Lesser Prairie-chicken Surveys on New Mexico

Department of Game and Fish Prairie-chicken Management Areas

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Introduction

Over the last 100 years, populations of Lesser Prairie-chickens (LPCH, *Tympanuchus pallidicinctus*) have been declining sharply over the bird's entire range in Kansas, Oklahoma, Texas, Colorado, and New Mexico (Lesser Prairie-chicken Interstate Working Group 1998). In 1995, the US Fish and Wildlife Service (Service) received a petition to list the LPCH as threatened (Biodiversity Legal Foundation 1995). In June, 1998, the Service ruled the LPCH listing as "warranted but precluded," meaning that, although the species should be listed, the Service will first act on behalf of other species of higher priority. The LPCH is currently being reconsidered and a ruling is expected in mid-1999. The recent ruling underscores the necessity of acting to conserve this species and its habitat.

Long-term lek survey data collected by the Bureau of Land Management (BLM) Roswell Resource District indicate that LPCH populations in New Mexico, although larger than in some states, are no exception to the range-wide trend. In response to the decline, the New Mexico Department of Game and Fish (NMDGF) recommended that the State Game Commission close the 1996-1999 LPCH hunting seasons. The NMDGF has recently recommended that the species be listed as threatened in New Mexico, under the New Mexico Wildlife Conservation Act (NMDGF 1999). In 1997 and 1998, the New Mexico Natural Heritage Program (NMNHP) conducted surveys of lekking birds for the NMDGF on its Lesser Prairie-chicken Management Areas (PCAs). NMDGF also cooperated with BLM by providing matching funds for a trapping and radio-telemetry study on the BLM Caprock Wildlife Management Area in 1997 and 1998.

The purposes of this study were to conduct 1999 surveys of lekking LPCH at the NMDGF and to enter data from 1996-1999 surveys of the PCAs into the NMNHP LPCH database.

Methods

Database

We entered survey data into an Access database and queried the database for trends in lek size and number from 1996-1999. Because we surveyed PCAs rather than traditional lek sites, we detected leks off PCAs but did not visit specific historic sites off PCAs. Therefore, negative surveys are only included in the database for historic leks that we were able to survey directly, those situated on or very near PCA boundaries. When we were unable to obtain an exact count, we estimated the number of birds heard. Estimates were entered as a "1" in the database count field, because if we did not observe the lek directly we could only be certain that one bird was present. Our estimates were also entered in a separate estimate field.

Surveys

We surveyed NMDGF PCAs from 5-18 April, 1999. We surveyed the following Management Areas for the presence of LPCH at lek sites: Milnesand, North Bluit, South Bluit, Black Hills, Crossroads #1-2, Marshall, Gallinas Wells #1-6, Claudell, and Liberty (Figures 2-13).

Surveys were conducted between 0550 and 0815 h. The surveyor approached survey sites by vehicle and listened for gobbling males. Where possible, we attempted a closer approach by vehicle or on foot, for purposes of obtaining exact counts of birds. Birds were counted and sex recorded whenever possible, but we attempted to avoid flushing birds from the leks. However, several lek sites off PCAs were not accessible because they were on private land, not accessible by vehicle, or too distant to access on foot. If we could not approach closely enough to count birds on leks, we estimated the number of individuals heard. For all leks located inside the boundaries of PCAs we obtained exact counts of bird numbers.

We mapped all active leks present from 1996 to 1999. Locations of leks detected off the PCAs that we were unable to access were estimated. Leks that moved less than one kilometer from previous years were given the same designation as in previous years.

Results

Compared to 1996 and 1997 (Figure 1), the 1998 surveys were quite successful. In 1999, numbers were comparable to those in 1998 (Table 1). In 1999, we detected 27 active leks, 8 inside PCA boundaries and 19 outside PCA boundaries (Table 2). Of the 19 leks detected off PCAs, 14 were on private land, three were on state land, and two were on land administered by the Bureau of Land Management. We counted 182 birds, and estimated 29 birds, for a total estimate of 199 birds (Table 1). Numbers at five of the 27 leks were estimated; each of these five received a "1" in the count field of the database, while the estimate was recorded in the estimate field.

In 1999, six new leks were detected, while 13 leks detected in 1998 did not appear in 1999. Twenty-two leks have been "lost" since the beginning of the study. However, this result should be interpreted with caution, because earlier surveyors probably mistook lone satellite or transient birds for leks. We are currently attempting to avoid this confusion by classing lone males near historical sites as satellites and adding them to the count for the main lek.

The mean number of birds at a lek was significantly different over the four years (ANOVA, $F=8.06$, $p=0.0002$). There was no difference between 1996 and 1997, or between 1998 and 1999. There were significantly fewer birds in 1996 than in 1998 (Scheffe contrast, mean difference = -5.86, $p=0.008$) and 1999 (mean difference = -5.18, $p=0.008$), and significantly fewer in 1997 than 1998 (mean difference = -5.61, $p=0.019$)

and 1999 (mean difference = -4.93, p=0.022). Thus, not only has the number of leks increased in recent years, but the size of leks has also increased.

Discussion

The surveys suggest that LPCH populations on and near the PCAs increased dramatically in 1998 and remained high in 1999. In 1996, NMDGF biologists detected 11 leks and counted 29 birds. In 1997, we counted 28 birds on nine leks and estimated 10 on a 10th, for an estimated total of 38 birds. In 1998, the counts were 32 leks and 127 birds (192 estimated), and in 1999, 27 leks and 182 counted, 199 estimated.

How can these increases be explained? We believe they should be considered in light of the surveys conducted in other parts of the state. The NMNHP LPCH database shows dramatic declines in LPCH numbers at the Carlsbad and Roswell BLM areas during the early- and mid-1990s. At Roswell, numbers increased in 1998, as they did at the PCAs, probably in response to increased rainfall in 1997 (Johnson et al. 1998). At Carlsbad, however, only one active lek of five males was detected in 1998 (Smith et al. 1998). In 1999, numbers at Roswell have declined again, and the single Carlsbad lek is down to three males (K. Johnson unpublished data).

The Palmer Drought Index and local rainfall data (www.ncdc.noaa.gov/cgi-bin/ginterface) indicate that the Carlsbad climate was wetter than average in 1997 and did not differ appreciably in 1996-7 from that in Portales, where the PCAs are located. Oil and gas activity is higher in the Carlsbad area than on the Caprock or at the PCAs, and grazing is also practiced. It appears that human impacts are responsible for the dismal state of the LPCH population in the Carlsbad area. However, there are no data available to test alternative hypotheses such as predation, disease, or loss of genetic variability.

Data from 1998 surveys suggest that the Caprock LPCH population increased approximately 100% over 1997. The number of active leks increased from 19 in 1997 to 25 in 1998. Although this increase was encouraging, the 1998 Roswell population was still only one-sixth as large as it was during years in the mid-1980s, in which comparable survey effort was exerted, and numbers will be down again in 1999 (K. Johnson, unpublished). As in Carlsbad and Portales, the drought of the early 1990s broke in 1997, one apparent reason for the 1998 LPCH increases at Roswell. Oil and gas impacts are fewer on the Caprock, but grazing is widespread there. Populations at both the PCAs and the Caprock probably suffered the effects of the drought in the early 1990s, but LPCH habitat has been more heavily grazed at the Caprock than at the PCAs, most of which are not grazed. It is possible that more suitable nesting habitat was present at the PCAs, and the birds were able to efficiently utilize the nesting habitat when the rains brought food and further increases in cover.

In summary, differences in land use patterns at the three areas may have impacted the abilities of LPCH populations to make a comeback after a severe drought. At the PCAs,

where petroleum exploitation and grazing are light or non-existent, LPCH populations began to rebound after drought. At Roswell, females nested in shinnery pastures, but nests were not typically constructed in large clumps of bluestem grass, as found by Davis et al. (1979). The LPCH population there was able to respond somewhat in response to increased precipitation in 1998, but numbers did not hold steady in 1999. At Carlsbad, it appears that populations were so small and/or impacts so great, that the LPCH population has not been able to rebound, and in fact extinction of that population is imminent. These data suggest that nesting habitat preserves near lek sites, such as the PCAs, are effective conservation tools.

It is interesting, however, that the proportion of active leks on the PCAs have declined steadily over the course of the study. The proportions of leks detected on the PCAs were 82% (9/11) in 1996, 60% (6/10) in 1997, 38% (12/32) in 1998, and 30% (8/27) in 1999. The absolute numbers of leks are somewhat subject to interpretation, as some surveyors may have described satellite males as leks. In addition, more effort may have been expended counting leks outside the PCAs in 1998 and 1999. Nevertheless, the apparent decrease in leks on PCAs is noteworthy, at a time when overall lek and bird numbers are increasing. It is possible that the PCAs are serving their intended function, to provide breeding habitat, but that as breeding habitat improves, traditional lek sites are becoming overgrown with vegetation and are becoming less suitable as display grounds.

In 1999, a new lek (GM-11) appeared on a burned site devoid of live vegetation. It is clear from Figures 2-13 that leks move spatially between years. The appearance of this new lek suggests that males may move to take advantage of lek site characteristics.

Research Recommendations

Surveys should be continued at all three New Mexico populations, and the NMNHP Access database updated yearly. Future studies should investigate the influence of the PCAs on LPCH reproduction, nest predation, and survival rates. Are the birds detected at leks actually using the PCAs for nesting? How far are nests from leks? What is the vegetation structure at nests? What are predation rates on hens and nests? Data on these questions could be compared to areas outside the PCAs, to determine whether the PCAs are functioning to provide higher quality nesting habitat. Similar comparisons could be made with habitat in the Roswell area, where land management practices differ.

Although high quality nesting habitat appears to be more limiting for LPCH than lek sites, no research has been conducted on characteristics of the lek sites. Availability of suitable lek sites probably differs among management areas, but no data that bear on this question have been collected. It is not known whether males and females favor the same characteristics in a lek site, or whether male or female preference determines lek location.

Management Recommendations

Several of the PCAs are heavily grazed (e.g., Liberty; Gallinas Wells 1, 2, 3, 4) or are not completely fenced (e.g., Crossroads 2, Marshall, Gallinas Wells 5). Obviously, fencing these PCAs and eliminating cattle should receive highest priority.

Second, the composition of vegetation on the PCAs should be investigated. Some PCAs may have greater than the optimal percentage of cover in shinnery oak, while cover is very sparse on others. Preferred nesting habitat for LPCH in eastern New Mexico should include roughly 60% tall grass and 40% shinnery oak (Davis et al. 1979), and vegetation above the nest should be about two feet in height (see Davis et al. 1979 for detailed description of nesting requirements). Thus, if successful reproduction on PCAs is to optimized, human-caused impacts must be limited, and optimal vegetation composition and structure must be maintained.

Tables

Table 1. History of leks on and near PCAs, 1996-1999. Estimates are entered below slashes for 1998 and 1999. GB=Black Hills, GC=Crossroads, GCL=Claudell, GGW=Gallinas Wells, GL=Liberty, GM=Milnesand, GMA=Marshall, GNB=North Bluit, GSB=South Bluit.

Table 2. Results of 1999 lek surveys on and near PCAs. Estimates are entered as "1" in count field. PVT=private, SNM=state of New Mexico, BLM=Bureau of Land Management. GB=Black Hills, GC=Crossroads, GCL=Claudell, GGW=Gallinas Wells, GL=Liberty, GM=Milnesand, GMA=Marshall, GNB=North Bluit, GSB=South Bluit

Table 1.

Plot ID	1996	1997	1998	1999	Years Active
GB1	5				1
GB2	2			7	2
GB3	3	2			2
GB4	1				1
GB5			3		1
GB6			1 / 4		1
GB7			10	6	2
GB8				1 / 4	1
GB9				1	1
GB10				5 / 10	1
GC1-1	5				1
GC1-2	1				1
GC1-3	1	2			2
GC1-4	3	2	10	10	4
GC1-5			5	1	2
GC1-6			1 / 4	12	2
GC1-7			1 / 4		1
GC1-8			1 / 4		1
GC1-9			1 / 5	1 / 6	2
GC2-1		3	1 / 8	10	3
GC2-2			1 / 4		1
GC2-3			1 / 2		1
GC2-4			1 / 3	1 / 6	2
GCL1			1 / 10		1
GGW1-1			4	7	2
GGW1-2			2		1
GGW2-1		4			1
GGW2-2			22	17	2
GGW2-3			1 / 2		1
GGW5-1			1 / 4		1
GGW5-2			1 / 4	4	2
GGW6-1			1 / 2	3	2
GL1		1		5	2
GM1	3				1
GM10				9	1
GM11				10	1
GM2	3	4	11	5	4
GM3	2				1
GM4		2	2 / 5	9	3
GM5			2 / 4		1
GM6			3		1
GM7			11	10	2
GM8			1 / 3	5	2
GM9			4 / 8		1
GMA1		4 / 10	10	6	3
GMA2			1 / 4	9	2
GNB1		6	11	10	3

GNB2				16	1
GSB1			1 / 4	2 / 3	2
Total	29	30	127	182	
total w/ estimates	29	36	192	199	

Table 2.

Lek	Date	Males	Females	Unknown	Max Count	Estimate	On/Off PCA	Ownership
GB2	1999-04-07	0	0	7	7		off	PVT
GB7	1999-04-07	0	0	6	6		off	PVT
GB8	1999-04-07	0	0	1	1	4	off	SNM
GB9	1999-04-07	1	0	0	1		off	PVT
GB10	1999-04-07	1	0	4	5	8	off	SNM
GC1-4	1999-04-15	0	0	10	10		on	SNM
GC1-5	1999-04-13	1	0	0	1		on	SNM
GC1-6	1999-04-15	0	0	12	12		off	PVT
GC1-9	1999-04-15	1	0	0	1	6	off	PVT
GC2-1	1999-04-16	0	0	10	10		on	SNM
GC2-4	1999-04-16	1	0	0	1	6	off	PVT
GGW1-1	1999-04-18	7	0	0	7		off	PVT
GGW2-2	1999-04-18	15	0	2	17		off	PVT
GGW5-2	1999-04-18	3	1	0	4		off	PVT
GGW6-1	1999-04-17	3	0	0	3		off	BLM
GL1	1999-04-05	1	0	4	5		on	SNM
GM2	1999-04-13	4	1	0	5		on	SNM
GM4	1999-04-16	5	1	3	9		on	SNM
GM7	1999-04-16	7	0	3	10		off	PVT
GM8	1999-04-16	0	0	5	5		off	SNM
GM10	1999-04-15	7	2	0	9		off	PVT
GM11	1999-04-13	0	0	10	10		on	SNM
GMA1	1999-04-17	6	0	0	6		off	BLM
GMA2	1999-04-17	0	0	9	9		off	PVT
GNB1	1999-04-09	9	1	0	10		on	SNM
GNB2	1999-04-09	10	0	6	16		off	PVT
GSB1	1999-04-09	2	0	0	2	3	off	PVT
27 leks		**84**	**6**	**92**	**182**	**w/ est.=199**	**8 on PCAs**	

Figures

Figure 1. Summary of survey results on PCAs, 1996-1999, showing number of birds and number of active leks.

Figures 2-13. Maps showing lek locations and land ownership on and near PCAs, 1996-1999.

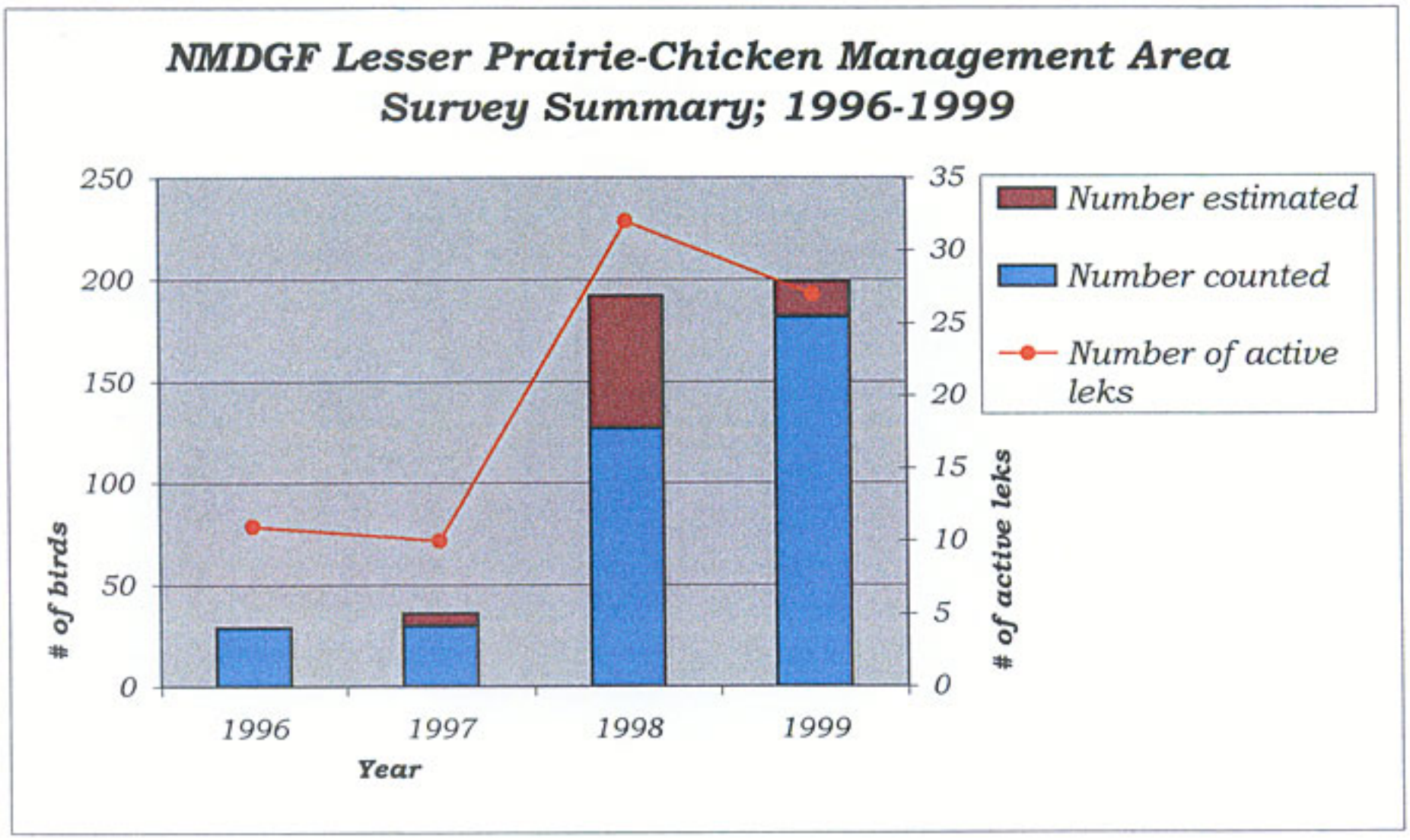
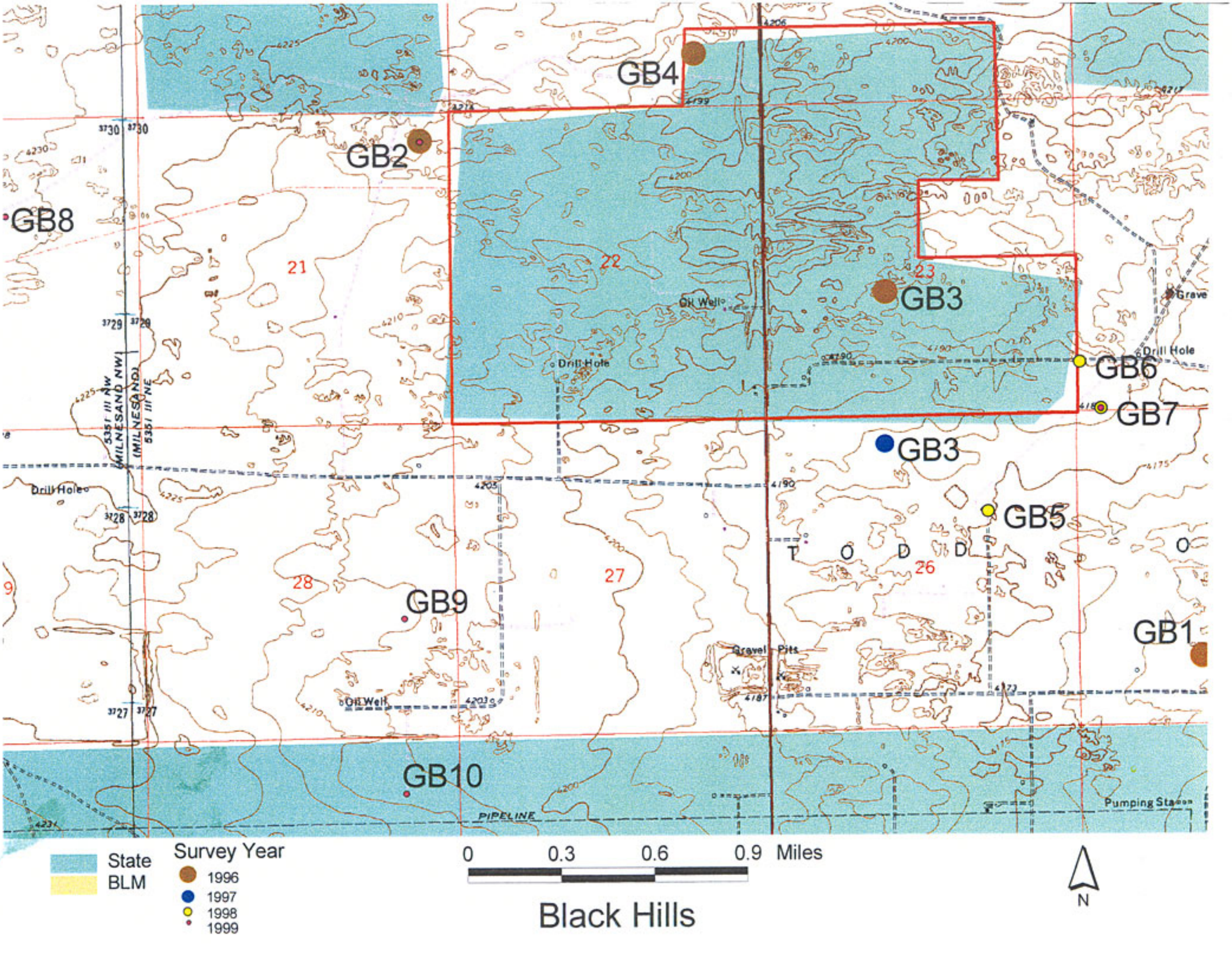

NMDGF Lesser Prairie-Chicken Management Area
Survey Summary; 1996-1999
250
200
150
100
50
0
# of birds
35
30
25
20
15
10
5
0
# of active leks
1996
1997
1998
1999
Year
Number estimated
Number counted
Number of active leks

Figure 1.


GB4
GB2
GB8
GB3
GB6
GB7
GB3
GB5
GB9
GB1
GB10
21
22
23
26
27
28
Oil Well
Drill Hole
Gravel Pits
PIPELINE
Pumping Sta
Drill Hole
Oil Well
Grave
T O D D O
5351 III NW (MILNESAND NW)
5351 III NE (MILNESAND)
State
BLM
Survey Year
1996
1997
1998
1999
0 0.3 0.6 0.9 Miles
N
Black Hills

Crossroads #1

GC1-5
GC1-1
GC1-2
GC1-3
GC1-3
GC1-6
GC1-4
GC1-8
GC1-7
GC1-4
GC1-9

Gravel Pits
Drill Hole
PIPELINE

22
23
24
25
26
27
34
35
36

4280
4263
4250
4266
4246
4273
4256
4260
4250
4235
4275
4249
4264
4248
4260
4250
4242
4235
4269
4248

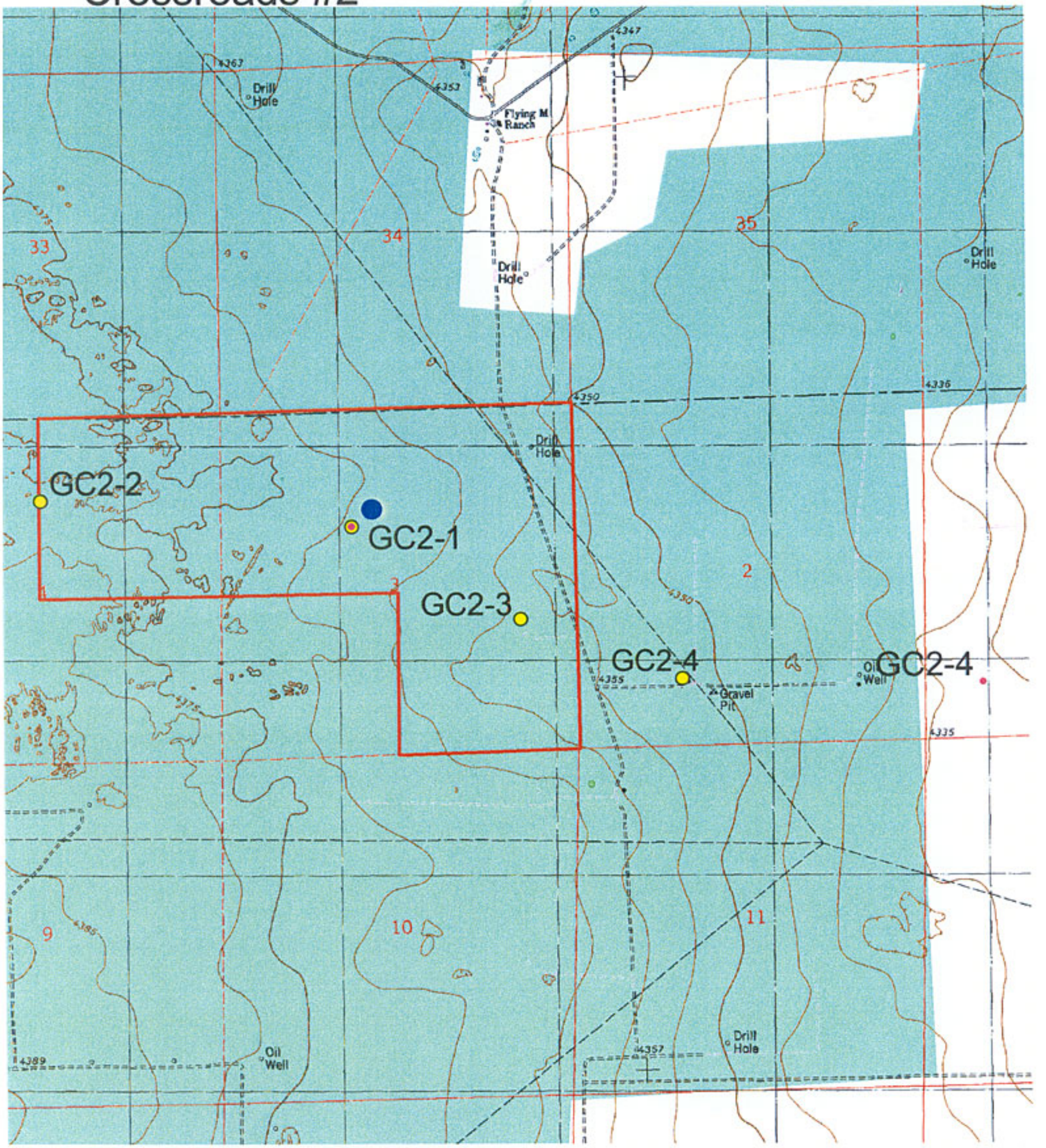
State
BLM

Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

N

Crossroads #2

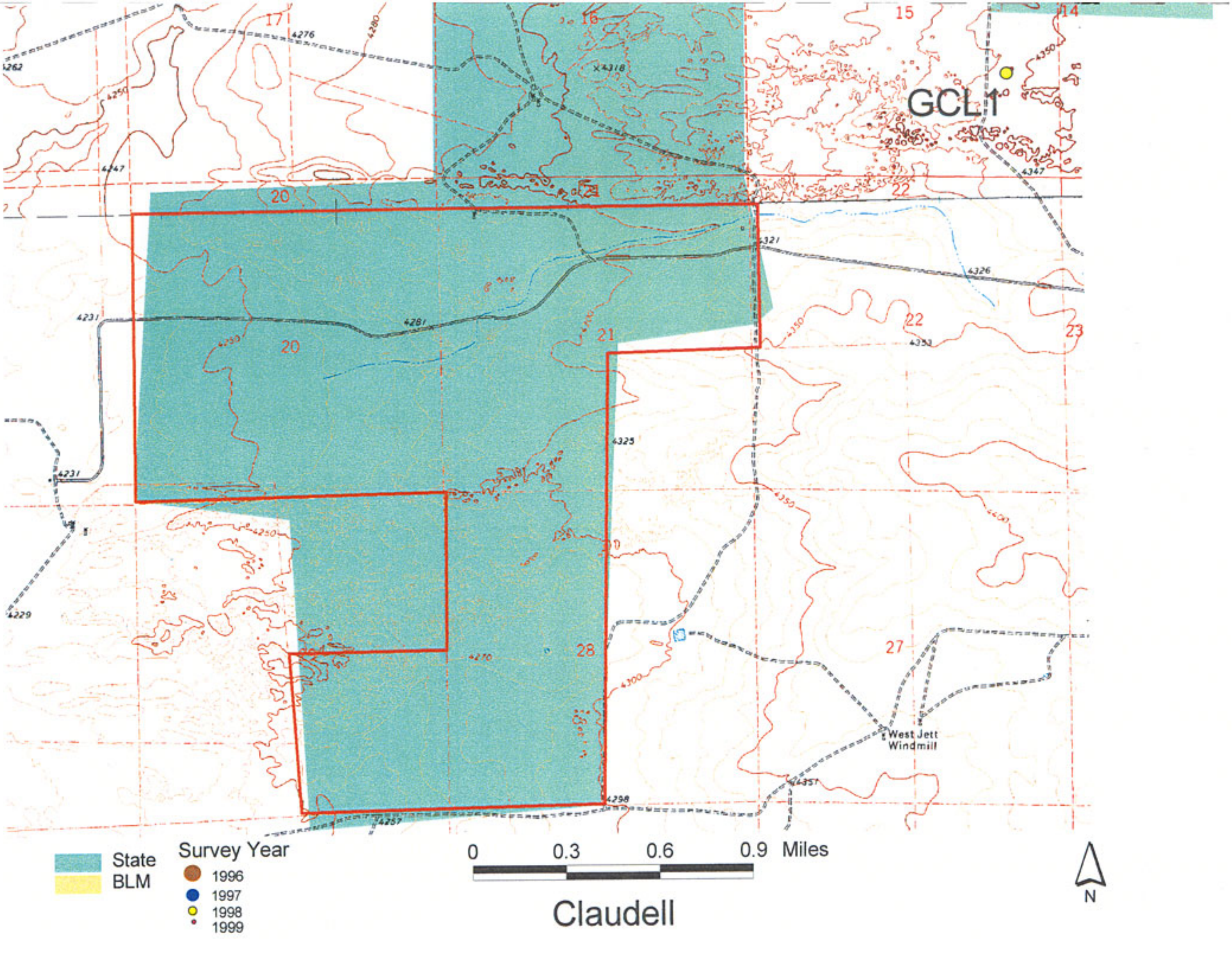


State
BLM

Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

N


GCL1
West Jett
Windmill
State
BLM
Survey Year
1996
1997
1998
1999
0
0.3
0.6
0.9 Miles
N
Claudell

GGW2-1

GGW2-2

GGW2-3

GGW1-2

GGW1-1

Jones Well

Oil Well

Oil Well

Gravel Pit

Drill Hole

Blackstock Well

Mc Lorn Well

CHAVEROO

OIL FIELD

Oil Well

Gravel Pit

TRAIL

JEEP

21

22

23

24

25

26

27

28

34

35

36

4469

4464

4457

4450

4456

4466

4475

4493

4501

4498

4499

4500

State

BLM

Survey Year

1996

1997

1998

1999

0 0.3 0.6 0.9 Miles

N

Gallinas Wells #1-#3

GGW5-2

GGW5-1

The Big A Well

Burnett Well

Gravel Pits

Oil Well

Oil Well

Gravel Pit

Gravel Pit

19

20

21

22

29

30

28

27

C H A V E R O O O I L

State
BLM

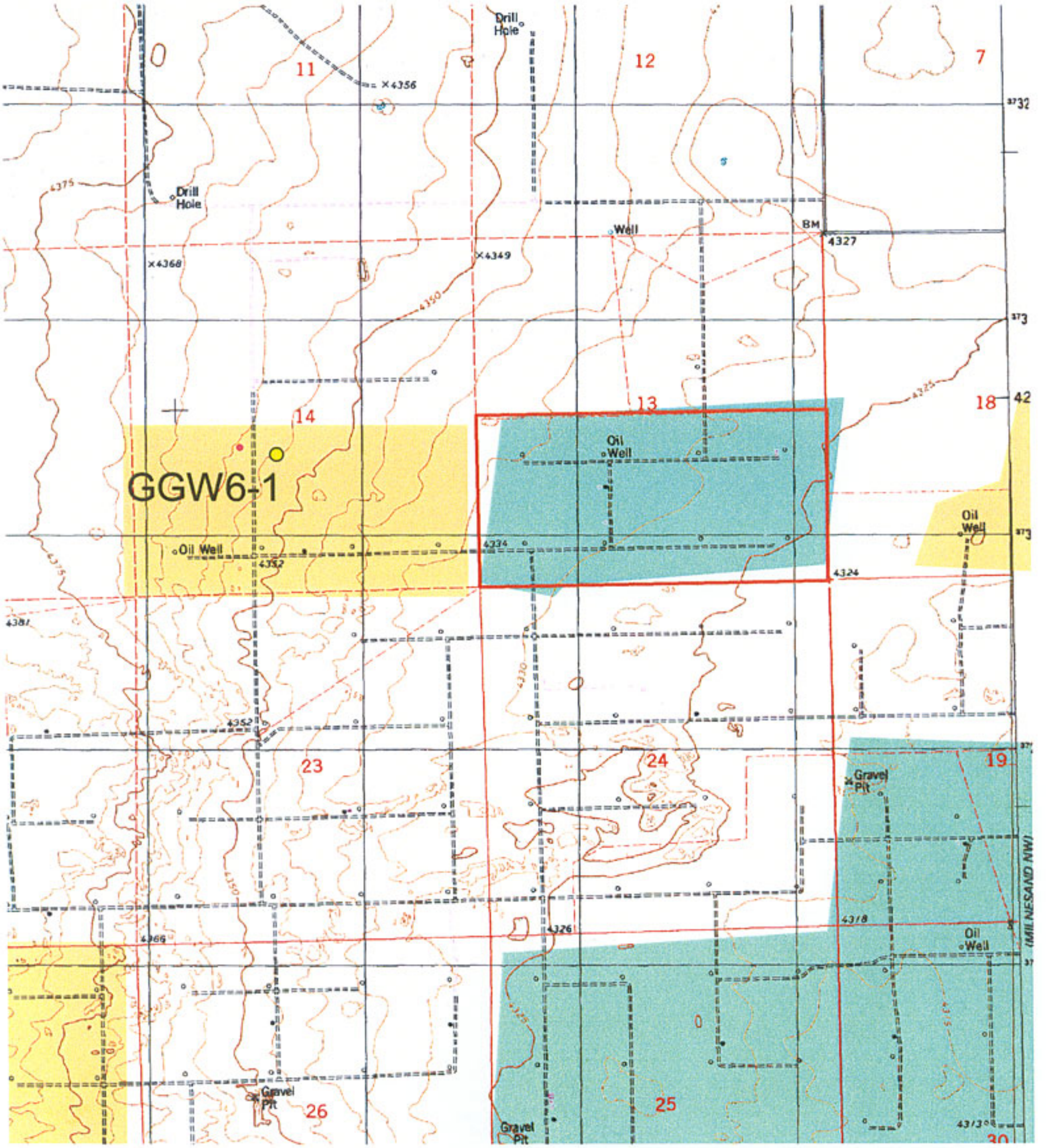
Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

N

Gallinas Wells #4, #5

Gallinas Wells #6



State
BLM

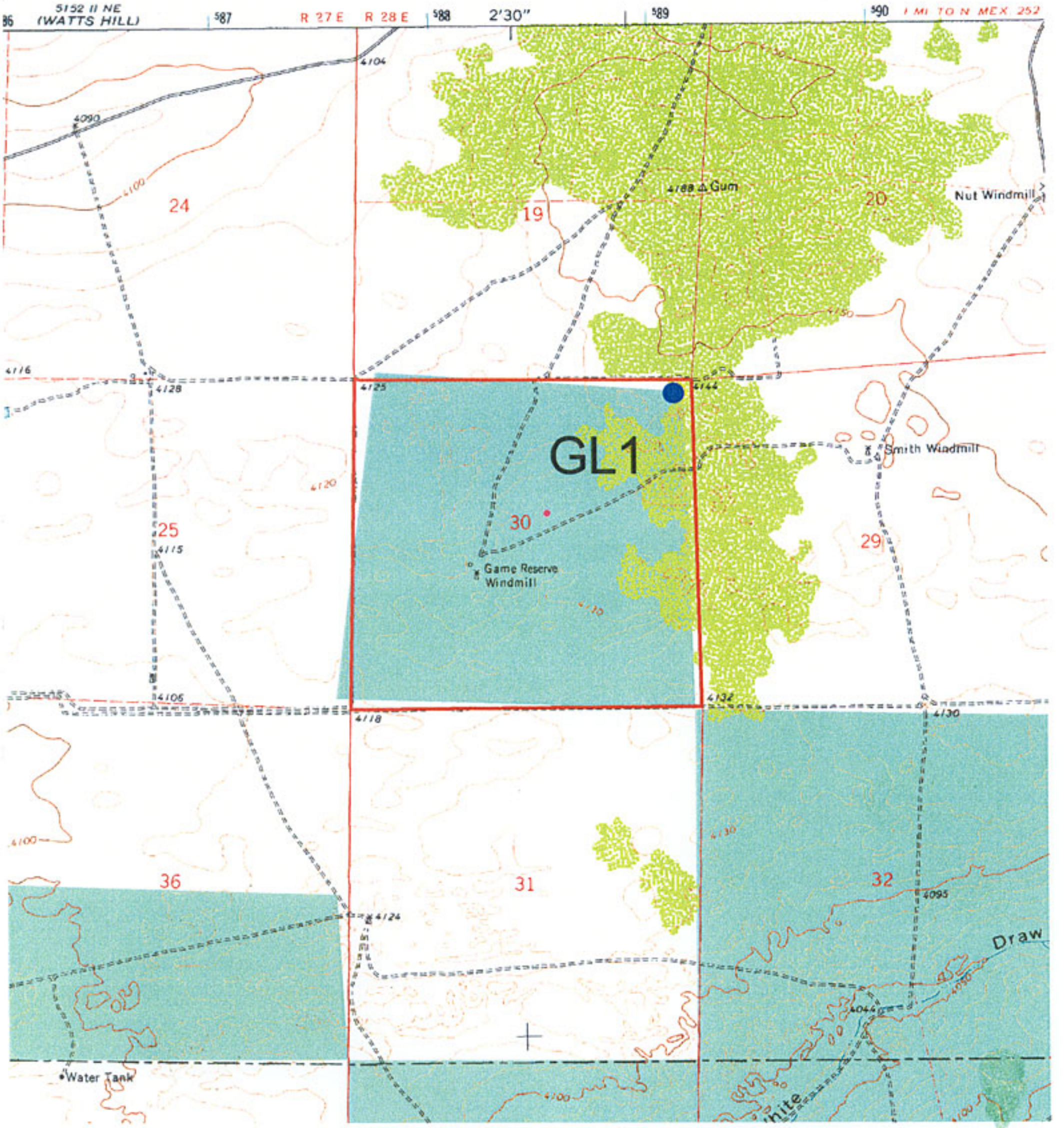
Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

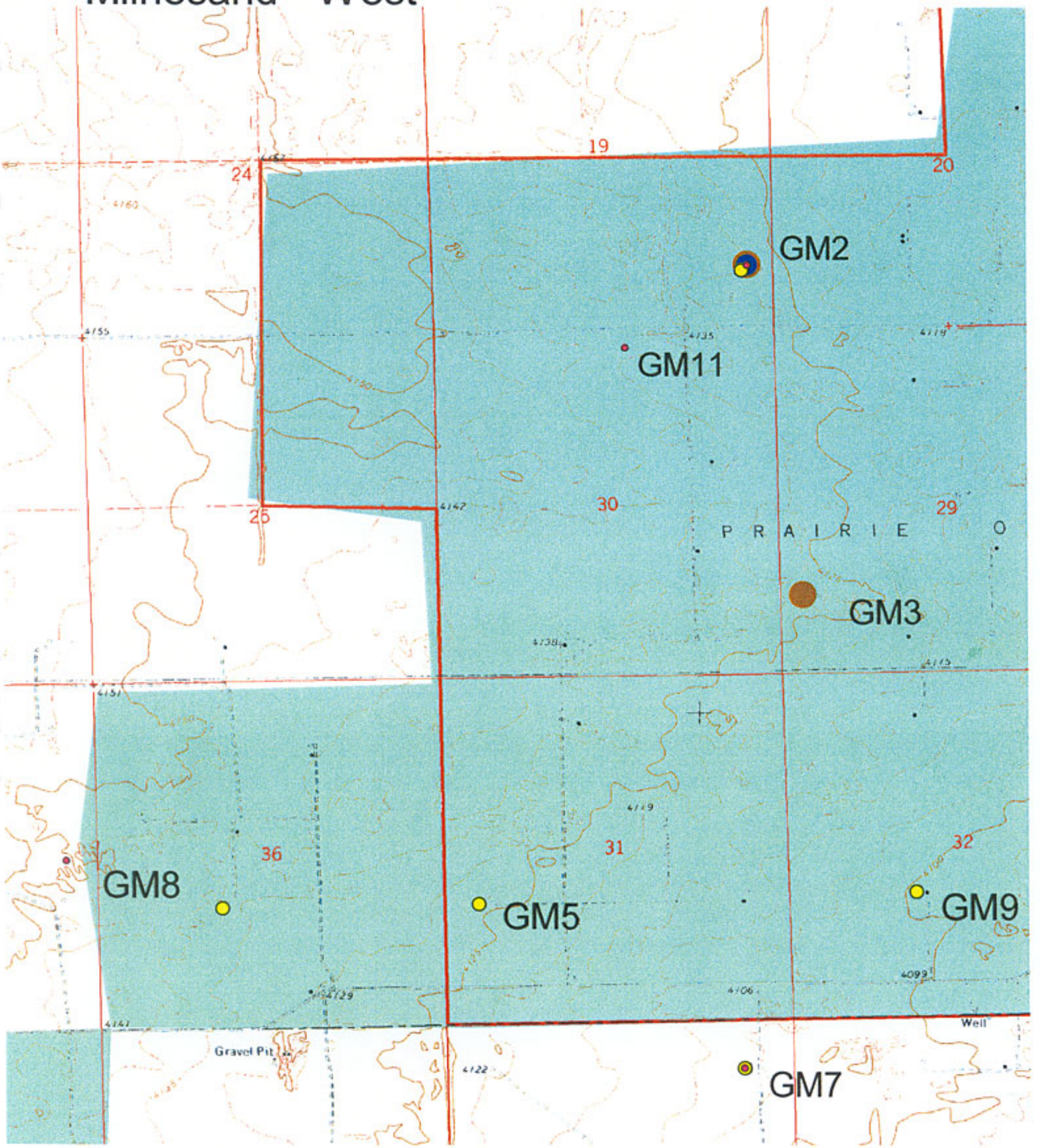
N

Liberty

7.5 MI



Milnesand - West



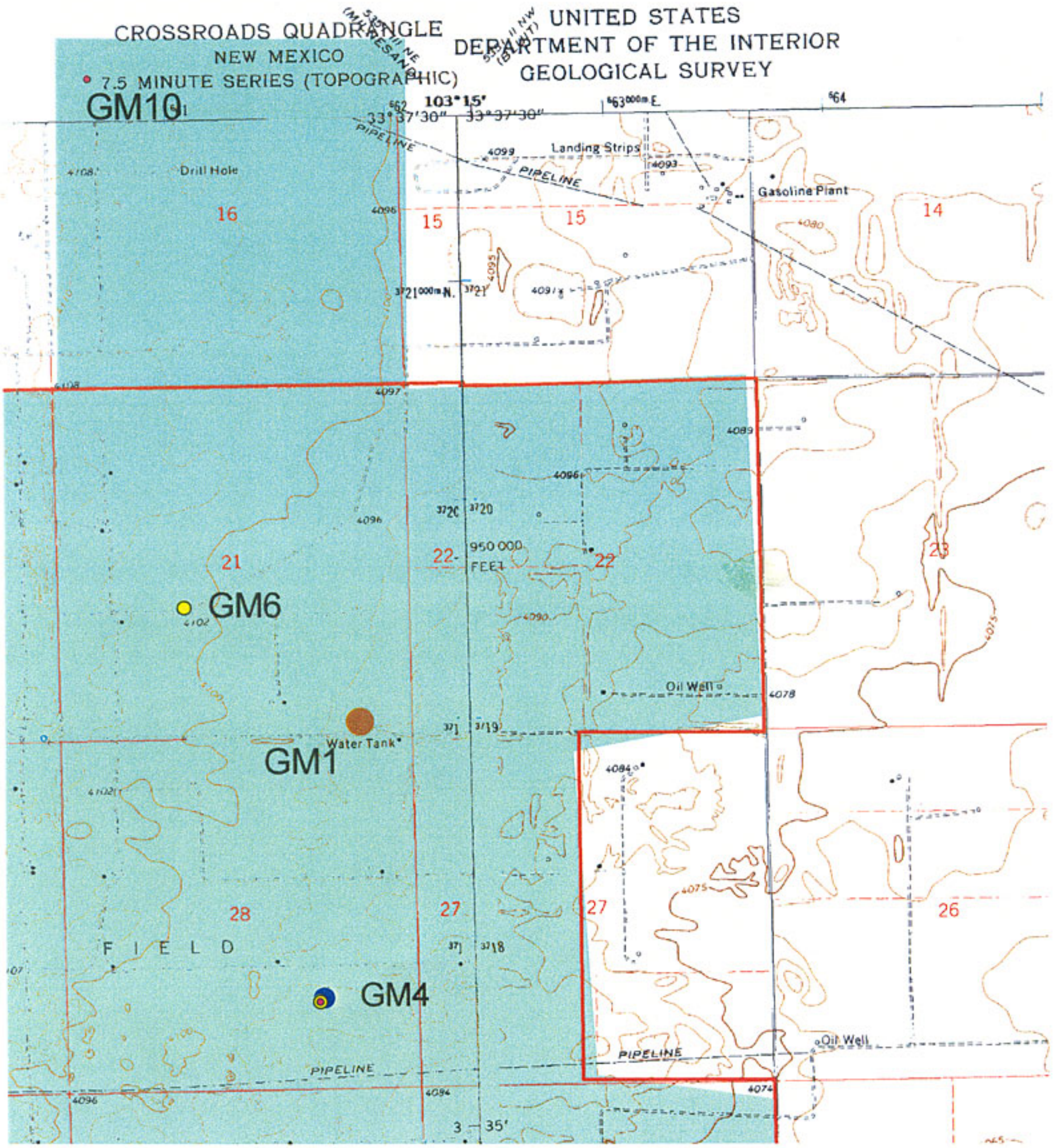
State
BLM

Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

N

Milnesand - East



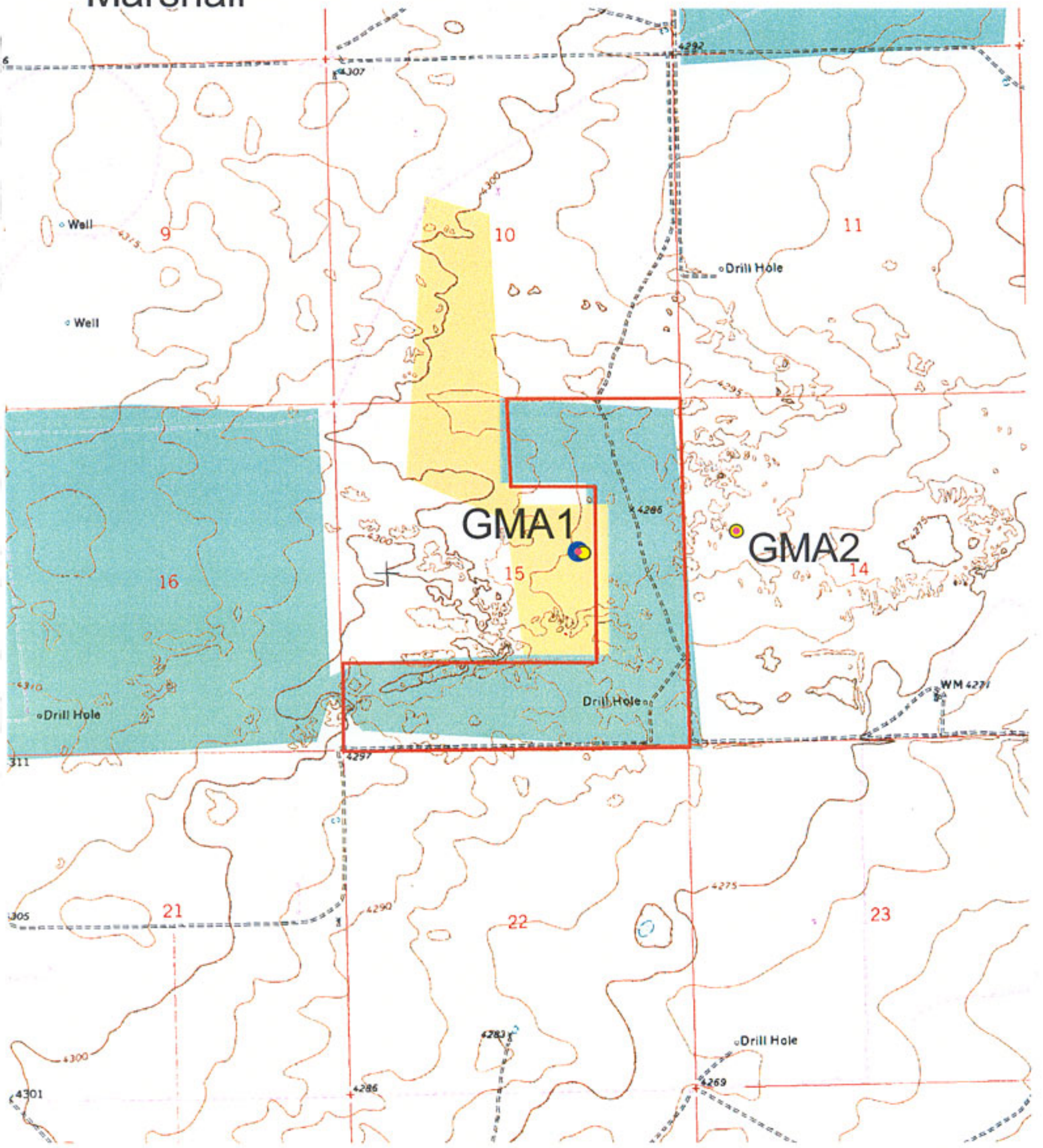
State
BLM

Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

N

Marshall



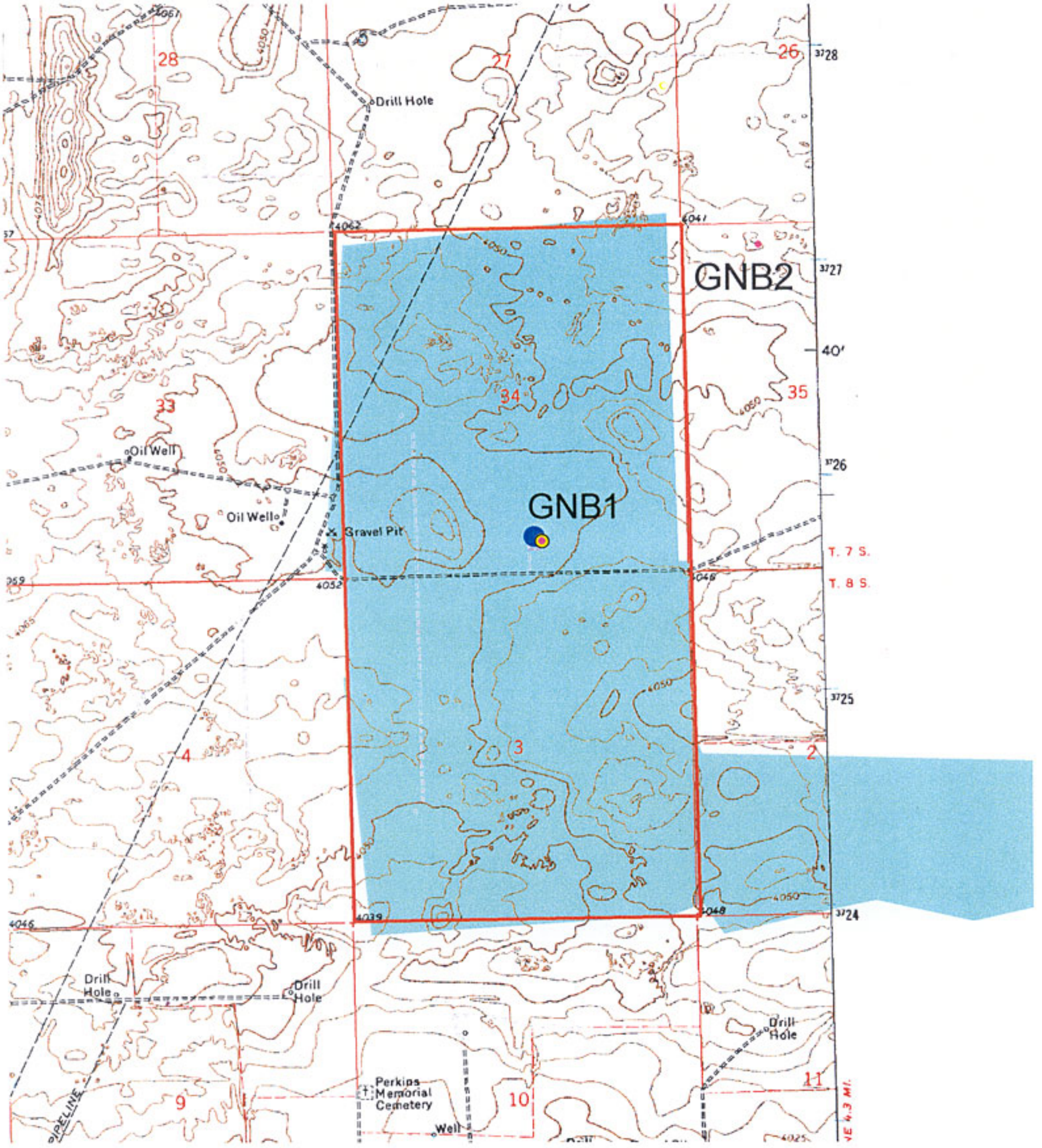
Survey Year

- State
- BLM
- 1996
- 1997
- 1998
- 1999

0 0.3 0.6 0.9 Miles

N

North Bluit



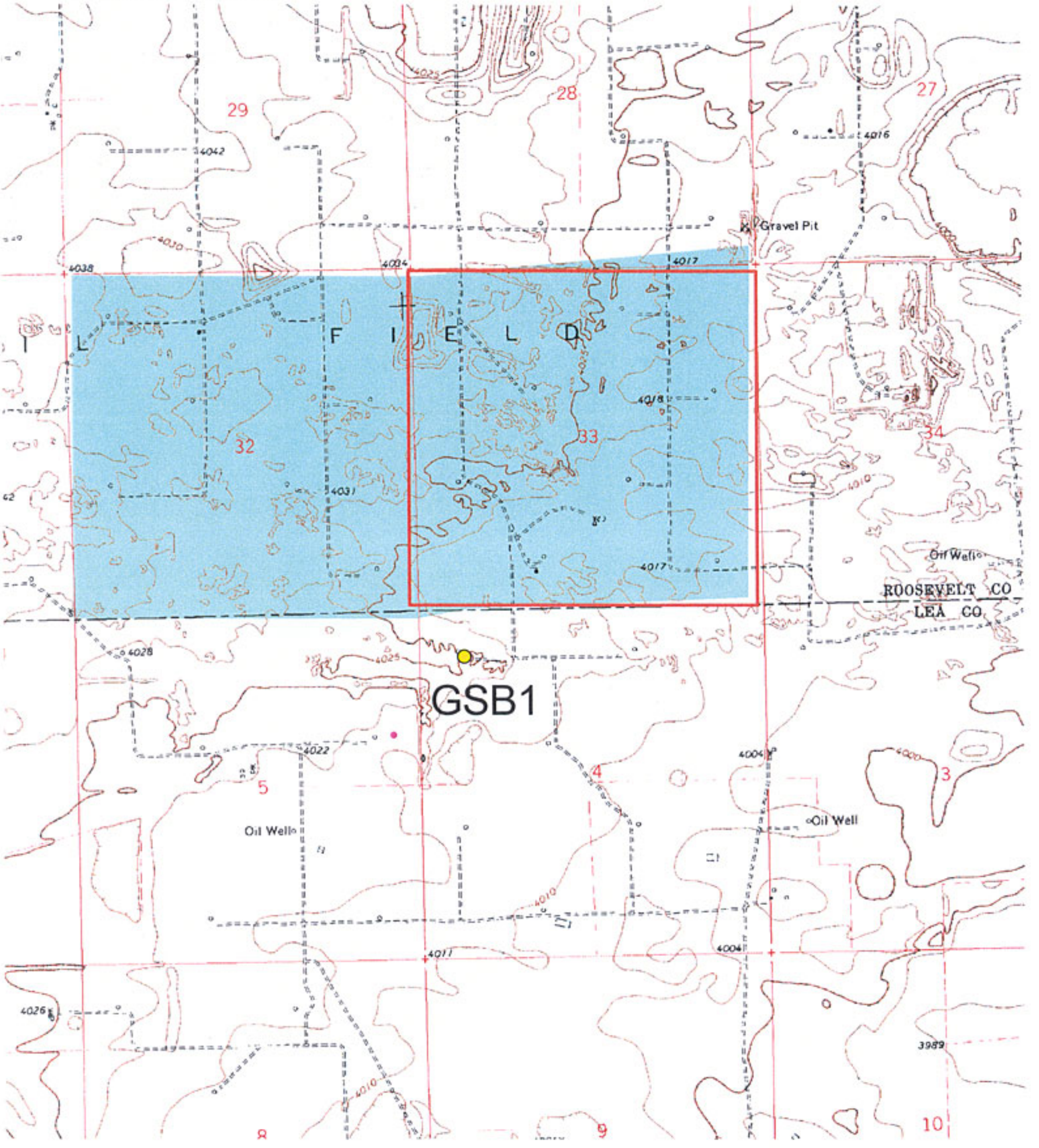
State
BLM

Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

N

South Bluit



State
BLM

Survey Year
1996
1997
1998
1999

0 0.3 0.6 0.9 Miles

N

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Appendix 1. UTM coordinates of all leks detected in 1999. For inaccessible leks, locations and UTMs were estimated from accessible locations.

Site	Northing	Easting
GL1	3774550	589115
GB2	3729875	652135
GB7	3728490	655650
GB10	3726520	652070
GB9	3727420	652060
GB8	3729500	650000
GNB1	3725710	672535
GNB1	3725710	672535
GSB1	3715260	670100
GNB2	3727070	673580
GM2	3719155	658775
GC1-5	3720000	642890
GC1-6	3718100	643460
GM11	3718770	658210
GC1-4	3717250	645090
GC1-6	3718100	643460
GC1-9	3715820	645340
GM10	3721920	660650
GM4	3717715	661710
GC2-1	3714700	634155
GM7	3715420	658750
GM8	3716160	656330
GC2-4	3713910	635590
GMA1	3730785	643765
GMA2	3730880	644500
GGW6-1	3730370	635620
GGW5-2	3730120	630920
GGW1-1	3726300	622010
GGW2-2	3729150	624050

Appendix 2. Data sheets from 1999 surveys of PCAs.