MORMON ISLAND CRANE MEADOWS

MANAGEMENT PLAN

Prepared for

THE PLATTE RIVER WHOOPING CRANE
CRITICAL HABITAT MAINTENANCE TRUST

By

THE NATURE CONSERVANCY
September 14, 1981

Written by

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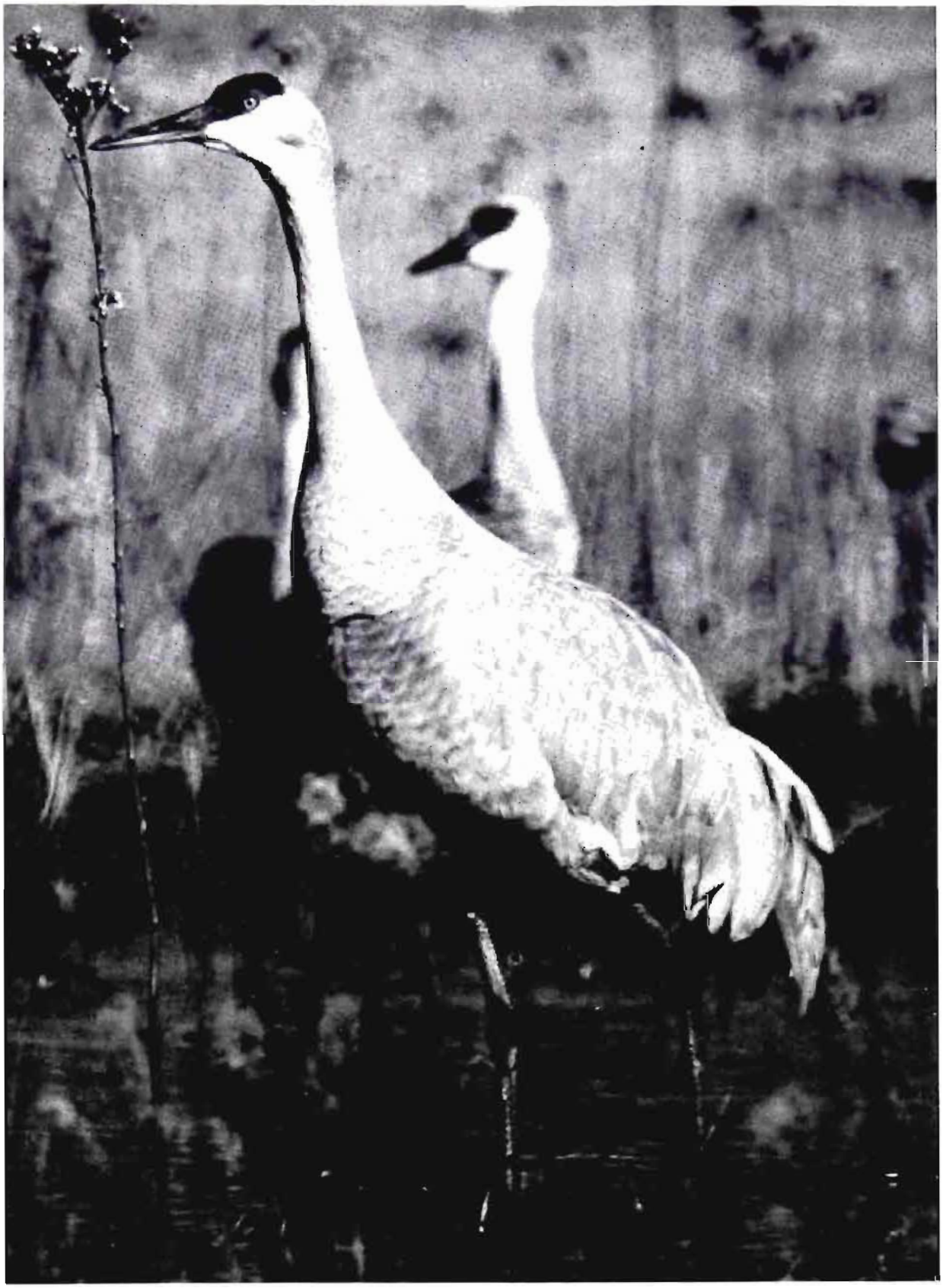

Sandhill Cranes on a Wetland Meadow

(photo by Jan Eldridge, U.S. Fish and Wildlife Service, Jamestown, North Dakota)

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PREFACE

After many years of negotiations, Mormon Island Crane Meadows (MICM) was acquired by The Nature Conservancy (TNC) in December 1979. Simultaneously the property was transferred to the Platte River Whooping Crane Critical Habitat Maintenance Trust (Trust) which funded the project. The Trust in turn leased the property back to TNC. Under the terms of the lease, TNC was to prepare and recommend to the Trust a plan which would direct the management of the property. The lease also provides that TNC is to make recommendations as to the long-term ownership of the property. Since the nature of the ownership of the property is basic to all the management considerations, that recommendation should be addressed first.

The paramount consideration in assuming ownership is who can best insure the long-term protection of the property for the purposes set out in the management plan. It is the judgment of TNC that neither the Trust nor the Conservancy alone can provide the degree of protection that both could provide together. TNC therefore recommends that the Trust continue to hold fee title to the property. The existing lease to the Conservancy should be terminated January 1, 1982 and the Trust should assume control of the management of the property pursuant to this management plan. At the same time the Trust should convey to the Conservancy a perpetual conservation easement which would require in concept that the property be perpetually used for the purposes of crane preservation, that crane management state of the art techniques be employed and that the Trust consult with TNC on a regular basis.

This easement arrangement will give the Trust, as the local organization, the direct day-to-day supervision of the property. It will give the Conservancy, as the national

organization, the perpetual backup and oversight role. It will also give the Conservancy a permanent base and presence on the Platte River which it does not now have for purposes of attracting resources from around the country to aid in crane habitat protection on the Platte River. What is most important, it will give MICM added assurance of continuity of protection.

The following management plan is based on this concept of ownership.

INTRODUCTION

General Background

In December 1979, 1902 acres of prime wetland meadow and open river habitat were acquired on the Platte River through a cooperative effort of The Nature Conservancy (TNC) and The Platte River Whooping Crane Critical Habitat Maintenance Trust (the Trust). Hence, Mormon Island Crane Meadows (MICM) came into being (Fig. 1). MICM is located seven miles south of Grand Island, Hall County, Nebraska (see Appendix A for legal description). The area supports one of the world's largest concentrations of Sandhill Cranes (Grus canadensis) each spring as well as multitudes of other migratory waterbirds. The wetland meadow habitat on MICM is the type that is rapidly disappearing along the Platte River Valley due to conversion to row crops. Protection of this habitat complex, for the Sandhill Cranes, Whooping Cranes (Grus americana) and tremendous numbers of waterbirds, became a primary objective of the Trust and TNC and led to the acquisition of MICM.

Current threats to this unique river system complex include sand mining, second home developments bordering sandpits, conversion of meadows to row crops and water diversion projects. Water consumption is perhaps the most critical problem. Current annual flows of the Platte River have diminished to 31% of historic flows in the Overton area (Kroonemeyer 1978). The completion of Kingsley Dam on the North Platte River in 1941 and the Tri-county Supply Canal on the Platte River in 1940 have had detrimental effects on the riparian habitat vital to Sandhill Cranes. These reduced flows have stimulated the encroachment of woody vegetation on riverine islands. Once this vegetation, primarily Cottonwood (Populus deltoides), Willows (Salix spp.)and Indigo Bush (Amorpha fruticosa), becomes established, use of the river by cranes for roosting diminishes.

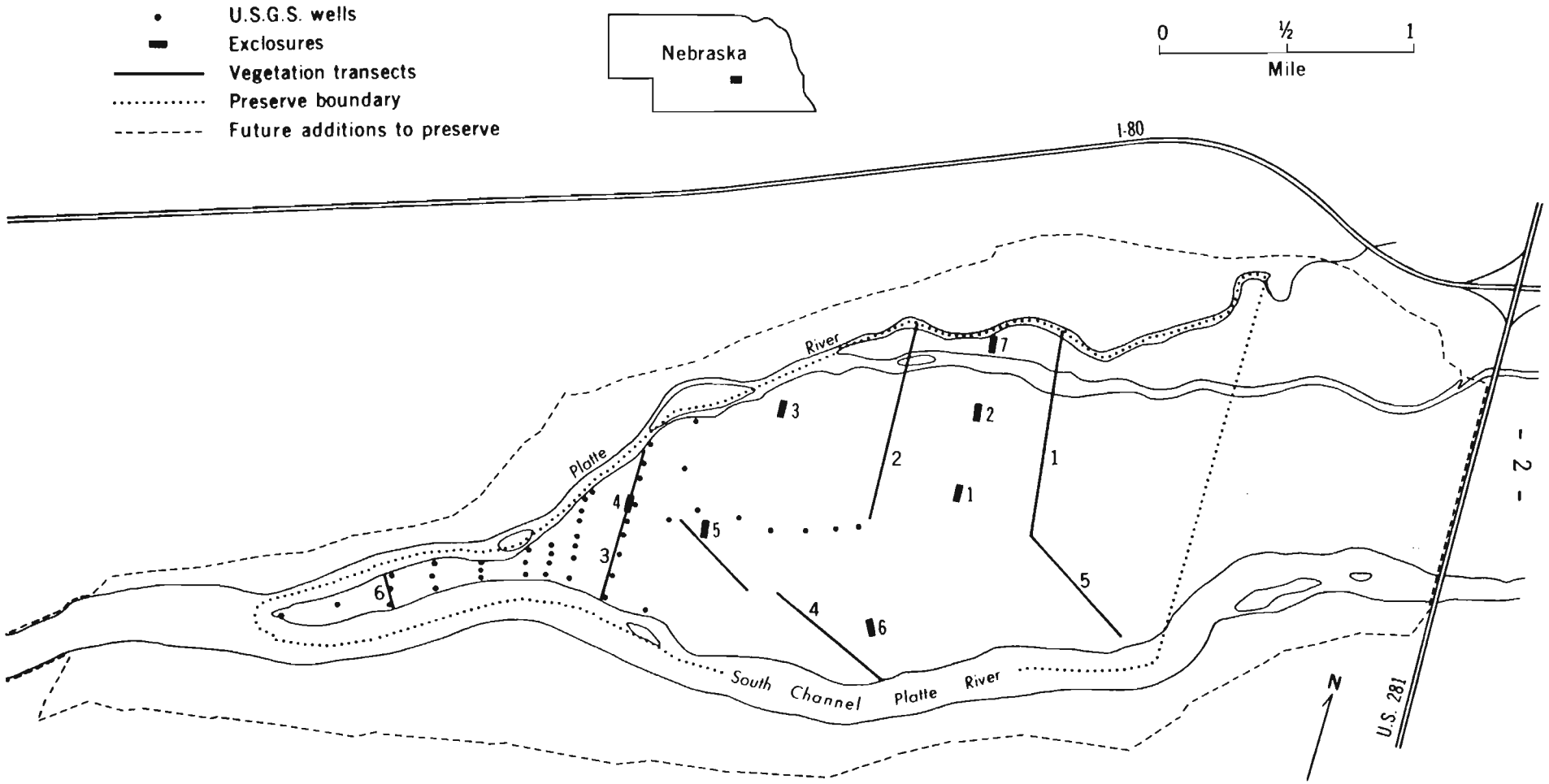

Fig. 1 Map of Mormon Island Crane Meadows including U.S. Geological Survey well locations, grazing exclosures, vegetation transects and recommended additions to MICM.

Several water projects are currently proposed within the Platte Valley watershed. These projects have potential detrimental effects on the habitat as well as on municipal use of water along the Platte. An important court ruling occurred on June 25, 1980. The Nebraska Supreme Court unanimously over-ruled a 1936 law which prohibited transbasin water diversion. Transbasin diversions are now lawful provided they are "in the best public interest". This has resulted in several proposals for transbasin diversion from the Platte, including the Little Blue Diversion Project and the Big Blue Diversion Project. On December 29, 1980, John Neuberger, former Nebraska Department of Water Resources Director, ruled that the Little Blue Diversion project would not significantly harm the Platte River and was in the best public interest. This project would result in the diversion of 125,000 acre-feet (about 16% of the current annual flow) of water from the Platte River near Overton. The Republican River Diversion near Frenchman River would take 25,000 acre-feet of water from the South Platte River. Other water projects are pending in Colorado on the South Platte and in Wyoming on the North Platte River. The Prairie Bend Project would remove water from the Platte near Kearney to irrigate 77,000 acres in the Shelton-Wood River area. Current water project plans would require consumption of more water than currently flows in the Platte River!

Identification as a Biologically Significant Area

U.S. Fish & Wildlife Service Involvement

The Platte River Valley and associated Rainwater Basin areas currently support 5-9 million ducks, geese and cranes annually (Kroonemeyer 1978) (Fig. 2). This region is vitally important in serving as a spring staging area for Sandhill Cranes, White-fronted Geese (Anser albifrons) and other

Fig. 2 Spring staging geese on the Platte River (photo by G.R. Lingle)

water birds. This area historically also served as a spring staging area for Whooping Cranes but artificial disturbances have apparently prevented Whooping Cranes from using the Platte River recently. Acquisition efforts by U.S. Fish & Wildlife Service have concentrated on the breeding grounds of waterfowl, especially in the Prairie Pothole region of the northern Great Plains while the staging areas along the Platte River Valley have been largely overlooked. It was not until 1973 that the Service (formerly U.S. Bureau of Sport Fisheries and Wildlife) proposed a 6069 hectare Sandhill Crane National Wildlife Refuge. It was to be established between U.S. Highway 281 and State Highway 11 along the Platte River and its stated purpose was to protect adequate habitat for the current Sandhill Crane population such that it does not become a critical limiting factor in this species population ecology. A public meeting was held on April 9, 1974 in Grand Island to discuss this proposal. The proposal was met with opposition from landowners and the State and was eventually abandoned (Kroonemeyer 1978).

The Nature Conservancy Involvement

TNC has had a long history of preservation efforts on the Platte River dating back to 1971 due to the significance of the Platte River within the Central Flyway. A TNC staff member attended a meeting in July 1971 with other conservation groups concerned about the future of the Platte River. This led to further TNC investigation into the specific biological importance of the Platte River, the identification of the most critical habitats on the river and an estimate of the local land values culminating in the selection of Mormon Island as the key parcel on the river for preservation. Owners Art and Maxine Terry were immediately contacted by TNC on September 2, 1971 and the first offer to purchase a portion of Mormon Island from the Terrys was made by TNC September 23, 1971.

As discussed earlier, the U.S. Fish and Wildlife Service (USFWS) proposed the establishment of a National Wildlife Refuge on this portion of the Platte River in 1973 and held a public meeting in Grand Island in April 1974 to allow for public comment. Because of this pending proposal, TNC kept in touch with the Terrys but did not actively negotiate to purchase Mormon Island except as an intermediary for USFWS. At this point the Terrys negotiated directly with USFWS and were attempting to reach a purchase agreement in 1974. However, the National Wildlife Refuge proposal received much local opposition and the Federal Water Resources Council requested that a principles and standards study be done for the proposed refuge. This study was initiated in 1977 and final reports are due in 1982.

Due to this delay in the establishment of the refuge, TNC again began to negotiate directly with the Terrys for the sale of their land on Mormon Island. Although Art Terry preferred to sell his land to the federal government, he was sympathetic to preserving crane habitat and in light of the delay and possible failure in establishing the refuge, he was willing to work with TNC.

This extended negotiation culminated in the March 13, 1979 option to purchase 1902 acres on Mormon Island. Various potential major funding sources including the Trust were contacted by TNC in an attempt to identify the necessary private funding. On December 4, 1978 the Trust was established. The Trust was subsequently funded and the Trustees were appointed pursuant to the terms of the Declaration. At the September 20, 1979 Trustees meeting TNC informed the Trustees that it held an option to purchase the Terry property and requested funding. The Trustees at that time approved of the participation of the Trust in the purchase of the Terry property. TNC immediately ceased negotiations with other potential funding sources and began working out the details of the agreement with the Trust.

TNC normally fundraises for acquisition of property and either holds title to the property or transfers certain interests in the property to other agencies or organizations who have better management capabilities for that particular property than TNC. That same strategy was used on Mormon Island as TNC approached the Trust as a foundation with the intent of using the grant to purchase the property and to maintain ownership. However, although the Trust agreed to provide the purchase price, the Trust wanted to hold title to the property.

At the time of the purchase of MICM, the Trust was a newly established entity as described above while TNC had extensive conservation land management experience. TNC then owned 650 preserves totalling over 360,000 acres. Another 1,700,000 acres had been acquired by TNC and had been transferred to others for management. TNC therefore wanted to be involved in the development of a management plan for the property and the Trust wanted to share in the experience and expertise of TNC.

Following much discussion between TNC and the Trust it was decided at the December 4, 1979 Trustees meeting that the Trust would hold title to the property and would lease the property back to TNC for short-term management and for purposes of preparing a management plan for the area. TNC then exercised its option to purchase the 1902 acres and simultaneously transferred title to the Trust. The property was then leased back to TNC (see Appendix B) (Fig. 3).

It was not possible for TNC to assign its option to purchase to the Trust because the Trust had not yet received its tax exemption ruling from the IRS. The Terry's were making a bargain sale donation and needed to deal with a public charity recognized by the IRS. It was at the December 4, 1979 Trustees meeting that the Trustees directed the Trust counsel to seek status as a public charity. A favorable ruling was subsequently received by the Trust from IRS after the purchase of MICM was made by TNC.

Fig. 3 Mormon Island Crane Meadows sign
(photo by G.R. Lingle)

Initial Objectives for Mormon Island Crane Meadows

Based on the primary goals of the Trust and TNC, the initial objectives on MICM were threefold: 1) to protect habitat for Whooping Cranes and Sandhill Cranes, 2) to determine and promote land uses on MICM compatible with other objectives and to foster local support for the recognition of the values of crane habitat protection, and 3) to maintain MICM to sustain other species, communities and natural features that make significant contributions to the biological diversity of the Platte River Valley.

With these three general objectives in mind TNC initiated in 1980 an inventory of the species and communities occurring on MICM to refine objectives if necessary and to obtain information necessary to prepare a management plan. Primary emphasis was placed on Sandhill Crane use of MICM and the bordering Platte River channel. Another component of MICM that was intensively investigated was the grasslands. The sedge meadow and tallgrass prairie community types previously bordering the Platte River for its entire length has been nearly extirpated due to agricultural conversion and other development (Kaul 1975). MICM represents one remnant of this green band of prairie vegetation that was once much more prevalent than today.

Mormon Island Crane Meadows Purchase

The purchase of the 1902 acres of Mormon Island from the Terrys was subject to an existing lease between the Terrys and Quirk Land and Cattle Company. When title of the property was transferred to the Trust, the Trust became Lessor in this lease but simultaneously assigned its interest as Lessor to TNC according to the lease between the Trust and TNC.

Quirk Land and Cattle Company has the right to use approximately 1100 acres as pastureland, approximately 200 acres for cropland, and approximately 600 acres for hayland

on MICM until March 14, 1982. On the pastureland, the grazing season is from May 1 to October 1 of each year. Quirk Land and Cattle Company also has the right to occupy and use the buildings on MICM and has the responsibility of maintaining the premises and all improvements. TNC, as Lessor, is responsible for monitoring the activities of Quirk Land and Cattle Company and assuring compliance with this lease.

Lease Agreements

During the five year term of the lease between TNC and the Trust, it is the responsibility of TNC to conduct inventory and research necessary to prepare a comprehensive management plan for the property to be submitted to the Trust by September 14, 1981. TNC had the option of preparing this plan to address only the duration of this lease with a supplemental plan to be submitted by TNC to the Trust by July 1, 1984 or of preparing this plan for a longer period of time. TNC chose to prepare this plan as a long-term management plan. The actions called for are to be carried out over the next few years, evaluated and revisions made to the plan appropriately.

HISTORICAL LAND USE

Importance of Platte River Valley

Wildlife and Human Use

The Platte River Va ley served as an important route west for early settlers. The first human occupants of the area were Indians with lands north of the Platte River inhabited by the Pawnee and lands south occupied by the Sioux (Andreas 1882). The first white men to visit the region were Spanish soldiers who marched northward from the Gulf of Mexico in 1541 (Olson 1966). Later, in the 1700's, the French arrived but did not settle. Lewis and Clark passed the mouth of the Platte in 1804 on their venture to discover the Northwest Passage (Olson 1966).

The Pawnee was the largest and most powerful nation in Nebraska. There were four branches and the Shani, or Grand Pawnee, had villages on the south bank of the Platte River opposite Grand Island. They lived in log houses covered with earth and sod and used tepees during extended hunts. The Pawnee raised corn and pumpkin, supplementing their diet with game. By 1831, small pox decimated their original 25,000 members and by 1889 only 824 members remained (Buechler and Barr 1920).

The Oregon Trail, although not passing directly through Hall County, had a marked influence on the area (Buechler and Barr 1920). Four periods of use have been recognized. The first was between 1813-1832 and was known as the Astorian period. John Jacob Astor, upon returning from the mouth of the Columbia, reached the "Great Island" on the Platte in March, 1813. This may be the first official mention of what became Grand Island. There his party bought elk hide boats and proceeded downstream to approximately 45 miles west of the mouth of the Platte (Buechler and Barr 1920). The first wagon train over the Oregon Trail departed April 10, 1830.

The second period of use was 1832-1849 and included the early Oregon migration. Next was the California Gold Rush era from 1849-1860, and it was during this time when the greatest number of travellers passed. The next decade, 1860-1869, brought about the decline of the trail's use and eventually it became defunct.

The first white settlers arrived in Hall County in 1857 and settled near the mouth of Wood River. Timber skirted the banks of the Platte River and occurred on larger islands during the years of first settlement. Game was very plentiful then. Elk (Cervus canadensis), dear, Pronghorn (Antilocapra americana), rabbits, turkeys, Prairie Chickens (Tympanuchus cupido) and Bobwhite (Colinus virginianna) abounded. Predators included wolves, fox, "wildcats", and Badgers (Taxidea taxus). Trade in buffalo hides was a lucrative business. Wolves were poisoned with strychnine and one man reportedly killed 75 wolves in one winter (Andreas 1882).

The Mormon Trail was established and used between 1847-1860 as Brigham Young led his group of Mormons to Salt Lake, Utah (Olson 1966) (Fig. 4). In 1858, the Mormons settled in Wood River near Shelton and their farms extended into western Hall County. They established the first newspaper in Hall County, The Huntsman Echo (Buechler and Barr 1920).

Hall County was organized in 1859. Of particular interest is some of the recollections of Fred Stolley. He came to Grand Island from Davenport, Iowa in 1859. His family ate Buffalo (Bison bison) and Pronghorn. He hunted deer in the swamp willows on the Platte River islands in winter with a shotgun and buckshot. Pronghorn were the most prized game. Early spring would bring the antelope down to Prairie Creek for the summer where they were harvested for meat. His family killed Prairie Chickens in unlimited numbers, often 60-70 per day. He recalled seeing a flock of geese which stretched for two miles from one bank of the river to the other in western Merrick County. The nearly extinct

Fig. 4 Handcart pioneers along the Mormon Trail (courtesy of the Nebraska State Historical Society)

Eskimo Curlew (Numenius borealis) provided tablefare in the spring. The curlew would arrive around May 1 and would feed in newly-plowed corn fields. Flocks numbering from 500-1000 would congregate in these fields and were extremely vulnerable to hunters. Between 2:00 and 4:00 in the afternoon they would spiral high into the sky, nearly out of sight, circling and calling (Buechler and Barr 1920).

Wheat and corn were the primary agricultural crops initially. By 1877, 34,759 acres were in cultivation out of the 337,920 acres comprising the county. Wild land was priced at $4-$7 per acre while improved land sold for $26 per acre. Federal land grants gave two million acres to the Union Pacific Railroad which later sold the land for $3-$6 per acre. Sugar beets became an important crop after the completion of the processing plant in Grand Island in 1890. Alfalfa (Medicago sativa) was introduced to the region in 1889 (Buechler and Barr 1920).

In September 1860, a battle between the Pawnee and Sioux occurred within sight of Grand Island. The settlers paid little attention to the skirmish and continued to haul their hay from the fields. By August 1864 war broke out between the settlers and the Sioux and Cheyenne. Following the massacre at Plum Creek, the homesteaders feared Indian attacks and abandoned their farms and small towns. The people of Grand Island stayed (Andreas 1882).

One of the worst blizzards to hit the Grand Island area occurred April 13, 1873. That spring began as a mild one with an early greening of the pastures. The clouds began to build up and gradually the rain turned to snow. Drifts 15-20 feet deep developed and the three-day storm killed a few people along with many birds, deer and cattle (Andreas 1882).

An interesting account of pioneer life is given by Caroline Converse (1963). She was born in Grand Island in 1878. Her German father pioneered the area after leaving

Davenport, Iowa and homesteaded 80 acres two miles north of Doniphan on the Platte River, two miles west of a bridge known as Nine Bridges. Caroline spent most of her childhood years on the banks of the Platte River. Her family harvested wild grapes and buffalo berries and they fished for catfish in the river. She talks of her love for the prairie and of the meadowlarks, crows, woodpeckers, geese, prairie chickens, quail and dogs that kept her company. Tragedy entered her life when her mother drowned in a flood on Decoration Day in May, 1881. Caroline and her two brothers watched their mother submerge in the raging Platte River, never to be seen alive again (Converse 1963).

The period from 1879-1900 was the market hunting era on the Platte River. The big game was all but eliminated by then. Game was shipped to eastern markets including Lincoln and Chicago. Chicago markets paid $4/dozen for Prairie Chickens, $3.75/dozen for Mallards (Anas platyrhynchos), $10-16/dozen for Canvasback (Aythya valisineria) and about $.10/pound for venison. The last herd of buffalo killed north of the Platte River was in 1881 when 33 were shot.

The Platte River provided tremendous waterfowl concentrations which were quickly exploited (Fig. 5 and 6). An 1890 hunt on the Platte River near Rogers was described by Sandy Griswold, "The far-reaching resonant hoo-roo-ooo-ooo of the Whooping Crane is a sound as hard to imitate as it is to describe...We lay there listening to the clamor of those approaching birds...As it proved, there were twenty odd in the flock....It looked like a great rolling cloud of snow....at the crack of our guns ....three of the great birds....came tumbling to the tan carpet spreading out before us" (Farrar, Jon, ed. 1979).

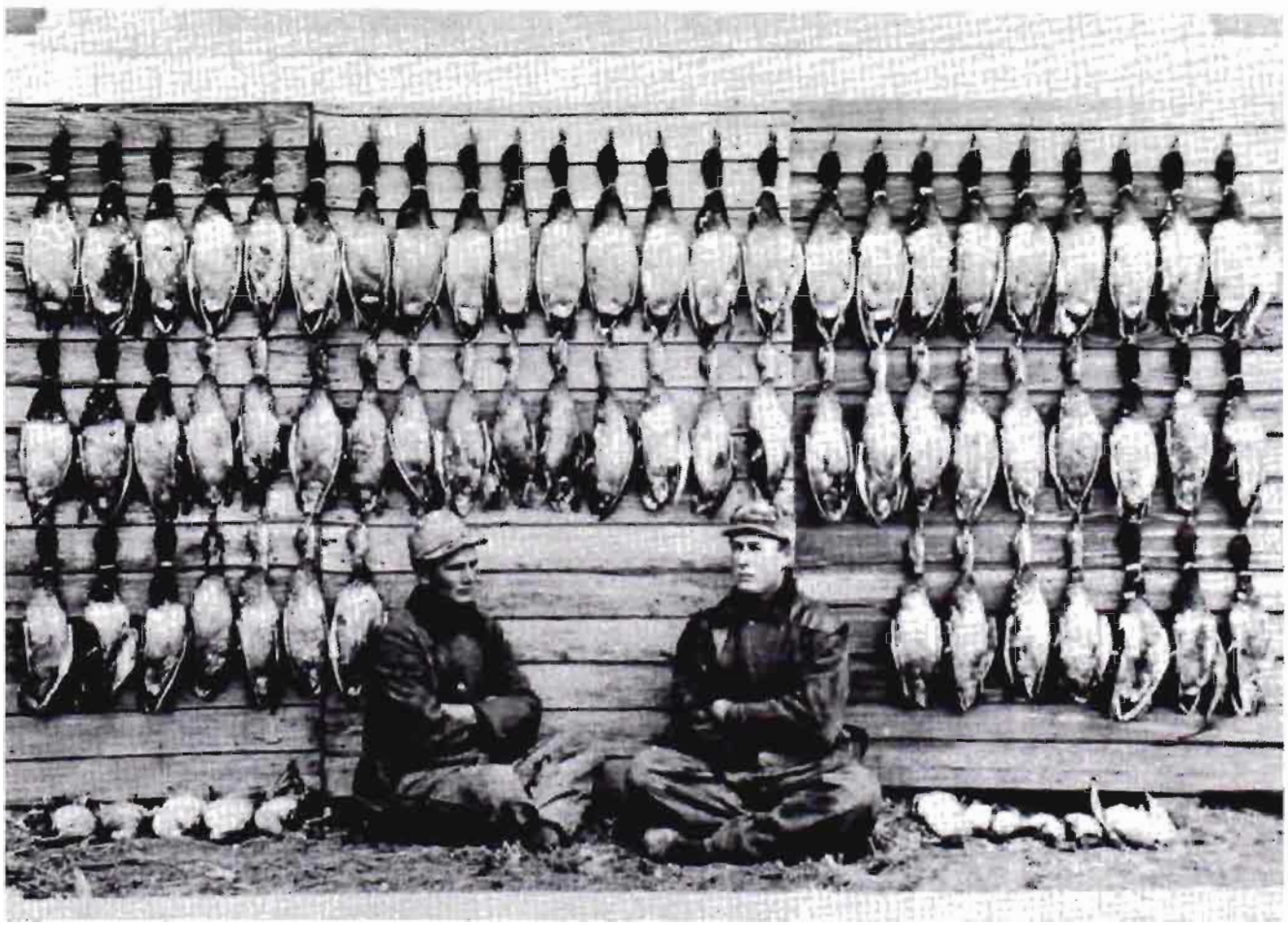

Fig. 5 A day's shoot on the Platte River Near Overton in 1920 (courtesy of the Nebraska Game and Parks Commission)

Fig. 6 1908 goose hunt on the North Platte River East of Paxton, Nebraska (courtesy of the Nebraska Game and Parks Commission)

U.S. Fish and Wildlife Service Study

Following the defeat of the Mid-State Irrigation Project and the abandonment of a National Wildlife Refuge in 1975, a study was initiated to determine if there was a need to protect migratory bird habitat on the Platte River, and if so, how to protect this habitat. The Platte River National Wildlife Study was conducted by the U.S. Fish and Wildlife Service and field work was initiated in 1977. There were three separate studies involved: 1) The Platte River Ecology Study to be conducted by the U.S. Fish and Wildlife Service, 2) a Water Use and Availability Study to be conducted by the Bureau of Reclamation (formerly the U.S. Water and Power Resource Service), and 3) an Hydrology Study of the Platte River to be conducted by the U.S. Geological Survey. The tentative completion date is September, 1982 (Kroonemeyer 1978). The ecology and hydrology studies are presently near completion while the water availability study is not progressing favorably.

The Platte River Ecology Study has added greatly to our understanding of this ecological system and has elucidated the importance of the area in providing for the welfare of migratory bird populations, an international resource. Each spring the Platte River hosts over 300,000 Sandhill Cranes, four-fifths of the world's population, and approximately 250,000 White-fronted Geese, which is two-thirds of the midcontinental population. The area serves as a refuelling point for these birds, where they deposit lipids and obtain nutrients to prepare them for their northward trek to the breeding grounds in northern Canada, Alaska and Siberia. It also prepares them physiologically for the upcoming nesting season, influencing their fertility and production of eggs (Krapu 1981). The greatest local concentration of Sandhill Cranes on the Platte River occurs between U.S. 281 and State Highway 11, often reaching

roosting densities of 10,000 cranes per one-half mile on the river (Frith 1974). Individual cranes spend an average of 30 days on the staging area engaging in social interactions and accumulating body fat reserves (Krapu 1981). They normally arrive in late February and depart by mid-April each year. Approximately two-thirds of the staging population of Sandhill Cranes occur between Grand Island and Kearney (Krapu 1981).

Sandhill Cranes have two basic habitat requirements during their stay on the Platte: 1) nocturnal or roosting habitat within the river channel (Fig. 7) and 2) diurnal habitat where they obtain food and interact with one another. Krapu (1981) found that cranes preferred to roost in river channels 150 meters in width. Once the channels became less than 55 meters wide, crane-use diminished. They roosted in water approximately six inches in depth. Three general diurnal habitats were used: 1) grassland, 2) hayland, and 3) cropland. Haylands and grasslands provided cranes with a concentrated source of amino acids in the form of earthworms, insect larvae and other invertebrates. Snails were utilized by cranes feeding in wetland meadows. It is believed the calcium in snail shells is important in egg formation and viability. Over 95% of the cranes' diet by weight consisted of waste corn. The cranes consumed approximately 1315 metric tons of corn during their stay from mid-February to mid-April. There was no competition between cranes and cattle in obtaining the corn since the cranes selected individual kernels while cattle fed on corn cobs and stalks. Cranes used about 10-20% of the available corn and typically fed within five miles of the river (Krapu 1981).

Krapu (1981) found that cranes sacrificed time and energy to forage for invertebrates in the hayland and grassland expending more energy to obtain the protein source than they acquired. This pointed out the importance of

Fig. 7 Sandhill Cranes roosting on Platte River at Mormon Island Crane Meadows (photo by M. Hay)

protein in their diet. Unfortunately, it is these habitat-types that are being lost by conversion to cropland. The net effect on the cranes' well-being in the future, due to the diminishing habitat and critical dietary components, is open to speculation although our current understanding of a balanced diet in domestic stock is well known.

Other rare or endangered species utilizing the Platte River include Bald Eagles (Haliaeetus leucocephalus), Least Terns (Sterna albifrons), Peregrine Falcons (Falco peregrinus), and Whooping Cranes. The Peregrine Falcon and Whooping Crane are mainly transient species while the Bald Eagle is a winter resident numbering up to 250 birds and the Least Tern is a summer resident. Two small colonies of Least Terns were found nesting on the river, one near Mormon Island and one near Shoemaker Island.

Most of the recent sightings of Whooping Cranes in Nebraska have been in the Big Bend region of the Platte River between Overton and Grand Island. Between 1930-1980, only five confirmed Whooping Crane sightings have been recorded on or near the Platte River (Krapu 1981). Three sightings were in the spring and two in the fall. During migration, Whooping Cranes seem to be more sensitive to habitat alterations and human disturbance than Sandhill Cranes, requiring more isolated areas and more open areas in which to roost. Channel width of roosting areas of Whooping Cranes was between 155 and 365 meters (Krapu 1981) which is uncommon on the river today.

Mormon Island Crane Meadows

The land comprising portions of MICM was first deeded in 1865 by the Union Pacific Railroad Company. Since that time the property has been in the ownership of about 36 individuals. The following narrative on land-use of MICM was based on a discussion with Mr. Arthur Terry, the

previous owner. He owned the land from 1946 to 1979 and described the history of the area as best as he could recall. The dates contained herein are approximate but land-use patterns are reasonably accurate.

The McCarty Ranch owned the area for approximately 50 years prior to Terry's purchase in 1946. Since that time only 200 acres have been broken by the plow. Terry remembers much higher water levels in the early years and it was not uncommon to have a "lake" in the north pasture following spring thaw and rains. The high sand banks located on the south channel were deposited during the "dirty thirties" by wind.

Each area of the property has been delineated in Figure 8 and a description of land-use follows:

Area 1 - Approximately 126 acres. This native prairie was never plowed or seeded and was pastured intermittently. Some cattle were allowed to fall graze within the last 20 years. The mid-channel was normally dry in the summer. Cottonwood, Green Ash (Fraxinus pennsylvanica) and American Elm (Ulmus americana) were and still are present along the mid-channel.

Areas 2,3 and 4 - Approximately 804 acres. This pasture was originally one piece. The current fences shown in Figure 1 were built by Morrison Quirk in 1968. Sloughs and low areas held water throughout the year. Grazing normally occurred from May 15 - September 15. The pasture was dragged occasionally with a harrow to break up cow chips. In 1953 the site was idle and the areas were combined in October and used for the production of native grass seed. There was a 160-acre parcel 1 mile x ¼ mile in size running parallel to the road on the south side of Area 4. This piece was originally part

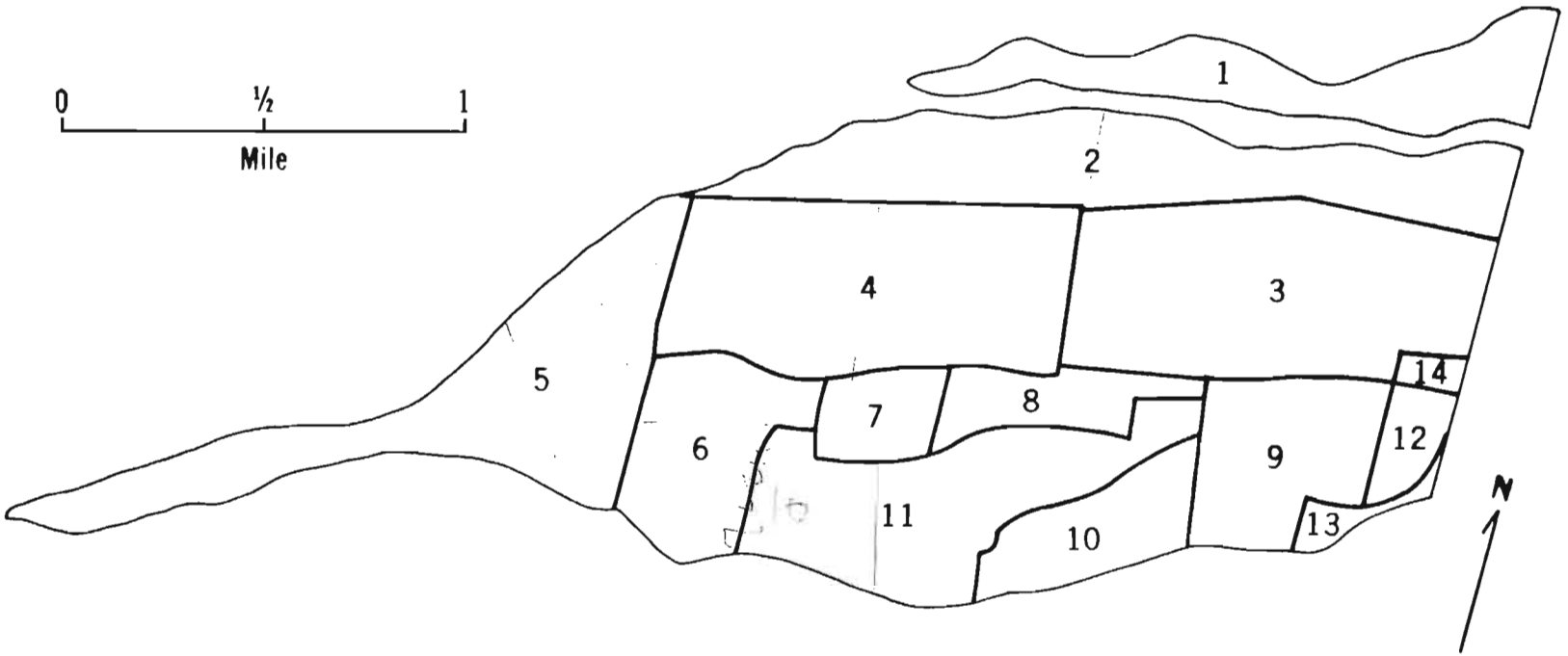

Fig. 8 Historical land use patterns on Mormon Island Crane Meadows (numbers referred to in text)

of Area 5. A homestead and small hay and cattle operation existed in the northwest corner of Area 4. An access road existed along the current west fence line of Area 4 which was originally a township road and later was maintained by Hall County. This 160-acre parcel was purchased by Terry in 1950. It contained an extensive willow growth which was eventually removed through continued mowing. A north-south buggy road crossed the Platte River near the existing fence line on the east side of Area 5. The road corresponded to the section line there and had a wooden bridge on it. Remnants of this wooden bridge exist today.

Area 5 - Approximately 222 acres. Terry's father leased this plot in 1944 with an option to buy and Terry purchased it in 1950. It was hayed and fall pastured until 1960. Terry recalls the Big Bluestem (Andropogon gerardi) growing to over six feet in height. Terry feels the Big Bluestem currently does not achieve this height due to the lowered water table. About 60-70 acres were broken in the eastern portion of this area and seeded to Smooth Brome (Bromus inermis) and alfalfa. The alkali deposits and competition with brome eventually choked out the alfalfa. Sorghum was planted in the broken areas in 1951.

Area 6 - Less than ten acres west of the west woodlot were broken and seeded to Smooth Brome prior to 1946. During 1953-1960 Terry farmed this area and periodically fall grazed it. In 1964 Quirk leased it and winter fed alfalfa to cattle, thus some alfalfa has been established. Quirk also had some fall grazing here.

Area 7-8 - Approximately 103 acres. This was broken ground when Terry purchased it in 1946. It was seeded to alfalfa in 1953. This seeding lasted about 15 years. Since then Quirk grew corn here in 1977 with

limited success. Areas 7 and 8 were seeded to alfalfa in the fall of 1979 and the spring of 1980 respectively. This site was surveyed by the Soil Conservation Service in 1957 to determine optimum use. They suggested it would be an excellent site for sorghum.

Area 9 - Approximately 112 acres. This site was never pastured intensively but was fall grazed periodically. It was over-seeded with a renovator to red clover for experimental purposes.

Area 10 - Approximately 57 acres. This area was broken prior to 1946. Alfalfa was seeded here in 1953. Corn was grown here from 1978-1980 but the yield in 1980 was only 25 bushels/acre. It was seeded to alfalfa in May 1981.

Area 11 - Approximatley 318 acres including Area 6. A house existed here in 1946 near the woodlot. Terry moved it near the current house to use as helpers' quarters and later it was torn down. The woodlot was used as a wintering yard and volunteer alfalfa grew here as a result of winter feeding. Some fall grazing occurred during times when the ground was frozen but it has not been summer pastured since 1946.

Area 12 - Approximately 15 acres. This lot was a Kentucky Bluegrass (Poa pratensis) pasture prior to 1957. Dairy cattle and horses grazed here and Terry used it as a wintering area for cattle.

Area 13 - Approximately 15 acres. This area was maintained as a recreation site for Terry during recent lease agreements. The sandpit was excavated in approximately 1964 and sand pumping operations occurred along the river at that time. The west pit was pumped shortly thereafter.

Area 14 - Current farmstead. This area contained the main house, barn and feed lot as it does today.

Art and his father fall burned Areas 2-4 occasionally to remove residual cover and spring growth was vigorous following these burns. It was burned at least twice before 1946 and only once since then, around 1953. Terry discontinued burning because of the hazards and amount of work involved.

Terry stocked about 400 cattle during 1957-1960. Stocking rates were one cow per two acres. He operated a hay and cattle farm and used to harvest 50,000 bales of hay at 75 lbs each. Yields averaged about one ton per acre for hay (one cutting) and three to four tons per acre for alfalfa (two to three cuttings). Terry worked about 1100 acres of hay and 800 acres of pasture.

Concerning history of the cranes in the area, Bud Wolbach (pers. comm.), a long-time resident of the area, does not recall significant numbers of Sandhill Cranes in the Grand Island area before 1940. Art Terry (pers. comm.) mentioned "good numbers" of cranes on MICM in 1946. Terry noted cranes preferred pastures over hayland and they avoided areas with tall grass. Frith (1974) reported the area along the Platte River between U.S. 281 to Alda as having the largest concentration of cranes during the 1971-1973 spring surveys conducted by the U.S. Fish and Wildlife Service. The three-year annual average was 25,963 birds compared to the next largest concentration (24,230 birds) located between Wood River and Shelton.

Art Terry (pers. comm.) saw the first deer on MICM in 1948. A severe blizzard occurred in November 1947 and forced deer down from the hills. There were a few Mule Deer (Odocoileus hemionus) present but since the completion of I-80 in 1966, very few Mule Deer have been observed.

ECOLOGICAL INVENTORY

Physical Characteristics

Climate

The climate of the Platte River Basin is continental, with hot summers and severe winters. Annual precipitation averages range from 22 inches in the sub-humid Kearney/Grand Island area to 18 inches in the semi-arid North Platte/ Ogallala area. Precipitation is seasonal, with over two-thirds occurring during May-September (Stevens 1978). Table 1 depicts weather data during 1978-1981 for Grand Island.

The climate of Hall County exhibits rapid weather changes from day to day and within a 24-hour period. July is the hottest month averaging 78° F while January is the coldest month averaging 23.7° F. Temperature extremes range from 117° F to -26° F. Winds are moderately strong averaging 12.5 mph and generally occurring from the south and south-east in summer and north to northwest in winter. Average annual precipitation at Grand Island is 24.6 inches. Hail storms and tornados are common in the spring and early summer. Frost penetrates to an average depth of two feet. Winters that follow dry periods have little frost penetration. The growing season is 161 days ranging from April 28 to October 6. The earliest frost recorded in the fall was on September 12 and the latest frost in spring was on May 24. The greatest climatic limiting factor for farming is the periodic droughts (Yost et al. 1962).

Soils

The major floodplain soils on the Platte River are alluvial and are members of the Wann-Leshara-Cass or Platte-Sarpy Associations (Yost et al. 1962). In Hall

Table 1. Weather data in Grand Island from January 1978 to June 1981 (From Climatological Data, NOAA, National Weather Service, Asheville, NC).

	1978				1979				1980				1981			
	Temp.		Precip.		Temp.		Precip.		Temp.		Precip.		Temp.		Precip.	
Month	Avg.	Dep.*	Avg.	Dep.	Avg.	Dep.	Avg.	Dep.	Avg.	Dep.	Avg.	Dep.	Avg.	Dep.	Avg.	Dep.
Jan	12.2	-10.1	.27	-.25	7.5	-14.8	.82	+.3	21.6	-.7	.80	+.28	28.1	+6.6	.16	-.36
Feb	15.0	-12.7	1.18	+.42	13.8	-13.9	.43	-.33	23.7	- 4.0	.65	-.11	31.4	+3.7	.19	-.57
Mar	35.5	0	.83	-.35	36.9	+ 1.4	5.56	+4.36	34.2	-1.3	2.23	+1.05	41.7	+6.2	3.14	+1.96
Apr	51.3	+ 1.4	6.12	+3.65	48.3	- 1.6	3.27	+ .8	51.5	+1.6	1.92	-.55	58.2	+8.3	1.14	-1.33
May	59.8	- .9	1.87	-1.91	57.5	- 3.2	3.99	+ .21	61.0	+ .3	2.06	-1.72	57.0	-3.7	4.28	+.5
Jun	73.7	+3.0	0.5	-3.9	70.5	- .2	2.65	-1.75	73.1	+2.4	3.62	- .78	73.2	+2.5	.60	-3.8
Jul	76.3	0	2.88	- .22	74.0	-2.6	2.66	- .34	80.7	+4.4	.85	-2.15	75.8	-0.5	3.45	+.45
Aug	73.8	-1.2	3.05	+ .51	74.2	- .8	1.39	-1.15	76.9	+1.9	4.42	+1.88				
Sep	68.3	+3.9	1.62	- .89	67.9	+3.5	2.54	+ .03	66.9	+2.5	.83	-1.68				
Oct	52.0	-1.7	.56	- .52	53.0	- .7	3.02	+1.94	51.5	-2.2	1.46	+ .38				
Nov	35.2	-3.0	1.35	+ .74	34.4	-3.8	1.78	+1.17	41.7	+3.5	.12	- .49				
Dec	18.4	-8.6	.64	+.08	33.2	+6.2	.48	- .08	29.8	+2.8	.18	- .36				
Annual	4 76	-2.5	20.87	-2.54	47.6	-2.5	28.59	+5.18	51.0	+ .9	19.14	-4.27				

* Departure from normal based on the 40-year average.

County about 15% of the soils are of the former association. They are bottomland soils and are well drained. The Cass soils are well drained and occur over mixed sand and gravel. Wann soils are similar as they are moderately thick over gravel but develop under poor natural drainage. They have a higher groundwater level than Cass soils. Leshara soils are dep, silty soils that are calcareous at the surface (Yost et al. 1962).

The Platte-Sarpy Association occurs on very sandy and shallow bottom lands. These soils were formed from recent alluvium and wind-deposited sands. Approximately 8% of Hall County exhibits this association. Platte soils are shallow (6-20 inches) and occur over coarse sand or mixed sand and gravel. Sarpy soils are excessively drained and are found on discontinuous sand ridges. Barney soils are poorly drained and consist of 10-20 inches of loam and sandy loam over mixed sand and gravel. They have the highest water table of all the soils in the Platte Valley (Yost et al. 1962).

Most of the soils in Hall County formed under grass vegetation. Parent materials are loess (silty, windblown deposits), alluvium and eolian (wind-deposited sand). Many of the bottomland soils are calcareous at the surface and contain lime in the substrata. A description of the soils found on MICM follows and is based on Yost et al. (1962) (Fig. 9).

Barney Series: Occur on poorly drained bottomlands. The groundwater is above the surface during wet periods and from three to four feet below the surface during dry periods. Small channels cross these areas. The surface horizon is gray to dark gray loam or silt loam five to ten inches thick. This horizon is friable when moist and slightly hard when dry. These areas become boggy when pastured. Small mounds 4 to 18 inches in height and 4 to 12 inches in diameter form. Three to four mounds per square

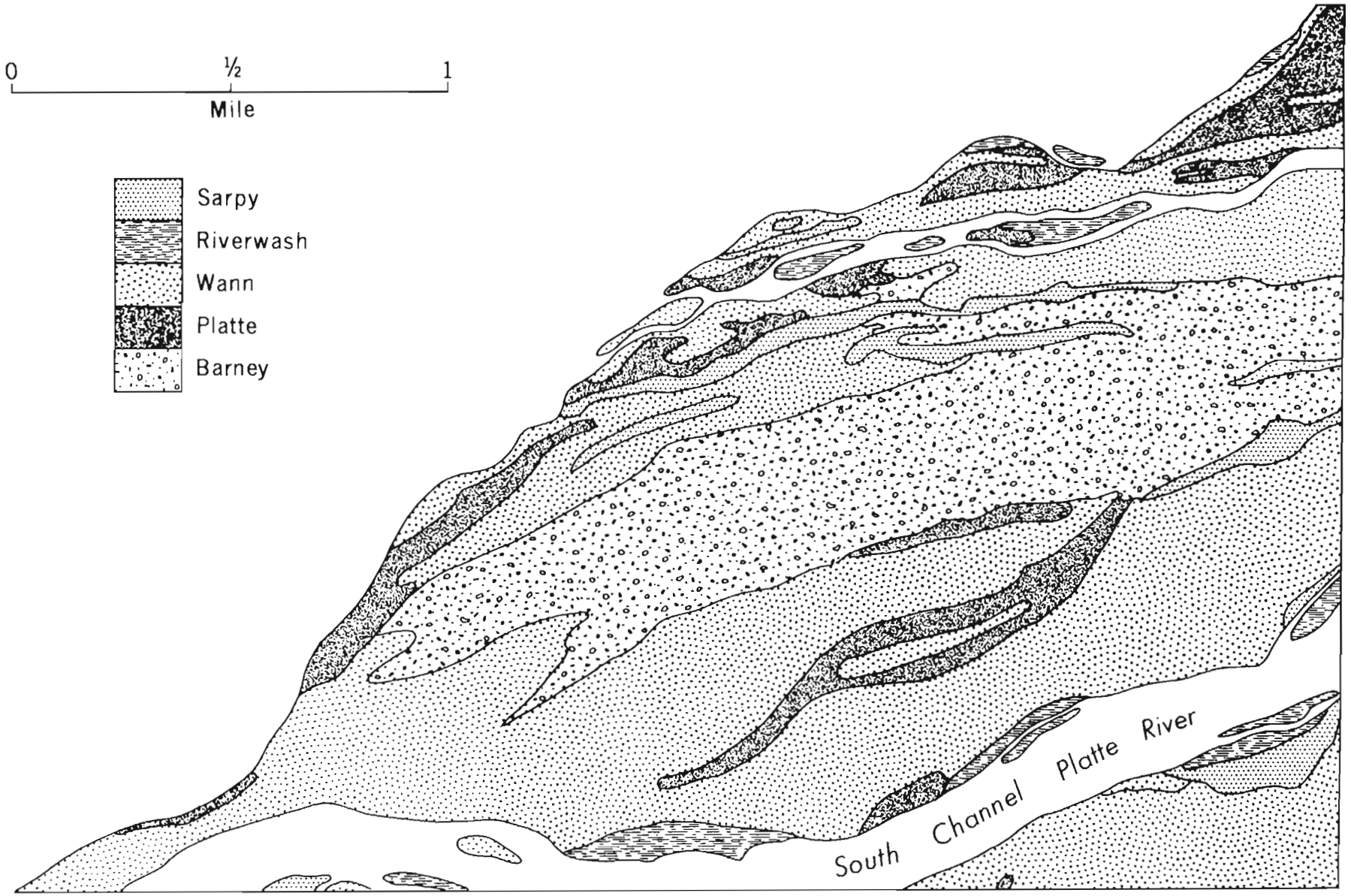

Fig. 9 Soils Map of Mormon Island Crane Meadows
(based on Yost et al. 1962)

yard can occur. If the soils remain in native meadow, the bog condition does not develop and the grasses produce good yields of native hay. These soils are too wet for cultivation.

Cass Series: Consist of excessively drained, deep bottomland soil with sandy subsoil. The surface soil is slightly acid to mildly alkaline. It is friable when moist. Free lime occurs in it. Wind erosion is a problem when cultivated. Permeability is rapid. Some hummocky areas are formed. The groundwater is 5 to 15 feet below the surface.

Leshara Series: The water table fluctuates between three and eight feet from the surface. These soils have a silty profile with a friable surface horizon 8 to 14 inches thick. Leshara soils have medium permeability. Capillary action can bring soluble salts to the surface where they form a white crust. Rains wash these deposits away.

Platte Series: These soils are shallow and form in 10 to 20 inches of recent alluvium. Most of this series are associated with former channels of the Platte River. They have low water-holding capacities and are underlain with coarse sand and gravel. The groundwater is from two to six feet below the surface. Soluble salts accumulate on the surface due to capillary action. Grasses in native pastures should not be overgrazed. Ironweed (Vernonia fasciculata), Vervain (Verbena spp.), Goldenrod (Solidago spp.) and Ragweed (Ambrosia spp.) have replaced Blue Grama (Bouteloua gracilis), Buffalo Grass (Buchloe dactyloides) Switchgrass (Panicum virgatum), Indian grass (Surghastrum avenaceum) and Bluestem where overgrazed. The Platte-Sarpy complex consists of Platte loams and Sarpy sands. The two are intermixed and cannot be mapped separately. Numerous small channels cross these areas. Wind erosion can be a hazard on sand ridges. The Platte-Wann complex

consists of Platte loam and deep, sandy Wann soils. These soils form in materials recently deposited in old channels. Permeability is high as is surface runoff.

Riverwash: Includes sandbars and sandflats. These areas are from one to three feet above the river surface. Some of the stabilized islands have a dark surface horizon two to eight inches thick. Cocklebur (Xanthium strumarium) and willows are pioneer species on these sites. These areas make excellent wildlife habitat.

Sarpy Series: Sarpy soils are slightly acidic and non-calcareous. Permeability is rapid. Their alluvial parent material has been formed into ridges by the wind. The loose surface horizon is 4 to 14 inches thick. Wind erosion is a hazard in cultivated or overgrazed areas.

Wann Series: A very friable calcareous soil with a sandy subsoil. The sandy texture ranges from 20 to 60 inches in depth. Lime carbonates are usually at the surface. Surface runoff is low and permeability is high. The groundwater fluctuates between three to eight feet below the surface. Wann soils are more poorly drained than Cass soils. They have sandier subsoils than Leshara soils but are not as sandy as Sarpy soils. Response to irrigation is good. Excellent stands of Big Bluestem, Switchgrass, Indian grass and Blue Grama grow on Wann soils. Most areas are nearly level but a few are in low, hummocky sites.

Geology and Physiography

The Platte River Valley is underlain by Ogallala sedimentary rock of the Tertiary Period (Bose 1977). Deep valleys with easterly flowing rivers traversed across Nebraska prior to Pleistocene Glaciation over one million years ago. The advance of the Nebraskan ice sheet dammed many of these rivers, causing the valleys to fill with clay, sand and gravel. Erosion during the Aftonian Interglacial period approximately 900,000 years ago reopened

some of these areas. The Kansan glacial advance approximately 600,000 to 700,000 years ago filled the valleys once again and altered river drainage. Minor changes occurred during subsequent glacial periods. Alluvial deposits now overlay thick layers of sand and gravel which comprise a major aquifer (Krapu 1981).

Nebraska lies within the High Plains section of the Great Plains Province. Elevation ranges from over 4,000 feet in the Pine Ridge to 825 feet in the southeast corner of the state (Fig. 10). Within Hall County the Platte River Valley varies in width from 12 to 19 miles. The alluvial bottomlands are four to six miles in width. The elevation at Grand Island is 1,846 feet. Elevations on MICM are slightly under 1,900 feet. The river gradient is approximately 1:750 and flows in a northeasterly direction (Yost et al. 1962).

Hydrology

The hydrology of the Platte River System has undergone marked changes in the last century. The first irrigation system on the Platte was in 1870. Since 1890, the benefits of irrigation have been realized and water diversion projects, both planned and completed, have accelerated. Figure 11 depicts historic trends of annual and peak flows and channel width at North Platte, Nebraska. From Overton to Grand Island the channel width in 1969 was about 0.6 as wide as in 1865 (Williams 1978). Current annual flows in the Overton area have dropped to 31% of historic flows (Kroonemeyer 1978). The reduction in flows has stimulated the encroachment of woody vegetation on riparian sites by 1) reducing the scouring effects of sandbars by ice and 2) increasing the amount of exposed sandbars suitable for seed germination.

The U.S. Geological Survey (USGS) initiated field work on MICM in spring 1980 to study hydrological features as

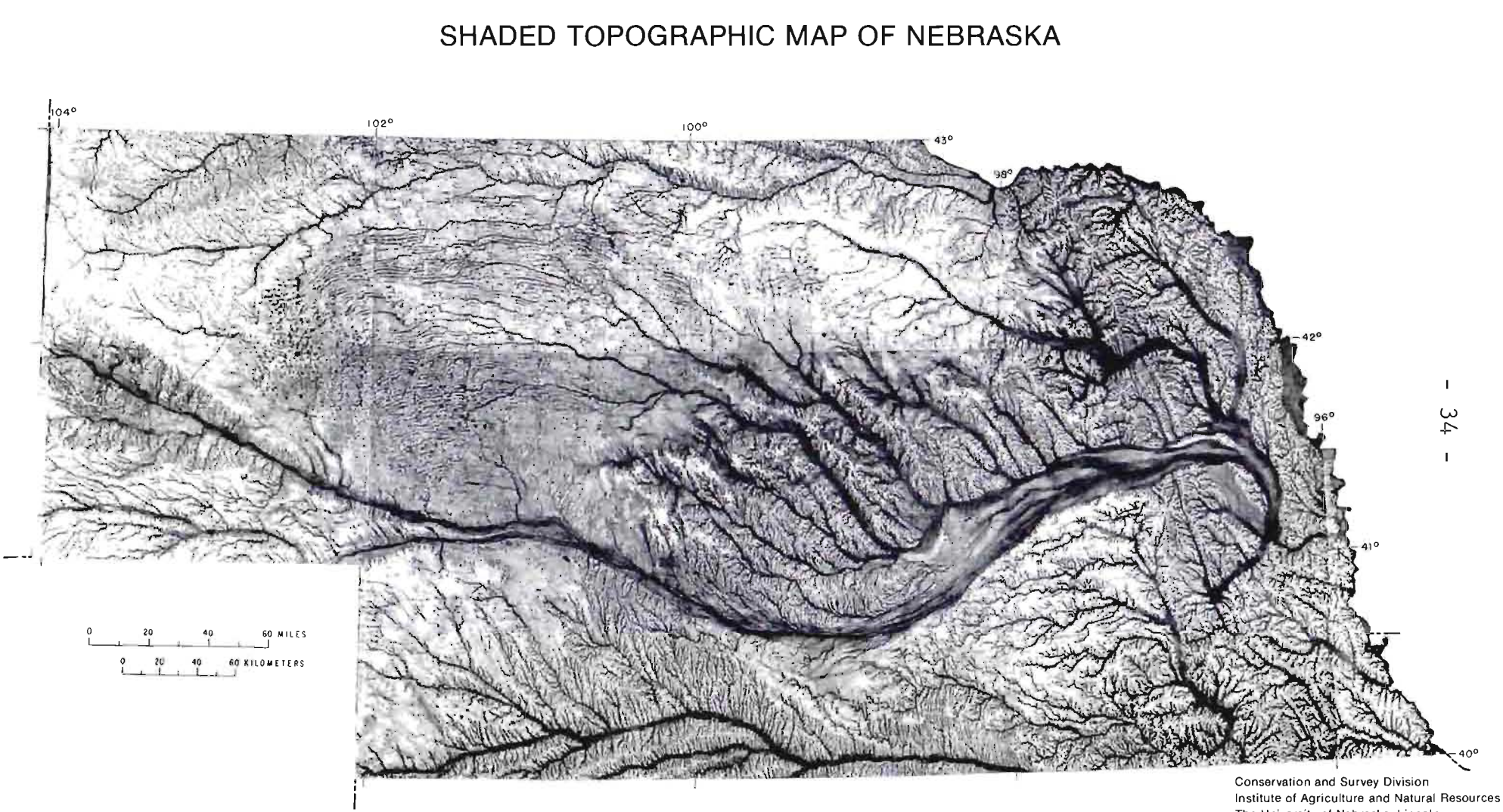

Fig. 10 Shaded topographic map of Nebraska

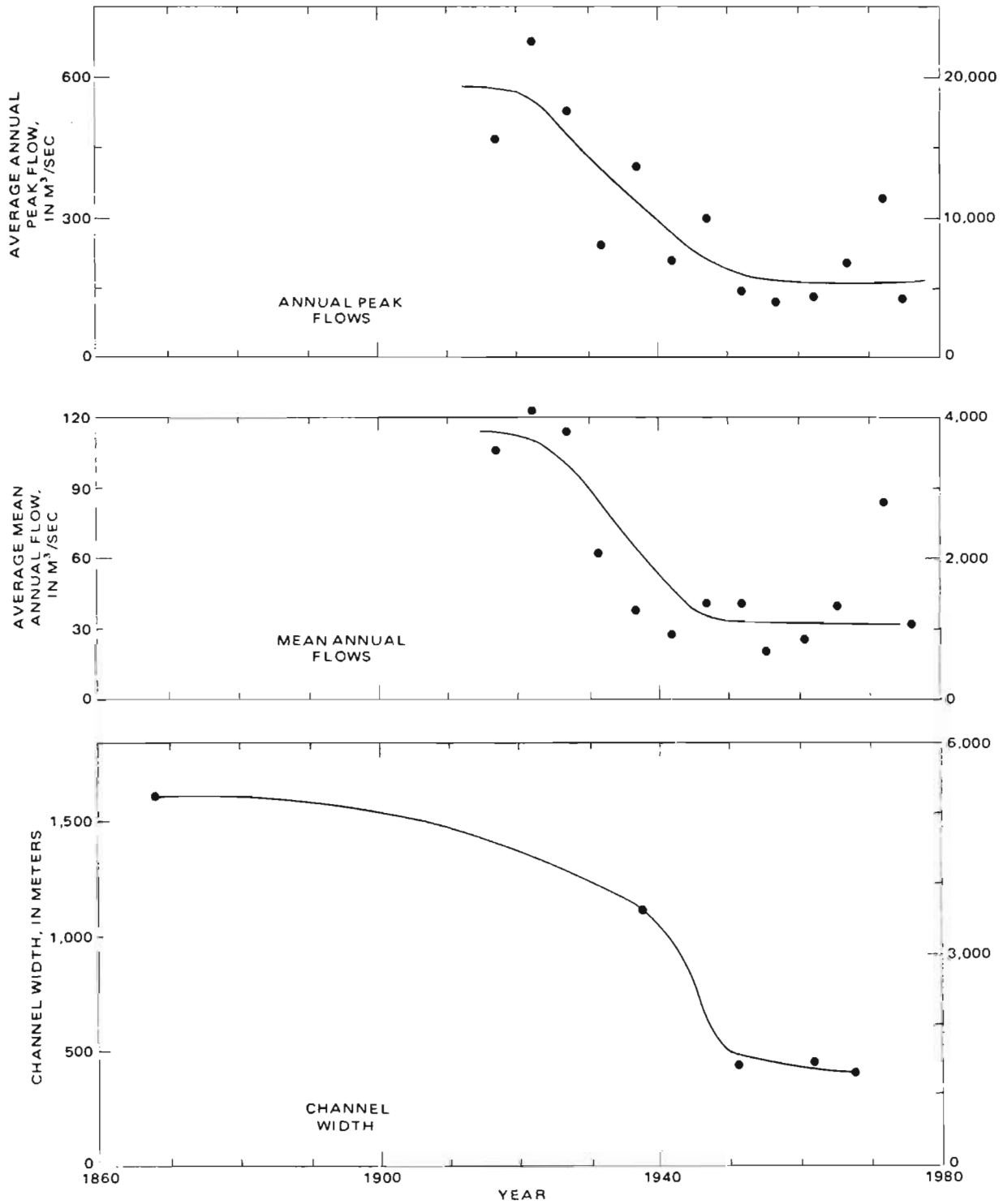

Fig. 11 Historical Trends in the Platte River Flows near Overton, Nebraska (from Williams 1978)

part of the National Wildlife Study. They drilled 60 wells in transects across MICM (Fig. 1) to study the relationship of river water levels to adjacent groundwater levels. The Platte River is a losing stream in this area, meaning water is discharged to groundwater supplies. USGS found that a major change in river water levels is reflected within 24 hours in the immediate groundwater levels indicating a 24-hour recovery period. The ramifications of this observation are many, but one crucial factor is implied: if removal of water upstream for proposed irrigation projects occurs, the wetland meadow habitat complex on MICM will be altered due to changes in the groundwater. Therefore, it is imperative that adequate instream flows be maintained if this habitat is to be protected.

Biological Characteristics

Introduction

The vegetation in Nebraska is diverse (Fig. 12) with the Platte River Valley consisting primarily of floodplain prairie and forest. This floodplain forest is characterized by an open canopy cottonwood forest with an understory of Red Cedar (Juniperus virginiana), Rough-leaf Dogwood (Cornus drummondii) and grasses and forbs (Currier 1981). Eastern arboreal species are common in the central Platte region and include species such as Green Ash, Hackberry (Celtis occidentalis) and American Elm. Diamond Willow (Salix rigida), Peach-leaved Willow (S. amygdaloides), Coyote Willow (S. exigua), and Indigo Bush are the dominant low tree or shrub species on the river channel and riverine islands. Recently exposed mudflats and sandbars are dominated by Lovegrass (Eragrostis pectinacea), Nutsedge (Cyperus spp.) and Barnyard Grass (Echinochloa crus-galli). Cocklebur, White Sweet Clover (Melilotus albus) and scattered willow and cottonwood seedlings dominate more elevated mudflats

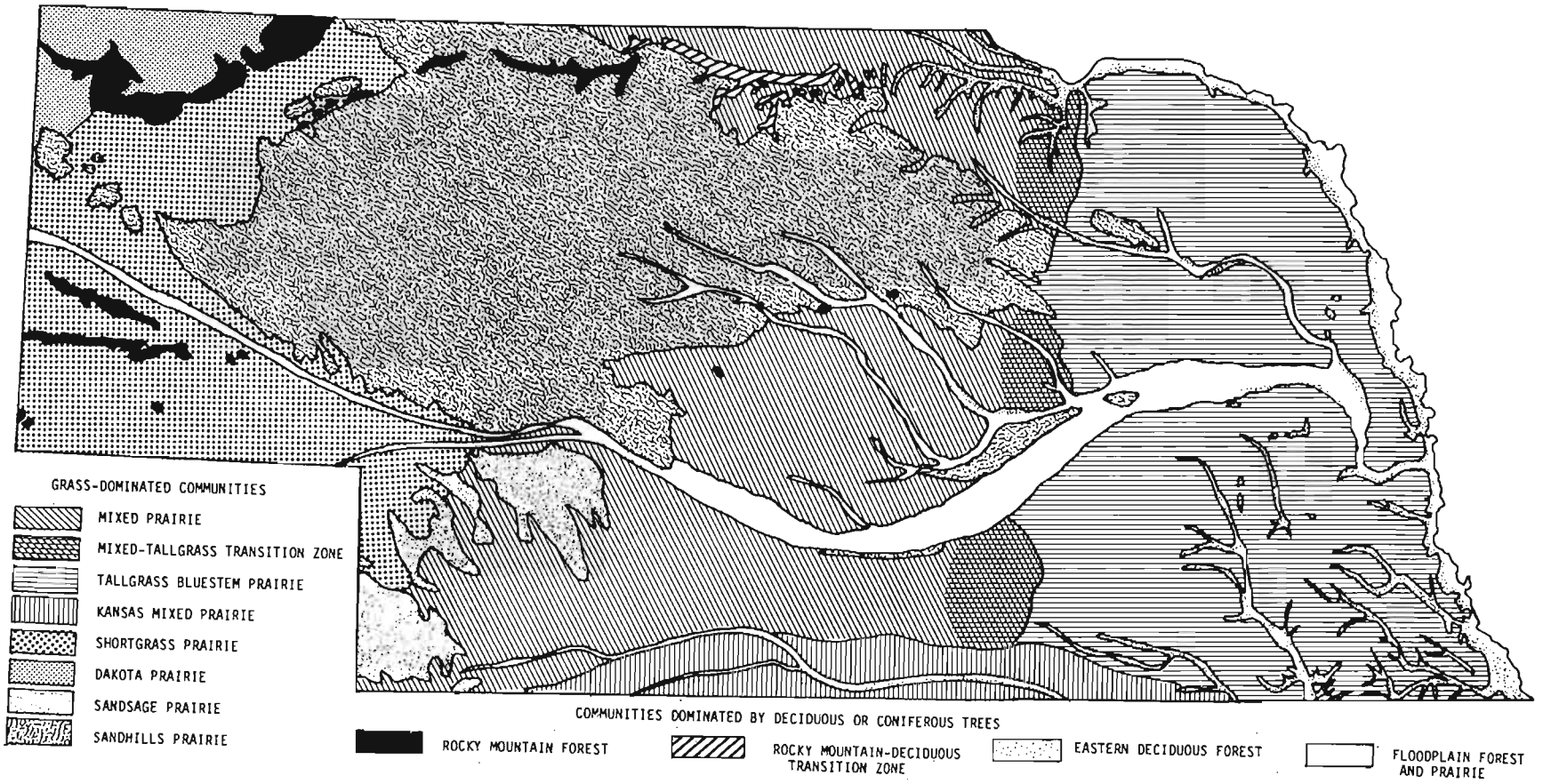

Fig. 12 The vegetation of Nebraska (reprinted with permission from Johnsgard 1980)

(Currier 1981). The prairie vegetation is dominated by Big Bluestem, Switchgrass and Indian grass on the higher sites and Prairie Cordgrass (Spartina pectinata) and Canarygrass (Phalaris arundinacea) in the lower, wetter sites.

Currier (1981) has classified the major vegetation types on the Platte River (Table 2) and has proposed a vegetation development scheme for the Platte Valley (Fig. 13). During periods of high water flows willow growth significantly increased, red cedar growth significantly decreased and cottonwood growth showed no change (Currier 1981).

Factors which affect seed germination have been outlined by Currier (1981). Viable seed was released from Populus and Salix from early June to mid-July. Seed viability lasted nearly three weeks for Populus and less than two weeks for Salix. Seedlings germinated best in areas with fine sand, a high percentage of soil moisture and an extensive substrate exposure during seed viability time. Once seedlings reached 15 cm in height, periodic flooding did not effectively remove or kill them. Mechanical or chemical techniques for woody vegetation control may be the most feasible for effective control (Currier 1981).

Changes in riparian habitat over the last century has impacted the fauna inhabiting the Platte Valley. As woody species became established, new niches were created which allowed the invasion of certain animals and has detracted from the suitability of this habitat by other species. As previously mentioned, this woody growth has encroached upon many areas which were once used as roosting sites by Sandhill Cranes. Walkinshaw (1956) reported crane distribution to be largely between Cozad and Grand Island, a distance of 93 miles. By 1979, areas west of Lexington were essentially abandoned by cranes and sites between Overton and Elm Creek were greatly localized (Krapu 1981). Both man-made and natural factors have been responsible for

Table 2 Summary of the vegetation types on the Platte River floodplain (reprinted with permission from Currier 1981).

Type	General Description	Subtypes
MUDFLAT		
Annual Mudflat	Recently exposed areas along the river channel colonized by *Cyperus*, *Eragrostis*, and other annuals.	
Perennial Mudflat	Partially exposed areas near the river channel characterized by 1-2 M high *Populus*, *Salix*, and *Amorpha* saplings.	
MEADOW		
Marsh	*Typha* and *Scirpus acutus* dominated communities in pools of standing water near river channels and in the backwaters of major dams and diversions.	
Lowland Grassland	Grazed, intermittently wet meadows dominated by *Ambrosia*, *Carex*, *Poa*, and a variety of other grasses. Low lying areas are dominated by *Scirpus*, *Eleocharis*, and *Phyla*.	Grazed Grassland Wetland Meadow
Upland Grassland	Dry meadows characterized by *Andropogon* prairie, sandy areas dominated by *Bromus tectorum*, and grasslands with scattered *Amorpha* shrub.	Prairie/Hayfield Sandy Meadow/Blowout Shrub Grassland

Table 2 (continued)

Type	General Description	Subtypes
SHRUB		
Wetland Shrub	Riverbank and island shrub dominated by *Salix exigua* and *Amorpha*, with an understory of *Carex*, *Scirpus*, and *Lycopus* in intermittently flooded areas, and an understory of *Solidago* and *Spartina* on drier island sites.	*Salix* wetland *Salix* shrub *Amorpha*/*Salix*
Upland Shrub	*Amorpha* and *Cornus drummondii* dominated upland shrub areas in forest openings and along raised riverbanks. *Ambrosia*, *Bromus japonicus* and open ground are common in the understory.	*Cornus*/*Amorpha* *Amorpha*/*Cornus*
FOREST		
Populus/*Salix* Wetland	Intermittently flooded forest dominated by *Salix rigida*, *Populus*, and *Fraxinus*, with an understory of *Amorpha*, *Cornus*, and *Salix exigua* shrub. *Phyla* and *Carex* are important herbaceous species.	
Populus/*Elaeagnus*	Wet forest areas dominated by either dense *Elaeagnus* with an overstory of scattered *Populus*, or dense *Populus* with *Elaeagnus* in the understory. *Ambrosia*, *Carex*, and *Poa* are the dominant herbaceous species.	*Elaeagnus*/*Populus* *Populus*/*Elaeagnus*

Table 2 (continued)

Type	General Description	Subtypes
Populus Meadow	Upland Populus forest with a grassland understory dominated by Panicum, Spartina, Poa, Sporobolus, Bromus, and scattered low Amorpha, Cornus, and Rosa shrub.	Populus Open Meadow Populus Shrub Meadow
Populus/Juniperus	Dry upland forest dominated by either dense Juniperus with an overstory of scattered Populus, or dense Populus with Juniperus in the understory. Fraxinus (seedlings), Rosa, Rhus radicans, and Ambrosia are the dominant ground cover species.	Juniperus/Populus Populus/Juniperus
Mixed Hardwood Shrub	Moderately dry forest dominated by Populus, with an understory of Fraxinus, Salix rigida, Morus, and Ulmus. Cornus drummondii, Amorpha, and Salix exigua are the dominant shrubs, while Solidago, Rhus radicans, Poa, and Elymus are the major herbaceous species.	Populus Shrub Mixed Hardwood Shrub

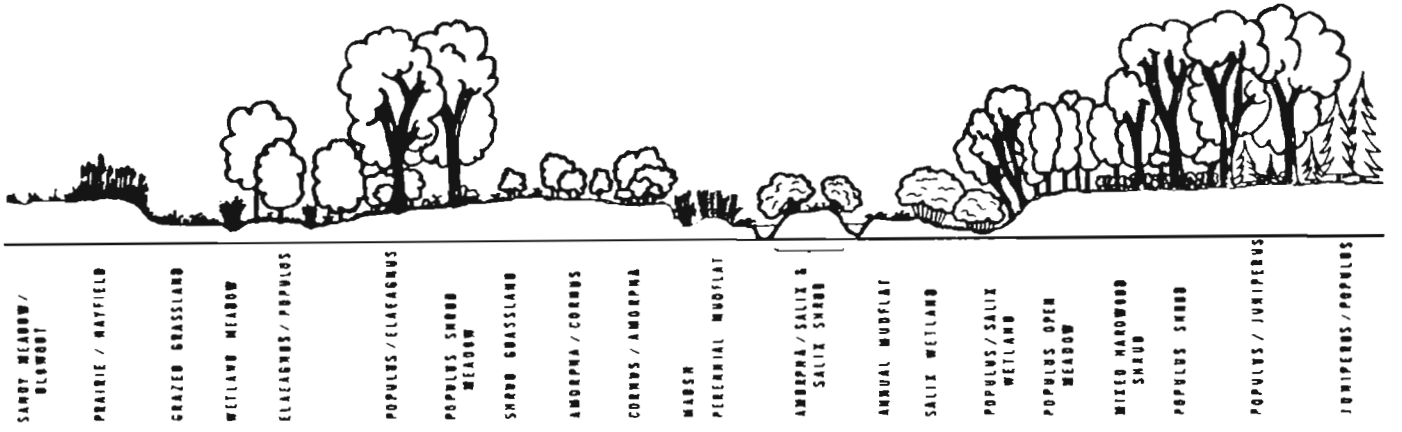

Fig. 13 Vegetation types occurring on the Platte River floodplain (reprinted with permission from Currier 1981).

a general easterly shift in crane distribution (Krapu 1981). Bridges, roads adjacent to the river and sand mining operations have caused cranes to abandon these areas. Water diversion projects and subsequent vegetation encroachment have rendered other sites unsuitable to Sandhill Cranes. Vegetation height along the banks also affect crane use as cranes prefer areas with low vegetation stature (Krapu 1981). Cranes avoided areas where the open channel was less than 55 meters in width.

Other avian species which have been adversely impacted by changes in habitat include Whooping Cranes, Least Terns, Piping Plovers (Charadrius melodus) and Burrowing Owls (Athene cunicularia). Whooping Cranes may be more sensitive to the encroachment than Sandhill Cranes. Sightings of Whoopers on or near the Platte River have dropped from 65 between 1920 and 1949 to five between 1950 and 1981. Least Terns and Piping Plovers are sandbar nesting species. Their distribution has been greatly reduced with the shrinkage of suitable habitat (Krapu 1981). Control of prairie dog towns has probably reduced Burrowing Owl populations.

Breeding species which have benefited from habitat changes include: Willow Flycatcher (Empidonax traillii), Bell's Vireo (Vireo bellii), Common Yellowthroat (Beothylpis trichas), Yellow Warbler (Dendroica petechia), Cardinal (Cardinalis cardinalis) and Indigo Bunting (Passerina cyanea). The low shrub growth of willows and Indigo Bush provide an abundant source of insects and berries which they feed on and also provide nesting cover. Great Blue Herons (Ardea herodias) have also benefited from the growth of cottonwoods. One colony near Cozad numbers over 100 nests. The Platte River Valley, as mentioned earlier, also attracts about 250 Bald Eagles during the winter months. Warm water discharges from the Tri-county Supply Canal create ice-free conditions where eagles obtain fish. The riparian forests provide roosting areas and feeding perches which eagles utilize.

Of the large mammals, White-tailed Deer (Odocoileus virginiana) and Coyotes (Canis latrans) now occupy the Platte River Valley in sizeable numbers. Raccoon (Procyon lotor), Opossum (Didelphus marsupialus), Beaver (Castor canadensis) and Cottontail Rabbit (Sylvilagus floridanus) populations have probably increased with the development of riparian forests. Blacktail Prairie Dogs (Cynomys ludvicianus), Blacktail Jackrabbits (Lepus californicus) and Pronghorns have probably declined in the valley through a combination of control measures and loss of habitat.

As indicated earlier, the two stewardship objectives on MICM are to sustain species, especially cranes, communities and other natural features that significantly contribute to the preservation of natural diversity and to promote uses of natural areas compatible with the above to foster support and understanding by the public of the values of natural diversity preservation. In order to accomplish these objectives effectively, it is necessary that an inventory of resources be made on MICM and that a master plan be developed by the end of the second year to guide future management. These inventories are directed at obtaining a better understanding of the management needs of the species and communities targeted for protection and at determining if secondary protection targets exist. The results of this inventory process determine the need for refinement of the preserve stewardship objectives and identify management needs leading to the development of a management plan.

This format was followed at MICM. Seven phases of the resource inventory were contracted to eleven professionals. Since MICM was purchased for the protection of crane habitat, a major focus of the inventory was crane use of the property. The other phases included a survey of the plant communities present and an inventory of the following groups: vascular plants, insects, fish, amphibians, reptiles, mammals and

other birds. All contracts were initiated by May 14, 1980 and the majority of field work was conducted during 1980. A more detailed report on the findings of these investigations, especially on crane use of MICM, is provided in the final reports from the respective investigators on file with TNC. A summary and brief discussion of the results of these inventories is presented in this section.

All contract inventory teams, with the exception of the bird inventory, were required to collect voucher specimens and to prepare those specimens for storage. In order to assure proper care and curation of these important specimens, TNC has agreements with the State Museum at Lincoln and Kearney State University whereby they have agreed to serve as repositories for portions of the MICM voucher collections. Conditions of the agreement with the State Museum are as follows:

1) the State Museum at Lincoln will be the official repository for the herbarium, entomological, fish and herpetile voucher specimens of Mormon Island Crane Meadows.
2) The Nature Conservancy will provide storage cabinets for the herbarium and entomological specimens.
3) Removal of these specimens and cabinets by The Nature Conservancy can occur any time within a five year period beginning January 1, 1981 and ending January 1, 1986. If these items are not removed prior to January 1, 1986, they will become the property of the State Museum and will be incorporated into the Systematics Research Collections of that facility.
4) The specimens will be available for use by any interested party and will be routinely maintained by museum staff.
5) Specimens will be labeled by individual researchers and a master list of these specimens will be provided for each taxa.

TNC has an agreement with Kearney State College that all mammal voucher specimens will be housed in the Vertebrate Museum of Kansas State College with the understanding that The Nature Conservancy can retrieve or relocate the collection at any future date if deemed necessary.

Flora

Since the preparation of a comprehensive management plan requires an understanding of the full array of biological diversity of the property, a floristics survey was made on MICM. Collections of vascular plants occurring on MICM were made from May through September 1980 at random sites in the various habitats. This floristic survey for the property totalled 262 taxa of vascular plants (Kolstad 1981) (Appendix C). This species list was based on collections during only one growing season but the investigator felt this total represents approximately 90% of the anticipated flora.

An annotated checklist was developed listing the flowering dates, habitat type and general distribution in Nebraska of all taxa (Kolstad 1981). Mounted voucher specimens were submitted to TNC and have since been deposited in the Nebraska State Museum in Lincoln. Duplicate voucher specimens have also been placed in the Kansas University herbarium and the Kearney State College herbarium.

No federally or state endangered, threatened or rare plant taxa were discovered. The following species are of interest because they are at the edge of their known distribution in Nebraska or the Great Plains on MICM:

Triglochin maritimum L.
Carex hallii Olney
Stipa comata Trin. & Rupr.
Allium textile A. Nels. & Macbr.

Smilax hispida Muhl.
Chenopodium missouriense Allen
Lysimachia thrysiflora L.
Rosa woodsii Lindl.
Oenothera pallida Lindl.
Zanthozylum americanum Mill.
Plantago eriopoda Torr.
Crepis runcinata (James T. & G.

Although 262 taxa were observed on MICM, 45 of these are of non-North American origin. Many of these exotic plants, such as asparagus, have become naturalized in the United States but do not represent components of the native, presettlement Platte River Valley flora. The remaining 217 taxa include 24 taxa restricted to disturbed areas that would be considered weedy plants, 27 taxa observed in the woodlots and considered characteristic forest flora, 36 riparian taxa and 130 grassland taxa that were observed exclusively or primarily in the pastures and hay meadow.

These totals are apparently indicative of a depauperate flora. Weaver (1968) characterizes the Nebraska prairies as areas where many species "...often a total of 200 or more per square mile..." are found. On a 200 acre prairie in western Iowa, Weaver (1958) found a total of 165 forbs alone. On a 640 acre prairie near Lincoln, Steiger (1930) found 237 species. While these totals can be misleading because of the differences in site characteristics, the short, one growing season study on MICM and the unknown impact of grazing and haying practices on the prairie community in MICM, a further investigation of the composition of the MICM flora suggests that indeed many characteristic prairie plants are absent.

This is perhaps most noticeable among the legumes which are important contributors of nitrogen to the system. The most conspicuous species not located on MICM was Lead Plant

(Amorpha canescens) a common prairie species which is considered a decreaser, meaning its abundance will decrease with increased grazing pressure. Lead Plant should occur on the ridges and mesic areas on MICM. Weaver (1968) lists eleven other legumes that are characteristic of Nebraska prairies. Three of these would not be expected to occur in the mostly mesic to wet-mesic habitats on MICM, but of the remaining eight, four were not observed on MICM. The missing four species include Tick Trefoil (Desmodium canadense), Bush Clover (Lespedeza capitata), Silver-leaf Psoralea (Psoralea argophylla) and Prairie Turnip (Psoralea esculenta).

Again, the total impact of grazing and haying on MICM is unknown and release from these pressures could result in additions to the floristics list. Plants could occur on MICM in a vegetative state and simply not flower due to top removal by cattle or mowing. Only periods of deferment from grazing and haying will allow an opportunity to study that possibility.

The plant communities of MICM were investigated to determine the types, composition and location of these communities on the property. Sampling transects totalling four miles were established on all major land use - range site combinations on MICM (Fig. 1) and during July 1980, 314 meter squared quadrats were taken at 20 meter intervals along these transects. At each quadrat a species list was made and foliage cover was estimated for each species using the following ranges: 95% to 100% cover by the species, 75% to 95%, 50% to 75%, 25% to 50%, 5% to 25% and 0% to 5% cover, according to Mueller-Dombois and Ellenburg (1974). Also, at each quadrat basal plant cover, litter cover and bare soil were determined by using a modified version of the step point sampling process described by Owensby (1973). The results of this sampling technique were used to compute plant composition of the communities sampled. In addition to the cover quadrats, five variable radius points were

established in each of the six forest stands sampled. More detailed information on the sampling procedure is presented by Nagel (1981).

Seven grazing or mowing exclosures were built during May 1980 on areas representing all land use - range site combinations (Fig. 1). These exclosures were established to allow for visual comparisons between grazed and ungrazed and between mowed and unmowed plots, to provide small rested areas for plant collections and to determine end of season forage production. Existing fencelines and stock wells are shown in Figure 14.

Range condition based on the vegetation sampling project were summarized by range site according to Table 3 which is based on soil types. The wetland range sites were dominated by sedges and appear to have been heavily grazed in the past as the range condition computed using the methods of Perry and Stubbendieck (1976) was fair, the productivity was low and the percentage composition of increaser species was 56.1%.

The sands and sandy range sites were dominated by Big Bluestem, Switchgrass and sedges and range condition was determined to be high fair. Plants such as Buffalo Grass and Side Oats Grama (Bouteloua curtipendula) which are characteristic of drier prairie types occur on these sites.

Subirrigated range sites were dominated by Big Bluestem, Indian Grass, and Switchgrass and rated as high fair condition. Significant amounts of the exotics Redtop (Agrostis stolonifera) and Kentucky Blue Grass occur in the subirrigated pasture sites. The west pasture also has an abundance of Smooth Brome.

When relating these findings based on the step point analysis to the pastures on MICM, the average percent composition of selected species for all pastures is as follows:

Carex spp.	20.45%
Poa pratensis	10.85
Agrostis stolonifera	10.45

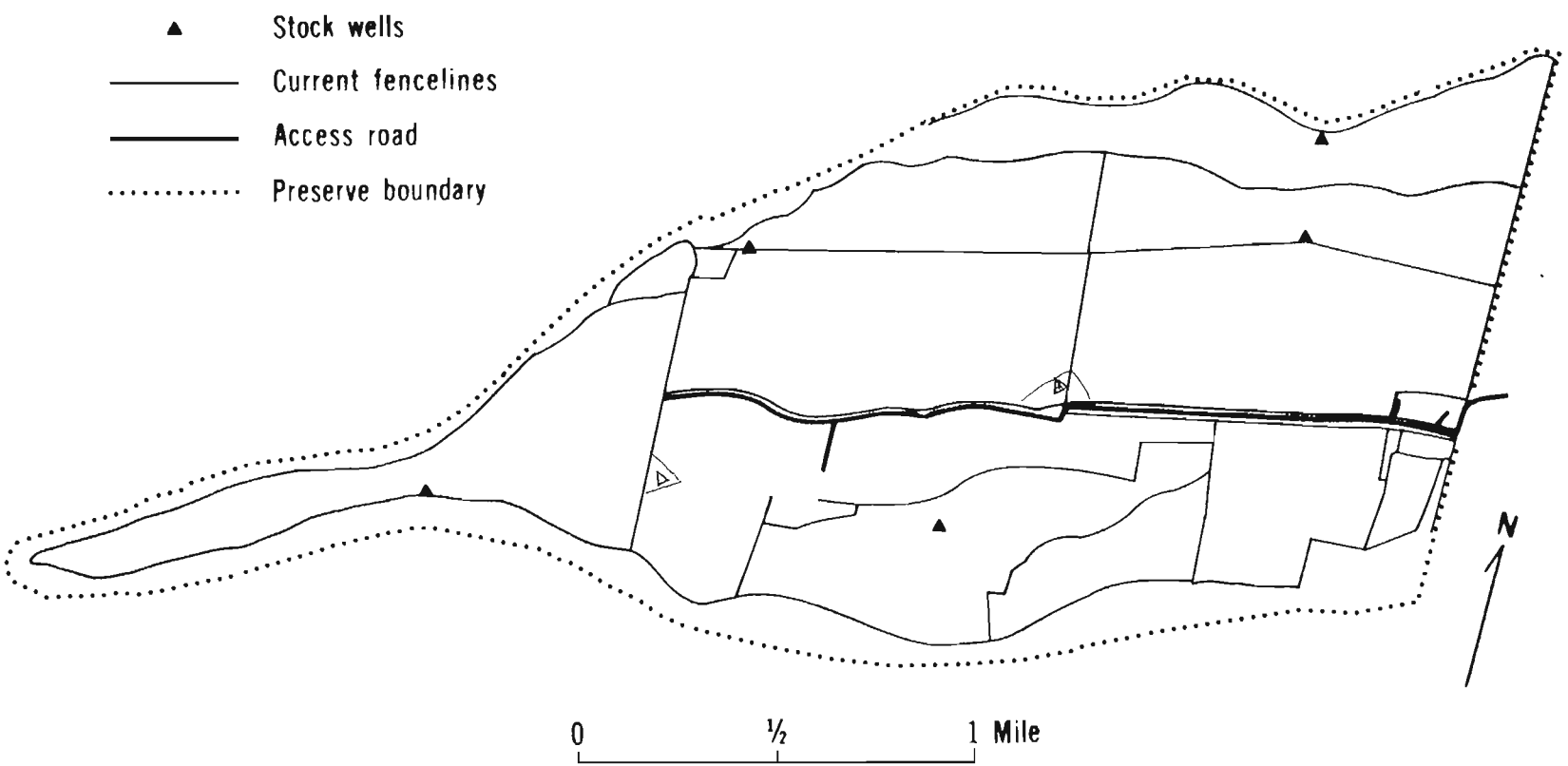

Fig. 14 Locations of existing fencelines and stock wells on Mormon Island Crane Meadows

Table 3. Mormon Island Crane Meadows Range Condition

Species Composition Percentage of:	Main Pasture			West Pasture	Hay Meadow			River Habitat
	Wetland	Subir-rigated	Sands & Sandy		North	South-east	South-west	
Decreaser species	15.8	34.6	26.7	23.6	41.1	37.2	27.1	27.4
Increaser species	56.1	37.6	44.0	33.9	29.9	19.9	20.2	18.3
Invader species	19.5	22.7	25.7	36.3	25.9	38.4	44.0	19.1
Unrated species	9.0	4.9	4.6	5.2	2.7	4.4	8.3	35.7
Counted toward range condition	36.1	48.1	46.2	37.6	54.7	46.2	36.9	39.9
Range condition	Fair	High Fair	High Fair	Fair	Low Good	High	Fair	Fair
Stocking rate (AUM per acre)*	1.7	1.1	0.7	1.1	1.2	1.2	1.1	—

* Calculated according to procedures in Perry and Stubbendieck (1976); AUM = animal unit month.

Andropogon gerardi	9.93
Eleocharis spp.	5.85
Panicum virgatum	5.40
Scirpus spp.	5.30
Spartina pectinata	3.20
Bromus inermis	3.10
Ambrosia spp.	2.70
Sorghastrum avenaceum	1.70

This indicates a high percentage of exotic species. Likewise, similar findings of the hay land indicate the same, as Kentucky Bluegrass averaged 19%, Smooth Brome 13% and Redtop 4.4%.

Forest stands were dominated by a Cottonwood overstory with an understory of Rough-leaved Dogwood, Indigo Bush, Poison Ivy (Toxicodendron radicans), Grape (Vitis riparia) and Prickly Ash (Zanthoxylum americanum).

Since pollination is a critical factor in the success or failure of plant seed production, a brief survey was conducted to determine the species of pollinators on MICM and whether species-specific pollination appeared to play a role in controlling pollination. In general, a high diversity of pollinating insect species were found to occur on MICM including 22 species of bees and 19 species of moths and butterflies. However, no highly specific relationships were seen where only one insect species was pollinating a specific plant species.

Fauna

Just as a knowledge of plant species and communities is necessary in the preparation of a comprehensive management plan, so is a knowledge of animals and animal communities. An attempt was made to obtain an overview of animal species occurring on MICM, their relative degree of rarity and their value to cranes. Consequently, five animal groups were inventoried: insects, herpetiles, fish, mammals and birds.

Insects were collected every other week from April to September 1980 in the various habitats, except aquatic and live animals, utilizing a variety of techniques during day and night (Ratcliffe 1981). The insect fauna of MICM appears very typical of south-central Nebraska with the exception of one species of Bittacus or scorpionfly located here that generally occurs in more moist habitats (Appendix C).

A fish inventory was conducted in the three channels of the Platte River bordering MICM and in the two sandpits on MICM. Temperature and dissolved oxygen readings were also taken in the sandpits. Contour maps were prepared for the sandpits. Thirty-one species of fish were collected from June through October 1980 (Appendix C) (Cochnar and Jenson 1981). Twenty-four of these species were collected in the river and distribution maps were developed for these species. Eighteen species were collected from the sandpits. While the fishery at MICM provides food for certain wildlife, no federally or state endangered, threatened or rare fish were located on MICM.

A survey of the amphibians and reptiles occurring on MICM was conducted from April to September 1980. Various habitats on MICM were observed for herpetiles; drift fences were established at three locations for capturing snakes; seines, fike nets and turtle traps were used in aquatic habitats. Three amphibian species and seven reptile species were observed (Appendix C) (Ballinger 1980). The Plains Leopard Frog (Rana blairi) was the most abundant amphibian and the Common Garter Snake (Thamnophis sirtalis) was the most abundant reptile. Herpetile diversity is typical of this area of Nebraska and the greatest abundance on MICM occurred in association with the woods and non-agricultural areas. No federally or state endangered, threatened or rare herpetiles were collected.

The abundance and diversity of mammals on MICM was determined by using snap-trap transects, live-trap grids and strip-transect observations from June to October 1980. Twenty-six species were observed (Appendix C) (Springer 1981). No federally or state endangered, threatened or rare mammals were observed or collected.

The avifauna on MICM tallied between March 1980 and June 1981 totalled 177 species, of which 62 species are potential or known breeders on MICM (Appendix C) (Hay and Lingle 1981).

A variety of methods was employed to assess the abundance and diversity of birds on MICM including daily observation, mist-netting, breeding bird censuses on seven plots, car censuses for Upland Sandpipers (Bartramia longicauda), Pheasant Crow (Phasianus colchichus) counts and intense observations of Sandhill Cranes during their spring staging period. The most numerous species occurring on MICM was the Sandhill Crane.

The diversity of birds inhabiting this area is remarkable, comprising nearly 44% of the species recorded in Nebraska. Two federally endangered species were encountered as migrants, the Bald Eagle and Peregrine Falcon. One state threatened species, the Least Tern, breeds on riverine sandbars 0.4 miles west of the property. No Whooping Cranes were observed or reported in the area.

Habitat use, distribution and populations of Sandhill Cranes were determined by ground counts of the birds on the fields, roost count of cranes either departing from or arriving at the river, aerial counts and photogaphy of cranes on the fields, and counting cranes on 6.4 acre plots to determine densities. The relationship between vegetation height and density on the wetland meadows was analyzed relative to crane use on each field. Crane use of each field did not appear to be influenced by vegetation height

which reached only a maximum of approximately 33 cm or density whereas the amount of lowlands in each field was highly correlated to crane use. It may be that the amount of surface area of water within the fields is an important contributin factor in attracting cranes. Some threshold of vegetation density or height tolerance by cranes probably exists between a completely rank stand of grass, which cranes will not use, and the vegetation stature on the fields in March 1981.

A much more detailed discussion of crane biology and crane use of MICM is found in Hay and Lingle (1981).

MICM OBJECTIVES

Biological

As stated earlier, TNC was drawn to the Platte River Valley because of the importance of this system in the Central Flyway and the need for habitat protection for Whooping Cranes. While sanctuaries have been established for the Whooping Cranes in their breeding territory at Wood Buffalo National Park in Alberta, Canada, and their wintering areas at Aransas National Wildlife Refuge in Texas, no sanctuaries exist in the Central Flyway to provide resting and staging areas during migration. It became a top Great Plains priority of TNC to protect such habitat along the Platte River. Similarly the Trust was established with the mission of protecting habitat in the Big Bend area of the Platte River for the benefit of Whooping Cranes and other migratory water birds.

The primary objective on MICM is to fulfill these goals of protecting and maintaining habitat for the Whooping Cranes and Sandhill Cranes. These two species are the number one protection priorities. Since Whooping Cranes are

so rare, Sandhill Cranes are being used as indicator species for the Whooping Cranes. The specific habitat requirements of cranes necessitate implementation of management practices which will not benefit all other species presently occurring on MICM. Cranes require open vistas of the wetland meadow and riparian habitats as well as low stature of the grasslands in spring. Whooping Cranes specifically will tolerate little artificial intrusians such as roads, bridges, powerlines, etc. Cranes also require certain foodstuffs from the native prairie that are unavailable elsewhere. Management of MICM will be directed toward providing these conditions. Other migratory bird species which may benefit from this type of management include Least Terns, Piping Plovers, Upland Sandpipers, Bobolinks (Dolichonyx oryzivorus) and Grasshopper Sparrows (Passerina savannarum).

A secondary objective on MICM is to maintain other species and communities representative of the native Platte River floodplain system when such is not incompatible with the primary objective. The wet prairie community type occurring on MICM has all but vanished along the Platte River. Nagel (pers. comm.) describes MICM as the best quality example of this type of system still in existence. Since the flora appears rather depauperate and the vegetation composition poor due to past land uses, the condition of this grassland type should be improved. Grazing, haying and prescribed burning are the three main tools that should be used to accomplish this.

Educational

An original objective on MICM as stated earlier is the fostering of public understanding of and support for the preservation of natural diversity. In cooperation with the Trust, this was initiated on MICM in 1981. Slide presentations describing the general ecology of the Platte

River Valley and its importance to cranes and other migratory waterbirds were made to the public. In conjunction with this, groups were escorted to the viewing blind on MICM prior to sunrise and prior to sunset from March 7 through April 11, 1981 to observe the cranes on MICM. These crane observation tours should be continued.

Recreational

Recreational activities on MICM should be considered on a case by case basis. The most sensitive times on MICM are from February 14 to April 15 and from November to mid-December when cranes use the property and June 1 to July 15 when other ground nesting birds are breeding on MICM. During those times MICM should be closed to all recreational activities except those such as the crane tours that are directly supervised by responsible, trained individuals.

Scientific

MICM offers excellent research opportunities because of the baseline data already gathered and because of the controlled and planned management of the property. Research that is not incompatible with crane protection should be encouraged. Approval of research requests is a difficult responsibility and to aid the Trust in this regard we recommend that a scientific advisory committee be established to review all proposals and make recommendations to the Trust and that the Trust consult with TNC and other qualified sources as necessary.

RESOURCE MANAGEMENT

Biological

Both aquatic and terrestrial systems on MICM require active management to protect suitable habitat for Whooping Cranes and Sandhill Cranes. Problems associated with the use of these systems by the cranes are very different. Cranes use the aquatic system of the Platte River almost exclusevely for night roosts. Preferences and requirements of the cranes for roosting have been described by Krapu (1981) and include the following: 1) shallow water to the depth of approximately six inches, 2) open, unobstructed channels at least 55 m wide and preferably 150 m wide, and 3) areas free from human disturbance such as roads, houses, railroads, etc. Krapu (1981) identified woody vegetation encroachment on riverine islands as a key factor in limiting the suitability of river habitat to serve as nocturnal roosting areas for Sandhill Cranes.

As described in earlier sections, the physical and biological conditions of the Platte River have changed drastically over the years to the point that the above requirements of the cranes are not being provided throughout the Big Bend region of the Platte River. These declining habitat conditions have forced cranes to congregate in higher numbers on smaller areas for roosting and feeding purposes. In order to improve roosting conditions in the river, we recommend that the river channel be experimentally cleared adjacent to portions of MICM.

Four general techniques have been proposed to clear this vegetation: 1) mechanical such as bulldozing or discing, 2) chemical, 3) controlled burning and 4) water flow manipulation to flood and scour the islands and sandbars. Two distinct phases of this project exist: the initial removal of the woody vegetation which in some places is well established and the maintenance of cleared sites.

There are obvious advantages and disadvantages with each of these techniques. Mechanical methods are extremely costly with heavy equipment costs approaching $70 per hour. Work would be limited to July through September when the Platte River is essentially dry and in wet years this work would be impossible. The effectiveness of mechanical removal is questionable because if any rootstocks remain on the islands they may root sprout prolifically depending on the timing of removal. Mechanical removal would probably have a lesser amount of detrimental environmental impact to the river and its organisms than the chemical method.

Chemical methods of removal and control appear to be more economical than mechanical control but present the greatest environmental hazard. Chemical applications could impact the aquatic river system and the complete biological impact of such applications is unknown.

Controlled burning has been suggested as a possible means of control of woody vegetation encroachment and would probably be the most cost-effective method. However, the islands appear to lack sufficient fuel to produce a complete, effective burn. This approach has been used on the Lillian Annette Rowe Sanctuary but with little apparent success. Other fire treatments such as flame throwers and incendiary devices have been suggested but no practical method has been identified.

Water flow manipulation is probably the best means of control since under natural conditions, ideal crane roosting conditions were maintained this way. Naturally this can no longer occur due to reduced flows in the Platte River but the potential may exist for off-river impoundments or diversions, to allow for timed release of sufficient water to simulate the natural action of the Platte River.

The best approach will probably involve a combination of these methods. Currier (1981) reported seed viability to last only two weeks for willows and three weeks for

cottonwoods in the Platte River although the period of release for both species spans from mid-May to mid-July. Seedling establishment occurs on sites with a high percentage of soil moisture, on soils with extensive substrate exposure during the period when viable seeds are present, and on fine textured soils such as sand and fine sand. Mudflats must be exposed at least 1-2 weeks during the seed viability period. The percent soil moisture is critical to seedling survival. Currier (1981) states that in order to prevent germination and seedling establishment it would be necessary to either raise the river stage during mid-May to August so mudflats are never exposed, or to allow the channel to completely dry out which would increase seedling mortality. During one growing season, seedlings under controlled conditions grew an average of 15 cm in height. Currier (1981) believes this is a critical height above which seedlings are able to withstand prolonged inundation. Chemical and mechanical methods of control are recommended by Currier (1981), but he cautions widespread application prior to an evaluation of their effectiveness.

Currier has submitted a detailed woody vegetation encroachment control plan to the Trust for its site located approximately one mile west of the Alda bridge. His proposal incorporates the use of chemical and mechanical removal methods and a combination of these methods as follow-up treatments. This control effort should be closely monitored and evaluated to determine its effectiveness and applicability to MICM.

The home range of 20 radio-marked Sandhill Cranes averaged 14 mi^2 and varied from 4.5 to 26 mi^2 (Krapu 1981). The habitat composition of these home ranges averaged 44% cropland, 20% native grassland, 18% riverine and 10% hayland. Cranes generally remained within three miles of the river channel. Fifty-five percent of the locations of the 20 radio-marked cranes were in cropland and 42% were in grassland and hayland (Krapu 1981).

The feeding ecology of Sandhill Cranes in the Big Bend Region of the Platte River is described by Krapu (1981). Ninety-five percent of their diet by dry weight was corn and this provided 90% of their energy. From their grassland diet cranes obtain 99% animal matter; from their hayland diet they obtain 82% animal matter; and from their cornfield diet they obtain less than 0.5% animal matter. In grasslands, 46% of the food consumed was earthworms, 29% was insects and 24% was snails. In haylands, 75% of their food was earthworms, 16% was alfalfa leaves and shoots, 5% was insects and 2% was terrestrial snails. Cranes are obtaining their carbohydrates from cornfields but the bulk of their protein and essential micronutrients such as calcium are being obtained in the prairie and tame haylands.

Sources of food for the cranes in the wet meadows include earthworms, snails, insect larvae and certain plant parts. The role these foodstuffs play in the dietary functions of cranes is not entirely known. Consequently we recommend that a diversified management program be applied to the grasslands on MICM and that observations be made on crane use within this diversified management plan.

The general range condition of the prairie on MICM varies from fair to low good indicating that current practices of season-long grazing and late season hay cutting are detrimental to the composition and vigor of the native prairie communities (Nagel 1981). Also, as discussed earlier, these grasslands contain a high proportion of non-native species such as Kentucky Bluegrass, Smooth Brome and Redtop. Based on the work of Nagel (1981) and Kolstad (1981) and consultation with range management experts in Nebraska and Kansas, TNC recommends that a four pasture, rotation grazing system be implemented on MICM. This system has been

specifically designed to provide low stature vegetation in the spring during crane use of MICM; to reduce the cool season exotic plant component of MICM; to improve the general range condition of the pastures on MICM; to increase weight gain potential of the pastures; and to possibly increase the carrying capacity for cattle. The recommended grazing system is presented in Table 4.

The system includes heavy grazing in spring one year in four, moderate grazing in summer two years in four and heavy grazing in fall one year in four. Two pastures will be burned three consecutive years and two pastures will be burned two consecutive years. The system in Table 4 is based on a herd of 200 animal units which averages about 1.1 AUM per acre.

Integrated with this grazing system is a prescribed burning program which will aid in accomplishing the above. Burning has been recommended as a management practice for Sandhill Cranes (Lovvorn 1980; Krapu 1981) and for Whooping Cranes (Labuda and Butts 1979). James (pers. comm.) has studied earthworm responses to prescribed burning on Kansas tallgrass prairies and has documented dramatic increases in earthworm density following periodic spring burns. On MICM, it is hypothesized that range improvement through a combination of the four pasture grazing system and prescribed burning on the pastures, an earlier date for cutting hay and possibly prescribed burning on the hayland will increase earthworm abundance.

The prescribed burning program should be professionally organized and supervised. Prior to the implementation of such a program a prescribed burning proposal should be completed by the Trust. Procedures for conducting such a program and a blank prescribed burning proposal are attached in Appendix D.

This burning program will be carried out in two phases. The first phase is the restoration phase which is designed

Table 4. Four Pasture Rotation Grazing System Proposed for Mormon Island Crane Meadows (see Figure 8 for pasture locations).

		Pasture 2	Pasture 4	Pasture 5	Pasture 6 and part of 11
Year 1 (1982)	May 1 - June 30	400 AUMs (F)	(F)		(F)
	July 1 - Sept 14		250 AUMs	250 AUMs	
	Sept 15 -				200 AUMs plus*
Year 2 (1983)	May 1 - June 30	(F)	400 AUMs (F)	(F)	
	July 1 - Sept 14			250 AUMs	250 AUMs
	Sept 15 -	200 AUMs plus*			
Year 3 (1984)	May 1 - June 30		(F)	400 AUMs (F)	(F)
	July 1 - Sept 14	250 AUMs			250 AUMs
	Sept 15 -		200 AUMs plus*		
Year 4 (1985)	May 1 - June 30	(F)		(F)	400 AUMs (F)
	July 1 - Sept 14	250 AUMs	250 AUMs		
	Sept 15 -			200 AUMs plus*	

(F) = Spring fire in late April.
* = Grazing may continue until the stature is reduced to about four inches or less.

Since the pastures are not identical in acreage and range site representation, grazing pressures at a fixed stocking rate will be uneven. Actual AUMs/acre are:

400 AUMs = 1.43 AUMs/acre for 280 acres
= 1.60 AUMs/acre for 250 acres
= 1.67 AUMs/acre for 240 acres
= 1.86 AUMs/acre for 215 acres

200 AUMs = .71 AUMs/acre for 280 acres
= .80 AUMs/acre for 250 acres
= .83 AUMs/acre for 240 acres
= .93 AUMs/acre for 215 acres

It is assumed that this range of stocking rates will not seriously impair the effectiveness of the system.

to reduce the exotic plant composition on the pastures and generally improve range condition during the first four years when all pastures will be burned at least twice. Following this initial phase, which may require more than four years depending on a number of factors, the burning program will enter a maintenance phase during which it may not be necessary to burn any one pasture more than once every two or three years depending on conditions then.

Due to weather conditions, it may not be possible to burn all three pastures recommended each year. The top priority pasture each year is the one that was spring grazed the previous year. This would be pasture 2 in 1983, pasture 4 in 1984 and pasture 5 in 1985.

In conjunction with the four pasture grazing system, TNC recommends that Pasture 3, Figure 8, be continued to be grazed season long. This treatment will act somewhat as a control for comparison to Pasture 4 and will provide additional grazing land on MICM which has been identified as a need by past lessees on the property. It is recommended that up to 2 AUMs per acre be grazed in this pasture. It is felt that the flexibility of having this season long pasture available will aid in our interpretation of crane use and will be an added incentive to obtain responsible lessees.

Nagel (1981) commented that haying can be very damaging to prairie communities. The damage apparently is directly related to the time of cutting the hay. Hay is currently cut on MICM sometime between July 20 and August 20 of most years. This occurs during maximum growth of the warm season component of the grasslands and thereby removes the valuable carbohydrates from the plants and sets back plant growth and seed production the following year. Consequently, TNC recommends that all hay on MICM be cut either by July 1 or after September 30 to allow for maximum seed production and carbohydrate production and storage in the root structures. The September cutting will provide the required low

stature vegetation for crane use. It is recommended that any hayland cut at the earlier date of July 1 receive a second cutting once the plants become dormant to provide low stature vegetation. This cutting need not be harvested.

Prescribed burning would be beneficial to the hayland also. However, we recommend that the response of the pastures and crane use following fire be evaluated and experience gained in prescribed burning before attempting to burn the hayland.

Management of the cultivated land on MICM has been a difficult problem for TNC to resolve. In addressing the question a number of range management specialists and prairie ecologists were consulted and a variety of recommendations were received. Consequently TNC recommends that the Trust consider the following alternatives and select the one most feasible in light of personnel and financial resources:

1. Continue to cultivate the land.

   This could be done by rotating alfalfa with other crops to maintain the fertility of the soil. Past crop performance indicates that the production will not be great.

2. Restore the lands to native prairie vegetation.

   A number of approaches to this have been suggested. These include sowing native species into the alfalfa once it has reached senescence so that the natives, once they are established, can out-compete and eventually replace the alfalfa; discing the alfalfa and sowing native species seed or discing in native hay; or simply letting the alfalfa die off and allowing native species to invade the cultivated lands.

Restoration can be an expensive and time-consuming project. In the long term, restoration to native prairie will probably be beneficial as fences could be removed and larger, more uniform management units could be established.

Also, the income from the cultivated lands appears to be less than could be obtained from pasture land or hayland.

If the Trust chooses to restore the cultivated land to native prairie, it is recommended that local seed sources within a 50 mile radius of MICM be used. Problems have been encountered on other properties where non-local genotypes have been reintroduced.

These recommendations are made assuming that sufficient water remains in the Platte River during the times of the year when the cranes are there. This is the major controlling factor of crane use of the river and the Trust has been exploring methods to assure that in fact sufficient water is provided. We recommend that work be continued until a satisfactory level of assurance has been obtained.

Educational

On March 7, 1981 the first "tour" was conducted to observe Sandhill Cranes from the newly constructed viewing facility. This was a pilot year for us and we learned much about people management. Forty-four tours were given between March 7 and April 11, 1981. Of these, 27 originated from the Stuhr Museum as Mr. Jack Learned, Director of the Stuhr Museum, offered the use of the museum's facilities. Here we provided a 40-minute slide lecture introducing guests to the Platte River Valley and, in particular, to MICM. The importance of the Platte River Valley to cranes and other migratory waterbirds and potential threats to this area were the central themes of the talk. The audience was also introduced to the efforts of the Trust and TNC to protect crane habitat. This program, combined with the visit to the viewing facility, was met by a very enthusiastic public. Donations were requested in order to help defray management and maintenance costs of the program. Guidelines for use of the blind, information sheets and other miscellaneous

items were prepared and given to visitors. Table 5 itemizes our expenses, and the geographic origins of the 1981 guests are given in Table 6.

TNC recommends that these crane observation tours be continued as the educational and public relations benefits appear to be worthwhile. The arrangement with the Stuhr Museum appeared to be most satisfactory and we recommend that it be continued. We also recommend that a volunteer donation bo be placed in the viewing facility to help cover the costs of this activity.

Another item that would prove most useful to MICM visitors is a display board in the viewing facility that graphically depicts the biology of the cranes including migration patterns demonstrating the often referred to hourglass migration configuration. Additional large scale maps identifying the location of MICM and the viewing facility in relation to surrounding landmarks would also be instructive.

Another aspect of the MICM educational program during 1980 and 1981 involved the presentation of a slide lecture to various groups and interviews with the news media. Programs were presented to a number of local and state organizations as well as to the scientific and profesional community, informing them of MICM objectives and plans for the future. Requests for presentations now are exceeding the capabilities of TNC and the Trust and we have discussed the possibility of developing a slide/tape program that could be sent out to groups for their use. TNC recommends that the Trust continue to pursue such a program within a year.

Since TNC's involvement to date, following acquisition of MICM, has been overseeing the management of the property, coordinating the inventory efforts and developing a management plan, very little effort was directed toward developing general educational programs or uses on MICM. Since Stuhr Museum and the Grand Island School System are in such close

Table 5. Expenses and donations associated with the Mormon Island crane tours March 7 - April 11, 1981.

Expenditures		Donations to:	
Stuhr Museum:			
overtime staff	$240.00	MICM	$1,146.71
janitors	50.00	Trust	650.00
coffee	57.59		
TNC vehicle (1445 mi @ .20/mi)	289.00		
Porta-potty rental	100.00		
Printing	150.00		
Total	$886.59*	Total	$1,796.71**

*Does not include staff time or Trust mileage.

**Of this amount, $1,324.21 was contributed by four people. Excluding these four gifts, $472.50 was donated by the general public consisting of 475 visitors.

Table 6. Geographical origin of visitors to the Mormon Island Sandhill Crane viewing facility March 7 - April 11, 1981.

Origin	Number of Visitors
Alaska	2
Arkansas	2
California	3
Colorado	2
Hawaii	2
Idaho	1
Illinois	2
Indiana	1
Iowa	31
Kansas	24
Massachusetts	2
Minnesota	26
Missouri	8
Nebraska	320
New Jersey	1
New York	1
North Dakota	1
Ohio	1
South Dakota	27
Washington, D.C.	4
Wisconsin	15
British Columbia	1
England	1
West Germany	1
Total	479

proximity to MICM, there exists great potential for establishing educational and interpretation programs on MICM. Since this is not a primary objective of TNC or the Trust, we are not devoting much of this plan to this topic but simply indicate the potential and state that TNC would not oppose such uses of MICM at times when the cranes are not there. Any attempts to expand use programs during the spring migration could be very disturbing to the cranes and generally would not be recommended by TNC based on the current size of MICM. If additional buffer land to the east or south were added to MICM then the possibility for such programs would be greater during the times cranes are on the property.

Recreational

Two types of recreational potential exists on MICM: 1) non-consumptive uses, and 2) consumptive uses. Non-consumptive uses involve activities which do not result in the removal of flora, fauna, or other preserve features. Hiking, bird-watching and canoeing are examples. Consumptive uses involve the removal or harvesting of flora, fauna, or other features. Examples are wild plant foraging, hunting, fishing and trapping. Before any activity is permitted, an objective assessment must be made to determine whether the activity is compatible with our stated objectives.

In an effort to minimize expenses involving the control of human use and to avoid establishing a precedent which may be difficult to alter at a later date, we feel initial activities should be minimal and non-consumptive. As mentioned earlier, the spring tours to view Sandhill Cranes should continue and should serve as both an educational and a recreational experience. Construction of a trail access

to the bunker will be discussed later. Public use during the crane season from mid-February to mid-April should be restricted to escorted tours only to minimize disturbance to cranes.

During the rest of the year, a hiking trail could be established on the south boundary of MICM. A 1.2 mile long vehicle trail currently exists west of the parking area. This could be used in its current condition for hiking or it could be extended to the west tip of the property, a distance of 3.7 miles. The perimeter of MICM along the south and middle channels is nine miles. Most people would not want to hike that distance so the shorter trails would be better to start with. Hiking is the only other recreational activity recommended. Expansion of other recreational pursuits can easily occur at a later date if it is determined that significant resources on the preserve will not be impacted.

General picnicking and camping should not be permitted. Adequate facilities are not available to provide for these types of activities and they do not complement the objectives of a natural area. Such activities would also conflict with the activity of lessees on the property. Nearby state facilities can accommodate these types of human uses.

The question of canoeing is more difficult to address. Since the Trust does not own both sides of the river, they have no legal authority to control canoe traffic. We can offer these recommendations: 1) canoeing should be discouraged from mid-February to mid-April to minimize disturbance to cranes, and during late May to mid-July to protect the nests of Least Terns and Piping Plovers, and 2) access to or from the river should not be allowed on MICM since suitable launch sites are not available.

Of the four potential types of consumptive uses mentioned above, hunting is probably the most controversial.

We feel that for the short-term hunting should not be allowed. Time is needed to better assess wildlife population trends and the potential effects of hunting on fall migratory bird populations before any recommendations can be made. Certain types of hunting could pose problems for lessees on MICM. The effects of waterfowl hunting disturbance on cranes has been well documented and generally has forced them away from sites they normally would inhabit during migration (Hoffman 1976; Bennett 1978; Crete and Toepler 1979; Lovvorn 1980; and Melvin and Temple 1980). The problem needs to be studies on MICM if waterfowl hunting is considered.

There are three types of hunting potential on MICM, 1) waterfowl, 2) upland small game and 3) deer. Each of these poses unique problems, therefore each will be discussed separately.

Waterfowl Hunting -- This type of hunting is undoubtedly the most limited in terms of public access to the Platte River and it has the greatest demand. Private landowners within the Platte River Valley generally lease hunting rights to individuals or groups, thereby precluding the general public. There is an average of six duck blinds per mile on the Platte River (Frith 1974) and the Lillian Annette Rowe Sanctuary is the only area within the Big Bend region that is closed to hunting. It attracts large numbers of waterfowl in the fall and, in effect, has improved hunting opportunities on lands adjacent to the refuge. The river becomes increasingly important to waterfowl as basins and backwater areas freeze. It may be in the best interests of the migratory bird resource to provide an undisturbed resting area during the fall migration.

Since the Trust owns only one-half of the south channel on MICM they cannot control hunting activities on that portion of the river. During the first week of November 1980,

approximately 6,000 Sandhill Cranes were observed on MICM and they attempted to roost on the river. Waterfowl hunters in the area created a disturbance to the birds and they were not able to find secure roosting sites until after sunset.

Another activity the Trust would have to engage in if hunting were offered would be the control of hunters. There are two approaches to providing hunting: 1) an annual lease of blinds and 2) a lottery system for each day's hunt. In the latter case, a full-time person would be needed on-site for the duration of the waterfowl season from approximately October through Deeember. Constant surveillance of the area would be needed to enforce regulations and to curtail trespass. An annual lease would benefit only a few hunters thereby precluding the general public. Open hunting would result in a very competitive situation and probably invite vandalism, therefore limitation on the number of hunters would have to be imposed.

Deer Hunting -- Two types of deer hunting exist in Nebraska: firearm and archery. The impact of archery hunting would be minimal if conducted under a controlled basis. The number of hunters would have to be regulated and this would require an on-site person to control the hunt during the archery deer season from September through December.

Firearm season typically is nine days long beginning the second Saturday in November. Safety hazards associated with the discharge of high-powered rifles include the proximity of buildings and conflicts with other uses of the area.

Presently, a healthy White-tailed Deer population exists on MICM as 36 deer were observed on March 27, 1981. Thus some harvest could potentially be tolerated without adversely impacting the population. On June 13, 1981, a yearling doe was observed with a three-inch tumor protruding between the left eye and ear. Disease can decimate a deer herd that is over-populated thus some cropping of the herd might be desireable.

Upland Small Game Hunting -- MICM harbors pheasants, bobwhite, cottontail rabbits, and a few fox squirrels. In general, hunting opportunities for these species are excellent in the local area. The problems associated with providing hunting for these species are controlling hunters, inviting vandalism and a conflict of interest with other users.

In summary, although hunting has been shown to have no biological impact on wildlife populations in many areas of the country if it is controlled, the people-management problems associated with it are often difficult to control. Waterfowl hunting would create a need for a tightly regulated and supervised operation and would negate the area's value as a fall resting area for migratory waterbirds. Upland game populations are marginal and opportunities for this type of hunting are good in the immediate area. Archery deer hunting may be a feasible activity in the future but it may be advisable not to allow it initially.

Scientific and Monitoring

In order to provide the most current management recommendations in the future based on crane use and other relationships, it is necessary to continually monitor crane behavior, water, wildlife and vegetation conditions. Since these factors are not independent of one another, priorities must be established and efforts must be focused on specific phases of habitat work or on indicator species which will provide the most insight into the degree of success toward meeting the stated objectives. This section then is perhaps the most important in outlining future research and management needs, yet it is probably the most difficult to define with our current body of knowledge. Based on the inventory results and the lengthy discussions with experts in the various fields of expertise in question, we propose the following monitoring activities to best manage MICM for cranes.

Sandhill Cranes -- At least three aerial censuses should be conducted during the cranes' stay on MICM each spring. One count would be conducted early in the season between February 25 and March 5, one count at the middle of the season between March 20 and April 1, and one count near the end of the season between April 5 and 10. Counts should be made in the early afternoon on mild days. This will be helpful in determining their numbers and distribution. The area between U.S. 281 and the Alda Bridge, possibly extended to the Wood River Bridge, should be included. A photographic record is strongly recommended along with ocular estimates.

Ground counts of cranes on Mormon Island including Moeller's pasture to the east, if possible, should be conducted weekly from their arrival on approximately February 20 to their departure on approximately April 10. Flocks should be mapped on their respective fields along with their numbers. This will facilitate identification of temporal patterns in field use as well as serving to identify their peak in numbers. Again, counts should be made in the early afternoon during calm and mild days. Neck collars should also be searched for and recorded. Certain individuals may be discovered occurring at the same location year after year. This date would be helpful in determining any pattern of a particular individual on a seasonal basis. Ground counts should be made the same day aerial counts are made.

In conjunction with the ground counts, secondary roost counts should be made. Again, cranes should be mapped and numbers recorded. Fields 6, 9, and 11 in Figure 8 should be included during these counts. Early evening, approximately one-half hour before sunset, is when counts should be conducted. This will help the Trust determine the use and importance of a particular field over the long-term.

River roost counts should be conducted on a bi-monthly or preferably a weekly basis. At least three observers

should record departing cranes on assigned river sections to determine distribution (see Hay and Lingle 1981 for details).

These counts will provide a sound data base from which long-term trends can be noted. They will serve an integral role in assessing responses to upland and riparian habitat manipulation.

Least Terns -- Although the nesting colony of Least Terns is not on MICM the threatened status of this species in the state and the proximity of the colony to MICM (0.4 miles west) makes it of particular interest. Their nesting habitat is that of barren sandbars thus with the proposed clearing of sections of the river of woody vegetation, the nesting habitat for Least Terns may be improved. The Trust should be aware if they respond to this management. Weekly visits should be made to the colony from early to mid-June until mid-July. Nests should be counted and production of young should be determined (see Hay and Lingle 1981 for techniques).

Bald Eagles - Weekly counts of Bald Eagles should be conducted on MICM from February 20 to March 30 during mid-day. This species is on the federally endangered species list and occurs on MICM during their "spring" migration. (See Hay and Lingle 1981 for current status of this species on MICM.)

Other species not considered endangered, threatened or rare in Nebraska but which are of general interest because they are either uncommon or are good indicator species include Upland Sandpipers, Piping Plovers, wintering raptors and waterfowl. We therefore recommend that monitoring of these species take place as a secondary priority and be provided as feasible. This would be accomplished as follows:

Upland Sandpipers -- At least two censuses should be conducted of adult Upland Sandpipers in late May to early June (see Hay and Lingle 1981 for routes and methods). Although this species is not necessarily targeted for in-depth study, monitoring their populations can be indicative of general grassland habitat conditions. Thus they are a good indicator species and may warrant annual censusing.

Piping Plover -- See Least Terns section for monitoring.

Wintering Raptors -- Bi-monthly counts should be made from November to February of all hawks and owls observed on MICM. Upland habitat management may affect their numbers and distribution and it would be useful for the Trust to be aware of this.

Waterfowl -- Weekly counts of waterfowl should be conducted from February 15 to April 15. Birds should be mapped in order to determine distribution and habitat use. Counts should be staggered, some in the early morning and others during mid-day, in order to assess habitat use. (see Hay and Lingle 1981 for methods.) Notes should be made of the occurrence of fowl cholera on MICM. In 1981 diseased waterfowl provided a major food base for transient Bald Eagles.

In conjunction with the above bird surveys, notes should be taken on other wildlife species observed such as White-tailed Deer, Black-tailed Jackrabbits, Raccoon, etc. No specific effort to census other animal species appears warranted at this time.

Surface Water -- Although the U.S. Geological Survey conducted preliminary hydrological work on MICM, their study did not provide sufficient information to determine the relationship between ground water and surface area of water on the wetland meadows. This information is critical in terms of quantifying the amount of water needed in the river to provide adequate water on the wet meadows for the cranes. Crane observations in 1980-81 indicate that surface water may be a major controlling factor of the distribution of cranes on MICM.

One approach to solving this problem is through aerial photography. Three or four flights would provide the needed data base if the timing were correct. One flight is needed for each of the following times: prior to spring break-up in late February to early March; during peak spring flows

from late March to mid-April; during receding water flows from mid-April to mid- May; and at the time when wetland meadows are nearly dry, approximately mid-May to early-June. A photographic record would be obtained at each of the various water regions and surface area of water on the meadows would be calculated. This would be accomplished concurrently with on-site groundwater level and river stage measurements. The existing wells constructed by USGS in 1980 (Fig. 12) would be used to measure on-site conditions. From this data, the Trust could determine the relationship between groundwater and surface water area and ultimately define the amount of river flow needed to provide the necessary number of acres of surface water on the meadow for cranes. Kearney Air Charter can provide the aerial photography service for approximately $300-$350 per session (Ed Ferguson, pers. comm. Kearney, Nebraska).

In addition, the groundwater-river stage relationships should be monitored on a regular basis for two years. The USGS acquired these data for June-August 1980 only, thus data for nearly three-fourths of the year are lacking. Ted Hurr (pers. comm.; Lakewood, Colorado) suggested two methods which would accomplish this task. One would be to manually monitor six wells on a monthly basis. After two years, we could decide which months provide us the necessary information and then take the readings accordingly.

The other method would be to install automatic recorders. At least two recorders would be desirable. Readings would be taken at two-hour intervals. One year's worth of data would be required initially. Then, readings would be adjusted to a monthly or an irregular schedule, whatever would be required to record trends. Mike Ellis (pers. comm.; USGS, Lincoln, Nebraska) mentioned a cost-sharing program available from USGS whereby they provide the recorders and maintain them on a 50% basis. The Trust would have to contract with Ron Bishop, Central Platte Natural Resource District,

to request this service from USGS since USGS is not permitted to deal directly with non-governmental groups. Ted Hurr also advised installing a river recorder. USGS currently has a gauging station near U.S. 281 on the south channel. The Trust could install a staff gauge upstream and adjust those readings with the downstream recorder thereby minimizing the number of recorders in operation. The Trust may be able to do the work themselves with the only major out-of-pocket expense being aerial photography.

Vegetation -- Vegetation monitoring is critical in determining the degree of success the management treatments are providing. It is recommended that the permanent transects sampled by Nagel (1981) in the prairie be resampled every two years beginning in 1983. This will provide a comparative data set to evaluate the effect of the revised grazing system and the different cutting times of the hay. While this approach will provide adequate general range condition information it will not provide an adequate sample of the subdominant species in the grassland communities. Two other procedures using frequency and density methods are recommended to be applied annually at MICM. The details of this procedure are currently being tested and described by TNC and are not available for inclusion here. The concept, however, involves the establishment of a macroplot encompassing smaller plots within which 160 quadrats will be sampled providing frequency data. Density data can also be collected for individual species. The details of this procedure will be forwarded to the Trust once it is finalized by TNC.

This monitoring work is recommended to monitor changes in relative abundance of populations to measure the increase or decrease over time. These trends are important to follow in order to determine the effectiveness of management treatments on MICM. Results of these monitoring efforts should be evaluated annually to provide objective data to be used in assessing all management treatments.

MANAGEMENT IMPLEMENTATION

Biological, Scientific and Monitoring

The Sandhill Crane monitoring program recommended earlier will requre 8-10 person-weeks from mid-February to mid-April each year. A person-week is defined as 40 hours. Only personnel costs and minimum supplies costs will be incurred except when aerial counts are made. Aerial counts are estimated to cost $200 per census. Crane sampling and monitoring on MICM is the most important resource management related activity as it measures the degree of success of the management strategy being implemented. Changes in the management plan can then be made according to changes in crane use on the property.

Another important relationship on MICM that needs further study is that between surface water and crane use as indicated earlier. Based on past crane observations, it is hypothesized that surface water in the wet meadows is a controlling factor on crane use and distribution on MICM. If proven true, this hypothesis would have a tremendous impact on the management strategy on MICM. We therefore recommend that the investigation of this relationship be initiated in 1982. Aerial photography will cost approximately $350 per flight totalling $1050 for the recommended three flights. The Western Energy and Land Use Team of the U.S. Fish and Wildlife Service has agreed to analyze this photography. Statistical inferences would be made to test the correlation between crane use and surface water on MICM. Approximately three person-weeks will be necessary to coordinate this study. This is anticipated to be a one-time study but follow-up work may be necessary.

In conjunction with this surface water study, groundwater levels on MICM should be monitored by using the existing U.S. Geological Survey wells. It is estimated that six person-weeks will be required.

The recommended prescribed burning program initially calls for burning three pastures each spring for two or three consecutive years depending on the pasture, totalling approximately 750 acres burned annually. This work will require a fire boss for approximately five weeks to organize and supervise the burning. In addition, a seasonal burn crew of at least six people will be required during three weeks of this period to actually carry out the burning.

Since such large burn units are recommended to be burned annually through a restoration phase and then periodically during the maintenance phase, certain equipment will need to be purchased. At a minimum this will include the following: one drip torch, seven back-pack pump sprayers, seven swatters and one slip-on water tank unit for the pick-up.

The vegetation transects should be resampled every two years beginning in 1983 to assess general range condition. This will require approximately 6-8 person-weeks and should be conducted in the late summer to co-retlate with the baseline study. Personnel costs will be the primary cost incurred. Vegetation sampling aimed at assessing trends in composition of the subdominant species should occur each year and will require four weeks.

The state threatened Least Tern should be monitored annually for nesting success on or near MICM from mid-June to mid-July. While conducting these surveys, Piping Plover nests could also be easily surveyed. It is estimated that these surveys will require 1.5 person-weeks.

General breeding bird surveys were conducted on 40 acre plots on MICM in 1980 and 1981. These surveys could easily be carried out each year from late May to mid-June to assess general bird use of MICM. This will require at least 4 person-weeks annually. As mentioned earlier, this is not a high priority activity and should be conducted only as time allows. Perhaps the most valuable portion of

this survey would be the Upland Sandpiper census which could be conducted in late-May requiring only .5 person-weeks.

Bald Eagle use of MICM is important due to the federally endangered status of this bird. Annual spring counts should be made of Bald Eagles on MICM and the Platte River should be searched for diseased waterfowl to determine the extent of fowl cholera present in the migratory waterfowl. It is estimated that this survey will require 2 person-weeks.

A project of interest to the Nebraska Game and Parks Commission is the establishment of Barn Owl nesting boxes on MICM. Barn Owls are of special concern in Nebraska and Ross Locke, Non-Game Biologist with Game and Parks, upon visiting MICM, suggested that Barn Owls might be enticed to nest there and he expressed an interest in placing nesting boxes in the barns on MICM. TNC would not be opposed to this activity and it could be done by Game and Parks with little time required of the Trust.

The control of woody vegetation encroachment in the river channel is a major item that should be initiated on MICM in 1983. Experimental work conducted by the Trust on its farm upstream near Alda should be instructive in determining which technique to use. Further investigation into the practicality of the use of mechanical removal and incendiary devices would also be helpful. At least 2 person-weeks should be allowed to evaluate this and make recommendations.

Earthworms and snails are important food sources for the cranes while on MICM. Mr. Sam James, graduate student at the University of Michigan conducting earthworm research at Konza Prairie in Kansas, has submitted a preliminary research proposal to the Trust to study the effects of land management practices and crane predation on earthworm and snail populations on MICM. Sam has proposed to study the following six hypotheses on MICM:

1) Grazed plots will have higher earthworm populations than ungrazed controls.

2) Mowing will stimulate production of native hay and earthworms, and the wet meadow will show little or no effect.

3) Spring burning will stimulate grass productivity and earthworm population growth.

4) Earthworm populations will be greater on areas exclosed from crane predation.

5) Vegetation stature influences the vulnerability of earthworms to crane predation.

6) Cattle will gain better on burned than on unburned land.

The cost for the initial testing of these hypotheses is estimated to be $6000 and TNC recommends that the Trust fund this work and initiate it in 1982.

It is important that the Trust report to the scientific community the major results of all crane-related research and monitoring conducted on MICM. Attendance at certain meetings to allow for this exchange of information should be provided including such meetings as the North American Prairie Conference, the Crane Workshop and annual meetings of the Whooping Crane Conservation Association. Certain results will also warrant publication in scientific journals as at least two such papers have already been submitted for publication regarding inventory work on MICM. A minimum of two person-weeks will be necessary.

Educational

Spring crane observation tours should be continued under the direct supervision of the Trust. An estimated 8 person-weeks will be necessary to prepare for this activity and to oversee it from early March through mid-April. Donations to help defray costs associated with these tours should be

solicited and it may become necessary to charge a user fee to cover these costs.

The use of the Stuhr Museum as a rendezvous point for these tours added greatly to the quality of the experience of the visitors. TNC recommends the continuation of this cooperative effort with the Museum. In 1981, 27 tours originated at the museum but a maximum of 70 tours could be accommodated during the five-week stay of the cranes. In order to formalize this relationship between the Trust and the Stuhr Museum, TNC recommends that an annual memorandum of understanding or contract agreement be established between the two parties.

As indicated earlier, both TNC and the Trust have been requested to make presentations about MICM to a variety of groups. This is an important function which the slide/tape show will help provide but certain personal presentations will still be necessary. At least 1 person-week should be provided to meet this need.

Recreational

Top priority should be given to the construction of a trail from the parking area to the crane viewing facility and to the establishment of a camouflaging of this access area. During 1981, access to this facility remained good due to little snow and rain but inclement weather could create severe access problems. Therefore TNC recommends that a gravel trail be built from the road west of the parking area to the north of the east sandpit and to the viewing facility. This gravel could also be covered with wood chips. The total length of this trail is approximately 3/16 of a mile. We estimate that 300 yards of gravel will be necessary at a cost of $5.00 per yard totalling $1500. Cost of site preparation and wood chips, if desired, would be additional.

The establishment of a shelter belt or camouflage for the access to the facility is also important to minimize disturbance to the cranes. Several possibilities exist for creating this camouflage. Red Cedar seedlings would provide a natural, aesthetically pleasing shelterbelt and can be purchased from the Central Platte Natural Resources District at a cost of $19.00 per 100 seedlings. A double row planted 16 feet apart with the rows staggered would require approximately 400 trees. While seedlings would be inexpensive to use they obviously will not provide the necessary camouflage for several years. Larger Cedars could be used but the cost would be much greater. A cinder block or wooden wall could be built as an alternative to live plantings but aesthetically would be less desirable. Haystacks were placed along the access trail in 1981 to provide a temporary screen and they were quite satisfactory. However, as they decay they lose their height and are currently slumping. They should be restacked and secured if they are to be used again in 1982. Prior to 1983 a more permanent camouflage should be established as the haystacks will not be sufficient.

TNC recommends that this issue be studied in more detail during the spring of 1982 and a decision be reached on the construction of this camouflage so that the work could be initiated during the summer of 1982. One person-week should be allowed for this.

TNC recommends that if the Trust desires to provide for general public access to MICM that the existing road along the south channel of the Platte River be established as a hiking trail during those times of the year when the cranes are not on the property. This road is approximately 1.2 miles in length from the parking area and would provide a nice area for public use and observation.

General Maintenance

Several small improvements should be made to the viewing facility prior to March 1982. Displays should be placed on the walls describing crane biology and a map of MICM showing prominent landmarks to orient visitors should be installed. Some type of carpet should be placed on the standing area next to the windows to deaden the sound of feet banging on the wood. A broom and window cleaner should be placed inside the facility to keep it clean. Locks should be placed on the door to keep unauthorized visitors out. A kerosene heater should also be placed in the facility for use in cold weather. The estimated costs of these items is approximately $200 and at least 1 person-week should be allowed to prepare and install these items.

An unsightly occurrence on MICM is the concrete and steel riprap that has been placed on the north bank of the south channel of the Platte River to stabilize the bank. While this is most effective in preventing erosion, the Trust might consider covering the material with dirt. An estimate of $6500 was received by TNC to cover approximately 3/8 mile of this bank. This is not a high priority item.

Perimeter and internal fencing on MICM is in fair condition. TNC recommends that the Trust require the next grazing lessee to improve the condition of these fences as partial payment for the lease. Then all future lessees should be required to furnish the labor to maintain the fences with the Trust providing the materials. Future lessees should also be responsible for maintaining all watering facilities.

TNC also recommends that the Trust have boundary signs prepared and placed along all perimeter fencing. The wording of these signs should be determined by the Trust but something similar to the following would be appropriate:

Mormon Island Crane Meadows Sanctuary

Access By Permission Only

Contact; John VanDerwalker
Platte River Whooping Crane
Critical Habitat Maintenance Trust
2550 N. Diers Avenue, Suite H
Grand Island, Nebraska 68801
384-4633

The Nebraska Game and Parks Commission might assist in the printing of these signs.

In order to meet the grazing and haying needs recommended in this plan, TNC recommends that the Trust offer MICM to Quirk Land and Cattle Company according to the grazing and haying schedule discussed earlier. All buildings should be offered as part of this lease but the Trust should retain the right to burn part or all of MICM and the right of access to all parts of the property so long as that access does not interfere with the rights of the lessee. That portion of MICM containing the viewing facility, parking area and proposed hiking trail should be excluded from the lease to allow for public access and use as appropriate. A sample lease is presented in Appendix E. Should Quirk Land and Cattle Company not be interested, then TNC recommends that the Trust seek other lessees through personal contact, advertisement or sealed bids. At least 4 person-weeks should be allowed to prepare this lease, solicit lessees and monitor compliance.

In light of the recommended management actions on MICM, TNC also recommends that a vehicle be purchased to help meet these needs. Equipment and supplies will need to be hauled for prescribed burning, bird surveys, vegetation sampling, while general maintenance and surveillance require the use of a vehicle. A 4-wheel drive, 3/4 ton pick-up truck is

the best all-around vehicle capable of meeting these needs. Estimated cost is $10,000.

A tabulation of the recommended personnel time to carry out these tasks is presented in Table 7 and the financial needs in Table 8.

While the management costs are relatively high in 1982, it should be noted that a large portion of these costs are one-time development costs. Also, the overall cost effectiveness of Trust land management will increase with the purchase of additional lands as the equipment will be available for use on other lands and all research and sampling done on MICM will increase our body of knowledge about crane requirements on the Platte River which can be applied to all lands. Management prescriptions can be tested on MICM, crane response measured and decisions reached about applicability to other Trust lands.

Table 7. Personnel Needs for 1982 MICM Management

Item	# person-weeks
Crane Monitoring	8
Surface Water Study	3
USGS Well Monitoring	6
Prescribed Burning	
Fire Boss	5
Fire Crew (6 members)	3 each
Vegetation Sampling	4
Least Tern & Piping Plover Surveys	1.5
General Bird Survey (Optional)	4
Bald Eagle Survey	2
Woody Vegetation Control Evaluation	2
Crane Observation Tours	8
Presentations	1
Shelterbelt Recommendation	1
Scientific Meetings	2
Viewing Facility Improvements	1
Lease Monitoring	4
Data Analysis and Report Preparation	4
Miscellaneous Maintenance and Management	2
Total	54.5*

*Does not include the optional general bird survey (4 weeks) or the fire crew (18 weeks total).

Table 8. MICM 1982 Management Costs

Annual Costs	
Preserve Manager Salary	$19,000
Benefits	2,850
Property Taxes	7,800
Telephone	750
Office Supplies	50
Printing and Photos	500
Books and Journals	50
Burn Crew Salaries and Expenses	2,880
Travel	1,000
	$34,880
Development Costs	
Vehicle	$10,000
Burning Equipment	2,540
Surface Water Aerial Census	1,050
Invertebrate Research	6,000
Viewing Facility Improvements	2,700
	$22,290
Riprap Covering (optional)	$6,500

SUMMARY

Mormon Island Crane Meadows has been identified as the most significant Sandhill Crane habitat on the Platte River and therefore should be properly managed to maintain these significant conditions. The management actions recommended in this plan are directed specifically at the maintenance of this important crane habitat.

As mentioned in the Preface, this management plan is based on the premise that the Trust will continue to hold fee title to MICM and will carry out the management of the property and that TNC will hold a conservation easement on the property. Details of this easement remain to be decided.

During 1980 and 1981 TNC studied crane use of MICM and obtained an overview of other species and communities on MICM. This plan presents in detail the proposed management actions to adequately manage MICM for optimum Sandhill Crane habitat. The main general management needs are the following:

1) Grassland improvement through a four pasture rotation grazing system, revised hay cutting times and initiation of a prescribed burning program.

2) Woody vegetation encroachment control in the Platte River channels bordering MICM based on results or experimental work.

3) Determination of surface water distributuion on MICM and possible correlation to crane use.

4) Crane monitoring and research.

Other aspects of this plan provide the details for this work. Additional recommended biological management consists primarily of sampling and monitoring activities. These include the following:

1) Determination of groundwater fluctuation trends and relationship to river flow and surface water on MICM.

2) Vegetation sampling to assess grassland conditions.

3) Least Tern, Piping Plover and Bald Eagle surveys.

4) Data analysis and report preparations.

Finally, the remaining proposed actions address educational, recreational and public relations needs on MICM and consist of the following:

1) Conducting annual crane observation tours on MICM and providing maintenance to the viewing facility.

2) Making presentations at certain selected local functions and attending scientific meetings to report on MICM management and significant findings.

Additional crane studies will provide a better basis for decisions about expansion of MICM but a preliminary recommendation of additional lands necessary is presented in Figure 1. This includes the entire channel of the Platte River bordering MICM to allow for proper channel maintenance and the land east of MICM to Highway 281 to protect more meadow habitat and to better control access.

TNC recommends that the Trust accept this plan and begin implementation effective January 1, 1982. This would provide for a smooth transition from TNC management to Trust management. It would also accommodate the financial considerations as TNC managed the property, carried out the basic inventory and prepared this plan with funds generated from MICM. During the 1980-81 calendar years this was done within the budget and a projected surplus of $5000 will remain. This amount would be refunded to the Trust if they began implementation January 1, 1982. If for any reason the Trust could not begin then, TNC would have to use this surplus to help meet management expenses.

This plan represents the recommendations of TNC to the Trust. It will be reviewed by the Trust and other interested parties over the next few weeks. A final management plan taking into account all comments and suggested revisions will be prepared and presented to the Trust no later than the March 14, 1982 date required in the lease between TNC and the Trust. However, if agreement can be reached on this plan, TNC would recommend preparing the final plan by January 1, 1982 to coincide with the Trust implementing the plan. This final plan should also contain a copy of the executed conservation easement.

REFERENCES CITED

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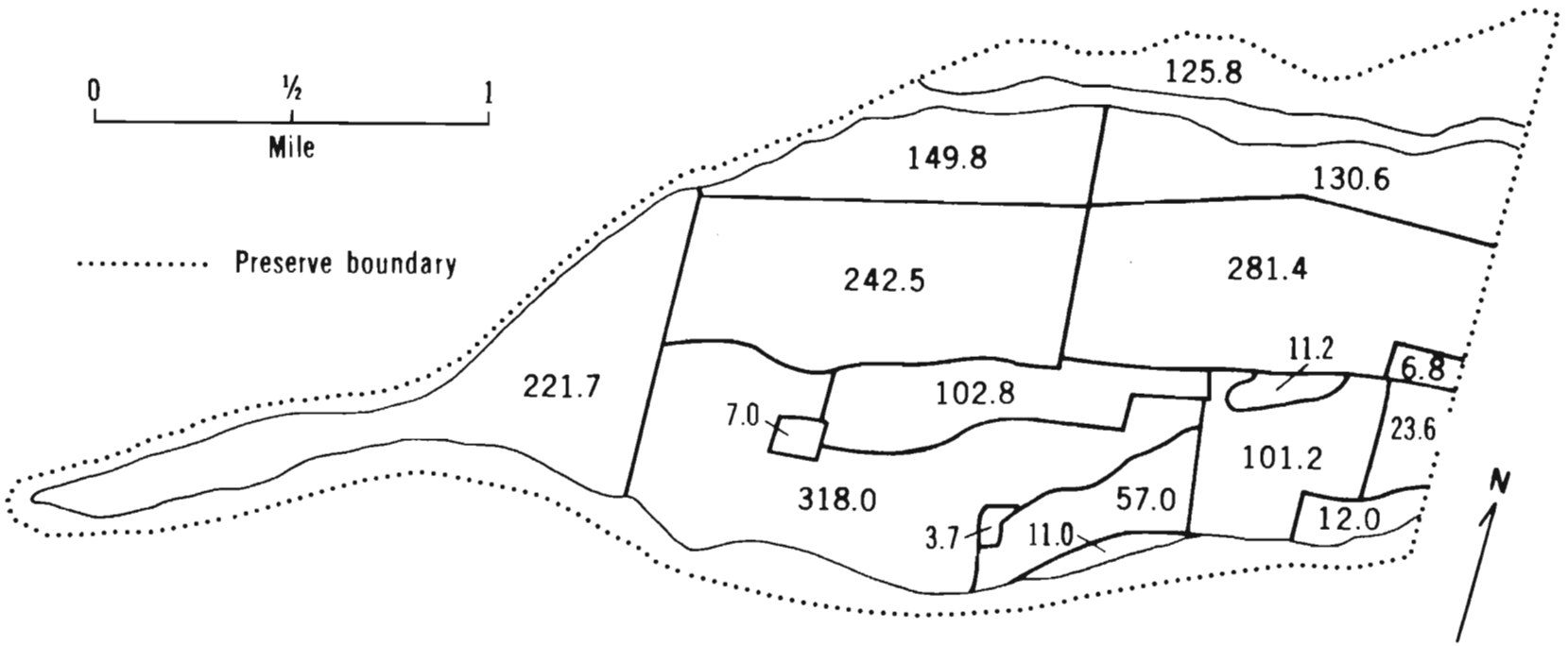
Appendix A Mormon Island Crane Meadows Legal Description

Parcel I

Lot One (1) in the Northwest Quarter (NW¼) of Section Four (4), and Lot Four (4) on Island in Section Five (5), all being in Township Nine (9) North, Range Ten (10) West of the 6th P.M.; also Lot Six (6), Seven (7), Ten (10), Eleven (11), Twelve (12), and Thirteen (13) on Island in Section Thirty Three (33), Also, the North Half of the Northeast Quarter (N½NE¼), and the Northeast Quarter of the Northwest Quarter (NE¼NW¼) and also the Northwest Quarter of the Northwest Quarter (NW¼NW¼) (Said NW¼NW¼ also known as Lot 1 on Island) all in Section Thirty Four (34), all being in Township Ten (10) North, Range Ten (10) West of the 6th P.M. in Hall County, Nebraska.

Parcel II

Lots One (1), Four (4), Five (5), Six (6), Seven (7), Eight (8), and Nine (9), and the South half (S½) of the Southwest Quarter (SW¼) and the South half (S½) of the Southeast Quarter (SE¼) all in Section Twenty Six (26), Lots Nine (9), Ten (10), Eleven (11), and Twelve (12), and the Southeast Quarter (SE¼) of the Southeast Quarter (SE¼), all in Section Twenty Seven (27); and Lots Three (3), Four (4), Five (5), and Six (6), and the South Half (S½) of the Northeast Quarter (NE¼), and the South Half (S½) of the Northwest Quarter (NW¼), all in Section Thirty Four (34), and Lots One (1), Two (2), Three (3), and Four (4), and the Northwest Quarter (NW¼), and the North Half (N½) of the Northeast Quarter (NE¼), and the Southwest Quarter (SW¼) of the Northeast Quarter (NE¼) all in Section Thirty Five (35), all in Township Ten (10) North, Range Ten (10) West of the 6th P.M., Hall County, Nebraska.



Acreage of Land Use Units on Mormon Island Crane Meadows

Appendix B

LEASE

This lease is between Richard E. Spelts, Jr., James L. Grahl, and Thomas L. Kimball, as Trustees of the Platte River Whooping Crane Habitat Maintenance Trust, Lessor (hereinafter referred to as the "Trust"), and The Nature Conservancy, Lessee (hereinafter referred to as the "Conservancy").

WHEREAS, The Trust was created by an "Agreement of Settlement and Compromise" dated December 4, 1978, for the purpose of protecting and maintaining suitable habitat for the Whooping Crane and associated migratory waterfowl on the Platte River between Overton and Chapman, Nebraska, and existing under and by virtue of a trust declaration styled "THE PLATTE RIVER WHOOPING CRANE HABITAT MAINTENANCE TRUST," hereafter referred to as the "Trust Declaration," and

WHEREAS, the Conservancy is a nonprofit corporation dedicated to the preservation of ecological diversity and is guided by the following objectives: (a) to preserve natural areas for biological diversity, for the uses of science, and for the wilderness experience; (b) to preserve open land for conservation of natural features; (c) to restore land; (d) to improve techniques of land preservation by demonstrating to others how to do it well, by studying and trying out new ways to do it better, and by devising standards and priorities for the preservation of natural areas; (e) to advance the cause of natural area preservation in the schools, in private enterprise, in government, and in other countries; (f) to advance the foregoing objectives in cooperation with other organizations having similar and related objectives, and

WHEREAS, the Conservancy currently owns and manages over 660 nature preserves, and

WHEREAS, the Conservancy desires to establish the leased premises as a nature preserve for the purpose of scientific research and environmental education in addition to providing a biological refuge, and

WHEREAS, the Conservancy acquired title to leased premises from Arthur P. Terry and wife Maxine M. for the purpose of furthering its objectives by providing protection to the migratory waterfowl and associated wildlife of the Platte River in Nebraska, and

WHEREAS, the Conservancy has this date conveyed title to the leased premises to the Trust, and

WHEREAS, this lease is part of the consideration for the conveyance of the leased premises to the Trust and provides the vehicle for sound management of the leased premises, and

WHEREAS, the Trust has determined that the Conservancy has the necessary land stewardship experience and expertise to assist the Trust in jointly managing the leased premises.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the Trust and the Conservancy agree as follows:

1. LEASED PREMISES: The Trust hereby grants to the Conservancy an exclusive lease of the property described in Exhibit A to the Conservancy. The leased premises includes any buildings and improvements thereon and all rights, hereditaments, easements, and appurtenances belonging to the leased premises.

2. TERM OF THE LEASE: This lease shall run from the date hereof for a period of 5 years, unless terminated earlier pursuant to Paragraph 4 hereof.

3. MANAGEMENT: The Conservancy shall manage the leased premises exclusively for the purpose of carrying out the intent and purpose of the Trust Declaration. From the date of this lease until March 14, 1982, the Conservancy shall have the affirmative obligation of acting as the agent of the Trust in carrying out its duties and obligations as assignee of the lease between Arthur P. Terry and Maxine M. Terry and Quirk Land and Cattle Company, dated October 26, 1976. In addition, the Conservancy shall have the affirmative obligation to conduct necessary resource inventory work and to prepare a comprehensive management plan for the leased premises. The management plan shall detail the use of the property only from March 14, 1982, until the termination of this lease with a new management plan to be agreed upon at that time, or it shall detail the use of the property for a longer period of time. In either case, the Conservancy shall submit said proposed management plan in writing to the Trust on or before September 14, 1981. The parties agree to exercise every reasonable effort to reach agreement on a management plan on or before March 14, 1982.

4. REVIEW AND APPROVAL OF MANAGEMENT PLAN: If the Trust and the Conservancy cannot agree on any mutually acceptable management plan on or before March 14, 1982, the Conservancy may elect either to terminate this lease or to exercise its option to purchase the leased premises pursuant to Paragraph 6 of this lease. If the Conservancy makes neither such election, this lease shall remain in full force and effect.

5. REVIEW AND APPROVAL OF LONG-TERM MANAGEMENT PLAN: In the event the Conservancy elected under Paragraph 3 hereof to prepare a management plan only for the term of this lease, and agreement was reached on such plan, then on or before the termination of this lease, the Conservancy and the Trust shall mutually agree on a long-term management plan for the leased premises which shall extend beyond the term of this lease. The Conservancy shall submit said proposed long-term management plan in writing to the Trust on or before July 1, 1984. The parties agree to exercise every reasonable effort to reach agreement on a long-term management plan on or before the expiration of this lease. The long-term management plan shall include an agreement regarding what ownership interest, such as fee title, restrictive covenants, and leases, if any, shall be held either by the Trust or by the Conservancy. If

the Trust and the Conservancy cannot agree on a mutually acceptable long-term management plan on or before the termination of this lease, the Conservancy's leasehold interest in the leased premises shall cease and the Conservancy may exercise its option to purchase the leased premises pursuant to paragraph 6 of this lease.

6. OPTION TO PURCHASE: The Conservancy is hereby granted an option to purchase the leased premises. Such option may be exercised by the Conservancy by serving written notice of exercise on the Trust on or at any time between March 14, 1982, and April 14, 1982, or by serving written notice of exercise on the Trust within thirty days after termination of this Lease. The failure of the Conservancy to exercise its option, as provided, in 1982, shall not be a bar to exercise of its option upon termination of this Lease. Closing shall occur within sixty days of receipt by the Trust of the Conservancy's written notice of exercise. The purchase price of the property shall be $1,606,600.73, payable in cash at closing. The Trust will convey all of its right, title and interest in the leased premises to the Conservancy by special warranty deed. In the event this option is exercised, the Conservancy shall be entitled to remain in possession of the leased premises until closing. This option to purchase shall survive the termination of this lease.

7. INCOME AND EXPENSES: During the term of this lease, all income generated from the leased premises shall accrue to the Conservancy to be used exclusively by the Conservancy to carry out its obligations under the terms of this lease. The Conservancy shall be responsible for all expenses relating to the leased premises, including real estate taxes, in addition to all expenses relating to the preparation of any management plan. The Trust shall have no obligation to spend any money on the leased premises during the term of this lease except for those funds committed for the purchase of the leased premises. The Conservancy shall have no obligation to spend any money under the terms of this lease which is not generated as income from the property. The Conservancy agrees to make no commitment for expenditures in excess of projected income, and such income shall first be committed to the payment of real estate taxes. In the event this lease is terminated because a management plan could not be agreed upon, and the Conservancy does not exercise its option to purchase, all unspent or uncommitted revenues generated from the leased premises shall be paid over to the Trust.

8. ASSIGNMENT: The Conservancy may not assign this lease without the prior written consent of the Trust.

9. INSURANCE: With reference to the leased premises, the Conservancy agrees to maintain bodily injury and property damage liability insurance, in a responsible company in the amount of not less than $300,000 for injury to any one person, $300,000 for injury arising from any one accident or occurrence, and $300,000 for property damage. Such policy or policies shall include the Trust as an additional insured and such insurance protection may be carried under a blanket policy. To the extent afforded by such insurance, the Conservancy agrees to hold the Tru harmless from any liability for damage or injury to any person, persons, or properties sustained on the leased premises, but the Conservancy's

liability in connection therewith is expressly limited to such insurance. The Conservancy will furnish the Trust with a certificate establishing that such insurance is in force within 30 days after signing this instrument.

10. EXISTING LEASE: The Conservancy's rights under this lease are subject to the rights of Quirk Land and Cattle Company, a Nebraska corporation, under a lease entered into on October 26, 1976, and effective on March 15, 1977, between Arthur P. Terry and Maxine M. Terry (Lessors) and Quirk Land and Cattle Company (Lessee), hereinafter referred to as "Quirk Lease." The Quirk Lease has been assigned to the Trust and the Trust, as Lessor under the Quirk Lease, hereby delegates all of its duties as Lessor under the Quirk Lease to the Conservancy. The Trust also assigns all of its rights as Lessor under the Quirk Lease, including the right to receive lease payments, to the Conservancy.

11. DEFAULT: In the event of an alleged breach or threat of breach of covenants contained in this lease, the injured party shall notify the breaching party of the breach in writing. Upon notification, the breaching party shall immediately cease the activity causing the alleged breach. The breaching party shall have sixty days thereafter either to cure the breach or to institute arbitration proceedings. If neither is done by the breaching party within said sixty days, the breaching party shall be considered in default. If the breaching party elects to institute arbitration, the dispute shall be submitted to a panel of three arbiters, one selected by the Trust, one by the Conservancy, and the third by the other two arbiters. The decision of the panel as to whether a breach exists shall be final and shall be binding upon each party. The costs of arbitration shall be paid according to the direction of the panel. If the panel declares that a breach exists, the breaching party shall have thirty days thereafter to cure said breach. If the breaching party does not cure, the breaching party shall be considered in default.

In the event of default, as herein defined, by the breaching party, the injured party may institute proceedings to enforce the terms of this lease, or the decision of the arbitration panel, if any, in law or equity.

12. NOTICES: All notices provided for in this lease shall be in writing, and shall be delivered in person or by registered or certified mail, return receipt requested. Such notices shall be delivered to the Lessor at its offices in Grand Island, Nebraska, and to the Lessee at 1800 North Kent Street, Arlington, VA 22209, or at such other place as the parties may hereafter designate to the other in writing.

13. NEBRASKA LAW GOVERNS: This lease shall be deemed to have been made and executed at Grand Island, Nebraska, and shall

be governed by, and interpreted in accordance with, the lasw of the state of Nebraska.

This lease is effective on the 19 day of December, 1979.

RICHARD E. SPELTS, JR., JAMES L. GRAHL, AND THOMAS L. KIMBALL, AS TRUSTEES OF THE PLATTE RIVER WHOOPING CRANE HABITAT MAINTENANCE TRUST

By: _____
Richard E. Spelts, Jr., Trustee

By: _____
James L. Grahl, Trustee

By: _____
Thomas L. Kimball, Trustee

THE NATURE CONSERVANCY

By: _____
Its President

ATTEST:

_____
Assistant Secretary

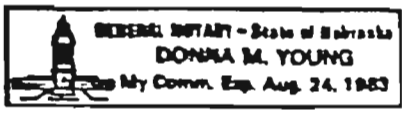
STATE OF NEBRASKA)

COUNTY OF HALL)

On this 24th day of December, 1979, before me, a Notary Public in and for said County and State, personally came RICHARD E. SPELTS, JR., Known to me to be the identical person whose signature is affixed to the foregoing lease as a Trustee of The Platte River Whooping Crane Habitat Maintenance Trust, and he acknowledged the

execution of said lease to be the voluntary act and deed of said Trust and his own voluntary and duly authorized act and deed as such Trustee.

WITNESS my hand and notarial seal the date last above written.



Donna M. Young
Notary Public

STATE OF North Dakota)
) ss.
COUNTY OF Burleigh)

On this 7th day of December, 1979, before me, a Notary Public in and for said County and State, personally came JAMES L. GRAHL, Known to me to be the identical person whose signature is affixed to the foregoing lease as a Trustee of The Platte River Whooping Crane Habitat Maintenance Trust, and he acknowledged the execution of said lease to be the voluntary act and deed of said Trust and his own voluntary and duly authorized act and deed as such Trustee.

WITNESS my hand and notarial seal the date last above written.

Kim Kenning
Notary Public

STATE OF VIRGINIA
~~DISTRICT OF COLUMBIA~~)
COUNTY OF ARLINGTON) ss.
~~CITY OF WASHINGTON~~)

On this 19th day of December, 1979, before me, a Notary Public in and for said District of Columbia, personally came THOMAS L. KIMBALL, Known to me to be the identical person whose signature is affixed to the foregoing lease as a Trustee of The Platte River Whooping Crane Habitat Maintenance Trust, and he acknowledged the execution of said lease to be the voluntary act and deed of said Trust and his own voluntary and duly authorized act and deed as such Trustee.

WITNESS my hand and notarial seal the date last above written.

June S. Goode
Notary Public June S. Goode

My commission expires: Feb. 24, 1981

STATE OF VIRGINIA)

COUNTY OF ARLINGTON) ss.

On this 19th day of December, 1979, before me, a Notary Public in and for said County and State, personally came Patrick F. Noonan, known to me to be the identical person whose signature is affixed to the foregoing lease as of The Nature conservancy, a corporation, and he acknowledged the execution of said lease to be the voluntary act and deed of said corporation, and his own voluntary and duly authorized act and deed as such officer.

WITNESS my hand and notarial seal the date last above written.

June S. Goode
Notary Public June S. Goode

My Commission expires:

February 24, 1981

Appendix C Taxa Occurring on Mormon Island Crane Meadows

PLANTS*

Equisetaceae	
Equisetum arvense	Field Horsetail
Equisetum laevigatum	Smooth Horsetail
Polypodiaceae	
Thelypteris palustris	Marsh Fern
Cupressaceae	
Juniperus virginiana	Red Cedar
Alismataceae	
Alisma subcordatum	Water Plantain
Sagittaria latifolia	Common Arrowhead
Juncaginaceae	
Triglochin maritimum	Arrowgrass
Commelinaceae	
Tradescantia bracteata	Spiderwort
Juncaceae	
Juncus balticus	Baltic Rush
Juncus dudleyi	Dudley Rush
Juncus nodosus	Knotted Rush
Juncus torreyi	Torrey's Rush
Cyperaceae	
Carex aquatilis	
Carex brevior	Fescue Sedge
Carex eleocharis	Needleleaf Sedge
Carex gravida	Heavy Sedge
Carex hallii	
Carex lanuginosa	Wooly Sedge
Carex meadii	Mead's Sedge
Carex molesta	
Carex praegracilis	Clustered-field Sedge

*Names according to Barkley, T.M., editor. 1977. Atlas of the Flora of the Great Plains. Iowa State University Press, Ames. 600 pp.

Cyperaceae (continued)

Carex scoparia	Broom Sedge
Carex stipata	Saw-beak Sedge
Carex vulpinoidea	Fox Sedge
Cyperus aristatus	
Cyperus esculentus	Yellow Nutsedge
Cyperus odoratus	
Cyperus schweinitzii	Schweinitz Flatsedge
Eleocharis acicularis	Needle Spikesedge
Eleocharis compressa	Flatstem Spikesedge
Eleocharis macrostachya	Spike Rush
Fimbristylis puberula	
Scirpus atrovirens	Darkgreen Bulrush
Scirpus fluviatilis	River Bulrush
Scirpus maritimus	Prairie Bulrush
Scirpus pungens	Common Threesquare
Scirpus validus	Soft-stem Bulrush

Poaceae

Agropyron repens	Quackgrass
Agropyron smithii	Western Wheatgrass
Agrostis stolonifera	Redtop
Alopecurus aequalis	Shortawn Foxtail
Andropogon gerardi	Big Bluestem
Andropogon scoparius	Little Bluestem
Aristida oligantha	Prairie Threeawn
Avena fatua	Wild Oat
Bouteloua gracilis	Blue Grama
Bromus inermis	Smooth Brome
Bromus japonicus	Japanese Brome
Bromus tectorum	Downy Brome
Calamagrostis inexpansa	Northern Reedgrass
Calamovilfa longifolia	Prairie Sandreed
Cenchrus longispinus	Field Sandbur
Digitaria sanguinalis	Crabgrass
Distichlis spicata	Seashore saltgrass
Echinochloa crusgalli	Barnyardgrass
Eleusine indica	Goosegrass
Elymus canadensis	Canada Wild Rye
Elymus virginicus	Virginia Wild Rye
Eragrostis cilianensis	Stinkgrass
Eragrostis pectinacea	Carolina Lovegrass
Eragrostis spectabilis	Purple Lovegrass
Festuca octoflora	Six-weeks Fescue
Festuca pratensis	Meadow Fescue
Hordeum jubatum	Foxtail Barley
Hordeum pusillum	Little Barley
Koeleria pyramidata	Junegrass
Leersia virginica	Whitegrass
Muhlenbergia asperifolia	Scratchgrass

Poaceae (continued)	
Muhlenbergia mexicana	Wirestem Muhly
Muhlenbergia racemosa	Marsh Muhly
Muhlenbergia sylvatica	Forest Muhly
Panicum capillare	Witchgrass
Panicum lanuginosum	
Panicum oligosanthes	Small Panicgrass
Panicum virgatum	Switchgrass
Paspalum setaceum	
Phalaris arundinacea	Reed Canarygrass
Phleum pratense	Timothy
Poa pratensis	Kentucky Bluegrass
Setaria glauca	Yellow Foxtail
Sorghastrum avenaceum	Indian-grass
Spartina pectinata	Prairie Cordgrass
Sphenopholis obtusata	Prairie Wedgegrass
Sporobolus asper	Rough Dropseed
Sporobolus cryptandrus	Sand Dropseed
Stipa comata	Needle-and-Thread
Triplasis purpurea	Sandgrass
Sparganiaceae	
Sparganium eurycarpum	Giant Burr-reed
Liliaceae	
Allium canadense	Wild Onion
Allium textile	White Wild Onion
Asparagus officinalis	Asparagus
Hyposix hirsuta	Yellow Stargrass
Smilacina stellata	Spikenard
Smilax hispida	Bristly Greenbriar
Iridaceae	
Sisyrinchium angustifolium	Blue-eyed-grass
Sisyrinchium campestre	White-eyed-grass
Orchidaceae	
Spiranthes cernua	Ladies-tresses
Ranunculaceae	
Anemone canadensis	Meadow Anemone
Delphinium virescens	Prairie Larkspur
Ranunculus cymbalaria	Shore Buttercup
Ulmaceae	
Ulmus americana	American Elm

Moraceae	
Morus alba	White Mulberry
Cannabaceae	
Cannabis sativa	Marijuana
Urticaceae	
Parietaria pensylvanica	Pennsylvania Pellitory
Urtica dioica	Stinging Nettle
Nyctaginaceae	
Mirabilis linearis	Narrowleaf Four-O'Clock
Mirabilis nyctaginea	Wild Four-O'Clock
Portulacaceae	
Talinum parviflorum	Prairie Flameflower
Chenopodiaceae	
Chenopodium album	Lamb's-quarters
Chenopodium missouriense	
Chenopodium standleyanum	
Cycloloma artriplicifolium	Winged Pigweed
Amaranthaceae	
Amaranthus arenicola	
Amaranthus retroflexus	Rough Pigweed
Polygonaceae	
Polygonum arenastrum	Common Knotweed
Polygonum coccineum	Swamp Smartweed
Polygonum convolvulus	Wild Buckwheat
Polygonum persicaria	Lady's-thumb
Polygonum punctatum	Water Smartweed
Rumex crispus	Curly Dock
Malvaceae	
Callirhoe alcaeoides	Pink Poppy Mallow
Callirhoe involucrata	Purple Poppy Mallow
Hibiscus trionum	Flower-of-an-hour
Malva neglecta	Common Mallow
Violaceae	
Viola pratincola	Meadow Violet
Cucurbitaceae	
Echinocystis lobata	Wild Cucumber

Salicaceae	
Populus deltoides	Cottonwood
Salix amygdaloides	Peach-leaved Willow
Salix exigua	Coyote Willow
Capparidaceae	
Cleome serrulata	Rocky Mountain Beeplant
Brassicaceae	
Chorispora tenella	Blue Mustard
Descurainia pinnata	Tansy Mustard
Descurainia sophia	Flaxweed
Lepidium densiflorum	Peppergrass
Sisymbrium loeselii	Tall Hedge Mustard
Thlaspi arvense	Penny Cress
Primulaceae	
Lysimachia ciliata	Fringed Loosestrife
Lysimachia thyrsiflora	Tufted Loosestrife
Rosaceae	
Geum canadense	White Avens
Rosa arkansana	Prairie Wild Rose
Rosa woodsii	Western Wild Rose
Rubus occidentalis	Black Raspberry
Fabaceae	
Amorpha fruticosa	False Indigo
Astragalus canadensis	Canada Milkvetch
Desmanthus illinoensis	Bundleflower
Desmodium glutinosum	Large-flowered Tickclover
Gleditsia triacanthos	Honey Locust
Glycyrrhiza lepidota	Wild Licorice
Lotus corniculatus	Bird's-foot Trefoil
Medicago lupulina	Black Medick
Medicago sativa	Alfalfa
Melilotus albus	White Sweet Clover
Melilotus officinalis	Yellow Sweet Clover
Petalostemom candidum	White Prairie Clover
Petalostemom purpureum	Purple Prairie Clover
Strophostyles leiosperma	Smoothseed Wild Bean
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Lythraceae	
Amannia coccinea	Tooth-cup
Lythrum dacotanum	Loosestrife

Onagraceae	
Gaura parviflora	Velvety Gaura
Ludwigia palustris	Water Purslane
Oenothera biennis	Common Evening Primrose
Oenothera pallida	
Elaeagnaceae	
Elaeagnus angustifolia	Russian olive
Cornaceae	
Cornus drummondii	Rough-leaved Dogwood
Celastraceae	
Celastrus scandens	Climbing Bittersweet
Euphorbiaceae	
Croton texensis	Texas Croton
Euphorbia dentata	Toothed Spurge
Euphorbia glyptosperma	Ridge-seeded Spurge
Vitaceae	
Parthenocissus vitacea	Woodbine
Vitis riparia	River-bank Grape
Aceraceae	
Acer negunda	Box Elder
Acer saccharinum	Silver Maple
Anacardiaceae	
Rhus glabra	Smooth Sumac
Toxicodendron radicans	Poison Ivy
Rutaceae	
Zanthoxylum americanum	Prickly Ash
Zygophyllaceae	
Tribulus terrestris	Puncture Vine
Oxalidaceae	
Oxalis dillenii	
Apiaceae	
Cicuta maculata	Water Hemlock
Daucus carota	Wild Carrot
Sanicula canadensis	Canada Sanicle

Gentianaceae	
Eustoma grandiflorum	Prairie Gentian
Apocynaceae	
Apocynum sibiricum	Prairie Dogbane
Asclepiadaceae	
Asclepias incarnata	Swamp Milkweed
Asclepias speciosa	Showy Milkweed
Asclepias verticillata	Whorled Milkweed
Solanaceae	
Physalis heterophylla	Clammy Ground Cherry
Physalis virginiana	Ground Cherry
Solanum americanum	Black Nightshade
Solanum rostratum	Buffalo Bur
Convolvulaceae	
Convolvulus arvensis	Field Bindweed
Convolvulus sepium	Hedge Bindweed
Ipomoea purpurea	Common Morning-glory
Cuscutaceae	
Cuscuta glomerata	Cluster Dodder
Hydrophyllaceae	
Ellisia nyctelea	Waterpod
Boraginaceae	
Lithospermum incisum	Narrow-leaved Puccoon
Verbenaceae	
Phyla lanceolata	Fog Fruit
Verbena bracteata	Bracted Vervain
Verbena hastata	Blue Vervain
Verbena stricta	Hoary Vervain
Verbena urticifolia	Nettle-leaved Vervain
Lamiaceae	
Hedeoma hispida	Rough Pennyroyal
Lycopus americanus	American Bugleweed
Lycopus asper	Rough Bugleweed
Monarda fistulosa	Wild Bergamot
Nepeta cataria	Catnip
Prunella vulgaris	Selfheal
Pycnanthemum virginianum	Mountain Mint
Teucrium canadense	American Germander

Plantaginaceae	
Plantago eriopoda	Alkali Plantain
Plantago major	Common Plantain
Plantago patagonica	Buckhorn
Oleaceae	
Fraxinus pennsylvanica	Green ash
Campanuluceae	
Lobelia siphilitica	Blue Cardinal-flower
Lobelia spicata	Pale-spike Lobelia
Rubiaceae	
Galium aparine	Catchweed Bedstraw
Caprifoliaceae	
Sambucus canadensis	Elderberry
Asteraceae	
Achillea millefolium	Yarrow
Ambrosia artemisiifolia	Common Ragweed
Ambrosia psilostachya	Western Ragweed
Ambrosia trifida	Giant Ragweed
Antennaria neglecta	Field Pussytoes
Arctium minus	Common Burdock
Artemisia ludoviciana	White Sage
Aster ericoides	White Aster
Aster simplex	Panicled Aster
Bidens comosa	Beggarticks
Bidens frondosa	Beggarticks
Carduus nutans	Musk Thistle
Chrysanthemum leucanthemum	Ox-eye Daisy
Chrysopsis villosa	Golden Aster
Cirsium flodmani	Prairie Thistle
Conyza canadensis	Horseweed
Coreopsis tinctoria	Plains Coreopsis
Crepis runcinata	Hawk's-beard
Erigeron philadelphicus	Philadelphia Fleabane
Erigeron strigosus	Daisy Fleabane
Eupatorium perfoliatum	Boneset
Grindelia squarrosa	Curly-top Gumweed
Helenium autumnale	Sneezeweed
Helianthus annuus	Common Sunflower
Helianthus grosseserratus	Sawtooth Sunflower
Helianthus maximiliana	Maximilian Sunflower
Helianthus petiolaris	Plains Sunflower
Helianthus tuberosus	Jerusalem Artichoke

Asteraceae (continued)

Iva annua	
Iva xanthifolia	Marsh Elder
Lactuca canadensis	Wild Lettuce
Lactuca oblongfolia	Blue Lettuce
Lactuca serriola	Prickly Lettuce
Liatris pycnostachya	Tall Blazing Star
Ratibida columnifera	Prairie Cone Flower
Rudbeckia hirta	Black-eyed Susan
Senecio plattensis	Prairie Ragwort
Solidago canadensis	Canada Goldenrod
Solidago gramifolia	Narrow-leaved Goldenrod
Solidago gigentea	Late Goldenrod
Taraxacum officinale	Dandelion
Tragopogon dubius	Goatsbeard
Vernonia fasciculata	Ironweed
Xanthium strumarium	Cocklebur

Appendix C (continued)

INSECTS*

Collembola	Sprigtails
Poduridae	Elongate-bodied Sprigtails
Entomobryidae	Elongate-bodied Sprigtails
Ephemeroptera	Mayflies
Ephemeridae	Burrowing Mayflies
Heptageniidae	Stream Mayflies
Baetidae	Small Mayflies
Odonata	Dragonflies and Damselflies
Coenagrionidae	Narrow-winged Damselflies
Gomphidae	Clubtails
Ophiogomphus severus	
Aeshnidae	Darners
Anax junius	
Libellulidae	Common Skimmers
Pantala hymenaea	
Sympetrum obtrusum	
Libellula luctuosa	
Libellula forensis	
Erythemis simplicicollis	
Orthoptera	Grasshoppers, Katydids, Crickets, Mantids and Cockroaches
Acrididae	Short-horned Grasshoppers
Melanoplus sp	
Tettigoniidae	Long-horned Grasshoppers
Conocephalus sp.	
Neoconocephalus sp.	
Orchelimum sp.	
Gryllidae	Crickets
Mantidae	Mantids
Blattidae	Cockroaches
Gryllotalpidae	Grylloblattids

*Family names for Celeoptera from Arnett, R.H., Jr. 1968. The Beetles of the United States. Amer. Ent. Inst., Ann Arbor. 1012 pp.

Other family names from Borror, D.J., D.M. Delong and C.A. Triplehorn. 1976. An Introduction to the Study of Insects. Holt, Rinehart, and Wilson, New York. 852 pp.

Plecoptera	Stoneflies
Perlidae	Common Stoneflies
Thysanoptera	Thrips
Thripidae	Common Thrips
Phloeothripidae	Tube-tailed Thrips
Hemiptera	Bugs
Corixidae	Water Boatmen
Notonectidae	Backswimmers
Miridae	Leaf Bugs
Phymatidae	Ambush Bugs
Phymatus sp.	
Reduviidae	Assassin Bugs
Nabidae	Damsel Bugs
Rhopalidae	Scentless Plant Bugs
Cydnidae	Burrower Bugs
Pangaeus sp.	
Pentatomidae	Stink Bugs
Euschistus sp.	
Thyanta sp.	
Lygaeidae	Seed Bugs
Homoptera	Cicadas, Hoppers, Whiteflies, Aphids and Scale Insects
Cicadidae	Cicadas
Tibicen sp.	
Membracidae	Treehoppers
Ceresa sp.	
Cicadellidae	Leafhoppers
Cercopidae	Spittlebugs
Lepyronia sp.	
Fulgoridae	Fulgorid Planthoppers
Dictyopharidae	Dictyopharid Planthoppers
Aphididae	Aphids
Neuroptera	Fishflies, Snake Flies, Lacewings, and Antlions
Mantispidae	Mantidflies
Chrysopidae	Green Lacewings
Myrmeleontidae	Antlions
Coleoptera	Beetles
Cicindelidae	Tiger Beetles
Cicindela sp.	

Carabidae	Ground Beetles
Harpalus sp.	
Chlaenius sp.	
Scarites sp.	
Pasimachus sp.	
Euryderus sp.	
Amara sp.	
Stenolophus sp.	
Haliplidae	Crawling Water Beetles
Peltodytes sp.	
Dytiscidae	Predaceous Diving Beetles
Gyrinidae	Whirligig Beetles
Dineutus sp.	
Histeridae	Hister Beetles
Hydrophilidae	Water Scavenger Beetles
Hydrophilus triangularis	
Sphaeridius sp.	
Hydrocharis sp.	
Enochrus sp.	
Tropisternus sp.	
Leiodidae	Round Fungus Beetles
Silphidae	Carrion Beetles
Silpha ramosa	
Silpha noveboracensis	
Nicrophorus pustulatus	
Nicrophorus orbicollis	
Staphylinidae	Rove Beetles
Bledius sp.	
Cantharidae	Soldier Beetles
Chauliognathus pennsylvanicus	
Lampyridae	Fireflies
Photinus sp.	
Melyridae	Soft-winged Flower Beetles
Collops sp.	
Lycidae	Net-winged Beetles
Dermestidae	Dermestic Beetles
Dermestes sp.	
Cleridae	Checkered Beetles
Elateridae	Click Beetles
Buprestidae	Mettalic Wood-boring Beetles
Acmaeodera sp.	
Heteroceridae	Variegated Mud-loving Beetles
Heterocerus sp.	
Erotylidae	Pleasing Fungus Beetles
Languriidae	Lizard Beetles
Cucujidae	Flat Bark Beetles
Phalacridae	Shining Flower Beetles
Nitidulidae	Sap Beetles
Coccinellidae	Ladybird Beetles
Coleomegilla sp.	
Hippodamia sp.	
Mycetophagidae	Mycetaeid Fungus Beetles
Anthicidae	Antlike Flower Beetles

Oedemeridae	False Blister Beetles
Meloidae	Blister Beetles
Epicauta Sp.	
Mordellidae	Tumbling Flower Beetles
Tenebrionidae	Darkling Beetles
Tenebrio sp.	
Alobates sp.	
Melandryiidae	False Darkling Beetles
Anobiidae	Death-watch Beetles
Bostrichidae	Twig Borers
Lyctidae	Powder-post Beetles
Scarabaeidae	Scarab Beetles
Aphodius fimetarius	
Aphodius walshii	
Aphodius distincta	
Aphodius lentus	
Aphodius rubeolus	
Aphodius granarius	
Ataenius spretulus	
Geotrupes opaca	
Geotrupes splendidus	
Bolbocerosoma bruneri	
Bolboceras filicornis	
Ochodaeus musculus	
Copris fricator	
Canthon nigricornis	
Onthophagus pennsylvanicus	
Onthophagus hecate	
Polyphylla hammondi	
Phyllophaga crassissima	
Phyllophaga rugosa	
Phyllophaga futilis	
Phyllophaga crenulata	
Phyllophaga fervida	
Phyllophaga fusca	
Phyllophaga gracilis	
Pelidnota punctata	
Anomala flavipennis stigmatella	
Strigoderma arboricola	
Cyclocephala pasadenae	
Dyscinetus picipes	
Ligyrus gibbosus	
Ligyrus relictus	
Trox foveacollis	
Trox suberosus	
Euphoria inda	
Cerambycidae	Long-horned Beetles
Tetraopes sp.	
Megacyllene sp.	
Chrysomelidae	Leaf Beetles
Chrysochus sp.	
Leptinotarsa sp.	
Bruchidae	Seed Beetles
Curculionidae	Snout Beetles

Mecoptera	Scorpionflies
Bittacidae	Hanging Flies
Bittacus sp.	
Trichoptera	Caddisflies
Hydropsychidae	Micro-caddisflies
Leptoceridae	Long-horned Caddisflies
prob. Brachycentridae	Brachycentrids
Lepidoptera	Butterflies and Moths
Satyridae	Satyrs
Cercyonis pegala	
Pieridae	Whites, Sulfus, and Orangetips
Pieris rapae	
Pieris protodice	
Colias eurytheme	
Colias philodice	
Danaidae	Milkweed Butterflies
Danaus plexippus	
Nymphalidae	Brush-footed Butterflies
Speyeria idalia	
Phycoides tharos	
Chlosyne gorgone	
Papilionidae	Swallowtails
Papilio glaucus	
Lycaenidae	Gossamer-winged Butterflies
Lycaenia helloides	
Hesperiidae	Common Skippers
Epargyreus tityrus	
Limochores taumas	
Pyrgus tesselata	
Noctuidae	Noctuid Moths
Catocala sp.	
Agrotis sp.	
Chorizagrotis sp.	
Pseudoletia unipuncta	
Sphingidae	Sphinx or Hawk Moths
Pachysphinx modesta	
Sphecodina abbotti	
Celerio lineata	
Ampeloeca myron	
Pholus achemon	
Arctiidae	Tiger Moths
Apantesis virgo	
Apantesis vittata	
Apantesis blakei	
Diacrisia virginica	
Euchaetias oregonensis	
Halisidota tessellatus	

Lithosiidae	
Hypoprepia fucosa	
Syntomidae	
Scepis fulvicollis	
Lasiocampidae	Tent Catepillars
Epicanptera americana	
Notodontidae	Prominents
Pheosia dimidiata	
Pterophoridae	Plume Moths
Pyralidae	Pyralid Moths
Geometridae	Geometer Moths
Diptera	Flies
Tipulidae	Crane Flies
Culicidae	Mosquitoes
Chironomidae	Midges
Stratiomyidae	Soldier Flies
Tabanidae	Horse Flies
Asilidae	Robber Flies
Bombyliidae	Bee Flies
Dolichopodidae	Long-legged Flies
Syrphidae	Syrphid Flies
Muscidae	Muscid Flies
Anthomyidae	
Calliphoridae	
Sarcophagidae	
Tachinidae	
Otitidae	Picture-winged Flies
Tephretidae	Fruit Flies
Pyrgotidae	Pyrgotid Flies
Chloropidae	Frit Flies
Lauxaniidae	Lauxaniid Flies
Therevidae	
Sphaeroceridae	Small Dung Flies
Bibionidae	March Flies
Rhagionidae	Snipe Flies
Hymenoptera	Ants, Wasps, and Bees
Tenthredinidae	
Ichneumonidae	Ichneumons
Braconidae	Braconids
Chrysididae	
Scoliidae	Scolid Wasps
Mutillidae	Velvet Ants
Formicidae	Ants
Pompilidae	Spider Wasps
Vespidae	Vespid Wasps
Sphecidae	Sphecid Wasps
Apidae	Bumble Bees and Honey Bees
Apis mellifera	
Anthophoridae	Digger Bees
Megachilidae	Leafcutting Bees
Colletidae	

FISH*

Lepisosteidae	
Lepisosteus platostomus	Shortnose Gar
Clupeidae	
Dorosoma cepedianum	Gizzard Shad
Hiodontidae	
Hiodon alosoides	Goldeye
Cyprinidae	
Cyprinus carpio	Carp
Cyprinus carpio	Mirror Carp
Semotilus stromaculatus	Creek Chub
Hybognathus placitus	Plains Minnow
Pimephales promelas	Fathead Minnow
Hybognathus hankinsoni	Brassy Minnow
Hybognathus nuchalis	Silvery Minnow
Hybopsis aestivalis	Speckled Chub
Notropis lutrensis	Red Shiner
Notropis stramineus	Sand Shiner
Notropis atherinoides	Emerald Shiner
Notropis blennius	River Shiner
Hybopsis aestivalis	Speckled Chub
Catostomidae	
Carpiodes carpio	River Carpsucker
Carpiodes cyprinus	Quillback Carpsucker
Catostomus commersoni	White Sucker
Ictaluridae	
Ictalurus melas	Black Bullhead
Ictalurus punctatus	Channel Catfish
Cyprinodontidae	
Fundulus kansae	Plains Killifish
Percichthyidae	
Morone chrysops	White Bass

*Names according to Pflieger, W.L. 1975. The Fishes of Missouri. Missouri Department of Conservation. Jefferson City, Missouri.

Centrarchidae

Lepomis macrochirus	Bluegill
Lepomis cyanellus	Green Sunfish
Lepomis humilis	Orangespotted Sunfish
Micropterus salmoides	Largemouth Bass
Micropterus dolomieui	Smallmouth Bass
Pomoxis annularis	White Crappie
Pomoxis nigromaculatus	Black Crappie

Percidae

Perca flavescens	Yellow Perch

Sciaenidae

Aplodinitus grunniens	Freshwater Drum

Appendix C (continued)

HERPETILES*

Anurans	
Pseudacris triseriata	Striped Chorus Frog
Bufo woodhousii	Woodhouse's Toad
Rana blairi	Plains Leopard Frog
Turtles	
Chelydra serpentina	Snapping Turtle
Chrysemy picta	Western Painted Turtle
Trionyx spiniferus	Spiny Softshell
Lizards	
Eumeces septentrionalis	Prairie Skink
Cnemidophorus sexlineatus	Six-lined Racerunner
Snakes	
Thamnophis sirtalis	Common Garter Snake
Thamnophis radix	Plains Garter Snake

*Names according to Collins, J.T., J.E. Huheey, J.L. Knight and H.M. Smith. 1978. Standard Common and Current Scientific Names for North American Amphibians and Reptiles. Herpetological Circ. No. 7, Society for the Study of Amphibians and Reptiles. 36 pp.

Appendix C (continued)

BIRDS*

Podicipedidae	
Eared Grebe	Podiceps nigricollis
Pied-billed Grebe	Podilymbus podiceps
Pelecanidae	
White Pelican	Pelecanus erythrorhynchos
Phalaerocoracidae	
Double-crested Cormorant	Phalacrocorax auritus
Ardeidae	
Great Blue Heron	Ardea herodias
Green Heron	Butorides virescens
Little Blue Heron	Florida caerulea
Black-crowned Night Heron	Nycticorax nycticorax
American Bittern	Botaurus lentiginosus
Threshkornithidae	
White-faced Ibis	Plegadis chihi
Anatidae	
Canada Goose	Branta canadensis
White-fronted Goose	Anser albifrons
Snow Goose	Anser caerulescens
Mallard	Anas platyrhynchos
Gadwall	Anas strepera
Pintail	Anas acuta
Green-winged Teal	Anas crecca
Blue-winged Teal	Anas discors
American Wigeon	Anas americana
Northern Shoveler	Anas clypeata
Wood Duck	Aix sponsa
Redhead	Aythya americana
Ring-necked Duck	Aythya collaris
Canvasback	Aythya valisineria
Lesser Scaup	Aythya affinis
Common Goldeneye	Bucephala clangula
Bufflehead	Bucephala albeola
Hooded Merganser	Lophodytes cucullatus
Common Merganser	Mergus merganser

*Names according to American Ornithologists' Union. 1957. Checklist of North American Birds. 5th ed. A.O.U. Baltimore. 691 pp. with supplements in 1973 and 1976.

Cathartidae	
Turkey Vulture	*Cathartes aura*
Accipritidae	
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Red-tailed Hawk	*Buteo jamaicensis*
Swainson's Hawk	*Buteo swainsoni*
Rough-legged Hawk	*Buteo lagopus*
Ferruginous Hawk	*Buteo regalis*
Golden Eagle	*Aquila chrysaetos*
Bald Eagle	*Haliaeetus leucocephalus*
Marsh Hawk	*Circus cyaneus*
Pandionidae	
Osprey	*Pandion haliaetus*
Falconidae	
Prairie Falcon	*Falco mexicanus*
Peregrine Falcon	*Falco peregrinus*
Merlin	*Falco columbarius*
American Kestrel	*Falco sparverius*
Tetraonidae	
Greater Prairie Chicken	*Tympanuchus cupido*
Phasianidae	
Bobwhite	*Colinus virginianus*
Ring-necked Pheasant	*Phasianus colchicus*
Gruidae	
Sandhill Crane	*Grus canadensis*
Rallidae	
Sora	*Porzana carolina*
American Coot	*Fulica americana*
Charadriidae	
Semipalmated Plover	*Charadrius semipalmatus*
Piping Plover	*Charadrius melodus*
Killdeer	*Charadrius vociferus*
American Golden Plover	*Pluvialis dominica*
Ruddy Turnstone	*Arenaria interpres*

Scolopacidae	
Common Snipe	*Capella gallinago*
Upland Sandpiper	*Bartramia longicauda*
Spotted Sandpiper	*Actitus macularia*
Solitary Sandpiper	*Tringa solitaria*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Willet	*Catoptrophorus semipalmatus*
Pectoral Sandpiper	*Calidris melanotos*
White-rumped Sandpiper	*Calidris fuscicollis*
Baird's Sandpiper	*Calidris bairdii*
Least Sandpiper	*Calidris minutilla*
Dunlin	*Calidris alpina*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Short-billed Dowitcher	*Limnodromus griseus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Stilt Sandpiper	*Micropalama himantopus*
Marbled Godwit	*Limosa fedoa*
Hudsonian Godwit	*Limosa haemastica*
Recurvirostridae	
American Avocet	*Recurvirostra americana*
Phalaropodidae	
Wilson's Phalarope	*Steganopus tricolor*
Laridae	
Herring Gull	*Larus argentatus*
Ring-billed Gull	*Larus delawarensis*
Franklin's Gull	*Larus pipixcan*
Forester's Tern	*Sterna forsteri*
Least Tern	*Sterna albifrons*
Black Tern	*Chlidonias niger*
Columbidae	
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Cuculidae	
Yellow-billed Cuckoo	*Coccyzus americanus*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Strigide	
Great Horned Owl	*Bubo virginianus*
Caprimulgidae	
Common Nighthawk	*Chordeiles minor*

Apodidae	
Chimney Swift	*Chaetura pelagica*
Alcendinidae	
Belted Kingfisher	*Megaceryle alcyon*
Picidae	
Common Flicker	*Colates auratus*
Red-bellied Woodpecker	*Melanerpes carolinus*
Redheaded Woodpecker	*Melanerpes erythrocephalus*
Hairy Woodpecker	*Picoides villosus*
Downy Woodpecker	*Picoides pubescens*
Tyrannidae	
Eastern Kingbird	*Tyrannus tyrannus*
Western Kingbird	*Tyrannus verticalis*
Great Crested Flycatcher	*Myiarchus crinitus*
Willow Flycatcher	*Empidonax traillii*
Least Flycatcher	*Empidonax minimus*
Olive-sided Flycatcher	*Nuttallornis borealis*
Alaudidae	
Horned Lark	*Eremophila alpestris*
Hirundinidae	
Tree Swallow	*Iridoprocne bicolor*
Bank Swallow	*Riparia riparia*
Rough-winged Swallow	*Stelgidopteryx ruficollis*
Barn Swallow	*Hirundo rustica*
Cliff Swallow	*Petrochelidon pyrrhonota*
Corvidae	
Blue Jay	*Cyanocitta cristata*
Black-billed Magpie	*Pica pica*
Common Crow	*Corvus brachyrhynchos*
Paridae	
Black-capped Chickadee	*Parus atricapillus*
Sittidae	
White-breasted Nuthatch	*Sitta carolinensis*
Troglodytidae	
House Wren	*Troglodytes aedon*

Mimidae	
Mockingbird	*Mimus polyglottos*
Gray Catbird	*Dumetella carolinensis*
Brown Thrasher	*Toxostoma rufum*
Turdidae	
American Robin	*Turdus migratorius*
Swainson's Thrush	*Catharus ustulata*
Gray-cheeked Thrush	*Catharus minimus*
Veery	*Catharus fuscescens*
Eastern Bluebird	*Sialia sialis*
Sulviidae	
Ruby-crowned Kinglet	*Regulus calendula*
Laniidae	
Northern Shrike	*Lanius excubitor*
Loggerhead Shrike	*Lanius ludovicianus*
Sturnidae	
Starling	*Sturnus vulgaris*
Vireonidae	
Bell's Vireo	*Vireo bellii*
Red-eyed Vireo	*Vireo olivaceus*
Warbling Vireo	*Vireo gilvus*
Parulidae	
Black-and-White Warbler	*Mniotilta varia*
Tennesee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*Dendroica coronata*
Blackpoll Warbler	*Dendroica striata*
Ovenbird	*Seirus aurocapillus*
Northern Waterthrush	*Seirus noveboracensis*
Common Yellowthroat	*Geothlypis trichas*
American Redstart	*Setophaga ruticilla*
Ploceidae	
House Sparrow	*Passer domesticus*

Icteridae

Bobolink	Dolichonyx oryzivorus
Eastern Meadowlark	Sturnella magna
Western Meadowlark	Sturnella neglecta
Yellow-headed Blackbird	Xanthocephalus xanthocephalus
Red-winged Blackbird	Agelaius phoeniceus
Orchard Oriole	Icterus spurius
Northern Oriole	Icterus galbula
Rusty Blackbird	Euphagus carolinus
Brewer's Blackbird	Euphagus cyanocephalus
Great-tailed Grackle	Quiscalus mexicanus
Common Grackle	Quiscalus quiscula
Brown-headed Cowbird	Molothrus ater

Fringillidae

Cardinal	Cardinalis cardinalis
Rose-breasted Grosbeak	Pheucticus ludovicianus
Indigo Bunting	Passerina cyanea
Dickcissel	Spiza americana
House Finch	Carpodacus mexicanus
American Goldfinch	Carduelis tristis
Rufous-sided Towhee	Pipilo erythrophthalmus
Lark Bunting	Calamospiza melanocorys
Savannah Sparrow	Passerculus sandwichensis
Grasshopper Sparrow	Ammodramus savannarum
Henslow's Sparrow	Ammodramus henslowii
LeConte's Sparrow	Ammospiza leconteii
Vesper Sparrow	Pooecetes gramineus
Lark Sparrow	Chondestes grammacus
Dark-eyed Junco	Junco hyemalis
Tree Sparrow	Spizella arborea
Chipping Sparrow	Spizella passerina
Clay-colored Sparrow	Spizella pallida
Field Sparrow	Spizella pusilla
Harris' Sparrow	Zonotrichia querula
White-crowned Sparrow	Zonotrichia leucophrys
White-throated Sparrow	Zonotrichia albicollis
Lincoln's Sparrow	Melospiza lincolnii
Swamp Sparrow	Melospiza georgiana
Song Sparrow	Melospiza melodia

Appendix C (continued)

MAMMALS*

Didelphidae	
Didelphus marsupialus	Virginia Opossum
Talpidae	
Scalopus aquaticus	Eastern Mole
Soricidae	
Sorex cinereus	Masked Shrew
Blarina brevicauda	Northern Short-tailed Shrew
Procyonidae	
Procyon lotor	Raccoon
Musetelidae	
Mustela nivalis	Least Weasel
Taxidea taxus	Badger
Mephitus mephitus	Striped Skunk
Canidae	
Canis latrans	Coyote
Sciuridae	
Sciurus niger	Fox Squirrel
Spermophilus tridecemlineatus	Thirteen-lined Ground Squirrel
Spermophilus franklinii	Franklin's Ground Squirrel
Cynomys ludvicianus	Black-tailed Prairie Dog
Geomyidae	
Geomys bursarius	Plains Pocket Gopher
Castoridae	
Castor canadensis	Beaver
Cricetidae	
Reithrodontomys montanus	Plains Harvest Mouse
Reithrodontomys megalotus	Western Harvest Mouse
Peromyscus maniculatus	Deer Mouse
Peromyscus leucopus	White-footed Mouse

*Names according to Jones, J.K., Jr. and J.R. Choate. 1980. Annotated Checklist of Mammals of Nebraska. Prairie Naturalist 12(2): 43-53.

Cricetidae (continued)	
Microtus pennsylvanicus	Meadow Vole
Ondatra zeibethicus	Muskrat
Perognathus hispidus	Hispid Pocket Mouse
Muridae	
Mus musculus	House Mouse
Zapodidae	
Zapus hudsonius	Jumping Mouse
Leporidae	
Lepus californicus	Black-tailed Jackrabbit
Sylvilagus floridanus	Eastern Cottontail
Cervidae	
Odocoileus virginianus	White-tailed Deer

Appendix D

PROCEDURES FOR PRESCRIPTION BURNING ON NATURE CONSERVANCY LANDS

A. PRESCRIBED BURNING DEFINED

Prescribed burning is the controlled use of fire according to plan in a specific time and place to accomplish a land management objective.

The Nature Conservancy uses prescription burning to:

* Reinstate a natural ecological process and regulate plant succession,
* maintain an open character in certain vegetation types,
* thin woodland, and suppress brush,
* restore native plant communities,
* remove built-up fuel and reduce wildfire hazard,
* suppress alien (non-native) plant species,
* perpetuate fire-dependent plants,
* improve habitat for animals of prairie and open habitats,
* educate and train persons in burning techniques,
* conduct research involving the application of fire.

B. PRESCRIBED BURNING POLICY

The Nature Conservancy recognizes that burning can contribute in certain cases to achieving its objectives.

Prior to any burning on Conservancy land:

1. A prescribed burning proposal must be prepared and approved by authorized Nature Conservancy personnel*.

2. All conditions described in the proposal -- including the crew, fireboss, equipment, and weather -- must be in effect for the burning to occur.

Following the burn a prescribed burning report must be submitted to The Nature Conservancy office.

C. BURNING WEATHER

Normally appropriate burning weather is relative humidity from 20 to 50%, wind velocity 5 to 15 miles per hour, and no unusually high fire danger due to prolonged drought.

Attention must be paid to smoke-sensitive areas (e.g., farm houses and barns) and special fire hazards. Burning should occur under conditions of wind directions that do not create unnecessary annoyance or danger.

D. SIZE OF BURNING UNIT

The unit burned must not be larger than the crew can safely watch and patrol. This will depend on the nature of the area, the fire and fuel breaks, the size of the crew, and method of communications.

The preserve management and use plan (Master Plan) should include a designation of fire units and fire prescriptions for each unit.

E. BURNING EQUIPMENT, VEHICLES

Useful equipment includes backpack water pumps, fire swatters, drip torches, rakes, auxiliary supply of water, gloves, flash lights and warning signs for traffic, and safety helmets in wooded areas. The Conservancy has some equipment available for prescribed burning use.

* A copy of the Prescribed Burning Proposal form is attached below.

MOTORIZED VEHICLES should be utilized primarily for back-up in case of emergency situations.

* Too often, vehicles break down or get stuck, thereby putting the operation into danger.

* Vehicles are damaging to natural areas and, in general, are prohibited from Conservancy preserves.

F. FIRE BREAKS OR FUEL BREAKS

Where boundaries of the burn unit do not follow existing fire barriers, such as roads or standing water, breaks should be prepared in most cases.

Breaks may be made by disking, but this usually results in weed invasion. Disked breaks should generally be confined to the perimeter of a preserve.

Mowing and raking will remove most fuel from a fire line. Mowing native prairie in mid-July and August will tend to favor cool season plants including Kentucky Bluegrass along the break. These plants green up early in Spring and this further retards fire spreading onto the break.

There are techniques for burning fire barriers that are very effective and minimally disturbing to the area. But this requires special equipment and training. In some cases, snowmobiles can aid in creating fire barriers. More information on these and other special techniques is available from The Nature Conservancy's Midwest Regional Office.

G. PERMITS REQUIRED

Permits for burning are required from the Nebraska Department of Environmental Control and the local fire department should be contacted.

H. NOTIFICATIONS

Every effort should be made to cooperate with local officials. Fire departments, forestry officials, and law officers in the vicinity should be notified of the burn, preferably through personal contact.

I. PUBLICITY

Burning should be planned with public relations in mind. People in the immediate vicinity should be contacted personally and provided factual information. Local media should be contacted prior to the burn. Usually the local newspaper editor will cooperate in announcing the burn before hand, covering the burn operation, and doing a follow-up story a month or so later on the results.

J. CREW SIZE, FIRE BOSS

The minimum crew size depends on the unit, equipment used, and other factors. As a general guideline, burns up to 40 acres require a crew of at least five and burns 80 acres or larger a crew of at least seven. This will, of course, vary from one area to the next and according to the experience and age of the crew. Too large a crew (more than twelve) is also undesirable because supervision may become a problem.

In the past, the Conservancy has relied heavily on students and volunteer fire departments. Students are interested in gaining resource management experience and volunteer fire departments can use the burn as a drill exercise. Nebraska Game and Parks' personnel have burning experience and should be contacted.

It is essential that all participants, even those with extensive fire experience, recognize the authority of the FIRE BOSS for the burning operation. This should be made absolutely clear at the time individuals are first asked to participate. At the same time, people should be warned about possible danger from breathing the smoke of poison ivy if it is present and about proper attire for burning; especially if the crew is made up of students, they must be told to wear long pants and leather-soled shoes or boots.

It should be explained beforehand to all crew members that scheduling is dependent upon weather and it may be necessary to cancel the burn, even at the last minute.

K. CREW DIVISION OF LABOR

There will normally be at least three crews.

IGNITION is done only by those designated for this task by the Fire Boss.

CONTROL (or holding) consists of guarding the boundaries of the fire unit and, if necessary, extinguising the flames as they reach the boundary line.

SPOTTING is watching for and extinguishing fire that has escaped beyond the boundaries of the fire unit or jumped across fire barriers.

There may also be assignments for managing traffic, providing information to people who stop and ask about the operation, photographing the burning, and recording weather.

L. FIRING TECHNIQUES

Fire techniques include back burning, flank fires, strip fires, and head fires. More information is available in manuals on prescription burning. The Nature Conservancy has compiled a catalog of prescribed burning literature and copies are available. In planning the burning, one should anticipate what would be done in the event of shifts in the wind direction during the operation.

M. THE BURNING OPERATION

Immediately prior to the burn, the Fire Boss should review the following topics

* the objectives of the burn
* area to be burned
* proper use of equipment
* special hazards, including poison ivy smoke
* crew division of labor, assignments
* communications
* sources of emergency assistance
* the authority of the Fire Boss
* special instructions
* questions from crew members

A test fire should begin the burning operation. It is often instructive to have the holding crew extinguish the test fire to get a feel for the ease or difficulty involved.

N. MOP-UP

Mop-up includes checking to see that the fire is completely out, dowsing smoldering material, cleaning and returning equipment.

O. PRESCRIBED BURNING REPORT

A copy of the report form is attached. The report should provide a record of the burn and suggestions for improving the effectiveness and efficiency of the operation. It is desirable to inspect the unit at least twice: soon after the burn to look for immediate effects on wildlife, and some weeks or months later to examine effects on vegetation.

PRESCRIBED BURNING PLAN, THE NATURE CONSERVANCY*

Part I

Preserve_____ County_____

Legal Description_____

Major Fuel Types_____

Major Hazards_____

Range of Acceptable Conditions for each fire unit. (Use attachment if needed)

	Unit___	Unit___	Unit___	Unit___
Wind Direction, Velocity				
Relative Humidity				
Temperature				
Days since rain				
Other				

PERMITS	Address & Phone	Contact
State Pollution Control		( )
State Forestry		( )
County		( )
Local		( )

NOTIFICATIONS	Address & Phone	Contact
Fire Departments		( )
State Law Enforcement		( )
Local Law Enforcement		( )
Other Officials		( )

*INSTRUCTIONS: Fill in all information on Part I, make a copy and keep it on file as a master. On the working copy, check off items as accomplished. Use Part II as a checklist immediately prior to ignition. For an authorized burn, Part I (master copy) must be reviewed by the regional office, an authorized fire boss must be directing the burn, current weather must be within prescription and, all contacts made, equipment obtained, and personnel on hand as called for in the plan.

PUBLIC RELATIONS

List individually neighbors to be contacted, locate on map (attach).

1. _____ ( )
2. _____ ( )
3. _____ ( )
4. _____ ( )
5. _____ ( )
6. _____ ( )
7. _____ ( )
8. _____ ( )
9. _____ ( )
10. _____ ( )
11. _____ ( )
12. _____ ( )
13. _____ ( )
14. _____ ( )
15. _____ ( )

Media to be contacted.

_____ ( )
_____ ( )
_____ ( )
_____ ( )

EQUIPMENT REQUIREMENTS

	Number	Item	Source
Burning Equipment:			( )
			( )
			( )
			( )
			( )
Safety Equipment:			( )
			( )
			( )
Other:			( )

Minimum Crew Size: _____. Source(s) of crew _____

_____

Individuals qualified to be fire boss _____

_____

Sources of emergency assistance (location, contact, phone):

Fire Fighting _____

First Aid _____

This inforamtion prepared by (name, position): _____

_____ Date: _____

This information reviewed by Regional Office

(name, position): _____

_____ Date: _____

Scale_____. Fire Breaks 

PRESCRIBED BURNING PLAN
PART II
CHECKLIST, FIRE RECORD

Checklist for Burn of Unit_____, Preserve_____

Date(s) of Burn Projected_____

Date(s) of Burn Attempted_____

Check off at the preserve prior to igniting fire.

Authorized fire boss present (name)_____.

Number of crew present_____. Check if considered adequate by fire boss ( ).

( ) Crew with proper personal equipment, clothing.

Preburn Discussion with Crew

( ) Objectives of Burn

( ) Exact Area of Burn

Crew assignments: ( ) Ignition, ( ) Control, ( ) Spotting, ( ) Traffic

( ) Ignition pattern discussed

( ) Use of equipment demonstrated, equipment all in working order.

( ) Authority and communications during burning discussed.

( ) Review of special hazards related to fuels, weather changes, fire breaks, smoke, poisonous plants, equipment failure, clothing flamability, other.

( ) Discussion of worst-case contingencies such as wind shifts, equipment failure, etc.

( ) Sources of assistance and how to get it.

( ) Questions.

FIRE RECORD

Date, time initiated_____

Weather: wind direction and velocity_____

Temperature_____Relative Humidity_____Other_____

FIRE RECORD - Continued

Source of information and time of weather report_____

Test fire location_____

Ignition pattern_____

_____

Weather changes, problems (use attachments)_____

_____

Fire out (time)_____

( ) Mop-up Completed

( ) Equipment Collected

( ) Final Check of Area

( ) Local Fire Authorities contacted after burn is out.

Recommendations for future burning of this unit:_____

_____

_____

_____

_____

_____

Phenological conditions at time of burn:_____

_____

_____

_____

_____ /_____

Fire Boss Signature Date

Appendix E

SAMPLE LEASE

This is a lease of real property for ranching and farming purposes between The Platte River Whooping Crane Critical Habitat Maintenance Trust (hereinafter "Trust") and _____ _____ (hereinafter "Lessee").

WHEREAS, the Trust has been established for the purpose of preserving migratory bird habitat along the Platte River for the benefit and protection of Whooping Cranes, Sandhill Cranes and other migratory bird species; and

WHEREAS, in furtherance of this purpose the Trust owns certain land in Hall County, Nebraska, known as Morman Island Crane Meadows, which is a ecologically significant feeding and roosting area for cranes and other migratory birds; and

WHEREAS, the Trust desires to lease a portion of that property which is more particularly described in Exhibit A attached hereto and incorporated by reference herein (hereinafter "the Property") for the purposes of allowing cattle grazing and cutting hay in a manner consistent with the Trust's objectives; and to have buildings on the Property occupied; and

WHEREAS, the Trust desires to have a responsible local lessee for the Property who will use the Property in a manner compatible with the Trust's habitat protection objectives; and

WHEREAS, the Lessee desires to rent the Property for these purposes and agrees to use the Property in a manner consistent with the Trust's objectives and the terms of this lease;

NOW THEREFORE, the Trust hereby leases the Property and buildings contained thereon to the Lessee under the following terms and conditions:

1. TERM: This lease shall commence on the 15th day of March, 1982 and continue through the 14th day of March, 1986.

2. GRAZING: The Lessee may use the Property and the buildings on the Property for the purposes of grazing cattle. Grazing shall be done in accordance with the schedule and map attached hereto as Exhibit B. Additionally, with regard to land use unit 3 of Exhibit B, that unit may be grazed continually from May 1 to October 1 of each year. Up to 2 AUM's per acre may be grazed in this pasture.

For the purpose of this lease, one (1) AUM (animal unit month) is the grazing equivalent of one (1) cow with a spring-born calf grazing for a period of thirty days or a one-thousand (1,000) pound animal grazing for thirty days.

Inusing the Property for grazing cattle, the Lessee shall be responsible for keeping all cattle on the Property and within the designated land use units.

3. HAYING: Each year, the Lessee shall cut and remove the hay from land units set forth in Exhibit B as unit numbers 1, 7, 8, 9, and 10. All hay must be out prior to July 1 of each year or after September 30 of each year.

4. PRESERVATION: The Lessee shall not use the Property in any manner which would, in the opinion of the Trust, have an adverse effect on the Property as a sanctuary for Whooping Cranes, Sandhill Cranes or other elements of biological diversity found on the Property.

5. REVISIONS: The Trust reserves the right to revise the grazing season, stocking rate and hay cutting time during the term of this lease. In the event of a revision of the terms of the lease, rent payments will be prorated to reflect AUM's actually grazed and/or the amount of hay actually cut and removed.

6. RENT: The Lessee shall pay the Trust a total of _____ cash rent to lease the Property for the term set forth in paragraph 1 of this lease. The payment schedule will be as follows: _____.

7. FENCES: The Lessee shall be responsible for keeping and maintaining in good repair all fences surrounding pastures grazed by his livestock on the Property. All materials necessary for maintenance and repairs shall be provided by and at the expense of the Trust. All labor necessary for maintenance and repairs shall be provided by and at the expense of the Lessee. The Lessee agrees to lease the Property as is and the Trust shall have no responsibilities to make any fence repairs before the term of this lease commences. Further, the Lessee shall inspect all fences and make any necessary repairs before allowing cattle on the Property. No additional fences may be constructed on the Property without prior written approval of the Trust.

8. WATERING FACILITIES: The Lessee shall inspect all watering facilities to ensure that they are in good working order and in good repair prior to driving cattle onto the Property. Any necessary repairs shall be done by and at the expense of the Trust prior to the term of this lease. All upkeep, maintenance and operation of watering facilities during the terms of this lease shall be done by and at the expense of the Lessee. Major repairs or replacement of watering facilities during the term of this lease shall be done by and at the expense of the Trust.

9. BUILDINGS: The Lessee shall be responsible for keeping and maintaining in good repair all buildings and structures located on the Property at the expense of the Lessee. The Lessee

shall also maintain fire and extended insurance coverage equal to the replacement value of the buildings on all buildings located on the Property.

10. INSURANCE/LIABILITY: With reference to the leased premises, the Lessee agrees to maintain bodily injury and property damage insurance with a responsible company, in the amount of not less than $300,000 for injury to any one person, and $100,000 for property damage. Such insurance protection shall include the Trust as an additional insured and may be carried under a blanket policy. Lessee will furnish the Trust with a certificate or other evidence establishing coverage is in force at least ten days prior to driving livestock onto the property.

11. PRESCRIBED BURNING: The Trust desires to initiate a prescribed burning program on the Property to benefit the cranes and to improve range conditions. The Trust shall therefore reserve the right to carry out such a program on the Property provided that it will not threaten or harm Lessee's livestock or equipment and will be compatable with acceptable grazing and haying practices. The Lessee will be notified by January of each year of the prescribed burning locations and times.

12. SUBLEASE: Lessee will not sublet the premises or any part thereof nor assign this lease, without in each case obtaining the prior written approval of the Trust.

13. ACCESS: The Trust and its guests shall have access to and use of said Property for all purposes which do not interfere with the Lessee's use of the Property for grazing and haying purposes under the terms of this lease.

14. CONDEMNATION: The Lessee agrees that if the Property or any part thereof shall be condemned or taken for public or quasi-public use or purpose by a competent authority, Lessee shall have no claim against the Trust and shall have no right or claim to any portion of the amount that may be awarded as damages or paid as a result of any such condemnation, and the Lessee appoints the Trust attorney-in-fact to collect and receive such award. Upon such condemnation or taking the term of this lease shall cease and Lessee shall have no claim against the Trust for the value of any unexpired term of this lease.

15. WARRANTY: The Lessee understands that the Trust makes no warranty concerning the safety or condition of the Property or of any buildings on the Property for any purposes whatsoever.

16. DEFAULT: If the Lessee fails to pay the rent required by this lease or violates or otherwise defaults on any of the terms contained herein and if the default is not remedied by Lessee upon notification by the Trust, the Trust may terminate this lease, re-enter and repossess the property or seek any other remedies available at law.

17. RIGHTS OF AGENTS: Where in this lease rights are given to either the Trust or the Lessee, such rights shall extend to the agent or representative of each party.

18. NOTICE: Where this lease requires written notice to be given to the Lessee, such notice shall be sufficient if it is hand-delivered to the Lessee or if it is mailed to the Lessee at the address set forth below. If notice is mailed, it shall be effective when deposited in the mail.

19. INQUIRIES: All inquiries concerning this lease or notices required by this lease shall be addressed to the Trust, in care of John VanDerwalker, Executive Director, (address) and to Lessee at (address_____).

IN TESTIMONY WHEREOF, the Parties hereto have executed this instrument with the following signatures:

THE TRUST	LESSEE
_____	_____
_____	_____

Exhibit A

	Section	Township	Range
South Half of Southeast Quarter (S½ SE¼) and South Half of Southwest Quarter (S½ SW¼) and Lots 1-4-5-6-7-8-9	26	10	10
Southeast Quarter of Southeast Quarter (SE¼ SE¼) and Lots 9-10-11 and 12	27	10	10
Lots 6-7-10-11-12 and 13 "Island"	33	10	10
North Half of Northeast Quarter (N½ NE¼); Northeast Quarter of Northwest Quarter (NE¼ NW¼); Lots 1 and 2; Lots 3-4-5 and 6 "Island"; South Half of Northeast Quarter (S½ NE¼); South Half of Northwest Quarter (S½ NW¼)	34	10	10
North Half of Northeast Quarter (N½ NE¼); Southwest Quarter of Northeast Quarter (SW¼ NE¼); Northwest Quarter (NW¼); Lot 1 in Northeast Quarter (NE¼) and Lots 2-3 and 4 "Island"	35	10	10
Lot 1 in Northwest Quarter (NW¼)	4	9	10
Lot 4 in Northwest Quarter (NW¼)	5	9	10

Exhibit B

Four Pasture Rotation Grazing System for Mormon Island Crane Meadows

		Land Use Unit 2	Land Use Unit 4	Land Use Unit 5	Land Use Unit 6/11
Year 1 (1982)	May 1 - June 30	400 AUMs			
	July 1 - Sept 14		250 AUMs	250 AUMs	
	Sept 15 -				200 AUMs plus*
Year 2 (1983)	May 1 - June 30		400 AUMs		
	July 1 - Sept 14			250 AUMs	250 AUMs
	Sept 15 -	200 AUMs plus*			
Year 3 (1984)	May 1 - June 30			400 AUMs	
	July 1 - Sept 14	250 AUMs			250 AUMs
	Sept 15 -		200 AUMs plus*		
Year 4 (1985)	May 1 - June 30				400 AUMs
	July 1 - Sept 14	250 AUMs	250 AUMs		
	Sept 15 -			200 AUMs plus*	

* = Grazing may continue until the stature is reduced to about four inches or less.

Exhibit B (con't)

Location of Land Use Units on
Mormon Island Crane Meadows