

**Monitoring of the Threatened
Delta Green Ground Beetle at the
East Wilcox Ranch (Solano County, CA)
in 2009**

Submitted By:

Richard A. Arnold, Ph.D.
Entomological Consulting Services, Ltd.
104 Mountain View Court
Pleasant Hill, CA 94523
(925) 825-3784
US Fish & Wildlife Permit #797233

Submitted To:

Benjamin Wallace
Conservation Project Manager
Solano Land Trust
1001 Texas Street, Suite C
Fairfield, CA 94533-5723

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INTRODUCTION

The Solano Land Trust has implemented a four-year program to monitor special-status species associated with the vernal pool and Valley Grassland habitats that occur at its East Wilcox Ranch property south of Dixon, CA. This ranch covers 1,342 acres and is located east of Travis Air Force Base within a region of Solano County that is referred to as the Jepson Prairie.

This report describes the findings of the third year of monitoring for the Delta Green Ground Beetle (DGGB), a federally-listed threatened species that is known to occur at the East Wilcox Ranch. Arnold (2007) presented background information on the DGGB, an assessment of the playa pool habitat suitability at East Wilcox Ranch, and other information about the site. The 2009 monitoring focused on presence-absence surveys of the DGGB at the ranch.

STUDY METHODS

Presence-absence surveys for the DGGB were conducted at the 18 playas at East Wilcox Ranch (#1 - #18 in Figure 1) and at 6 playas at the Jepson Prairie Preserve (#49 - #54 in Figure 2). The “squat and stare” survey technique, as described in Arnold (2007), was used to sample for DGGB adults. Surveys were conducted on six dates in February and March, 2009.

During my 2007 and 2008 surveys I attempted to visit several playas during a single sampling visit and observed rather limited numbers of DGGB adults. In 2009 I changed my survey approach in an effort to increase the number of DGGB observations at each playa. Instead of visiting as many playas as time and weather allowed during each survey visit in 2009, my sampling efforts were focused on only a few neighboring playas during a single survey visit to increase my survey time at each playa. The number of sampling stations for the squat and stare technique ranged from 20 for smaller playas to 40 for larger playas at East Wilcox Ranch and 80 for Olcott Lake (playa #54) at the Jepson Prairie Preserve.

RESULTS AND DISCUSSION

As summarized in Table 1, 79 DGGB adults were observed at 15 of 18 playas on East Wilcox Ranch in the spring of 2009 between February 21 and March 18. An additional, 17 DGGB adults were observed at six control pools (#49 - #54 in Figure 2) at the Jepson Prairie Preserve during this same period. Table 1 also provides information on weather conditions for each DGGB observation and the number of “squat and stare” survey stations at each playa pool on every survey date. Locations of adult observations at East Wilcox Ranch are presented in Figure 3.

One of the original goals of the DGGB monitoring at East Wilcox Ranch was to estimate the beetle's abundance. Unfortunately during 2007 and 2008, the number of beetle observations were too low to calculate accurate estimates of abundance. With the change in the sampling approach in 2009, more adult DGGBs were observed, so beetle densities (i.e., number of DGGB observations/playa area or playa perimeter) were calculated for each playa and are presented in

Table 2. Adult DGGB density (beetles/ft.²) was first calculated for the area of the sampling stations at each playa. These areas varied because the number of sampling stations differed among the playas. This density was then multiplied by the number of square feet in one acres to estimate the number of beetles per acre at a particular playa. Since DGGB adults were observed within the shoreline area of each playa, a similar calculation was performed to estimate beetle density for the shoreline perimeter of every playa. No DGGB adults were observed at three playas, #3, #5, and #7. Thus density estimates for each playa's shoreline ranged from 0.000 to 174.6 beetles, while the average density for all 18 playa shorelines was 43.692. Ideally, beetle densities could be assessed at every playa at multiple times throughout the seasonal activity period of the DGGB, but budget constraints limit the number of survey visits that can be performed and the cryptic behavior of the adult beetle require a time intensive sampling procedure for successful detection.

Table 3 compares DGGB survey findings for the years 2002, 2007, 2008, and 2009 using the playa identifiers as illustrated in Figure 1. The 2002 DGGB surveys were conducted by Larry Serpa, while the 2007 - 2009 surveys have been conducted by me. Results for the 2010 DGGB surveys will be added once those surveys have been completed.

Although fewer DGGB observation occurred in 2007 and 2008 compared to 2009, it is difficult to say whether population numbers have increased, decreased, or remained stable during this three-year period. During 2007 and 2008 I had attempted to sample more playas within a particular survey date, so time was lost moving between playas that could have been spent searching for beetles. In contrast, during 2009 I focused my survey efforts at one or a couple of neighboring playas to increase my sampling intensity at each playa. This approach yielded more DGGB observations at each occupied playa, but every playa was surveyed only once during the adult season.

Because the DGGB is cold-blooded, adults are often active more active and detectable when ambient air temperatures are $\geq 60^{\circ}\text{F}$; however, this is not an absolute threshold as wind speed and cloud cover can influence beetle activity. Many insects, including the DGGB, can be active at slightly lower temperatures, especially when there is full sunlight and little or no wind. All DGGB observations during 2009 occurred when the ambient air temperature was $\geq 58^{\circ}\text{F}$, so temperature should not have influenced detectability of DGGB adults. Indeed, as evidenced by the activity of other ground-dwelling insects, all survey dates had suitable weather conditions for observing DGGB adults. Nonetheless temperatures below the mid- 50°F range are probably too cold for adult activity. This may explain why adults have not been observed at light traps because nocturnal temperatures during the late winter and early spring activity period of the beetle are generally colder.

Although the 2008-2009 rainy season was still considered a drought year due to below normal annual precipitation, the pattern of rainfall may have been more conducive for DGGB activity during the late winter and early spring of 2009 compared to 2007 and 2008. Approximately five inches of rain fell during November and December 2008. Although January 2009 received only about 1.3 inches of rain, February and early March received about 10 inches, which fell and kept the playas full and springtails (prey items of the DGGB) active during the activity period for the DGGB.

RECOMMENDATIONS

As stated previously, differences in observed numbers of the DGGB in 2007 and 2008 may have been due to a population increase, more appropriate weather conditions in 2009, or the focused sampling effort at one or a couple of neighboring playas. Regardless, many more sample events and days per year at all playas would be needed to properly determine any actual population trends of the beetle. Unfortunately, the land trust's funding for DGGB monitoring is insufficient to perform any type of population monitoring that requires a greater sampling effort. Given these budget constraints, I recommend using the focused sampling technique in 2010 and future monitoring efforts to provide a sense of DGGB occupancy at the East Wilcox Ranch playas.

ACKNOWLEDGEMENTS

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REFERENCES CITED

Arnold, R.A. 2007. Monitoring of the Threatened Delta Green Ground Beetle at the East Wilcox Ranch (Solano County, CA). Report prepared for the Solano Land Trust.

Table 1. DGGB Observations at Wilcox Ranch and Jepson Prairie in 2009

| Playa Pool ID # | Survey Date | Number of DGGB Observed | Number of Survey Stations | Air Temp °F | Wind Speed mph |
|------------------------|--------------------|--------------------------------|----------------------------------|--------------------|-----------------------|
| 1 | Feb. 27 | 13 | 40 | 58-67 | 0-8 |
| 2 | Feb. 27 | 4 | 20 | 58-67 | 0-8 |
| 3 | Feb. 27 | 0 | 20 | 58-67 | 0-8 |
| 4 | Feb. 27 | 3 | 20 | 58-67 | 0-8 |
| 5 | Feb. 27 | 0 | 20 | 59-67 | 0-8 |
| 6 | Feb. 27 | 2 | 20 | 58-67 | 0-8 |
| 7 | Feb. 21 | 0 | 20 | 58-64 | 0-6 |
| 8 | Feb. 21 | 1 | 20 | 58-64 | 0-6 |
| 9 | Feb. 21 | 4 | 20 | 58-64 | 0-6 |
| 10 | Feb. 21 | 3 | 20 | 58-64 | 0-6 |
| 11 | Feb. 21 | 3 | 20 | 58-64 | 0-6 |
| 12 | March 6 | 3 | 20 | 58-62 | 0-8 |
| 13 | March 6 | 4 | 20 | 58-62 | 0-8 |
| 14 | March 6 | 6 | 20 | 58-62 | 0-8 |
| 15 | March 8 | 3 | 20 | 58-65 | 0-7 |
| 16 | March 8 | 2 | 20 | 58-65 | 0-7 |
| 17 | March 8 | 2 | 40 | 58-65 | 0-7 |
| 18 | March 8 | 9 | 40 | 58-65 | 0-7 |
| 49 | March 13 | 3 | 40 | 58-71 | 0-11 |
| 50 | March 13 | 5 | 40 | 58-71 | 0-11 |
| 51 | March 13 | 2 | 40 | 58-71 | 0-11 |
| 52 | March 18 | 4 | 40 | 58-77 | 0-6 |
| 53 | March 18 | 1 | 40 | 58-77 | 0-6 |
| 54 | March 18 | 2 | 80 | 58-77 | 0-6 |

Table 2. Estimated densities for DGGB at East Wilcox Ranch in 2009.

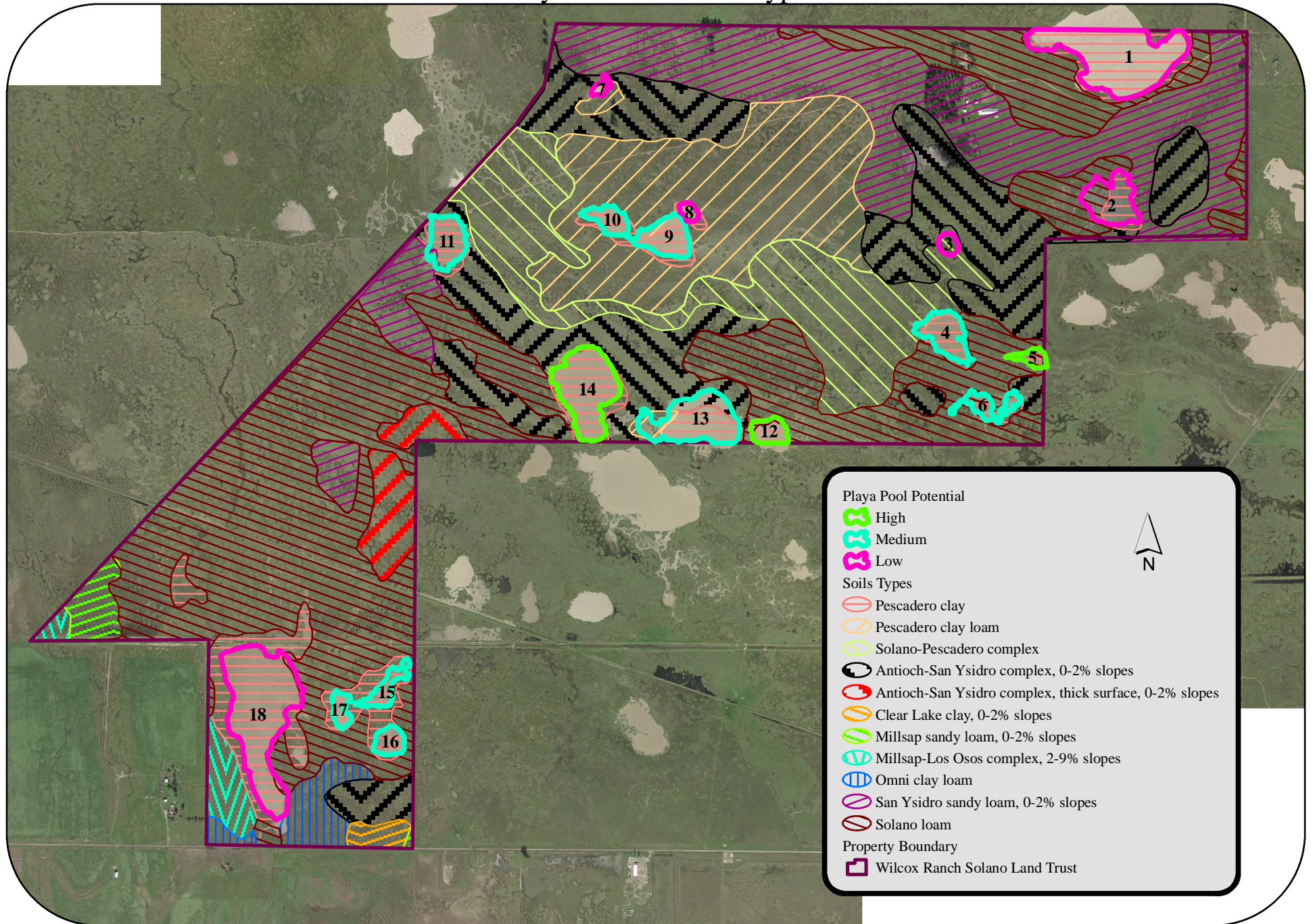
| Pool ID | No. of DGGB Observations | Pool Size - Acres | Pool Perimeter - Feet | DGGB Density/ Acre | DGGB Density/ Pool Perimeter |
|----------------|---------------------------------|--------------------------|------------------------------|---------------------------|-------------------------------------|
| 1 | 13 | 25.0 | 5,641 | 1,348.286 | 174.6012 |
| 2 | 4 | 7.9 | 2,778 | 829.700 | 52.9216 |
| 3 | 0 | 1.3 | 871 | 0.000 | 0.0000 |
| 4 | 3 | 6.1 | 2,671 | 622.300 | 38.1501 |
| 5 | 0 | 1.5 | 1,370 | 0.000 | 0.0000 |
| 6 | 2 | 3.0 | 3,299 | 414.900 | 31.4235 |
| 7 | 0 | 0.7 | 1,048 | 0.000 | 0.0000 |
| 8 | 1 | 0.9 | 803 | 207.400 | 3.8257 |
| 9 | 4 | 5.9 | 2,232 | 829.700 | 42.5150 |
| 10 | 3 | 3.2 | 1,859 | 622.300 | 26.5583 |
| 11 | 3 | 6.1 | 2,314 | 622.300 | 33.0519 |
| 12 | 3 | 2.9 | 1,422 | 622.300 | 20.3176 |
| 13 | 4 | 13.3 | 3,836 | 829.700 | 73.0738 |
| 14 | 6 | 15.1 | 3,684 | 1,244.600 | 105.2658 |
| 15 | 3 | 2.9 | 2,456 | 622.300 | 35.0867 |
| 16 | 2 | 2.6 | 1,262 | 414.900 | 12.0220 |
| 17 | 2 | 1.9 | 1,421 | 207.400 | 6.7687 |
| 18 | 9 | 29.3 | 6,108 | 933.400 | 130.8816 |
| Average | | | | 576.194 | 43.692 |

Table 3. Summary of DGGB Observations at East Wilcox Ranch (2002, and 2007 – 2010)

| Playa Pool Id | Summary of DGGB Observations (+ or -) at 18 Wilcox Ranch Playas | | | | |
|------------------|---|-------------|-------------|------|------|
| | Serpa 2002 | Arnold 2007 | Arnold 2008 | 2009 | 2010 |
| 1 | - | + | + | + | |
| 2 | + | - | - | + | |
| 3 | - | - | - | - | |
| 4 | - | + | + | + | |
| 5 | - | + | + | - | |
| 6 | - | + | - | + | |
| 7 | - | - | - | - | |
| 8 | - | + | + | + | |
| 9 | - | + | - | + | |
| 10 | - | - | - | + | |
| 11 | + | + | + | + | |
| 12 | + | - | - | + | |
| 13 | + | + | + | + | |
| 14 | + | + | + | + | |
| 15 | - | - | - | + | |
| 16 | + | - | - | + | |
| 17 | - | - | - | + | |
| 18 | + | - | + | + | |

Note: + = present and - = absent.

Figure 1: Delta Green Ground Beetle Study at Wilcox Ranch Solano Land Trust
Playa Pools and Soil Types



0 1,250 2,500 5,000 Feet

September 19, 2007
Entomological Consulting Services, Ltd.

Figure 2. - DGGB Jepson Study Area: Pools 50 - 54

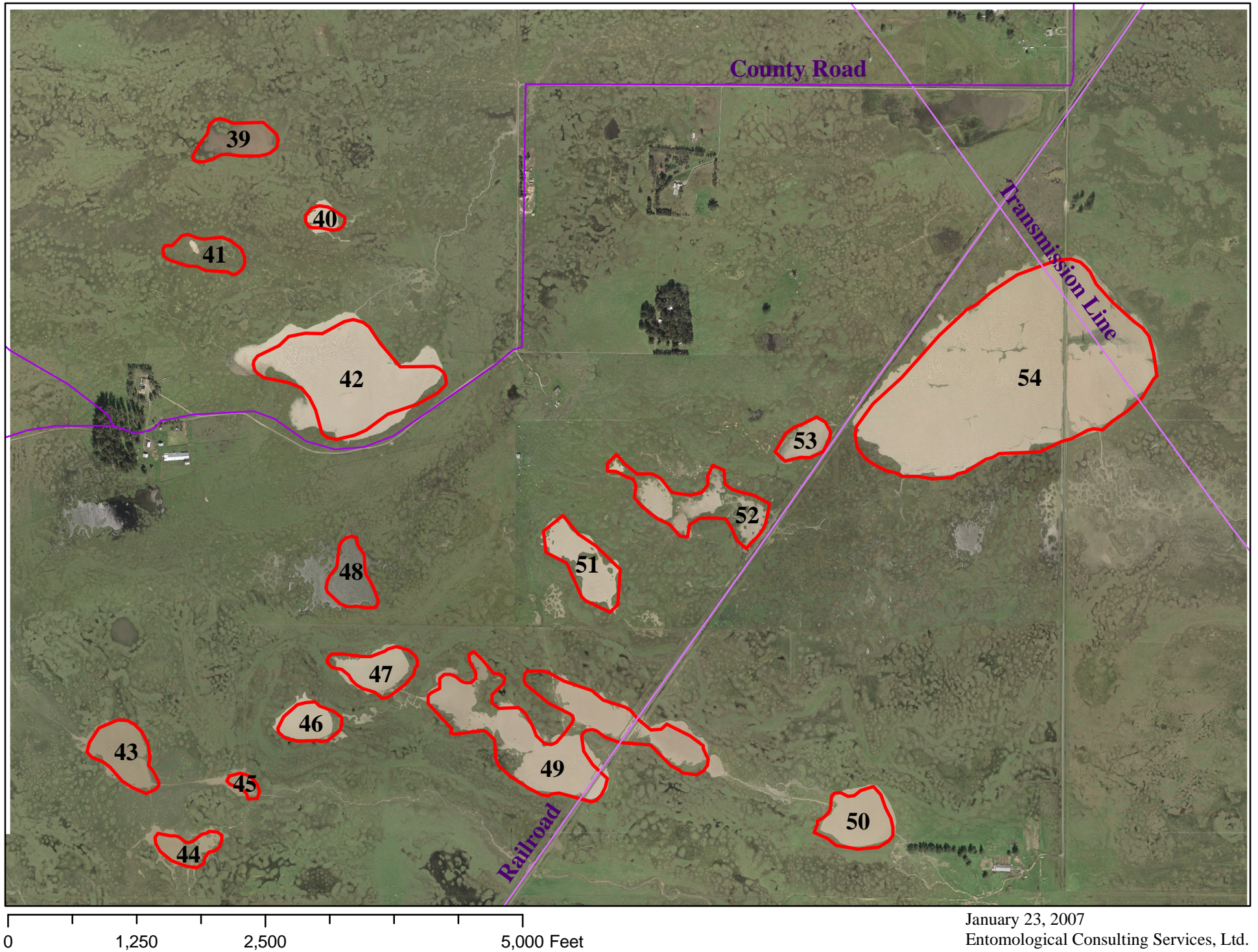
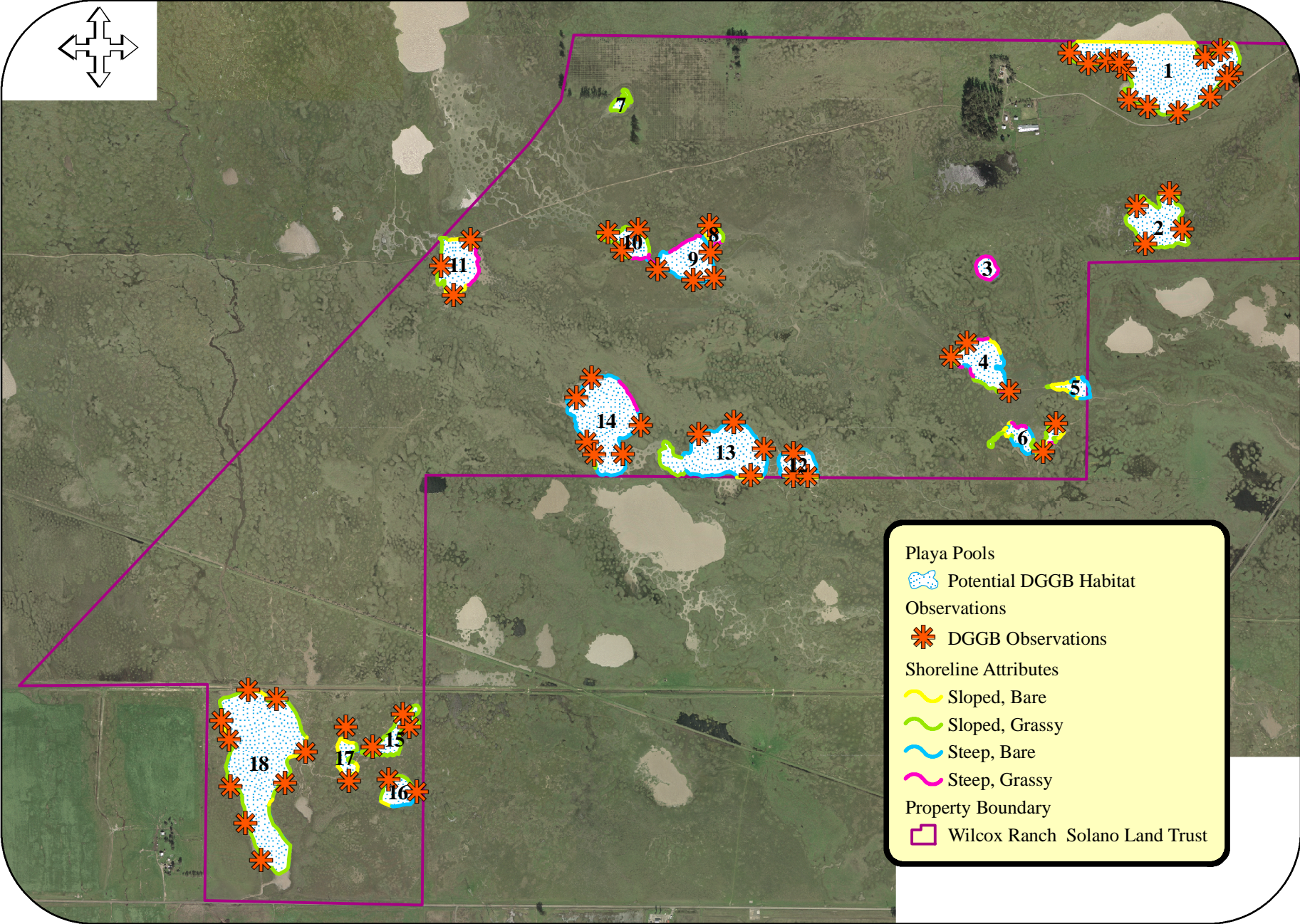


Figure 3: Delta Green Ground Beetle Study at Wilcox Ranch Solano Land Trust
Playa Pools, Habitat Types and 2009 DGGB Observations



0 1,250 2,500 5,000 Feet