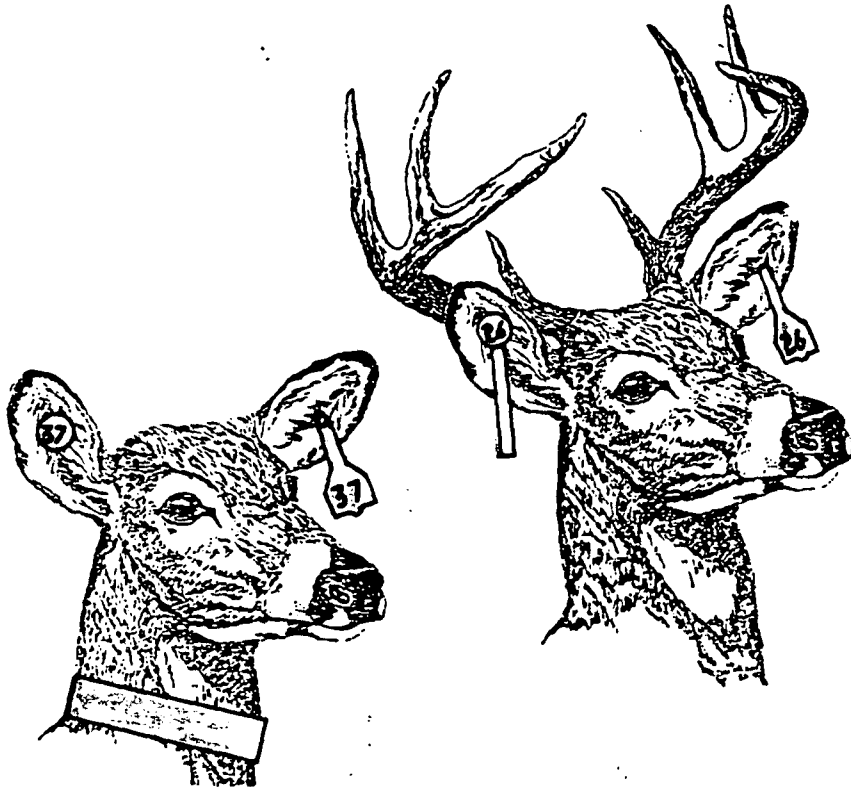
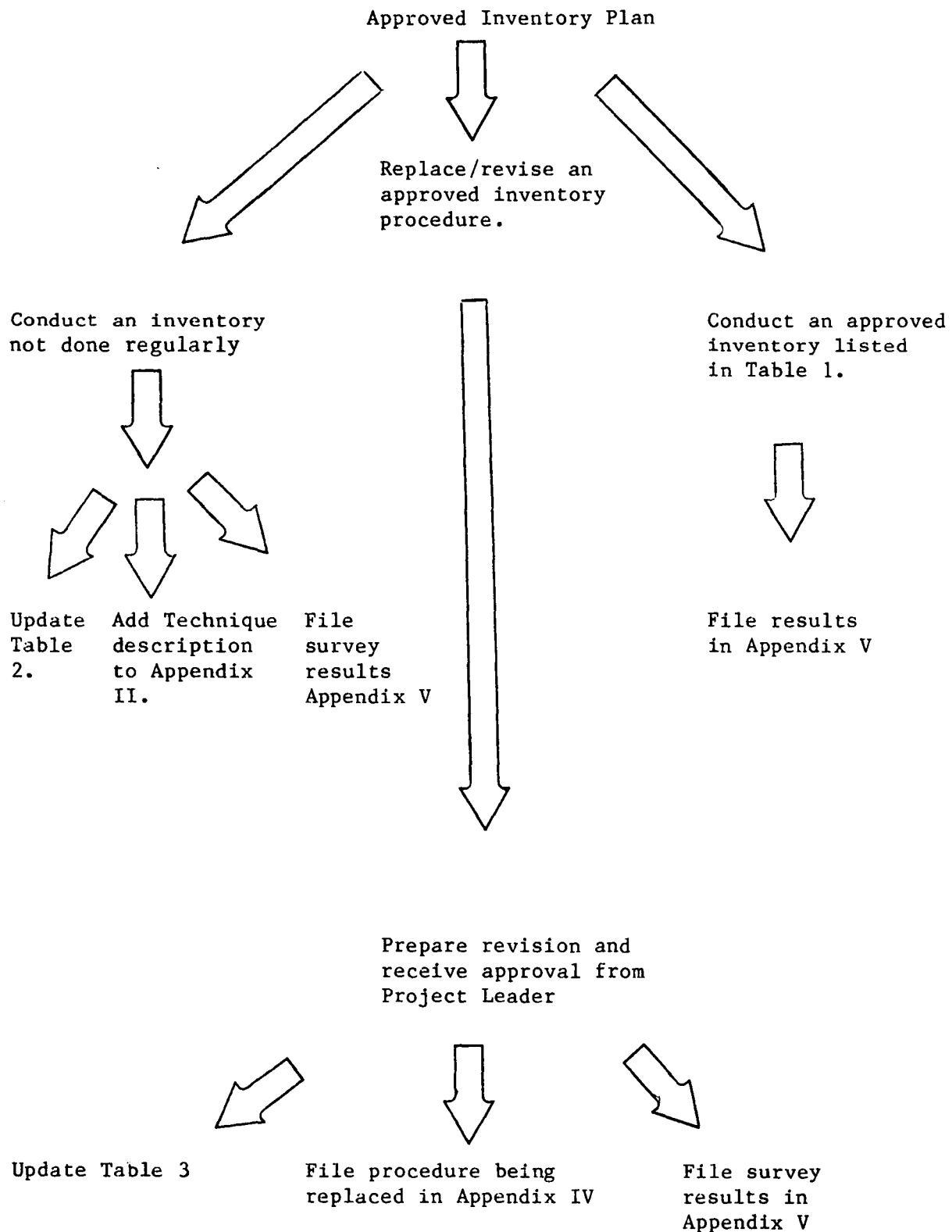


WILDLIFE INVENTORY PLAN



Minnesota Valley National Wildlife Refuge

Key to maintaining the Wildlife Inventory Plan in an updated condition



Inventory Plan Information Summary

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WILDLIFE INVENTORY PLAN

I. Introduction

A Wildlife Inventory Plan is mandatory for all refuges according to section 7RM11.3 of the Refuge Manual. This plan will fulfill that requirement plus provide guidance and consistency for wildlife inventories on the refuge in the future. A quote from the Refuge Manual 7RM11.4C is worth mentioning here, "A major principle to guide refuge wildlife inventory operations is that a few good censuses of good quality and known reliability during critical periods are of far greater value than other counts." The Manual also states in that same section that ". . . inaccuracy is acceptable as long as the bias resulting is replicated between years." These two statements set the goal for this plan.

The goals for this plan are:

1. To provide as good a survey method as possible to estimate population levels of key refuge species at times of the year that are critical to those species, or during those periods that are the only practical times of the year to count certain key species.
2. To describe a standard survey method that will allow trends in key wildlife populations to be monitored over several years even if exact numbers are not 100% accurate.
3. To detail the minimum number of wildlife surveys that are necessary to monitor key wildlife populations on the refuge, stressing quality of surveys over quantity.

Refuge goals as far as desirable population levels for specific species will not be discussed here, but can be found in the refuge Master Plan. There is also a wealth of wildlife information in the Master Plan regarding wildlife inventories that were done during the master planning process. This should be consulted by anyone who will be doing inventory work on the refuge. It will provide a good feel for the species diversity on the refuge and can provide information on sites of occurrence and seasonal use of the area for a variety of species in general, and migratory birds in particular.

Approximately 75% of the designated refuge area is wetland or open water; however, the percent of each unit varies from 51% for the Louisville Swamp unit to as high as 98% for the Black Dog Lake unit. Of the remaining refuge lands, approximately 10% is hillside forest, oak savanna and dry grassland, and approximately 15% is agricultural land. For a more detailed break down of habitat types by unit, see the refuge Master Plan. Copies of detailed vegetation maps are included in Appendix I.

There are a number of conditions that occur on Minnesota Valley NWR that make conducting certain wildlife inventories difficult. These are as follows:

1. The large size (1000+ acres) of many flood plain wetlands makes it difficult to survey them effectively in a short period of time.
2. The Minnesota River Valley is subject to widespread flooding especially in the spring. This expands the amount of habitat available to many species, especially migrating waterfowl, and makes counting even more difficult due to the larger area to search and more difficult access.
3. Most of the refuge units are bounded by steep bluffs, the Minnesota River, and private land, making access to certain parts of refuge units very difficult.
4. The abundance of high tension electric lines crossing the valley and, at the north end of the refuge, the proximity of the Twin Cities International Airport makes aerial surveys more difficult than most refuge situations.
5. The refuge's elongated shape (36 miles from one end of the refuge to the other) plus non-contiguous nature (there are currently 7 discrete refuge units - including Round Lake) makes conducting a survey more difficult and time consuming than working on one discrete area.
6. A problem common to all refuges is a lack of personnel and/or time to conduct as many surveys, or as frequent a survey as would be desirable.

Species that should be surveyed on Minnesota Valley NWR on a regular basis are listed in Table 1.

There are also other species that should be surveyed occasionally, but due to time limitations, cannot be inventoried regularly by permanent refuge staff. Included among these species are:

Predators (fox, coyote, raccoon)
 Reptiles/amphibians
 Small mammals
 Shorebirds
 Raptors other than eagles

If any of these or other species are inventoried, the information requested in Table 2 should be entered in the table and a description of the survey technique should be added to Appendix II. Results of the survey should be filed in Appendix V by species or appropriate general group (e.g. waterfowl, raptors, etc.)

Table 1. Wildlife species that should be surveyed on a regular basis and currently they are of interest for survey purposes.

| Species | Type of Survey | Refuge Inventory Proced. # | Date of Survey | Reason for Survey |
|------------------------|-----------------------------------|-------------------------------|--------------------|--|
| Waterfowl | Monthly population inventory | IP1 | Monthly | Estimate migratory and resident waterfowl populations and wading bird populations |
| Waterfowl | Breeding pair count | IP2 | 05/1-25 | Estimate # breeding pairs of waterfowl |
| Waterfowl | Brood count | IP3 | 07/1-21 | Estimate # waterfowl produced |
| Deer | Aerial count | IP4 | January | Estimate winter population of deer on or within .5 miles of refuge to determine need for reduction programs. |
| Muskrat | Aerial house count | IP5 | 10/15-31 | Estimate fall muskrat population to determine need/feasibility of a harvest program |
| Beaver | Aerial lodge/ Food cache count | IP6 | 10/15-31 | Estimate fall beaver population to determine need/feasibility of a harvest program. |
| Eagles | Mid-winter survey | IP7 | 01/2-16 approx. | Part of a national survey |
| Colonial nesting birds | Ground survey of coloney | IP8 | mid-nesting period | Part of a national survey |
| Song birds | Monthly volunteer transect survey | IP9 | Monthly | Monitor migratory song birds as a reflection of habitat changes - volunteer run survey. |

Table 2. Species inventoried on an intermittent basis, the survey date, and technique.

| | Species | Date | Technique | Appendix II reference for technique details |
|----------|----------|----------|-----------------------|---|
| Example: | Aardvark | 05/12/84 | Trail Drag Mark Count | IIA.1 ¹ |
| Example: | Ostrich | 07/04/85 | Head Count | IIB.i |
| Example: | Aardvark | 05/02/86 | Trail Drag Mark Count | IIA.2 |

1 Assign letters chronologically but keep different surveys for the same species together in the Appendix.

II. Wildlife Inventory Procedures

The following inventory procedures are to be followed on Minnesota Valley NWR. If any of these procedures are significantly modified, or if a new procedure is substituted, the procedure being replaced should be filed in Appendix IV of this plan and the date it was replaced written on the old procedure worksheet (7RM11.3A). The appropriate data should also be entered in Table 3 following a change in inventory procedure. The footnote in Table 3 describes how the inventory procedure number will change following a modification. All survey results should be filed in chronological order by species or group of species (e.g. waterfowl) in Appendix V.

Table 3. Record of changes in Inventory Procedures.

| Original refuge proced. # | New Refuge proced. #* | Date of change | Species inventor- ied | Reason for procedure modification or replacement |
|---------------------------------|--------------------------|-------------------|-----------------------------|---|
|---------------------------------|--------------------------|-------------------|-----------------------------|---|

* All new procedure numbers should be the same as the old number but with the suffix ".Mx" where x is the chronological number of the modification. For example, the first time the monthly waterfowl survey was modified or replaced the new refuge procedure number would be IP1.M1. The second time the procedure was changed, the procedure number would become IP1.M2.

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP1Date Procedure Implemented: April 1, 1984Species: Waterfowl/wading birds
(herons and egrets)Date Procedure replaced/
modified: _____Title: Monthly Population
InventoryI. Inventory Purpose/Justification

The majority of the refuge Master Plan output objectives are related to waterfowl maintenance or production. We must know waterfowl population levels throughout the year to determine how well we are meeting the objectives. Herons and egrets are easily counted at the same time as the waterfowl and so are also included in this inventory. There are species of waterfowl and herons which are included in the Regional Resource Plans (RRP), and so should be monitored to help assess how well RRP goals are being met.

II. Procedure

Inventory Date(s): Monthly Time of day: 8:00 a.m. - 1:00 p.m.
(2 successive days)

Number of personnel: 1

Weather conditions: optimal: Overcast; calm
acceptable: Sunny; wind 10-15 mph; light rain

Equipment/supplies: Binoculars, Bird ID Field Guide; Spotting Scope;
vehicle; data sheets; computer; Multiplan program

Inventory Technique:

The inventory should be conducted as follows:

1. Run on 2 successive days, doing Long Meadow Lake and Black dog Lake units (and Round Lake if it is inventoried) on one day and the rest of the refuge on day 2. If the entire inventory is run on one day, visibility and bird activity can change considerable from the beginning to the end of the day. If the entire inventory can be run on one day and be finished by 1:00 p.m., this is permissible.

2. Fill in the date, weather, observer(s), and time of arrival at each observation point on each data sheet.
3. The inventory should proceed from one observation point to the next in numerical order. At each observation point, record the following information:
 - A. Total count ~~by~~ species.
 - B. Estimate the percent of the observation area that is visible. See Attachment IP1A for the area encompassed at each observation area that is considered 100% visible.
 - C. The time that you arrived at the observation point.
4. If more than one observer is present, do not talk loudly in such a way that would scare the birds. Also, do not slam doors when exiting the vehicle. Try and remain as inconspicuous as possible when approaching the observation point. If you can count from the vehicle, this will disturb the birds less than getting out beside the vehicle.
5. If no birds are visible at the observation point upon arrival, scan the area for at least 5 minutes before moving on to the next observation point.
6. During fall and spring migrations, the population inventory should be done once at least every 2 weeks if possible to document peak numbers.

Summarizing Data:

The data will be summarized using the Multiplan program on the refuge computer. The Multiplan sheet called ab blank must first be called up. On this sheet the user must enter the percent of each observation point that is able to be seen, the percent of the birds visible in the survey month and at a specific observation point (Table IP1.A) and the percent of the unit covered by the observation points for high or low water conditions (Table IP1.B and procedure IP1 section II, part 1). Once the spread sheet is filled in, it should be stored under the name "W1YRMODA" or "W2YRMODA" where YR= a 2 number abbreviation for the year, MO= the month in a 2 digit numerical abbreviation, and DA= the day expressed in 2 digits. The 1 is to be used with Long Meadow Lake, Bloomington Ferry, Chaska, and Louisville. The 2 is to be used with other refuge units. For example, the name of the work sheet for an inventory run February 1, 1984 on the Long Meadow Lake unit is W1840201. Specific directions for running the computer or Multiplan can be found in the computer manuals. There are also help instructions on the spread sheets cited above.

The percent birds visible at any one observation point for a given month is entered by pushing the "C" key followed by the "F" key. Then type in the name of the month in full. Press the cancel key (key marked -->1 on some machines). Then type r6c2 and hit the enter key. This will move the data for the month you selected to the percent birds visible row (row 6).

The percent of the unit visible for high and low water is entered by moving the appropriate row also. In this instance, type "C" (for copy from), then "F" (from), and then the word "low or high" to designate water level. Then hit the "cancel (or -->1) key, type r35c2 and finally, hit the enter key. This will move the data for each unit for the high or low water condition selected to the percent of the unit covered by the observation points row (row 35).

If unusual flooding occurs during the normal low water period, the high water values may be used to estimate populations during that month. The percent unit values may also be entered manually if only some of the units are flooding.

After these values are entered, save the sheet to disk under the name "ab". Also save a copy of the sheet for the records under the name abYRMODA, where YR, MO, and day represent 2 digit abbreviations for the year, month and day.

The next step is to load the Multiplan sheet called "WF1" or "WF2." The sheet "WF1" is for entering observations on Long Meadow Lake, Bloomington Ferry, Chaska and Louisville. It will also calculate estimated populations for these units. The sheet "WF2" is for entering Black Dog Lake, Upgrala and Round Lake counts. It will also calculate estimated populations for those units.

Data Analysis:

Calculation of the actual waterfowl populations will be done by the computer program automatically as described above in "Summarizing Data". Besides entering the number of birds by species seen at each observation point and the percent of the area that was seen, you will also have to enter the percentage of birds seen at each observation point. This assumes that not all birds that are actually at an observation are seen. The actual percentage that the observer can see is an estimate. It can be determined by counting at a point and then doing a complete beat-out of the area to find out how many birds actually are there. Preliminary information has been gathered at the refuge to determine these values, but they are still rough estimates. The value will vary with the weather, stage of vegetation growth, and stage of flooding. Until better values can be obtained, the values in Table IPl.A should be used for the corresponding percent visibility for the area. These values are already listed on the Multiplan sheet called "abblank" and are entered as described in the "Summarizing Data" section.

The percentage of any one refuge unit covered by all the observation points varies with the water levels on the refuge. The percentage covered during flood stage is much less than during normal water levels. The percentage of the unit covered by the observation points is shown in Table IPl.B. These values are incorporated into the Multiplan sheet called "abblank. The actual formula used to estimate the population is:

$$\left[\sum_{x=1}^n \#O_x / (OA_x)(B_x) \right] / WA_y$$

Where:

#O_x = Actual number of each species counted from the ground (usually once a month) at observation point X.

OA_x and B_x = Visibility correction factors where OA_x = fraction of observation area visible from observation point X (expressed as a decimal) - value varies with season and stage of plant growth - estimated in the field; and B_x = % of birds seen that are actually at observation point X (expressed as a decimal, see Table IP1.A). This value is difficult to determine. Data is being gathered to provide better estimates for this value.

WA_y = Percent of wetland acres on Y unit which are visible from established observation points (expressed as a decimal - see Table IP1.B). This variable is given a value dependent upon time of year and flood conditions and can be derived using existing land management computerized data and unit water gauges. The formula is applied to each refuge unit and then all unit estimates are summed to produce a waterfowl population estimate for the entire refuge.

The formula totals estimated populations at each observation point on a unit and then divides this estimate by the percentage of the wetlands on the unit that are covered by the observation points. The estimated population at each observation point is calculated by dividing the number of birds actually counted by the product of the percent of the observation point visible at that time of the year and the percent of the birds actually seen at that time of the year.

Normally, counts will not be made on Louisville, Bloomington Ferry and Round Lake. These are omitted due to the difficulty of access and lack of good observation points. The computer program will compensate for this lack of counts by estimating populations for these areas by taking a percentage of the population for other sections of the refuge with similar habitat. The populations on these units will be derived by the following means:

| | High Water (Apr.-June) | Low Water (July-Mar.) |
|--------------------|--|--|
| Bloomington Ferry* | 17 x Peterson pond estimate (LML) | 3.5 x Peterson pond estimate (LML) |
| Louisville Swamp = | .46 x Long Meadow Lake estimate | .28 x Long Meadow Lake estimate |
| Round Lake = | 1.72 x Big Grass Lake observation point estimate (UP15) | 1.72 x Big Grass Lake observation point estimate (UP15) |

- * The only species not estimated in this way for Bloomington Ferry is Canada geese. The estimate of Canada geese on Bloomington Ferry will be considered equal to the estimate of Canada geese on the Chaska Lake unit. This is done since the Peterson Pond area receives regular use at certain times of the year by roosting Canada geese. This is not known to occur on the Bloomington Ferry unit.

If any of the 3 units are counted during a survey, the estimated population of that unit in the computer summary can be changed by replacing the value after the formulas have been unlocked. The values above are incorporated into the Multiplan sheet called "abblank."

If only one inventory is run during the month, the calculated population should be recorded as the average monthly population on the waterfowl output reports. The peak population should be recorded as occurring on the 15th day of the month and should be considered to be 50% higher than the calculated average population during spring and fall migrations. During summer and winter, the peak population should be reported as 10% higher than the average population. If more than one waterfowl inventory is run during a month, the peak population may be more accurately estimated and the day of its occurrence recorded.

Table IPl.A

Percent (expressed as a decimal) of the birds actually present at an observation area that are seen

| Unit and Observation Point | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|---|----|
| Month | LML | | | | | | | | | | | * | BDL | | | * | UP | | | | * | CK |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | 12 | 13 | 14 | | 15 | 16 | 17 | 18 | | |
| MP cell | | | | | | | | | | | | * | | | | * | | | | | * | |
| reference | r6c2 | r6c3 | r6c4 | r6c5 | r6c6 | r6c7 | r6c8 | r6c9 | r6c10 | r6c11 | r6c12 | r6c13 | r6c14 | r6c15 | r6c16 | r6c17 | r6c18 | r6c19 | r6c20 | | | |
| January | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.9 | 0.9 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| February | 1 | 1 | 0.95 | 1 | 1 | 1 | 1 | 1 | 0.95 | 1 | 0.95 | 0.9 | 0.9 | 0.95 | 1 | 1 | 1 | 1 | 1 | | | |
| March | 0.8 | 0.8 | 0.8 | 0.85 | 0.95 | 0.8 | 0.75 | 0.95 | 0.8 | 0.85 | 0.8 | 0.8 | 0.8 | 0.75 | 0.75 | 0.8 | 0.75 | 0.7 | 0.9 | | | |
| April | 0.8 | 0.75 | 0.55 | 0.7 | 0.95 | 0.65 | 0.6 | 0.95 | 0.7 | 0.8 | 0.65 | 0.8 | 0.8 | 0.75 | 0.6 | 0.7 | 0.65 | 0.6 | 0.8 | | | |
| May | 0.75 | 0.65 | 0.4 | 0.6 | 0.95 | 0.5 | 0.5 | 0.95 | 0.5 | 0.75 | 0.5 | 0.75 | 0.75 | 0.6 | 0.5 | 0.5 | 0.5 | 0.4 | 0.7 | | | |
| June | 0.75 | 0.5 | 0.15 | 0.4 | 0.95 | 0.35 | 0.4 | 0.95 | 0.15 | 0.7 | 0.35 | 0.65 | 0.6 | 0.5 | 0.35 | 0.4 | 0.2 | 0.2 | 0.65 | | | |
| July | 0.5 | 0.6 | 0.25 | 0.55 | 0.95 | 0.4 | 0.45 | 0.95 | 0.5 | 0.6 | 0.5 | 0.8 | 0.75 | 0.65 | 0.35 | 0.6 | 0.6 | 0.35 | 0.6 | | | |
| August | 0.55 | 0.65 | 0.3 | 0.5 | 0.95 | 0.45 | 0.5 | 0.95 | 0.35 | 0.6 | 0.5 | 0.7 | 0.8 | 0.8 | 0.35 | 0.55 | 0.55 | 0.3 | 0.7 | | | |
| September | 0.6 | 0.75 | 0.5 | 0.6 | 0.95 | 0.5 | 0.55 | 0.95 | 0.45 | 0.7 | 0.55 | 0.8 | 0.85 | 0.8 | 0.4 | 0.65 | 0.65 | 0.45 | 0.75 | | | |
| October | 0.65 | 0.8 | 0.55 | 0.7 | 0.95 | 0.6 | 0.6 | 0.95 | 0.5 | 0.75 | 0.6 | 0.85 | 0.85 | 0.8 | 0.5 | 0.7 | 0.7 | 0.55 | 0.8 | | | |
| November | 0.7 | 0.85 | 0.6 | 0.75 | 0.95 | 0.65 | 0.7 | 0.95 | 0.55 | 0.85 | 0.65 | 0.85 | 0.85 | 0.85 | 0.55 | 0.75 | 0.75 | 0.6 | 0.8 | | | |
| December | 0.85 | 0.9 | 0.8 | 0.9 | 0.95 | 0.8 | 0.85 | 0.95 | 0.7 | 0.9 | 0.8 | 0.9 | 0.9 | 0.9 | 0.7 | 0.9 | 0.8 | 0.75 | 0.9 | | | |

Table IP1.B

Fraction of each Refuge unit wetland area covered by the
waterfowl survey observation points

| | * Fraction of the unit covered * for different water levels * | | | |
|-------------------|---|------|--------------|------|
| Unit | * average water | | * high water | |
| | * | | * | |
| Long Meadow Lake | * | 0.29 | * | 0.17 |
| | * | | * | |
| Black Dog Lake | * | 0.44 | * | 0.23 |
| | * | | * | |
| Bloomington Ferry | * | -- | * | -- |
| | * | | * | |
| Upgrala | * | 0.24 | * | 0.14 |
| | * | | * | |
| Chaska | * | 0.38 | * | 0.12 |
| | * | | * | |
| Louisville Swamp | * | -- | * | -- |
| | * | | * | |

Field Data forms:Attachment IPl.A Observation Point Location mapsAttachment IPl.B Field Data sheetAttachment IPl.C Computer Form printoutInventory areas/routes/transects:

The areas to be counted have been located in easily accessible areas to facilitate speed of doing the inventory. The areas also provide good coverage of a large part of the primary waterfowl habitat.

Attachment IPl.A Observation point location maps

III. Special Considerations

Documentation of acreages and other information used to derive values used in this inventory are included in Attachment IPl.D. If the opportunity arises for an aerial waterfowl count during fall and spring migrations, this should be utilized. A ground count should also be conducted the same day to verify aerial species identification and to check ground count accuracy.

IV. Manpower and costs per inventory

| <u>Item</u> | <u>Cost</u> |
|---|-------------|
| Manpower (assume \$10/hr and 10 hours) | \$100.00 |
| Equipment (assume \$.25/mile and 100 miles) | \$ 25.00 |
| Materials: Already in stock | \$.00 |
| TOTAL | \$125.00 |

Prepared by:

Thomas J. Larson

Date:

3/7/84

Reviewed by:

E.S. Crozier

Date:

3/8/84

Approved by:

Date:

Attachments

| <u>Subject</u> | <u>Attachment</u> |
|---|-------------------|
| Observation Point location maps | IP1.A |
| Field Data Sheet | IP1.B |
| Computer Summary forms/printouts | IP1.C |
| Documentation for values used in deriving the inventory procedure | IP1.D |

| DATE | | | OBS. TIME AT | AREA | SPECIES | | | | | | | | | | | | | | | | | | | | COMMON | | | | |
|--|----|----|--------------|------------|---------|------|-------|-------|-------|------|-------|-----|-----|-----|-----|-----|------|------|------|-----|-------|------|-------|-----|--------|-----|------|-------|--|
| YR | MO | DA | OB. PT. | VISIBILITY | COOT | SWAN | GEE.S | GEE.W | GEE.C | MALL | BLACK | GAD | PIN | GWT | BWT | WJG | SNOW | WOOD | REDH | CAN | L-SCA | BUFF | RUDDY | GRN | CEGR | PBG | COAW | DA BA | |
| SURVEY TYPE: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SURVEY NAME ON DISKETTE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W 1 YR MO DA P 09 B 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W-MONTHLY WATERFOWL SURVEY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P-BREEDING PAIR COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B-BROOD COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1-LNL, BF, CHE, LVL 2-BDL, CPG, RL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBSERVER(S) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WEATHER: CLOUD COVER: 0-25% 26-50% 51-75% 76-100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TEMPERATURE: F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIND SPEED: mph | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRECIPITATION: RAIN DRIZZLE HAIL SNOW NONE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIND DIRECTION (CIRCLE DIRECT, BLOWING FROM) CALM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| N NW NE W SE S | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| DATE | YR | MO | DA | OBS. | ARRIV. TIME AT | % AREA VISIBLE | COOT | SWAMP | GLE.S | GEE.W | GEE.C | MALL | BLACK | GAD | PIN | SPEC | GWT | BWT | WLOG | SHOV | WOOD | REDH | CAN | L.SCA | BUFF | RUDDY | GBH | CEGR | PBG | CORN | COMMENT # | |
|------------------------------|----|----|----|------|----------------|----------------|------|-------|-------|-------|-------|------|-------|-----|-----|------|-----|-----|------|------|------|------|-----|-------|------|-------|-----|------|-----|------|-----------|--|
| SURVEY TYPE: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SURVEY NAME ON DISKETTE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W | 1 | YR | MO | DA | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P | OR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W=MONTHLY WATERFOWL SURVEY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| P=BREEDING PAIR COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B=BROOD COUNT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1=LML,BF,CHK,LVL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2=BDL,UPG,RL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OBSERVER(S) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WEATHER: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X CLOUD COVER: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0-25% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-50% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 51-75% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 76-100% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TEMPERATURE: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIND SPEED: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| mph | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRECIPITATION: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAIN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DRIZZLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| HAIL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SNOW | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NONE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIND DIRECTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (CIRCLE DIRECT BLOWING FROM) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CALM | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| N | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NW NE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| W E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SW SE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| S | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Diskette: Multiplan Files for Calculating Waterfowl Populations"

| | |
|---------|----------------------------|
| WF1 | |
| WF2 | Working copies of programs |
| AB | |
| ABBLANK | |

| | |
|----------|---------------------------|
| ABMASTER | |
| WF1MASTR | Master copies of programs |
| WF2MASTR | |

To start system, put Multiplan Disk in Drive 0 and turn CRT on. Press MP, press return.

Take Multiplan disk out and put data disk in drive 0

Type T (for transfer), L (for load)

Type name of file and hit return.

You are all set to go.

1 date
 2 month day year
 3
 4 lm1 lm2 lm3 lm4 lm5 lm6 lm7 lm8 lm9 lm10 lm11 bd12 bd13 bd14 up15 up16 up17 up18 ck19
 5 % area seen
 6 % birds seen
 7 product 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 8
 9 push the 'c' key (for copy)
 10 push the 'f' key (for from)
 11 type in the full name of the month, ~~starting with a capital letter~~
 12 press the cancel key to tab to the next space
 13 type in r6c2
 14 push the enter key
 15 the computer will do the rest for you!
 16 now goto row 35 for the next step
 17

| | lm1 | lm2 | lm3 | lm4 | lm5 | lm6 | lm7 | lm8 | lm9 | lm10 | lm11 | bd12 | bd13 | bd14 | up15 | up16 | up17 | up18 | ck19 |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 18 | | | | | | | | | | | | | | | | | | | |
| 19 % birds seen | | | | | | | | | | | | | | | | | | | |
| 20 January | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.9 | 0.9 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 February | 1 | 1 | 0.95 | 1 | 1 | 1 | 1 | 1 | 0.95 | 1 | 0.95 | 0.9 | 0.9 | 0.95 | 1 | 1 | 1 | 1 | 1 |
| 22 March | 0.8 | 0.8 | 0.8 | 0.85 | 0.95 | 0.8 | 0.75 | 0.95 | 0.8 | 0.85 | 0.8 | 0.8 | 0.8 | 0.75 | 0.75 | 0.8 | 0.75 | 0.7 | 0.9 |
| 23 April | 0.8 | 0.75 | 0.55 | 0.7 | 0.95 | 0.65 | 0.6 | 0.95 | 0.7 | 0.8 | 0.65 | 0.8 | 0.8 | 0.75 | 0.6 | 0.7 | 0.65 | 0.6 | 0.8 |
| 24 May | 0.75 | 0.65 | 0.4 | 0.6 | 0.95 | 0.5 | 0.5 | 0.95 | 0.5 | 0.75 | 0.5 | 0.75 | 0.75 | 0.6 | 0.5 | 0.5 | 0.5 | 0.4 | 0.7 |
| 25 June | 0.75 | 0.5 | 0.15 | 0.4 | 0.95 | 0.35 | 0.4 | 0.95 | 0.15 | 0.7 | 0.35 | 0.65 | 0.6 | 0.5 | 0.35 | 0.4 | 0.2 | 0.2 | 0.65 |
| 26 July | 0.5 | 0.6 | 0.25 | 0.55 | 0.95 | 0.4 | 0.45 | 0.95 | 0.5 | 0.6 | 0.5 | 0.8 | 0.75 | 0.65 | 0.35 | 0.6 | 0.6 | 0.35 | 0.6 |
| 27 August | 0.55 | 0.65 | 0.3 | 0.5 | 0.95 | 0.45 | 0.5 | 0.95 | 0.35 | 0.6 | 0.5 | 0.7 | 0.8 | 0.8 | 0.35 | 0.55 | 0.55 | 0.3 | 0.7 |
| 28 September | 0.6 | 0.75 | 0.5 | 0.6 | 0.95 | 0.5 | 0.55 | 0.95 | 0.45 | 0.7 | 0.55 | 0.8 | 0.85 | 0.8 | 0.4 | 0.65 | 0.65 | 0.45 | 0.75 |
| 29 October | 0.65 | 0.8 | 0.55 | 0.7 | 0.95 | 0.6 | 0.6 | 0.95 | 0.5 | 0.75 | 0.6 | 0.85 | 0.85 | 0.8 | 0.5 | 0.7 | 0.7 | 0.55 | 0.8 |
| 30 November | 0.7 | 0.85 | 0.6 | 0.75 | 0.95 | 0.65 | 0.7 | 0.95 | 0.55 | 0.85 | 0.65 | 0.85 | 0.85 | 0.85 | 0.55 | 0.75 | 0.75 | 0.6 | 0.8 |
| 31 December | 0.85 | 0.9 | 0.8 | 0.9 | 0.95 | 0.8 | 0.85 | 0.95 | 0.7 | 0.9 | 0.8 | 0.9 | 0.9 | 0.9 | 0.7 | 0.9 | 0.8 | 0.75 | 0.85 |

| | LML | BDL | UP | CK | BF | LVS |
|----------------|------|------|------|------|-----|------|
| 32 | | | | | | |
| 33 | | | | | | |
| 34 | | | | | | |
| 35 water level | | | | | | |
| 36 | | | | | | |
| 37 | | | | | | |
| 38 low water | 0.29 | 0.44 | 0.24 | 0.38 | 3.5 | 0.28 |
| 39 high water | 0.17 | 0.23 | 0.14 | 0.12 | 17 | 0.46 |

40
 41
 42 this will be the same basic procedure followed above
 43 press c(for copy), followed by f(for from)
 44 type in 'low' or 'high' to designate water level
 45 tab over one space with the cancel key, type in r35c2
 46 press enter, sit back and watch the computer do your work
 47 you're all done with this sheet. Transfer and Save it
 48 make sure you save your sheet as 'ab' for the computer's reference
 49 also save another copy for your records (see procedure IP1 documentation)

| | | | | | | | | | | | | | | | | | | | |
|---|---------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 "date" | | | | | | | | | | | | | | | | | | | |
| 2 | "mont " | day " | yea | | | | | | | | | | | | | | | | |
| 3 | h" | " | r" | | | | | | | | | | | | | | | | |
| 4 | "lm1" | "lm2" | "lm3" | "lm4" | "lm5" | "lm6" | "lm7" | "lm8" | "lm9" | "lm10" | "lm11" | "bd12" | "bd13" | "bd14" | "up15" | "up16" | "up17" | "up18" | "ck19" |
| 5 "% area seen" | | | | | | | | | | | | | | | | | | | |
| 6 "% birds seen" | | | | | | | | | | | | | | | | | | | |
| 7 "product" | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] | R[-2] |
| | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- | C*R[- |
| | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC | 1JC |
| 8 | | | | | | | | | | | | | | | | | | | |
| 9 "push the 'c' key (for copy)" | | | | | | | | | | | | | | | | | | | |
| 10 "push the 'f' key (for from)" | | | | | | | | | | | | | | | | | | | |
| 11 "type in the full name of the month, starting with a capital letter" | | | | | | | | | | | | | | | | | | | |
| 12 "press the cancel key to tab to the next space" | | | | | | | | | | | | | | | | | | | |
| 13 "type in r6c2" | | | | | | | | | | | | | | | | | | | |
| 14 "push the enter key" | | | | | | | | | | | | | | | | | | | |
| 15 "the computer will do the rest for you!" | | | | | | | | | | | | | | | | | | | |
| 16 "now goto row 35 for the next step" | | | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | | | |
| 18 | "lm1" | "lm2" | "lm3" | "lm4" | "lm5" | "lm6" | "lm7" | "lm8" | "lm9" | "lm10" | "lm11" | R4C13 | R4C14 | R4C15 | R4C16 | R4C17 | R4C18 | R4C19 | R4C20 |
| 19 "% birds seen" | | | | | | | | | | | | | | | | | | | |
| 20 "January" | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0.9 | 0.9 | 1 | 1 | 1 | 1 | 1 | 1 |
| 21 "February" | 1 | 1 | 0.95 | 1 | 1 | 1 | 1 | 1 | 0.95 | 1 | 0.95 | 0.9 | 0.9 | 0.95 | 1 | 1 | 1 | 1 | 1 |
| 22 "March" | 0.8 | 0.8 | 0.8 | 0.85 | 0.95 | 0.8 | 0.75 | 0.95 | 0.8 | 0.85 | 0.8 | 0.8 | 0.8 | 0.75 | 0.75 | 0.8 | 0.75 | 0.7 | 0.9 |
| 23 "April" | 0.8 | 0.75 | 0.55 | 0.7 | 0.95 | 0.65 | 0.6 | 0.95 | 0.7 | 0.8 | 0.65 | 0.8 | 0.8 | 0.75 | 0.6 | 0.7 | 0.65 | 0.6 | 0.8 |
| 24 "May" | 0.75 | 0.65 | 0.4 | 0.6 | 0.95 | 0.5 | 0.5 | 0.95 | 0.5 | 0.75 | 0.5 | 0.75 | 0.75 | 0.6 | 0.5 | 0.5 | 0.5 | 0.4 | 0.7 |
| 25 "June" | 0.75 | 0.5 | 0.15 | 0.4 | 0.95 | 0.35 | 0.4 | 0.95 | 0.15 | 0.7 | 0.35 | 0.65 | 0.6 | 0.5 | 0.35 | 0.4 | 0.2 | 0.2 | 0.65 |
| 26 "July" | 0.5 | 0.6 | 0.25 | 0.55 | 0.95 | 0.4 | 0.45 | 0.95 | 0.5 | 0.6 | 0.5 | 0.8 | 0.75 | 0.65 | 0.35 | 0.6 | 0.6 | 0.35 | 0.6 |
| 27 "August" | 0.55 | 0.65 | 0.3 | 0.5 | 0.95 | 0.45 | 0.5 | 0.95 | 0.35 | 0.6 | 0.5 | 0.7 | 0.8 | 0.8 | 0.35 | 0.55 | 0.55 | 0.3 | 0.7 |
| 28 "September" | 0.6 | 0.75 | 0.5 | 0.6 | 0.95 | 0.5 | 0.55 | 0.95 | 0.45 | 0.7 | 0.55 | 0.8 | 0.85 | 0.8 | 0.4 | 0.65 | 0.65 | 0.45 | 0.75 |
| 29 "October" | 0.65 | 0.8 | 0.55 | 0.7 | 0.95 | 0.6 | 0.6 | 0.95 | 0.5 | 0.75 | 0.6 | 0.85 | 0.85 | 0.8 | 0.5 | 0.7 | 0.7 | 0.55 | 0.8 |
| 30 "November" | 0.7 | 0.85 | 0.6 | 0.75 | 0.95 | 0.65 | 0.7 | 0.95 | 0.55 | 0.85 | 0.65 | 0.85 | 0.85 | 0.85 | 0.55 | 0.75 | 0.75 | 0.6 | 0.8 |
| 31 "December" | 0.85 | 0.9 | 0.8 | 0.9 | 0.95 | 0.8 | 0.85 | 0.95 | 0.7 | 0.9 | 0.8 | 0.9 | 0.9 | 0.9 | 0.7 | 0.9 | 0.8 | 0.75 | 0.85 |
| 32 | | | | | | | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | | | | | |
| 34 | "LML" | "BDL" | "UP" | "CK" | "BF" | "LVS" | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | |
| 38 "low water" | 0.29 | 0.44 | 0.24 | 0.38 | 3.5 | 0.28 | | | | | | | | | | | | | |
| 39 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 40 "high water" | 0.17 | 0.23 | 0.14 | 0.12 | 17 | 0.46 | | | | | | | | | | | | | |
| 41 | | | | | | | | | | | | | | | | | | | |
| 42 "this will be the same basic procedure followed above" | | | | | | | | | | | | | | | | | | | |
| 43 "press o(for copy), followed by f(for from)" | | | | | | | | | | | | | | | | | | | |
| 44 "type in 'low' or 'high' to designate water level" | | | | | | | | | | | | | | | | | | | |
| 45 "tab over one space with the cancel key, type in r35 c2" | | | | | | | | | | | | | | | | | | | |
| 46 "press enter, sit back and watch the computer do your work" | | | | | | | | | | | | | | | | | | | |
| 47 "you're all done with this sheet. Transfer and Save it" | | | | | | | | | | | | | | | | | | | |
| 48 "make sure you save your sheet as 'ab' for the computer's reference" | | | | | | | | | | | | | | | | | | | |
| 49 "also save an other copy for your records (see procedure IPI documentation)" | | | | | | | | | | | | | | | | | | | |

[illegible]

| obs. Pt. | coot | swan | see:w | see:s | see:c | mall | black | sad | rin | swt | bwt | wids | shov | wood | shov | redh | rn | can | l.sca | buf | r | 0 | 0 | 0 | 0 | 0 | 0 | |
|-------------|-------|------|-------|-------|-------|-------|-------|-------|-------|-----|-----|-------|------|------|-------|------|----|-----|-------|-----|---|---|---|---|---|---|--------|--------|
| lm1 | 0 | 0 | 54.55 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 54.545 | |
| lm2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| lm3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| lm4 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | |
| lm5 | 0 | 0 | 0 | 0 | 0 | 21.05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2.632 | 0 | 0 | 0 | 65.79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 89.474 | |
| lm6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| lm7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16.84 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 16.842 | |
| lm8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| lm9 | 171.4 | 0 | 0 | 0 | 0 | 0 | 76.19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 247.62 | |
| lm10 | 0 | 0 | 0 | 0 | 0 | 3.333 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.3333 | |
| lm11 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | |
| sub total | 221.4 | 0 | 54.55 | 0 | 0 | 24.39 | 0 | 76.19 | 0 | 0 | 0 | 16.84 | 0 | 0 | 2.632 | 0 | 0 | 0 | 65.79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| unit POP | 763.5 | 0 | 188.1 | 0 | 0 | 84.09 | 0 | 262.7 | 0 | 0 | 0 | 58.08 | 0 | 0 | 9.074 | 0 | 0 | 0 | 226.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1592.5 |
| ck19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.524 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.5238 | |
| unit POP | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25.06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 25.063 | |
| lv unit | 213.8 | 0 | 52.66 | 0 | 0 | 23.55 | 0 | 73.56 | 0 | 0 | 0 | 16.26 | 0 | 0 | 2.541 | 0 | 0 | 0 | 63.52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 445.89 |
| bf unit | 0 | 0 | 190.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 190.91 | |
| Page totals | 977.3 | 0 | 431.7 | 0 | 0 | 107.6 | 0 | 336.3 | 25.06 | 0 | 0 | 74.34 | 0 | 0 | 11.62 | 0 | 0 | 0 | 290.4 | 0 | 0 | | | | | | | |

Example of WF1 filled
with hypothetical data

| WF2 | date | test | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|-------|-------|-------|------|------|------|----|-----|-------|-----|----|---|---|---|---|---|---|--------|-------|
| birds obs. | coot | swan | seew | sees | seec | mall | black | sad | pin | swt | bwt | wids | shov | wood | shov | redh | rn | can | l.sca | buf | ru | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| obs. ft. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| bd12 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| bd13 | | 8 | | | | | | 6 | | | 15 | | | | | | | | | | | | | | | | | 5 | |
| bd14 | | | 15 | | | | | | | | | | | | | | | | | | | | | | | | | 29 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | 15 | |
| UP15 | | | | 25 | 63 | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| UP16 | | | | | | 54 | | | | | | | 4 | | | | | | | | | | | | | | | 88 | |
| UP17 | | | | | | | 98 | | | | | | | | | | | | | | | | | | | | | 58 | |
| UP18 | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | 98 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| total | 5 | 8 | 15 | 25 | 63 | 54 | 98 | 6 | 1 | 0 | 15 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 294 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| calc. POP. | coot | swan | seew | sees | seec | mall | black | sad | pin | swt | bwt | wids | shov | wood | shov | redh | rn | can | l.sca | buf | ru | 0 | 0 | 0 | 0 | 0 | 0 | 0 | total |
| obs. ft. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| bd12 | 10.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| bd13 | 0 | 12.5 | 0 | 0 | 0 | 0 | 0 | 9.375 | 0 | 0 | 23.44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| bd14 | 0 | 0 | 22.06 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| sub total | 10.2 | 12.5 | 22.06 | 0 | 0 | 0 | 0 | 9.375 | 0 | 0 | 23.44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| unit POP | 23.19 | 28.41 | 50.13 | 0 | 0 | 0 | 0 | 21.31 | 0 | 0 | 53.27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 176.31 | |
| UP15 | 0 | 0 | 0 | 79.37 | 200 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| UP16 | 0 | 0 | 0 | 0 | 0 | 109.1 | 0 | 0 | 0 | 0 | 0 | 8.081 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| UP17 | 0 | 0 | 0 | 0 | 0 | 0 | 237.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| UP18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4.762 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| sub total | 0 | 0 | 0 | 79.37 | 200 | 109.1 | 237.6 | 4.762 | 0 | 0 | 0 | 8.081 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| unit POP | 0 | 0 | 0 | 330.7 | 833.3 | 454.5 | 989.9 | 19.84 | 0 | 0 | 0 | 33.67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 638.87 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | 2662 | |
| rl unit | 0 | 0 | 0 | 136.5 | 344 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 480.51 | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Page totals | 23.19 | 28.41 | 50.13 | 467.2 | 1177 | 454.5 | 989.9 | 21.31 | 19.84 | 0 | 53.27 | 0 | 33.67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3318.8 | |

Example of WF2 filled
With hypothetical data

Documentation for values used in deriving the inventory procedure

Actual Wetland Acres

From computerized Wetland Types*Riverine System and Palustrine System

Average Water (July-March)

Unconsolidated Bottom

Aquatic Bed

Emergent Wetland Non-persistent

High Water (April-June)

Forested Wetland

Unconsolidated Shore

Emergent Wetland Persistent

Scrub-Shrub Wetland

Numbers used to calculate actual wetland area covered by observation points:

| | Average Water | Acres (% of area observed) | | High Water |
|----------------|---------------|----------------------------------|-----|---------------|
| | | | | |
| 1. Long Meadow | 1201.5 | .29 | .17 | 2,001 |
| 2. Black Dog | 622.0 | .44 | .23 | 1,192 |
| 3. Blm. Ferry | 62.5 | -- | -- | 306 |
| 4. Upgrala | 941.5 | .24 | .14 | 1,667 |
| 5. Chaska | 120.0 | .38 | .12 | 384 |
| 6. Louisville | <u>339.5</u> | -- | -- | <u>912</u> |
| | 3,287.0 acres | | | 6,462 |

Round Lake- 129.3 acres of wetland - water level not fluctuating significantly. Include entire unit as observed.

Attachment IP1.D

| <u>Obs. point</u> | <u>Acreage</u> | <u>Acreage of unit seen from observation points</u> |
|-----------------------|----------------|---|
| 1. | 18.48 A | Peterson Pond - 18 acres |
| 2. | 07.70 A | Bass Ponds - 8 acres |
| 3. | 104.72 A | Long Meadow Lake from 4-105 acres |
| 4. | 3.85 A | Hog Back Marsh - 4 acres |
| 5. | 16.17 A | Gravel Pit - 16 acres |
| 6. | 43.12 A | Long Meadow Lake from 7 - 43 acres |
| 7. | 43.12 A | Boardwalk blind - 43 acres |
| 8. | .77 A | Highway Dept. Pond - 1 acre |
| 9. | 70.84 A | Long Meadow Lake from 10-71 acres |
| 10. | 14.63 A | New Cedar bridge - 15 acres |
| 11. | 25.41 A | Old Cedar bridge - 25 acres |
| 12. | 99.33 A | North Black Dog East of plant - 99 acres [©] |
| 13. | 110.88 A | North Black Dog West of plant - 111 acres |
| 14. | 64.68 A | North Black Dog West of plant - 65 acres |
| 15. | 74.69 A | Big Grass Lake - 75 acres |
| 16. | 30.03 A | Little Grass Lake - 30 acres |
| 17. | 17.71 A | East end Rice Lake - 18 acres |
| 18. | 105.49 A | West end Rice Lake - 105 acres |
| 19. | 46.20 A | Chaska Lake - 46 acres |

Wetland Acreages

From computerized Habitat types

Wetlands = Emergents + Aquatics + Open Water (July-March)

| <u>(July-March)</u> | <u>April-June (Incl. wet meadow)</u> |
|-------------------------------------|--------------------------------------|
| 1. Long Meadow Lake - 1,201.5 Acres | 1,569 acres |
| 2. Black Dog - 622 Acres | 1,229 acres |
| 3. Bloomington Ferry - 62.5 Acres | 133.5 acres |
| 4. Upgrala - 941.5 Acres | 1,349 acres |
| 5. Chaska Lake - 120 Acres | 233 acres |
| 6. Louisville Swamp - 339.5 Acres | 686 acres |

From computerized Wetland Types*

Wetlands = Every category except "Not a wetland"

1. Long Meadow Lake - 2,001 acres
2. Black Dog - 1,192 acres
3. Bloomington Ferry - 306 acres
4. Upgrala - 1,667 acres
5. Chaska Lake - 384 acres
6. Louisville Swamp - 912 acres

* Reference: Classification of Wetlands and Deepwater Habitats of the United States, by Cowardin et. al. 1979. In library - 500.1

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP2
Date Procedure Implemented: 04/01/84

Species: Waterfowl

Date Procedure Replaced/
Modified _____ Modified on 03/30/87

Title : Breeding Pair Count

I. Inventory Purpose/Justification

To properly assess the impact of refuge management practices on wildlife production on the refuge, the number of waterfowl breeding on the refuge must be assessed. Estimates of the number of breeding pairs will be used to calculate estimated brood production for the refuge. This information is needed to assess whether or not specific waterfowl output objectives (see Master Plan) are being met.

II. Procedure

Inventory Date(s): May 1-25

Time of Day: 8:00am - 1:00pm

Conduct two breeding pair surveys within the given time period, with each survey conducted on two successive days.

Number of Personnel: 1

Weather Conditions: Optimal: Overcast, calm
Acceptable: Sunny, wind 10-15 mph, light rain

Equipment/Supplies: Binoculars, spotting scope, bird identification guide, vehicle, data sheets, computer, Multiplan program.

Inventory Technique:

The same inventory technique will be used as that used for the monthly waterfowl inventory (IP1). However, instead of merely counting the number of individuals of each species, the number of pairs of each species must be recorded. Lone males or groups of 5 or fewer males will count as pairs (1 pair for each male). If the males are American wigeon or northern shovelers, then only record lone males or male/female pairs as pairs. Do not record lone females or groups of females as pairs unless the birds are diving ducks and males of the same species are not recorded within 1/4 mile. Two breeding pair surveys will be conducted between May 1 and May 25 and the higher estimate will be used to calculate production.

Summarizing Data:

Data will be summarized using the same Multiplan program as used for Inventory Procedure IP1. However, instead of entering counts of individuals by species, the number of pairs of each species at each observation point will be entered. The spreadsheet should be sored under the name "P1YRMODA" or "P2YRMODA" where YR = a two-number abbreviation for the year, MO = a two-number abbreviation for the month, and DA = the day of the month. For example, the name of the worksheet for an inventory run on May 15, 1984 is P1840515. Sheet P1 is used for Long Meadow Lake, Bloomington Ferry, Chaska Lake and Louisville Swamp Units. Sheet P2 is used for Blackdog, Upgrala and Round Lake Units. Specific directions for running the computer or Multiplan can be found in the computer manuals.

Data Analysis:

Calculation of the number of breeding pairs on the refuge will be done in the same manner as the general waterfowl population estimate (see Data Analysis, Procedure IP1). The Multiplan program will perform the calculations automatically. The estimated numbers of for each unit will be the estimated number of breeding pairs on the refuge.

The estimated number of breeding pairs will then be used in formulas provided by Bob Oetting, Migratory Bird Coordinator, in a memo dated 03/28/84, to calculate number of young produced. The formulas used to calculate waterfowl production are as follows:

For dabbling ducks: Production = Total estimated breeding pairs on refuge X 40% hen success X average of 8.4 eggs hatched/successful hen X 55% duckling survival to fledging.

____ Breeding Pairs X 0.4 X 8.4 X 0.55 =
 ____ Ducklings produced to flight stage

For wood ducks : Production = Total estimated breeding pairs on refuge X 55% hen success (inflated for strong renesting effort and multiple successful nests) X average of 12 eggs per successful hen X 60% duckling survival to fledging.

____ Breeding Pairs X 0.55 X 12 X 0.60 =
 ____ Ducklings produced to flight stage

For diving ducks : Production = Total estimated breeding pairs on refuge X 45% hen success X average of 8 eggs hatched/successful hen X 65% duckling survival to fledging.

____ Breeding Pairs X 0.45 X 8 X 0.65 =
 ____ Ducklings produced to flight stage

Dr. Oetting cautions that the above formulae assume only the more traditional forms of managing nesting cover and water levels is being used to improve waterfowl production. They do not include such exotic activities as electric fences, predator management, nest baskets and boxes, harvest control, etc. Each of these activities would affect the formulae in one or more of their elements.

IV. Manpower and Costs Per Inventory

| <u>Item</u> | <u>Cost</u> |
|---|-------------|
| Manpower (assume \$10/hour and 10 hours) | \$100.00 |
| Equipment (assume \$.25/mile and 100 miles) | 25.00 |
| Materials - Already in stock | .00 |
| TOTAL | \$125.00 |

Prepared by: Mary Mitchell
 Reviewed by: Ed Grozel
 Approved by: _____

Date: 03/31/87
 Date: 07/1/87
 Date: _____

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP3
Date Procedure Implemented: 04/01/87

Species: Waterfowl

Title: Waterfowl Brood Count

Date Procedure Replaced/
Modified: ELIMINATED FROM WILDLIFE
INVENTORY PLAN ON 03/30/87

I. Inventory Purpose/Justification

Brood surveys were conducted in 1984 through 1986 using the same inventory technique as used for the monthly waterfowl inventory. Dawn and dusk broods counts were also attempted from shore and canoe with little success. Heavy marsh vegetation and a heavily forested riverbluff and floodplain make visibility of large areas difficult. Therefore, the refuge will no longer run the July brood survey but will estimate production from the breeding pair survey using formulae provided by the Regional Office Migratory Bird Coordinator (See IP2). An additional breeding pair survey in May will be conducted in lieu of the July brood survey.

The refuge will continue to investigate different procedures for surveying waterfowl broods and, if one is found appropriate for the conditions found on this refuge, the survey procedure will be incorporated in the refuge's Wildlife Inventory Plan.

Prepared by: Mary Mitchell

Dated: 03/31/87

Reviewed by: ES Cruzier

Dated: 04/01/87

Approved by: _____

Dated: _____

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP4

Date Procedure Implemented: April 1, 1984

Species: White-tailed deer

Date Procedure replaced/
modified: _____

Title: Annual Population
Inventory

I. Inventory Purpose/Justification

White-tailed deer are the most visible and one of the more numerous mammals on the refuge. The species draws much public attention and can have a significant impact upon the habitat if the population becomes too large. The Refuge Master Plan lists objectives for production of white-tailed deer and sets the refuge production goal at 250. To manage the deer herd properly, the population level must be monitored closely, particularly on Minnesota Valley NWR where high winter densities of deer have been recorded. An annual aerial survey is the most accurate means of monitoring this population.

II. Procedure

Inventory Date(s): January

Time of day: 9:00 a.m.-3:00 p.m.

Number of personnel: 1 pilot, 2 observers

Weather conditions: optimal: overcast; calm; complete ground snow cover
acceptable: sunny; light wind; 95% ground snow cover

Equipment/supplies: Refuge unit maps; helicopter or small fixed wing aircraft

Inventory Technique:

For an accurate count of deer from the air, complete ground snow cover is necessary. If this condition does not exist in January, the count should be delayed until February. When possible, the count should be made by helicopter. The improved accuracy of the helicopter counts outweighs the disadvantage of the higher cost compared to counts from fixed wing aircraft. Counts should include areas within 1/2 mile of

the refuge boundaries since deer within these areas are likely to use the refuge as well (see Attachment IP4.B). No specific flight pattern need be followed as long as all sections of all refuge units are covered. The Minnesota DNR and the Hennepin County Park Reserve District should be consulted prior to the aerial count in the event that they intend to inventory sections of interest to the refuge. An inventory coordinated among all parties is more efficient and cost effective. Survey time required to cover the entire refuge and adjacent areas between refuge units or within 1/2 mile is about 8 hours by helicopter and about 2.5 hours by fixed wing aircraft.

The number of deer sighted during the count should be recorded directly on the refuge maps in the site they were seen. If a group of greater than 9 deer are seen, the number should be circled so there is no confusion later as to whether the number indicates 2 small groups close together or 1 large group. The time the count begins and ends should also be recorded as well as weather conditions, date, observers, pilot, aircraft type, ground snow cover conditions, and comments or problems. The basic data should be recorded on a data sheet (Attachment IP4.A) but each map with the actual counts should also be dated.

A bright but overcast day with a high ceiling is the best type of day to count. On sunny days, the shadows in wooded areas make spotting deer more difficult. The count should be made at an altitude of 200 to 300 feet.

An observer should count on each side of the aircraft with one recording all sightings made by both observers and the pilot. Often a pilot experienced in doing aerial wildlife surveys will be the best observer in the aircraft. Note group sizes and locations to avoid double counting if more than one pass is made over the area.

Summarizing Data

The number of deer seen are recorded on the refuge maps as close to the location they were actually seen at as possible. The number of deer seen on each unit and within 1/2 mile of each unit should be totaled and the values placed on the summary section of the data sheet. Also total all deer seen outside the refuge units and outside the areas within 1/2 mile of the refuge units and place this value on the data sheet. The data sheets and all the maps should all be filed together in Appendix V.

Data Analysis:

If a fixed-wing aircraft is used, a smaller percentage of the deer are seen than if a helicopter is used. To compensate for this, the fixed-wing counts must be corrected with an expansion factor. In 1982, 1983, and 1984 deer counts were conducted on the refuge using both fixed-wing aircraft and a helicopter. Comparing the two counts, correction factors for the fixed-wing counts were obtained.

The correction factors by year and refuge unit are as follows
(Helicopter count/fixed-wing count):

| <u>Unit</u> | <u>1982</u> | <u>Year</u> <u>1983</u> | <u>1984</u> |
|-------------------|-------------|----------------------------|-------------|
| Long Meadow Lake | 2.75 | 1.54 | 1.58 |
| Black Dog Lake | ---- | 7.80 | 0.95 |
| Bloomington Ferry | 1.70 | 1.16 | 1.97 |
| Upgrala | 1.24 | 2.78 | 1.00 |
| Chaska | ---- | 0.80 | ---- |
| Louisville | 2.86 | 1.76 | 1.70 |
| Average by year: | 2.44 | 1.66 | 1.51 |

Average of all three years: 1.87

The best snow conditions for a survey occurred in 1984. Under those conditions, the fixed-wing correction factor is the lowest of all three years surveyed. The value of 1.51 should be used with excellent snow cover. With snow cover less than 100%, the value of 1.87 should be used (average totaling all counts for the 3 years).

The inventory results should be summarized on the Result Summary Sheet (Attachment IP4.C). The estimated population should be derived by taking the helicopter count and dividing by .75 (the estimated fraction of deer seen using a helicopter). If a fixed-wing aircraft is used, the actual count must be multiplied by the fixed-wing correction factor (see above) to arrive at the adjusted count value. This value is then divided by .75 to produce the population estimate. The deer density (Estimated population/mi²) is obtained by dividing the estimated population by the area (square miles) of each unit inventoried. The area includes all habitats, including wetlands and open water.

Field Data forms:

Attachment IP4.A
Attachment IP4.B

Data Sheet
Refuge unit maps and areas within 1/2
mile of refuge units.

Inventory areas/ routes/ transects:

All refuge units and areas within 1/2 mile of refuge units should be inventoried. In addition, areas between refuge units and such areas as Nine Mile Creek and Fort Snelling National Cemetery should also be inventoried to analyse the status of the entire Minnesota River Valley deer population within the vicinity of the refuge. A deer live-capture and tagging program on the refuge has shown that there is a great deal of movement of deer within the river valley.

III. Special Considerations

None.

IV. Manpower and costs per inventory

| <u>Item</u> | <u>Cost</u> |
|--|-------------|
| Manpower (assume \$10/hr and 15 hours) | \$150.00 |
| Equipment: | |
| Helicopter; 8 hours x \$125/hour = \$1000.00 | |
| Fixed-wing; 3 hours x \$80/hour = \$240.00 | |
| (1984 prices) | \$1000.00 |
| Materials: in stock | \$.00 |
| Total | \$1150.00 |

Prepared by:

F. Thomas J. Larson

Date:

3/7/84

Reviewed by:

E.D. Crogel

Date:

3/8/84

Approved by:

Date:

Attachments

Data sheet

Maps of Refuge Units and areas to be counted
falling within 1/2 mile of the units

Aerial Survey

Summary Sheet

Attachment IP4.A

Attachment IP4.B

Attachment IP4.C

Data Sheet

Aerial Inventory

Date: _____ Count Starting time _____ Count Ending time _____

Observers: _____ Pilot: _____

Aircraft: _____ Altitude _____

Airspeed: _____ mph Ground Snow conditions: _____

Weather: _____

% cloud cover (check one): _____ 0-25%; _____ 26-50%; _____ 51-75% _____ 76-100%

Temperature _____ F; wind speed _____ mph

Wind Direction (circle direction wind is blowing from): W

N
NW NE
SW SE
S

Precipitation (check one): _____ rain _____ snow
_____ drizzle _____ none
_____ hail

Comments/problems:

Result summary:

| | Count |
|-----------------------|--|
| <u>On refuge unit</u> | Off refuge but within 1/2 mile of refuge <u>unit</u> |

Long Meadow Lake:

Black Dog Lake:

Bloomington Ferry:

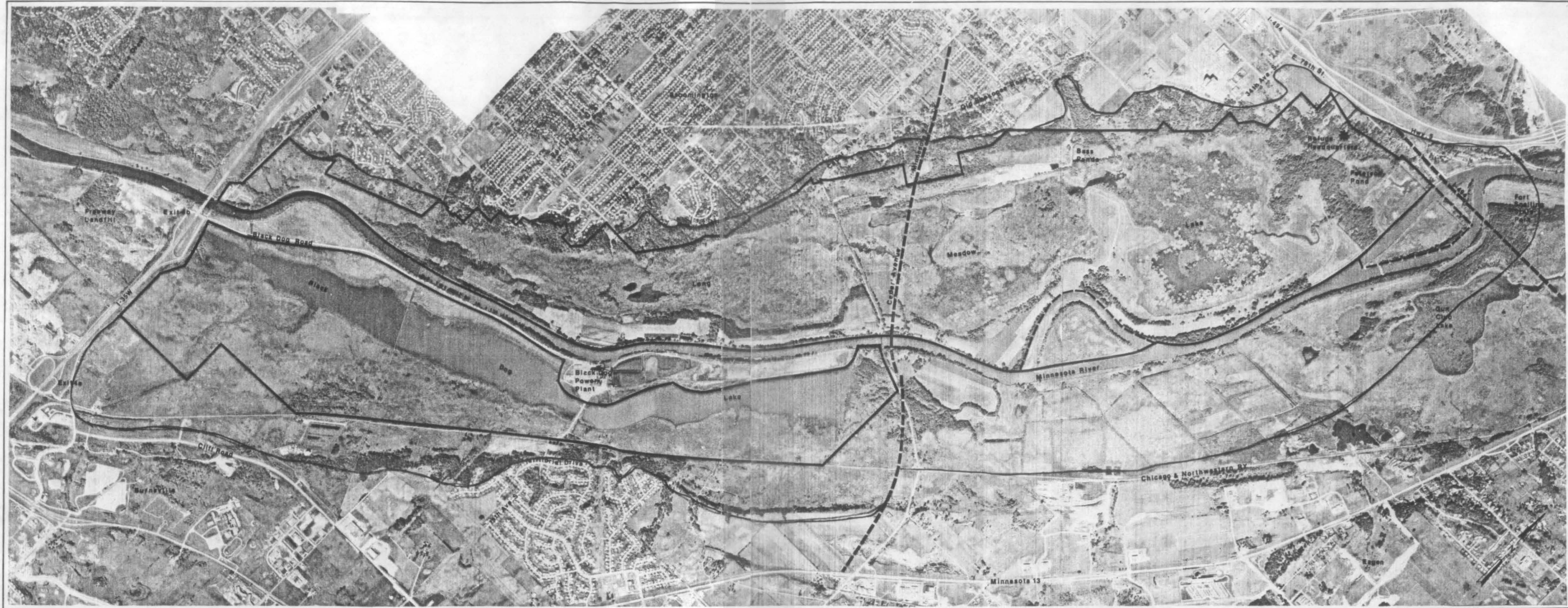
Upgrala:

Chaska:

Louisville:

Wildlife counted but not on refuge or within 1/2 mile: _____

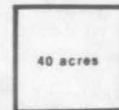
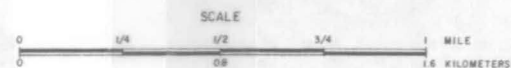
Refuge Unit Maps with additional survey areas
(within 1/2 mile) shown in red



MINNESOTA VALLEY

NATIONAL WILDLIFE REFUGE

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



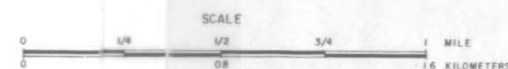
LONG MEADOW LAKE UNIT
BLACK DOG LAKE UNIT



MINNESOTA VALLEY

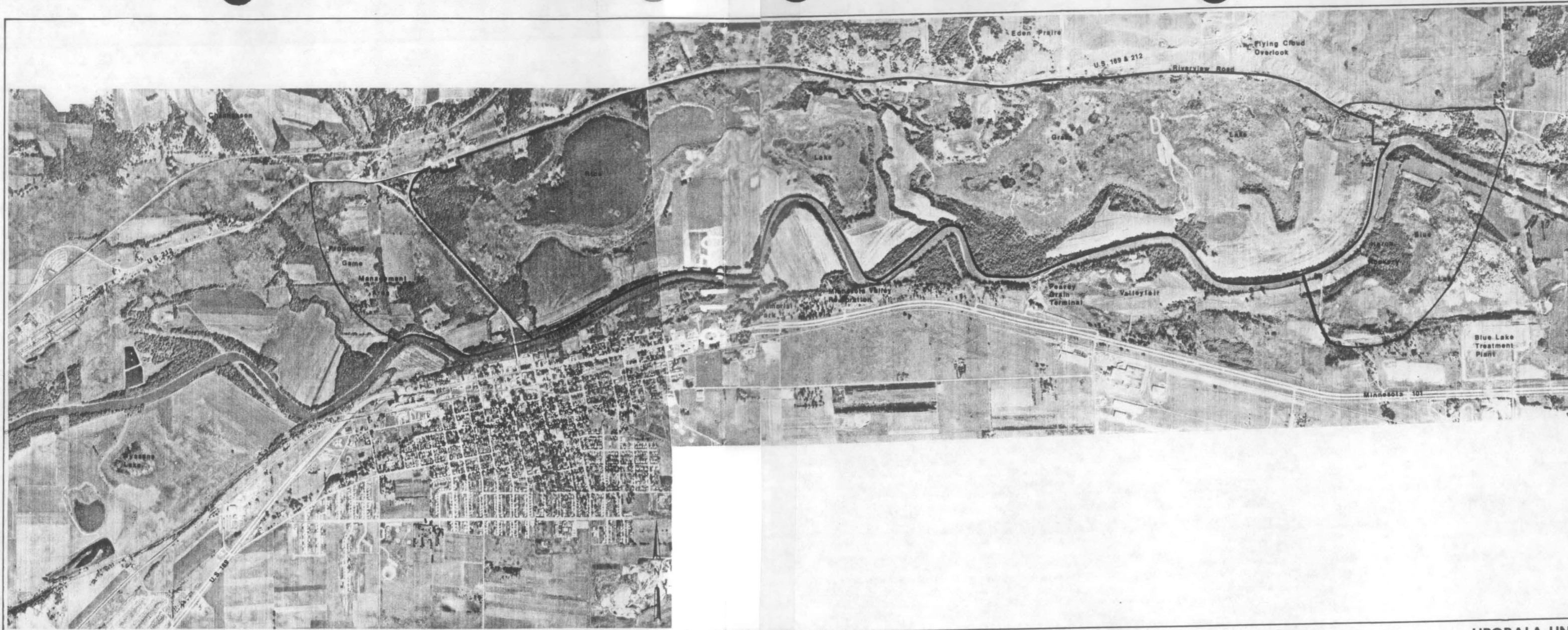
NATIONAL WILDLIFE REFUGE

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



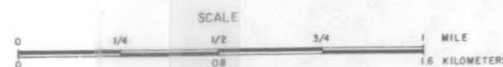
BLOOMINGTON FERRY UNIT

40 acres

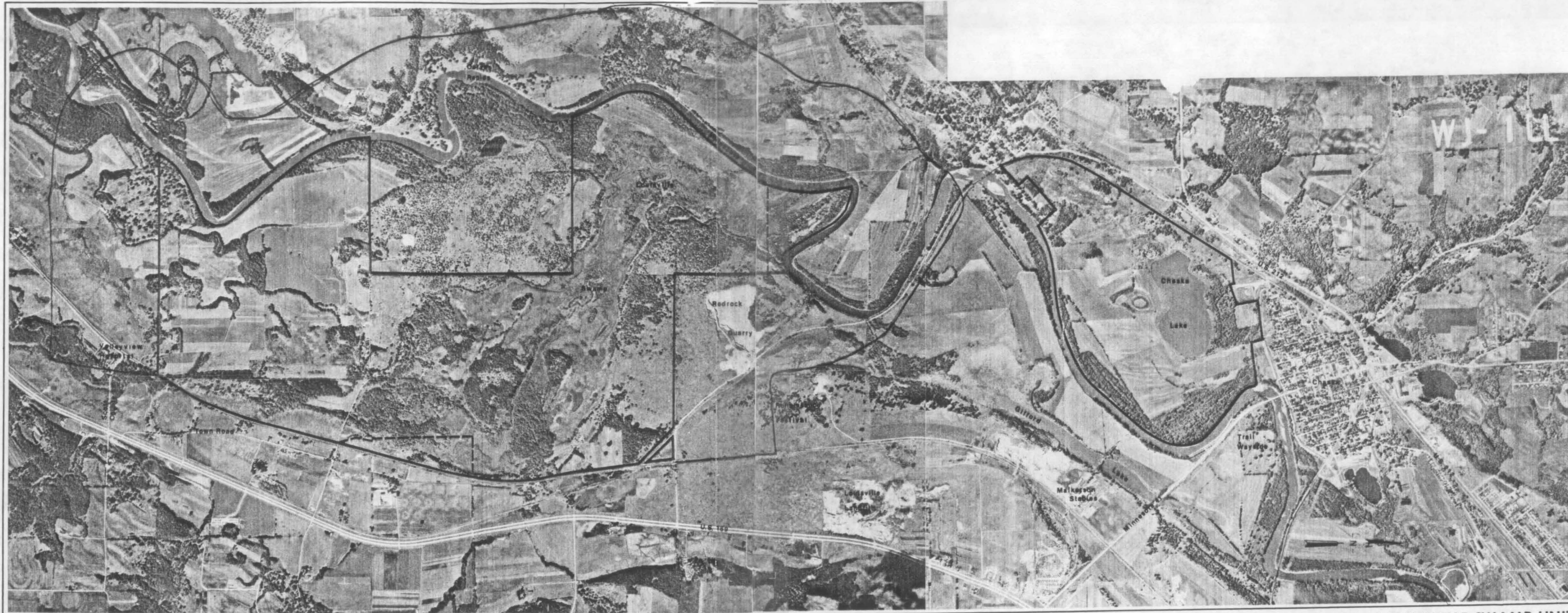


MINNESOTA VALLEY **NATIONAL WILDLIFE REFUGE**

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



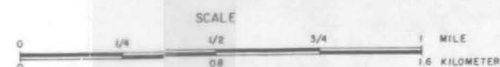
UPGRA LA UNIT



MINNESOTA VALLEY

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CHASKA LAKE and LOUISVILLE SWAMP UNITS

Attachment IP4.C

Result Summary Sheet
Aerial White-tailed Deer InventoryDate: _____
Aircraft type _____If fixed-wing aircraft used, correction factor used to
equate with Helicopter Count (see Data analysis
section) = _____

| Unit Inventoried | Area (mi ²) | Helicopter Actual count | Adjusted count* | Est. pop.** | Est. pop./mi ² |
|---|----------------------------|----------------------------|--------------------|----------------|------------------------------|
| Long Meadow Lake (LML) | 3.85 | | | | |
| w/i 1/2 mi. of LML | 1.64 | | | | |
| LML + w/i 1/2 mi. | 5.49 | | | | |
| Black Dog Lake (BDL) | 2.04 | | | | |
| w/in 1/2 mi. of BDL | .94 | | | | |
| BDL + w/i 1/2 mi. | 2.98 | | | | |
| Bloomington Ferry (BF) | .60 | | | | |
| w/i 1/2 mi. of BF | 2.53 | | | | |
| BF + w/i 1/2 mi. | 3.13 | | | | |
| Upgrala (UPG) | 3.83 | | | | |
| w/i 1/2 mi. of UPG | 1.01 | | | | |
| UPG + w/i 1/2 mi. | 4.84 | | | | |
| Chaska (CHK) | .92 | | | | |
| w/i 1/2 mi. of CHK | --- | | | | |
| UPG + 1/2 mile CHK | .92 | | | | |
| Louisville (LVL) | 4.12 | | | | |
| w/i 1/2 mi. of LVL | 2.30 | | | | |
| LVL + w/i 1/2 mi. | 6.40 | | | | |
| Deer counted out- side areas listed above | 13.75 | | | | |
| Total all refuge units | 15.36 | | | | |
| Total all areas w/i 1/2 mi. | 8.42 | | | | |
| Total all refuge units + w/i 1/2 mi. | 23.78 | | | | |

* If a helicopter was used this column is blank; if fixed-wing aircraft
used Adjusted count - actual count multiplied by fixed wing correction
factor.** Est. Pop. = Actual count (or adjusted count if fixed-wing used) divided
by .75 (est. % of deer seen during a helicopter count).

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP5

Date Procedure Implemented: April 1, 1984

Species: Muskrat

Date Procedure replaced/
modified: _____

Title: Muskrat house count

I. Inventory Purpose/Justification

The refuge Trapping Plan calls for the periodic harvesting of muskrats. To do this in a biologically sound manner, we must know how many muskrats there are. Muskrats can benefit other wetland dwelling species by feeding upon aquatic vegetation and creating open water areas. This can improve the diversity of a wetland. Muskrat houses provide good nesting platforms for some species of waterfowl. However, when muskrat populations get too large, they can eat too much of the vegetation in a localized area. They can also burrow into dikes, weakening them and sometimes causing them to wash out. Population numbers must be known if the positive and negative values of muskrats are to be balanced through management.

II. Procedure

Inventory Date(s): Oct 15-31 Time of day: Daylight

Number of personnel: 1 pilot, 2 observers

Weather conditions: optimal: calm; clear; after initial freeze
following light (1-2 cm. snow fall)
acceptable: wind 5-10 mph; light overcast

Equipment/supplies: Small aircraft or helicopter; data sheets;
binoculars; refuge maps

Inventory Technique:

Muskrats will be surveyed by counting the number of active muskrat houses on the refuge. The population will then be estimated by assuming that each house is occupied by the parents and one litter (Dozier, 1948). The count should be made using a small fixed-wing aircraft or helicopter flown at an altitude of 200-300 feet above the

ground. The inventory goal will be a complete count of all active muskrat houses on all refuge wetlands 5 acres in size or greater. Inactive houses can be distinguished from active houses by the sunken dome area of the house. Also, if the survey is conducted under the weather conditions listed as optimum above, the occupied houses will melt off more quickly than the unoccupied houses, due to the heat generated by the muskrats inhabiting the house.

Muskrat feeding and resting platforms must also be distinguished from houses. The platforms should not be as domed or as large as active houses. If the active versus inactive houses or houses versus platforms cannot be determined from the air, a ground level inspection of a few refuge areas will be necessary. The proportion of active houses to inactive houses and platforms can then be applied to the total aerial count. If a ground check is necessary, Long Meadow Lake should be sampled. An adequate check could possibly be made by observing the area with a spotting scope from the Apple Tree Square parking ramp and from the new Cedar Avenue bridge.

When possible, the muskrat house count should be made with the beaver lodge count (Inventory Procedure 6).

Summarizing Data:

The number of houses counted on each refuge unit should be totaled. A total should also be obtained for the entire refuge. If the unit has been divided into trapping compartments, a total count for each of these should be determined.

Data Analysis:

A Multiplan spreadsheet program is being developed to assist in the analysis of the data (Appendix VI). It will convert the active house counts to estimated populations by assuming 2 adults and 1 litter per house. A litter will be assumed to contain 6 young. This figure is obtained from the 6 young per litter calculated by McCann (1944) in Minnesota and 6.5 young per litter calculated by Errington (1939 and 1943) in Iowa. The estimated population is equal to the number of active houses multiplied by 8 (2 adults + 6 young per house).

This estimate will not account for the muskrats using bank dens. At the present, there is no information regarding what percentage of the population does use bank dens. The population estimate from the house counts will provide a good index of the population and should provide a minimum population estimate. If there is a significant change in muskrat numbers based upon house counts, the possibility of part of the population shifting to bank dens must be considered. This could result from dike construction providing bank den sites or from water level management practices.

An attempt should be made to initiate a cooperative study with volunteers or local college students to determine how many bank dens there are per unit length of wetland area. Adding this figure into the house count population estimate could improve the accuracy of the population estimate.

Results from the survey along with the original data sheets and maps should be filed chronologically in Appendix V.

Field Data forms:

Aerial counts should be recorded directly on refuge maps. The general aerial count data sheet used when counting white-tailed deer (Inventory Procedure No. 4) can be used to record basic data such as times and weather.

Inventory areas/routes/transects:

All wetlands 5 acres or larger on the designated refuge area should be counted.

III. Special Considerations:

None.

IV. Manpower and costs per inventory:

| <u>Items</u> | <u>Cost</u> |
|---|-------------|
| Manpower (assume \$10/hr and 8 hours - flight and data summary) | \$ 80.00 |
| Equipment: | |
| Aircraft rental | |
| Helicopter = \$130/hr. x 5 hr. = \$650 | |
| Fixed Wing = \$80/hr x 2 hr = \$160 | \$160.00 |
| Materials: No cost | \$.00 |
| Total | \$240.00 |

V. References cited:

Dozier, H.L. and Radway, M. 1984. Pelting Muskrats by air inflation., J. Wildl. Manage. 12:333-334.

Errington, P.L. 1939. Observations on young muskrats in Iowa. J. Mammal. 20:465-478.

_____. 1948. an analysis of mink predation upon muskrats in north-central United States. Iowa State Coll. Agric. Exp. Stn. Res. Bull. 320:798-924.

McCann, L.J. 1944. Notes on growth, sex and age ratios and suggested management of Minnesota muskrats. J. Mammal. 25:59-63.

Prepared by: Thomas J. Larson Date: 3/7/84
Reviewed by: _____ Date: _____
Approved by: _____ Date: _____

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP6

Date Procedure Implemented: April 1, 1984

Species: Beaver

Date Procedure replaced/
modified: _____

Title: Aerial Beaver lodge/
food cache count

I. Inventory Purpose/Justification

Beaver are common on Minnesota Valley NWR and play an important role in the wetland community. Beaver often create excellent wetlands for other species use by damming streams or culverts. However, excessive numbers of beaver that undermine dikes with bank dens or plug water control structures is not desirable. The beaver can sustain a controlled harvest program and at times must be controlled if other species or facilities are being adversely affected by beaver.

To manage the beaver properly, the size of the refuge population or at least the trend of the population (increasing, decreasing, or steady) must be known. The refuge Trapping Plan does list beaver as one of the species that can be trapped.

II. Procedure

Inventory Date(s): Oct. 15-31 Time of day: Daylight
(after leaf fall
and before perm.
ice formation)

Number of personnel: 1 pilot, 2 observers

Weather conditions: optimal: calm, clear
acceptable: 5-10 mph; light overcast

Equipment/supplies: small fixed-wing aircraft or helicopter,
binoculars, refuge maps, data sheets

Inventory Technique:

A fixed-wing aircraft or helicopter will be used to count active beaver lodges and food caches. If the funds and an approved (by the

FWS) helicopter are available, this should be employed to make the count. It is likely that a count from the helicopter is likely to be more accurate than a fixed-wing aircraft count. The count should be made 200 to 300 feet above the ground. A complete search of all wetlands 5 acres or larger on all designated refuge units should be made. Record both active lodges and food caches directly on a refuge map. Designate as precisely as possible where each lodge and cache are located. Use the aerial deer survey (IP4) data sheet for recording such information as times and weather.

An active lodge should have fresh cut trees in it or in the vicinity. There will also be a food cache located in the pond of an active beaver colony. The number of food caches may be a better indicator of the number of active colonies since caches usually are limited to one per colony (Davis and Winstead, 1980). However, they may also be more difficult to see from the air than lodges, depending upon water and sky conditions.

Any beaver dams observed during the count should also be recorded. Noticeable areas of beaver cutting can be recorded on the maps as well.

When possible the beaver lodge count should be run at the same time as the muskrat house count (inventory procedure 5).

Summarizing Data:

The number of beaver lodges, food caches and dams should be totaled by refuge unit and a total for the entire refuge calculated. If a unit has designated trapping compartments, totals for each of these areas should also be obtained.

Data Analysis:

The estimated beaver population will be obtained by multiplying the number of active colonies times 5 (average number of beaver per colony). The number of active colonies will be determined by comparing the number of active lodges counted to the number of food caches observed. Generally the lodge count should be used with the cache count used to verify it. If there is a large discrepancy between the 2 counts, a ground check of lodges in part of the area inventoried should be made to determine if all lodges recorded as active really were active. More than one active lodge with only one food cache could indicate that only one colony is present. The 5 beaver per colony figure is used to estimate the total population based upon a Michigan study that found the average colony contained 5.1 individuals (Bradt, 1938). In another study based upon survey data from 22 states, an overall average of 5.2 beaver per colony was found (Denny, 1952)

A Multiplan spreadsheet program is being developed that will estimate the refuge beaver population by refuge units based upon the lodge counts. This will be added to Appendix VI when completed.

Field Data forms:

Aerial counts of lodges, food caches, and dams should be placed directly on refuge maps. The general aerial deer count data sheet (Inventory Procedure No. 4) can be used to record basic data such as times and weather.

Inventory areas/routes/transects:

All wetlands 5 acres or larger on the designated refuge area should be searched. Wetlands less than 5 acres where there is evidence of or known beaver activity should also be inventoried.

III. Special Considerations

None.

IV. Manpower and costs per inventory

| <u>Item</u> | <u>Cost</u> |
|--|-------------|
| Manpower (assume \$10/hour and 8 hours, flight and data summary) | \$ 80.00 |
| Equipment | |
| Aircraft rental: | |
| Helicopter = \$130/hour x 5 hours = \$650.00 | |
| Fixed-wing = \$80/hour x 2 hours = \$160.00 | \$160.00 |
| Materials: No cost. | \$.00 |
| Total | \$240.00 |

V. Literature Cited:

Bradt, G.W. 1938. A study of beaver colonies in Michigan. J. Mammal. 19:139-162.

Davis, D.E. and R.L. Winstead. 1980. Estimating numbers of wildlife populations. Pages 2231-245 in S.D. Schmemm, ed. Wildlife management techniques manual, 4th ed. Wildl. Socl, Washington, D.C. 686pp.

Denny, R.N. 1952. A summary of North American beaver management, 1946-1948. Current Rept. 28. Colorado Game and Fish Dept., Denver. 58 pp.

Prepared by: Thomas J. Larson Date: 3/7/84
 Reviewed by: E. S. Cresgel Date: 3/8/84
 Approved by: _____ Date: _____

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP7
Date Procedure Implemented: 04/01/84

Species: Eagles

Date Procedure replaced/
modified: _____

Title: Mid-winter Eagle count

I. Inventory Purpose/Justification

An annual eagle count is sponsored by the National Wildlife Federation with the cooperation of a variety of individuals and agencies, including Minnesota Valley NWR. Since the bald eagle is a species of national significance, it is advisable that the eagle populations be monitored continually. Participation in the Mid-winter eagle count is one way the refuge can contribute to monitoring the eagle populations. Observations of eagles on or near the refuge at other times of the year should always be recorded by all refuge personnel.

II. Procedure

Inventory Date(s): Approx. 1/2-16 Time of day: Any time
(see survey
issued annually
for exact dates)

Number of personnel: All refuge personnel

Weather conditions: optimal: sunny; calm; warm
acceptable: any other conditions

Equipment/supplies: Bird identification guide; binoculars; spotting
scope; vehicle; data sheet

Inventory Technique:

Normally all refuge personnel should be advised to watch for eagles while they go about their normal work routine during the inventory period. All likely areas that eagles might be found at (Black Dog Lake and the Blue Lake Sewage Treatment plant area especially) should be checked at least once during the inventory period. See attachment IP7.A for standard directions on conducting the survey.

Summarizing Data

The data should be summarized as requested on the reporting form, Attachment IP7.B.

Data Analysis:

Data analysis will be done by Minnesota DNR Nongame Program. A copy of the inventory report form should be filed in Appendix V.

Field Data forms:

Attachment IP7.B

Inventory reporting forms

Inventory areas/routes/transects:

There is no set route but areas with open water should be checked at least once during the inventory period. The areas with open water will vary with the severity of the winter but Black Dog Lake and the Blue Lake Sewage treatment plant generally will have open water areas.

III. Special Considerations:

None.

IV. Manpower and costs per inventory:

| <u>Item</u> | <u>Cost</u> |
|--|-------------|
| Manpower (assume \$10/hr and 4 hours) | \$ 40.00 |
| Equipment (assume \$.25/mile and 40 miles) | \$ 10.00 |
| Materials: No cost | \$.00 |
| | \$ 50.00 |

Prepared by: Thomas J. Larson Date: 3/7/84
 Reviewed by: E.D. Grogel Date: 3/8/84
 Approved by: _____ Date: _____

Attachments

Directions for conducting the
Mid-winter eagle survey

Attachment IP7.A

Inventory reporting form

Attachment IP7.B



STATE OF
MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

Attachment IP7.A

BOX 7, CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

DNR INFORMATION
(612) 296-6157

| | |
|--------------|------|
| Manager | Set |
| Admin./Tech. | |
| Const./Maint | |
| Use | |
| FILE NO. | X TC |

30 November 1981

Dear Sir,

For four years now the Nongame Wildlife Program in the Department of Natural Resources has been cooperating with the National Wildlife Federation in a mid-winter bald eagle survey. This annual nationwide survey is sponsored by the National Wildlife Federation to help determine the total number of bald eagles wintering in the United States. This is an important index of the status of our bald eagle population.

Should you have any time available we would like to invite you to participate in this important survey. The 1982 survey will be conducted from January 2-16 with target dates of January 8-9. The priority is to cover those areas where there is open water and/or where individuals have been observed in the past. One may establish either a car route or fixed points for observation.

If you or other staff members would like to participate, additional information and report forms are available from our staff zoologist, Lee Pfannmuller:

DNR Nongame Program
Box 7, Centennial Bldg.
St. Paul, Minnesota 55155
(612-296-2895)

Thank you for your help.

Sincerely,

Carrol Henderson
Carrol Henderson
Nongame Supervisor

See multiple copies. Survey that the previous 72 copies were sent home with my staff on the survey. There should be a copy in the survey folder. That is right. All the copies are in the survey folder. Thank you.

P _____ of _____
A _____
C _____ (only one per form)
D Name of Recorder: _____
Address and Phone: _____

Affiliation: _____
No. of observers: _____

OFFICE USE ONLY

TRD: _____

FORMS MUST BE SUBMITTED
TO THE REGIONAL COORDINATOR
NO LATER THAN 1/31/82

OFFICE USE ONLY
BCN #: _____

| RC Use | Location ^a | Lat/Long ^b | Count ^c Type | Method ^d | Date ^e | Time ^f | Adult | | Imm. | | Total | | Adult | | Imm. | | Total | | Other ^g Eagles |
|--|-----------------------|-----------------------|----------------------------|---------------------|-------------------|-------------------|-------------|------|------|------|-------|------|-------|------|------|------|-------|--|------------------------------|
| | | | | | | | Imm. | Imm. | Imm. | Imm. | Imm. | Imm. | Imm. | Imm. | Imm. | Imm. | | | |
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| 13 | | | | | | | | | | | | | | | | | | | |
| Please complete "Comments" section on back of form | | | | | | | Page Totals | | | | | | | | | | | | |

- a) List each location surveyed using abbreviations on reverse side of this form (e.g., MINGO NWR, SKAGIT R, MODOC NF, CHENLY RES). Each line of data should represent a single 10 minute lat./long. block (see superscript b) (e.g., for a survey along 55 mi. of a river, report data separately for each 10 minute block surveyed along the river. Discrete locations surveyed within the same 10 minute block should also be reported separately. (e.g., a stretch of river occurring in the same block as an upland night roost). REPORT ALL LOCATIONS AND 10 MINUTE BLOCKS SURVEYED, INCLUDING THOSE IN WHICH NO EAGLES WERE SIGHTED. IMPORTANT: Attach a map (portion of State highway map or map with more appropriate scale) with the survey route clearly outlined in detail. IF SUCH A MAP DOES NOT ACCOMPANY YOUR SURVEY FORM, WE WILL BE UNABLE TO USE YOUR DATA.
- b) Record the first three digits of latitude and the first four digits of longitude for the SE coordinates of the 10 minute block of latitude and longitude in which the survey occurred. Example: a feeding area located at appx. 48° 23' latitude, 122° 45' longitude is within the 10 minute block delineated by 48° 20' to 48° 30' latitude and 122° 40' to 122° 50' longitude. The coordinates of the SE corner of this block are 48° 20' and 122° 40' and are coded "482424" (note: for longitudes less than 129° - 77° 33' longitude would be coded "0773").
- c) Indicate whether the survey at this location was a count of a night roost by the letter "R". For all others, indicate with an "X".
- d) Indicate survey method: Fixed wing (FW), helicopter (HD), Boat (B), count route (CR), fixed point (FP).
- e) Month/day/year
- f) Use military time (e.g., 0900)
- g) Eagles not identifiable as balds or golden.

COMMENTS

Visibility: _____

Precipitation? _____

Ice conditions at various
locations surveyed: _____

Prey availability and types: _____

Local movements of eagles
during survey period
(if known): _____

Wing or band tag markers seen:
(describe in detail) _____

Other: _____

LOCATION ABBREVIATIONS

B - Bay
CK - Creek
CY - Canyon
D - Dam
E - East
FH - Fish Hatchery
HBR - Harbor
IND RES - Indian Reservation

I - Island
L - Lake
MT - Mountain
MTS - Mountains
N - North
NF - National Forest
NFH - National Fish Hatchery
NG - National Grasslands

NHS - National Historic Site
NM - National Monument
NRA - National Recreation Area
NS - National Seashore
NWR - National Wildlife Refuge
PT - Point
R - River
RA - Recreation Area

RES - Reservoir
S - South
SF - State Forest
SP - State Park
VA - Valley
W - West
WA - Wilderness Area
WMA - Wildlife Management Area

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP8

Date Procedure Implemented: When a colony
appears on the refuge.

Species: Colonial nesting birds

Date Procedure replaced/
modified: _____

Title: Colonial Bird Register
Survey

I. Inventory Purpose/Justification

The U.S. Fish and Wildlife Service is cooperating with the colonial Bird Register (CBR) to develop survey methods and assess population trends of colonial waterbirds. The CBR survey is part of the cooperative project. In addition, many of the colonial birds are of significance because of declining or low populations. They can also be sensitive indicators of changes in habitat quality.

II. Procedure

Inventory Date(s): Nesting Season Time of day: Daylight

Number of personnel: 1-2

Weather conditions: optimal: Wind 1-5 mph; light overcast
acceptable: Sunny or heavy overcast, wind 5-10 mph

Equipment/supplies: Binoculars; data sheet;

Inventory Technique:

The inventory techniques described in Attachment IP8.A should be followed. In particular, see the section titled "Guidelines for Inventory of Colonial Waterbirds." The survey should be conducted on foot.

Summarizing Data:

The Colonial bird register data sheet (Attachment IP8.A) should be filled out as requested.

Data Analysis:

Copies of all data sheets should be sent to the Minnesota DNR Non-game wildlife coordinator with the original sent to the Colonial Bird Register. A copy of the results should also be filed in Appendix V.

Field Data forms:

Attachment IP8.A

Inventory instructions and data sheet

Inventory areas/routes/transects:

There are currently no colonies of waterbirds on refuge controlled property. However, there are plans for the refuge to some day acquire or manage under a cooperative agreement, the Wilkie Park Reserve (Part of Hennepin County Park Reserve District). There is a great blue heron rookery on the west side of that area.

III. Special Considerations

See Inventory areas above.

IV. Manpower and costs per inventory

| <u>Item</u> | <u>Cost</u> |
|--|-------------|
| Manpower (assume \$10/hr and 8 hours) | \$ 80.00 |
| Equipment (assume \$.25/mile and 40 miles) | \$ 10.00 |
| Materials: in stock | \$.00 |
| Total | \$ 90.00 |

Prepared by: Thomas J. LarsenDate: 3/7/84Reviewed by: E.S. GroganDate: 3/8/84

Approved by: _____

Date: _____

Attachments

Colonial Bird Register
Survey Directions and data sheet

Attachment IP8.A

MN Valley NWR

Attachment IP3.A



United States Department of the Interior

FISH AND WILDLIFE SERVICE

Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

IN REPLY REFER TO:

WA

APR 22 1983

Memorandum

To: All Refuge Managers - Region 3
All Wetland Offices - Region 3

From: ~~Act's~~ Asst. Regional Director, FWS, Twin Cities, MN (AW/WA)

Subject: Colonial Bird Register (CBR) survey and census

Tom C
Please handle
ELC

The attached memo (Reffalt; March 16, 1983) and attachments are self-explanatory. Mr. Richard Winters (WA) FTS 725-3313 has been selected as the Regional Coordinator. The surveys should be confined to Service lands. Efforts should be held to the minimum level required for each situation. Forms should be requested from CBR. Copies of all data should be sent to the respective state non-game coordinator with the original to CBR. No copies of the data are required for RO. Note the Region 1 instructions for refuges.

Attachments

cc: All WAs



ADDRESS ONLY THE DIRECTOR
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

MAR 16 1983

MEMORANDUM

To: Regional Directors, Regions 1, 2, 3, 4, 5 and 6
Acting Associate
From: Director

Subject: Fish and Wildlife Service/Colonial Bird Register (CBR) Cooperative Project

The Service is cooperating with the CBR to develop survey methods and assess population trends of colonial waterbirds based on data from CBR files. Doing this effectively will require that additional data be provided to the CBR.

It appears that this year an increased effort will be made by various State and private organizations and individual researchers to survey and census colonial waterbirds. To make the most of these efforts, the attached letter was sent to selected agencies and individuals soliciting their support and voluntary contributions of data. Contacts were made with those who previously contributed data to the CBR or who are likely to be involved in major colonial waterbird census or survey work during the 1983 breeding season. Among those contacted were a number of National Wildlife Refuges which have in the past cooperated with the CBR (list attached).

// Please appoint a staff person in your region to contact those Refuges not already approached alerting them to this activity and soliciting their cooperation. It would be advantageous to select a Regional coordinator to serve as a contact point for groups and/or individuals wishing to work on colonies or Refuges. For those Refuges willing to participate, data forms (sample attached) are available from the CBR. Guidelines for inventorying colonial waterbirds, developed by Region 1, are attached. Any questions should be referred to Mark Shaffer, MBMO, Washington, D.C. (202-254-3207). Your assistance is appreciated.

Attachments



William C. Reffalt

Refuges Contacted by CBR

Region 1

Bear Lake
Camas
Deer Flat
Grays Lake
Kern
Klamath Basin
Malheur

Minidoka
Nisqually
Ruby Lake
Sacramento
San Francisco Bay
Stillwater

Region 2

Havasu

Imperial

Region 3

Big Stone
Horicon
Mingo
Rice Lake

Sherburne
Shiawassee
Upper Mississippi River

Region 4

Chassahowitzka
Merritt Island
Okefenokee

Pea Island
St. Vincent
Tennessee

Region 5

Montezuma
Erie
Iroquois

Missiquoi
Ninigret

Region 6

Alamosa/Monte Vista
Arapaho
Audubon
Arrowwood
Benton Lake
National Bison Range
Bowdoin
Crescent Lake
Des Lacs
Fish Springs
Kirwin
Lostwood
Lacreek

Lake Andes
Ouray
Quivira
Red Rock Lakes
Charles M. Russell
J. Clark Salyer
Sand Lake
Seedskaadee
Swan River
Tewaukon
Upper Souris
Valentine
Waubay



COLONIAL BIRD REGISTER

159 Sapsucker Woods Road • Ithaca, N.Y. 14850 • (607) 256-4999



Dear Colleague:

The Colonial Bird Register (CBR) and the U.S. Fish and Wildlife Service (FWS) have cooperated for several years to collect and computerize colony data for more than 35 species of birds in North America. At the Laboratory of Ornithology, we have assembled a comprehensive computer base of information on national and regional colonial bird populations in the United States. We want to use those data to assess population trends for colonially nesting species, for example, Great Blue Herons, Least Terns, and Double-crested Cormorants. To do this, we very much need your help.

We want to compare mid-to late 1970's data on colony location, species composition and numbers of breeding birds with similar data gathered in the Spring of 1983. We are asking that new and previous cooperators make a special effort to collect such data during the upcoming breeding season and thus provide a basis for evaluating population trends.

We believe you are in a position to either personally collect or coordinate the collection of colony data, and ask that you make a vigorous effort to send as much of your data as you can to the Colonial Bird Register Office before September 1, 1983. Upon receipt and prior to analysis, CBR data editors will computerize your data and send you a printout for verification. We will analyze the data during the winter of 1983-84 and provide you and your cooperators with the results of our analyses. Should you plan an independent analysis of your data, and so inform us, we will guarantee that those data you submit will not be released by the CBR until after January 1, 1985.

If you are willing to participate in this effort, a package of CBR data forms will be sent under separate cover. The forms are straightforward and easy to fill out. We ask that you let us know how many forms you will need and that you submit data only on these forms. By so doing, you can speed our data-entry process and help us assure that the most important data are collected in an efficient and standard manner.

Today, funds for research on colonial bird populations are severely limited. Local and State-wide efforts have been established but analysis of trends on a regional or national basis cannot be possible unless some program acts to coordinate the effort. Our Cooperative Research Program, using the resources of the CBR and the FWS, can meet the need. We urge you to join this landmark effort to voluntarily collect and assemble systematic and comprehensive bird population data.

We look forward to hearing from you and would appreciate a reply no later than February 28, 1983 to allow for further planning.

Sincerely,

Donald A. McCrimmon, Director
Cooperative Research Program
Laboratory of Ornithology

Charles Walcott
Executive Director
Laboratory of Ornithology

Mark L. Shaffer
Office of Migratory Bird Management
U.S. Fish and Wildlife Service

COLONIAL BIRD REGISTER

Supplemental Instructions for Field Data Tabulation and Reporting

Please read and follow these instructions carefully. If you do not, we may have to recopy or discard your data.

Many parts of this form are self-explanatory. Some parts, however, require careful attention. Do not attempt to use this form until you are sure that you are doing so correctly. 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 cards by PENCIL ONLY. We routinely encounter information in the wrong spaces. When this is done in ink, the entire card must be transcribed to correct the error. With pencil it can be corrected on the original card. OMIT BOXES WITH DIAGONAL LINES. If information exceeds space given on form, e.g., for "Remarks", please attach additional sheets. Please include date, colony name, sub-colony if applicable, and observer on any attached sheets.

Put only one letter or digit in each column or box of a section except for "Total Population", "Total Active Nests", "Total Young Out of Nest" and "No. Banded This Visit" of Side 1 and "Precip. Type", "Photography Filed?", "Windspeed", "Sea Conditions", and "Tide" of Side 2. These sections may require use of more than 1 digit.

For information which the observer is to code into boxes or columns, e.g., "Date", "Colony Name", "Colony Size", "Nesting Stage", etc., the data should be justified to the right on entry. For example, if Colony Size is 450 hectares, the section should be completed as:

Colony Size
(ha)
| 4 | 5 | 0 |

and not as

Colony Size
(ha)
| 4 | 5 | 0 |

which reads 4,500

One hectare = 2.47 acres or 107,593 square feet.

| <u>Item</u> | <u>Instructions/Information</u> |
|-------------------------------------|---|
| 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, write 'None' in boxes and, in sketch block, explicitly indicate the direction and distance to the nearest known chart location. Island numbers adopted by coastal zone management commissions are acceptable as colony names, provided that detailed information on location is also provided. Where several subcolonies exist in close proximity, designate each by number and show on sketch. Separate reports should be submitted for each sub-colony. Lat./Long. coordinates (to nearest minute) are especially valuable in these instances. |
| Time | Use military time, e.g., 1:00 P.M. = 1300, 9:00 A.M. = 0900. Under "Block" note time zone and standard or daylight savings time, e.g., Eastern Standard Time = EST, Mountain Daylight Savings Time = MDT. |
| Latitude/Longitude | Designate if possible. Please give coordinates to nearest minute. If not available, show location in colony sketch. |
| Species | Fill in Common Name or Scientific Name in large box. |
| (1.) Number of breeding individuals | Depending on the census technique used, record active nests (preferred) or total population. Estimates of total population should be reported as individuals rather than pairs. Do <u>not</u> fill in the number of breeding individuals (1). This will be recorded by this office after all available information for the colony and region is submitted. See "census technique" instructions (below) for the kinds of numbers to report. |
| (2.) Total population (individuals) | |
| (3.) Active nests | |

| <u>Item</u> | <u>Instructions/Information</u> | | | | | | | | | | | | | | | | | | |
|-------------------------------------|--|---|-------------|-----------------------|-----|------------|---|-----|---------------|---|-----|--------------|--|-----|-----------|--|-----|------|---|
| Young Out of Nest | For estimates of productivity, the number of "large" young with a good chance of survival should be recorded. Only those individuals whose primaries have fully erupted should be included. | | | | | | | | | | | | | | | | | | |
| Nesting Stage | Indicate the stage at which the majority of that species in the colony is nesting. | | | | | | | | | | | | | | | | | | |
| Census Techniques | If, on the current visit, more than one technique was applied, file a separate report for each technique. For techniques which sample only a portion of the colony (e.g., quadrat sampling), extrapolate sample counts to total colony numbers to derive the 'active nest' total or total number of 'young out of nest'. Show conversion factors in "Remarks". <u>If the level of precision is questionable, include ranges in addition to the single best estimate of numbers.</u> | | | | | | | | | | | | | | | | | | |
| Nest Site Substrate | The nest substratum used by the majority of birds of each species should be noted. Any vegetation higher than 7 meters may be regarded as a tree. | | | | | | | | | | | | | | | | | | |
| Human Activity Levels | The levels of "none-light-medium-heavy" should be based on immediate, observable activity (e.g., jeep traffic through colony). Human technology is a general term relating to airports, highways, oil refineries, industrial parks, etc. The "potential" category should be used when no immediate activity is found, but: (1) existing structures (e.g., power plant, refinery) may accidentally result in environmental damage in the future, or (2) known legislative action (regional planning) may lead to changes in the land-use pattern in the vicinity of the colony. Include details of the "potential" in "Remarks". | | | | | | | | | | | | | | | | | | |
| Tide | (1) high, (2) low, (3) half ebb, (4) half flood, (5) storm. | | | | | | | | | | | | | | | | | | |
| Wind Speed and/or Sea Conditions | Classify according to Beaufort Scale: <table><tr><th><u>Scale</u></th><th><u>Wind</u></th><th><u>Sea Conditions</u></th></tr><tr><td>0-1</td><td>light airs</td><td>sea mirror-like, or with scale-like ripples</td></tr><tr><td>2-3</td><td>gentle breeze</td><td>wavelets form, a few scattered 'white horses'</td></tr><tr><td>4-5</td><td>fresh breeze</td><td>small to moderate waves, numerous 'white horses'</td></tr><tr><td>6-7</td><td>near gale</td><td>sea heaps up, foam blown from breaking waves</td></tr><tr><td>8-9</td><td>gale</td><td>high waves, foam blown in well-marked streaks down wind</td></tr></table> | <u>Scale</u> | <u>Wind</u> | <u>Sea Conditions</u> | 0-1 | light airs | sea mirror-like, or with scale-like ripples | 2-3 | gentle breeze | wavelets form, a few scattered 'white horses' | 4-5 | fresh breeze | small to moderate waves, numerous 'white horses' | 6-7 | near gale | sea heaps up, foam blown from breaking waves | 8-9 | gale | high waves, foam blown in well-marked streaks down wind |
| <u>Scale</u> | <u>Wind</u> | <u>Sea Conditions</u> | | | | | | | | | | | | | | | | | |
| 0-1 | light airs | sea mirror-like, or with scale-like ripples | | | | | | | | | | | | | | | | | |
| 2-3 | gentle breeze | wavelets form, a few scattered 'white horses' | | | | | | | | | | | | | | | | | |
| 4-5 | fresh breeze | small to moderate waves, numerous 'white horses' | | | | | | | | | | | | | | | | | |
| 6-7 | near gale | sea heaps up, foam blown from breaking waves | | | | | | | | | | | | | | | | | |
| 8-9 | gale | high waves, foam blown in well-marked streaks down wind | | | | | | | | | | | | | | | | | |
| Precipitation | Classify: (1) foggy, (2) drizzling, (3) light rain, (4) heavy rain, (5) intermittent showers, (6) none, (7) other(specify | | | | | | | | | | | | | | | | | | |
| Photography Filed | Indicate "yes" or "no" on form. In "Remarks" section, include photographer's name, date, time, location, direction to subject, type of camera, film type, lens type, focal length, and sketch of colony. | | | | | | | | | | | | | | | | | | |
| Colony Sketch | On the left side, show the colony location in reference to known chart locations. For sub-colonies, number each one and be sure the correct sub-colony number appears on page 1 of the form. On the right in the space, show sample plots (if used) and the approximate scale in relation to the whole colony. If more room is needed, attach an additional sheet. | | | | | | | | | | | | | | | | | | |

| | | | | | |
|-----|----|-----|---------|---------------|------|
| Mo. | Df | Yr. | Started | TIME Ended | Zone |
| | | | | | |

OBSERVER. Two initials, last name.

VISIT # ___ to this colony for
current nesting season.

| | | | | | | | | | | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| COLONY NAME | | | | | | | | | | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

| | | |
|----------|-----------|-----------------------|
| Latitude | Longitude | Elevation (meters) |
| | | |

OBSERVER'S ADDRESS:

LAND OWNER'S NAME AND ADDRESS:

| | | |
|---------------------|-------------------------------------|---------------------|
| Colony size (ha) | Island size (ha) (if applicable) | Subcolony number |
| | | |

Nearest Town:

County:

State/Province/Territory:

Country:

| SPECIES* Common or Scientific Name | Number of Breeding Birds | Total Population | Total Active Nests | Total Young Out of Nest | Nesting Stage† | Nest Site Substrate†† | No. Banded This Visit |
|---------------------------------------|-----------------------------|---------------------|-----------------------|----------------------------|-------------------|--------------------------|--------------------------|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

*If space for more species is needed, use additional cards and fill in the following information: Card ___ of ___.

†NESTING STAGE CODES:

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.

- ††NEST SITE SUBSTRATE CODES:
1. Trees - coniferous.
 2. Trees - deciduous.
 3. Trees - mixed.
 4. Shrub - medium height (2-7m).
 5. Shrub - low (2m or less).
 6. Herbaceous - nongrass.
 7. Grass - beach.
 8. Grass - upland.
 9. Marsh - salt.
 10. Marsh - brackish.
 11. Marsh - fresh.
 12. Sand.
 13. Sand-cobble-shell.
 14. Cobble.
 15. Rocks-crevices/holes.
 16. Rock-cliff face.
 17. Burrows.
 18. Dirt bank.
 19. Man-made structure (specify) _____
 20. Other _____

- A: 1. Suburban 2. Urban 3. Rural 4. Undeveloped 5. Other:
- B: 1. Mainland sandy beach 2. Marsh - salt 3. Marsh - brackish 4. Marsh - fresh 5. Inland island 6. Spoil bank 7. Marsh island 8. Barrier island 9. Non-barrier island, coastal
10. Bog 11. Swamp 12. Lake or pond 13. Woodland 14. Tundra 15. Field 16. Other:

COLONY HISTORY (Circle one or more)

- Forms filed for previous years (see note*)
- Colony present previously, but no exact data available.
- Colony considered to have moved from another site:
Previous locality: _____
- Colony absent previous year.
- Area not visited previously.
- Other _____

| | | |
|-------------------------------|------------------------------------|------|
| PRECIP. TYPE | PHOTOGRAPHY FILED? | |
| | | |
| WINDSPEED (Beaufort Scale) | SEA CONDITIONS (Beaufort Scale) | TIDE |
| | | |

REMARKS: Include comments on outcome of colony. See Instructions.

Please complete forms for earlier years if exact data available. If forms have been completed earlier years, list years under Remarks.

- Visual estimate - air (fixed wing).
Visual estimate - air (rotary).
3. Visual estimate - boat, car, foot (Circle which).
4. Aerial photographic count.
5. Total ground count - individuals.
6. Total ground count - nests.
7. Quadrat census (Sketch below).
8. Line strip census (Sketch below).
9. Other: _____

NOTE: ☐ Check if more than one census technique has been used for this colony on the current visit. File separate reports for each technique.

HUMAN ACTIVITY (Check appropriate level of immediate activity of each type. If the potential for activity exists, check where appropriate.)

| Type | Immediate | | | | Potential |
|--------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| | None | Lt. | Med. | Hvy. | |
| Human Technology | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Human Habitation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Human Recreation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Vehicular Use | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Scientific Invest. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

(Indicate exact type of activity in "Remarks" area.)

GENERAL COLONY SKETCH in relation to some prominent topographic feature. Include approx. compass coordinates, directions to colony, and scale of distance.

Sketch details of sample plots within colony boundary.

Guidelines for Inventory of Colonial Waterbirds

I. Introduction

The purpose of these guidelines is to promote a standardized inventory of colonially nesting waterbirds on National Wildlife Refuges in Region 1. This annual breeding population and production inventory will provide reliable and comparable data from each colony and aid in identification of species approaching threatened status.

Colonial waterbirds are being given special emphasis because they require water related habitats which are the most limited and the most threatened in the arid west. Since they are at the top of the wetland food chain they are also excellent indicator species of the status of wetland habitats. These birds are concentrated in colonies during the nesting season resulting in entire populations which are vulnerable to disturbance or destruction. National Wildlife Refuges are a source of generally dependable and protectable wetlands and are therefore in an excellent position to provide a nucleus of "seed" colonies for preservation and possible recolonization of other habitats.

For the purpose of this inventory effort, colonial nesting waterbirds in Region 1 include a.) the long-legged wading birds: herons, egrets, ibis, (but not bitterns) b.) gulls and terns and c.) pelicans and cormorants. Those species loosely called "marine birds" that nest on islands, coastal rocks and headlands, etc. and spend their life in a marine environment are not included. The refuges concerned with marine birds are developing specialized techniques and programs for the inventory of this group.

Based on refuge output reports the species known to nest in Region 1 include white-faced ibis, great blue heron, great egret, snowy egret, black-crowned night heron, cattle egret, double-crested cormorant, white pelican, California gull, ring-billed gull, Franklin's gull, Caspian tern, Forster's tern and black tern. Other similar waterbirds which nest in colonies should also be included if any are known. The least tern is also a colonial nester, but its endangered status has already given it special attention.

II. Inventory

Four basic steps have been identified in assessing wading bird colonies: surveying, censusing, monitoring and evaluating (Buckley and Buckley, 1976). Surveying locates active colonies, censusing records the species and numbers of birds, monitoring is observing a colony throughout the nesting season or over many years and evaluating is interpreting the data to determine colony productivity.

A. Survey

It is assumed that the basic surveys of all non-marine waterbird colonies have been completed on the National Wildlife

Refuges in Region 1. However, there may be opportunities to survey land outside the refuges in cooperation with others. Aerial surveying is the fastest and most efficient method of locating colonies as it allows the widest coverage in the shortest time. Helicopters are considered the best aircraft because of their slower speed and greater maneuverability. However, fixed-winged aircraft are generally recommended because of the higher cost and greater disturbance of helicopters. Nest desertion may occur due to helicopters approaching too close or staying too long (Buckley and Buckley, 1976).

B. Census and Evaluation

1. Techniques. Aircraft are also efficient tools for censusing colonies, especially in remote areas such as great blue heron colonies in tall trees and marsh colonies in dense emergents. Several factors limit the accuracy of aerial censusing: 1.) only the upper layer is visible in tree and shrub colonies where nesting birds are stratified; 2.) some species hide and are not easily counted; 3.) background color makes some species more visible than others; and 4.) larger birds are more visible than smaller birds (King, 1977). Ground verification of aerial census data is important due to limitations on visibility.

Under some conditions aerial photography is an excellent census method. Aerial photos may be enlarged to count birds and/or nests at a later date, and to provide a permanent record of a colonies boundaries. They may also be used to verify either ground or aerial observations.

Ground censusing is generally a more accurate and cheaper method than aerial as it allows assessment of stage of nesting, proportion of birds in the colony nesting and other pertinent biological data (King, 1977). Because of a diversity of species, colony size, vegetative cover, etc. there is no one census technique which works best for all colonies. It is most important to determine which system works best for a particular colony and that it is replicable each year.

The desired accuracy of censuses must be determined by the degree of precision needed to detect significant changes in a population (King, 1977). Annual fluctuations as great as 50 percent are considered normal for individual wading bird nesting colonies, but by taking regular censuses and evaluating them on a regional basis it is possible to establish population trends and detect unusual fluctuations.

The accuracy of censusing a colony is often limited by a prolonged nesting season due to nest destruction, movement of birds in and out, renesting, etc. Ideally a colony should be checked several times during the nesting season, but this is rarely feasible due to time and funding constraints. For

these reasons and especially to prevent undue disturbance, one visit to the colony during the peak of the nesting season is usually recommended to census the nesting population (Buckley and Buckley, 1976). One other total colony count near the end of the nesting season will allow an estimate of reproductive success.

Ideally a complete colony census should include the number of birds (by species in mixed colonies), proportion of the birds in the colony that are nesting, number of nests and stage of nesting. If conditions allow it is also valuable to determine eggs laid, eggs hatched and young fledged for each nest and for the full colony, but this is seldom feasible.

In small colonies of fewer than several hundred pairs an attempt should be made to count all birds and nests (King, 1977). For intermediate size colonies where the total number of birds can be estimated but total nests cannot be counted it is useful to establish a bird:nest ratio in an isolated section of the colony and apply it to the entire colony to arrive at a nest estimate. Sampling techniques are available for larger colonies of several thousand birds but this is probably not pertinent to Region 1. Contact the Regional office (ARW-MB) if more information is needed.

Evaluation of census data to estimate colony production will of course depend on the type and quantity of data obtained. If it is only possible to make one count of the colony, it should be made at the peak of the nesting season to allow a good estimate of the breeding population. Many investigators believe that an annual count of active nests is the most reliable long-term index of a colonies' breeding population (Buckley and Buckley, 1976). If the data available does not allow direct estimates of reproductive success, an estimate should be made from indirect sources anyway, with proper documentation of it's derivation so that it can be compared with estimates from other years.

Data should be recorded on standardized forms to ensure comparability with other colonies and with future censuses. The Colonial Bird Register (CBR) at Cornell University has recently simplified the field form which it uses for a computerized collection of waterbird nesting colony data throughout the United States. Use of this form is highly recommended as it contains well organized spaces for all pertinent data. A small supply of the forms is attached to these guidelines for each refuge and more are available from the CBR.

It is important to describe the colony as a baseline for future reference by noting location, vegetative type and structure, and physical features (King, 1977). Aerial photos or topographic quadrangles are useful for mapping the location and limits of the colony for permanent records. Other pertinent information for each colony visit includes the date, time, observer, weather and census technique. Census work should be

made at the same time each year with consideration for variations in chronology due to weather and by the same personnel if possible.

- C. Disturbance. Disturbance is an important consideration to the welfare of a waterbird colony (King, 1977). Research has shown that for some species frequent disturbance causes nest abandonment, significantly reduces clutch size, lowers hatching success and increases predation on eggs and young. These birds are most likely to abandon nesting attempts during the courtship and nest selection periods and least likely when young are present.

Disturbance may be either direct where humans enter the colony or indirect--caused by human related activities such as aircraft, boats, etc. Most direct disturbance is caused by scientists, banders, photographers, etc. and there is growing concern that these activities which are mostly directed toward preserving the colonies are actually contributing to their demise.

Generally, the longer humans remain in a colony the greater the impact. You should plan ahead to ensure gathering all necessary information while there to avoid a return trip. The observer(s) should remain in the colony for the shortest time possible, stay in a group, keep moving and if banding, always place the young back in their nest. Also, never enter colonies during cold, rainy or exceptionally hot weather to avoid exposing the young to these conditions.

Disturbance by aerial overflights should be minimized as prolonged or repeated disturbance is as harmful as a prolonged ground visit. If an air boat is used to reach the colony it should be parked at the periphery since the noise and wind created are similar to that of a helicopter.

D. Monitoring

Long-term population and habitat condition trends should be monitored for each colony by the refuge concerned. More importantly, the Regional office (APW-MB) will monitor regional population trends for each species since year-to-year fluctuations of up to 50 percent for an individual colony are not thought to be cause for alarm.

It is also highly recommended that each refuge cooperate with the Colonial Bird Register (CBR) and thereby participate in a nationwide monitoring program. If the CBR field forms are used, the Regional office (APW-MB) will be able to consolidate and submit those forms not sent directly from the refuges.

III. Summary of Inventory Procedures

A. Conduct survey to locate colonies if necessary

B. Census and Evaluation

1. Select technique for each colony based on habitat type, accuracy needed, and replicability.

a. Aerial or Ground

- 1.) visual estimate of breeding population
- 2.) total count of birds and/or nests
- 3.) photograph with subsequent total count
- 4.) sample - large colonies

2. Conduct census

a. Visit colony at least once during peak of nesting - same time each year

b. Utilize Colonial Bird Register field form

- 1.) describe location, vegetative type and structure and physical features
- 2.) note date, time, weather, census technique and observer(s)

c. Map colony on aerial photo, topographic quadrangle, etc.

d. Record number of birds (by species), proportion of the population nesting, number of nests and stage of nesting if technique allows. Also number eggs laid, eggs hatched, young fledged per nest if possible.

e. Plan ahead to minimize disturbance

- 1.) avoid prolonged or repeated aerial over flights
- 2.) restrict colony visits to minimum necessary
- 3.) remain in the colony for the shortest time necessary, stay in a group, and keep moving

3. Evaluate data to estimate production

a. Direct - from eggs laid, eggs hatched, young fledged, etc.

b. Indirect - from breeding pairs, number nests, population after nesting, etc.

4. Monitor population and habitat trends of colonies

a. Refuge - individual colonies

b. Regional Office - Regional

c. Colonial Bird Register - National

Literature Cited

King, K. A. 1977. Colonial wading bird survey and census techniques.
pp. 155-159 in Sprunt, A. IV, Ogden, J. C. and S. Winckler. (eds.)
Wading Birds. Nat'l. Audubon Society Res. Report No. 7.

Buckley, P. A. and F. G. Buckley. 1976. Guidelines for the Protection
and Management of Colonially Nesting Waterbirds. N. Atlantic Reg.
Office, Nat'l. Park Service, Boston, Mass.- 52 pp.

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP9
Date Procedure Implemented: 04/01/84

Species: Song birds

Date Procedure replaced/
modified: _____

Title: Monthly Volunteer
Bird Survey

I. Inventory Purpose/Justification

Much can be learned about the quality of habitat on the refuge and effects of management practices on both the habitat and wildlife by monitoring the song bird populations. Many species of song birds are very habitat specific. This makes them good indicators of changes in habitat quality and quantity. There is a great deal of public interest in song birds, especially in the Twin Cities Metropolitan area. This interest by the public is another reason the refuge staff should know how nongame populations are reacting to both refuge and non-refuge related activities in and near Minnesota Valley NWR.

II. Procedure

Inventory Date(s): One month
between 2nd
and 3rd week-
end of the
month inclu-
sive

Time of day: Within 4 hours of sun-
of sunrise and in May
and June one hour
before sunset as well

Number of personnel: 39+

Weather conditions: optimal: sunny; calm
acceptable: overcast; wind 5-10 mph

Equipment/supplies: Binoculars; bird identification guide; data sheet;
watch

Inventory Technique:

To properly monitor song bird populations, a great deal of time is required. With the current refuge staffing pattern, there is not sufficient personnel to conduct the inventories necessary to monitor

song bird populations. Therefore, the inventory procedure described here is to be conducted by refuge volunteers.

The procedure involves running 39 permanent transects once a month. Each transect is assigned to one or more volunteers. Transects are located in a variety of habitats. The habitats can generally be described as:

- Oak Savanna
- Bottomland forest
- Bluff forest
- Marsh
- Wet meadow
- Agricultural land/old fields
- Prairie

Attachment IP9.A lists the transects by habitat type.

The basic method involves counting birds along a transect with five stopping points 100 meters apart (1 meter = 39 inches). At each stop, count anything seen or heard within 50 meters of the stopping point. The observer should stay at each stopping point at least 5 minutes. Avoid staying at the stopping point longer than 5 minutes unless the number of birds at the point requires more time than that to identify or record. Try not to spend more than 10 minutes at each point. A good way to learn to estimate 50 meters is to measure your normal walking pace and then practice estimating distances and pacing them off. An error of + or - 5 meters should be acceptable if the average over time equals 50 meters. The layout of the transects need not be in a straight line, but should fall entirely within the designated habitat type for each transect.

Each transect should be run once between the first and third full weekends of the month inclusive. The transects may be run any day within that period. The count must be completed within four hours of sunrise.

In addition, one evening count should be conducted in May and June. this count is intended to detect some evening active birds such as woodcock. This count should be done as close to dusk as possible while there is still enough light to allow good bird identification. It should not be started earlier than one hour before sunset.

If identification of a particular bird or song is uncertain, indicate it by putting the name of the bird in parenthesis and indicate on the bottom of the data sheet what the parenthesis means. Also indicate if the identification was by hearing the song rather than seeing the bird. Fill the data sheet out completely. If you have nothing to enter for a particular blank, say so - leave nothing blank.

The miscellaneous section would include such information as other animals, plant phenology (leaf-out, leaf fall, wild flower appearance), nests, difficulties encountered, and anything else you feel you or the refuge would be interested in. This information is optional.

When walking between stopping points, do not record every bird. Do record the birds that you do not commonly see at the stopping points. Some birds such as grassland dwelling sparrows may be under-represented at stopping points, but flushed while walking between points.

It is important that the counts be performed as consistently as possible. Try to do them the same way each time. Avoid weather extremes, try to wear similar colored clothing, start at the same point, keep conversation low and consistent from time to time. You may take other interested people with you, but do remember that they could alter your results if behavior in the group is markedly different from normal.

Summarizing Data:

A computer program is being developed which will summarize all the individual data sheets. It will allow the data to be sorted by habitat type, species, data, weather conditions, or by any of the other variables on the data sheet. Until the program is completed, data sheets will be filed chronologically by transect number.

Data Analysis:

As described in the "Summarizing Data" section, analysis of the data will be assisted with the use of a computer. With the data summarized by the computer, trends in bird or specific species populations can be tracked. The relationship of birds to specific habitat types can be examined. Analysis should particularly involve transects where wildlife management practices have occurred or are planned, or where an outside disturbance has occurred (such as construction of a storm sewer or housing development nearby). Results and summaries of the data should be filed in Appendix V. The data sheets themselves will be transferred to a computer floppy disk and stored in that manner.

Field Data forms:

Attachment IP9.B

Bird Transect Data Sheet

Inventory areas/routes/transects:

The habitat types each transect occurs in is listed in Attachment IP9.A. Maps showing the locations of each transect are found in Attachment IP9.C

III. Special Considerations

None.

IV. Manpower and costs per inventory

| <u>Item</u> | <u>Cost</u> |
|---|---------------|
| Manpower (assume \$10/hr and 5 hours/month Permanent staff, handling data and miscellaneous administrative time) | \$ 50.00 |
| Equipment: No cost | \$.00 |
| Materials: No cost | <u>\$.00</u> |
| Total | \$ 50.00 |

Prepared by: Thomas J. Lazen Date: 3/7/84
Reviewed by: Ed Craig Date: 3/8/84
Approved by: _____ Date: _____

Attachments

Song Bird transects listed
by habitat type

Attachment IP9.A

Bird Transect Data Sheet

Attachment IP9.B

Transect Location Map

Attachment IP.C

Attachment IP9.A

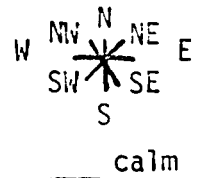
Song bird transects listed by habitat type:

| <u>Habitat</u> | <u>Transect number</u> |
|------------------------|------------------------------------|
| Bluff Forest | 25,26,27,28,33,34,36 |
| Oak Savanna | 20 |
| Bottomland Forest | 9,10,15,17,18,19,22,24,29,30,37,39 |
| Wet Meadow | 4,12,13,21,31,32,35 |
| Marsh | 2,11,14,23,36,38 |
| Prairie | 1,3,5 |
| Agric. Land/old fields | 6,7,8,16 |

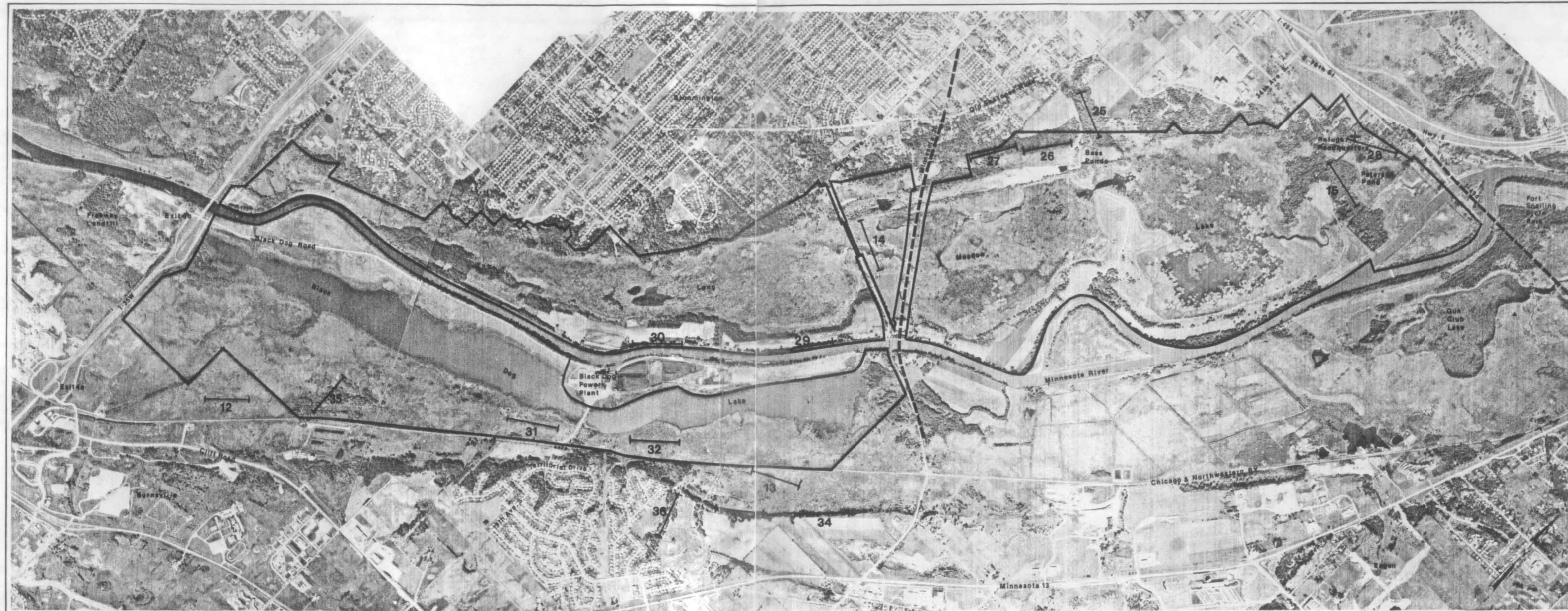
Transect # _____
Observer(s) _____

Starting Time _____ AM/PM (circle
Ending Time _____ AM/PM one)

Precipitation (check one): ☒ rain
☐ drizzle
☐ hail
☐ snow
☐ none

[illegible]

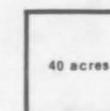
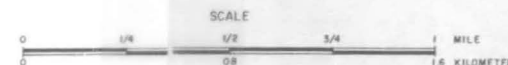
Miscellaneous Data and Comments: _____



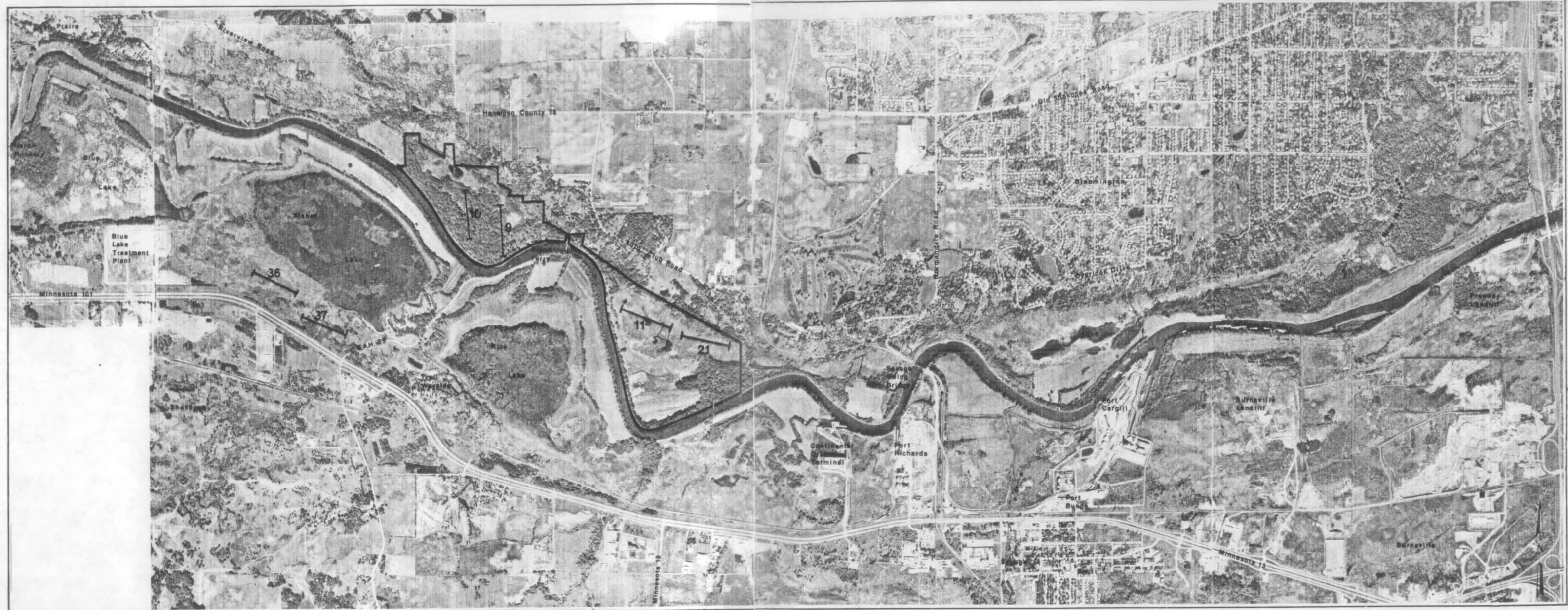
MINNESOTA VALLEY

NATIONAL WILDLIFE REFUGE

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



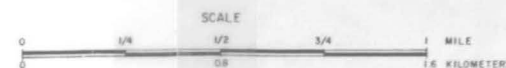
LONG MEADOW LAKE UNIT
BLACK DOG LAKE UNIT



MINNESOTA VALLEY

NATIONAL WILDLIFE REFUGE

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



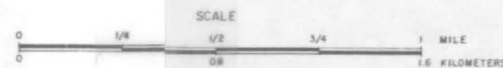
BLOOMINGTON FERRY UNIT



MINNESOTA VALLEY

NATIONAL WILDLIFE REFUGE

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



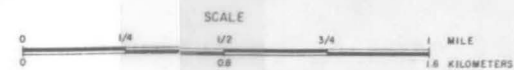
UPGRA LA UNIT



MINNESOTA VALLEY

NATIONAL WILDLIFE REFUGE

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



40 acres

CHASKA LAKE and LOUISVILLE SWAMP UNITS

VEGETATION CODING LIST

MAP KEY

CODE NO.

| | | |
|----|---|----|
| 1 | Cottonwood - Willow | 1 |
| 2 | Elm - Silver Maple - Cottonwood | 2 |
| 3 | Sugar Maple - Basswood | 3 |
| 4 | Mixed Lowland Conifer | 4 |
| 5 | Mixed Upland Conifer | 5 |
| 6 | Willow - Elm - Aspen | 6 |
| 7 | Dead Forest | 7 |
| 8 | Side Hill or Upland Forest | 8 |
| 9 | Ornamental Conifers | 9 |
| 10 | Lowland Shrubs | 10 |
| 11 | Upland Shrubs | 11 |
| 14 | Oak Savannah | 14 |
| 15 | Large Manicured Lawns or Golf Courses | 15 |
| 16 | Wet Meadow | 16 |
| 17 | Forb Dominated Site | 17 |
| 18 | Dry Meadow | 18 |
| 19 | Right-Of-Way Grass Type | 19 |
| 20 | Open Arrowhead Stand | 20 |
| 21 | Scirpus fluviatilis (Scirpus holzneri) | 21 |
| 22 | Submergent Vegetation | 22 |
| 23 | Duckweed and Floating Algae | 23 |
| 24 | Scattered White Water Lily | 24 |
| Pt | Populus tremuloides - Quaking Aspen | 25 |
| Pd | Populus deltoides - Cottonwood | 26 |
| Sn | Salix nigra - Black Willow | 27 |
| Q | Quercus spp. - Oaks | 28 |
| Ua | Ulmus americana - American Elm | 29 |
| Ah | Acer saccharinum - Silver Maple | 30 |
| Bn | Betula nigra - River Birch | 31 |
| Ta | Tilia americana - American Basswood | 32 |
| Jn | Juglans nigra - Black Walnut | 33 |
| | Carya spp. - Hickory | 34 |
| | Fraxinus pennsylvanica - Green Ash | 35 |
| Pr | Pinus resinosa - Red Pine | 36 |
| Pk | Pinus banksiana - Jack Pine | 37 |
| Ll | Larix laricina - Tamarack | 38 |
| Pm | Picea mariana - Black Spruce | 39 |
| Sa | Salix spp. - Willow | 40 |
| Al | Alnus spp. - Alder | 41 |
| Bp | Betula pumila - Bog Birch | 42 |
| Cs | Cornus stolonifera - Red Osier Dogwood | 43 |
| Cp | Cephalanthus occidentalis Button Bush | 44 |
| Le | Leersia orizoides - Rice Cut Grass | 45 |
| Ph | Phalaris arundinaceae - Reed Canary Grass | 46 |
| Sp | Spartina pectinata-Cord Grass | 47 |
| Pg | Phragmites communis - Flag Grass | 48 |
| Py | Polygonum spp. - Smartweed | 49 |
| Sg | Sagittaria latifolia - Arrowhead | 50 |

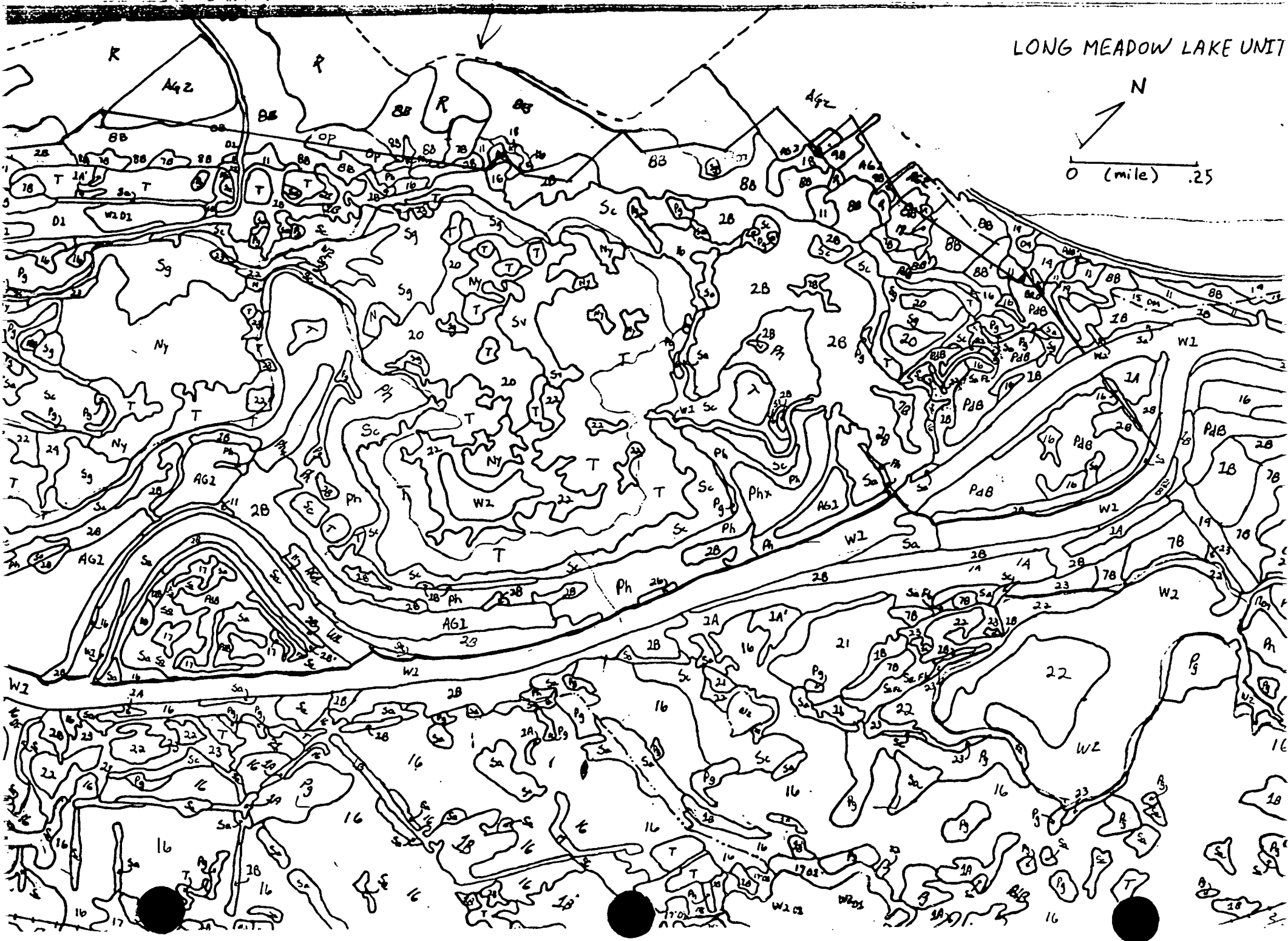
VEGETATION CODING LIST (CONTINUED)

| | | |
|-----|--------------------------------------|----|
| Sc | Scirpus fluviatilis - River Bulrush | 51 |
| Sv | Scirpus validus - Softstem Bulrush | 52 |
| Sp | Spartanium spp. - Bur Reed | 53 |
| T | Typha spp. - Cattail | 54 |
| Z | Zizania aquatic - Wild Rice | 55 |
| N | Nelumbo lutea - American Lotus | 56 |
| Ny | Nymphaea spp. - White Water Lily | 57 |
| V | Valisneria spp. - Water Celery | 58 |
| W1 | Flowing Open Water | 59 |
| W2 | Lake or Pond Open Water | 60 |
| D | Pavement or Gravel Surface | 61 |
| D1 | Gravel Pit or Quarry | 62 |
| D2 | Sewage Treatment Facility | 63 |
| D3 | Landfill Dump | 64 |
| D3E | Power Plant Slag Pile | 65 |
| D4 | Stockpile Site | 66 |
| D5 | Unknown Disturbance | 67 |
| D6 | Spoil Bank or Levee | 68 |
| D7 | Active Construction | 69 |
| D8 | Recreational Site e.g. (Valley Fair) | 70 |
| D9 | Office or Commercial Buildings | 71 |
| DE | Power Plant, Substation, & Grounds | 72 |
| DF | Farmstead | 73 |
| DM | Military Facility | 74 |
| X | Mowed Wild Grass or Timber Harvest | 75 |
| R | Residential | 76 |
| OrP | Orchards and Nurseries | 77 |
| AG1 | Cereal or Row Crops | 78 |
| OP | Open Pasture | 79 |
| WdP | Wooded Pasture | 80 |
| BRO | Banks and Rock Outcrops | 81 |
| SBD | Sand Beaches and Dunes | 82 |
| Md | Mud Flat | 83 |
| FL | Flood Killed Vegetation | 84 |
| | No Information | 85 |

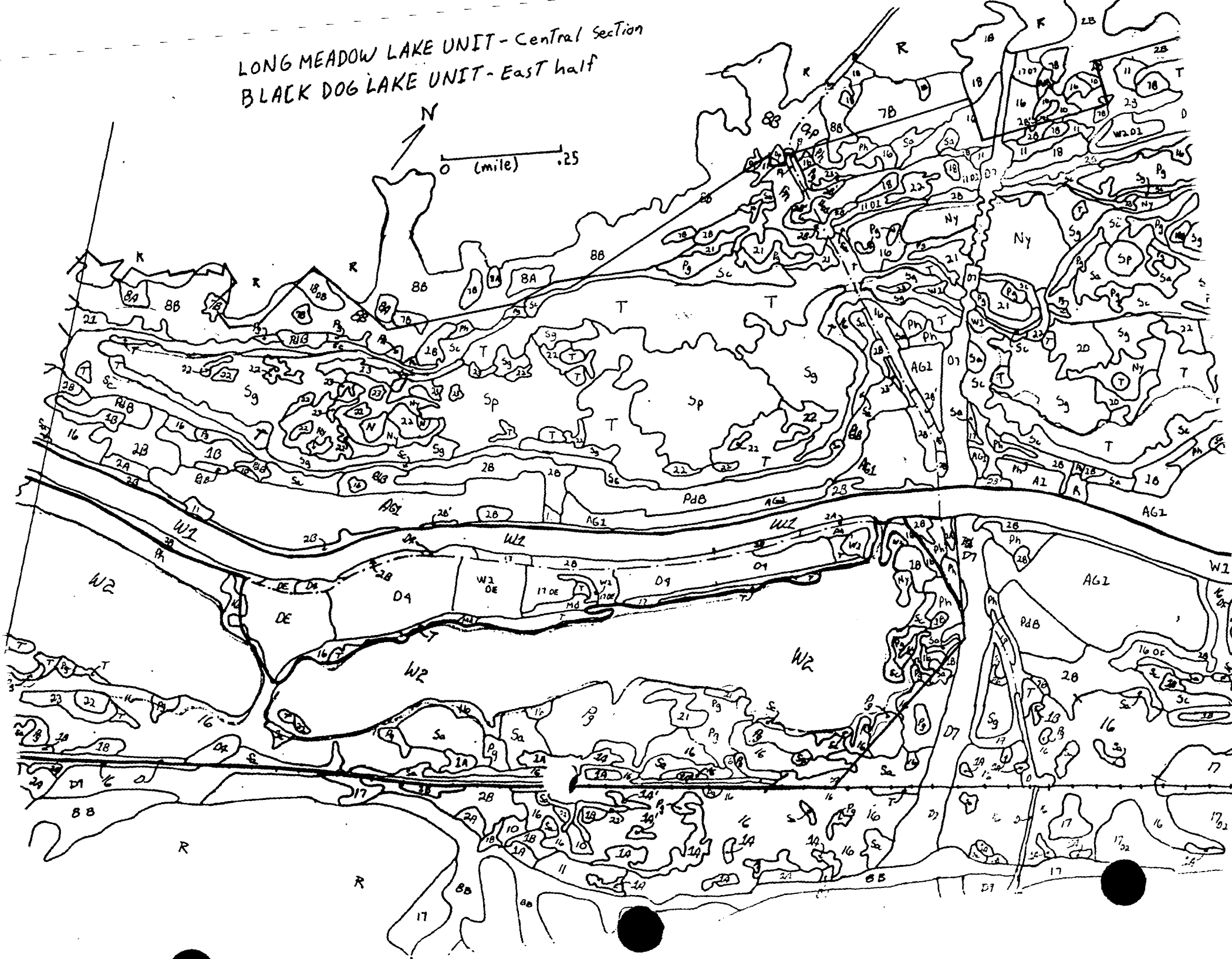
VEGETATION QUALIFIERS

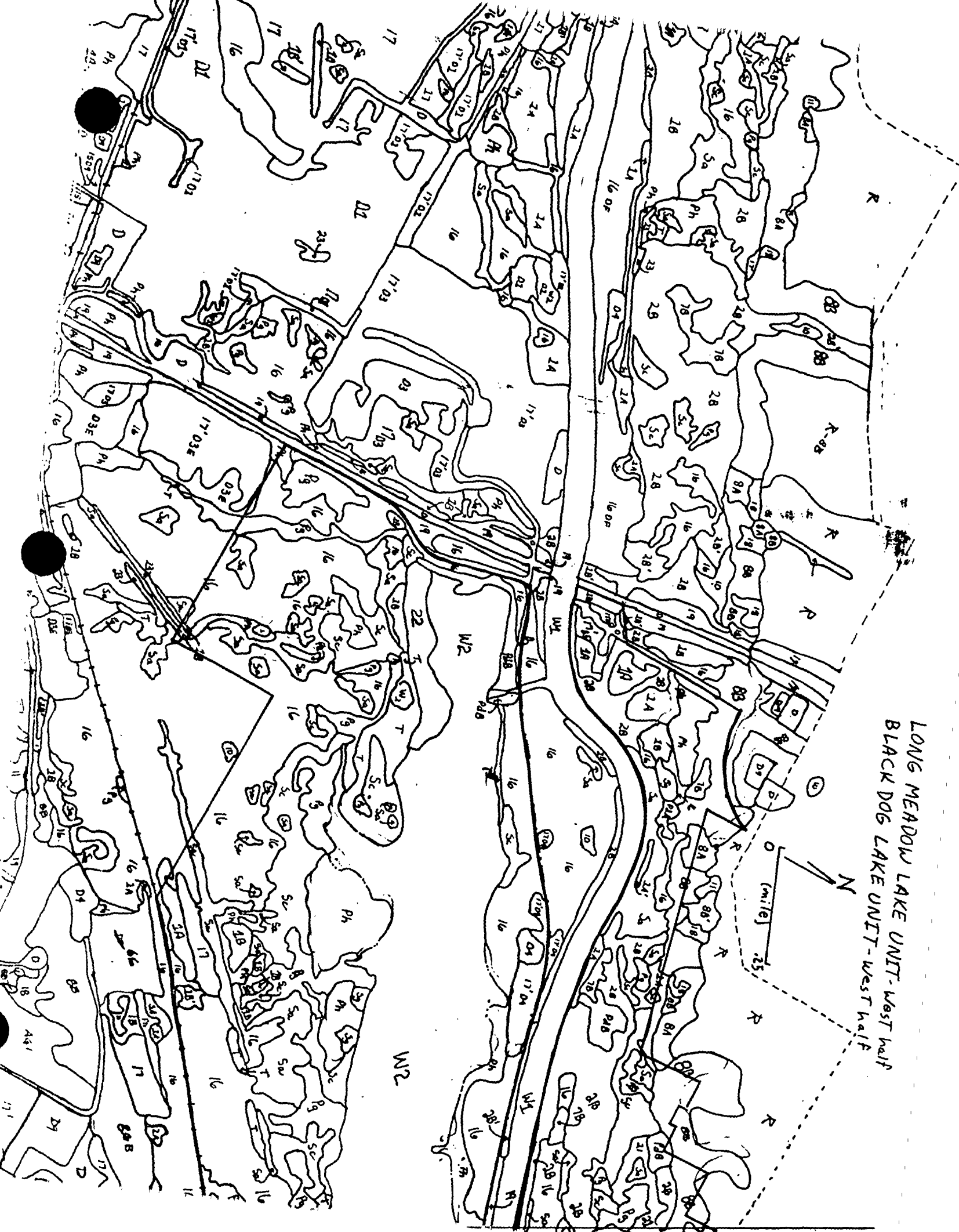
| | |
|-----------------|------------|
| 1 - A | 1 - D1 |
| 2 - B | 2 - D2,DE |
| 3 - ' | 3 - D3 |
| 4 - A' | 4 - D3E,D4 |
| 5 - B' | 5 - D5 |
| 6 - F1 (A or B) | 6 - ORP |
| 7 - X | 7 - DF |
| 8 - D7 | 8 - D8 |
| 9 - D6 | 9 - D9 |

LONG MEADOW LAKE UNIT

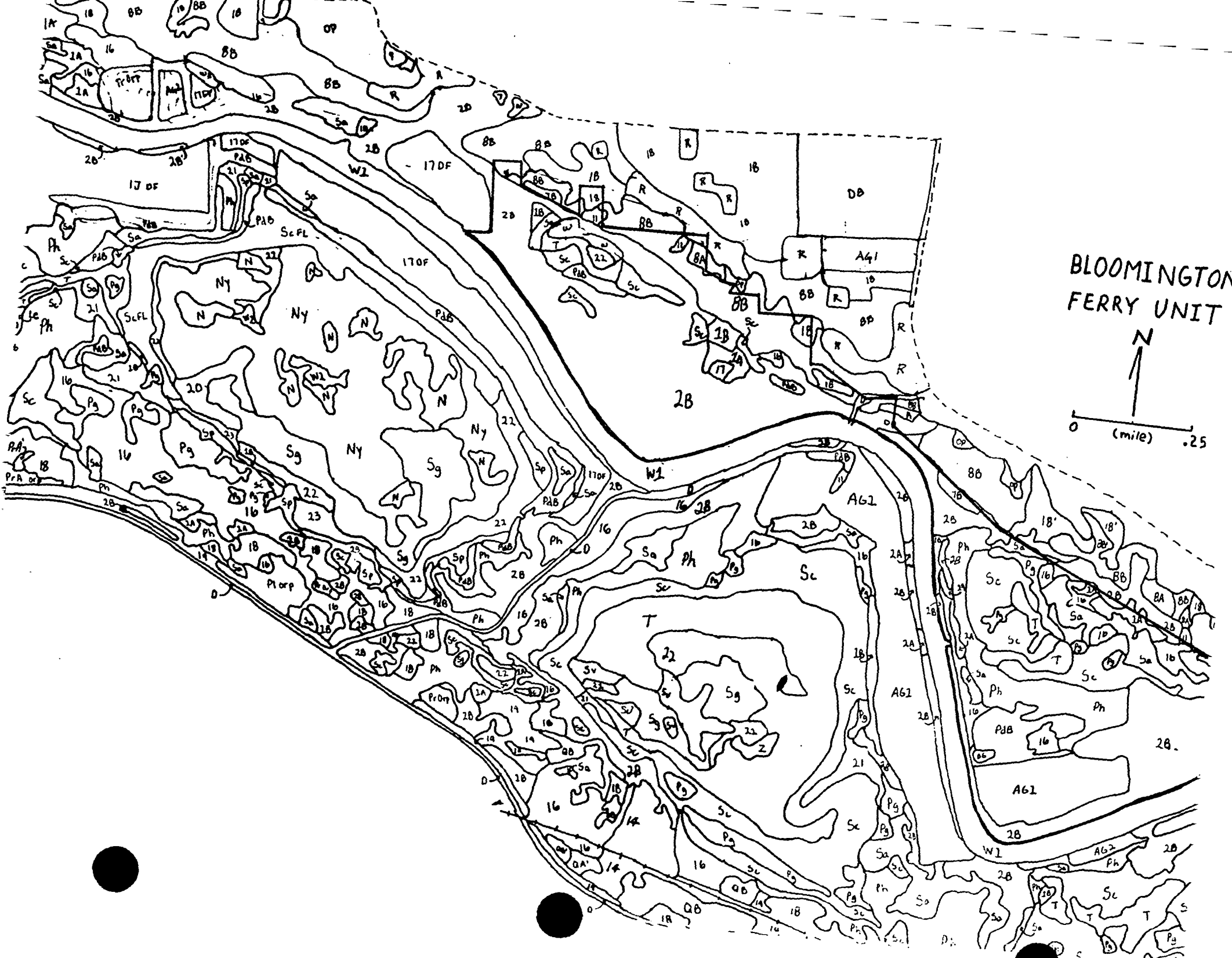


LONG MEADOW LAKE UNIT - Central Section
BLACK DOG LAKE UNIT - East half



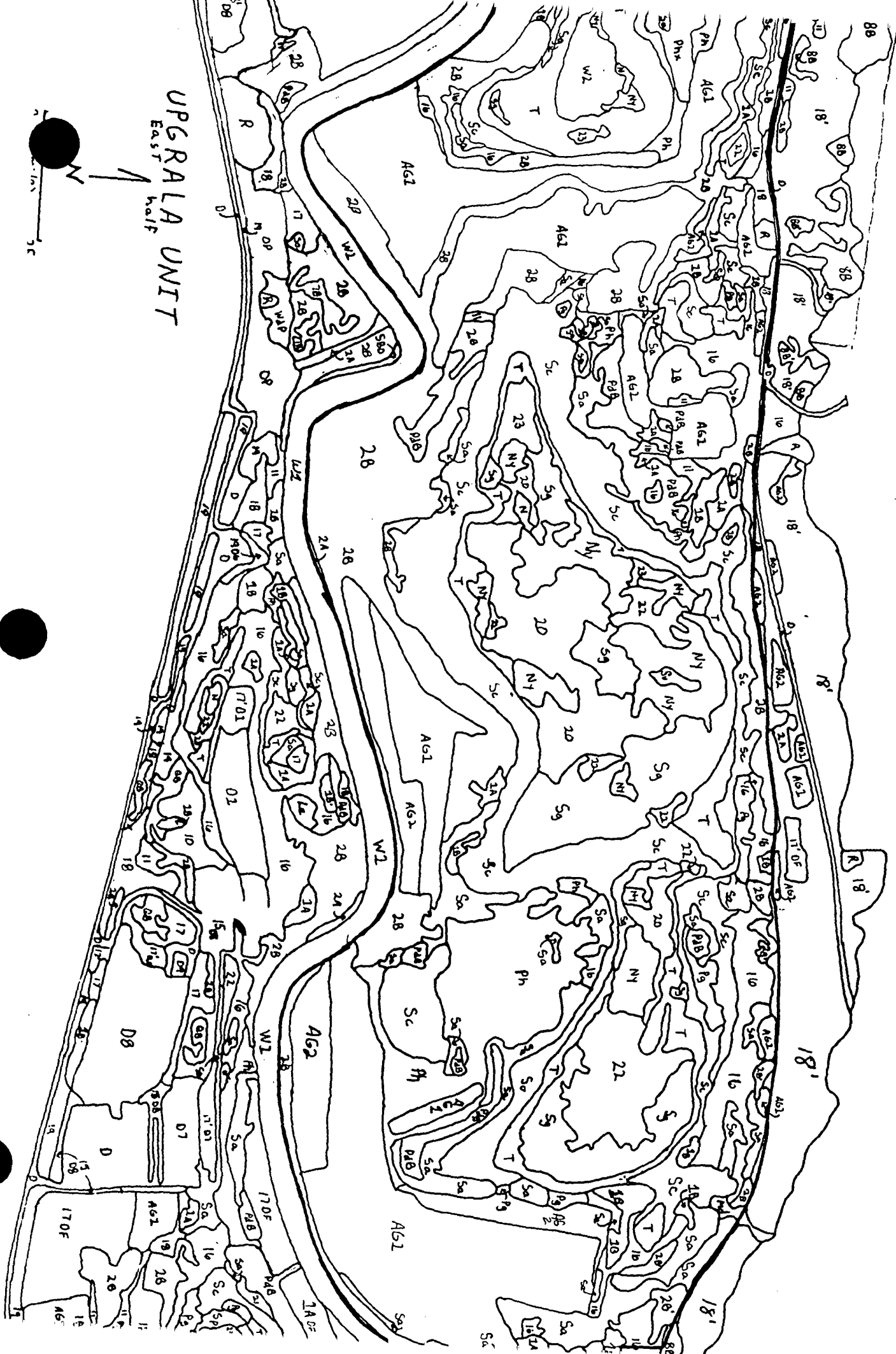


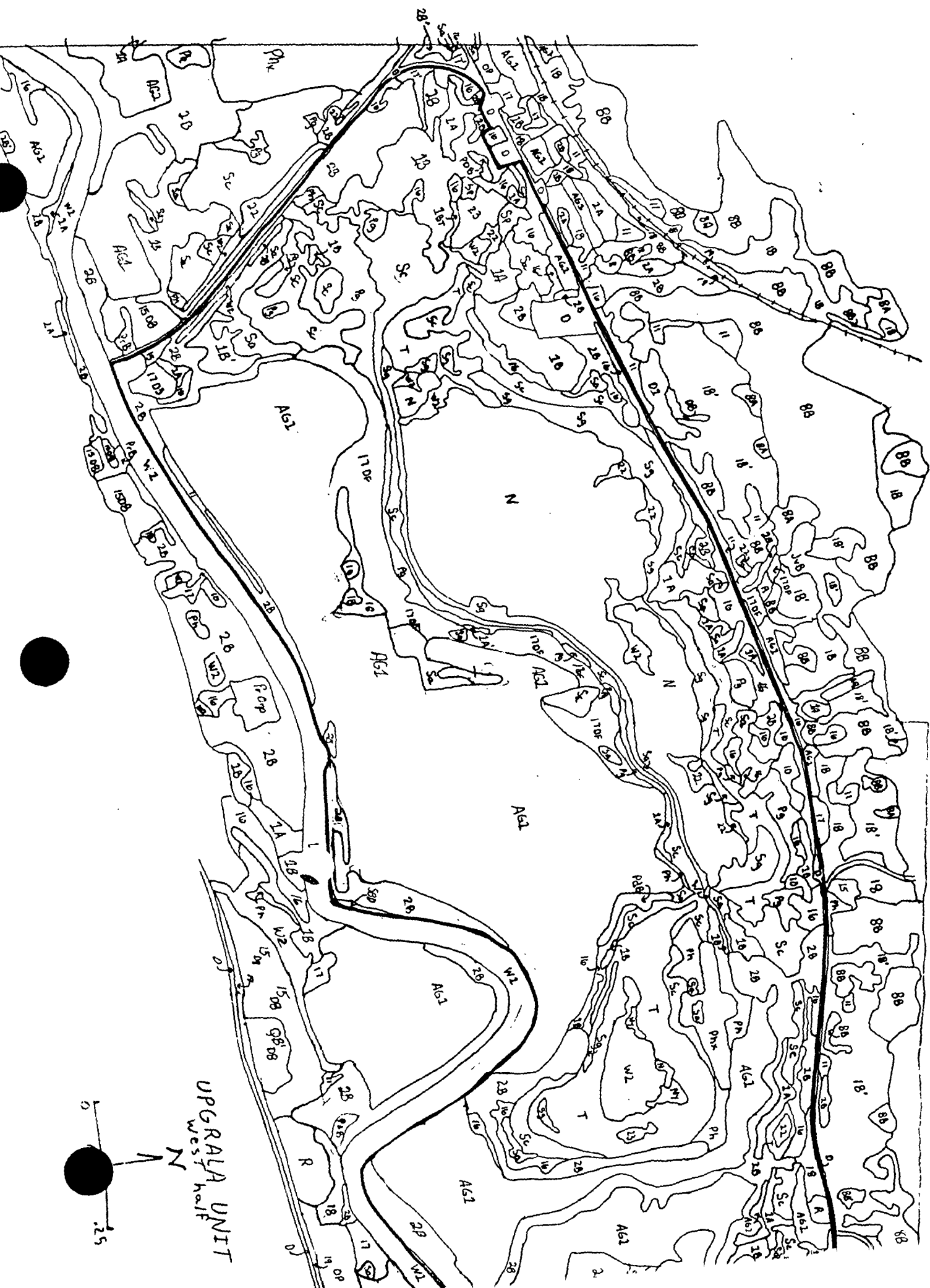
LONG MEADOW LAKE UNIT-West half
BLACK DOG LAKE UNIT-West half

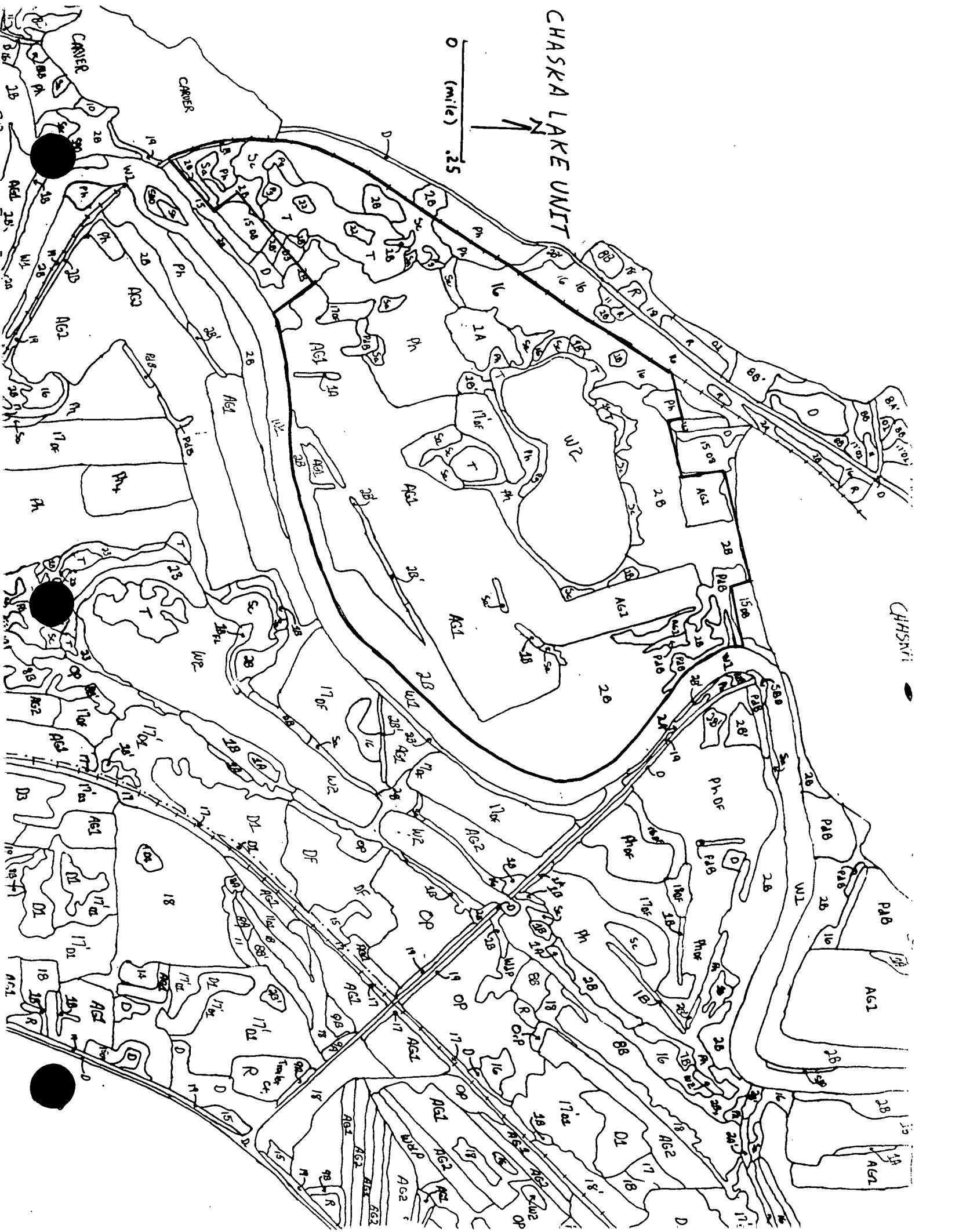


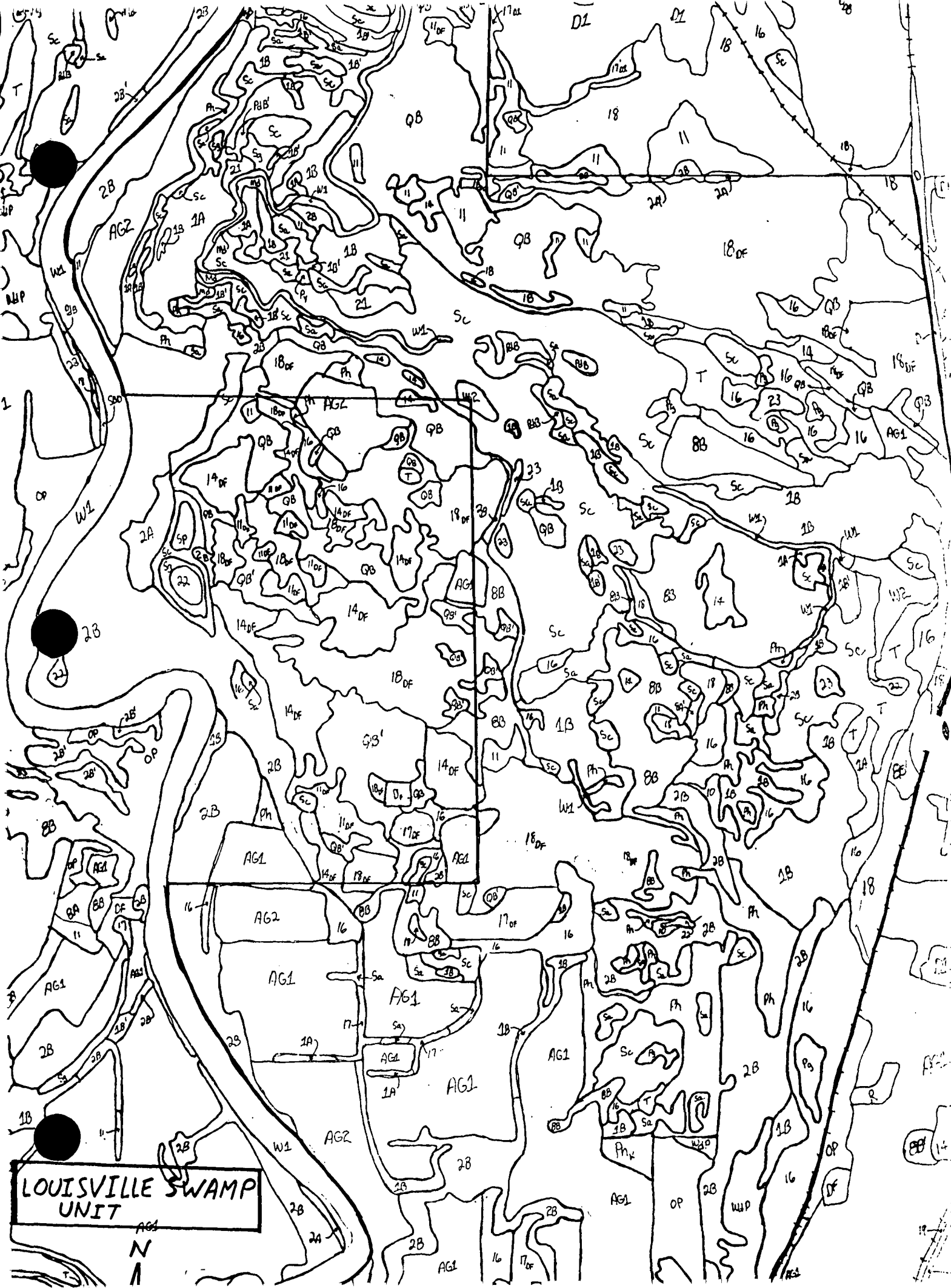
UPGRALA UNIT

East half









LOUISVILLE SWAMP
UNIT



INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP2

Date Procedure Implemented: April 1, 1984

Species: Waterfowl

Date Procedure replaced/
modified: _____

Title: Breeding pair count

I. Inventory Purpose/Justification

To properly assess the impact of refuge management practices on wildlife production on the refuge, the number of waterfowl breeding on the refuge must be assessed. ~~Estimates of the number of breeding~~
* ~~pairs on the refuge will be compared to brood counts done later to~~
~~determine the number of waterfowl being produced.~~ This information is needed to assess whether or not specific waterfowl output objectives (see master plan) are being met.

II. Procedure

Inventory Date(s): May 1-25 _____ Time of day: 8:00 a.m. - 1:00 p.m.
(2 successive days)

Conduct two breeding pair surveys in the given time period.

Number of personnel: 1

Weather conditions: optimal: overcast, calm
acceptable: Sunny; wind 10-15 mph; light rain

Equipment/supplies: Binoculars, spotting scope, bird identification guide, vehicle, data sheets, computer, Multiplan program.

Inventory Technique:

The same inventory technique will be used as that used for the monthly waterfowl inventory (IP1). However, instead of merely counting the number of individuals of each species, the number of pairs of each species must be recorded. Lone males or groups of 5 or ~~less~~ ^{fewer} males will count as pairs (1 pair for each male). If the males are ~~widgeons or shovelers~~ ^{within}, then only record lone males or male/female pairs as pairs. Do not record lone females or groups of females as pairs unless the birds are diving ducks and males of the same species were not recorded within 1/4 mile. *Two breeding pair surveys will be conducted between May 1 and May 25 to ~~increase the~~ ~~to increase the~~ and the ~~target~~ higher estimate and calculate production.*

Summarizing Data:

Data will be summarized using the same Multiplan program as used for Inventory Procedure IP1. However, instead of entering counts of individuals by species, the number of pairs of each species at each observation point will be entered. The spread sheet should be stored under the name "P1YRMODA" or "P2YRMODA" where YR= a 2 number abbreviation for the year, MO= the month in a 2 digit numerical abbreviation, and DA= the day expressed in 2 digits. For example, the name of the worksheet for an inventory run February 1, 1984 is P1840201. Sheet P1 is used for Long Meadow Lake, Bloomington Ferry, Chaska and Louisville units. Sheet P2 is used for Black Dog, Upgrala and Round Lake units. Specific directions for running the computer or Multiplan can be found in the computer manuals.

Data Analysis:

Calculation of the number of breeding pairs on the refuge will be done in the same manner as the general waterfowl population estimate ~~to~~ ~~done~~ (see Data analysis, Procedure IP1). The Multiplan program will perform the calculations automatically. The estimated numbers for each unit will be the estimated number of breeding pairs on the refuge. ** ^{totalled to get} ~~one~~

Field Data forms

See monthly waterfowl survey procedure IP.1.

| | |
|------------------|---------------------------------|
| Attachment IP1.A | Observation point location maps |
| Attachment IP1.B | Field data sheet |
| Attachment IP1.C | computer form printout |

In recording numbers of each species at each observation point, record lone males, or groups of 5 or less, lone females or groups, and male/female pairs. Use the letters "M", "F" and "PR" to separate these categories on the data sheet.

Inventory Areas/routes/transects:

The inventory routes are the same as those described in the monthly waterfowl inventory procedure IP.1.

III. Special Considerations

None.

IV. Manpower and costs per inventory

| <u>Item</u> | <u>Cost</u> |
|--|-------------|
| Manpower (assume \$10/hour and 10 hours | \$100.00 |
| Equipment (assume \$.25/mile and 100 miles | \$ 25.00 |
| Materials: already in stock | <u>.00</u> |
| Total | \$125.00 |

Prepared by: J. Thomas J. LarsonDate: 3/7/84Reviewed by: E.S. GrozielDate: 3/8/84Approved by: R.E. [Signature]Date: 4/1/87

Ad. ARW

INVENTORY PROCEDURE

Minnesota Valley NWR

Refuge Procedure No.: IP3

Date Procedure Implemented: April 1, 1984

Species: Waterfowl

Date Procedure replaced/
modified:

March 20, 1987

Title: Waterfowl Brood Count

I. Inventory Purpose/Justification

Included among the refuge wildlife objectives (see Master Plan) are waterfowl production goals. To determine if these objectives are being attained, waterfowl production must be determined. This inventory procedure is an attempt to gather this information.

II. Procedure

Inventory Date(s): July 1-21
(2 successive
days)

Time of day: 8:00 a.m. - 1:00 p.m.

Number of personnel: 1

Weather conditions: optimal: overcast, calm
acceptable: sunny; wind 10-15 mph; light rain

Equipment/supplies: Binoculars, spotting scope, bird identification guide, vehicle, data sheets, computer, Multiplan program.

Inventory Technique:

The same inventory technique will be used as for the monthly waterfowl inventory (IP.1). However, in addition to counting all individual adults, all broods, number of young per brood, and the age class of the brood should be recorded (see Attachment IP3.A for age class information).

Summarizing Data:

Counts?

Data will be summarized (using the same Multiplan program discussed in inventory procedure IP1. All individuals, including the young should be entered on one spread sheet to estimate the monthly waterfowl population (see IP1). The difference between that estimate and the

Non Comp Keade!

new estimate should also reflect waterfowl production. On another Multiplan spreadsheet, enter the number of broods by species seen at each observation point. This will summarize the total number of broods seen by species. The sheet for Long Meadow Lake, Bloomington Ferry, Chaska, and Louisville should be saved under "B1MODAYR." The sheet for Black Dog Lake, Upgrala, and Round Lake should be saved under the name "B2YRMODA." See IP1 "Summarizing Data" section for a definition of YR, MO, and DA.

Data Analysis:

The calculation of the estimated number of broods on the refuge will be made automatically by the Multiplan program just as it does for the waterfowl population estimates (see procedure IP1). After the number of broods are estimated, the average brood size by species must be calculated. This value for each species is then multiplied times the estimated number of broods for that species to determine the number of young produced.

As mentioned above in the "Summarizing Data" section, the population estimate difference between June and July should also be examined since an increased population in July should reflect production.

A final production estimate to examine is derived by taking the breeding pair count (procedure IP2) and assuming that 15% of the nesting pairs will successfully raise a brood. Assume there are 5 young per brood and obtain an estimated number of young produced by the formula:

$$\text{No. of pairs} \times .15 \times 5 = \text{No. of young produced}$$

After calculating production using the three methods above, compare the results. If the high and low estimates are within 20% of each other, use the high estimate. If the estimates have a greater spread than this, select the estimate which seems to most closely reflect the perceived real situation on the refuge. All estimates and rationale for selecting a specific estimate should be filed in Appendix V.

Field Data forms

The same data sheet as used in procedure IP1 is used for this inventory. See the inventory technique section of this inventory to determine what information must be recorded.

| | |
|------------------|---------------------------------|
| Attachment IP1.A | Observation point location maps |
| Attachment IP1.B | Field Data sheets |
| Attachment IP1.C | Computer form printout |

Inventory areas/routes/transects:

The inventory areas are the same as those described in the monthly Waterfowl Inventory Procedure IP1.

| | |
|------------------|---------------------------------|
| Attachment IP1.A | Observation point location maps |
|------------------|---------------------------------|

III. Special Considerations

None.

IV. Manpower and costs per inventory

| <u>Item</u> | <u>Cost</u> |
|---|---------------|
| Manpower (assume \$10/hr. and 10 hours) | \$100.00 |
| Equipment (assume \$.25/mile and 100 miles) | \$ 25.00 |
| Materials: already in stock | <u>\$.00</u> |
| Total | \$125.00 |

Prepared by:

J. Thomas J. Larson

Date:

3/7/84

Reviewed by:

Ed George

Date:

3/8/84

Approved by:

Date:

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Table 11.28. Development of a wild duckling as viewed under ideal conditions (from Gollop and Marshall 1954). See Table 11.29 for use in aging.

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

From:

Larson, J.S. and R.D. Taber, Criteria of Sex and Age. Pages 186 and 187 in S.D. Schemnitz, ed. Wildlife Management Techniques Manual, 4th ed. Wildl. Soc., Washington, D.C. 686 pp.

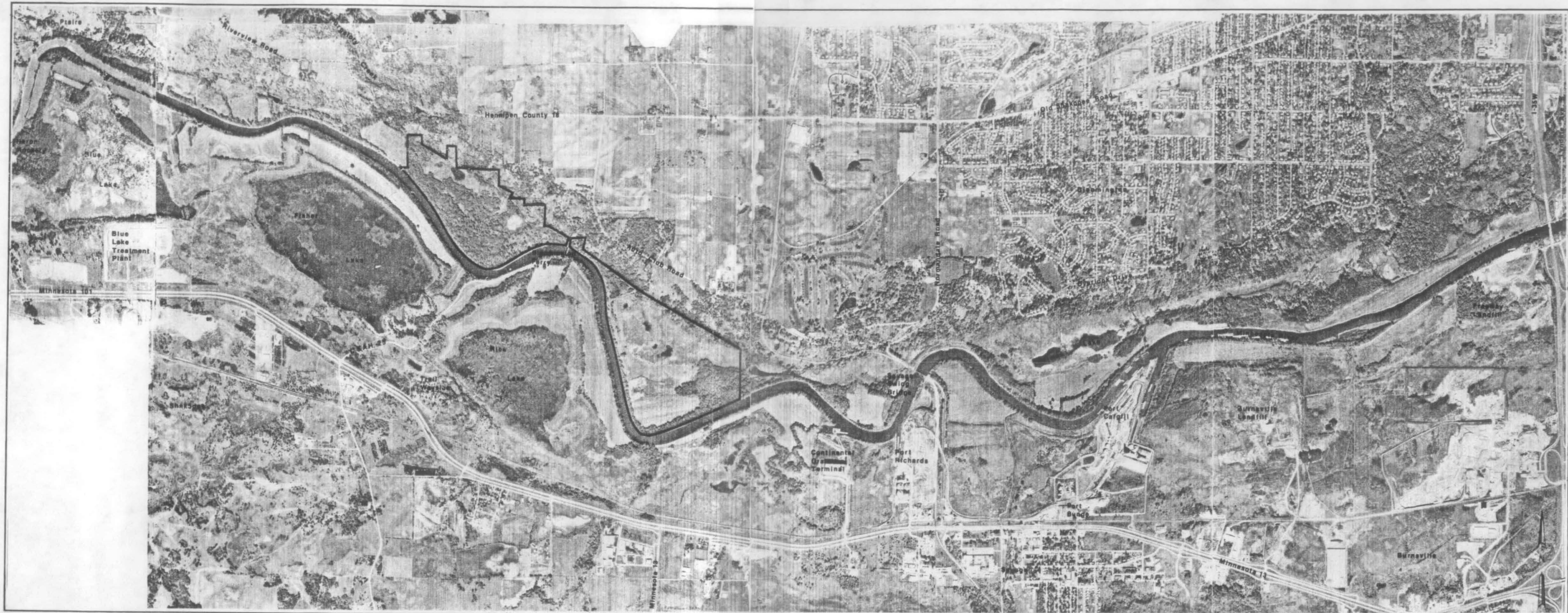
Table 11.29. Approximate age-span and midpoint (in days) for each plumage subclass for 11 ducks, with supplementary data (after Gollop and Marshall 1954).

| Species | Plumage Subclass (see Table 11.28) | | | | | | | Flying | Pri- maries break from sheaths | Areas of last down visible |
|------------------|------------------------------------|----------|----------|----------|----------|----------|----------|--------|--|--|
| | Ia | Ib | Ic | IIa | IIb | IIc | IIIa | | | |
| Mallard | 1-4-6 | 7-10-12 | 13-16-18 | 19-22-25 | 26-31-35 | 36-41-45 | 46-51-55 | 52-60 | 35 days | Rump |
| Black Duck | 1-3-5 | 6-9-12 | 13-16-18 | 19-22-25 | 26-30-33 | 34-39-43 | 44-52-60 | 58-63 | | |
| Gadwall | 1-4-6 | 7-11-14 | 15-17-18 | 19-23-27 | 28-33-38 | 39-42-44 | 45-48-50 | 48-52 | 31 | Nape & back |
| Bald-pate | 1-4-7 | 8-10-12 | 13-16-18 | 19-23-26 | 27-31-35 | 36-39-41 | 42-46-50 | 47+ | 30 | Nape & rump |
| Pintail | 1-3-5 | 6-9-12 | 13-16-18 | 19-21-23 | 24-29-33 | 34-39-43 | 44-48-51 | 46-57 | 31 | Back |
| Blue-winged Teal | 1-3-5 | 6-8-9 | 10-12-13 | 14-18-21 | 22-26-30 | 31-34-36 | 37-39-40 | 35-44 | 30 | Nape & rump |
| Shoveler | 1-4-6 | 7-10-13 | 14-16-17 | 18-23-27 | 28-32-35 | 36-40-44 | 45-48-50 | 47-54 | 33 | Nape & back |
| Red-head | 1-4-6 | 7-13-18 | 19-22-24 | 25-29-32 | 33-39-45 | 46-50-54 | 55-58-60 | 60-63 | 43 | Rump & back |
| Ring-necked Duck | 1-3-5 | 6-8-10 | 11-14-16 | 17-21-24 | 25-28-30 | 31-35-38 | 39-44-49 | 49-53 | | |
| Canvas-back* | 1-5-9 | 10-14-18 | 19-22-25 | 26-29-32 | 33-37-42 | 43-48-53 | 54-59-65 | 56-68 | 40 | Rump & back |
| Lesser Scaup | 1-3-6 | 7-10-13 | 14-17-20 | 21-25-28 | 29-31-33 | 34-38-42 | 43-47-50 | 47+ | | |

*Dzubin (1959) gives a waterline (swim) ratio of length of young: adult hen: 1 day old—1:3; Subclass IIa—2:3; subclass IIIa—3:3.

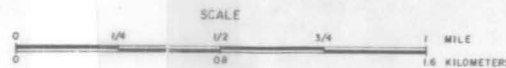
From:

Larson, J.S. and R.D. Taber. Criteria of Sex and Age. Pages 186 and 187 in S.D. Schemnitz, ed. Wildlife Management Techniques Manual, 4th ed. Wildl. Soc., Washington, D.C. 686 pp.

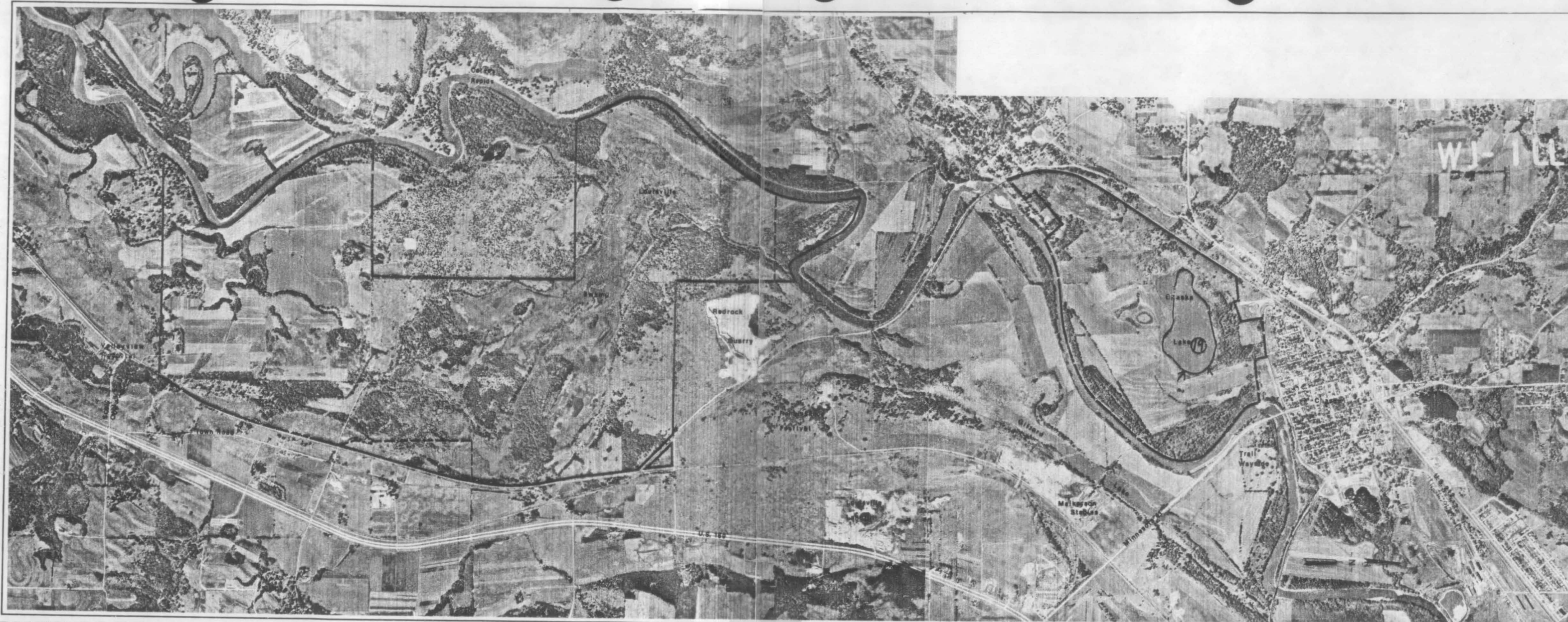


MINNESOTA VALLEY **NATIONAL WILDLIFE REFUGE**

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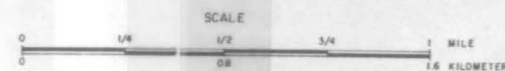
BLOOMINGTON FERRY UNIT



MINNESOTA VALLEY

NATIONAL WILDLIFE REFUGE

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



CHASKA LAKE and LOUISVILLE SWAMP UNITS