

FWS/ARW-RF1

OCT 21 1987

Memorandum

To: Refuge Manager, Big Stone NWR  
From: Regional Refuge Supervisor, RF1  
Subject: Wildlife Inventory Plan

The subject plan was reviewed in this office and by Jan Eldridge, Division 1 Biologist, and is approved as written. The plan is thorough and well written and can be used as a standard for other managers to follow. There are, however, a few comments shown below that would enhance the quality of the plan should it be reviewed at some future date:

- Part IV, Manpower and Costs, as shown in the outline should include equipment and materials such as pickup truck with automatic transmission, 7 x 35 binoculars, 60X spotting scope, tape recorder, etc. If these items are listed in tabular form, they would be easier to identify. The title of Part IV might be better stated as Personnel, Costs, Equipment, and Materials.
- On most of the survey maps, neither the census route nor the direction to be traveled is shown. Variations in procedure could make a significant difference in the information being gathered.
- On an introductory page to this chapter, it would help in planning and scheduling of staff time to provide a calendar showing the approximate months, weeks, or days when surveys will be conducted.

/s/ John W. Ellis

John W. Ellis

Attachment

cc: Division Biologist (MN Valley NWR)

RF1:JWellis:bak:10/21/87:x3701



# United States Department of the Interior

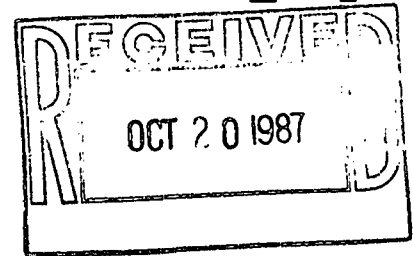
FISH AND WILDLIFE SERVICE  
FEDERAL BUILDING, FORT SNELLING  
TWIN CITIES, MINNESOTA 55111

TAKE  
PRIDE IN  
AMERICA

IN REPLY REFER TO:

FWS/ARW/WSS-TS

October 19, 1987

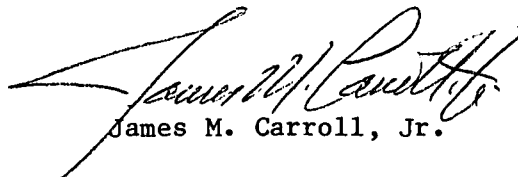


## Memorandum

To: Regional Refuge Supervisor (RF1)  
From: Wildlife Biologist  
Subject: Comments on Big Stone National Wildlife Refuge Inventory Plan

Generally this chapter of the Big Stone National Wildlife Refuge management plan conforms with the outline shown in the refuge manual, 7 RM 11 Exhibit 1. Inclusion of the following comments would enhance the plan.

- Part IV, Manpower and Costs, as shown in the outline should include equipment and materials such as pickup truck with automatic transmission, 7 X 35 binoculars, 60X spotting scope, tape recorder, etc. If these items are listed in tabular form they would be easier to identify. The title of Part IV might be better stated as Personnel, Costs, Equipment, and Materials.
- On most of the survey maps neither the census route nor the direction to be traveled is shown. Variations in procedure could make a significant difference in the information being gathered.
- On an introductory page to this chapter it would help in planning and scheduling of staff time to provide a calendar showing the approximate months, weeks, or days when surveys will be conducted.

  
James M. Carroll, Jr.



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

Minnesota Valley National Wildlife Refuge  
4101 East 80th Street  
Bloomington, MN 55420

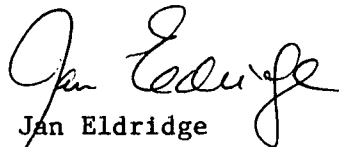
IN REPLY REFER TO:

October 19, 1987

### Memorandum

To: Regional Refuge Supervisor (RF1)  
From: Regional Biologist (RB1)  
Subject: Big Stone Wildlife Inventory Plan

I have reviewed the Wildlife Inventory Plan from Big Stone National Wildlife Refuge and I recommend that it be approved as written. The plan is thorough and well written and it can be used as a standard for other managers to follow.

  
Jan Eldridge

Attachment

WILDLIFE INVENTORY PLAN

BIG STONE NATIONAL WILDLIFE REFUGE

ORTONVILLE , MINNESOTA

Submitted by: James Heinicke Date 9/29/87  
Refuge Manager

Concurrence: Jan Essick Date 10/19/87  
Regional Biologist (RB-1)

Approval: John W. Elk Date 10/31/87  
Division Supervisor (RF-1)

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WILDLIFE INVENTORY PROCEDURE NO. 1Waterfowl Population SurveysI. Purpose

- 1) Waterfowl maintenance is the fourth ranked objective for this refuge. Therefore, waterfowl inventories must measure, by some means, use day levels to determine if refuge objectives are being achieved.
- 2) Regional Resource Plans (RRP) have identified several species of special emphasis that occur on Bit Stone. These species are mallard, Northern pintail, redhead, canvasback, wood duck, white-fronted goose, snow goose and the Eastern Prairie Population (EPP) Canada goose. Population data on these species are collected as it becomes available and will help form the appropriate management strategies for RRP species at Big Stone.

II. ProcedureA. Backgrounds

Waterfowl population inventories for geese and ducks, excluding pair and brood counts are outlined in this procedure. A combination of survey routes and census methods are employed to obtain waterfowl use data throughout the year. Waterfowl maintenance data on Big Stone NWR is collected via vehicle routes, wade/walk routes and feeding flight surveys. Off-refuge waterfowl surveys are not covered by this procedure but are conducted on a cooperative basis.

Waterfowl surveys and censuses have been conducted by refuge personnel since the refuge was established. During this time, inventory procedures became standardized but changes in plant succession by emergent and riparian vegetation have influenced how personnel conduct surveys and compute data. Habitat manipulations via drawdown and burning will cause survey personnel to adjust procedures to compensate for these variables.

B. Data Collection & Processing

Waterfowl population data is collected throughout the year but intensity of census activity increases to a minimum of weekly surveys during spring and fall migration periods. These inventories are conducted along established survey routes and observation points (map-Appendix No. 1-1). Survey methods include vehicle and wade/walk surveys, feeding flight counts and breeding pair counts to estimate refuge population levels.

Spring

Beginning with the spring migration actual counts will be used as migrants arrive to frozen wetland. Actual counts should be taken from the Highway 75 dam, banding site and diversion channel. These observation points will allow the observer to census all open water on the refuge.

As spring thaw progresses, waterfowl disperse to more open water areas throughout the refuge and are no longer observable to the same degree. If spring flooding is extensive, special efforts may be required to survey waterfowl which include additional wade/walk surveys and/or feeding flight counts. Under normal conditions, surveys as outlined in Appendix 1-1 are used. Survey routes are broken down by segments for both the east and west pools. The east pool segment should be surveyed first to take advantage of calmer morning winds. Surveys should begin at sunrise. Numbers of each species observed at each observation point are recorded on the waterfowl survey form (Appendix 1-2) for each survey segment.

The actual number of waterfowl for each segment must be adjusted by an expansion coefficient to establish an estimate for that given segment for that given week or month. The actual number of waterfowl counted should be divided by the estimated percent habitat surveyed and divided again by an estimated percent of the total birds actually present. Diving duck species and geese will usually have a much higher percent observability than that of dabbling ducks. As an example; if 40 mallard were actually observed at location x and the observer estimated only 80 percent of the mallards present were observable and 50 percent of the mallard habitat was surveyed, the estimated total mallards present at location x would be 100;  $(40 \div .80 \div .50 = 100)$  this number would be the number used on waterfowl survey form Appendix 1-2. At the same location, perhaps 20 redhead were present in open water. The observer estimated 100 percent of the redheads were counted and 90 percent of redhead habitat was observable. The estimated redhead total would be 22;  $(20 \div 1.00 \div .90 = 22.2)$ .

### Summer

Waterfowl population estimates are determined by a different set of procedures during the summer months once spring populations have stabilized into breeding pairs (approximately mid-May). Population data for the summer period is derived from estimates computed from breeding pair counts. A breeding population estimate for each species is made according to methods outlined in Wildlife Inventory Procedure No. 2.

### Fall

Once fall migrants begin to arrive, the collection and computation of data is similar to that of spring whereby east and west pool segment surveys are conducted as outlined in Appendix 1-1 and recorded on survey form Appendix 1-2.

In late fall (usually around November 1) when most small wetlands are beginning to freeze over, feeding flight counts are incorporated. These counts are very accurate particularly for mallard and Canada geese. Two observers are required for this count when refuge pools are full. Observers must position themselves not later than 45 minutes before sunrise for mallard estimates and somewhat later for Canada geese. Several recommended observation points are shown on Appendix 1-1. Actual counts are recorded on Appendix 1-3.

## Winter

Winter waterfowl surveys begin about mid-November and consist of one vehicle survey and/or feeding flight count per week. The counts are associated with the little remaining open water areas usually in the east pool.

In addition to early winter refuge waterfowl surveys, the refuge cooperates with regional surveys by participating in the mid-December goose count and mid-winter waterfowl survey. These two surveys are conducted at the same locations and are actual counts. These locations include: 1) any open water areas of the Big Stone Refuge 2) open water areas of Big Stone Lake 3) cooling ponds at the Big Stone Power Plant and 4) Bentsen Lake accessed through Everhart Berdan property. Data from these surveys are recorded on appropriate forms as shown on Appendix 1-5 and 1-6 and are submitted to the requesting FWS office, usually Wildlife Assistance or the Regional Migratory Bird Coordinator.

### C. Summary of Data Processing

- Weekly waterfowl population surveys are conducted weekly by conducting east and west pool segment surveys. (Appendix 1-1)
- Numbers are recorded on refuge waterfowl survey form. (Appendix 1-2)
- At each observation point or total segment, an expansion coefficient is determined to estimate a total population. These weekly population estimates are recorded on Appendix 1-3
- The average monthly waterfowl populations are derived from the sum of the weekly population estimates divided by the number of weeks per month and reported in Appendix 1-4. This report is submitted to the Washington office.
- Fall feeding flight counts and early spring - late fall counts when most wetland habitat is frozen are actual counts. Numbers are processed in the same sequence as outlined above.
- After breeding pairs are established and the population is stabilized (usually by mid-May) waterfowl populations are estimated from establish breeding pair counts outlines in Wildlife Inventory Procedure No. 2.

### III. Special Considerations

Other census techniques have been considered particularly in regard to waterfowl production which would apply to maintenance surveys. Quarter section sampling was rejected due to the small sample size from which to draw. Stratified survey methods are feasible, but the area is quite small and population levels change too rapidly during the migration periods. At present, no solution is offered for this dilemma other than procedures outlined above.

In gathering migration data, arrival and departure dates can be gathered by surveys of certain areas that waterfowl frequent more than others. During spring, first arrivals are found generally in the east pool; and, can be observed from various vantage points along the Highway 75 dam and the bird banding road. Redheads and canvasbacks utilize the following areas prior to their departure or disperse to the local breeding site (the borrow pit pond on the south side of the dam, the smokehouse kettle pond and the Minnesota River by the Ruby Red Quarry and the Christensen homesite). Bufflehead and



wigeon find favorable habitat by the west pool island. Throughout the migration, green-winged teal and northern pintails will consistently forage along the Andreasen shoreline with its backwater marshes. Since construction of the diversion channel entering the west pool, the majority of the fall and spring migrant population of gadwall and wigeon can be found here and to the southwest of the channel along the old county ditch.

During the fall, migrating divers seem to prefer habitat conditions found in the west end of the east pool. Swans in small family groups frequent this area around the first week of November. The west pool, especially by the auto tour stop #1, receives good use by early migrating dabblers, i.e. gadwall, wigeon and northern shovelers.

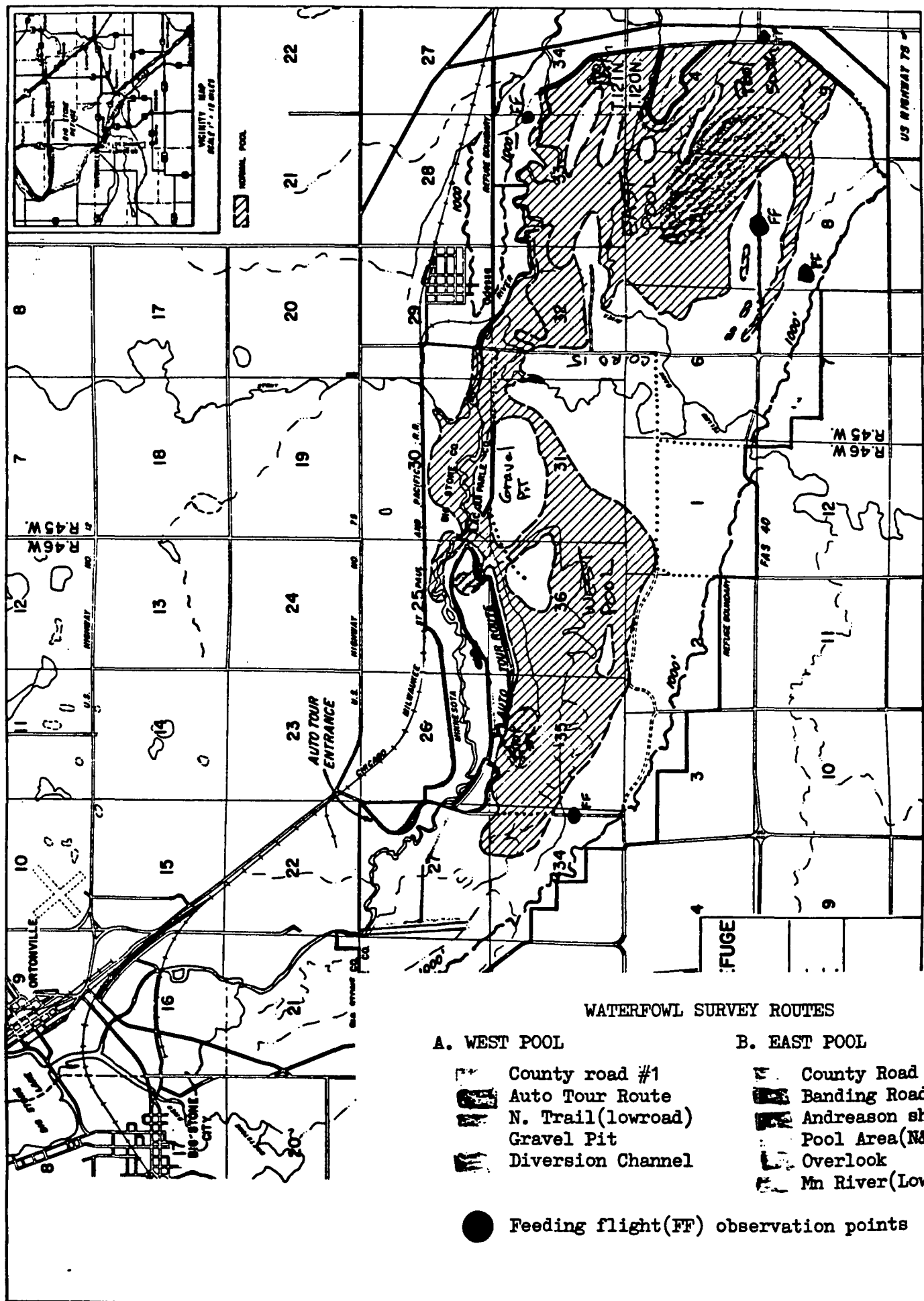
The chronology of the migration is recorded with the aid of arrival and departure dates and trend data; and, can become a useful management tool. Off-refuge wetlands will provide supplemental information and should be checked periodically for early spring migrants.

#### IV. Manpower and Costs

To estimate waterfowl maintenance by these procedures requires the expenditure of about 20 staff days (SD) per year. The manpower commitments by season are as follows: Spring--7 SD, Summer--3 SD, Fall--7SD and Winter--3 SD. Equipment costs are estimated at \$100 for maintenance. Materials consumed consist primarily of gas and oil at \$150 annually.

#### V. Appendices

- Appendix No. 1-1 - Map of Waterfowl Survey Routes
- Appendix No. 1-2 - Refuge Waterfowl Survey Form
- Appendix No. 1-3 - Waterfowl Quarterly Summary
- Appendix No. 1-4 - Monthly Waterfowl Populations
- Appendix No. 1-5 - Mid-December Goose Count
- Appendix No. 1-6 - Mid-Winter Waterfowl Survey



## REFUGE WATERFOWL SURVEY

Date \_\_\_\_\_ Time \_\_\_\_\_ Observers \_\_\_\_\_

Weather Conditions \_\_\_\_\_

## WEST POOL

Species	Gravel Pit	North Trail	Diversion Channel	Auto Tour Stop #1	Co. Rd. 1	Actual Total	Combined Total
W. Swan							
C. Goose							
B./S. Goose							
Mallard							
Gadwall							
Widgeon							
Pintail							
Shoveler							
B.W. Teal							
G.W. Teal							
Wood Duck							
Buddy							
Redhead							
Canvasback							
Scamp							
R.N. Duck							
Goldeneye							
Bufflehead							
H. Merganser							
C. Merganser							
Comments: Pool Level		m.l				Total	

# REFUGEE WATERFOWL SURVEY

Date \_\_\_\_\_ Time \_\_\_\_\_ Observers \_\_\_\_\_

Weather Conditions \_\_\_\_\_

## EAST POOL

Species	Andreassen Backwaters	Pool Area South North	Overlook	Minn. River	Co. Rd. 15	Pool Area Bndg. Site	Actual Total
W. Swan							
C. Goose							
B./S. Goose							
Mallard							
Gadwall							
Widgeon							
Pintail							
Shoveler							
B.W. Teal							
G.W. Teal							
Wood Duck							
Ruddy							
Redhead							
Canvasback							
Scaup							
R.N. Duck							
Goldeneye							
Bufflehead							
H. Merganser							
C. Merganser							

Comments: Pool Level m.l.

Total

\_\_\_\_\_**QUARTER, FY**\_\_\_\_\_

**I**

## Whistling

## Canada

## Snow

## White-Fronted

## Mallard

## Gadwall

## Widgeon

## Pintail

## Shoveler

## Blue-Winged Teal

## Green-Winged Teal

## Wood

## Ruddy

IR Code				Organization Number					Name				Report Period		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Yr	Mo
3	0	4	0	3	2	6	4	0	0	0	0	3	4	5	

APPENDIX 1-4

## MONTHLY WATERFOWL POPULATIONS

SPECIES NAME	LINE CODE									NO. HARVESTED	AVERAGE POPULATION	UNIT RBU	PEAK POPULATION	
	18	19	20	21	22	23	24	25	26				27-35	36-45
AMERICAN COOT	7	2	1	2	2	1	0	W	P					
SWANS:	7	1	1					W	S					
GEESE: White-Fronted	7	1	2	1	7	1	0	W	G					
Snow-blue	7	1	2	1	6	9	0	W	G					
Canada	7	1	2	1	7	2		W	G					
DUCKS: Mallard	7	1	3	1	3	2	0	W	D					
Black	7	1	3	1	3	3	0	W	D					
Godwall	7	1	3	1	3	5	0	W	D					
Pintail	7	1	3	1	4	3	0	W	D					
Green-winged Teal	7	1	3	1	3	9	0	W	D					
BW/Cinn Teal	7	1	3	1	4	0	0	W	D					
Am. Widgeon	7	1	3	1	3	7	0	W	D					
Shoveler	7	1	3	1	4	2	0	W	D					
Wood Duck	7	1	3	1	4	4	0	W	D					
Redhead	7	1	3	1	4	6	0	W	D					
Ring-necked Duck	7	1	3	1	5	0	0	W	D					
Canvasback	7	1	3	1	4	7	0	W	D					
Lesser Scaup	7	1	3	1	4	9	0	W	D					
Bufflehead	7	1	3	1	5	3	0	W	D					
Ruddy	7	1	3	1	6	7	0	W	D					
CONTROL TOTALS	9	9	5	0	0	0	0	W	Z					

Region 3 Station BIG STONE NWR Date Prepared \_\_\_\_\_

Name \_\_\_\_\_

Form 3-243  
Rev. 12 /75

## Mississippi Flyway

**Area Surveyed** \_\_\_\_\_

### Weather

How Surveyed: Aerial \_\_\_\_\_ Boat \_\_\_\_\_ Auto \_\_\_\_\_  
hrs. mi. mi.

9

Species	Field Notes	Total
Canada geese		
Blue geese		
Snow geese		
White-fronted geese		
Brant		
Other		
Total Geese		

Comments: \_\_\_\_\_

Observer's Signature

# MIDWINTER WATERFOWL SURVEY

S. \_\_\_\_\_ Dates of Survey \_\_\_\_\_, 19\_\_ County BIG STONE  
Area Covered BIG STONE NWR How Covered: aerial \_\_\_\_\_ boat \_\_\_\_\_ auto \_\_\_\_\_  
hrs. \_\_\_\_\_ mi. \_\_\_\_\_ mi.

Species	Field Notes	Totals	Species	Field Notes	Totals
Mallard			Eider		
Black d.			Scoter		
Mottled d.			Oldsquaw		
Gadwall			Harlequin		
Wigeon			SEADUCK		
G-W teal			TOTAL		
B-W teal			MERGANSERS		
Cinn. teal			UNIDENTIFIED		
Shoveler			TOTAL		
Tail			DUCKS		
Wood d.			Brant		
Whistling d.			Snow g.		
DABBLER			Blue g.		
TOTALS			Ross' g.		
Redhead			White-fr. g.		
Canvasback			Canada g.		
Scaup			TOTAL		
Ringneck			GEESE		
Goldeneye			Whistling swan		
Bufflehead			Trumpeter swan		
Ruddy d.			Mute swan		
DIVER			TOTAL		
TOTALS			SWANS		
			COOT		
			GRAND TOTAL		

**COMMENTS:**

(Signature)



WILDLIFE INVENTORY PROCEDURE NO. 2Goose and Duck ProductionI. Purpose

Waterfowl production is the primary objective for Big Stone National Wildlife Refuge. Waterfowl production estimates determined by breeding pair count and brood surveys will determine if refuge objectives are being met or if special management practices have influenced production. Though this may be difficult to measure because of the questionable comparability of year-to-year counts, long term trend data is valuable.

Regional Resource Plans (RRP) have identified several species of special emphasis that are being produced on Big Stone NWR. These species are mallard, redhead, canvasback, northern pintail, wood duck and the Canada goose (Eastern Prairie Population). Production data are collected on these species and will help for the appropriate management strategies for those RRP species on the refuge.

II. ProcedureA. Background

Waterfowl production is estimated by data collected during breeding pair counts, brood surveys and general surveys. Separate procedures for each method are discussed below.

Similar to waterfowl population surveys (Procedure No. 1) production surveys have been conducted by refuge personnel but for a shorter period, since 1978. During this period these procedures became standardized but changes in plant succession have influenced not only how observers conduct the surveys but the distribution of breeding pairs and broods by habitat preference.

B. Data Collection1. Breeding Pair Counts

Waterfowl census for breeding pairs are conducted annually around May 18th. Census will be performed on several different days during the period five days before and after May 18th in order to estimate the status of the migration. This is done to gauge whether or not local breeding populations have stabilized. The results of each census are compared with emphasis placed on mallard and blue-winged teal counts. When the ratio of lone males per pairs reaches about 1:1, local breeding populations are thought to have stabilized. Additional surveys may be required to determine the respective population and production levels of other late nesting dabblers and migrating diver ducks.

Pair counts are normally performed along established routes. Some minor exceptions occur as vehicle and/or wade/walk routes are added or deleted in order to adjust to water level variations, prescribed burning, plant succession and manpower shortages. The survey map (Appendix No. 2-1) is a composite map depicting routes that were utilized from 1980 to 1987.

Breeding pair census routes are conducted in the following manner which requires a minimum of two observers. The east pool route begins at the maintenance shop on County Road #15 and proceeds counter-clockwise around the pool. Vehicle surveys are completed before the wade/walk surveys are performed around the east pool. The west pool surveys begin at the gravel pit entrance on County Road #15. On this portion of the count, water levels can influence which transects are completed; therefore, concerns stated in Wildlife Inventory Procedure No. 1 should be considered. At stop #1, a permanent wade/walk transect is performed when the observer arrives at this part of the census. When vehicle surveys are completed, observers establish radio contact to coordinate the next phase of the census, i.e. wade/walk transects on the east pool.

During breeding pair counts, waterfowl sightings are recorded in the following manner on either a micro-cassette recorder or the refuge waterfowl survey form (Appendix No. 2-2). When a cassette recorder is used, census results are transposed onto the forementioned form. For each survey segment, waterfowl counts are kept by species according to the number of lone males and pairs for dabblers; and, the number of pairs, lone males and lone females for diver ducks. Also, the number of ducks in each flock is recorded by species. For Canada geese, brood sightings are recorded as a breeding pair as are lone geese.

A minimum of two observers is required to conduct breeding pair counts since wade/walk surveys consume large amounts of time. Observers need to begin surveys within one-half hour after sunrise.

Wade/walk surveys are incorporated into the breeding pair census, and are conducted primarily around the east pool. On the Andreassen shoreline transect, hip-boots are required. Here the survey begins at the Highway 75 dam and proceeds west to the bay adjacent to the bird banding area and then goes one-quarter mile to the west to a large oak tree. This transect requires about one hour to walk. On the low flow prairie transect, the observer begins at the low flow structure and proceeds west just above the shoreline for about one-half mile to a small gully. This round trip takes about 45 minutes to walk. The wade/walk survey of the Yellowbank River area is described in Wildlife Inventory Procedure No. 3.

Minimum acceptable weather conditions are partly cloudy or broken cloud conditions with good visibility. Broken cloud conditions exist when 60-90% of the sky contains clouds within about a five mile radius of the observer. Also, winds should be below 15 mph.

## 2. Brood Surveys

Production data from brood surveys is obtained from both standardized procedures and general surveys. Brood data that is gathered along established routes is collected according to guidelines developed by Hammond, M.C. as revised in his Waterfowl Brood Survey Manual of 1970. A summary of these procedures follows. The three-count method is preferred with counts performed around June 24, July 20 and August 15. The following information is recorded for each brood sighting if possible: waterfowl species, number of young, age-class and location. Age-class determinations are made according to the criteria in Appendix No. 2-3. When gathering the above data, extra time is not taken to "stretch" glasses in order to avoid biasing the data. Vehicle stops can range from 1-5 minutes to scan areas where water extends from the transect route for more than 200 yards. Otherwise, vehicles do not stop when passing water bodies except when broods are seen. Vehicle speeds of 5-10 mph are recommended along transects next to brood habitat.

Brood census routes are similar to breeding pair routes (Appendix No. 2-1) and are performed in the same manner as breeding pair counts. Vehicle transects are conducted prior to wade/walk surveys. Vehicle travel is the same direction around each pool. Equipment needs are identical.

Brood surveys on most samples should be completed during the two hour period after sunrise. Brood counts can be conducted in the two hour period before sunset, but this option has not been utilized at Big Stone. The wade/walk transects can be surveyed throughout the day as weather permits. Minimum weather conditions are broken cloud cover and winds below 10 mph with moderate temperatures.

Brood sighting at other times are documented whenever they occur. Field notes contain as much of the above species specific information as possible. These sightings are listed in chronological order by date on file memorandum.

## B. Data Processing

### 1. Breeding Pair Counts

Breeding pair census data are processed in the following manner. For each species the number of observed pairs are added to the number of lone males for segment of the survey. Lone males

up to a flock of four are each representative of an individual pair. This composite number of breeding pairs for each species (pairs + lone males) is summed over all species to yield a census total for all breeding pairs. Then a species frequency of occurrence for the census is determined by dividing each species breeding pair total by the census breeding pair total.

Next, to expand census results to the entire refuge, an intermediate step is required. An expansion coefficient is developed for the percentage of habitat surveyed over the entire count. The percentage of habitat surveyed is roughly determined by area and miles of shoreline sampled. Miles of shoreline at full pool (952.3 msl) were calculated by the Corps of Engineers in their original design documents. For water levels below pool stage, rough estimates of surface acres and miles of shoreline are made from ASCS aerial photographs.

Another variable that is considered when developing the expansion coefficient is the observability factor. Previously, the observability factor was a subjective estimate averaged over the refuge pools. However, following the first and second drawdowns of Big Stone's pool in 1981 and 1983, the observability factor changed radically. Presently, efforts are in the developmental stage on how to adjust census results to accommodate the increase in emergent vegetation. The following procedure serves as a starting point. The observability factor is a visual estimate of the percent of water surface open enough to permit waterfowl observations. Thin emergent vegetation is classed as open if inspection with binoculars or spotting scope suggests that waterfowl would be seen. The percentage of open water is estimated for each census transect. An average for the refuge is developed from the summation of all percent figures and divided by the number of transects. Then, this average is used to adjust the percentage of area sampled, and yields the expansion coefficient.

<u>Percent Open Water</u>	<u>Percent Adjustment to the Percent of Area Sampled</u>
81 to 100	-20
61 to 80	-10
41 to 60	0
21 to 40	+10
0 to 20	+20

Previously, the expansion coefficient has varied from 10% to 58.6%

Once the expansion coefficient is developed, it is divided into the census total for all breeding pairs. This yields an estimated refuge population of breeding pairs. Next, species specific data is developed out of this hypothetical estimate. The frequency of occurrence for each species is multiplied into the

population total to yield individual breeding population estimates for all species censused during the count. After a species breeding population has been estimated, it is multiplied by several factors which estimate sex ratios, hen survival, hen success, clutch sizes and duckling survival to fledging. The resulting figures equal waterfowl production. These factors were derived from a March 28, 1984 memo from the Region Three Migratory Bird Coordinator and can be found in Appendix No. 2-4; the memo is filed under REFUGE: Annual Waterfowl Production.

The above factors may be adjusted annually to reflect refuge-specific data derived from Big Stone's nest-dragging study, wood duck nesting box survey, and other waterfowl studies.

## 2. Brood Counts

Annually, brood surveys of various sorts have attempted to gather useful waterfowl production data on Big Stone. However, no procedure to date has produced meaningful results. Data processing consists primarily of a compilation of the total number of broods observed per species per year. Broods that are observed during the Hammond three-count census are recorded separately from other brood sightings. When brood counts of sufficient numbers occur from all surveys, efforts are made to distinguish between broods sighted repeatedly for a given locale by age-class, time between sightings and mortality considerations. These results could generate hatching curves which might be helpful in determining when to conduct the Hammond counts and make them more productive.

In the meantime, annual waterfowl production estimates are derived primarily for breeding pair counts. On rare occasions, brood surveys have provided sufficient information to mold production estimates particularly for over-water nesters when late season water level fluctuations cause renesting to occur. Annual waterfowl production is recorded in Appendix No. 2-5.

## III. Special Considerations

Waterfowl production surveys encounter all the difficulties associated with statistical methods for data gathering. Obtaining representative samples for the distribution and abundance of breeding pairs or broods continues as an elusive goal. The heterogeneity of habitat, land and water management programs, station funding and manpower and the natural variability of the resource and climate, all interact to limit census efforts. Considering the complexity of the problem and the size of Big Stone Refuge, management decisions are required to delineate what resources should be committed to determine waterfowl production. In this regard, refuge personnel contacted several researchers at the Northern Prairie Research station during the summer of 1981. Several of their concerns about our situation are restated below. Given the

size of Big Stone, brood movements along the Minnesota River and the surrounding wetlands might cause difficulties in estimating production on Big Stone. Due to the small size of the refuge and the low percentage of waterfowl production from this area as compared to the Northern Prairie Pothole Region, trend data might be all that is needed. Production estimates with high degrees of accuracy might not be cost effective for our situation. Should resources become available, production surveys could be stratified and a variety of census methods employed for cross-checking production.

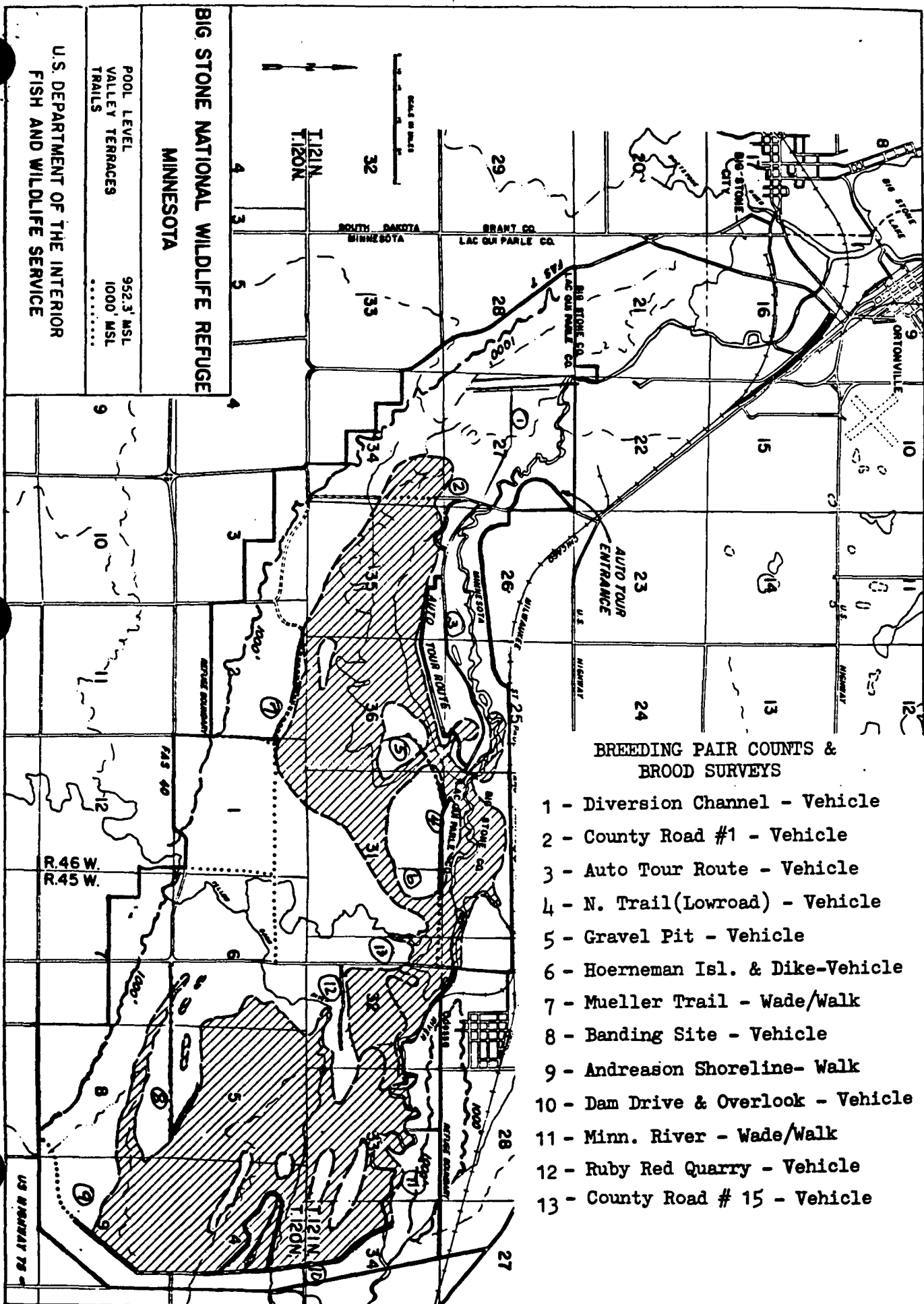
Given the present situation, continuity of procedures followed by repetition are the foremost concerns. Procedures to develop stratified survey routes should be investigated since water level manipulations have altered the marsh habitat considerably. Also, refuge nesting studies should be accomplished to compare local production per acre from Big Stone with Wetland Management Districts and the Prairie Pothole Region.

#### IV. Manpower and Costs

To estimate waterfowl production, a total of six staff days (SD) are utilized. Three SD each are required to conduct breeding pairs and brood surveys and process the information. Equipment and material costs are negligible with a combined cost of \$100.

#### V. Appendices

Appendix No. 2-1 - Breeding Pair Survey, Brood Survey Map  
Appendix No. 2-2 - Refuge Waterfowl Survey Form  
Appendix No. 2-3 - Waterfowl Age-Class Table  
Appendix No. 2-4 - Waterfowl Production Formulas  
Appendix No. 2-5 - Annual Waterfowl Production Report



REFUGE WATERFOWL SURVEY

Date \_\_\_\_\_ Time \_\_\_\_\_ Observers \_\_\_\_\_

Weather Conditions \_\_\_\_\_

WEST POOL

Species	Gravel Pit	North Trail	Minn. River	Auto Tour Stop #1	Co. Rd. 1	Actual Total	Combined Total
W. Swan							
C. Goose							
B./S. Goose							
Mallard							
Gadwall							
Widgeon							
Pintail							
Shoveler							
B.W. Teal							
G.W. Teal							
Wood Duck							
Ruddy							
Redhead							
Canvasback							
Scaup							
R.N. Duck							
Goldeneye							
Bufflehead							
H. Merganser							
C. Merganser							

Comments: Pool Level m.1 Total



Table 20.1. Development of a wild duckling as viewed under ideal conditions (from Gollop and Marshall 1954). See Table 20.2 for use in aging.

Plumage Class	Sub-class	Description
I	a	" <i>Bright Ball of Fluff.</i> " Down bright. Patterns distinct (except diving ducks). Body rounded. Neck and tail not prominent.
Downy young; no feathers visible	b	" <i>Fading Ball of Fluff.</i> " Down color fading, patterns less distinct. Body still rounded. Neck and tail not yet prominent.
	c	" <i>Gawky-Downy.</i> " Down color and patterns faded. Neck and tail become prominent. Body becomes long and oval.
II Partly feathered as viewed from the side	a	" <i>First Feathers.</i> " First feathers show on side under ideal conditions, stays in this class until side view shows one-half of side and flank feathered.
	b	" <i>Mostly Feathered.</i> " Side view shows one-half of side and flank feathered. Primaries break from sheaths. Stays in this class until side view shows down in one or two areas only (nape, back or upper rump).
	c	" <i>Last Down.</i> " Side view shows down in one or two areas only (nape, back or upper rump). Sheaths visible on erupted primaries through this class. Stays in this class until profile shows no down.
III Fully-feathered as viewed from side	a	" <i>Feathered-Flightless.</i> " No down visible. Primaries fully out of sheaths but not fully developed. Stays in this class until capable of flight.

Waterfowl Production Formulas\*

Dabblers: (mallard data)

Production = total estimated breeders on refuge land x  
47.62% hen ratio (1.10 M:F) x 72% summer hen survival  
x 40% hen success x average of 8.4 eggs hatched/success-  
ful hen x 55% duckling survival to fledging.

Divers: (canvasback data)

Production = total estimated breeders on refuge land x  
35.5% hen ratio (1.82 M:F) x 90% summer hen survival  
x 45% hen success x average of 8 eggs hatched/success-  
ful hen (some will be redheads) x 65% duckling survival  
to fledging.

Wood ducks:

Production = total estimated breeders x 43.2% hen ratio  
(1.76 M:F) x 85% summer hen survival x 55% hen success  
(inflated for strong renesting effort and multiple  
successful nests) x average of 12 eggs/successful hen.  
x 60% duckling survival to fledging.

\* Oetting memo of 3/28/84.

- APPENDIX NO. 2-5

# ANNUAL WATERFOWL PRODUCTION

TR Code				Organization Number							Name				Report Period			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
3	0	5	0						0	0								

SPECIES NAME	LINE CODE											BREEDING POP.	ESTIMATED PRODUCTION	UNIT RBU
	18	19	20	21	22	23	24	25	26			27-35	36-45	46-55
AMERICAN COOT	0	8	0	2	2	1	0	L	C					
SWANS: Trumpeter	8	0	1	1	8	1	0	L	S					
GEESE: Canada	8	0	2	1	7	2		L	G					
DUCKS: Mallard	8	0	3	1	3	2	0	L	D					
Black	8	0	3	1	3	3	0	L	D					
Gadwall	8	0	3	1	3	5	0	L	D					
Pintail	8	0	3	1	4	3	0	L	D					
Green-winged Teal	8	0	3	1	3	9	0	L	D					
BW/Cinn. Teal	8	0	3	1	4	0	0	L	D					
Am. Widgeon	8	0	3	1	3	7	0	L	D					
Shoveler	8	0	3	1	4	2	0	L	D					
Wood Duck	8	0	3	1	4	4	0	L	D					
Redhead	8	0	3	1	4	6	0	L	D					
Ring-necked Duck	8	0	3	1	5	0	0	L	D					
Canvasback	8	0	3	1	4	7	0	L	D					
Lesser Scaup	8	0	3	1	4	9	0	L	D					
Common Goldeneye	8	0	3	1	5	1	0	L	D					
Barrows Goldeneye	8	0	3	1	5	2	0	L	D					
Bufflehead	8	0	3	1	5	3	0	L	D					
Ruddy	8	0	3	1	6	7	0	L	D					
CONTROL TOTALS	9	9	6	0	0	0	0	L	X					

Region \_\_\_\_\_ Station \_\_\_\_\_ Date Prepared \_\_\_\_\_

Name \_\_\_\_\_

Form 3-244  
Rev. 12/75

WILDLIFE INVENTORY PROCEDURE NO. 3Cavity Nesting Duck Population & Production SurveysI. Purpose

- 1) Wood duck habitat constitutes a minor percentage of the habitat types on Big Stone Refuge, and wood duck habitat is not randomly sampled during other waterfowl surveys. To overcome these biases, separate inventory procedures are required in order to obtain population data for cavity nesting ducks.
- 2) Cavity nesting duck production ranks third in priority for this refuge. Further emphasis on the importance of wood duck population data is exemplified by the Regional Resource Plan (RRP) which identifies the wood duck as a Species of Special Emphasis. Big Stone's base line data for wood ducks will be needed to track the refuge and regional success of proposed strategies for wood duck management.

II. Procedure

Duck population and production procedures are combined here, due to the limited size of the wood duck and hooded merganser populations on the refuge. The present method for estimating population data for cavity nesters is based on breeding pair counts, brood surveys, and general and special waterfowl surveys.

A. Cavity Nesting Duck Populations1. Background

The Minnesota River valley provides a migration corridor for cavity nesting ducks into western Minnesota. With the establishment of Big Stone Refuge, the local populations of the wood duck and hooded merganser increased in size, and complimented the populations that were utilizing the sanctuary on Lac qui Parle State Refuge. When the pool on Big Stone Refuge was flooded in 1974, cavity nesters found favorable habitat amongst flooded timber and backwater areas. This significant change in the resource base was met with a corresponding increase in duck maintenance and production. Locally, this initial influx of cavity nesters stabilized by 1979 and 1980. Colonization by wood ducks reached the saturation point early due to the limited size of the floodplain forest. Timber flooded by impounded water created a housing boom with short term implications. As flooded timber died, the generation of natural nesting cavities was stopped. Artificial nesting structures were installed between 1976 and 1978 in an attempt to maximize wood duck production in refuge habitat. Possibly by 1980, the wood duck production had peaked, with the increasing loss of nest trees to decay. Consequently, production and maintenance totals are expected to decrease as nesting sites are lost unless the artificial nesting box program is continued. Currently, there are approximately 50 artificial boxes available each year.

## 2. Data Collection

During the spring and fall migration, data on cavity nesting ducks is collected according to general waterfowl survey procedures. Weekly inventories are conducted to measure important changes in population trends of migrating waterfowl.

During the period of May through September, cavity nester use days are developed from breeding pair counts and special woodie surveys. At this time, a large percentage of cavity nester habitat is surveyed and the obtained results are used to estimate the size of resident population. A special survey to estimate wood duck abundance is conducted along the Yellowbank River, east of county road #15 for the following reasons:

- area is consistently used by wood ducks,
- area is representative of local wood duck habitat,
- both stream flow and backwater areas are surveyed,
- and, time spent surveying is minimal.

this special survey of the Yellowbank River/Ruby Red Quarry area samples a large percentage of the refuge's wood duck habitat. The survey should be done by wade/walk method during the period of mid-May to early June. The survey is conducted according to the survey map (Appendix No. 3-1) and accomplished about two hours after sunrise. Basic equipment consists of binoculars, hip boots and micro recorder. Data is later recorded on weekly waterfowl survey form (Appendix 3-2).

## 3. Data Processing

During spring and fall migrations, wood duck and hooded merganser populations are derived from weekly counts of survey segments and lumped together by species in Appendix No. 3-2 as per other waterfowl population surveys (Procedure No. 1). The observer must develop an expansion factor by the percentage of species observed and the percentage of habitat observed at each location similarly described under procedure No. 1. Generally a much lower percentage of species and habitat observed for cavity nesters is assigned due to their lower observability and habitat preference.

Weekly population estimates are computed from data in Appendix No. 3-2 and are recorded in Appendix No. 3-3. Average monthly populations are derived from the sum of weekly estimates, divided by the number of weeks for that month reported on the monthly waterfowl populations output report (Appendix No. 3-4), and submitted to the Washington Office as in Procedure No. 1.

During May, cavity nesting waterfowl populations are developed from breeding pair counts, feeding flight surveys, and special surveys (Appendix No. 3-1).

## B. Cavity Nesting Duck Production

### 1. Background

Historically, wood duck and hooded merganser production has been occurring along the Minnesota and Yellowbank Rivers throughout the refuge. Attempts by Service personnel to estimate this annual production began in 1972 when refuge lands were purchased by the Corps of Engineers. Production estimates and procedures were documented in 1976. Breeding pair counts were conducted in May of 1976, and 47 Bellrose type artificial nesting structures were installed during the summer and checked in the fall. The following basic format of surveying, 1) standard routes for various types of information, and 2) artificial nesting boxes during a given period annually, has remained relatively constant even though some of the basic assumptions have changed. For example, survey assumptions from 1976 to 1979 were based on a percentage of the refuge population observed; while today, a percentage for the amount of habitat surveyed is used as a coefficient to expand survey data. Also, in 1978 brood surveys were initiated and continued to the present with varying degrees of success. Production estimates for cavity nesting ducks on Big Stone follow no proven method although attempts have been made to utilize parts of various census methods.

### 2. Data Collection

Production by cavity nesting ducks is estimated by data collected during breeding pair counts, brood surveys and nest box surveys. A synopsis of breeding pair count procedures are presented here from Wildlife Inventory Procedure No. 2. Essentially breeding pairs are counted along established survey routes. All wood duck pairs and male ducks up to four in a flock are counted individually by category; and, are considered as a breeding pair for pair count purposes. Hooded mergansers are counted slightly different in that female ducks are included in the count and are added as a breeding pair to the count total.

Production data from brood surveys is obtained from both standardized procedures and chance sightings. Brood data that is gathered along established routes is collected according to guidelines developed by Hammond, M.C. as revised in his Waterfowl Brood Survey Manual of 1970. The three-count sampling method is used with counts occurring around the following dates: June 24, July 20 and August 15. Most of Hammond's observation correction factors have not been applied to survey data nor are his data gathering forms utilized. Occasionally, canoe surveys are undertaken along the Minnesota and Yellowbank Rivers when other surveys fail to produce merganser and wood duck brood sightings.

Artificial nesting structures are surveyed to provide production information on cavity nesting ducks. During this survey, as much information as possible is recorded about any wildlife usage

at each nesting box according to species and nesting success. Information collected should include species, number of eggs hatched and unhatched. This data is recorded on refuge box inventory form (Appendix 3-5).

Big Stone's nesting boxes have been surveyed during winter after freeze-up since 50% of the nesting boxes are located over water. However, it is possible and most desirable to check boxes shortly after the nesting season (July). Data collected is usually more complete and accurate and is used for estimating the refuge waterfowl production for that year. The following factors should be considered when performing this survey. Two workers are required for this survey for safety reasons. A twenty foot extension ladder is needed for this survey, and a large scale map depicting the nest box locations is necessary. Also, a sample of egg shells and down feathers from wood ducks and hooded mergansers is desirable for species identification. A supply of wood chips/sawdust and a carrying pail are used to service the nest boxes. Various hand tools are also made available for maintenance purposes.

### 3. Data Processing

Production data that is gathered from breeding pair counts, brood surveys and nesting box surveys is developed by procedures specific for each survey. The results from each survey, however, are considered in light of other survey findings due to various survey biases. Finally, subjective judgments are employed to finalize production estimates for wood ducks and hooded mergansers.

Breeding pair count data is developed according to procedures in Wildlife Inventory Plan No. 2. Pair count production estimates for wood ducks and hooded mergansers are modified as appropriate from findings from other surveys.

Pair count results with adjustments are finalized at the end of the summer when brood surveys are complete and refuge population estimates are considered adequate.

Brood survey data is generated via the Hammond three-count surveys, canoe surveys and chance sightings. Data processing consists primarily of a computation of the number of broods seen per species per season. When brood sightings are of sufficient number, efforts are made to distinguish between broods sighted repeatedly for a given area by age-class, time between sights and mortality considerations. Broods sightings of sufficient quantity and quality provided meaningful population data for wood ducks in 1980 and hooded mergansers in 1981. Yearly production estimates are reported in Appendix No. 3-6, Annual Waterfowl Production.

Artificial nesting box surveys generate base line information on the activity of cavity nesting wildlife. Survey data is only processed to simple levels, for example: percentages of box use by all wildlife and by duck species; and the percentage of successful duck nests for either Bellrose or Tom Tubb boxes. In addition, duck use over a period of time is evaluated for given areas and for the type of nesting boxes.

Depending on nesting records, boxes are removed and/or replaced by boxes of a different type in various areas.

All waterfowl surveys including maintenance and production surveys provide input into the annual production estimate for cavity nesting ducks. At present, population estimates that are derived from the Yellowbank River and feeding flight surveys do more to mold the production estimates than do the results from production surveys. This situation is expected to continue into the future.

### III. Special Considerations

To detect changes in the level of the resident populations, additional efforts are needed due to the difficulty of censusing cavity nesters. Essential wade/walk or boat surveys are required to transverse wood duck habitat. At times, two or three observers are required to conduct particular surveys. This is especially true to decipher the results of feeding flights and whether or not the ducks are roosting on the refuge. Survey personnel will encounter an additional factor that wood duck habitat preference changes between the spring and summer. Generally, wood ducks move from the shallow west pool to the deeper east pool to molt. These additional efforts are needed to gather more base line data on local wood duck population in order to evaluate the success of any RRP management strategies applicable to Big Stone.

RRP strategies for wood duck management emphasizes the importance of 1) reducing the rate of habitat destruction and 2) reducing predation. While accomplishing habitat preservation on Big Stone Refuge, continual efforts are made to preserve nesting trees in areas where head and/or flooded timber are removed by special permits. Cavity tree production and maintenance will be address in this stations Forest Management Plan.

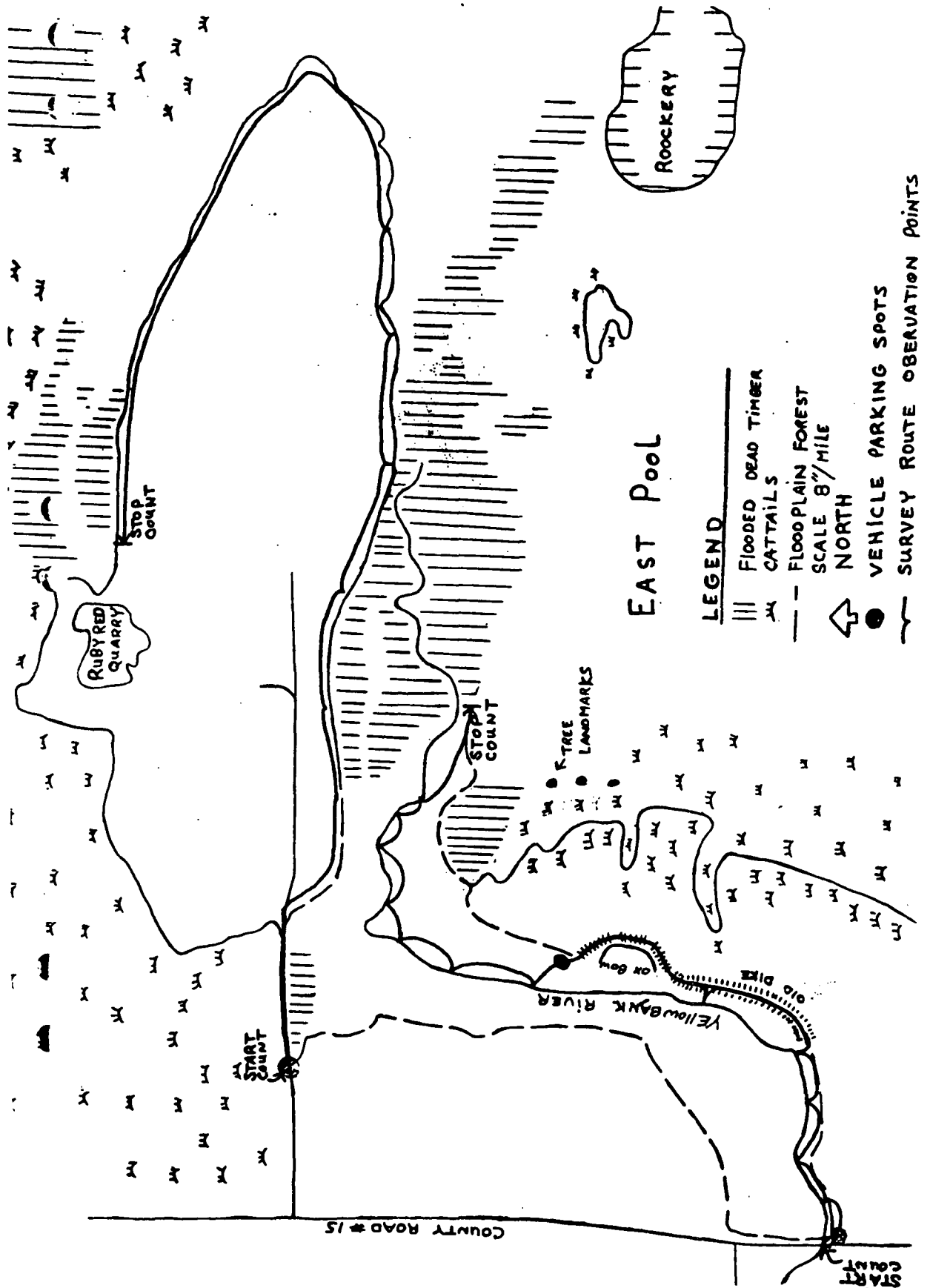
### IV. Manpower and Costs

Five staff days are utilized to inventory cavity nesting ducks in the following manner: boat surveys - 2 SD, wade/walk and feeding flight surveys - 1 SD, and a pro-rated annual cost against all waterfowl surveys, - 2 SD. Equipment costs are estimated at \$30 for maintenance. Materials consumed consist primarily of gas and oil at \$20 annually.

### V. Appendices

- Appendix No. 1 - Yellowbank River Wade/Walk Survey
- Appendix No. 2 - Refuge Waterfowl Survey
- Appendix No. 3 - Waterfowl Quarterly Summary
- Appendix No. 4 - Monthly Waterfowl Populations
- Appendix No. 5 - Artificial Nesting Box Survey Legend
- Appendix No. 6 - Annual Waterfowl Production





## REFUGE WATERFOWL SURVEY

Date \_\_\_\_\_ Time \_\_\_\_\_ Observers \_\_\_\_\_

Weather Conditions \_\_\_\_\_

## EAST POOL

Species	Andreassen Backwaters	Pool Area South North	Overlook	Minn. River	Co. Rd. 15	Pool Area Bndg. Site	Actual Total
W. Swan							
C. Goose							
B./E. Goose							
Mallard							
Gadwall							
Widgeon							
Pintail							
Shoveler							
B.W. Teal							
G.W. Teal							
Wood Duck							
Ruddy							
Redhead							
Canvasback							
Scaup							
R.N. Duck							
Goldeneye							
Bufflehead							
H. Merganser							
C. Merganser							
Comments: Pool Level		m.l.				Total	

# REFUGE WATERFOWL SURVEY

Date \_\_\_\_\_ Time \_\_\_\_\_ Observers \_\_\_\_\_

Weather Conditions \_\_\_\_\_

## WEST POOL

Species	Gravel Pit	North Trail	Minn. River	Auto Tour Stop #1	Co. Rd. 1	Actual Total	Combined Total
W. Swan							
C. Goose							
B./S. Goose							
Mallard							
Gadwall							
Widgeon							
Pintail							
Shoveler							
B.W. Teal							
G.W. Teal							
Wood Duck							
Buddy							
Redhead							
Canvasback							
Scaup							
R.N. Duck							
Goldeneye							
Bufflehead							
H. Merganser							
C. Merganser							

Comments: Pool Level

m.l

Total

# WATERFOWL \_\_\_\_\_ QUARTER \_\_\_\_\_

Page \_\_\_\_\_ of 2

## REPORTING WEEK AND ENDING DATE

### Ducks (Continued)

Redhead

Canvasback

Scaup

Ring-necked

Goldeneye

Bufflehead

Merganser-Hooded

Merganser-Common

Mare Coot



Fish and Wildlife Service  
Division of Wildlife Refuges  
APPENDIX NO. 3-4

MONTHLY WATERFOWL POPULATIONS

TR Code				Organization Number					Name				Report Period		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	Yr	Mo
3	0	4	0						0	0					

SPECIES NAME	LINE CODE									NO. HARVESTED	AVERAGE POPULATION	UNIT RBU	PEAK POPULATION	
	18	19	20	21	22	23	24	25	26				NUMBER 56-65	DAY 66 67
	7	2	1	2	2	1	0	W	P	27-35	36-45	46-55	56-65	66 67
AMERICAN COOT	7	2	1	2	2	1	0	W	P					
SWANS:	7	1	1					W	S					
GEESE: White-Fronted	7	1	2	1	7	1	0	W	G					
Snow-blue	7	1	2	1	6	9	0	W	G					
Canada	7	1	2	1	7	2		W	G					
DUCKS: Mallard	7	1	3	1	3	2	0	W	D					
Black	7	1	3	1	3	3	0	W	D					
Gadwall	7	1	3	1	3	5	0	W	D					
Pintail	7	1	3	1	4	3	0	W	D					
Green-winged Teal	7	1	3	1	3	9	0	W	D					
BW/Cinn Teal	7	1	3	1	4	0	0	W	D					
Am. Widgeon	7	1	3	1	3	7	0	W	D					
Shoveler	7	1	3	1	4	2	0	W	D					
Wood Duck	7	1	3	1	4	4	0	W	D					
Redhead	7	1	3	1	4	6	0	W	D					
Ring-necked Duck	7	1	3	1	5	0	0	W	D					
Canvasback	7	1	3	1	4	7	0	W	D					
Lesser Scaup	7	1	3	1	4	9	0	W	D					
Bufflehead	7	1	3	1	5	3	0	W	D					
Ruddy	7	1	3	1	6	7	0	W	D					
CONTROL TOTALS	9	9	5	0	0	0	0	W	Z					

Region \_\_\_\_\_ Station \_\_\_\_\_ Date Prepared \_\_\_\_\_

Name \_\_\_\_\_

## INDIVIDUAL NEST BOX RECORD

<u>BOX NO.</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>
8	WD 0/11				
10	WD 8/1				
11	No Use				
13	WD 0/2 HM 0/6				
14	HM 10/1				
15	WD 14/0				
16	HM 7/4				
17	No Use				
18	WD 17/4				
20	WD 10/1				
23	WD 9/0				
24	WD 10/5				
26	No Use				
27	No Use				
28	No Use				
29	HM 0/2				
31	WD 10/1				
32	HM 9/5				
40	No Use				
41	HM 8/4				
42	No Use				
43	HM 8/4				
44	No Use				
45	HM 12/3				
46	No Use				
50	HM 11/2				
51	HM 17/8				
53	HM 4/1				
56	HM 16/1				
61	HM 10/0				
63	HM 0/18				
64	HM 11/0				
65	HM 11/1				
68	NS				
69	NS				
70	HM 0/18				
71	HM 12/7				
72	No Use				
73	HM ?/1				
74	HM ?/10				
79	WD 13/0				
80	HM 16/1				
81	WD 8/0				
86	WD 16/0				
94	WD 12/1				
96	WD 0/3				
97	WD 7/1				

TOTAL  
AVAILABLE

47

WD-Wood Duck  
 HM-Hooded Merganser  
 NS-Not Surveyed  
 #/#-Eggs Hatched/Eggs Unhatched

APPENDIX NO. 3-6

TR Code	Organization Number										Name		Report Period		
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3	0	5	0						0	0					

## ANNUAL WATERFOWL PRODUCTION

SPECIES NAME	LINE CODE								BREEDING POP.	ESTIMATED PRODUCTION	UNIT RBU
	18	19	20	21	22	23	24	25			
AMERICAN COOT	0	8	0	2	2	1	0	L C	27-35	36-45	46-55
SWANS: Trumpeter	8	0	1	1	8	1	0	L S			
GEESE: Canada	8	0	2	1	7	2		L G			
DUCKS: Mallard	8	0	3	1	3	2	0	L D			
Black	8	0	3	1	3	3	0	L D			
Gadwall	8	0	3	1	3	5	0	L D			
Pintail	8	0	3	1	4	3	0	L D			
Green-winged Teal	8	0	3	1	3	9	0	L D			
BW/Cinn. Teal	8	0	3	1	4	0	0	L D			
Am. Widgeon	8	0	3	1	3	7	0	L D			
Shoveler	8	0	3	1	4	2	0	L D			
Wood Duck	8	0	3	1	4	4	0	L D			
Redhead	8	0	3	1	4	6	0	L D			
Ring-necked Duck	8	0	3	1	5	0	0	L D			
Canvasback	8	0	3	1	4	7	0	L D			
Lesser Scaup	8	0	3	1	4	9	0	L D			
Common Goldeneye	8	0	3	1	5	1	0	L D			
Barrows Goldeneye	8	0	3	1	5	2	0	L D			
Bufflehead	8	0	3	1	5	3	0	L D			
Ruddy	8	0	3	1	6	7	0	L D			
CONTROL TOTALS	9	9	6	0	0	0	0	L X			

Region \_\_\_\_\_ Station \_\_\_\_\_ Date Prepared \_\_\_\_\_

Name \_\_\_\_\_



WILDLIFE INVENTORY PROCEDURE NO. 4

MARSH AND WATER BIRD  
POPULATIONS AND PRODUCTION

I. Purpose

- 1) Marsh and water bird population maintenance ranks sixth in output priorities. The marsh and water bird population on Big Stone Refuge are monitored to fulfill the Service's stewardship role in managing the nation's wildlife resources.
- 2) Regional Resource Plans have identified two species that occur on Big Stone. These species of special emphasis are the great blue heron and the greater sandhill crane. Appropriate base line data is gathered on Big Stone NWR as it becomes available.

II. Procedure

- 1) Marsh and water bird maintenance and production surveys are combined under one procedure for reason of simplicity. Population data for this species group is obtained during general waterfowl surveys and special marsh bird production surveys.

A. Marsh and Water Bird Maintenance

1. Background

Marsh and water bird maintenance has been rather variable in the past due to fluctuations in the resource base. Probably the peak use for this species group occurred during C.Y. 1977 with 1,066,530 use days, excluding coot use. This peak use year can be correlated to the biological productivity of the refuge impoundment which had only been flooded since 1974. The wildlife response to 1977's abundance of food, water, and sanctuary can be attributed to favorable water supplies during a regional drought, a prolific fishery with a young age-class distribution and abundant nest sites for colonial nesting birds.

The greater sandhill crane visits Big Stone Refuge on rare occasions. Generally, sightings records have lacked information concerning roost areas. Field notes will include this habitat information so these areas can be monitored yearly.

Populations of colonial nesting birds provide the mainstay of Big Stone's marsh and water bird maintenance objective. Breeding cormorants, great blue heron, great egrets and black-crowned night herons in the east pool rookery make a significant use day contribution. However, since 1978, rookery use had been declining due to natural processes of wood decay resulting in the loss of nesting trees especially for black-crowned night herons. In time, all rookery trees are expected to fall, displacing the majority of these breeding birds from the refuge.

## 2. Data Collection

During migration periods, marsh bird abundance is monitored in conjunction with general waterfowl surveys. Weekly counts record wildlife abundance along established routes (Map-Appendix No. 4-1). Actual count figures are recorded on panasonic micro recorders and/or field data forms (Appendix No. 4-2). While most of this species group can be surveyed anytime in the morning, cormorant abundance needs to be determined during early morning feeding flights. Cormorant feeding flights can be conducted from either county road #15 or the bird banding road.

Survey routes are only generally segmented in east and west pools for this diverse wildlife group. Observation points are marked on the attached survey map. Coot observations are included on the marsh and water bird survey form and are reported on the monthly waterfowl report.

During the summer, marsh and water bird maintenance is estimated from weekly counts and special marsh bird production surveys. These special surveys determine, by the direct count method, the number of nests for the following colonial nesting species/groups: 1) western grebes and 2) cormorants, great blue herons, great egrets and black-crowned night herons. The number of active nests determines the population estimate for these birds.

The east pool rookery of herons, egrets and cormorants should be surveyed during June before the third fiscal quarter ends. Early morning is the best survey time since wind velocity is the most critical element in determining when this boat survey can be conducted. Minimum weather requirements are partly cloudy skies with winds below 8-10 mph.

To census the east pool rookery, the 16 foot flatbottom boat, motor oars, personal floatation devices, gas, micro recorder and binoculars are required. The work boat is rowed around the rookery at a distance of 30-50 yards from the outer most rookery trees. The preferred route begins at the east end of the rookery and proceeds first along the side of the rookery facing the prevailing breeze. For counting purposes the rookery is divided into imaginary north and south segments. The observer counts active nests through his binoculars and uses the tallest trees along the rookery's horizon as his imaginary east-west dividing line. In each tree, the number of active nests per species and the number of young present are recorded on a micro tape recorder as the observer proceeds slowly around the rookery. Also, nesting stage is recorded according to Colonial Bird Register procedures. Usually, only a portion of the total nests have visible young present. The average number of young observed in "x" number of nests can be expanded to include all active nests to estimate rookery production.

Western grebe nesting colonies are surveyed by canoeing in, around and through cattail stands. As nests are found, they are identified as to species and the number of eggs present is recorded. Other species nests that may be encountered are pied-bill grebes, eared grebes, ruddy ducks, redhead and black tern nests. An active western grebe nesting colony was located southeast of Odessa. This colony has not been located for the past several years but production has continued on the refuge. Nesting data from colonial bird surveys are recorded on Colonial Bird Register forms. (Appendix No. 4-3).

To conduct colonial nesting bird surveys for western grebes, the following equipment replaces that listed for rookery surveys: a 16 foot MonArk canoe, two paddles, a 2 HP Evinrude outboard, and an accessory two-gallon gas can. A 4 x 4 pickup fitted with a canoe carrying rack compliments the other equipment needed to complete this survey.

### 3. Data Processing

Marsh and water bird data is processed onto Appendix No. 4-4 according to the following method. Actual count figures are expanded by various coefficients for this species group with exceptions made for greater sandhill cranes, western grebes and rookery species. Expansion coefficients are determined the same way waterfowl expansions are made. The observer must determine what percent of the species was observed and what percent of the habitat of that specie's was covered. The number of individuals are then divided by these percentages to yield a population estimate on that particular segment of the survey. The sum of the segment populations will be the population estimate for the refuge.

Marsh and water bird maintenance totals during migration do not contribute significantly to the use day totals generated by resident populations. However, this migration data is particularly important in developing a framework in which to estimate the abundance of the resident populations. In addition, population data from previous years helps to develop this framework by giving an indication of potential species diversity and abundance.

Summer population levels are estimated from weekly surveys and special production surveys. Once an adequate population estimate is arrived at for each resident species, this weekly figure is used throughout the summer. Any unusual increases or decreases are documented with population levels adjusted accordingly.

Population data, that is finalized on Appendix No. 4-4, 4-5, is processed onto the required quarterly report. Use days per weekly period are summed over the quarter and reported in Appendix 4-6. Here, each species weekly population estimate is multiplied by 7 and summed over the quarter yielding a use day total.

### III. Special Considerations

Marsh and water bird surveys are conducted with varying degrees of difficulty depending upon the species. Rookery species during migration are difficult to census since feeding areas are widely dispersed and go beyond the refuge boundary. Also, these species are adapted to foraging in dimly lighted conditions or at night when surveys are ineffective. However, rookery species provide the easiest and most accurate nesting population data in the summer. At this time, the disturbance factor at the rookery is kept to a minimum with surveys performed at the peak of the nesting season. Otherwise, these species are most likely to abandon nesting attempts during the courtship and nest selection periods and least likely when young are present. Also, the colony is never entered during cold, rainy or exceptionally hot weather to avoid exposing the young to these conditions. Late season surveys past mid-July are discouraged since cormorant young will jump from their nests in fright. Having no resting area, these young die in the water.

Western grebe population on Big Stone offers a unique opportunity to develop a qualitative and quantitative natural history data base. Efforts should continue on an annual basis to relocate the nesting colony. Canoe surveys provide precise nesting information which can easily be expanded by candling grebe eggs to develop various population parameters/indices. Direct count or total census data can be compared to sample census data from vehicle surveys. These indices could have various applications in determining population data for other over-water nesting birds (Appendix No. 4-6).

Inventory procedures for marsh birds of low abundance or with secretive habits have not been standardized for obvious reasons. The presence of these species may be known, but their abundance and/or productivity would be guesswork without the investment of scarce resources. In this light, the American bittern qualifies. Calling counts during the summer reveal the bitterns' presence; yet, the possibility exists to estimate their abundance by counting calls from various locations on the refuge.

Additional sources of marsh and water bird population data have been provided by private citizens who volunteer their survey findings for our use. Nearly every year the Minnesota Ornithologist Union conducts a spring bird count from Salt Lake, South Dakota to Big Stone Lake, Minnesota on the fourth weekend of April. Valuable information is obtained from this group about species sighted on the Big Stone Refuge. Closer ties and cooperation with this group could provide untold benefits in the gathering of wildlife information at other times of the year while reducing our costs.

### IV. Manpower and Costs

Annual costs for marsh and water bird inventories are combined for special and weekly surveys. About four staff days are utilized for surveys. Equipment and material costs are less than \$50 per year less equipment depreciation.

V. Appendices

- Appendix No. 4-1 - Survey Map for Marsh and Water Birds
- Appendix No. 4-2 - Marsh and Water Bird Survey Form
- Appendix No. 4-3 - Colonial Bird Register Form
- Appendix No. 4-4 - Marsh and Water Bird Weekly Summary
- Appendix No. 4-5 - Shore Birds Weekly Summary
- Appendix No. 4-6 - Quarterly Wildlife Information Report



# REFUGE RAPTORIAL BIRD SURVEY

Date \_\_\_\_\_ Time \_\_\_\_\_ Observers \_\_\_\_\_

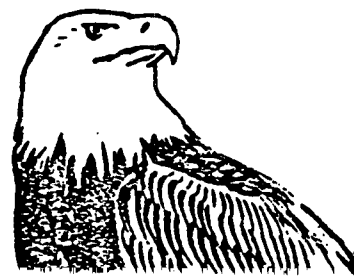
Weather Conditions \_\_\_\_\_

## EAST POOL

## WEST POOL

	Co. Rd. 15	South Bluffs	Over- look	Low- flow	G. Pit Area	Auto Tour	S.W. Bluffs	South Bluffs
T. Vulture								
Hawks								
Marsh								
Sharp-shinned								
Cooper's								
Red-tailed								
Red-shouldered								
Swainson's								
Broad-winged								
Rough-legged								
Eagles								
Golden								
Bald								
Osprey								
Falcons								
Prairie								
Merlin								
Kestrel								
Owls								
Long-eared								
Short-eared								
Screech								
Great horned								

Comments:



## INSTRUCTIONS FOR FIELD DATA TABULATION AND REPORTING

Please read and follow these instructions carefully. If you do not, we may have to reject or discard your data. The data form is set up as the source document for keypunching. It is very important, therefore, that the data is entered correctly. To facilitate making changes where necessary during editing, we ask that you fill in the information in PENCIL ONLY. We routinely encounter information in the wrong spaces. When this is done in ink, the entire form must be transcribed to correct the error. With pencil it can be corrected on the original form. OMIT SHADED BOXES. If information exceeds space given on the form, e.g., for "REMARKS", please attach additional sheets. Please include date, colony name, sub-colony if applicable, and observer on any attached sheets.

COLONY SIZE (ha): One hectare = 2.47 acres or 107,593 square feet.

COLONY NAME: Because local names often differ from "official" names, use USGS chart name if given. Include all local names in "REMARKS". If no chart name is shown, use a local name and, in SKETCH space, provide a map, if possible. Island numbers adopted by coastal zone management commissions are acceptable as colony names, provided that information on location is also provided. LAT./LONG. coordinates (to nearest minute) are especially valuable in such instances. Where several subcolonies exist in close proximity, identify each with a number in the space provided for SUBCOLONY. Separate reports should be submitted for each subcolony. Show relationships of subcolonies on SKETCH.

TIME: Use military time, e.g., 1:00 P.M. = 1300, 9:00 A.M. = 0900.

LATITUDE/LONGITUDE: Designate if possible. Please give coordinates to nearest minute. If not available, show location in colony sketch, specifying county, and we will complete.

SPECIES: Use either Common Name or Scientific Name.

TOTAL POPULATION (INDIVIDUALS)/TOTAL ACTIVE NESTS: Depending on the census technique used, record active nests (preferred) and/or total population. Estimates of total population should be reported as Individuals rather than pairs. See "CENSUS TECHNIQUE" instructions (below) for the kinds of numbers to report.

NESTING STAGE: Use the following numeric categories to indicate whether the greater number of each species in the colony is: 1. Prenesting. 2. Pairing - territory establishment. 3. Egg laying. 4. Incubation. 5. Hatching. 6. Downy young. 7. Feathered young. 8. Young flying or ready for flight. 9. Renesting. 10. Loafing on colony.

CENSUS TECHNIQUES: If, on the current visit, for each species more than one technique was used, file a separate report for each technique. Use the following numeric categories to designate the type of census: 1. Visual estimate - air (fixed wing). 2. Visual estimate - air (rotary). 3. Visual estimate - boat, car, foot (Circle one). 4. Aerial photographic count. 5. Total ground count - individuals. 6. Total ground count - nests. 7. Quadrat census (SKETCH). 8. Line strip census (SKETCH). 9. Other \_\_\_\_\_. If "OTHER" CATEGORY IS USED, PLEASE SPECIFY IN "REMARKS" AND FILL IN BLANK SPACE ON INSTRUCTIONS (ABOVE). For techniques which sample only a portion of the colony (e.g., quadrat sampling), extrapolate sample counts to total colony numbers. Show conversion factors in "REMARKS". If the level of precision is questionable, include ranges in addition to single best estimate of numbers.

DISTURBANCE: Please check box if disturbing human activity was present at the time you visited the colony. Human technology is a general term relating to airports, highways, oil refineries, industrial parks, etc.

GENERAL HABITAT OF COLONIES: Describe the dominant feature of the habitat around the colony: e.g., a marsh, bog, island, woodland, tundra, cliff face, etc. If colony is on a spoil island, please so state. Information about particular vegetational species of interest (e.g., plants used as nest-site substrate, etc.) can be included in "REMARKS".

COLONY SKETCH: Show the colony location in reference to known map locations. Identify subcolonies in the sketch. Show sample plots (if used) and the approximate scale in relation to the whole colony. If more room is needed, attach additional sheets.



# COLONIAL BIRD REGISTER

159 Sapsucker Woods Road • Ithaca, N.Y. 14850 • (607) 256-5056





\_\_\_\_\_ QUARTER, FY \_\_\_\_\_

## - QUARTER, FY \_\_\_\_\_

**L rno Blue - 2000**

[illegible]

## - QUARTER, FY

[illegible]

**Yellow-crowned - 2030**

### Cattle - 2001

**Sora - 2140**

**QUARTER, FY**

**Dowitcher - 232.**

[illegible]

\_\_\_\_ QUARTER, FY \_\_\_\_

**Spotted - 2630**

[illegible]

Code		Number															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3	1	0	0	3	2	6	4	0	0	0	B	G	S				

SPECIES NAME:	LINE CODE:										NO. HARVESTED 27-36	USE DAYS 36-45	BREEDING POPULATION 46-55	PEAK POPULATION					NO. PRODUCED 70-79
	18	19	20	21	22	23	24	25	26	Number				No. DQ					
										66-66				66	67	68	69		
Willet	7	2	2	2	5	8	0	W	S										
American woodcock	7	2	2	2	2	8	0	W	S										1
Greater yellowlegs	7	2	2	2	5	4	0	W	S										
Lesser yellowlegs	7	2	2	2	5	5	0	W	S										
Dunlin	7	2	2	2	4	3	0	W	S										
Bald eagle	7	0	2	3	5	2	0	W	R										
Golden eagle	7	2	3	3	4	9	0	W	R										
American peregrine falcon	7	0	1	3	5	6	1	W	T										
Prairie falcon	7	0	4	3	5	5	0	W	U										
Northern harrier	7	2	3	3	3	1	0	W	R										
Broad-winged hawk	7	2	3	3	4	3	0	W	R										
Northern goshawk	7	2	3	3	3	4	0	W	R										
Red-shouldered hawk	7	2	3	3	3	9	0	W	R										
Red-tailed hawk	7	2	3	3	3	7	0	W	R										
Rough-legged hawk	7	2	3	3	4	7	0	W	R										
Sharp-shinned hawk	7	2	3	3	3	2	0	W	R										
Cooper's hawk	7	2	3	3	3	3	0	W	R										
CONTROL TOTALS	9	9	7	0	0	0	0	1	2										

Region 3

Station Big Stone NWR

Date Prepared

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IR Code				Organization Number				Y QTR								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3	1	0	0	3	2	6	4	0	0	0	B	G	S			

# WILDLIFE INFORMATION REPORT Division of Wildlife Refuges

SPECIES NAME	LINE CODE									NO. HARVESTED 27-56	USE DAYS 56-65	BREEDING POPULATION 46-55	PEAK POPULATION				NO. PRODUCED 70-79	
													Number		No. DQ			
	18	10	20	21	22	23	24	25	26				28	56-65	66-65	66		67
Swainson's hawk	7	2	3	3	4	2	0	W	R									
American kestrel	7	2	3	3	6	0	0	W	R								1	
Merlin	7	2	3	3	5	7	0	W	R									
Osprey	7	0	4	3	6	4	0	W	U									
Barred owl	7	2	3	3	6	8	0	W	R									
Great horned owl	7	2	3	3	7	5	0	W	R									
Northern saw-whet owl	7	2	3	3	7	2	0	W	R									
Short-eared owl	7	2	3	3	6	7	0	W	R									
Snowy owl	7	2	3	3	7	6	0	W	R									
Eastern screech owl	7	2	3	3	7	3	0	W	R									
Long-eared owl	7	2	3	3	6	6	0	W	R									
Turkey vulture	7	2	3	3	2	5	0	W	R									
Red-winged blackbird	0	7	1	4	9	8	0	W	R									
Yellow-headed blackbird	0	7	1	4	9	7	0	W	R									
Northern bobwhite	0	7	1	2	8	9	0	W	R									
Common crow	0	7	1	4	8	8	0	W	R									
Mourning dove	7	2	4	3	1	6	0	W	O									
CONTROL TOTALS										9	9	7	0	0	0	0	1	4

Field Code				Organization Number				Date				Y QTR				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3	1	0	0	3	2	6	4	0	0	0	B	G	S			

# WILDLIFE INFORMATION REPORT

Division of Wildlife Refuges

SPECIES NAME:	LINE CODE:										NO. HARVESTED 27-36	USE DAYS 36-45	BREEDING POPULATION 46-55	PEAK POPULATION				NO. PRODUCED 70-79	
	18	19	20	21	22	23	24	25	26	27				Number		No. DQ			
														66-65		66	67		68
Rock dove	✓	7	2	4	3	1	3	1	W	O									
Belted kingfisher	✓	0	7	1	3	9	0	0	W	R									1.
Gray partridge	✓	0	7	1	2	8	8	1	W	R									
Ring-necked pheasant	✓	0	7	1	3	0	9	1	W	R									
Barn swallow	✓	0	7	1	6	1	3	0	W	R									
Cliff swallow	✓	0	7	1	6	1	2	0	W	R									
Tree swallow	✓	0	7	1	6	1	4	0	W	R									
Wild turkey	✓	0	7	1	3	1	0	0	W	R									
Savannah sparrow	✓	7	0	4	5	4	1	0	W	U									
Pileated woodpecker	✓	0	7	1	4	0	5	0	W	R									
Badger	✓	0	7	2	8	4	1	5	W	B									
Beaver	✓	0	7	2	8	1	0	0	W	B									
Eastern cottontail	✓	0	7	2	8	0	4	0	W	B									
Coyote	✓	0	7	2	8	2	6	0	W	B									
Mule deer	✓	0	7	2	8	5	3	0	W	B									
White-tailed deer	✓	0	7	2	8	5	4	0	W	B									
Gray fox	✓	0	7	2	8	3	1	5	W	B									
CONTROL TOTALS		9	9	7	0	0	0	0	1	4									



PIC Code				Organization Number							Location				Activity			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		
3	1	0	0	3	2	6	4	0	0	0	B	C	S					

SPECIES NAME	LINE CODE									NO. HARVESTED 27-36	USE DAYS 36-46	BREEDING POPULATION 46-56	PEAK POPULATION					NO. PRODUCED 70-79
													Number	No. DQ				
	18	19	20	21	22	23	24	25	26				60-66	66	67	68	69	
Red fox	0	7	2	8	2	9	0	W	B									
White-tailed jackrabbit	0	7	2	8	0	8	5	W	B									
Link	0	7	2	8	4	0	0	W	B									
Muskrat	0	7	2	8	2	3	5	W	B									
River otter	0	7	2	8	4	4	5	W	B									
Raccoon	0	7	2	8	3	5	5	W	B									
Striped skunk	0	7	2	8	4	3	0	W	B									
Box squirrel	0	7	2	8	1	8	0	W	B									
Gray squirrel	0	7	2	8	1	7	0	W	B									
Weasel	0	7	2	8	3	8	0	W	B									
Woodchuck	0	7	2	8	1	1	0	W	B									
Northern leopard frog	0	7	3	9	3	0	5	W	F									
Snapping turtle	0	7	3	9	2	0	0	W	F									
Western painted turtle	0	7	3	9	2	0	5	W	F									
American toad	0	7	3	9	3	4	6	W	F									
Red-bellied snake	0	7	3	9	2	8	1	W	F									
Plains garter snake	0	7	3	9	2	9	7	W	F									
GRAND TOTALS	0	0	7	0	0	0	0	0	0									

[illegible]

Code				Number													Y 910	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
3	1	0	0	3	2	6	4	0	0	0	B	G	S					

WILDLIFE IN CHINA

SPECIES NAME:	LINE CODE:										NO. HARVESTED 27-36	USE DAYS 36-45	BREEDING POPULATION 46-55	PEAK POPULATION					NO. PRODUCED 70-79
														Number		No. DQ			
	18	19	20	21	22	23	24	25	26	27				56-65	66	67	68	69	
Semipalmated plover ✓	7	2	2	2	7	4	0	W	S										
Sanderling ✓	7	2	2	2	4	8	0	W	S									1	
Least sandpiper ✓	7	2	2	2	4	2	0	W	S										
Pectoral sandpiper ✓	7	2	2	2	3	9	0	W	S										
Semipalmated sandpiper ✓	7	2	2	2	4	6	0	W	S										
Solitary sandpiper ✓	7	2	2	2	5	6	0	W	S										
Spotted sandpiper ✓	7	2	2	2	6	3	0	W	S										
Stilt sandpiper ✓	7	2	2	2	3	3	0	W	S										
Upland sandpiper ✓	7	2	2	2	6	1	0	W	S										
Western sandpiper ✓	7	2	2	2	4	7	0	W	S										
White-rumped sandpiper ✓	7	2	2	2	4	0	0	W	S										
Baird's sandpiper ✓	7	2	2	2	4	1	0	W	S										
Common snipe ✓	7	2	2	2	3	0	0	W	S										
Black tern ✓	7	2	2	0	7	7	0	W	S										
Common tern ✓	7	2	2	0	7	0	0	W	S										
Caspian tern ✓	7	2	2	0	6	4	0	W	S										
Forster's tern ✓	7	2	2	0	6	2	0	W	S										
Ruddy turnstone ✓	7	2	2	2	8	3	0	W	S										
CONTROL TOTALS	9	9	7	0	0	0	0	1	4										

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Code	ORGAN. Number								Name								FY	QTR
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
0	0	3	2	6	4	0	0	0	B	G	S							

# WILDLIFE INFORMATION REPORT

Division of Wildlife Refuges

APPENDIX 4-6

APPENDIX 4-6

SPECIES NAME	LINE CODE:									NO. HARVESTED 27-36	USE DAYS 38-45	BREEDING POPULATION 46-55	PEAK POPULATION				NO. PRODUCED 70-79									
													Number		No. DQ											
	18	19	20	21	22	23	24	25	26				66-69	66	67	68		69								
Bittern	7	2	1	1	9	1	0	W	W																	
an Bittern	7	2	1	1	9	0	0	W	W																	
-crested Cormorant	7	2	1	1	2	0	0	W	W																	
r Sandhill Crane	7	2	1	2	0	6	0	W	W																	
Egret	7	2	1	2	0	0	1	W	W																	
Egret	7	2	1	1	9	6	0	W	W																	
Egret	7	2	1	1	9	7	0	W	W																	
Eared Grebe	7	2	1	0	0	4	0	W	W																	
Horned Grebe	7	2	1	0	0	3	0	W	W																	
Pied-billed Grebe	7	2	1	0	0	6	0	W	W																	
Red-necked Grebe	7	2	1	0	0	2	0	W	W																	
Western Grebe	7	2	1	0	0	1	0	W	W																	
Black-Crowned Night Heron	7	2	1	2	0	2	0	W	W																	
Great Blue Heron	7	2	1	1	9	4	0	W	W																	
Green-backed Heron	7	2	1	2	0	1	0	W	W																	
Little Blue Heron	7	2	1	2	0	0	0	W	W																	
Yellow-Crowned Night Heron	7	2	1	2	0	3	0	W	W																	
Common Loon	7	2	1	0	0	7	0	W	W																	
CONTROL TOTALS	9	9	7	0	0	0	0	6	4																	

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Rev. 8-64

Code				Number											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
3	1	0	0	3	2	6	4	0	0	0	B	G	S		

SPECIES NAME	LINE CODE										NO. HARVESTED 27-36	USE DAYS 38-46	BREEDING POPULATION 48-56	PEAK POPULATION				NO. PRODUCED 70-79
	18	19	20	21	22	23	24	25	26	27				58-66	68	69	70	
American white pelican ✓	7	2	1	1	2	5	0	W	W									
King rail ✓	7	2	1	2	0	8	0	W	W									
Virginia rail ✓	7	2	1	2	1	2	0	W	W									
Sora ✓	7	2	1	2	1	4	0	W	W									
American avocet ✓	7	2	2	2	2	5	0	W	S									
Long-billed dowitcher ✓	7	2	2	2	3	2	0	W	S									
Marbled godwit ✓	7	2	2	2	4	9	0	W	S									
Hudsonian godwit ✓	7	2	2	2	5	1	0	W	S									
Herring gull ✓	7	2	2	0	5	1	0	W	S									
Glaucous gull ✓	7	2	2	0	4	2	0	W	S									
Ring-billed gull ✓	7	2	2	0	5	4	0	W	S									
Bonaparte's gull ✓	7	2	2	0	6	0	0	W	S									
Franklin's gull ✓	7	2	2	0	5	9	0	W	S									
Killdeer ✓	7	2	2	2	7	3	0	W	S									
Wilson's phalarope ✓	7	2	2	2	2	4	0	W	S									
Black-bellied plover ✓	7	2	2	2	7	0	0	W	S									
Lesser golden plover ✓	7	2	2	2	7	2	0	W	S									
CONTROL TOTALS	9	9	7	0	0	0	0	1	4									

Region B

Station Big Stone NWR

Date Prepared \_\_\_\_\_

Page 2 of \_\_\_\_\_

Form 3-245

WILDLIFE INVENTORY PROCEDURE NO. 5Roadside Pheasant SurveyI. Purpose

Upland game bird hunting ranks thirteenth on the master plan output list and contributes significantly to recreation activity hours on this refuge. Annual trend data obtained from this survey will enable the refuge manager to respond accurately to public concerns and questions regarding current pheasant populations. It also enables us to monitor pheasant population trends related to habitat management programs and yearly weather phenomena which influences production and population maintenance.

II. ProcedureA. Background

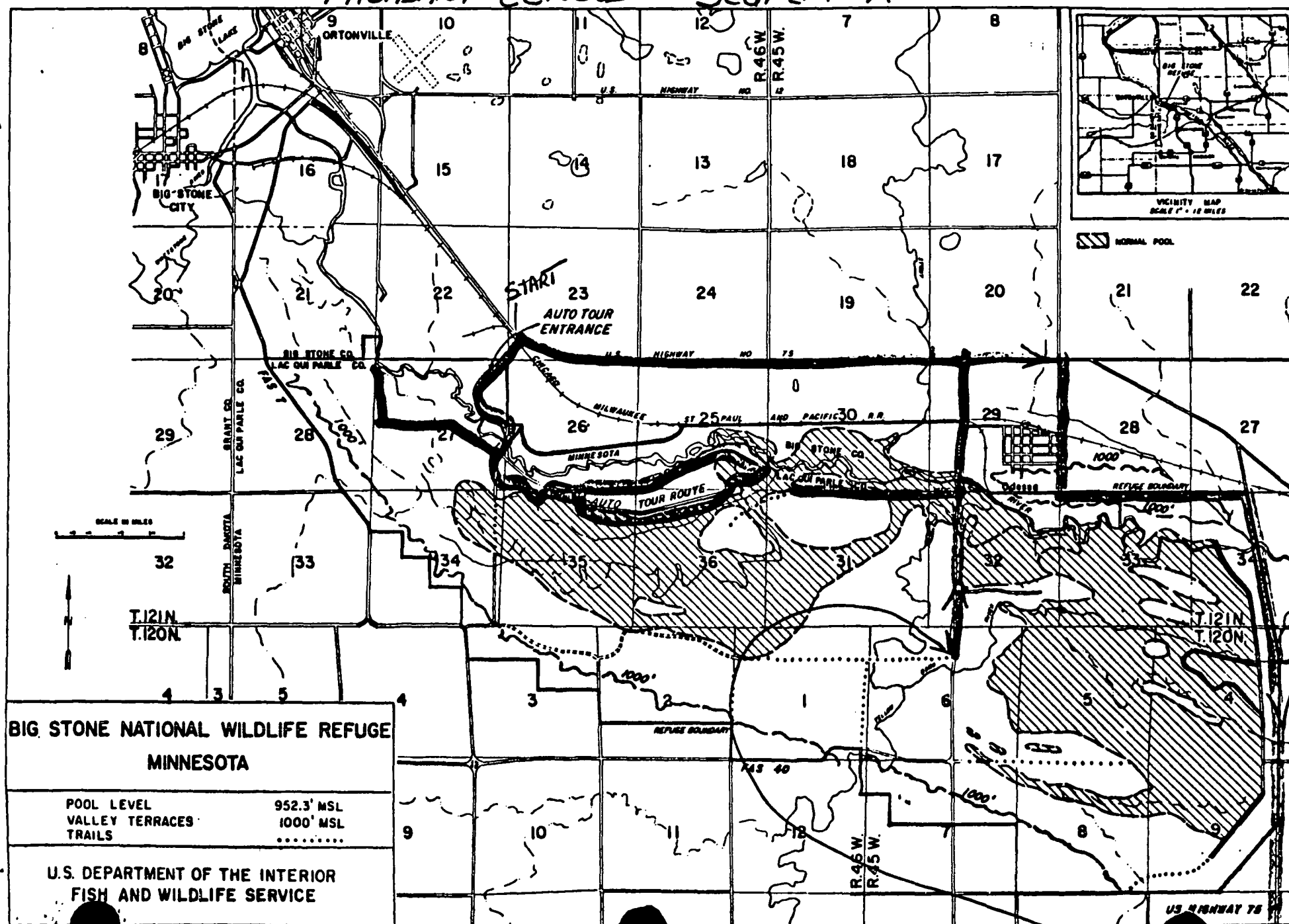
Pheasant censusing has not been conducted at this station until 1987. During the period of July 20 to August 15, 1987 the first established roadside pheasant count was conducted. No previous trend data was available other than yearly comparisons of data obtained by the Minnesota Department of Natural Resources. This data compared pheasant trends on a county and area wide (west-central) basis.

Data obtained from this annual survey will provide trend data only and no estimate of population numbers can be made.

B. Data Collection

A roadside pheasant count route is established and covers approximately 32 miles of county roads adjacent to or near the refuge boundary as well as some maintained refuge interior graveled roads. The route is divided into two segments on maps shown as Appendix 5-1 and 5-2 of this procedure. The following procedures are to be used to obtain a comparable count each year:

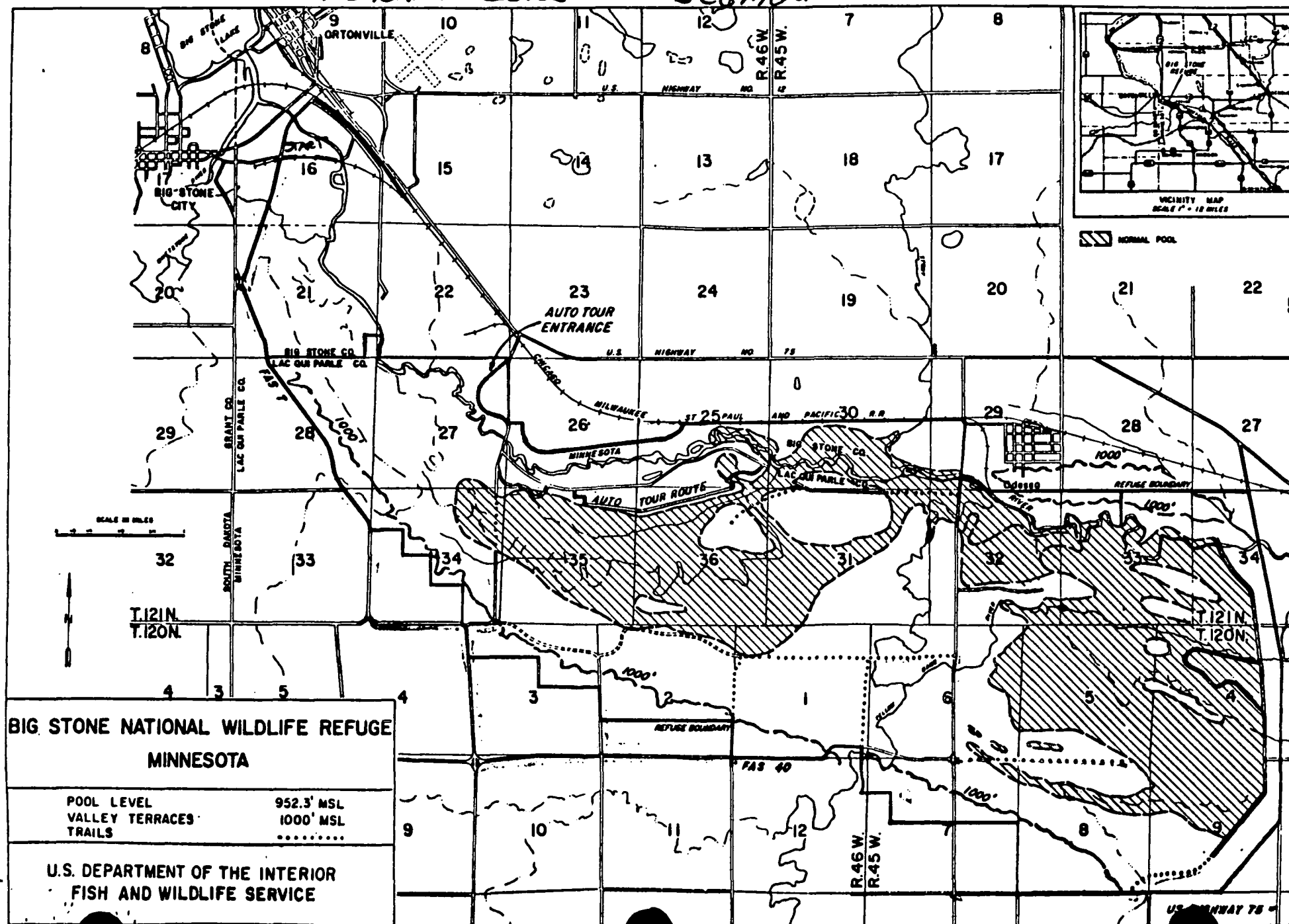
- Run pheasant counts each year beginning July 20 and ending around August 15.
- Begin each segment at sunrise or shortly after. Pheasant activity usually peaks one-half hour after sunrise but is influenced by duration of dew on vegetation.
- Travel each segment at a speed of 20 mph.
- Count all pheasants including broods. Include all pheasants observed on roadway, in road right-of-ways, perched on fence posts, hay bales or on field edges. Record numbers for each segment on field form Appendix 5-3.
- Select mornings which are considered primary if possible. Primary mornings are those having heavy dew conditions, winds less than 8 mph and preceded by clear conditions.



## APPENDIX 5-3

[illegible]





### C. Data Processing

An attempt should be made to obtain as many primary morning counts as possible. It has been suggested that upwards of 15 primary morning counts be obtained to approach higher statistically valid confidence limits on a route of this short length.

Tally up all primary morning totals for each route segment. The sum of each segment is divided by the number of primary mornings to obtain an average number of birds per primary morning per segment.

The average number of pheasants observed for each segment is added together giving a total number of birds per route. This total is divided by 32 (miles in route) and shown as number of birds per mile. This is the index by which annual counts are compared and reported.

Secondary morning counts should be processed in the same manner giving a bird per mile index. In the event few primary morning conditions are encountered through the July-August period, secondary counts can be compared to previous years' secondary counts for some trend comparisons.

### III. Special Considerations

Pheasant activity is greatly influenced by weather conditions. Favorable primary morning conditions are infrequent in this region. Since only one segment can be surveyed per morning by one observer it is best to assign one observer per each segment to take advantage of those primary conditions. It is often the case where primary or secondary conditions cannot be ascertained until the survey is begun on that particular morning. Due to work schedules or other conflicts, sometimes only one route may be run on a given day. In any event, as many primary mornings as possible for each segment should be obtained.

It is each observer's responsibility to get the most accurate and comparable data as possible. Often a hen and brood will be observed in the distance leaving the roadway before a total number is determined. In that case the observer should leave the vehicle and attempt to flush the birds to get an exact count. If a flush is not possible, an estimate should be made. Often the same brood will be observed in the same vicinity morning after morning. It is then possible to get a more accurate estimate of the number in that brood during the survey period.

### IV. Manpower and Costs

Each segment requires approximately one hour to complete. Assuming 15 mornings per segment, a total of 30 man hours are required to complete the annual survey. Equipment and fuel costs are minimal and not expected to exceed \$100.

### V. Appendices

Appendix No. 5-1 - Map, Segment A  
Appendix No. 5-2 - Map, Segment B  
Appendix No. 5-3 - Field Form

WILDLIFE INVENTORY PROCEDURE NO. 6Wintering White-tailed Deer SurveyI. Purpose

- 1) White-tailed deer maintenance ranks 7th in output importance. The maximum wintering deer herd objective level is set at 1000 animals. It is essential to monitor the wintering herd in relationship to that herd.
- 2) The deer herd associated with the refuge is a valuable economic and recreational resource. It is also in conflict with deer-crop depredations and deer-car collisions. Big Stone refuge personnel are committed to cooperating with the Minnesota Department of Natural Resources in monitoring the herd size. Knowledge of the wintering deer herd will influence management strategies and over winter crop commitments on and off the refuge.

II. Background

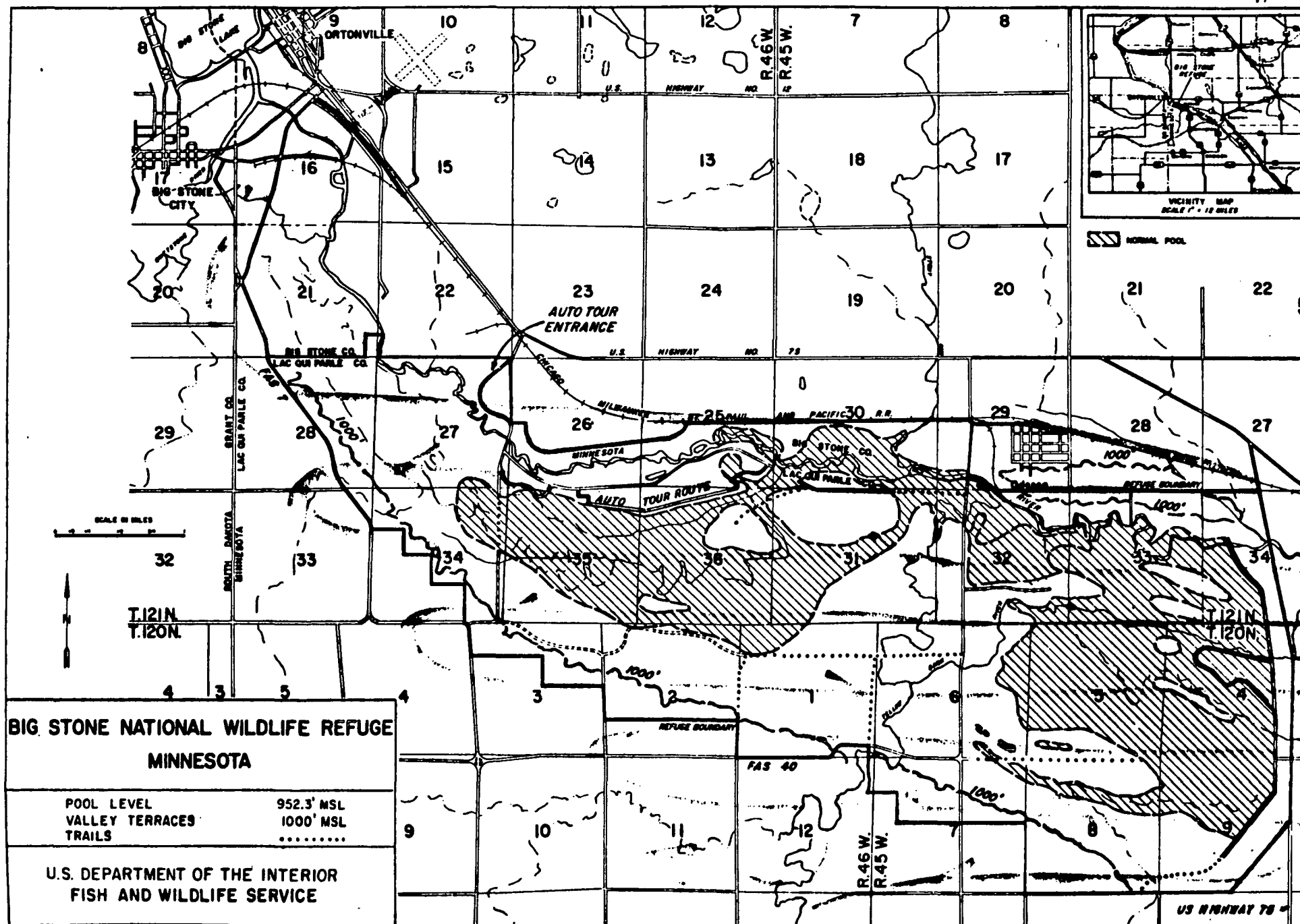
The Minnesota River Valley has been a traditional deer wintering area. Prairie white-tailed deer traditionally have spent the warmer months in the upland prairies as far as 30 miles from their wintering ground.

Big Stone NWR is now an important component of the habitat for the deer herd of a large area of western Minnesota and eastern South Dakota. The Minnesota DNR estimates this area to be approximately 350 square miles. The establishment of Big Stone NWR and subsequent habitat improvements have increased the attractiveness of the unit to wintering deer. In addition, the local deer herd has grown in response to hunting season modifications instituted by the Minnesota DNR since 1976. The result is that in certain years large concentrations of deer winter within Big Stone NWR. The wintering herd has grown from 30 in 1971 to 1,150 in the winter of 1983-84. The more severe the winter the larger the number of deer wintering within the refuge. They forage daily onto private lands where they feed on stored crops, haystacks, crop residues, standing crops, cut-over alfalfa, etc.

During heavy winters, deer crop depredations and deer-car collisions (primarily Highway 75) often reach unacceptable levels. Most refuge neighbors have experienced unacceptable crop losses in recent years. Deer/car collisions have been equally unacceptable. White-tailed deer maintenance will continue to generate conflict and it will require significant resources and cooperation between agencies to handle the situation. Part of that cooperation is conducting and reporting the deer herd size throughout the winter months.

III. Data Collection

Wintering deer populations must be monitored throughout the winter months. Numbers will increase or decrease dramatically and over a very short time in response to winter weather and field conditions. The following steps are taken to obtain comparable annual winter counts.



- Contact the Regional Aircraft Manager (RAM) in October and request assistance for flights conducted in December, January, February and March if snow conditions permits.
- Snow cover must be adequate to allow maximum visibility from the aircraft particularly in cattail areas.
- Two observers are required, each observer will count animal observed from his respective side of the aircraft.
- The refuge is flown in an east to west fashion beginning along the north boundary. Each return flight is shifted approximately one-half mile south to allow the observer approximately one-quarter mile coverage per pass over the refuge. (Appendix 6-1)

Totals from each observer are combined to obtain a refuge total. This sum is expanded by multiplying by 1.51. This coefficient expands the count to a value comparable to an expected count obtained from a helicopter. Since helicopter surveys count approximately 75 percent of the animals present, the expanded value is divided by .75 to give an estimated population. As an example of 500 deer are counted from a fixed winged aircraft; 500 is multiplied by 1.51 then divided by .75 to equal 1006 animals actually present ( $500 \times 1.51 \div .75 = 1006$ ).

#### IV. Manpower and Costs

Cost of the aircraft is furnished by the Regional Office when the Service plane is used. Approximately 1-2 hours is required to complete the survey using two observers. Total staff time for four surveys is 8 staff hours. Fuel is also furnished by RAM.

#### V. Appendices

Appendix No. 6-1 - Deer Survey Map

WILDLIFE INVENTORY PROCEDURE NO. 7Muskrat Population SurveyI. Purpose

- 1) To monitor muskrat population trends throughout the refuge.
- 2) To aid in management decisions related to the annual refuge trapping program.
- 3) To document muskrat trends related to improved water management programs associated with new water control structures.

II. Background

Prior to 1984, muskrat populations were somewhat depressed throughout prime aquatic furbearer habitat presumably due to dramatic fluctuation in water levels. Winter draw down of the east conservation pool for flood control often left many muskrat houses dry prior to spring breeding season. As a result, muskrat population were associated with limited permanent and stable water areas and river bank habitat.

From 1984 through 1986, high stable water levels remained throughout the refuge this change occurred due to increased volumes of water entering the refuge from the diversion channel and heavy run-off. Heavy run-off forced the Corps of Engineers to reduce reservoir outflow to prevent extensive flooding downstream. During that period muskrat house building activity increased dramatically. In 1986, a permanent muskrat house transect was established to document location and number of muskrat houses. Also, Ducks Unlimited began construction on a number of water control structures to aid in more precise water management to improve waterfowl production and maintenance. The transects will document furbearer response to these water impoundments.

III. Data Collection

Appendix 7-1 displays the total refuge muskrat transect. The transect contains 17 individual routes identified by a number and letter. The letter designation divides a route from one side of the route from the other side to more accurately document trends. The routes also takes into account current and future water management development.

Each route is a road or trail where yearly access is possible. One observer simply drives along the trail and counts the number of muskrat houses observed on each side and records the number on field form Appendix 7-2. The total number is reported and compared to previous year totals. Individual route totals can be used to compare yearly trends associated with water management strategic occurring an the particular area.

The survey should be conducted after total freeze-up and as soon as possible after the first snow fall. Muskrat houses with fresh snow on

top are the most visible at this time.

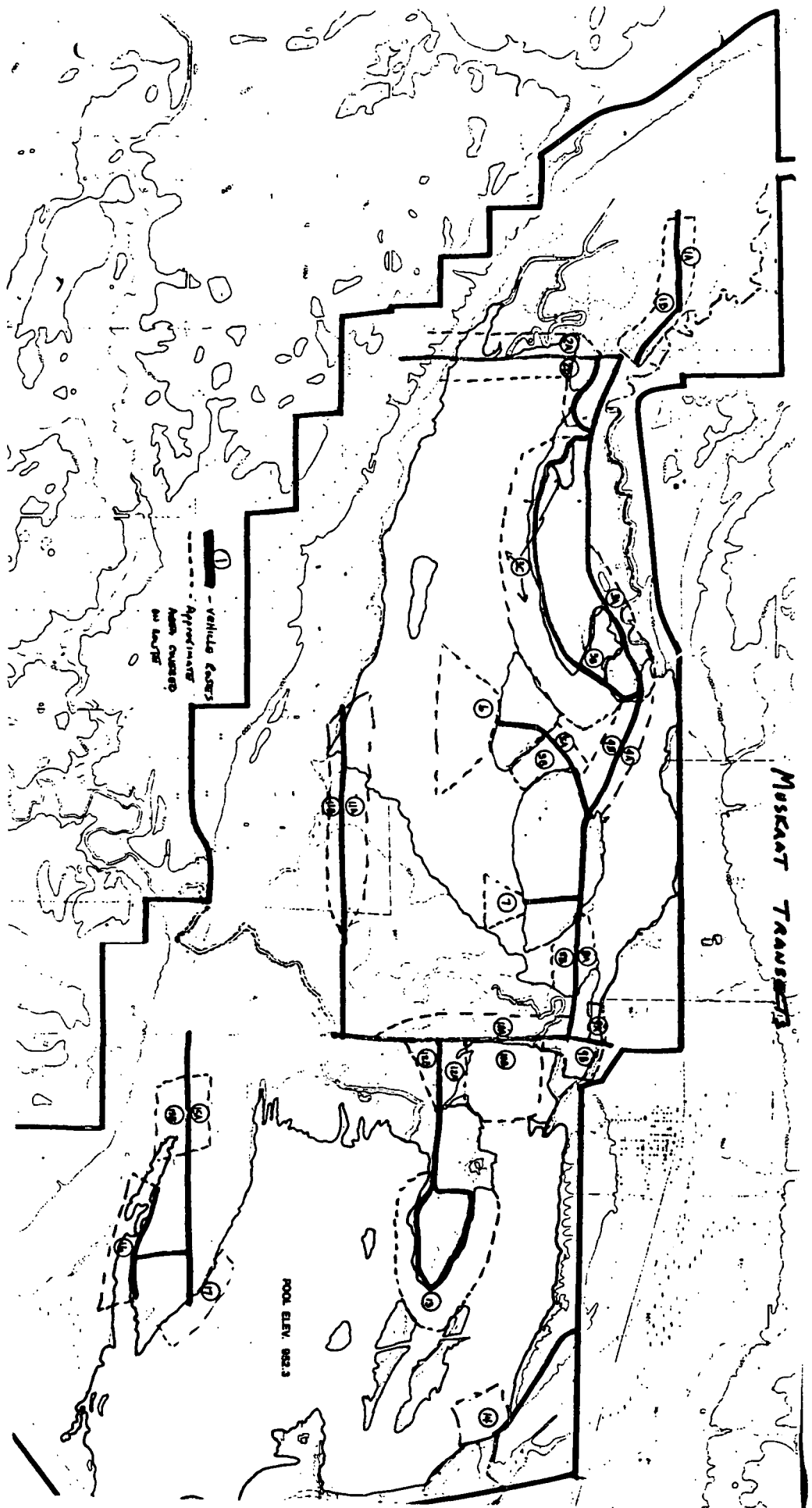
IV. Manpower and Costs

One observer is required and the total time required to complete the transect is about four hours. Material and equipment costs are low and not expected to exceed \$20.

V. Appendices

Appendix No. 7-1 - Transect Map

Appendix No. 7-2 - Field Survey Form





Muskrat Population Survey

Route #	1986	1987	1988	1989	1990	1991
1A	1					
1B	5					
2A	3					
2B	10					
3A	6					
3B	10					
3C	31					
4A	5					
4B	4					
5A	4					
5B	6					
6	5					
7	10					
8A	2					
8B	2					
9A	3					
9B	7					
10A	7					
10B	21					
11A	3					
11B	1					
12A	6					
12B	6					
13	12					
14	3					
15A	2					
15B	0					
16	12					
17	0					
<hr/>						
TOTAL	187					
% change from previous year		%	%	%	%	%