

QUARTERLY NARRATIVE REPORTS FOR THE  
BITTER LAKES WILDLIFE REFUGE  
1939

BITTER LAKES

QUARTERLY NARRATIVE REPORTS

FEBRUARY 1939 - JANUARY 1940

R  
Bitter Lakes

February 21, 1940.

Mr. Grant H. Shager,  
Bitter Lakes Migratory Waterfowl Refuge,  
Box No. 10<sup>1</sup>,  
Roswell, New Mexico.

Dear Shager:

Your first report on the Bitter Lakes Refuge was a very fine one. It compares favorably with the best reports received from the refuge system as a whole. It gives an extra fine picture of wildlife populations of the refuge and contains the right amount of detail on refuge operation. I will look forward to seeing future Bitter Lakes reports.

We expect to have a reasonable amount of recreation on our refuges up to a point where such recreation does not destroy the primary wildlife conservation aim of the project. It is not our general policy to permit boating on an area of the Bitter Lakes type, nor overnight camping. Our recreation here will be confined to a small family picnic area, if there is an ultimate demand for this, and to sports fishing when the development is out of the way and a game fish population builds up to a point where this sport can be sustained. Fishermen will probably not be allowed on the area during times of major waterfowl concentrations.

Please keep up this excellent work.

Sincerely yours,

JCS:nbw

J. Clark Salyer II,  
Chief,  
Division of Wildlife Refuges.

CC: Mr. Gatlin.

February 21, 1940.

MEMORANDUM for Mr. Ackerknecht.

Refer to the November-January narrative report from the Bitter Lakes Refuge. Notice the maps in the back of this report showing the land acquisition status. The area is still checkerboarded with lands to which we have not secured title, and this condition is greatly impeding our construction work.

Get in touch with Mr. Dieffenbach's office and persistently raise the question until we get some more aggressive action on this land clearance.

JCS:nbw

J. Clark Salyer II,  
Chief,  
Division of Wildlife Refuges.

QUARTERLY REPORT OF ACTIVITIES

For The Months Of

NOVEMBER, DECEMBER and JANUARY 1940

\*\*\*\*\*

\*B-I-T-T-E-R\* \*L-A-K-E\* \*M-I-G-R-A-T-O-R-Y\* \*B-I-R-D\* \*R-E-F-U-G-E\*

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UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF BIOLOGICAL SURVEY

Roswell, New Mexico.

*JS*

*Just  
Carled 2/20*

## INTRODUCTION

The Bitter Lakes Migratory Waterfowl Refuge is located about six miles north and east of the town of Roswell, in Chaves county, New Mexico, laying between two cross country highways that skirt the south and west boundaries by about one mile. It is divided into two units, of about equal size and together exceeding 21,000 acres. The north unit lies about five miles to the north and is served with one of the highways forming a connecting link to the other unit. The Pecos river meanders well within the eastern boundaries of both units with its fertile valley ranging one and two miles in width forming the basis of the refuge development program.

The town of Roswell reflects the atmosphere and prosperity of a fine agricultural community. It is known for its beautiful shaded trees that make an indelible impression on the traveler weary from the monotony of many miles of travel through the semi-arid back lands. This oasis-like community is located in the north portion of a substantial artesian basin that extends sixty miles to the south. The South unit of the refuge is situated on the northern rim of this large artesian basin and in turn benefits from this strange paradox, -a floating valley in the heart of this semi-arid desert land.

The surrounding country as well as the refuge is characterized by many small "bottomless lakes" ranging from twenty to three hundred feet in diameter and penetrating the water bearing strata as much as two hundred feet. These interesting creations of nature are most abundant in the northwest portion of the South unit; which is also the highest ground of the area. They maintain water levels from 3500 to 3515 feet elevation and for some reason lakes that are nearly adjoining possess different levels. From this point there is a gradual slope south and east into the Pecos River valley. Forming a rather

circular border starting west of this concentration of "bottomless lakes" and arising within the limits of the refuge is Bitter Creek following a jagged, deep and narrow course about one mile to Bitter Lake. Here a shallow body of water is formed supplying a fine marsh and shore line to the vast delight of the many visiting birds. It maintains a lake level (high) at an elevation of 3492 feet. Springs rolling out of cavernous underground channels and seeping from the side hills are the source of water from the start of Bitter Creek to its junction with the Pecos River below the south boundary.

The soil at this part of the drainage is very concentrated in gypsum deposits and other kindred salts and as the water etches its passages through this material it becomes very hard and bitter developing a nature not greatly unlike sea water. Consequently there are barren spots on the refuge where this water has in successive years deposited thick alkaline beds upon evaporation which has had its limiting effect on vegetation.

A typical sample of water from this area is analyzed as follows:

234	parts of	Aluminum
190	" "	Bicarbonates
400	" "	Calcium
0	" "	Carbonates
1190	" "	Chlorides
35	" "	Magnesium
1384	" "	Sulphates
383	" "	Sodium
TOTAL----	4146	" " dissolved solids per million.

#### RAINFALL

Annual rainfall approximates twelve inches which is usually liberated in torrential spasms with

its consequent erosional effect on the fine sand loam soil. The artesian cap rock and successive strata from the hills in the west have a downward tilt as it progresses toward the Pecos River valley. So whatever water lies behind and above determines the pressure, consequent run off and supply in the agricultural low lands.



A typical "bottomless lake",-note the coral-like walls that are visible for great depths in the clear water. Musk grasses are abundant in these calcareous formations.

WATER MEASUREMENTS

DECEMBER				JANUARY			
NUMBER ONE	NO TWO	WEATHER		NUMBER ONE	NO TWO	WEATHER	
Head in inches	Flow C.F.S.	Inches	Inches prec't	Head in inches	Flow C.F.S.	Inches	Inches prec't
				Date			Wind, snow etc.
				17-3/8	.496	11-3/8	
				27-5/16	.486	11-1/2	
				37-3/8	.496	11-5/8	
				47-7/16	.506	11-3/4	
				57-3/8	.496	11-7/8	
				67-7/16	.506	12-	
				77-1/4	.476	12-1/8	
				87-1/4	.476	12-1/4	
				97-3/16	.467	12-3/8	
				107-1/8	.458	12-9/16	
				117-	.434	12-7/8	
				127-	.434	13-	
				136-7/8	.420		Heavy winds.
				146-3/4	.394		It was necessary to lower
				156-3/4	.394		the lake level at this time.
		00.00		166-11/16	.385		
5-7/8	.282	-1/8		176-11/16	.385		
5-7/8	.282	-1/4		186-5/8	.376		
5-15/16	.290	-3/8		196-5/8	.376		
6-1/16	.304	-1/2		206-5/8	.376		
6-1/8	.312	-5/8		216-5/8	.376		
6-3/16	.320	-3/4		226-11/16	.385		
6-1/4	.328	-7/8	3.00	236-11/16	.385		Heavy rain
8-1/4	.660	4-3/8		246-11/16	.385		
7-7/8	.580	5-7/8		256-11/16	.385		
7-7/8	.580	7-	.05	266-3/4	.394		Two in. snow
7-7/8	.580	8-		276-3/4	.394		
7-7/8	.580	8-7/8		286-3/4	.394		
7-9/16	.526	9-5/8		296-11/16	.385		
7-1/2	.512	10-3/8		306-11/16	.385		
7-3/8	.496	10-7/8		316-3/4	.394		
7-3/8	.496	11-1/4					

The zero reading on number two gauge is at an elevation of 3490 feet and eleven inches. The number one measurement is a sixty degree weir.

FIRE SUPPRESSION:

While the refuge has no problem arising from the burning of trees or forests we are confronted with an abundance of dead, rank vegetation. At this time of the year the local ranchers burn their fields and with the approach of the warm spring sun and wind there is consolation in the fact that the one hundred and ten foot tower will soon be complete and with the Civil Service Commission just completing their register to fill the vacancy of the Labor-Patrolman.

WATERFOWL:

\*- WILDLIFE -\*

The large flights of waterfowl had their appearance on the refuge about November 15th. while the sandhill cranes were moving through several weeks prior. The latter reached the peak of migration on Thanksgiving day, November 23rd., at which time 4500 were estimated on the refuge. They were concentrated at four different places which made it possible to obtain a fairly accurate estimate by allowing them to "take to the air" in separate groups. The ducks became more numerous each week and at the end of December about fifty thousand were on the refuge. Just prior to the cold spell, January 10th., the migratory waterfowl reached the peak with approximately 74,000 ducks using the refuge.

The estimate was as follows:

✓ Pintails - - - - -	24,000
✓ Mallards - - - - -	21,000
✓ Balpates - - - - -	18,000
✓ Shovellers - - - - -	3,000
✓ Gadwalls - - - - -	2,000
✓ Green-winged Teal - - - - -	2,000
✓ Canvasbacks - - - - -	1,000
✓ Redheads - - - - -	1,000
Other Species: Scaups,	
Goldeneyes, & Buffleheads-	2,000
	<hr/>
	74,000

1 - 40

Geese are occasionally on the refuge in small flocks of from ten to fifty. They are chiefly Canadian honkers and recently snow geese have been seen.

CONCENTRATION OF WATERFOWL ON BITTER LAKE



The waterfowl using the refuge during the winter migration seem to visit its calm and peaceful waters more for solace and comfort rather than for the choice vegetative specimens that abound from its marshes and lakes. Although there is an abundance of Widgeon grass (*Ruppia maritima*) and Musk grass (*Chara*) growing in the water, and Salt grass (*Distichlis spicata*) glasswort (*Salicornia*) and alkali and gypsum tolerant species the birds would all leave at dusk each evening for the grain fields some ten to fifty miles south and return on the appearance of the sun the next day. A habit well regulated for their health to escape and outwit the sportsmans cunningness.

Bitter Lake proved to be a favorite spot with its shallow bed spreading out over many acres. Day after day from 25,000 to 50,000 birds crowded its waters and shoreline, seeming to rest and await their daily venture for the "nights raid" in the farmers fields which provided an observer a splendid opportunity to estimate the number on the lake as they would consistently leave in successive flights and if one selected the right spot they would all go over him.

The limited feed supply has about reached its extremity and the problem here is mainly providing grain fields of our own. To that extent we can almost set our bird visitors to whatever number we wish by merely supplying the necessary feed on the refuge.

#### UPLAND GAME BIRDS:

✓ The upland game birds consist of about 150 quail which seems to be the favorite bird of the local hunter. The long season indicates on the refuge that plenty of management and encouragement would be a desirable venture in its behalf. Pheasants of the ring necked species would no doubt show fine progress and merit their introduction on the refuge with several shelters strategically stationed accessible to their utilization.

*Stocking of pheasants not desirable - R.H.*

PREDATORS:

The predators on the refuge consist of the coyote, bobcat and skunk of which authorization from Washington office has been secured in an effort to control the coyote. In as much as the refuge is in the heart of a fine sheep country it is our obligation to keep in step with the control effected by the local ranchmen if we are to expect or deserve the modicum results in our public relations. None have been taken to date as we are awaiting shipment of traps.

While on the subject of predators some thought should be given to the snapping turtle which seems to abound in these deep lakes and underground ledges of streams. In as much as the refuge development program is going to be decidedly advantageous to the limited number of nesting birds on the refuge it no doubt will be necessary to make every effort possible to "pull through" a good sized brood and one of the problems in attaining that end will be meeting the onslaught of the many snapping turtles therefore we feel it desirable to make the necessary study to determine the predation caused by this specie and the measures necessary to be pursued. Another numerous inhabitant of these waters is the carp and being our aquatic vegetation is none too abundant it seems to be more in line with good management to supply that food to some fur bearing animal and supplant the carp with a gamier fish.

FUR BEARING ANIMALS:

The fur bearing animals of the refuge consists of the beaver, raccoon and a limited number of muskrats. In this field we have the most interesting species of the wildlife of the refuge- the South American Beaver-(Nutria). It is an introduced animal in this country with its history starting when a number were imported from South America by one of the local residents in an effort to establish a fur farm and in subsequent years his property became inundated by the rising flood water of the Pecos River.

*Beth  
dunne  
note  
J. S.*

BEAVER HAVEN



The inlet to Bitter Lake in its delta-like formation provides a fine habitat for the introduced South American beaver. Bitter Lake in the back ground with large concentrations of waterfowl.



Bitter Creek about one half mile below the lake, -opposite the headquarters. A good sized colony of beaver have made well worn trails in the heavy and thick vegetation.

As the water receded it took the fur-bearers with and on their journey down stream found the comforts of the south unit much to their liking. Now there are several fine colonies developing. It is truly a fine fur bearing animal and one cannot help but be impressed with the possibilities of this specie on Bitter Lakes Refuge. It is the writers opinion that there is approximately one hundred and fifty on the refuge. This count is based on periodic trips over the areas they frequented in which can be observed the great amount of activity in search of food and the building of dens. They develop trails in the very dense vegetation giving evidence of much travel and wear.

This specie has characteristics of the beaver also the muskrat having a long tail about eighteen inches in length flattened vertically like the latter, the skull and teeth markings of the former, and possessing a fur of a texture even superior to either specie. It measures thirty six inches from tip to tip and floats high in the water with its whole length visible. There has been no evidence found of any stream damming action of this animal or any building of mounds but seems to confine this activity to den building however maybe the kind of vegetation available has determined this and not a characteristic or instinct of this specie. They are very active on the shore line and seeming to be endowed with curiosity emerge from their dens as the visitors approach their hideouts.

The deep undermined ditches, the "bottomless holes" and cavernous banks provide a fine habitat as they seemed to have produced in such remarkable numbers that it is no doubt opportune for considerable thought and study in so far as their action on ditches, dykes and structures as well as their possibility as a revenue will be concerned. Considerable droppings have been collected with a view toward food habits research. Probably the most important problem on the outset is the status of title. Being this is an introduced specie and proof of the ownership of the original stock is only a matter of record it would be difficult to determine just how a court would react and again how long it would take to have a decision rendered. In the meantime with a probable injunction preventing the taking of the fur what would the increasing numbers be doing to the refuge development work?

*Survey  
note  
The*

REFUGE DEVELOPMENT AND MAINTAINANCE:

The number one- (1)- water measurement tabulated is a sixty degree weir recording the flow of water that **eminates** from the series of ditches connecting thirty one "bottomless lakes" and supplying the water for impoundment unit number one- (1). The water level reached the spillway on January 2nd. and released into impoundment unit number two- (2)- forming about a sixty acre lake with many small islands and an irregular shoreline.

The number two- (2)- measurement was a point at the height of the water on the date taken and used as a zero point to determine and tabulate the rising lake level. It was later established as 3490 feet **eleven** inches elevation. The water level reached the **maximum** 3492 foot height on January 12th. at which time the lake level was lowered to prevent undue damage from wave action resulting from a severe storm. At the same time it was **decided** that the **up-stream** side of the structure headwa// is somewhat low and now a sub-normal lake level is being held to **allow** for the construction of the additional head. This impoundment unit takes drainage from the whole upper Bitter Creek and Bitter Lakes watershed and as shown by number two- (2)- measurement increased in such encouraging manner and arrived at its maximum height of 3492 by about the first of the year it would appear with several months of raising water table ahead that a far more substantial volume of water could be impounded and provide a reservoir incalculably valuable to refuge development and maintainance. Mr. Winsor suggested or proposed raising the dyke and headwalls to provide for a lake level of 3494 feet. This would supply a lake of approximately three hundred acres.

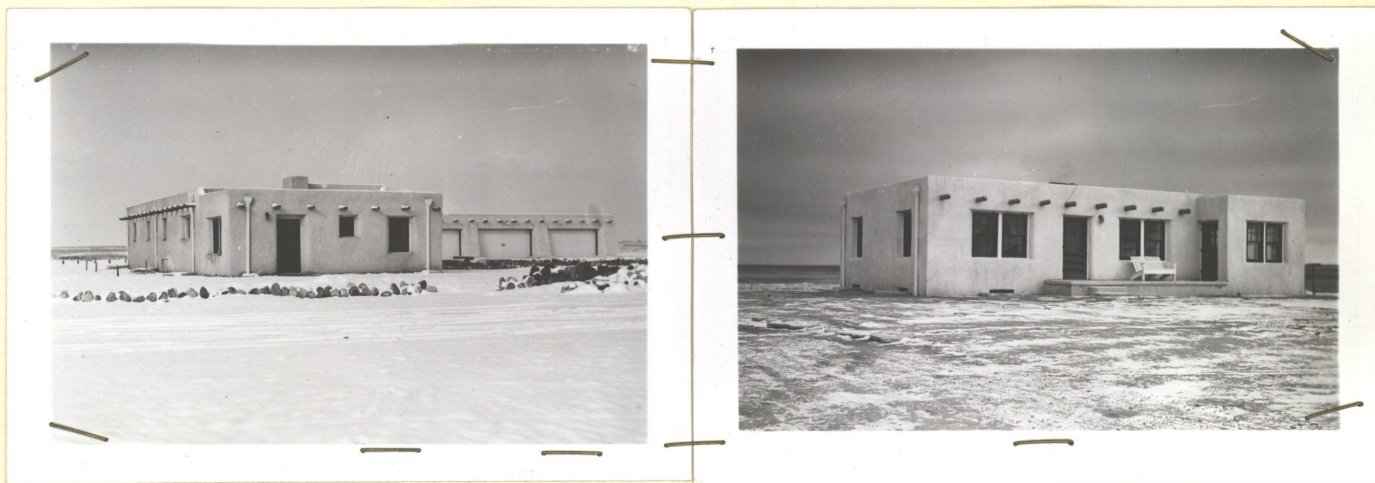
The main water control structure of the south unit #17 is completed with a very fine job of construction resulting and water could now be impounded at that point but with the dyke work still in progress on that area it would be very inadvisable to back the water thus impeding the progress of the several heavy equipment units operating there.

H-E-A-D-Q-U-A-R-T-E-R-S



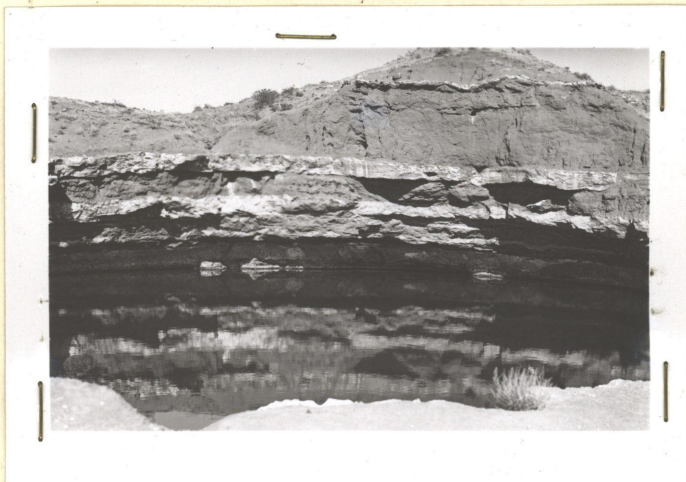
Looking East.

The main refuge road approaches the headquarters set-up from the west. This picture was taken Christmas day 1939.

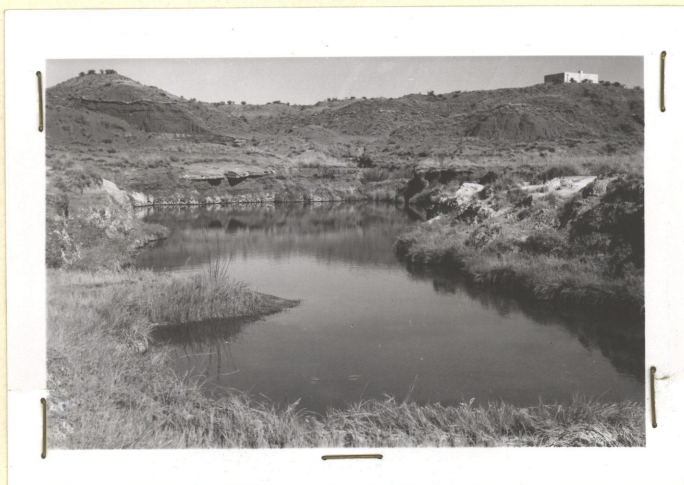


The road turns into the headquarters from the south side of the plot between the office-service building on the left and the residence on the right. The equipment building will be seen in the back ground on the left. The fine adobe structures are an inspiration to all visitors.

NORTH UNIT



This large "bottomless lake" is the chief water supply to the impoundment unit (No.16) of the north unit. A dangerous lake with precipitous sides from ten to twenty feet high.



This is the lower of the two lakes in the series. In the upper left hand corner the side walls of the first lake are visible. In the upper right hand corner is the adobe over night cabin overlooking the valley and the lake formed by unit number 16.

North Unit



This picture was taken from the over night cabin showing the fine lake formed by impoundment unit number sixteen. This is the only development work completed on the north unit. This dyke was put in by W.P.A. hand labor. It is a good project and used by many birds. There is a heavy matting of saltgrass (*Distichlis spicata*) developing on the dyke and has provided excellent resistance to frequent wave action.

The checker board ownership and progress of land acquisition are placing the development work of the refuge at a decided handicap. With the heavy growths of vegetation at some places on the refuge and its resulting fire hazard indicates that the refuge in places is ready for stock utilization but due to the fact that we are not in control of sufficient property to complete our exterior fencing program let alone work out interior fencing plots. The title as it rest in the government is shown in this report.

The over night cabin of the north unit is about complete and reflects the fine adobie architecture that has given such an outstanding distinction to the headquarters set-up. It is situated on the hill in a commanding position overlooking impoundment unit number sixteen- (16)- which receives a good supply of water from two large "bottomless lakes" nestled in the hills beside this adobie structure.

#### PLANTINGS:

Two fifty acres plots of hygeria of the dwarf species are planned as shown on the accompanying refuge map and experimental plots of wild millet (*Echinochloa crusgalli*) and plants that will supply food and cover for upland game birds are of an urgent nature on the refuge.

The proposed labor patrolman's residence will no doubt soon be underway and on the approach of the warm spring days the landscaping program for the headquarters is planned. Several Chinese Elms trees could be placed around the residence and office buildings with some of the salt cedars transplanted from the valley floor. An artesian well is being planned which will allow our lawn and landscaping an adequate opportunity for success as the strong water available at our shallow well would no doubt in time make a deposit of alkaline salts injurious to most vegetation.

The salt grass (*Distichlis Spicata*) grows most abundantly and forms an excellent mat to resist the wave action of most of our dykes. We are planning to transplant this species from its massive beds in the marsh areas to the sides of the dykes.

Some thought and study could be expended to an advantage regarding collecting seeds from some of the fine range plants that possess the qualities of resisting the alkaline and gypsum contents of this soil i.e. alkali sacaton (*Sporobolus Airoides*) gyp grama (*Bouteloua breviseta*) and black grama (*Bouteloua eriopoda*). These are dominant species of refuge plants of the range specie and have the palatability rating of 50, 70 and 70 respectively. Every opportunity will be utilized in an effort to work out the above seed collecting and harvesting project.

#### PUBLIC RELATIONS:

The public relations is slowly advancing and more visitors are driving out to the refuge and invariably seem to be impressed by the vastness of the project and fine work that is being accomplished.

At present there are no recreational facilities but it has unlimited possibilities as the vast impoundment of water by the Bitter Lakes unit will provide a fine lake and no doubt both boating and fishing with a small picnic and camp grounds could be developed and utilized at a time when there would be no interference with biological development. As previously mentioned the large numbers of carp should be replaced by a gamier fish. Being the Bitter Lakes unit is possessed with a means allowing full drainage at that time whatever predator control was deemed advisable could be instituted ~~at the time~~ and a good planting of trout of the rainbow or cutthroat specie introduced. The water maintains a low temperature even in the summer which would provide a fine habitat for these fish.

#### LAW ENFORCEMENT:

With the spotted unacquired land status of the refuge it has made law enforcement somewhat difficult as with some parts of the refuge unfenced trespass might result unintentionally.

However there has been little hunting within the proposed boundaries of the refuge.

USES OF THE REFUGE:

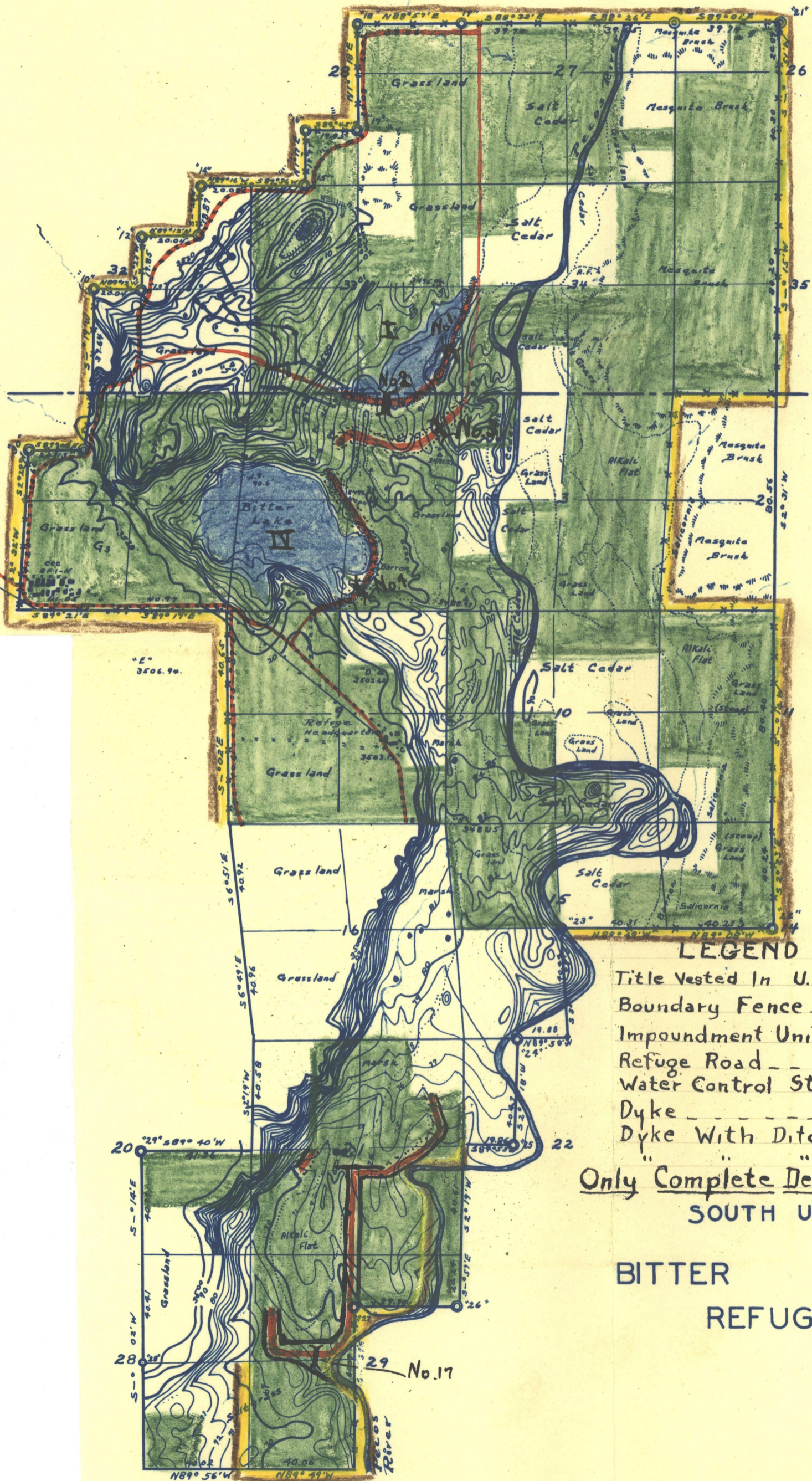
Of course the primary purpose of the refuge is the development of wildlife and conditions encouraging their utilization. On the completion of the large development program the Bitter Lakes Refuge will be able to hold its place as a fine wildlife area and at the same time it should be able to supply some revenue and resulting tax benefit to the local school and road funds. It would be very difficult to present any more than a guess in that direction as the success of the agricultural units will be somewhat problematic until the development work will allow the control of the refuge water supply for farm utilization. What effect repeated saturation with the strong water will have in successive years; however great help to be obtained in this effort by providing all areas to be easily flushed when deemed necessary. Crops of various kinds, grazing a limited amount of kattle and fur resources will be the chief source of refuge revenue as far as it is possible to determine at this time.

Respectfully submitted








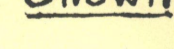
*Grant H. Shager*  
Grant H. Shager  
Refuge Manager

APPROVED: 2-17-40 -

*John C. Gatlin*  
JOHN C. GATLIN  
Regional Director.



**LEGEND**

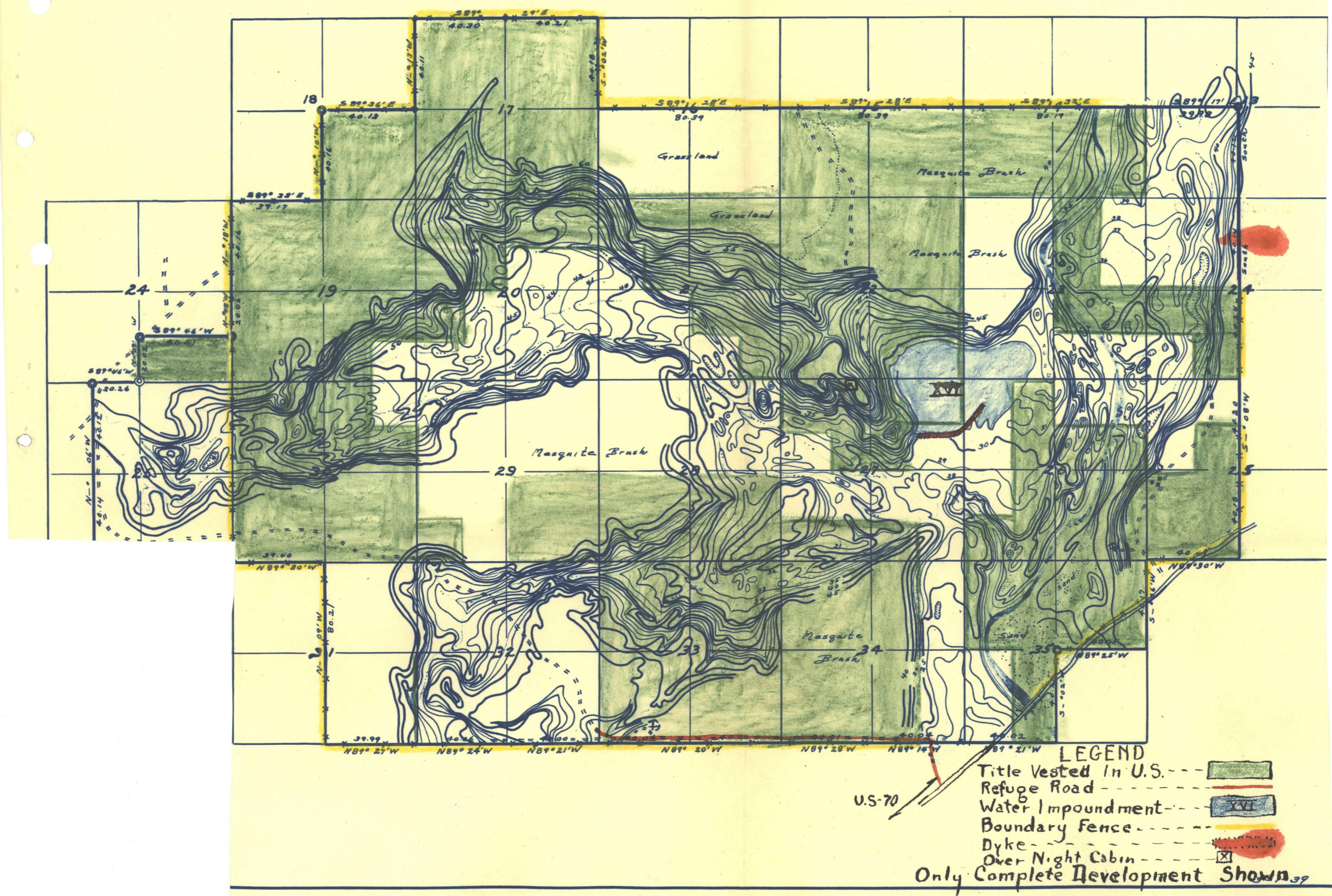
Title Vested In U.S.	-----	
Boundary Fence	-----	
Impoundment Unit No.	-----	
Refuge Road	-----	
Water Control Structure No.	-----	
Dyke	-----	
Dyke With Ditch (Single)	-----	
" " " (Double)	-----	

Only Complete Development Shown

**SOUTH UNIT**

**BITTER LAKES  
REFUGE**

# NORTH UNIT BITTER LAKES REFUGE



This image contains all information on the document.

REFUGE NARRATIVE REPORT

Bitter Lakes Migratory Waterfowl Refuge

Aug, Sept and Oct.

Climatic Conditions:

Precipitation: No rainfall occurred on the refuge during August and September. Occasional showers during the first and second week of October constituted the total precipitation for the quarter, amounting to 1.03 inches.

Temperatures: Average maximum temperatures during August and September ranged between 90 and 100 degrees with the exception of a few cloudy days. Cooler temperatures were experienced during October, maximum temperatures dropping as low as 60 degrees. The first killing frost occurred on October 30. Light frosts, however, occurred several times during the last two weeks of October.

With the exception of the first two weeks of October, there were very few cloudy days during the three month period covered by this report. North and westerly winds prevailed during September and October, but the velocity was not great.

WILDLIFE:

Waterfowl: The migratory waterfowl population increased sharply during October. An estimated population of 400 on August 1, exclusive of shore birds, increased to approximately 5,500 on October 31. The sudden decline in temperatures which occurred during the first week of October evidently affected this increase.

Flocks of sandhill cranes numbering from 20 to over 300 utilized the refuge during October. However the cranes noted only remained on the refuge for a few days after arriving, then moved to locations farther down the Pecos valley where cereal crops were plentiful. They were noted feeding on salicornia to some extent on the refuge and a few fed in the cultivated hegari field on the refuge.

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NOV 1 1938

U. S. BUREAU OF BIRD SURVEY  
ALBUQUERQUE, N. M.

Woods

Carroll v. W.

REFUGEE NARRATIVE REPORT

Bitter Lakes Migratory Waterfowl Refuge

Aug, Sept and Oct.

Climate Conditions:

Precipitation: No rainfall occurred on the refuge during August and September. Occasional showers during the first and second week of October constituted the total precipitation for the quarter, amounting to 1.03 inches.

Temperatures: Average maximum temperatures during August and September ranged between 90 and 100 degrees with the exception of a few cloudy days. Cooler temperatures were experienced during October; maximum temperatures dropping as low as 80 degrees. The first killing frost occurred on October 30. Light frosts, however, occurred several times during the last two weeks of October.

With the exception of the first two weeks of October, there were very few cloudy days during the three month period covered by this report. North and westerly winds prevailed during September and October, but the velocity was not great.

WINDS:

Waterfowl: The migratory waterfowl population increased sharply during October. An estimated population of 400 on August 1, exclusive of shore birds, increased to approximately 2,500 on October 31. The sudden decline in temperatures which occurred during the first week of October evidently affected this increase.

Flocks of sandhill cranes numbering from 20 to over 300 utilized the refuge during October. However the cranes noted only remained on the refuge for a few days after arriving, then moved to locations farther down the Pecos valley where cereal crops were plentiful. They were noted feeding on Salicornia to some extent on the refuge and a few fed in the cultivated beets field on the refuge.

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NOV 12 1938

U. S. BIOLOGICAL SURVEY  
ALBUQUERQUE, N. M.

✓  
Reported 1936 - H. L. Bennett  
1928 - W. W. Bennett

~~Survey~~  
~~notes~~  
~~that~~  
~~cancelled~~

Five lesser snow geese were noted to remain on the refuge for two weeks during October. These were the first to occupy the refuge since it was established. A few blue and Canada geese stopped on the refuge last winter but remained only a day or two.

Approximately 40 percent of the ducks now occupying the refuge are widgeon. Pintail, mallard, ruddy, and blue-winged teal constitute approximately 40 percent in nearly equal numbers, and the remaining 20 percent include shoveler, green-winged teal, gadwall, redhead, lesser scaup, a few bufflehead and cinnamon teal.

A great fluxuation in the number of birds was noted from day to day during October. This can partially be accounted for by wind action, since it was noted that fewer waterfowl occupied the refuge during windy days. Many birds concentrated on the smaller bodies of water which offered some protection from wind but many also left the refuge for more protected areas farther down the Pecos Valley.

An estimated 800 American coot occupy the refuge at the present time. From 150 to 200 avocets remained on the refuge throughout the three month period covered by this report. Other shore-birds occupying the refuge during this period include many black-necked stilts, curlew, greater yellow-legs and killdeer.

Although the marked increase in the population of migratory waterfowl indicates that the fall migration is in progress, the peak of the migratory period does not occur on the refuge until near the middle of December, based on the past two years observations.

The refuge has much more aquatic waterfowl food available this year than it had last year and it is expected that a larger number of birds will remain over the winter months this year for the above reason. Chara sp. and Ruppia maritima have reached a growth of from 12 to 30 inches in the newly ponded areas. Waterfowl are noted to be utilizing these two species heavily at the present time.

Water levels have remained constant with the exception of the Bottomless Lakes development unit, which had little water left by October 1. Since that time, however, the water supply has increased due to the rising water table and it is expected to be back to a normal level before the heavy concentration of waterfowl this winter.

Upland Game Birds: The upland game birds on the refuge are limited in species to the scale and gambel quail.

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NOV 13 1938  
U. S. GEOLOGICAL SURVEY  
WASHINGTON, D. C.

*Journal*  
*1939*

Five lesser snow geese were noted to remain on the refuge for two weeks during October. These were the first to occupy the refuge since it was established. A few blue and Canada geese stopped on the refuge last winter but remained only a day or two.

Approximately 40 percent of the ducks now occupying the refuge are wildfowl. Pintail, mallard, ruddy, and blue-winged teal constitute approximately 40 percent in nearly equal numbers, and the remaining 60 percent include show-eyes, green-winged teal, gadwall, redhead, lesser scaup, and few bufflehead and cinnamon teal.

A great fluctuation in the number of birds was noted from day to day during October. This can partially be accounted for by wind action, since it was noted that fewer waterfowl occupied the refuge during windy days. Many birds concentrated on the smaller bodies of water which offered some protection from wind but many also left the refuge for more protected areas farther down the Pecos Valley.

An estimated 800 American coot occupy the refuge at the present time. From 150 to 200 swans remained on the refuge throughout the three month period covered by this report. Other shore-birds occupying the refuge during this period include many black-necked stilts, curlew, greater yellow-legs and killdeer.

Although the marked increase in the population of migratory waterfowl indicates that the fall migration is in progress, the peak of the migratory period does not occur on the refuge until near the middle of December, based on the past two years observations.

The refuge has much more aquatic waterfowl food available this year than it had last year and it is expected that a larger number of birds will remain over the winter months this year for the above reason. Grebe, sp. and Ruddy turnstones have reached a growth of from 18 to 30 inches in the newly ponded areas. Waterfowl are noted to be utilizing these two species heavily at the present time.

Water levels have remained constant with the exception of the Bottomless Lakes development unit, which had little water left by October 1. Since that time, however, the water supply has increased due to the rising water table and it is expected to be back to a normal level before the heavy concentration of waterfowl this winter.

Upland Game Birds: The upland game birds on the refuge are limited in species to the quail and quail.

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A major portion of the quail on the refuge are located on the north unit of the refuge and on the east side of the south unit, since the best native cover, mainly mesquite and sage brush, is located on these areas. No loss of birds has been noted either by predators or adverse weather conditions and it is estimated that approximately 500 quail occupy the refuge at the present time. A covey of 35 quail occupy the CCC Camp area and have been observed using one of the garages for protection. Many coveys have been noted occupying the area between the north and south units.

There is expected to be a shortage of upland game bird food on the refuge this coming winter since the bean crop on the mesquite brush was damaged by frost last spring and few beans matured. This will necessitate some feeding. At the present time there is sufficient food available consisting of weed and various grass seed.

Fur Take: No fur has been taken from the refuge during the past three months, either by private trappers or by refuge personnel.

#### Refuge Development and Maintenance:

##### WPA Operations:

WPA operations were completed on the refuge during the month of July and no new projects have been submitted for approval up to the present time.

##### CCC Operations:

CCC operations during the past three months have been confined largely to work on the water development program and some road construction. Very little work was performed in the field during the month of October, since the camp enrolled practically a new Company of boys on October 1. Approximately 50 enrollees were detailed to Camp BS-2-NM during September for the purpose of constructing a new camp at the Bosque del Apache refuge.

Widening of the Bottomless Lakes dike has been completed and gravelled on the upstream side and top. Two concrete water control structures were constructed on this unit at designated points. A patrol road extending from the north end of this dike to the north boundary of the south unit has been graded up. Since this road crosses many drainages which empty into the Pecos River, a heavy borrow ditch was excavated with the grader on the upstream side and the road was built up at points crossing these drainages.

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There is expected to be a shortage of upland game bird food on the refuge this coming winter since the bean crop on the mesquite brush was damaged by frost last spring and few beans matured. This will necessitate some feeding. At the present time there is sufficient food available consisting of weed and various grass seed.

Turkeys: No turkeys have been taken from the refuge during the past three months, either by private trappers or by refuge personnel.

#### Refuge Development and Maintenance:

##### WPA Operations:

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This will divert a large volume of water into the Bottomless Lakes development unit during the summer months when the rainy season in this section occurs.

Some work was accomplished on the supplementary dike on the Bottomless Lakes development unit and on the Bitter Lake dike. The water control structure was completed on the Bitter Lakes dike and the old outlet channel to Bitter Lake was diked off. By plugging the outlet to Bitter Lake, the water level in the lake was caused to raise five inches during the past three weeks. It is the plan to raise the water level an additional twelve inches at least.

Construction work was started on the water structure located on the south dike and it is the plan to start impounding water in that unit on the structures completion. The Ruth dredger has been working on construction of the south dike during the entire three months and an additional two months will be required to complete the dike.

For detailed information on CCC activities, it is suggested that Mr. Campredon's narrative report be referred to.

Public Relations:

Recreational Uses: No public camp facilities have been developed on the refuge to date, and fishing and hunting have been prohibited. The number of visitors frequenting the refuge during the past three months remained about the same as the previous period. Most of the visitors are residents of Roswell or the immediate vicinity, where interest in the refuge and relating activities appears to be increasing.

Economic Use of Refuge: No haying, timber removal, grazing or share-cropping has taken place during the three months covered by this report.

The native range vegetation appears to be in much better condition than during the same period a year ago. This can be attributed to the increase in rainfall this year and to the closing of the refuge to grazing. A good seed crop of native grasses is evident, and a greater increase in the vegetative density during the coming year should be experienced.

The fifty-acre field of hegar planted and cultivated on the refuge has reached maturity and is being utilized to some extent by waterfowl and upland game birds at the present time.

Respectfully submitted,  
*A. D. Campbell*  
A. D. Campbell, Refuge Manager.

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U. S. BIRDS AND MAMMALS  
M. W. BRIDGES

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For detailed information on CCC activities, it is suggested that Mr. Campbell's narrative report be referred to.

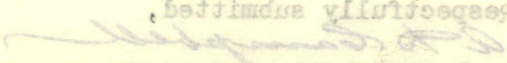
Public Relations:

Recreational Uses: No public camp facilities have been developed on the refuge to date, and fishing and hunting have been prohibited. The number of visitors frequenting the refuge during the past three months remained about the same as the previous period. Most of the visitors are residents of Roosevelt or the immediate vicinity, where interest in the refuge and relating activities appears to be increasing.

Economic Use of Refuge: No haying, timber removal, grazing or sheep-grazing has taken place during the three months covered by this report.

The native range vegetation appears to be in much better condition than during the same period a year ago. This can be attributed to the increase in rainfall this year and to the closing of the refuge to grazing. A good seed crop of native grasses is evident, and a greater increase in the vegetative density during the coming year should be experienced.

The fifty-acre field of beargrass planted and cultivated on the refuge has reached maturity and is being utilized to some extent by waterfowl and upland game birds at the present time.

Respectfully submitted,  
  
A. D. Campbell, Refuge Manager.

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REFUGE NARRATIVE REPORT

Bitter Lakes Migratory Waterfowl Refuge

May, June and July, 1939

REFUGE NARRATIVE REPORT

Bitter Lakes Migratory Waterfowl Refuge

May, June and July

Climatic conditions:

precipitation: No rainfall occurred on the refuge during May or June but during July several heavy showers fell over the area. The total precipitation during July amounted to 5.32 inches, approximately one-half of the average annual precipitation. The total precipitation since January 1st to date has been approximately 10.5 inches, well above the ten year average for the same period.

The salt Creek Valley within the refuge was flooded over three times, flood waters attaining a width of over half a mile in some sections. No damage resulted from these floods, except that the channel of salt Creek was extended by water erosion and the road to the overnight cabin on the north unit was impassible during most of the month of July.

A heavy shower on the south unit filled the Bottomless Lakes development unit to capacity and finally broke the retaining dike at the point where the water control structure was being constructed. The break was repaired the following day and the unit was filled by a similar shower during the following night.

Temperatures: Average maximum temperatures during the months of May and June were well over 95° and on several occasions reached around 110°. During the month of July, temperatures did not range as high due to the cloudy weather experienced during a greater portion of the month. Minimum temperatures ranged from 60° to 75°. Very little wind prevailed during the three months covered by this report.

Wildlife:

Waterfowl: The following numbers and species of waterfowl were on the refuge on May 1. Figures are estimated:

<u>Species:</u>	<u>Number:</u>
<i>bullygate</i> Mallard ✓	200 ✓
Widgeon ✓	150

REFUGE NARRATIVE REPORT

Bitter Lakes Migratory Waterfowl Refuge

May, June and July

Climatic Conditions:

Precipitation: No rainfall occurred on the refuge during May or June but during July several heavy showers fell over the area. The total precipitation during July amounted to 5.32 inches, approximately one-half of the average annual precipitation. The total precipitation since January 1st to date has been approximately 10.5 inches, well above the ten year average for the same period.

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Wildlife:

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Number:

200  
150

Species:

Widgeon  
Mallard

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<u>Species:</u>	<u>Number:</u>
Blue-winged Teal ✓	200
Shoveler ✓	400
<i>Scaup</i> Bluebill ✓	150
American Coot ✓	400
Ruddy Duck ✓	50
White Pelican ✓	28
Snowy Egret ✓	6
Glossy Ibis ✓	Occasional..
Bufflehead ✓	Occasional..

Large numbers of shore-birds were also present, mainly black-necked stilts, avocets, curlews, and killdeer.

During May, several black-necked stilt nests and two shoveler nests were found. Several pair of blue-winged teal remained on the refuge throughout the summer but their nests were never located. A majority of the waterfowl on the refuge as of May 1st continued migration during the first two weeks of May, those remaining did not number over 400, excluding the American coot. Practically all of those that did remain occupied the north unit of the refuge, since no development work is being carried on there at this time. Large numbers of black-necked stilts and avocets remained on the refuge throughout the summer.

The absence of a heavy population of waterfowl during this period has allowed the natural aquatic waterfowl food to attain a very good stand in certain portions of the refuge and to become established in other portions that were free of aquatic vegetation up until this year. The development unit on the north unit has become completely covered with Chara and Ruppia maritima. Last summer, when the area was newly ponded, the establishment of Chara and Ruppia seemed about equal in quantity but this year the Chara appears to be crowding out the Ruppia to some extent and attaining a much more luxuriant growth. This may possibly be due to the fact that Chara is more tolerant to the character of the water on this section of the refuge.

A few small quantities of Ruppia established in the bottomless lakes development unit on the south unit have spread satisfactorily, but the stand is not dense enough and over a large enough area as yet to yield an appreciable amount of food for waterfowl during the coming winter. The varying water level has had some adverse effect on the establishment of a dense stand. Water from the bottomless lakes drainage ditch practically petered out during May and June, causing the unit to become partially dry during that period.

It might also be mentioned that the source of water from the bottomless lakes has become less reliable and much

Number:	Species:
300	Blue-winged Teal
400	Shoveler
150	Bluebird
400	American Coot
50	Ruddy Duck
28	White Pelican
2	Snowy Egret
Occasional..	Glossy Ibis
Occasional..	Bufflehead

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less in quantity than it was last year, even though last year was considered a drier year.

No damage reports were received from the farmers in the immediate vicinity of the refuge, since very few ducks have remained in this section of the Pecos Valley.

Upland Game Birds: The upland game birds on the refuge are limited in species to the scale and gamble quail.

A major portion of the quail on the refuge are located on the north unit of the refuge and on the east side of the Pecos River on the south unit, since the best native cover, mainly mesquite, is located on these areas. No loss of birds has been noted either by predators or adverse weather conditions and it is estimated that approximately 500 quail populate the refuge at the present time. This estimate is rough, since it is very difficult to accurately estimate the number. Coveys of quail are often heard but never sighted in the heavy mesquite cover. (The number of coveys were estimated at 40 with an average of 12 to 14 per covey.) *quite guessing*

*very few*  
Very few beans were formed on the mesquite bushes this year, indicating a shortage of food for upland birds from this source during the coming winter. However, the July rains have started a luxuriant growth of weed and grass vegetation, and it is expected that a good seed crop will result even without the aid of additional rainfall.

Fur Take: No fur has been taken from the refuge during the past three months, either by private trappers or by refuge personnel.

#### Refuge Development and Maintenance:

##### WPA Operations:

*Survey note*  
WPA operations have been confined to completion of the headquarter buildings, fencing, ditching, roadwork, and the construction of the overnight cabin on the north unit of the refuge. Project 865-85-2-4 was closed down during the latter part of June. This project carried approximately 20 men. Project 565-85-2-6 was closed down during the latter part of July due to the lack of funds. This project also carried approximately 20 men and was restricted in operation to fencing, ditching, and roadwork.

Work on the adobe dwelling was completed during June by WPA. Installation of the water system was not completed before July 15th but this installation was set up under the CCC work program and completed by CCC.

construction of the Service Building was completed

less in quantity than it was last year, even though last year was considered a drier year.

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Very few beavers were found on the mesquite brush this year, indicating a shortage of food for upland birds from this source during the coming winter. However, the July rains have started a luxuriant growth of weed and grass vegetation, and it is expected that a good seed crop will result even without the aid of additional rainfall.

Four traps: No fur has been taken from the refuge during the past three months, either by private trappers or by refuge personnel.

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Construction of the Service Building was completed

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during the month of May.

The pumphouse, with the exception of installing the pipe and pump was completed during June. The CCC work program included installation of the water lines and system.

No work was done on the equipment shed by WPA during the past three months, since the completion of this building was previously turned over to CCC.

The balance of the WPA operations were confined to boundary fence construction; approximately one mile of new fence and rebuilding one-half mile of fence that was washed out by the heavy July rains. Boundary fence construction has been completed on all lands where title has been vested in the United States.

Construction of the overnight cabin on the north unit of the refuge was undertaken during this period. The cabin is located on the north side of Salt Creek; travel to the cabin was practically cut off during July, since the only route to the location at present is across the Salt Creek valley, a dry weather road. The cabin was completed, however, before the wet weather stopped work, with the exception of finishing the roof, outside and inside plastering, and pouring the floor and installing windows. No damage was done to the building by the heavy rains.

#### CCC Operations:

Most of the CCC operations have been confined to the completion of their projects on the headquarters area and the construction of dikes and ditches on the south unit of the refuge, primarily the widening of the bottomless lakes dike and the construction of the retaining dike along the south boundary. Widening of the bottomless lakes dike is being accomplished by hand labor since attempts to operate heavy equipment on this dike have failed. However, when a base has been built up by hand labor, which will support heavy equipment, trucks will be used to complete the dike.

The Ruth dredger and the R D 7 with carryall are being used to construct the south dike. Difficulty is being encountered in operating the dredger on the soft ground. The dredger is working, however, under conditions where it is impossible to operate a tractor, or any other equipment that we have on the refuge at the present time.

The CCC work projects on the headquarters area have been completed with the exception of landscaping. Work on the landscaping project is being held pending location of the proposed labor-patrolman's residence. Completed projects on the headquarters area include construction of the Equipment shed, installation of the pipe and tile lines, installation of

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during the month of May.

The pump house, with the exception of installing the pipe and pump was completed during June. The GOC work program included installation of the water lines and system.

No work was done on the equipment shed by WPA during the past three months, since the completion of this building was previously turned over to GOC.

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the parkway cable system, and installation of the water system.

For detailed information on the CCC activities, it is suggested that Mr. Campredon's narrative report be referred to.

public relations:

Recreational Uses: No public camp facilities have been developed on the refuge to date, and fishing and hunting have been prohibited. The number of visitors frequenting the refuge during the past three months have increased over the previous three-month period. Most of the visitors are residents of Roswell or the immediate vicinity, where interest in the refuge and relating activities appears to be increasing.

Economic Use of Refuge: No haying, timber removal, grazing or share-cropping has taken place during the three months covered by this report.

*with zinc*  
The native vegetation has shown a great increase in density over the past two years, more noticeable on the north unit of the refuge. This has been brought about by the protection of the area from grazing and the timely heavy rainfall during July. Sufficient rainfall occurred to insure a good seed crop of the native vegetation without further precipitation this year.

Approximately 50 acres of dwarf hegari was planted during July. Nearly one-half of this acreage was seeded before the heavy rains occurred and was damaged considerably by the rain. The remaining one-half was not planted until after the heavy rains and is coming satisfactorily. Dwarf hegari grows only to a height of about 12 inches and is within reach of nearly all species of waterfowl.

Approximately 100 pounds of wild millet were used in seeding scattered low areas on the south unit and in most cases, show good prospects of establishing a stand.

Respectfully submitted,

*A. D. Campbell*  
A. D. Campbell,  
Refuge Manager

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U. S. BIOLOGICAL SERVICE  
ALBUQUERQUE, N. M.

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For detailed information on the CCC activities, it is suggested that Mr. Campbell's narrative report be referred to.

Public Relations:

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Approximately 50 acres of dwarf hickory was planted during July. Nearly one-half of this acreage was seeded before the heavy rains occurred and was damaged considerably by the rain. The remaining one-half was not planted until after the heavy rains and is coming satisfactorily. Dwarf hickory grows only to a height of about 12 inches and is within reach of nearly all species of waterfowl.

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Respectfully submitted,

*A. D. Campbell*  
A. D. Campbell,  
Refuge Manager

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ALBUQUERQUE, N. M.

REFUGE NARRATIVE REPORT

Bitter Lakes Migratory Waterfowl Refuge

February, March and April

Climatic Conditions:

Precipitation: The total precipitation on the Bitter Lakes Refuge for the three month period included in this report did not exceed two inches. This total amount occurred during the third week of March, at which time it rained intermittently for three or four days. No rain fell during February and April. The total amount of rainfall for the three month period is considerably less than the ten year average for the same period.

Temperatures: Mild temperatures existed during the month of February and the first half of March, at which time maximum daily temperatures began rising and reached over 90° during the month of April. The last killing frost occurred during the first week in March.

Strong prevailing southeasterly and northeasterly winds carrying considerable dust occurred during March and April. It is reported that this dust was carried from parts of Oklahoma and Texas.

Wildlife:

Waterfowl: The following numbers and species of waterfowl were on the refuge on February 1. Figures are estimated:

<u>Species</u>	<u>Number</u>
Mallard ✓	6,000
Gadwall ✓	600
Widgeon ✓	2,500
Green-winged Teal ✓	600
Blue-winged Teal ✓	1,200
Shoveler ✓	1,500
Pintail ✓	600
Bluebill ✓	200
Goldeneye ✓	50
Bufflehead ✓	100
Ruddy Duck ✓	100
American Coot ✓	200

WBA

Most of the waterfowl migrated north during April with the spring migration, but more waterfowl remained on the refuge after migration this year than last year. No large concentrations of waterfowl were noted during the spring migration on the refuge, but appeared to be moving quite steadily during the latter part of March and April.

Several <sup>Brewster's</sup> Snowy Egrets, White Pelicans and a number of gulls were noted on the refuge during April. These species were not noted last year during either the spring or fall migrations. No geese occasioned the refuge during this period but large numbers of sandhill cranes would remain on the refuge several days at a time.

The following numbers and species of waterfowl were noted on the refuge during the last week in April. Figures are estimated:

<u>Species:</u>	<u>Number:</u>
Mallard ✓	200
Widgeon ✓	150
Blue-winged teal ✓	200
Shoveler ✓	400
Bluebill ✓	150
Ruddy Duck ✓	50
White Pelican ✓	28
Snowy Egret ✓	6
Glossy Ibis ✓	Occasional.
Bufflehead ✓	Occasional.

*checked  
BURN*

practically all of the available aquatic waterfowl food was utilized by the waterfowl prior to February 1. The practice of feeding was established during January and continued through the months of February and March. Wheat mixed with a small amount of corn was used for this purpose but it is believed that there was not enough of this feed available to supplement the small amount of native food for the number of waterfowl that remained on the refuge.

No reports of damage were received by the farmers in the immediate vicinity of the refuge but reports from farmers farther down the Pecos Valley indicated that large numbers of sandhill cranes were doing considerable damage. This damage, however, was not to crops left in the field but bundled grain used in the winter feeding and spring feeding of cattle and sheep. It was reported that large numbers of cranes would enter the stock feeding grounds and utilize a considerable percentage of the grain that was intended for the stock.

Upland Game Birds: The upland game birds on the refuge are limited in species to the scale and gamble quail.

A major portion of the quail on the refuge are located on the north unit of the refuge and on the east side of the south unit, since the best native cover, mainly mesquite, is located on these areas. No loss of birds has been noted by either predators or adverse weather conditions and it is estimated that approximately 500 quail populate the upland of the refuge at the present time.

Food for quail and other upland game birds is limited during the winter season on the refuge. A small amount of wheat was used in feeding at various feeding stations established on the refuge, which attracted several coveys of quail.

predatory and rodent control: The trapping of coyotes on the north unit and adjoining lands was undertaken by a Bureau trapper, under the supervision of the Division of Game Management. The exact number of coyotes taken on the refuge is not known since the trapper left without leaving this information. A large number of coyotes are known to still frequent the north unit of the refuge, however. Very few coyotes frequent the south unit of the refuge, probably due to the extensive development activities on that area.

Fur Take: No fur has been taken from the refuge within the last three months, either by private trappers or by refuge personnel.

#### Refuge Development and Maintenance:

##### WPA Operations:

Headquarters: About one-half of the WPA operations have been confined to the construction of the headquarter buildings on the refuge. These buildings are all adobe structures and consist of the dwelling, service building, equipment shed and pump-house.

Construction of the dwelling is complete with the exception of the exterior stucco-plaster, interior trim and finish, basement stairway and installation of water and light systems. Both the water and electric installations have been roughed in, however. Some pictures taken on May 10 are attached illustrating the progress on the headquarter buildings. The stucco-plaster was put on during the period May 1 to 10.

The service building has been completed with the exception of finishing the interior, hanging the garage doors and the exterior stucco. Since plaster is available on the refuge with no out-lay of cash, the interior of this building has been plastered which will aid greatly in the

Records of gmt.  
Supplies.  
C. L. Ford  
Ransom, N.M.  
Feb-25 coyotes  
Mar. 8 "  
Apr. 7-0 "

protection of the adobe bricks and add to the appearance of this building.

Since the equipment shed is to be finished with CCC labor, activities on this building have been suspended by WPA. At the time the WPA activities on the headquarters area are complete, CCC activities will resume. It is planned to finish all of the buildings on the headquarters area on or before July 1, and present progress indicates that this will be accomplished.

The pump-house is complete with the exception of pouring the concrete floor, hanging the door and windows, and applying the white coat of cement on the exterior. This building was constructed with \$28.00 worth of material to date and the total cost of material probably will not exceed \$50.00 when complete.

Fencing and dike construction: Approximately 40 miles of boundary fence have been constructed to date by WPA. About six miles of this fence was completed during the last three months.

The balance of the WPA activities were confined to clearing right-of-ways for dikes and ditches. Before dike and ditch construction is undertaken, all of the sod and grass roots are removed from the location with hand labor since it is impossible in most cases to use heavy machinery for this purpose.

#### CCC Operations:

Gravelling of the five miles of entrance road from U. S. Highway No. 70 to the refuge headquarters has been completed. No new roads have been graded up, since there is still some 15 miles of dirt road to be gravelled with the five operating dump trucks available at the camp.

The telephone line has been completed from the Santa Fe Railway right-of-way to the refuge headquarters and to Camp BF-1-N. The Army has installed a telephone in their office at the camp which is also available to the technical service.

None of the CCC work projects on the headquarters area have been completed but progress has been shown on the sewerage disposal system, water system and landscaping. The building construction has been suspended until WPA activities are complete.

Most of the CCC operations have been directed toward dike and ditch construction and considerable progress has been shown during the period covered by this report. The Ruth dredger is operated on two shifts per day and is moving on the average of 15,000 yards per month. Two R D 7 Caterpillar

tractors with rotary scrapers supplement the dredger for moving yardage. Work has been concentrated on the south development unit and the bottomless lake development unit.

It is suggested that Mr. Campredon's narrative report covering CCC activities be referred to for further information.

Public Relations:

Recreational Uses: No public camp facilities have been developed on the refuge to date, and fishing and hunting have been prohibited. Very few visitors have frequented the refuge during these three months.

Economic Use of Refuge: No haying, timber removal, grazing or share-cropping has taken place during the months covered by this report.

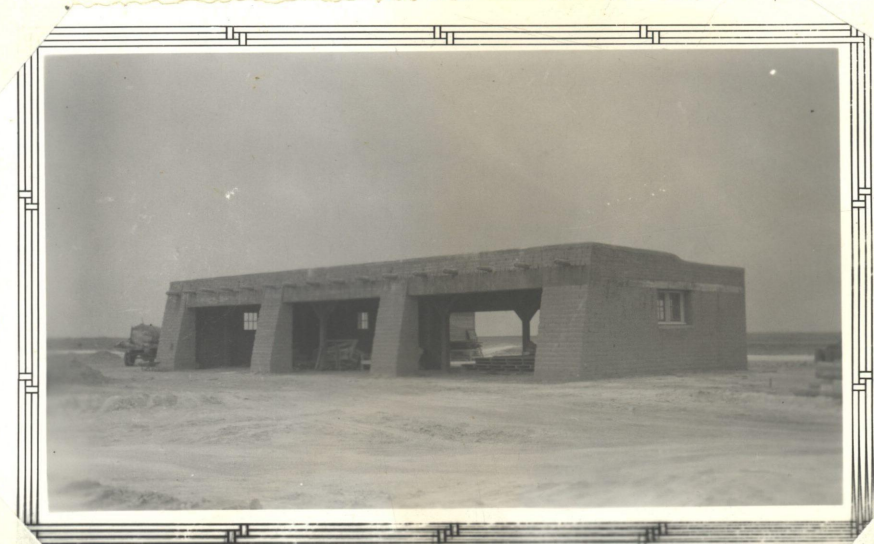
Respectfully submitted,

*A. D. Campbell*

A. D. Campbell,  
Refuge Manager



Residence, Bitter Lakes Refuge as of May,  
10, 1939



Equipment Shed, Bitter Lakes Refuge, as of  
May 1, 1939



Service Building, Bitter Lakes Refuge, as of  
May 10, 1939



Adobes for Labor Patrolman's Residence