Appendix D-2

Mojave ground squirrel Habitat Assessment

Mohave Ground Squirrel Habitat Assessment
SEGS X Site

Phil Brylski, Ph.D.

This report summarizes the results of a habitat assessment for the Mohave ground squirrel (MGS, *Xerospermophilus mohavensis*) on an approximately 600-acre site within the Harper Lake valley, San Bernardino County. The site is in unincorporated Hinkley, CA, approximately 7.8 miles north of the intersection of Harper Lake Road and Mojave-Barstow Highway 58 (see Figure 1, *Aerial Photo*). The site is located on the U.S. Geological Survey (USGS) Lockhart 7.5-minute topographic quadrangle (Township 11 North, Ranges 4, 5 West; portions of Sections 13, 18, 19, and 24) with a range in elevation from 2,035 to 2,075 feet above mean sea level. The Universal Transverse Mercator coordinates for the approximate center of the site are 11S 468053E, 387794N. Site photos are found in Appendix 1.

Site History and Setting

The California Energy Commission approved the Solar Electric Generating Systems X (SEGS X) project as an 80 MW solar thermal facility in 1990. Construction of SEGS X was initiated with site preparation activities including clearing of vegetation, grading, and compacting the soils, and construction of concrete infrastructure in a few areas. The project was halted before the solar panels were installed due to insufficient funding.

The site is vacant, surrounded by the chain link fence and crossed by two dirt roads. The site is bordered to the south by the existing SEGS VIII and IX Solar Thermal Plants and by vacant lands to the west, north and east. The western edge of Harper Dry Lake is approximately 1,800 feet east/northeast of the eastern edge of the site. Parts of the site were in intensive agriculture from the 1940s to the 1980s. The site had been subjected to extensive disturbance associated with past agricultural use and site preparation during partial construction of the SEGS X facility. The site has been unused since the early 1990s, when construction of SEGS X was halted.

Background on the Mohave Ground Squirrel

The MGS is a small ground squirrel (approximately nine inches long) that inhabits the Mojave Desert, in parts of Inyo, Kern, Los Angeles and San Bernardino counties. The historical range of the MGS covered approximately 5 million acres from Palmdale in the south to Owens Lake in the north, and from the eastern edge of the Sierra Nevada to the Mojave River Valley (Gustafson 1993, Leitner 2008).

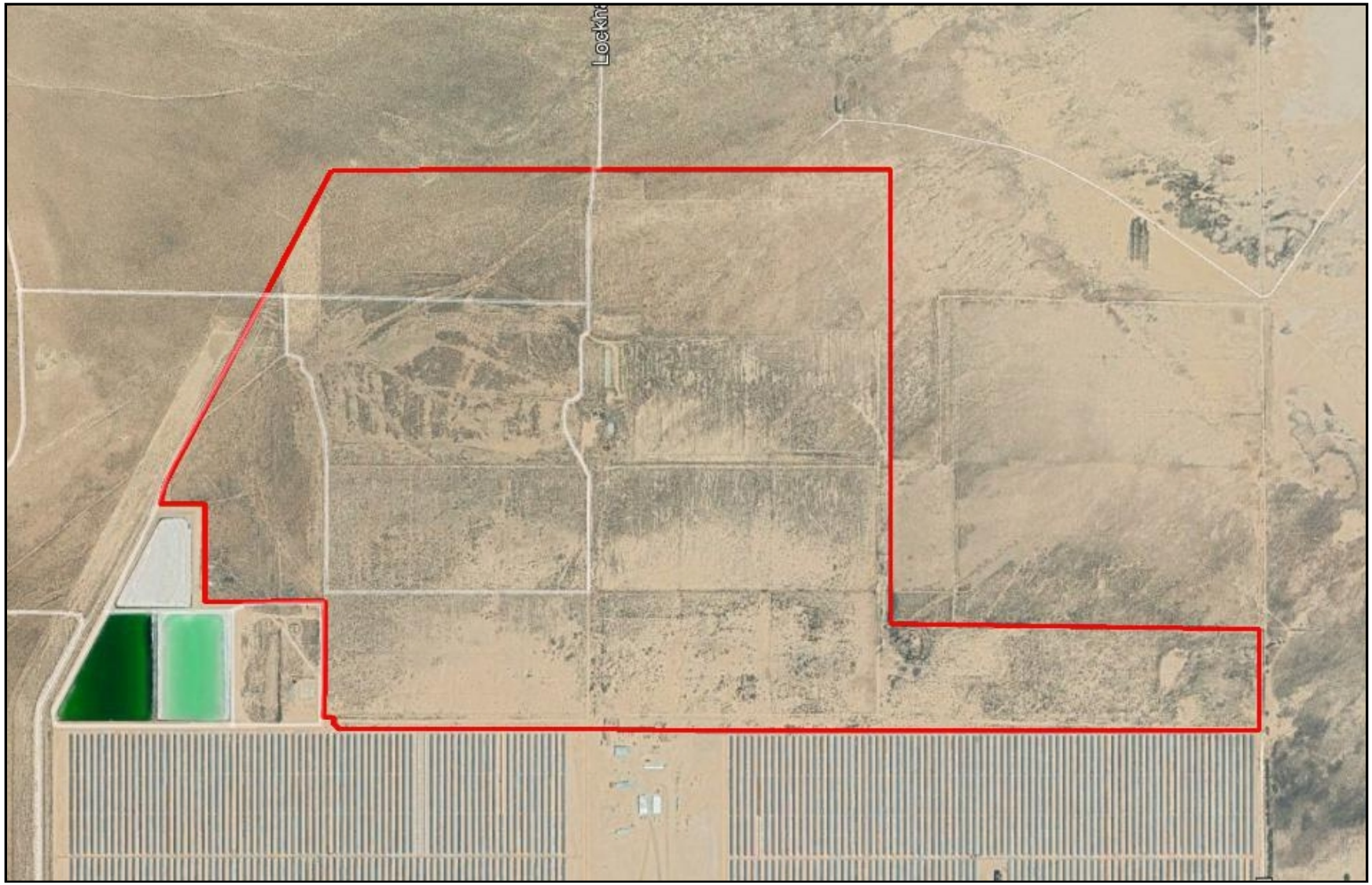

Figure 1. Site (red line) on aerial photo.

MGS occur in a range of open desert habitats, most commonly in creosote scrub but also in Joshua tree woodland, desert saltbush scrub, desert sink scrub, desert greasewood scrub, and shadscale scrub (Gustafson, 1993). MGS typically occur in areas with open vegetative cover and small bushes (< 0.6 meter [2 feet] in height) spaced approximately 6 to 9 meters (20 to 30 feet) apart. On Edwards Air Force Base in Kern County, where the MGS population has been studied intensively over the last three decades, MGS is most abundant in open creosote scrub and saltbush scrub plant communities on fine sandy soils, and uncommon in open creosote bush scrub and saltbush on firm sands and playa/claypan soils. MGS consume leaves, forbs, shrubs, and grasses of several species and genera, including creosote (*Larrea tridentata*), winter fat (*Krascheninnikovia lanata*), spiny hop-sage (*Grayia spinosa*), saltbush (*Atriplex* spp.), golden linanthus (*Linanthus aureus*), Mediterranean grass (*Schismus arabicus*), box thorn (*Lycium* spp.), and several other plant species (Best 1995). Winter fat, spiny hop-sage, and saltbush are thought to make up approximately 60% of the species' shrub diet, indicating that these are important food sources when forbs are unavailable. These diet data are based on observations in the northern part of the species' range, and the extent that they are the same or differ in the southern part of the range has not been analyzed, apart from limited observations (Leitner 2002).

MGS dig burrows in friable sandy and gravelly soils on flat to moderately sloping terrain. The burrows are used to avoid predators and high temperatures, and for aestivating during winter months. MGS are active only during the spring-summer months and spend most of the year (approximately seven months) below ground.

Methods

A field-based habitat assessment that examined soil, vegetation, topographic and disturbance features was carried out to assess the suitability of habitat for MGS on the site. The field assessment involved walking meandering transects in all parts of the site, noting plant species, plant communities, and soil/slope/disturbance factors that affect MGS suitability. The field assessment was carried out on September 11 and 14, 2021 by Phil Brylski, Ph.D., who holds a California Department of Fish Wildlife (CDFW) Memorandum of Understanding to trap and handle MGS.

Available literature was reviewed, including:

- MGS surveys (Leitner 2008, 2015) in the project region for the periods 1998-2007 and 2008-2012;
- Records in the California Natural Diversity Database (CNDDB, CDFW 2021) and the online database of museum mammal specimens (Vertnet.org); and
- The California Department of Fish and Wildlife 2019 Mohave ground squirrel Conservation Strategy.

Results

The site is predominantly allscale scrub dominated by allscale (*Atriplex polycarpa*), with red stemmed filaree (*Erodium cicutarium*), winged comb seed (*Pectocarya penicillata*), western tansy mustard (*Descurainia pinnata*), and California goldfields (*Lasthenia californica*) in the

understory. A small (47.5 acres) patch of spinescale scrub is found in the northeastern corner of the site (Michael Baker International, 2021) with the same understory species observed in the allscale plant community. Winter fat (*Krascheninnikovia lanata*), spiny hop sage (*Grayia spinosa*), and box thorn (*Lycium* spp) shrubs occur on the site in low densities.

The soils on the site are predominantly Cajon loamy sands, Norob-Halloran complex, and Victorville Variant sands, with a small area of Kimberlina loamy fine sands. Most of the soils on the site have been impacted by farming practices and/or grading and soil compaction for the original SEGS X solar project.

Site in Relation to MGS Historical Range

The site is located in the south-central part of the historical range of MGS. The Harper Dry Lake area is considered a core population area for MGS (Leitner 2015). There have been relatively few live-trapping surveys in this area, probably due to the low number of proposed development projects. Six protocol surveys in the Harper Dry Lake area were recorded 1998 to 2007 period and yielded no MGS captures (Leitner 2008); no MGS surveys were reported for the 2008 to 2012 period (Leitner 2015).

The survey data indicate that the MGS occurs in the Harper Dry Lake area, but are not abundant. In the 46-year period from 1975 to 2021, MGS were documented at 11 sites within approximately five miles of the site (CNDDB, CDFW 2021). In 1988, surveys detected MGS immediately south of the southwestern boundary of SEGS X (in the SEGS VIII site). In 1988 and 1989, eight MGS were recorded approximately 1,100 feet west of the northwestern part of the SEGS X site. Follow-up MGS surveys within SEGS X did not yield any MGS captures (CEC 1990). Genetic analysis of a 2014 capture approximately 4.9 miles south of the site revealed an individual produced by mating of an MGS and the common round-tailed ground squirrel (a hybrid) (CDFW 2021).

Site History

Europeans settled the Harper Valley area around 1910 and developed it as an agricultural community by the 1940s focused on crops (alfalfa, wheat) and grazing (cattle and sheep). The ranches in an around the site pioneered the circular irrigation system for alfalfa. Figure 2 shows the alfalfa fields in historical aerials on Google Earth from December 1985 (Google Earth, 2021). In 1985, the southerly and westerly parts of the site were in alfalfa production whereas the northerly and eastern portions appear to be undeveloped or at least less disturbed than the agricultural lands. This is noted in Swanson's (1989) history of the Harper Valley area. The section numbers (13, 18, 19, 24) in Figure 2 are included because they are referenced in Swanson (1989).

Analysis of ground waters in the area for the original SEGS X development concluded that substantial declines in the water table occurred as a result of pumping water for previous agricultural uses (LeRoy Crandall Associates 1986), resulting in a drop in the water table between 67 and 80 feet in the period from 1956 to 1985.

The site is relatively flat, dominated by allscale scrub vegetation with a patch of spinescale scrub in the northeastern corner of the site. The allscale and spinescale scrub habitats and associated understory of shrubs and forbs provide suitable forage for MGS. Food plants used by MGS such as hop sage and winterfat are present but not in abundance. More importantly, the site has a history of substantial disturbance, first from agriculture followed by site preparation for the SEGS X project. The SEGS X site still has compacted soils that date to the soil compaction that occurred in the early 1990s, which reduces its MGS habitat value.

The MGS habitat suitability model summarized in the conservation strategy (CDFW 2019) ranks the habitat around proposed SEGS X solar facility as being unsuitable MGS habitat, bordered to the north by moderately suitable MGS habitat.

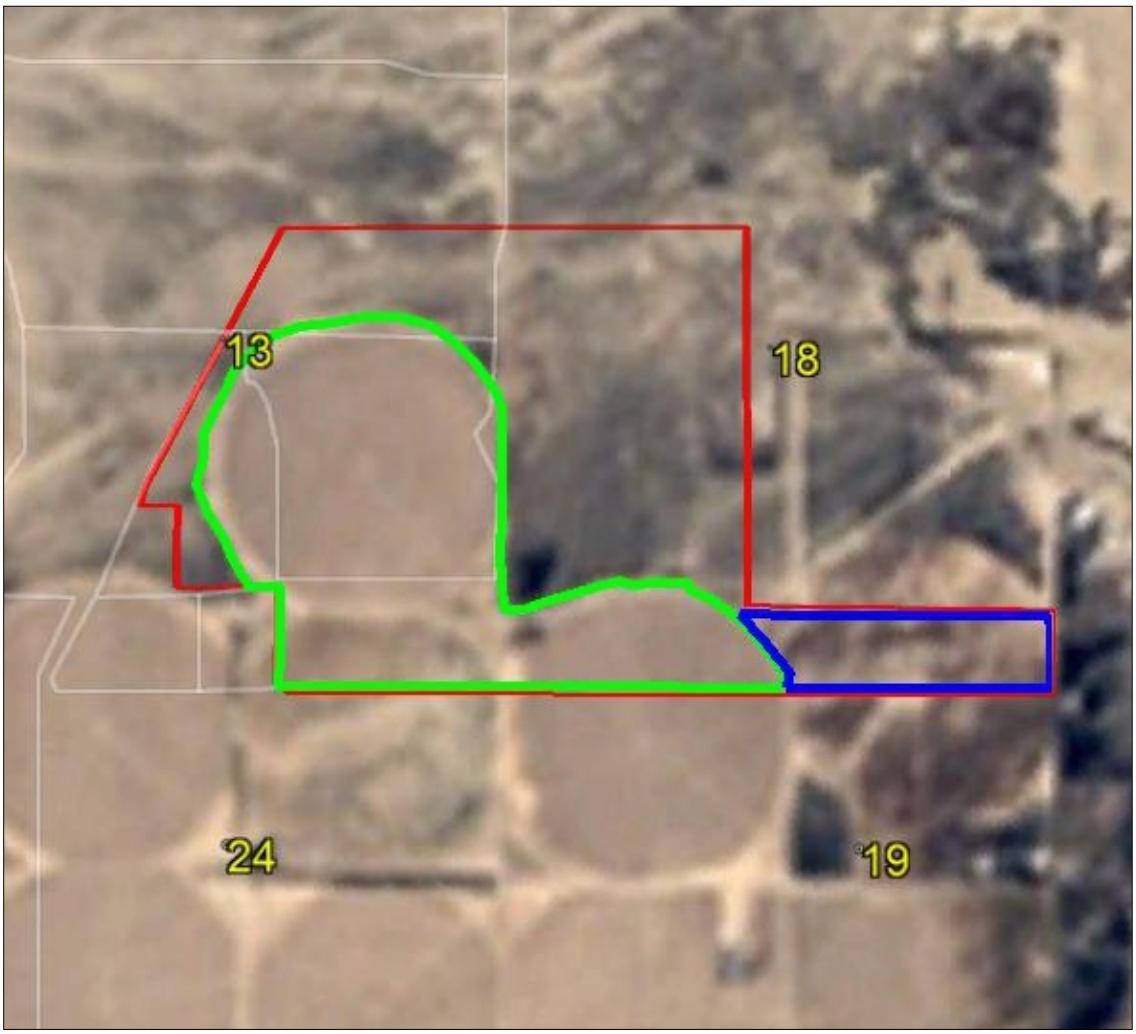

Figure 2. Site boundary (red perimeter line) over December 1985 aerial showing alfalfa fields (green and blue perimeter lines). Yellow numbers are topographic sections.

Figure 3 shows categories of disturbance history of the site. The red numbers in Figure 3 refer to the locations of the site photos in Appendix 1.

The site contains five areas with disturbed saltbush scrub regrowth, as follows:

1. **Blue (none to low quality habitat).** The 290.6-acre area outlined in blue in Figure 3 had been prepared for solar panel installation under the original SEGS X project. In the early 1990s, the area was grubbed, graded, and compacted, and concrete piers were installed in parts of the area to support solar panels. The western part of this area had been in alfalfa production from the 1940s to the 1980s (Figure 2). The geotechnical technical report for the original SEGS X project found that the soils were unsuitable to support slabs or solar array foundations and recommended that they be excavated to a depth of 48 inches and compacted to at least 90% of maximum density (Applied Geotechnical Engineering, 1987). Currently, this area is compacted to the extent that driving a wooden stake into the surface is difficult, slowing vegetation recovery. Compacted soils render the habitat unsuitable to poor quality for MGS burrow construction. Photos 1-5 and 9 show the current habitat of this area.

2. **Yellow (low quality habitat - northwest).** Two areas in the northwestern part of the site (together comprising 10.6 acres), outlined in yellow in Figure 3, had vegetation removed and graded under the original SEGS X project. Allscale saltbush has regrown in these areas. Habitat suitability for MGS is considered low based on this disturbance history.

3. **Green (low to moderate quality habitat).** The 83.1-acre circular area outlined in green in Figure 3 was graded to install an alfalfa field prior to 1985 (Figure 2). The aerial photos in Google Earth from May 2004 indicate that additional vegetation removal and possibly grading occurred for the original SEGS X project. The current site condition is largely moderate saltbush shrub density (Photo 6) with some open scrub. Dense desert scrub would be considered low quality MGS habitat whereas low to moderately dense scrub is consistent with moderate MGS habitat with this level of disturbance. The dense and open/moderately open saltbush scrub covers are estimated at 50% each.

4. **Pink (low quality habitat).** The 56.1-acre area outlined in pink in Figure 3 was part of an alfalfa field prior to 1985 (Figure 2) and was grubbed and graded to serve as a staging yard for the original SEGS X project. Saltbush shrubs have regrown in the area (Photo 10). There are several constructed basins in this area, one with tamarisk trees. Habitat suitability for MGS is considered low to moderate based on the history of disturbance.

5. **Yellow (moderate quality habitat - northeast).** The area in the 66.5-acre rectangular area in the northeastern quadrant of the site, outlined in yellow in Figure 3, was cleared of vegetation; the southwestern corner of this area was graded. The area apparently was not compacted. A low-density saltbush scrub cover recovered since that impact (Photo 7), which is of moderate habitat quality for MGS.

The remainder of the site contains allscale and spinescale scrub habitat and did not experience substantial disturbance as a result of agriculture or the original SEGS X project. These areas occur along the western and northern sides of the site, covering approximately 93.0 acres. Photo 8 shows the sparse spinescale scrub habitat in the northeastern corner of the site. Based on this history and the relatively few MGS captures, habitat quality for MGS is considered moderate.

Table 1. Summary of MGS habitat quality within the site		
Area	**Habitat Quality**	**Acres**
1. Blue outline in Figure 3: Solar field site that was graded and compacted.	None/low	290.58
2. Yellow outlines in northwestern part of site. Vegetation cleared and graded.	Low	10.6
3. Green outline. Part of alfalfa field that dates to the 1950s or later, abandoned in the 1980s	Low/moderate	83.13
4. Pink outline. Part of pre-1985 alfalfa field developed as staging ground for SEGS X.	Low/moderate	56.13
5. Yellow outline in northeastern part of site. Vegetation cleared.	Moderate	66.54
Remaining areas around the western, northern edges of the site (not outlined in Figure 3).	Moderate	92.99
	Total	**600.00**

Habitat Corridors

The site is located immediately west of Harper Lake in an area previously developed for solar fields. The site is east of the boundary for the Harper Lake Core Population shown in the MGS conservation strategy (CDFW 2019) and is not within a connecting corridor between MGS core populations.

Conclusion

Approximately 159.53 acres of the 600-acre site contains moderate quality habitat for MGS. The remainder of the site has been significantly disturbed through multiple activities, including agricultural cultivation, grading, soil compaction and construction activities.

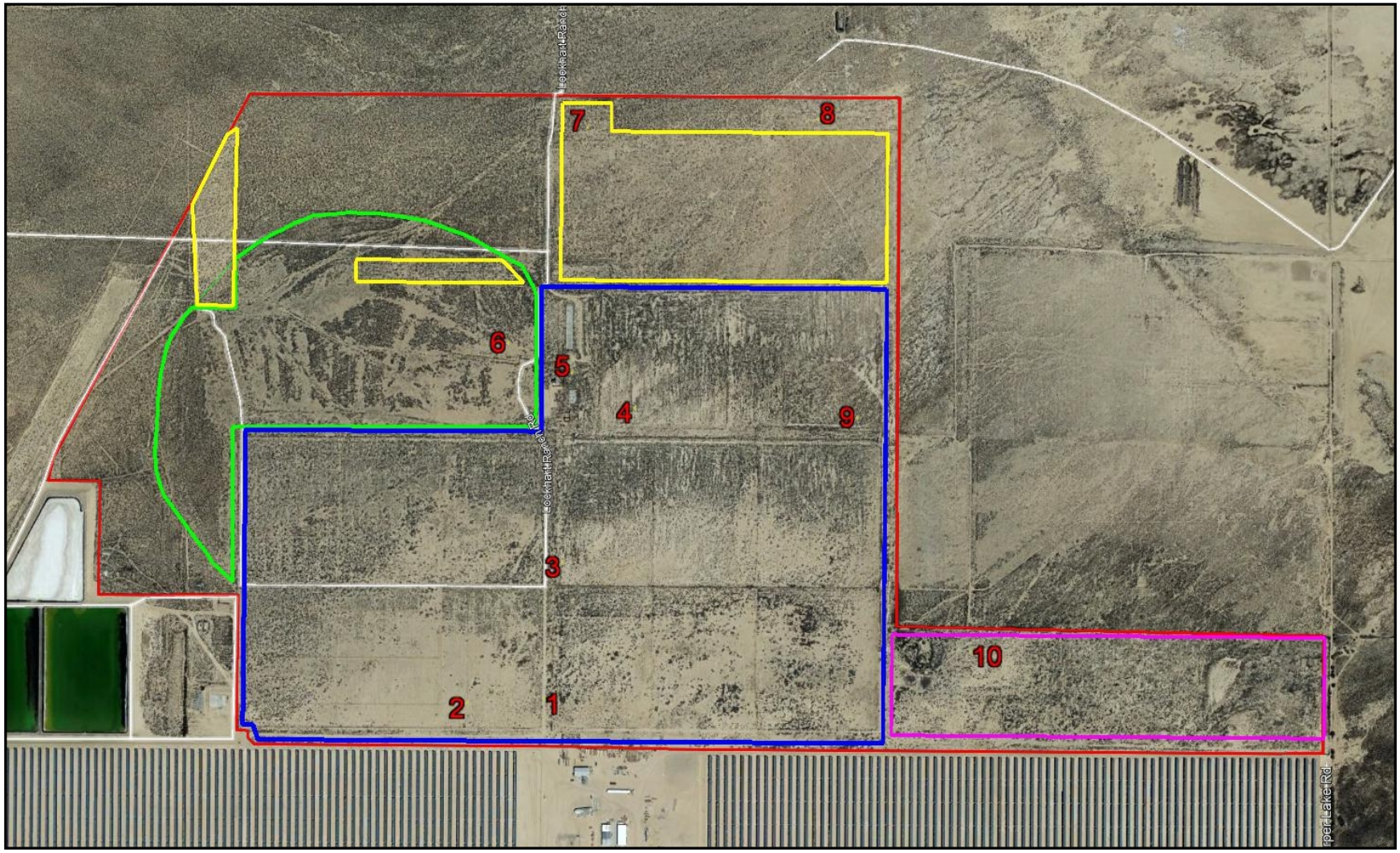

Figure 3. Habitat disturbance history

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Appendix 1. Site photos.

Photo 1. Sparse saltbush scrub in part of the site previously graded and compacted, looking north.

Photo 2. Graded and compacted area with concrete pilons, looking north.

Photo 3. Sparse saltbush scrub in graded and compacted area, looking east.

Photo 4. Saltbush scrub in graded and compacted area, looking northeast.

Photo 5. Infrastructure built in the early 1990s surrounded by saltbush scrub, looking south.

Photo 6. Dense saltbush scrub in area occupied by an alfalfa field until 1980s, looking west.

Photo 7. Saltbush scrub in northern part of the project site, looking south.

Photo 8. Sparse saltbush scrub in northeastern part of the site, looking southwest.

Photo 9. Sparse saltbush scrub in eastern part of the graded and compacted site, looking west.

Photo 10. The southeastern part of site, which had been graded for a staging yard in the early 1990s, looking southeast.