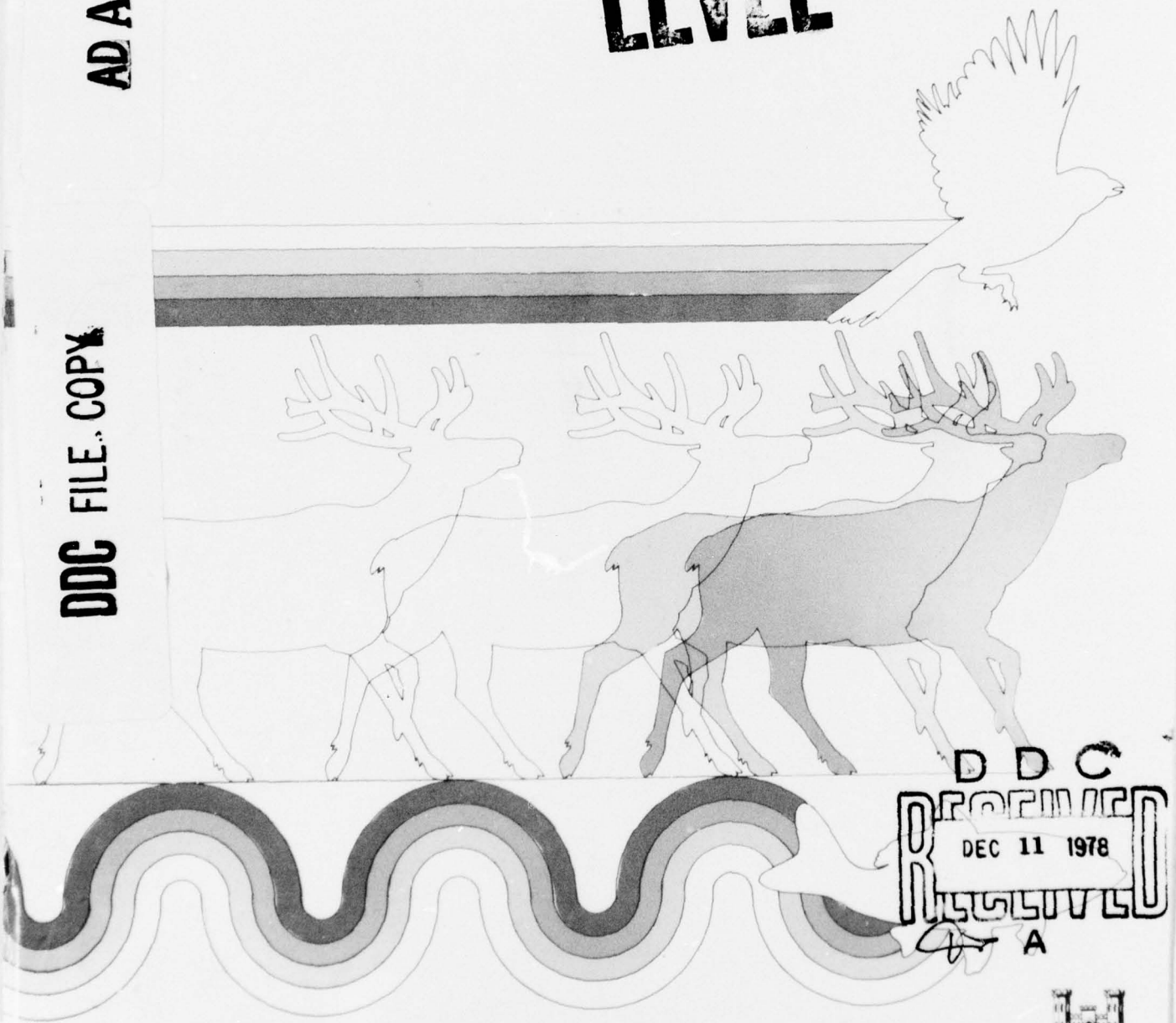
Evaluation of Planning for Fish & Wildlife

LEVEL II

Council Grove Lake Project
April 1978



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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*
The lake impounded by Council Grove Dam, on the Neosho River, Kansas, flooded approximately 24 km (15 mi) of stream and river habitat. Terrestrial wildlife populations dependent upon 1,157 ha (2,860 ac), which were permanently inundated plus an additional 1,004 ha (2,480 ac) in the five-year flood frequency pool, were impacted by the Council Grove project. Upon initiation of water supply storage, an original though not yet contracted project purpose, the project will permanently inundate 1,327 ha (3,280 ac).

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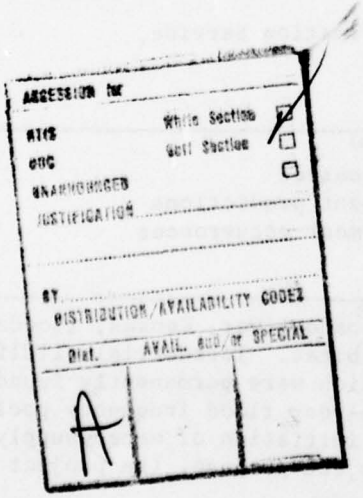
Inter-agency coordination was poor during the critical early planning stages. Pre-construction fish and wildlife planning recommendations lacked detail and were not submitted in a timely manner. Several major planning recommendations provided by the U.S. Fish and Wildlife Service, in cooperation with the Kansas Forestry, Fish and Game Commission, were never implemented by the Corps of Engineers. Among these recommendations were acquisition of 293 ha (725 ac) of land above the five-year flood pool, for wildlife mitigation purposes, and provision of a 15 cfs minimum water release downstream. Acquisition of the wildlife mitigation lands was requested very late in the planning process. This recommended land acquisition plan was rejected by the construction agency on the grounds that the cost: benefit ratio was unfavorable.

The present fishery is largely supported by non-native species. The opportunity to introduce non-native game fish species was not addressed by the pre-construction planners. It appears probable that the pre-construction angling predictions were much too high. Angling effort (based on KFFGC data) averaged 14,228 angler-days during 1974 and 1976. This level of use approximates only 27 percent of the average level which is assumed to have been predicted.

Opportunities available to the KFFGC to replace the terrestrial wildlife losses at the project site have been limited to the use of state funds (some matching Pittman-Robertson funds) to improve the 368 ha (909 ac) of suitable project lands located within the five-year flood storage zone. This frequently-flooded land is part of the 1,068 ha (2,638 ac) of project lands and water licensed to the KFFGC. Current information indicates, and responsible state biologists agree, that this management program at Council Grove has succeeded in replacing the 1,200 hunter-days which were predicted to be displaced by construction of the Council Grove project. However, this replacement has not been accomplished as a project cost.



PREFACE

This document was prepared by staff of the Sport Fishing Institute for the U.S. Army Corps of Engineers (CE) under contract number DACW73-74-C-0040. The contract requires the compilation and comparison of pre- and post-construction data treating fish, wildlife, or both fish and wildlife (depending upon data availability) for twenty separate CE water development projects. This report presents the findings for one of the twenty individual project evaluations.

Upon completion of the full series of twenty separate studies, a final report will be prepared which will contain an analysis of the validity of the predictive procedures used in fish and wildlife planning, and will contain recommendations for improving the planning process.

This study of fish and wildlife planning at the Council Grove Lake project in Kansas benefitted from the cooperative assistance provided by many knowledgeable state and federal personnel. Kansas Forestry Fish and Game personnel including Messrs. Bob Hartmann, Don Dick, Charles Howe, Charles Swank and Troy Schroeder supplied the post-impoundment information. Mr. George Harrington with the Fish and Wildlife Service and Messrs. Buell Atkins, Jim Randolph and Cleon Linton with the Corps of Engineers provided necessary documents and many valuable suggestions. Mr. Murray T. Walton, Southcentral Representative, Wildlife Management Institute, visited the project area and critically reviewed the manuscript.

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SPORT FISHING INSTITUTE

PROJECT PERSONNEL

Norville Prosser (Assistant Project Leader)

Robert Martin (Project Leader)

Richard Stroud (Contractor's Representative)

CONSULTANT'S REVIEW

Professional terrestrial wildlife consultative services were provided by the staff of the Wildlife Management Institute (WMI). Project personnel were accompanied by a WMI staff specialist during field reconnaissance and on on-site discussions. The terrestrial wildlife portion of the prepared evaluative manuscript was reviewed and evaluated by WMI. All pertinent suggestions offered by the consultant are reflected in this report.

INDIVIDUAL RESERVOIR PROJECT EVALUATION REPORTS

THE COUNCIL GROVE LAKE PROJECT

INTRODUCTION

Location

Council Grove Dam is located on the Neosho River about three miles northwest of Council Grove, Kansas. The project lies entirely in Morris County, Kansas, which had a population of 6,432 people in 1970. The city of Council Grove is the seat of county government.

Several cities with populations over 5,000 are located within a 50-mile radius of Council Grove Lake. Topeka and Manhattan are the largest cities, having a combined total population in 1970 of 150,586. Six other reservoirs constructed by the Corps of Engineer (CE) are also located within the same 50-mile radius. Council Grove Lake is readily accessible by the Kansas Turnpike and U.S. Route 56.

Authorization

The Council Grove Lake project (Figure 1) was authorized by the Flood Control Act of May 1950 (Public Law 516, 81st Congress, Chapter 188, 2nd session) for purposes of downstream flood control and provision of municipal and industrial water for Emporia and Council Grove, Kansas.

Physical Features

Council Grove Lake covers 1,327 ha (3,280 ac) at average recreation pool elevation of 388 m (1,274 ft) mean sea level (msl), and the lake covers 1,157 ha (2,860 ac) at the top of the conservation pool of 387 m (1,270

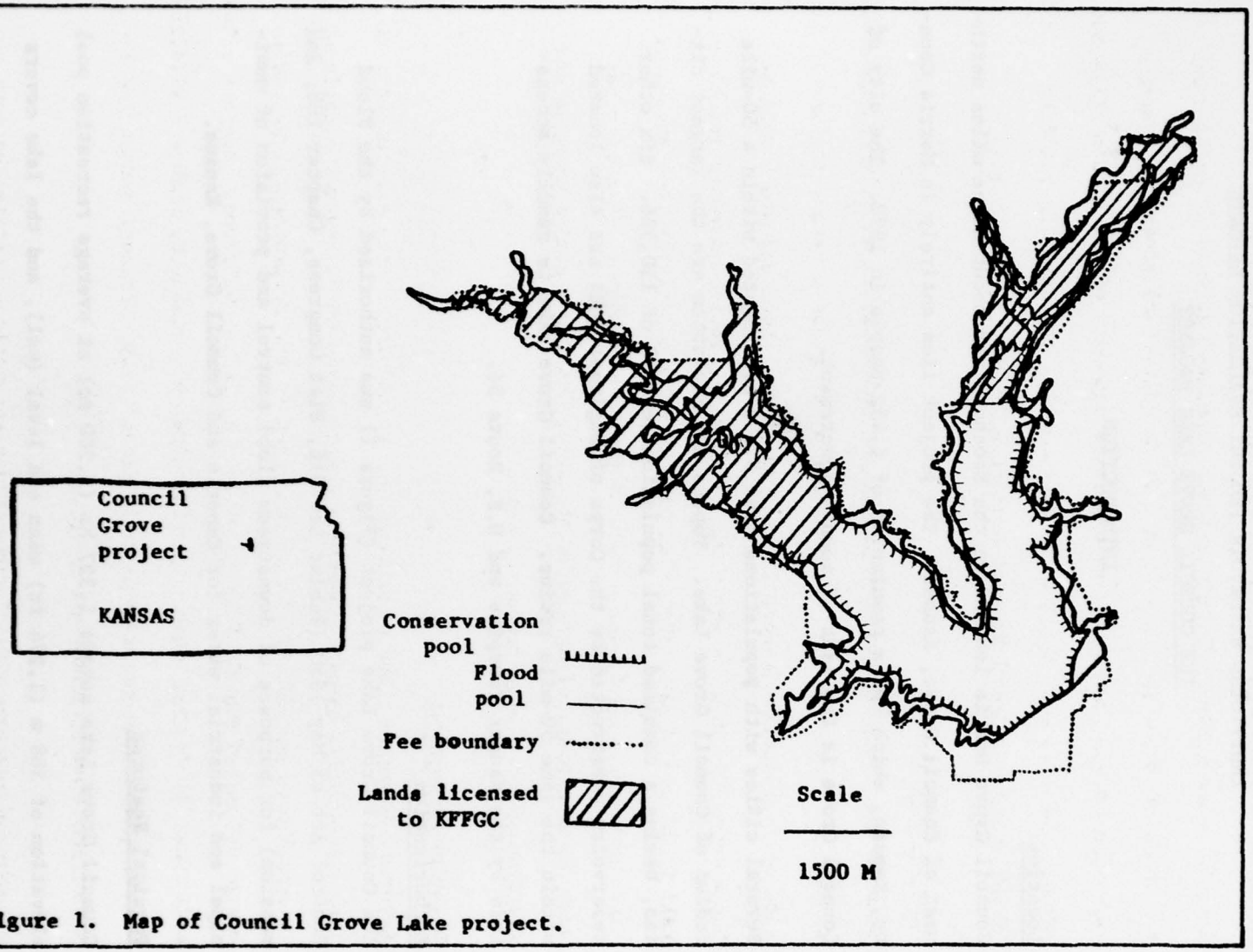

Figure 1. Map of Council Grove Lake project.

ft) msl. The average recreation pool has a shoreline 64 km (40 mi) in length. Some 2,161 ha (5,340 ac) are inundated at full flood storage elevation of 391 m (1,284 ft), or 834 ha (2,060 ac) above the average recreation pool. The lake has a storage capacity of $1.4 \times 10^8 m^3$ (114,300 ac-ft). Land area at average recreation pool elevation is 2,436 ha (6,020 ac) for a total project area of 3,764 ha (9,300 ac) (1).

Area Description

Council Grove Lake is located in the predominantly rural Flint Hills area of Kansas. The watershed consists mostly of grass-covered, rolling hills with crop production generally limited to the river and creek valleys. The surrounding uplands are used for grazing cattle. Average annual rainfall is 81 cm (32 in). Water quality remains relatively good except at times of heavy runoff, which creates turbid conditions. The lake has been the recipient of agricultural waste, and low dissolved oxygen concentrations have occurred on occasion (2).

Descriptive Reports

Reports, documents, and correspondence pertaining to the pre-impoundment fish and wildlife impact assessments were reviewed at several locations. Council Grove project files were searched at the Environmental Resources Branch Office of the CE Tulsa District, in Tulsa, Oklahoma. Project files maintained by the Ecological Services Branch of the U.S. Fish and Wildlife Service (FWS) were reviewed both in Kansas City, Missouri and at the National Archives in Washington, D.C.

A number of pre-impoundment communiques and various post-impoundment re-

ports on the fish and wildlife resources associated with the Council Grove project were pertinent to this planning evaluation. These documents are referenced throughout the report as they are cited. Additional information was gathered during discussions with knowledgeable state and federal personnel when the project was visited.

The FWS's first Council Grove planning report was released on April 28, 1959 (3). This report recommended that certain peripheral lands be acquired in fee to mitigate terrestrial wildlife losses. The location and extent of these lands, however, were not designated. Several years later, a request from the Kansas Forestry Fish and Game Commission (KFFGC), to specify the land requirements, prompted the FWS to submit a supplemental report dated March 27, 1963 (4). This report contained the KFFGC's land acquisition recommendation, which was considered necessary by that agency to mitigate the project-associated wildlife losses. The CE's response to the 1963 FWS letter-report was contained in a supplement to the General Design Memorandum (5).

WILDLIFE RESULTS AND DISCUSSION

Wildlife Resources -- Pre-impoundment Predictions

The original wildlife-related projections and mitigation recommendations were contained in a brief letter-report prepared by the FWS and released on April 28, 1959. FWS personnel rushed their report to print only 25 days after being notified by the CE of major project design changes. These changes included a 20 percent enlargement in the flood storage area, from 1,805 ha (4,460 ac) to 2,161 ha (5,340 ac). Had the FWS not met the publication deadline imposed by the CE, their recommendations and comments would not have been incorporated into the CE's General Design Memorandum released in June, 1959.

The 1959 FWS report addressed only the 2,161 ha (5,340 ac) flood control pool. Impact of the smaller, permanently flooded conservation pool was not addressed, nor were differences between the two pools. All resource-related projections, furthermore, were given as monetary values based on sportsmen's expenditures.

The subject of acquiring additional lands for mitigating project-occasioned wildlife losses, as summarized in the 1959 report, is reproduced below:

> The upland-game losses associated with $5,000 annually in sportsmen's expenditures could be mitigated through Corps of Engineers acquisition in fee of certain reservoir peripheral lands for wildlife management. Other lands within the five year flood frequency pool also may be required for acquisition in fee to assure adequate free public access to the reservoir area. These lands cannot be specifically designated at this time, but feasibility of incorporating such lands in the project is being investigated. If such acquisitions are determined to be both desirable and feasible, a recommendation will be forthcoming within the next 60 days.

The report contained three specific recommendations that were designed to lessen the project's impact on fish and wildlife resources, viz: (1) water storage in the amount of $6.2 \times 10^6 m^3$ (5,000 ac-ft) be provided to allow a 15 second-feet (CFS) minimum water release downstream for enhancement of the downstream fishery, (2) a reservoir site-clearing plan be jointly prepared to benefit fish and wildlife, and (3) safe, adequate, free public access to the lake be provided.

In their response to the April 28, 1959 FWS letter-report, the CE stated that Congressional approval would be required for the increased storage necessary to provide a minimum low water-flow of 15 CFS. The CE pointed out that a 10 to 12 CFS minimum release was already planned for low flow and water supply purposes, and suggested that the minimum releases already planned might satisfy the requirements of the FWS's recommendation.

The CE requested a specific timber clearing plan in response to the FWS's second recommendation. The CE also indicated that adequate, free public access (FWS's third recommendation) would be provided as part of the usual procedures at CE projects.

In addition, the CE requested a specific tabulation of the monetary benefits anticipated from the mitigation of project-occasioned wildlife losses ($5,000) estimated in the 1959 FWS report. There was no further exchange regarding specific land acquisition needs to mitigate the terrestrial wildlife losses associated with the project.

The CE's Design Memorandum, for which the FWS's 1959 report was elicited,

appears to have been developed independently and completely without benefit of FWS input (6). The pertinent paragraphs are reproduced below:

> 61. Biological management:
>
> a. Fish and wildlife
>
> (1) Effects of impoundment on fish and wildlife. - The topography of the Council Grove Reservoir area indicates that a majority of the reservoir area would have moderately steep shorelines and rather flat areas. The reservoir would replace a stream fishery with an improved reservoir-type fishery and would provide habitat for largemouth bass, crappie, channel catfish and other desirable sport fish species. The degree of improvement of the fishery below the dam would be dependent,for the most part, upon water releases from the reservoir. Since the river valley is intensively cultivated and the valley slopes are utilized for grazing, the wildlife resources of the project are limited. However, some loss of small game habitat is recognized within the reservoir area. After impoundment, the reservoir would provide a more diversified fish and wildlife habitat and, by proper management, any specific losses that might occur would be replaced.
>
> (2) Management. - The management of the fish and wildlife resources of the Council Grove Reservoir would be primarily the responsibility of the Kansas Forestry, Fish and Game Commission. This agency and Fish and Wildlife Service both assume responsibility for the management of migratory water fowl.

There was little informational exchange between the planning agencies in 1960. A public hearing was held on November 15, 1960, in Council Grove, Kansas, to inform the public of the proposed plan for project development and management. All interested agencies were afforded the opportunity to express their views. The CE later expressed regret that the FWS did not attend this public meeting to provide support testimony regarding the project's impacts on fish and wildlife resources (7).

By letter dated April 19, 1961, the KFFGC notified the CE that they con-

curred with the construction agency's timber clearing plan for the Council Grove project (8). About the same time, KFFGC spokesmen began to question the lack of a specific land acquisition request for mitigating wildlife losses at the project. By letter dated May 12, 1961 (9), the KFFGC requested the FWS to prepare a supplemental report containing a specific land request. Included with the request was a map illustrating the lands considered necessary by the KFFGC to mitigate the wildlife losses associated with the project.

The FWS submitted a draft of its supplemental report to the CE in October, 1961. The report requested acquisition in fee of 526 ha (1,300 ac), of which 142 ha (350 ac) were to be converted from flowage easement to fee and 384 ha (950 ac) were to be acquired outside project boundaries. The CE responded that acquisition of the additional acreage would require further justification from the FWS (7). The CE also indicated that if the additional justification could be developed, the proposal would then be prosecuted through the "5-step" procedure. Briefly, the five steps were: (1) preparation of a detailed justification report by the FWS, (2) meet with and receive support from interested Congressmen and Senators, (3) obtain views and support of Governor of Kansas and Director of KFFGC, (4) hold public hearings, and (5) process a favorable report by the CE to Congress.

The CE informed the FWS that, "violent opposition to acquisition of additional lands might be expressed by local interests since organized resistance to purchase of lands for the project has been encountered."

The requirements and concerns expressed by the CE were mentioned by the FWS in their letter to the KFFGC dated December 22, 1961, a part of which is quoted below (10):

> The District Engineer's letter presents some weighty problems for consideration. If you still wish to pursue the proposed acquisition and will provide us with an indication of your Commission's intent, we will notify Mr. Romero that he should meet with you to secure your plan for management of the proposed wildlife area.
>
> We are concerned particularly with the Corps view that violent opposition to land acquisition may occur. In your opinion, would such opposition be likely to have a deterring effect upon the official attitude and support of the State of Kansas toward acquisition of the proposed wildlife area?

The KFFGC continued actively to seek an opportunity to manage wildlife resources in conjunction with Council Grove project lands. In May of 1962, the KFFGC expressed an interest in managing certain lands purchased for other project purposes under a General Plan and license from the construction agency (11).

During this same period, the supplemental report of the FWS was being redrafted by that agency. Concurrently, the CE decided to raise the conservation pool to elevation 387 m (1,270 ft) msl (initially), instead of 385.6 m (1,265 ft) as originally planned (12). Also, recreation and fish and wildlife were added by the CE as project purposes.

A year later, the issue of land acquisition for purposes of mitigating wildlife losses continued to be discussed. The KFFGC revised their land acquisition request in January, 1963. This revision constituted the final proposal and was incorporated in the FWS's supplemental report, which

was released to the CE two months later.

After approximately four years, during which period the dam and lake became substantially completed, the FWS formally submitted an acquisition plan in its 1963 report to mitigate wildlife losses. The report also contained updated impact predictions for terrestrial wildlife.

Prior to project construction, the project area provided important upland game habitat and also supported a limited but expanding white-tailed deer population and moderate waterfowl use. The importance of various groups of game animals, prior to project construction, was described in the following statements in the 1963 letter-report of the FWS.

> Important upland game within the project area includes bobwhites, cottontails, fox squirrels, prairie chickens, ring-necked pheasants, and mourning doves. The mixed woodland, cropland, grassland, and brushy areas provide excellent habitat for these species. The reservoir site and the bottomland area downstream from the damsite are particularly valuable as the winter habitat of prairie chickens. The bobwhite is the most important upland-game species, and many hunters travel from population centers to hunt these birds in the vicinity of the reservoir site. Hunting of other upland game such as cottontails, fox squirrels, and mourning doves is important in the area also. The general area, located along the bottomlands of the Grand (Neosho) River, currently provides excellent upland-game hunting. Without the project, the project area could be expected to provide a minimum of 7,000 man-days of upland-game hunting annually over the 100-year period of analysis.
>
> Populations of white-tailed deer are increasing throughout the State, and it is anticipated that, without the project, the bottomland habitat of the reservoir site and of the area which will receive flood protection downstream from the dam would become important to this species.
>
> Waterfowl use within the project area is moderate. During migration periods, ducks and geese feed in fields within the reservoir site and rest on the open water areas of farm ponds and lakes in the vicinity of the project area. Without the project, it is anticipated that there would be about 1,000 man-days of waterfowl hunting carried out annually over the 100-year period of analysis.

The period assumed in all computations was a 100-year project life. The project was flooded in 1964; thus, impact projections would extend over the period 1964 to 2064.

The FWS's basic data files could not be located. Efforts to locate these data were made at the Kansas City FWS office and at the National Archives in Washington, D.C. This informal support information contained the approach and computational records which resulted in the fish and wildlife impact projections. Owing to the lack of these records, it was not possible to determine the methods used to develop any of the impact projections.

Reduced wildlife values, both within the project site and downstream from the project, were expected to occur as a result of project construction. A loss of upland game resources and retarded expansion of the white-tailed deer herd were projected. These predicted impacts were described in the FWS 1963 letter-report as follows:

> The reservoir will inundate permanently 2,260 acres of the best wildlife habitat within the project area. Additionally, operation of the reservoir for flood control will affect adversely wildlife populations and hunting on more than 3,000 acres within the flood control pool and 30,000 acres within the downstream flood-protected area. Hunters will be deprived of the opportunity to spend many man-days of outdoor recreation.
>
> The loss of wildlife habitat will cause a decline in the numbers of mourning doves, bobwhites, fox squirrels, and cottontails. Prairie-chicken populations will suffer from the loss of valuable winter habitat in the bottomlands along the river, and white-tailed deer will not increase as could be expected without the project.
>
> Although the reservoir will provide increased resting areas for waterfowl, a dearth of croplands near the reservoir as well as the lack of refuge area on the reservoir itself will limit its

value for ducks and geese. However, the reservoir can be expected to provide increased hunting opportunities for waterfowl.

Projected over the period of analysis with the project, it is anticipated that upland-game hunting will amount to 5,800 man-days annually. Waterfowl hunting during the same period will amount to about 1,500 man-days annually.

These projected levels of post-construction use postulated a 17 percent reduction in upland-game hunting, or a loss of 1,200 hunter-days, and a 50 percent increase in waterfowl hunting, representing 500 man-days.

To compensate for the expected loss of wildlife habitat, three specific recommendations were provided by the FWS (1963 letter-report), viz:

1. That the project specifically provide for the acquisition in fee of about 725 acres of land above the flood control pool elevation 1289 and that these lands along with other project lands, as shown on Plate I, be made available to the Kansas Forestry, Fish and Game Commission in accordance with the terms of a General Plan as provided in Section 3 of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). The estimated cost of acquiring the 725 acres of land is $245,000.

2. That about 20 miles of fencing be provided at project cost for the proposed wildlife management area cited in Recommendation No. 1 above. The estimated cost of the 20 miles of fencing is $20,000.

3. That the Kansas Forestry, Fish and Game Commission be given the opportunity to select such buildings as may be acquired in connection with land acquisition for use in administration of the proposed wildlife management area cited in Recommendation No. 1 above, and that such buildings as may be available under existing law and regulations be transferred without cost to the Commission.

Operation and maintenance of the management lands were not expected to constitute a significant cost:

All internal developments needed for the area would be con-

> structed and funded by the Kansas Forestry, Fish and Game Commission. Annual operation and maintenance costs would be minimal and also would be borne by the Commission.

Even at this juncture, the FWS's understanding of the project's physical dimensions were incorrect. Based on what they believed to be current information, the FWS planners assumed the project would create a 2,161 ha (5,340 ac) flood pool and a permanent pool of 915 ha (2,260 ac). This erroneously placed the conservation pool at elevation 385.6 m (1,265 ft) msl. However, six days after release of the FWS's long delayed, updated letter-report of 1963, the CE acknowledged its receipt and advised the FWS of certain project engineering changes, viz (13):

> In order that you may be aware of current planning on the Council Grove project, it is now proposed to impound the reservoir initially to an interim operating pool at elevation 1,270.0. Previous plans were to impound to elevation 1,265.0 in the initial stage. The five-foot raise in pool level is to be provided in the interest of recreation and public use.
>
> It is proposed to operate the reservoir at this interim level until such time as the allocated water supply storage has been contracted. At that time it will be raised to the top of the ultimate conservation pool, elevation 1,274.0. When this ultimate condition is reached, there will be increased fluctuation in the conservation pool when utilization of the water supply storage becomes necessary. The inclosed Pool Elevation Probability and Duration Curve shows the average recurrence interval in years of various elevations and the percent of time the pool would be at or below a given elevation for both the initial and future conditions.

The change constituted an increase of 243 ha (600 ac) of impounded surface area and a concurrent loss of an equal area of flood pool storage area.

The CE prepared a detailed response to the FWS's 1963 letter-report as a supplement to their General Design Memorandum (5). All three FWS recom-

mendations were rejected by the CE. The recommendation for acquisition of lands for the purpose of mitigating wildlife losses was denied on the basis of an unfavorable cost/benefit ratio. According to the FWS, acquisition and development of the requested lands would mitigate the loss of 1,200 man-days annually of upland game hunting. This use was valued by the CE at $1,800. The value used by the CE, $1.50/man-day, was an intermediate value within the allowable range of small game hunting values, which ranged from $0.50 a day to $3.00 a day (21). The annual cost of mitigating this loss ($7,800), was based on the FWS's purchase price estimate amortized at 2 1/2 percent over 100 years, plus operation and maintenance cost (estimated by the CE at $5,000 annually) -- a total estimated cost of $12,800. The resulting cost/benefit ratio of 0.14 was considered unfavorable by the CE.

The second recommendation, to construct about 32 km (20 mi) of fencing at project cost, was rejected as being a non-Federal cost. Recommendation number 3 (use of existing buildings by KFFGC) was submitted too late in the planning and construction period, according to the CE, to be a legitimate planning aid.

The revised, updated Master Plan issued by the CE in October, 1963 (14), contained the same basic statement of project impact on wildlife resources as presented nearly four years earlier, viz:

> Effects of the impoundment. - The construction of the Council Grove project will create an excellent reservoir fishery, replacing the existing stream fishery. The sport fish population of the reservoir will consist primarily of crappie, largemouth bass, white bass, channel catfish, flathead catfish, and various sunfish species. The remainder of the fish population

will consist primarily of gizzard shad, buffalo, drum, carp, and suckers. The degree of improvement of the downstream fishery will depend for the most part on water releases from the reservoir. Releases from the reservoir will eliminate the periods of no-flow during drought periods and high-flood flows will be reduced and released over a longer period of time. The reservoir will increase waterfowl habitat and create resting areas for waterfowl, with subsequent increased hunting opportunities for these species. Some losses of upland game habitat are recognized due to impoundment of the reservoir. However, the reservoir will provide a greater diversification of fish and wildlife habitat and any specific losses could be partially replaced by proper wildlife management on project lands and waters.

Management. - The management of the fish and wildlife resources of the Council Grove project will be primarily the responsibility of the Kansas Forestry, Fish and Game Commission. Both that agency and the Fish and Wildlife Service assume responsibility for the management of migratory waterfowl.

The CE's formal denial of the FWS/KFFGC planning recommendation was received by the FWS in March, 1964 (15). The CE's refusal to acquire lands for wildlife mitigation, on the basis that monetary benefit could not be developed, was deemed inappropriate by the FWS. A formal expression of concern regarding this policy was drafted by the Assistant Secretary of the Interior in June of 1964 (16).

A General Plan providing for management for wildlife of a substantial portion of the lands acquired for other project purposes, under license by the KFFGC, was formally adopted in April, 1965.

Wildlife Resources -- Post-impoundment Occurrences

A license for the management of 1,067.6 ha (2,638 ac) of project land and water was received by the KFFGC in August, 1965, and initial management began in 1966 (17). Land management opportunities are restricted due to location of the licensed lands within the five-year flood frequency con-

tour. Of the licensed 1,067.6 ha (2,638 ac), 255 ha (629 ac) are located in the annual flood zone and cannot be managed for maximum production of terrestrial wildlife. Narrow bands of timber occur along stream channels in this zone. Approximately 368 ha (909 ac) are situated above the annual flood zone; the remaining area, 445 ha (1,100 ac) is water. Of the 368 ha (909 ac) located above the annual flood zone, 278 ha (687 ac) are in crop production through sharecropping agreements, 41 ha (102 ac) are in weed patches, and the remaining 49 ha (120 ac) are in scattered native grass areas. The KFFGC has planted several thousand shrubs for wildlife food and cover within this area. The CE operates and maintains an additional 500 ha (1,236 ac) of recreational land around the lake perimeter, of which approximately 121 ha (300 ac) aremaintained in native cover (Cleon Linton, pers. comm., 1977).

al plan, for water-level manipulation between the interim conservation pool elevation of 387 m (1,270 ft) msl and the ultimate conservation pool elevation 388 m (1,274 ft) msl, was prepared cooperatively by the involved state and federal management agencies. A description of the purpose and limitations of the plan was contained in the narrative prepared by the KFFGC (17):

> Council Grove Reservoir is managed under a water fluctuation plan developed through our agency, the Water Resources Board, the Corps of Engineers, and other agencies involved with operations of Council Grove. This plan calls for water holding and release actions designed to promote both fisheries and waterfowl benefits. This plan cannot take precedence over the primary function of Council Grove Reservoir, which is flood control. Consequently, maximum benefits to fish and waterfowl are not always possible. Approximately 420 acres are tentatively managed for waterfowl benefits, depending on annual water conditions. Some of this acreage is seeded to Japanese millet for fall reflooding while the remainder is permitted to come up in natural vegetation (nut sedge and smartweed, primarily) and reflooded.

The basic water-manipulation plan is illustrated in Figure 2, which de-

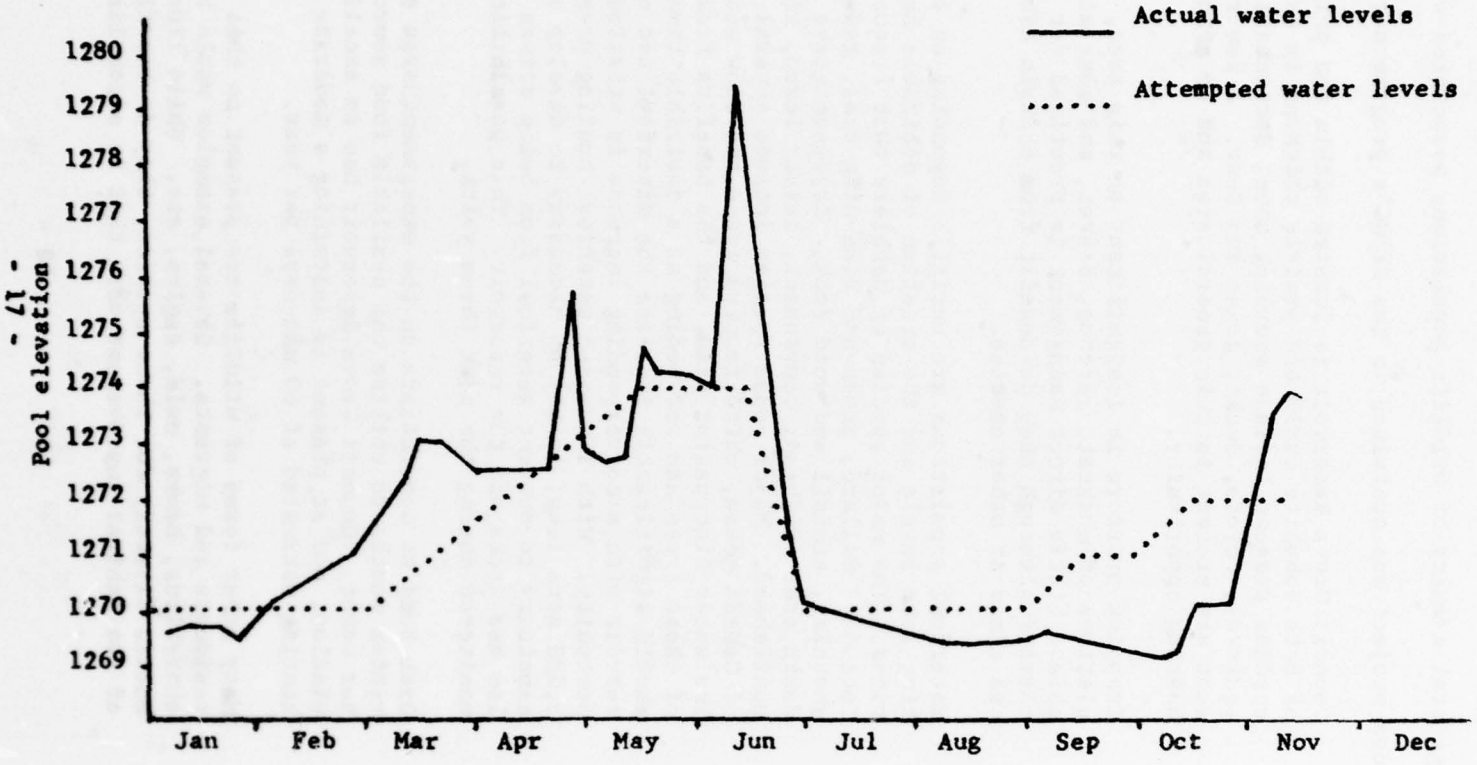

Figure 2. Water levels at Council Grove Reservoir during 1974.

picts the attempted storage plan and the actual storage in 1974 (18).

A general summary of wildlife populations associated with the Council Grove project was contained in the KFFGC's program narrative (17), viz:

> Council Grove Reservoir is located within the principal range of both bobwhite quail and prairie chickens in Kansas. Other species present include mourning dove, cottontail rabbit, fox squirrel, coyote, ducks, geese and deer. A few ringneck pheasant are present in this general area and do afford limited hunting opportunity.
>
> Trapping pressure is insignificant on this area, but good populations of muskrat, raccoon, beaver, and some mink are available. Little direct management is practiced for these furbearers although they do benefit from certain habitat practices aimed at other species.
>
> Waterfowl populations are variable depending on the fluctuating lake levels and the creation of desirable habitat conditions. The major species of dabblers that frequent the area include: mallard, green-and blue-wing teal, gadwall, widgeon, shoveler, pintail and wood duck. Representative of the diving ducks are: redhead, canvasback, lesser scaup, ring-neck and bufflehead. Major goose species include several sub-species of Canada geese, white-fronted geese and snow and blue geese. The water fluctuation plan, and the benefits from management of these areas and reflooding at a desirable time of year should significantly increase the waterfowl use on this reservoir with a corresponding increase in waterfowl hunting opportunity. With increased waterfowl hunting pressure on a 3,000 acre lake, it may be necessary to develop a waterfowl sanctuary to prevent waterfowl from being driven out of public use areas and the reservoir. This possibility will be monitored during the next three years.
>
> Deer tend to concentrate on the management area during the winter months to utilize the available food sources and winter cover. Council Grove Reservoir has an excellent deer population, and at present is sustaining a moderate level of deer hunting estimated at 60 man-days per year.
>
> Many other forms of wildlife are present on this area both as residents and migrants. Several examples would be songbirds, shorebirds, hawks, owls, eagles, etc. While little management occurs directly for these species, they do benefit from most of the habitat improvement work that is accomplished.

Professional employees of the KFFGC estimate waterfowl use of Council Grove project lands and waters on a regular basis from August through April of each year. Table 1 summarizes the results of these counts for six consecutive migratory seasons (19,20). The 1977 data were made available though not yet published (Charles Swank, pers. comm., 1977). Abnormal precipitation patterns prevented project managers from meeting the desired water-level manipulation plan during the last two seasons. As a result, waterfowl use of the project declined sharply in those years.

No definitive data are available with regard to the extent of waterfowl nesting at the project. The flooding of timber containing nesting cavities was a positive influence on wood duck production. Also, 20 wood duck nesting boxes have been erected. An approximation of the wood duck production on the project, developed by project biologists, is 50-100 young per year. In addition, an average of perhaps 10 blue-winged teal young are produced on the project each year (Charles Swank, pers. comm., 1977).

According to KFFGC wildlife biologists, the Council Grove project has probably had an overall beneficial impact on prairie chickens and deer (Charles Swank, pers. comm., 1977). To a large degree, this has been due to the increased food that is now available during the critical winter months. This increased food availability results from the 240-280 ha (600 - 700 ac) presently being managed under sharecropping agreements.

Approximately 243 ha (600 ac) of timber and/or brush habitat remains on

Table 1 . -- Annual waterfowl visitation records at Council Grove project, Kansas (1971-72 through 1976-77)

Category	Year of count						Average
	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	
Duck-use weeks	190,798	310,650	219,970	150,000	81,194	58,978	168,600
Goose-use weeks	25,039	10,680	10,680	2,000	10,012	13,494	11,984
Total use weeks	215,837	321,330	230,650	152,000	91,206	72,472	180,584
Peak duck count	20,000	40,000	40,000	35,000	20,231	4,500	26,789
Peak goose count	7,000	2,000	2,000	1,500	3,597	4,160	3,376

the management area. This relatively small but important acreage of deer cover will not be converted to agricultural lands. Timber clearing practices along the Neosho (Grand) River banks and flood plain below the project were discussed with local biologists. These knowledgeable wildlife managers indicated that conversion of wooded habitat was proceeding at no greater rate downstream from the Council Grove project than above the project. They could not discern any relationship between loss of woody cover and the presence of the Council Grove project. In fact, flooding of riparian lands was believed to be a greater problem below the project than above the project.

Muskrat and mink populations are believed to be greater within the project area than on the river. No particular impact has been evident on beaver. No population figures for furbearers were available.

According to the KFFGC (17), approximately 260,500 people (1973 census), or 11 percent of the State's population, lived within an 80-km (50-mi) radius of the Council Grove Game Management Area. Hunting license sales by county indicated that there were 25,300 licensed hunters within the 80-km radius. Adding the non-licensed hunters (persons over 65 and under 16), it was estimated that 30,360 hunters resided in this area. Kansas hunters average about 10 hunting trips per season; therefore, it was estimated that hunters in the area of Council Grove influence (80-km radius) participated in approximately 303,600 man-days of hunting recreation annually.

Hunter-visitation data for the Council Grove Game Management Area are re-

gularly estimated by the KFFGC staff. To arrive at these estimates, field personnel estimate the total number of cars on the area and apply various expansion factors, including hunters/car, hours/hunter and kill/hour for the various target species. During discussions with local staff at the project, hunter-use of the non-licensed federal lands (CE-administered) was estimated as five percent of the effort on the state management area for waterfowl and upland game and one percent for deer (Cleon Linton, pers. comm., 1977). Hunter-use of licensed lands, non-licensed federal lands, and total effort, is summarized for three consecutive years in terms of estimated hunter-days devoted to various target animal groups (Table 2). Based on these calculations, total hunting use of the Council Grove project lands and water averaged approximately 1,600 man-days annually from 1974 through 1976.

Additional project-related waterfowl hunting occurs off the project as a direct result of the creation of resting and feeding areas by construction of the lake. Local KFFGC law enforcement officials estimated hunting effort for waterfowl off project lands was probably equal to the hunting effort occurring on the project. According to the KFFGC estimates, this would place the additional project-related hunting pressure at around 450-500 man-days annually.

The CE develop independent estimates of project visitation by means of traffic counters (21). The vehicular counts are treated with various expansion factors to generate numbers of visitations. Visitors are interviewed on 6 days per year to determine the percentage of visitations with-

Table 2 . -- Estimated man-days of hunting activity on Council Grove project during period 1974 through 1976

Hunting category	State management area				Corps-managed* lands	Estimated total
	1974	1975	1976	Average		
Waterfowl	540	517	292	450	23	473
Upland game	300	569	1,317	729	36	765
Dove	50	238	**	144	7	151
Deer-archery	25	104	**	65	0	65
-firearms	75	124	**	100	1	101
Trapping	**	50	**	50	**	50
Varmint	10	25	**	17	**	17
Totals	1,000***	1,627	1,609***	1,555	67	1,622

* Estimated by local CE & KFFGC personnel as percentages of state effort

** Data not available

*** Minimum figures

in various activity categories, i.e., camping, hunting, fishing, etc. For purposes of the present discussion, these CE-developed visitation figures require further analysis.

The CE estimated there were 3,981,600 visitations at the Council Grove project during the four-year period, 1973 through 1976, averaging 992,900 visits each year. Of this total, 137,500 visits were by hunters, or an average of 34,375 hunter-visits per year. Such an estimate is 21 times larger than the combined KFFGC/CE estimates presented in Table 2, thereby requiring further analysis.

Based on the number of hunting license-holders within an 80-km (50-mi) radius of Council Grove (30,360) and the KFFGC's estimate of 10 trips per year per license holder, the CE statistics indicated that the 9,300-acre facility supports over 11 percent of all hunting activity within the radius of 80-km (includes 11 percent of the population of Kansas).

Closer scrutiny of the CE figures reveal several likely sources of inflation, viz:

(1) All vehicles containing project users are routinely expanded by four persons per vehicle. No differentiation is made among user groups. Evidently, for hunter parties, four persons per vehicle is too high. KFFGC studies on the project area indicated the number of hunters per vehicle ranged from 1 for deer hunters to 2.7 for dove hunters. The weighted average KFFGC figure (1.85) was less than 2 hunters/vehicle.

(2) Obvious variations occurring in the seasonal breakdown of hunting effort are not taken into account, leading to errors in estimation. Figure 3 presents the 1974 legal hunting seasons in eastern Kansas, including the Council Grove project area. The CE visitation records for 1974 show a total of 11,900 man-days of hunting effort at the project over the first five months of the year. Only rabbit, pheasant, furbearer, and coyote hunting were legally permitted during this time. Since no furbearer hunting was reported by the KFFGC on the management area (slight amount of trapping), little of the CE-reported effort estimate can be attributed to furbearer hunters. Also, according to the KFFGC, only 17 man-days of "varmint" hunting (1 percent of total) occurred on the state management area. Evidently, little of the CE use estimate can be accounted for by coyote hunters. Therefore, almost all of the 11,900 man-days of hunting estimated by the CE during the first five months of 1974 would necessarily have been for rabbits and pheasants.

(3) Questionable access-point allocations are apparent. Nine access areas are recorded on the CE printout. Table 3 summarizes the hunting effort attributed to each access site during 1974. The sum of the use at two access sites listed as "other" areas and "remote" areas, was 7,800 man-days or 28 percent of the total. Use of these two access areas reflect all direct access to all of the project-related wildlife habitat except for the estimated 300 acres of native habitat adjoining the recreation areas administered by the CE. Although some hunters that utilize the state management area park their

Figure 3. -- 1974 Kansas hunting season by month.

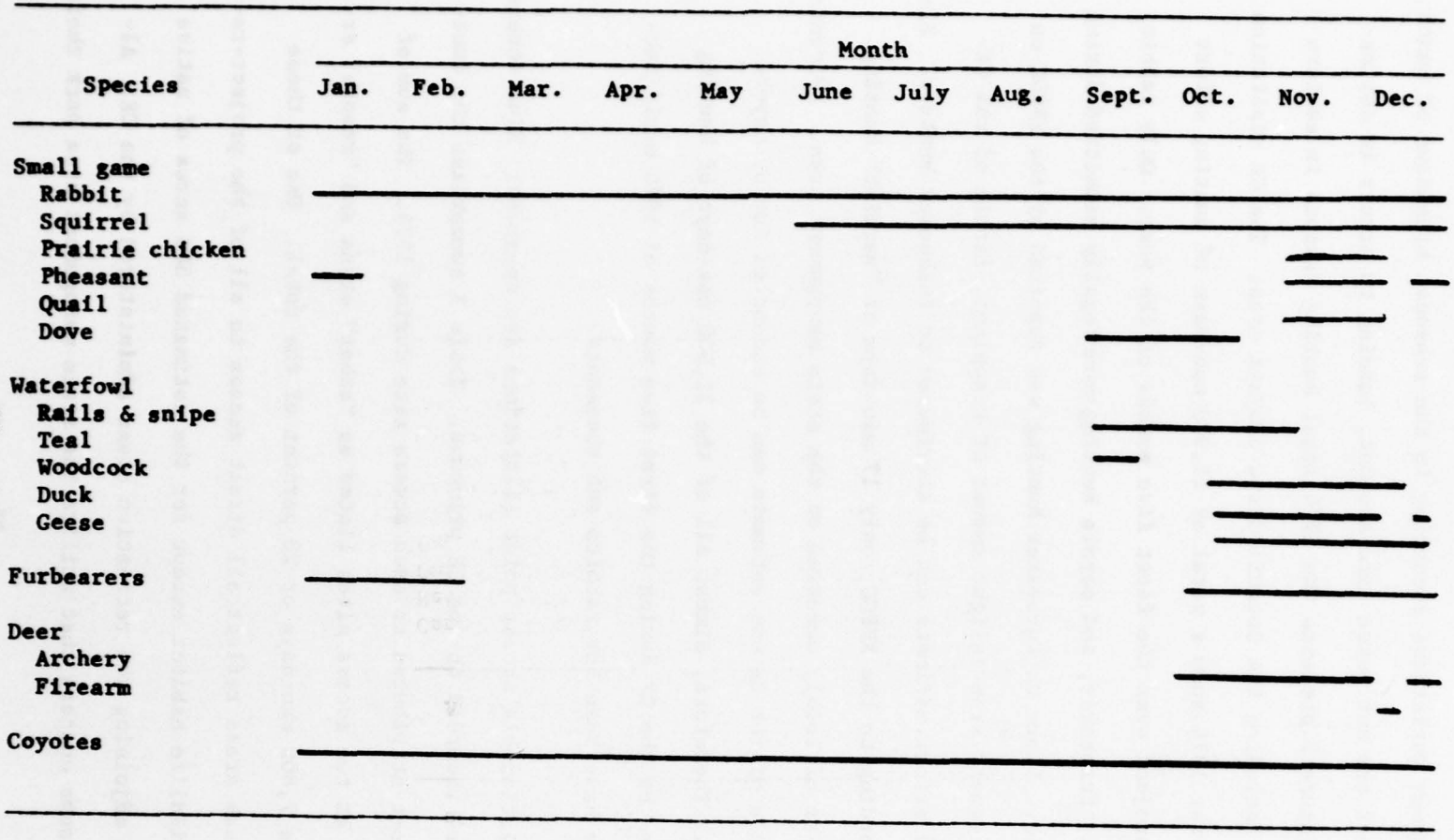

Table 3. -- Hunting effort estimated by the CE during 1974, related to various access sites at the Council Grove project

Access area	Attributed hunting effort (hunter-days)
Canning Creek	3,200
Neosho Park	4,600
Outlet Channel	3,300
Dam site	0
Richery Cove So.	6,600
Richery Cove No.	2,500
Other areas	3,900
Remote areas	3,900
Overlook	0
Total	28,000

vehicles at CE areas, other than the "remote" and "other" access points, the relative hunting effort ascribed to the remaining CE-administered sites seems excessive in comparison.

Limited harvest information was available from either the KFFGC or the CE. Harvest estimates for the KFFGC's management area were provided for 1975 (22). These data indicated that 466 doves, 684 waterfowl, and 796 upland game birds and mammals were harvested from the Council Grove Game Management Area in 1975. According to the project manager (CE), the harvest of game birds and animals on non-licensed, CE-administered lands probably approaches 15 percent of the harvest on the state-administered management area. If correct, this would indicate an additional harvest of approximately 100 waterfowl, 70 doves and 120 upland game birds and mammals. It was estimated further that an average of six deer were harvested annually from all project lands.

Wildlife Resources -- Evaluation of Planning Input

The first FWS letter-report concerning the Council Grove project was transmitted on April 28, 1959, in response to an April 3, 1959, request from the District Engineer for a "preliminary statement or expression as to the interest of your Service in the development of the fish and wildlife resources on the project." The FWS was limited to approximately one month after being informed of major project design changes to provide wildlife planning input for inclusion in the CE's GDM. Although the 1959 FWS report correctly anticipated pertinent problem areas associated with the project, the treatment was superficial and subsequent follow-up was inadequate.

Highlighting a general lack of adequate inter-agency coordination, one of the most important deficiencies of the planning process,was the subsequent failure of the FWS to provide timely and detailed recommendations for land acquisition to mitigate wildlife habitat losses outlined in the 1959 FWS report. The 1959 FWS report indicated that recommendations for specific land acquisition plans would be forthcoming within 60 days. However, the acquisition plans were not formally submitted by the FWS until 1963, long after public hearings on the project had been completed and property for other aspects of the project had been acquired. The project was completed in 1964.

Few of the other specific wildlife-related planning recommendations submitted by the conservation agencies substantially influenced project design or operation (Table 4). Water storage for downstream release was recommended in the 1959 report. In responding, the CE indicated that storage already planned for low flow and water supply purposes (10-12 cfs minimum) might adequately insure downstream minimum flows for fish and wildlife purposes. The CE response may be assumed to have satisfied the conservation agencies as they made no further mention of downstream flow releases in subsequent reports and correspondence.

The 1959 recommendation for cooperative timber clearing did result in interagency coordination relating to this aspect of project construction. The third and final recommendation in the 1959 FWS report sought safe and adequate public access, and was treated by the construction agency as a standard planning procedure at all of their projects.

Table 4. -- Implementation record of mitigation recommendations at the Council Grove project in Kansas

Description	Formal recommendations of FWCA reports	Implementation record
Additional storage to provide 15 cfs minimum instantaneous downstream release	1959	No*
Cooperative plan for timber clearing	1959	Yes
Safe, adequate, free public access	1959	Yes**
Acquisition in fee of 725 ac of land above flood pool elevation	1963	No
20 miles of fencing be provided at project cost	1963	No
Provision of surplus buildings for use by KFFGC for managing proposed wildlife management area	1963	No
Management under license by KFFGC of project lands purchased for other project purposes for wildlife management	***	Yes

* 10 to 12 CFS minimum release planned prior to FWS recommendation, eventually only 5 CFS implemented

** Standard CE policy

*** Not specifically listed as a recommendation but earlier requested by KFFGC in direct communications with CE

Other than formally responding to the three recommendations, there was little indication that the construction agency was influenced in any significant way by the 1959 FWS report. The CE planners concluded (6): "After impoundment, the reservoir would provide a more diversified fish and wildlife habitat and, by proper management, any specific losses that might occur would be replaced."

Following the KFFGC's expression in 1961 of a more active interest in mitigating wildlife losses at the project, the FWS began to prepare their supplemental report which contained a more specific land acquisition recommendation. Their report was submitted to the construction agency in draft form in 1961. In response, the CE indicated that the acquisition of additional land to mitigate wildlife losses at Council Grove would be faced with "violent local opposition." They also indicated that any such project modification would require prosecution through the "5-step procedure." The final version of the report, which had been submitted in draft form in 1961, was delayed considerably. It was submitted in final form in 1963.

To compensate for the loss of wildlife habitat, the 1963 FWS report recommended acquisition in fee of 293 ha (725 ac) of land above the flood control pool elevation. The report also recommended that the construction agency install 32 km (20 mi) of fencing and, further, that the KFFGC be given the opportunity to select surplus buildings for use in administering the proposed wildlife management area. All of these recommendations were rejected by the construction agency. Acquisition of the additional 293 ha was rejected,according to the CE, because the computed

cost/benefit ratio was 0.1. Benefits expected to occur as a result of the acquired land were limited in the CE's deliberations to compensating the loss of 1,200 man-days of upland game hunting each year. The CE valued the hunting at $1.50 per man-day, based on the accepted value schedule (23), for a total annual monetary return of only $1,800. At the same time, acquisition cost (amortized over 100 years) and operation and maintenance costs were expected to total $12,800 per year.

To have returned $12,800 annually based solely on hunting, the proposed 293 ha plot would have had to generate almost $44.00 of hunting use per ha ($17.00 per ac) annually, or almost 29 upland game hunting trips per ha (12 trips per ac) each year. Upland game hunting of this intensity would rarely be supported by resident upland game communities.

The fencing recommendation was rejected out-of-hand as constituting a non-Federal cost. The lateness of the request for transferal of selected buildings was given as the reason for that proposal's rejection. The CE emphasized that consideration would have been given the building transfer recommendation provided a firm request had been made before the acquisition of project lands. However, project land acquisition had been completed and the buildings otherwise disposed of prior to receipt of the

FWS request.

The CE's communique to the FWS, following the construction agency's receipt of the long delayed supplemental report of 1963 was yet another compelling example of the inadequate coordination among agencies. As previously related, the FWS was advised only at that time of a five-foot increase in the planned initial operating-pool level. The construction agency had justified this increase in the interest of recreation and public use.

Development of habitat for wildlife purposes involves considerable expense and careful scientific husbandry. Habitat improvement on flood storage zones subject to frequent flooding, such as the project lands available at the Council Grove project, constitutes potentially hazardous investments of time and money. Extensive damage to wildlife plantings and crops was noted during an August 2, 1977 visit to the project area. Although the KFFGC readily accepted, under a general plan, a license agreement to manage 1,067.6 ha (2,638 ac) of these low-lying, five-year flood frequency project lands, the requested 293 ha (725 ac) of higher, less flood-prone lands were considered essential to mitigate wildlife losses occasioned by the project.

Having failed in their efforts to obtain acquisition of the less flood-prone acreage at project cost, the KFFGC attempted at their own expense to develop wildlife habitat on the available flood storage lands to compensate for the habitat and game populations lost as a result of the project. This habitat development program has not been funded by the agency responsible for the losses.

The loss or destruction of the basic data files considerably handicapped efforts to assess the accuracy of wildlife-associated predictions at the Council Grove project. The basic data files could not be located either at the local FWS offices in Kansas City, MO, or at the National Archives in Washington, D.C. These informal files contained the original developmental strategies and computational work which resulted in the fish and wildlife projections.

Reference to this basic information was particularly important for the Council Grove evaluation, as the predicted adverse impacts of the project extended beyond the specific project area to a 30,000-acre area of downstream flood plain. Only total impact figures were provided for the two areas combined, i.e., the project lands and downstream flood plain. Thus, it was not possible to separate the impact projections for the project site, for which post-impoundment inventory and survey data were available, from the impact projections for the downstream area, for which no data were available.

The only quantitative descriptions of the wildlife resource values without the project was the statement (4):

> The general area, located along the bottom lands at the Grand (Neosho) River, currently provides excellent upland-game hunting. Without the project, the project area could be expected to provide a minimum of 7,000 man-days of upland-game hunting annually over the 100-year period of analysis.

The waterfowl value of the project area was further estimated (op. cit.):

> Without the project, it is anticipated that there would be about 1,000 man-days of waterfowl hunting carried out annually over the 100-year period of analysis.

The total annual hunting effort estimate was 8,000 man-days without the project (average over 100 years).

Post-impoundment conditions were predicted as: "...upland-game hunting will amount to 5,800 man-days annually. Waterfowl hunting during the same period will amount to about 1,500 man-days annually." This amounted to an expected loss of 1,200 man-days of upland game hunting and an increase of 500 man-days of waterfowl hunting annually. The decrease in upland game hunting was expected as the result of unquantified losses of mourning doves, bobwhites, fox squirrels, cottontails, and prairie-chickens. Also, continued expansion of the white-tailed deer population in the project area was expected to be curtailed by the project.

To totally replace the upland game hunting opportunity lost, following construction of the Council Grove project, it would be necessary to replace an average of 1,200 man-days of hunting annually. The project-associated game management lands have, in fact, provided hunting opportunity approaching the level equivalent to complete compensation (Table 2). For example, the 1974 through 1976 average upland game (including dove) hunting pressure supported by these project lands was 873 man-days. The most recent year (1976) supported over 1,317 man-days.

It appears that the management of the high-risk flood pool at Council Grove has resulted in mitigating the upland game hunting opportunity losses which were predicted prior to project completion. These figures tend to corroborate information provided by local KFPGC game biologists. These local wildlife experts believed, as a result of the habitat de-

velopment program on Council Grove project lands, that the wildlife losses associated with the project had indeed been mitigated (Swank; Howe, pers. comm., 1977). Wildlife food and shelter plantings, water-level manipulation and share-cropping programs all contribute to the wildlife management program.

Contrary to the pre-impoundment predictions, according to KFFGC biologists, the Council Grove project has not resulted in a net adverse impact on the local white-tailed deer population. The active share-cropping program on CE-licensed lands has produced a readily available food source for white-tailed deer and prairie chicken. As a result of these management activities, local populations of deer and prairie chicken have not been adversely impacted by the project (Charles Swank, pers. comm., 1977). A recent KFFGC planning report (17) described the Council Grove deer situation as follows:

> Deer tend to concentrate on the management area during the winter months to utilize the available food sources and winter cover. Council Grove Reservoir has an excellent deer population, and at present is sustaining a moderate level of deer hunting estimated at 60 man-days per year.

The KFFGC management staff stressed the many management difficulties encountered on project lands, all of which are located within the five-year flood contour. In view of the increasing competition for the state's limited habitat development budget, frequent flooding of these developments may well result in a less intensive effort on these high-risk Council Grove lands in favor of development of more easily-managed lands located elsewhere in Kansas (Swank; Howe, pers. comm., 1977).

This costly annual operation was not clearly appreciated by the project planners. This circumstance is reflected in the following statement, which appeared in the 1963 FWS report:

> All internal developments needed for the area would be constructed and funded by the Kansas Forestry, Fish and Game Commission. Annual operation and maintenance costs would be minimal and also would be borne by the Commission.

According to a recent KFFGC planning document (17), the anticipated state development and maintenance costs for the Council Grove management lands, during the period 1976-1978, amounted to $28,550 per year. Considering that the amortized annual cost of acquiring the recommended 293 ha (725 ac) was computed by the CE at $7,800 (5), an annual operating cost of $28,550 (13 years later) is perhaps not as minimal as believed by the planners who prepared the 1963 report of the FWS. Management inefficiencies imposed by frequent flooding of the available wildlife habitat, has produced greater operating costs than were originally anticipated based on the opportunities associated with acquisition of less flood prone mitigation lands.

The 1963 FWS report stated that the Council Grove project would result in an adverse impact on wildlife populations and hunting on some 30,000 acres within the downstream flood-protected area. It may be reasonably inferred that the FWS predicated their prediction on expected ecological-impact of the clearing and conversion of streamside vegetation for purposes of creating additional agricultural crop lands. Contrary to this prediction, however, the pattern of flood-water releases below Council Grove unexpectedly has precluded woodland and brushland clearing to the extent that occurred along the Neosho (Grand) River upstream from the reservoir. Such was the opinion of local KFFGC biologists (Charles Howe and Charles Swank, pers. comm., 1977).

Prior to project construction, waterfowl use within the project area was described as "moderate." Some local use of ponds, lakes, and fields for resting and feeding occurred, although this use was not estimated. Hunting opportunity supported by waterfowl was estimated at 1,000 man-days annually. Project construction was expected to provide increased waterfowl resting areas, but a lack of suitable feeding conditions or formal refuge on, or near, the reservoir was expected to limit the project's value for ducks and geese. Hunting opportunities were predicted to increase by 50%, to 1,500 man-days annually.

A cooperative program to benefit waterfowl, involving the CE, the KFFGC, and the Kansas Water Resources Board, to provide an effective water-level manipulation schedule has been developed for Council Grove (24). Approximately 170 ha (420 ac) of project lands are managed for waterfowl enhancement by planting and then flooding the green vegetation.

Average annual use of the project by waterfowl between 1971-72 was 1,180,000 duck-use days and 84,000 goose-use days (19,20). This use represents 41% and 17% of the use by ducks and geese, respectively, which are attracted to the federal Flint Hills National Wildlife Refuge, located just downstream on the CE's John Redmond Reservoir project (25).

Although the water-level manipulation plan cannot take precedence over flood control activities at the project, this game management operation has produced benefits exceeding those anticipated by the early planning staff. It should be noted that this effective interagency cooperative waterfowl enhancement program at Council Grove was not undertaken in re-

sponse to pre-construction recommendations. Water-level fluctuation as a management tool was not covered in the early planning documents.

Waterfowl production is limited to approximately 50-100 wood duck and up to perhaps 10 blue-winged teal per year. Based on estimated waterfowl harvest on the lake (784 birds), the production of an average of 85 birds would support less than 11 percent (by number) of the total harvest associated with the project. This estimate does not include the unknown harvest of birds attracted by the lake which are harvested off project lands.

Waterfowl hunting on the Council Grove project was estimated by the KFFGC and CE Project Manager, for purposes of this evaluation, to approximate 473 man-days annually. A like amount of waterfowl hunting on surrounding fields is also estimated to occur. The total opportunity for waterfowl hunting provided by the project is, therefore, estimated at approximately 1,000 man-days annually. This use is only 65 percent of the hunting effort predicted for the project. It must be recognized, however, that the prediction may have included some hunting effort on the downstream river area, which is not included in the current 1,000 man-days hunting estimate. It must also be noted that the post-impoundment projection covered the 100-year project life. Taking these two factors into account, the prediction appears to have been reasonably precise.

Public hunting activity estimated by the CE for Council Grove project lands amounts to approximately 34,375 man-days annually, which is 21 times the combined estimates generated for purposes of this evaluation by the re-

sponsible KFFGC and CE personnel. The earlier CE estimates of hunting pressure at Council Grove would approximate four-tenths of one percent of all hunting activity in Kansas, based on 1975 National Hunting and Fishing Survey data (26). It is considered unlikely that 1 out of every 250 hunting trips in Kansas is attracted to the 3,764 ha (9,300 ac) Council Grove project. Consequently, the earlier CE estimates of such hunting activity are deemed to be excessive.

As a final point, the current project allocation of land and water is an interim regime. When water supply storage (not presently impounded) is requested, the lake will be enlarged to the 1,274 msl contour. The loss of game management opportunities expected to result has been described by the KFFGC as follows (17):

> The 2,638 acres of land is based on an interim conservation level of 1,270 msl. Future plans call for an increase in conservation pool level to 1,274 msl. This will result in a net loss of approximately 420 acres of public hunting land. These 420 acres are only of marginal habitat value; therefore, the direct loss will not be of great severity. The most serious loss will occur in rendering an additional area of approximately 500 acres unmanageable due to more frequent flooding. Plus operational access for development purposes will be severely restricted.

If an additional 202 ha (500 ac) are lost, only 162 ha (400 ac) of suitable project lands will remain (a loss of some 56 percent) with which to mitigate the considerable losses of terrestrial wildlife habitat associated with the Council Grove project.

FISHERY RESULTS AND DISCUSSION

Fishery Resources -- Pre-impoundment Predictions

The only fishery-related planning recommendations submitted by the FWS were those contained in their April 28, 1959 report (3). As described in the previous section on wildlife planning, this five-page letter-report appears to have been drafted in approximately one month's time following receipt by the FWS of major project design information from the CE. At the time, the FWS believed the project would impound a 2,161 ha (5,340 ac) reservoir having an average annual fluctuation of 8.5 m (28 ft) and a normal pool "in excess of 2,000 acres." Project purposes were flood control and provision of municipal and industrial water downstream.

The pre-project river fishery was described as follows:

> The fisheries of the Neosho River and tributaries in the project area vary in quality from moderate to negligible from one period to another in almost direct relation to the distribution of rainfall. With the exception of about five years of drought, when there was practically no fishing, the fisheries of the streams of the project area have been fair with considerable interest being shown in taking catfish, carp, buffalo, crappie, drum, and the numerous sunfishes.
>
> Fishermen's expenditures associated with streams in the project area will be about $34,000 annually without the project.

As was the case with all fishery-related discussions, monetary figures were submitted but use figures were not. Converting these dollar expenditure figures to man-days use statistics was not directly possible due to the loss or destruction of the basic data files which may have contained this data. Comparison of the predicted reservoir fishing value with the previously used predictive "von Limbach curve" (27), clearly in-

dicated that this was not the procedure used. The 1959 Council Grove report pre-dated the 1960 report on recreational values, published by the Subcommittee on Evaluation Standards (23). The Council Grove report was written less than three years prior to a similar report prepared for the John Redmond Reservoir project in Kansas. Both reports were released by the same FWS Area Office. It seems a reasonable deduction, therefore, that the man-day monetary values used for the John Redmond evaluation (25) may also have been used to prepare the Council Grove report. That value was approximately $3.13 per angler-day, with no distinction between river fishing and reservoir fishing.

Application of the $3.13 per angler-day value generated a corresponding pre-impoundment use estimate for the Council Grove project area amounting to 10,863 angler-days ($34,000/$3.13). This estimate related to 32 km (20 mi) of tributaries and 137 km (85 mi) of Neosho (Grand) River, including 22.5 km (14 mi) within the reservoir site. Such a prediction of angling effort in absence of the project approximates 64 trips/km (103 trips/mi) annually.

The following two paragraphs contain descriptions of the fishery-related conditions expected to occur following Council Grove construction (3):

> Construction and operation of the project will result in fishery benefits. The 5,340-acre reservoir will provide warm-water fishing in an area where a lack of adequate opportunities to fish has resulted in a high demand. More than 700,000 people reside in three cities - Wichita, Topeka, and Kansas City - all within two hours driving distance of the proposed reservoir. Sportsmen's annual expenditures associated with reservoir fishing will be about $166,000.
>
> Neosho River below the Council Grove Dam is expected to have an

> improved water supply resulting from better distribution of the flows. Five second-feet allocated to Emporia, Kansas, for municipal water will be released directly into the stream. This minimum flow will perpetuate the 40-mile reach of stream between the dam and Emporia and eliminate the periods of no flow which would occasionally occur without the project. High floodflows will be beneficially reduced and subsequent releases of stored flows distributed over a longer period of time. The improvement of the river downstream from Council Grove Dam will mitigate stream fishery losses incurred through stream inundation in the reservoir site, and with-the-project stream fishermen expenditures will remain at about $34,000 annually.

As before, an angler-day expenditure of $3.13 is assumed to have been applied by the report's authors. This computation ($166,000/$3.13) produces a post-impoundment reservoir usage of 53,035 angler-days, equivalent to approximately 24.5 trips/ha (10 trips/ac), based on the 2,161 ha (5,340 ac) flood pool. The prediction would have amounted to approximately 58 trips/ha (23 trips/ac) if based on the expected 915 ha (2,260 ac) conservation pool. The remaining 114 km (71 mi) downstream stretch was expected to continue to support $34,000 worth of angling per year, assumed equivalent to 10,863 angler-days. This represented an increase in angling intensity for the uninundated stretch from 64 trips/km (103 trips/mi) to 95 trips/km (153 trips/mi).

Three specific recommendations were made (3) to enhance the project-associated river and lake fisheries. These actions were described as follows:

> Project enhancement to provide stream fishing benefits resulting in sportsmen's expenditures of about $25,000 annually could be realized through provision of 5,000 acre-feet of storage on Council Grove Reservoir for purposes of maintaining a minimum instantaneous release of 15 second-feet. This release to the Neosho River would greatly improve stream fishing. There also exists an opportunity to obtain better control of the reservoir

fish population and to realize benefits through clearing of selected seining areas and through retention of fish attracting vegetation in other parts of the reservoir. In addition, there will be a need for safe, well arranged means of access to the reservoir and its perimeter areas for hunting and fishing. Access roads and boat-launching ramps are the primary features required to encourage sportsmen's use of the area.

The CE responded within two weeks to the FWS's April 1959 report. The CE's reply, relating to the low flows request, is presented below:

> The conservation storage provided by this plan amounts to 25,000 acre-feet initially and will be reduced by sedimentation to 19,400 acre-feet at the end of 50 years. This storage is provided to maintain low flow releases of water in the main channel of the Grand (Neosho) River below Council Grove Dam and initially would yield 12 cfs and after 50 years would yield 10 cfs. Yield studies further indicate that approximately 35,800 acre-feet would be required in the initial development to yield your recommended minimum discharge of 15 cfs. This would indicate that approximately 16,400 acre-feet additional storage would be required to assure a minimum sustained flow of 15 cfs during this stage of development. Design memorandum studies also provide for possible future reallocation of storage to provide for 16 cfs yield from conservation storage, 10 cfs, low flow, and 6 cfs water supply, which may be withdrawn directly from the reservoir. Based on the yield studies, 71,400 acre-feet would be required to yield 21 cfs which would insure releases of 15 cfs as recommended in your report. This would necessitate the allocation of an additional 29,500 acre-feet of storage for your recommended purposes. Authority to provide this additional storage or any part thereof, would require the submission of a detailed report indicating positive monetary benefits to the stream fishery below the dam that would justify the cost of providing additional storage. Any cost assigned to this additional feature would require Congressional approval. It is believed that the planned releases of 10 to 12 cfs as previously defined, may satisfy your requirements for the downstream fisheries.

The CE responded affirmatively to the FWS's recommendation for a cooperative clearing plan, viz:

> This office proposes to consider the views of all interested State and Federal agencies in the preparation of the reservoir clearing plan for this reservoir, as has been done in the past on other reservoir projects. This office would be pleased to receive your recommendations for reservoir clearing, so that they may be considered for incorporation into the clearing plan.

Safe, adequate, free public access was recommended and elicited the following response from the CE:

> Public Law 524, 78th Congress, 2nd Session, as amended by Public Law 526, 79th Congress, 2nd Session, authorizes the Corps of Engineers to construct, maintain and operate public use and recreational facilities in reservoir areas. The recreational planning on Council Grove Reservoir includes major public use areas at which there would be provided access roads and boat-launching ramps to satisfy the requirements of the public for recreation, including hunting and fishing. Except for portions of the reservoir and lands reserved for safety, operation, and protection of public property, all reservoir lands owned in fee and reservoir waters, under the jurisdiction of the Corps of Engineers would be open to the public for free fishing and hunting.

Subsequently, the KFFGC examined and concurred with the CE's proposed clearing plan (8). A change in the initial storage plan was proposed by the District Engineer in early 1963 (12). The CE proposed to increase the conservation storage elevation from the previously planned 1,265 ft msl contour to 1,274 ft msl for purposes of recreation and fish and wildlife. This change would have increased the conservation pool size from 915 ha (2,260 ac) to 1,327 ha (3,280 ac). An intermediate elevation of 1,270 ft msl was finally adopted by the CE. The resulting conservation pool impounds 1,158 ha (2,860 ac), or 243 ha (600 ac) more than anticipated in the 1959 FWS report.

There was no evidence of any formal request for formal assistance or guidance from the conservation agencies at any juncture of the design reconsideration process. In fact, the 1963 supplemental Fish and Wildlife Coordination Act report, which addressed the terrestrial wildlife impacts of a project with conservation pool at elevation 1,265, was submitted ap-

proximately 30 days prior to the Chief of Engineers' final decision to construct the project at the 1,270 ft contour. The project plan incorporating the conservation pool at 1,270 was not discussed in the 1963 FWS report or at any time subsequent to the report's release.

Fishery Resources -- Post-impoundment Occurrences

Fisheries management programs at Council Grove have included a fish stocking program, annual population sampling, creel surveys, construction of fish attractors, and a water-level manipulation program.

The dam was completed in 1964 and the reservoir was stocked initially in the spring of 1965, with walleye, northern pike, largemouth bass, and bluegill. Walleye fry were again stocked in 1966 and 1971. Northern pike were restocked annually beginning in 1974. Gizzard shad were planted in 1968 and white bass were introduced in 1970. Table 5 summarizes the fish introduction information for the Council Grove project.

Since 1970, the water level between elevation 1,270 and 1,274 msl has been manipulated to benefit fish and wildlife (18). Typical water-level fluctuations prior to implementation of the manipulation plan are presented in Figure 4. The 1974 water-level manipulation plan and actual levels were presented earlier (Figure 2).

The water-level management plan was designed mainly to improve spawning conditions for northern pike by establishing vegetation on the exposed shoreline between 1,270 ft and 1,274 ft elevations. The basic plan involved lowering the lake level from elevation 1,274 to 1,270 between Aug-

Table 5 . -- Stocking records for Council Grove Lake

Species	Year(s) stocked	Numbers stocked	Size stocked
Northern pike	1965	1,321,433	Fry
	1974	3,500	Fingerling (6"-10")
	1975	1,675	Fingerling (6"-10")
	1976	44,000	Fingerling (1"-3")
	1976	3,500	Fingerling (6"-10")
	1977	25,000	Fingerling (1"-3")
Walleye	1965	1,000,000	Fry
	1966	1,000,000	Fry
	1971	1,000,000	Fry
Largemouth bass	1965	247,000	Fingerling
Bluegill	1965	143,000	Fingerling
Gizzard shad	1968	*	*
White bass	1970	120	Adult
Channel catfish	1975	400	Adult
Flathead catfish	1975	50	Adult

* Specifics not recorded in KFFGC records

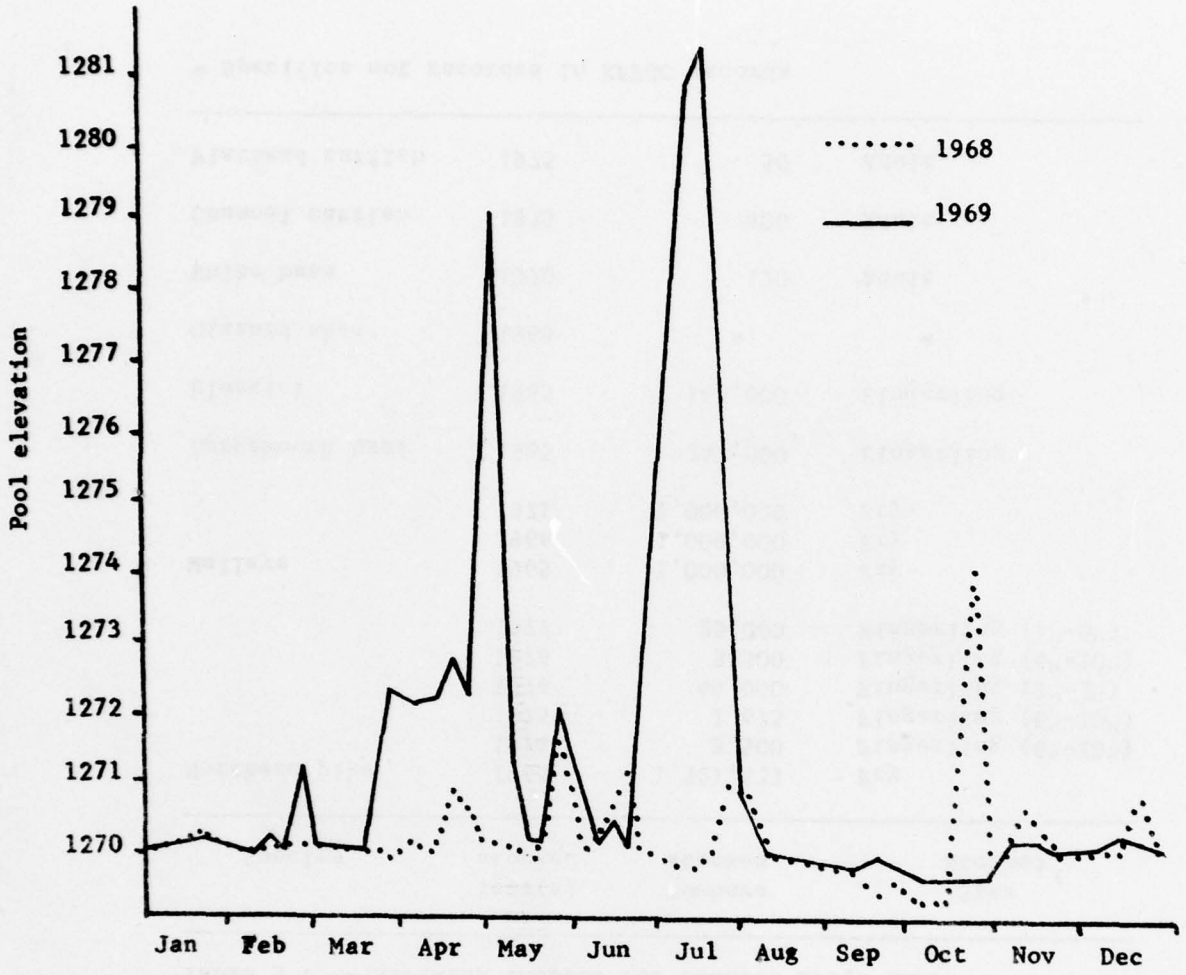

Figure 4. Water level fluctuation at Council Grove during the two years immediately preceeding implementation of water level manipulation plan.

ust 15 and September 1 to encourage the establishment of peripheral shoreline vegetation and then to flood the vegetation during the following spring by raising the lake level up to the original 1,274 ft contour between January and June.

This basic plan has since been modified to incorporate waterfowl benefits. The current plan calls for an early drawdown on July 1 to allow vegetation to grow in the drawdown zone and allow time for the planted grains to mature. A rise of one foot is scheduled in the fall to attract waterfowl. After the fall migratory waterfowl season, the reservoir is drawn back to the conservation pool elevation of 1,270.

Population sampling has included shoreline seining and test netting. Seining data contained in a KFFGC report (24) are presented in Table 6. The occurrence of natural reproduction has been documented each year since 1972 for largemouth bass, walleye, white bass, and several sunfish species. No northern pike reproduction has been documented. In fact, young northern pike were captured in 1976 only following the introduction of 44,000 one- to three-inch fingerlings in May. Channel catfish reproduction was noted in 1973, 1975, and 1976.

Test netting indicated a favorable response by the fish community since initiation of the water-level manipulation program (Table 7). The average catch of harvestable game and pan fish increased from 15.5 percent to 52.9 percent of the total test-netting catch made by KFFGC personnel over the period 1974-1976. The number of harvestable game and pan fish caught per net-night increased from 3.7 in 1974 to 18.4 in 1976, a nearly four-fold gain.

Table 6 . -- Summary of shoreline seining results at Council Grove Reservoir 1972-1976

Species	Year and month sampled, number of seine hauls in ( )									
	1972 Jun Aug Oct (35)		1973 Aug Oct (32)		1974 Jul Aug Oct (24)		1975 Jun Jul Aug Sep (29)		1976 Jun Jul Aug Sep (44)	
	No/haul	No/mile	No/haul	No/mile	No/haul	No/mile	No/haul	No/mile	No/haul	No/mile
Largemouth bass	1.57	207	0.03	4	0.63	83	0.38	50	0.25	33
Walleye	0.09	11	0.03	4	0.08	11	0.31	41	0.07	9
Northern pike	-	-	-	-	-	-	-	-	0.18	24
White bass	0.83	109	0.34	45	0.58	77	8.55	1,129	1.11	147
Channel catfish	-	-	0.19	25	-	-	0.24	32	0.02	3
White crappie	0.14	19	2.72	359	0.25	33	1.14	150	0.55	72
Bluegill	0.71	94	0.19	25	1.21	160	0.55	73	0.96	126
Other sunfish	0.58	77	0.06	8	0.58	77	0.14	18	0.23	30
Gizzard shad	12.74	1,682	22.03	2,908	36.75	4,851	66.38	8,762	15.10	1,896
Minnows and other forage size fish*	9.88	1,305	2.94	388	32.93	4,346	13.19	1,745	24.57	3,243
Carp	0.17	23	0.47	62	0.08	11	1.62	214	-	-
River carpsucker	-	-	0.06	8	0.58	77	0.03	5	0.07	9
Bigmouth buffalo	-	-	-	-	-	-	-	-	0.07	9
Drum	0.11	15	0.69	91	-	-	0.17	23	0.16	21

* The following fish are included in this category: red shiner, bluntnose minnow, sand shiner, golden shiner, stoneroller, suckermouth minnow, fathead minnow, mosquitofish, log perch.

All seining was done with a 20' x 6' x 3/16" mesh seine using the Swingle method. Results are given in number of fish per haul and expanded to number of fish per mile of shoreline.

Table 7 . -- Test netting results, Council Grove Lake, 1974, 1975 and 1976

	Year, net nights in ( )		
	1974 (45)	1975 (48)	1976 (46)
Total no caught	1,077	1,297	1,598
Total wt caught	602.4	1,265.0	1,865.1
% game fish by no	5.0	6.8	7.1
% game fish by wt	20.3	16.9	15.1
% pan fish by no	64.7	63.2	63.3
% pan fish by wt	13.6	26.2	30.5
% rough fish by no	30.3	30.1	28.1
% rough fish by wt	66.0	57.0	54.2
% harvestable game and pan fish by no	15.5	41.7	52.9
% harvestable game and pan fish by wt	30.3	40.3	44.1

Creel surveys were conducted on Council Grove Lake and on the tailwater extending approximately 1.6 km (one mi) downstream from the dam. Three years' information have been gathered under this program (1974-1976); however, only the data for 1974 and 1976 (Table 8) were found to be reliable at the time of this evaluation.

While angling effort on the reservoir proper remained fairly stable, approximately 12 trips/ha (5 trips/ac), angling effort on the tailwater varied considerably. The reduced tailwater angling of 1976 reflected the absence of large-scale water releases from the lake. That circumstance inhibited the usual concentration of walleye and other species in the tailrace.

Harvest for the total complex (lake and tailwater) remained substantially unchanged between 1974 and 1976, in the approximate range of 12,000 to 14,000 kg (27,000 to 32,000 lbs). Harvest data from the Council Grove project were available by species caught for the 1976 angling season (Table 9). The most important species in the creel, in descending order of importance, were white crappie, white bass, and channel catfish.

As discussed in the previous section on terrestrial wildlife, independent estimates of resource utilization (e.g., angling) are compiled by the CE (21). The four-year (1973-1976) average number of angler visitations (equivalent to an angler-trip as reported by KFFGC) reported by the CE was 306,050 per year (Table 10). This four-year average is 16 times higher than the average use estimated by KFFGC based on creel surveys it conducted in 1974 and 1976.

Table 8. -- Sport fishery creel statistics for Council Grove Lake for 1974 and 1976

	1974			1976			Average		
	Lake	Tailwater	Total	Lake	Tailwater	Total	Lake	Tailwater	Total
Angler use									
Angler hours	45,651	33,205	78,856	46,030	4,593	50,623	45,841	18,899	64,740
Angler trips	12,622	11,308	23,930	15,834	1,767	17,601	14,228	6,538	20,766
Hours per hectare	39.44	-	-	39.75	-	-	39.60	-	-
Hours per acre	15.96	-	-	16.09	-	-	16.03	-	-
Trips per hectare	10.90	-	-	13.68	-	-	12.29	-	-
Trips per acre	4.41	-	-	5.53	-	-	4.97	-	-
Angler harvest									
No. fish caught	18,118	12,728	30,846	27,101	1,973	29,074	22,610	7,351	29,961
No. fish per hour	0.41	0.38	0.39	0.59	0.42	0.57	0.49	0.39	0.46
No. fish per trip	1.42	1.13	1.29	1.71	1.12	1.65	1.59	1.12	1.44
No. fish per hectare	15.64	-	-	23.41	-	-	19.53	-	-
No. fish per acre	6.33	-	-	9.47	-	-	7.90	-	-
Wt. fish caught									
Kilograms	5,877	6,174	12,051	13,691	766	14,457	9,784	3,470	13,254
Pounds	12,957	13,611	26,568	30,184	1,689	31,873	21,571	7,650	29,221
Wt. fish per hour									
Kilograms	0.13	0.19	0.15	0.29	0.17	0.29	0.21	0.18	0.20
Pounds	0.28	0.41	0.34	0.66	0.37	0.63	0.47	0.40	0.45
Wt. fish per trip									
Kilograms	0.47	0.55	0.50	0.86	0.43	0.82	0.69	0.53	0.64
Pounds	1.03	1.20	1.11	1.91	0.96	1.81	1.52	1.17	1.41
Kg. fish per hectare	5.08	-	-	11.82	-	-	8.45	-	-
Lb. fish per acre	4.53	-	-	10.55	-	-	7.54	-	-
Wt. per fish caught									
Kilograms	0.33	0.48	0.39	0.51	0.39	0.50	0.43	0.47	0.44
Pounds	0.72	1.07	0.86	1.11	0.86	1.10	0.95	1.04	0.98

Table 9 . -- Harvest by species at Council Grove Lake and Tailwater during 1976

Species	Reservoir			Tailrace			Total		
	No	Wt Kg	(lbs)	No	Wt Kg	(lbs)	No	Wt Kg	(lbs)
Largemouth bass	369	212.2	(467.8)	-	-	-	369	212.2	(467.8)
Channel catfish	3,331	2,716.5	(5,988.8)	1,048	357.5	(788.1)	4,379	3,074.0	(6,776.9)
Bluegill	104	15.0	(33.1)	-	-	-	104	15.0	(33.1)
Black crappie	173	80.9	(178.3)	-	-	-	173	80.9	(178.3)
White crappie	13,384	5,087.2	(11,215.4)	139	47.4	(104.4)	13,523	5,134.6	(11,319.8)
Northern pike	114	261.8	(577.2)	-	-	-	114	261.8	(577.2)
Carp	641	293.6	(647.2)	202	140.3	(309.3)	843	433.9	(956.5)
Bullhead	78	18.2	(40.2)	108	48.8	(107.6)	187	67.0	(147.8)
Flathead catfish	244	336.1	(740.9)	103	84.7	(186.7)	347	420.8	(927.6)
White bass	7,308	3,616.3	(7,972.6)	-	-	-	7,308	3,616.3	(7,972.6)
Walleye	599	454.4	(1,001.7)	-	-	-	599	454.4	(1,001.7)
Drum	755	598.9	(1,320.4)	373	87.4	(192.7)	1,128	686.3	(1,513.1)
Total	27,101	13,691.1	(30,183.6)	1,973	766.0	(1,688.8)	29,074	14,457.1	(31,872.4)

Table 10. -- Angling effort in visitations by fishermen at Council Grove project, as compiled by CE for 1973-1976

Month	Survey years				Average
	1973	1974	1975	1976	
January	7,400	12,800	3,600	1,900	6,425
February	13,000	13,500	4,200	7,800	9,625
March	32,900	37,300	15,000	14,700	24,975
April	49,000	40,500	33,600	36,200	39,825
May	47,500	50,800	45,600	77,100	55,250
June	50,200	60,000	23,200	64,300	49,425
July	32,200	47,000	36,100	29,800	36,275
August	28,200	40,800	25,100	35,600	32,425
September	26,600	17,500	17,200	23,700	21,250
October	29,700	10,500	9,400	15,900	16,375
November	10,500	7,000	7,200	8,600	8,325
December	7,800	4,100	4,700	6,900	5,875
Total	335,000	341,800	224,900	322,500	306,050

Construction by the CE of a catwalk along the tailrace has facilitated angling in the tailwater. Four fish attractors have been built in the reservoir by KFFGC staff.

Fishery Resources -- Evaluation of Planning Input

The FWS released only one planning document (April 28, 1959) that contained discussions of the fishery-related impacts of the Council Grove project. This report was prepared after the CE submitted considerably altered design data for the project, and after they requested fish and wildlife input within approximately one month for incorporation into the General Design Memorandum for the project.

The cursory and tentative fishery discussions in the 1959 report bore little relevancy to the project as finally constructed. Following release of the 1959 document, some of the physical dimensions and operational plans for the project were changed by the construction agency. Although these design and operational alterations impacted the fishery resources of the project area differently than described in 1959, no updated follow-up report was forthcoming from the FWS. The 1959 report refers to the flood pool, viz:

> The 5,340-acre reservoir will provide warm-water fishing in an area where a lack of adequate opportunities to fish has resulted in a high demand.

This 2,161 ha (5,340 ac) pool included the five-year flood frequency pool. The conservation pool planned at the time was only 915 ha (2,260 ac) in size. Later, the CE elected to increase the initial conservation pool to 1,158 ha (2,860 ac). The impact of this enlarged pool was never addressed

by the FWS. However, it should be noted that the construction agency's final decision to enlarge the initial conservation pool to 1,158 ha was reached just a few days after the FWS released their updated Coordination Act report, which addressed the anticipated impacts of the project on wildlife.

Two fishery-related recommendations developed by the conservation agencies, a mutually acceptable reservoir clearing plan and a system of access roads and boat ramps, were accepted by the CE. The third and final FWS recommendation dealt with a minimum flow from the project. A guaranteed minimum flow of 5 cfs was considered sufficient to mitigate stream fishery losses, according to the FWS. However, a 15 cfs minimum release was recommended by that agency to enhance the river fishery. The FWS believed 5,000 ac-ft of storage would be needed for this purpose. The CE indicated that 29,500 ac-ft would, in fact, be necessary to guarantee a 15 cfs minimum flow. The CE noted that any action taken to provide the requested additional low-flow augmentation would require Congressional authorization. Further, the CE related that a minimum downstream release of 10 to 12 cfs for low flow augmentation was already planned as a project purpose. For whatever reason, the FWS did not press further their request for 15 cfs downstream release. According to the CE (Cleon Linton, pers. comm., 1977), the Council Grove project is currently operated to provide a minimum downstream release of only 5 cfs rather than the 10 to 12 cfs originally anticipated.

The planners did not anticipate the potential management opportunities as-

sociated with the introduction of non-native fish species. Most of the current fish management activities at Council Grove are directed at the introduced northern pike, walleye, and white bass populations which have become established. The cooperative water-level manipulation program, initiated originally as a northern pike management measure, was conceived and carried out only after several years of reservoir operation. Large concentrations of walleye and other reservoir-inhabiting species customarily occur in the immediate area of the tailrace following large-scale releases of reservoir water. Angler utilization of this fishery resource has been considerably enhanced by the "catwalk" access features constructed by the CE alongside the tailrace. The special access problems of the tailrace area were not mentioned in the 1959 planning report. Establishment of a white bass fishery has created an access problem not forseen in the planning stage. The spring spawning run of white bass in the headwaters and reservoir tributary streams are largely inaccessible to anglers due to inadequate public access facilities in these areas of the project.

Assessing the accuracy of the various use predictions was nearly impossible due to incomplete pre-construction documentation. The post-impoundment predictive information that was given to the construction agency was furnished exclusively in terms of dollars. The fishery was expected to support anglers in sufficient numbers to generate $166,000 and $34,000 in angler expenditures annually in the lake and tailwater, respectively. Estimates of the actual numbers of angler-days or trips expected at the project evidently no longer exist if, in fact, such estimates were ever generated. A likely approximation to the number of angler-days spent at

Council Grove can be developed by applying the average value per angler-day ($3.13) that was located while researching the planning at another Kansas project, the John Redmond Reservoir (25). Assuming that the same value was employed by FWS planners in assessing the project of current attention, it appears probable that the Council Grove planners anticipated that the reservoir would support some 53,035 angler-trips and that the Neosho (Grand) River would support an additional 10,863 angler-trips.

A significant portion of the fishing at Council Grove occurs in the tailrace. In 1974, about 47 percent of all angler-trips to the reservoir complex occurred in the tailwater area, which comprises approximately 1.5 ha (4 ac). The remaining 53 percent of angling activity occurred on the 1,158 ha (2,860 ac) lake. Determination of the accuracy of user predictions requires assuming that the authors of the 1959 report considered fishing in the tailrace to be the same as river fishing (tailwater). Under this assumption, the average effort in the censused 1.6 km (1 mi)-long tailwater section (6,538 angler trips), plus the unmeasured angling effort on the remaining downstream section of Neosho (Grand) River (to the head of the John Redmond Reservoir), would approximate the predicted level of 10,863 trips (Troy Schroeder, pers. comm., 1977).

Angling effort on the reservoir (14,228 angler-days) falls considerably short of the level which is assumed to have been anticipated (just over 53,000 trips). One probable cause for this over-estimate was the FWS authors' questionable assumption relating to the willingness of anglers to travel long distances to fish at Council Grove. The 1959 FWS report

stated:

> The 5,340-acre reservoir will provide warm-water fishing in an area where a lack of adequate opportunities to fish has resulted in high demand. More than 700,000 people reside in three cities - Wichita, Topeka, and Kansas City - all within two hours driving distance of the proposed reservoir.

The 1976 creel survey revealed that 77 percent of the Council Grove anglers resided within 50 miles of the lake. Only eight percent lived further than one hundred miles away (approximately equivalent to a two-hour drive).

Also contributing to the lower than expected angling intensity was the authors' failure to consider the great number of "competing" lakes located nearby. Six CE-constructed reservoirs are within 80 km (50 mi) of the Council Grove project.

In 1970, the state of Kansas had an estimated 575,153 anglers (angling license sales x 1.4); equivalent to 25.6 percent of the state's population. Assuming that the proportion of the populace that fishes was reasonably uniform throughout the state, some 60,000 anglers resided within 80 km (50 mi) of the project in 1973 (260,500 residents x .256). The 1975 National Survey of Fishing and Hunting (26) indicated the average Kansas warmwater angler fished 24 times annually in his home state. This would constitute a potential 1.4 million angler-trips by anglers residing within 80 km of Council Grove. The reservoir attracted an average (1974 and 1976) of 14,228 angler-days (KFFGC statistics), or 1 percent of the potential effort.

Contrasting dramatically with the foregoing calculation is the CE's ang-

ling estimate of 306,050 angler-days per year. According to the latter, Council Grove Lake would have attracted 22 percent of the potential angler-trips represented by the angling public residing within 80 km of the lake.

Turbidity has been identified as perhaps the most important limiting factor governing the Council Grove Lake fishery (Troy Schroeder, pers. comm., 1977). Erosion of the shoreline by wave action is the prime source of the lake's suspended sediment load. The water-level manipulation program allows seeding and stabilizing these shorelines. This program, by reducing erosion, has resulted in considerably improved water quality. This cooperative program was possible because of the reserve water-supply storage capability built into the project. When this water-supply storage is sold, and these waters are impounded, the opportunity for shoreline stabilization will be lost and water quality can again be expected to deteriorate.

SUMMARY

The amended Fish and Wildlife Coordination Act (1958) requires water development agencies to consult with the state conservation department and the FWS, "with a view to the conservation of wildlife resources by preventing loss of and damage to such resources...," and to prepare a project plan, which "shall include such justifiable means and measures for wildlife purposes as the reporting agency [in this case, the CE] finds should be adopted to obtain maximum overall project benefits." In turn, the FWCA requires the Secretary of Interior to provide the construction agency with predictions and recommendations, which are "as specific as is practicable with respect to features recommended for wildlife conservation and development, lands to be utilized or acquired for such purposes, (and) the results expected," and which "shall describe the damage to wildlife attributable to the project and the measures proposed for mitigating or compensating for these damages."

Although the Council Grove Reservoir project was authorized by Congress prior to the 1958 amendments to the FWCA, the project was not "significantly completed" at that time and, therefore, was subject to the requirements of the Act. The record does not indicate that pre-construction project planning was affected in any significant way by the FWCA. Planning for habitat development and other features, specifically designed to mitigate wildlife losses at the Council Grove project, occurred erratically. In the end, the planning effort proved to be almost totally ineffectual. Interagency cooperation was limited to sporadic communications. The FWS

and KFFGC recommendations were, with but few exceptions, never implemented by the CE. Beginning with the earliest FWS report, the affected agencies appeared to proceed independently except for an occasional, often tardy, exchange of information.

The planning report submitted by the FWS in 1959 was inadequate. The report contained only three specific recommendations, viz: a 15 cfs minimum downstream release, a cooperative timber-clearing plan, and adequate free public access. In response, the CE indicated a 10 to 12 cfs minimum downstream release was already planned for other project purposes. Although the other two recommendations lacked sufficient detail, they were generally implemented by the CE as incidental project development features.

The most important oversight in the report was the failure to provide a specific land acquisition plan to mitigate the project-occasioned wildlife losses. The CE's attitude toward pre-construction fish and wildlife planning at the Council Grove project seemed best expressed by their summary response to the concerns expressed by the conservation agencies, viz: "After impoundment, the reservoir would provide a more diversified fish and wildlife habitat and, by proper management, any specific losses that might occur would be replaced."

The later supplemental FWS report (1963) addressed more specifically the question of land acquisition for purposes of mitigating the wildlife losses. This proposal, to acquire 293 ha (725 ac) of land located above the flood pool, was eventually rejected by the CE. Their reason was that the

"benefits" associated with the habitat acquisition did not justify the cost of land acquisition, operation and maintenance. The FWS did not consider recovery of lost habitat, wildlife populations, and hunting opportunity as "benefits"; rather, they regarded such recoveries as necessary compensation for damages incurred. The FWS recommendations, for 32 km (20 mi) of fencing, and for transfer of certain surplus buildings located on project lands to the KFFGC for game management purposes, were rejected by the construction agency.

Assessing the accuracy of wildlife predictions at Council Grove was a difficult task due to the failure of the planners to provide specific hunting or wildlife population values. Also, losses expected specifically on project lands were not separated from the general losses expected downstream. Post-impoundment wildlife-related data were not gathered for the 12,141 ha (30,000 ac) downstream flood plain.

According to local state biologists, contrary to the FWS's prediction, the pattern of flood-water releases below Council Grove has unexpectedly prohibited woodland and brushland clearing to the extent which has occurred along the Neosho (Grand) River upstream from the reservoir. Consequently, wildlife habitat loss along the downstream river corridor may have been less than anticipated in the 1959 FWS report.

The KFFGC readily accepted, under a general plan, a license agreement to manage 1,067.6 ha (2,638 ac) of project land and water for wildlife purposes. Some 368 ha (909 ac) of the licensed area are manageable for terrestrial wildlife, although located in the five-year flood pool. These

lands have been managed for wildlife by the state at their own expense, and the KFFGC staff is of the opinion that the program has successfully compensated for the project-incurred terrestrial wildlife losses. The cost of the wildlife habitat development and maintenance program for these frequently-flooded lands has not been shared by the federal program which caused the original wildlife losses.

The reservoir has been operated at an interim level and includes an as yet unclaimed water-supply storage zone. Currently, the manipulation of this future water-supply zone is highly beneficial for waterfowl and fisheries purposes. This valuable management option will be lost when the water-supply storage is requested by the Kansas Water Resources Board.

The final reservoir dimensions, tardily conveyed by the CE to the FWS, were never adequately taken into account by the conservation agencies' planners. Fisheries discussions in the 1959 FWCA report bore little relevance to circumstances characterizing the project as finally built. Unfortunately, these early recommendations and predictions were never updated in the light of altered reservoir conditions. The introduction of non-native species, which comprise the major sport fishery, was not anticipated prior to project construction. Special management problems and opportunities associated with these existing fish communities were, therefore, not considered by the conservation agencies. Such special problems as access to the tailrace and headwater areas were not considered by the FWS planners. The need for access to both situations has arisen; tailrace access has subsequently been provided by the CE.

It appears probable that the fish and wildlife agencies considerably over-estimated angling use at Council Grove. According to KFFGC statistics, current use of the reservoir (14,228 angler-days annually) may approximate only 27 percent of the predicted level. However, the projections were made to cover the average 100-year period of anticipated project life; it is conceivable that annual angling effort may triple by 2014 (half way through project planning period).

Hunting and fishing effort statistics developed independently by the CE were found to be 21 times higher for hunting and 16 times higher for angling than comparable estimates developed by the KFFGC. The CE statistics are believed to be unrealistically high.

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