

FLINT HILLS

NARRATIVE REPORT

January-December 1966

FLINT HILLS NATIONAL WILDLIFE REFUGE
BURLINGTON, KANSAS

PERSONNEL

Lyle A. Stemmerman
Marcella Giesy
Robert E. Wilkerson
Elmo H. Botham
Wesley E. Spencer, Jr.

Refuge Manager
Clerk 7-28-66 to 10-30-66
WAE Laborer 8-29-66
WAE Laborer 10-3-66
WAE Laborer 8-29-66

ANNUAL NARRATIVE REPORT
FLINT HILLS NATIONAL WILDLIFE REFUGE
BURLINGTON, KANSAS

September 1 to December 31, 1966

INDEX

| | |
|---|------|
| I. GENERAL | Page |
| A. Weather Conditions..... | 1 |
| B. Habitat Conditions..... | 1 |
| II. WILDLIFE | |
| A. Migratory Birds..... | 6 |
| B. Upland Game Birds..... | 8 |
| C. Big Game Animals..... | 8 |
| D. Fur Animal Predators, Rodents and etc..... | 8 |
| E. Hawk, Eagles, Owls, Crows, Ravens and Magpies. | 9 |
| F. Other Birds..... | 9 |
| G. Fish..... | 10 |
| H. Reptiles..... | 11 |
| III. REFUGE DEVELOPMENT AND MAINTENANCE | |
| A. Physical Development..... | 11 |
| B. Planting..... | 12 |
| C. Collection and Receipts..... | 12 |
| D. Control of Vegetation..... | 12 |
| E. Planned Burning..... | 13 |
| F. Fires..... | 13 |
| IV. RESOURCE MANAGEMENT | |
| A. Grazing..... | 13 |
| B. Haying..... | 13 |
| C. Fur Harvest..... | 13 |
| D. Timber Removal..... | 13 |
| E. Commerical Fishing..... | 13 |
| F. Other Uses..... | 13 |
| V. FIELD INVESTIGATION OR APPLIED RESEARCH | |
| VI. PUBLIC RELATIONS | |
| A. Recreational Uses..... | 14 |
| B. Refuge Visitors..... | 14 |
| C. Refuge Participation..... | 14 |
| D. Hunting..... | 15 |
| E. Violations..... | 15 |
| F. Safety..... | 16 |
| VII. OTHER ITEMS..... | 16 |

FLINT HILLS NATIONAL WILDLIFE REFUGE
ANNUAL NARRATIVE REPORT
CALENDER YEAR 1966

I. GENERAL

A. Weather Conditions.

Weather information is obtained from the official government weather station maintained by the U S Army Corps of Engineers at John Redmond Dam. The Burlington weather station was discontinued earlier in the year after 67 years of operation. Average precipitation figures are taken from data collected at the Burlington station.

| | | <u>Precipitation</u> | | Max. | Min. |
|-----------|------------|----------------------|-------------|-----------|----------|
| | Snowfall | This Year | Normal | Temp | Temp |
| January | T | 0.01 | 1.19 | 59 | -11 |
| February | 6.0 | 1.28 | 1.25 | 63 | 0 |
| March | | 1.28 | 2.59 | 81 | 11 |
| April | | 4.89 | 3.78 | 89 | 21 |
| May | | 2.16 | 5.34 | 93 | 40 |
| June | | 3.07 | 4.87 | 98 | 50 |
| July | | 4.44 | 4.23 | 102 | 63 |
| August | | 3.31 | 4.04 | 98 | 54 |
| September | | 1.84 | 4.38 | 90 | 45 |
| October | | 0.55 | 2.99 | 87 | 28 |
| November | | 0.39 | 1.94 | 79 | 7 |
| December | <u>5.1</u> | <u>0.68</u> | <u>1.41</u> | <u>76</u> | <u>1</u> |
| TOTAL | 11.1 | 23.90 | 38.01 | 102 | -11 |
| Extremes | | | | | |

A quick glance at the above chart will reveal that 1966 was well below normal (-14.11) in Precipitation. Spring and summer precipitation though below normal was adequate to produce average and better crops of beans, milo and corn. Fall precipitation was well below normal and refuge habitat suffered accordingly.

B. Habitat Conditions

1. Water

a. Pertinent Reservoir Data and Relation to Refuge

| Item | Elevation | Surface Acres | Acre Ft. |
|--------------------------------|-----------|---------------|----------|
| Minimum Pool | 1033.0 | 5,700 | 36,500 |
| Conservation Pool | 1036.0 | 7,700 | 56,450 |
| Ultimate Conservation Pool | 1039.0 | 9,400 | 82,700 |
| Top of Flood Control Pool | 1068.0 | 31,700 | 644,800 |
| Acquistion guide line Fee | 1063.0 | 26,800 | 498,360 |
| Acquistion guide line Easement | 1073.0 | | |

John Redmond Reservoir represents the Corps of Engineers most conservative approach to land acquisition for reservoir needs. This acquisition policy effects the refuge (mostly adversely) all the way from waterfowl potential to routine operations.

Acquisition of fee land closely approximated the 5 years flood frequency elevation of 1063 with flowage easement acquired to 1073. As a result, the refuge contains precious few acres that are not susceptible to being flooded. Fee acquisition was held very tightly to the 1063 elevation resulting in an extremely erratic boundary (53½ miles to encompass 18,500 acres) which at the present time is unsurveyed. This acquisition policy produced numerous instances of split fields where the government owns 20 or 30 acres and a private individual the remainder of the field. These fields will be extremely difficult to manage particularly on a share cropping basis and the potential for troublesome boundary line hunting occurs all along the boundary.

At the present permanent pool elevation the refuge contains 1500 acres of reservoir waters. At the ultimate conservancy pool elevation of 1039 3,000 acres of impounded waters will lie within the refuge.

b. Reservoir Habitat Conditions

The 1,500 acres of reservoir waters contained within the refuge provide outstanding waterfowl habitat. The shore line is extremely broken with numerous sloughs and buyos particularly in and around the large exbow formed by the Neosho River just prior to entering the reservoir. The flooded timber in this area is particularly attractive to Mallards.

Unlike many reservoirs which are relatively low in waterfowl food production Redmond has the appearance of a managed marsh in the early stages of succession. Abandoned farm fields near the water line have developed dense stands of wild millet and smartweed. Along the

periferies of the permanent pool such common marsh species as cattail, button bush, arrowhead, little round steen, big round stemm and nut grass are beginning to dominate. In the shallow water areas which comprise the majority of the 1500 acres stands of smartweed are highly developed with duckweed, sago poodweed and a species of large leaf potomogeaton common.

c. Flooding

The Flint Hills Refuge is the most flood prone area now being managed in Region2.

Corps of Engineer hydrographs which reflect water levels of Redmond Reservior had it been in place from 1922 through 1956 (35 years) give an indication of the flooding frequency we may expect in future years. The following chart based on information contained in the hydrographs depicts flooding in relation tothe refuge area.

| Situation | # of years situation would have occured | % of years situation would have occured |
|----------------------------------|---|---|
| No Floods | 16 | 45 |
| 0-25% of Refuge area inandated | 2 | 6 |
| 25-60% of Refuge area inandated | 7 | 20 |
| 60-100% of Refuge area inandated | 10 | 29 |

This chart fairly well points out that the flooding potential will be the primary factor affecting the development and management of the station.

The reservior has already received one major flood which occured in June of 65 and peaked at an elevation of 1060. Surprisingly the refuge shows little effect from this flood. Damage to structures or roads is no where apparent and siltation is very slight with no adverse effects.

d. Marsh & Wet Meadow Development Potential

The river valley which comprizes roughly 90% of the refuge is ideally suited for marsh and wet meadow development.

Relatively minor dike and water control structures can create 3,700 acres of ponds marshes and wet meadows within the refuge.

For water supply there are 24 separate drainage systems carrying run off waters from 30,600 acres of land that can be controlled to supply water for the proposed marsh systems.

Refuge lands quickly revert to a smartweed and wild millet cover when wet land management is applied. The proposed pond and marsh areas are therefore expected to have a high food producing potential.

e. Water Conditions During 1966

As stated earlier, 1966 was an extremely dry year. Reservoir levels were relatively stable throughout the spring and summer with fall and winter levels $\frac{1}{2}$ to 1 foot below the permanent pool elevation. The drop in water levels during the fall decreased the attractiveness of the reservoir to waterfowl and resulted in use lower than that which would have occurred if normal or slightly higher levels would have prevailed.

2. Food and Cover

a. Agriculture Potential & Problems

The Flint Hills Refuge is composed primarily of river bottom farm lands. Of the total refuge area (18,500 acres) approximately 12,500 acres are presently under cultivation. The soil while fertile, has a high clay content and much of it is poorly drained. Over all production is, however, good to excellent. The food producing capabilities of the area is one of the factors that gives it a high waterfowl potential.

There are several problems which will effect the management of the agricultural resource and foremost is the projected flood frequency for Redmond Reservoir.

The Corps of Engineers hydrographs referred to earlier have been studied in detail to obtain some approximation of the effects of flooding on the refuge's food production capabilities. The following chart is based on these hydrographs that show the dates and elevations of floods that would have occurred had Redmond Reservoir been in place between 1922 through 1956. For purposes of this chart it has been assumed that wheat would have

been available for waterfowl consumption if the field in question were not inundated between October 1 and March 15 and that corn or milo would have been produced if inundation did not occur between May 15 and October 30.

| Elevations | Wheat | | Corn or Milo | | |
|------------|-------------------------------------|--|--|--|--|
| | Approx. Acres of Ag. Lands involved | # of years forrage available for waterfowl | % of years forrage available for waterfowl | # of years grain available for waterfowl | % of years grain available for waterfowl |
| 1040-1050 | 4,500 | 24-26 | 69-74 | 19-20 | 54-57 |
| 1050-1055 | 3,300 | 29 | 83 | 21 | 60 |
| 1055-1065 | 4,700 | 29-32 | 83-91 | 29-31 | 83-90 |

Past flooding history indicates that the areas food producing capabilities are fairly good despite the high frequency of flooding. Even on the 4,500 acres of agriculture lands most susceptible to flooding we can expect forrage production 70-75% of the years operated. The refuge does contain approximately 4,700 acres that have a 80-90% change of being effective in producing both forrage and grain crops.

Other problems which adversely effect farmland management are invasion by johnsongrass and other noxious weeds and inadequate wheat allotments. These problems will be discussed in greater detail in other sections.

b. Cooperative Farming Program

Every attempt will be made to manage the agricultural resource through cooperative farming agreement, with the refuge assuming operational responsibilities only when it is absolutely necessary to do so.

In general, our co-op programs will call for the production of wheat, corn and milo. Agreements will be more liberal than normal on fields lying below elevation 1050. Present programs for wheat forrage production are not the most effective but must be utilized in the absence of adequate wheat allotments.

We received approximately 90 applications for cooperative farming privileges. Initially the entire farming program will be carried out by the efforts of 56 cooperators selected for the program.

Due to the establishment of the refuge late in the year the decision was made that former owners and tenants could retain their priority leases with the Corps of

Engineer through December 31, 1967. The refuge will not assume management jurisdiction on the entire area until January 1, 1968. The assumption of management on bid lease areas and the voluntary transfer of former owners and tenants to our program will result in 3,000 acres of farm land being managed for the production of wildlife foods in 1967.

II. WILDLIFE

A. Migratory Birds

1. Anticipated Use

The Flint Hills Refuge is expected to attract large concentrations of waterfowl and serve as both a migratory and wintering area.

Snow and blue goose populations are expected to reach peaks of 75,000 birds. Use by Canada and white-fronted geese is not expected to be as intensive. Duck use of the refuge will result principally from late winter use by mallards whose concentrations are expected to exceed 100,000. Use of the area by other species of ducks will occur principally during the early fall and for short periods while the spring migration is underway.

2. Previous Use figures

The reservoir was inundated for two years prior to the establishment of the refuge. Though inventory records are incomplete, the following peak populations were recorded mostly occurring during the fall of 1964 when excellent habitat conditions were created by initial inundation of the reservoir.

| | | | |
|-------------------|--------|-------------------|-------|
| Snow - blue geese | 5,000 | Green-winged Teal | 200 |
| Canada geese | 290 | Blue-winged Teal | 6,800 |
| White-fronts | 1,000 | Shoveler | 500 |
| Mallard | 25,000 | Redhead | 1,000 |
| Gadwall | 3,000 | Ringneck | 8,000 |
| Widgeon | 2,000 | Canvas Back | 150 |
| Pintail | 4,000 | Lesser Scaup | 4,500 |
| Common Merganser | 16,000 | Bufflehead | 25 |
| Coot | 10,000 | | |

3. Water Fowl Use - Fall 1966

Utilization of the refuge by waterfowl did not meet our expectations particularly in the case of snow and blue geese. Significant migrations of snow geese occurred during October though the refuge failed to hold any of the migrants for more than a couple of days. In early November a small

flock of snows begin to build and reach a peak of 1300 birds. This flock remained in the area for 6 weeks and appeared to be relatively stable. The flock utilized the refuge exclusively during its stay and represents a "seed crop" that will attract additional members in future years.

A small flock of Canada geese numbering from 100 to 160 individuals also utilized the area for six weeks. Approximately 35 members of the flock were of the large Canada goose varieties. Little use was made of the refuge by white-fronted geese. A small flock of 50 white-fronts were recorded during two consecutive weeks of the period.

Mallard use of the refuge was gratifying and in fact exceeded our expectations. Mallard numbers were insignificant until the first of November when 3,500 were recorded. This flock increased steadily until a peak of 33,000 was reached in late November. During December the population decreased to a fairly stable level of 10-13,000 birds. Mallards fed within the refuge until available waste grain was consumed or plowed under, the latter occurring first in most instances. Refuge feeding terminated about the time the peak populations were reached. From then on the refuge was utilized as a roosting and resting area with morning and evening feeding lights made into the general area.

Concentrations of other species of ducks was insignificant except for a brief period in late October. The abruptness of this October influx was impressive. On the morning of October 22 few duck were observed on the reservoir. By mid afternoon of the 23rd, 13,000 mix ducks and coots were present.

A population of 2,500 Mergansers were present just prior to Christmas, but decreased to 650 birds by the end of December.

4. Other Migratory Birds

Little effort was made to inventory Franklin's Gulls though it is known that 20,000 of these birds were present at the end of September.

Very little data was obtained on other forms of migratory birds. What few observations that were made are recorded in NR forms.

No estimates were made of the dove population though routine observations indicate that the refuge contains a large resident population and is a significant production area.

Fall concentrations of dove were quite good throughout the general area.

B. Upland Game Birds

Present information on upland game birds is too meager to allow for a reliable population estimate. N R form 2 is therefore omitted from this report.

This years Kansas produced a bumper quail crop probably the best on record. The refuge also contained an abundant population particularly during the fall months. Present indications are that quail production is relatively light in the river bottoms contained by the refuge. There is, however, an influx of birds from the surrounding uplands during the fall months.

The Lesser Prairie Chicken is quite common in Coffey County, Primarily a bird of the uplands they do occur on the refuge particularly during the fall months when feeding concentrations are observed.

C. Big Game Animals

White Tailed Deer are fairly common ^{on} the refuge. Track and signs are abundant and observations of deer were made in numerous locations.

The refuge posses ideal deer habitat and the present population is expected to increase rapidly during the next few years; at some future date a removal program will be necessary.

D. Fur Animal Predators, Rodents and Other Animals

Again not enough information is available for reliable population estimates. The following statements reflect our present thinking as to relative abundance.

Muskrat and beaver are quite common on the area and from all appearances the 20½ miles of flooded river channel with in the refuge has provided ideal habitat for these species. Future construction of ponds and marshes will in all probability lead to over abundant populations and a trapping program will be involved.

Racoon are at the present time over abundant in some areas and will cause problems particularly on those areas where corn is produced.

Coyotes are abundant. Single animal observations are common and several packs have been observed. Control will be required to maintain coyote populations at acceptable levels.

Cotton-tailed rabbits are quite abundant and reflect the overall increase of the species in Eastern Kansas.

The following species are known to occur on the area but little is known about their population status.

| | |
|--------|---------------|
| Mink | Striped Skunk |
| Badger | Bobcat |

E. Hawk, Eagles, Owls, Crows, Ravens and Magpies

Hawk observations were primarily of redbills and marsh hawks. Furregenous and Sparrow hawks also were observed. During December several accipetrine hawks were observed. Though not positively identified they are believed to be Coopers hawks.

Eagles began to be apparent during December with five of the largest concentrations observed. Both bald and golden eagles were identified. An immature golden eagle was observed harassing a flock of several hundred snow geese while they were attempting to feed. From all appearances the eagle was on a lark rather than a serious hunt and kept the geese in constant turmoil for 45 minutes.

The Great Horned Owl is a common observation on the refuge. A snowy owl while not recorded on the refuge spent approximately two weeks in New Strawn. A small flock of 200-500 crows were present during the period.

F. Other Birds

Every reservior has its black bird problem and it is doubtful that Flint Hills will be an exception. A peak of only 20,000 was observed this year but we are betting on a significant increase in future years.

For record purposes all new additions to the stations bird list will be listed in this section. The following species (81) have been observed since the area was started in March of 1965.

| | |
|--------------------------|-----------------------|
| White Pelican | Redhead |
| Double Crested Cornorant | Ring-necked Duck |
| Great Blue Heron | Lesser Scaup |
| Green Heron | Bufflehead |
| Canada Goose | Ruddy Duck |
| White-fronted goose | Common Merganser |
| Snow Goose | Turkey Vulture |
| Blue Goose | Red-tailed Hawk |
| Mallard | Furregenous Hawk |
| Gadwall | Golden Eagle |
| Pintail | Bald Eagle |
| Green-winged Teal | Marsh Hawk |
| Blue-winged Teal | Sparrow Hawk |
| American Widgeon | Lesser Praire Chicken |
| Shoveler | Bobwhite |
| Wood Duck | Virginia Rail |

Sora
 American Coot
 Semipalmated Plover
 Kill deer
 Upland Plover
 Spotted Sandpiper
 Greater Yellowlegs
 Lesser Yellowlegs
 Least Sandpiper
 Long-billed Dowitcher
 Western Sandpiper
 Franklin's Gull
 Black Dove
 Morning Dove
 Yellow-billed Cuckoo
 Great Horned Owl
 Yellow-shafted Flicker
 Red headed Woodpecker
 Yellow-bellied Sapsucker
 Downy Woodpecker
 Eastern Kingbird
 Western Kingbird
 Great Crested Flycatcher
 Eastern Phoebe
 Sissor-tailed Flycatcher

Horned Lark
 Barn Shallow
 Common Crow
 Black-capped Chickadee
 Long-billed Marsh Wren
 Mocking Bird
 Brown Thrasher
 Swainson's Thrush
 Eastern Bluebird
 Loggerhead Shrike
 Solitary Vireo
 Yellowthroat
 Eastern Meadowlark
 Red-winged Blackbird
 Orchard Oriole
 Baltimore Oriole
 Common Crackle
 Brown Headed Cowbird
 Cardinal
 Dickcissel
 American Goldfinch
 Vesper Sparrow
 Slate-colored Junco
 Harris Sparrow

G. Fish

Redmond Reservoir has an outstanding fishing potential and fishing use of the reservoir particularly the flooded stream channel within the refuge is intensive. The Kansas Park Authority in their recreational planning projects 320,000 fishing days use by 1970. A majority of this use will occur on refuge waters and will require a significant portion of our O and M efforts for proper administration.

Though Redmond Reservoir is presently an outstanding sport fisheries resource it has several built in problems which could result in a serious decline in the Sport Fisheries potential. Due to natural conditions the reservoir has an oxygen depletion problem during the summer months when oxygen levels reach the minimum for fish survival complicating this natural condition is the frequent loss of fish due to pollution. From available information it appears that the source is the numerous feed lots along the Cottonwood River near Strong City. Organic waste accumulate in these lots during dry period. Rains water washes this material into the river where the subsequent break down by bacteria deplets the oxygen supply and results in fish kills as far down river as Hartford.

The following information was provided by the Kansas Forestry Fish and Game Commissions fishery division.

Stocking Record

| | | |
|-----------------|-----------|------|
| Crappies | 7,000 | 1963 |
| Stripped Bass | 400,000 | 1966 |
| Blue Gill | 17,750 | 1964 |
| Walleye | 3,000,000 | 1964 |
| Forgemouth Bass | 298,817 | 1964 |

Other Species of Fish known to be present

| | |
|--------------------|-----------------|
| Bigmouth Buffalo | Gizzard Shad |
| Smallmouth Buffalo | White Bass |
| Carp sucker | Kentucky Bass |
| German Carp | Drum |
| Channel Catfish | Greensunfish |
| Flathead | Longear Sunfish |
| Shortnose Gar | Golden redhorse |
| White Crappie | |

H. Reptiles - Nothing of significance to report

III. Refuge Development and Maintenance

A. Physical Development

Very little was accomplished during the period in the way of physical development.

Boundary signs were erected on "pen ta" Treated posts, along 53 ½ miles of boundary. (A "Best Guess" operation that will have to be repeated when the boundary is surveyed at some future date.)

Barricade consisting of 3/8" cable strung between two posts were erected on all roads entering closed area. Reflectors and reflectorized warning signs were installed as a safety measure. The barricades were generally effective in that they were respected by the general public, but were easily driven around by individuals not intending to abide by the regulations.

Sixteen 2' x 2' x 2' styrafoam buoys were spaced over 2 miles of water to establish the stream boundary of the refuge. Another 16 styrafoam blocks were painted red and black and placed in the upper regions of the reservior to mark the river channel boundaries.

In an effort to obtain some experience in wet meadow management, 57 acres of abandoned pasture were mowed in early September.

A low dike capable of flooding 35% of the pasture was constructed. Several small plugs and a diversion ditch were constructed to direct run-off water to the area. Little was learned from this effort as our wet meadow remained dry throughout the period.

This station presently lacks storage and shop facilities on the refuge. To effectively carry out future work programs the erection of a field headquarter complex with minimum facilities is required.

B. Planting

1. Aquatic and Marsh Plants: None

2. Trees and Shrubs

Prior to the establishment of the refuge the Corps of Engineers through contract planted numerous trees mostly sycamore on the Strawn & Hartford recreation areas. The trees planted had less than a 50% survival rate and the contractor replanted those lost. Future tree planting for beautification purposes must rely on flood resistant species such as sycamore. A native maple common, on the area has exhibited an even greater ability to survive flooding and will also be used in future plantings.

3. Upland Herbaceous Plants

The establishment of permanent grass cover on several hundred acres of land will be required in the future. Known flood tolerant species such as Reeds Canary grass and lowland Switch grass will be utilized. Under the soil and moisture program trail plantings of these and other species will be made to determine their ability to survive under periods of prolonged inundation.

4. Cultivated Crops

Only 700 acres of the refuge area were under agricultural management by our Bureau in 1966. The lands involved were situated just above the upper limits of the reservoir. Because of their location the Corps of Engineers did not receive bids on these tracts and by mid-summer they were covered with Johnson grass, cocklebur and cottonwood seedlings. By offering the cooperator a liberal program we were able to obtain cooperative farming of these tract. Good wheat forage was produced on about 400 acres while production on the remainder was poor due to a later planting date and lack of fall precipitation. Because of their location these fields were important to the program and sustained the majority of the feeding activities of the goose flock utilizing the refuge.

C. Collection and Receipts: None

D. Control of Vegetation

The control of noxious weeds will be a major management problem for the refuge.

Inadequate wheat allotments prohibits the use of wheat rotation with row crops as a weed control measure. Under our present farming program the majority of refuge lands will be under row crop cultivation with little or no opportunity for summer fallowing. A chemical control program for the use of 24D by cooperators in corn and milo crops has been recommended. Chemical control may be carried out on as much as 4,000 acres in future years. While 2-4D will aid in the control of pig weeds, sunflower, and ~~cuck~~le-burr it will have little effect on Johnson grass invasion.

E. Planned Burning: None

F. Fires: None

IV. RESOURCE MANAGEMENT

A & B Grazing and Haying

Grazing and Haying operations during the year were conducted under lease with the US Army Corps of Engineers and the majority of the areas suited for these uses will be handled by Corps lease during 1967.

The refuge contains approximately 2,000 acres of grasslands scattered in small tracts throughout the area, but occurring primarily along the outer edges. A grazing program on these lands will be extremely difficult to administer. Without benefit of fencing a controlled grazing program will be virtually impossible. Generally the refuge tracts will be small in relation to the total pastures and because of their location and character (usually occurring in draws, well supplied with timber & water) will be preferred site for cattle and overgrazing will result.

In our agreement with the Corps of Engineers it has been stipulated that for uses where an exchange of funds is required the Corps will execute a lease under their policies. This will result in the selection of permittees by bid solicitation and create administrative and control problems for both the grazing and haying programs.

C. Fur Harvest: None

D. Timber Removal: None

E. Commercial Fishing: None

F. Other Uses: None

V. FIELD INVESTIGATION OR APPLIED RESEARCH

The Emporia State Teachers College has conducted limnological

studies of Redmond Reservoir since the summer of 1963.

One publication "Some Variations In the Chemical Characteristics of John Redmond Reservoir, Kansas During Its Early Impoundment" has resulted from this study which is expected to yield good basic information particularly important to the fisheries resource.

VI. PUBLIC RELATIONS

Sport Fishing is the principal recreational use made of the Flint Hills Refuge followed closely by driving and sightseeing.

The majority of the fishing use of Redmond Reservoir occurs on refuge waters with other water orientated recreation such as swimming, boating and water skiing being concentrated on the reservoir proper.

The Strawn ramp area received extremely heavy utilization particularly by fisherman. Existing facilities are already over-taxed and the areas expansion and development for camping activities will be a major item in our development program. The Hartford Recreation area receives little use except during periods of high water. Though this area is equipped with a ramp boating in the river is hazardous for some two miles below the site. At the present permanent pool elevation channel water is not deep enough to permit safe boat travel. Lebo ramp constructed by the Corps of Engineer in late August of this year received intensive use during the fall months particularly by individuals desiring access to the river from the north side.

The refuge will be intensively utilized by the general public in future years. Fishing and potential programs such as public hunting wildlife observation, and nature study together with the already popular driving and sightseeing are expected to attract in excess of 400,000 visitors per annum by 1970.

B. Refuge Visitors:

Official visits to the refuge were confined mostly to regional office personnel on missions of planning and inspection. Soil Conservation Service Personnel also frequently visited the area to assist in S & MC planning, soil type mapping and to provide technical advice in planning pond and marsh systems. All Kansas Game Management Agents visited the area at one time or another to assist in enforcement activities.

C. Refuge Participation:

Programs pertaining to the establishment of the refuge were presented to three civic organizations in Burlington and Emporia.

A program based on tree identification was presented to 70 girl scouts during a weekend campout held on the refuge. Eight boy scouts and three adult advisors were given a tour of the refuge to view waterfowl concentrations. A dozen different meetings were attended by the refuge manager during the year. Many were with personnel of the Corp of Engineers to discuss refuge operations under the terms of the cooperative agreement. Others were local meetings where factors effecting the refuge were under discussion.

D. Hunting

Two thousand nine hundred and six acres in the Eagle Creek arm of the refuge were open to public hunting during the 66 season. The opening was a general one encompassing all species legally hunted under state law and adopting the state seasons without restrictions. Hunting of waterfowl, mourning doves, prairie chicken, quail, rabbits, squirrel and deer with bow and arrow was therefore permitted. We did not have the time or personnel to obtain detailed records of hunting participation and success. The area was, however, intensively utilized during the first two weeks of the quail season and some waterfowl hunting occurred.

Waterfowl hunting on the reservior and areas adjoining the refuge was not intensive except during the early part of the season. The incidence of waterfowl hunting and the kill of ducks and geese was lower than that occurring the past two years due primarily to the refuge establishment on the more productive waterfowl areas.

The refuge did show beneficial effects to local residents in that several canada geese were harvested late in the season. Their presence in the area in December was due to the existence of the refuge. The presence of 15-30,000 mallards during the last half of the waterfowl season offered excellent hunting opportunities though only a few local waterfowl hunters took advantage of the situation.

E. Violations

Without fencing it was virtually impossible to prevent trespassing into closed areas. Numerous cases to trespass as well as hunting violations were known to have occurred. Though several enforcement patrols were conducted by refuge employees and GMA Charles Graham and particular attention was given the area by KFF&G Game Protector, Clyde Bolin, no apprehensions were made.

While numerous violations occurred we were still pleased with the over-all picture. This was the first year of operation and closure of the refuge was made on relatively short notice. There was considerable opposition to our program and there was little to prevent entry into closed areas other than a sign and barricade which could be easily circumvented. Stil disturbance was minimal and did not interfere with waterfowl use of the area.

The first waterfowl season ~~went~~ more smoothly than anticipated.

The "openess" of this area and anticipated waterfowl concentrations will create a significant enforcement problem in future years.

Sometime during the latter part of the year a car stolen in Kansas City and was driven into one of the closed areas and stripped of motor, transmission, etc; an indication that present security measures leave something to be desired.

F. Safety

One safety meeting was conducted primarily for the benifit of newly hired temporary employees. The meeting covered the Bureau's safety program in general and specific instructions for safe conduct on the jobs then being preformed.

All refuge vehicles are equipped with safety belts. Fire extinguishers and first-aid kits. A large first-aid kit was purchased for the office. Hard hats and safety goggles were purchased for field personnel.

VII. OTHER ITEMS

A map of the refuge denoting areas opened to the public during the waterfowl season is included after the photo section. The original hunting & fishing plan stipulated that the Lebo ramp and the Neosho River channel below Old Strawn would be closed. These two features of the plan met with strong public oposition, primarily from the winter fishing fraternity. The original closing was based on the premise that these areas were included in the refuges most critial waterfowl habital and we were reluctant to permit vehicle and boat access. The intensity and scope of the opposition forced a change in the Hunting & Fishing plan to open the Lebo ramp and the Neosho River Channel from below Strawn to the down stream boundary of the refuge. Opening of these areas did create additional enforcement and distrubance problems and hunting violations were known to have occurred in the channel area. The effect of opening these areas was not, however, as devious as anticipated.

Redmond Reservior at the present permanent pool elevation of 1036 is not ideally suited for water skiing and pleasure boating. The lake is quite shallow over much of its area and is well supplied with boating hazards such as stumps, bridge abutments, etc. The recreational potential of the reservior would be vastly increased if the ultimate permanent pool level of 1039 were utilized. The Corps of Engineers position at present is the the permanent pool elevation of 1036 will be utilized until such time as there is a

municipal commitment for use of the water to be stored between elevation 1036 and 1039. There is much pressure being exerted by citizens and groups in Burlington and the surrounding communities to raise the level to 1039 in the near future.

Need less to say, a change in the permanent pool elevation of the reservoir would have a profound effect on the refuge though it is impossible at this time to determine if the net result would benefit or be disadvantageous to our program. On the plus side an additional 1700 acres of reservoir waters would be impounded within the refuge and present indications are that excellent waterfowl habitat would be created. The additional three feet of storage would place all agricultural fields three feet closer to water and the already adverse effects of flooding would be increased.

The refuge was staffed on March 10, 1966 when refuge manager Stemmerman and his family left Oklahoma for the third time and returned to their native state.

Born and raised in eastern Kansas I came to the rather obvious conclusion that it was too hot, too humid and too flat and promptly departed for points west. Five years of college, nine years of my career and six duty stations, later I'm 75 miles from home which all goes to prove that the best laid plans of mice and men often go astray or that there is no place like home.

Mrs. Marcella Giesy was hired as part-time clerk in July and was just becoming acquainted with her duties when a change in her husband's occupation forced a move to Topeka at the end of October.

While running a one man operation of this size is untold of fun and games, additional help would be graciously excepted.

Respectfully submitted,



Lyle A. Stemmerman
Refuge Manager

March 3, 1967 

Reviewed:


Regional Director

Date:

3/15/67

W A T E R F O W L

REFUGE Flint Hills

MONTHS OF September TO December, 1966

| (1) Species | (2) Weeks of reporting period | | | | | | | | | |
|--------------------|----------------------------------|----|-----|----|----|-------|-----|-----|-------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Swans: | | | | | | | | | | |
| Whistling | | | | | | | | | | |
| Trumpeter | | | | | | | | | | |
| Geese: | | | | | | | | | | |
| Canada | | | | | | 3 | | 4 | 60 | 120 |
| Cackling | | | | | | | | | | |
| Brant | | | | | | | | | | |
| White-fronted | | | | | | | | 4 | 10 | |
| Snow | | | | | | | | 300 | 940 | 1,200 |
| Blue | | | | | | | | | | |
| Other | | | | | | | | | | |
| Ducks: | | | | | | | | | | |
| Mallard | | 15 | 20 | 25 | 25 | 30 | 40 | 50 | 3,500 | 11,000 |
| Black | | | | | | | | | | |
| Gadwall | | | | | | 225 | 600 | 870 | 2,000 | 30 |
| Baldpate | | | | 12 | 50 | 425 | 200 | 500 | 1,500 | |
| Pintail | | | | 5 | | | | 20 | | |
| Green-winged teal | | 13 | | | | | | | | |
| Blue-winged teal | | 2 | 200 | 17 | 75 | 170 | 50 | | | |
| Cinnamon teal | | | | | | | | | | |
| Shoveler | | | | 4 | 75 | 125 | 50 | | | |
| Wood | | | | 2 | 20 | 32 | 25 | | | |
| Redhead | | | | | | 3 | | | 500 | |
| Ring-necked | | | | | | | | | 2,000 | 1,200 |
| Canvasback | | | | | | | | | | |
| Scaup | | | | | | | | | | |
| Goldeneye | | | | | | | | | | |
| Bufflehead | | | | | | | | | | |
| Ruddy | | | | | | | | | 1,000 | |
| Other Common Merg. | | | | | | | | | | |
| Coot | | | | | | 1,280 | | 100 | 3,000 | |

3-1750a

Cont. NR-1

(Rev. March 1953)

W A T E R F O W L
(Continuation Sheet)

REFUGE Flint HillsMONTHS OF September TO December, 1966

| (1) Species | (2) Weeks of reporting period | | | | | | | | (3) Estimated waterfowl days use | (4) Production Broods:Estimat seen : total |
|-------------------|----------------------------------|--------|--------|--------|--------|--------|--------|--------|---|---|
| | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | | |
| Swans: | | | | | | | | | | |
| Whistling | | | | | | | | | | |
| Trumpeter | | | | | | | | | | |
| Geese: | | | | | | | | | | |
| Canada | 100 | 105 | 150 | 160 | 140 | 130 | 80 | 65 | 7,819 | |
| Cackling | | | | | | | | | | |
| Brant | | | | | | | | | | |
| White-fronted | 50 | 50 | | | | | | | 798 | |
| Snow | 1,000 | 1,300 | 1,300 | 1,300 | 800 | 450 | 200 | | 61,530 | |
| Blue | | | | | | | | | | |
| Other | | | | | | | | | | |
| Ducks: | | | | | | | | | | |
| Mallard | 18,230 | 25,000 | 33,380 | 18,000 | 10,300 | 12,500 | 13,000 | 13,000 | 1,106,805 | |
| Black | | | | | | | | | | |
| Gadwall | | | | | | | | | 26,075 | |
| Baldpate | | | | | | | | | 18,809 | |
| Pintail | | | | | | | | | 175 | |
| Green-winged teal | | | | | | | | | 91 | |
| Blue-winged teal | | | | | | | | | 3,598 | |
| Cinnamon teal | | | | | | | | | | |
| Shoveler | | | | | | | | | 1,778 | |
| Wood | | | | | | | | | 553 | |
| Redhead | | | | | | | | | 3,521 | |
| Ring-necked | | | | | | | | | 22,400 | |
| Canvasback | | | | | | | | | | |
| Scaup | | | | | | | | | | |
| Goldeneye | | | | | | | | | | |
| Bufflehead | | | | | | | | | | |
| Ruddy | | | | | | | | | 7,000 | |
| Other | | | | | | | | | 50,050 | |
| Common Merg. | | | | 1,000 | 2,000 | 2,500 | 1,000 | 650 | | |
| Coot: | | | | | | | | | 30,660 | |
| | | | | (over) | | | | | | |

| | (5) Total Days Use | (6) Peak Number | (7) Total Production | SUMMARY |
|-------|-----------------------|--------------------|-------------------------|-------------------------|
| Swans | | | | Principal feeding areas |
| Geese | 70,147 | 1,460 | | |
| Ducks | 1,190,805 | 33,380 | | Principal nesting areas |
| Coots | 3,000 | 30,660 | | |
| | | | | Reported by |

INSTRUCTIONS (See Secs. 7531 through 7534, Wildlife Refuges Field Manual)

- (1) Species: In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and national significance.
- (2) Weeks of Reporting period: Estimated average refuge populations.
- (3) Estimated Waterfowl Days Use: Average weekly populations x number of days present for each species.
- (4) Production: Estimated number of young produced based on observations and actual counts on representative breeding areas. Brood counts should be made on two or more areas aggregating 10% of the breeding habitat. Estimates having no basis in fact should be omitted.
- (5) Total Days Use: A summary of data recorded under (3).
- (6) Peak Number: Maximum number of waterfowl present on refuge during any census of reporting period.
- (7) Total Production: A summary of data recorded under (4).

PUBLIC RELATIONS
(See Instructions on Reverse Side)

Refuge Flint HillsCalendar Year 1966

1. Visits

a. Hunting 975 b. Fishing 48,200 c. Miscellaneous 74,930 d. TOTAL VISITS 124,105

1a. Hunting (on refuge lands)

| TYPE | HUNTERS | ACRES | MANAGED BY |
|-------------|---------|-------|------------|
| Waterfowl | 250 | 2,906 | Bureau |
| Upland Game | 700 | 2,906 | Bureau |
| Big Game | 25 | 2,906 | Bureau |
| Other | | | |

Number of permanent blinds 0Man-days of bow hunting included above 25

Estimated man-days of hunting on lands adjacent to
refuge 1,000

1b. Fishing (area open to fishing on refuge lands)

| TYPE OF AREA | ACRES | MILES |
|--------------------|-------|-------|
| Ponds or Lakes | 1,510 | |
| Streams and Shores | | 26.5 |

1c. Miscellaneous Visits

Recreation 71,830 Official 100
Economic Use 3,000 Industrial _____

2. Refuge Participation (groups)

| TYPE OF ORGANIZATION | NO. OF GROUPS | NUMBER IN GROUPS | NO. OF GROUPS | NUMBER IN GROUPS |
|-------------------------|---------------|------------------|---------------|------------------|
| Sportsmen Clubs | | | | |
| Bird and Garden Clubs | | | | |
| Schools | | | | |
| Service Clubs | 3 | 120 | | |
| Youth Groups | | | 2 | 85 |
| Professional-Scientific | | | | |
| Religious Groups | | | | |
| State or Federal Govt. | | | | |
| Other | | | | |

3. Other Activities

| TYPE | NUMBER | TYPE | NUMBER |
|--------------------------------|--------|----------------------|--------|
| Press Releases | 4 | Radio Presentations | 0 |
| Newspapers (P.R.'s sent to) | 5 | Exhibits | 0 |
| TV Presentations | 1 | Est. Exhibit Viewers | 0 |

INSTRUCTIONS

Item 1: Total of a, b, and c, equal d.

"Visit" - definition. Any person who is on refuge lands or waters during a day or part thereof for the purpose of: hunting, fishing, bird-watching, recreation, business or economic use, official visit, or similar interest. INCLUDE - those who stop within the refuge while traveling on a public highway because of an interest in the area. EXCLUDE - persons engaged in oil or other industry not directly related to the refuge, persons using refuge as most direct route or principal avenue of traffic, and those boating on navigable rivers or the Intercoastal Canal, unless they stop to observe wildlife on the refuge.

Computing visits. Where actual counts are impractical, "sampling" is used with midweek and weekend samples varied by season or weather. A conversion factor of 3.5 (of passengers per car) is used when accurate figures are not available. Each refuge will develop a conversion factor for boats based on range of usage. Count a camper once for each 24-hour period or fraction thereof.

Item 1a: Acres - of refuge open for each type of hunting.

Managed hunts require check in and out of hunters, issuance of permits, or assignment of blinds.

Other - INCLUDE crow, fox, and similar hunting.

Lands adjacent to refuge. Normally considered within 1 mile or less of boundary, unless established sampling procedures cover a wider area. For big game hunting, the distance may be greater.

Item 1b: Acres of streams open to fishing, if practical; otherwise just miles open. Information on "shores" is primarily for coastal fishing.

Item 1c: Recreation. INCLUDE photography, observing wildlife, picnicking, swimming, boating, camping, visitor center use, tours, etc. TOTAL Recreation, Official, and Economic Use visits under Item 1.

Industrial. INCLUDE persons engaged in industry, i.e., oil industry or factories. EXCLUDE these from Item 1.

Item 2: INCLUDE the "On Refuge" groups in Items 1c and 1. In "Off Refuge" column include only those group meetings in which refuge employees actually participate. EXCLUDE these from Items 1c and 1.

Item 3: Exhibits - INCLUDE displays, fairs, parades, and exhibits OFF the refuge; EXCLUDE those ON.

3-1758
Form NR-8
(Rev. Jan. 1956)

Fish and Wildlife Service Branch of Wildlife Refuges

CULTIVATED CROPS - HAYING - GRAZING

Refuge Flint Hills County Coffey State Kansas

| Cultivated Crops Grown | Permittee's Share Harvested | | Government's Share or Return | | | | Total Acreage | Green Manure, Cover and Water- fowl Browsing Crops Type and Kind | Total Acreage |
|------------------------------|--------------------------------|----------|------------------------------|----------|--------------------|----------|------------------|---|------------------|
| | | | <u>Harvested</u> | | <u>Unharvested</u> | | | | |
| | Acres | Bu./Tons | Acres | Bu./Tons | Acres | Bu./Tons | | | |
| Wheat | | | | | | | 700 | 700 | 700 |
| | | | | | | | | Fallow Ag. Land | 0 |

No. of Permittees: Agricultural Operations 4 Haying Operations 0 Grazing Operations 0

| Hay - Improved (Specify Kind) | Tons Harvested | Acres | Cash Revenue | GRAZING | Number Animals | AUM'S | Cash Revenue | ACREAGE |
|----------------------------------|-------------------|-------|-----------------|--|-------------------|-------|-----------------|---------|
| | | | | 1. Cattle | | | | |
| | | | | 2. Other | | | | |
| | | | | 1. Total Refuge Acreage Under Cultivation | | | | 700 |
| Hay - Wild | | | | 2. Acreage Cultivated as Service Operation | | | | 0 |

DIRECTIONS FOR PREPARING FORM NR-8
CULTIVATED CROPS - HAYING - GRAZING

Report Form NR-8 should be prepared on a calendar-year basis for all crops which were planted during the calendar year and for haying and grazing operations carried on during the same period.

Separate reports shall be furnished for Refuge lands in each county when a refuge is located in more than one county or State.

Cultivated Crops Grown - List all crops planted, grown and harvested on the refuge during the reporting period regardless of purpose. Crops in kind which have been planted by more than one permittee or this Service shall be combined for reporting purposes.

Permittee's Share - Only the number of acres utilized by the permittee for his own benefit should be shown under the Acres column, and only the number of bushels of farm crops harvested by the permittee for himself should be shown under the Bushels Harvested column. Report all crops harvested in bushels or fractions thereof except such crops as silage, watermelons, cotton, tobacco, and hay, which should be reported in tons or fractions thereof.

Government's Share or Return - Harvested - Show the acreage and number of bushels harvested for the Government of crops produced by permittees or refuge personnel. Unharvested - Show the exact acreage and the estimated number of bushels of grain available for wildlife.

If grazing is made available to waterfowl through the planting of grain, cover, green manure, grazing or hay crops, estimate the tonnage of green food produced or utilized and report under Bushels Unharvested column.

Total Acreage Planted - Report all acreage planted, including crop failures.

Green Manure, Cover and Waterfowl Grazing Crops - Specify the acreage, kind and purpose of the crop. These crops and the acreage may be duplicated under cultivated crops if planted during the year, or a duplication may occur under hay if the crop results from a perennial planting.

Hay - Improved - List separately the kinds of improved hay grown. Annual plantings should also be reported under Cultivated Crops, and perennial hay should be listed in the same manner at time of planting.

Total Refuge Acreage Under Cultivation - Report total land area devoted to agricultural purposes during the year.

Form NR-1A
(Aug. 1952)

Refuge Flint Hills

Months of September to January, 19 66

| (1) Species | (2) First Seen | | (3) Peak Concentration | | (4) Last Seen | | (5) Production | | | (6) Total |
|---|-------------------|------|---------------------------|-----------------|------------------|-------|-------------------|---------------|-------------|--|
| Common Name | Number | Date | Number | Inclusive Dates | Number | Date | Number Colonies | Total # Nests | Total Young | Estimated Use |
| I. <u>Water and Marsh Birds:</u> | | | | | | | | | | Not enough observations for reliable estimates |
| Double Crested Cormorant | 1 | 10/4 | 40 | 10/20 | 401 | 10/20 | | | | |
| White Pelican | 5 | 9/9 | 600 | 10/12 | 60 | 10/20 | | | | |
| Great Blue Heron | 8 | 9/9 | 15 | 9/20 | 11 | 11/17 | | | | |
| Green Heron | 7 | 9/9 | 7 | 9/9 | 7 | 9/9 | | | | |
| Sora Ruddy Duck | 1 | 9/20 | 1 | 9/20 | 1 | 9/20 | | | | |
| Virginia Rail | 1 | 9/20 | 1 | 9/20 | 1 | 9/20 | | | | |
| II. <u>Shorebirds, Gulls and Terns:</u> | | | | | | | | | | |
| Franklin's Gull | 20 | 9/5 | 20,000 | 9/27 | 15 | 11/17 | | | | |
| Greater Yellowlegs | 4 | 9/20 | 4 | 9/20 | 4 | 9/20 | | | | |
| Lesser Yellowlegs | 2 | 9/20 | 2 | 9/20 | 2 | 9/20 | | | | |

(over)

| (1) | (2) | (3) | (4) | (5) | (6) |
|--|-----|-----|-----|-------------------|-----|
| III. Doves and Pigeons: Mourning dove White-winged dove | | | | | |
| IV. Predaceous Birds: Golden eagle Duck hawk Horned owl Magpie Raven Crow | | | | | |
| | | | | Reported by _____ | |

INSTRUCTIONS (See Sec. 7532, Wildlife Refuges Field Manual)

- (1) **Species:** Use the correct names as found in the A.O.U. Checklist, 1931 Edition, and list group in A.O.U. order. Avoid general terms as "seagull", "tern", etc. In addition to the birds listed on form, other species occurring on refuge during the reporting period should be added in appropriate spaces. Special attention should be given to those species of local and National significance. Groups: I. Water and Marsh Birds (Gaviiformes to Ciconiiformes and Gruiformes)
 II. Shorebirds, Gulls and Terns (Charadriiformes)
 III. Doves and Pigeons (Columbiformes)
 IV. Predaceous Birds (Falconiformes, Strigiformes and predaceous Passeriformes)
- (2) **First Seen:** The first migration record for the species for the reporting period.
- (3) **Peak Numbers:** Estimated number and inclusive dates when peak population of the species occurred.
- (4) **Last Seen:** The last refuge record for the species during the season concerned.
- (5) **Production:** Estimated number of young produced based on observations and actual counts.
- (6) **Total:** Estimated species days use (average population X no. days present) of refuge during the reporting period.

The upper reaches of Redmond Reservoir provide outstanding waterfowl habitat. The top photo represents, but a portion of the numerous smartweed beds that cover much of the shallow portions of the lake. The lower photo is taken looking inland from water edge. The vegetation along the shore line is primarily wild millet with cattail and various species of bull rush invading the site.



Arrow head and water lilly are developing in the shallow areas covered with less than 6" of water. Sago pond weed and duckweed are the common submergents in these areas.



A small natural pond formed by the abandoned "Katy" Railroad bed. The railroad bed offers excellent opportunities for easy development of several such ponds.

Laborer Bob Wilkerson operating the newly acquired Moline 670 tractor and mower. The mowing operation is taking place on 60 acres of abandoned pasture that will be developed into a wet meadow area.



The top photo was taken looking North from the Neosho river at the extreme upper limits of the reservoir. This area with its numerous bays and flooded timber was the preferred resting and roosting area for this fall's mallard population.

The wheat in this photo is only a portion of a large 400 acre field. Because of its proximity to the upper reaches of the reservoir, its potential for attracting initial waterfowl use is outstanding. Unfortunately this is the area in which the Lebo ramp was constructed. The access road to the ramp can be seen in the center of the photo. Entrance to the area is on the left and the Lebo ramp to the right of the photo. Heavy vehicle traffic particularly during the early fall prevents significant utilization of this field and adversely affects the ability to attract and hold early snow goose migrants.



This photo is taken north and west of Hartford, Kansas and virtually all of the lands shown are included in the refuge. The area is flat and poorly drained and can easily be developed into an excellent shallow water marsh totaling approximately 600 acres.

This photo is taken from the approximate center of the refuge looking west towards Hartford. The dike which surrounds Hartford on three sides to prevent its inundation during flood times can be seen in the upper portion of the photo. The photo shows two of the numerous sloughs formed by ancient meanderings of the Neosho that are common throughout the refuge. These and other sloughs can be easily developed to produce excellent waterfowl habitat.



Strawn Ramp is the most heavily utilized recreation area on the reservior by the fishing public. Our development plans call for its expansion and contruotion of camping facilities.

The Hartford Ramp situated just outside of the town would offer excellent recreation opportunities for this small community except for the fact that present lake levels do not provide adequate water for safe boating.

