A Brief Summary of Annual Avian Abundance and Avian Use of Drain Habitat in the Corrales Bosque, 2004-2016

Since 2004, Hawks Aloft, Inc. has conducted avian monitoring in the middle Rio Grande bosque between Rio Rancho and the La Joya Waterfowl Management Area. Currently, we survey 81 transects (averaging 800 m in length), including 22 in the Corrales bosque (see Figures 1-5), during both winter and summer. In response to requests from multiple entities, this brief summary of data from 2004-2016 documents changes in annual avian abundance in the Corrales bosque as a whole and compares avian abundance and richness between drain (DR) transects (i.e. sites incorporating "clear ditch" habitat) that have understory vegetation on the west edge (DR 5) with those where the west edge vegetation has been cleared (DR 6).

To be consistent with the landmark, early 1980's Middle Rio Grande Biological Survey (Hink and Ohmart 1984), we followed the survey protocol and density estimate calculations described by Emlen (1971), and modified by Balph et al. (1977) and Anderson et al. (1977). Observers slowly walked the length of each transect, recording all birds seen or heard within the transect strip. Observers recorded the lateral distance of the bird from the transect line using the following distance classes: <5 m, 5-15 m, 16-30 m, 31-45 m, 46-60 m, 61-80 m, and 81-122 m. For drain transects, only detections within 30 m were recorded. Avian density estimates were calculated and expressed as the number of birds per 100 acres. We calculated the number of birds per 100 acres based on our observations within 30 m of the transect line. We chose 30 m as our limit for density estimates because it is accepted that skilled observers can estimate out to that distance to within approximately 10% of the actual distance; accuracy declines beyond 30 m (Emlen 1971, Verner and Ritter 1988, Rumble and Gobeille 2004). In addition, our ability to detect birds rapidly decreased beyond 30 m, especially in dense habitat. We defined avian richness as the number of species per transect documented at densities ≥1.5 individuals per 100 acres. By choosing ≥1.5 individuals per 100 acres as the density threshold for inclusion in species richness calculations, multiple individuals of a species had to be observed on a given transect for the season in question. As with density calculations, only detections recorded within 30 m of a transect line were included in richness calculations. Statistical analyses comparing avian density and species richness across habitat types and/or years were conducted using post-hoc Tukey-Kramer tests. We set statistical significance for all comparisons at $\alpha \leq 0.05$. All statistical analyses were conducted using JMP 5.0 statistical software.

Avian density in the Corrales bosque was consistently lower during summer in 2010-2016 than 2004-2009 and consistently lower during winter in 2011-2016 than 2005-2010 (Tables 1 and 2). During summer, density was significantly lower in all years from 2010-2016 than all years from 2005-2009 (Tukey-Kramer test). During winter, density during all years from 2011-2016 was lower than all years from 2005-2010, and winter density during all years from 2011-2016 was significantly lower than 2007 and 2010. Widespread drought was a key factor in the lower densities recorded from summer 2010 through winter 2014. But, other management areas within the middle Rio Grande saw recoveries in density beginning in summer 2014 that did not occur in Corrales.

Vegetation removal is the other key factor in the reduction of avian use in recent years. The first significant vegetation removal in Corrales occurred in late winter 2011 when the west side of the drain north of the Harvey Jones channel was completely cleared. This clearing resulted in a significant decrease in avian density and richness during both summer and winter on the two transects impacted (Tukey-Kramer tests; Tables 3-6). From 2012 through 2015, restoration and swale/bank terrace construction by the U.S. Army Corps of Engineers (USACE) resulted in the removal of large amounts of woody vegetation throughout the Corrales bosque. The removal of this vegetation negatively impacted avian use through summer 2016. Hopefully, revegetation efforts and the creation of swale/bank terrace habitat by USACE will enhance bird numbers in the future. But, the growth of new vegetation has generally not yet been substantial enough to begin supporting increased numbers of birds. Additionally, sporadic thinning efforts, presumably by NM Department of Forestry crews, occurred in USACE project areas during fall 2016/winter 2017. This thinning appeared to primarily target Russian olive, which had intentionally been retained by USACE during their restoration work. Our long-term data from the bosque has clearly shown that Russian olive (along with cottonwood and New Mexico olive) is one of the three most important plant species for bosque birds. This additional loss of Russian olive plants specifically retained by USACE, especially larger, berry-producing individuals with complex structure desirable for nesting birds, is likely to further reduce avian use in Corrales.

Among the 22 transects we surveyed in Corrales were six drain transects. Three of these transects (NW11, NW20, and NW22) retained substantial woody vegetation on the west edge of the drain (or “clear ditch”) and are classified as DR 5 habitat (dense understory). The other three (NW08, NW25, and NW27) have been cleared to the west of the drain and are classified as DR 6 (sparse or open understory). NW08 retained some cottonwood canopy on the west edge of the drain, but NW25 and NW27 retained no woody vegetation.

During summer, both cumulative avian density and cumulative avian richness were significantly higher at all three DR 5 transects than at any of the three DR 6 transects (Tukey-Kramer tests; Tables 7 and 8). Among DR 6 transects, summer avian density at NW08, which incorporates some cottonwood canopy, was significantly higher than the two DR 6 transects lacking any woody vegetation. There was no significant difference in summer avian richness between any of the DR 6 transects. Similar to summer, cumulative winter avian density and avian richness were both significantly higher at all three DR 5 transects than at any of the three DR 6 transects (Tukey-Kramer tests; Tables 9 and 10). Among DR 5 transects, winter avian density was significantly higher at NW22 than NW11 and winter avian richness was significantly higher at NW22 than NW20. Among DR 6 transects, winter density was significantly higher at NW08 than NW25 and NW27. There was no significant difference in winter richness among DR 6 transects.

These data clearly show the importance of maintaining vegetation on the west edge of the drain (DR 5 habitat) to the avian community in terms of both density and richness. The dense vegetation present on the west edge of the drain in Corrales is critical during winter, when it may be the most important habitat for birds within the entire middle Rio Grande bosque. This edge habitat provides critical cover, foraging habitat, and safe access to water for wintering birds. Among the 81 transects we survey, the three DR 5 transects support some of the highest winter avian density (2nd, 5th and 6th) and avian richness (1st, 4th and 5th; see Table 11). Combined into a distinct habitat type, these three transects support both the highest winter avian density and winter avian richness among the 22 bosque habitat types we survey.

Although avian use of the DR 5 transects during summer appears more modest, it provides critical breeding, foraging, and migration habitat for numerous species. Despite the limited width of the vegetation on the west edge of the drain at these transects, both summer avian density (24th, 25th and 27th of 81 transects) and richness (28th, 34th and 35th of 81 transects) are higher than average (Table 11). In contrast, the three DR 6 transects in Corrales, which lack understory vegetation on the west edge of the drain, support some of the lowest levels of summer avian density (57th, 76th and 77th of 81 transects) and richness (71st, 79th and 80th of 81 transects) within the middle Rio Grande.

It is important to realize that the nearest 15 m (from the west edge of the levee road to the east edge of the drain) of our 30 m wide DR 5 transects support no woody vegetation and provide almost no avian detections during our summer surveys. Thus, the reality is that summer avian density in the vegetated area on the west edge of the drain approaches or exceeds that of any other habitat we survey in the middle Rio Grande. If, for example, we only surveyed the approximately 15 m wide strip of vegetation from the west edge of the drain to the east edge of the closest interior access road (not all of this area is captured by our current surveys), the summer avian density would likely be the highest of any location in the middle Rio Grande. The extremely high levels of avian use during both winter and summer in this drain edge vegetation illustrate the importance of its retention and the critical value it has for wintering, breeding, and migrating birds.

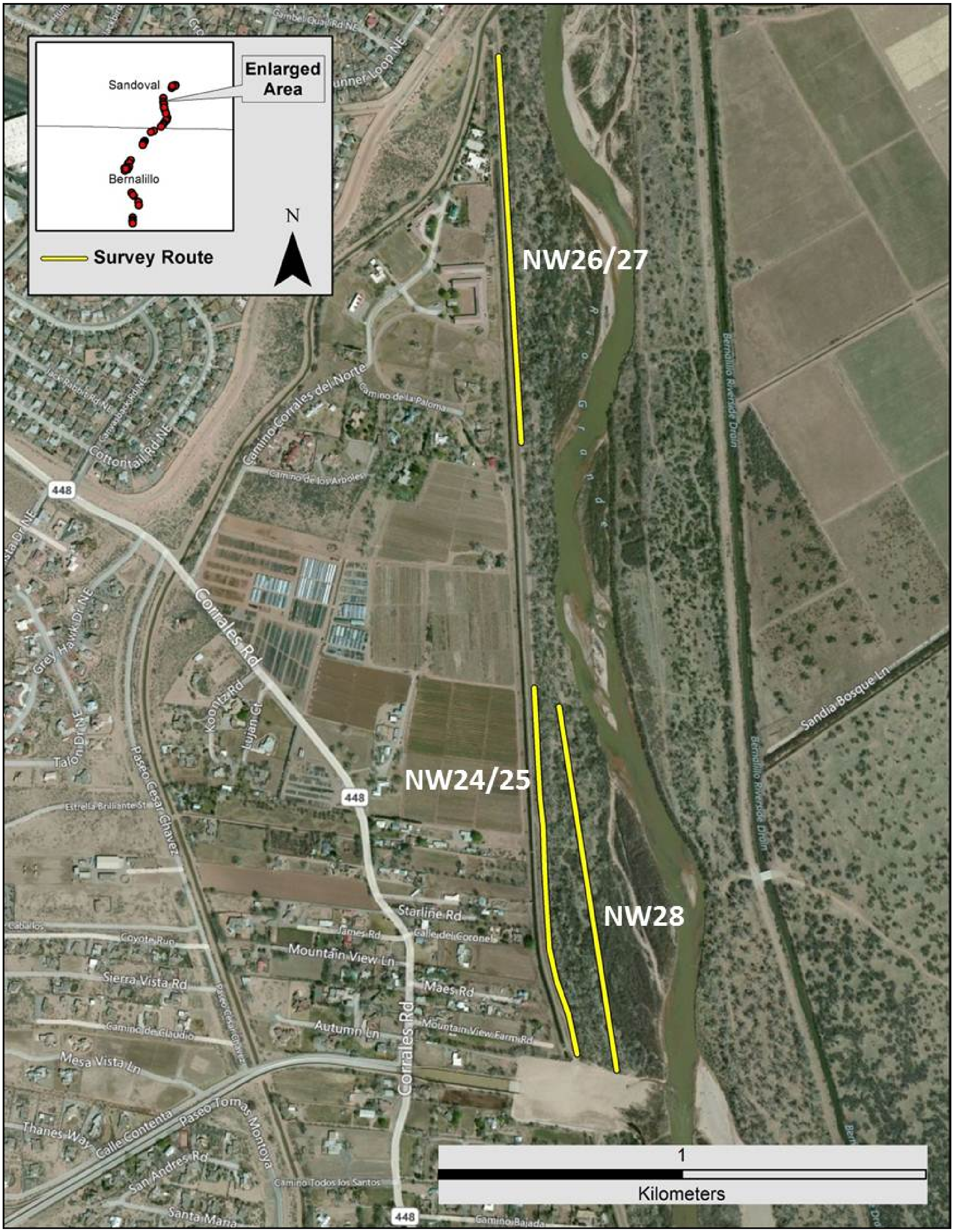

Figure 1. Map of transects north of the Harvey Jones Channel, Corrales, New Mexico.

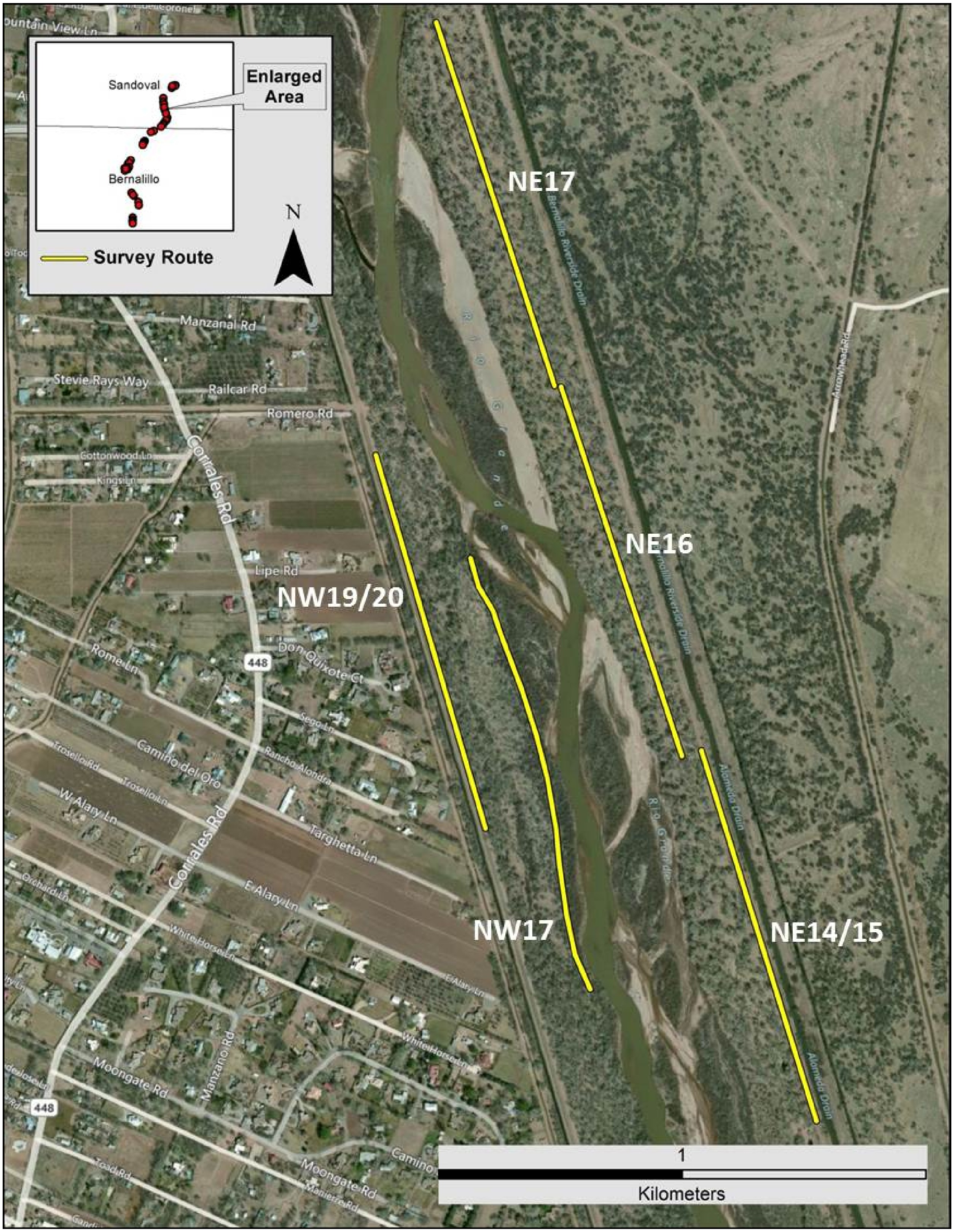

Figure 2. Map of transects south of Romero Road, Corrales, New Mexico.

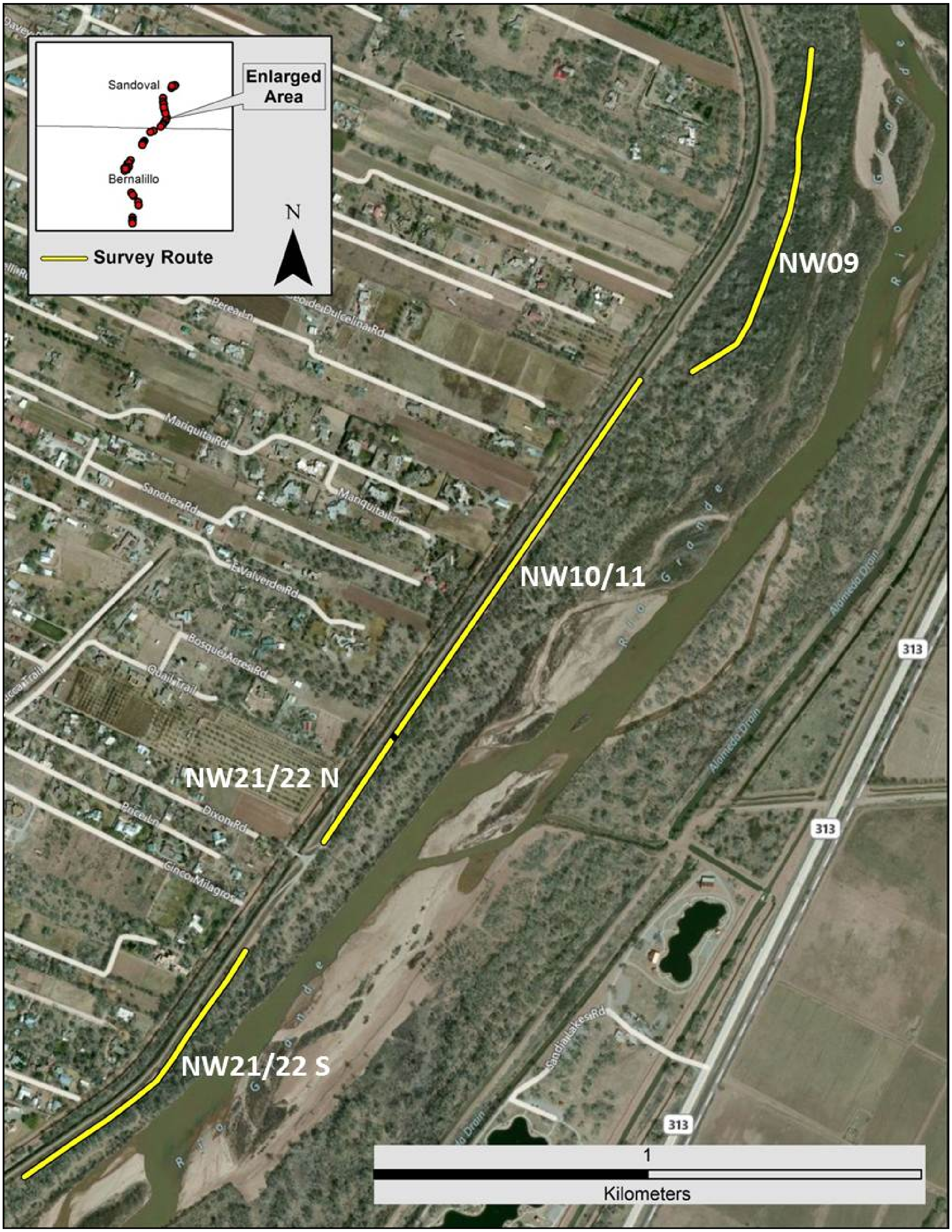

Figure 3. Map of transects near Dixon Road, Corrales, New Mexico.

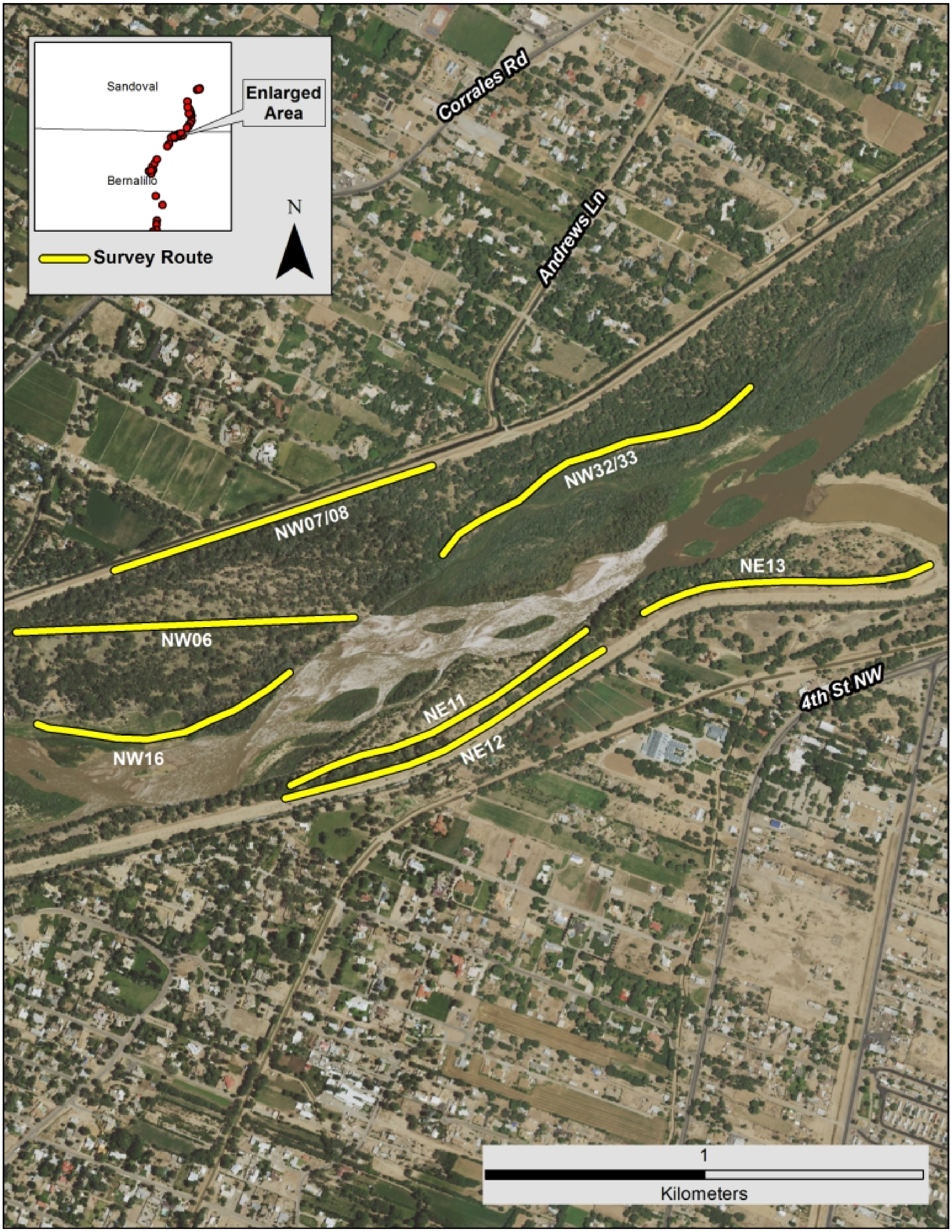

Figure 4. Map of transects near Andrews Lane, Corrales, New Mexico.

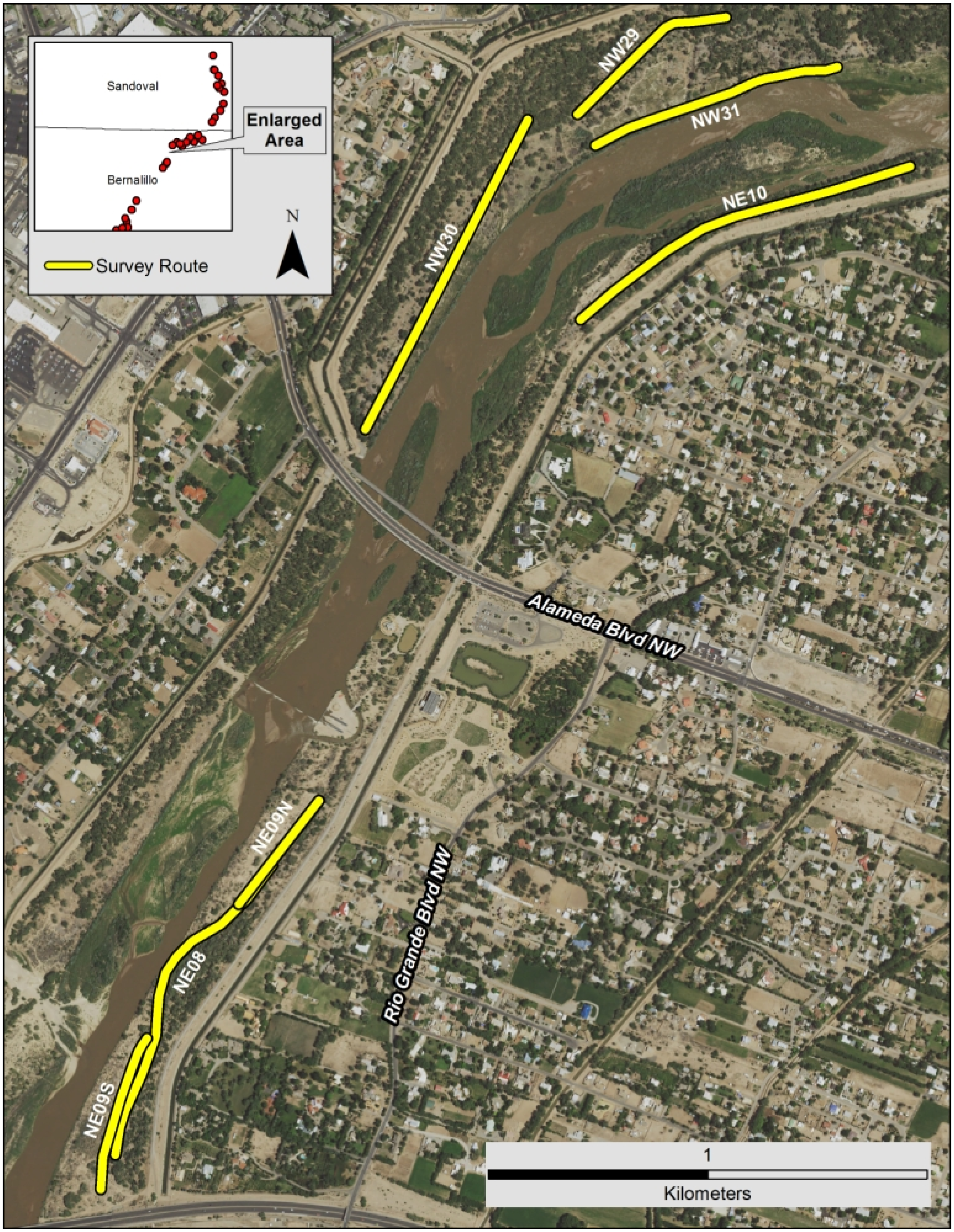

Figure 5. Map of transects north of Alameda Boulevard, Corrales, New Mexico.

Table 1. Cumulative summer avian density (mean # birds/100 acres) by year (2004-2016) for all Corrales transects (n = 22). All years not connected by a common letter are significantly different (Tukey-Kramer test).

Year						# birds/100 acres
2006	A					950
2007	A					945
2008	A	B				903
2005	A	B				888
2009	A	B				860
2004		B	C			791
2015			C	D		699
2010			C	D		684
2014			C	D		684
2011				D	E	655
2016				D	E	653
2012				D	E	616
2013					E	561

Table 2. Cumulative winter avian density (mean # birds/100 acres) by year (2005-2016) for all Corrales transects (n = 22). All years not connected by a common letter are significantly different (Tukey-Kramer test).

Year					# birds/100 acres
2007	A				1110
2010	A				953
2008		B			752
2009		B	C		639
2005		B	C	D	618
2006		B	C	D	607
2011		B	C	D	598
2013		B	C	D	598
2015		B	C	D	574
2016			C	D	512
2014			C	D	487
2012				D	421

Table 3. Cumulative summer avian density (mean # birds/100 acres) at NW25 and NW27 before (DR 5; 2007-2010) and after (DR 6; 2011-2016) clearing of vegetation on the west edge of the drain. Habitat types not connected by a common letter are significantly different (Tukey-Kramer test).

Habitat type			# birds/100 acres
DR 5	A		626
DR 6		B	233

Table 4. Cumulative summer avian richness (mean # species detected at densities ≥1.5 individuals per 100 acres) at NW25 and NW27 before (DR 5; 2007-2010) and after (DR 6; 2011-2016) clearing of vegetation on the west edge of the drain. Habitat types not connected by a common letter are significantly different (Tukey-Kramer test).

Habitat type			# species
DR 5	A		28.8
DR 6		B	11.5

Table 5. Cumulative winter avian density (mean # birds/100 acres) at NW25 and NW27 before (DR 5; 2007-2010) and after (DR 6; 2011-2016) clearing of vegetation on the west edge of the drain. Habitat types not connected by a common letter are significantly different (Tukey-Kramer test).

Habitat type			# birds/100 acres
DR 5	A		1459
DR 6		B	308

Table 6. Cumulative winter avian richness (mean # species detected at densities ≥1.5 individuals per 100 acres) at NW25 and NW27 before (DR 5; 2007-2010) and after (DR 6; 2011-2016) clearing of vegetation on the west edge of the drain. Habitat types not connected by a common letter are significantly different (Tukey-Kramer test).

Habitat type			# species
DR 5	A		26.6
DR 6		B	8.3

Table 7. Cumulative summer avian density (mean # birds/100 acres) by drain transect. DR 5 transects incorporated substantial understory vegetation on the west edge of the drain. DR 6 transects lacked understory vegetation on the west edge of the drain. For DR 6 transects, data from years before clearing is excluded (i.e. when these transects were also DR 5). Transects not connected by a common letter are significantly different (Tukey-Kramer test).

Transect	Habitat type				# birds/100 acres
NW20	DR 5	A			715
NW22	DR 5	A			700
NW11	DR 5	A			663
NW08	DR 6		B		390
NW27	DR 6			C	235
NW25	DR 6			C	230

Table 8. Cumulative summer avian richness (mean # species detected at densities ≥1.5 individuals per 100 acres) by drain transect. DR 5 transects incorporated substantial understory vegetation on the west edge of the drain. DR 6 transects lacked understory vegetation on the west edge of the drain. For DR 6 transects, data from years before clearing is excluded (i.e. when these transects were also DR 5). Transects not connected by a common letter are significantly different (Tukey-Kramer test).

Transect	Habitat type			# species
NW22	DR 5	A		25.9
NW20	DR 5	A		24.3
NW11	DR 5	A		23.5
NW08	DR 6		B	15.8
NW27	DR 6		B	10.5
NW25	DR 6		B	10.2

Table 9. Cumulative winter avian density (mean # birds/100 acres) by drain transect. DR 5 transects incorporated substantial understory vegetation on the west edge of the drain. DR 6 transects lacked understory vegetation on the west edge of the drain. For DR 6 transects, data from years before clearing is excluded (i.e. when these transects were also DR 5). Transects not connected by a common letter are significantly different (Tukey-Kramer test).

Transect	Habitat type					# birds/100 acres
NW22	DR 5	A				1296
NW20	DR 5	A	B			1141
NW11	DR 5		B			1118
NW08	DR 6			C		699
NW25	DR 6				D	378
NW27	DR 6				D	231

Table 10. Cumulative winter avian richness (mean # species detected at densities ≥1.5 individuals per 100 acres) by drain transect. DR 5 transects incorporated substantial understory vegetation on the west edge of the drain. DR 6 transects lacked understory vegetation on the west edge of the drain. For DR 6 transects, data from years before clearing is excluded (i.e. when these transects were also DR 5). Transects not connected by a common letter are significantly different (Tukey-Kramer test).

Transect	Habitat type				# species
NW22	DR 5	A			27.0
NW11	DR 5	A	B		23.0
NW20	DR 5		B		22.4
NW08	DR 6			C	12.4
NW25	DR 6			C	8.2
NW27	DR 6			C	8.2

Table 11. Rankings of Corrales drain transects out of 81 total transects surveyed in the middle Rio Grande bosque for winter avian density, winter avian richness, summer avian density and summer avian density. DR 5 transects support dense understory vegetation on the west edge of the drain. DR 6 transects lack understory vegetation on the west edge of the drain.

Transect	Habitat	Winter density	Winter richness	Summer density	Summer richness
NW22	DR 5	2nd	1st	25th	28th
NW20	DR 5	5th	5th	24th	35th
NW11	DR 5	6th	4th	27th	34th
NW08	DR 6	19th	61st	57th	71st
NW25	DR 6	40th	73rd (tie)	76th	80th
NW27	DR 6	54th	73rd (tie)	77th	79th

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