

5.17

HABITAT MANAGEMENT PLAN

Audubon National Wildlife Refuge  
Lake Nettie National Wildlife Refuge  
McLean National Wildlife Refuge  
Audubon Wetlands Management District

Coleharbor, North Dakota

JUNE 1983

## FINDING OF NO SIGNIFICANT IMPACT

### Habitat Management Plan - Audubon NWR, North Dakota

Based on review and evaluation of the information contained in the supporting reference listed below, I have determined that the proposed Habitat Management is not a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an environmental statement on the proposed action is not required.

#### Supporting Reference

1. E A - Habitat Management, Audubon NWR
2. FEIS - Operation of the National Wildlife Refuge System
3. Habitat Management Plan, Audubon NWR, December, 1981

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Regional Director

ENVIRONMENTAL ASSESSMENT  
HABITAT MANAGEMENT PLAN  
AUDUBON NATIONAL WILDLIFE REFUGE COMPLEX  
NORTH DAKOTA

U.S. Fish & Wildlife Service  
Region 6  
Audubon National Wildlife Refuge  
Coleharbor, North Dakota

June, 1983

ENVIRONMENTAL ASSESSMENT  
HABITAT MANAGEMENT PLAN  
AUDUBON NATIONAL WILDLIFE REFUGE COMPLEX  
North Dakota

In accordance with the procedures for the preparation of environmental impact statements as they apply to the National Wildlife Refuge System (authorized by numerous Congressional Acts, National Wildlife Refuge System Administration Act - 16 USC 668 dd - 668 ee, et. al.), an environmental assessment has been performed on the following proposed action:

Habitat Management Planning on Audubon NWR Complex; Audubon NWR, Lake Nettie NWR, McLean NWR and Audubon Wetland Management District, North Dakota.

Project Description:

The project proposes a planned approach to habitat management on the Audubon NWR Complex using various techniques and methods to manipulate habitat for optimum waterfowl and other wildlife benefits.

Authored By

Randall D. Slupe  
Project Leader, Audubon NWR

June 14, 1983  
Date

## SECTION I: PURPOSE AND NEED FOR ACTION

The management of habitat is one of the most basic tools available to the wildlife manager for achieving wildlife objectives. Habitat management encompasses a wide variety of activities ranging from no intervention with natural processes to intensive manipulating of soils, water, topography and vegetative cover. Currently, on the Audubon National Wildlife Refuge Complex there are many techniques and methods used for habitat manipulation including grazing, farming, haying, mechanical disturbance (spiking, disking, etc.) and the use of chemicals to control weeds, and to encourage productivity through the use of fertilizers and soil amendments.

It is the policy of the Fish and Wildlife Service that management activities, including habitat management, which form the basis for accomplishing refuge objectives be identified, described, and approved prior to implementation. Existing habitat management plans for the Audubon NWR Complex are outdated and inadequate. It is the intent of the proposed action to implement a habitat management plan for the Complex that reflects current Service policy, philosophy, and refuge objectives.

As discussed in the Service's Refuge Manual (4 RM 3.1) the objectives of refuge management planning are:

- (1) to provide a written program of action which leads toward the achievement of approved station objectives (outputs and objective levels).
- (2) to ensure that management activities make efficient and effective use of refuge fiscal and personnel resource.
- (3) to ensure that all management activities are fully coordinated.
- (4) to communicate management decisions to higher levels of authority.
- (5) to provide management continuity by documenting management decisions and supporting information.

Habitat management on the Complex is presently being carried out with these objectives in mind. However, the program is not based on useable, written documents or plans. The proposed action, Habitat Management Plan, will provide this documentation, satisfy Service requirements and meet Service management planning objectives. (Also see 6 RM 1-9).

The lack of a Plan creates problems of continuity between managers as they come and go. It also results in a lack of an overall coordinated effort in manipulation habitat and results in an inefficient method of management. Selection of manipulation techniques is more likely to be biased and arbitrary rather than objective to accomplish specific goals and objectives for individual habitat units.

## SECTION II: ALTERNATIVES INCLUDING THE PROPOSED ACTION

### A. No Action Alternative

Under this alternative habitat management would continue to be controlled by out dated and inadequate plans. There would be no formal planning process to determine what needed to be done or how to do it, nor would there be any systematic review by higher authority.

No action would perpetuate the problems outlined in Section I. Habitat management would not necessarily reflect Service policy or objectives. Continuity between management regimes would not be possible and refuge objectives would not necessarily be realized.

It is assumed that decision making as it relates to habitat management would be sound and that impacts overall would be more beneficial than detrimental. However, without a structured planning process, documentation and evaluation, impacts would be difficult to monitor. Actions would tend to be fragmented, uncoordinated and inefficient.

The socioeconomic effects would not be significant. It is highly likely, however, that management activities would be more costly and more difficult to defend from criticism.

It is unlikely that implementation of this alternative would be likely to result in any significant controversy. The public is generally unaware and not interested in habitat management planning.

### B. Proposed Action Alternative

It is proposed to implement a Habitat Management Plan for the Audubon National Wildlife Refuge Complex. The objectives of such a plan are to meet internal requirements of the Fish and Wildlife Service, to provide continuity between managers, to make efficient and effective use of Station personnel and funds, produce a coordinated effort for managing habitat, to provide for higher authority review and approval and to provide a written program which leads to fulfillment of station objectives. The plan provides for overall guidance to meet FWS policies and objectives, while allowing for a decision making process that selects management techniques and methods most appropriate for each habitat unit on an objective basis.

The proposed action would meet the needs and satisfy the problems outlined in Section I. Whenever habitat is manipulated there are some impacts to the environment. These impacts affect the soil, water, topography and vegetative cover directly while effecting wildlife populations indirectly. The impacts may be slight and short lived as in grazing and haying or they may be severe and long lasting when such techniques as farming, spiking or discing are employed. It is assumed that the methods will be selected and used correctly to minimize adverse impacts. Overall the activities are beneficial to wildlife particularly ground nesting birds such as waterfowl and upland game. There is always the potential that any of the techniques used will be applied incorrectly. When that occurs the impacts may be considerably worse.

Socio-economic effects are judged to be slight with implementation of this alternative. To the general public little difference will be apparent compared to existing operations. Likewise, it is unlikely that significant controversy would be generated.

#### C. Seperate Planning by Activity

This alternative would implement a seperate management plan for each activity i.e. Grassland Management Plan, Cropland Management Plan, Grazing Plan, etc. The seperate plans would accomplish much of the same goals as the proposed action, but could lead to activities that are uncoordinated and conflicting.

The environmental impacts of this alternative would be similar to the proposed action. Wildlife would probably not benefit as greatly, however, because of the lack of coordination between the plans.

As with the No Action Alternative and the proposed action socio-economic effects would be minimal and little controversy would be expected.

#### D. Maximize Economic Benefits

This alternative would implement a Habitat Management Plan to maximize economic benefits to the refuge, Service and local communities. Manipulation would be carried out with accepted techniques to minimize adverse impacts to the environment, but would be done to obtain economic return rather than to produce or benefit wildlife.

The problems and needs outlined in Section I would only partially be met since refuge and Service objectives could not be met under this alternative. As far as producing coordination of activities, continuity, efficiency, etc. this alternative would accomplish those goals.

Even properly conducted this alternative would impact soil, vegetation, water and topography considerably more than other alternatives, because there would be both an increase in acres being used at any given time and the frequency of manipulation. The impact on wildlife would be severe as they would become secondary to economic return. Declines in current populations could be expected and objective levels could not be met. There would be great potential for abuse of the environment to generate even greater economic return.

Local agricultural interests would benefit considerably from this alternative. Opportunity for grazing, haying and farming would increase appreciably bringing greater monetary benefits both to the government and the local economy.

This alternative would result in significant controversy both locally and probably nationally. Hunters and conservation groups as well as other interested citizens would be very upset as wildlife become secondary to economic benefits. Legal actions to the action would be very likely.

#### E. Non-use Alternative

This alternative would prescribe non-intervention in the natural forces acting upon the various habitat types. No manipulation would be allowed and each habitat unit would be allowed to become whatever nature dictated.

Non-use throughout the Complex would not meet the needs, solve the problems or achieve the objectives identified in Section I.

Soil, water and air quality might benefit from a program of non-use. Vegetation and wildlife, however, would be adversely impacted, particularly over the long-term. Due to the small size of the units involved natural balance as it is commonly thought of could not operate. Activities on the surrounding private lands would dictate the direction the units would evolve towards. Vegetation would stagnate, be increasingly invaded by undesirable exotic species (leafy spurge, smooth brome, etc.) and productivity would decline. Wildlife populations would also decline. Current economic benefits that result from habitat manipulation (farming, grazing, etc.) would be lost as would revenue accruing to the government.

This alternative would be controversial. Local agricultural interests would be unhappy because of the economic loss, increased fire danger and untreated noxious weeds. Conservation oriented groups and hunters would be unhappy as wildlife populations declined.

Table I. Alternative Matrix. A comparison of alternatives illustrating decision process and criteria

Decision Criteria	No Action	Alternative A	Alternative B	Alternative C	Alternative D
Extent to which problems, needs & objectives would be met.	Would not meet needs or objectives at satisfactory levels.	Greatest potential for meeting needs and objectives.	Would meet some needs partially (Wildlife objectives) but not needs for continuity & efficiency.	Would not meet wildlife objectives or Service Policy. Would be efficient.	Would not meet needs or objectives.
Principle Environmental effects.	Continued degradation of vegetation. Potential for harm to soil & water.	Impacts slight and short term. Greatest benefit potential for wildlife.	Potential for abuse of soil, water & vegetation. Wildlife populations would decline.	Wildlife would be adversely effected. Potential for harm to soil, water and plants.	Soil and water would be benefited, but wildlife and vegetation would decline in productivity.
Principle Socio-economic effects.	Little change expected.	Some increase in benefits but not significant.	Some increase in benefits, but not significant.	Large increases in benefits to local interests and increase in revenue to Government.	Economic benefits would be eliminated.
Degree of Public Controversy	Little if any controversy expected.	Little if any controversy expected.	Little if any controversy expected.	Significant controversy expected from hunters and conservationists.	Significant controversy from agriculture interests, hunters and conservationists.

### SECTION III: AFFECTED ENVIRONMENT

The Audubon Wetland Management District encompasses Ward, Sheridan and McLean Counties in west central North Dakota. The Audubon NWR, Lake Nettie NWR and McLean NWR are located in McLean County. The complex of Waterfowl Production Areas and National Wildlife Refuges is administered from the Audubon NWR headquarters located approximately three miles north of Coleharbor, North Dakota along the south shore of Lake Audubon, a sub-impoundment of the Garrison Dam and Reservoir Project (Figure 1).

These management areas occupy lands that were formed by glacial activity during the last continental ice age (Wisconsin) ending from 9,000 to several hundred thousand years ago. In general the topography is characterized by gentle to rough hills on dead-ice moraine. Associated with the dead-ice moraine are numerous kames, lake plains, ice contact gravel deposits, and areas of collapsed outwash topography. This glacial moraine runs basically from northwest to southeast through the three counties. The terrain becomes more gentle to either side of the moraine known as the Missouri Coteau.

The climate of the area is one of extremes with temperatures from -40° F. in January to 100° F. in July. Precipitation averages 12 to 17 inches, increasing from west to east. The majority of the precipitation is received during the spring and summer with 60 percent of the annual average coming in the period May through August.

Ecologically the area is a transition zone from short grass prairie to the west and tall grass prairie to the east termed mid-grass prairie. Common grasses include western wheatgrass (Agrophron smithii), blue gramma (Bouteloua gracilis), green needlegrass (Stipa viridula), little bluestem (Andropogon scoparius), switchgrass (Panicum virgatum), and prairie cordgrass (Spartina pectinata). Woody species may include willow (Salix spp.), snowberry (Sumphonicarpus occidentalis), cottonwood (Populus spp.) and green ash (Fraxinus pennsylvanica). Characteristic forbs include sunflower (Helianthus spp.), pasque flower (Anemone patens), fleabane (Erigeron spp.), gumweed (Grimdelia squarrosa) and fringed sage (Artemisia frigida). A more complete list of plant species is found in refuge files.

Wildlife are characteristic of the northern great plains and include 186 species of birds, and 37 species of mammals that have been recorded on the various areas under management. Mammal and bird lists are available at the refuge office.

There are three endangered or threatened species of animals, all birds, that can be expected to be found in the three county area especially during migration periods. These are the bald eagle, peregrine falcon and whooping crane. None of these species would be expected to be affected by the proposed action. No historical, architectural, archaeological or other significant cultural resources are known to be present on any of the areas.

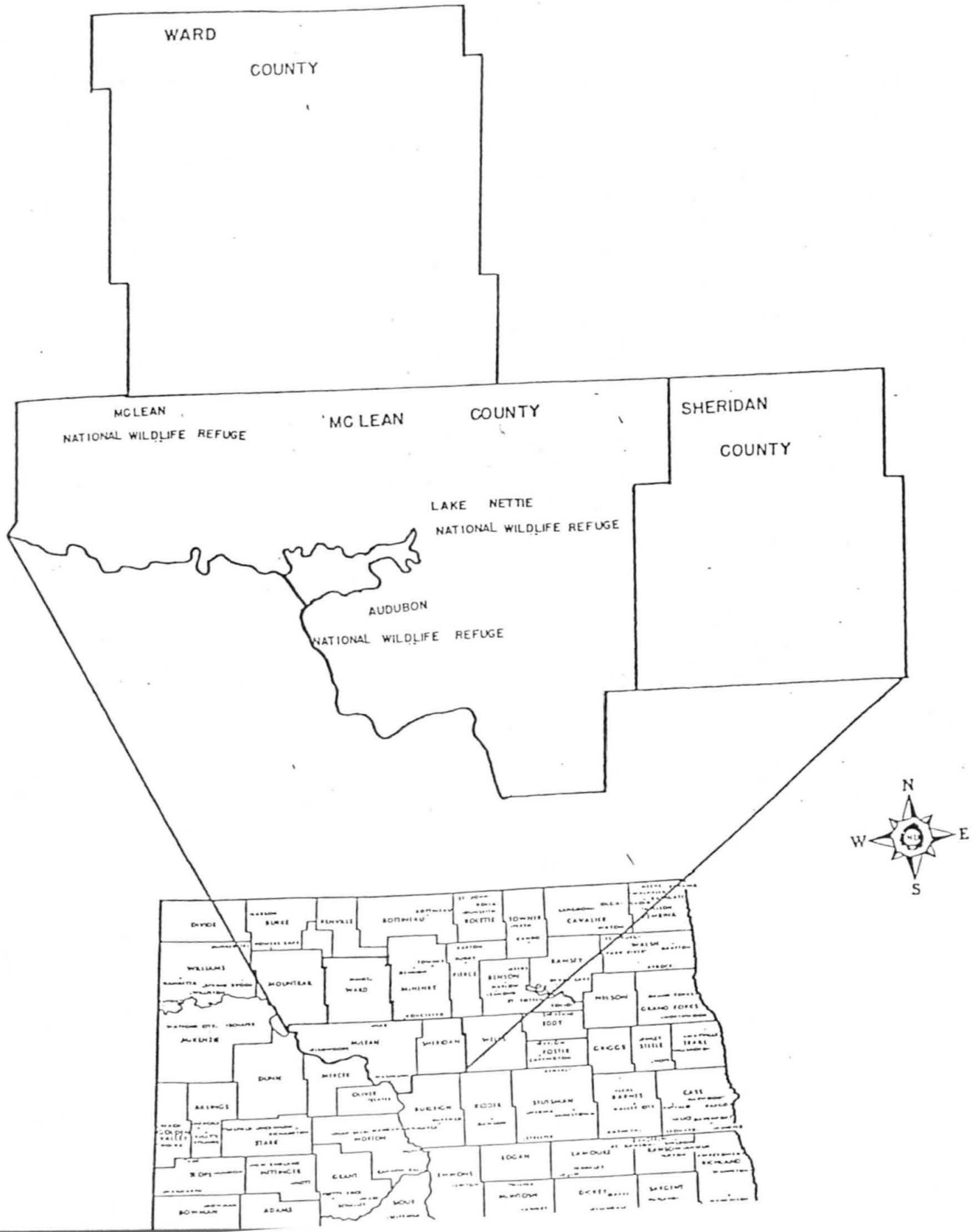
Table II presents the land type inventory for the three counties.

Table II. Land Type Inventory of Audubon NWR, Lake Nettie NWR, McLean NWR and Audubon WMD in acres.

Land Type	AREA				Totals
	Audubon NWR	L. Nettie NWR	McLean NWR	Audubon WMD	
Seasonally Flooded Basins	80	0	0	70	150
Fresh Meadows	28	732	90	0	850
Shallow Fresh Marshes	152	140	0	985	1,277
Deep Fresh Marshes	135	249	6	3,676	4,066
Open Fresh Water	10,420	0	13	1,052	11,485
Open Saline Marshes	0	0	0	560	560
Croplands	675	37	0	0	712
Native Grasslands	1,014	566	63	6,058	7,701
Restored Native Grasslands	0	0	0	251	251
Introduced Grasslands	939	139	6	556	1,640
Dense Nesting Cover	1,128	390	163	2,987	4,668
Trees	82	2	0	31	115
Brush	11	10	0	301	322
Admin. Lands	71	0	0	120	191
Streams	0	0	3	0	3
Totals	14,735	2,265	344	16,647	33,991

Figure 1 9

Audubon Wetland  
Management District,  
Audubon NWR, Lake  
Nettie NWR and McLean N



#### SECTION IV: ENVIRONMENTAL CONSEQUENCES

##### Alternative A: No Action

Currently habitat manipulation involves a variety of techniques or methods. Among those used are grazing, haying, farming, spiking and disking, prescribed burning, herbicides used for noxious weed control and chemical fertilizers. All of these techniques involve a degree of surface or subsurface disturbance to the soil and covering vegetation. Under current management special consideration is given to soil types, topography and other environmental considerations to keep disturbance to a minimal level. On native prairie communities only haying, grazing and prescribed fire are used. Native grassland are not disturbed by mechanical means. Cropland is of course a significant disturbance. All croplands managed on the complex were cropland prior to the acquisition of the areas. Units with Dense Nesting Cover require occasional disturbance to retain productivity for nesting. These units are disturbed once in every seven to eight year period. During that manipulation there are short term impacts to the soil and vegetative cover before DNC is re-established.

Control of State listed noxious weeds is mandated by State law. All personnel using chemicals are certified pesticide applicators or work under the direct supervision of a certified applicator. Great care is used to follow label directions and only pesticides approved by higher authority are used.

##### Alternative B: Proposed Action

Environmental consequences of the proposed action are very similar to those of the No Action alternative. Under the proposed action, however, a greater degree of planning is involved as well as review by higher authority of the techniques and methods used. Impacts to the environment are minimized under this alternative.

##### Alternative C: Seperate Planning by Activity

Again the environmental consequences of this alternative are similar in nature to those for Alternative A and B above. The only difference with this alternative is that each activity would be planned seperately i.e. farming, grazing, prescribed burning, etc. As a result coordination between the activities would be more difficult and impacts to the environment could be somewhat greater than either of those alternatives, although probably not significantly.

#### Alternative D: Maximized Economic Benefits

The environmental consequences of this alternative could be significant. Under this alternative current habitat management techniques that bring economic benefit to the Service and the local community would be increased and objectives would change from producing wildlife benefits to producing economic benefits. The increase in these activities would involve greater soil disturbance, loss of vegetative cover conducive to waterfowl nesting, increased human disturbance, and increased use of pesticides, fertilizers and soil amendments. There is potential to sacrifice proper management for even greater short term economic benefits that could result in significant impacts to soil, water, wildlife and other environmental consideration.

This alternative would reduce wildlife populations on and in the vicinity of each refuge and WPA in the Complex. Waterfowl production in particular would suffer. This action could establish a precedent for similar actions on other National Wildlife Refuges, subverting wildlife benefits to economic gain. It is highly likely that implementation of this alternative would generate significant controversy. Sportsmen and conservation oriented groups and individuals in general would be unhappy with the declining wildlife populations.

Maximizing economic benefits at the expense of wildlife benefits would violate the compatibility test of the National Wildlife Administration Act (16 USC 668 dd-ee). It is assumed that a proposal to implement this alternative would require a full Environmental Impact Statement.

#### Alternative E: Non-use

Periodic periods of non-use may be beneficial to many types of habitat. Long-term non-use, however, is generally counter productive, particularly for grassland communities. Soil is protected from erosion and disturbance thereby, protecting adjacent wetlands from sedimentation and degradation. However, this same action causes vegetation to decline in both vigor and productivity as litter build up cools the soil, ties up available nutrients and allows invasion of the community by exotic species that tend to form monotypic communities.

In general wildlife use and productivity declines on habitat managed under a non-use regime.

The current economic benefits realized by local agricultural interests and the revenue accruing to the Service would be eliminated. This could cause considerable controversy by these interests. Sportsmen and conservation groups would also be unhappy over the decline in wildlife. It is also highly likely that depredations on private land adjacent to the various units would greatly increase under non-management of habitat, because of the decline of foods on the units.

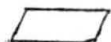
## SECTION V: CONSULTATION AND COORDINATION WITH OTHERS

Consultation and coordination during planning for this Environmental Assessment and the proposed Habitat Management Plan have been carried out with the following agencies and organizations:

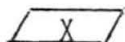
J. Clark Salyer NWR  
Arrowwood NWR Complex  
Des Lacs NWR Complex  
FWS Denver Regional Office  
Corps of Engineers (Riverdale)  
North Dakota Game & Fish Department

## SECTION VI: CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained in this document, I find that implementation of the proposed action



would constitute an action significantly affecting the quality of the human environment and, therefore, recommend an EIS be prepared.



would not constitute an action significantly affecting the quality of the human environment and, therefore, recommend a Finding of No Significant Impact (FONSI) be prepared.

Ronald W. Dwyer

Project Leader

6/14/83

Date

\_\_\_\_\_  
Regional Office Reviewer

\_\_\_\_\_  
Date

HABITAT MANAGEMENT PLAN  
AUDUBON NATIONAL WILDLIFE REFUGE COMPLEX  
Coleharbor, North Dakota

Audubon National Wildlife Refuge  
United States Department of the Interior  
Fish and Wildlife Service  
Region 6

June, 1983

Submitted by,

Ronald D. Shupe  
Ronald D. Shupe, Project Leader

6/14/83  
Date

Review and Approvals

\_\_\_\_\_  
Refuge Supervisor, ND

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Date

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Regional Director

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Date

## TABLE OF CONTENTS

	<u>Page</u>
I. Introduction .....	1
II. Objectives .....	5
III. Habitat Inventory and Description	
A. Refuges .....	6
1. Wetlands .....	11
2. Croplands .....	11
3. Grasslands .....	11
4. Other Lands .....	11
B. Wetland Management District .....	11
IV. Habitat Management	
A. Wetlands .....	13
B. Croplands .....	14
C. Grasslands .....	19
1. General Consideration .....	19
2. Management Options and Techniques .....	20
3. Selection of Options and Techniques .....	22
4. Annual Planning .....	23
D. Forest .....	23
E. Selection of Cooperators and Permittees .....	26
V. Records and Evaluation .....	27
Amendments and Revisions .....	28

## LIST OF FIGURES AND TABLES

### Figures

1. Location Map .....	2
2. Physiographic Map .....	3
3. Location Map (Audubon NWR) .....	7
4. Location Map (Lake Nettie NWR) .....	8
5. Location Map (McLean NWR) .....	9
6. Siphon System .....	15
7. Annual Grassland Manipulation Form .....	25

### Tables

1. Habitat Inventory for Refuge Fee Title Lands .....	10
2. Habitat Inventory for WPA .....	12
3. Farm Unit Location .....	17
4. Grassland Inventory .....	19
5. Grassland Manipulation Matrix .....	24
6. Habitat Measurement Techniques .....	29

## LIST OF EXHIBITS

1. Letter of Understanding
2. Habitat Management - Audubon NWR
3. Habitat Management - Lake Nettie NWR
4. Habitat Management - McLean NWR
- 5a. Daubenmire Canopy-Covered Measurement
- 5b. Key Species Canopy-Covered Measurement
- 5c. Modified Robel Method for Measurement Vegetation
- 5d. Photo Point Record
- 5e. Narrative Description of Vegetative Condition

## HABITAT MANAGEMENT PLAN

### AUDUBON NATIONAL WILDLIFE REFUGE COMPLEX

#### I. INTRODUCTION

The Audubon National Wildlife Refuge Complex, located in west central North Dakota, consists of three fee title National Wildlife Refuges, five easement refuges, 81 Waterfowl Production Areas and 1,169 wetland easements in three counties, McLean; Sheridan and Ward. This management plan is concerned with habitat management on the fee title lands only. Since the refuge and wetland easements are on privately owned land, no direct habitat management is possible.

The refuges and WPA's comprise approximately 34,000 acres as follows:

Audubon NWR	14,735
Lake Nettie NWR	2,265
McLean NWR	344
McLean WPA's	4,436
Sheridan WPA's	6,843
Ward WPA's	5,368
Total Acres	33,991

The three refuges are all within McLean County while the WPA's are situated throughout the three counties. The complex is administered from the Audubon NWR headquarters, three miles north of Coleharbor (Figure 1).

Physiographically the three counties administered from the Audubon Complex are divided into three types from west to east; Coteau Slope, Missouri Coteau and Drift Prairie. This configuration is shown in Figure 2. Descriptively the Coteau Slope is characterised by moderate relief, generally less than 25 feet locally, but greater near some deeper valleys. These valleys carry intermittent streams over the slope to the Missouri River. Maximum elevations range from 2,000 feet to 2,400 feet at the west edge of McLean and Ward Counties.

The Missouri Coteau is an area of high local relief averaging 25 to 30 feet between lows and adjacent highs. The topography is characterised by numerous sloughs, lakes and rolling hills. Elevations range from 1800 to 2200 feet. The Drift Prairie is relatively level to gently undulating plains with many shallow depressions. Elevations average 1600 feet.

The land forms were created from glacial action occurring from 2,000 to 10,000 years ago at the time of the last continental ice sheet, the Wisconsin. Much of the soils are derived from this glacial action and the various types of moraines left by the receding ice. The Coteau Slope is basically covered by ground and sheet moraine and dead-ice moraine characterising the Missouri Coteau. The Drift Plain is covered by shallow glacial drift.

Figure 1. Location of Audubon NWR Management Complex, North Dakota.

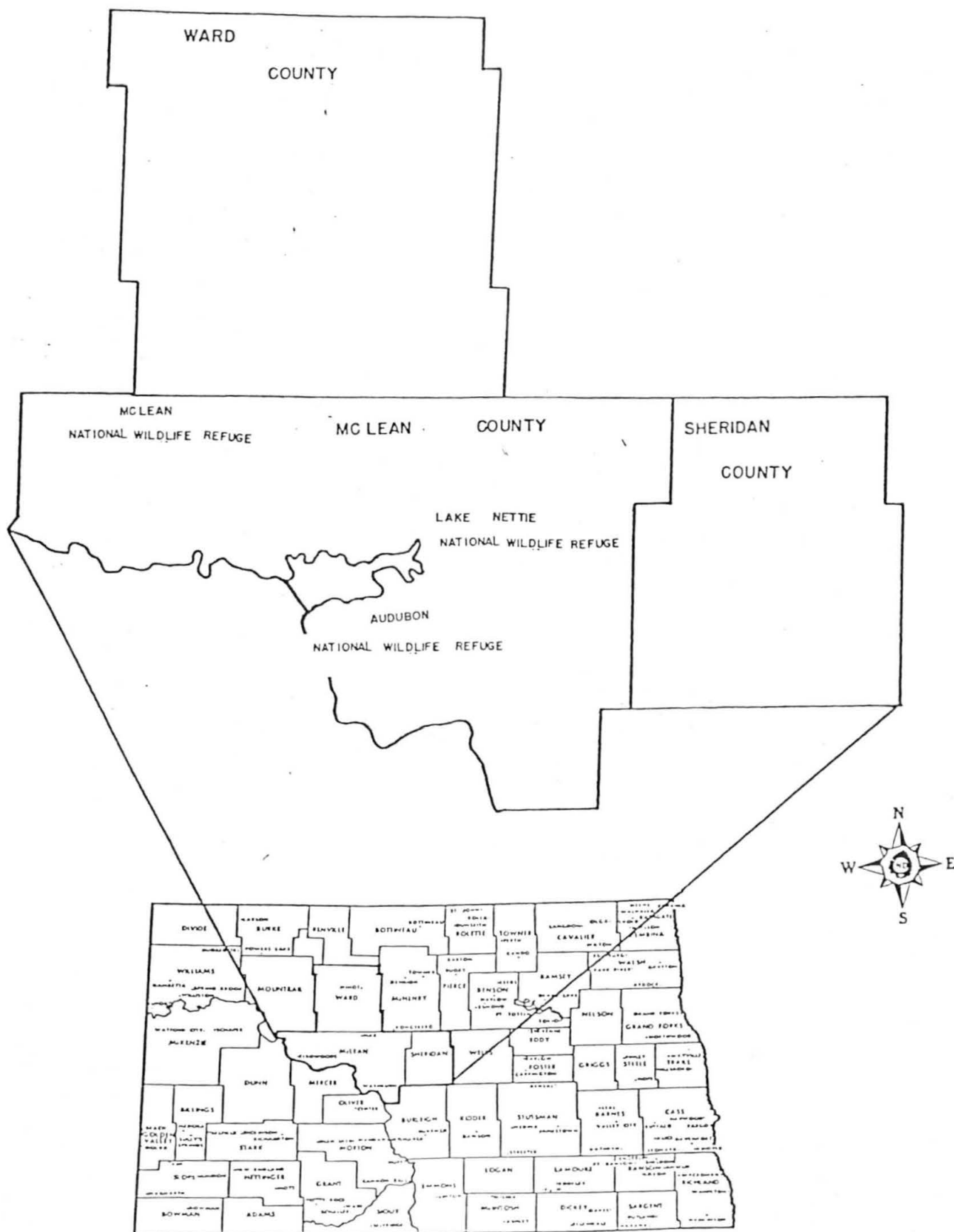
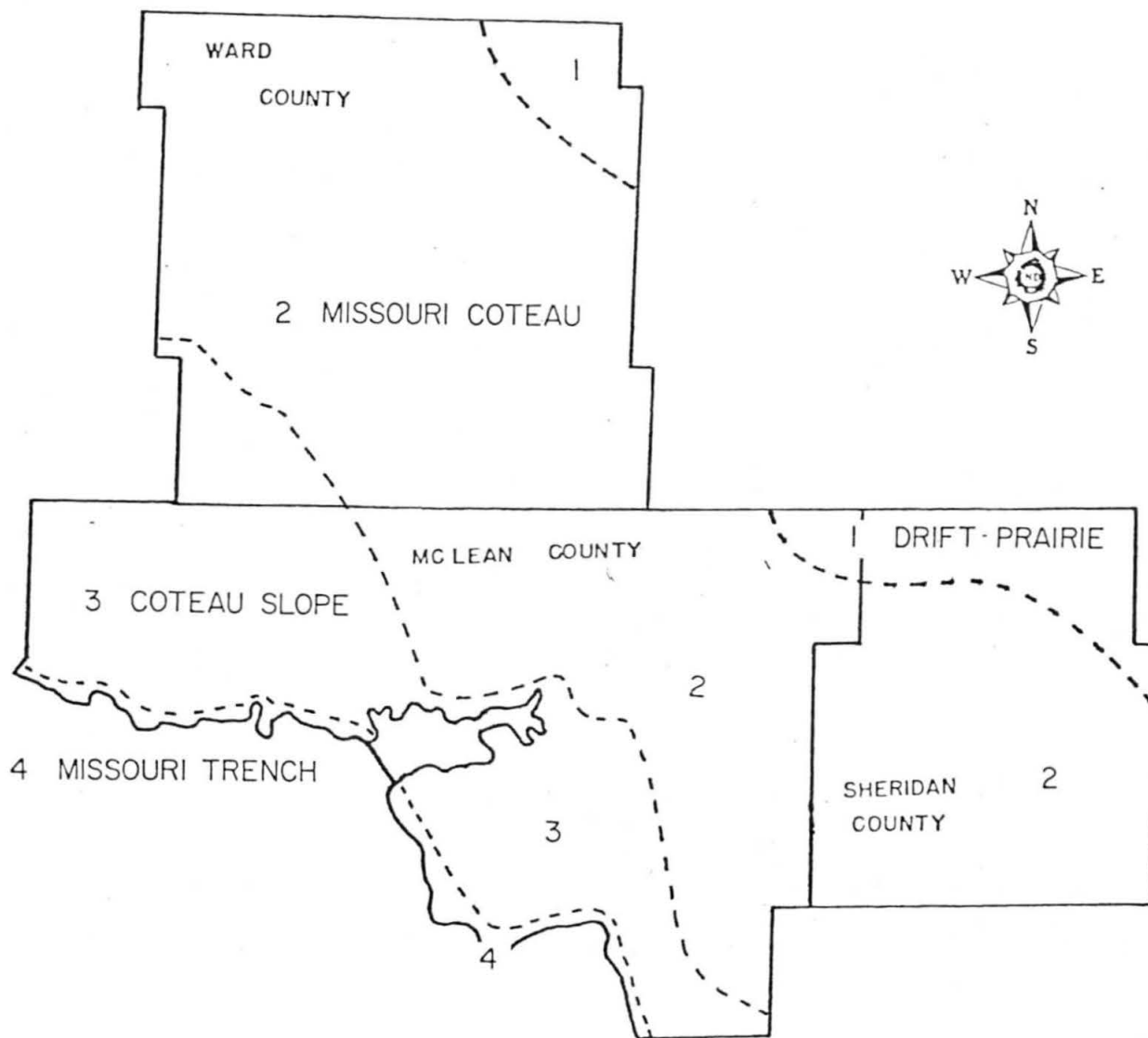


Figure 2. Physiographic map of Sheridan, McLean and Ward Counties North Dakota.



- 1 DRIFT PRAIRIE
- 2 MISSOURI COTEAU
- 3 COTEAU SLOPE
- 4 MISSOURI TRENCH

The soils formed from this glacial material belong to the Chestnut and Chernozem soil groups characterised by an accumulation of calcium salts at depths of 14 to 36 inches. The depth of this calcium zone varies due to annual average precipitation and is shallower to deeper from west to east within the District. Detailed soil surveys are available for Ward and McLean Counties. Sheridan County will have a survey available by 1985. These surveys are an integral part of the planning process in habitat management as they relate to productivity and soil erosion potential.

The climate of the three county district is characteristic of the Northern Great Plains i.e. one of extremes; hot summers and cold winters. Temperatures of over 100° F. during July and below -20° F. in winter are common. Annual precipitation averages 14 to 18 inches increasing from west to east. Sixty-one percent of the annual precipitation occurs from May through August with June and July the wettest months (37 percent). The warm summer temperatures accompanied by adequate rainfall are conducive to high vegetative growth.

The District is within the geographic area known as the Great Plains stretching from Canada into Mexico and classified vegetatively as mixed grass prairie; a transition zone between the short grass prairie to the west and the true or tall grass prairie to the east. The native prairie within most of the District is dominated largely by cool season grasses with warm season species becoming more abundant in the eastern part of the District. There are two other types of grassland communities within the District; tame or introduced grasslands and dense nesting cover (DNC). The introduced or tame grasslands are largely composed of smooth brome (Bromus inermis), crested wheatgrass (Agropyron cristatum) and Kentucky bluegrass (Poa pratensis) in varying composition. The DNC areas are tall wheatgrass (Agropyron elongatum), intermediate wheatgrass (Agropyron intermedium) alfalfa (Medicago sativa) and yellow sweet clover (Melilotus officinalis).

Grasses of the native prairie are mainly blue grama (Boutelona gracilis), needle-and-thread (Stipa comata), green needlegrass (Stipa viridula), porcupinegrass (Stipa spartea), western wheatgrass (Agropyron smithii), little bluestem (Andropogon scoparius) and big bluestem (Andropogon gerardii) with lesser abundance of switchgrass (Panicum virgatum) and Indian grass (Sorghastrum nutans).

Major forb species include Astragalus spp., heath aster (Aster ericoides), Penstemon sp., western yarrow (Achillea millefolium), silver-leaf scurfpea (Psoralea argophylla), herbaceous sage (Artemisia glauca) and dotted gayfeather (Liatris punctata). Woody species include fringed sage (Artemisia frigida), green sage (Artemisia campestris), western snowberry (Symphoricarpos occidentalis), buffaloberry (Shepherdia canadensis), willow (Salix sp.) and cottonwood (Populus sp.).

Wetlands of all types and sizes from the 10,500 acre refuge portion of Lake Audubon down to one-tenth acre seasonal ponds dominate the landscape. Approximately 54 percent of the fee title holdings are wetlands with the remainder primarily grasslands of one type or another.

## II. OBJECTIVES

The primary objectives of the refuge Complex are the production of migratory waterfowl and maintenance and enhancement of migration habitat for ducks and geese. Secondary objectives include production of migratory non-game birds, protection and enhancement of non-migratory wildlife species, environmental education, wildlife/wildlands oriented recreation, where compatible with the primary objectives, and the protection and enhancement of natural ecological communities. Habitat management is a critical function necessary to meet these objectives.

Refuge habitat management is aimed at achieving the primary objectives i.e. waterfowl production and migration habitat. In turn habitat managed for production and migration contribute considerably in meeting secondary objectives as well. There are basically four types of habitat that are managed with differing objectives for each type. These are wetlands, grasslands, croplands and tree plantings.

In general wetlands within the complex are naturally occurring with little opportunity for management. Lake Audubon (10,420 acres) is controlled by the Bureau of Reclamation for the Garrison Diversion Project and is not available for management. In general the remaining wetlands will be managed as natural conditions of drought and precipitation dictate. The natural wetlands are generally at the mercy of the whims of nature. The exceptions are Lake Suzy on McLean NWR and some of the wetlands adjacent to Lake Audubon where some management is possible due to a series of siphons. On those areas the concerned wetlands will be managed to encourage use by ducks and geese through the nesting, brood rearing and migration seasons. On the Wetland Management District opportunities for restoring drained wetlands, and creating new wetlands will be constantly looked for and achieved.

There are basically three types of grasslands within the overall habitat type; native, introduced and dense nesting cover (DNC). The objective for native prairie is to achieve a range condition in the good to excellent category based on standard Soil Conservation Service guidelines. This standard is based on natural ecological succession of vegetation according to range site, soils, slope, aspect and precipitation with other limiting factors considered. The objective for both the introduced grassland community and dense nesting cover plantings is to maintain the units in a state of optimum vegetative productivity and vigor. This optimum condition is variable among the units according to the actual potential of the soil and other variables such as precipitation and topography.

Croplands are managed on the Complex to meet three objectives: provide food for migrating birds, reduce depredations by geese and ducks on adjacent private lands and to a much lesser degree provide a food source for resident wildlife.

With the arrival of the white settlers on the Dakota plains almost any tree became a welcome one. As a result many of the trees we have now were planted around homesteads. With the great drought of the 1930's tree plantings received even greater emphasis to control soil erosion and provide resident wildlife habitat. From a waterfowl management point of view tree plantings have little benefit and may in fact be detrimental because they provide habitat for predators. For resident species they are beneficial in providing cover. In general existing tree plantings will be allowed to remain, but no new plantings will be undertaken without careful thought and justification. Naturally occurring trees will be encouraged.

### III. HABITAT INVENTORY AND DESCRIPTION

Much of the native prairie in west central North Dakota has been broken for cropland during the last one hundred years. As a result in many areas native prairie has been reduced to remnant tracts scattered amongst cropland. The Missouri Coteau still has considerable unbroken prairie due to the unsuitable soils and topography. Even in this area, however, prairie is being broken as economic pressures encourage farmers to plant everything they can. Much of the fee title lands administered from this office are a mixture of native prairie, retired croplands and tame pasture.

#### A. Refuges

The three fee title refuges are all located in McLean County. Acquisition occurred in the mid 1950's through mid 1960's. Audubon NWR, the largest of the three, is a mitigation area superimposed on the Corps of Engineers Garrison Dam and Reservoir Project. Lake Audubon is separated from the rest of Garrison Reservoir by an earth-fill embankment and is intended to serve as the principle supply reservoir for the Bureau of Reclamation's Garrison Diversion Irrigation Project. The Service has no control over the water levels in Lake Audubon. There is an Agreement between the FWS, COE, BR and State Game and Fish regarding fluctuations and timing of both releases from Lake Audubon and replenishment through BR's Snake Creek Pumping Plan. (See Exhibit 1).

Both Lake Nettie NWR and McLean NWR were begun in the 1930's as hunting and flowage easement refuges. Subsequently fee title acquisition occurred in the 1960's with both areas now being a mixture of fee title and easement lands. Figures 3, 4 and 5 illustrate the three refuges. Table 1 shows the habitat inventory for these areas. Exhibit 2-4 at the back of this plan illustrate the habitat types and the locations for the three fee title refuges. Refuge files also contain detailed habitat inventory for each area.

# AUDUBON NATIONAL WILDLIFE REFUGE

UNITED STATES  
DEPARTMENT OF THE INTERIOR

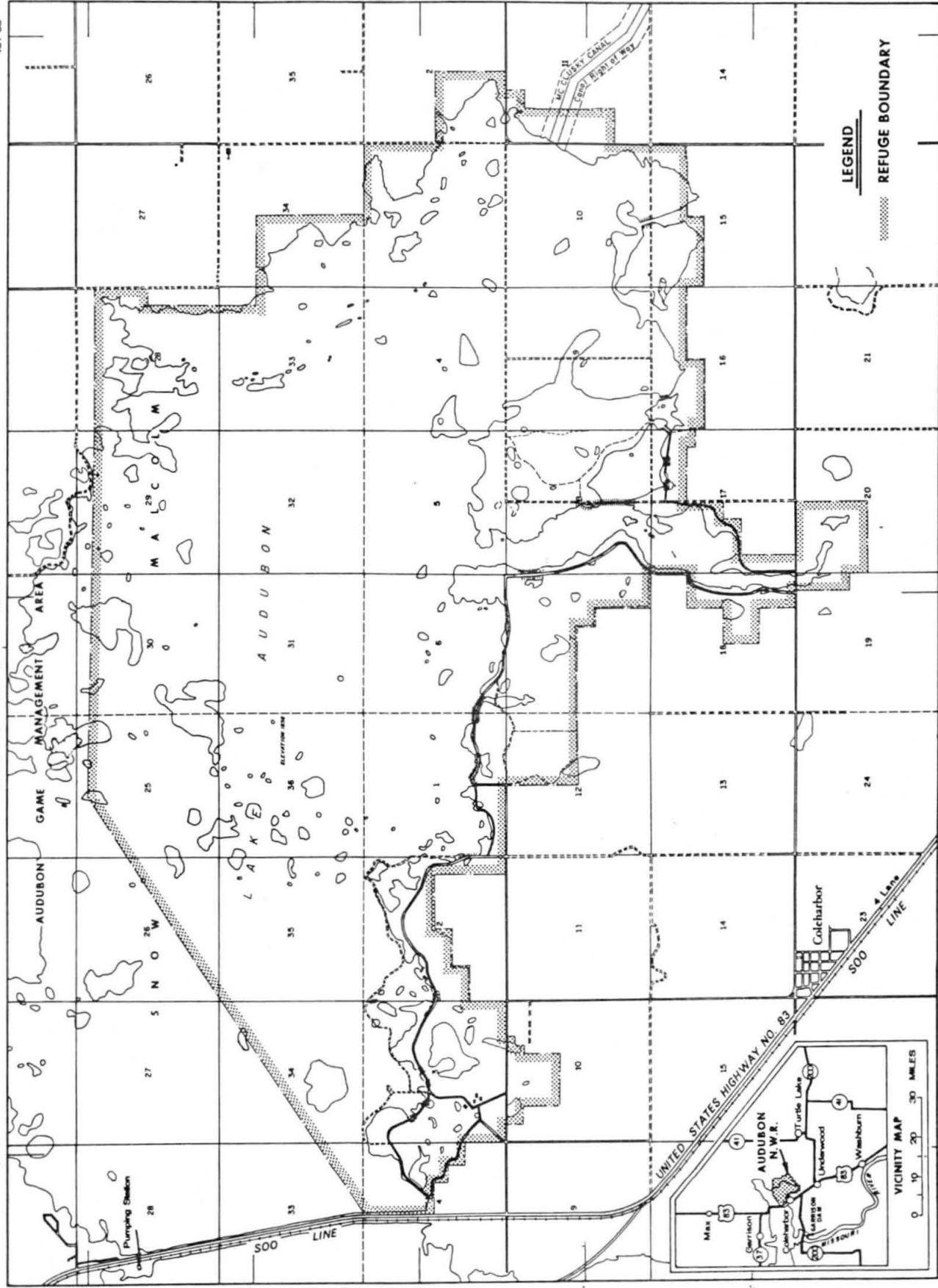
MC LEAN COUNTY, NORTH DAKOTA

UNITED STATES  
FISH AND WILDLIFE SERVICE

R.83 W. R.82 W. 101°10'

101°15'

101°05'



LEGEND  
REFUGE BOUNDARY

R.83 W. R.82 W. 101°10'  
FIFTH PRINCIPAL MERIDIAN

101°15'

COMPILED IN SURVEYS AND MAPS FROM  
SURVEYS BY USGS AND USFWS

DENVER, COLORADO NOVEMBER, 1976  
REVISED: APRIL 1981



12°  
True North  
Magnetic N  
MEAN  
DECLINATION  
1975

6R N.D. 487 403

Figure 3

# LAKE NETTIE NATIONAL WILDLIFE REFUGE

Figure 4

UNITED STATES  
DEPARTMENT OF THE INTERIOR

MC LEAN COUNTY, NORTH DAKOTA

UNITED STATES  
FISH AND WILDLIFE SERVICE



R.81.W.  
R.80.W.

20

21

22

29

28

27

LAKE

NETTIE

MARSH POOL

33

34

## LEGEND

REFUGE BOUNDARY

8 County Road

32

True North  
Magnetic N  
12°  
MEAN  
DECLINATION  
1975

T.148.N.

T.147.N.

FIFTH PRINCIPAL MERIDIAN

# MC LEAN NATIONAL WILDLIFE REFUGE

Figure 5

UNITED STATES  
DEPARTMENT OF THE INTERIOR

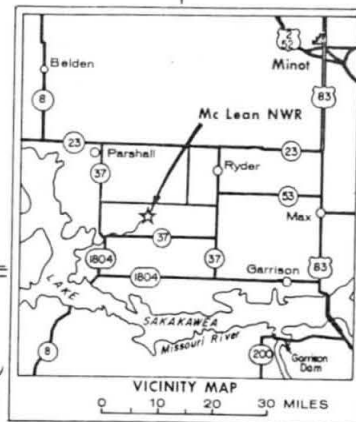
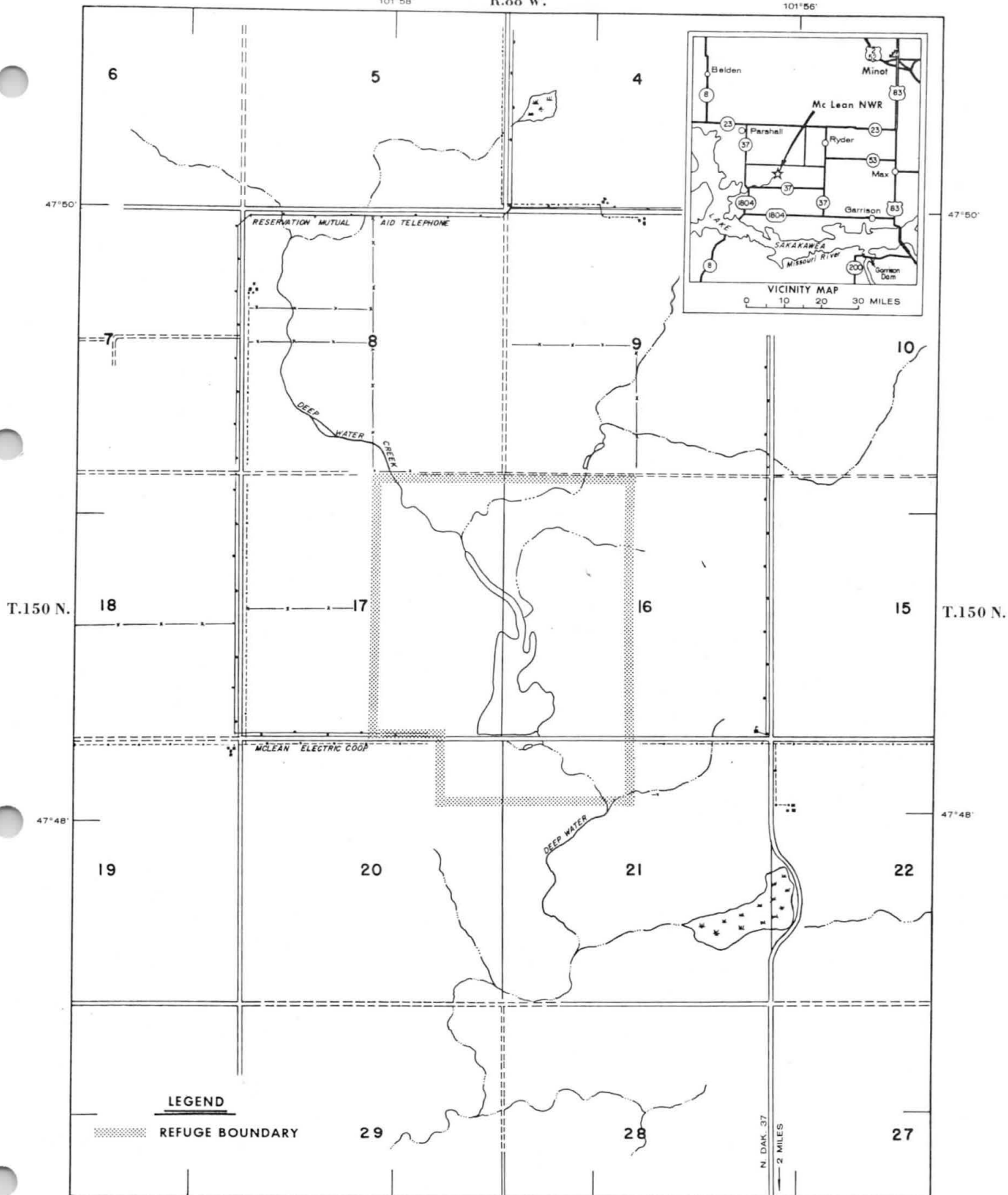
MC LEAN COUNTY, NORTH DAKOTA

UNITED STATES  
FISH AND WILDLIFE SERVICE

101°58'

R.88 W.

101°56'



## LEGEND

REFUGE BOUNDARY

COMPILED IN THE DIVISION OF REALTY  
FROM SURVEYS BY THE BLM, USGS  
AND USFWS

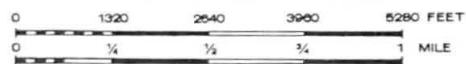
DENVER, COLORADO DECEMBER, 1976

101°58'

R.88 W.

101°56'

FIFTH PRINCIPAL MERIDIAN



True North  
Magnetic N  
12°

MEAN  
DECLINATION  
1975

6R N.D. 314 403

Table I. Habitat inventory for refuge fee title lands, Audubon NWR Complex in acres.

Habitat Type	Audubon NWR	Lake Nettie NWR	McLean NWR	Totals
*Emergent wetland, temporarily flooded, Fresh (Type I)	80			80
Emergent wetland, saturated Fresh (Type II)	28	732	90	850
Emergent wetland, semi-permanently flooded, fresh (Type III)	152	140		292
Emergent wetland, permanently flooded, fresh (Type IV)	135	249	6	390
Aquatic bed, permanently flooded, fresh (Type V)	10,420		13	10,433
Total Wetland Acres	10,815	1,121	109	12,045
Cropland	675	37		712
Native Grassland	1,014	566	63	1,643
Introduced Grassland	939	139	6	1,084
Dense Nesting Cover	1,128	390	163	1,681
Trees	82	2		84
Brush	11	10		21
Administration Lands	71			71
Rivers/Streams			3	3
Total Upland Acres	3,920	1,144	235	5,299
Total Habitat Acres	14,735	2,265	344	17,344

\*Wetland classification from "Classification of Wetlands and Deepwater Habitats of the United States", Cowardin, et. al. FWS/OBS-79/31, 1979.

## 1. Wetlands

As indicated in Table I wetlands comprise the majority of acres managed from this office on the refuges, with Lake Audubon accounting for over 60 percent of the total acreage and nearly 87 percent of the wetlands acreage. Except for Lake Audubon and Lake Suzy the wetlands are typical of the prairie pothole region. They are cyclic in nature, full in some years and dry in others. This hydrologic cycle is natural and very important to waterfowl. Periodic drying allows for nutrient recycling and when wet once more provides an abundant food source for waterfowl and other migratory birds.

## 2. Croplands

Nearly all of the permanent cropland is located on Audubon NWR. There is one field of 37 acres on Lake Nettie NWR that is intermittently used for crop production. In addition to the permanent acres approximately 500 acres annually may be in cropland for DNC or other grassland reestablishment on the three fee title refuges and WPA's.

## 3. Grasslands

Table I gives the accounting for the basic three types of grassland on the refuges. The introduced grassland is primarily composed of smooth brome, crested wheatgrass and Kentucky bluegrass of varying composition. The DNC category also includes a few acres of planted native grasses. In the future as we plant more natives, where appropriate, a fourth category may be appropriate.

## 4. Other Lands

This general category includes roads and trails, building and storage areas, tree and brush plantings and three acres of intermittent stream at McLean NWR, approximately 180 acres total.

## B. Wetland Management District

The three county WMD encompasses 81 units totalling 16,646 acres. There is quite a bit of variation between the units as to habitat types, wetland complexes and soil types as would be expected in such a large area covering three distinct physiographic units. The Coteau is represented by the largest concentration of WPA's with fewer units to either side, Missouri Slope and Drift Prairie. Table 2 gives the habitat type breakdown by county. With 81 areas it is not possible to include a habitat map for each area. The reader is referred to the refuge files for specific, detailed habitat information for individual WPA's.

Table 2. Habitat inventory for Waterfowl Production Areas, Audubon Wetland Management District in acres.

Habitat Type	McLean County	Sheridan County	Ward County	Totals
*Emergent Wetland, temporarily flooded, fresh (Type I)	16	29	29	70
Emergent wetland, saturated, fresh (Type II)	0	0	0	0
Emergent wetland, semi-permanently flooded, fresh (Type III)	236	404	345	985
Emergent wetland, permanently flooded, fresh (Type IV)	882	1,507	1,287	3,676
Aquatic bed, permanently flooded, fresh (Type V)	252	432	368	1,052
Unconsolidated bottom, permanently flooded, Eusaline (Type XI)	134	230	196	560
Total Wetlands	1,520	2,602	2,221	6,343
Native Grasslands	1,921	2,437	1,700	6,058
Restored Native Grasslands	13	32	206	251
Introduced Grasslands	43	290	223	556
Dense Nesting Cover	867	1,227	893	2,987
Trees	8	15	8	31
Brush	34	187	80	301
Administrative Lands	30	53	37	120
Total Uplands	2,916	4,241	3,147	10,304
Grand Total	4,436	6,843	5,368	16,647

\* Wetland Classification from "Classification of Wetlands and Deepwater Habitat of the United States". Cowardin, et.al. FWS/OBS - 79/31, 1979.

#### IV. HABITAT MANAGEMENT

Habitat management for the purpose of this plan may be defined as the purposeful, deliberate and judicious manipulation of water, soil and vegetation to achieve defined objectives for the benefit of wildlife and humans. The overriding objectives of the Audubon Complex are waterfowl production and enhancement of migration habitat for waterfowl. Therefore, we are obligated to manipulate the public lands that we administer in such a manner (purposeful, deliberate and judicious) that those objectives are achieved. Habitat management is not a static endeavor. If properly done it is always changing to reflect innovation, needs and new information. We will never reach a point where the manager can sit back and reflect on a finished job. This is as it should be, because what we are managing wildlife for is people and their needs which are always changing. In this section we will present the relationship between the different habitat types and refuge objectives. Manipulation techniques will be discussed and the processes by which the manager may choose the appropriate technique to achieve the desired result.

In general the Service policies and guidelines for habitat management are contained in Chapter 6 of the Refuge Manual. In addition station files contain Regional Office memos and directions regarding specific policies and guidelines applicable to this Region and North Dakota. The manager shall be familiar with the contents of these references and incorporate them into the management process.

##### A. Wetlands

Wetlands are the backbone of the waterfowl objectives for the Complex. Except for Lake Audubon and Lake Suzy they are naturally occurring and dependent on the vagaries of nature for management. Our management policy for these naturally occurring wetlands will be to recognize the importance of the natural hydrologic wetland dry cycle and the role it plays in waterfowl and other wildlife management. The periodic dry cycles may be detrimental in the short term to wildlife, particularly waterfowl, but in the long term drying out is very important in nutrient recycling and aquatic vegetation management. The manager should resist the urge to provide a consistent water supply unless a specific objective is formulated, whereby continuously full wetlands is the only alternative to meet a specific high-priority need. For Lake Audubon, Lake Suzy and potentially Lake Nettie, where some water management is possible and perhaps unavoidable, different guidelines are appropriate.

Lake Audubon, as mentioned earlier in this report, is the main supply reservoir for the Garrison Diversion Project. As such the refuge has virtually no control in its management. Therefore, it is not considered in this plan. Adjacent to Lake Audubon, however, are a series of natural wetlands where under certain circumstances water may be added by means of five siphons through dikes. In addition there is a temporary pumping

site and 12 inch culvert installed to divert Lake Audubon water to a 40 acre natural marsh. Figure 6 shows the location of the siphon facilities and the wetlands they can serve. The philosophy behind the siphons and pump site is that under severe, area wide drought conditions water can be transferred to these areas to provide minimal habitat where otherwise there would be none. However, keeping these wetlands wet when they would naturally be dry would negate the benefits of periodic drying and eventually productivity would decline. There is no black and white solution to this dilemma. The manager must decide whether or not to let these wetlands dry out or keep them wet based on what is best for the resource. It is recommended that if it is decided to add water it be done in the late summer or early fall for migration habitat and let them dry through the summer for partial drying benefits. It is also proposed that a series of seven small, simple water control structures to installed on the subject wetlands to allow more flexibility. With the structures the wetlands could be either filled or allowed to dry out as desired. Figure 6 shows the recommended location of these structures.

Lake Suzy on McLean NWR is formed by an earth fill dam with a masonry rubble spillway. The spillway is scheduled for replacement in 1983. The new structure will have a control structure to allow periodic draw down for nutrient recycling and vegetation management. It is proposed that the impoundment be drawn down approximately every five years and left dry for at least one full year. Deep Water Creek, which feeds the lake is spring fed and would refill it in one to two years. The drawn down should begin in late fall. By spring thaw the water level should be as low as it is possible to get it. The lake should be left down until the next spring when the control structure would be closed just prior to runoff. If desired the lake could be left dry longer to allow island construction, channel clean out, cattail control or for other management needs.

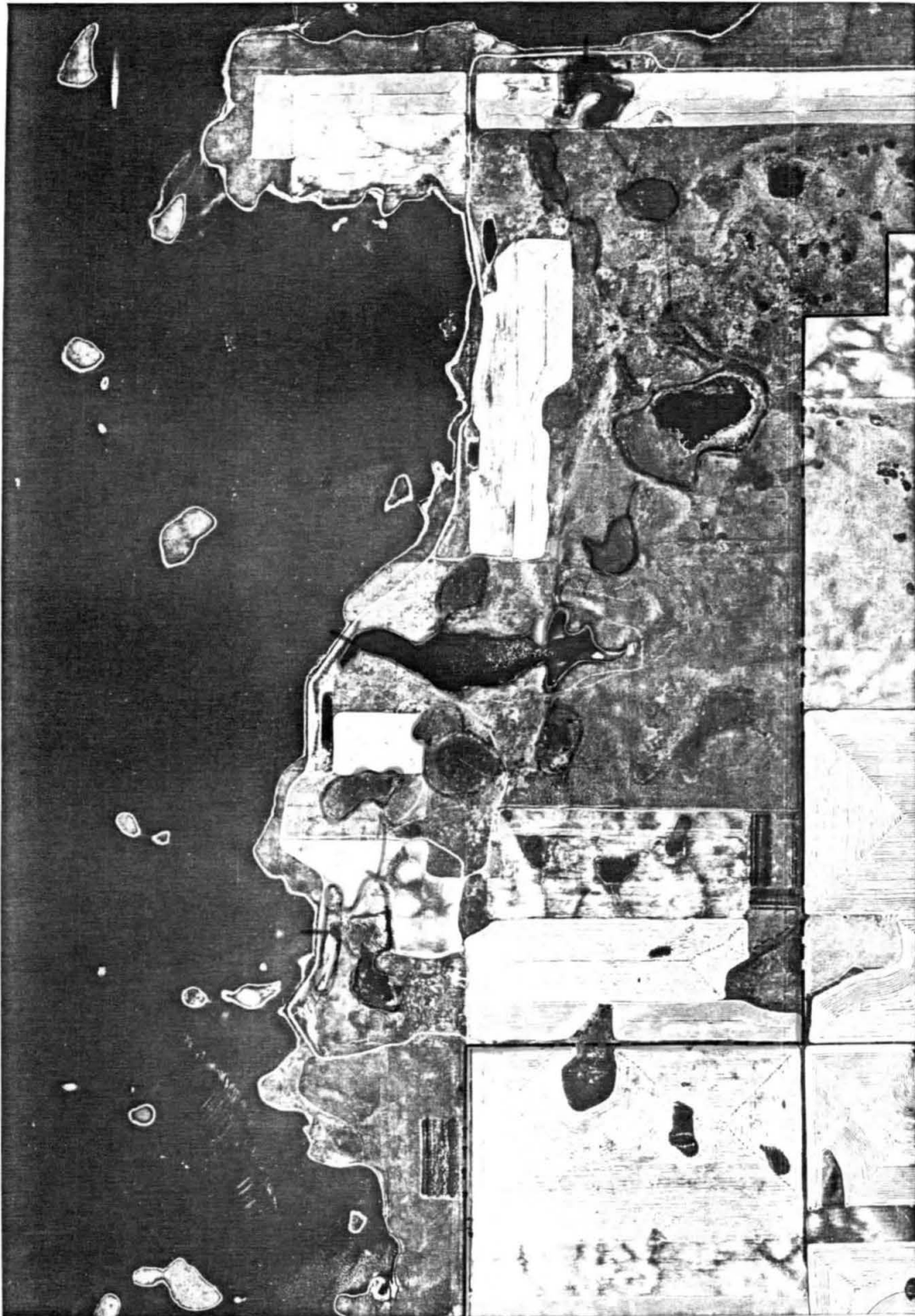
Currently, Lake Nettie has no water management capability. Due to rising water levels throughout that area, however, water management will be desirable in the near future. Planning is only in the preliminary stage at this point. When more definite plans are available this plan will be amended.

Water and wetland management are discussed in 6 RM 2. Service policies have been incorporated in this plan as appropriate, however, the manager should refer to the Refuge Manual for specific guidance.

#### B. Croplands

Specific guidelines and policies regarding croplands are found in 6 RM 4. The manager shall refer to the Refuge Manual for National policies and guidelines. The only permanent cropland managed at this station is on the Audubon NWR. Currently there are 675 acres in the program. All DNC plantings throughout the three fee title refuges and 81 WPA's are

Figure 6. Siphon system for adding water to natural wetlands. Proposed control structures shown in red. Siphons are shown in green with wetlands and flow in blue.



subject to periodic cropping for rejuvenation or reestablishment of DNC or other cover. Cropping these areas, however, is less desirable than other techniques, because it removes them from nesting habitat for up to four years. Therefore, breaking and cropping these areas is only used when it is the only or best alternative to achieve the objectives for a particular field. (See Grassland Management, Section IV. C. for further discussion). Whenever a field is cropped for whatever purpose it will be managed for that period as cropland and be done in accordance with this section of the Habitat Management Plan.

There are two primary objectives for our refuge farming program. The first is to supplement naturally occurring food supplies in support of the National and Central Flyway Waterfowl Management Program. The second objective is to lessen the impact of waterfowl depredations on private lands in the vicinity of the Audubon NWR. Secondary objectives include supplemental food supplies for non-game migratory birds and resident wildlife, support of the State waterfowl hunting program and as needed for control of noxious weeds.

Cropping a particular field for DNC or other cover establishment is used to compensate a private farmer for breaking, preparing the seed bed and seeding the cover. Used in this manner the crops are not considered excess and do not fall under the prohibition of supplementing the station budget, which is illegal. This process is discussed more fully in Section IV C., Grassland Management.

The Audubon Refuge receives considerable use by both ducks and geese during migration periods. Peaks in the fall of 30,000+ geese and 50,000+ ducks are common. Obviously, there is not sufficient natural food supplies to sustain this number of birds. Hence a supplemental source is necessary. During the spring and summer upwards of 2,500 geese and 8,000 to 10,000 ducks use the refuge. Lake Audubon itself produces very little natural foods and the natural wetlands do not produce enough to support this number of birds. The farming program provides the deficit.

Small grain harvest usually begins on private land in the vicinity of the Audubon NWR in mid-August and lasts through September depending on the weather. Cool wet conditions prolong the harvest while dry, warm conditions hasten it. The common practice in this area is to swath small grain, let it dry for several days and then combine it. If the swaths get wet they can't be combined until they dry out. The swaths are very attractive to ducks and geese and some depredations will occur irregardless of refuge attempts to prevent them. Our farming program, along with other measures, can lessen depredation impacts considerably. While legally we are not required to do anything about depredations, morally, politically and realistically we must. To help alleviate off-refuge depredations each farmer is encouraged to plant at least some refuge shares as early in the spring as possible.

As grain harvest approaches at least one field in each farm unit should be mature enough to cut. Refuge personnel can swath or mow a small portion to encourage waterfowl to use it. Once they get used to using refuge grain they are less likely to leave the refuge and depredate on private lands.

Secondary objectives of the farming program are normally met incidentally to achieving the primary objectives. Normally nothing additional is needed for these lesser objectives. As such this plan will not address these objectives specifically.

Currently there are six farming units comprising 675 acres. Table 3 gives the data on these units. In any given year roughly one-third of the cropland is in summerfallow (225 acres) for moisture conservation, weed control and nutrient recycling. Of the remaining 450 acres the Cooperative Farmer gets two-thirds (300 acres) of the crop produced and the refuge gets one-third (150 acres). This share is based on the prevailing crop-sharing ratio for central McLean County as established from the local S.C.S. and A.S.C.S. offices. At least every five years this ratio will be reviewed using S.C.S. and A.S.C.S. data to insure that the ratio is equitable to both the farmer and the government.

Table 3. Farm unit location, size and 1983 Cooperator, Audubon NWR.

Farm Unit	Location Sec. No.	Total Acres	1983	1983 Crop Acres		Cooperator
			Acres Fallowed	Coop.	Refuge	
A-3	2 & 3	140.9	48.3	61.7	30.9	J. Fransen
A-5	7 & 12	203.5	71.8	87.8	43.9	W. Wilson
A-13	8 & 17	139.8	65.8	49.3	24.7	R.V. Nelson
A-24	2 & 3	84.1	47.7	24.3	12.1	R. Voth
A-27	34	18.5	10.7	5.2	2.6	R. Voth
A-28	28	88.8	0	59.2	29.6	C. Okerson
Totals		675.6	244.3	287.5	143.8	

In general refuge farmers will be required to follow standard farming practices to insure good soil conservation and produce optimum crop production. This includes appropriate weed control. Fallowing one year out of every three does a fairly good job of keeping weeds in check. However, it frequently becomes necessary to use chemicals to achieve the necessary control. It is the manager's responsibility to obtain approval for individual chemicals that the farmer may want to use through

the standard Chemical Proposal forms and procedures (See Pesticide Manual and 7 RM 14). In theory the farmer will be applying the pesticide under the manager's supervision as a State Certified Pesticide Applicator. The farmers will be required to use pesticides in a proper safe manner and in accordance with label directions including maintaining records of use as prescribed by the Cooperative Farming Agreement. Selection of farmers is discussed under Section IV. E.

The location of the farm units on the refuge is important to realize their maximum effectiveness in meeting refuge objectives. They should be situated so as to provide edge effect and provide the best use by waterfowl and resident wildlife. The fields should be kept relatively small and aligned so that wind erosion does not become a problem. In addition they should be spread strategically throughout the refuge to encourage their use. Periodically, as needed a farm unit may need to be retired to DNC or a native grass seeding to build soil productivity. Croplands should be located only in soil classed I, II, or III ( See McLean Soil Survey, 1979) except in unusual circumstances that must be documented in the refuge files.

In general the determination of the location of refuge shares is split into two phases. At the time the annual farm program is determined in mid-winter part of the refuge share may be delineated. It is recommended, however, that no more than one-half be determined at that time to allow for adjustments needed due to goose use through the growing season, and to insure that the refuge share is given the same attention and care as the farmer's share. The remaining refuge shares can be determined just prior to harvest to account for goose use, weather, etc. The refuge shares should be located to encourage maximum use and availability to wildlife, preferably adjacent to the lake and away from the refuge tour route for example.

Currently, the refuge is force account farming three small food plots (3.2, 3.4 and 3.2 acres) on Haugeberg Island in Section 8. They are planted to rye or winter wheat in mid-August for goose browse through the fall migration. The use by geese is so heavy virtually none of the plantings survive. These plots assist considerably in holding geese on the refuge through the harvest season and reducing depredations. In spring whatever comes up is allowed to grow and provide some browse to returning birds, then plowed under and fallowed until time to plant again in late summer.

To manage the farming program effectively and efficiently the manager must be flexible enough to provide for the needs of the refuge and the farmer while staying within Service policy and guidelines. This is not always easy but is absolutely necessary.

## C. Grassland Management

### 1. General Consideration

There are approximately 14,260 acres of grassland on the three fee title refuges and 81 WPA's. Their proper management is crucial to realizing primary refuge objectives for waterfowl production and secondary objectives. Much of the Northern Great Plains has been broken up for agricultural production. As a result large tracts of native prairie are almost non-existent. Instead there is a mixture of native grassland, usually on the less productive sites, interspersed with seeded vegetation of varying composition. For management purposes these seeded areas are broken down into seeded nesting habitat and seeded pasture. The nesting habitat is termed DNC (Dense Nesting Cover) and is usually composed of tall and intermediate wheatgrasses with alfalfa and sweetclover. The seeded pasture is primarily smooth brome, crested wheatgrass and Kentucky bluegrass. This sub-division also includes "go-back" lands i.e. former cropland that has been allowed to revert to whatever would grow there. Table 4 summarizes these categories.

Table 4. Grassland inventory by type and area. Audubon NWR Complex.

<u>Area</u>	<u>Grassland Types</u>			<u>Totals</u>
	<u>Native Grassland</u>	<u>Seeded Pasture</u>	<u>Dense Nesting Cover</u>	
Refuges				
Audubon	1,014	939	1,128	3,081
Lake Nettie	566	139	390	1,095
McLean	63	6	163	232
Sub-total	1,643	1,084	1,681	4,408
<u>WMD Counties</u>				
McLean	1,934	43	867	2,844
Sheridan	2,469	290	1,227	3,986
Ward	1,906	223	893	3,022
Sub-total	6,309	556	2,987	9,852
TOTAL	7,952	1,640	4,668	14,260

There are numerous constraints and special considerations that must be recognized in managing grasslands. Endangered and threatened species always require special recognition. In this area the only endangered or threatened species known are the peregrine falcon, bald eagle and whooping crane. In addition there are two other species that are of special concern, the prairie merlin and the prairie falcon. Any of these species may be present, particularly during migration periods, but do not stay any length of time. Therefore, other than being cognizant of their occasional presence the manager need not take special measures.

The State of North Dakota requires control of nine species of plants considered noxious, primarily for agricultural purposes. The Service cooperates by controlling these species as manpower and funding permit. The species are absinth wormwood, Canada thistle, field bindweed, hemp, hoary cress, leafy spurge, musk thistle, perennial sowthistle and Russian knapweed. When planning management of any grassland the presence of any of these species will be considered and control will be part of the manipulation process. Also the State has air and water pollution control regulations that must be considered in planning grassland management. The manager should be familiar with these regulations and adhere to their requirements.

Perhaps the greatest constraints placed on grassland management are the political and emotional attitudes of citizens in the vicinity where a program is being planned. Generally a management practice that produces an economic return to the local community is preferred by the local citizens (grazing, haying, etc.). It is difficult to convince a rancher that all that grass out there is not just being wasted. The manager must be aware of these local philosophies and make an effort to sell his program on its merits and benefits. Sometimes a management technique that is sound and proper can't be used because it is totally unacceptable and alternatives must be considered.

Refuge objectives as they relate to grassland management are discussed in detail in Section I of this Plan. It must be remembered that these objectives are still somewhat general as necessitated by the widespread grassland units. Objectives are developed and related to each unit as appropriate in the unit planning process prior to manipulation. The Refuge Manual (6 RM 5) should also be consulted for national objectives and policy as well as Regional memorandums and guidelines.

## 2. Management Options and Techniques

The manager has many options and techniques available to manipulate grasslands to achieve the objectives set for a particular area or unit. All of these options have advantages and disadvantages. The actual selection process is discussed in the following section. Following is a synopsis of some techniques. (Also see 6 RM 5.6 and 6 RM 5, Exhibit 2).

- a. Non-use is generally beneficial in the short-term and detrimental in the long term. Resting an area to increase vigor and productivity for several years between manipulations can be very beneficial particularly if the area is in poor condition to start with. However, prolonged non-use usually results in poor vigor and productivity and eventual deterioration of the grassland community. Very few if any grassland areas managed from this office would be properly managed by prolonged non-use.
- b. Grazing can be used as an effective grassland management tool if properly applied and used with close control. Most grassland communities in the great plains evolved under some type of periodic grazing by native herbivores. This tool is usually best applied to native grasslands rather than either type of seeded grasslands. The greatest disadvantage of this option is that the manager may lose control to the rancher doing the grazing. When this happens grazing becomes grazing for economic return rather than grazing for grassland management. A grazing permittee should always be fully aware of what our objectives are and encouraged not to become dependent on refuge or WPA grazing. The grazing we provide will be periodic and should be considered as an extra to the rancher and not part of his regular operation. Grazing also usually takes a longer period of time to achieve desired results than some other options. (See also 6 RM 9).

There are many different types of grazing systems and approaches that can be used to achieve different objectives. Consultation with local S.C.S. offices, University Range Management Specialists, other experienced refuge managers and personnel should be used to design a grazing program to achieve individual unit needs. Soil types, stocking rates, availability of cattle, willingness to cooperate, range condition and unit objectives all must be considered in designing a system.

- c. Fire has always been an important function in the evolution of native grassland, hence its use to manipulate grassland can be a very important tool. Prescribed burning for this Complex is discussed in great detail in the Station Fire Management Plan and will not be repeated here. Suffice it to say that fire can be effective, economical and produce rapid results in managing grasslands. Its disadvantages are that it is not well received by citizens in some areas, may create erosion problems if improperly applied and there is always the danger of fire burning up things the manager doesn't want burned. (See also 6 RM 7).
- d. Haying may be used at times to manipulate the grassland community. In general haying is not particularly effective in making significant changes, but it has the benefit of being highly selective and is easy to use and administer. Perhaps its greatest use is in combination with other techniques.

- e. Seeding is normally used to establish habitat on retired cropland, to increase density or composition on native grassland and to revegetate disturbed areas such as wildfire, construction, etc. Seeding native species may be desirable because the stands can be maintained relatively easy, but native grasses are generally harder to establish and usually quite expensive. Seeding introduced species (DNC) is generally less expensive initially, may produce taller/denser stands and are fairly easy to establish, however, they are more difficult and expensive to maintain.
- f. Mechanical treatments involve disturbance to the soil and vegetation such as chiseling, ripping, chaining, etc. Rejuvenation of DNC fields involving haying, chiseling and disking is an example of such treatment. Normally mechanical treatment of native prairie should be avoided because it significantly disturbs the soil and may alter the native community drastically. Mechanical disturbance of seeded fields, however, shows some promise. It can and has been used to rejuvenate DNC fields for example in one year. This returns the field to productive status considerably faster than the traditional breaking and re-seeding.
- g. Chemical treatment may involve the use of herbicides, fertilizers or soil amendments. Chemicals should normally be avoided because of the potential damage to the environment from misuse, pollution and expense. In some instances i.e. noxious weed control, they may be the only realistic option, however.

### 3. Selection of Options and Techniques

The techniques discussed above plus others are simply tools in the managers habitat tool box. To be used effectively these techniques must be matched with the needs of the resource, refuge and Service objectives and what is realistically possible. The manager should avoid at all costs panacea or fad management. It is easy to become enamored with one technique to the exclusion of others e.g. prescribed burning. The usual result of such thinking is misuse of the technique, degradation of the resource and emotionally charged controversies.

Selecting the best or most appropriate technique must involve considerable thought and consideration of as many parameters as possible. This thought process might include but is not limited to the following:

- a. What are the stated primary objectives for the unit?
- b. What is to be achieved? (recycle nutrients, etc.)
- c. What are the environmental parameters? (Range and soil type, topography, habitat type, erosion potential, etc.)
- d. Are there any political or philosophical constraints (ante-burning sentiment, Service policy regarding breaking up native prairie, etc.)?

- e. What techniques are available that will achieve the desired results?
- f. What are the costs versus benefits?
- g. Is time to achieve desired results a significant consideration.
- h. Are the expertise, personnel, equipment etc. available?
- i. What are the advantages and disadvantages of a particular technique for a particular habitat unit?
- j. Are there safety problems with certain techniques in the identified unit?

Often times non-biological or non-administrative factors will make it impossible to use a tool that is otherwise the best technique available. For example there may not be any ranchers in the vicinity of a WPA that can supply sufficient numbers of cattle for a spring crowd grazing treatment. These factors must be considered.

The manager must be flexible and innovative in manipulating grasslands. What works well on one area may actually be detrimental on another. Table 5 lists certain techniques, their advantages and disadvantages and comparative costs.

#### 4. Annual Planning

The manager should avoid spur-of-the moment grassland manipulation. Sometimes conditions are such that it can't be helped, but normally manipulation should be planned in advance. Advanced planning results in a much more efficient, less expensive and better received program. To this end units to be manipulated should be selected at least one year in advance. This gives ample time to select permittees, appropriate techniques, establish monitoring system, enter into the AWP and identify problems.

This annual planning process should at the minimum identify the unit to be treated, soil type, range and condition survey if applicable, specifics of treatment selected and documentation of rejection of viable alternatives, schedule of what will be done, how, by whom and basic cost estimates and identification of any problems that might be encountered. This plan may simply be notes in the appropriate file or by filling out a simple form as shown in Figure 7.

#### D. Forest Management

Trees are a rarity in the Northern Great Plains. Native species such as cottonwood and green ash are normally found along water courses, but are scarce elsewhere. In this area virtually all the trees are the result of plantings for shelterbelts and windbreaks around farm steds.

Table 5. Grassland Manipulation Matrix

TECHNIQUE	ADVANTAGE	DISADVANTAGE	COST/ACRE*
1. Grazing	Mimics natural processes Usually economical Provides economic return to local community Can be used for maint. treatment Well received by locals	Requires considerable time to achieve results Manager may lose control Requires considerable administrative time May be difficult to balance ranchers wants with resource needs	\$1.10/ac.
2. Prescribed Burning	Mimics natural process If timed properly can be very selective Usually quite economical Results can be very rapid Useful for maintenance of areas If properly applied it is under full control of manager	May increase erosion potential May illicit emotional response from locals Adds little to local economy Safety hazard is high May result in direct loss of some individual animals	\$2.90/ac.
3. Haying	May be highly selective (weed control etc.) Adds to local economy Well received by locals Can be used to provide browse Useful in DNC rejuvenation Very economical	May reduce plant vigor Difficult to change composition Doesn't cycle nutrients Is not a natural process More demand than can fill	\$0.60/ac.
4. Seeding	Can be used to establish cover on disturbed areas Possible to reestablish missing components of native areas Adds to local economy Provides excellent nesting habitat (DNC)	Usually quite expensive May be difficult to establish good stands on poor soil May present fire hazard Requires intensive effort and energy Well received (usually) by locals	\$30-50/acre for account \$1.50/ac. using coop. farmer
5. Mechanical	Can be used to rejuvenate DNC Adds to local economy Usually a rapid improvement in habitat	Expensive May increase erosion potential Aesthetically unpleasing Leave soil surface very rough Limited in application	\$35-40/acre for account .80/ac. coop. farmer
6. Chemical	Can be very selective May be only technique that works (weed control)	Limited application Can affect non target species Pollution and safety hazard high Usually quite expensive	\$3-5/acre

Figure 7. Annual Grassland Manipulation Plan Form

ANNUAL GRASSLAND MANAGEMENT PLAN  
AUDUBON NWR COMPLEX

Unit \_\_\_\_\_ Acres \_\_\_\_\_ Objectives \_\_\_\_\_

Desired Results: \_\_\_\_\_

Treatment Selected: \_\_\_\_\_

Alternatives Rejected & Why: \_\_\_\_\_

Environment: Unit Description

Habitat Type \_\_\_\_\_

Predominant Soils \_\_\_\_\_

Aerial Photo No. \_\_\_\_\_

Range Site & Condition Survey Results: \_\_\_\_\_

Description of Treatment and Schedule:

Permittee Selection: \_\_\_\_\_

Monitoring System: \_\_\_\_\_

Cost Estimate:

Personnel \_\_\_\_\_

Equipment \_\_\_\_\_

Materials \_\_\_\_\_

Results:

Generally they are relatively small in size, from two to five acres, and are of little value for our primary objective, waterfowl production. Their primary benefit is for resident game species such as the ring-necked pheasant and white-tailed deer. Unfortunately, they also provide excellent habitat for waterfowl predators such as skunk, raccoon, fox and various avian predators.

There are a total of 115 acres of trees on the various units of the Complex. The majority are found in shelterbelts inherited when the land was purchased. Because such plantings provide for predators it is our general policy not to plant any more trees and not to replace those that have died. The exception is to the shelterbelts around the headquarters complex where they serve as windbreaks for those buildings. On some WPA's natural stands of trees exist e.g. Geigle, Allen and Davis. Where trees occur they will be protected, but not specifically managed for.

Around Lake Audubon cottonwood and willow are invading the shoreline of both islands and the mainland. This woody growth is beneficial in that it stabilizes these shorelines and protects them from erosion. Conversely, they also provide habitat for predators. Beaver have been encouraged and protected on the refuge portion of the lake and at this point in time appears to be doing a good job of controlling these trees. In the future it may be necessary to take more active steps to keep the number and density within reason.

#### E. Selection of Cooperators and Permittees

Due to a shortage of funds and personnel it is often necessary to utilize private citizens to carry out habitat manipulation practices. This is especially true with agricultural practices such as farming, haying and grazing. In general the policies and guidelines set forth in the Refuge Manual will be followed. In 5 RM 17 there is a broad discussion on this topic and in 6 RM there are specific considerations for different types of management such as farming and grazing.

There are basically three major methods of obtaining permittees or cooperators to accomplish habitat manipulation. These are direct sale of resultant products, lottery and negotiated sale with numerous variations of the three. Generally, the manager should select the best or most appropriate method to get the results desired. Competitive bidding probably generates the best return to the government, but there will not be as much control over the quality of the activity. A lottery or random drawing allows the manager to establish fair market value, increases the control and flexibility of the project, but still there is the unknown quality of how well the job gets done, etc. Negotiation may or may not bring fair market value, but control and flexibility are good and the potential for achieving the desired results is much better. Also, negotiation for long projects, such as four year rest-rotation grazing or a three year DNC rejuvenation

project results in less administration costs and expenditures of manpower than annual bidding or drawings.

Under the permittee selection criteria outlined in 5 RM 17.6(a) previous permittees or former landowners have the highest priority when economic benefits are available. This priority is well received by the public. Selecting a permittee or cooperator beyond these two priorities is often resented. Generally, we will negotiate for permittees, because past experience has shown that we get better results. Bids and lotteries should be reserved for situations where habitat manipulation results are not significant, such as may occur under State imposed emergency haying programs. The eligibility and selection priorities outlined in 5 RN 17.6 will be followed.

For each refuge and WPA in the Complex a list will be maintained of individuals interested in using refuge products or exercising potential privileges that may become available. The list will be annotated with eligibility status and priority and maintained in a specific refuge file. In the case of WPA's the list should be located in the individual WPA folder. Memos to the files on the performance of cooperators and permittees is very important. Unsatisfactory individuals should not be used subsequently without careful consideration. Guidelines, policies and regulations governing the use of refuge resources contained in the Refuge Manual and in 50 CFR 25.41 and Part 29, Land Management, should be followed. Any deviation must be documented carefully and approvals obtained where needed.

#### V. RECORDS AND EVALUATION

Habitat management is a complex of art and science. The manager establishes goals based on objectives and produces plans to accomplish those goals. The process, however, is incomplete unless the activities are evaluated to make sure that whatever was done did indeed produce the desired results. To this end records must be kept to evaluate techniques, establish costs and support decisions.

Due to the large number and wide dispersion of habitat units it is not realistic or possible to monitor all of them annually or even periodically. We simply do not have the personnel or time to achieve that. Eventually when (and if) we can computerize our habitat records a tickler system can be set up to alert us when we should look at specific areas. Until then we will have to rely on experience and routine functions to identify units needing some manipulation. To do this the professional staff will have to constantly be on the alert to recognize the symptoms of units becoming unproductive. Annual notes will be kept in the appropriate file indicating the time of last manipulation. Whenever possible notes will be added to reflect current conditions as observed. When it becomes obvious that a particular unit

needs manipulation more specific records will be made. There may be several types of records desired to document conditions and by which to monitor results.

The type of record system may vary from very detailed analysis using such techniques as Daubenmire transects to no more than a narrative description of what the conditions were before and after treatment. On most areas photo points with a narrative description are sufficient to document why manipulation was needed and what results were achieved. Exhibit 5 illustrates a Photo Point Record form and other recommended measurement systems. The Daubenmire Transect is intended to collect very specific species information. It is normally used to obtain very detailed information on vegetative communities. Unless a specific research project is needed we will normally not need that specific type data. Table 6 lists examples of several types of data collection systems that we will use and their degree of specificity. Exhibit 5 gives instructions on each type.

Often modifications, combinations or changes will need to be made to fit the system used to the management need. When this occurs notes will be kept with the records to document what was done and why.

Following manipulation of a habitat unit a narrative summary will be made to the appropriate file documenting the success, failure and results of the manipulation using before and after comparisons as appropriate. This becomes particularly important when results are not satisfactory. An analysis of the problems and causes can help avoid future failures thereby saving time and money.

#### AMENDMENTS AND REVISIONS

This plan as approved will remain in effect until superseded by a new plan. It is recognized that periodically conditions will require revisions to part of the plan or amendments. Minor changes may be made by substituting dated pages or simple amendments appended to the plan. Significant revisions or changes that change or reflect policy decisions will be submitted to the Regional Office for review and approval. A log at the end of this plan (page 30) will be used to reflect all revisions and amendments.

Table 6. Habitat measurement techniques used at Audubon NWR Complex to document habitat manipulation needs and results of treatments.

MEASUREMENT TECHNIQUE	DEGREE OF ACCURACY	ADVANTAGES	DISADVANTAGES	RECOMMENDED USE
1. Daubenmire Canopy - Coverage Transect	Very accurate measurement of ecological community	Gives species composition by individual plants. Used to detect small changes in a plant community.	Very time consuming. Degree of accuracy greater than normally needed.	Only when specific data is needed such as in formal research.
2. Modified Key Species Transect	Less accurate than 1. Uses only key species rather than all species.	Measures basic changes of indicator species.	Time consuming.	Used when more data is needed than usual i.e. evaluate new techniques.
3. Modified Robel Height-Density Measurement	Less accurate than 1 or 2. Establishes relationship between visual obstruction and productivity.	Relatively quick and easy to conduct.	Gross measurement. Doesn't identify species or composition.	Use to measure relationship and potential wildlife productivity.
4. Photo Point Record	Visual record of grass conditions.	Easy to establish and run as often as desired. Easy to relocate. Visual base for comparison.	Doesn't tell productivity or composition.	Non-specialized record of routine type treatment.
5. Narrative Description of Observation	Variable dependent on observation. Least accurate system.	No special data collection needed. Takes little time.	Observations may be inaccurate. Doesn't tell productivity or composition.	Only when time prevents using another method.

## LOG OF REVISIONS AND AMENDMENTS

R = REVISION, A = AMENDMENT

Date

Number

Subject

Approval

---

mwp

LETTER OF UNDERSTANDING  
BETWEEN  
BUREAU OF RECLAMATION, FISH AND WILDLIFE SERVICE,  
NORTH DAKOTA GAME AND FISH DEPARTMENT, AND CORPS OF ENGINEERS  
CONCERNING OPERATING PROCEDURES FOR WATER LEVEL MANAGEMENT  
IN AUDUBON LAKE

A meeting was held on July 16, 1981, to discuss operating procedures for water level management in Audubon Lake. Individuals and agencies represented were:

Merle Bennett	- U.S. Fish and Wildlife Service, Bismarck, ND
Ron Shupe	- U.S. Fish and Wildlife Service, Coleharbor, ND
Bob Morgan	- ND Game and Fish Department, Bismarck, ND
George Enyeart	- ND Game and Fish Department, Riverdale, ND
Roger Branning	- U.S. Corps of Engineers, Riverdale, ND
John E. Knoll	- U.S. Bureau of Reclamation, Bismarck, ND
Duane E. Krogstad	- U.S. Bureau of Reclamation, Bismarck, ND

The following operating procedures were agreed to:

1. The Bureau of Reclamation shall operate the Snake Creek Pumping Plant to fill Audubon Lake to elevation 1848 by April 15. An alternate date may be agreed to by the local coordination team as waterfowl nesting, climatic conditions and works schedules dictate.
2. A water level of approximately 1848 will be maintained from April 15 through September 1 to provide uninterrupted nesting of migratory waterfowl. This will be accomplished by pumping at the Snake Creek Pumping Plant when the water surface elevation recedes from 0.1 to 0.3 feet from the 1848 elevation.
3. After September 1, Audubon Lake will be allowed to drop by evaporation to approximately elevation 1847.5. Pumping into the lake will then be scheduled to maintain an elevation of approximately 1847.5 through freeze-up. The lower water surface elevation will help prevent ice-gouging on the shoreline and provide storage for spring snowmelt. The drop should be limited to about 0.8 feet. (The average net evaporation from Audubon Lake from September through November is 0.6 feet.)
4. A four-person local coordination team is established consisting of:

Leo Silbernagel, Snake Creek Pumping Plant Operator  
U.S. Bureau of Reclamation  
Snake Creek Pumping Plant  
Coleharbor, North Dakota 58531  
Ph. 337-5756

Ron Shupe, Refuge Manager  
U.S. Fish and Wildlife Service  
Audubon National Wildlife Refuge  
Coleharbor, North Dakota 58531  
Ph. 442-5474

George Enyeart, Dist. Wildlife Resource Mgt. Biologist  
North Dakota Game and Fish Department  
Riverdale, North Dakota 58565  
Ph. 654-7475

Robert Paterson, Commercial Fishery Supervisor  
North Dakota Game and Fish Department  
Riverdale, North Dakota 58565  
Ph. 654-7475

The coordination team shall assess the effects of pumping on the water level management plan prior to each pumping through the following procedures:

- a. Mr. Silbernagel shall inform Mr. Paterson of pumping plans several days in advance of pumping to allow Mr. Paterson ample time to schedule commercial fishing activities in Audubon Lake. (Fish seem to congregate at the pumping plant outlet works while pumping into Audubon Lake.)
- b. Mr. Silbernagel shall inform Mr. Enyeart and Mr. Shupe of the pumping plan after he and Mr. Paterson have concurred on same.
- c. Deviations from this agreement that cannot be resolved by the local coordination team will be referred to an agency coordination team through a meeting called by the Bureau of Reclamation. The agency coordination team shall consist of those persons that attended the July 16, 1981 meeting.
- d. The Bureau of Reclamation will provide daily pumping operational data during periods of pumping to the Reservoir Regulating Branch, Omaha District, Corps of Engineers.

The undersigned concur on this 27 day of August, 1981, with the provisions and conditions of this agreement as described above. This Letter of Understanding may be cancelled by any of the parties' signature thereto by 60 days written notice to the other parties.

Gilbert E. Key 8/24/81  
Area Manager  
U.S. Fish and Wildlife Service

Logan W. Dunning  
Area Engineer  
Corps of Engineers

Stacy H. Henshaw  
Commissioner  
ND Game and Fish Department

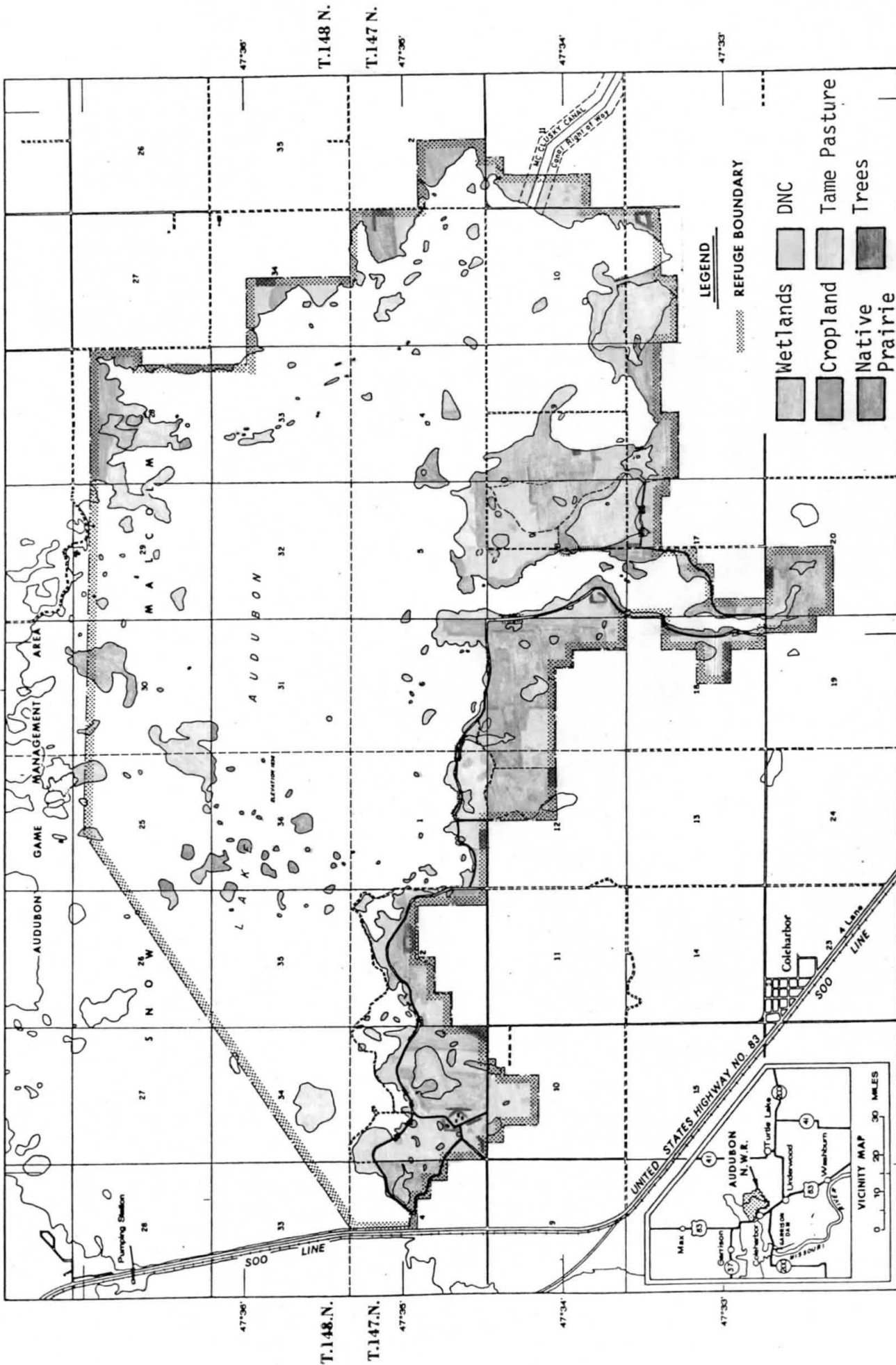
D. L. Lull  
Project Manager  
U.S. Bureau of Reclamation

# AUDUBON NATIONAL WILDLIFE REFUGE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
101°15'

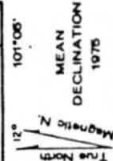
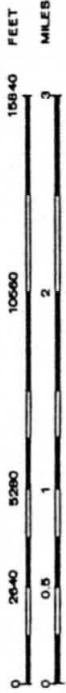
MC LEAN COUNTY, NORTH DAKOTA  
R.83 W. R.82 W. 101°10'

UNITED STATES  
FISH AND WILDLIFE SERVICE  
101°05'



101°15'  
COMPILED IN SURVEYS AND MAPS FROM  
SURVEYS BY USGS AND USFWS

R.83 W. R.82 W. 101°10'  
FIFTH PRINCIPAL MERIDIAN



DENVER, COLORADO NOVEMBER, 1976  
REVISED: APRIL 1981

6R N.D. 487 403

# HABITAT MANAGEMENT PLAN LAKE NETTIE NATIONAL WILDLIFE REFUGE MC LEAN COUNTY, NORTH DAKOTA

Exhibit 3

UNITED STATES  
DEPARTMENT OF THE INTERIOR

UNITED STATES  
FISH AND WILDLIFE SERVICE



8

20

29

## LEGEND

REFUGE BOUNDARY

8

County Road



Wetland



Cropland



Native Prairie



DNC



Tame



Trees



Easement

33

15

16

21

22

28

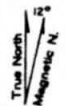
27

34

LAKE

NETTIE

MARSH POOL



MEAN  
DECLINATION  
1975

T.148.N.

T.147.N.

FIFTH PRINCIPAL MERIDIAN

10

25

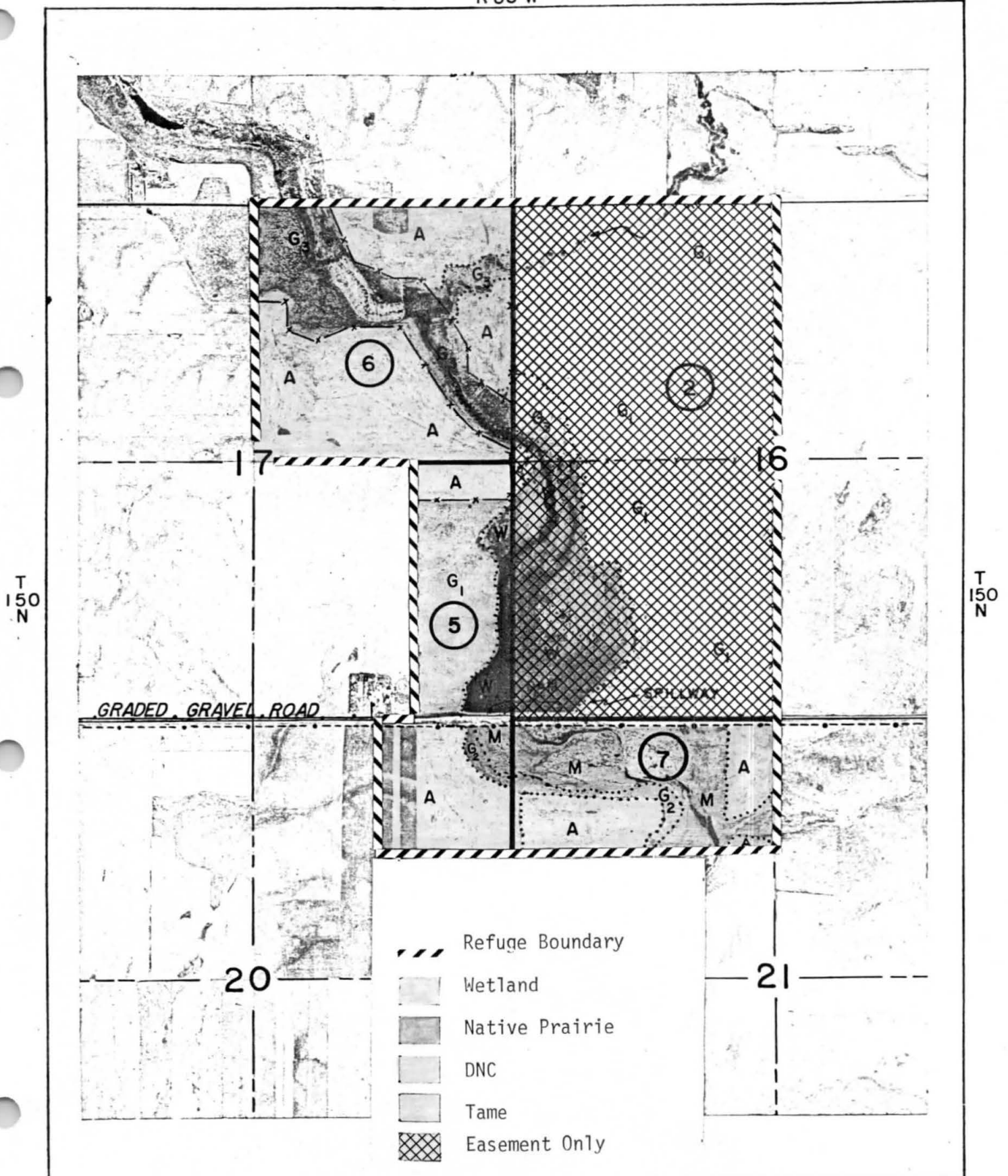
R.81.W.  
R.80.W.

McLEAN NATIONAL WILDLIFE REFUGE

US DEPARTMENT OF THE INTERIOR

McLEAN COUNTY, NORTH DAKOTA  
R 88 W

FISH AND WILDLIFE SERVICE



COMPILED IN THE BRANCH OF LANDS  
FROM AERIAL PHOTO BAQ-2G-123  
DATED 9-21-50

R 88 W

FIFTH PRINCIPAL MERIDIAN

0 10 20 40 CHAINS  
0 1/4 1/2 MILES

MINNEAPOLIS, MINN. MARCH 1957

TRUE N

# DAUBENMIRE CANOPY-COVERED MEASUREMENT\*

Measurements are taken in August. Select representative transect or transects 200 yards in length in each field to be measured. Transects should not cross soil type lines. Separate transects should be used for each soil type. A compass heading and distance from a permanent landmark can be used to identify the transect location. A rock pile at the start of the transects is also beneficial in relocating the transect lines. Forty (40) plots are taken along the 200-yard line at 5-yard intervals. At each plot, a  $1/10 \text{ m}^2$  (20cm x 50cm inside dimensions) frame is used to estimate the canopy coverage of the various plant species contained within the frame. The frame is made of rigid 3/16-inch steel with sharpened legs three centimeters long to hold the frame in place on the ground. In heavy cover or dense brush, it is recommended to use a frame with an open side so that it can be placed on the ground under the vegetation. Unbiased placement of the frame at the 5-yard intervals is crucial and so using some system, like placing the frame off the toe of your boot, should be employed.

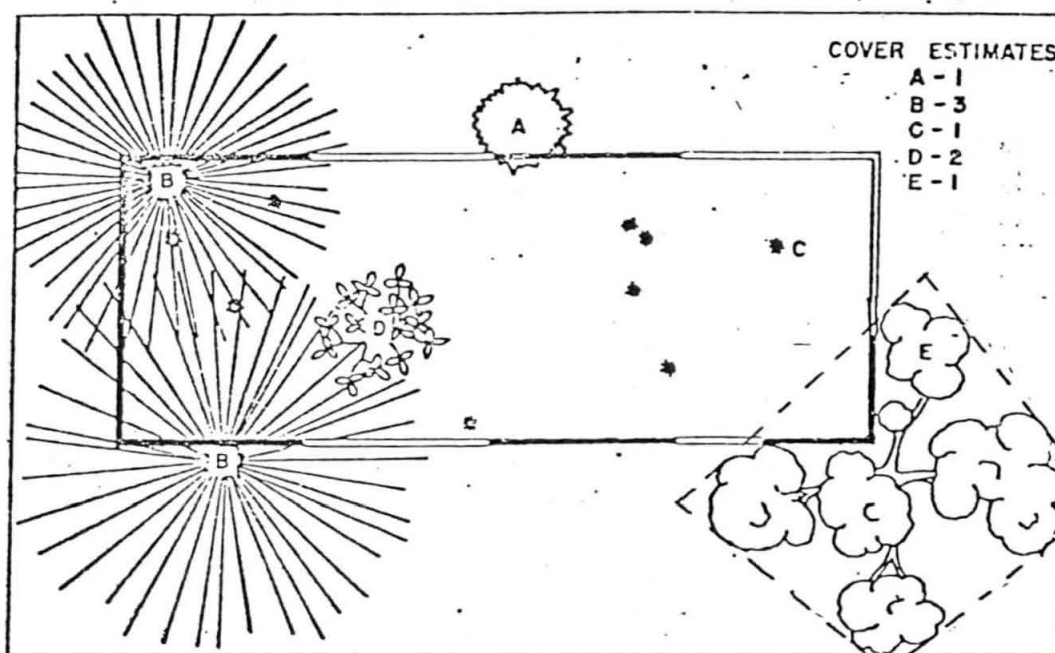


Figure 1. Diagram illustrating method of estimating canopy coverage. The biologic soundness of using the vertical projection of a polygon drawn about the extremities of the plant canopy is illustrated by E, which, by accident of foliage arrangement, actually has no leaves directly above the plot frame. A plant of this type probably exerts at least as much influence on the 20 x 50 cm portion of an ecosystem as does A.

The frame is marked (painted) off in quarters crosswise, and then in one corner of the frame, two sides of a square are marked, each side being 7.1 cm in length (Figure 1). The quarter marks indicate areas of 25 percent each, while the 7.1 cm sided square indicates

a 5% area. When looking down upon the vegetation and frame, one must draw an imaginary polygon about the extremities of irregular plants to perceive the apparent canopy coverage of that plant within the frame (Figure 1). Canopy coverage of vegetation for each species within the frame is placed into one of the following percent coverage classes:

<u>Coverage Class</u>	<u>Midpoint</u>
0 - 5%	2.5%
5 - 25	15
25 - 50	37.5
50 - 75	62.5
75 - 95	85
95 -100	97.5

The midpoint of each class is used to total and calculate a mean value for each plant species along each transect. An example of the data collected is as follows:

---

Transect Number - 1

<u>Plant Species</u>	<u>Percent Canopy Cover by Plot</u>						<u>Average % Canopy Coverage</u>
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5....40</u>		
Western Wheatgrass	15	15	37.5	15	15	15	18.5
Green needlegrass	2.5	15	2.5	2.5	2.5	2.5	4.5
Blue Grama	2.5	15	2.5		15		5.8
Snowberry	2.5		15			2.5	3.3
Gray Sage		2.5		15			2.9
Etc.							

---

Av. Vegetation Height (inches)	22	24	18	18	20	22	20.6 inches
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At each plot, after canopy coverages are measured, the Average Vegetation Height within the frame should be recorded. This is a mean of the maximum heights of brush, forbs, and grass (measured at the height where seed stalks emerge, not at seed head height).

The locations of the transects are the same as for the Robel readings as mapped and described in the explanation of that procedure.

\* This information is taken from:

Daubenmire, R. 1959. A Canopy-Coverage Method of Vegetational Analysis. Northwest Science, Vol. 33 (1), pp. 43-64.

Remarks \_\_\_\_\_

[illegible]

## KEY SPECIES CANOPY-COVERAGE MEASUREMENT

The Key Species Canopy-Coverage measurement is conducted the same as the Daubenmire transect (See Exhibit 5a). However, instead of identifying every individual species within the plot frame only key species are separated out. For example on a Silty(Si) Range Site key species might be green needlegrass, needle and thread, western wheatgrass, blue grama and upland sedges. These would be the only species recorded and measured individually. The other plants within the frame are lumped under categories such as legumes, forbs, other native grasses, exotic grasses, etc. This reduces considerably the time required to conduct the transect while still providing information about the basic status of the grassland being measured. Selection of categories into which other vegetation is lumped is determined by what the observer wishes to know i.e. degree of infestation by cool season exotics such as Kentucky bluegrass and smooth brome, etc.

This technique is particularly useful to analyze DNC plantings. The component and composition of the DNC are known from planting records. The changes can be monitored easily with Key Species transects. Combined with a Robel transect the current status of the DNC is easily ascertained. The form used is the same as for the Daubenmire transect except for the title. The observer may list the key species prior to going into the field for convenience.

Audubon National Wildlife Refuge  
Habitat Management Plan  
Key Species Canopy-Coverage Transect

Refuge (WPA) \_\_\_\_\_ Unit or Location \_\_\_\_\_

Observers \_\_\_\_\_ Date \_\_\_\_\_ Refuge Site \_\_\_\_\_

Soil Type \_\_\_\_\_ Transect: No. \_\_\_\_\_ Description (Include starting point, direction, length, distance between stations, etc.) \_\_\_\_\_

Aerial Photo No. \_\_\_\_\_ Photo Point (if used) (1) Location and (2) Direction

Habitat Type: Native grassland, DNC, Tame Pasture, Go-back, Other (Specify) \_\_\_\_\_

Remarks \_\_\_\_\_

[illegible]

## MODIFIED ROBEL METHOD FOR MEASURING VEGETATION

The relationship between visual obstruction measurement taken with a height-density pole and the weight of grassland vegetation was reported by Robel (1970) in the journal of Range Management, 23(4):295-297. Visual obstruction measurements taken from a height of one meter and a distance of four meters also provide an extremely reliable measure of the height and density of the vegetation. Such measurements were used by Stanley C. Kohn to evaluate sharp-tailed grouse habitat in North Dakota during 1973 (unpublished P-R Report B-220, North Dakota Game and Fish Department). Results of preliminary work on the Woodworth Study Area indicate that a strong relationship exists between the height-density factor of grassland vegetation obtained by the Robel method and wildlife reproductive activity in the vegetation.

Following is a slightly modified version of the Robel method which may prove effective in evaluating the quality of grassland habitat for nesting ducks and other wildlife.

Procedures:

The transect may be run at any time. The timing is determined by what the objectives are. For determining status of DNC it should be conducted during the nesting season to reflect the conditions at that time of year. The length of the transect and distance between stations is determined by the size of the area to be sampled. The greater the number of stations the more accurate is the sample. In general there should be at least one station for every 6 acres. For example: 160 acres, 25 stations, transect length of 415 yds. (400 meters) with 16 yards (15 meters) between stations. This may be modified for greater or less accuracy of the sample as desired.

Record the following data:

- (1) Range Site (from S.C.S. soil survey. If not available use West Meadow - WM, low prairie - LP, mid prairie - MP or high prairie - HP)
- (2) Exposure (If on hillside record the cardinal direction the slope most nearly faces) N for north, E for east, S for south and W for west.
- (3) Record to the nearest 0.5 decimeter the height where total visual obstruction occurs by sighting on the height-density pole from a distance of 4 meters and a height of one meter. Take readings from each of 4 plots: Plot 1, located 4 meters north of the height-density pole, plot 2, located 4 meters east of the pole, plot 3, located 4 meters south of the pole, and plot 4, located 4 meters west of the pole.
- (4) Litter depth (record at each plot the litter depth where the slight-pole contacts the ground. Litter is defined as the matrix of dead undecomposed or slightly decomposed plant material above the soil surface.
- (5) Average height of tallest plant for each plot.

## EXAMPLES OF TRANSECT LOCATIONS AND FIELD NOTES:

Transect Locations - See map

1. Grazing Unit 1 -- Start at bridge at intake canal at post on left side of north end of bridge. Compass bearing 300°. Walk out 20 yards for first plot.
2. 1.2 miles down tour route from Transect 1 at culvert with metal stake on left hand side of road. First plot is 50 yards from the stake on a compass bearing of 0° due north (line of sight is a Bureau of Reclamation power pole).

## Field Notes

Transect Number - 1		Site Type - Silty		Litter in cm.		
Station	Pole Readings	Average		0-1	1-5	5+
1	1.0, 1.5, 1.5, 2.0	1.8		x		
2	1.5, 1.5, 1.0, 1.5	1.4		x		
3	2.0, 2.5, 2.0, 1.5	2.0			x	

## SUPPLIES:

1. Height-density pole 1.5 meters X 5 centimeters graduated in decimeters and half decimeters (bottom decimeter graduated in centimeters).
2. Sight-pole 1.5 meters in length with marker 1 meter from the base.
3. Cord 4 meters long connecting the top of the height-density pole to the top of the sight-pole for maintaining sighting distance.
4. Field sheets for recording data.

Prepared by: Leo Kirsch

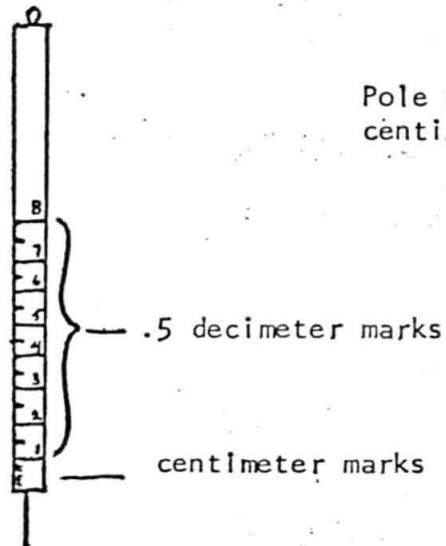
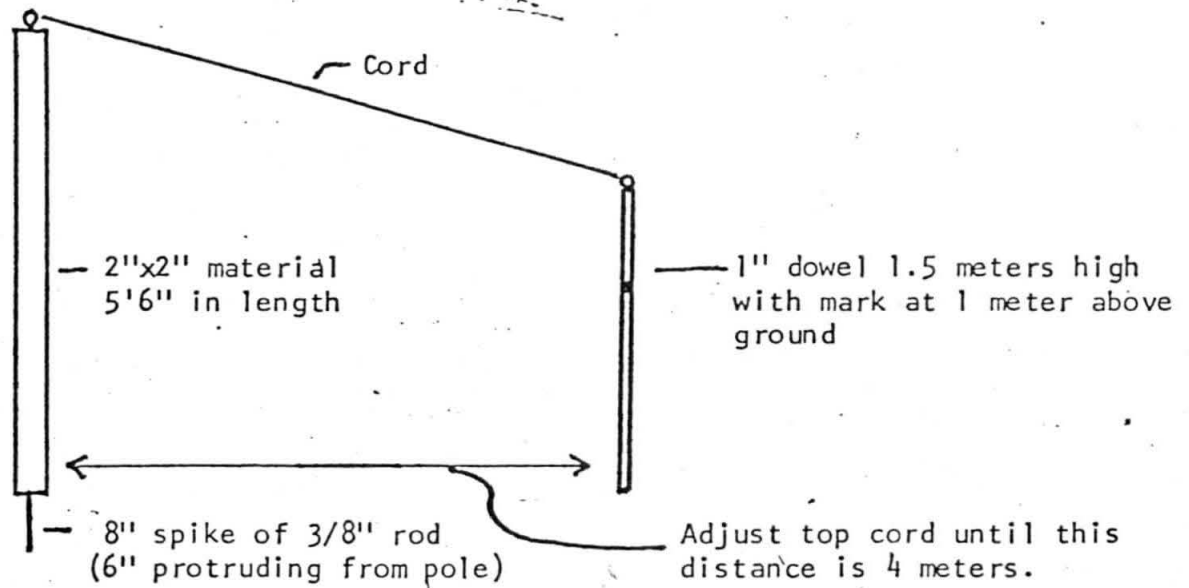
May 5, 1974

revised December 18, 1975

March 1, 1976

Revised: May, 1983, Audubon NWR

# HEIGHT - DENSITY POLE



Pole painted white with .5 decimeter marks and  
centimeter marks painted on in black.

MODIFIED ROBEL TRANSECT

Refuge (WPA) \_\_\_\_\_ Unit or Location \_\_\_\_\_  
 Date Read \_\_\_\_\_ Observer(s) \_\_\_\_\_ Transect No. \_\_\_\_\_  
 Transect Description \_\_\_\_\_  
 Photo Point: Location \_\_\_\_\_ Roll & Frame No. \_\_\_\_\_  
 Remarks: \_\_\_\_\_

Codes: (1) WM-Wet Meadows, LP-Low Prairie, MP-Mid Prairie, HP-High Prairie  
 (2) Compass Direction; N = North, NE = North east  
 (3) Litter Depth: 1 = 0-1 cent., 2 = 1.1-5.0 cent., 3 = 5.1+ cent.

Station No.	Plot No.	(1) Site	(2) Exposure	Pole Reading in Decimeters	Litter Depth			Ht. of Tall Plant -Dec.	Remarks
					1	2	3		
1	1								
	2								
	3								
	4								
	1								
	2								
	3								
	4								
3	1								
	2								
	3								
	4								
4	1								
	2								
	3								
	4								
5	1								
	2								
	3								
	4								
6	1								
	2								
	3								
	4								
7	1								
	2								
	3								
	4								
8	1								
	2								
	3								
	4								
9	1								
	2								
	3								
	4								
10	1								
	2								
	3								
	4								

AUDUBON NATIONAL WILDLIFE REFUGE

PHOTO POINT RECORD

Date Taken \_\_\_\_\_ Purpose \_\_\_\_\_

Refuge (WPA) \_\_\_\_\_ Unit No. or Description \_\_\_\_\_

Habitat Type (DNC-NP) \_\_\_\_\_

Photographer \_\_\_\_\_ Date \_\_\_\_\_ Camera \_\_\_\_\_

Roll No. \_\_\_\_\_ Frame(s) No. \_\_\_\_\_

Film Type \_\_\_\_\_ A.S.A. \_\_\_\_\_ F stop \_\_\_\_\_ Lens \_\_\_\_\_

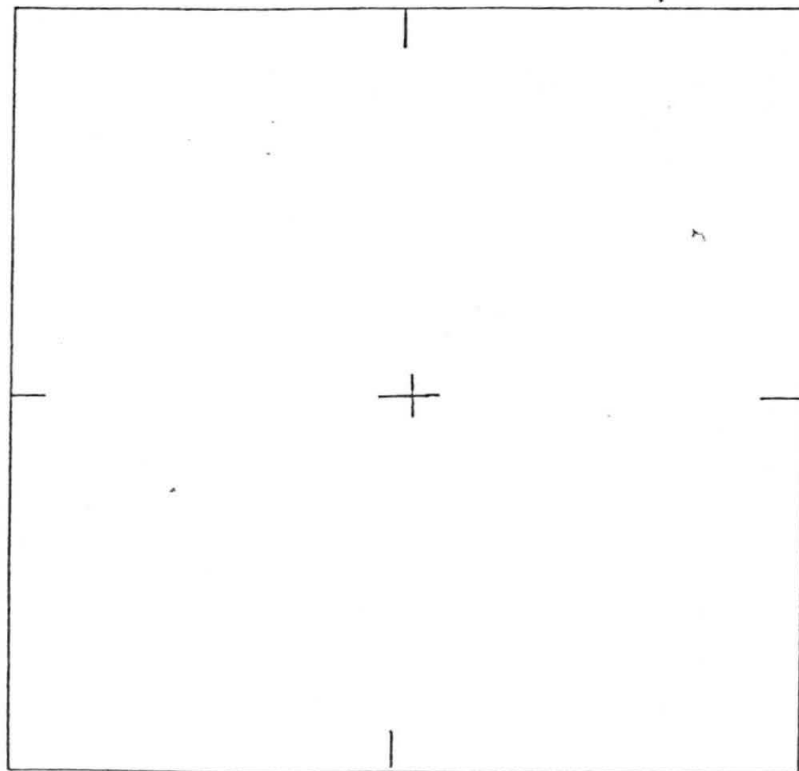
Shutter Speed \_\_\_\_\_ Description of Photo Point:

Direction \_\_\_\_\_ Height \_\_\_\_\_

Weather: % Cloud Cover \_\_\_\_\_ Temperature \_\_\_\_\_

Wind Speed and Direction \_\_\_\_\_ Precipitation \_\_\_\_\_

On bottom half of sheet draw simple diagram of unit showing location of photo point(s), direction of photo(s) and instructions for replication as appropriate.



AUDUBON NATIONAL WILDLIFE REFUGE  
NARRATIVE DESCRIPTION OF VEGETATIVE CONDITION

Many times the vegetative condition of an individual grassland unit is obvious to the trained observer. Invasion of DNC or native grassland by cool season exotic grasses is an example. In these isolated situations detailed data collection measurements are not needed or desired. Instead a narrative analysis of what is observed, a statement of the problem and need for manipulation placed in the appropriate file is all that is needed to document why something was done. The narrative should contain enough information to make after treatment comparisons. If ocular estimates and observations are not sufficient to establish the problem or provide for after treatment comparisons a mote detailed measurement system must be used.