

**Prairie-Grouse Lek Survey for Spring 2012**  
**Grande Prairie Wind Energy Project, Holt County, Nebraska**

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Prepared for:

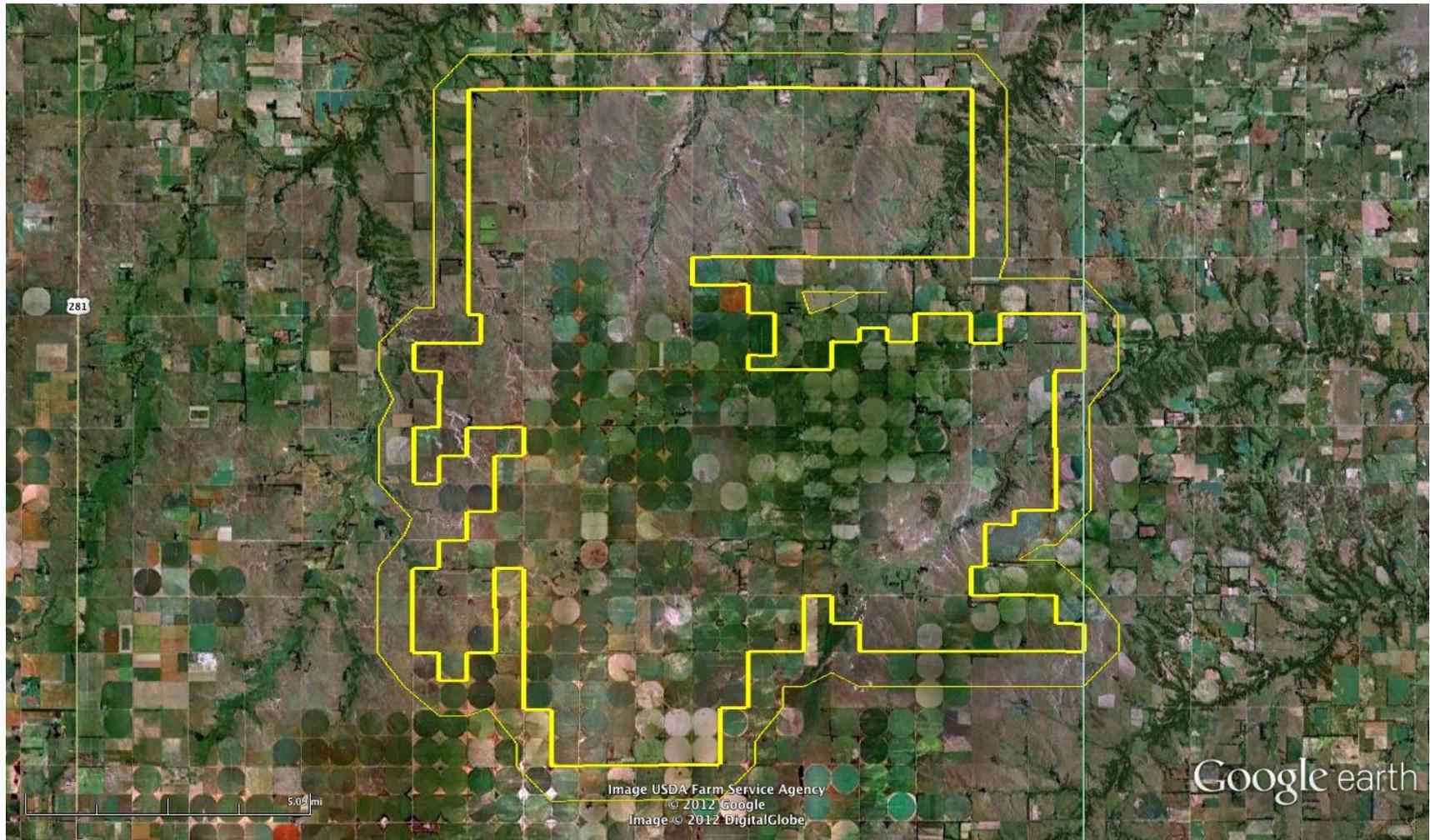
Grande Prairie Wind, LLC

23 August 2012

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**Figure 1-1.** Boundary (dark yellow polygon) of Grande Prairie Wind Energy Project with surrounding buffer zone 1 km wide (light yellow polygon).



## 1 INTRODUCTION

The Nebraska Game and Parks Commission (NGPC) has issued draft voluntary guidelines (NGPC 2012) for evaluating the risk of impacts of wind energy facilities on Nebraska's birds. Among various recommended studies is a Prairie Grouse Survey (hereafter the Survey). As stated in the guidelines, the purpose of the Survey is to determine prairie-grouse presence, lek locations within a wind farm area, and number of males and females that are likely using each lek. A comparison of pre and post-construction Surveys may indicate the effects of construction and operation of a wind farm on prairie-grouse attending leks.

This report describes a pre-construction Survey conducted in April 2012 at the site of the Grande Prairie Wind Energy Project (hereafter the Project), located in Holt County (Figure 1-1). Biologists from Olsson Associates in Mullen, Nebraska, collected the data, which was analyzed by Curry & Kerlinger, LLC, for the client, Midwest Wind Energy.

## 2 METHODS

Methods followed the draft voluntary guidelines of the NGPC (2012).

The site of the Grande Prairie Wind Energy Project measured 257.6 km<sup>2</sup>, but NPGC guidelines called for searching 1 km beyond the boundary, which added another 112.0 km<sup>2</sup> to be searched (total search area of 369.6 km<sup>2</sup>; see Figure 1-1).

Olsson Associates' strategy to survey such a large area thoroughly was twofold: (1) fly transects over the entire study area to locate leks, then (2) visit each lek three times on the ground to observe from a distance and tally the number of attending males and females. This methodology allowed Olsson Associates to get a "big picture" view of the study area with respect to prairie-grouse leks, then focus the effort on the ground to satisfy NGPC data requirements.

Olsson Associates assigned four qualified field ornithologists to conduct the Survey. They were Senior Scientist Tim Andersen, who oversaw the field team, and Heather Darrow, Dane Peterson, and Parker Maners. Their qualifications are described in Appendix A.

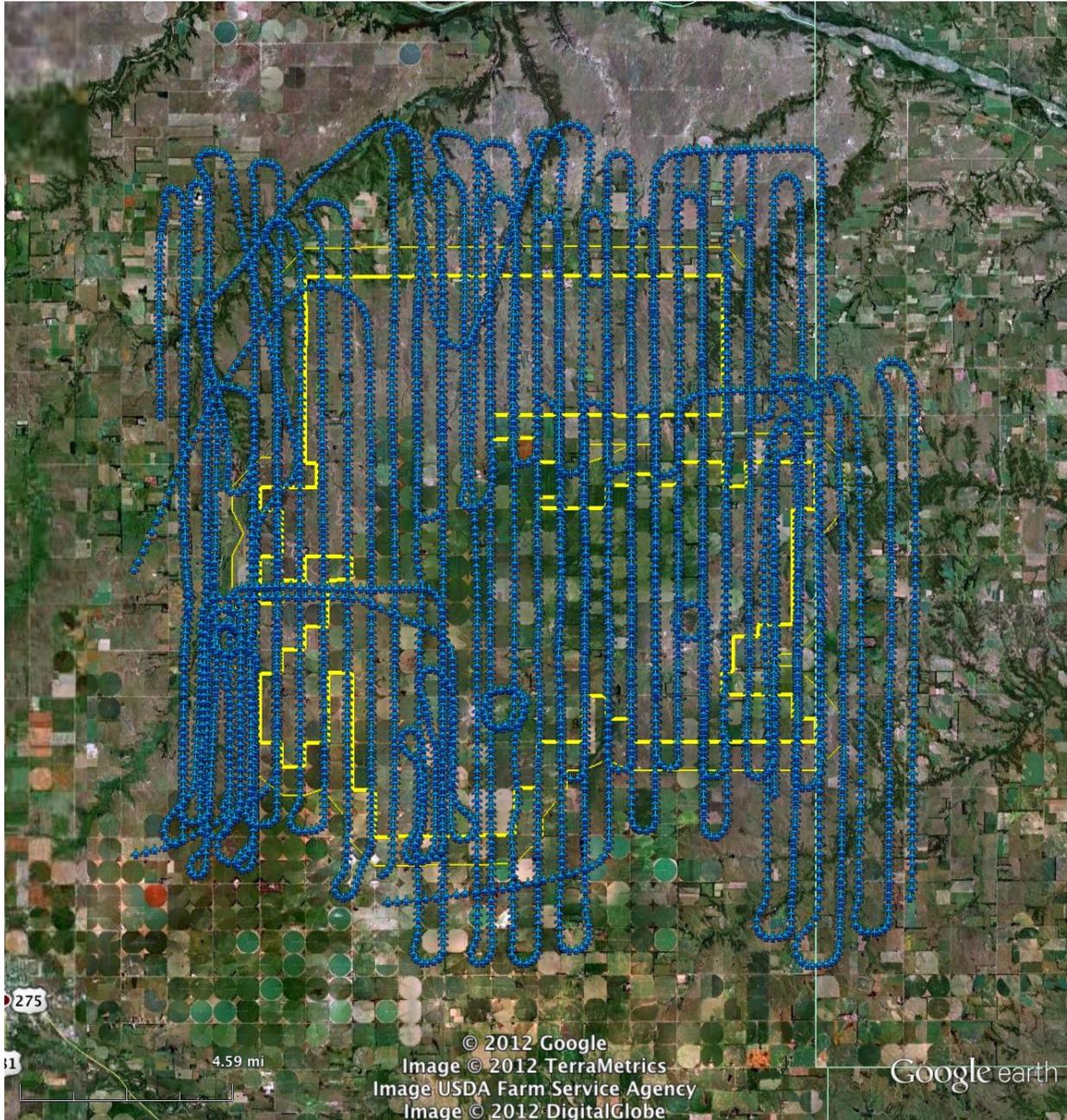
Flights were scheduled for three mornings (dawn to 2.5 hours after sunrise) in early April, but they could only be conducted on two mornings (3 and 5 April) because of adverse weather conditions. As stated in a protocol sent to NGPC for comment (*fide* Tim Andersen), north-south transects were flown 800 meters apart (0.5 miles), not 400 meters (0.25 miles) as specified in the NPGC guidelines. This was because the purpose of the flights was to locate leks for later census on the ground, not to census leks from the air. Two field ornithologists, one on each side of the aircraft, observed the entire study area at altitudes of 50-100 m at an approximate speed of 140 km/hr.

Subsequently (3-26 April), each lek was visited three times on the ground, where it was viewed from a distance with a spotting scope, and the following information was collected on a specially designed data sheet:

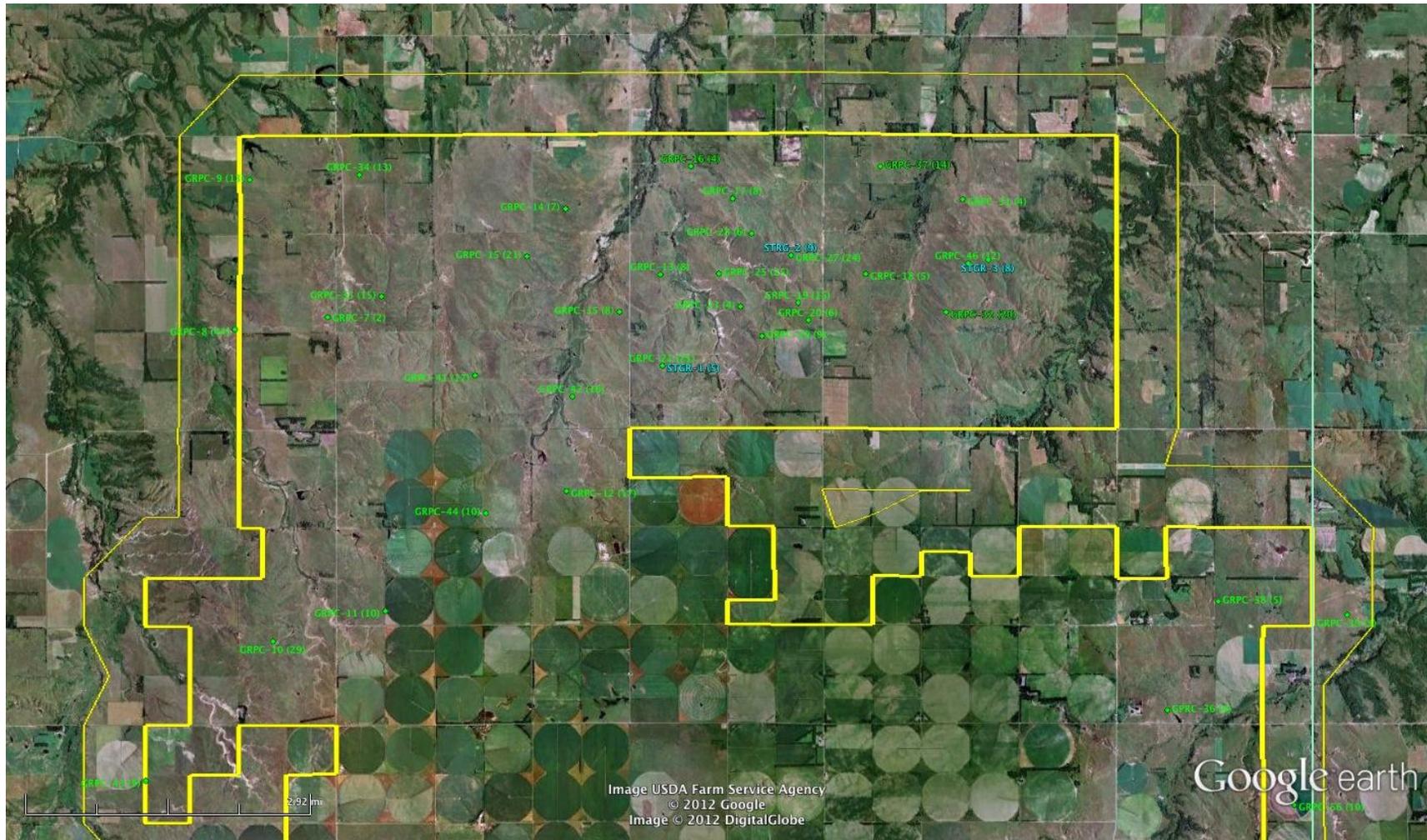
- Observer.
- Date of visit.
- Time of visit: Visits were made when light was adequate for counting and were to conclude by 2.5 hours post-sunrise. Nonetheless, due to adverse weather conditions and the large number of leks in the study area, evening surveys were also conducted between 2 hours before sunset to sunset.
- Species: Greater Prairie-Chicken or Sharp-tailed Grouse.
- Lek number: Olsson Associates identifier.
- Number of males.
- Number of females.
- Number of birds of unknown sex.
- Lek location: Recorded in decimal degrees in NAD83.
- Visit Number: Guidelines stipulated that each lek be visited three times to record the number of males and females attending the lek.
- Weather conditions, including temperature, cloud cover, precipitation, and wind speed and direction.
- Vegetation description, land-use description, and general comments.

Surveys were only conducted during favorable weather, which was defined as sunny, lacking precipitation, with winds <24 kph, and with visibility at least to 0.75 km. Weather information was recorded daily on the data sheet.

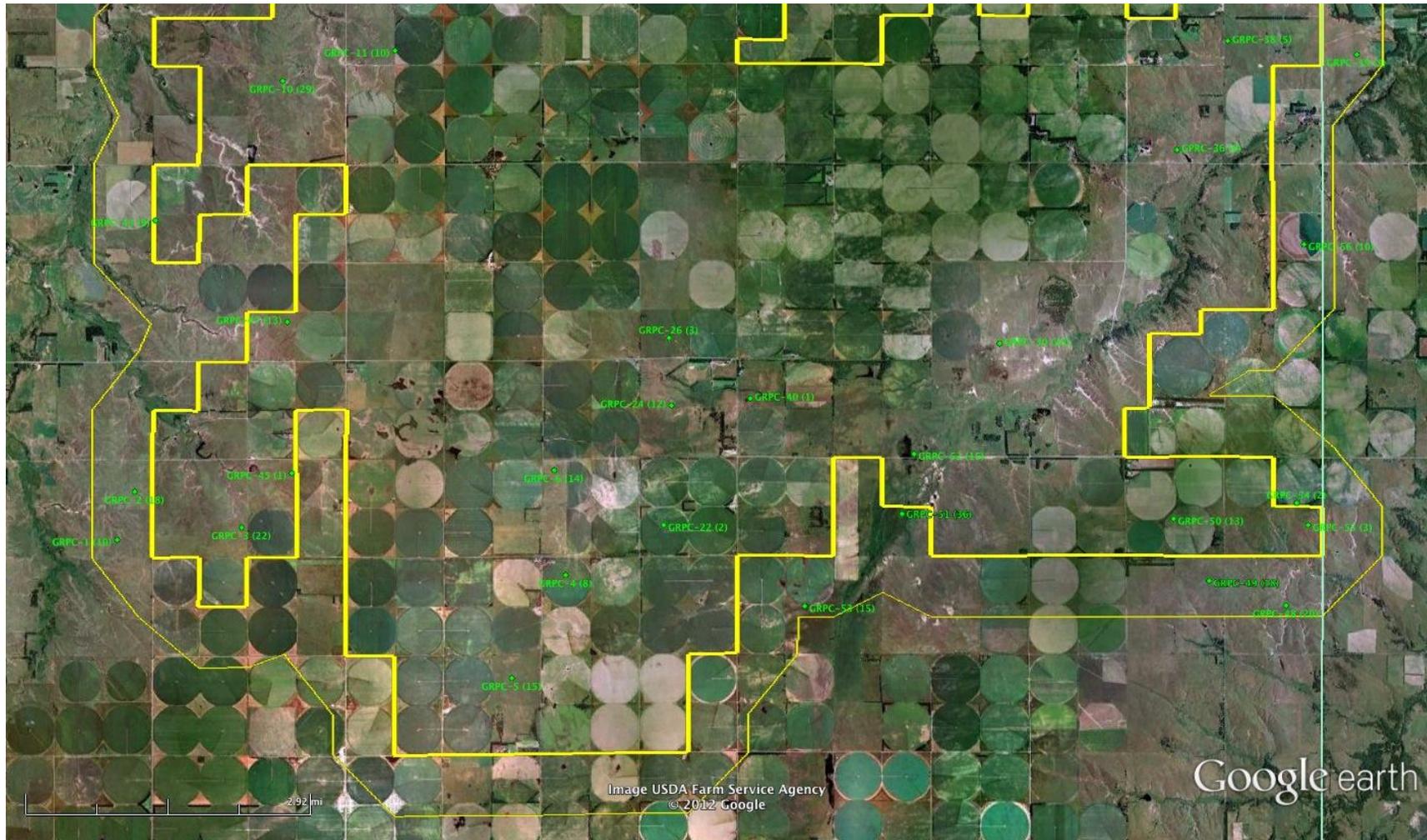
**Figure 3-1.** Flight transects flows to survey study area.



**Figure 3-2.** Prairie-grouse leks surveyed in the northern section of the project site. Leks are identified by the number after hyphens; see Tables 3-1, 3.1-1, and 3.2-1 for data. The numbers in parentheses indicate the maximum number of birds recorded in a visit.



**Figure 3-3.** Prairie-grouse leks surveyed in the southern section of the project site. Leks are identified by the number after hyphens; see Tables 3-1, 3.1-1, and 3.2-1 for data. The numbers in parentheses indicate the maximum number of birds recorded in a visit.



**Table 3-1. Prairie-grouse attendance at leks**

| Species | Lek # | Olsson Ref. # | Latitude  | Longitude  | Observer | Visit # | Date      | Time  | # males | # females | # unknown sex | total |
|---------|-------|---------------|-----------|------------|----------|---------|-----------|-------|---------|-----------|---------------|-------|
| GRPC    | 1     | PGMGL1        | 42.540563 | -98.547226 | DEP      | 1       | 4/3/2012  | 7:00  | 8       | 3         | 0             | 11    |
| GRPC    | 1     | PGMGL1        | 42.540563 | -98.547226 | PGM      | 2       | 4/8/2012  | 6:42  | 12      | 7         | 0             | 19    |
| GRPC    | 1     | PGMGL1        | 42.540563 | -98.547226 | PGM      | 3       | 4/11/2012 | 6:19  | 6       | 1         | 0             | 7     |
| GRPC    | 2     | PGMGL2        | 42.547698 | -98.543711 | DEP      | 1       | 4/3/2012  | 8:00  | 15      | 3         | 0             | 18    |
| GRPC    | 2     | PGMGL2        | 42.547698 | -98.543711 | PGM      | 2       | 4/8/2012  | 7:13  | 11      | 3         | 0             | 14    |
| GRPC    | 2     | PGMGL2        | 42.547698 | -98.543711 | PGM      | 3       | 4/11/2012 | 7:00  | 13      | 1         | 3             | 17    |
| GRPC    | 3     | PGMGL16       | 42.542442 | -98.522216 | DEP      | 1       | 4/3/2012  | 8:30  | 17      | 5         | 0             | 22    |
| GRPC    | 3     | PGMGL16       | 42.542442 | -98.522216 | PGM      | 2       | 4/11/2012 | 7:18  | 6       | 1         | 1             | 8     |
| GRPC    | 3     | PGMGL16       | 42.542442 | -98.522216 | PGM      | 3       | 4/11/2012 | 18:06 | 0       | 0         | 4             | 4     |
| GRPC    | 4     | HLek1         | 42.535512 | -98.457162 | HD       | 1       | 4/3/2012  | 8:35  | 7       | 1         | 0             | 8     |
| GRPC    | 4     | HLek1         | 42.535512 | -98.457162 | PGM      | 2       | 4/18/2012 | 18:20 | 0       | 0         | 0             | 0     |
| GRPC    | 4     | HLek1         | 42.535512 | -98.457162 | DEP      | 3       | 4/26/2012 | 7:30  | 7       | 0         | 1             | 8     |
| GRPC    | 5     | PGMGL5        | 42.520298 | -98.467929 | DEP      | 1       | 4/3/2012  | 8:40  | 11      | 4         | 0             | 15    |
| GRPC    | 5     | PGMGL5        | 42.520298 | -98.467929 | PGM      | 2       | 4/8/2012  | 19:32 | 0       | 0         | 6             | 6     |
| GRPC    | 5     | PGMGL5        | 42.520298 | -98.467929 | PGM      | 3       | 4/11/2012 | 19:55 | 4       | 1         | 0             | 5     |
| GRPC    | 6     | PGMGL6        | 42.550997 | -98.459499 | HD       | 1       | 4/3/2012  | 9:03  | 12      | 2         | 0             | 14    |
| GRPC    | 6     | PGMGL6        | 42.550997 | -98.459499 | PGM      | 2       | 4/9/2012  | 6:55  | 10      | 2         | 0             | 12    |
| GRPC    | 6     | PGMGL6        | 42.550997 | -98.459499 | PGM      | 3       | 4/11/2012 | 19:45 | 0       | 0         | 9             | 9     |
| GRPC    | 7     | TPAGL1        | 42.656298 | -98.503305 | TPA      | 1       | 4/8/2012  | 6:27  | 2       | 0         | 0             | 2     |
| GRPC    | 7     | TPAGL1        | 42.656298 | -98.503305 | DEP      | 2       | 4/11/2012 | 19:13 | 0       | 0         | 0             | 0     |
| GRPC    | 7     | TPAGL1        | 42.656298 | -98.503305 | DEP      | 3       | 4/25/2012 | 8:56  | 0       | 0         | 0             | 0     |
| GRPC    | 7     | TPAGL1        | 42.656298 | -98.503305 | DEP      | 4       | 4/26/2012 | 6:10  | 0       | 0         | 0             | 0     |
| GRPC    | 8     | TPAGL2        | 42.654477 | -98.521995 | TPA      | 1       | 4/8/2012  | 7:15  | 24      | 10        | 10            | 44    |
| GRPC    | 8     | TPAGL2        | 42.654477 | -98.521995 | DEP      | 2       | 4/11/2012 | 18:30 | 9       | 11        | 0             | 20    |
| GRPC    | 8     | TPAGL2        | 42.654477 | -98.521995 | DEP      | 3       | 4/25/2012 | 8:20  | 15      | 1         | 2             | 18    |
| GRPC    | 9     | TPAGL3        | 42.676575 | -98.519065 | TPA      | 1       | 4/8/2012  | 8:30  | 9       | 2         | 2             | 13    |
| GRPC    | 9     | TPAGL3        | 42.676575 | -98.519065 | DEP      | 2       | 4/11/2012 | 18:50 | 9       | 2         | 0             | 11    |

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|      |    |         |           |            |     |   |           |       |    |    |    |    |
|------|----|---------|-----------|------------|-----|---|-----------|-------|----|----|----|----|
| GRPC | 9  | TPAGL3  | 42.676575 | -98.519065 | DEP | 3 | 4/25/2012 | 8:11  | 6  | 1  | 0  | 7  |
| GRPC | 10 | PGMGL3  | 42.608414 | -98.514180 | PGM | 1 | 4/8/2012  | 8:40  | 14 | 12 | 0  | 26 |
| GRPC | 10 | PGMGL3  | 42.608414 | -98.514180 | PGM | 2 | 4/10/2012 | 18:26 | 21 | 6  | 2  | 29 |
| GRPC | 10 | PGMGL3  | 42.608414 | -98.514180 | PGM | 3 | 4/17/2012 | 19:31 | 8  | 4  | 2  | 14 |
| GRPC | 11 | PGMGL4  | 42.612927 | -98.491610 | PGM | 1 | 4/8/2012  | 9:04  | 7  | 3  | 0  | 10 |
| GRPC | 11 | PGMGL4  | 42.612927 | -98.491610 | PGM | 2 | 4/11/2012 | 19:17 | 0  | 0  | 10 | 10 |
| GRPC | 11 | PGMGL4  | 42.612927 | -98.491610 | PGM | 3 | 4/17/2012 | 19:45 | 0  | 0  | 0  | 0  |
| GRPC | 12 | TPAGL4  | 42.630692 | -98.455252 | TPA | 1 | 4/8/2012  | 9:10  | 0  | 0  | 7  | 7  |
| GRPC | 12 | TPAGL4  | 42.630692 | -98.455252 | DEP | 2 | 4/11/2012 | 18:30 | 6  | 2  | 0  | 8  |
| GRPC | 12 | TPAGL4  | 42.630692 | -98.455252 | DEP | 3 | 4/18/2012 | 19:53 | 15 | 2  | 0  | 17 |
| GRPC | 13 | TPAGL5  | 42.662695 | -98.436429 | TPA | 1 | 4/8/2012  | 18:20 | 5  | 3  | 0  | 8  |
| GRPC | 13 | TPAGL5  | 42.662695 | -98.436429 | DEP | 2 | 4/11/2012 | 19:50 | 3  | 0  | 1  | 4  |
| GRPC | 13 | TPAGL5  | 42.662695 | -98.436429 | DEP | 3 | 4/25/2012 | 7:30  | 5  | 0  | 0  | 5  |
| GRPC | 14 | TPAGL6  | 42.672367 | -98.455501 | TPA | 1 | 4/8/2012  | 18:35 | 4  | 1  | 2  | 7  |
| GRPC | 14 | TPAGL6  | 42.672367 | -98.455501 | DEP | 2 | 4/10/2012 | 9:03  | 3  | 0  | 2  | 5  |
| GRPC | 14 | TPAGL6  | 42.672367 | -98.455501 | DEP | 3 | 4/25/2012 | 7:20  | 5  | 0  | 0  | 5  |
| GRPC | 15 | TPAGL7  | 42.665349 | -98.463267 | TPA | 1 | 4/8/2012  | 18:50 | 9  | 0  | 12 | 21 |
| GRPC | 15 | TPAGL7  | 42.665349 | -98.463267 | DEP | 2 | 4/10/2012 | 9:17  | 14 | 3  | 2  | 19 |
| GRPC | 15 | TPAGL7  | 42.665349 | -98.463267 | DEP | 3 | 4/25/2012 | 7:25  | 15 | 2  | 0  | 17 |
| GRPC | 16 | TPAGL8  | 42.678679 | -98.430319 | TPA | 1 | 4/8/2012  | 19:05 | 3  | 0  | 1  | 4  |
| GRPC | 16 | TPAGL8  | 42.678679 | -98.430319 | DEP | 2 | 4/11/2012 | 19:45 | 3  | 1  | 0  | 4  |
| GRPC | 16 | TPAGL8  | 42.678679 | -98.430319 | DEP | 3 | 4/25/2012 | 7:45  | 2  | 0  | 0  | 2  |
| GRPC | 17 | TPAGL9  | 42.673930 | -98.421905 | TPA | 1 | 4/8/2012  | 19:15 | 3  | 0  | 0  | 3  |
| GRPC | 17 | TPAGL9  | 42.673930 | -98.421905 | DEP | 2 | 4/11/2012 | 6:35  | 8  | 0  | 0  | 8  |
| GRPC | 17 | TPAGL9  | 42.673930 | -98.421905 | DEP | 3 | 4/18/2012 | 18:30 | 0  | 0  | 0  | 0  |
| GRPC | 17 | TPAGL9  | 42.673930 | -98.421905 | DEP | 4 | 4/25/2012 | 6:10  | 1  | 0  | 0  | 1  |
| GRPC | 18 | TPAGL21 | 42.662824 | -98.395123 | TPA | 1 | 4/8/2012  | 19:45 | 3  | 0  | 1  | 4  |
| GRPC | 18 | TPAGL21 | 42.662824 | -98.395123 | TPA | 2 | 4/9/2012  | 19:50 | 2  | 1  | 1  | 4  |
| GRPC | 18 | TPAGL21 | 42.662824 | -98.395123 | DEP | 3 | 4/10/2012 | 7:50  | 4  | 0  | 0  | 4  |
| GRPC | 18 | TPAGL21 | 42.662824 | -98.395123 | DEP | 4 | 4/17/2012 | 19:25 | 4  | 0  | 1  | 5  |
| GRPC | 19 | TPAGL11 | 42.658553 | -98.408731 | TPA | 1 | 4/8/2012  | 20:00 | 11 | 2  | 0  | 13 |
| GRPC | 19 | TPAGL11 | 42.658553 | -98.408731 | DEP | 2 | 4/11/2012 | 7:00  | 10 | 0  | 2  | 12 |
| GRPC | 19 | TPAGL11 | 42.658553 | -98.408731 | DEP | 3 | 4/17/2012 | 19:40 | 9  | 0  | 3  | 12 |

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|      |    |         |           |            |     |   |           |       |    |   |    |    |
|------|----|---------|-----------|------------|-----|---|-----------|-------|----|---|----|----|
| GRPC | 19 | TPAGL11 | 42.658553 | -98.408731 | DEP | 4 | 4/18/2012 | 18:45 | 14 | 1 | 0  | 15 |
| GRPC | 20 | TPAGL12 | 42.655981 | -98.406657 | TPA | 1 | 4/8/2012  | 20:15 | 2  | 0 | 4  | 6  |
| GRPC | 20 | TPAGL12 | 42.655981 | -98.406657 | DEP | 2 | 4/11/2012 | 7:15  | 0  | 0 | 0  | 0  |
| GRPC | 20 | TPAGL12 | 42.655981 | -98.406657 | DEP | 3 | 4/17/2012 | 19:34 | 0  | 0 | 0  | 0  |
| GRPC | 21 | TPAGL13 | 42.649215 | -98.435977 | TPA | 1 | 4/9/2012  | 6:20  | 13 | 4 | 4  | 21 |
| GRPC | 21 | TPAGL13 | 42.649215 | -98.435977 | DEP | 2 | 4/18/2012 | 19:15 | 15 | 3 | 0  | 18 |
| GRPC | 21 | TPAGL13 | 42.649215 | -98.435977 | DEP | 3 | 4/25/2012 | 6:50  | 15 | 2 | 0  | 17 |
| GRPC | 22 | PGMGL7  | 42.542889 | -98.437451 | PGM | 1 | 4/9/2012  | 7:17  | 2  | 0 | 0  | 2  |
| GRPC | 22 | PGMGL7  | 42.542889 | -98.437451 | PGM | 2 | 4/11/2012 | 19:36 | 0  | 0 | 0  | 0  |
| GRPC | 22 | PGMGL7  | 42.542889 | -98.437451 | PGM | 3 | 4/18/2012 | 18:38 | 0  | 0 | 0  | 0  |
| GRPC | 23 | TPAGL14 | 42.657988 | -98.420285 | TPA | 1 | 4/9/2012  | 7:20  | 2  | 0 | 2  | 4  |
| GRPC | 23 | TPAGL14 | 42.657988 | -98.420285 | DEP | 2 | 4/11/2012 | 20:05 | 3  | 0 | 0  | 3  |
| GRPC | 23 | TPAGL14 | 42.657988 | -98.420285 | DEP | 3 | 4/18/2012 | 18:56 | 0  | 0 | 0  | 0  |
| GRPC | 23 | TPAGL14 | 42.657988 | -98.420285 | DEP | 4 | 4/25/2012 | 6:36  | 0  | 0 | 0  | 0  |
| GRPC | 24 | PGMGL8  | 42.560567 | -98.435961 | PGM | 1 | 4/9/2012  | 7:34  | 8  | 1 | 3  | 12 |
| GRPC | 24 | PGMGL8  | 42.560567 | -98.435961 | PGM | 2 | 4/11/2012 | 8:56  | 5  | 0 | 2  | 7  |
| GRPC | 24 | PGMGL8  | 42.560567 | -98.435961 | PGM | 3 | 4/17/2012 | 19:00 | 0  | 0 | 0  | 0  |
| GRPC | 24 | PGMGL8  | 42.560567 | -98.435961 | PGM | 4 | 4/18/2012 | 20:00 | 0  | 0 | 4  | 4  |
| GRPC | 25 | TPAGL15 | 42.662838 | -98.424659 | TPA | 1 | 4/9/2012  | 7:35  | 11 | 8 | 6  | 25 |
| GRPC | 25 | TPAGL15 | 42.662838 | -98.424659 | DEP | 2 | 4/18/2012 | 18:50 | 11 | 1 | 1  | 13 |
| GRPC | 25 | TPAGL15 | 42.662838 | -98.424659 | DEP | 3 | 4/25/2012 | 6:24  | 8  | 1 | 0  | 9  |
| GRPC | 26 | PGMGL9  | 42.570562 | -98.436490 | PGM | 1 | 4/9/2012  | 7:50  | 3  | 0 | 0  | 3  |
| GRPC | 26 | PGMGL9  | 42.570562 | -98.436490 | PGM | 2 | 4/11/2012 | 9:12  | 0  | 0 | 0  | 0  |
| GRPC | 26 | PGMGL9  | 42.570562 | -98.436490 | PGM | 3 | 4/17/2012 | 19:05 | 0  | 0 | 0  | 0  |
| GRPC | 27 | TPAGL16 | 42.665546 | -98.410165 | TPA | 1 | 4/9/2012  | 8:00  | 8  | 4 | 12 | 24 |
| GRPC | 27 | TPAGL16 | 42.665546 | -98.410165 | DEP | 2 | 4/10/2012 | 8:00  | 12 | 2 | 0  | 14 |
| GRPC | 27 | TPAGL16 | 42.665546 | -98.410165 | DEP | 3 | 4/11/2012 | 6:45  | 14 | 1 | 0  | 15 |
| GRPC | 27 | TPAGL16 | 42.665546 | -98.410165 | DEP | 4 | 4/24/2012 | 9:07  | 9  | 0 | 0  | 9  |
| GRPC | 28 | TPAGL17 | 42.668757 | -98.418113 | TPA | 1 | 4/9/2012  | 8:05  | 2  | 4 | 0  | 6  |
| GRPC | 28 | TPAGL17 | 42.668757 | -98.418113 | DEP | 2 | 4/18/2012 | 18:42 | 0  | 0 | 0  | 0  |
| GRPC | 28 | TPAGL17 | 42.668757 | -98.418113 | DEP | 3 | 4/25/2012 | 6:15  | 3  | 0 | 0  | 3  |
| GRPC | 29 | TPAGL18 | 42.653618 | -98.415968 | TPA | 1 | 4/9/2012  | 8:20  | 4  | 5 | 0  | 9  |
| GRPC | 29 | TPAGL18 | 42.653618 | -98.415968 | DEP | 2 | 4/18/2012 | 19:05 | 0  | 0 | 0  | 0  |

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|      |    |         |           |            |     |   |           |       |    |   |   |    |
|------|----|---------|-----------|------------|-----|---|-----------|-------|----|---|---|----|
| GRPC | 29 | TPAGL18 | 42.653618 | -98.415968 | DEP | 3 | 4/25/2012 | 6:41  | 5  | 0 | 0 | 5  |
| GRPC | 30 | PGMGL10 | 42.569778 | -98.370107 | PGM | 1 | 4/9/2012  | 8:34  | 4  | 3 | 5 | 12 |
| GRPC | 30 | PGMGL10 | 42.569778 | -98.370107 | PGM | 2 | 4/17/2012 | 18:36 | 5  | 0 | 1 | 6  |
| GRPC | 30 | PGMGL10 | 42.569778 | -98.370107 | PGM | 3 | 4/18/2012 | 18:56 | 5  | 0 | 5 | 10 |
| GRPC | 30 | PGMGL10 | 42.569778 | -98.370107 | DEP | 4 | 4/24/2012 | 7:55  | 18 | 2 | 0 | 20 |
| GRPC | 31 | TPAGL19 | 42.673837 | -98.375658 | TPA | 1 | 4/9/2012  | 19:15 | 1  | 0 | 3 | 4  |
| GRPC | 31 | TPAGL19 | 42.673837 | -98.375658 | DEP | 2 | 4/10/2012 | 7:30  | 0  | 0 | 0 | 0  |
| GRPC | 31 | TPAGL19 | 42.673837 | -98.375658 | DEP | 3 | 4/17/2012 | 19:20 | 0  | 0 | 0 | 0  |
| GRPC | 32 | TPAGL20 | 42.657171 | -98.378984 | TPA | 1 | 4/9/2012  | 19:35 | 13 | 0 | 1 | 14 |
| GRPC | 32 | TPAGL20 | 42.657171 | -98.378984 | DEP | 2 | 4/11/2012 | 8:25  | 17 | 3 | 0 | 20 |
| GRPC | 32 | TPAGL20 | 42.657171 | -98.378984 | DEP | 3 | 4/17/2012 | 18:30 | 16 | 0 | 3 | 19 |
| GRPC | 32 | TPAGL20 | 42.657171 | -98.378984 | DEP | 4 | 4/20/2012 | 9:15  | 13 | 0 | 3 | 16 |
| GRPC | 33 | DEPGL18 | 42.659380 | -98.492523 | DEP | 1 | 4/10/2012 | 6:10  | 9  | 0 | 1 | 10 |
| GRPC | 33 | DEPGL18 | 42.659380 | -98.492523 | DEP | 2 | 4/26/2012 | 6:30  | 13 | 2 | 0 | 15 |
| GRPC | 34 | DEPGL19 | 42.677341 | -98.496990 | DEP | 1 | 4/10/2012 | 6:22  | 11 | 1 | 1 | 13 |
| GRPC | 34 | DEPGL19 | 42.677341 | -98.496990 | DEP | 2 | 4/25/2012 | 7:59  | 11 | 1 | 1 | 13 |
| GRPC | 34 | DEPGL19 | 42.677341 | -98.496990 | DEP | 3 | 4/26/2012 | 7:00  | 12 | 1 | 0 | 13 |
| GRPC | 35 | DEPGL21 | 42.657160 | -98.444643 | DEP | 1 | 4/10/2012 | 6:37  | 7  | 0 | 1 | 8  |
| GRPC | 35 | DEPGL21 | 42.657160 | -98.444643 | DEP | 2 | 4/25/2012 | 7:35  | 8  | 0 | 0 | 8  |
| GRPC | 35 | DEPGL21 | 42.657160 | -98.444643 | DEP | 3 | 4/26/2012 | 7:19  | 7  | 0 | 0 | 7  |
| GRPC | 36 | PGMGL11 | 42.598394 | -98.334444 | PGM | 1 | 4/10/2012 | 6:47  | 6  | 1 | 2 | 9  |
| GRPC | 36 | PGMGL11 | 42.598394 | -98.334444 | PGM | 2 | 4/17/2012 | 17:54 | 4  | 2 | 0 | 6  |
| GRPC | 36 | PGMGL11 | 42.598394 | -98.334444 | PGM | 3 | 4/18/2012 | 19:10 | 4  | 1 | 0 | 5  |
| GRPC | 37 | DEPGL22 | 42.678695 | -98.392217 | DEP | 1 | 4/10/2012 | 7:00  | 5  | 2 | 3 | 10 |
| GRPC | 37 | DEPGL22 | 42.678695 | -98.392217 | DEP | 2 | 4/11/2012 | 6:20  | 10 | 0 | 3 | 13 |
| GRPC | 37 | DEPGL22 | 42.678695 | -98.392217 | DEP | 3 | 4/17/2012 | 19:09 | 11 | 0 | 3 | 14 |
| GRPC | 38 | PGMGL12 | 42.614470 | -98.324244 | PGM | 1 | 4/10/2012 | 7:26  | 2  | 3 | 0 | 5  |
| GRPC | 38 | PGMGL12 | 42.614470 | -98.324244 | PGM | 2 | 4/17/2012 | 18:14 | 0  | 0 | 0 | 0  |
| GRPC | 38 | PGMGL12 | 42.614470 | -98.324244 | PGM | 3 | 4/18/2012 | 19:31 | 0  | 0 | 0 | 0  |
| GRPC | 39 | PGMGL13 | 42.612467 | -98.298314 | PGM | 1 | 4/10/2012 | 8:01  | 3  | 0 | 0 | 3  |
| GRPC | 39 | PGMGL13 | 42.612467 | -98.298314 | PGM | 2 | 4/17/2012 | 18:24 | 0  | 0 | 0 | 0  |
| GRPC | 39 | PGMGL13 | 42.612467 | -98.298314 | PGM | 3 | 4/18/2012 | 19:16 | 0  | 0 | 0 | 0  |
| GRPC | 40 | PGMGL14 | 42.561632 | -98.420147 | PGM | 1 | 4/10/2012 | 8:51  | 1  | 0 | 0 | 1  |

Grande Prairie Wind Energy Project, Holt County, Nebraska

|      |    |         |           |            |     |   |           |       |    |   |   |    |
|------|----|---------|-----------|------------|-----|---|-----------|-------|----|---|---|----|
| GRPC | 40 | PGMGL14 | 42.561632 | -98.420147 | PGM | 2 | 4/11/2012 | 9:21  | 0  | 0 | 0 | 0  |
| GRPC | 40 | PGMGL14 | 42.561632 | -98.420147 | PGM | 3 | 4/17/2012 | 18:52 | 0  | 0 | 0 | 0  |
| GRPC | 41 | DEPGL26 | 42.647755 | -98.473662 | DEP | 1 | 4/10/2012 | 18:30 | 13 | 2 | 2 | 17 |
| GRPC | 41 | DEPGL26 | 42.647755 | -98.473662 | DEP | 2 | 4/11/2012 | 19:30 | 11 | 0 | 3 | 14 |
| GRPC | 41 | DEPGL26 | 42.647755 | -98.473662 | DEP | 3 | 4/18/2012 | 19:40 | 11 | 0 | 3 | 14 |
| GRPC | 42 | DEPGL27 | 42.644657 | -98.454091 | DEP | 1 | 4/10/2012 | 19:00 | 8  | 3 | 0 | 11 |
| GRPC | 42 | DEPGL27 | 42.644657 | -98.454091 | DEP | 2 | 4/11/2012 | 18:43 | 15 | 1 | 0 | 16 |
| GRPC | 42 | DEPGL27 | 42.644657 | -98.454091 | DEP | 3 | 4/18/2012 | 19:30 | 9  | 1 | 0 | 10 |
| GRPC | 43 | PGMGL15 | 42.587760 | -98.539678 | PGM | 1 | 4/10/2012 | 19:06 | 5  | 0 | 0 | 5  |
| GRPC | 43 | PGMGL15 | 42.587760 | -98.539678 | PGM | 2 | 4/11/2012 | 19:07 | 7  | 0 | 2 | 9  |
| GRPC | 43 | PGMGL15 | 42.587760 | -98.539678 | PGM | 3 | 4/17/2012 | 19:52 | 2  | 0 | 4 | 6  |
| GRPC | 44 | DEPGL28 | 42.627412 | -98.471446 | DEP | 1 | 4/10/2012 | 20:00 | 7  | 1 | 0 | 8  |
| GRPC | 44 | DEPGL28 | 42.627412 | -98.471446 | DEP | 2 | 4/11/2012 | 18:35 | 7  | 2 | 0 | 9  |
| GRPC | 44 | DEPGL28 | 42.627412 | -98.471446 | DEP | 3 | 4/18/2012 | 20:05 | 7  | 0 | 3 | 10 |
| GRPC | 45 | PGMGL17 | 42.550487 | -98.512188 | PGM | 1 | 4/11/2012 | 7:31  | 1  | 0 | 0 | 1  |
| GRPC | 45 | PGMGL17 | 42.550487 | -98.512188 | PGM | 2 | 4/11/2012 | 18:26 | 0  | 0 | 0 | 0  |
| GRPC | 45 | PGMGL17 | 42.550487 | -98.512188 | PGM | 3 | 4/18/2012 | 18:09 | 0  | 0 | 0 | 0  |
| GRPC | 46 | DEPGL30 | 42.664388 | -98.374531 | DEP | 1 | 4/11/2012 | 8:20  | 7  | 1 | 0 | 8  |
| GRPC | 46 | DEPGL30 | 42.664388 | -98.374531 | DEP | 2 | 4/17/2012 | 18:10 | 9  | 2 | 0 | 11 |
| GRPC | 46 | DEPGL30 | 42.664388 | -98.374531 | DEP | 3 | 4/20/2012 | 8:45  | 11 | 1 | 0 | 12 |
| GRPC | 47 | PGMGL18 | 42.572829 | -98.513143 | PGM | 1 | 4/11/2012 | 8:21  | 10 | 2 | 1 | 13 |
| GRPC | 47 | PGMGL18 | 42.572829 | -98.513143 | PGM | 2 | 4/11/2012 | 18:52 | 8  | 2 | 0 | 10 |
| GRPC | 47 | PGMGL18 | 42.572829 | -98.513143 | PGM | 3 | 4/18/2012 | 17:58 | 6  | 0 | 0 | 6  |
| GRPC | 48 | DEPGL31 | 42.531084 | -98.312586 | DEP | 1 | 4/11/2012 | 8:35  | 13 | 2 | 1 | 16 |
| GRPC | 48 | DEPGL31 | 42.531084 | -98.312586 | DEP | 2 | 4/19/2012 | 18:15 | 12 | 0 | 4 | 16 |
| GRPC | 48 | DEPGL31 | 42.531084 | -98.312586 | DEP | 3 | 4/20/2012 | 8:10  | 15 | 0 | 3 | 18 |
| GRPC | 48 | DEPGL31 | 42.531084 | -98.312586 | DEP | 4 | 4/26/2012 | 8:19  | 17 | 1 | 2 | 20 |
| GRPC | 49 | DEPGL32 | 42.534726 | -98.328022 | DEP | 1 | 4/11/2012 | 8:39  | 13 | 1 | 2 | 16 |
| GRPC | 49 | DEPGL32 | 42.534726 | -98.328022 | DEP | 2 | 4/19/2012 | 18:25 | 15 | 2 | 1 | 18 |
| GRPC | 49 | DEPGL32 | 42.534726 | -98.328022 | DEP | 3 | 4/20/2012 | 8:15  | 12 | 2 | 1 | 15 |
| GRPC | 49 | DEPGL32 | 42.534726 | -98.328022 | DEP | 4 | 4/26/2012 | 8:30  | 7  | 0 | 0 | 7  |
| GRPC | 50 | DEPGL33 | 42.543890 | -98.335183 | DEP | 1 | 4/11/2012 | 8:45  | 7  | 0 | 3 | 10 |
| GRPC | 50 | DEPGL33 | 42.543890 | -98.335183 | DEP | 2 | 4/19/2012 | 18:35 | 9  | 2 | 1 | 12 |

Grande Prairie Wind Energy Project, Holt County, Nebraska

|      |    |         |           |            |     |   |           |       |    |   |   |    |
|------|----|---------|-----------|------------|-----|---|-----------|-------|----|---|---|----|
| GRPC | 50 | DEPGL33 | 42.543890 | -98.335183 | DEP | 3 | 4/20/2012 | 8:20  | 10 | 1 | 2 | 13 |
| GRPC | 50 | DEPGL33 | 42.543890 | -98.335183 | DEP | 4 | 4/26/2012 | 8:02  | 6  | 0 | 0 | 6  |
| GRPC | 51 | DEPGL34 | 42.544610 | -98.389689 | DEP | 1 | 4/11/2012 | 8:50  | 29 | 0 | 4 | 33 |
| GRPC | 51 | DEPGL34 | 42.544610 | -98.389689 | DEP | 2 | 4/24/2012 | 6:15  | 30 | 2 | 2 | 34 |
| GRPC | 51 | DEPGL34 | 42.544610 | -98.389689 | DEP | 3 | 4/26/2012 | 8:39  | 33 | 3 | 0 | 36 |
| GRPC | 52 | DEPGL35 | 42.553455 | -98.387283 | DEP | 1 | 4/11/2012 | 8:57  | 12 | 2 | 1 | 15 |
| GRPC | 52 | DEPGL35 | 42.553455 | -98.387283 | DEP | 2 | 4/24/2012 | 7:30  | 12 | 2 | 1 | 15 |
| GRPC | 52 | DEPGL35 | 42.553455 | -98.387283 | DEP | 3 | 4/26/2012 | 6:14  | 8  | 2 | 0 | 10 |
| GRPC | 53 | DEPGL36 | 42.530971 | -98.409187 | DEP | 1 | 4/11/2012 | 9:04  | 13 | 0 | 2 | 15 |
| GRPC | 53 | DEPGL36 | 42.530971 | -98.409187 | DEP | 2 | 4/24/2012 | 8:30  | 13 | 0 | 2 | 15 |
| GRPC | 53 | DEPGL36 | 42.530971 | -98.409187 | DEP | 3 | 4/26/2012 | 9:05  | 5  | 0 | 1 | 6  |
| GRPC | 54 | DEPGL37 | 42.546242 | -98.310431 | DEP | 1 | 4/11/2012 | 9:15  | 1  | 0 | 0 | 1  |
| GRPC | 54 | DEPGL37 | 42.546242 | -98.310431 | DEP | 2 | 4/18/2012 | 8:15  | 1  | 1 | 0 | 2  |
| GRPC | 54 | DEPGL37 | 42.546242 | -98.310431 | DEP | 3 | 4/20/2012 | 8:00  | 0  | 0 | 0 | 0  |
| GRPC | 54 | DEPGL37 | 42.546242 | -98.310431 | DEP | 4 | 4/23/2012 | 18:38 | 0  | 0 | 0 | 0  |
| GRPC | 55 | DEPGL38 | 42.542952 | -98.308131 | DEP | 1 | 4/11/2012 | 9:20  | 1  | 0 | 0 | 1  |
| GRPC | 55 | DEPGL38 | 42.542952 | -98.308131 | DEP | 2 | 4/18/2012 | 6:50  | 2  | 0 | 0 | 2  |
| GRPC | 55 | DEPGL38 | 42.542952 | -98.308131 | DEP | 3 | 4/20/2012 | 7:00  | 2  | 0 | 1 | 3  |
| GRPC | 56 | PGMGL19 | 42.584414 | -98.308962 | PGM | 1 | 4/23/2012 | 20:11 | 8  | 1 | 0 | 9  |
| GRPC | 56 | PGMGL19 | 42.584414 | -98.308962 | PGM | 2 | 4/24/2012 | 18:41 | 6  | 1 | 0 | 7  |
| GRPC | 56 | PGMGL19 | 42.584414 | -98.308962 | PGM | 3 | 4/25/2012 | 6:58  | 8  | 2 | 0 | 10 |
| STGR | 1  | TPAGL13 | 42.649215 | -98.435977 | TPA | 1 | 4/9/2012  | 6:20  | 0  | 0 | 0 | 0  |
| STGR | 1  | TPAGL13 | 42.649215 | -98.435977 | DEP | 2 | 4/18/2012 | 19:15 | 0  | 0 | 0 | 0  |
| STGR | 1  | TPAGL13 | 42.649215 | -98.435977 | DEP | 3 | 4/25/2012 | 6:50  | 5  | 0 | 0 | 5  |
| STGR | 2  | TPAGL16 | 42.665546 | -98.410165 | TPA | 1 | 4/9/2012  | 8:00  | 0  | 0 | 0 | 0  |
| STGR | 2  | TPAGL16 | 42.665546 | -98.410165 | DEP | 2 | 4/10/2012 | 8:00  | 4  | 0 | 2 | 6  |
| STGR | 2  | TPAGL16 | 42.665546 | -98.410165 | DEP | 3 | 4/11/2012 | 6:45  | 7  | 0 | 2 | 9  |
| STGR | 2  | TPAGL16 | 42.665546 | -98.410165 | DEP | 4 | 4/24/2012 | 9:07  | 6  | 0 | 0 | 6  |
| STGR | 3  | DEPGL29 | 42.664877 | -98.370485 | DEP | 1 | 4/11/2012 | 8:15  | 4  | 3 | 1 | 8  |
| STGR | 3  | DEPGL29 | 42.664877 | -98.370485 | DEP | 2 | 4/17/2012 | 18:15 | 0  | 0 | 6 | 6  |
| STGR | 3  | DEPGL29 | 42.664877 | -98.370485 | DEP | 3 | 4/20/2012 | 9:00  | 5  | 0 | 1 | 6  |

### 3 RESULTS

Flight transects flown on 3 and 5 April 2012 (Figure 3-1) discovered 56 leks. Those leks were surveyed on the ground on 13 days from 3 to 26 April 2012. Table 3-1 presents the data. Note that leks in Table 3-1 are numbered in the order of when they were first visited on the ground. Identifiers used by Olsson Associates are also included in the table.

As noted above, some lek visits were conducted during evening hours (2 hours before sunset to sunset). Olsson Associates deemed this acceptable because males were found to display actively during those hours. Nonetheless, male presence was less during evening hours than during morning hours. For example, mean males attending leks ( $\pm$  SE) in 80 evening surveys was  $5.1 \pm 0.6$ , while in 110 morning surveys, mean males attending leks was  $8.1 \pm 0.6$  ( $p = 0.0008$ ). However, all but four leks (41, 42, 43, and 44) were surveyed at least once during the morning.

Two species of prairie-grouse were present at the Grande Prairie site: Greater Prairie-Chicken and Sharp-tailed Grouse. Lek distributions are illustrated in Figures 3-2 and 3-3.

#### 3.1 Greater Prairie-Chicken (GRPC)

A total of 56 GRPC leks were recorded in the 2012 Survey (Table 3.1-1), of which 45 were considered active (i.e., traditional, or regularly attended) and 11 were considered marginal (i.e., nontraditional, or irregularly attended by small numbers of birds). Maximum males at active leks averaged  $11.5 \pm 0.9$ , and the maximum number of all birds averaged  $15.1 \pm 1.2$ . When maximum males and all birds at all leks (active and marginal) were considered, the study area was found to have a population of 538 males and 713 males, females, and birds of unknown sex.

#### 3.2 Sharp-tailed Grouse (STGR)

Compared with the GRPC, the STGR was relatively scarce in the study area. Only three leks were found, two active and one marginal (Table 3.2-1). Two of those leks appeared to be mixed with GRPC leks. Lek STGR-1 was found at GRPC-21, and STGR-2 was found at GRPC-26. Maximum males at active leks averaged  $6.0 \pm 1.0$ , and the maximum number of all birds averaged  $8.5 \pm 0.5$ . When maximum males and all birds at all leks (active and marginal) were considered, the study area was found to have a population of 17 males and 22 males, females, and birds of unknown sex.

**Table 3.1-1. GRPC leks recorded**

| Species | Lek # | Olsson Ref. # | Latitude  | Longitude  | Lek Status | Maximum confirmed males | Maximum all birds |
|---------|-------|---------------|-----------|------------|------------|-------------------------|-------------------|
| GRPC    | 1     | PGMGL1        | 42.540563 | -98.547226 | Active     | 12                      | 19                |
| GRPC    | 2     | PGMGL2        | 42.547698 | -98.543711 | Active     | 15                      | 18                |
| GRPC    | 3     | PGMGL16       | 42.542442 | -98.522216 | Active     | 17                      | 22                |
| GRPC    | 4     | HLek1         | 42.535512 | -98.457162 | Active     | 7                       | 8                 |
| GRPC    | 5     | PGMGL5        | 42.520298 | -98.467929 | Active     | 11                      | 15                |
| GRPC    | 6     | PGMGL6        | 42.550997 | -98.459499 | Active     | 12                      | 14                |
| GRPC    | 7     | TPAGL1        | 42.656298 | -98.503305 | Marginal   | 2                       | 2                 |
| GRPC    | 8     | TPAGL2        | 42.654477 | -98.521995 | Active     | 24                      | 44                |
| GRPC    | 9     | TPAGL3        | 42.676575 | -98.519065 | Active     | 9                       | 13                |
| GRPC    | 10    | PGMGL3        | 42.608414 | -98.514180 | Active     | 21                      | 29                |
| GRPC    | 11    | PGMGL4        | 42.612927 | -98.491610 | Active     | 7                       | 10                |
| GRPC    | 12    | TPAGL4        | 42.630692 | -98.455252 | Active     | 15                      | 17                |
| GRPC    | 13    | TPAGL5        | 42.662695 | -98.436429 | Active     | 5                       | 8                 |
| GRPC    | 14    | TPAGL6        | 42.672367 | -98.455501 | Active     | 5                       | 7                 |
| GRPC    | 15    | TPAGL7        | 42.665349 | -98.463267 | Active     | 15                      | 21                |
| GRPC    | 16    | TPAGL8        | 42.678679 | -98.430319 | Active     | 3                       | 4                 |
| GRPC    | 17    | TPAGL9        | 42.673930 | -98.421905 | Active     | 8                       | 8                 |
| GRPC    | 18    | TPAGL21       | 42.662824 | -98.395123 | Active     | 4                       | 5                 |
| GRPC    | 19    | TPAGL11       | 42.658553 | -98.408731 | Active     | 14                      | 15                |
| GRPC    | 20    | TPAGL12       | 42.655981 | -98.406657 | Marginal   | 2                       | 6                 |
| GRPC    | 21    | TPAGL13       | 42.649215 | -98.435977 | Active     | 15                      | 21                |
| GRPC    | 22    | PGMGL7        | 42.542889 | -98.437451 | Marginal   | 2                       | 2                 |
| GRPC    | 23    | TPAGL14       | 42.657988 | -98.420285 | Marginal   | 3                       | 4                 |
| GRPC    | 24    | PGMGL8        | 42.560567 | -98.435961 | Active     | 8                       | 12                |
| GRPC    | 25    | TPAGL15       | 42.662838 | -98.424659 | Active     | 11                      | 25                |
| GRPC    | 26    | PGMGL9        | 42.570562 | -98.436490 | Marginal   | 3                       | 3                 |
| GRPC    | 27    | TPAGL16       | 42.665546 | -98.410165 | Active     | 14                      | 24                |
| GRPC    | 28    | TPAGL17       | 42.668757 | -98.418113 | Active     | 3                       | 6                 |
| GRPC    | 29    | TPAGL18       | 42.653618 | -98.415968 | Active     | 5                       | 9                 |
| GRPC    | 30    | PGMGL10       | 42.569778 | -98.370107 | Active     | 18                      | 20                |
| GRPC    | 31    | TPAGL19       | 42.673837 | -98.375658 | Marginal   | 1                       | 4                 |
| GRPC    | 32    | TPAGL20       | 42.657171 | -98.378984 | Active     | 17                      | 20                |
| GRPC    | 33    | DEPGL18       | 42.659380 | -98.492523 | Active     | 13                      | 15                |
| GRPC    | 34    | DEPGL19       | 42.677341 | -98.496990 | Active     | 12                      | 13                |
| GRPC    | 35    | DEPGL21       | 42.657160 | -98.444643 | Active     | 8                       | 8                 |
| GRPC    | 36    | PGMGL11       | 42.598394 | -98.334444 | Active     | 6                       | 9                 |
| GRPC    | 37    | DEPGL22       | 42.678695 | -98.392217 | Active     | 10                      | 14                |
| GRPC    | 38    | PGMGL12       | 42.614470 | -98.324244 | Marginal   | 2                       | 5                 |
| GRPC    | 39    | PGMGL13       | 42.612467 | -98.298314 | Marginal   | 3                       | 3                 |
| GRPC    | 40    | PGMGL14       | 42.561632 | -98.420147 | Marginal   | 1                       | 1                 |

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|      |    |         |           |            |          |    |    |
|------|----|---------|-----------|------------|----------|----|----|
| GRPC | 41 | DEPGL26 | 42.647755 | -98.473662 | Active   | 13 | 17 |
| GRPC | 42 | DEPGL27 | 42.644657 | -98.454091 | Active   | 15 | 16 |
| GRPC | 43 | PGMGL15 | 42.587760 | -98.539678 | Active   | 7  | 9  |
| GRPC | 44 | DEPGL28 | 42.627412 | -98.471446 | Active   | 7  | 10 |
| GRPC | 45 | PGMGL17 | 42.550487 | -98.512188 | Marginal | 1  | 1  |
| GRPC | 46 | DEPGL30 | 42.664388 | -98.374531 | Active   | 11 | 12 |
| GRPC | 47 | PGMGL18 | 42.572829 | -98.513143 | Active   | 10 | 13 |
| GRPC | 48 | DEPGL31 | 42.531084 | -98.312586 | Active   | 17 | 20 |
| GRPC | 49 | DEPGL32 | 42.534726 | -98.328022 | Active   | 15 | 18 |
| GRPC | 50 | DEPGL33 | 42.543890 | -98.335183 | Active   | 10 | 13 |
| GRPC | 51 | DEPGL34 | 42.544610 | -98.389689 | Active   | 33 | 36 |
| GRPC | 52 | DEPGL35 | 42.553455 | -98.387283 | Active   | 12 | 15 |
| GRPC | 53 | DEPGL36 | 42.530971 | -98.409187 | Active   | 13 | 15 |
| GRPC | 54 | DEPGL37 | 42.546242 | -98.310431 | Marginal | 1  | 2  |
| GRPC | 55 | DEPGL38 | 42.542952 | -98.308131 | Active   | 2  | 3  |
| GRPC | 56 | PGMGL19 | 42.584414 | -98.308962 | Active   | 8  | 10 |

**Table 3.2-1. STGR leks recorded**

| Species | Lek # | Olsson Ref. # | Latitude  | Longitude  | Lek Status | Maximum confirmed males | Maximum all birds |
|---------|-------|---------------|-----------|------------|------------|-------------------------|-------------------|
| STGR    | 1     | TPAGL13       | 42.649215 | -98.435977 | Marginal   | 5                       | 5                 |
| STGR    | 2     | TPAGL16       | 42.665546 | -98.410165 | Active     | 7                       | 9                 |
| STGR    | 3     | DEPGL29       | 42.664877 | -98.370485 | Active     | 5                       | 8                 |

## 4 DISCUSSION

According to Johnson et al. (2011), densities of males and/or booming grounds (i.e., leks) are frequently used to evaluate the status of Greater Prairie-Chicken populations, with estimates of male density showing considerable annual and regional variation, from 0 to >10 males/100 ha.

In the entire study area (359.6 km<sup>2</sup>, or 359,600 ha), a maximum of 538 male GRPCs were recorded. This yields a density of 1.5 males/100 ha, which is near the low end of the range given above. Nonetheless, Figures 3.2 and 3.3 show that GRPC leks were largely clustered outside of irrigated crop circles, which accounted for roughly 50% of the study area. When those areas are excluded, male GRPC density increases to about 3.0 males/100 ha.

Connelly et al. (1998) reported that lek density for Sharp-tailed Grouse in Nebraska has been measured at 0.02-0.25 leks/100 ha. The two active leks found in the study area yield a density of 0.01 leks/100 ha. Those leks were found in the northern half of the study area, where grassland habitat is least fragmented.

As may be appreciated in the density calculations above, the GRPC was much more abundant in the study area than the STGR. This is likely because the Project site is well within the current year-round range of the GRPC (Johnson et al. 2011) while it is at the southeastern edge of the current range of the STGR (Connelly et al. 1998).

### Literature Cited

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**APPENDIX A. Qualifications of field biologists who conducted the 2012 Survey.**

**Tim Andersen**

**Senior Scientist**

**Bachelor of Arts, Biology, Environmental Studies; Dana College, 2001**

**Olsson Professional Experience, 2005 to Present**

**Total Professional Experience, 1999 to Present**

Tim is an experienced field biologist and project manager with relevant project experience that emphasizes on biological assessments for avifauna and flora supporting renewable energy, land development, and transportation projects located in the Midwest. In support of wind energy development, floral assessments have included habitat surveys for rare and threatened and endangered species or vegetative communities, whooping crane stopover risk assessments, wetland delineations, grassland suitability surveys, and floristic quality assessments. Avian studies include breeding bird and avian use surveys using various methodologies including line transects, distance sampling, and point/plot counts. Additional avian studies include Migratory Bird Treaty Act nesting surveys, sharp-tailed grouse and greater prairie chicken lek surveys, and nesting raptor surveys. Tim is proficient in visual and aural bird identification for species prevalent in the Midwest. He is also an active member of the Nebraska Wind and Wildlife Working Group.

**Heather Darrow**

**Assistant Scientist**

**Bachelor of Science, Biology; Beloit College, 2003**

**Olsson Professional Experience, 2011 to Present**

**Total Professional Experience, 2003 to Present**

As a field biologist, Heather's experience includes a range of field surveys pertaining to threatened and endangered species, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Act. She has provided support for projects that have included wind energy development, oil/gas exploration and development, logging, U.S. Air Force, Army National Guard, and commercial infrastructure projects. Her background has included extensive avian surveys for projects involving lek counts for sharp-tailed grouse, greater prairie chickens and lesser prairie chickens, raptor nest surveys, fixed-point bird use surveys, spotted owl presence/absence, whooping crane monitoring, bald eagle winter roost surveys, and greater sage grouse brood counts. At her previous employ with Western EcoSystems Technology, Inc., Heather performed numerous point-count migration surveys and line-transect surveys for raptor species, and is well-versed in playback methods for attracting raptors and habitat and nest characterization. Heather provides statistical analysis and prepares a range of pre- and post-construction reports for wind energy development projects.

**Dane Peterson**

**Associate Scientist**

**Bachelor of Science, Wildlife and Fisheries; University of Nebraska-Lincoln, 2008**

**Olsson Professional Experience, 2010 to Present**

**Total Professional Experience, 2008 to Present**

Dane is a field biologist specializing in avian and bat surveys for wind energy projects. Avian studies have included ground and aerial raptor nest and sharp-tailed grouse/greater prairie chicken lek surveys, breeding bird and avian use surveys, habitat assessments, and Migratory Bird Treaty Act nesting surveys. He is proficient in visual and aural bird identification for species prevalent in the Midwest. Surveys for bats have included habitat assessments and passive acoustical monitoring and analysis using Wildlife Acoustics SM2BAT and Titley Electronics AnaBat detectors. In addition, Dane has conducted habitat surveys for rare and threatened and endangered species or vegetative communities, wetland delineations, and floristic quality assessments.

**Parker Maners**

**Assistant Scientist**

**Bachelor of Science, Biology; Southeast Missouri State University, 2011**

**Olsson Professional Experience, 2012 to Present**

**Total Professional Experience, 2011 to Present**

Parker is a biologist that is relatively new to Olsson Associates. He supports field staff with conducting wildlife and habitat surveys for wind energy projects. Field surveys have included surveys for prairie grouse and raptor nests, wetland delineations and orchid surveys. In his previous employment, Parker conducted post-construction mortality monitoring for a wind farm located in Indiana.