

MISSOURI RIVER
INTERIOR LEAST TERN AND PINK FLOWER
POPULATION STATUS AND PRODUCTIVITY SUMMARY

Including
Permit Activity Report



"...when the last individual
of a race of living things
breathes no more, another
Heaven and another Earth
must pass before such a
one can be again."

W. Oakes (1877-1898)



US Army Corps
of Engineers
Omaha District

DECEMBER 1993

**MISSOURI RIVER
INTERIOR LEAST TERN AND PIPING PLOVER
POPULATION STATUS AND PRODUCTIVITY SUMMARY**
**including
Permit Activity Report**

1993

**Prepared by the U. S. Army Corps of Engineers
Endangered Species Coordinator, Operations Division, Omaha District**

**A report submitted to meet condition 4 page 3
of the permit PRT-704930 (subpermit 93-07)
issued to the**

**U.S. Army Corps of Engineers
Missouri River Division
P.O. Box 103, Downtown Station
Omaha, NE 68101-0103**

1993 AT-A-GLANCE

PIPING FLOVER (*CHARADRIUS MELODUS*)

MISSOURI RIVER POPULATION SURVEY AND PRODUCTIVITY MONITORING

	ADULT CENSUS	ADULTS ^a MONITORED PRODUCTION	NESTS	NEST ^b SUCCESS	OBSERVED ^c PRODUCTION	FLEDGE ^d RATIO	ACTUAL ^e PRODUCTION
Fort Peck Reservoir (FTPKRES)	30	30	15	40.0	9	0.60	9
Fort Peck River (FTPKRIV)	2	1	1	0.0	0	0.00	0
Lake Sakakawea (LKSKRES)	5	3	11	27.3	34	1.07*	94
Garrison River (GARRRIV)	125	86	69	31.9	23		
Lake Oahe, ND (LONDRES)	45	27	41	14.6	6		
Lake Oahe, SD (LOSDRES)	21	14	7	57.1	1	0.14	2
Fort Randall River (FTRLRIV)	12	12	4	50.0	0	0.00	0
Lewis and Clark Lak (LECLRES)	32	32	16	31.2	1	0.06	1
Gavins Point River (GAPTRIV)	109	109	54	68.5	58	1.05	58
TOTAL	381	314	218	39.0	132	0.84 f	168

^a Adults within areas monitored for productivity.

^b Nests hatched per 100 attempted.

^c Chicks observed to have fledged from areas monitored for productivity.

^d Chicks fledged per pair of adults on areas monitored for productivity.

^e Chicks fledged on the entire reach (fledge ratio X total adults).

^f Weighted average (each reach X corresponding fledge ratio)

* Composite fledge ratio due to movement of birds within these reaches prior to adult census.

1993 AT-A-GLANCE

INTERIOR LEAST TERN (*STERNA ANTILLARUM*)

MISSOURI RIVER POPULATION SURVEY AND PRODUCTIVITY MONITORING

	ADULT CENSUS	ADULTS ^a MONITORED PRODUCTION	NESTS	NEST ^b SUCCESS	OBSERVED ^c PRODUCTION	FLEDGE ^d RATIO	ACTUAL ^e PRODUCTION
Fort Peck Reservoir (FTPKRES)	7	7	3	0.0	0	0.00	0
Fort Peck River (FTPKRIV)	31	13	14	57.1	3	0.43	7
Lake Sakakawea (LKSKRES)	14	9	10	20.0	1	0.19*	22
Garrison River (GARRRIV)	135	80	66	36.4	12		
Lake Oahe, ND (LONDRES)	82	49	65	4.8	0		
Lake Oahe, SD (LOSDRES)	41	38	13	38.5	0	0.00	0
Fort Randall River (FTRLRIV)	38	38	15	40.0	0	0.00	0
Lewis and Clark Lak (LECLRES)	76	76	54	37.0	37	0.97	37
Gavins Point River (GAPTRIV)	272	272	182	46.7	113	0.83	113
TOTAL	696	582	422	36.3	166	0.57 f	179

^a Adults within areas monitored for productivity.

^b Nests hatched per 100 attempted.

^c Chicks observed to have fledged from areas monitored for productivity.

^d Chicks fledged per pair of adults on areas monitored for productivity.

^e Chicks fledged on the entire reach (fledge ratio X total adults).

^f Weighted average (each reach X corresponding fledge ratio)

* Composite fledge ratio due to movement of birds within reaches prior to adult census.

SUBJECT: Annual report on the Missouri River interior least tern (*Sterna antillarum*) and piping plover (*Charadrius melodus*) population status and productivity including activity conducted under endangered species research permit PRT-704930.

PURPOSE: This report is intended to provide annual trend data on the adult populations and production estimates of least terns and piping plovers nesting along monitored reaches of the mainstem Missouri River during 1993. Efforts have been made to standardize data presentation in this report so that comparisons can be made with previous data collected on these reaches. All activities and procedures used to collect this data during the 1993 nesting season are discussed within this document. This report represents compiled data from seven U.S. Army Corps of Engineers Lake and Natural Resource Offices and three contracted U.S. Fish and Wildlife Service-Ecological Services Offices. If procedural information in greater detail than what is presented herewithin is required for comparative studies, unassimilated field office reports are available from the Operations Division of the Omaha District, U.S. Army Corps of Engineers, Omaha, NE.

INTRODUCTION

The U.S. Army Corps of Engineers (Corps) received a jeopardy Biological Opinion on the operations of the Missouri River Main-stem System from the U.S. Fish and Wildlife Service (USFWS) on November 14, 1990. This Biological Opinion (Opinion) concluded that the operations of the Missouri River would likely jeopardize the continued existence of the interior population of the least tern (*Sterna antillarum*) and the Great Plains population of the piping plover (*Charadrius melodus*). The least tern was listed as state and federally endangered in 1985. The piping plover was listed as state and federally threatened also in 1985.

The Opinion included Reasonable and Prudent Measures, Reasonable and Prudent Alternatives, and Conservation Measures that, if implemented, would preclude jeopardy to these species. The preclusion of jeopardy was based on production to be measured by fledge ratios of least terns and piping plovers on the Missouri River. Implementation of recovery measures is to be monitored through annual breeding adult population censuses and productivity surveys. Once productivity standards are achieved they will be maintained and monitored for ten consecutive years.

During the period from 1986-89 the Corps, in anticipation of an Opinion, began funding a series of studies to determine the population distribution of least terns and piping plovers throughout the Missouri River basin, and to determine factors

influencing the decline of these species. Based on findings of these studies, measures were initiated to reduce the impacts of human recreation on nesting areas and water release hydrographs were developed to prevent flooding of nests and pre-fledged chicks.

Upon receiving the Opinion in 1990, the corps intensified efforts to gather life history data and vital rates of piping plovers and least terns nesting on the Missouri River. Universities and the USFWS were contracted to collect this information during a second series of studies. Further measures, resulting from these continuing studies, have been developed and are currently being implemented to deter predation on the nesting colonies, to better control the inundation of low elevation nesting sites, and to retard the loss of habitat due to vegetation encroachment.

The 1993 nesting season represented the initial effort by the Corps to undertake the survey and monitoring activities and to become actively involved from the field perspective in the recovery of these two species. Corps staff from four Lake Offices and three Natural Resource Offices were involved on seven of nine designated reaches of the Missouri River, conducting adult population surveys and productivity monitoring of nesting sites along nearly 500 miles of river and reservoir shoreline. In addition, the Corps provided funding for scope-of-work contracts with three USFWS-Ecological Services field offices, which surveyed and monitored an additional two reaches and part of a third involving 225 river miles.

Data collection was standardized through the development and use of basin wide data cards for nest sites, adult surveys, and chick observations (Appendix A page 22). A guidelines manual for field personnel to use during piping plover and least tern survey and monitoring activities was developed and utilized during the field season. Training sessions covering proper field techniques, chick identification, juvenile aging, permit compliance, and record keeping were held for all staff involved with either the adult surveys or the productivity monitoring.

All work was conducted in compliance with the conditions of the endangered species research permit (Regional Blanket Permit PRT-704930, subpermit 93-07) issued to the U.S. Army Corps of Engineers, Missouri River Division, Omaha, Nebraska, by the USFWS's Denver Regional Office to work on least terns and piping plovers within the Missouri River Basin during 1993, and with authorization of represented state game and fish departments. Contracted agencies were individually permitted.

DESIGNATED STUDY AREAS

Study development included designating nine reaches historically identified as plover and tern nesting areas within the mainstem Missouri River, to be used as management units. These reaches were selected based on geographic location, hydrographic characteristics, and the ability to control or influence water elevations through dam releases. These nine management units include four riverine or lotic reaches and five reservoir reaches. Lake or field office responsible for adult censuses and productivity monitoring was determined by proximity to the given reach. Management reaches, agency and office conducting the surveys and monitoring activities during 1993, and inclusive river miles of survey and productivity subsample areas are listed below.

FORT PECK RESERVOIR (FTPKRES)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office
Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Lake
Office, Fort Peck, Montana

Adult Census: River Miles 1785.0-1771.0

Productivity: River Miles 1785.0-1771.0

RIVER BELOW FORT PECK RESERVOIR (FTPKRIV)

USFWS Charles M. Russell National Wildlife Refuge-Fort Peck Office
Billings Suboffice, Ecological Services; Assisted by Corps Fort Peck Lake
Office, Fort Peck, Montana

Adult Census: River Miles 1712.5-1581.5

Productivity: River Miles 1712.5-1673.0

LAKE SAKAKAWEA RESERVOIR (LKSKRES)

Corps Lake Sakakawea Natural Resource Office, Williston, ND

Adult Census: River Miles 1568.0-1480.5

Productivity: River Miles 1505.0-1507.0

Corps Lake Sakakawea Lake Office, Riverdale, ND

Adult Census: River Miles 1456.0-1389.6

Productivity: River Miles 1452.0-1444.0, 1393.5-1393.2

RIVER BELOW LAKE SAKAKAWEA RESERVOIR (GARRRIV)

Corps Lake Sakakawea Lake Office, Riverdale, ND

Adult Census: River Miles 1389.2-1341.2

Productivity: River Miles 1377.5-1367.5, 1360.0-1350.0

USFWS Ecological Services-North Dakota Field Office, Bismarck, ND

Adult Census: River Miles 1341.5-1299.7

Productivity: River Miles 1328.5-1318.5, 1317.5-1307.5

LAKE OAHE RESERVOIR, NORTH DAKOTA (LOSDRES)
Corps Lake Oahe Natural Resource Office, Bismarck, ND
Adult Census: River Miles 1232.0-1299.0
Productivity: River Miles 1296.5-1286.5, 1282.0-1272.0

LAKE OAHE RESERVOIR, SOUTH DAKOTA (LONDRES)
Corps Lake Oahe Natural Resource Office, Mobridge, SD
Adult Census: River Miles 1231.5-1165.0
Productivity: River Miles 1190.0
Corps Lake Oahe Lake Office, Pierre, SD
Adult Census: River Miles 1165.0-1110.0
USFWS Ecological Services-South Dakota Field Office, Pierre, SD
Adult Census: River Miles 1110.0-1072.0
Productivity: River Miles 1110.5-1110.0, 1104.0-1089.8

RIVER BELOW FORT RANDALL DAM (FTRLRIV)
Corps Lake Francis Case Lake Office, Pickstown, SD
Adult Census: River Miles 880.0-845.0
Productivity: River Miles 880.0-845.0

LEWIS AND CLARK RESERVOIR (LECLRES)
Corps Lewis and Clark Lake Office, Yankton, SD
Adult Census: River Miles 845.0-811.0
Productivity: River Miles 845.0-811.0

RIVER BELOW GAVINS POINT DAM (GAPTRIV)
Corps Lewis and Clark Lake Office, Yankton, SD
Adult Census: River Miles 811.0-750.0
Productivity: River Miles 811.0-750.0

GENERAL LIFE HISTORY AND HABITAT OBSERVATIONS

Due to the Corps commitment to attain training for all field personnel involved in the 1994 surveying and monitoring activities and the difficulty in coordinating a basin wide effort, initial habitat use surveys were conducted one to two weeks later than when they typically occurred in the past. Least terns and piping plovers were found to be distributed through out the management units by the end of May - first week of June.

Habitat use surveys to locate active nesting colonies for monitoring purposes, were conducted with the aid of binoculars or spotting scope. Potential nesting areas were typically observed from a boat. Large islands or beach areas accessible from land were searched on foot using bird behavior to indicate active nesting colonies. LKSKRES used a fixed-wing aircraft to locate nesting colonies on the extensive reservoir system found within this reach. Sites found to have terns or plovers

actively exhibiting nesting or courting behavior were recorded on U.S. Army Corps of Engineers aerial mosaic maps (Appendix B page 26) and monitored during production surveys. Habitat use surveys were conducted from the third week of May until the middle of July. By 15 July, successful colonies were assumed to be established and located nests were generally into the later stages of incubation with many successful adults brooding chicks.

FTPKRES: Habitat was in good condition upon the arrival of birds to the nesting areas within FTPKRES. Due to the continued drought and subsequent reduction of reservoir water levels at Fort Peck, shoreline habitat suitability may have exceeded that found during the previous years nesting season. Plovers were noted to be present at the reservoir on 28 April with the earliest terns documented on 3 June. Nest initiation dates for piping plovers at FTPKRES ranged from 3 May to 11 June while least terns initiated nests from 11 to 18 June. Above normal precipitation during the spring and summer led to rapidly rising reservoir elevations at FTPKRES. A 17.3 ft increase in water level (2208.8 ft above mean sea level, 1 March to 2226.1 ft msl, 1 September) inundated past years nesting beaches and terminated many of the active low elevation nests. Nesting islands were further impacted by the high water as wave action likely destroyed several nests that were not completely inundated. Habitat conditions expected for the 1994 nesting season continue to deteriorate as water levels continue to rise. Beaches likely to remain exposed will have had six years of uninterrupted vegetative growth.

FTPKRIV: Quality of habitat on the FTPKRIV reach during 1993 was comparable to that observed during past surveys. Below normal daily average discharges of 6600-7500 cfs from Fort Peck Dam resulted in several bare islands and sandbars with crest elevations up to two feet above the water surface. The first least tern observed within the subsample area during 1993 was sighted on 27 May. Piping plovers arrived on the nesting area 9 June. Nest initiation dates for least terns nesting on the FTPKRIV reach ranged from 2 to 18 June. Piping plovers initiated a single nest within this reach on 6 July, 25 days later than any nest initiated by plovers on the FTPKRES reach. Habitat conditions within this reach during 1994 will be highly dependent on releases from Fort Peck Dam. High elevation sandbars have become vegetated due to the lack of scouring flows.

LKSKRES: Least terns and piping plovers were well distributed throughout the historic nesting sites on the LKSKRES reach when surveys began on 27 May. Although both species were present at this time, back-calculation of incubated eggs indicated that plovers began initiating nests during the week of 3 May while terns did not begin laying eggs until 13 June. The latest recorded nest initiations for plovers on LKSKRES during 1994 were on 13 and 17 June. Terns were observed to

continue nest initiation as late as 10 July. Habitat condition on LKSKRES was very good for both species at the beginning of the nesting season. Low lake levels exposed large gravel-sand beaches, and several large gravel islands were available within the reservoir. Habitat had changed dramatically by completion of the nesting season. The majority of the nesting habitat available during the early part of 1993 was inundated by the rapidly rising lake elevations and many of the birds were forced to abandon this reach by the end of July. High elevations of many of these nesting areas during nest initiation aided early nesting plovers in fledging broods before inundation. Elevation of Lake Sakakawea rose from 1816.8 ft above msl on 1 March to 1837.1 ft above msl (20.3 ft) on 1 September. Ridge Island in the Van Hook Arm of LKSKRES was 400 acres in size and 2.5 miles long on 1 June. At this time, twenty-eight adult piping plovers were observed on the island. By August, Ridge Island had been reduced to slightly more than an acre. Full reservoir conditions coupled with efforts to maintain a stable pool during the spring for fish spawn in Lake Sakakawea, will make habitat availability extremely marginal for least tern and piping plover nesting during 1994.

GARRRIV: Below normal releases of 16,500 cfs daily average provided excellent nesting conditions during nest initiation periods along the GARRRIV reach. Extensive sandbar and island beach habitat was available throughout the reach when plovers began to arrive on the nesting areas in late April. Least terns were first observed 19 May. Nest initiation was documented as early as 8 May for plovers and the first week of June for terns. A record rainfall in mid-July inundated all sandbars downstream of the Heart River confluence near Bismarck, ND and likely impacted recruitment of juvenile plovers and terns throughout the GARRRIV reach. Sandbar availability and habitat condition for the 1994 nesting season will depend on releases from Lake Sakakawea. Sandbar and island beach habitat within this reach has extensively vegetated on the higher points during the past several years of reduced flow. A decreasing flow during the nesting season, if significant, could provide vegetation free nesting sites and increase chick survival by providing areas for brood dispersal during the fledging period.

LONDRES: Below normal pool elevation in Lake Oahe again resulted in good habitat conditions for both terns and plovers nesting within the headwaters region of LONDRES reach during the spring of 1993. Piping plovers had begun nesting activity prior to the start of monitoring in late May. Earliest nest initiation for plovers was calculated to be 13 May and 8 June for terns. Cold wet weather in late May and early June in this reach appeared to delay tern nesting activity for nearly two weeks after the birds arrived on the nesting areas. As occurred on most reaches during the 1993 tern and plover nesting season, rapidly rising reservoir conditions

and high tributary flows terminated nearly all of the nesting activity within the LONDRES reach. With reservoir pool levels expected to remain high during 1994, natural nesting habitat within the upper end of lake Oahe may be nearly non-existent.

LOSDRES: Lower basin precipitation and high late spring tributary flows caused earlier rises in lower basin reservoir elevations than what was experienced in the upper basin reservoir reaches (Lake Oahe - 1592.7 ft above msl on 1 March, 1610.7 ft above msl on 1 September). This increase in Oahe pool resulted in a nine foot increase in elevation between the beginning of the 1992 nesting season and the 1993 nesting season. Subsequently habitat conditions had deteriorated as water levels approached the vegetation on many of the historic nesting areas located on the LOSDRES reach. Both piping plovers and least terns were seen on the nesting areas when surveys started in the Mobridge area on 18 May, and in the Pierre area on 25 May. The earliest recorded nest initiation for plovers on LOSDRES during 1993, was 1 June with most birds initiating on or about 10 June. Least terns began initiating nests 8 June with the majority nesting on or about 18 June. Continued rise of reservoir surface elevation prematurely terminated all nesting activity on this reach by the end of July 1993. Habitat availability will be severely limited in 1994 if reservoir conditions remain the same. Many of the nesting areas including the Blue Blanket area near Mobridge were completely inundated during 1993. Wave action and high water scouring of vegetation should improve the condition of these areas for nesting when receding reservoir elevations again expose these sites.

FTRLRIV: Habitat conditions within the FTRLRIV reach remained much the same as they have during the past several years during the early part of the 1993 nesting season. Very few high quality areas exist within this reach although sites that are available are typically quite large. Vegetation has impacted these areas above the elevations where water has been able to prevent new plant growth. Piping plovers and least terns were observed on this reach during an initial inspection trip 4 June, 1993. Initial plover nest initiation was determined to have occurred on 3 June with terns initiating nests starting 15 June. Flood control measures, with releases being dramatically reduced during the first week of July, resulted in vast expanses of sandbar habitat being exposed throughout the FTRLRIV reach. Daily average releases from Fort Randall Dam were as low as 650 cfs for the period from 11 to 14 July. Water conditions within the river channel were so low that survey efforts were complicated during this time. Fort Randall releases in the period from 1 June through 31 August averaged 27% of normal. Observations that were conducted did not indicate as large a use of this habitat by renesting terns as one would expect. It is possible that this habitat became available too late for it to

be utilized as nesting habitat in 1993.

LECLRES: Reconstructed habitat within the LECLRES reach was the primary habitat of choice for piping plovers and least terns during the early part of the 1993 nesting season. Plovers were distributed throughout the reach during habitat use surveys the third week of May, and began initiating nests on 8 May. Least terns were first observed on the LECLRES reach the last week of May and began to initiate nests 4 June. Large, newly aggradated sandbars, formed at the upper end of this reach during flooding of the Niobrara river, provided new nesting substrate for re-nesting terns after the water receded starting the first week of July. Twenty-three tern nests were initiated on this habitat in the upper reach during the period 1 through 8 July and birds continued to initiate nests until 20 July even though the lake peaked out at 1208.9 ft msl on 15 July due to flood inflows. Excellent nest and chick success was recorded for this reach during the later part of the nesting season as expansive sand flats developed with the continued recession of flood waters. Habitat should be in good condition within this reach for the 1994 nesting season particularly if flows from the Fort Randall Dam and the Niobrara River do not greatly exceed those observed during the early part of the 1993 nesting season.

GAPTRIV: The 1993 nesting season on the GAPTRIV reach was successful even though it contained both catastrophic flooding events on the lower part of the reach and record low water conditions during flood control activities on the upper part of the reach. An initial reduction of discharge from Gavins Point Dam to no more than 26,500 cfs for 12 hours every third day, provided habitat conditions similar to those seen along this reach during the past several nesting seasons. Vegetation has severely impacted availability of nesting habitat in this reach. Both terns and plovers have been forced to nest on extremely low elevation sandbars that are periodically flooded by tributary inflow or off season changes in dam discharges. Birds primarily nested on areas exposed by the reduction in flows with plovers initiating nests as early as 25 April and terns beginning to nest over a month later on 30 May. Record numbers of terns began to show up on the GAPTRIV reach during the first week in June. Large nesting colonies were established on the upper end of the reach where less tributary inflow resulted in more habitat being exposed. Peaking discharges for the birds was abandoned 27 June as tributary runoff between Yankton, SD and Sioux City, IA continued to increase. Flood control measures to help reduce the record setting flood stages on the lower Missouri River, reduced the amount of water being discharged into the river in late June. Habitat condition and availability greatly increased as the river elevation receded throughout July. This was a result of releases from Gavins Point Dam averaging only 28% of normal during the period from 1 July to 31 August. Habitat increased in the reach from

approximately 13 small sites at the start of the nesting season to nearly 600 acres late in July. Highly fluctuating tributary inflow from the James and Vermillion Rivers impacted nesting on the lower end of the reach, although much of the re-nesting effort was concentrated on the upper end near Yankton, SD as habitat simply didn't exist below the confluence of the Vermillion River. Nesting success on these late nest attempts was actually similar to those earlier in the year and would have been higher if not for the nests lost to weather and flooding (Figure page 10). Abundant habitat for brood dispersal, due to extremely low water conditions, led to excellent chick survival rates on several of the larger nesting colonies. Nearly forty fledged least tern chicks were seen in one flock staging on a sandbar near Yankton, SD. Habitat conditions on the GAPTRIV reach actually deteriorated during the 1993 nesting season. Vegetation was able to establish over much of the historic nesting sites and predicted high discharges for the reach will put nesting sites at a premium for the 1994 nesting season.

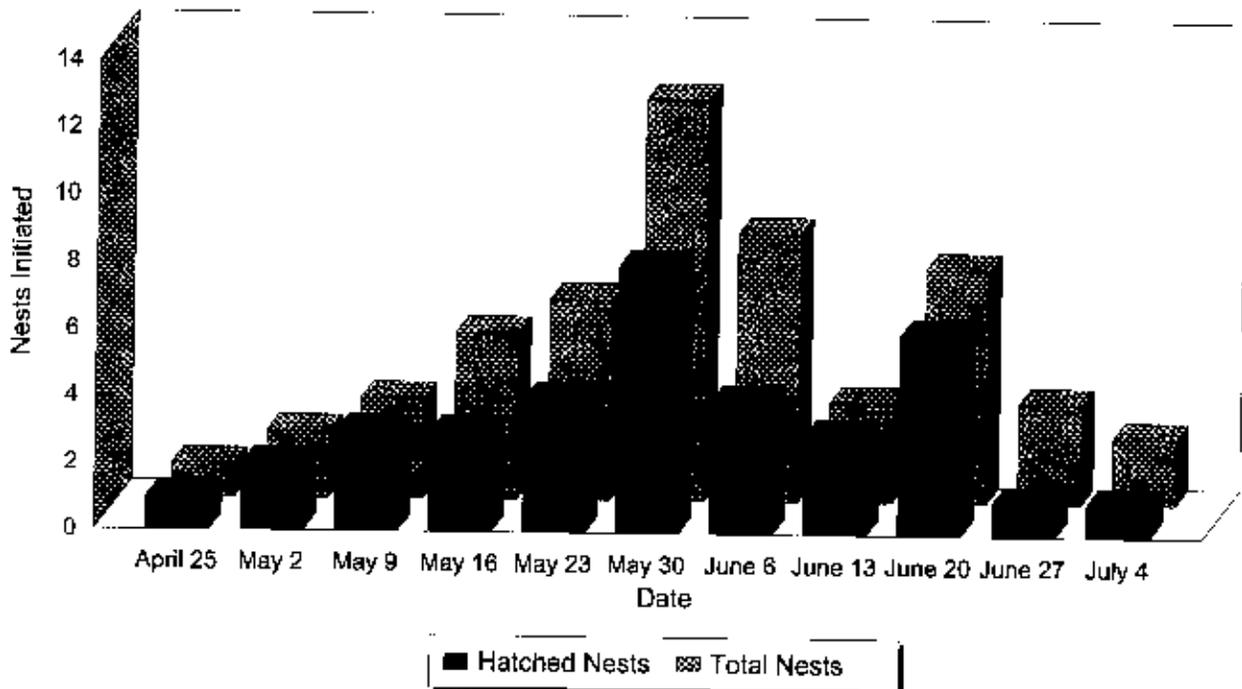
POPULATION CENSUS

The adult population census was scheduled to be conducted simultaneously throughout the Missouri River during the weeks of 27 June and 4 July. Extended periods of rain, cold damp weather, and high wind delayed completion of the survey until 24 July. Weather conditions and drastic changes in nesting site distribution due to rising reservoir levels, complicated survey results. During the survey many birds were recorded as transient probably moving off of a flooded area. Surveys in the FTPKRES, FTPKRIV, LOSDRES, FTRLRIV, LECLRES, and GAPTRIV were completed prior to emigration of adults off the breeding sites within these reaches. Survey results in the LKSKRES, GARRRIV, and LONDRES indicated that water conditions may have forced birds to emigrate out of the reservoir reaches and into the higher habitats of the riverine reaches (Figure page 11) prior to the survey. This is especially evident in the results of the LKSKRES census where only five adult plovers were counted but where 34 chicks were known to have fledged earlier in the year.

Census activities were conducted with the aid of a boat and binoculars or spotting scope. Adults were counted either while incubating clutches, loafing on the sandbar, or flying overhead near the natal areas. If heavy vegetation existed on an area preventing observation of adults on the ground, sites were entered, causing the birds to flush where they were then counted in the air. On sites with large nesting colonies, where bird activity makes actual counts improbable, the census count was recorded as twice the number of active nests plus the brooding pairs. Date, time, observers, and site location was recorded during entry of each census record.

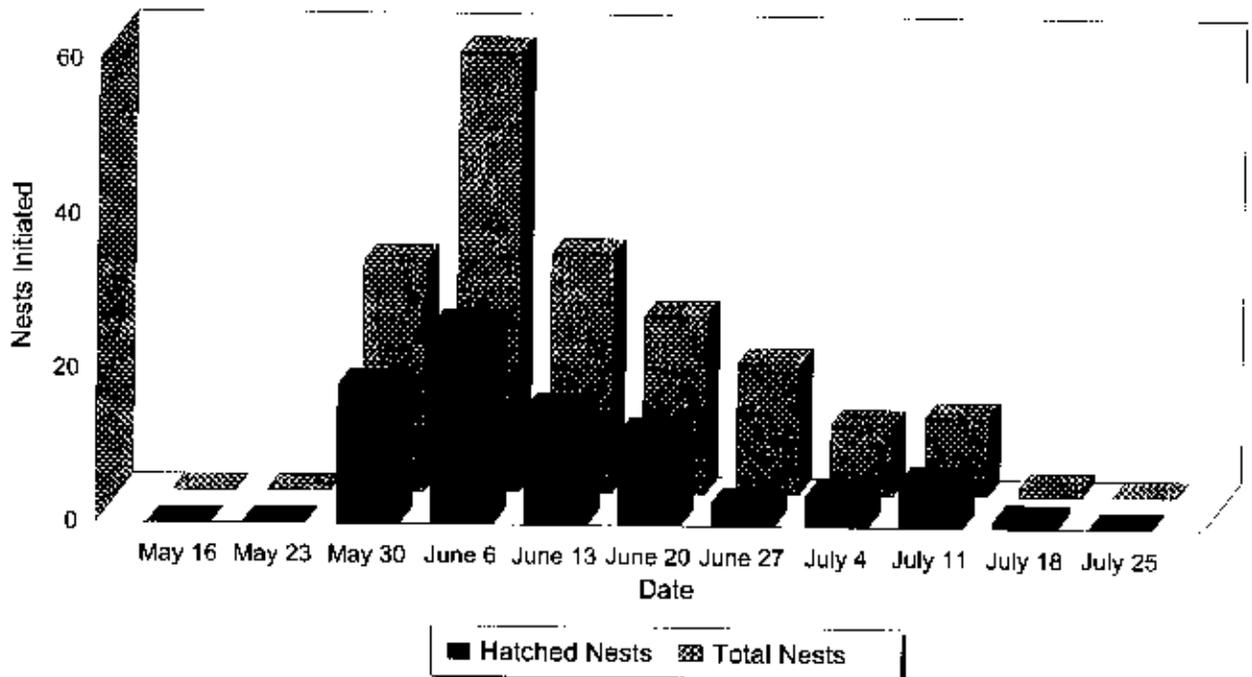
Piping Plover Nests Initiated By Week

Gavins Point Reach



Least Tern Nests Initiated By Week

Gavins Point Reach



ANNUAL PIPING PLOVER POPULATION COUNTS, 1986-1993

SURVEY REACH	1993	1992	1991	1990	1989	1988	1987	1986
FORT PECK RESERVOIR	30	26	25	22	12	10	10	16
FORT PECK RIVER	2	0	13	17	11	5		
LAKE SAKAKAWEA	5	108	150	132	57	143		
GARRISON RIVER	125	77	121	71	86	113	160	139
LAKE OAHE, ND-SD	66	143	87	88	140	55	4	4
FORT RANDALL RIVER	12	12	45	31	0	31	16	11
LEWIS & CLARK LAKE	32	1	12	11	18	0	0	0
GAVINS POINT RIVER	109	111	165	144	122	212	177	172
TOTAL	381	478	618	516	446	569	367	342

ANNUAL LEAST TERN POPULATION COUNTS, 1986-1993

SURVEY REACH	1993	1992	1991	1990	1989	1988	1987	1986
FORT PECK RESERVOIR	7	0	10	6	4	3	4	
FORT PECK RIVER	31	110	66	92	51	18		
LAKE SAKAKAWEA	14	29	8	6	15	7		
GARRISON RIVER	135	198	195	174	122	142	175	171
LAKE OAHE, ND-SD	123	124	143	100	97	82	21	16
FORT RANDALL RIVER	38	20	62	67	4	45	60	25
LEWIS & CLARK LAKE	76	22	25	21	29	0	0	0
GAVINS POINT RIVER	272	186	193	166	210	252	232	181
TOTAL	696	689	702	632	532	549	492	393

○ REACH HIGH
 / PARTIAL SURVEY

All terns and plovers observed on the Missouri river having adult plumage were recorded as breeding adults.

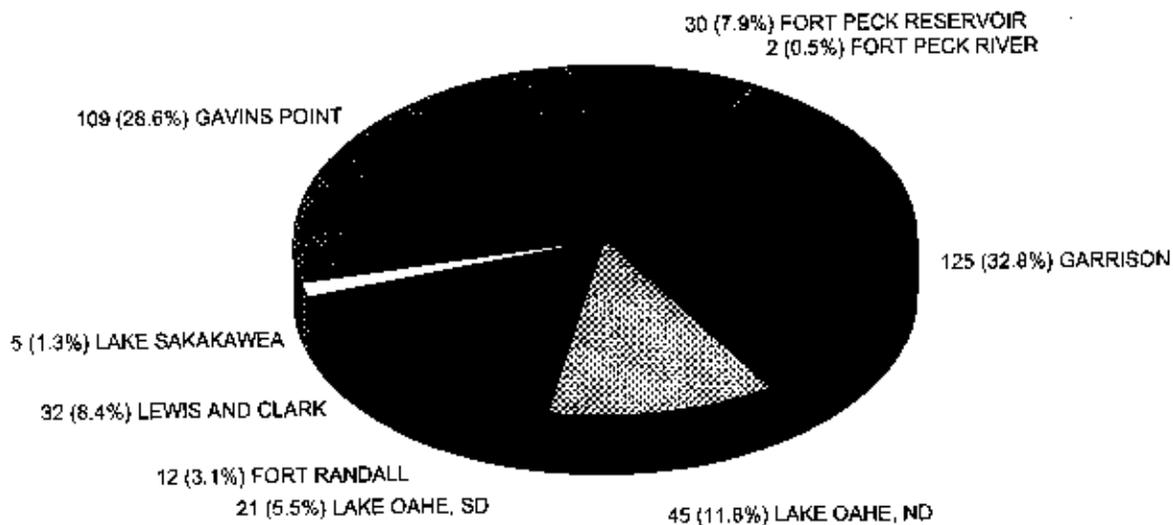
The 1993 population distribution of piping plovers and least terns nesting on the Missouri River, remained similar to past years, with Gavins Point and Garrison river reaches supporting the largest concentrations (Figure page 13). As previously mentioned, LKSKRES counts were most certainly impacted by the rising reservoir, while GAPTRIV record least tern census may have in part been due to the poor nesting conditions on the southern reaches of the terns nesting range. Flooding on the Platte River system in Nebraska, and on the Mississippi River, precluded least tern and piping plover production within those areas in 1993. Population trends show a fairly stable population of least terns using the Missouri River system (Figure page 14), while piping plovers continue in a three year decline (Figure page 14). This decline in nesting adult plovers is a point of concern and may be partly explained by improved nesting conditions on alkaline wetlands within the prairie coteau region of the Northern Great Plains. Reaches conducting the adult census and dates during which the census was conducted are listed below.

Fort Peck Reservoir	10 - 11 June
Fort Peck River	14 - 16 July
Lake Sakakawea	10 - 24 July
Garrison River	7 - 16 July
Lake Oahe ND	12 - 20 July
Lake Oahe SD (southern 1/3)	22 - 30 June
Lake Oahe SD (central 1/3)	6 July
Lake Oahe SD (northern 1/3)	13 July
Fort Randall River	22 July
Lewis and Clark Lake	9 - 13 July
Gavins Point River	29 June - 7 July

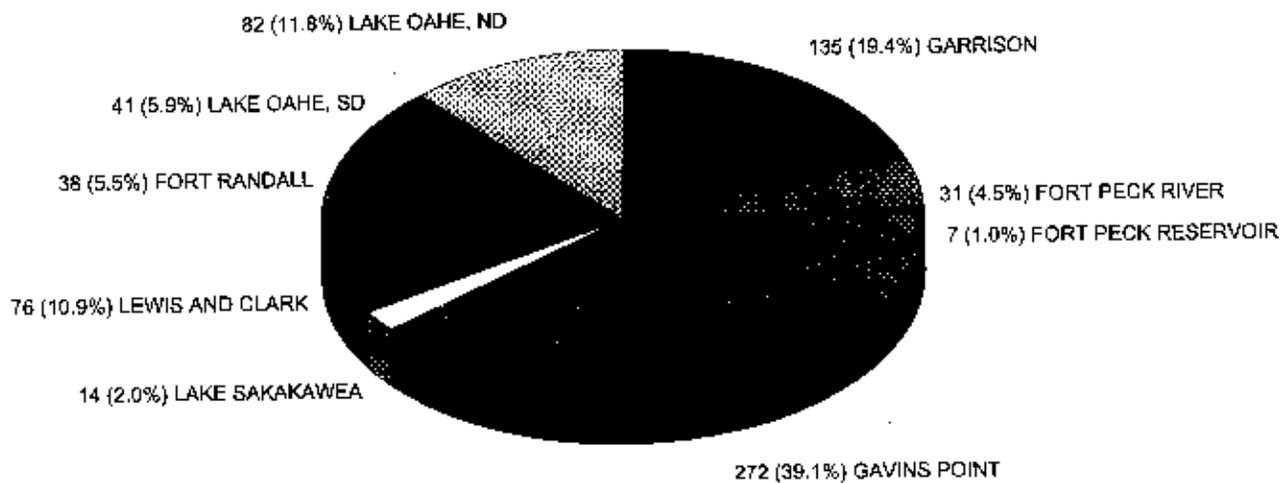
*Harmony with land is like harmony with a friend;
you cannot cherish his right hand and chop off his left.
That is to say, you cannot love game and hate predators.
"----- The land is one organism."*

Albin S. Sargent

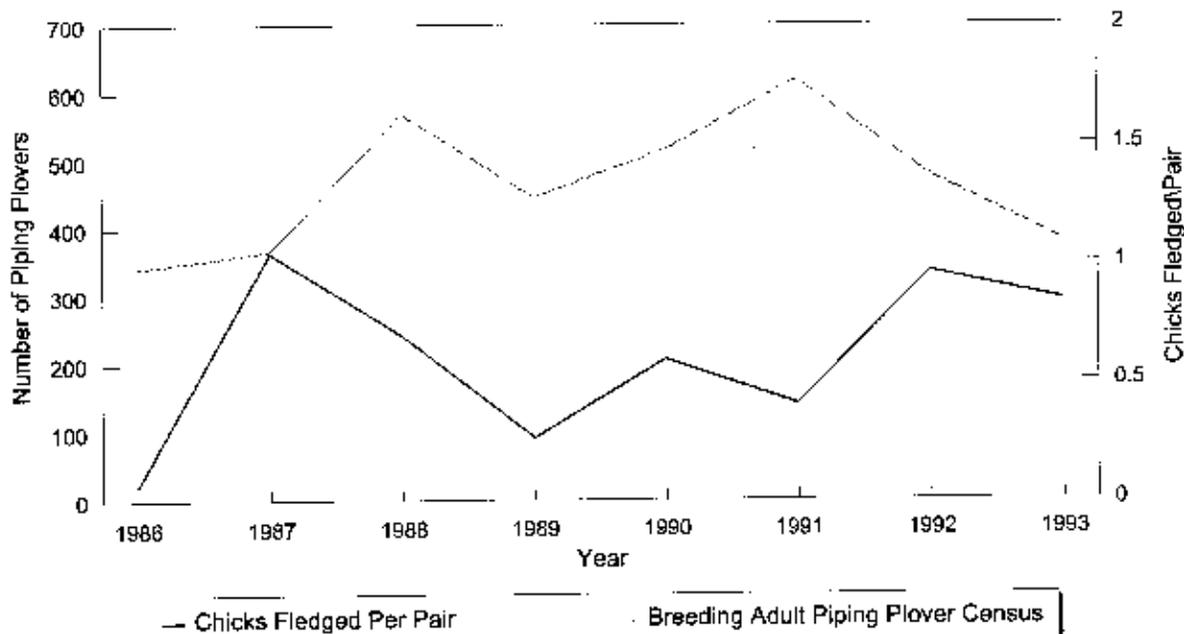
PIPING PLOVER POPULATION DISTRIBUTION 1993 BREEDING ADULT CENSUS



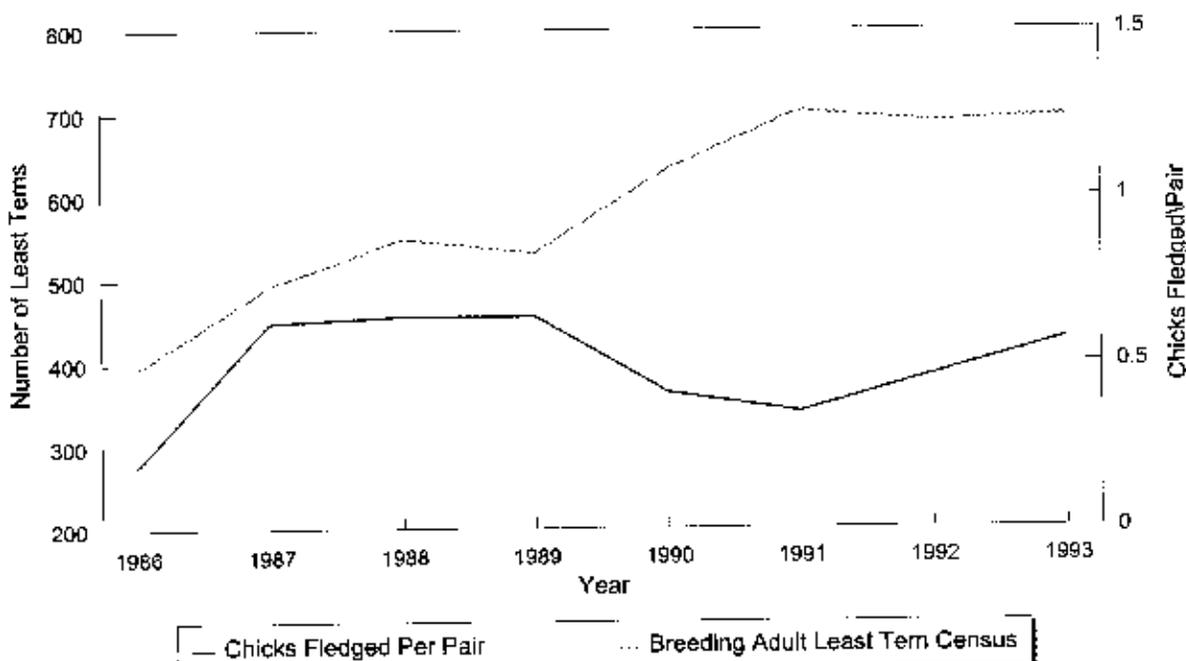
LEAST TERN POPULATION DISTRIBUTION 1993 BREEDING ADULT CENSUS



Annual Piping Plover Population Trends
With Corresponding Chicks Fledged Per Pair Ratio



Annual Least Tern Population Trends
With Corresponding Chicks Fledged Per Pair Ratio



PRODUCTIVITY AND RECRUITMENT OF FLIGHTED CHICKS

Productivity monitoring provides a standard of measurement onto which success or failure of implemented management practices can be evaluated. The most critical scale of any recovery effort must be rated with the return gained from annual reproductive efforts or in the recruitment of young to the adult population. No matter how much habitat is created or prudent measures implemented, nothing will recover piping plover and least tern populations unless annual productivity exceeds annual mortality. In light of this, fledge ratio goals (number of juveniles produced annually per pair of breeding adults) were established by the Biological Opinion to give the Corps a target to meet in implementing management activities on the Missouri River. Correct estimates of these ratios are essential to evaluate the success of efforts applied towards meeting recovery goals. Every effort was made to accurately collect and report all aspects of the productivity monitoring activities during 1993.

Sites identified through early habitat use surveys to contain active nesting colonies (except on the FTPKRIV and GARRRIV reaches where productivity was geographically subsampled), were revisited every 7-10 days during the duration of the summer to record nesting activity and chick survival. Active nesting sites were searched to determine number of nests and principle causative factors responsible for any nest being prematurely terminated. Each colony was searched on foot with the aid of binoculars. Nests were located by observing adult behavior or by doing systematic searches of the colony site. Each nest was identified by placing a numbered wooden tongue depressor within five meters of the nest. Nests were relocated every 7 to 10 days until the nest was terminated. All on site activity was limited to 30 minutes or less including any passive predator management activities.

Information collected from each nest was recorded on a standardized nest card and included number of eggs, stage of incubation-obtained through use of the egg flotation method, nest fate, nest location, and nest elevation (only for highest and lowest nest on the site). Cause of nest termination was recorded as hatched or destroyed, with hatched nests being determined by the presence of piping fragments or chick excrement in the nest bowl. A nest was considered successful if it hatched a single egg from the clutch. Cause of nest fate on large nesting colonies was greatly aided by identifying all eggs in active nests with the nest number written on both ends of the egg with a non-toxic felt pen. Destroyed nests were identified to a principle causative factor including but not limited to , flooding, weather, human disturbance, predation, and abandonment.

Chick survival was recorded during weekly nest searches of nesting areas. As the breeding season progressed, efforts were concentrated on locating chicks and keeping track of fledged chicks using natal areas. Chicks were typically flushed ahead of observers on the nesting sites and were aged by visual observation of size and primary feather development. Care was taken to prevent chicks from fleeing into the water in efforts to escape from the observers. Chicks were tracked during the fledging period by recording each observation on a chick record sheet. Because of a high probability of fledging before the next weeks visit twenty-two day old plovers and 15 day old least terns were considered fledged.

The 1993 breeding season proved to be extremely difficult for plovers and terns particularly within the reservoir reaches. Results of the 1993 production surveys are given for plovers (Table page 17) and for terns (Table page 18). Flooding and weather are the dominant factors identified to have severely impacted recruitment of chicks to the flighted population. The reservoir water level at FTPKRES increased 6.2 feet between the earliest nest initiation date and the last nest termination date, resulting in the inundation of all tern nests and eight of 15 plover nests. Strong winds accompanied with rain, along with flooding of the Milk River in Montana, drowned or killed by exposure, at least nine tern chicks and destroyed several other nests along the FTPKRIV reach, despite a reduction in releases from Fort Peck Dam. Rising lake levels on the LKSKRES reach destroyed 55% of the plover nests and two-thirds of the tern nests along with flooding three nearly fledged plover chicks in Hoffland Bay. GARRRIV reach had extremely wet cold conditions during much of the nesting season and several chicks were presumed to have been lost to exposure. Flooding of tributary rivers impacted many of the nesting sites especially below the Heart and Knife Rivers, even though releases from Garrison Dam were reduced to compensate for higher flows. This may also explain many of the unknown nest fates recorded in this reach. LONDRES and LOSDRES suffered nearly complete losses of nesting efforts due to the unusually rapid rise of this reservoir. It is difficult to explain the abrupt cessation of nesting within the FTRLRIV reach between 1992 and 1993. Vast amounts of habitat, available after drawdown during flood control measures, apparently did not attract terns. Difficulty in river navigation and greatly reduced survey effort may explain some of this change in tern and plover use of this reach. Inability to get to nesting sites prevented fates from being determined on many of the nests located within the FTRLRIV reach in 1993. Predation, unusually nonexistent on other reaches during 1993, severely impacted first nesting plovers and terns on artificial habitat within LECLRES reach. One-hundred percent of the first 16 nests on this reach were destroyed by mink and raccoon predation. Renesting activity started

MAINSTEM MISSOURI RIVER PIPING PLOVER PRODUCTIVITY MONITORING, 1993.

R/FACH	RIVER MILES	NEST EGGS		FATE DESTROYED			FATE		AVG. CLUTCH PAIRS ^a	ADULT CHICKS FLEDGE							
		HAT.	SUCC.	HAT.	FLOOD PRED.	H. DIST.	WTHR.	UNKN.			UNKN.						
FTPKRES	14.0	15	55	6	40.0	20	8	0	0	0	1	0	0	3.7	15	9	0.60
FTPKRIV	39.5	1	4	0	0.0	0	1	0	0	0	0	0	0	4.0	1	0	0.00
LKSKRES	86.8	11	38	3	27.3	11	6	0	0	0	0	0	2	3.5	2	34	1.07
GARRIV	40.0	69	58	22	31.9	33	11	12	2	2	11	6	2	3.4	43	23	
LONDRES	20.0	41	105	6	14.6	18	24	4	0	0	6	0	1	2.6	14	6	
LOSDRES	61.7	7	7	4	57.1	11	1	1	0	0	0	1	0	3.5	7	1	0.14
FTRLRIV	35.0	4	12	2	50.0	8	1	0	0	0	1	0	0	3.0	6	0	0.00
LECLRES	34.0	16	51	5	31.2	16	0	5	0	0	5	1	0	3.2	16	1	0.06
GAPTRIV	61.0	54	195	37	68.5	130	4	1	1	3	7	1	0	3.6	55	58	1.05
TOTAL	378.0	218	525	85	39.0	247	56	23	3	5	31	11	3	3.2	157	132	0.84

^a Rounded up to represent complete pairs.

✓ Subsampled reaches

○ Incomplete reporting

➤ Composite fledge ratio due to movement of birds within reaches prior to adult census.

MAINSTEM MISSOURI RIVER LEAST TERN PRODUCTIVITY MONITORING, 1993.

REACH	RIVER MILES	NEST EGGS		FATE DESTROYED			FATE		AVG. CLUTCH PAIRS ^a	ADULT CHICKS FLEDGE	FLEDGE RATIO						
		HAT.	SUCC.	HAT.	FLOOD PRED.	H. DIST.	WTHR.	UNKN.				UNKN.					
FTPKRES	14.0	3	7	0	0	3	0	0	0	2.3	4	0	0.00				
FTPKRIV	39.5	14	37	8	57.1	20	0	0	0	2.6	7	3	0.43				
LKSKRES	86.8	10	15	2	20.0	3	4	2	0	1	0	1	1				
GARRIV	40.0	66	52	24	36.4	20	15	7	0	6	8	4	2	1.9	40	12	0.19
LONDRES	20.0	65	119	3	4.8	3	52	1	0	3	5	0	1	1.8	25	0	
LOSDRES	61.7	13	13	5	38.4	8	6	0	0	1	0	1	0	1.9	19	0	0.00
FTRLRIV	35.0	15	31	6	40.0	12	0	0	0	1	0	8	0	2.1	19	0	0.00
LECLRES	34.0	54	107	20	37.0	41	9	13	0	0	10	11	0	2.0	38	37	0.97
GAPTRIV	61.0	182	430	85	46.7	216	29	1	0	3	28	32	4	2.4	136	113	0.83
TOTAL	378.0	422	811	153	36.3	323	118	24	0	15	51	63	7	2.2	291	166	0.57

a Rounded up to represent complete pairs.

✓ Subsampled reaches

○ Incomplete reporting

▲ Composite fledge ratio due to movement of birds within reaches prior to adult census.

after the Niobrara River receded, exposing vast areas of unconsolidated sands. One tern colony initiated 12 nests at River Mile 839.0 laying 27 eggs the first week of July. Twenty-six chicks fledged from this sandbar during August. Severe flooding on the lower end of GAPTRIV reach was compensated for by excellent nesting and chick survival on colony sites at the upper end of the reach. Although predator presence on natal areas did not appear to be significantly lower than in past years, predator impact was almost nonexistent. Low predator success and the subsequent high fledge counts can be assumed to be related to the vast size of the sandbars used for brood rearing. Continued decline of reservoir releases from Gavins Point Dam during the later portions of the nesting season, exposed large areas of sand adjacent to the nest site sandbars, and allowed wide-spread dispersal of pre-flight chicks. Basin-wide fledge ratios declined for the piping plover to 0.84 chicks per pair (Figure page 14), well below that needed to establish a stable population. Least tern fledge ratio, similar to total population numbers, increased in 1993 to 0.57 chicks per pair (Figure page 14), highest ratio on the Missouri River mainstem since the 0.64 recorded in 1988 and 1989.

OTHER ACTIVITIES AND MANAGEMENT ACTIONS

PREDATOR AVERSION

Predator exclosure cages were utilized on five of the nine reaches to increase survival of piping plover nests. Cages were assembled on site during the time allowed for productivity monitoring activities. Hands were washed with no scent soap prior to the handling of any cage components. Cages used on the LKSKRES, GARRRIV, and LONDRES were constructed of 2" X 4" welded wire mesh and held in place with four electric fence t-posts. Assembly and installation time was approximately five minutes. Cages used on LECLRES and GAPTRIV were constructed of 2" X 2" welded wire mesh and held in place by six 14" wire hook stakes, assembly and installation time was similar. No apparent avoidance of caged nests by piping plovers was detected. Results of cage use during 1993 are listed by reach below.

LKSKRES	1 cage		1 flooded	0.00% nest success
GARRRIV	15 cages	10 hatched		0.67% nest success
LONDRES	14 cages	6 hatched	8 flooded	0.43% nest success
LECLRES	14 cages	4 hatched	10 predate	0.26% nest success
GAPTRIV	38 cages	29 hatched	6 flooded	0.76% nest success

Three strobe light systems were experimentally erected in 1993 to test their ability to deter nocturnal ocular dependent predators. Results continue to warrant further experimentation with this technique. Two systems which remained operational for the duration of the nesting season, installed at River Miles 801.5 and 799.2, had a combined fledge ratio of 2.75 chicks per pair for plovers and 1.77 chicks per pair for least terns.

POSTING AND FENCING

Discretionary posting of nesting areas was again undertaken during 1993. Islands with more than four active nests and in jeopardy of human disturbance were signed prohibiting access and roped off with baling twine. Compliance with this posting has been excellent, and recreational influence on plover and tern production was nearly non-existent during the 1993 nesting season.

SPECIMEN COLLECTION FOR CONTAMINATE ANALYSIS

Sixty-two least tern eggs, 44 piping plover eggs, 2 adult terns, 8 tern chicks, and 1 plover chick were collected during field activities and forwarded to respective federal contaminate labs for analysis.

NEST RELOCATION

After verbal permit amendments, nine piping plover nests and two least tern nests were relocated on sandbars to protect them from rising water or sandbar degradation during the 1993 nesting season. Nests were relocated less than ten feet from the original nest location and nest site substrate and vegetation were made to appear similar. If multiple moves of a nest were expected, nests were relocated onto a 12" X 12" piece of 1/8" plywood buried in the sand. This allowed the nest and its immediate surroundings to be picked up multiple times without disturbing the actual nest bowl after the first move. Nests were typically only moved in the later stages of incubation. The nesting birds showed very little stress over the moved nest location and many returned to the eggs shortly after the area was vacated. Excellent success was obtained by relocating nests which only had a couple of days left before hatching. This method is recommended to save the occasional nest which may be lost just prior to hatching.

FUTURE PROJECTS

- ☛ Development of a GIS database for least tern and piping plover nesting areas along the mainstem Missouri River.
- ☛ Use of GPS system for nest elevation, island mapping, geomorphological studies, and nest relocation.
- ☛ Develop a single pole strobe light unit for rapid installation and better site coverage.
- ☛ Software development to provide a faster transfer of data to ensure proper water release regulation and standardization of data analysis procedures.
- ☛ Study least tern and piping plover nesting chronology and survival rates on unregulated tributary system to determine applicability of a "natural hydrograph" to the Missouri River.
- ☛ Continue adult census and productivity monitoring.

APPENDIX A

NEST RECORD

PIPING PLOVER AND LEAST TERN

A	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">1 2 3</td> <td style="width: 25%; text-align: center;">4 5 6</td> </tr> <tr> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> </tr> </table> <p style="text-align: center;">Nest Number</p>	1 2 3	4 5 6			<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">7 8 9</td> <td style="width: 25%; text-align: center;">10</td> </tr> <tr> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> </tr> </table> <p style="text-align: center;">Year</p>	7 8 9	10			<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">11 12 13</td> </tr> <tr> <td style="border: 1px solid black; width: 33px; height: 20px;"></td> </tr> </table> <p style="text-align: center;">Species</p>	11 12 13	
1 2 3	4 5 6												
7 8 9	10												
11 12 13													

B	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">14 15 16</td> <td style="width: 33%; text-align: center;">17</td> </tr> <tr> <td style="border: 1px solid black; width: 33px; height: 20px;"></td> <td style="border: 1px solid black; width: 33px; height: 20px;"></td> </tr> </table> <p style="text-align: center;">Site Reach</p>	14 15 16	17			<p style="text-align: center;">SITE DATA</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">18 19 20 21</td> <td style="width: 25%; text-align: center;">22</td> <td style="width: 25%; text-align: center;">23 24 25</td> <td style="width: 25%; text-align: center;">26 27</td> </tr> <tr> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> <td style="border: 1px solid black; width: 25px; height: 20px;"></td> </tr> </table> <p style="text-align: center;">River Mile Habitat Man. Act.</p>	18 19 20 21	22	23 24 25	26 27				
14 15 16	17													
18 19 20 21	22	23 24 25	26 27											

C	NEST DATA				EGGS				
	Visit	Date	Time	Observer	No.	#'ed	Inc.	Status	
	28 29	30 31 32	33 34 35 36	37 38 39	40	41	42 43	44 45	

D	NEST PATE	PREDATOR MANAGEMENT	
	46 47 48 49 50	51 52 53 54 55 56 57 58 59	
	Pate Cause Pred. Reason	Strobe Cage Other Date Installed	

F	NEST SUMMARY						G	NEST ELEVATION
	60 61 62 63	64 65 66 67	68 69	70 71 72			Date: ____/____/____	
							Time: _____:	
							Nest Elev: _____	
	Nest Initiation	Est. Hatch	Exp. Days	Max Eggs	Add.	Clutch Hatch Eggs	Warr Elev: _____	

H	OPTIONAL (for nest relocation)		
	_____	_____	_____
	Type of Object	Dominant Vegetation	Nearest Plant Sp.

COMMENTS: _____

Nest Site Map

NEST RECORD PROCEDURES

A. NEST IDENTIFICATION

- Box 1-3
Total Nests Found w/in Reach
- Box 4-6
Tern or Plover Nest Number
- Box 7-10
Year Nest Located
- Box 11-13
A.O.B. Species No.
277 Piping Plover
074 Least Tern

B. SITE DATA

- Box 14-16
Site Identification Number;
(14 corresponds with reach code)
- Box 17
River Reach Nest Located In
1 Fort Peck Reservoir
2 Missouri River below Ft. Peck
3 Lake Sakakawea
4 Missouri River below Garrison
5 Lake Oahe, North Dakota
6 Lake Oahe, South Dakota
7 Fort Randall Reach
8 Lewis and Clark Lake
9 Gavins Point Reach

- Box 18-22
River Mile of Nesting Site

- Box 23-25
Nest Site Habitat Characteristics
100 Sandbar
200 Beach
300 Peninsula/Point
400 Island Beach
500 Island Peninsula/Point
600 Other

- Box 26-27
Nest Site Habitat Manage. Activity
10 Herbicide
20 Hand-pulled
30 Bulldozed
40 Sand-fenced
50 Burned
60 Oyster Shell
70 Floating Island
80 Decoys
90 Other

C. NEST DATA

- Box 28-29
Number of Nest Visit
7 Final Nest Visit
- Box 30-36
Date and Time of Nest Visit
- Box 37-39
Observer Initials

- Box 40
Number of Eggs in Nest Bowl
- Box 41
Number of Eggs Numbered During Visit
- Box 42-43
Incubation Stage of Clutch
(See Diagram Below)

- Box 44
Adult Status
1 Present
2 Absent

- Box 45
Nest Status
1 Normal
2 Appears Abandoned
3 Hatched
4 Destroyed
5 Unknown

D. NEST FATE

- Box 46
Nest Fate
1 Hatched
2 Destroyed
3 Abandoned
4 Unknown

- Box 47-48
Cause of Nest Fate
Hatched
11 Chicks in Bowl
12 Chicks Observed on Site
13 Hatched Eggs
14 Piping Fragments in Nest
15 Chick Droppings in Nest
Destroyed Flooded
21 Eggs Present, Washed Out
22 Nest Filled, No Eggs
23 Flood Debris Near Nest,
No Eggs Present
Destroyed Weather
31 Eggs Suspended in Sand
w/in Nest Bowl
32 Eggs Smashed in Nest
Destroyed Predator
41 Tracks w/in 2 m of Nest
42 Destr. Egg Shell Near Nest
43 Egg Yolk in Nest Bowl
44 Predator Observed
50 Destroyed Sandbar Erosion
60 Destroyed Human Disturbance
70 Destroyed Unknown

- Box 49
Impact Predator
1 Mink
2 Raccoon
3 Coyote
4 Red Fox
5 Domestic Dog
6 Striped Skunk
7 Ring-billed Gull

- 8 American Crow
9 Other

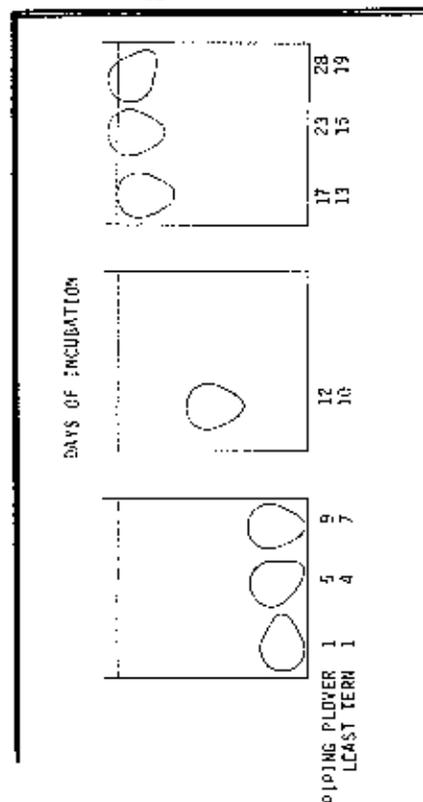
- Box 49
Factor of Identification
1 Predator Observed
2 Tracks w/in 2 m of Nest
3 Destroyed Egg Characteristics

E. PREDATOR MANAGEMENT

- Box 51-53
Management Techniques
1 Yes
2 No
- Box 54-56
Date Strobe System Installed
- Box 57-59
Date Enclosure Cage Installed

F. NEST SUMMARY

- Box 60-63
Date of Nest Initiation
- Box 64-67
Estimated Hatching Date
- Box 68-69
Nest Exposure Days
- Box 70
Maximum Clutch Size
- Box 71
Number of Eggs Hatched
- Box 72
Added Eggs Left in Nest



CENSUS RECORD

<div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div> Site	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div> Reach	<div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div> River Mile	<div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div>	Date (MM-DD-YY)	
<div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div>		<div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div>	<div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div>		<div style="border: 1px solid black; width: 40px; height: 20px; margin: 0 auto;"></div>			<div style="border: 1px solid black; width: 30px; height: 20px; margin: 0 auto;"></div>
		Time			Observers			

PIPING PLOVERS

LEAST TERNS

Total Adults Observed _____

Total Adults Observed _____

Total Active Nests _____

Total Active Nests _____

Total Adults w/Young _____

Total Adults w/Young _____

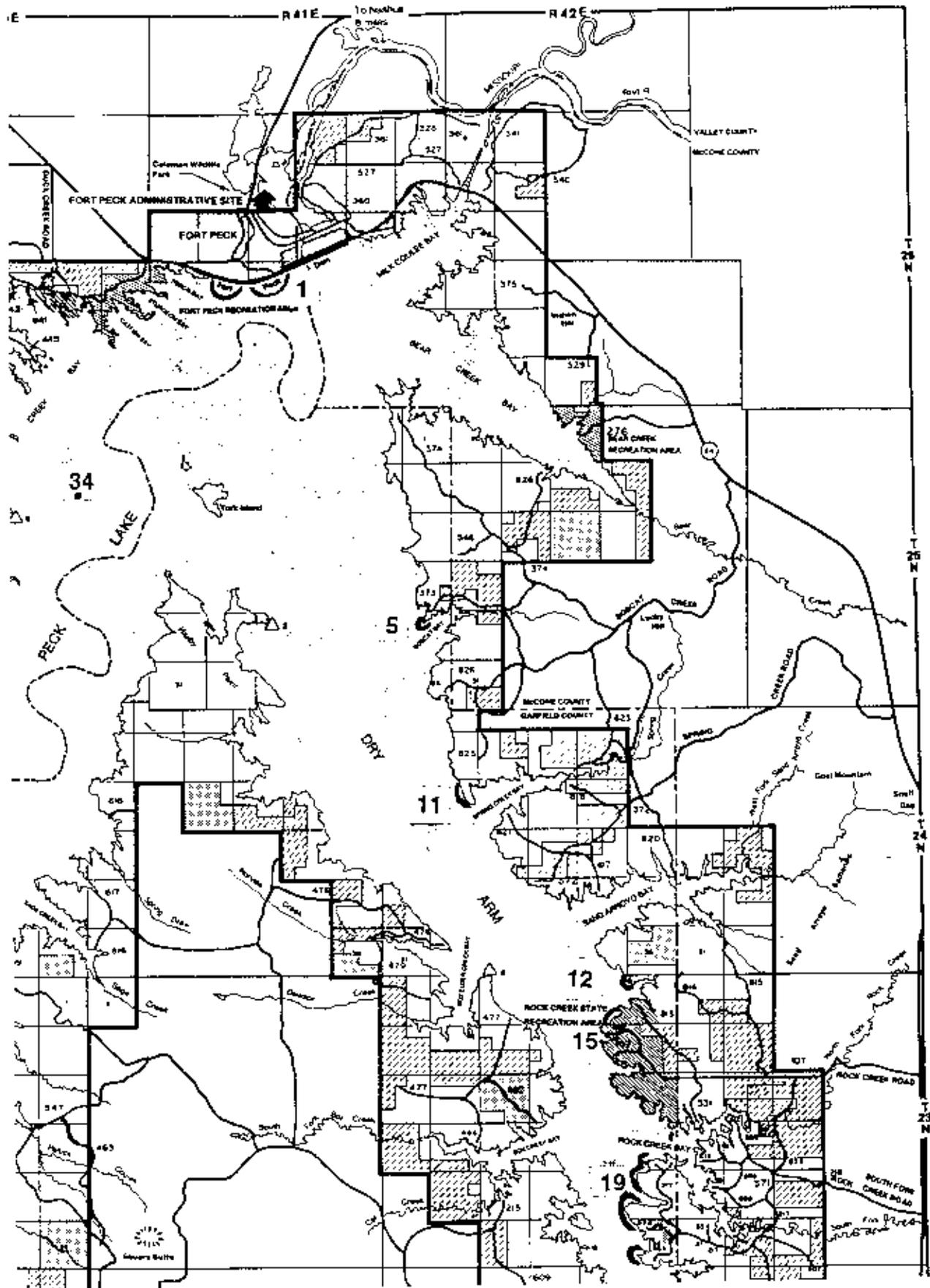
 Comments: _____

CODES FOR REACH:

- 1 Fort Peck Reservoir
- 2 Missouri River below Fort Peck
- 3 Lake Sakakawea
- 4 Missouri River below Garrison
- 5 Lake Oshe North Dakota
- 6 Lake Oshe South Dakota
- 7 Fort Randall Reach
- 8 Lewis and Clark Lake
- 9 Gavins Point Reach

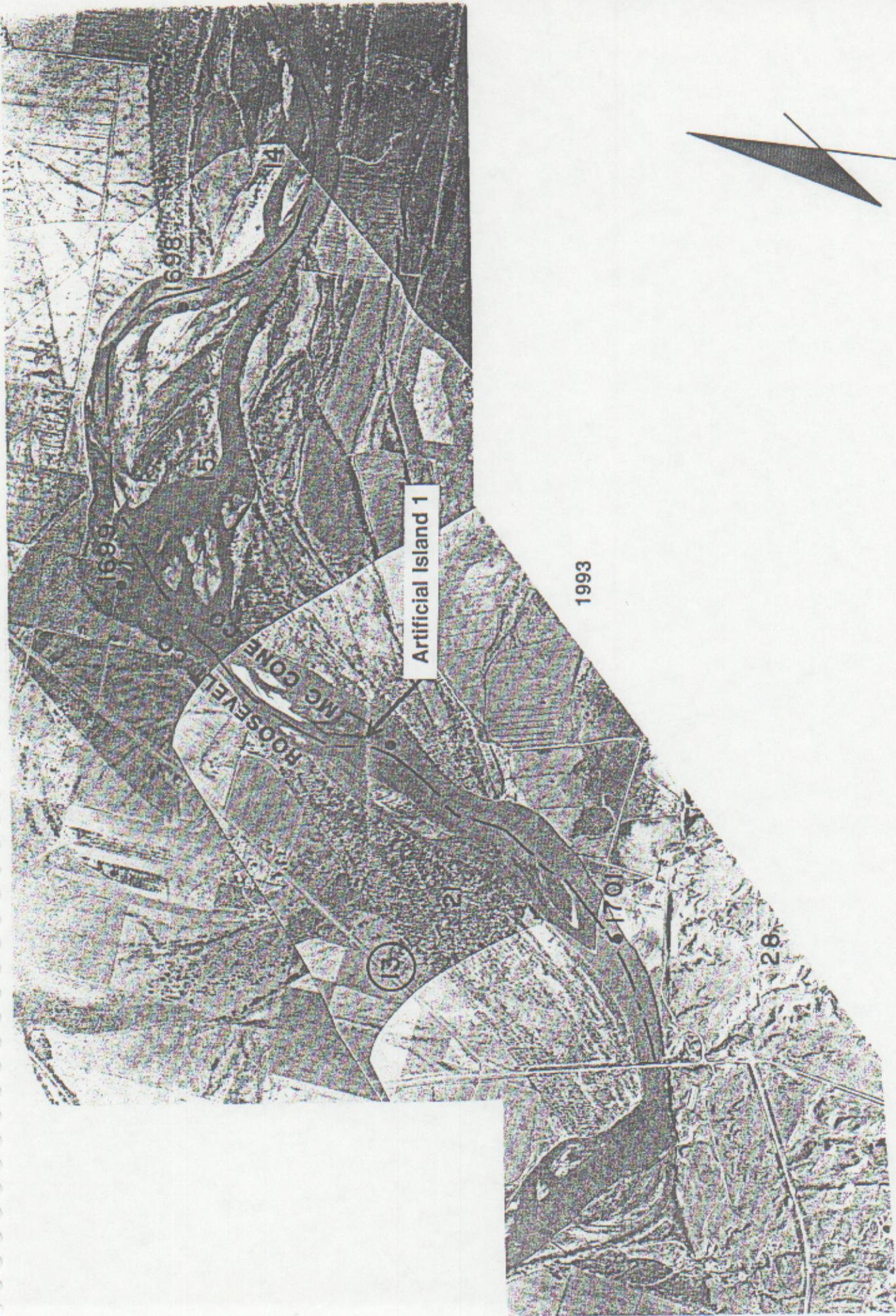
APPENDIX B

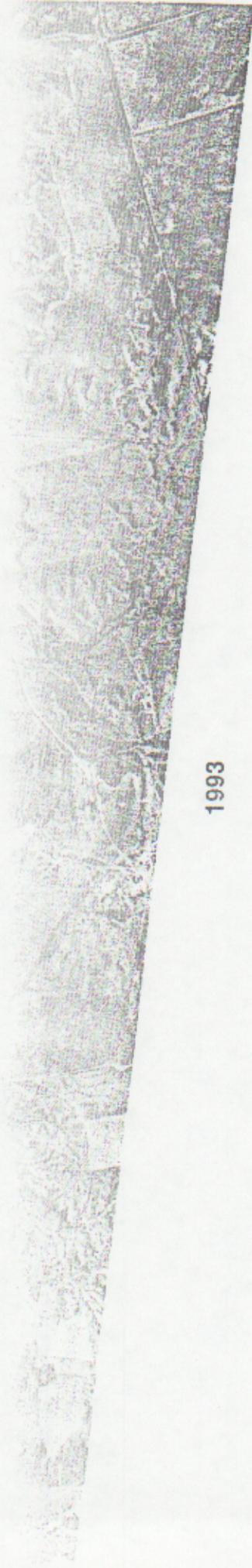
FORT PECK RESERVOIR 1993 NESTING SITES



Legal descriptions of Fort Peck Reservoir beach locations

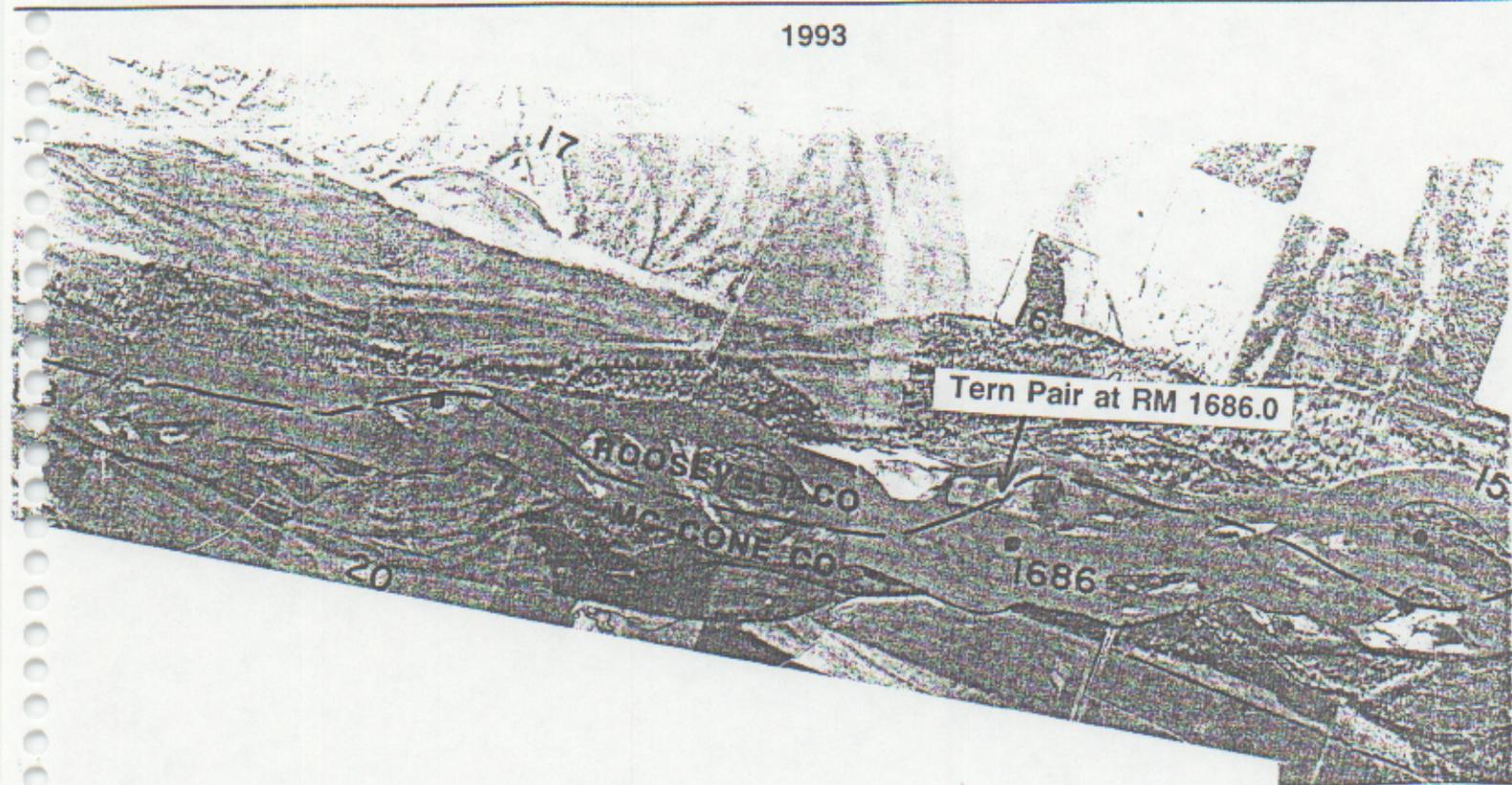
Beach No.	Beach Location	
1	T26N, R41E, Sec. 19 Sec. 21	NE1/4 NE1/4 to NE1/4 SW1/4
5	T25N, R41E, Sec. 24 Sec. 25	SW1/4 SW1/4 NW1/4 NE1/4
11	T24N, R42E, Sec. 17 Sec. 17	NW1/4 NE1/4 to NE1/4 NE1/4
12	T24N, R42E, Sec. 35 T23N, R42E, Sec. 1	SE1/4 SE1/4 to NW1/4 NW1/4
15	T23N, R42E, Sec. 2 Sec. 11	NE1/4 SE1/4 to NW1/4 NE1/4
19	T23N, R42E, Sec. 24 Sec. 36	NW1/4 SE1/4 to SE1/4 SE1/4
34	T25N, R40E, Sec. 10	NE1/4 SE1/4



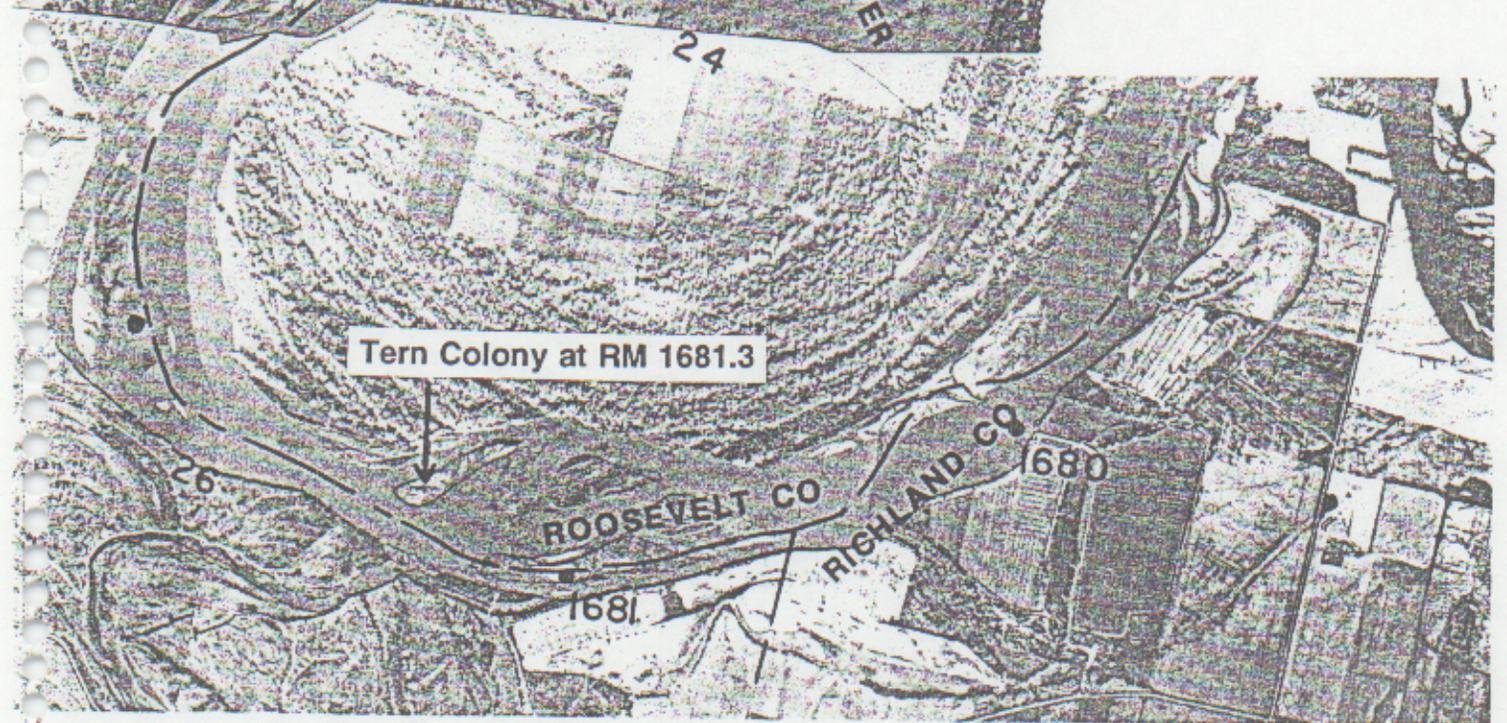
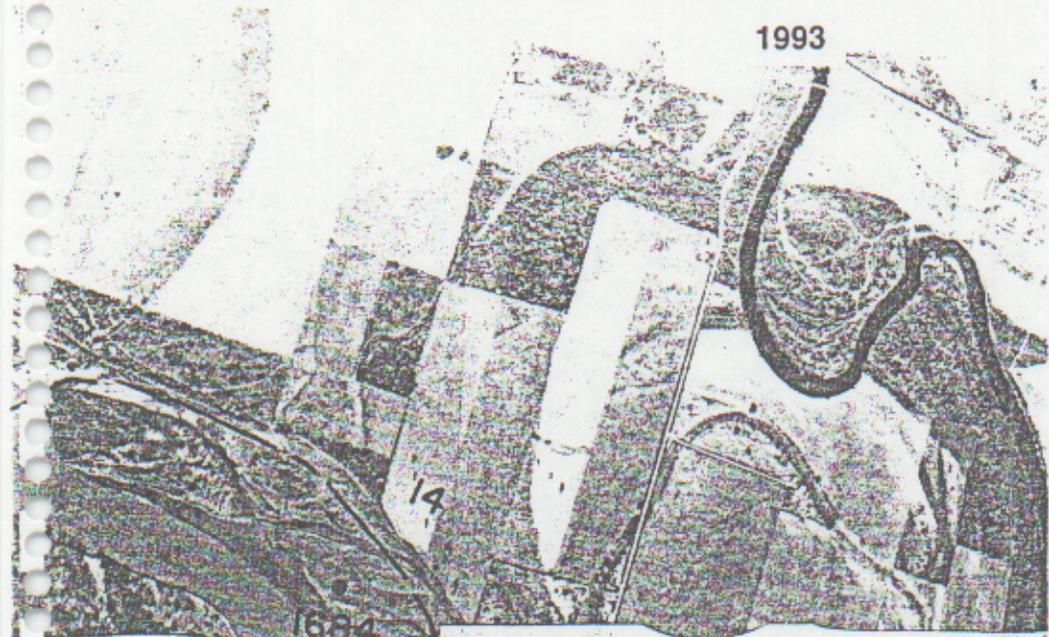


1993

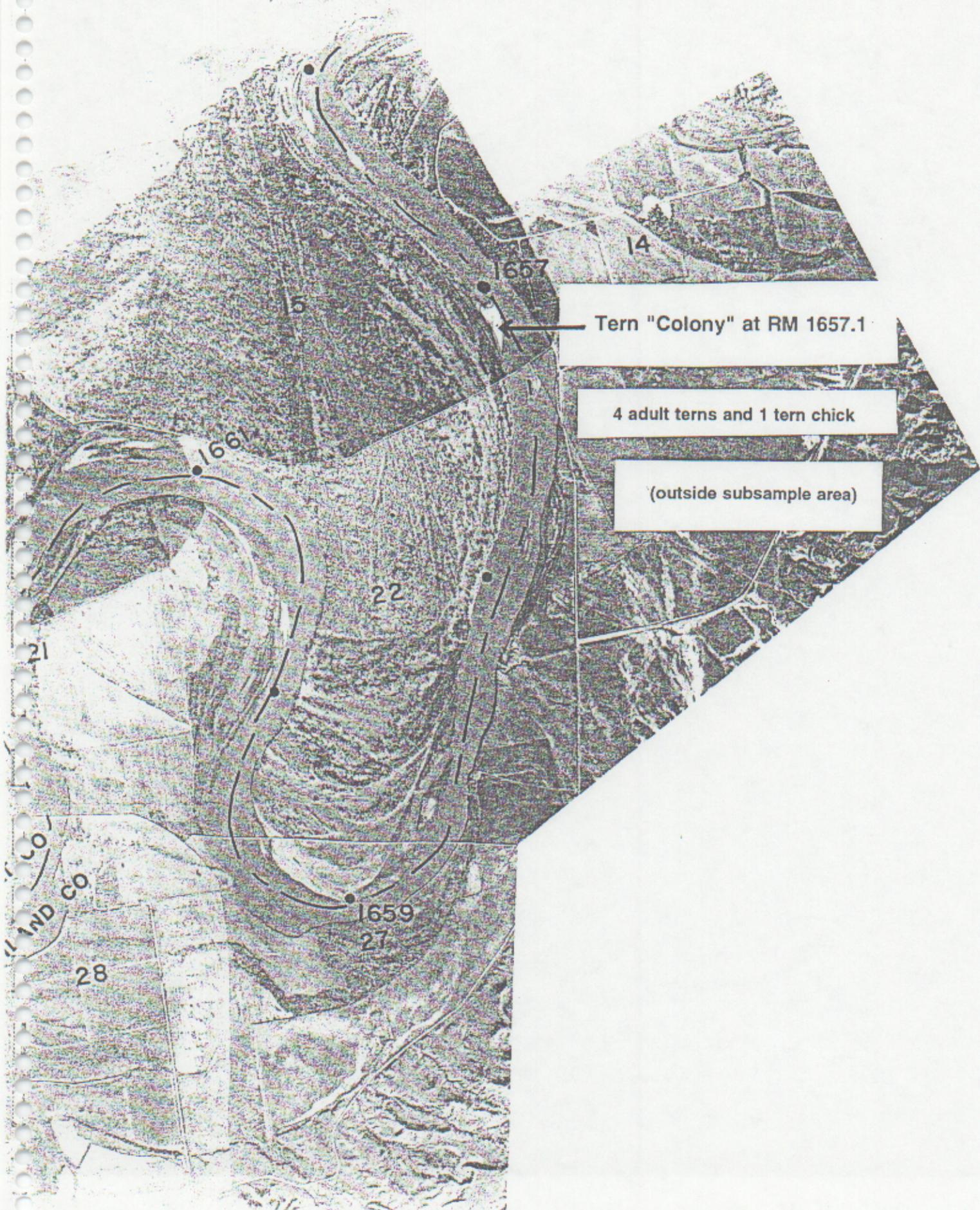
1993



1993



1993



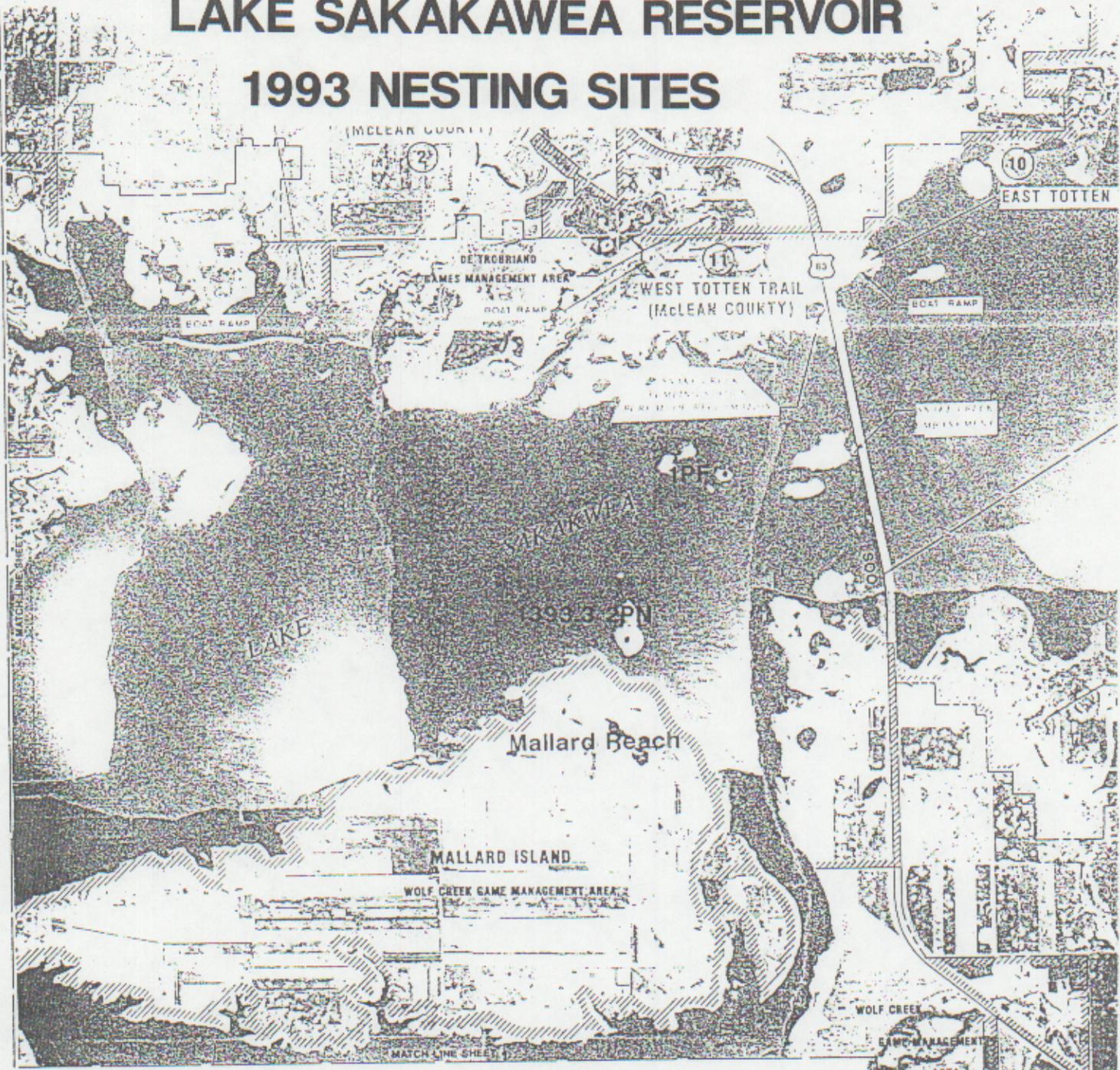
Tern "Colony" at RM 1657.1

4 adult terns and 1 tern chick

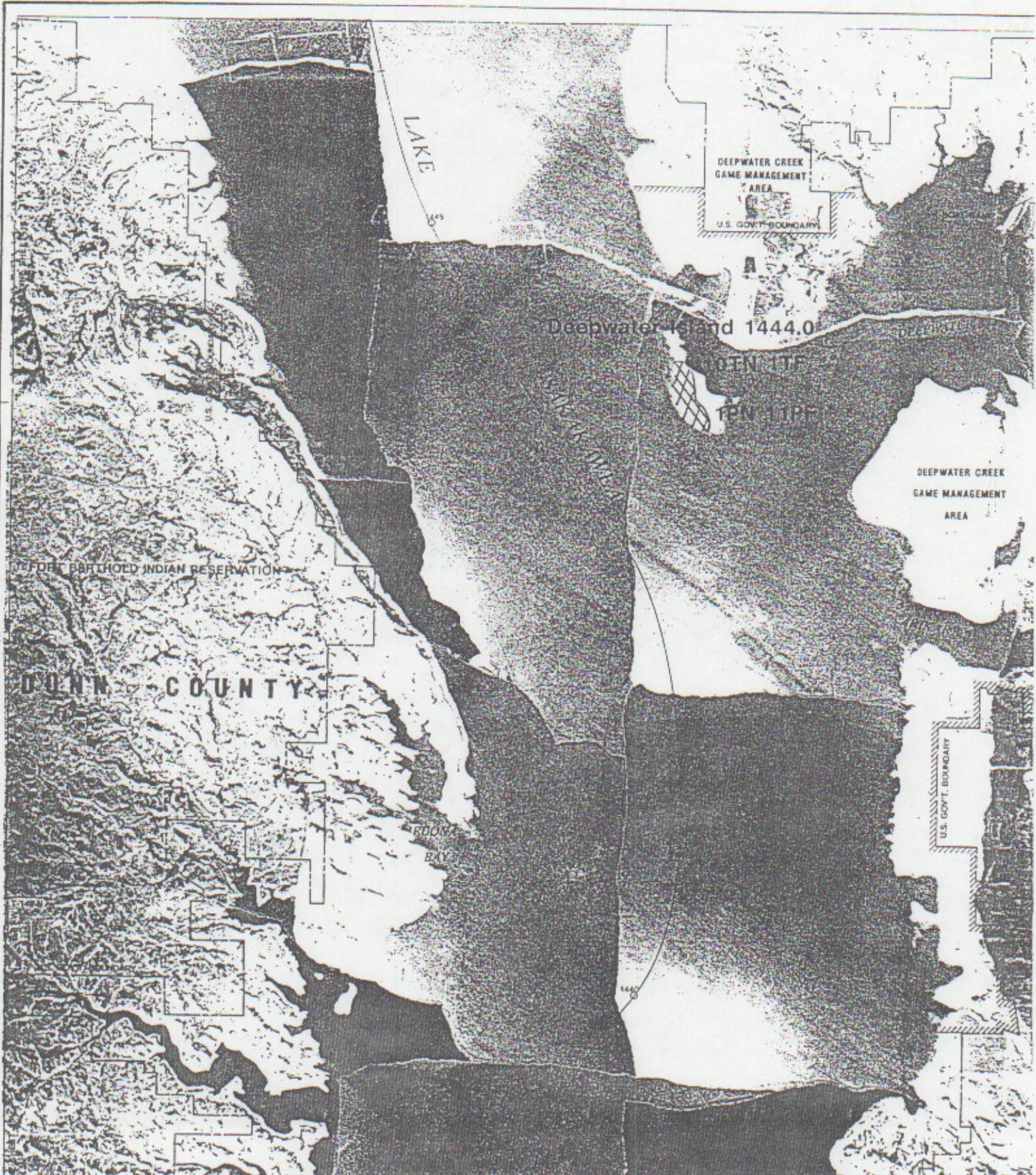
(outside subsample area)

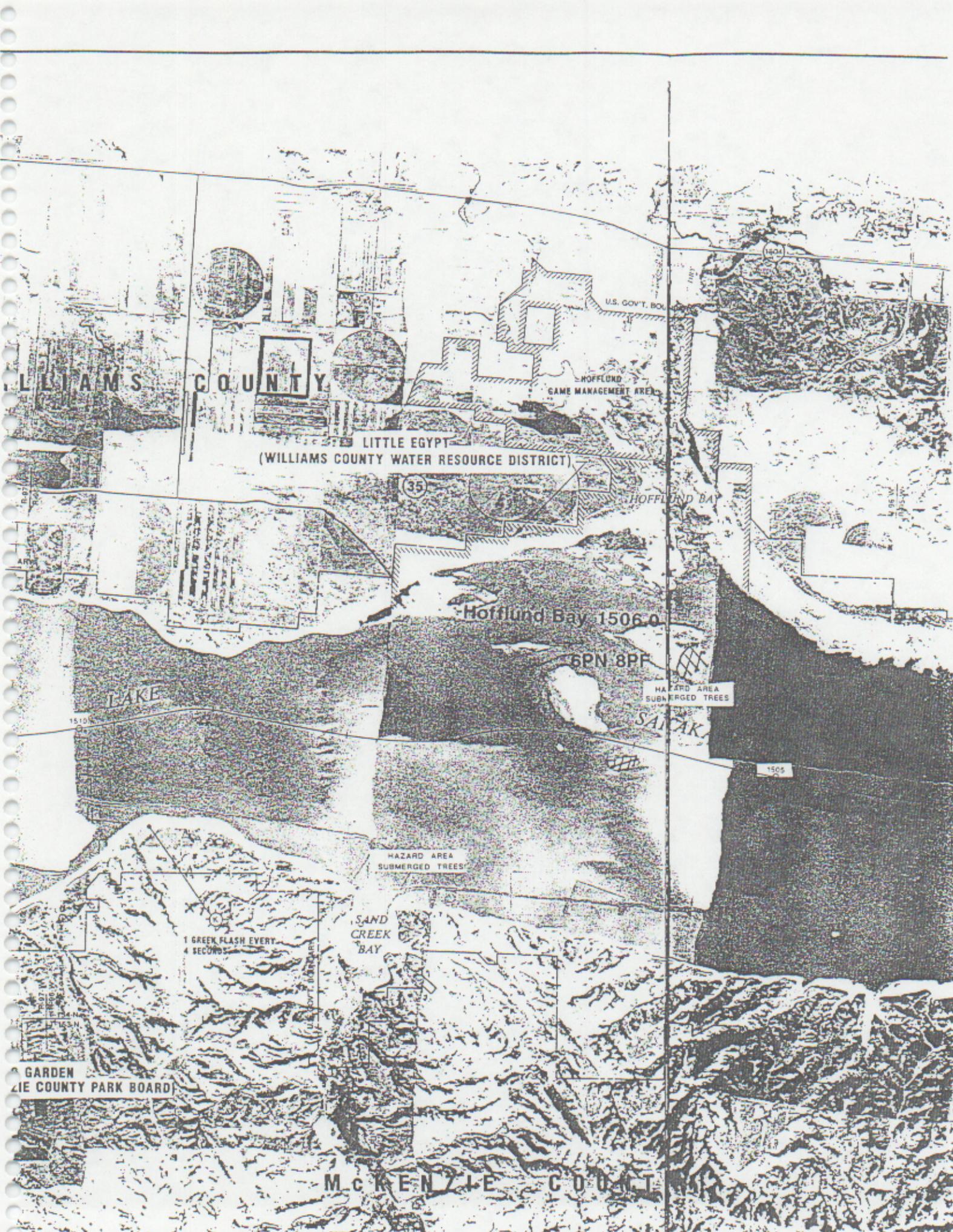
LAKE SAKAKAWEA RESERVOIR

1993 NESTING SITES



- PN = Plover Nests
- PF = Plovers Fledged
- TN = Tern Nests
- TF = Tern Fledged





WILLIAMS COUNTY

LITTLE EGYPT
(WILLIAMS COUNTY WATER RESOURCE DISTRICT)

35

Hofflund Bay 1506.0

6PN 8PF

HAZARD AREA
SUBMERGED TREES

SANCAK

1505

HAZARD AREA
SUBMERGED TREES

SAND
CREEK
BAY

1 GREEN FLASH EVERY
4 SECONDS

GARDEN
OF EATING COUNTY PARK BOARD

McKENZIE COUNTY

GARRISON RIVER 1993 NESTING SITES





37
7
P

ALDERIN

1369
3PN-1
1369 O
McLEAN CO.
MERCER CO.

BURLINGTON

19

R 82 W
R 83 W

R 82 W
R 83 W

13552

18

1359

19

17

1355

20

1357

16

21

28

SOUTHERN
CREEK

9

8

7





SHBURN

13

23

24

26

1354.0 2PN

1353.8 4PN 5TN

1353.5 1PN

19

25

1353

83

1352.7 1 PN

TURTLE CREEK

36

R 81 W
R 82 W

1352.0 6PF

29

31

MCLEAN CO.
OLIVER CO.

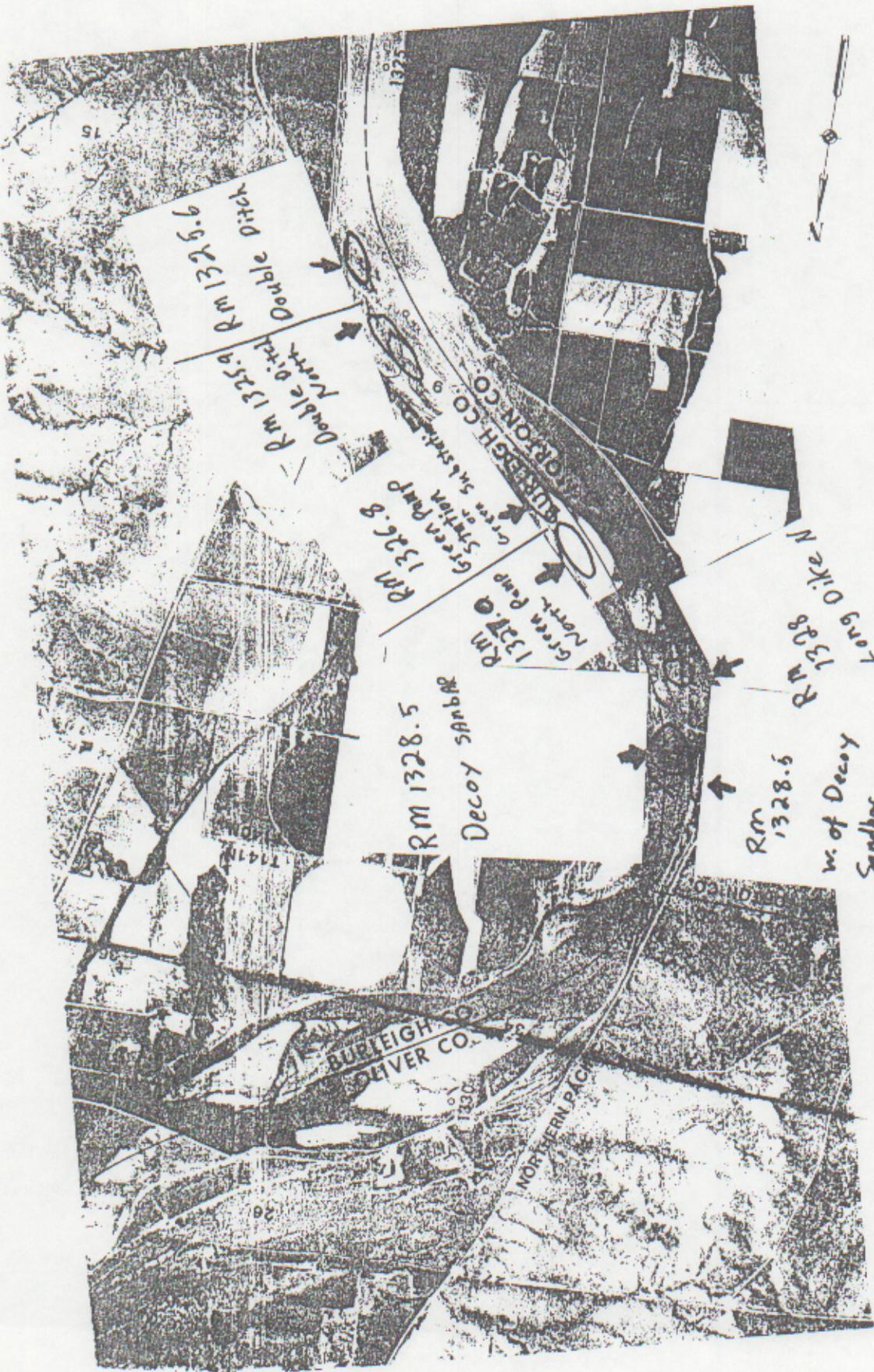
1352

1351 1351

1351 1PN 1TN

32

1351



HO-

15

1325

1320

BURKEIGH CO. RIVER CO.

NORTHERN P.C.

RM 1328.8
Long Dike N

RM 1328.6
w. of Decoy
Sandbar

RM 1328.5
Decoy
stubs

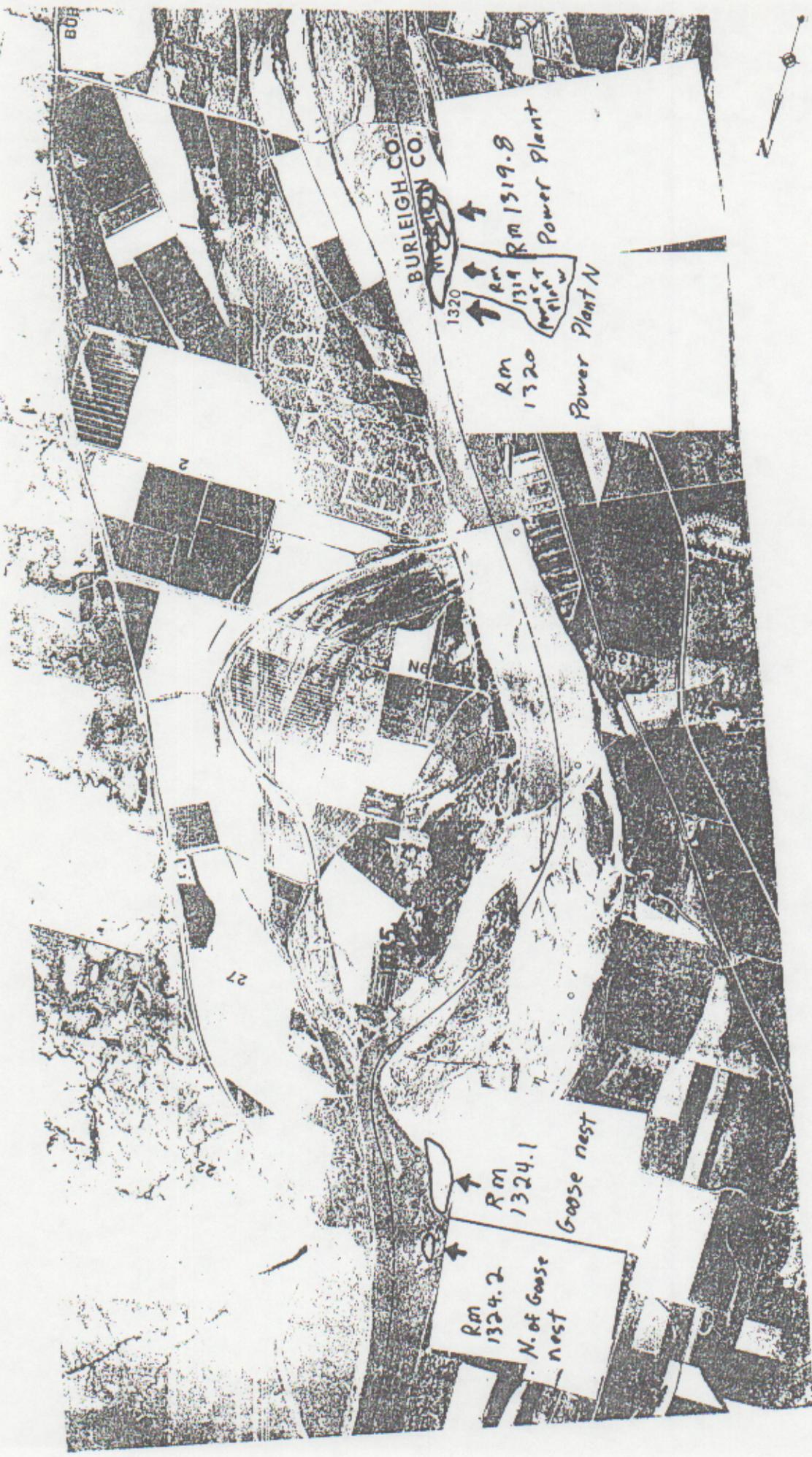
RM 1328.8
Green Pump
North

RM 1328.8
Green Pump
Green Station
Green Substation

RM 1325.9
Double Outlet

RM 1328.6
Double Ditch





BURLEIGH CO.
MONTGOMERY CO.

1320
↑
↑
↑

Rm
1320
Power Plant N

Rm 1319
Rm 1319.8
Power Plant

NE

139

27

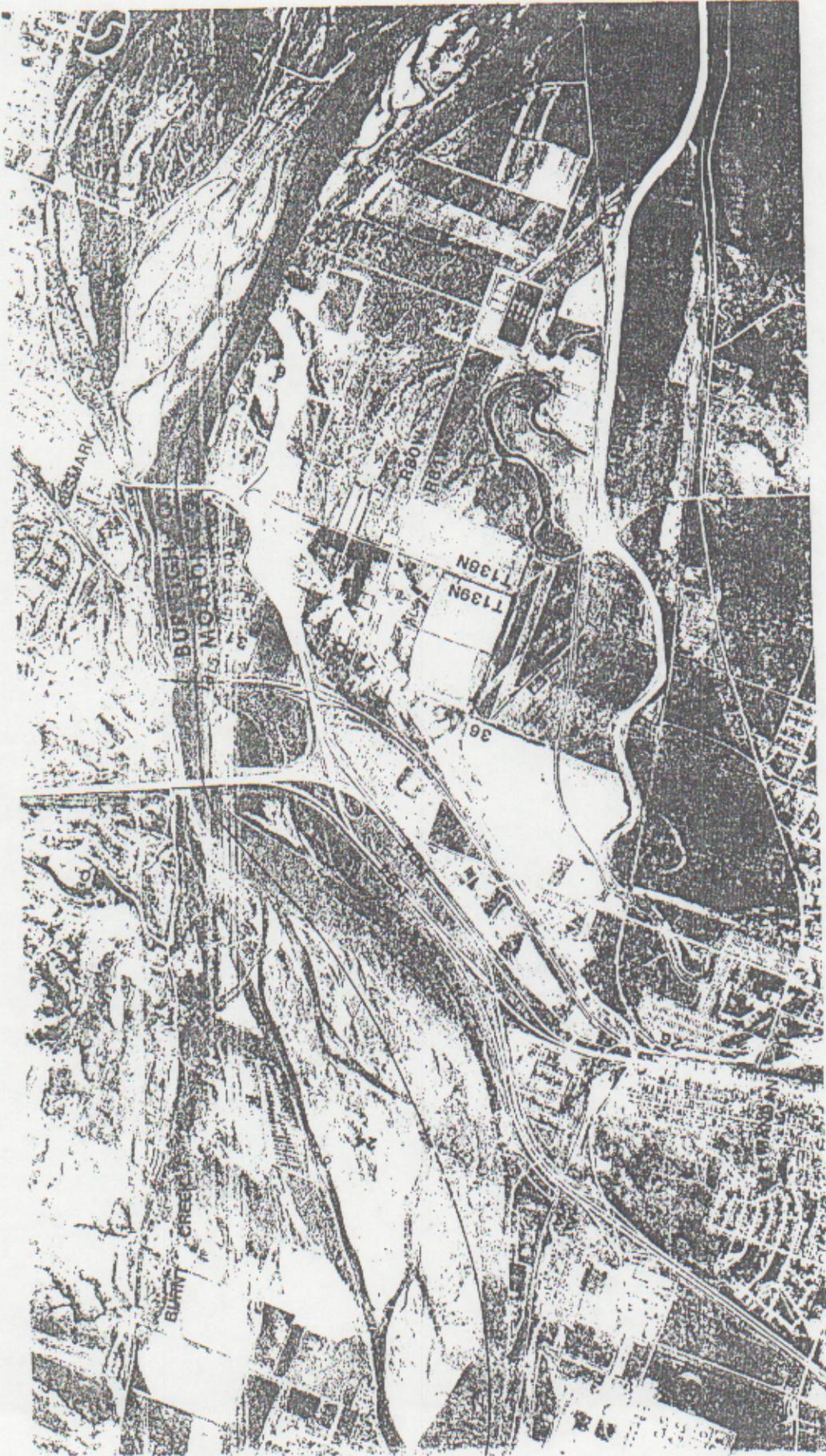
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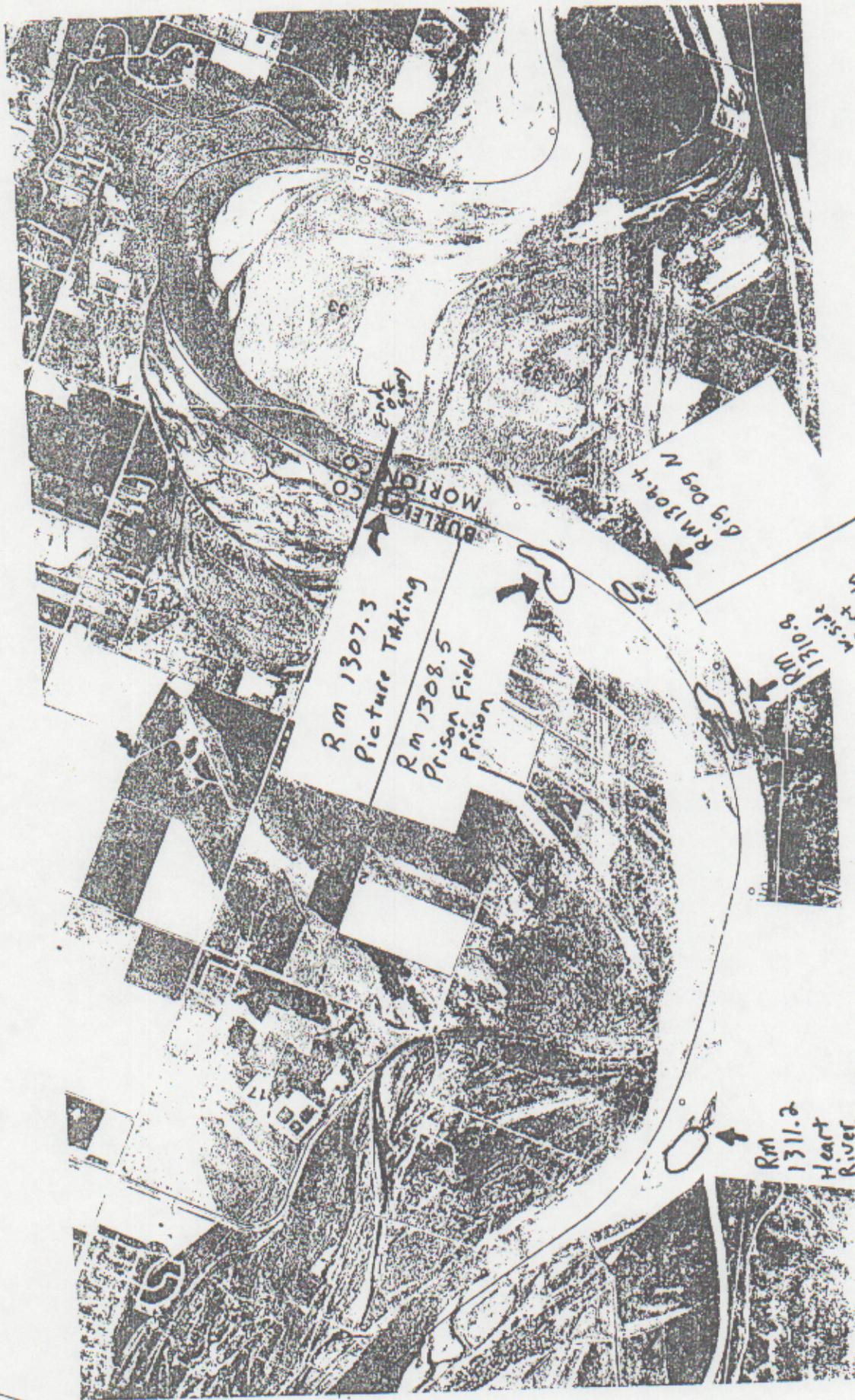
Rm
1324.2
N. of Goose
nest

Rm
1324.1
Goose nest



D. 11





RM 1307.3
Picture Taking

RM 1308.5
Prison Field
Prison

RM
1311.2
Heart
River
Confluence

RM
1310.8
Left
side
Lincoln

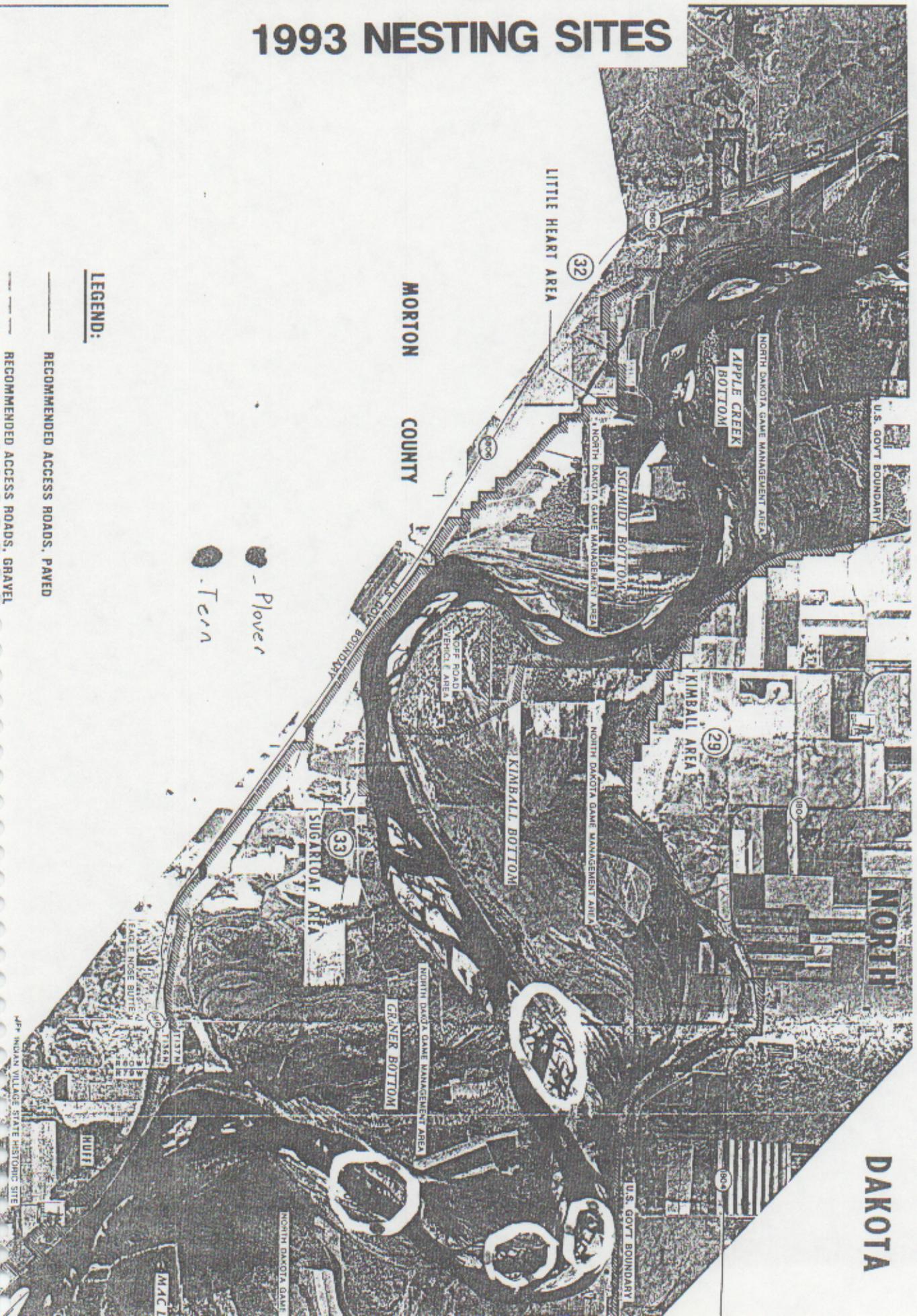
RM 1309.4
N Big Dog N

MORTON CO
BURLEIGH CO

1" = 2000 FEET

LAKE OAHE NORTH DAKOTA

1993 NESTING SITES



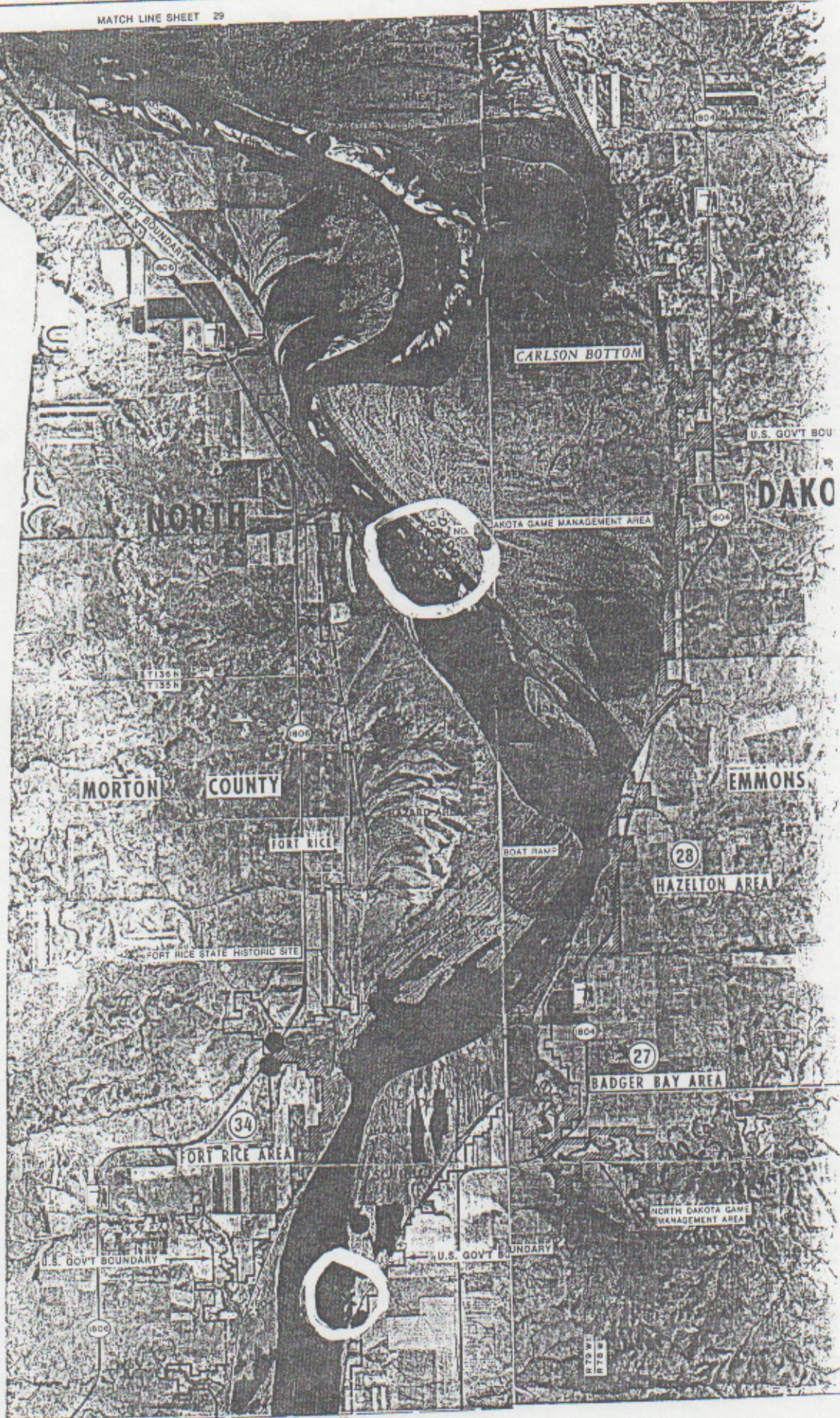
LEGEND:

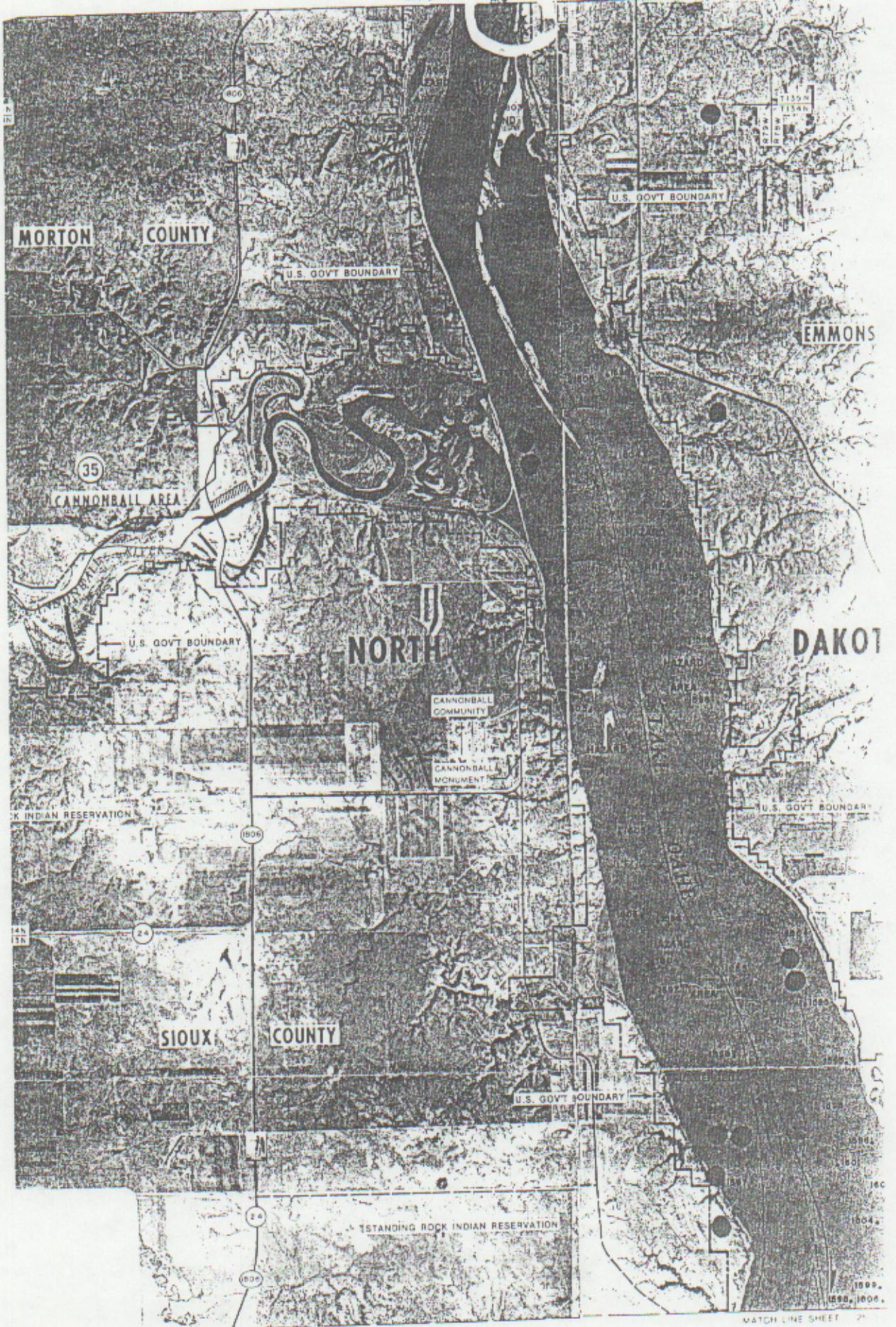
— RECOMMENDED ACCESS ROADS, PAVED

— RECOMMENDED ACCESS ROADS, GRAVEL

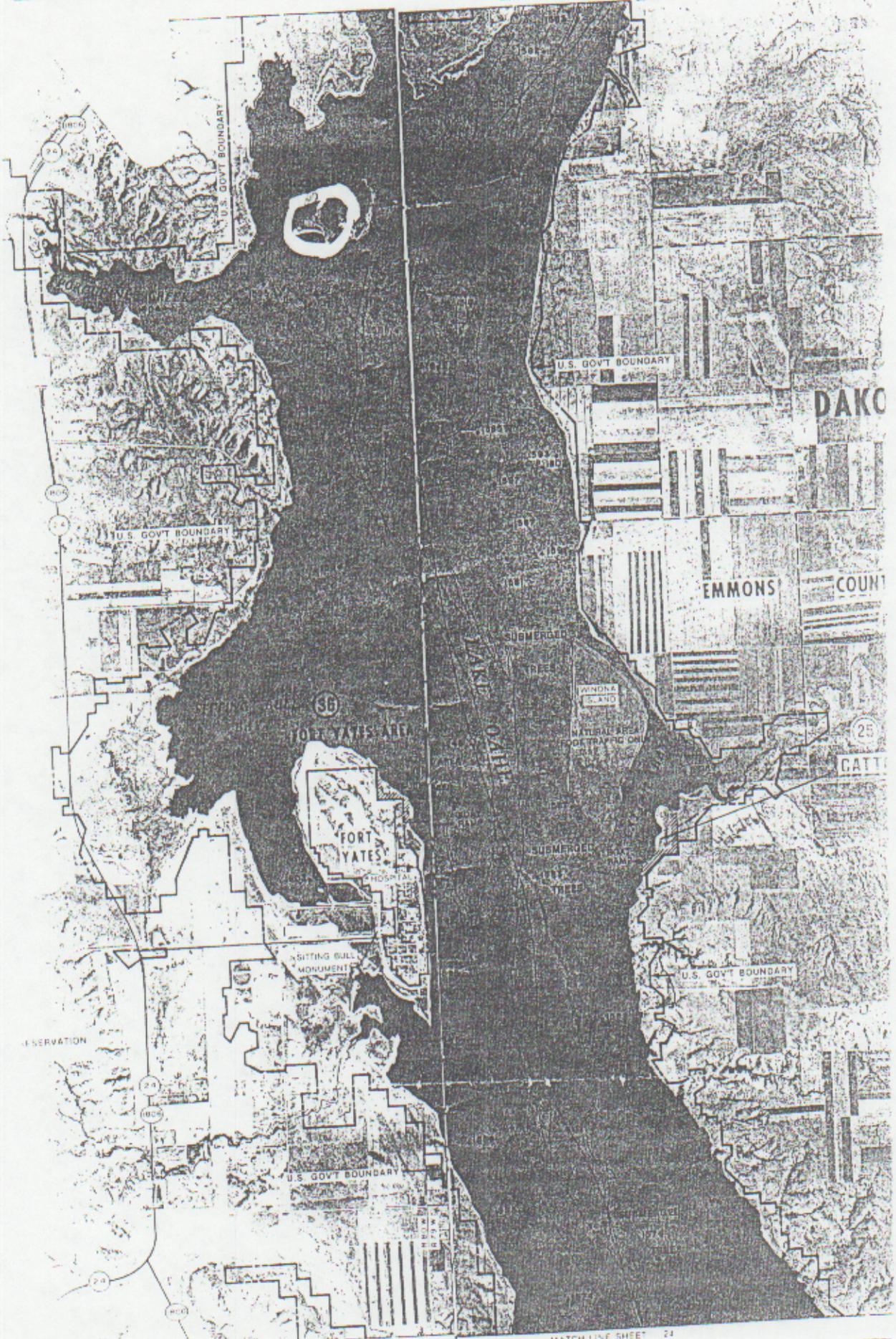
● Plover
● Tern

4P* ANGLON VILLAGE STATE HISTORIC SITE



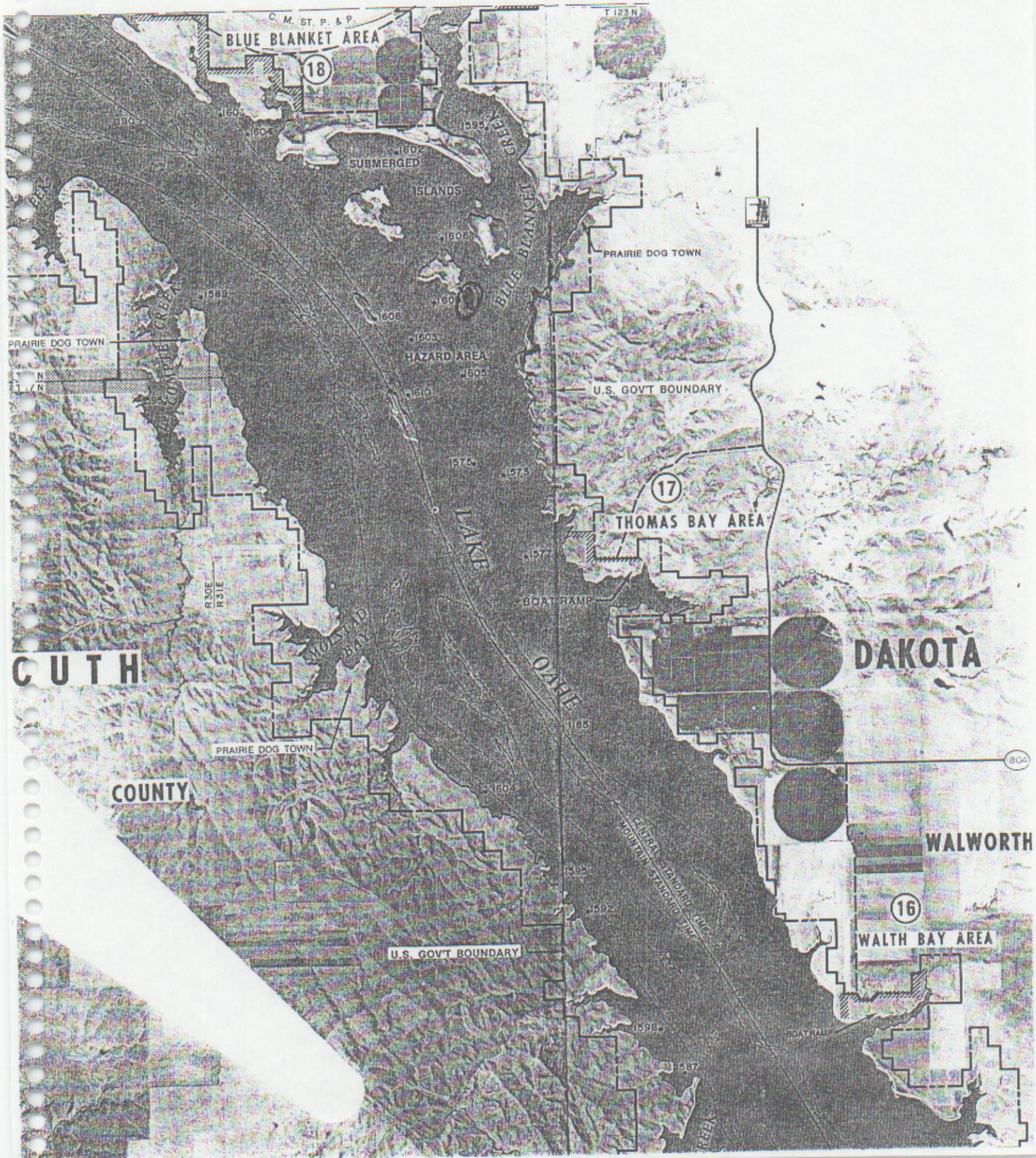






LAKE OAHE RESERVOIR SOUTH DAKOTA

1993 NESTING SITES



SOUTH DAKOTA

CHEYENNE RIVER INDIAN RESERVATION

ROCKY MOUNTAINS

DEWEY COUNTY

U.S. GOV'T BOUNDARY

FISH CREEK

LITTLE CREEK

PIKON

LAKE CHEYENNE

U.S. GOV'T BOUNDARY

41

MINNECONJOU AREA

BOAT RAMP

SOUTH

STANLEY

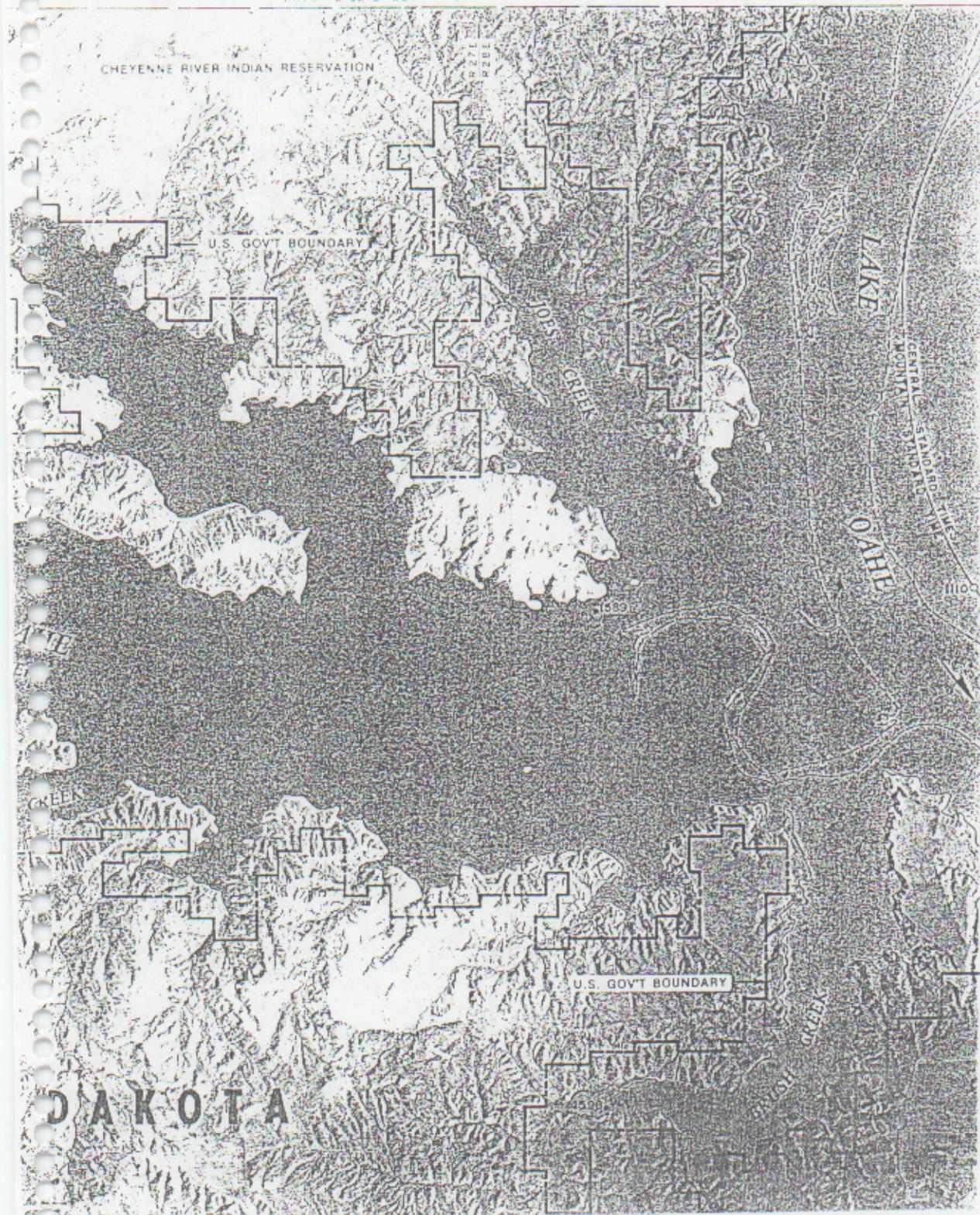


LEGEND:

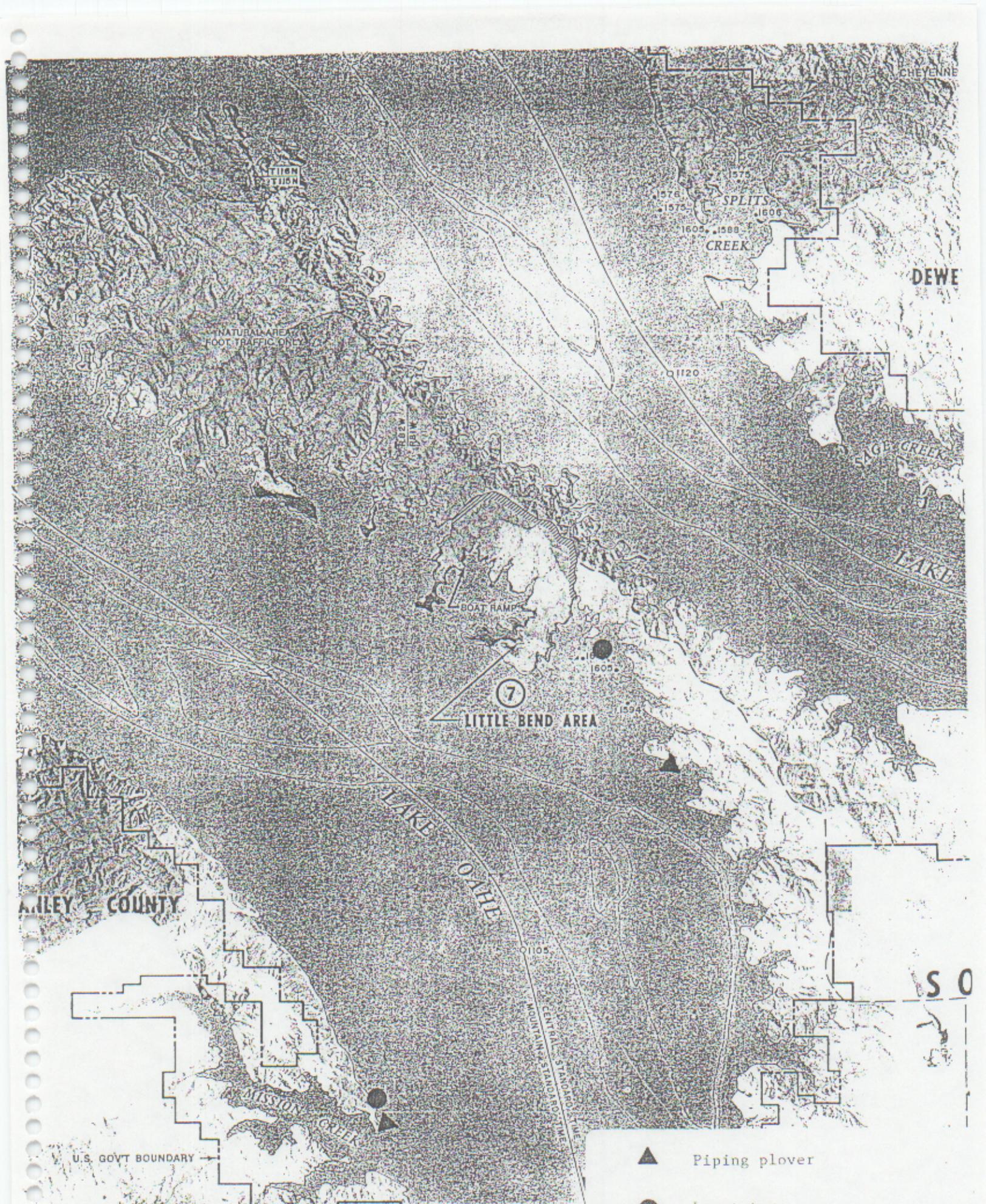
▲ Piping plover

● Least tern

MATCH LINE SHEET 13



MATCH LINE SHEET 10



CHEYENNE

STICH
STICH

SPLITS
1575
1576
1575
1605
1588
1606

CREEK

DEWEY

NATURAL AREA
FOOT TRAFFIC ONLY

1120

EDGE CREEK

LAKE

BOAT RAMP

7

LITTLE BEND AREA

1605

1594

WYOMING COUNTY

LAKE OAHPE

S O

U.S. GOV'T BOUNDARY

MOUNTAIN STANDARD TIME
CENTRAL STANDARD TIME

▲ Piping plover

● Least tern

MATCH LINE SHI

LEGEND:

- RECOMMENDED ACCESS ROAD
- - - - RECOMMENDED ACCESS ROAD

BOUNDARY

SULLY COUNTY

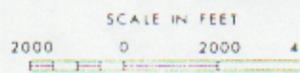
DAKOTA

U.S. GOV'T BOUNDARY

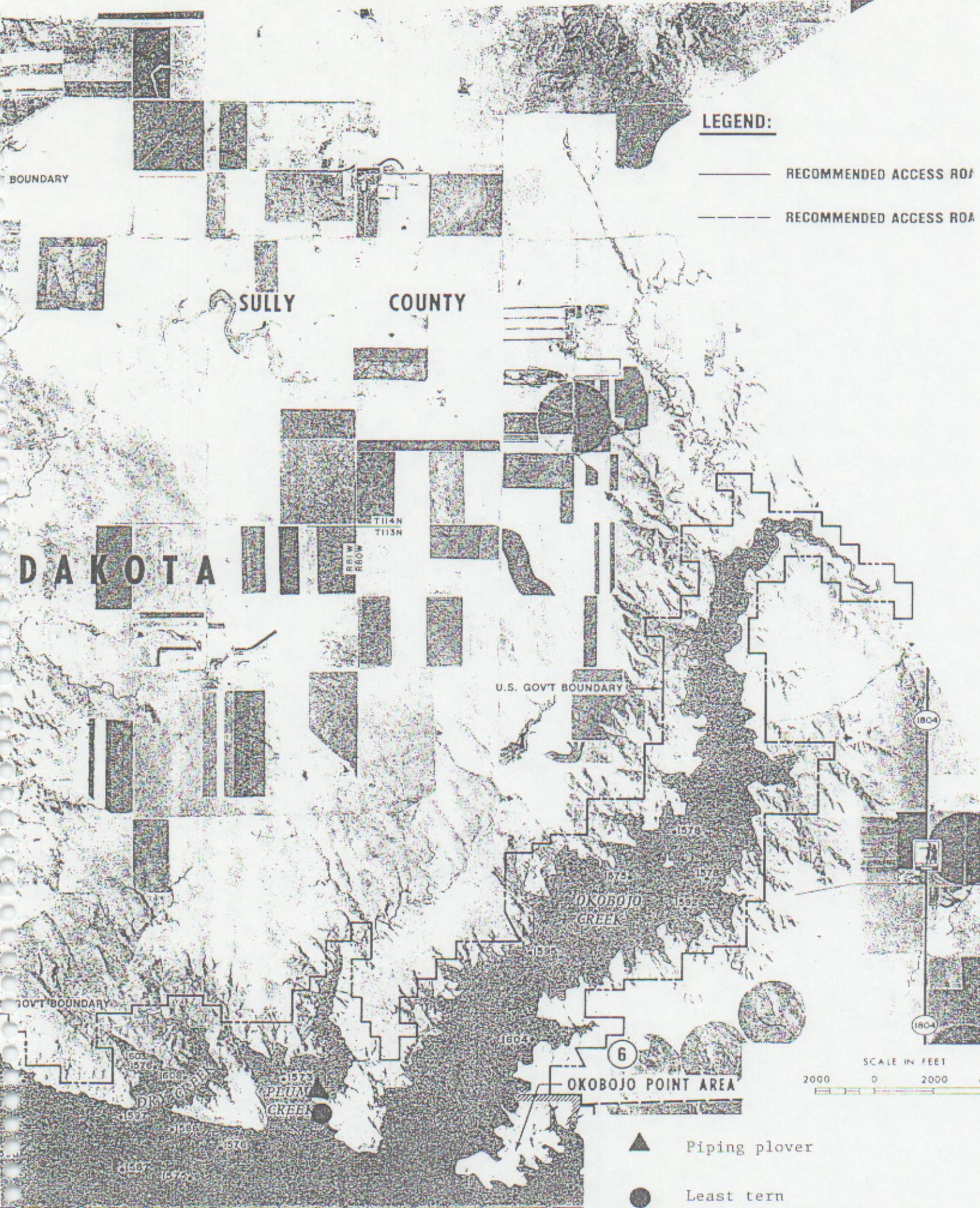
GOV'T BOUNDARY

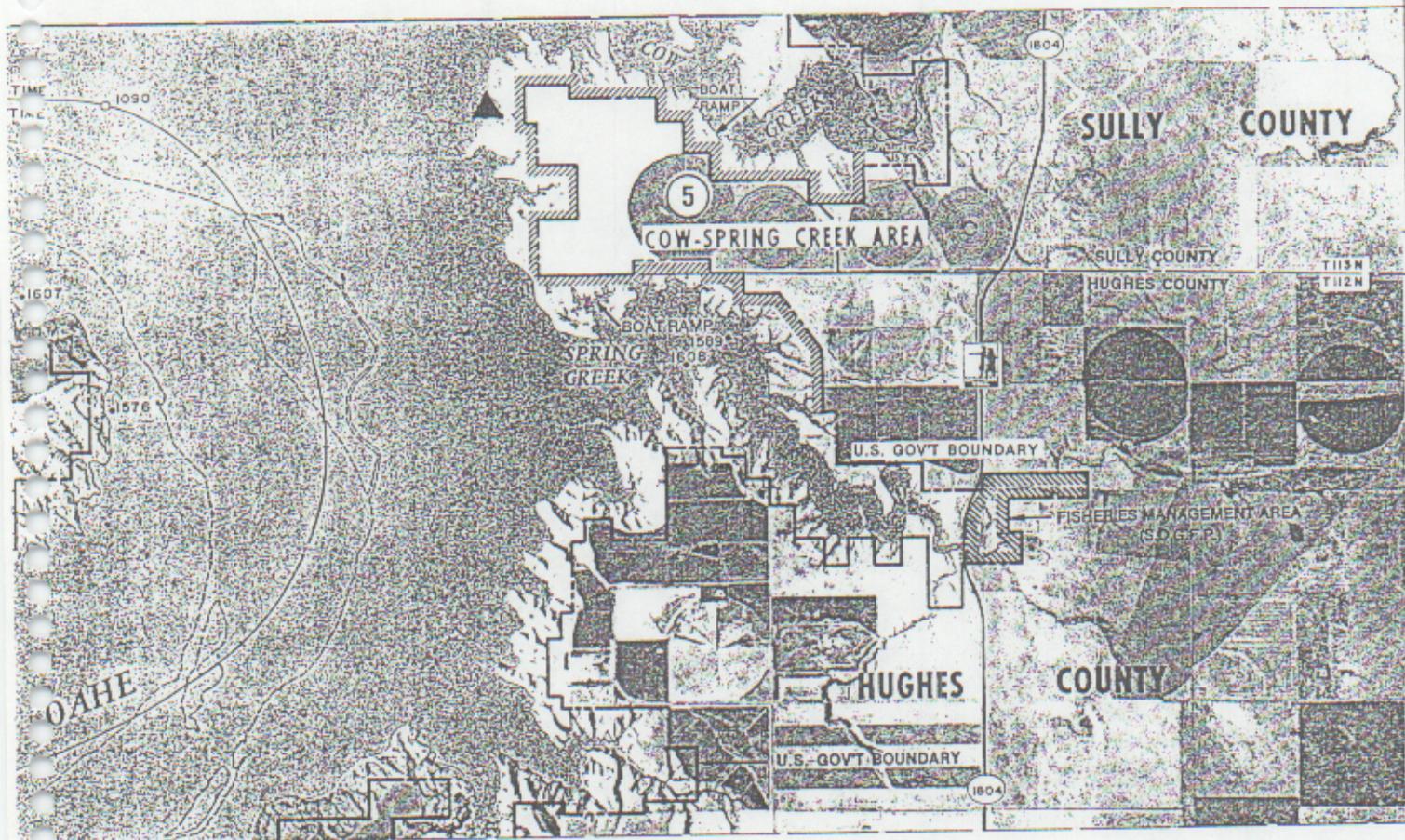
OKOBOJO POINT AREA

- ▲ Piping plover
- Least tern



6





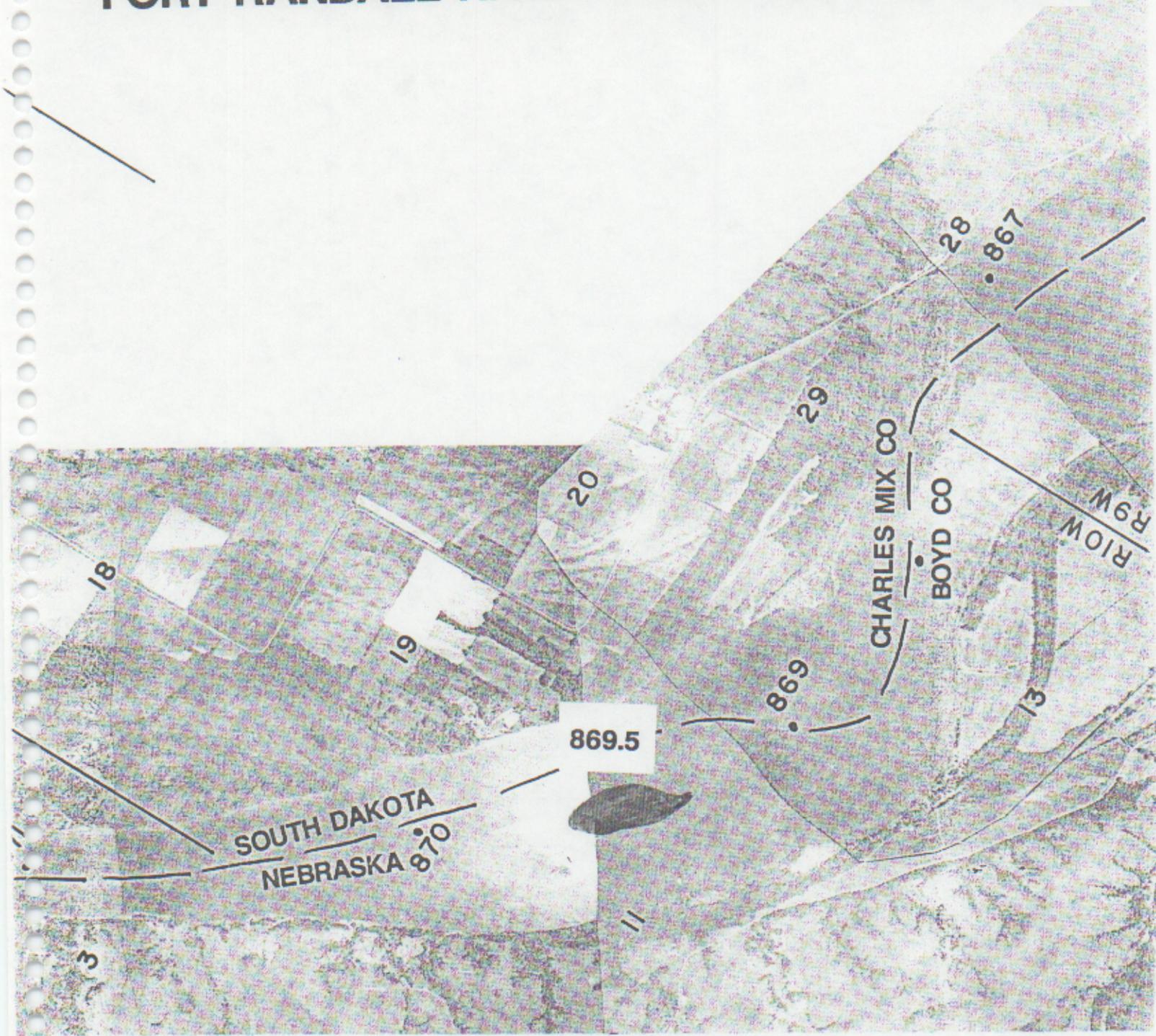
MATCH LINE SHEET 7

LEGEND:

- ▲ Piping plover
- Least tern



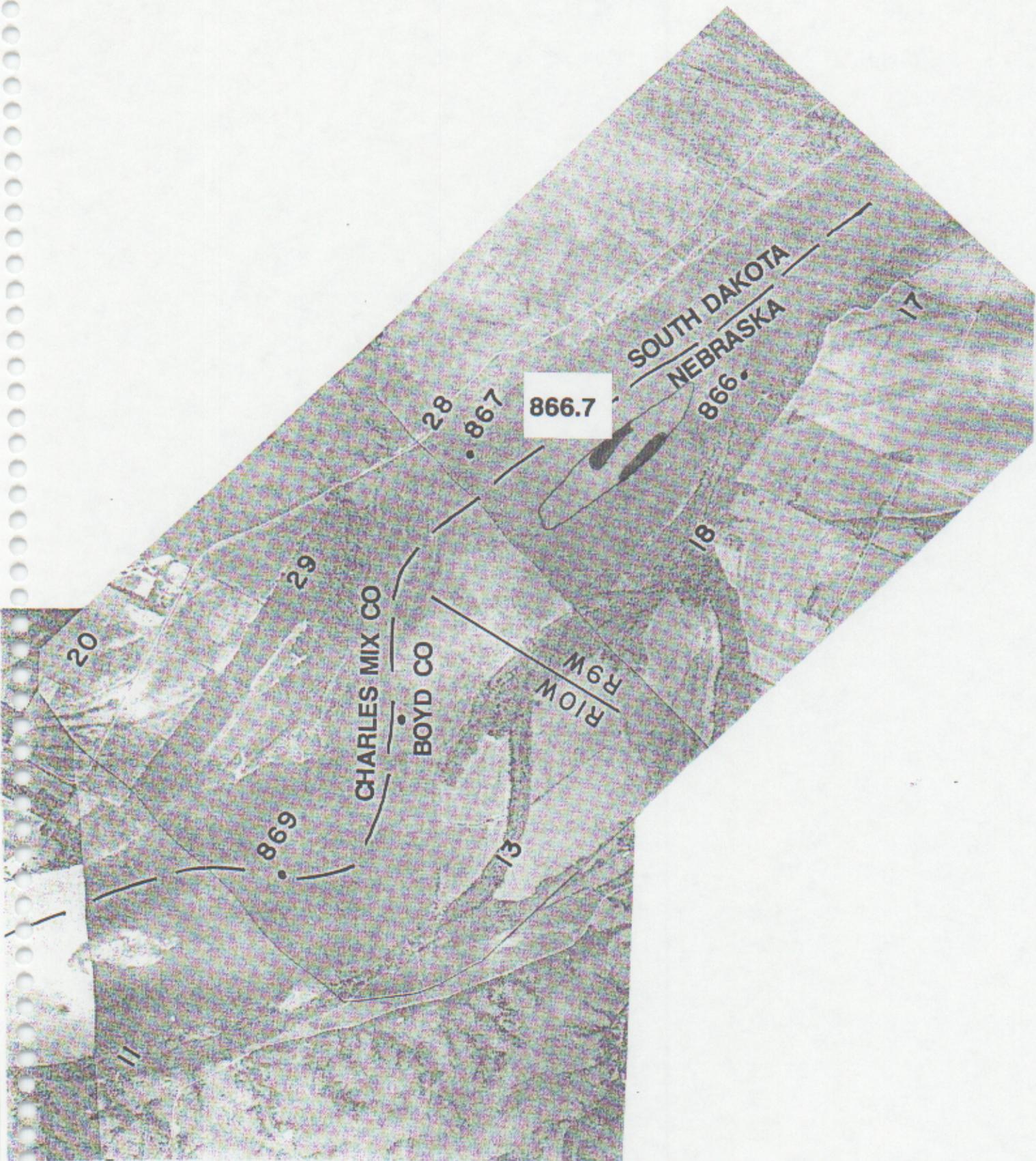
FORT RANDALL RIVER 1993 NESTING SITES



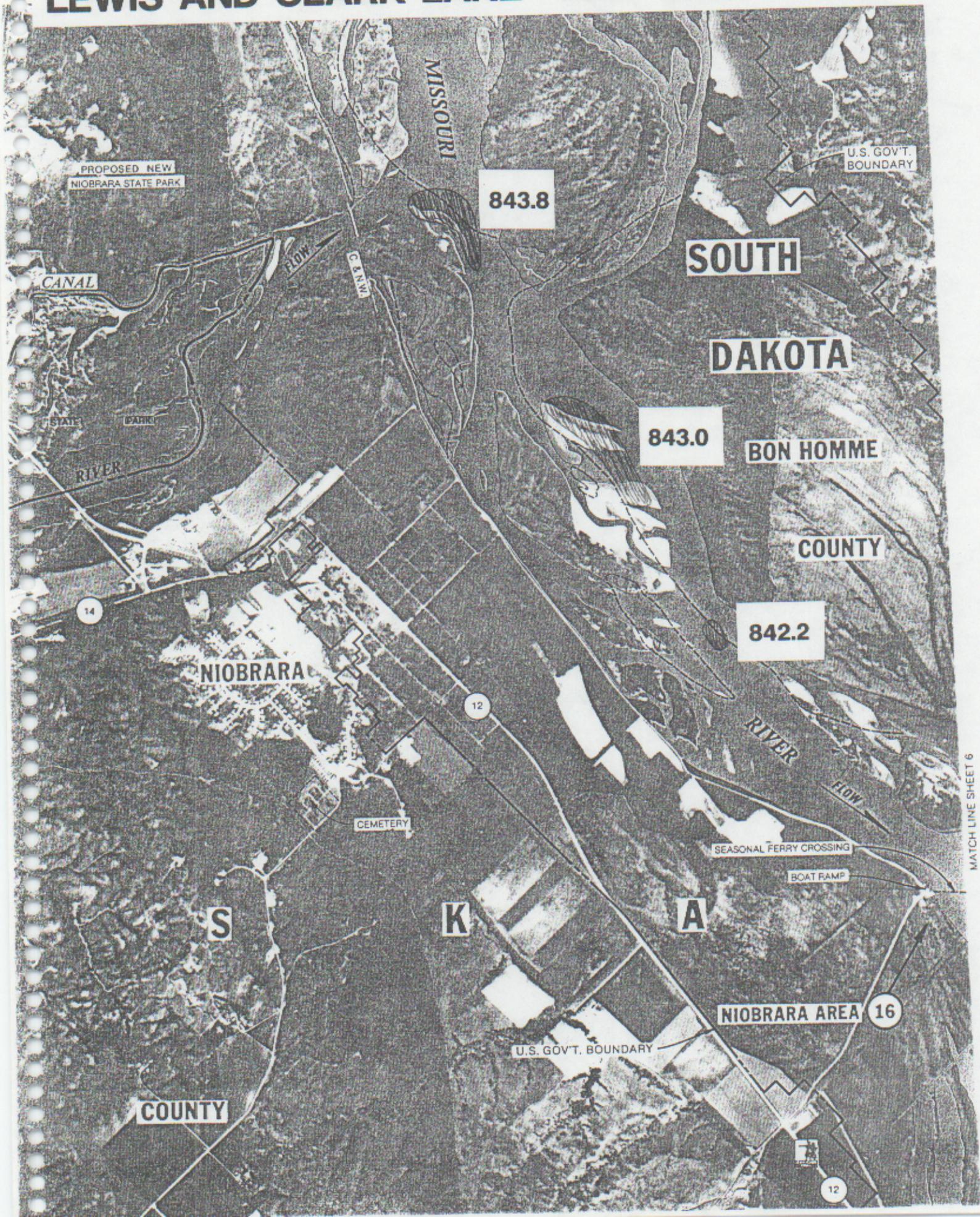
MISSOURI RIVER

FORT RANDALL DAM TO NIC

SCALE: 1" = 2000'



LEWIS AND CLARK LAKE 1993 NESTING SITES



MATCH LINE SHEET 6

MATCH LINE SHEET 7



U.S. GOV'T. BOUNDARY

S O U T H

37

15 RUNNING WATER AREA

BON

SEASONAL FERRY CROSSING

BOAT RAMP

840.0

BOAT RAMP

LEWIS

12

ACW
RSW

17 BAZILE CREEK AREA

SANTEE INDIAN RESERVATION

U.S. GOV'T. BOUNDARY

CREEK

BAZILE

N E B

18

S O U T H D A

15 RUNNING WATER AREA

BON

HOMME

BOAT RAMP

839.0

T-503A
P-653W

17 BAZILE CREEK AREA

LEWIS

AND

CLARK

18 LOST CREEK AREA

N E B E R A

KNOX

A K O T A

COUNTY

EMANUEL CREEK AREA 14

U.S. GOV'T. BOUNDARY

EMANUEL CREEK

BOAT RAMP

MATCH LINE SHEET 5

LAKE

U.S. GOV'T. BOUNDARY

SANTEE

INDIAN

RESERVATION

A

S

K

A

COUNTY

1:25,000
1:25,000

U T H D A K O

37

BON

HOMME

COUNTY

R-60-W
R-55-W

SPRINGFIELD AREA

13

SEWAGE LAGOON

UNIVERSITY OF
SOUTH DAKOTA
AT SPRINGFIELD

SPRINGFIELD

BOAT BASIN & RAMP

BEACH AREA

832.8

833.0

833.7

MATCH LINE SHEET 6

CEMETERY

SANTEE

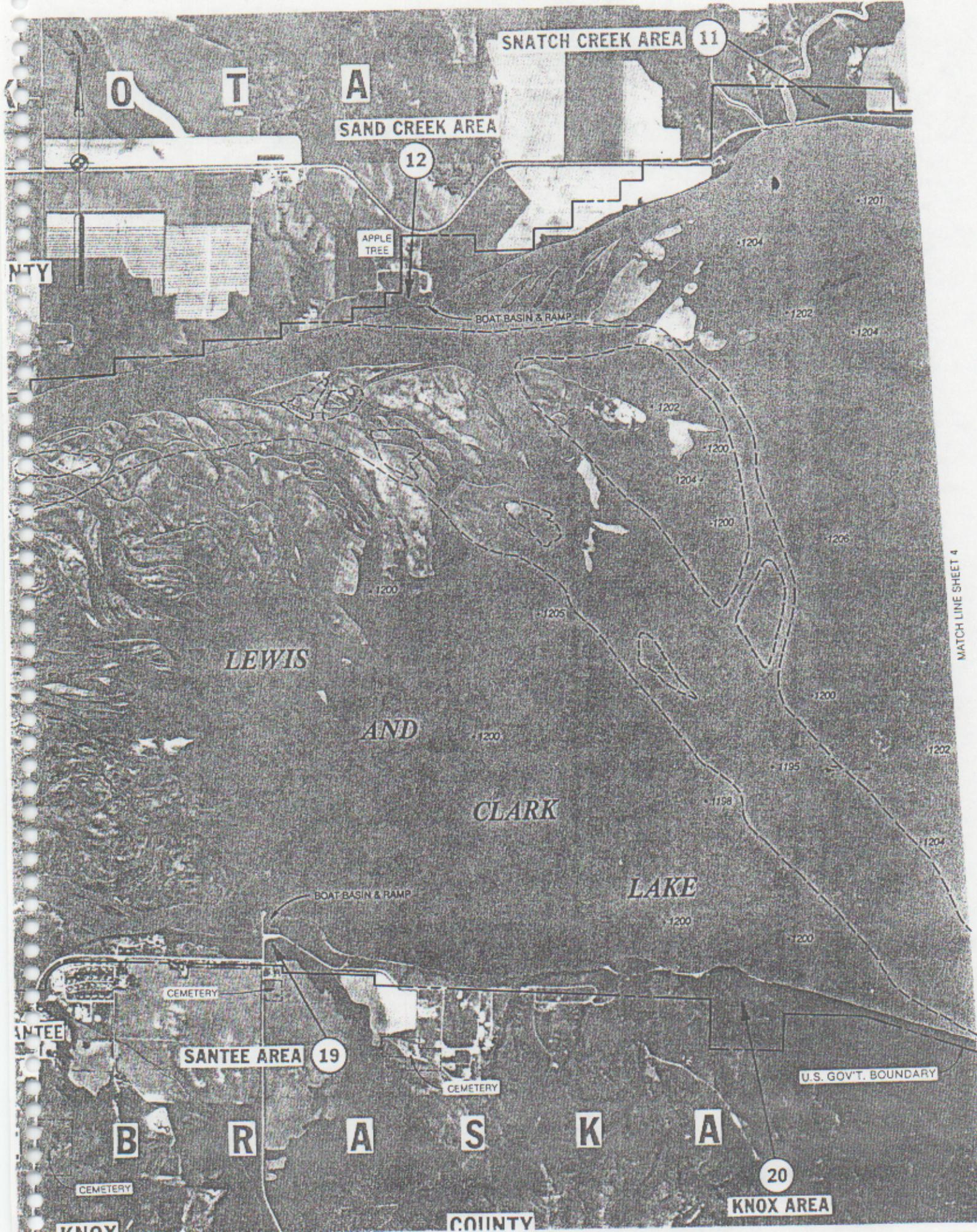
SANTI

N E B

CEMETERY

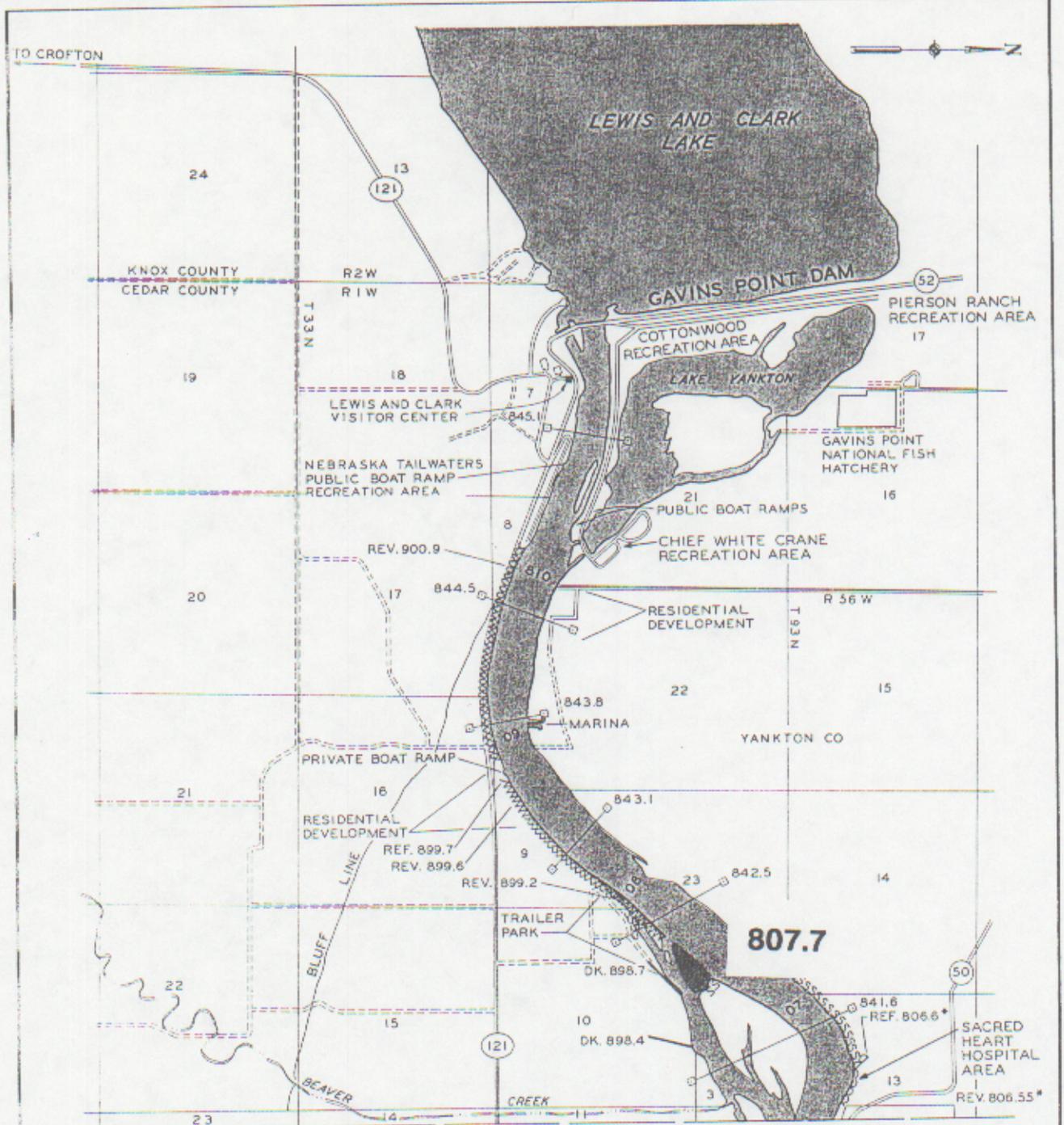
BLUFF HEIGHTS

KNOX



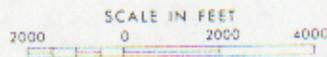
MATCH LINE SHEET 4

GAVINS POINT RIVER 1993 NESTING SITES



DATE	SOURCE OF BANKLINE DATA
1980	U.S.C. OF E. AERIAL PHOTOS

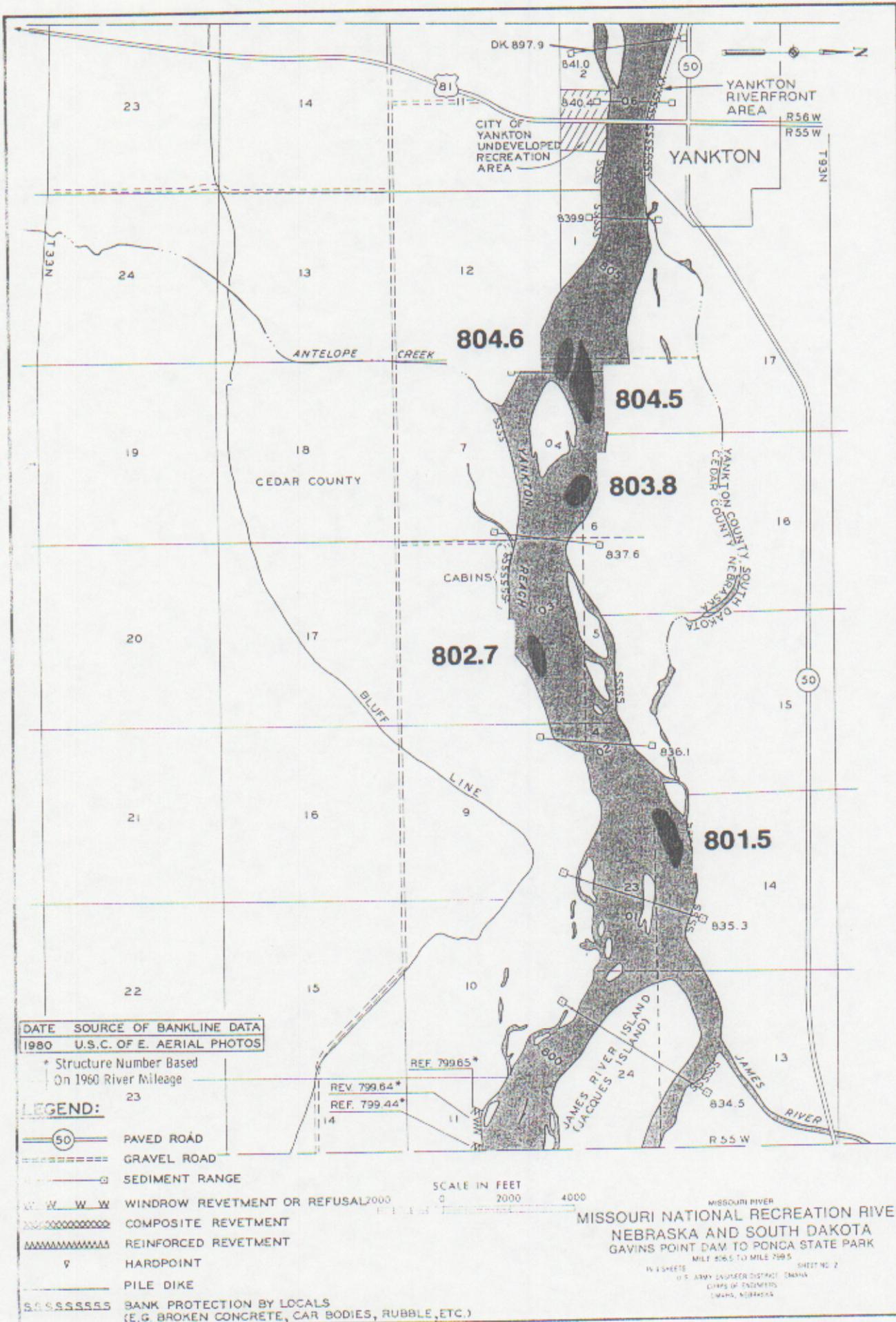
* Structure Number Based
On 1960 River Mileage



LEGEND:

- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- PILE DIKE
- BANK PROTECTION BY LOCALS
(E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)

MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA STATE PARK
MILE 811.0 TO MILE 806.5
IN 4 SHEETS U.S. ARMY ENGINEER DISTRICT, DAKOTA
CORPS OF ENGINEERS
DUMAR, NEBRASKA



DATE SOURCE OF BANKLINE DATA
 1980 U.S.C. OF E. AERIAL PHOTOS

* Structure Number Based
 On 1960 River Mileage

LEGEND:

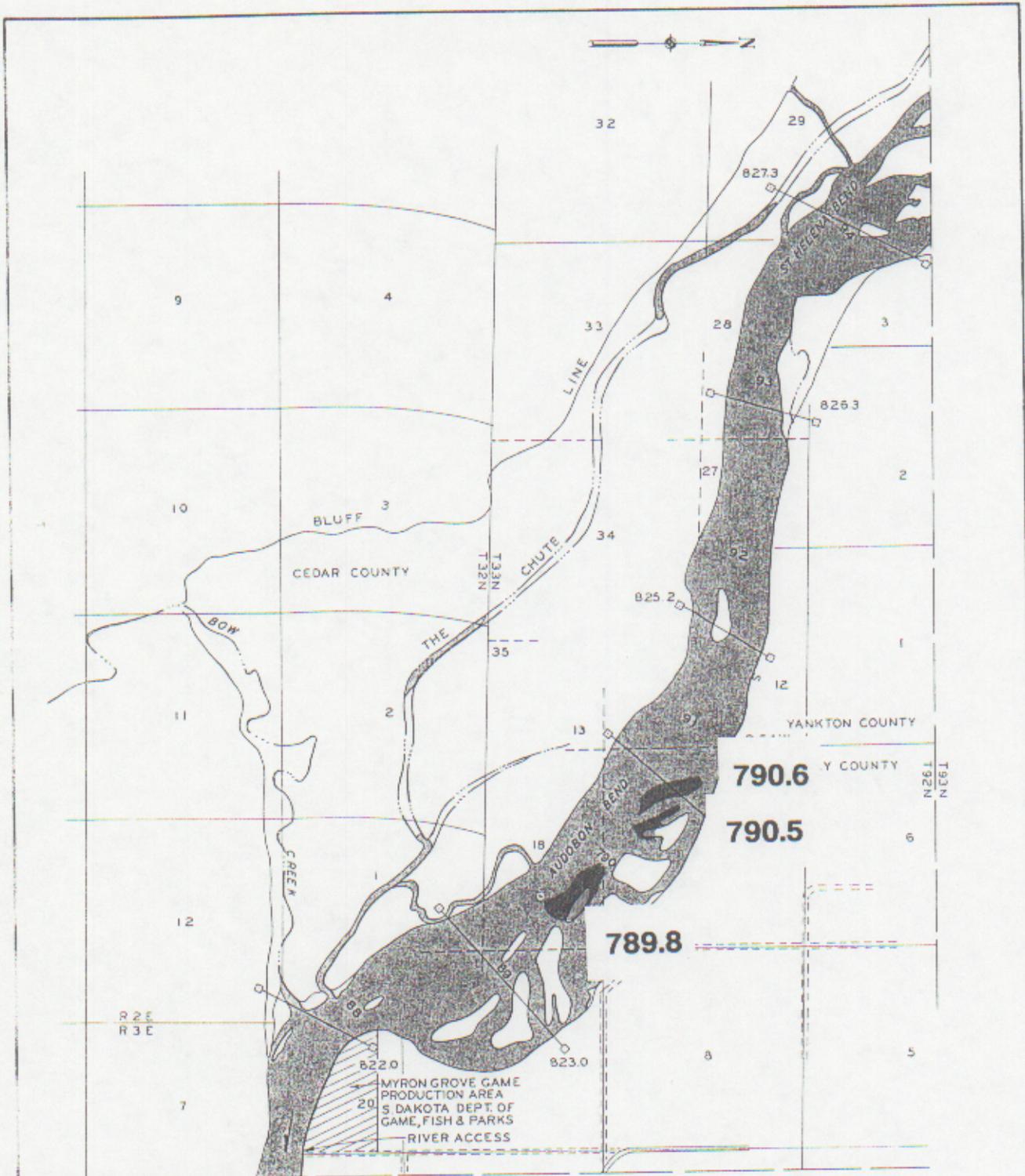
- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- PILE DIKE
- BANK PROTECTION BY LOCALS
 (E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)

SCALE IN FEET
 0 2000 4000

MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
 NEBRASKA AND SOUTH DAKOTA
 GAVINS POINT DAM TO PONCA STATE PARK
 MILE 806.5 TO MILE 799.5
 IN 4 SHEETS U.S. ARMY ENGINEER DISTRICT (DANNA)
 CHIEFS OF ENGINEERS
 OMAHA, NEBRASKA

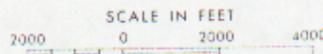
REF 799.65*
 REV 799.64*
 REF. 799.44*
 14

LEGEND:



DATE	SOURCE OF BANKLINE DATA
1980	U.S.C. OF E. AERIAL PHOTOS

* Structure Number Based
On 1960 River Mileage

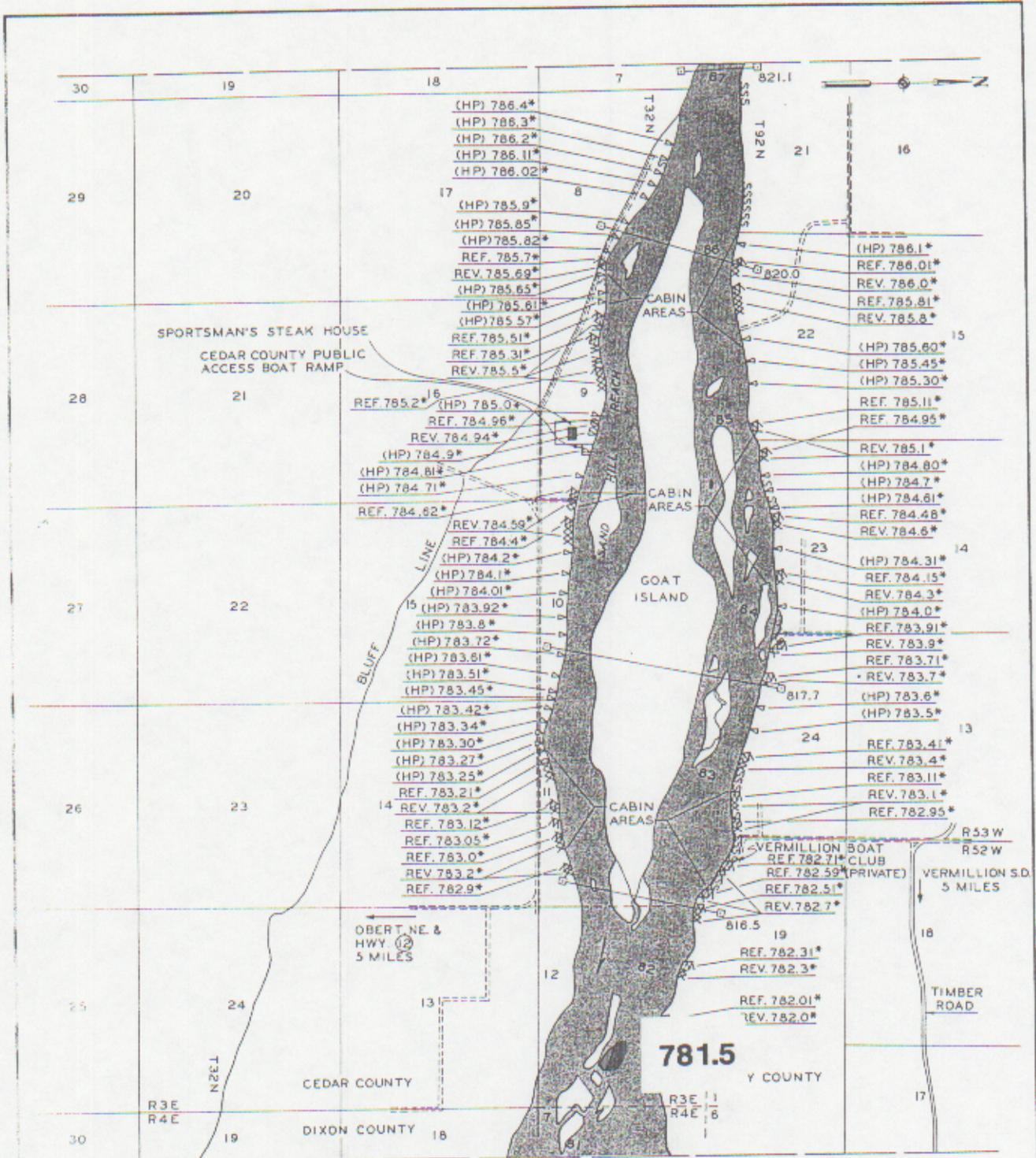


LEGEND:

- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- BANK PROTECTION BY LOCALS
(E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)

MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA STATE PARK
MILE 794.5 TO MILE 787.2

14 SHEETS SHEET NO. 4
U.S. ARMY ENGINEER DISTRICT, DAVENP
CORPS OF ENGINEERS
OMAHA, NEBRASKA



DATE	SOURCE OF BANKLINE DATA
1980	U.S.C. OF E. AERIAL PHOTOS

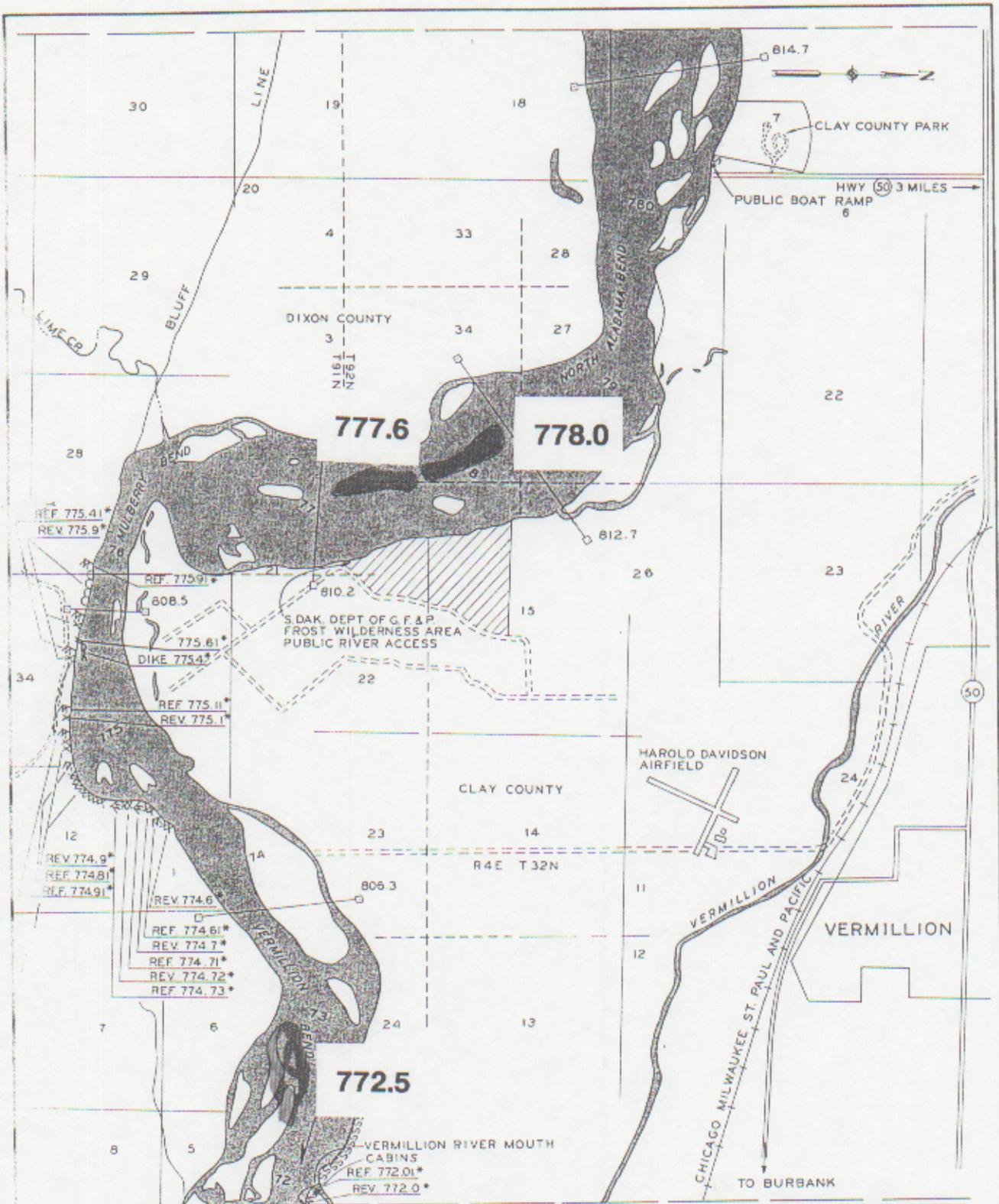
* Structure Number Based On 1960 River Mileage



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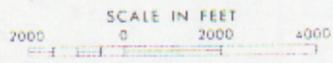
- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- STONE FILL DIKE, REVETMENT OR REFUSAL
- BANK PROTECTION BY LOCALS (E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)

MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
 NEBRASKA AND SOUTH DAKOTA
 GAVINS POINT DAM TO PONCA STATE PARK
 MILE 787.2 TO MILE 780.9
 14 SHEETS SHEET NO. 5
 U.S. ARMY ENGINEER DISTRICT OMAHA
 CORPS OF ENGINEERS
 OMAHA, NEBRASKA



LEGEND:

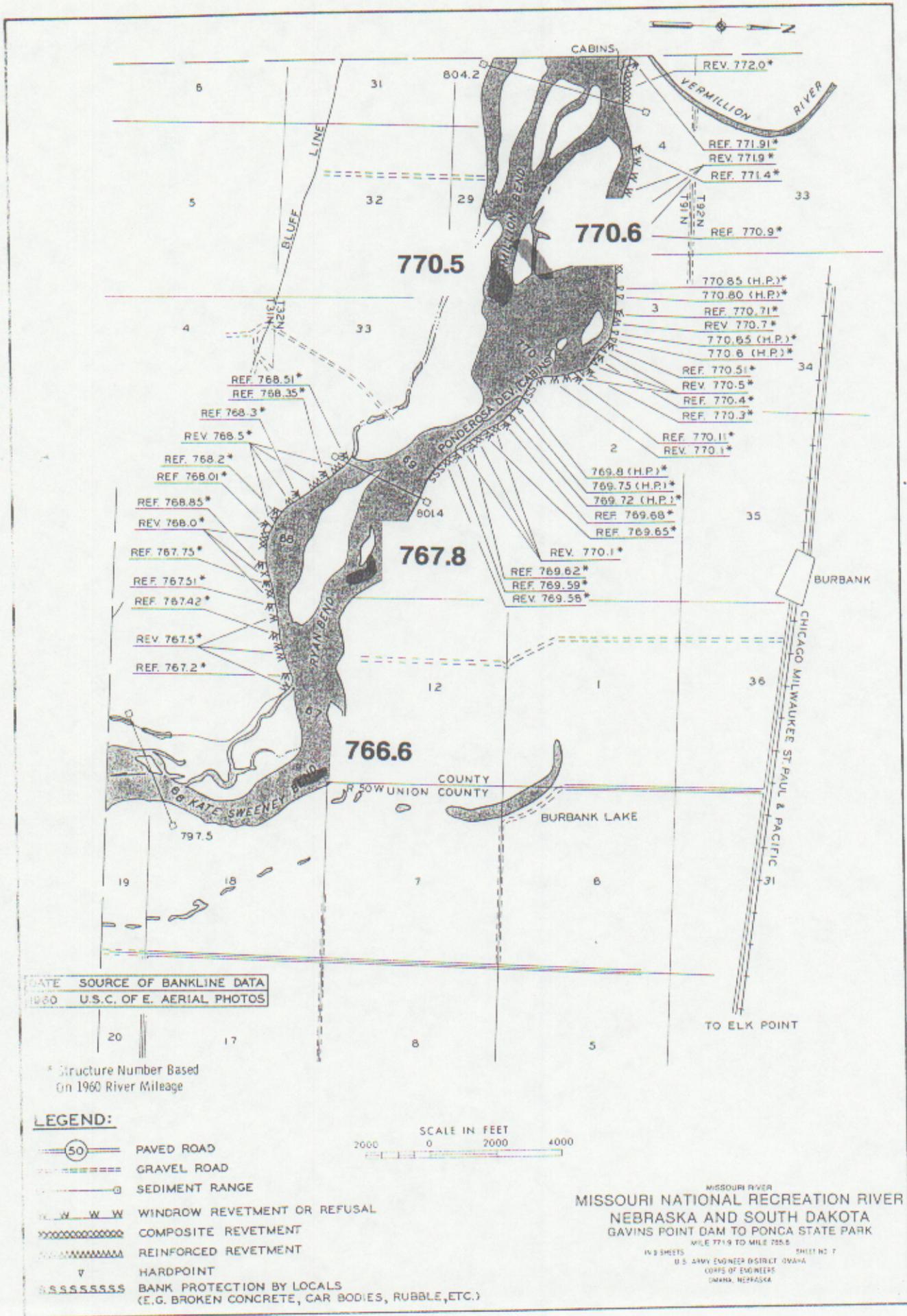
- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- BANK PROTECTION BY LOCALS (E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)



DATE	SOURCE OF BANKLINE DATA
1980	U.S.C. OF E. AERIAL PHOTOS

* Structure Number Based On 1960 River Mileage

MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
 NEBRASKA AND SOUTH DAKOTA
 GAVINS POINT DAM TO PONCA STATE PARK
 MILE 780.9 TO MILE 771.9
 19 SHEETS U.S. ARMY ENGINEER DISTRICT, OMAHA
 CORPS OF ENGINEERS
 OMAHA, NEBRASKA

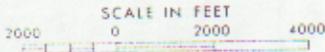


DATE	SOURCE OF BANKLINE DATA
1960	U.S.C. OF E. AERIAL PHOTOS

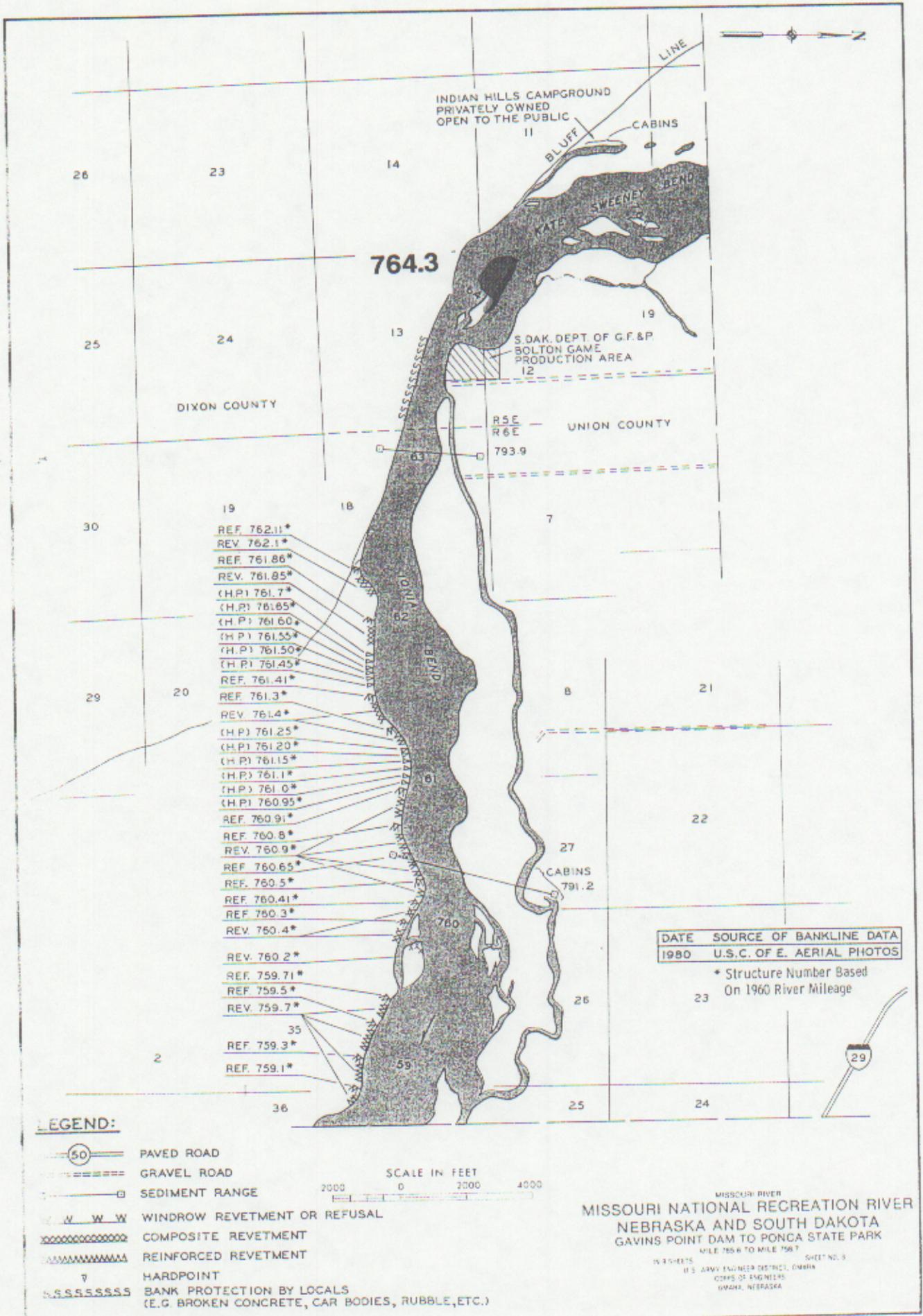
* Structure Number Based
On 1960 River Mileage

LEGEND:

- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- BANK PROTECTION BY LOCALS
(E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)



MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
 NEBRASKA AND SOUTH DAKOTA
 GAVINS POINT DAM TO PONCA STATE PARK
 MILE 771.9 TO MILE 755.6
 14 SHEETS SHEET NO. 7
 U.S. ARMY ENGINEER DISTRICT, OMAHA
 CORPS OF ENGINEERS
 OMAHA, NEBRASKA



764.3

DIXON COUNTY

UNION COUNTY

INDIAN HILLS CAMPGROUND
PRIVATELY OWNED
OPEN TO THE PUBLIC

CABINS

S. DAK. DEPT. OF G.F. & P.
BOLTON GAME
PRODUCTION AREA

R5E
R6E
793.9

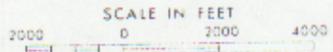
- REF. 762.11*
- REV. 762.1*
- REF. 761.86*
- REV. 761.85*
- (H.P.) 761.7*
- (H.P.) 761.65*
- (H.P.) 761.60*
- (H.P.) 761.55*
- (H.P.) 761.50*
- (H.P.) 761.45*
- REF. 761.41*
- REF. 761.3*
- REV. 761.4*
- (H.P.) 761.25*
- (H.P.) 761.20*
- (H.P.) 761.15*
- (H.P.) 761.1*
- (H.P.) 761.0*
- (H.P.) 760.95*
- REF. 760.91*
- REF. 760.8*
- REV. 760.9*
- REF. 760.65*
- REF. 760.5*
- REF. 760.41*
- REF. 760.3*
- REV. 760.4*
- REF. 760.2*
- REF. 759.71*
- REF. 759.5*
- REV. 759.7*
- REF. 759.3*
- REF. 759.1*

DATE	SOURCE OF BANKLINE DATA
1980	U.S.C. OF E. AERIAL PHOTOS

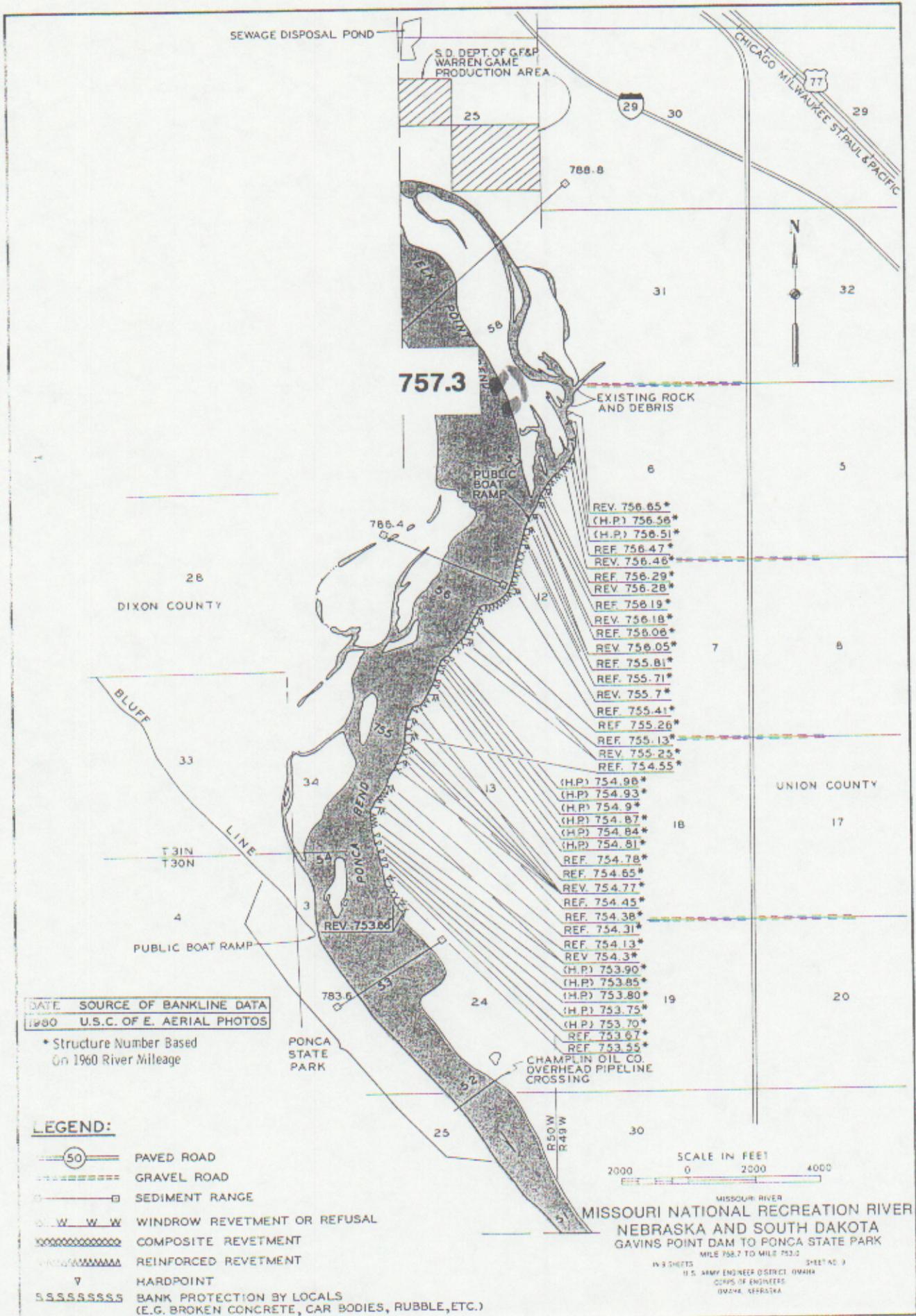
* Structure Number Based
On 1960 River Mileage

LEGEND:

- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- BANK PROTECTION BY LOCALS
(E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)



MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA STATE PARK
MILE 765.6 TO MILE 767
SHEET NO. 3
U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS
OMAHA, NEBRASKA

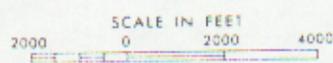


DATE	SOURCE OF BANKLINE DATA
1980	U.S.C. OF E. AERIAL PHOTOS

* Structure Number Based
On 1960 River Mileage

LEGEND:

- PAVED ROAD
- GRAVEL ROAD
- SEDIMENT RANGE
- WINDROW REVETMENT OR REFUSAL
- COMPOSITE REVETMENT
- REINFORCED REVETMENT
- HARDPOINT
- BANK PROTECTION BY LOCALS
(E.G. BROKEN CONCRETE, CAR BODIES, RUBBLE, ETC.)



MISSOURI RIVER
MISSOURI NATIONAL RECREATION RIVER
NEBRASKA AND SOUTH DAKOTA
GAVINS POINT DAM TO PONCA STATE PARK
MILE 758.7 TO MILE 753.0

IN 3 SHEETS U.S. ARMY ENGINEER DISTRICT OMAHA
CORPS OF ENGINEERS OMAHA, NEBRASKA SHEET NO. 3

Thank you to the following people and their crew of dedicated staff who have diligently conducted the surveys, compiled the data, and submitted the annual field report.

MR. GORDON WARRICK - FTPKRES and FTPKRIV

MR. GREG PAVELKA - LKSKRES and GARRRIV

MR. DAN LICHT - GARRRIV

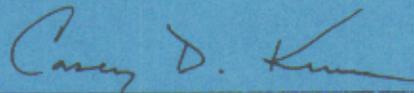
MR. BILL MAY - LONDRES

MS. NELL MCPHILLIPS - LOSDRES

MR. JIM SUEDKAMP - LOSDRES

MR. MERRITT STEGMEIER - FTRLRIV

STAFF OF LEWIS AND CLARK LAKE



Casey D. Kruse

Wildlife Biologist/Field Coordinator