BIG STONE NATIONAL WILDLIFE REFUGE

ORTONVILLE, MINNESOTA

ANNUAL NARRATIVE REPORT

Calendar Year 1981

NATIONAL WILDLIFE REFUGE SYSTEM
Fish and Wildlife Service
U.S. DEPARTMENT OF THE INTERIOR

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PERMANENT FULL-TIME EMPLOYEES

Left to right: Jim, Carole, Bob and Butch

1.	James W. Heinecke	Refuge Manager, GS-11
2.	Robert B. Berger	Assistant Refuge Manager, GS-9
3.	Norman Christensen	Maintenance Worker, WG-7
4.	Carole Gerber	Administrative Clerk, GS-4

REVIEW AND APPROVALS

James Heinecke 3-23-82
Submitted by Date

Area Office 4/9/82
Date

Big Stone National Wildlife Refuge

Calvin R Gabe 4-14-82
Regional Office Date

TEMPORARY FULL-TIME EMPLOYEE

1. Bradley Wold — Biological Technician, GS-5

TEMPORARY INTERMITTENT EMPLOYEE

1. Micki Buer — Biological Aid (Wildlife), GS-4

A. HIGHLIGHTS

Low runoff in the spring of 1981 was used to advantage in an attempt to rejuvenate the west pool. (Section F. 2)

I & R facilities were completed and opened to the public. (Section H. 1)

Snowy plovers were observed on the refuge. This is the second known sighting of these birds in the state. (Section G. 5)

Due to drought conditions, waterfowl production was a bust. (Section G. 3)

The refuge AV show was completed for public showing. (Section H. 6)

Lem Kaercher passed away August 13. (Section J. 2)

Low water levels exposed east pool mudflats and attracted record numbers of waterfowl during fall migration. (Section G. 3)

River otters were reintroduced to this area with a release of six otters on the refuge by the Minnesota DNR in November. (Section G. 12)

The Highway 75 dam, owned and operated by the Corps of Engineers, is beset by slumping and other problems of unknown origin. (Section I. 3)

B. CLIMATIC AND HABITAT CONDITIONS

For the second straight year, a mild, snowless winter occurred, causing a 1980 precipitation deficit of eight inches to carry over into 1981. Pool freeze-up occurred on January 6, 1981. Because of a poor winter snowpack, refuge pool levels were kept two feet above normal in accordance with an agreement between the Service and the Corps of Engineers. The spring runoff of 1981 was the lowest on record. The refuge pool level, that had been retained throughout the winter, provided the only water available to maintain water levels above 947.3 msl during the summer. A warm, dry spring created ideal mudflat conditions benefiting some wildlife. However, production by overwater nesting species was a bust as water levels at 949.6 receded beyond cattail beds. Dabbling duck production was also nil in 1981 as temporary wetlands were not available to stimulate breeding activity. Most type 4 wetlands were dried out by early summer, and only type 5 wetlands held water throughout the year.

Seasonal precipitation had various effects upon refuge management programs. Timely spring showers moistened ground litter and enabled the prescribed burning program to continue. June showers contributed to a slump on the Highway 75 dam. A fall thunderstorm put a stop to the indigenous native grass seed harvesting project.

Drought conditions prevailed until year's end leaving a precipitation deficit of six inches for 1981. A regional water shortage caused poor waterfowl hunting and brought peak numbers of fall migrants to the refuge east pool. Fortunately, late fall rains were timely, leaving three inches of stored soil moisture prior to freeze-up. Frozen surface water has created the possibility of a heavy spring runoff depending on snowfall through the rest of the winter. Also, with a frost seal on the ground, the effects of wind action has been held down, reducing soil erosion or snirt (blowing snow and dirt).

CLIMATIC CONDITIONS

	PRECIPITATION			TEMPERATURE	
Month	Normal	Melted	Snow	Max.	Min.
January	.47	.12	.5	62°	-16°
February	.58	.98	3.0	61°	-20°
March	.97	1.20	T	71°	9°
April	2.49	1.16		82°	23°
May	3.16	1.59		90°	33°
June	3.97	5.35		89°	50°
July	3.60	3.05		99°	51°
August	3.14	1.18		96°	47°
September	2.32	.46		96°	35°
October	1.80	2.43	.02	73°	20°
November	.98	.27	.06	68°	8°
December	.57	.41	4.0	43°	-13°
Annual Totals	24.05	18.20	7.58	96°	-20°

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[1]Precipitation Normal is calculated over a 30-year period average, 1941 to 1970.

[2]Source of precipitation data is official weather observer at Otter Tail Power Company, Ortonville, Minnesota. Source of temperature data is KDIO Radio Station, two miles north of Ortonville.

C. LAND ACQUISITION

1. Fee Title

Fee title acquisition for Big Stone National Wildlife Refuge is complete as authorized at 10,795 acres. The refuge is part of the Big Stone Lake-Whetstone River Flood Control Project being constructed and operated by the U.S. Army Corps of Engineers (COE). The land was purchased by COE in 1971 and transferred to the FWS in May, 1975.

The granite outcrop at auto tour stop #1 offers many things to different people.

CJB 9/78 28mm

The refuge lies along the Minnesota River Valley in west-central Minnesota.

Management activities and benefits could be enhanced by a few roundout purchases should this ever become possible.

D. PLANNING

1. Master Plan

Work on the refuge master plan was scheduled to begin in FY 80 by regional office personnel. Refuge personnel were to assist the planning team as necessary. The whole effort was placed on hold at the regional level due to other commitments. It is not known where it stands at this time.

2. Management Plan

Work on Phase I of the Interpretation and Recreation Prospectus continues. It is to be completed during FY 82, and will have extra depth since the refuge master plan is not available to draw upon for guidance.

3. Public Participation

Informal discussions have been held with various individuals and local groups such as the Ortonville Kiwanis and the Odessa Rod and Gun Club. The discussions were to ascertain local preferences on the direction of refuge hunting, firewood cutting, and other public use activities.

4. Compliance with Environmental Mandates

Curious rock placements occur on the refuge along the southwest bluff line. Preliminary archeological investigations and historical record searches indicate that these formations could be pre-settlement defense works or the remains of an 1820's trading post known to have been in the area. Segments of an early ox cart trail were discovered near the site following a prescribed burn during the spring of 1980. These segments dovetail fairly well with known portions of the old Red River Trail System.

In conjunction with work on the I & R prospectus, a more detailed examination of the site was requested from the regional office staff. Again, other commitments precluded any work being done on this project.

The Bendix Smokehouse on the refuge auto tour route may fit the requirements as a structure eligible for the National Register of Historic Places. According to oral history, this structure dates to about 1890. Also, this smokehouse may well be the structure Mr. Bendix indicated on his land patent which is filed in the Pre-Emption/Homestead Settlement Records in the U.S. Land Office, Washington, D.C. A PDW has been submitted to rehabilitate this structure.

The Bendix Smokehouse adjacent to the auto tour route reminisces of yesteryears.

CJB 10/79 50mm

E. ADMINISTRATION

1. Personnel

No staff changes occurred during the year. The five year figures are as shown in the table.

	Permanent		
	Full Time	Part Time	Temporary
FY 77	5	0	8
FY 78	4	0	11
FY 79	3	1	3
FY 80	3	1	6
FY 81	3	1	3

5. Funding

Funding shortages have limited management activities at this station the same as it has at every other station we know about. Every habitat improvement operation has been affected. Specifically, priority projects such as native grass seeding and prairie management activities have received the most attention. Comparatively little has been done on management of woodlots, flood plain forests or wetlands.

One particular problem at Big Stone NWR is the resources required to operate the refuge auto tour route. Experience has shown that it is necessary to close the tour route each night in order to maintain the integrity of the facilities. This involves closing the gate each night and opening it each morning in addition to evening, weekend, and holiday patrol. Current funds and manpower are insufficient to operate and maintain the auto tour route without adversely affecting higher priority projects.

Even without operating the tour route, current funding and manpower limitations will make it difficult if not impossible to maintain the continuity of the habitat management effort. As an example, Big Stone is primarily a grassland refuge. Grassland habitat in this area declines in productivity rather quickly if periodic restorative management practices such as controlled burning, grazing, haying, or cultivation are not applied on schedule. There is no question but that the current situation will sidetrack these efforts.

A five year funding comparison is not valid since the Ortonville Wetland Management District was transferred to the Morris WMD in October, 1978. A table showing funding since that time is presented.

	1210	1220	1240	Total	BLHP	
FY 79	88,000	3,000	3,000	94,000	151,000	(I&R Pkg.)
FY 80	95,000	3,000	19,000	117,000	*356,000	(Hab. Mgmt.)
FY 81	98,000	2,000	20,000	120,000	10,000	(I&R Add-On)

*FY 80 BLHP Fund Redistributions: $100,000 to Minnesota Wetland Complex at Fergus Falls, $52,000 to cover regional office accounts.

6. Safety

Safety meetings are held periodically but are concentrated when temporary employees are on board. Topics are selected for timing and relevance.

7. Technical Assistance

Bob Berger assisted the Big Stone County SCS Office with development of a slide-tape program on local soil erosion problems. Refuge AV equipment was used in the development of the program.

F. HABITAT MANAGEMENT

1. General

The refuge prairie wetland inventory was completed during 1981 by Biological Technician Bradley Wold. Mr. Wold completed the first half of the inventory in 1980. The results are summarized in tabular form as follows:

Wetland Type	Quantity	Range (Acres)	Total Acreage	Mean Acre/Wetland	Mode	Median
1	106	0.1- 1.9	30.3	0.3	0.1	0.2
2	62	0.1-27.0	136.6	2.2	0.3	0.9
3	96	0.1- 6.4	78.5	0.8	0.2	0.4

Circular 39 definitions were used for typing wetlands.

2. Wetlands

The 1981 spring runoff was the lowest on record due to a snowless winter. The Yellowbank River peaked at 20 cfs on February 24. This is a record low.

Runoff via the Minnesota River did not occur until summer since water was being stored in Big Stone Lake. A one foot increase in water levels was needed to bring Big Stone Lake up to summer levels before more than the minimum flow could be released.

In anticipation of this, Fish and Wildlife Service (FWS) personnel, working with the Corps of Engineers (COE) personnel, developed a standby water schedule to maintain refuge water levels above normal.

Refuge pools were held at 949.6 msl or about 2½ feet above normal throughout the winter and critical spring runoff period. This standby schedule which considered forecasted climatic conditions was implemented in anticipation of a new cooperative agreement between FWS and COE. This agreement increased management flexibility to more effectively manage refuge pools. The refuge manager now recommends an annual water schedule to COE who, if they find it satisfactory, are responsible for implementation.

With the 1981 water regimen, the west pool essentially dried up as planned and mudflats were exposed in the east pool. Vegetation response to the partial drawdown was interesting. Areas that were dewatered prior to July had mixed stands of smartweed, millet, red-rooted sedge, arrowheads, and bidens species. In the west pool, areas that contained shallow water or were exposed as mudflats between July and August, were overgrown with a carex species that grew from waist to shoulder height. While in the east pool, mudflat areas that were exposed after early July were barren through the fall.

Emergent vegetation grew where previously water depths were too great. Carex species formed a solid stand within this backwater area at the east end of the auto tour route.
RBB 6/81 50mm

Riparian vegetation, primarily aspen and willow, will become a management problem in the near future. These species have established rank stands in moist areas where access is difficult except during winter. A number of alternatives are being considered.

Cattail management by rotary mowing has not been successful for the last two years. In 1981, freeze-up occurred with water levels that enabled cattails to be mowed in areas that would reflood to depths over one foot. Spring runoff was insufficient to flood these areas.

3. Forests

Big Stone NWR contains 800 acres of floodplain forest, old building site woodlots and brush. An attempt is being made to rejuvenate some of these areas by cutting and piling brush and creating openings, etc. It is hoped that this will encourage a more varied plant community with an increase in wildlife diversity. Priorities, however, have limited this project to a token effort to date.

A firewood cutting program is being conducted on hazard trees, canoe route logjams, and timber killed by the filling of the refuge pools. Only down timber is taken with slash left in piles. This program has been well received by the public in this era of high energy costs. No cutting is allowed near the rookery sites.

4. Croplands

Big Stone NWR was purchased in fee title by the U.S. Army Corps of Engineers (COE) in 1971 but was not transferred to FWS for management as a refuge until 1975. During this interval, many former agricultural fields reverted to or were seeded to undesirable species such as quackgrass, bromegrass, bluegrass, and crested wheatgrass.

The main purpose of the refuge farming program is seedbed preparation prior to converting these areas to stands of viable, productive nesting cover. This cover consists of tall, warm season, native grasses or cool season domestics.

During 1981, a total of 435 acres were farmed on Big Stone NWR. Cooperators farmed 360 acres while force account farming accounted for 75 acres in several small, odd-shaped fields. In addition, 70 acres were fallowed and fall packed in preparation for seeding to native grasses in the spring of 1982.

Cooperators planted corn, wheat, or barley and received two-thirds of the crop as their share. The remaining one-third was left standing. These areas will be seeded to desirable nesting cover as soon as sufficient resources are available.

The 75 acres, farmed by force account, were seeded to silage blend corn or grain sorghum. These fields are farmed with minimum tillage and no herbicide application. The resulting mixed stands are attractive to a rich variety of wildlife.

In June, 220 acres were seeded to native grasses by the refuge staff using the Truax grass drill. The seeded areas were fallowed and fall packed during 1980. It has been our experience that fallowing one year prior to seeding and the use of the herbicide Roundup, significantly reduces weed competition. A high site seed mixture was seeded into three fields totaling 85 acres. In addition, one 17 acre field was seeded to straight switchgrass, and two fields totaling 36 acres were seeded to indigenous native grasses harvested in 1980 from refuge native prairie.

High Site Mix

Species	Lbs. PLS/AC	Total Live Seeds/ Sq. Ft./Acre
Big bluestem	3	11.4
Indiangrass	3	12.0
Switchgrass	1	8.9
Little bluestem	2	12.0
Green needle	1	4.2
5	10	48.5

Low Site Mix

Big bluestem	4	15.2
Indiangrass	4	16.0
Switchgrass	2	17.8
3	10	49.0

The seed mixture harvested from refuge native prairie consisted of 84% big bluestem and 16% Indiangrass. It was seeded at 10 lbs. PLS/AC. With proper post seeding care, it is hoped that the two fields seeded to indigenous native grasses can be harvested for seed beginning in 1982 or 1983. Details concerning bulk weights, drill settings, seeding maps, seed varieties, seedbed preparation, soils data, and post-seeding care can be found in station files.

5. Grasslands

Refuge native prairie and seeded native grasses are managed primarily by prescribed burning. The burning program is designed to retard cool season, exotic grasses and enhance tall, warm season grasses and forbs. This results in an increase in plant vigor, a more diverse species composition and a more productive prairie.

Remnant prairie by Ell's coulee responded well to prescribed burning. RBB 6/81 28mm

Of continuing concern, is the invasion of refuge pools and grasslands by exotic woody species such as Siberian elm and Russian olive. An ongoing control program using mowing, burning, and herbicide application is losing ground. Resources are not available to do a complete job. During 1981, approximately five acres were rotary mowed.

6. Other Habitat

Approximately 100 acres of granite outcrops exist on Big Stone NWR. These unique habitats contain the only naturally occurring ball cactus in Minnesota. In general, the outcrops exhibit a more xeric life zone such as that found in the western part of South Dakota.

These outcrops are included in prescribed burn units when possible.

Granite outcrop basins encourage wildlife diversity when filled with rain water.

RBB 7/81 28mm

7. Grazing

The use of prescribed grazing as a management tool on areas too difficult or too wet to burn has been discussed with local landowners. Since most local operators are involved in dairy operations, little interest has developed. Erecting temporary fences, daily retrieval of dairy cattle, etc., has been judged as not worth the effort.

9. Fire Management

As mentioned on the previous page, prescribed burning is used as a management tool on refuge grasslands. Most of the refuge grasslands are divided into burn units and are burned on a regular rotation. A few units are not burned on a regular basis because they are too difficult for our usual crew to burn safely. They are included in the rotation whenever sufficient help can be obtained. Two of these units were burned in 1981 with the help of local SCS offices. SCS personnel participated in the refuge burning program as a training exercise. A tour of the burned units was conducted in September as part of the same exercise. SCS personnel will advocate controlled burning as a management option on private prairie.

During 1981, a total of 895 acres were burned on 7 units. Burns were conducted between May 1 and May 15. Response by warm season grasses and forbs was excellent with some grasses reaching a height of nearly 7 feet. By contract, exotic, cool season target species were able to reach a regrowth height of only six to eight inches. These grasses are primarily quackgrass, bromegrass, and Kentucky bluegrass. While the regrowth of the warm season grasses was tall and dense; and, provided excellent cover, the plants themselves produced little viable seed. This factor combined with rain and high winds at critical times cancelled our September attempt to harvest indigenous native grass seed. Another attempt will be made in 1982.

Over most of the refuge, wildfire attack readiness is adequate. A fire protection cooperative agreement is in effect with the Odessa, Minnesota, fire department. During the fire season, the refuge fire unit is maintained at ready.

Two wildfires occurred on Big Stone NWR in 1981. One fire was set on the Roehl quarter at approximately 9:30 P.M. on March 26 and burned about five acres. It was quickly contained by the refuge fire unit and the Odessa Fire Department. Two individuals were apprehended. The case details are contained in the section on law enforcement.

The other wildfire occurred along the blacktop east of Odessa on a Sunday in October. This fire was of unknown origin and burned approximately 70 acres. Winds of 40 mph prevented containment of this fire. It was bounded by roads and the east pool, however, so it burned itself out in short order. The gravel trail on the fire's west boundary was disced down and backfired to be safe.

10. Pest Control

Domestic dog-deer problems occur in years of heavy snow. If the dog owners can be identified they are contacted and given a chance to restrain their animals. If they cannot be identified or do not comply, the dogs are then shot. A minor problem exists with ferel housecats. Some stray onto the refuge and some are dumped in the auto tour route area by visitors. As with other pests, .222 Remington management is applied incidental to other duties.

Weed control is done to conform to state weed control laws. Mechanical control is used if possible. Herbicides are used only if no practical alternative exists. Herbicide use in 1981 was as follows:

Herbicide	Acres Treated	Target Species
2,4-D (L.V. Ester)	25	Thistles
Tordon 22K	1 (Spot treat)	Leafy spurge
Atrazine	100	Cool season exotic grasses
Roundup	220	Cool season exotic grasses
Pramitol 5E	0.25	All vegetation
5	346.25	

Atrazine was used to accelerate establishment of a viable stand of warm season native grasses. It was applied in early May, 1981, immediately after burning on native grasses seeded in June, 1980. The atrazine helps control exotic, cool season grasses as they re-emerge. This significantly lessens competition for the seeded grasses.

Roundup was applied in early June, 1981 to reduce all vegetation on fields scheduled to be seeded to native grasses a week or two later. This procedure provides an excellent seedbed for expensive native grasses to germinate and take root. Mechanical control was accomplished by row tillage or rotary mowing on about 200 acres.

G. WILDLIFE

1. Wildlife Diversity

Big Stone's accumulative wildlife diversity index stands at 336 species of vertebrate wildlife. Refuge objectives and habitat management for migratory waterfowl will benefit other migratory birds and resident wildlife. These spin-off benefits will affect the distribution and abundance of many wildlife species, and may result in the re-stocking of prairie chickens on Big Stone by the Minnesota DNR, provided habitat evolution supports this. Presently, prairie chickens are being reintroduced into the Lac qui Parle Wildlife Management area; however, the success of that program has not yet been determined.

Marsh management whether by mechanical or natural means could increase wildlife diversity of over-water nesting species. The potential for marsh management has increased tremendously due to greater water management flexibility obtained via a new cooperative agreement with the Corps of Engineers. Water level manipulation to rejuvenate the marsh would, in the short term, adversely affect over-water nesting wildlife but would attract shorebirds during drawdown, as was the case in 1981.

Woodlot management to increase tree stand age class diversity will benefit resident wildlife initially, particularly rabbits. In subsequent years, migratory birds and resident wildlife would be expected to take advantage of these mixed-age tree stands.

Habitat preservation has already brought the expansion of the pileated woodpecker back into the area. The river otter propogation program on Big Stone NWR further exemplifies the benefits obtained by preserving habitat. The adaptable coyote has also taken advantage of the resources offered at Big Stone NWR and expanded back into the area.

2. Endangered and/or Threatened Species

The annual bird migration brings eagles through Big Stone Refuge. During calendar year 1981, 412 bald eagle use days were reported, a record high. Between 1975-1981, a yearly average of 239 use days per year have been generated from sighting by refuge observers. This average starts from the 1975 period since this was the first year that refuge pools were flooded throughout the year.

The Arctic peregrine falcon is seen occasionally during its migration through northwestern South Dakota and western Minnesota. No known recent sightings have occurred on Big Stone NWR.

Presently, the state of Minnesota does not have a species listing for state endangered or threatened species. State legislation has been pending for several years to replace the Minnesota "Uncommon Ones" list with an endangered and threatened species list. To date, the only refuge species in consideration for state designation is the ball cactus (Mamillaria vivipara). The ball cactus occurs on several granite outcrops on the refuge.

3. Waterfowl

As a warm, early spring developed in 1981, the annual waterfowl migration was about two weeks earlier than in 1980. The early vanguards of 1981 migration arrived during the fourth week of March. By April 10, the migration peaked at 19 species totaling 8,000 individuals. Even with a regional water shortage, no significant concentrations of waterfowl were observed on the refuge.

Breeding pair counts were conducted on May 19 indicating a 27% decline from 1980. While the count was more accurate this year, a comparison of 1981's count with other years is not posssible due to a drastic increase in the waterfowl observability factor. This increase in observability was caused by low water levels. Though breeding pair counts are used to estimate yearly production, this method lacks accuracy as the production rate to flight stage is not known and a constant is used. Until production rates are determined, pair counts will serve as good indexes of site attractability. In this regard, waterfowl production was a bust for species in Big Stone even with fair pair count totals.

Only 33 broods were observed by July 23, while 129 were seen in 1980 by this date. Total duck production was estimated at 1,100. Hooded merganser production was good with 13 brood sightings in 1981 as compared to one in 1980. Canada goose production was estimated at 90 young, a slight increase from last year.

Quality pictures can be obtained via special use permits.
CJB 1981

The main factor that depressed local waterfowl production was the lack of temporary wetlands to stimulate breeding activity. With the nutrient base absent, waterfowl are thought to have departed the area, as summer populations were down considerably. Blue-winged teal numbers were down the sharpest on the refuge, and their numbers never reached normal abundance statewide, according to DNR reports. Production by over-water nesting species was almost non-existent. Coot production was not observed as no broods were seen. The same can be said for ruddy ducks.

The fall migration was again monitored weekly as part of a flyway effort to track waterfowl during the hunting season in this region. Weekly waterfowl surveys indicated that waterfowl were attracted to east pool mudflats and water resources as the drought continued. The duck migration peaked at 70,000 during the first week of November. This increase correlates with the freezing over of northern Minnesota wetlands and a rapid crop harvest locally. Local temperatures were in the 30°-60° range, and the crop harvest was 90% completed. The duck populations declined just as rapidly as fall plowing and disking turned the countryside black.

Canada goose population peaked at 25,000 on November 11, and were mainly birds that dispersed from Lac qui Parle Wildlife Management area as the area goose totals remained the same. Snow geese peaked at 1,000 on October 23 and white-fronted geese at 25 on November 6. Ten whistling swans were also attracted to Big Stone on November 12. The fall waterfowl migration through the refuge was completed on December 18, when the east pool froze over.

4. Marsh and Water Birds

During the last week of April, the full species compliment of marsh and water birds had completed their spring migration to Big Stone. Water bird use days for 1981 were only down 5% to 395,800 use days in spite of a drought. Because of the drought, western grebe production was nil and the black-crowned night heron population declined 50% to 75 nesting pairs. However, Big Stone's available water resources did attract minor concentrations of pelicans and great egrets in late summer.

The population of colonial nesters in the east pool was only mildly affected by drought. Nest surveys on June 26 revealed the following:

Colonial Nest Survey

Species	Total Active Nests
Double-crested cormorant	400
Great blue heron	130
Great egret	80
Black-crowned night heron	75
Little blue heron	2

Notable observations for the year were the following. Several pairs of horned grebes that frequented Big Stone in early spring were seen around the inactive western grebe colony south of Odessa. The return of the little blue heron was a welcome addition to species diversity. Several common loons, second year juveniles, were seen in the east pool in July.

By October 1, the fall migration was in full swing. The marsh and water bird migrations for 1981 was short due to persistently, cool weather.

5. Shorebirds, Gulls and Terns

1981 was an exciting year for shorebirds, gulls and tern observations on Big Stone NWR. While there was a regional scarcity of charadriiforms, Big Stone's use days by these species (513,600 U.D.) was up 250% from 1980. In comparison, 1980 use days for this category were up 280% over 1979 totals. In spring 1981, a refuge record of 27 shorebird species took advantage of about 3,000 mudflat acres out of a normally wet 4,400 surface acres.

An exciting spring migration was topped off with the presence of two snowy plovers, sighted by Assistant Manager Berger. These were only the second and third birds sighted in Minnesota. The third sighting has not yet been approved by a vote of the Minnesota Ornithological Union.

A snowy plover photograph on the refuge banding site. Thanks to photography, this is a verified sighting.
RBB 4/24/81 300mm & 2x

Several birders from various parts of the country frequented Big Stone in search of the wily woodcock. These hunters were sent to the auto tour route area and several met with success.

Big Stone's shorebird bonanza continued throughout the summer as drought conditions kept exposing mudflats. A pair of avocets spent the summer on Big Stone, and are thought to have nested if our interpretation of their behavior is correct. This would be a refuge first for avocet production.

Quite an off-hand photograph!

BKW 7/81 300mm & 2x

The fall migration began in mid-August and was over for most species by the end of September with a total of 31 charadriiforms utilizing Big Stone. A notable concentration of gulls and terns were observed on the east pool mudflats during September. All shorebirds, gulls, terns and allied species departed Big Stone for the winter in early November.

6. Raptors

An early spring brought several marsh and rough-legged hawks into the area in mid-February, one month ahead of the main flight. Raptor use days for 1981 declined 33% to 14,135 use days. In general, raptor use days on Big Stone have declined steadily since 1978. Different observers and a reduction in effort or time afield are the main cause for this decline. Time and energy has been directed toward developing refuge I & R facilities, thus reducing time afield. In this regard, many transient species were not observed in 1981. Also drought conditions have contributed to a further reduction in raptor use days.

Through June, a Cooper's hawk was observed repeatedly along the Yellow-bank River. Dense vegetations prohibited observation in this area later in the summer.

A Swainson's hawk being chased by an eastern kingbird.
BKW 7/81 300 mm & 2 x

The raptor's fall migration began in early September and was monitored along with weekly waterfowl surveys. All raptor surveys are summarized in the raptor inventory files. The appearance of several rough-legged hawks in mid-November signaled an end to the raptor migration except for eagles.

7. Other Migratory Birds

Signs of the pileated woodpecker are now becoming common on Big Stone NWR even though they were not detected until March, 1978. Chance sightings of this woodpecker are becoming more frequent, and the possibility of capturing the pileated woodpecker on slides becomes more promising.

Migratory warblers may be the next species group to be added to the list of refuge surveys. This survey would be conducted at the Odessa maintenance building in order to monitor the number of bird-radio tower collisions. In fall 1981, five dead warblers were found underneath our 180' radio tower.

The 1981 Ortonville Christmas Bird Count was not conducted this year. Previously, refuge personnel were organizing and carrying out this survey even though public participation has dropped to nothing. It is hoped that public interest and support will increase and that a person from the private sector will take over the functions of organizing and conducting this survey.

8. Game Mammals

Mammals of interest in this area include white-tailed deer, red fox, coyote, raccoon and badger.

The deer herd is highly mobile, spending the summer months out on the surrounding prairies. During mild winters, many deer stay in the open prairies, finding shelter in farm groves and wetlands. The last two winters were two of the mildest on record. State DNR personnel reported deer wintering in areas that hadn't wintered deer in 30 years. During heavy winter, however, the critters from miles around end up in the Minnesota River bottoms. This includes Big Stone NWR and the Lac qui Parle WMA operated by the Minnesota DNR.

Generally, starvation problems do not exist due to the mobility of the herd, local weather patterns, and the availability of food in wintering areas. Adequate browse is available in both refuges and adjacent fields usually blow clear.

Domestic dog packs do present a problem during severe winters.

Census flights have not been flown since February, 1979 due to poor snow conditions. At that time, the refuge was wintering approximately 700 deer. The actual count was 612. Based on harvest information and general observations, the herd is in excellent shape. At least three sets of triplets were observed on the refuge during the summer.

At this writing (January, 1982), snow conditions are adequate for observation so census flights will be coordinated with the DNR and flown in February, 1982.

Red fox pup near den in Erdahl seeding.

BKW 7/81 300mm & 2x

Fox and coyote populations received heavy hunting and trapping pressure again this year as pelt prices remain in the $50-$60 range. No systematic data is available on these species; however, coyotes appear to be increasing in the area. Both casual observations by DNR and FWS personnel and the numbers of coyotes taken by trappers have steadily increased the past few years. No data is available on raccoon and badger, though both are present. Raccoon pelt prices were around $25 this year.

10. Other Resident Wildlife

Pheasant populations have increased about 30% in each of the last two years in response to the mild winters and the warm, dry spring. Flocks of as many as 100 birds could be seen feeding in stubble fields both on and adjacent to the refuge. Pheasants have been repeatedly observed feeding on yellow pigeongrass in the fall, especially in November.

Cottontail rabbit use of brush piles cut and stacked as a management effort has been observed but it is not known if the rabbit population has increased.

11. Fisheries Resource

In 1980, fish surveys were conducted on the Minnesota River through Big Stone Refuge by the Minnesota DNR's section of technical services. A final report for this comprehensive survey of the entire Minnesota River will be several years in preparation. On Big Stone NWR, the results from a half an hour of boom shocking were very poor with only a handful of minnows and rough fish caught. Carp and northern pike were out in the marsh; and therefore, not susceptible to capture.

Fish productivity may have peaked on Big Stone if fishing success by local sportsmen is any indication. Fishing success has declined and remains poor. If a correlation can be drawn between local fishing success and productivity, this could affect the otter propogation program.

12. Wildlife Propogation and Stocking

River otters are being reintroduced into the Minnesota River system. To date, Minnesota DNR personnel have transported six of ten otters from Babbitt, and Clearbrook, Minnesota, where they were captured by licensed trappers. The other four otters will be released during spring, 1982.

The female otter quenches her thirst after a long trip.
RBB 10/81 300mm

Six otters were released along the auto tour route into the Minnesota River. Three male otters and one female otter were released along with two otters of undetermined sex. Unfortunately, the female was found dead near the outlet of Big Stone Lake on December 22, seven weeks after her release. An autopsy will be performed by DNR personnel to determine cause of death.

16. Marking and Banding

No waterfowl were banded on Big Stone NWR this year. Mallards did not respond to the baited rocket banding site which was left high and dry due to low water levels. Therefore, no attempt was made to fill the pre-season quota of 100 birds of each sex and age class. Also, the wood duck pre-season quota of 25 birds of each sex and age was not filled. The refuge wood duck population was down considerably and production was a bust in 1981.

17. Disease Prevention and Control

To date, the only known disease to affect waterfowl on Big Stone is blue-green algae toxicity. Blue-green algae blooms in early July in this locality. Big Stone's wood duck population has been more affected by this toxicity than any other species. Habitat preference by wood ducks appears to be the probable cause for this selectivity in regard to duck mortality. Several wood ducks were observed to be suffering from this poisoning in 1981. Disease control and prevention measures consist of removing the dead birds in order to prevent a possible botulism outbreak.

H. PUBLIC USE

1. General

Public use data from 1977-1981 is summarized below in order to depict some recreational trends occurring on Big Stone NWR. While a multitude of factors influence recreational opportunities, some public use trends are discussed here which are directly affected by management decisions and some sociological factors. An up to date analysis is attempted at this time because recreational uses appeared to have stabilized in 1981 from a history of fluctuation.

PUBLIC USE: ACTIVITY HOURS C.Y. 1977-1981

	1977	1978	1979	1980	1981
Interpretation	280	10	297	1,450	3,448
Environmental Ed.	320	985	525	2,080	1,425
Wildlife Rec.					
1) Consumptive	8,370	20,982	35,770	25,085	15,260
2) Non-Cnsmpt.	25,670	25,260	17,735	49,985	41,571
Total Activity Hours	34,640	47,243	54,327	78,600	61,704
Total Visits	68,705	66,632	24,323	43,000	35,412

Management decisions began impacting this area when refuge lands were purchased in 1971 as authorized by Congress. From 1971-1975, the Corps of Engineers' policy of unrestricted use encouraged incompatible uses such as dirt biking and 4 WD rallies, etc.

In 1975, Fish and Wildlife Service policies and objectives were implemented as formulized in the 1974 PPBE objective setting process. The current authorized uses reflect the implementation of Service policies over the past seven years. As a National Wildlife Refuge, greater management efforts were directed to impact upon the habitat development and public use programs. Funding and personnel changes have affected what emphasis various programs were given and how public use was reported (see Section H. 11). The three year funding comparison on page five, which includes BLHP funds, depicts the emphasis that the I & R program was given on Big Stone. Interpretative facilities such as an interpretative wildlife drive and two permanent exhibits were finally completed in 1981.

Increases in consumptive wildlife recreation are directly related to management decisions. For example, in 1978 and 1979, a primitive weapons deer hunt was held on Big Stone and the size of the hunting area was increased. This was planned in cooperation with the Minnesota DNR to increase the deer harvest and reduce deer depredations on neighboring farms. Also, the refuge was opened to ice fishing in 1979; however, a greater portion of fishing activity hours are related to natural events with 1979 being just a good year for fishing.

By 1981, consumptive uses stabilized with the efforts of the habitat development program providing spin-off benefits to the hunting program. Sociological changes as influenced by management decisions, were brought about by time, public relations and law enforcement efforts. Incompatible uses die hard. For several years after Service policies were implemented, refuge locks were cut almost nightly. The age-class of people which enjoyed the earlier near lawless situation, matured through time. And today, the refuge and what it offers is well accepted by most of the local community.

During 1980, an active law enforcement program terminated another undesirable situation that had been developing on the auto tour route through 1978. Frequent late-night parties, hooliganism and some drug trafficking were known to occur. The closure of the auto tour during all of 1979 because of flood damage and active enforcement in 1980 greatly reduced these activities. Further discussion on the quality of wildlife recreation on the auto tour is discussed in Section H. 5 and 11.

2. Environmental Education Students

Refuge outputs for 1981 were 1,400 activity hours which generally occurred in the auto tour area. Eight EE sites were designated on Big Stone with six sites in the auto tour vicinity. Unfortunately, environmental education on the auto tour is greatly unrecorded since many users do not inform refuge personnel about their visits. User groups will be contacted in early spring for various reasons.

In April, the Ortonville High School held two days of mini classes whereby students can choose from a list of outings as to which one they prefer. A climbing class utilized "Old Stone Face," EE site number 3. A bicycle touring class requested a slide talk prior to their outing. Assistant Manager Berger presented this slide talk on wetland wildlife.

Environmental education use for the period of June-September was down to three outings in 1981 as compared to nine in 1980. During 1981, the following three groups were known to have used the refuge for EE: an adult education art class, Girl Scouts from Area Six Peace Pipe Council and Big Stone County 4-H'ers. Additional EE use, via outreach contacts, were not developed due to program time conflicts in order to complete the AV show, "The Ancient Valley of Life," and portions of the I & R prospectus in which Bio Aid Buer was particularly knowledgeable.

Three EE outings took place during the fall with one outing worthy of mention not because of its success but because of its lack of success. On the morning of October 9, sixty Ortonville first and second graders toured the interpretive foot trail with three teachers prepped as guides and assisted by refuge personnel. Unfortunately on this day, the local high school homecoming football game was to be played, and other preliminaries included a pep rally and a student parade, complete with costumes, through Ortonville during the afternoon. These events excited the youngsters to astonishing levels of hyper-activity and inattention. These factors will definitely be considered in the future when scheduling EE sessions.

3. Environmental Education Teachers

While the potential is great, the opportunities are limited for teacher EE workshops on Big Stone due to manpower constraints. Generally outputs in this category result from pre-trip planning with teachers who have scheduled an outing for their class.

4. Interpretive Foot Trail

Big Stone's foot trail will not be up-graded to an interpretive foot trail until phase 1 of the I & R prospectus is completed. New leaflets are needed; but, will not be ordered until various refuge themes are outlined in the prospectus and incorporated in the foot trail leaflet.

5. Interpretive Tour Route

This was the first complete year for the operation of the refuge interpretive auto tour route. The auto tour was opened from April 10 to November 23 with approximately 6,825 vehicles frequenting the route. While open for a 218 day period, visitor use for the interpretive tour route was estimated at 3,125 visits with one activity hour per visit. The formula that breaks down our traffic counter reading uses an estimate of three persons per vehicle visit with 15% of that total visitation utilizing the tour route for interpretive purposes. These fudge factors will be used for several years to provide continuity in reporting and to help determine changing public use patterns. Moreover, a noticeable change in public use via land vehicles is occurring and is discussed further in the wildlife observation section 11.

Thanks to a history of active law enforcement efforts, a quality interpretive or recreational experience can be obtained by persons who utilize the auto tour. To protect I & R facilities and keep out undesirable types of public use, the auto tour must be closed daily by personnel with law enforcement authority. However, with the present fiscal and personnel limitations, a different way of doing business will be required during the 1982 season. Plans are being made to open the auto tour during weekends and holidays since 60% of land vehicle use during 1980 occurred on weekends. Data for 1981 was not kept in a manner for similar analysis. Another alternative for auto tour operation (i.e., an automatic gate with a 24 hour time) was scuttled from the 1982 AWP due to changing emphasis in public use policies and fiscal cutbacks. A PDW for this automatic gate (costs: $11,000 with installation) is in the system for 1984 purchases.

6. Interpretive Exhibits/Demonstrations

On Big Stone Refuge there are two permanent structures in which exhibits are installed: the Kaercher Overlook at Highway 75 dam and the interpretive shelter on the auto tour route. The interpretive shelter's exhibit was on display throughout all of 1981 without any vandalism occurring to it. The overlook was activated for the first time as an exhibit in late April and was dedicated during the first week of June. Lem Kaercher requested and was given a tour of the overlook and an explanation of the exhibit prior to his death. No vandalism to either the sign or the exhibit has occurred to date. Opposition to this dedication has in the past been vocal; however, time heals things and the opponents' threats have been thawed by a clear conscience.

The Kaercher Overlook describes the Minnesota River Valley as changed by geology and man.

RBB 7/81 50mm

Kaulfuss designers did an excellent job in making this display conform and compliment the unique structure of this shelter. Artwork suggestion and arrangements were recommended by refuge personnel.

RBB 7/81 50 mm

Public use estimates at these exhibits are derived from vehicle traffic counter readings. Visitation at both exhibits is projected at 620 visits.

Off-refuge interpretative exhibits and demonstrations are expected to increase at Big Stone for various reasons. The quantity of increase and its direction will be scrutinized under present policies even though prior I & R decisions and expenditures have been made. Until Big Stone's I & R prospectus is completed, information gathered for phase 1 of the prospectus will provide a valuable guidance.

Off refuge exhibits consist primarily of Expo-Multiscreen and System 70 displays. These displays are utilized during National Wildlife Week and occasionally on National Hunting and Fishing Day.

For National Wildlife Week, exhibits were placed in local banks, and Wildlife Week packets were distributed to area schools along with several wildlife portrait series packets. These materials sparked enthusiasm for a poster contest that was occurring at St. Lawrence Elementary School. Also during National Wildlife Week, a wildlife film festival sponsored by the Ortonville Jaycee's was held at the local theater. Assistant Manager Berger represented the refuge in preparing this program and did the lion's share of the work. The following Fish and Wildlife Service equipment was used: five films, one 16 MM projector with zoom lens and one AV dissolve unit with microphone in order to address the audience and provide music between films. Due to the bluebird weather only 50 people came to this event.

An increase in other off-refuge demonstrations, or manned exhibits, will generally center around audio visual programs. Refuge audio visual presentations have been enhanced significantly by 1) the acquisition of a two-projector dissolve unit, and 2) 3,000 professional quality slides supplied via an I & R photography contract. This refuge's first permanent AV production is entitled "The Ancient Valley of Life." This portable AV exhibit is an 11¼ minute self-contained program that was completed under the terms of the Kaulfuss I & R contract for $2,900. Seven flashbacks depicted with artwork provide a historical perspective of the area. Also, an overview of this refuge's niche throughout the four seasons is provided along with several land management practices.

Due to the quality of our slide library and AV equipment, our audio visual program is quite flexible, and can accomodate various requests or special topic presentations. In response to a unique request from St. John's Catholic Church, Assistant Manager Berger worked up and presented a slide tape show for the Easter services. This temporary production emphasized the spring renewal of life in the woods and marshes with appropriate slides keyed to religious music with no narration. Many favorable comments were received by this office about that presentation. This refuge's AV programs (slide tapes or Service films) continue to generate excellent public relations with favorable long range benefits.

7. Other Interpretive Programs

The following special refuge tours and off-refuge personal appearances occurred during 1981. "Wetland Awareness Week," June 14-20, was a Minnesota state function to increase public awareness for the values of wetlands. Refuge personnel participated by inviting the public to a canoe float in the closed portion of the east pool. Eleven participants received a rewarding experience as they observed first hand a four species colonial rookery composed of 700 nesting pairs.

In September, a special grassland tour was offered to local district agents of the Soil Conservation Service. Those who participated in the 1981 prescribed burning season were present as well as other agents who thought they might utilize this land management practice in their program.

During the year, requests for personal appearances were accomodated for different organizations to discuss some specific aspect of refuge management. In February, Manager Heinecke spoke with the Marietta Sportsman's Club on prescribed burning and gave a slide program on the topic. The refuge's prescribed burning program is starting to be considered an acceptable management practice by most of the local public. In October, Assistant Manager Berger presented a program on refuge objectives and recreational opportunities to the Ortonville Knights of Columbus. Following the program a slide-tape show was presented.

Other interpretive off-refuge programs occurred throughout the year, but were not as intensive presentations. Public involvement (i.e., questions and criticisms) and the purpose of the presentation (i.e., recreation versus information) are considered in determining the value of personal appearances. The presentation of Service films accounts for about half of the off-refuge personal appearances and are classed as professional services on the monthly Public Use Report.

8. Hunting

In line with current policy, the refuge hunting program is being streamlined to conform more closely with the state seasons. In 1981, the season dates for the refuge small game season were the same as the state season. Previously all refuge hunting had ended on November 30. The 1981 pheasant season was the best quality hunt in several years. Publicity surrounding the high pheasant populations brought many hunters afield. Opening weekend saw approximately 250 hunters on the refuge. Several parties contacted had limited out by mid-afternoon. All parties had seen birds and nearly all had at least a couple in the bag. Of course, hunters with trained dogs did the best. Dedicated hunters were still doing well late in the season especially in native grass seedings which still contained significant amounts of yellow pigeongrass.

Hunter Activity Hours and Visitation: C.Y. 1977-1981

	1977	1978	1979	1980	1981
Upland Game					
Act. Hrs.	1,050	1.640	1,790	3,400	2,400
Visits	360	440	605	1,690[1]	1,150
Deer-Gun					
Act. Hrs.	4,140	8,300	6,450	2,250	2,700
Visits	690	1,060[2]	1,720	375	450
Deer-Bow					
Act. Hrs.	2,660	5,390	1,290	580	1,390
Visits	550	1,130[1]	410	210	695
Total					
Act. Hrs.	7,850	15,330	9,530	6,230	6,490
Visits	1,600	2,630	2,735	2,275	2,295

[1]Variance is due to different observers using different estimators.
[2]Refuge was opened to primitive weapons hunting in 1978 and 1979. Visitation gives a more accurate measurement of use.

Deer bow hunting continues to grow in popularity on the refuge. Opening weekend saw 100 hunters using the refuge hunting area. Over the season, bow hunters took 25 deer.

Problems exist with the bow season in that the party hunting privilege is abused and hunters tend to hunt well past the legal sunset closing time. Because of this, regulations were emended to require that bows be unstrung or cased at legal sunset. Serious bow hunters applauded this change.

Shotgun-slug deer hunters took 75 deer over the four day season in November. Hunting pressure was down 20% from 1980 with only 100 hunters showing up on opening day. This was probably due to herd dispersal patterns which finds deer wintering on the prairies in mild winters. They don't return to the refuge river bottoms in large numbers until a normal winter sets in. Many deer were taken by hunters in the surrounding prairies in both the 1980 and the 1981 seasons.

During the fall, a few hunters were observed hunting squirrels along the Yellowbank River.

9. Fishing

Due to low water levels, fishing pressure was way down from 1980. Some success was reported on small northern pike on the Minnesota River below the cemetery hill at Odessa. A few large northerns were taken through the ice at the spillway on the Highway 75 dam.

Warm Water Fishing: C.Y. 1977-1981

	1977	1978	1979	1980	1981
Act. Hrs.	140	5,512	26,100	18,855	8,750
Visits	140	2,908	11,100	4,635	2,925

During 1979, fishing activity hours skyrocketed for the following reasons. Spring runoff was extremely heavy and fishing success was excellent, particularly in the basin below the spillway. Northerns moved up from Marsh Lake and large numbers of fishermen were attracted. Within the refuge, fish productivity probably peaked around 1979 as this was the fifth year since refuge pools were flooded. This appears to be the case from impoundment studies in mid-America according to research coming out of the FWS cooperative unit in Columbia, Missouri. This would be the case for Big Stone if fishing success can be an indicator of productivity. Also, fishing activity hours increased when the refuge was opened to ice fishing for the first time in 1979. Through 1981, fishing pressure decreased and will probably remain at these low levels into the future.

Because of this activity in 1979, the Corps of Engineers contemplated structural modifications to the service spillway to accomodate higher fishing activity. However, due to funding priorities, these modifications will not be made, and, may in fact, not be needed today.

11. Wildlife Observation

Wildlife observation on Big Stone is quite varied and dependent on the season of the year. A successful observer must be familiar with the habitat of Big Stone and the habits of his prey. A refuge bird list helps in this regard, although a more professional bird list is planned for the future. For birders, the springtime is the most active time of year, particularly for members of the Minnesota Ornithological Union. This group conducts a survey by vehicle from Salt Lake, Minnesota to Big Stone NWR. Valuable information is obtained from this group on the status of the bird migration.

The water resource of Big Stone and habitat preservation are main causes for our high species diversity index. These resources are made accessible via an auto tour route which contributes significantly to this station's public use outputs. Both man and wildlife are brought together in close proximity in a variety of habitats at a rapid rate. In this regard, the overall wildlife observation outputs were down 16% as compared to 1980. A general decrease in vehicle traffic is the most noticeable indicator of this decline.

Vehicle Counter Data C.Y. 1977-1981

	1977	1978	1979	1980	1981
Auto Tour					
Counter Days	210	172	Closed[1]	153	218
Veh/Season	8,721	9,979		7,114	6,825
Avg # Veh/Day	46.30	58.0		46.50	31.30
Low Flow					
Counter Days	210	237	---[2]	153	290
Veh/Season	1,562	2,620		1,976	2,595
Avg # Veh/Day	7.44	11.05		12.92	8.95
Spillway Drive					
Counter Days	210	237	123	Closed[1]	296
Veh/Season	5,462	5,464	3,400		4,135
Avg # Veh/Day	26.01	23.05	27.64		13.97

[1]Road closures: Auto tour route - flood damage, spillway drive - embankment slump.
[2]No data.

Most non-consumptive wildlife recreation on Big Stone is determined according to formulas based on traffic counter data. Therefore outputs, that are tied to this method, are down as well; like walking 20% and land vehicle 14%. Non-consumptive recreation has become the mainstay of Big Stone's public use outputs with 67% of all public use activity hours occurring in this category (Public Use data-page 22).

More than half of Big Stone's non-consumptive recreation is generated via the auto tour route. Several efforts can be made to increase public use on the auto tour while maintaining a quality recreational experience. One attempt, an automatic gate, failed this year due to budget cuts. This device would open at sunrise, allowing public access at an optimum time for wildlife observation; yet close automatically after sunset and reduce law enforcement expenses. The 1981 low average of 31.3 vehicles per day on the auto tour could be increased with such a gate. While drought conditions contributed to a lower daily vehicle average, we feel that this represents both the quality user groups and the minimal usage that could be expected. This year's usage contrasts sharply with the 1978 daily use of 58.0 vehicles per day that occurred when the auto tour was open throughout the night.

While public use decreased overall for 1981, visitation at the auto tour decreased at a slower rate. In fact, the percentage of public use generated via the auto tour increased in 1981 over that of 1980 according to the table on the following page. This table detects this difference in the categories: land vehicles, auto tour and % total public use.

Public Use: A Modeled Comparison

	1977	1978	1979	1980	1981
Total Public Use:	34,640	47,243	54,327	78,600	61,704
Act. Hrs.	62,605*	81,926*	54,110*		
Land Vehicles	20,400	20,300	8,850	34,250	31,791
Total Act. Hrs.	39,961*	46,302*	9,744		
Auto Tour Veh.	34.24	23.05	Closed	21.38	26.88
% Total P.U.	37.73*	29.6*			
Foot and Vehicle	58.89	42.97	16.33	43.5	51.52
% Total P.U.	63.83*	56.52*	18.0*		

*Data remodeled according to 1981 formulas.

This modeled comparison is obtained by remodeling some of the non-consumptive wildlife recreation components of the public use outputs. The remodeled components, foot and land vehicles, are then added to other categories of public use which are unchanged. The major change that occurs is how traffic counter data is expanded to derive the total visitation for non-consumptive wildlife recreation at a given site.

Windshield wildlife observation does not generate the preferred uses. Wildlife observation opportunities on Big Stone, that are exposed via vehicle traffic, may entice some visitors to go afoot.

12. Other Wildlife Oriented Recreation

In spite of a drought, canoeists were able to traverse the Minnesota River through the refuge. The Minnesota River was terraced, thanks to three small beaver dams along the auto tour route.

Occasionally, horseback riding groups request permission to utilize the refuge for an outing. This use is permitted with riders required to utilize trails. The Koch road west, which was repaired for law enforcement reasons, will provide a good route for trail rides. This two mile trail has hunter parking lots at each end which creates ideal conditions to load and unload the horses.

17. Law Enforcement

The refuge law enforcement effort is concentrated during periods of high public use such as when the auto tour route is open or during hunting seasons. This time period generally runs from April 15 to December 1, depending on weather conditions.

Auto tour route patrols are conducted irregularly evenings and weekends. Occasional stakeouts are set up to give the appearance of a continuing presence. Complaints by the visiting public on activities such as speeding, loud music, littering, etc. have declined significantly since enforcement patrols have been increased.

Enforcement patrols are conducted during the waterfowl, deer firearm, deer bow, and upland game seasons. Night patrols are used intermittently to combat vandalism, jacklighting, etc.

In addition to approximately 30 verbal explanations and warnings, the following cases were prosecuted during 1981:

Violation	Fine ($)
Arson (two individuals)	200
Speeding	50
Cattle trespass	100
Failure to report accident	50
Driving without due care	50
Possess uncased bow after sunset	50
Hunting deer from platform more than 6' above ground level	50
Leaving portable deer stand on refuge overnight	50

At 9:30 P.M. on the night of March 26, 1981, two local individuals set fire to the refuge grasslands south of Odessa. They were observed at the scene by two local high school students who recorded their license number and contacted the Odessa Fire Department. The fire did minimal damage due to quick action by the fire department. The grass was tinder dry. The damage potential was serious as two private homes were in the fire path had it gotten away. The two defendants were accompanied by a juvenile girl who eventually gave us a signed statement admitting arson. One defendant is a three time convicted felon who was on parole at the time of the fire. Special Agent Ed Spoon, LE, St. Paul, was primarily responsible for the successful investigation and prosecution of the case. Big Stone NWR personnel assisted with interviewing witnesses, taking statements, and coordinating with local law enforcement agencies. Big Stone NWR has received excellent support and cooperation from the St. Paul LE office. Especially appreciated is the expertise and effort expended in assisting the refuge with the arson case and jacklighting problems.

Big Stone NWR personnel also assisted Agent Spoon with investigation of complaints concerning the pursuing and taking of waterfowl with power boats on Artichoke Lake. Three individuals were apprehended in this case.

I. EQUIPMENT AND FACILITIES

1. New Construction

The new refuge office originally scheduled for 1981 BLHP funds was cancelled in 1980.

3. Major Maintenance

A slump on the Highway 75 dam occurred for the second time in one year on July 22. By October 28, the settlement area, which is approximately $\frac{1}{4}$ mile south of the service spillway, had dropped a total of 82 inches along the upstream face of the dam. The total length of the crack was 170 feet. The following is from a COE field report: "Heavy rainfall preceeded both slides (4 inches in 1982), but pool levels did not fluctuate significantly. . . . Although the 1981 slide contained some of the earth embankment, the slide is not of sufficient magnitude to jeopardize the integrity of the embankment." While the embankment repairs were finished on Dec. 1, four slope movement indicators that are mounted in shale bedrock reveal there is movement at the 13'-17' level down in the face of the embankment. Also, the latest find is that a bulge is developing in the original groundline 60' away from 952.3 waterline on the upstream side of the dam. The cause for this phenomenon is not understood at present, and previous corrective recommendations may be re-evaluated. Since cracks and signs of slumping are appearing along the length of the embankment, COE repair recommendations, such as a berm, may be required for the length of the dam. Present cost repair estimates are at $\frac{1}{4}$ million dollars. The COE feels that these repairs can be made without altering water levels.

4. Equipment Utilization and Replacement

The refuge TD 18 tractor was transferred to the J. Clark Salyer NWR in North Dakota. No significant problems have occurred since most of the refuge equipment is relatively new.

5. Communications Equipment

Motorola Maxar 80 55 watt radios were installed in the Ford 6600 tractor and the Ford Fairmont. The 5 watt portable radio (with vehicle charger and permanent antenna) installed in the Ford 8700 tractor has proved inadequate. This radio will be replaced with a Maxar 80 in FY 82. The radios in other refuge vehicles are Motorola Micor 100 watt mobiles.

6. Energy Conservation

Significant energy reduction has been achieved at the shop by heating only one stall and the shop office through the winter. Future plans include augmenting the present propane heat with an auxiliary system such as a solar installation.

J. OTHER ITEMS

2. Items of Interest

In March, the TD 18 tractor broke through the ice while crossing the Yellowbank River. Upon crawling over a small log, the blade came down like a jackhammer and shattered 18 inches of thick ice. Thanks to the cable winch and a chain saw, the "cat" was retrieved after four hours of work. Fortunately, the "cat" was retrieved and transferred to J. Clark Salyer NWR, where transfer papers were waiting throughout that whole ordeal.

Positive believing and hard work paid off.

RBB 2/81 50mm

3. Credits

Heinecke wrote sections A, C, D, E, F 1, F 3-13, G 8-10, H 8-10, H 17-21, I, J, and K. Berger wrote sections F 2, G 1-7, H 1-7, H 11-16, and arranged the photographs. The report was typed and assembled by Carole Gerber.

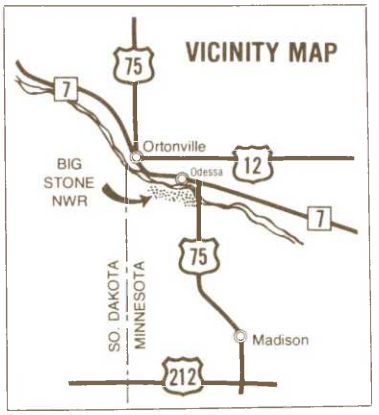
K. FEEDBACK

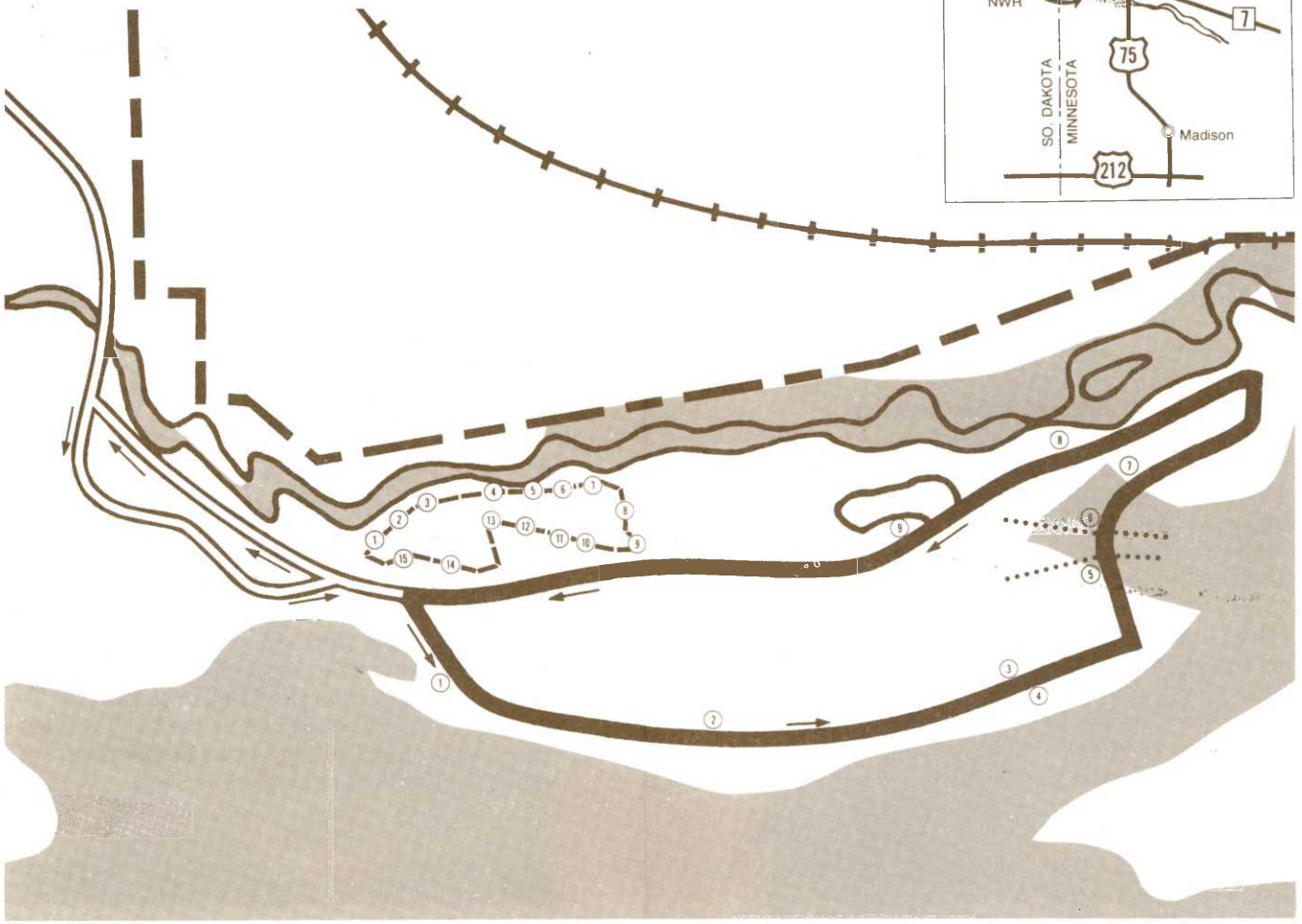
Like everyone else we're just holding our breath while the rumble and flash of heavy guns continues around the central portion of the eastern seaboard. We're hoping we don't get too many stray rounds.

Pasque flower. Keeping low.

CJB 5/80 Micro-zoom

Auto Tour Route





LEGEND

- REFUGE BOUNDARY
- CONSERVATION POOL
- FOOT TRAIL
- AUTO TOUR ROUTE
- (1) POINT OF INTEREST
- MINNESOTA RIVER
- WATER AREA

N

Scale In Miles

0 1/2 1

0 .8 1.6

Scale In Kilometers

REFUGE BOUNDARY SIGN — ENTRY BY PERMISSION ONLY

AREA OPEN TO FISHING AT SPECIFIC TIMES

SANCTUARY AREA — OFF LIMITS TO THE PUBLIC UNLESS OTHERWISE SPECIFIED

Station 7. Our Pioneer Past

Before the coming of the settlers, Indians of the Dakotah nations hunted the herds of pronghorn antelope, bison, deer and elk which thrived on the Great Plains.

With the pioneers came changes. The tall grass prairie was transformed into farmland, and towns; roadways and railroads were built across the plains.

A reminder of our pioneer past is this shallow depression, the location of an original "Soddy." This was a house made from bricks of sod. The pile of rocks nearby is the remains of a "milk cellar" — a partially underground structure used as cold storage for food.

Station 8. Wood Duck Woodlands

One of the most interesting inhabitants of the floodplain forest is the wood duck — considered by some to be the most beautiful of all our North American ducks.

Long ago the wood duck adapted to nesting in tree cavities instead of the ground used by many other waterfowl. The young leave their tree-top nests when they are 24 hours old. They jump to the ground or water from distances of 50 feet or more, but land unharmed.

Station 9. Forest Formation

As you view this small ice block lake, changes are occurring which you cannot see. If you returned to this spot 100 years from now, do you think it would look the same? Chances are you would come upon the beginnings of a hardwood forest instead of a marsh.

Remember the flooded lands at Station 5? In the same way, clumps of dense vegetation will gradually fill in the margins of this pond. Seeds from nearby trees will land on wet soil and send down roots. In time elm, willow and maple will form a forest which will continue to reproduce itself into the future as a "climax" plant community.

At The End of Your Auto Tour:

Did you notice as many species of wildlife outside the refuge? Probably not. On this auto tour, you have seen the reasons why. Land and water are managed at Big Stone to produce quality habitat for wildlife — and quality viewing conditions for visitors.

If you would like a closer view of Big Stone, hike on the "Prairie Past and Present" foot trail which begins at the interpretive shelter.

Information

Additional information may be obtained by writing Refuge Manager, Big Stone National Wildlife Refuge, 25 Northwest Second Street, Ortonville, Minnesota 56278.
Phone: (612) 839-3700

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

RF-32582-10 April 1979

☆ U.S. GOVERNMENT PRINTING OFFICE: 1979—666-620

Big Stone National Wildlife Refuge

Auto Tour Route

Big Stone Auto Tour Route

Welcome to Big Stone National Wildlife Refuge's self-guided auto tour. The three-mile drive will take you through a portion of the Minnesota River Valley — rich in geologic, human and natural history.

Numbered sign posts or "stations" at vehicle turnouts refer to descriptions in this leaflet.

Big Stone National Wildlife Refuge is a valuable resource. Please leave the refuge as you found it so others may enjoy it, too.

Station 1. Granite Overlook

Try to imagine the geologic forces which shaped the land.

Granite, which underlies the region, was formed by volcanic activity over 2.6 billion years ago. These outcrops were exposed when the huge glacial River Warren flowed through the area.

Few plants can live in these hot and sterile conditions very similar to a desert. Two kinds of cactus can be found — the prickly pear cactus and the rarer ball cactus. Remnants of the tall grass prairie exist in surrounding areas where soil is adequate.

Station 2. Wildlife Needs

Just like people, wildlife have needs that must be met if they are to survive and reproduce. Food, water, shelter and living space are the most important requirements for any species.

Land must be managed to provide these requirements at optimum levels. Rotational farming is used to prepare the land for establishment of desirable vegetation such as native grass seeding and dense nesting cover.

Station 3. Prairie Restoration

Tall grass prairie once was the dominant plant community at Big Stone NWR.

Refuge personnel are restoring this important grassland type by seeding "tall grass" species: Indian grass, big bluestem, little bluestem, Canada wildrye, switch grass, side oats grama and green needle grass. Native prairie flowers will be added.

Can you tell the difference between the prairie restoration and the neighboring "dense nesting cover?" The "DNC" is a mix of sweet clover, alfalfa and domestic wheat grasses.

Together, prairie and "DNC" offer wildlife excellent living conditions. With improved habitat, grassland species will become a more stable part of Big Stone wildlife population.

Station 4. Conservation Pool

Floodwaters from the Minnesota River formerly covered these lowlands each spring, but flowed away by mid-summer. Now a dam constructed down-stream has created a 4,250 acre pool, with the depth of water averaging three feet. Although the trees and shrubs will die, their usefulness for wildlife continues.

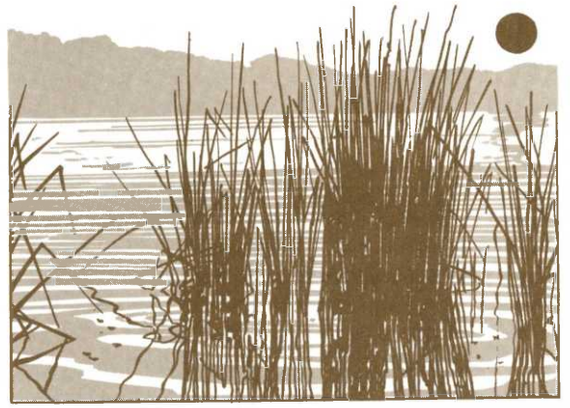
Wood ducks and hooded mergansers nest in dead tree cavities, and hawks and eagles use them as perches. Nesting colonies of egrets, herons and cormorants can be found among the dead standing timber.

In addition, the pool attracts hundreds of migratory waterfowl from mallards to snow geese. What species can you find?

Station 5. Wetland Community

Nearly all prairie wildlife species are dependent on wetlands at some time during their life cycle. Deer use heavy cattail stands as winter cover. Marsh hawks hunt the grassy borders for small mammals. Muskrats feed on starchy cattail roots and use the stalks to build nests.

Periodic dry cycles keep prairie marshes in a productive state. Nutrients, recycled by dry conditions, are utilized by aquatic invertebrates which, in turn, provide waterfowl with protein. Concentrated protein is essential during egg laying, periods of growth, and migration.



Station 6. The Water Cycle

This small pond helps support the earth's water cycle and life as we know it.

Did you know that less than 1% of the earth's water is available for living organisms? Almost all of the earth's fresh water is frozen in glaciers and ice caps or is unusable saltwater.

Much of the trillions of tons of rainwater that fall to the surface of the earth this year evaporates and eventually produces more rain clouds. Only a small portion remains in lakes and streams or filters down to become ground water. Wetlands play a vital role in storing much of this water for use by wildlife and people alike.

Information
Additional information may be obtained by writing Refuge Manager, Big Stone National Wildlife Refuge, 25 Northwest Second Street, Ortonville, Minnesota 56278.
Phone: (612) 839-3700

Big Stone
National
Wildlife Refuge

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

RF-32582-1 April 1979

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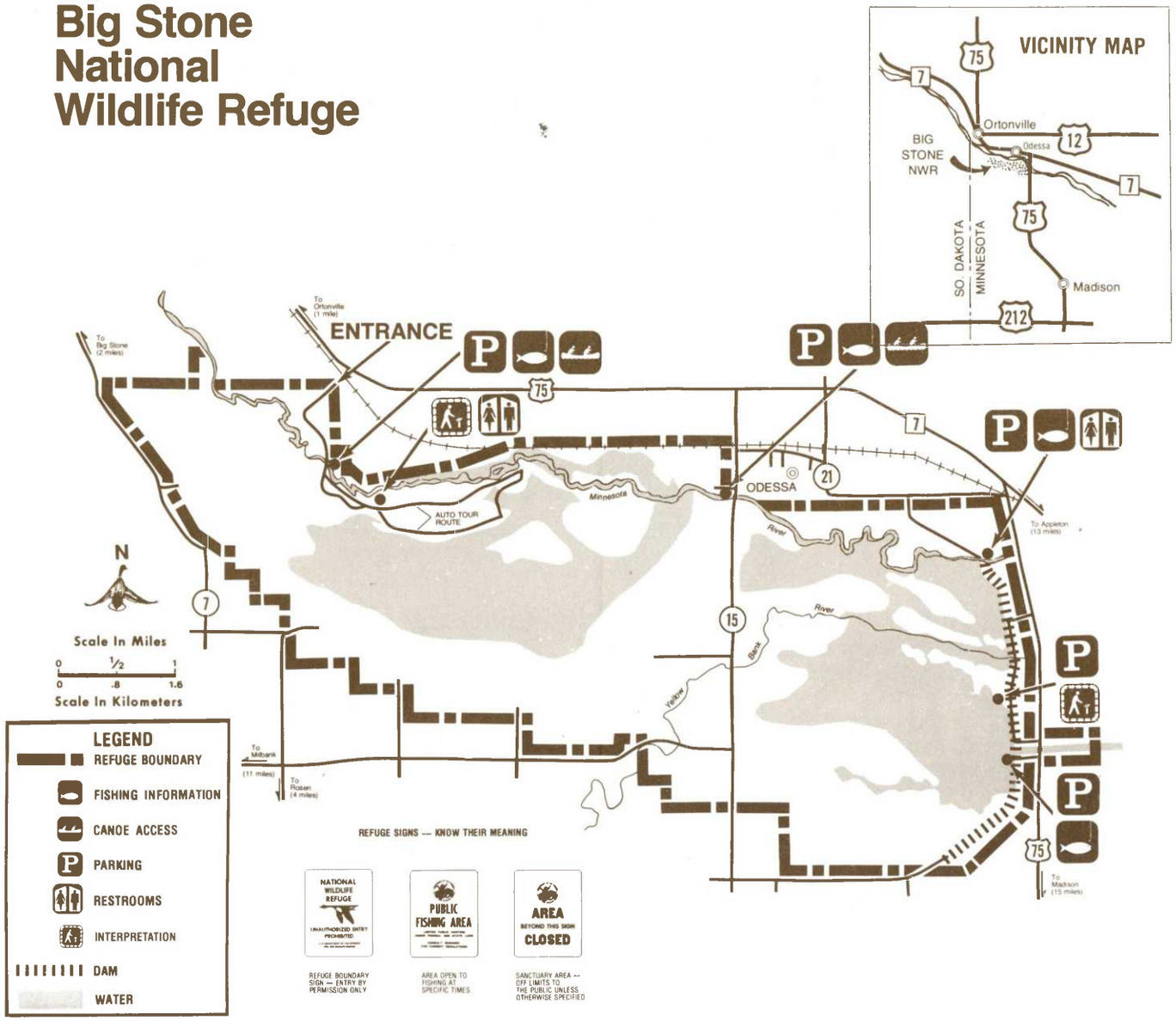
Big Stone National Wildlife Refuge



Fishing

Fishing is a popular activity at the refuge. The best places are along the banks of the reservoir or the refuge's rivers — the Minnesota and the Yellowbank.

Look for fishing leaflets at the service spillway, low flow structure, and both canoe access points. The fishing season each year extends between state opening and September 30.

Hunting

Hunting areas are available during the official state hunting seasons. Species open to hunting are gray partridge, cottontail rabbit, gray and fox squirrel, pheasant, and deer.

Hunting leaflets are available in hunting area parking lots during the hunting season. All hunting ends November 30 each year.

Cross-Country Skiing and Snowshoeing

Cross-country skiiers and snowhsoers will find Big Stone National Wildlife Refuge an attractive place. Park outside the main entrance and ski or snowshoe wherever you would like to explore. Be careful to avoid steep drop-offs on granite rock outcrops. The easiest trail for beginners would be to follow the refuge roads.

Tips on Visiting the Refuge

Restrooms are provided on the refuge but no drinking water is available. No picnic area is available. Camping and building fires are prohibited. However, bring along a sandwich and a thermos, because there are enough areas to visit and wildlife to see to fill a whole day.

Remember to keep pets on leash. Swimming, horse-back riding, traveling by off-road vehicles or snowmobiles, or collecting of any plants, animals, and artifacts also are not permitted.

The closest lodging is at Ortonville. The nearest public and private campgrounds are along the shores of Big Stone Lake.

Big Stone National Wildlife Refuge

The upper reaches of the Minnesota River in west central Minnesota are a refuge for wildlife — and are fascinating to people interested in wildlife-oriented recreation.

Located two miles southeast of Ortonville near the Minnesota-South Dakota border, Big Stone National Wildlife Refuge offers recreational opportunities to visitors throughout the year.

The River Valley

The Minnesota River winds 11.5 miles through the refuge. From an airplane, the river looks like a wavy line stretching along the bottom of a much wider valley.

The wide valley was carved thousands of years ago. Melting ice from glaciers caused a huge lake to form in northwestern Minnesota. This lake, called Lake Agassiz, overflowed to the south.

In time, these torrents of water eroded a river bed named the glacial River Warren. Today, the quiet Minnesota River occupies the bottom of the old glacial river.

Look for evidence of glacial times. Try to catch a view of the high bluffs on either side of the river. The valley is 1.5 miles wide at the upper end of the refuge and four miles wide at the lower end. Imagine the time required for a river to carve a valley of this size!

Human History

Little is known about early native tribes that used the Minnesota River as their highway.

But, Dakotah Indians lived along the river banks at the time the earliest settlers arrived in Western Minnesota. Some interesting Indian and early settler sites are still visible.

A number of farms were present in the river bottomlands in 1971 when the Big Stone National Wildlife Refuge was authorized.

The U.S. Army Corps of Engineers built a dam to create a large reservoir, and then in 1975 transferred land to the U.S. Fish and Wildlife Service.

Through a cooperative agreement, the Corps still maintains the water control facilities, but the USFWS has management responsibility for all 10,795 acres of refuge lands.

Habitats for Wildlife

A wide variety of habitats exist on the refuge — from the wet world of the river and reservoir areas to the dry world of the granite rock outcrops.

The dam in the Minnesota River created an additional 4,250 acres of wetlands which provide a stopping-off place for migrating waterfowl and a home for summer residents such as: great egrets, great blue and black crowned night herons, cormorants, and many species of ducks.

Low-lying woodlands support migrating warblers and other song birds, as well as resident populations of deer and other mammals. Flooded woodlands containing American elm, ash, box elder and silver maple provide old tree trunks with hollow cavities which are good nesting sites for wood ducks and hooded mergansers. Some introduced species such as the Russian olive often are removed because of their tendency to spread into areas like "weeds." About 850 aces of refuge lands consist of low woodlands.

The refuge still contains about 1,700 acres of native prairie. This is typical tall grass prairie country, with occasional oak trees. Because many farm grasses, woody shrubs, and non-native flowers seed themselves among the native prairie species, refuge staff use controlled burns from time to time to restore and maintain a vigorous growth. A state effort to reestablish the prairie chicken in this region may be successful.

Approximately 4,000 acres of refuge lands are used to grow crops for wildlife or reestablish grassy areas which provide food, nesting areas, and cover for wildlife. Some areas have been seeded to native grass, others to mixtures of legumes and wheatgrass.

One of the most interesting habitats on the refuge is the 100 acres of granite rock outcrops. These bare rock areas support unusual species of cactus and other plants. The high outcrops provide some excellent views over the entire refuge and its wildlife populations.

Wildlife Watching

Big Stone National Wildlife Refuge offers exceptional opportunities for wildlife watching.

During spring and fall migrations, 17 species of ducks can be sighted in and round the refuge. Some of the more common species to be seen are: mallard, blue-winged teal, northern shoveler, pintail, redhead, and ruddy duck. Canada and snow geese also have been seen.

Many species become summer residents on the refuge. Western grebes, uncommon in Minnesota, are using the area to rear their young.

Other animal species to watch for include white-tailed deer, gray partridge, muskrats, beaver, and woodchucks.

Wildlife watching always is more successful if done during morning or evening when animals are most active. A bird list is available at various points on the refuge.

Auto Touring

A four-mile auto-tour route on the refuge is open to the public. Numbered stops along the way correspond to notes on a special auto tour leaflet which describes the features to watch for along the way. Pick up the leaflet at Stop #1.

The auto tour provides a view of the major habitats in the refuge. Be on the lookout for wildlife. Turnouts provide a place to park while watching.

Foot Trail

An interesting foot trail starts at the rest area near the interpretive shelter. A walk of about an hour's time will provide a close-up view of prairie plants, granite rock outcrops, river meanders and wildlife.

A special foot trail leaflet provides information keyed to numbered stops. Pick up the leaflet at the start of the trail.

Canoeing

The Minnesota River is one of the state's official canoe routes. Big Stone National Wildlife Refuge offers canoe access areas and parking.

Canoeing down the refuge's section of the river will require between a half and a whole day, depending on skill and the number of fallen trees or beaver dams encountered along the way.

There are no official portages except for a 150 yard portage at the low flow water control structure.

Canoeists must stay in the main river channel on a route marked with signs. The canoe trail is open from mid-April to September 30, but canoeing is best during high water time in the Spring.

Only canoes are allowed on the refuge, so do not plan a float trip with raft, inner tube, boat, or other devices. Motors are prohibited.

Hunting Regulations

SMALL GAME
Hungarian Partridge
Cottontail Rabbit
Grey and Fox Squirrel
Pheasant

BIG GAME
Deer - Archery

Deer - Firearms (shotgun-slug)

Season Dates are the same as the Minnesota State Regulations.

SPECIAL CONDITIONS

NO DUCK, GOOSE, COOT, or SNIPE HUNTING IS ALLOWED ON THE REFUGE.

Species not listed above are protected and may *NOT* be killed.

All state regulations are in effect and will be enforced.

All hunting bows must be unstrung or cased at legal sunset.

All vehicle travel is prohibited except on roads and parking areas designated for such use.

Snowmobiles are prohibited.

Overnight use and fires are prohibited.

Shooting hours are the same as in the state regulations.

Construction or use of permanent blinds, platforms, or scaffolds is prohibited. Portable blinds and platforms may not be left on the refuge overnight.

Report all injuries and accidents to Refuge Headquarters, 25 N.W. 2nd St., Ortonville, Minnesota 56278 or Phone 612/839-3700.

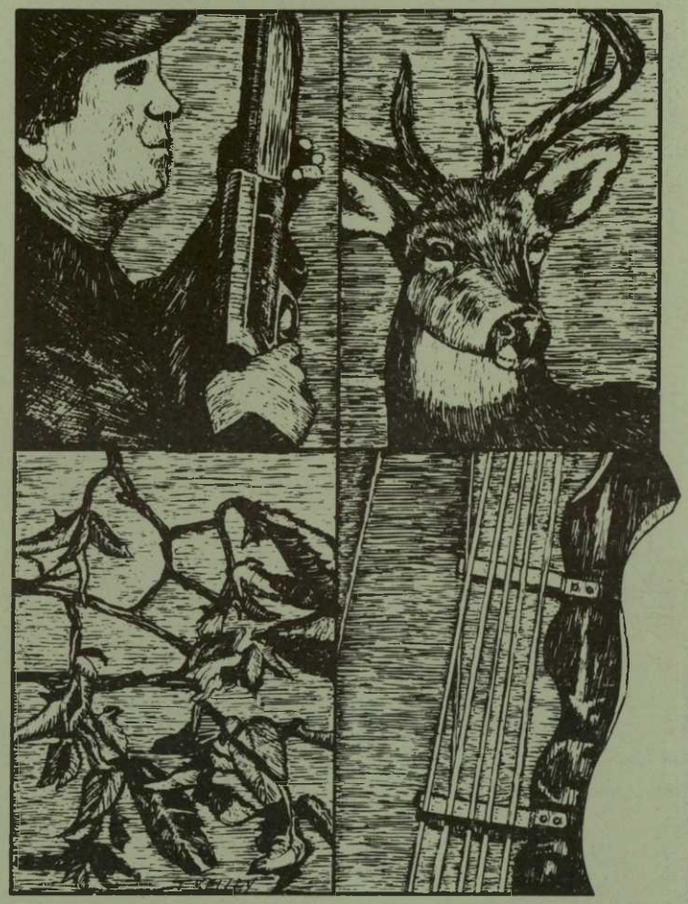
QUALITY HUNTING DEPENDS ON YOU
PLEASE RESPECT ALL REGULATIONS

RF-32582-6

July 1980

Big Stone
National Wildlife Refuge
Minnesota

MAP & REGULATIONS

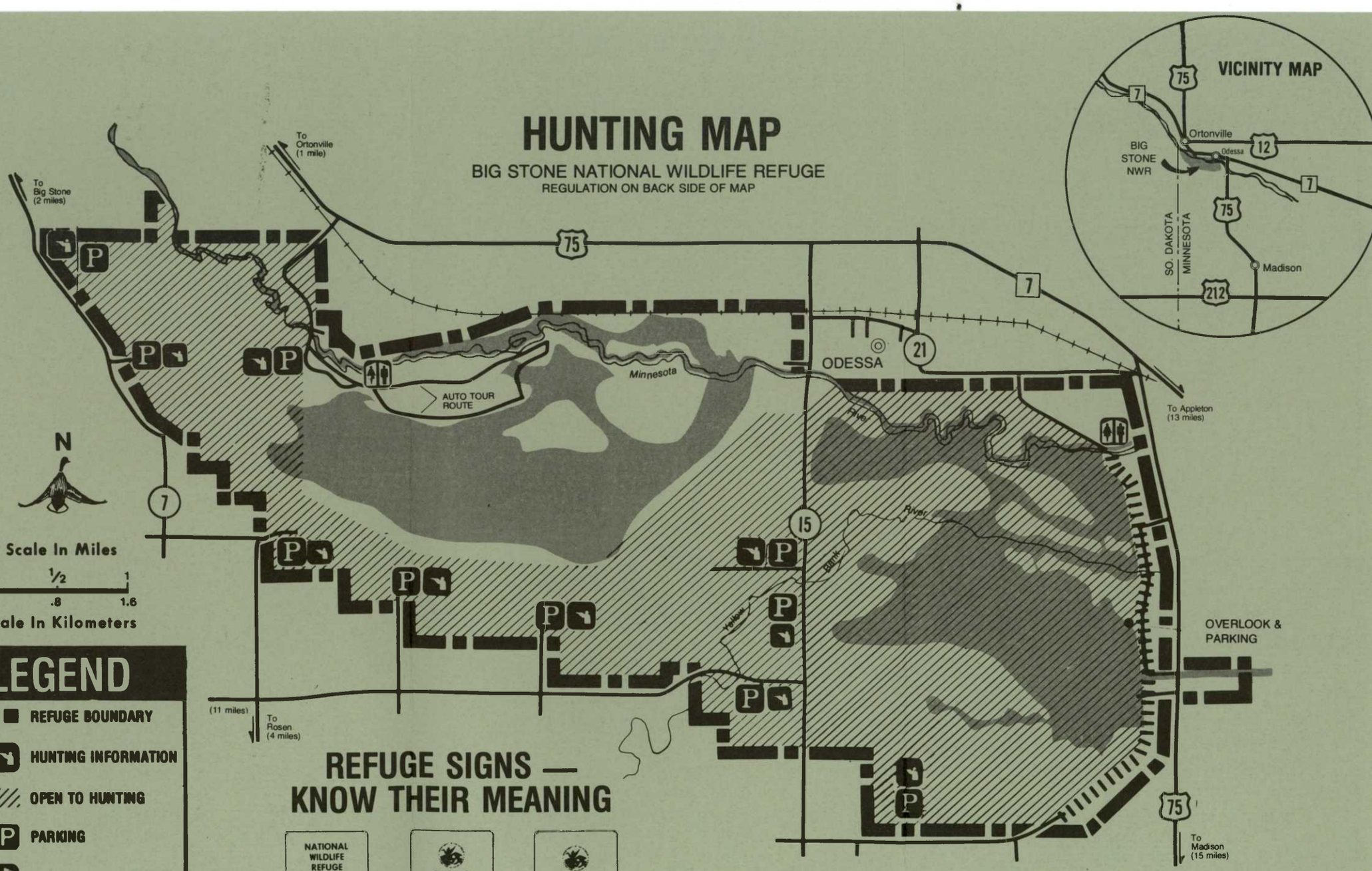


BIG STONE
National Wildlife Refuge/MN

HUNTING MAP

BIG STONE NATIONAL WILDLIFE REFUGE

REGULATION ON BACK SIDE OF MAP



N

Scale In Miles

0 ½ 1

0 .8 1.6

Scale In Kilometers

LEGEND

- REFUGE BOUNDARY
- HUNTING INFORMATION
- OPEN TO HUNTING
- PARKING
- RESTROOMS
- DAM
- WATER

REFUGE SIGNS — KNOW THEIR MEANING

REFUGE BOUNDARY SIGN —

AREA OPEN TO HUNTING AT SPECIFIC TIMES

SANCTUARY AREA — OFF LIMITS TO THE PUBLIC UNLESS OTHERWISE SPECIFIED