

# STATUS SURVEY FOR BAKERSFIELD CACTUS (*OPUNTIA BASILARIS* VAR. *TRELEASEI*)



PREPARED FOR: U.S. BUREAU OF RECLAMATION  
CENTRAL VALLEY PROJECT CONSERVATION PROGRAM  
AGREEMENT NUMBER R10AC20716

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September 29, 2011

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## EXECUTIVE SUMMARY

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Bakersfield cactus (*Opuntia basilaris* var. *treleasei*) is endemic to the southeastern corner of the San Joaquin Valley. Many sites with cactus have been converted to agricultural and urban uses, and remaining populations are fragmented and generally occur on small parcels. Populations of Bakersfield cactus continue to be lost, and habitat conditions are being degraded for some remaining populations. Consequently, the species is listed as federally and state endangered.

We conducted a survey of sites with Bakersfield cactus based on occurrence records from the California Natural Diversity Database (CNDDDB). The goal of this project was to assess the current status of Bakersfield cactus. Specific objectives were to (1) document the presence or absence of Bakersfield cactus at reported occurrence locations, (2) determine the number of individuals present in extant populations, (3) assess current habitat conditions at each site to determine whether habitat improvement measures might be necessary to enhance the potential viability of each population, (4) identify actual and potential threats to the populations at each site, and (5) develop recommendations for conservation and management of Bakersfield cactus populations.

Of the 39 occurrence records in the CNDDDB (30 presumed extant and 9 presumed extirpated), we visited 33 of the sites and examined aerial photography or conducted aerial surveys of the remaining sites. Based on our surveys, 25 populations were confirmed extant, 11 are believed to be extirpated, and the status of 3 could not be determined. Furthermore, 2 previously unreported populations were documented, and 6 undocumented translocated populations were identified.

Of the 33 sites with Bakersfield cactus, 27 occur entirely or partly on private lands. For the 27 naturally occurring extant populations, estimated size ranges from 2 to over 11,000 plants, but 16 (59%) populations have 100 plants or fewer. At least 9 populations were considerably smaller compared to previous estimates. Habitat conditions within remaining populations ranged from relatively undisturbed to highly disturbed. A number of internal threats (disturbances within populations) and external threats (activities on adjacent lands) were documented. Only 4 entire populations and parts of 8 others are permanently conserved. All or parts of 10 populations currently receive some formal protections by landowners, but these protections are not guaranteed in perpetuity.

Based on the reduced number of extant populations and the reduced number of plants within many populations, Bakersfield cactus appears to be declining on multiple landscape scales. Furthermore, remaining populations are at risk from numerous internal and external threats, and also from 2 potentially serious future threats, the *Opuntia*-killing cactus moth (*Cactoblastis cactorum*) that is spreading westward from Florida and climate change. Thus, aggressive proactive measures are warranted for the conservation and recovery of Bakersfield cactus. Conservation needs include the permanent conservation of additional populations, increased protections from impacts, vegetation management within populations, increasing the number of populations and the number of plants within populations, surveys for additional populations, and outreach and education programs. Recommendations for conserving and recovering Bakersfield cactus are offered.

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## **ACKNOWLEDGEMENTS**

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This project was funded by a grant from the U.S. Bureau of Reclamation, Central Valley Project Conservation Program. We thank Dan Strait for administrative assistance and project support. We greatly appreciate the assistance of Ellen Cypher in identifying populations and conservation issues, and in helping design the survey protocol. We thank numerous landowners for providing access to their properties in order to conduct the survey. These landowners (and key individuals) include the California Department of Fish and Game, California Department of Water Resources (Xiao Hong Huang), U.S. Forest Service (Steven Anderson), Center for Natural Lands Management (Greg Warrick), Panorama Vista Preserve (Andy Honig, Carolyn Belli), The Wildlands Conservancy (Dave Clendenen), Tejon Ranch (Mike White), Kern County Waste Management Department (Frank Bedard), Chevron (Jessica Ross, Brad Noblitt), Nichols Land Company (Jamie Nichols), The Nature Conservancy (Zachary Principe), and Parker Ranch (Bill Parker). Finally, we thank Allie Madrid and Tory Westall for field assistance.

## INTRODUCTION

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Bakersfield cactus (*Opuntia basilaris* var. *treleasei*) is endemic to the southeastern corner of the San Joaquin Valley of central California. The species historically occurred from just north of Bakersfield down to the Wheeler Ridge area at the southern end of the valley; cactus populations may have been more or less continuous within this area. Many sites with Bakersfield cactus have been converted to agricultural and urban uses.

Approximately one-third of cactus locations have been lost (U.S. Fish and Wildlife Service 1998). Remaining Bakersfield cactus populations are fragmented and generally occur on small parcels. Although some of these parcels are protected lands (e.g., California Department of Fish and Game, Tejon Ranch Conservancy), an increasing number are surrounded by incompatible land uses (e.g., urban development) and are subject to frequent disturbance from destructive trespass activities (e.g., off-highway vehicle use, dumping, fires). Also, some of the remaining cactus populations are on private lands where developments are planned. Thus, populations of Bakersfield cactus continue to be lost, and habitat conditions are being degraded for some remaining populations.

The status of most of the remaining Bakersfield cactus populations has not been assessed for over two decades. According to the California Natural Diversity Database (2011; CNDDDB), the last large-scale status survey was conducted by Moe (1989), while updates on specific populations were provided by Pearson in 1982, Byrne in 1987, Mullen in 1989, Lewis in 1991, York in 1991, Taylor in 1992, Brown in 1996, Cooley in 1996, and Wiggins in 2002. Periodic status surveys for listed species are necessary to determine whether populations are still extant and to assess current site conditions throughout the range. This information is crucial for devising appropriate management actions necessary for the prevention of extinction or foreseeable irreversible decline of the species.

Our goal was to conduct surveys to determine the current state of the historical occurrences of Bakersfield cactus throughout its range. Specific objectives were to:

1. Document the presence or absence of Bakersfield cactus at locations listed in occurrence records in the CNDDDB.
2. Determine the number of individuals present in extant populations.
3. Assess current habitat conditions at each site to determine whether habitat improvement measures might be necessary to enhance the potential viability of each population.
4. Identify actual and potential threats to the populations at each site.
5. Develop recommendations for the conservation and recovery of Bakersfield cactus.

## STUDY AREA

Bakersfield cactus primarily occurs in chenopod scrub and grassland habitats in the southeastern portion of the San Joaquin Valley. Habitat conditions in extant populations range from severely impacted and degraded to relatively undisturbed (E. Cypher, California Department of Fish and Game, personal communication). The CNDDDB lists 45 Bakersfield cactus occurrences. However, 6 of these occur on the east side of the Tehachapi Mountains and preliminary genetic analyses indicate that these may not be *Opuntia basilaris treleasei* (P. Smith, CSU-Bakersfield, personal communication). Of the remaining 39 occurrences, 29 were presumed extant and 9 were known or possibly extirpated (Figure 1).

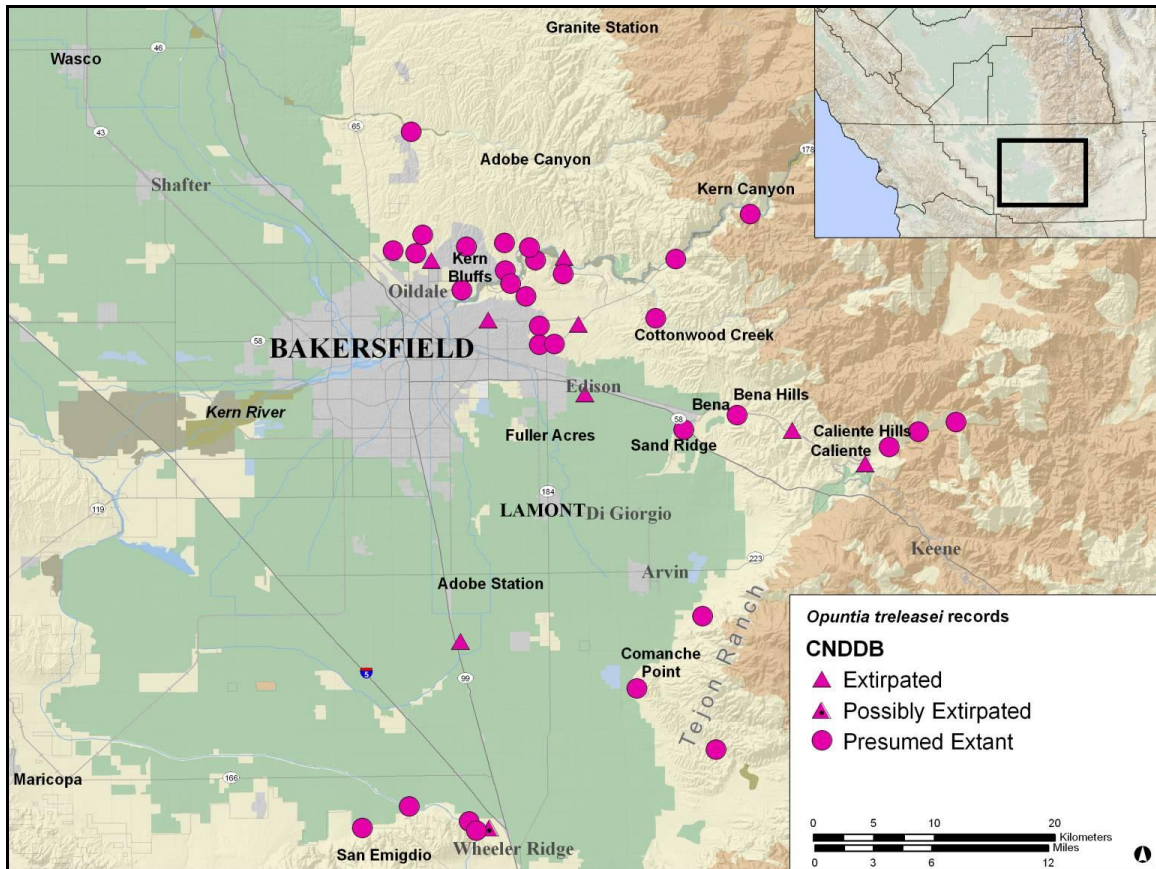


Figure 1. CNDDDB occurrence records for Bakersfield cactus in the San Joaquin Valley, California.

## METHODS

### *SPECIES OCCURRENCES*

Prior to conducting field work, we compiled a list of sites where Bakersfield cactus was known to occur, based on historic or recent observations. The initial list was generated based on Element Occurrences (EO) in the CNDDDB. Additional locations were added to

the list based on personal knowledge as well as information from individuals (e.g., local biologists, land owners) who had information on cactus occurrences not yet reported to the CNDDDB.

Next, we attempted to identify landowners for each of the locations. This was achieved by superimposing a GIS layer of Kern County parcels on a GIS layer of cactus occurrence records and aerial photographs to determine whether habitat was still present on parcels with known occurrence records. For these parcels we used their Assessor Parcel Number (APN) and the program Parcel Quest to obtain landowner information from county property records. For many of the locations, the cactus population occurred on multiple parcels, and we attempted to contact all landowners to secure permission to access their property to survey for cactus.

### ***SURVEY PROTOCOL***

During site visits, we attempted to survey as much of each EO or new site as possible. In particular, we attempted to visit each parcel with a different owner. Parcels under different ownership frequently were subject to different land uses or management that produced differential effects on cactus presence and condition. At least 2 field biologists conducted each survey. Surveys were conducted on foot. Information recorded during surveys is described in Table 1, and the data sheet used during surveys is provided in Appendix A.

We developed a ranking system to provide a more quantitative assessment of the status of each population. Points were assigned for protection status, population size, parcel size, internal threat level, and external threat level (see Appendix A for details). Points assigned to populations increased with higher levels of protection, larger population size, larger area occupied, lower levels of internal threats, and lower levels of external threats. Thus, populations with higher point totals generally are considered to be more secure while those with lower point totals are considered to be at greater risk of extirpation.

Some sites could not be accessed, primarily because they were on private lands and attempts to secure permission from landowners to access the sites were not successful. To the extent possible, these sites were examined from public roads, adjacent public lands, or adjacent private lands for which access had been granted. When these approaches were not possible or insufficient for thoroughly inspecting a site, we surveyed from the air to determine whether suitable habitat for Bakersfield cactus was present, and if so, to see if we could observe any cactus on the sites. We flew over these sites in a chartered, fixed-wing, single-engine aircraft. Two biologists, one in a front seat and one in a rear seat, surveyed from each side of the plane. Surveys were conducted from an altitude of approximately 300-600 m (1,000-2,000 ft). Each site was circled for whatever time was necessary for the biologists to conduct a thorough inspection.

Results were summarized across sites to provide a comparative assessment of Bakersfield cactus occurrences. Furthermore, site-specific summaries were prepared and are provided in Appendix B. Finally, maps were prepared for each site that display current occupation by Bakersfield cactus, and a GIS layer was prepared that depicts element occurrence boundaries currently in the CNDDDB and any proposed changes to those boundaries.

**Table 1. Information collected during surveys of Bakersfield cactus populations.**

<b>Variable</b>	<b>Description</b>
EO #	Element Occurrence number from CNDDDB or unique label for new populations.
Location	General location of EO or population.
Land owner	Owner(s) of parcels within each Element Occurrence or new population.
Conservation Status of Site	Whether all or portions of the site have any status that would conserve them in perpetuity, such as being owned by a federal or state conservation organization, or being covered by a conservation easement.
Genetic sample collected	As part of a collaborative study of genetic variation and partitioning in the Bakersfield cactus metapopulation, 1-10 genetic samples (pads) were collected from each population and submitted to CSU-Bakersfield.
Size of extant population	The number of plants (cactus clumps) was counted or estimated for each population. Clumps are defined as "groups of pads that are rooted at the same point" (U.S. Fish and Wildlife Service 1998).
Estimated overall area	General estimate of the area covered by the population.
% cover inside area	Estimate of proportion of population area actually covered by cactus.
Habitat conditions	General description of dominant plant community and plant species, terrain, soil type, and any other pertinent habitat information
Internal disturbances	Any evidence of disturbance within the population including OHV use, roads, human foot traffic, dumping, shooting, grazing, burning, and invasive non-native plants.
Extent of area disturbed within the population area	Percentage of area disturbed within the population.
Estimated threat level from internal disturbances	Qualitative ranking of the threat to the population from internal disturbances.
Adjacent land uses	Uses and activities on lands immediately adjacent to the population
Estimated threat level from activities on adjacent lands	Qualitative ranking of the threat to the population from activities on lands immediately adjacent to the population.
Probability of population presence in 100 years	Qualitative assessment of the probability that the population will persist and be present in 100 years, assuming that all current conditions within and around the population remain the same.
Recommendations for conservation	Recommended measures for protecting, enhancing, or expanding the population.
Point total	Points were assigned for protection status, population size, parcel size, internal threat level, and external threat level.

## **RESULTS**

### ***SITE VISITS AND POPULATION STATUS***

Sites with Bakersfield cactus were visited during March 2010-May 2011. Time spent at each site varied from about 1 hour to 6 hours, depending upon the size of the site and access to various areas within each site. Some of the larger populations were visited multiple times in order to achieve more complete survey coverage.

Of the 39 EOs listed in the CNDDDB, we did not visit 6 sites (Table 2). Of the 6, 4 were listed as "presumed extirpated", and an examination of aerial imagery confirmed that no habitat remained at 3 of the 4 sites. Habitat appeared to be present on the fourth site, but



this site was on private land and we could not gain access. For the remaining 2 sites of the 6 not visited, the populations were listed as “presumed extant” and habitat appeared to be present, but both were on private land and we were unsuccessful in gaining permission to access. For all sites for which permission to access was not secured, habitat was confirmed present based on aerial imagery, inspection from adjacent accessible properties, and aerial surveys conducted on 18 May 2010 and 4 May 2011.

**Table 2. Status of Bakersfield cactus populations based on surveys conducted March 2010 to May 2011.**

Population	Population Status		
	Confirmed extant	Confirmed or likely extirpated	Unknown
CNDDDB Element Occurrence			
Presumed extant	23	5	2
Presumed extirpated	2	6	1
Previously undocumented	2		
Translocated	6		
<b>Totals</b>	<b>33</b>	<b>11</b>	<b>3</b>

We visited all or portions of 33 EO sites. Of these, 5 populations were listed as “presumed extirpated”. Indeed, we did not find cactus at 3 of the 5 sites, but we did find Bakersfield cactus at the remaining 2 sites. Thus, these 2 populations were previously reported as extirpated but actually are extant. For the remaining 28 EO sites visited, the population status was listed as “presumed extant”. However, we could not find cactus at 5 sites. Although the putative determination is that these populations are extirpated, additional visits may be desirable to confirm our findings. Bakersfield cactus was located at the remaining 23 sites and these populations were confirmed extant.

Thus, of the 39 EOs listed in CNDDDB, 25 populations were confirmed extant, 11 are probably extirpated, and the status of 3 could not be determined (Table 2). Additionally, we were alerted by landowners to the presence of 2 previously undocumented populations, both of which were visited and assessed, and the results included in this report (Figure 2). Finally, we know of 6 Bakersfield cactus populations that were created by translocating cactus clumps or pads from other sites (Figure 2). Details for these 6 populations also are included in this report. Thus, Bakersfield cactus populations currently are present at a minimum of 33 sites (Table 2).

Ownership for lands with Bakersfield cactus populations includes both public and private (Table 3). Public lands are owned by the U.S. Forest Service, California Department of Fish and Game, California Department of Water Resources, and Kern County. Some private lands are owned by conservation organizations including the Center for Natural Lands Management, The Wildlands Conservancy, and the Kern River Corridor Endowment and Holding Company. Most of the populations occur on private lands, some of which are owned by corporations (e.g., Tejon Ranch Corporation, various oil companies, PG&E, development corporations) and some of which are owned by families or individuals. Also, few of the populations occur on lands with a single owner. Instead, most populations occur on two or more parcels with different owners.

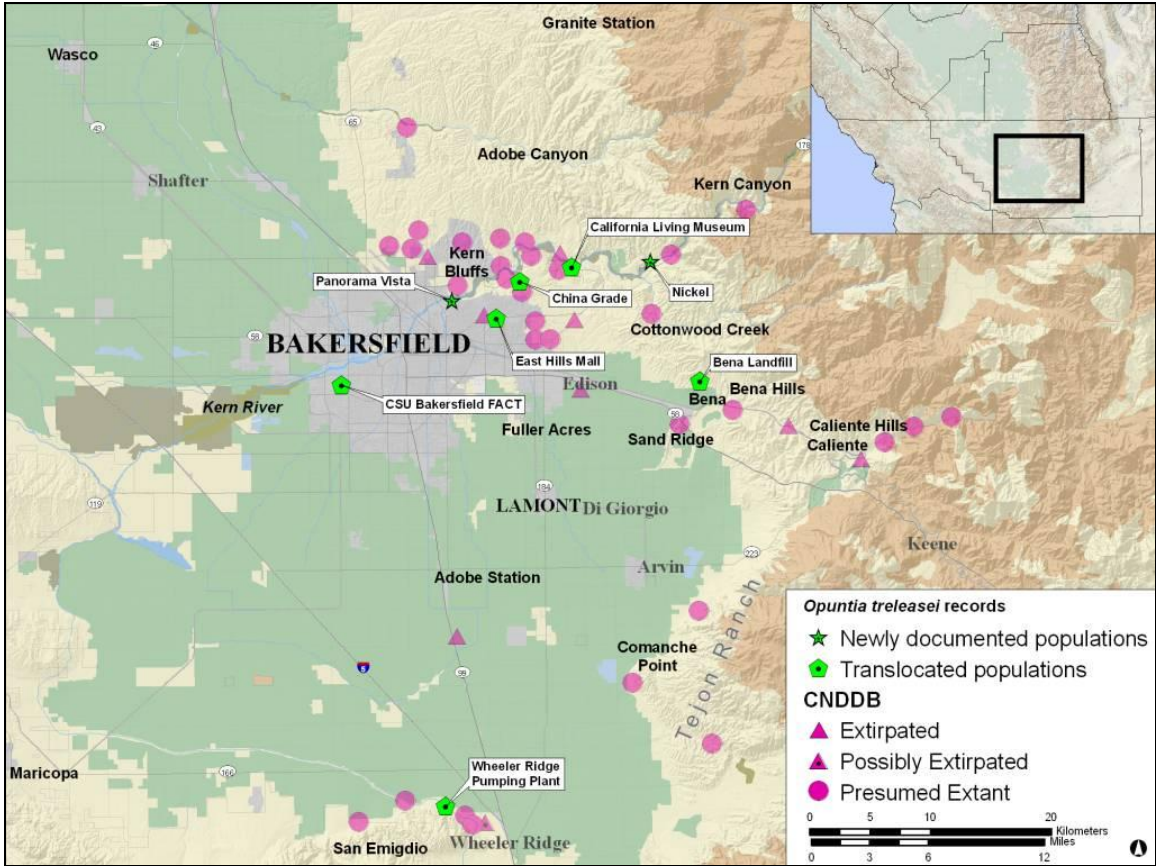


Figure 2. Locations of new and translocated Bakersfield cactus populations.

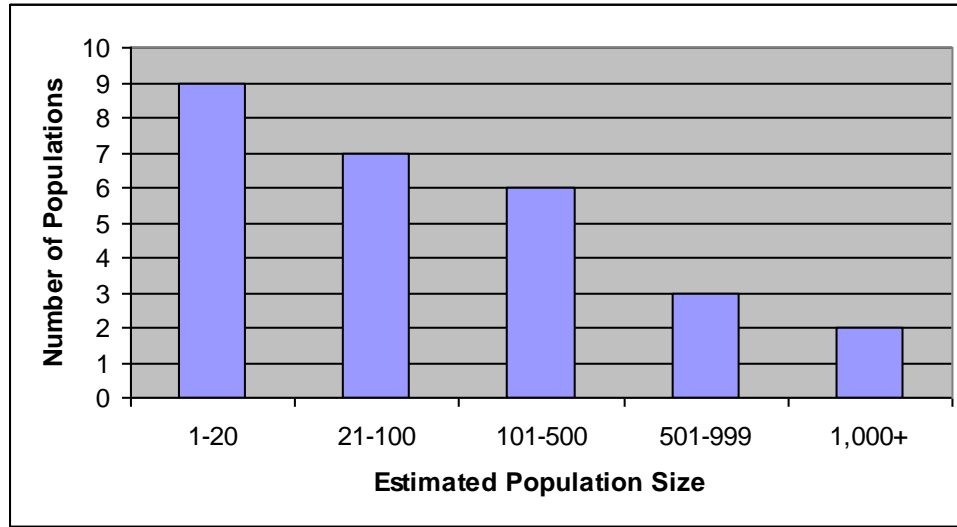
Table 3. Land ownership for 33 sites with Bakersfield cactus as of May 2011. Most occurrences extend across lands with different ownership and therefore may be included in more than one category.

Ownership	Entity	Number of populations (entire populations owned)
Public	<b>Total</b>	<b>10 (2)</b>
	Federal	1 (1)
	State	7
	County	2
Private	<b>Total</b>	<b>26 (10)</b>
	Conservation organizations	3 (2)
	Corporations or individuals	24 (10)

### *NATURAL POPULATION ATTRIBUTES*

Estimated population size for the 27 natural (non-translocated) populations of Bakersfield cactus assessed ranges from 2 to over 11,000 plants. Of these, 16 (59%) number 100 plants or less (Figure 3) while only 2 number over 1,000 plants. We must emphasize that the population sizes provided are estimates. Factors inhibiting precise estimates include populations dispersed over large areas, plants obscured by topography or vegetation, and

lack of access to some portions of populations (e.g., portion of EO on private land for which access was not secured).



**Figure 3. Number of populations by size category for extant Bakersfield cactus populations based on surveys conducted March 2010 to May 2011.**

Among the EO populations we assessed and for which previous population size estimates were available from CNDDDB records, 10 were approximately the same size as previously reported, 2 were considerably larger, and 9 were considerably smaller. For the 2 populations that were larger (EO-23 and EO-24), both were on private lands where past access might have been limited resulting in incomplete counts. Also, differences in past and current population estimates possibly could be a result of different enumeration methods. Among the 9 populations for which estimates were smaller, some of the more notable declines included:

- 500 down to 100 on EO-7
- 50-75 down to 18 on EO-8
- 2,000 down to 250-500 on EO-15
- “several hundred” down to 50 on EO-20
- 2,500-3,000 down to 500 on EO-25
- 14,000 down to 5,000 on EO-36

The decline on EO-25 could be attributable to lack of access to a large portion of this site. For some populations, declines were attributable to destruction of portions of the populations while abundance appeared to be unchanged in the undisturbed portions. For other populations, significant declines appeared to have occurred within areas that did not seem to have been disturbed (e.g., EO-15 and EO-36).

For 4 populations, a change in size could not be determined. Two of these populations (EO-1 and EO-37) were previously reported as “presumed extirpated”, and therefore, population estimates were not available. For 2 other populations (EO-19 and EO-21), plants were found in the vicinity of the original occurrence, but were sufficiently far from

the original coordinates that it was questionable whether they were part of the original occurrence. In the case of EO-21, only 1 plant was originally reported at the location provided. We could not find any plants at that location, but did locate several hundred plants within a 2-3 km radius of this location.

Habitat conditions varied considerably among the 27 natural populations. In some populations, habitat disturbance was considerable while conditions were relatively undisturbed at others. Broadly classified, habitat was relatively undisturbed in 12 populations, low to moderately disturbed in 12 populations, and highly disturbed in 3 populations. For the partially disturbed populations, in some cases the disturbance was distributed throughout the population. In other cases, some portions of a population had disturbances while other portions were relatively undisturbed.

Internal disturbances within populations included roads (both paved and unpaved), off-highway vehicle use, human foot traffic, illegal dumping, target shooting, burning, sand mining, erosion, oil field activities, flooding, and invasive non-native plants. Invasive non-native plants were present in most populations, but in some areas were sufficiently abundant or dense to potentially constitute a serious competitive threat to Bakersfield cactus. Invasive species included red brome (*Bromus madritensis spp. rubens*), wild oats (*Avena spp.*), tumbleweed (*Salsola spp.*), and Sahara mustard (*Brassica tournefortii*). Also, cattle grazing occurs in many populations. This activity technically constitutes a disturbance, but grazing at low to moderate intensities generally does not appear to adversely impact Bakersfield cactus and may even improve conditions by reducing the density of non-native grasses.

External threats to populations include all of the disturbances described above. Additional threats include habitat conversion for urban, industrial, and agricultural developments. Particularly in the northeast Bakersfield area, residential and commercial development is occurring at a rapid pace. Industrial developments include continuing oil field activities (e.g., construction of well pads and associated roads and facilities) and expanding sand or gravel mines. Agricultural development also is a threat. During the status survey, a portion of EO-3 was converted to citrus groves resulting in the loss of Bakersfield cactus plants.

Level of administrative protection varies considerably among the 27 natural Bakersfield cactus populations and ranges from lands being protected from development in perpetuity to absolutely no protections. As described earlier, some populations extend across lands with different owners, and protection levels vary accordingly depending upon land ownership. Lands owned and managed by the U.S. Forest Service and the California Department of Fish and Game are public lands managed by natural resource conservation agencies and where endangered species protection is mandated by law. Cactus populations on these lands are administratively very secure. Furthermore, some populations occur on lands that have been placed under permanent conservation easements. Examples include Tejon Ranch Corporation lands managed by the Tejon Ranch Conservancy (EO-21, 25, and 38) and private lands under easements with The Nature Conservancy (EO-23 and 24). These populations also are administratively very secure.

Other lands currently have significant protective measures in place, but these protections are not guaranteed in perpetuity. For example, lands owned and managed by the Center

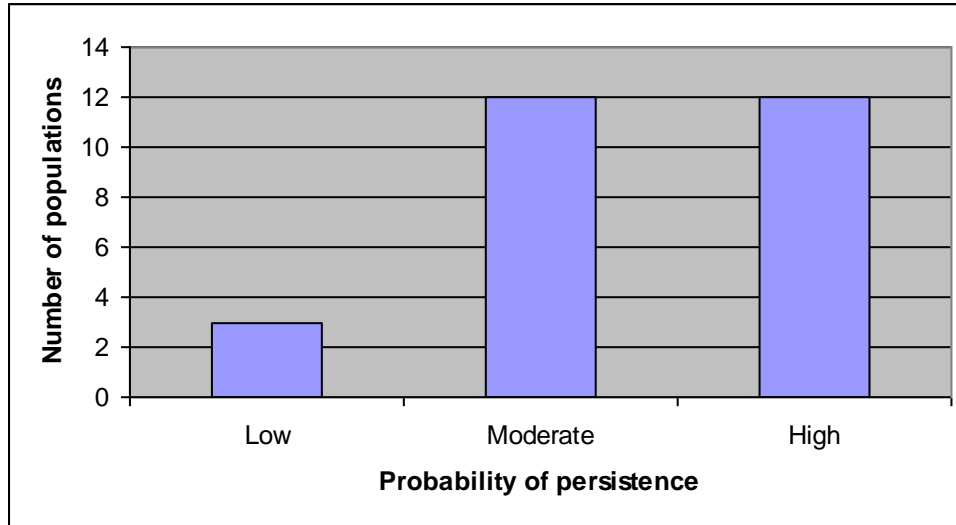
for Natural Lands Management (EO-3; Sand Ridge Preserve), The Wildlands Conservancy (EO-44; Wind Wolves Preserve) and the Kern River Corridor Endowment and Holding Company (EO-18 and new undocumented population; Panorama Vista Preserve) currently benefit from stringent protective measures implemented by these organizations (e.g., fencing, restricted access, avoidance measures, etc.). However, these lands are not permanently protected by conservation easements or other mechanisms. Cactus populations on lands owned by certain corporations (e.g., EO-28; PG&E, and lands owned by oil companies) receive some protections from policies and procedures (mostly avoidance) implemented by these current landowners, but there are no permanent protections in place on these lands. Finally, populations on some private lands, particularly grazing lands, currently receive some protection primarily because public access is proscribed or highly restricted. However, again, these protections are not guaranteed in perpetuity.

Currently among the 27 natural populations, only 4 entire populations are protected in perpetuity (Table 4). Portions of 8 other populations also are protected in perpetuity. For the remaining 15 populations, no portion is protected in perpetuity. All or portions of 10 populations currently receive some formal, but non-permanent, protective measures.

**Table 4. Protection status for Bakersfield cactus populations as of May 2011.**

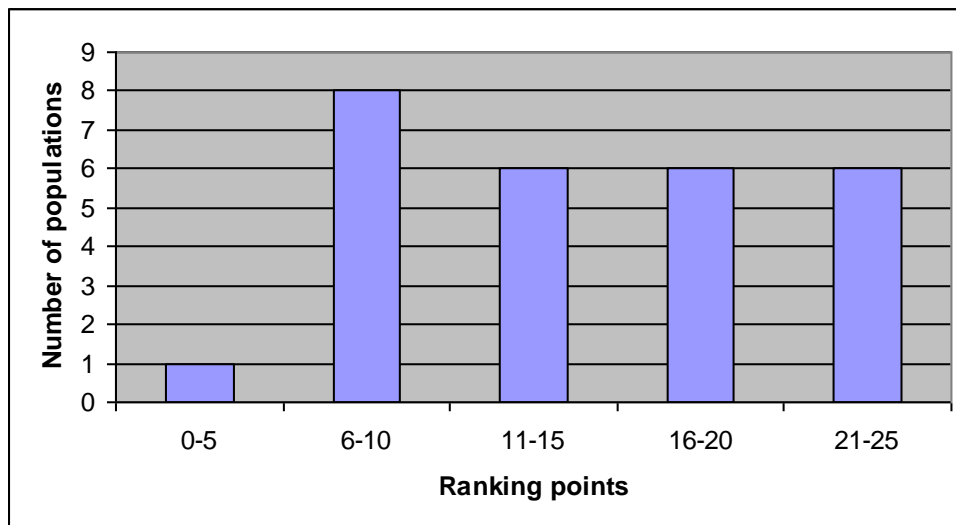
<b>Protection status</b>	<b>Number of populations</b>	<b>Populations</b>
Entire population protected in perpetuity	4	Element Occurrences 21, 23, 38, 51
Portion of population protected in perpetuity	8	Element Occurrences 2, 3, 15, 24, 25, 32, 36, 45
No portion of population protected in perpetuity	14	Element Occurrences 1, 7, 10, 11, 16, 17, 18, 19, 20, 37, 43, 44, 59. New populations – “Nickel”, “Panorama Vista”
Number of unprotected populations with formal but non-permanent protective measures	11	Element Occurrences 1, 11, 16, 18, 20, 28, 37, 44. New population - “Panorama Vista”

Estimated probability of persistence for Bakersfield cactus populations ranged from low to high (Figure 4). Note well that this subjective estimation was for the population in its entirety. In many populations, the actual probability of persistence likely varies among segments of the population. This is particularly true where land ownership varies among different portions of a population resulting in some portions having permanent protections while other portions are not protected. The 3 populations estimated to have a low probability of persistence were EO-16, 19, and 59. These populations are small populations with no permanent protections in highly degraded habitats in which threats from on-going land-uses (e.g., oil field activities) are high.



**Figure 4. Number of populations by probability of persistence for Bakersfield cactus populations based on surveys conducted March 2010 to May 2011.**

Ranking point totals range from 4 to 24 out of a possible 25 points (Figure 5). Populations with higher point totals are protected, larger in size, occupy larger areas, and have relatively low levels of internal and external threats. Populations with lower point totals generally have no permanent protection, are smaller in size and area occupied, and have relatively high levels of internal and external threats. Populations with the highest rankings include EO-44 (24 points) and EO- 21 (23 points). The population with the lowest ranking is EO-19 (4 points). Similar to probability of persistence, the rankings are for entire populations, and in actuality, rankings likely would vary between different segments of a given population depending upon ownership, habitat conditions, threats, and protection levels.



**Figure 5. Number of populations by ranking point category for Bakersfield cactus populations based on surveys conducted March 2010 to May 2011.**

### ***TRANSLOCATED POPULATION ATTRIBUTES***

Among the 6 translocated Bakersfield cactus populations, population size ranges from 1 to 22 plants. Attributes for each population are provided below.

The California Living Museum (CALM) population (2 plants) occurs among native plant gardens at a small zoo. These plants were translocated here from the East Hills Mall development site in the 1980s. The property is owned by Kern County and managed by the Kern County Superintendent of Schools. The population is protected by current policies, but is not protected in perpetuity. Threats include human foot traffic and possibly chemicals, and the probability of persistence is considered only moderate because of the small size of the population.

The East Hills Mall population (~10 plants) is in a highly disturbed landscape embankment next to a busy road and parking lot. These plants were collected and placed in this location when the Mall was constructed in the 1980s. The property is privately owned and no protective measures are in place. Threats include human foot traffic and vandalism, erosion of the embankment, roads, and potential development of the site. The population is in decline and the probability of persistence in the current location is considered low.

The California State University-Bakersfield (CSUB) population (~10 plants) occurs on the grounds of the Facility for Animal Care and Treatment (FACT). These plants were translocated from various natural populations in the 1980s prior to the Bakersfield cactus being federal or state listed. FACT is protected from future development, but no other formal protections are in place. The area is subject to minimal disturbance, but the probability of persistence is considered only moderate because of the relatively small size of the population.

The China Grade Landfill population (~10 plants) occurs in a relatively undisturbed buffer area of this inactive landfill. Some plants were translocated in 2008 to this site from another portion of the landfill that was going to be disturbed. Other plants also were translocated in 2008 after they were salvaged from a site in northeast Bakersfield that was about to be developed. The property is owned by Kern County and is managed by the Kern County Waste Management Department (KCWMD). Current zoning precludes development of this site, but no other formal protections are in place. The area is subject to minimal disturbance, and threats include nearby roads and the possibility of wildfires. The probability of persistence is considered only moderate because of the relatively small size of the population.

The Bena Landfill population (22 plants) occurs in a relatively undisturbed buffer area of this still active landfill. Plants were translocated to this site from the nearby Sand Ridge Preserve (EO-3) in 2009 as an experimental attempt to establish a new population of Bakersfield cactus (Cypher et al. 2011). The property is owned by Kern County and is managed by the KCWMD. Under a Habitat Conservation Plan prepared by the KCWMD, the buffer area was set aside as compensation for landfill activities and will be conserved in perpetuity. The site is relatively undisturbed except for grazing by cattle. Threats include nearby landfill operations and possible pesticide drift from nearby citrus groves. The probability of persistence is considered only moderate primarily because the population was just recently translocated and long-term establishment is not yet certain.

The Wheeler Ridge Pumping Plant population consists of 1 plant growing in what appears to be a small succulent garden established on the edge of a parking area for the Pumping Plant along the California Aqueduct. The plant clearly was translocated from another location and planted at the site. The date of the translocation is unknown but is suspected to be no more recent than 15 years. The property is owned and managed by the California Department of Water Resources. The site is protected by current policies, including restricted public access. Threats include vehicles, embankment erosion. The size and spreading habit of the clump suggests that it may have grown considerably since planting. However, the probability of persistence is considered low primarily because the population consists of only one plant.

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## DISCUSSION

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### *SURVEY LIMITATIONS*

The information conducted during this survey provided significant insights into the current status of the Bakersfield cactus metapopulation. However, when considering these findings, there are some limitations to the data set that need to be considered in drawing conclusions about the current status of this species. Some of these limitations have been alluded to in the Results section. Following is a discussion of the limitations we identified along with an assessment of their impact on survey results.

We were not able to access all populations in their entirety. Usually, this resulted from an inability to secure permission to visit portions of a population occurring on private property. In a few instances, lack of access precluded our ability to visit any part of a population resulting in a complete lack of information regarding the status of that population. This is the case for EO-8, EO-26, and EO-43. In all 3 cases, we were able to at least verify that habitat still persisted on these sites based on inspections from adjacent lands to which we had access or aerial surveys. The lack of information on these 3 populations probably constitutes the most significant deficiency in the survey results. For all other populations that could not be surveyed in their entirety, we were at least able to access a portion of the site and were able to verify that the population was extant. Thus, the lack of information on the remainder of these populations is disappointing, but the impact on overall survey results is significantly reduced.

Vegetation conditions were not optimal for conducting surveys. Vegetation density was relatively high during the survey, which obscured cactus at times. This density was attributable to above average precipitation during the last 2 years. Average annual (1 July-30 June) for the Bakersfield area is ca. 17.1 cm (6.75 in). Total precipitation during the 2009-2010 and 2010-2011 rain years was 18.0 cm (7.1 in) and 26.2 cm (10.3 in), respectively (National Oceanic and Atmospheric Administration 2011). Surveys were initiated in spring 2010 but then postponed until fall to allow time for vegetation to cure and begin decomposing. Wet conditions during winter 2010-2011 delayed access to some sites and also promoted a regrowth of dense vegetation, particularly non-native grasses such as bromes (*Bromus* spp.) and wild oats (*Avena* spp.). Dense vegetation may have affected survey results in 2 ways. It is possible that cacti were present but not detected on some sites resulting in a conclusion that the population is extirpated.



However, we feel that our searches were sufficiently thorough such that the probability of a false extirpation determination is low. Cacti obscured by dense vegetation also may have resulted in lower estimates of population size. Again, we feel that our searches were sufficiently thorough such that any underestimates of population size are not likely to significantly affect the survey results.

### ***META-POPULATION STATUS***

Of the 39 populations listed in the CNDDDB, 9 were presumed extirpated and 30 were presumed extant. Two of the presumed extirpated populations were found to be extant, and no Bakersfield cactus was found at 5 of the populations presumed extant and so they are now presumed extirpated. Thus, of the 39 populations, 25 are confirmed extant, 11 appear to be extirpated, and the status of 3 could not be confirmed (one of which was a presumed extirpated population and two of which were presumed extant populations). Additionally, 2 undocumented populations were found. Therefore, at least 27 natural populations currently are known to persist and 6 translocated populations have been documented resulting in a minimum of 33 extant populations.

In a number of instances, cactus located during this survey did not correspond well spatially with CNDDDB records. This discrepancy potentially is attributable to several factors. In some instances, the locations of the cacti may not have originally been recorded accurately or mapping methods differed. In other instances, cacti occurring outside of polygons simply may not have been located in previous surveys. Also, dispersion within an occurrence may have changed over time with plants disappearing from some portions of a site and new plants expanding into areas outside of the previously recorded site. Regardless of the causes, polygons should be revised to reflect current distributions so that status can be more easily and accurately assessed during any future surveys.

Bakersfield cactus likely occurs in additional locations that have not been documented. Vast areas of potential habitat have not been surveyed, primarily because this habitat occurs on private lands. In particular, considerable potential habitat still occurs in the Kern Front region, Caliente Creek drainage, and Comanche Point region of Tejon Ranch. Indeed, significant numbers of Bakersfield cactus plants have been found in recent opportunistic surveys in the Comanche Point region of Tejon Ranch (tentatively assigned to EO-21 in this survey) and the probability is high that additional plants may occur in areas not yet surveyed. Thus, additional surveys are warranted as opportunities present themselves.

The two previously undocumented populations were brought to our attention by the owners of the lands on which these populations occur. One population is on property owned by the Nickel Family, and was shown to us by a family member who was taking us to a known population on their property (EO-28). The other population occurs on the Panorama Vista Preserve owned by the Kern River Corridor Endowment and Holding Company. A preserve manager contacted us regarding this population and guided us to it for documentation and assessment.

“Population” has been used interchangeably with “element occurrence” in this report. However, “occurrence” is probably the more accurate term. A “population” generally is defined as a group of individuals that occur in a given geographic area and that have a

higher probability of reproducing with individuals within the group than without (e.g., Pianka 1978). The population status of the Bakersfield cactus element occurrences is difficult to determine. The working definition generally employed by CNDDDB for plants is that occurrences separated by at least one-quarter mile are considered separate occurrences while those closer than this distance generally are lumped as a single occurrence. The probability of cross-pollination between occurrences greater than one-quarter mile apart probably is low. Similarly, for a number of occurrences, segments of these occurrences (as defined by CNDDDB polygons) are greater than one-quarter mile apart and probability of cross-pollination between these segments probably is low. However, the element occurrence concept is probably the easiest and most convenient approach for considering subdivisions of the Bakersfield cactus metapopulation.

Clearly, the remaining occurrences are anthropogenically induced artifacts. Bakersfield cactus likely was widely and mostly continuously distributed within San Joaquin Valley portions of the Kern River and Caliente Creek drainages (U.S. Fish and Wildlife Service 1998). However, profound habitat destruction and other factors (e.g., fires and other disturbances) have resulted in the current highly fragmented distribution of this taxon. Cross-pollination between fragments likely is highly limited by distance, and dispersal is severely limited by surrounding incompatible land uses (e.g., agricultural and urban development).

Gene flow and genetic partitioning within the current Bakersfield cactus metapopulation is being investigated by researchers at the California State University – Bakersfield. In support of this investigation, genetic samples were collected from all of the element occurrence sites visited. Samples also have been collected from other populations normally considered outside the range of Bakersfield cactus. Some of these populations exhibit phenotypic traits characteristic of Bakersfield cactus (e.g., Tehachapi Mountains groups) while others do not (e.g., Mojave Desert) and have taxonomically been considered to be the related subspecies *O. b. basilaris* (P. Smith, CSU-Bakersfield and E. Cypher, CDFG – personal communications). The results of the genetic study in progress will assist in more accurately defining the distribution of the *O. b. treleasei* genotype and also the degree of genetic subdivision and exchange among remaining occurrences.

### ***PROTECTION STATUS, THREATS, AND ON-GOING IMPACTS***

Of the remaining Bakersfield cactus occurrences, permanent protections are in place for 4 entire populations and portions of 8 others. These protections include ownership and management by federal (e.g., U.S. Forest Service) or state (e.g., CDFG) natural resource agencies, and permanent conservation easements on lands managed by non-profit conservation organizations (e.g., Tejon Ranch Conservancy) or on private lands. Conservation easements on private lands have been arranged by The Nature Conservancy (EO-23 and 24), the Tejon Ranch Conservancy (EO-21, 25 and 38), and the California Department of Water Resources (EO-45). These occurrences may still face anthropogenic or biological threats, but are administratively secure. Furthermore, they include some of the larger remaining cactus populations (e.g., EO-3, 25, and 36).

Other populations, or portions thereof, currently are receiving active or passive protection, but such protections are not permanent. Several populations receiving active protection occur on lands owned and managed by conservation organizations (e.g.,

Center for Natural Lands Management, The Wildlands Conservancy, Kern River Corridor Endowment and Holding Company) or a state agency (e.g., California Department of Water Resources). These populations might be permanently protected if these landowners were willing to implement conservation easements on lands with cactus. Other populations receiving active protection are located on lands owned and managed by corporations (e.g., Chevron, Vintage, PG&E). The willingness of these landowners to implement conservation easements is unknown, and they possibly would seek compensation in exchange for such easements. As stated previously, some populations on private lands receive passive protection because of access restrictions. Thus, a considerable number of the remaining Bakersfield cactus occurrences currently are receiving some form of protection, but of the 26 natural populations confirmed extant, only 12 are entirely or partly protected in perpetuity.

Two populations occur on lands owned by Kern County (EO-11 and 16). It is unclear whether county ownership affords any protections to Bakersfield cactus. Another population on county land (EO-30) apparently was destroyed, possibly by grading and/or fire.

Many of the Bakersfield cactus populations, including protected ones, are subject to a variety of internal and external threats. Internal threats are a function of activities occurring within populations that result in potentially detrimental disturbances. Some of these activities are unauthorized and are conducted by trespassing individuals. Other activities are legal and are conducted by landowners. Internal disturbances include roads (both paved and unpaved), off-highway vehicle use, human foot traffic, dumping (Figure 6), target shooting, sand mining, and oil field operations. These disturbances can lead to physical damage to plants (e.g., crushing, burial), soil contamination, fires, altered hydrologic patterns, and erosion of supporting substrate. Non-native invasive plants constitute another internal threat to cactus. These plants can compete with cactus for moisture, nutrients, and sunlight. Grasses such as bromes and wild oats are particularly problematic, but other species such as Sahara mustard can also impact cactus. Survival and growth of Bakersfield cactus increased significantly when non-native grasses were controlled around cactus clumps (Cypher and Fiehler 2006). Internal threats such as those described above may be responsible for the marked declines in the number of Bakersfield cactus plants observed in 9 (36%) of the 25 populations assessed in previous status surveys.



**Figure 6. Dumping observed at Bakersfield cactus sites EO-2 (left) and EO-3 (right).**

Many of the remaining sites with Bakersfield cactus are subject to grazing by cattle. The effects of cattle grazing are not clear and very likely vary with grazing intensity. Cows do not appear to feed on the cactus, but do occasionally damage it mechanically by kicking or trampling plants. At most sites with grazing, little or no damage was observed. Some damage was observed at one site (EO-36) where grazing intensity appeared to be relatively high (Figure 7). Alternatively, cattle grazing may provide potential benefits to cactus populations. Cattle can significantly reduce the biomass of plants that potentially compete with the cactus and that also provide fuel for fires. Also, the detachment and movement of cactus pads might contribute to dispersal and the establishment of new plants. Indeed, some of the pads in EO-36 that appeared to have been detached by cows also appeared to have rooted and produced new plants.



**Figure 7. Damage to Bakersfield cactus plants caused by cattle in EO-36.**

External threats result from activities occurring on adjacent lands but that can impact cactus populations. Many of the activities identified above as internal threats also constitute external threats. Additional activities include agricultural and industrial operations and urban development. Although occurring off-site, these activities can lead to on-site impacts such as soil contamination, fires, altered hydrologic patterns, erosion of supporting substrate, and trespass activities.

Probably the most significant threat to remaining Bakersfield cactus populations comes from on-going habitat conversion for urban, agricultural and industrial developments. Development is a particularly significant threat for unprotected populations. Of the 11 occurrences now thought to be extirpated, at least 6 of these findings are attributable to agricultural or urban development. Additionally, portions of several other occurrences have been lost due to development (e.g., EO-2, urban; EO-3, agriculture and sand mining; EO-16, oil field development; EO-36, agriculture). As a striking example of this continuing habitat conversion, a portion of EO-3 was converted to a citrus grove during this status survey (Figure 8). FWS and CDFG staff were alerted, but because the action was occurring on private property, the destruction could not be stopped. However, the landowner did permit CDFG staff to organize and conduct a salvage effort, and some of the impacted cacti were collected and transplanted to CDFG land at the southern end of EO-3. Other populations also are under threat from imminent development, particularly several (i.e., EO-7, 10, and 15) in the northeastern portion of Bakersfield where urban development is occurring at a rapid pace.



**Figure 8. Habitat conversion in progress and impacted Bakersfield cactus at EO-3, 14 December 2010.**

The risk to Bakersfield cactus populations associated with the multitude of internal and external threats is significantly enhanced by the relatively small size of many of the known extant natural populations. Of the 27 populations, 16 (59%) comprise 100 plants or less. Populations with such low numbers of plants are already vulnerable to demographic and environmental stochasticity, and the threats just exacerbate the probability of eventual extirpation.

Furthermore, the potential for natural dispersal (and subsequent establishment of new populations) appears to be low (U.S. Fish and Wildlife Service 1998). Unlike other *Opuntia* species that produce fruits that are highly attractive to potential animal dispersers, Bakersfield cactus fruits tend to be rather dry (Parfitt and Baker 1993), and therefore are relatively unappealing to potential dispersers. Thus, there are no known vertebrate dispersers. Although Bakersfield cactus appears to readily produce seeds, many of these seeds apparently are predated by insects or rodents prior to germination (E. Cypher, California Department of Fish and Game, personal communication). Consequently, seedlings rarely are observed. The primary dispersal strategy employed by this plant appears to be shed pads. However, these pads rarely move far from the parent plant unless assisted by gravity, flowing water, or possibly animals. Even where such agents are present, the highly fragmented condition of remaining habitat significantly inhibit movement and minimize the probability of a pad being transported to a suitable unoccupied habitat patch.

The threats and impacts described above are all local in nature. However, a couple of non-local threats also may impact Bakersfield cactus populations and increase the risk of extinction. One potential threat is climate change. This threat is poorly defined simply because of the high degree of uncertainty regarding the potential manifestations and patterns of climate change. It is even conceivable that climate change potentially could have a beneficial effect on Bakersfield cactus, to the extent that such change might produce more arid conditions that might favor this species, particularly in the foothills of the Tehachapi Mountains. Increased aridity also could cause the discontinuation of agricultural activities on some lands, which then might be available for colonization by Bakersfield cactus.

A more serious potential threat to Bakersfield cactus may come from the cactus moth (*Cactoblastis cactorum*). This moth is a native to South America. It lays its eggs on the spines of *Opuntia* cactus, and the larvae feed on the pads and kill them in the process. The moth was introduced as a biological agent to control non-native *Opuntia* cactus in Australia, Mauritius, the Hawaiian Islands of the United States, and several Caribbean countries. It was detected in the Florida Keys in 1989 and has impacted a rare cactus that occurs there, the semaphore cactus (*Opuntia corallicola*) (Stiling et al. 2004). Since its initial detection in Florida, the moth has rapidly spread north and west. In 2009, it was detected in Louisiana (U.S. Department of Agriculture 2011). Experts expect that it is only a matter of time before the moth reaches the southwestern United States, including California (Stiling 2002). Where it occurs, the moth has had devastating effects on *Opuntia* populations, and it could do the same to Bakersfield cactus populations if it reaches the San Joaquin Valley.

### **CONSERVATION NEEDS AND STRATEGIES**

During the past decade or so, the number of Bakersfield cactus populations has declined. Additionally, significant declines in cactus abundance are evident in a number of the remaining populations. Thus, Bakersfield cactus continues to decline in abundance and distribution on multiple landscape scales. Furthermore, remaining populations are at risk from a number of immediate threats, and at least 2 potential future threats (i.e., cactus moth, climate change) could profoundly impact this taxon. Given the current situation and future prospects for Bakersfield cactus, aggressive proactive conservation measures are warranted and may be necessary to not only recover this taxon, but even just to prevent its possible extinction.

Conservation needs for Bakersfield cactus include:

- the permanent conservation of additional populations
- increased protections from impacts
- habitat management within populations
- expansion within existing populations and the creation of new populations
- additional surveys for new populations
- outreach and education programs

Currently, only 4 entire populations and portions of 8 others are conserved in perpetuity. Conserving additional populations would help decrease long-term extinction risk for Bakersfield cactus. Conservation of populations could be achieved through purchase of properties by a natural resource agency or other entity willing to forfeit development rights for those lands. Conservation also could be achieved through permanent conservation easements placed on lands with cactus, as has been done for several populations (e.g., EO-23 and 24). Funding for the purchase of properties or conservation easements could come from a variety of sources including the Metropolitan Bakersfield Habitat Conservation Plan, Central Valley Project Improvement Act Habitat Restoration Program and Central Valley Project Conservation Program, Wildlife Conservation Board, and a variety of other public and private sources. The establishment of cactus preserves using funds from the Metropolitan Bakersfield Habitat Conservation Plan would be

highly appropriate given that a number of Bakersfield cactus populations have been destroyed or impacted by development authorized under that plan.

Several factors could be considered in prioritizing Bakersfield cactus populations to target for conservation. As part of this status survey, we used a point ranking system to evaluate populations. In general, populations with higher point totals are protected, larger in size, occupy larger areas, and have relatively low levels of internal and external threats. Populations with lower point totals generally have no permanent protection, are smaller in size and area occupied, and have relatively high levels of internal and external threats. One approach is to target populations with lower rankings as they are at greater risk of extirpation. Another approach is to target populations with higher rankings as they have the greater probability of persistence. As an extension of the latter approach, another strategy may be to target groups of populations (regardless of rankings) occurring in regions with greater habitat quality and ecosystem function because of the enhanced probability of persistence in these areas. Regions with relatively high habitat quality and ecosystem function include Tejon Ranch lands (although these populations are already conserved in perpetuity), Sand Ridge area (EO-3), upper Caliente Creek area (EO-23, 24, 25, and 26), and the southern end of the San Joaquin Valley (EO-36, 37, 44 and 45). These approaches could be useful, although in actuality, conservation efforts likely may largely be driven by the availability of landowners willing to sell properties or conservation easements.

Many remaining populations, particularly smaller ones and those located within the rapidly expanding urban landscape of Bakersfield, could benefit from increased site protections. Such protections might include fencing, road closure, signage, and the establishment of buffer areas around the populations. As one example, fencing installed by CDFG on one property (EO-2) has significantly reduced the amount of dumping, OHV use, and human foot traffic through a Bakersfield cactus population.

Vegetation management potentially could improve the health of some populations. As mentioned previously, competition from non-native invasive plant species may adversely impact Bakersfield cactus. These plants also increase fuels around cacti thereby increasing the risk of injury or mortality from wild fires. Reducing the abundance of these species within populations, particularly in the immediate vicinity of cactus plants, could improve population vigor. Potential strategies include grazing, grass-specific herbicides, and clipping. Cypher and Fiehler (2006) found that controlling grasses around cactus clumps with Fusilade II significantly improved survival and growth of Bakersfield cactus. Burger and Louda (1994) also found that brittle prickly pear (*Opuntia fragilis*) grew significantly larger when released from competition with grasses. CDFG staff occasionally reduce grass density around cactus plants on their lands by clipping. Grazing likely is more practical for larger sites while herbicides and clipping may be more practical for small sites.

Expansion of existing populations and the creation of new populations through translocation offer immense potential for increasing the abundance and distribution of Bakersfield cactus. Doing so also would increase metapopulation security and decrease extinction risk. Either pads or clumps can be used in translocation efforts. Cactus pads commonly detach from plants and root resulting in new plants. Cactus plants also have successfully been excavated and planted in new locations. Using one or both of these

means, at least 5 new Bakersfield cactus populations have been established, as described previously. In the experimental translocation to the Bena Landfill conservation area, the 1.5-year survival of 10 clumps was 100% while that of 25 pads was 48% (Cypher et al. 2011). Translocation and reintroduction are strategies that have been employed in conservation efforts for a number of rare plant species (Allen 1994, Given 1994, Falk et al. 1996), including another rare cactus in the Florida Keys, the semaphore cactus (Stiling et al. 2000). In 2011, a new project will be initiated by the CSU-Stanislaus Endangered Species Recovery Program to attempt additional Bakersfield cactus translocations with an emphasis on using shed pads that are propagated into small clumps prior to planting.

When and where possible, additional surveys should be conducted to locate new Bakersfield cactus populations. As mentioned previously, considerable suitable habitat appears to be present in certain localities, but few or no surveys have been conducted in these areas, primarily because most of the lands are in private ownership. Areas that may harbor additional populations include the Kern Front region, Caliente Creek region, and valley floor portions of Tejon Ranch, particularly in the Comanche Point area. In the past 5 years, hundreds of additional Bakersfield cactus plants were located in the Comanche Point area of Tejon Ranch during general botanical surveys. If additional populations exist, they would increase metapopulation security and reduce extinction risk for Bakersfield cactus.

Finally, outreach and education programs may benefit Bakersfield cactus by raising awareness of the plight of this taxon as well as providing information on ways to assist with conservation and recovery efforts. These programs could target the general public, landowners with Bakersfield cactus on their properties, and also organizations and individuals that potentially could provide funding or other support for conservation and recovery efforts.



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## **RECOMMENDATIONS**

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Based on the results of this status survey, the following recommendations are offered for Bakersfield cactus conservation. Details relevant to most of these recommendations were provided in previous sections of this report.

### **1. Pursue permanent conservation of additional populations**

Permanent conservation of populations could be achieved through acquisition of properties or conservation easements.

### **2. Improve protections for populations**

Protection of populations could be enhanced through fencing, signage, road closures, buffer areas, and other means.

### **3. Manage competition from non-native invasive plants**

Competition from non-native plants could be reduced through use of herbicides, vegetation removal, and grazing.

### **4. Increase the size of existing populations**

The number of plants within a population and the area occupied by the population could be expanded by translocating shed pads or small clumps from that same population to nearby unoccupied areas.

### **5. Increase the number of populations**

The number of populations could be increased by translocating shed pads or small clumps to suitable habitat on conserved sites.

### **6. Conduct surveys to locate additional natural populations**

As opportunities present themselves, surveys should be conducted in suitable habitat to search for additional populations.

### **7. Conduct a population viability analysis**

A population viability analysis should be conducted for Bakersfield cactus to determine the optimal number of individual populations necessary to sustain a metapopulation with long-term viability. Such an analysis would help determine a target number for new, translocated populations. A population viability analysis also might help identify the optimum or at least the minimum size necessary to maintain viability for individual populations.

### **8. Conduct outreach and education programs**

Outreach and education programs could increase public support for conservation efforts, provide information on conservation measures to landowners, and encourage contributions of resources for conservation efforts.

**9. Conduct another status survey in 10 years**

This survey should be repeated in 10 years to reassess the status of populations and assess conservation efforts. Given the many immediate threats to this species and the on-going impacts to populations, an inter-survey period greater than 10 years would reduce the ability to react appropriately if populations continue to decline.

**10. Form a subteam under the San Joaquin Valley Upland Species Recovery team to guide Bakersfield cactus conservation and recovery efforts and monitor progress**

The FWS and CDFG are the agencies primarily responsible for oversight of Bakersfield cactus conservation and recovery. Due to insufficient staff and resources, these agencies can not always dedicate the time and efforts necessary to direct effective conservation and recovery efforts. A subteam formed under the Upland Species Recovery team could provide the expertise and direction necessary to optimize conservation and recovery efforts.

**11. Organize a workshop to consider the potential threat to Bakersfield cactus from the cactus moth and climate change, and identify any preparatory measures to battle these threats**

Such a workshop would be a proactive attempt to consider these serious threats and identify potential strategies for mitigating them.

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**APPENDIX A. BAKERSFIELD CACTUS FIELD DATA SHEET**

<b>Date:</b>		<b>Observers:</b>	
<b>Camera:</b>		<b>GPS:</b>	
<b>EO #:</b>  <b>Waypoint (if needed):</b>  <b>Location:</b>  <b>Landowner:</b>  <b>Conservation Status of Site:</b>			
<b>Genetic sample collected Y/N</b>		<b>Y</b>	<b>N</b>
<b>Size of extant population (Number of plants/Number of polygons):</b>  <b>Est. overall area:</b>  <b>% cover inside area:</b>			
<b>Habitat conditions (dominant plant association; soil; slope/aspect):</b>			
<b>Internal disturbances:</b> <ul style="list-style-type: none"> <li>• OHV</li> <li>• Roads</li> <li>• Human foot traffic</li> <li>• Dumping</li> <li>• Shooting</li> <li>• Grazing</li> <li>• Burned</li> <li>• Noxious plants (e.g., significant stand of non-natives)</li> <li>• Other (describe)</li> </ul>			
<b>Extent of area disturbed within population area: (circle one)</b> <ul style="list-style-type: none"> <li>• 0-10%</li> <li>• 10-25%</li> <li>• 25-50%</li> <li>• 50-75%</li> <li>• &gt;75%</li> </ul>			

<p><b>Estimate threat level, considering internal disturbances:</b></p> <p>5: None or very little disturbance or threatening activities          4: Some          3: Moderate          2: High          1: Extreme</p>	
<p><b>Adjacent land uses:</b></p>	
<p>N:          NW:          W:          SW:</p>	<p>S:          SE:          E:          NE:</p>
<p><b>Estimate threat level, considering adjacent land uses/external activities: (circle one)</b></p> <p>5: None or very little disturbance or threatening activities          4: Some          3: Moderate          2: High          1: Extreme</p>	
<p><b>Probability of population presence 100 years from now assuming current conditions remain same (consider internal &amp; external threats, size of pop area, # of clumps, "protected" or not)</b></p> <p>1: Extremely low probability of persisting for another 100 years, likely to be extirpated          2: Low probability          3: Moderate probability (50/50)          4: High probability          5: Seems relatively secure and highly likely to still be present in 100 years (under current conditions)</p>	
<p><b>Recommendations for protection: (fencing; grazing; transplantation?)</b></p>  	
<p><b>Other notes/comments:</b></p>   	

**Point Tally****Protected:**

0 pt: No  
5 pt: Yes

**Population size (in clumps):**

1 pt: 1-50  
2 pt: 50-100  
3 pt: 100-500  
4 pt: 500-1000  
5 pt: >1000

**Parcel size (consider protected parcel):**

1 pt: <1 ac  
2 pt: 1-5 ac  
3 pt: 5-25 ac  
4 pt: 25-100 ac  
5 pt: >100 ac

**Internal treat level:**

5 pt: None  
4 pt.  
3 pt.  
2 pt.  
1 pt: Extreme

**External treat level:**

5 pt: None  
4 pt.  
3 pt.  
2 pt.  
1 pt: Extreme

**TOTAL POINTS (out of 25):**

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**APPENDIX B. BAKERSFIELD CACTUS ELEMENT OCCURRENCE SUMMARIES**

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For each Bakersfield cactus element occurrence visited during this status survey, summaries of the information collection are provided below. Methods for the collection of this information are provided in the main report. A map also is provided. The map depicts the existing CNDDDB polygons for each occurrence, and any significant departures from those polygons based on field observations during the status survey. Information and maps also are provided for the 2 populations not yet recorded in the CNDDDB.

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**ELEMENT OCCURRENCE: 1**

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**Date(s) Surveyed:** March 17, 2011

**Property Ownership:** Private (currently Chevron)

**Historical Status:**

Approximately 50 plants were found at this site in 1981. By Moe's survey in 1989, the site had been disked and the occurrence was documented as extirpated.

**Conservation Status:**

The parcels in this area currently are not protected.

**Total Population Size:** ~20

**Population Extent/Dispersion:**

We could not find any cactus in the polygon area documented by CNDDDB. However, we did find cactus approximately 200-300 meters east of the CNDDDB polygon in a small sandy wash area. In this area we found approximately 20 clumps of cactus.

**Habitat Conditions:**

This area is predominately non-native annual grassland with a few scattered patches of saltbush scrub (*Atriplex polycarpa*). The soil on the site is predominately sandy and alluvial.

**Internal Threats and Disturbances:**

Internal disturbances to the cacti in this area include roads and oil production activities. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 4, indicating that there are some threats to this population.

**Adjacent Land Uses/External Threats:**

Adjacent land use includes oil development activities to the north, northwest, southeast, east, and northeast. Adjacent to the natural parcel to the west is a residential area. To the southwest, south, and parts of the southeast and northeast are industrial areas. We felt that external threats were a 3, indicating there are moderate threats from development and oil field activities in the area.

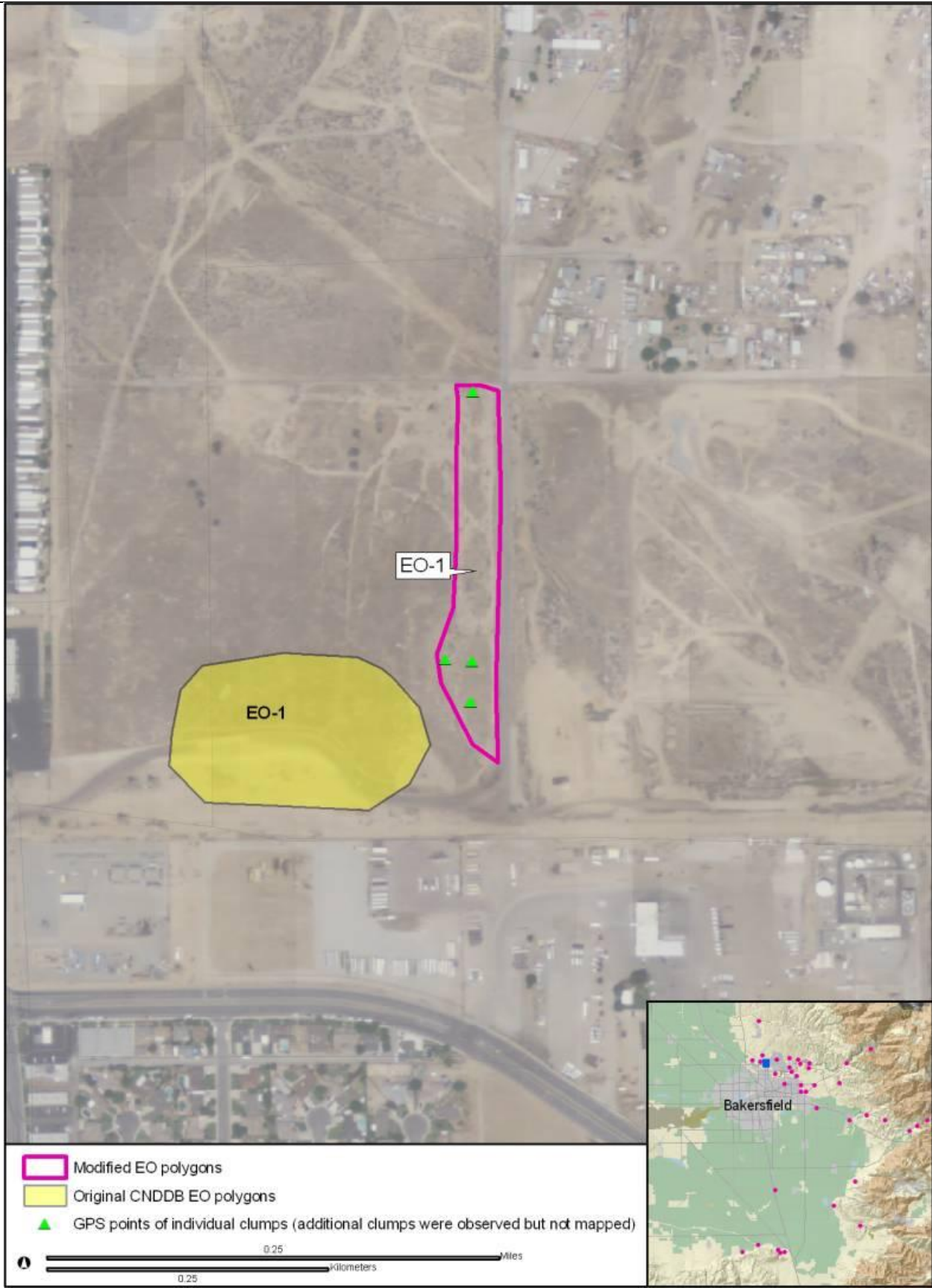
**Probability of Persistence:**

We estimate that this population has a moderate (50/50) probability of persistence in 100 years assuming current conditions remain the same. We chose moderate probability because there are so few cacti in this population and there are threats from adjacent potential industrial development and oil field activities. Using our ranking system we gave this population 8 points out of 25.

**Recommendations:**

We recommend protection for this population through property acquisition or a conservation easement. Also, some form of vegetation management may be beneficial in high rainfall years when annual vegetation productivity is high. Fencing also might help protect the cactus. If protection for this area could be secured, then translocation within the native habitat left in this area could be a potential way to expand the population.





Map 1. Element Occurrence 1

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**ELEMENT OCCURRENCE: 2**

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**Date(s) Surveyed: March 3, 2010**

**Property Ownership: CDFG; Private**

**Historical Status:**

Previous status survey by Bowie in 1981 documented 50-10 plants in 2 northern colonies. In 1988 Stebbins, Foster and Kakiba documented 125-175 plants in a southern colony. In 1989 Moe estimated the total population to be 225. In 1989 it was documented that the northeastern colony was extirpated, possibly due to disking.

**Conservation Status:**

Located in northeast Bakersfield, near the Bakersfield Meadows Field Airport, CNDDDB EO-2, was originally recorded in 1981. Part of area within the CNDDDB occurrence is now protected by DFG. The protected parcel was purchased through the Metro Bakersfield Habitat Conservation Plan and is 146 acres and has a known cactus population (E. Cypher, personal communication). The surrounding parcels that also have polygons that are part of EO-2 are in private ownership. The area within the polygon that is northeast of the DFG property has been largely developed and no habitat for cactus remains.

**Total Population Size: 100-150**

**Population Extent/Dispersion:**

Nearly all of the cacti in EO 2 are found inside or just outside the original CNDDDB polygon located in the southwest portion of the DFG protected parcel (Map 2a). The percent cover of cacti inside this polygon is approximately 5%. This main population has approximately 100-150 clumps of cacti, and coordinates for all of the clumps were recorded by DFG in 2007. In the polygon that is located in the northeastern part of the DFG protected parcel only two clumps of cacti were found. We also found one other clump of cactus near EO-2 just southeast of the DFG parcel that was not officially part of the EO (Map 2b).

**Habitat Conditions:**

Habitat conditions on the DFG parcel include areas of degraded saltbush scrub (predominately *Atriplex polycarpa*) and open habitat dominated by native forbs (e.g., amsinckia; *Amsinckia menziesii*), with some non-natives grasses and red-stemmed fillaree (*Erodium cicutarium*). The soil on the site is predominately sandy and alluvial.

**Internal Threats and Disturbances:**

Disturbances on the protected DFG parcel have been reduced in the last 3 years due to fencing of the property that occurred in 2007 (E. Cypher, personal communication). OHV activity used to be quite extensive on the property, and now only occurs occasionally. Internal disturbances to the cactus population on the site also occur from roads through the protected area that include abandoned dirt roads and powerline access roads. Dumping still occurs on the periphery of the protected area. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 4, indicating there are some threats.

**Adjacent Land Uses/External Threats:**

Adjacent land uses this population include a low density oil field and oil equipment yard to the north and northwest; open, degraded or disked natural land to south, southwest, and west; and developed or planned development areas that have been disked to the southeast, east, and northeast. We estimated that the threat level from adjacent land uses/external activities to be a 4, indicating there are some threats.

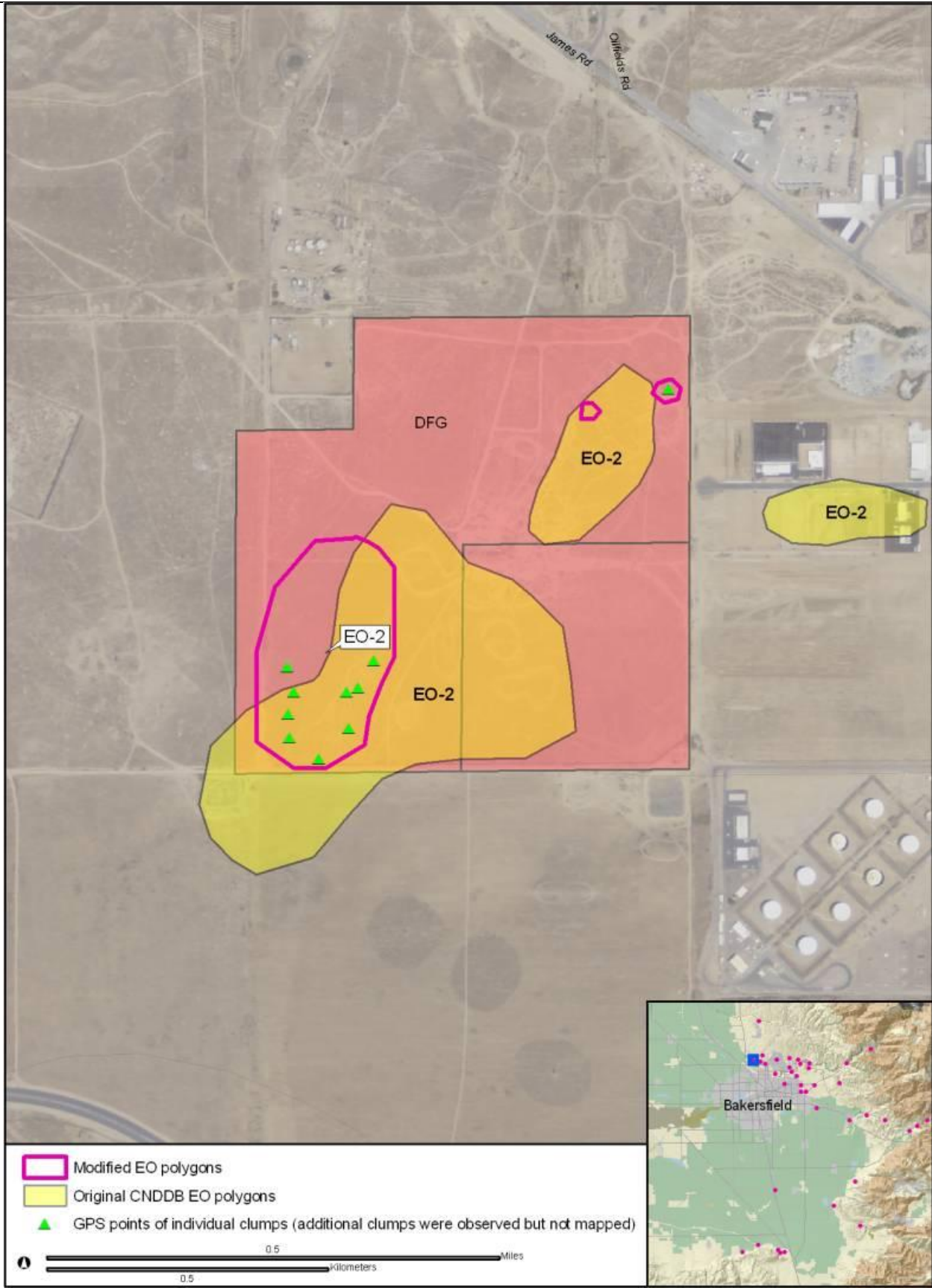
**Probability of Persistence:**

We estimated that this population had a moderate (50/50) probability of presence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 21 points out of 25.

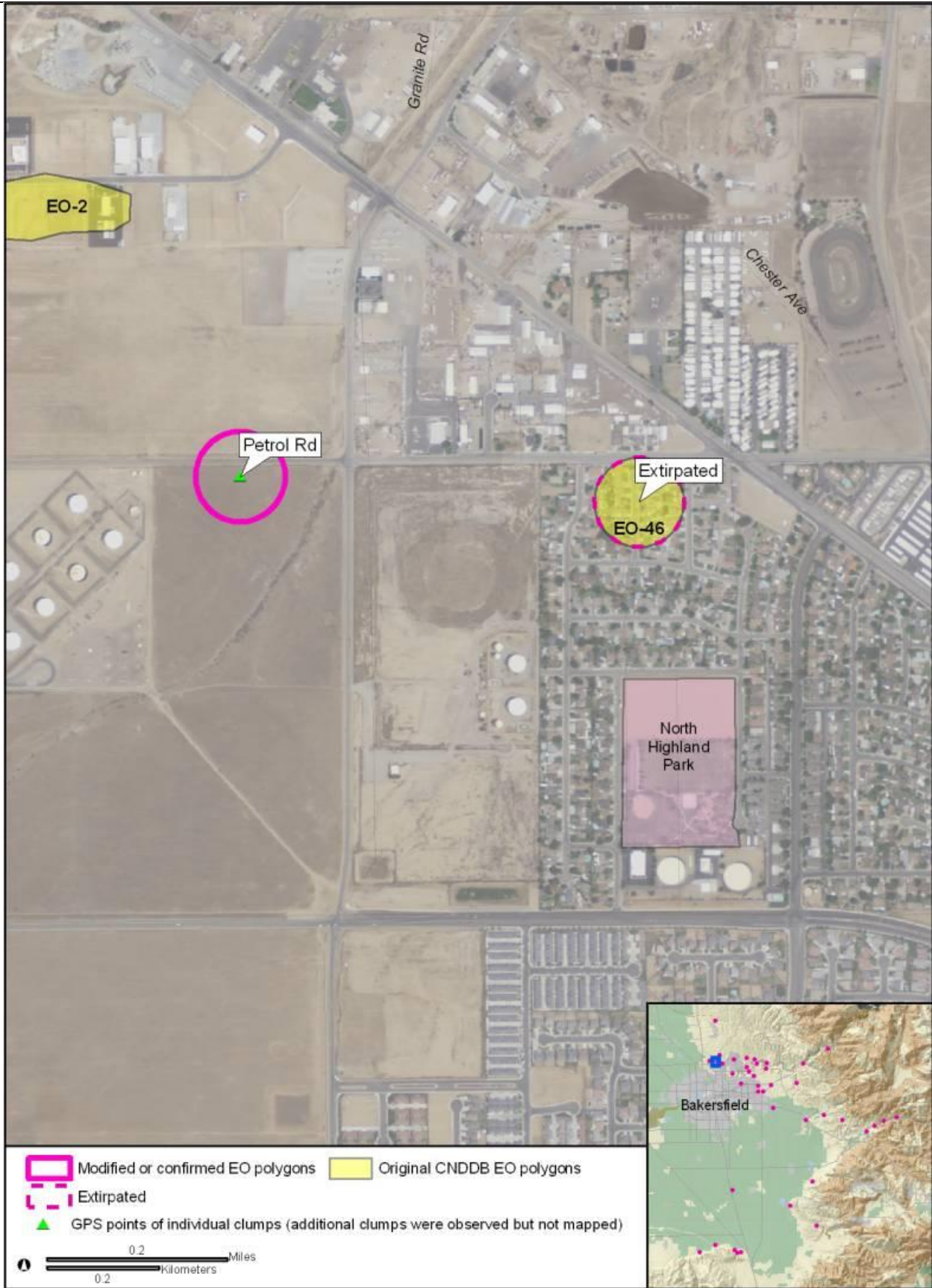
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**Recommendations:**

We recommend maintenance of the fence surrounding this protected population in order to exclude illegal OHV activity and other disturbances, such as human trespass and dumping. Also, some level of grazing may be beneficial for the population in high rainfall years in which annual vegetation productivity also is high. We suspect that this population was likely reduced due to past disturbances and suggest that translocation could potentially be used to expand this population to other parts of the protected parcel and better ensure long-term survival.



Map 2a. Element Occurrence 2.



Map 3b. Cactus clump found near Element Occurrence 2.

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**ELEMENT OCCURRENCE: 3 – NORTHEAST OF HIGHWAY 58**

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**Date(s) Surveyed:** December 9, 2010

**Property Ownership:** Private

**Historical Status:**

In 1981 this was an extensive population with >10,000 plants (including the portion of the EO south of Highway 58. This EO includes former occurrences 5 and 48. In 1986 and 1989 portions of the population burned, but it was noted that plants resprouted. This is an extensive population that extends along the banks of “Sand Ridge,” which runs along the western edge of Caliente Creek. In the CNDDDB historic record it is noted that one colony north of Hwy 58 (EO-5) has been extirpated.

**Conservation Status:**

The area that extends northeast of Highway 58 is on private land.

**Total Population Size:** ~1,000

**Population Extent/Dispersion:**

Several polygons extend northeast of Highway 58. The area covered by the polygons is approximately 65 acres (26 ha). In this area, nearly all of the cacti are found on the sand ridge formation. Nearly all of the cacti are located on the south/southeast facing slope of the ridge. This is a sandy ridge that forms a western bank along Caliente Creek.

**Habitat Conditions:**

Habitat in this area is dominated by non-native annual grassland with bladderpod (*Isomeris arborea*), ephedra (*Ephedra* spp.), saltbush (*Atriplex polycarpa*), and scale-broom (*Lepidospartum squamatum*).

**Internal Threats and Disturbances:**

Disturbances in this area include sand and gravel mining that has been ongoing on the ridge since the 1980s. There is also some erosion on the ridge, probably because of ongoing disturbance in the area. Because of disturbance there is some Russian thistle (*Salsola tragus*). Also, there are some roads through the area and agricultural lands at the base of the ridge that appear to be continually cutting into the side of the ridge base. We estimated disturbance within population to be about 10%. We ranked the threats from internal disturbances as a 4, indicating that there are some threats.

**Adjacent Land Uses/External Threats:**

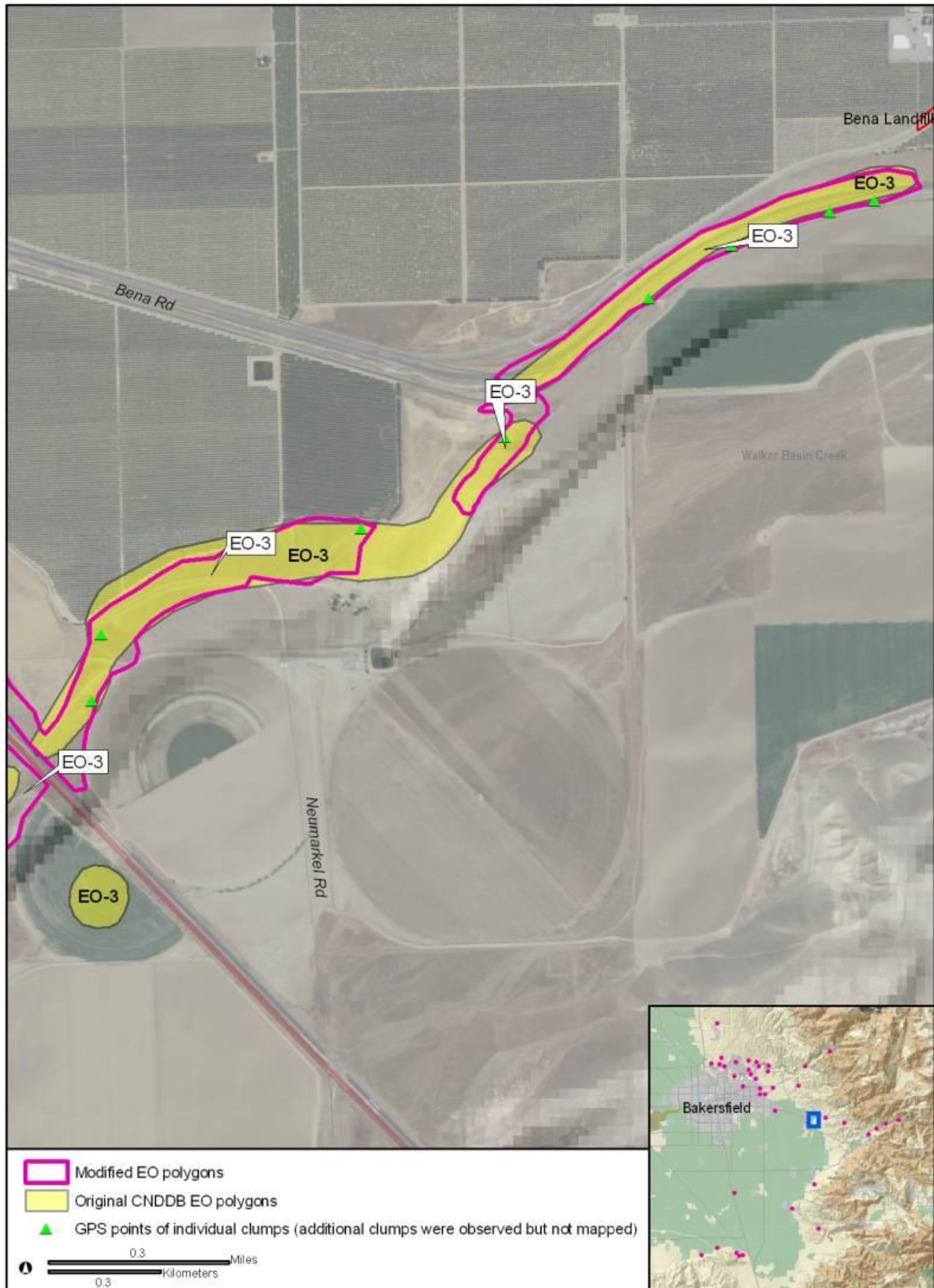
Adjacent land uses include orange groves, other types of farming, roads, a railroad right-of-way, the Bena landfill, and some natural land to the northeast. We estimated the threat level considering adjacent land uses and external activities to be a 4, indicating that there is some threat, especially from sand mining and erosion.

**Probability of Persistence:**

We estimate that this population has a high probability of persistence in 100 years assuming current conditions remain the same. We are not sure that this population will be as extensive as it is now without some protection, but we predict that some part of it will persist. Using our ranking system we gave this population 13 points out of 25.

**Recommendations:**

We recommend protection for this extensive population. We recommend that sand mining be limited in this area or halted altogether. We also recommend discouraging disking of agriculture lands up to the base of the ridge, which may only promote erosion of the ridge. Light grazing (e.g., sheep) may benefit cactus in this area by reducing competition from non-native grasses. Because of the fragile nature of the sandy banks we recommend great care when doing any work in this area to prevent further erosion.



Map 4. Element Occurrence 3 northeast of Highway 58.

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**ELEMENT OCCURRENCE: 3 – SOUTHWEST OF HIGHWAY 58**

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**Date(s) Surveyed:** December 14, 2010

**Property Ownership:** Private and protected (CNLM; CDFG)

**Historical Status:**

In 1981 this was an extensive population with > 10,000 plants. This EO includes former occurrences 5 and 48. In 1986 and 1989 portions of the population burned, but it was noted that plants resprouted. This is an extensive population that extends along the banks of “Sand Ridge,” which runs along the western edge of Caliente Creek.

**Conservation Status:**

The majority of the area that extends southwest of Highway 58 is not protected. There are some protected parcels owned by CNLM and CDFG.

**Total Population Size:** ~10,000

**Population Extent/Dispersion:**

This population covered several polygons that extend south and west of Highway 58. The area covered within the polygons is approximately 280 acres (108 ha). In this area nearly all of the cacti are found on the sand ridge formation or the wash formed by Caliente Creek. Nearly all of the cacti are located on the south/southeast facing slope of the ridge, except for a few isolated clumps that are on the west side of the ridge. We estimated that the CNLM and CDFG protected properties only protect small percentage of the cactus found in this occurrence.

**Habitat Conditions:**

The main feature in this area a large sandy ridge that forms the western bank along Caliente Creek. Habitat in this area is dominated by non-native annual grassland with *Ephedra* spp., *Senecio* spp., scale broom (*Lepidospartum squamatum*), *Crypton* spp., *Ambrosia* spp., bladderpod (*Isomeris arborea*), and cheesebush (*Hymenoclea salsola*).

**Internal Threats and Disturbances:**

Disturbances in this area include sand and gravel mining that has been ongoing on the ridge since the 1980s. Also, sections of the ridge are continually being converted into orange groves, which we actively witnessed during our site visit. There is also some erosion on the ridge, probably because of ongoing disturbance and road building in the area. This disturbance is exacerbated by extensive OHV activity and trespass, which is most prevalent on the southern part of the ridge where there also is an active sand mine. Because of this disturbance there is some invasive Russian thistle (*Salsola tragus*), sahara mustand (*Brassica tournefortii*), and short-pod mustard (*Hirschfeldia incana*). There also are trespassers in this area using the ridge for target shooting and dumping. We estimated internal disturbances to this population to be about 10-25%. We considered threats from internal disturbances to be a 3, indicating that there are moderate threats.

**Adjacent Land Uses/External Threats:**

Adjacent land uses include orange groves, other types of agricultural farming (primarily carrots), ranchettes, and some native habitat. We estimated the threat level considering adjacent land uses and external activities to be a 4, indicating that there is some threat, especially from sand mining and OHV activity.

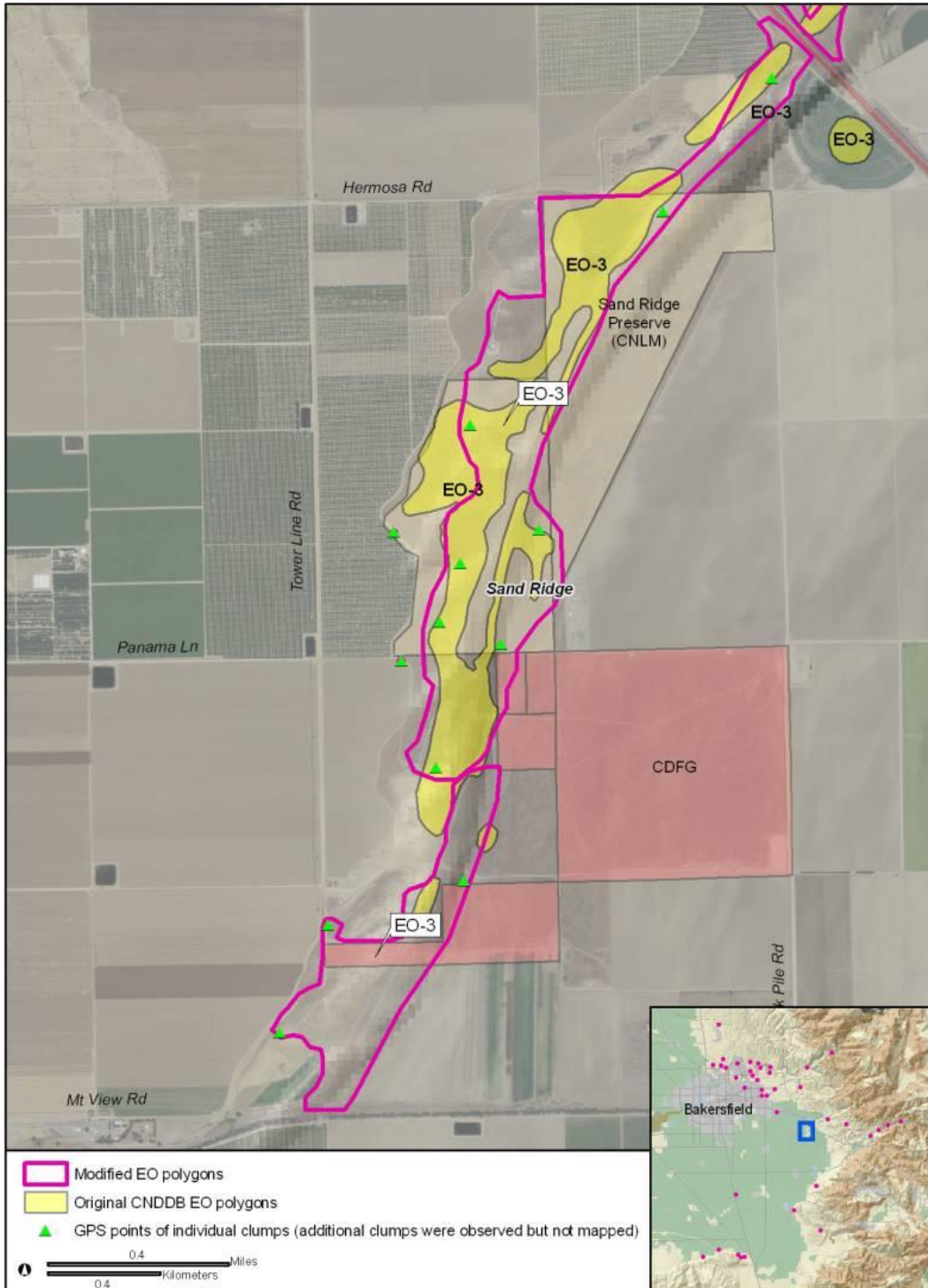
**Probability of Persistence:**

We estimate that this population has a high probability of persisting in 100 years assuming current conditions remain the same. This population is not likely to remain as extensive as it is now without some protection, but we predict that some part of it will persist. Using our ranking system we gave this population 19.5 points out of 25.



**Recommendations:**

We recommend increased protections for this population. One helpful approach may be to divide out the ridge portion of parcels in this area so that the ridge itself can be protected but the creek bed and valley floor will be left for continuing agricultural activities. We also recommend that sand mining be limited in this area or halted altogether. We also recommend discouraging disking of agriculture lands up to the base of the ridge, which may only promote erosion of the ridge. Grazing with sheep might benefit cactus in this area by reducing competition from non-native grasses. Because of the fragile nature of the sandy banks we recommend great care when doing any work in this area.



**Map 5. Element Occurrence 3 southwest of Highway 58.**

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**ELEMENT OCCURRENCE: 7**

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**Date(s) Surveyed: November 17, 2010**

**Property Ownership: Private**

**Historical Status:**

Historically, several colonies or polygons were mapped as part of this element occurrence. Previous occurrences 9 and 35 were incorporated into this EO. For the northern 7 colonies, estimated size was <1000 plants in 1981 and ~500 in 1989. The current CNDDDB occurrence report states that most this population is now mostly extirpated. In the southern center four colonies, the occurrence record states that there were many plants in 1987 and only 9 in 1989.

**Conservation Status:**

None of the parcels in this area are currently protected. However, there is a high transmission power line that runs through the center of the large northern polygon. Because development is not likely to occur under the powerline, this may offer the site some limited protection.

**Total Population Size: ~100**

**Population Extent/Dispersion:**

There are seven polygons in the northern part of EO-7. The two western most polygons have been extirpated by development activities. Inside the main center polygon there are three areas with cactus. The western most has ~35 clumps and encompasses approximately 1.5 acres. The central, largest area has ~60 clumps and encompasses approximately 12 acres. The three polygons just east of the main polygon have all been disked and no cactus remains. In the eastern most polygon in the northern portion there are ~6 clumps of cactus in an area that is 2.5 acres. In the southern portion of EO-7 there are 5 polygons. The western most polygons is now a residential area. The center four polygons still have natural land, but no cactus was found in this area.

**Habitat Conditions:**

This area is characteristic of the bluffs of northeastern Bakersfield. In this area there are coarse to well-drained granitic sandy soils that sometimes have large cobbles. The area also has low hills and flats within grassland terrain that is dominated by saltbush shrub (*Atriplex polycarpa*) and/or non-native grasses such as *Bromus* spp., *Hordeum* spp., and wild oats (*Avena* spp.) as well as some non-native short-pod mustard (*Hirschfeldia incana*). The western most polygon with ~35 clumps had burned in the recent past and the area was mostly barren during our site visit. The eastern polygon that has ~6 clumps of cactus is dominated primarily by Russian thistle (*Salsola tragus*), which may have blown in from an area that was disked for development and then abandoned.

**Internal Threats and Disturbances:**

Internal disturbances to the cacti in this area include OHV activity, roads, human foot traffic, dumping, shooting, fires, and noxious plants (eastern area with extensive *S. tragus*). We estimated the extent of area disturbed within the population to be 25-50%, largely because of disturbances such as roads, powerlines, and dumping that occur within the population. We estimated that the threat level from internal disturbances to be a 2, indicating that threats to this population are high.

**Adjacent Land Uses/External Threats:**

Adjacent land use includes Highway 178 and residential development to the north, northwest, and northeast. To the west, southwest, and southeast, there is some natural land and then developed areas beyond the natural area. To the east there is a disked area that was likely a development project that is now abandoned as well as some natural land. To the west is mostly a residential area. We ranked external threats as a 2, indicating a high threat level from human disturbance and potential development in the area.

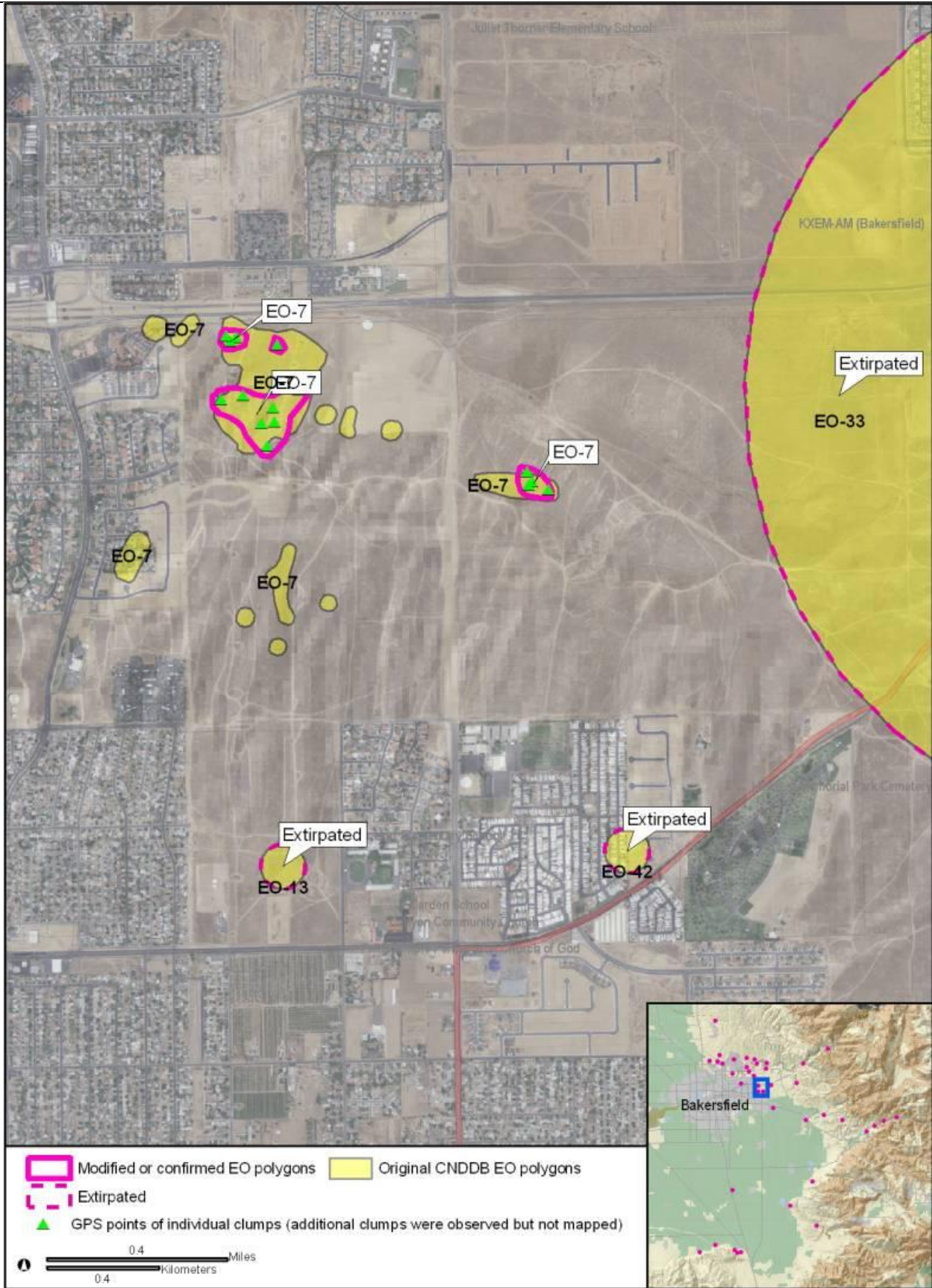
**Probability of Persistence:**

We estimate that this population has a moderate (50/50) probability of persistence in 100 years assuming current conditions remain the same. We chose moderate probability because we felt the population is at risk

from human disturbances and potential development expansion. Using our ranking system we gave this population 6.5 points out of 25.

**Recommendations:**

We recommend protection for this population through property acquisition or a conservation easement. A conservation easement may be possible as part of this property is likely to be left undeveloped because it is a powerline corridor. Any protection for the remaining cactus in this area from human disturbances would be beneficial. Protection might be facilitated by fencing the areas with cactus. Grazing or other vegetation management may be beneficial in high rainfall years in which annual vegetation productivity also is high. The cacti in the area that had been burned looked healthy, and this may be because small, fast-moving fires can be beneficial for cactus. However, larger, hotter fires that occur when there is a high accumulation of annual vegetation can kill cactus.



Map 6. Element Occurrence 7.

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**ELEMENT OCCURRENCE: 8**

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**Date(s) Surveyed:** Drive-by inspection March 9, 2011; aerial survey in May 2011

**Property Ownership:** Private

**Historical Status:**

This EO includes former occurrences 12 and 31. More than 10 plants were mapped in this location in 1981, and 15 plants were observed in 6 polygons in 1989 by Moe.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:**

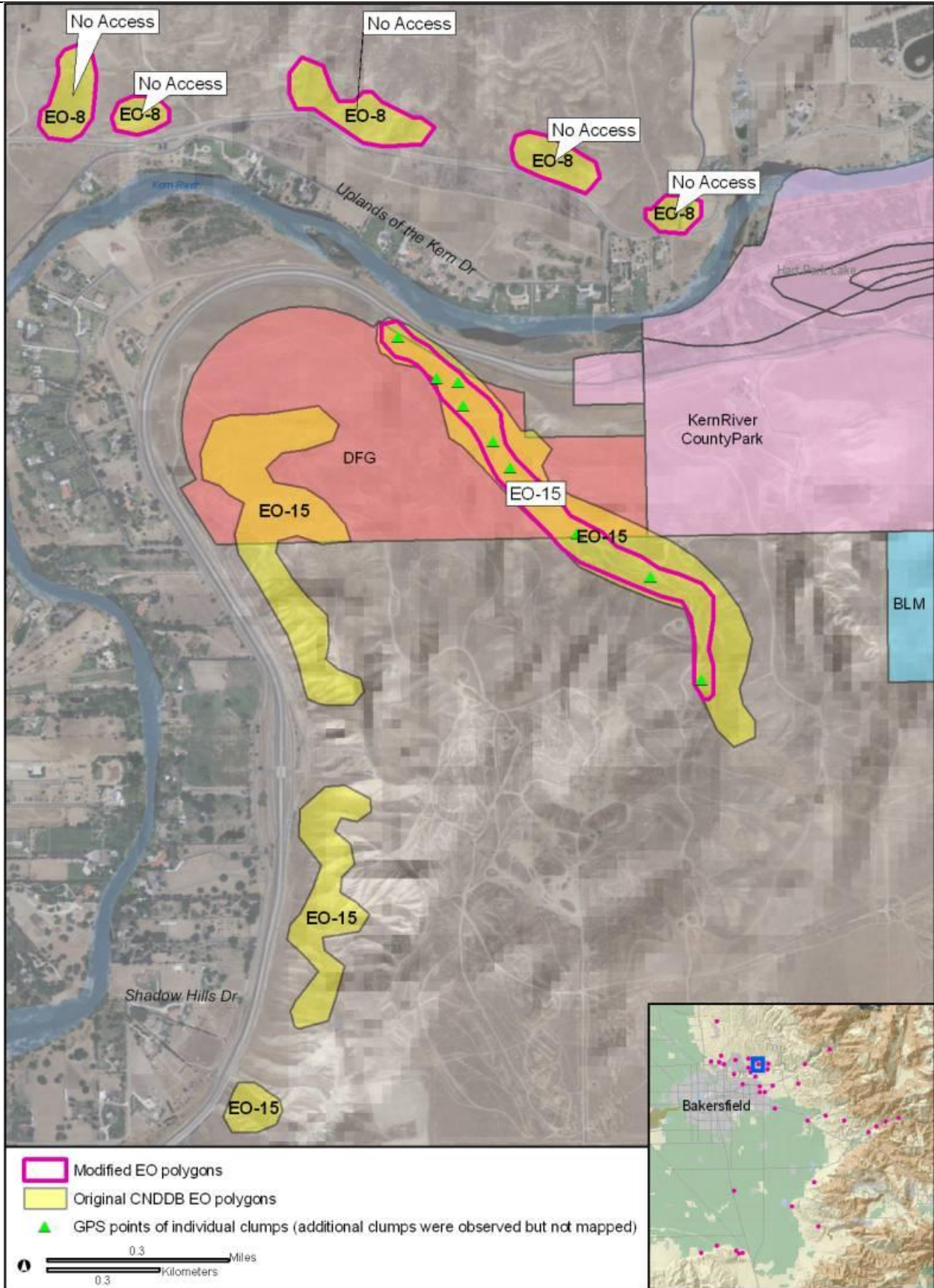
We were unable to gain permission to access this site. We flew over the site in May 2011 and the habitat in the area is still extant.

**Habitat Conditions/Disturbances:**

The habitat is similar to that of other EOs along the bluffs of northeastern Bakersfield. There are coarse to well-drained granitic sandy soils that sometimes have large cobbles. The area also has low hills and flat areas, and dominant vegetation is saltbush shrub (*Atriplex polycarpa*) and/or non-native grasses such as *Bromus* spp., *Hordeum* spp., and wild oats (*Avena* spp.).

**Adjacent Land Uses:**

Lands adjacent to this EO include native habitat and residential areas along the Kern River.



Map 7. Element Occurrence 8.

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**ELEMENT OCCURRENCE: 10**

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**Date(s) Surveyed:** October 7, 2010; November 16, 2010

**Property Ownership:** CDFG (in escrow); private

**Historical Status:**

Five colonies or polygons were originally mapped as part of this element occurrence. These include several polygons that were originally cited as EO-40 and 41, but later were combined into EO-10. In a 1981 survey 10-50 plants were observed. In 1989 Moe documented 6 plants in the south colony, 7-12 clumps in the northeast colony, and 1 clump in the northwest colony. In 2002, 5 plants were documented in the center colony. The CNDDDB record does not document who the reporting party was in 2002. In 2006, J. Wiggins observed 16 clumps. The CNDDDB does not state where these clumps were located.

**Conservation Status:**

EO-10 is located in the northeast Bakersfield bluffs area. The very northern part of the northeast polygon occurs on a parcel that is currently in escrow with CDFG and is being purchased through the Metro Bakersfield Habitat Conservation Plan. This parcel is approximately 95 acres. The remaining polygons with cactus are on private property.

**Total Population Size:** 23

**Population Extent/Dispersion:**

The population in the northern polygon that is on or adjacent to CDFG has approximately 19 clumps of cactus. The size of this polygon is approximately 3 acres. In the eastern most polygon there are 3 clumps of cactus. Just outside the southern most polygon there is 1 clump of cactus. We searched the middle two polygons but found no cactus.

**Habitat Conditions:**

The cactus population in the northern most polygon occurs on northwest and southwest facing slopes that are steep with coarse or cobby substrates. The site is predominately non-native grassland dominated by bromes (*Bromus* spp.), *Hordeum* spp., and wild oats (*Avena* spp.). There is also some scattered desert saltbush (*Atriplex polycarpa*), as well as non-native Russian thistle (*Salsola tragus*) and short-pod mustard (*Hirschfeldia incana*). The cacti in the eastern polygon also are on steep southwest facing slopes with coarse or cobby substrates and dominated by the same species. The southern most polygon with one clump of cactus has been largely disturbed and appears to have experienced extensive erosion. The same non-native grasses and Russian thistle dominate this area.

**Internal Threats and Disturbances:**

Internal disturbances to the cacti in this area include OHV activity, roads, human foot traffic, dumping, shooting, and noxious plants (especially in the southern polygon where there is extensive *S. tragus*). We estimated the extent of area disturbed within the population to be 0-10%. We estimated the threat level from internal disturbances to be a 4, indicating that there were some disturbances.

**Adjacent Land Uses/External Threats:**

Adjacent land use includes open natural space and oil fields to the north and the China Grade landfill to the northwest. To the west, southeast, east, and northeast there is primarily open natural space, except across the Kern River, where there is a residential area. To the south and southwest there are residential areas. We estimated the threat level considering adjacent land uses and external activities to be a 3, indicating that there are moderate threats in the area. We felt that external threats were a 3 primarily due to the few, isolated cactus clumps that exist in this occurrence, which is surrounded by human activity.

**Probability of Persistence:**

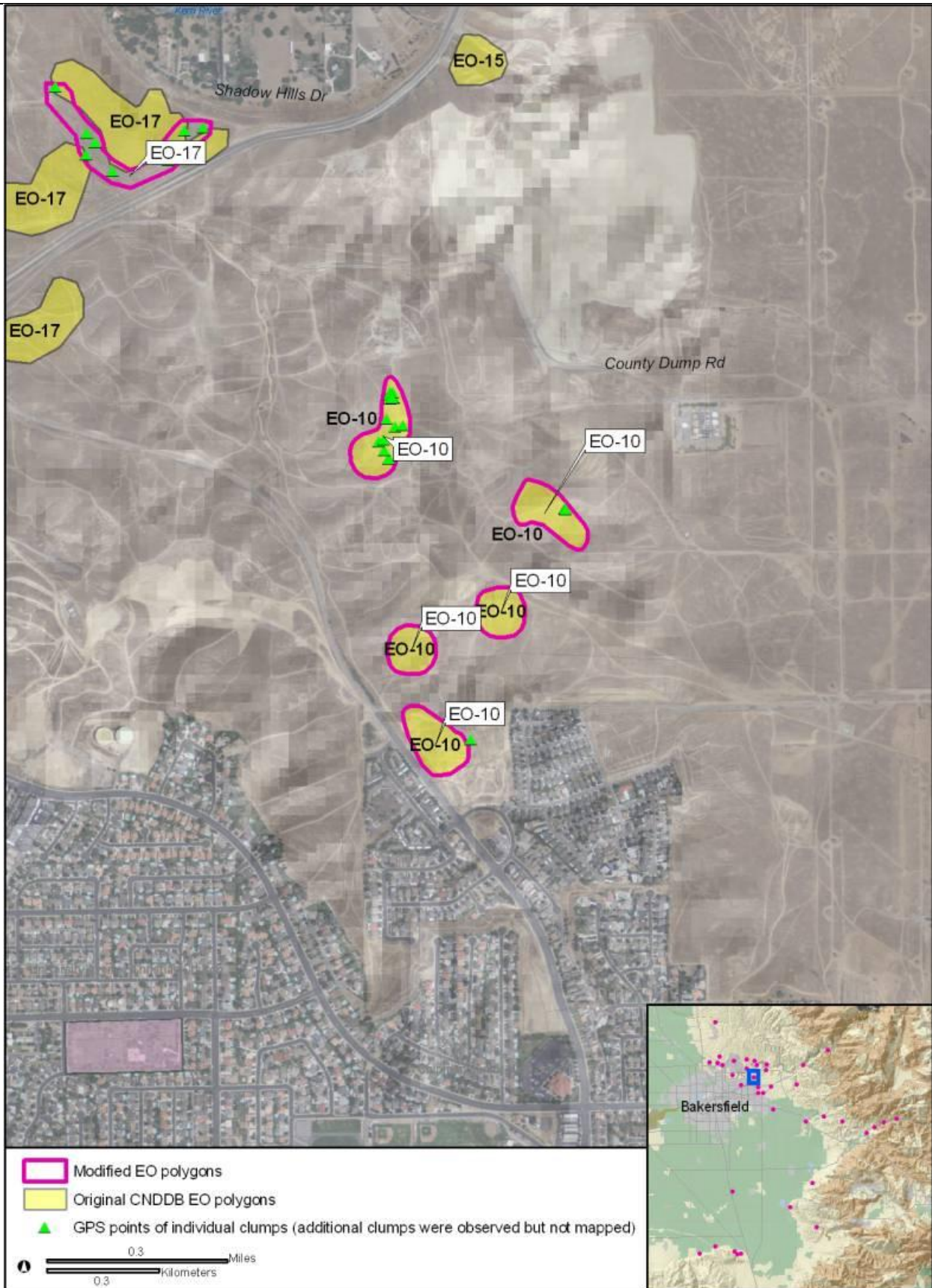
We estimate that this population has a moderate (50/50) probability of persistence in 100 years assuming current conditions remain the same. We chose moderate probability because the population is small,

fragmented, and at risk from human influences and potential development. Using our ranking system we gave this population 8 points out of 25.

**Recommendations:**

We recommend protection for the populations on private land through acquisition or a conservation easement. Furthermore, fencing the protected parcel and other cactus clumps in this area would help to reduce human impacts to cactus. Grazing or other vegetation management may be beneficial in high rainfall years in which annual vegetation productivity also is high. Finally, we suggest that translocation might be used to expand this population to other parts of the CDFG protected parcel (currently in escrow) and better ensure long-term survival.





Map 8. Element Occurrence 10.

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**ELEMENT OCCURRENCE: 11**

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**Date(s) Surveyed: September 14, 2010**

**Property Ownership: Kern County**

**Historical Status:**

Historically EO-11 extended to both sides of Alfred Harrell Highway. In 1981 Chamberlain saw 10+ clumps of plants south of the highway. In 1989 Moe mapped 9 plants south of the highway and 7 plants north of the highway. However, this conflicts with a report in 1987 by Bowen who thought the southern plants were extirpated.

**Conservation Status:**

Located in northeast Bakersfield off of Alfred Harrell Highway, EO-11 is not on protected property owned by a conservation organization. However, the area where cactus is located in EO-11 is on a tiny parcel of land owned by Kern County. It appears that Kern County is aware of the cactus because the area was marked off with small stakes and rope. The parcel is adjacent to the Kern County soccer park, which is also owned by Kern County. We believe that the parcel may be part of the Alfred Harrell Highway road right-of-way.

**Total Population Size: 10-20**

**Population Extent/Dispersion:**

The small polygon with cactus on Kern County property is approximately half an acre. The area covered by cactus inside the polygon is 1-5%. We thoroughly searched the area south of Alfred Harrell Highway for cactus but found none in this area.

**Habitat Conditions:**

The small polygon with cactus on Kern County property is a wash-like area with sandy soils. Perhaps at one time it was part of a more extensive wash. The terrain is flat and there are predominately non-native grasses on the property with a few cheesebush (*Hymenoclea salsola*).

**Internal Threats and Disturbances:**

We documented no disturbances present on this small piece of property. Thus, we estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating that there were none or very few disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

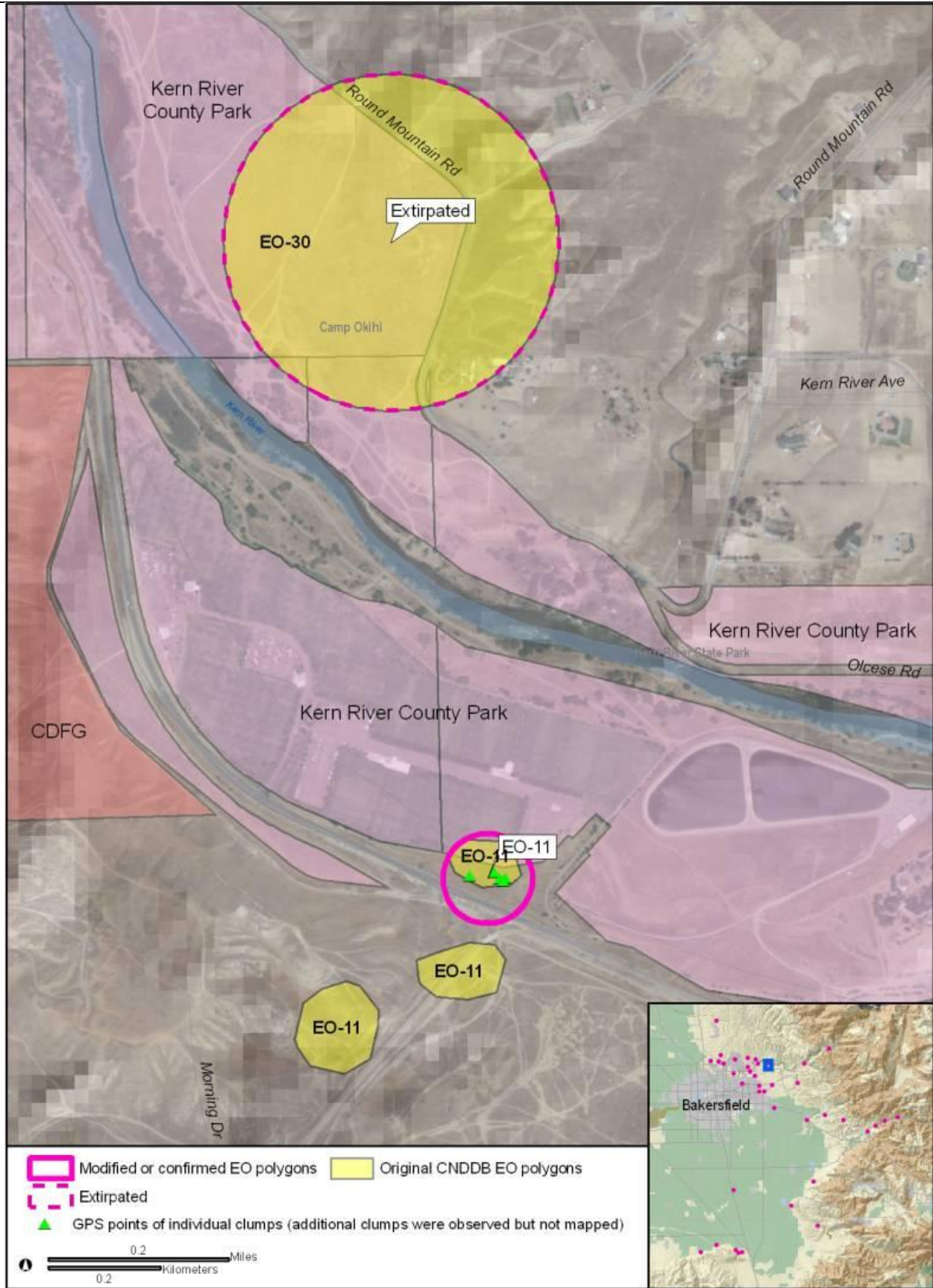
Adjacent land uses include the Kern County soccer park to the north. To the south, southwest, and west is Alfred Harrell Highway, a paved bike trail, and open natural land. To the southeast, east, and northeast is open natural land and the same paved bike trail. We estimated the external threat level to be a 4, indicating that there is some threat to the population considering adjacent land uses and external activities, largely because the population is very small and there is not a buffer around the property.

**Probability of Persistence:**

We estimated that this population has a moderate (50/50) probability of persistence in 100 years assuming current conditions remain the same. We chose moderate probability because the population is small and on an isolated patch of natural habitat. Using our ranking system we gave this population 12 points out of 25.

**Recommendations:**

We recommend better protection for this small population to keep any OHV or mountain bikers from disturbing the cactus. We believe that reducing non-native annual grasses that accumulate during high rainfall years may be beneficial for cactus. Since this site is too small to support livestock grazing, we suggest hand weeding or weed-whacking around cactus. We further recommend that if areas that perhaps once supported cactus south of Alfred Harrell Highway could be protected it may be beneficial for future protection of Bakersfield cactus to translocate clumps to this area.



Map 9. Element Occurrence 11.

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**ELEMENT OCCURRENCE: 13**

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**Date(s) Surveyed:** November 17, 2010

**Property Ownership:** Private

**Historical Status:**

Benson originally described this site based on a collection in 1957. However, the site was thought to be extirpated by urban sprawl according to Chamberlain in 1981 and Bowen in 1987. When Moe visited the site in 1989, one clump of cactus was found.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:** No cactus found – site extirpated.

**Population Extent/Dispersion:**

No cactus found.

**Habitat Conditions/Disturbances:**

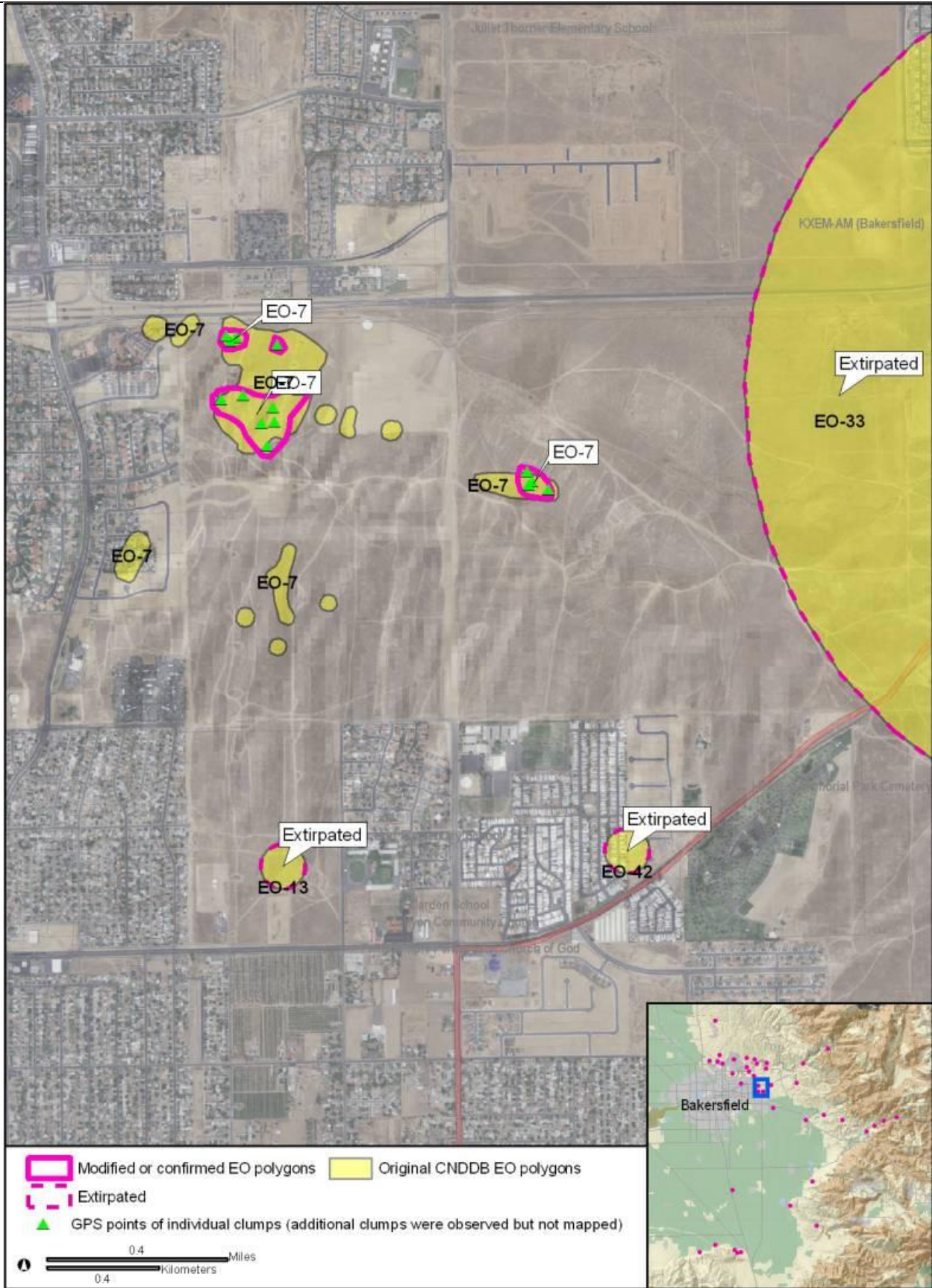
While this site does have some native habitat intact, the area is highly disturbed and very urban. Disturbances include dumping, dirt roads, OHV activity, and general human trespass through this open area (walkers, runners, dog walkers). The habitat is similar to what we have reported for other areas in the bluffs of northeastern Bakersfield. There are coarse to well-drained granitic sandy soils that sometimes have large cobbles. The area is characterized by low hills and flats, and the vegetation is dominated by saltbush shrub (*Atriplex polycarpa*) and/or non-native grasses such as *Bromus* spp., *Hordeum* spp., and wild oats (*Avena* spp.).

**Adjacent Land Uses:**

Lands adjacent to this EO are almost entirely developed. The only area with any natural land is to the north. To the east and west are residential developments. To the south is a small orange grove as well as residential areas. There is a small industrial development adjacent to the CNDDDB polygon to the west.

**Recommendations:**

The lack of protection and level of disturbance at this site precludes any recommendations for future translocation/reintroduction efforts for cactus. Furthermore, this site is likely to be development in the next 5-10 years and therefore is not a candidate for future conservation.



Map 10. Element Occurrence 13.

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**ELEMENT OCCURRENCE: 15**

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**Date(s) Surveyed: September 9, 2010**

**Property Ownership: CDFG; Private**

**Historical Status:**

Approximately 2000 plants were counted in surveys during 1981-1991. In the status survey in 1989 by Moe, he described this site as having the best habitat and most plants second only to the Sand Ridge area.

**Conservation Status:**

Located in northeast Bakersfield on the Kern River bluffs (also called Panorama Bluffs) and near Hart Park, EO-15 was originally recorded in 1981. Part of area within the CNDDDB occurrence is now protected by DFG. The protected parcels were purchased through the Metro Bakersfield Habitat Conservation Plan, are 134 acres in total, and have a known cactus population (E. Cypher, pers. comm.). This population is located in the bottom of a sandy wash, and also extends into a private parcel north of the DFG protected area. The parcel to the north has been slated for a housing development called The Canyons and has already had some disturbance throughout the property; however, the development has been put on hold due to the decline in the economy (E. Cypher, pers. comm.).

**Total Population Size: 250-500**

**Population Extent/Dispersion:**

Approximately 2000 clumps of cactus were seen in four separate polygons reported to the CNDDDB from 1981-1991, and this was considered one of the best sites for cactus in the status survey by Moe in 1989. We only found cactus in one of the four CNDDDB polygons. The area of the polygon is approximately 25 acres and we estimate there to be 250-500 clumps of cactus in that polygon. We searched the remaining three polygons for cactus several times from multiple approaches from the ground, and once from the air, and no cactus were found. It is unknown why a large extent of this population has been reduced from four polygons to one. We suspect that because much of the area covered by these three polygons includes very steep slopes of the Panorama Bluffs, erosion and possibly also extensive OHV activity could be responsible for a loss of cactus.

**Habitat Conditions:**

The cactus population is located a dry sandy wash with desert associated shrubs, including cheesebush (*Hymenoclea salsola*), Mormon tea (*Ephedra californica*), bladderpod (*Isomeris arborea*), and scale broom (*Lepidospartum squamatum*).

**Internal Threats and Disturbances:**

Disturbances on the protected DFG parcel include off-road vehicle activity (OHV), roads, human foot traffic, and dumping. Kern County residents have historically used this area of the Panorama Bluffs for OHV recreation. While fencing of this property by DFG and enforcement against trespassing by Kern County law enforcement has reduced impacts from OHVs, disturbance still continues on the property. The roads that occur through the property are primarily powerline access roads, and local residents who hike and ride horses in this area often use these roads. There is also some dumping that has occurred on the property, but the amount is minimal. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 4, indicating there are some threats.

**Adjacent Land Uses/External Threats:**

Adjacent land uses include a four-lane divided road called Alfred Harrell Highway, the Kern River, homes and natural land to the north, northwest, and west. Natural land and potential development exist to the southwest, south and southeast. There is natural land to the east and a large park, called Hart Park, to the northeast. We estimated the threat level considering adjacent land uses and external activities to be a 3, indicating a moderate threat, based on the fact that development is likely in this area. If development does eventually occur we estimate that approximately 100 clumps of cactus, which do not currently have any protection, could be lost.

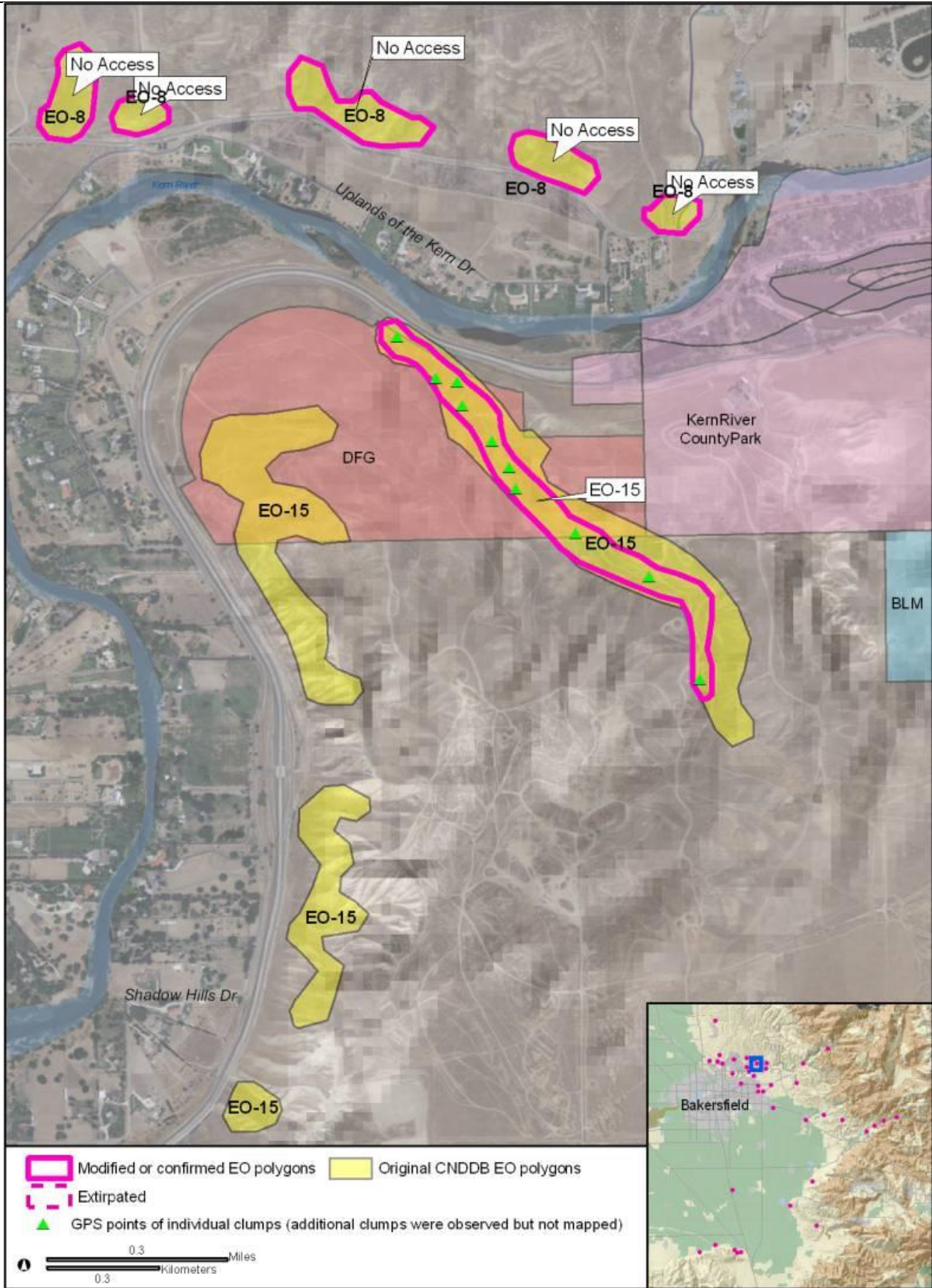
Furthermore, development upslope from the wash where the majority of the cactus is currently located would likely affect water drainage patterns (E. Cypher, pers. comm.).

**Probability of Persistence:**

We estimated that this population had a moderate probability (50/50) of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 18 points out of 25.

**Recommendations:**

We recommend maintenance of the fence surrounding this protected population in order to exclude illegal OHV activity. There may be other uses for the property that are compatible with cactus conservation, including hiking, mountain biking, and horseback riding trails on existing roads. We also highly recommend protecting the southern portion of this population that is currently on private land. If this population cannot be protected, we recommend transplanting any cactus that will be impacted by development to the protected area. Grazing or other vegetation management may be beneficial in high rainfall years in which annual vegetation productivity also is high. Finally, translocation might be used to expand this population to other parts of the protected parcel and better ensure long-term survival.



Map 11. Element Occurrence 15.



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**ELEMENT OCCURRENCE: 16**

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**Date(s) Surveyed:** November 22, 2010; March 17, 2011

**Property Ownership:** Private

**Historical Status:**

Approximately 50 plants were found at this site in 1981 by Chamberlain and in 1989 by Moe. Historically, these plants were found on the county road right-of-way.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:** ~50

**Population Extent/Dispersion:**

Along the county road right of way adjacent to a Chevron oil field and just outside the CNDDDB polygon we found ~40 clumps of cactus in November 2010. We returned to the interior portion of the polygon in March 2011 to visit parts of the population on Chevron property. During this time we saw approximately 5-10 clumps within and just outside the CNDDDB polygon. We suspect that there could be more cactus plants in this area. During our visit, tall grass made it difficult to easily spot cactus.

**Habitat Conditions:**

This area is predominately non-native annual grassland with a few scattered patches of saltbush scrub (*Atriplex polycarpa*). There was also some quail bush (*Atriplex lentiformis*) along some of the roadsides. The soil on the site is predominately gravely to sandy.

**Internal Threats and Disturbances:**

Internal disturbances to the cacti include roads and oil production activities in this area. We estimated the extent of area disturbed within the population to be 50-75% because of the high level of oil production disturbance that has taken place within this population. We estimated the threat level from internal disturbances to be a 2, indicating that threats are high to this population. On the roadside embankment where there are ~40 clumps, the treat level is a bit lower because there is no oil development.

**Adjacent Land Uses/External Threats:**

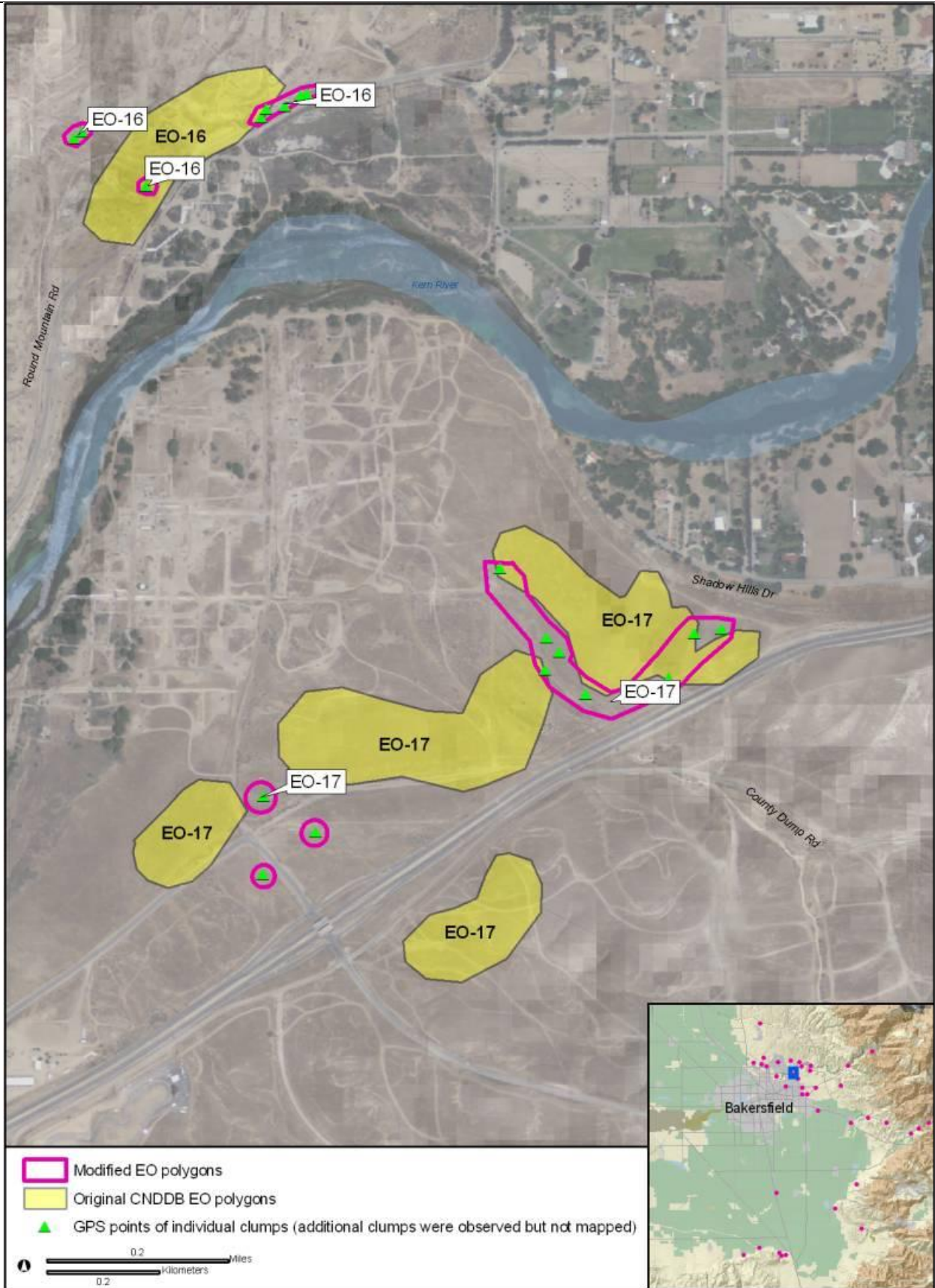
Adjacent land use is dominated by oil production activities. To the south of Round Mountain Road there is some natural land adjacent to the Kern River, but oil production activities are still taking place in this area. We estimated that external threats were a 3, indicating are moderate threats from oil development activities in the area.

**Probability of Persistence:**

We estimate that this population has a low probability of persistence in 100 years assuming current conditions remain the same. We chose low probability because there are so few cacti in this population and there are threats from adjacent oil development activities. Furthermore, this population has already been highly disturbed by oil development. Using our ranking system we gave this population 7 points out of 25.

**Recommendations:**

We recommend protection for this population by preserving and enhancing remaining habitat, especially along the Round Mountain Road right-of-way. Another way to protect cactus in this area would be to install fencing around the cactus. If protection for this area could be secured, translocation within the native habitat left in this area could be a potential way to expand the population. Grazing or other vegetation management may be beneficial in high rainfall years in which annual vegetation productivity also is high.



Map 12. Element Occurrence 16.

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**ELEMENT OCCURRENCE: 17**

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**Date(s) Surveyed:** October 7, 2010; November 16, 2010

**Property Ownership:** Private

**Historical Status:**

Historically, several different colonies of cactus were mapped inside four polygons that were both north and south of Alfred Harrell Highway. More than 50 plants were observed in this area in 1981 and Moe observed approximately 50 in 1989. The CNDDDB report states that the southern colony had a few plants that were extirpated by the construction of the China Grade Landfill.

**Conservation Status:**

None of the parcels in this area are currently protected.

**Total Population Size:** ~18

**Population Extent/Dispersion:**

There are four polygons that make up EO-17. We searched the polygon south of Alfred Harrell Highway and found no cactus in this area. The CNDDDB occurrence report states that this polygon was extirpated by construction of the China Grade Landfill; however, the polygon from the CNDDDB database occurs on natural habitat. Although this habitat is still present, we found no cactus. There are three polygons on the north side of the highway. We found 6 clumps of cactus just outside the western most polygon. We found ~12 clumps of cactus in a sandy wash and hillside inside and just outside the eastern most polygon. The area with cactus is approximately 8.5 acres.

**Habitat Conditions:**

This area is characteristic of the bluffs area of northeastern Bakersfield. In this area there are coarse to well-drained granitic sandy soils that sometimes have large cobbles. The area also is characterized by low hills and flats that is dominated by saltbush shrub (*Atriplex polycarpa*) and scale broom (*Lepidospartum squamatum*), and non-native grasses such as *Bromus* spp., *Hordeum* spp., and wild oats (*Avena* spp.). In areas with more disturbance, there is also some non-native short-pod mustard (*Hirschfeldia incana*).

The polygon south of the highway with no cactus has mostly thick non-native grass and non-native mustard. The western most polygon north of the highway burned in the recent past and this area was barren during our site visit. The remainder of the polygon is dominated by saltbush and thick, thatchy non-native grasses. The eastern part of the occurrence has some low hills with some scattered saltbush and scale broom. The majority of the cactus is located on west or southwest facing slopes just above a small sandy drainage.

**Internal Threats and Disturbances:**

Internal disturbances to the cacti in this area include OHV activity, roads, fires, noxious plants (some areas with non-native mustard and thatchy grass), equestrian trails, and oil field development. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 4, indicating that there are some threats to this population.

**Adjacent Land Uses/External Threats:**

Adjacent land uses include oil field activities to the north and northwest, and open areas, a horse stable, and a development to the west. The rest of the adjacent area is most natural although there are roads throughout the area as well as a residential development to the northeast beyond the Kern River. The China Grade Landfill is to the southeast. We felt that external threats were a 4, indicating that there are some threats from development and oil field activities in the area.

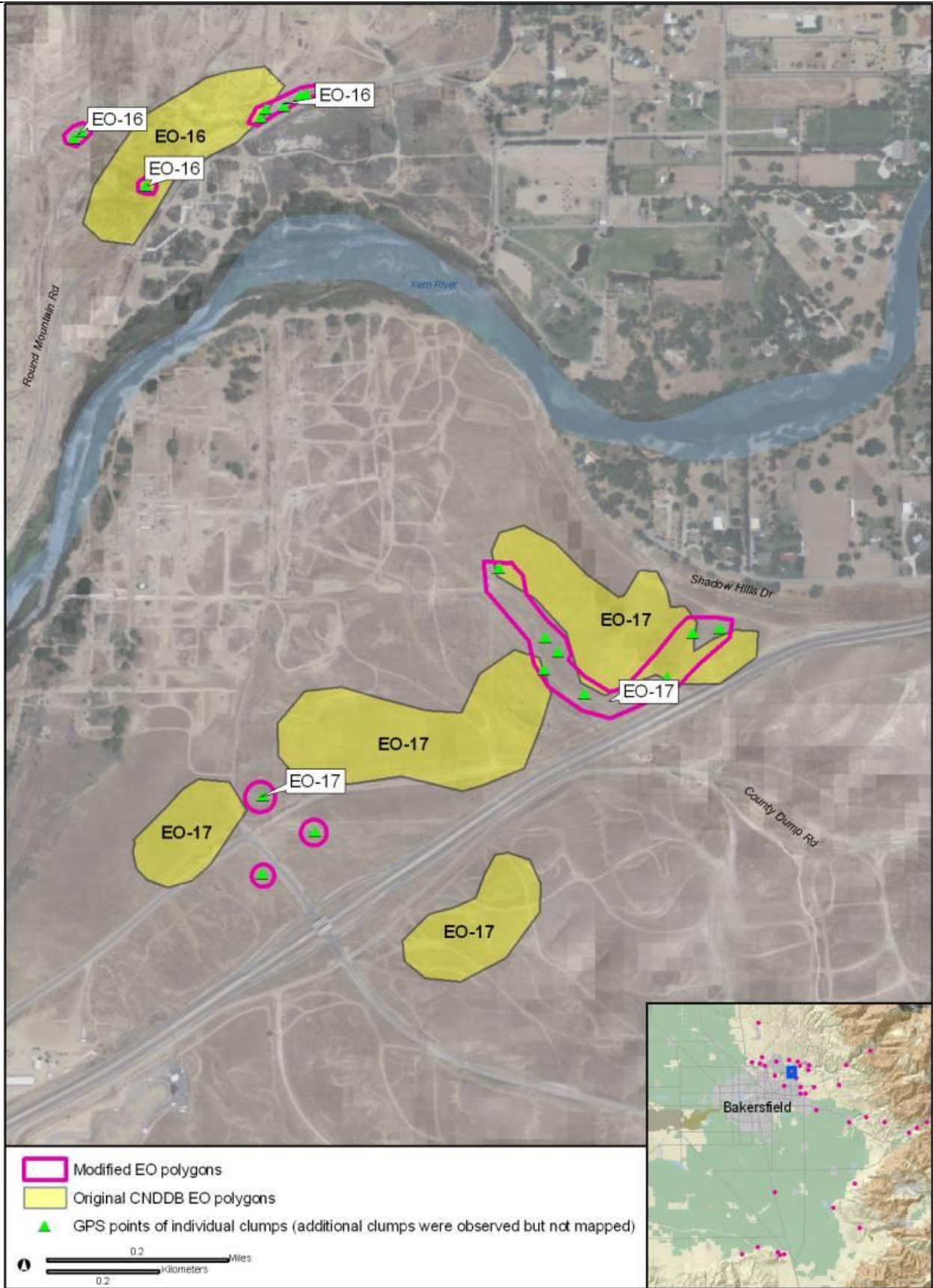
**Probability of Persistence:**

We estimate that this population has a moderate (50/50) probability of persistence in 100 years assuming current conditions remain the same. We chose moderate probability because there are so few cacti in this population and there are threats from adjacent development and oil field activity. Using our ranking system we gave this population 9 points out of 25.

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**Recommendations:**

We recommend protection for this population through property acquisition or a conservation easement. Grazing or other vegetation management may be beneficial in high rainfall years in which annual vegetation productivity also is high. Several cacti in the occurrence were nearly completely buried by non-native grasses and introduced mustard. Another way to protect cactus in this area would be to install fencing around the plants.



Map 13. Element Occurrence 17.

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**ELEMENT OCCURRENCE: 19**

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**Date(s) Surveyed: March 17, 2011**

**Property Ownership: Private (Chevron)**

**Historical Status:**

In 1982, this occurrence was recorded as three small clumps of 15-20 individual plants.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size: 5**

**Population Extent/Dispersion:**

We found 5 clumps of cactus in or near this polygon. There may be more cactus on the remnant habitat left in this active oilfield

**Habitat Conditions:**

We characterized the habitat in this area as non-native annual grassland among graded areas for oil production and development. There are very small margins of habitat among the oil field roads and facilities that has some scattered saltbush scrub (*Atriplex polycarpa*).

**Internal Threats and Disturbances:**

Internal disturbances to the cacti in this occurrence are extensive. This area is a high intensity active oil field. Thus, roads, pipes, and well pads are extensive throughout the area. We estimated the extent of area disturbed within the population to be 50-75%. We estimated that the threat level from internal disturbances to be a 3, indicating that threats are moderate to this population.

**Adjacent Land Uses/External Threats:**

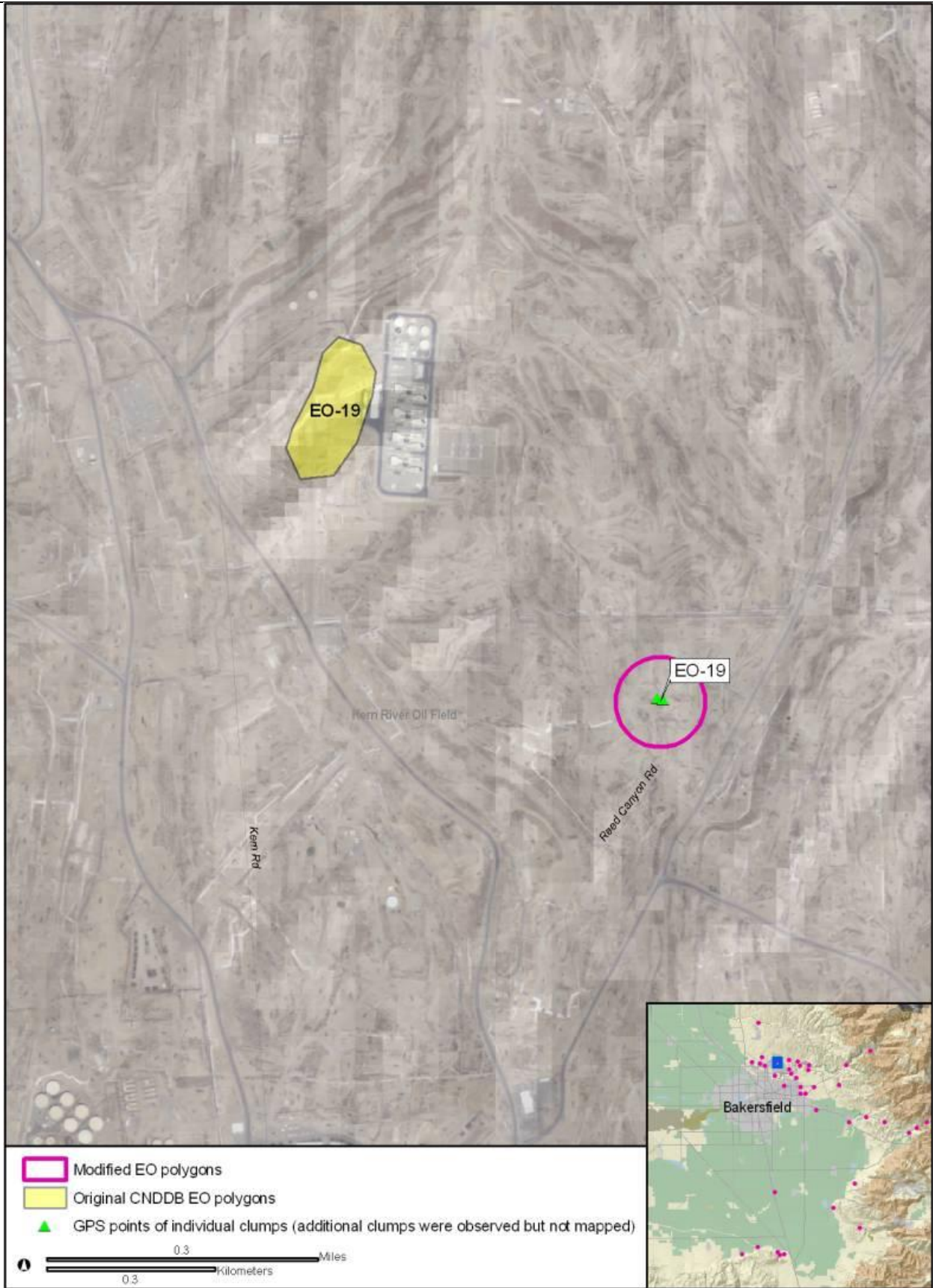
Adjacent land use is dominated by high intensity oilfield activities. We estimated that external threats were a 1, indicating that threats are extreme.

**Probability of Persistence:**

We estimate that this population has a low probability of persistence in 100 years assuming current conditions remain the same. We chose low probability because there are so few cacti in this population and there are extensive threats from oil development activities. Furthermore, this population has already been highly disturbed by oil development. Using our ranking system we gave this population 4 points out of 25.

**Recommendations:**

We recommend better protection for the few clumps of cactus left in this population. One way to do this would be to install fencing and signs around the remaining clumps. Another possibility is to translocate the remaining cactus clumps into less disturbed and more protected areas.



Map 14. Element Occurrence 19.

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**ELEMENT OCCURRENCE: 20**

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**Date(s) Surveyed: March 17, 2011**

**Property Ownership: Private (Chevron and other)**

**Historical Status:**

In 1982 and 1989, 75-100 clumps comprising several hundred plants were observed in this area.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size: 40-50**

**Population Extent/Dispersion:**

We were able to survey the Chevron portion of this EO. There were at least 25-30 plants on the Chevron side of the fence line. There likely were more that we did not see as the grass was quite dense. Looking across the fence onto the private property, we could see approximately 10 more plants. The population appears to continue to the east into a large drainage, and there could easily be many more plants in this area. Cactus coverage was <1%, and the area with cactus may encompass 50-100 acres.

**Habitat Conditions:**

The habitat in this area was primarily non-native annual grassland with dense brome (*Bromus* spp.), wild barley (*Hordeum* spp.), and wild oats (*Avena* spp.), and some scattered desert saltbush (*Atriplex polycarpa*), Mormon tea (*Ephedra* spp.), and buckwheat (*Eriogonum fasciculatum*). The terrain was moderately hilly. The private lands are grazed by cattle.

**Internal Threats and Disturbances:**

Currently, there do not appear to be any obvious internal threats to this population. We estimated the extent of area disturbed within the population to be 0-10%. We estimated the threat level from internal disturbances to be a 4, indicating there are some threats, primarily because of oil production activities just outside the population and the uncertainty of activities on the adjacent private lands.

**Adjacent Land Uses/External Threats:**

Adjacent land use is dominated by low to moderate intensity oilfield activities on the Chevron lands. The private lands are being grazed by cattle. Adjacent land uses consisted of grazing to the northeast, east, and southeast, and low to moderate oilfield activities to the northwest, west, and southwest. We estimated that external threats to be a 4, indicating there are some threats.

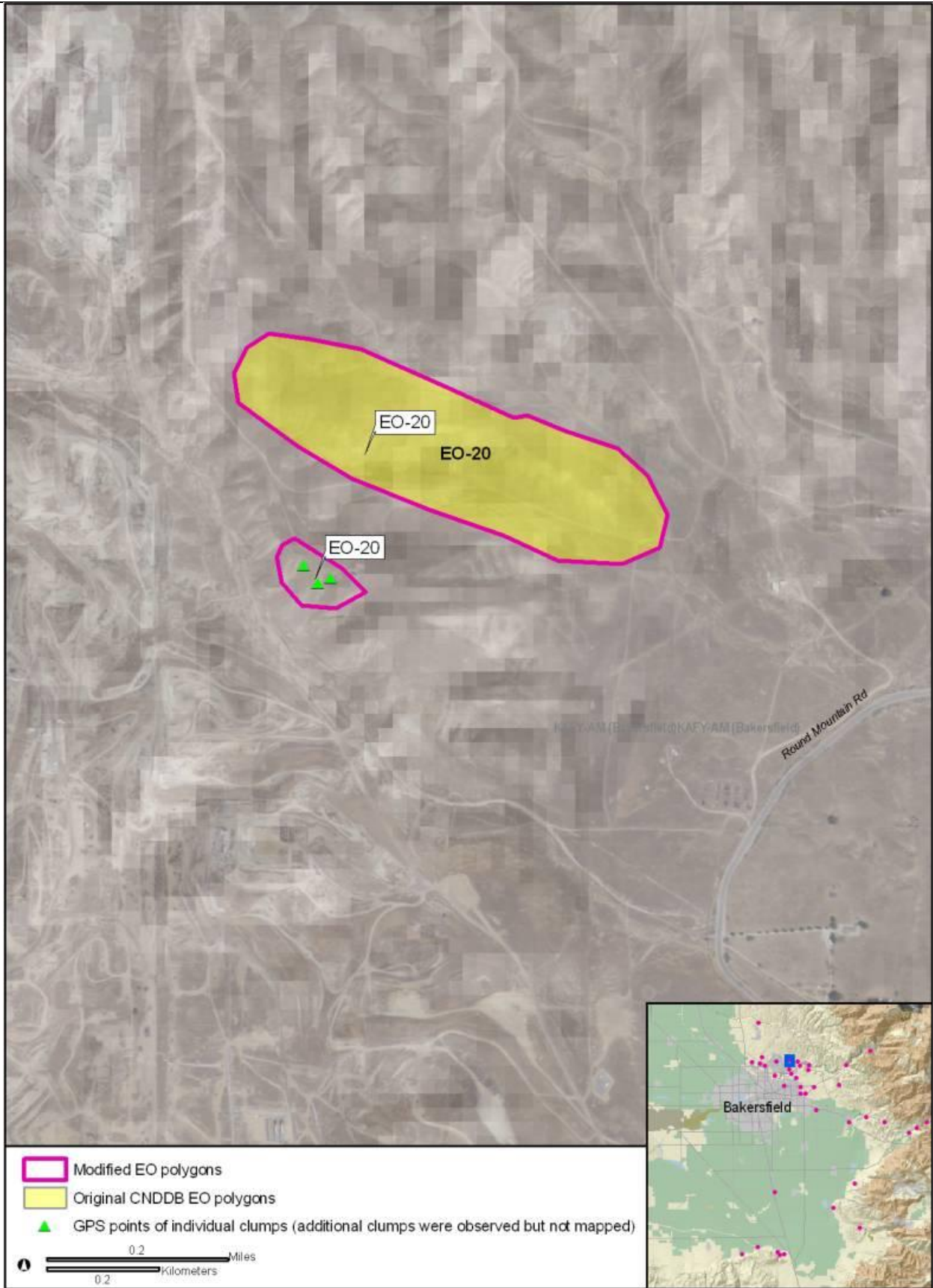
**Probability of Persistence:**

We estimate that this population has a moderate probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 9 points out of 25.

**Recommendations:**

We recommend protection for this population through property acquisition or a conservation easement. Chevron did not seem to be planning oil field development for this area and therefore potentially might consider placing a conservation easement on this area. If oilfield developments are implemented in this area, then the fencing could be used to help protect the cactus. Grazing or other vegetation management may be beneficial in high rainfall years in which annual vegetation productivity also is high. Non-native grasses were very dense in the ungrazed portion of this population. If the area is permanently protected, then translocation could be used to expand this population.





Map 15. Element Occurrence 20.

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**ELEMENT OCCURRENCE: 21 AND 58**

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**Date(s) Surveyed:** March 9, 2011

**Property Ownership:** Private (Tejon Ranch)

**Historical Status:**

One large plant was observed by Taylor and Palmer in 1987, and by Moe in 1989. In 2009, Magney reported a new occurrence (EO-58) in this general vicinity consisting of dozens of plants.

**Conservation Status:**

This area is protected under a permanent conservation easement. Management of the area is by the Tejon Ranch Conservancy.

**Total Population Size:** ~200 plants, likely more

**Population Extent/Dispersion:**

We could not locate the one plant observed during previous surveys at the coordinates for EO-21. However, in this general vicinity, many more cacti have been located during informal surveys by Tejon Ranch Conservancy staff, David Magney, and Impact Sciences staff. Tejon Ranch Conservancy staff shared the locations with us. The Magney observations were reported as a new EO, but all of the cacti in this region are probably part of a single, large population.

In the drainage for Comanche Creek, we observed at least 100 plants. Most were on more sparsely vegetated southeast facing slopes on the west side of the creek. This was a fairly dense concentration. There probably are more plants in this area than we observed. At least 2 plants were observed on a southwest facing slope further south on the east side of Comanche Creek. Approximately 10 plants were observed on a north facing slope near Alkali Spring on generally north facing slope about 0.5 miles northwest of the plants along Comanche Creek. Approximately 70 plants were observed on south facing slopes on the north side of the Tejon Creek drainage. This area begins approximately 2 miles directly east of the Tejon Ranch boundary. Finally, at least 3 plants were observed on ridges approximately 0.5 miles directly east of the population along Comanche Creek. This area encompasses rolling terrain and limited direct access. Thus, relatively little of it has been thoroughly surveyed. Based on habitat conditions, this area could support many more plants than were observed by us or previous surveyors. The area with similar habitat conditions encompasses approximately 12 mi<sup>2</sup>.

**Habitat Conditions:**

The habitat in this area was primarily non-native annual grassland with dense brome (*Bromus* spp.), wild barley (*Hordeum* spp.), and wild oats (*Avena* spp.), and some scattered desert saltbush (*Atriplex polycarpa*), bladderpod (*Isomeris arborea*), cheesebush (*Hymenoclea salsola*), and goldenbush (*Isocoma* spp.). The terrain was moderately hilly with wide valley bottom areas along Tejon and Comanche Creeks. The entire area is grazed by cattle. Soils are relatively sandy.

**Internal Threats and Disturbances:**

Currently, there do not appear to be any obvious internal threats to this population. We estimated the extent of area disturbed within the population to be 0-10%, and most of that disturbance consists of existing dirt roads. We estimated the threat level from internal disturbances to be a 5, indicating a very low level of threats.

**Adjacent Land Uses/External Threats:**

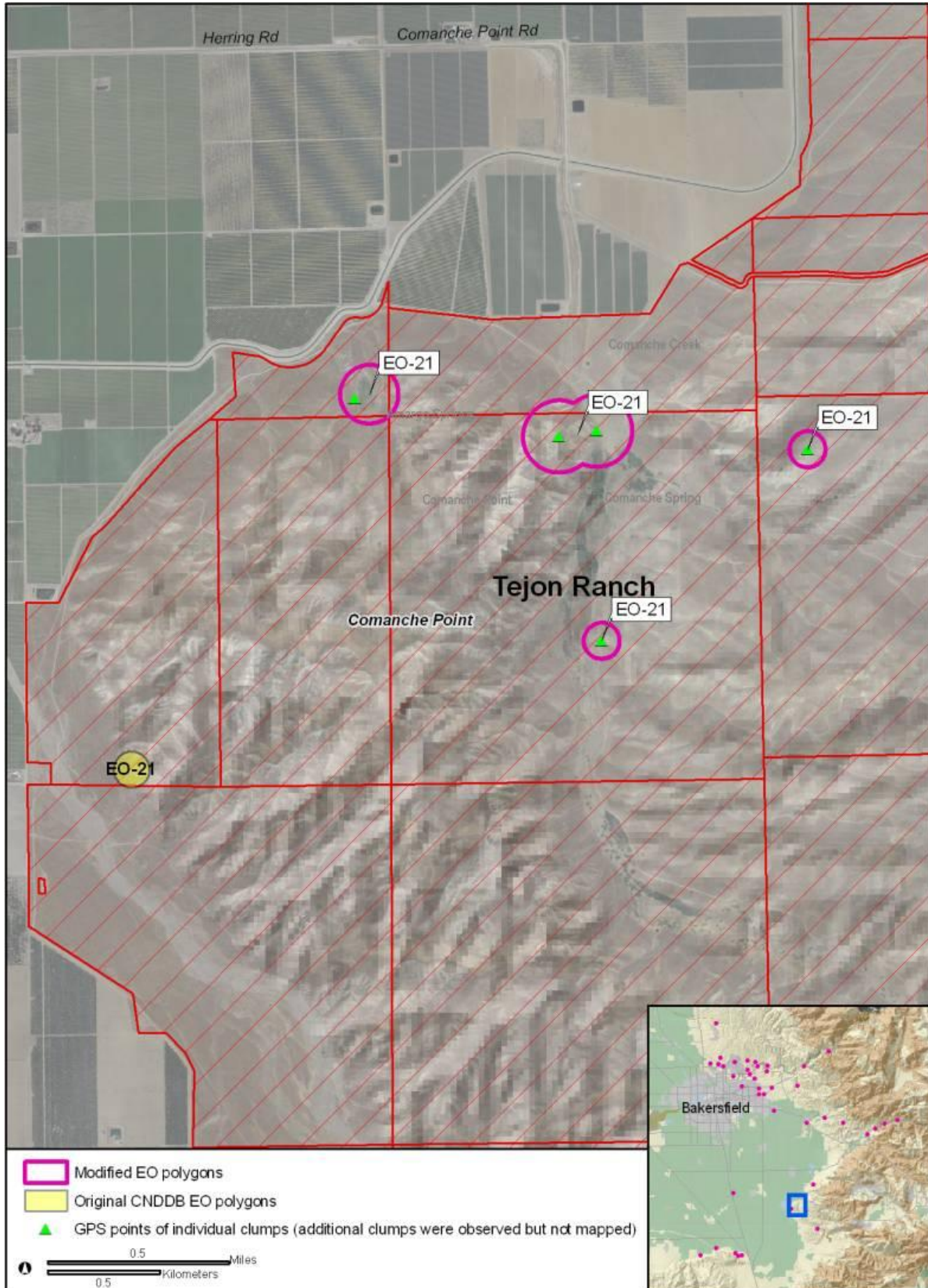
The primary land use in all directions from the areas with cactus is cattle grazing. In general, the populations are well buffered within Tejon Ranch lands. We estimated that external threats to be a 5, indicating a very low level of threats.

**Probability of Persistence:**

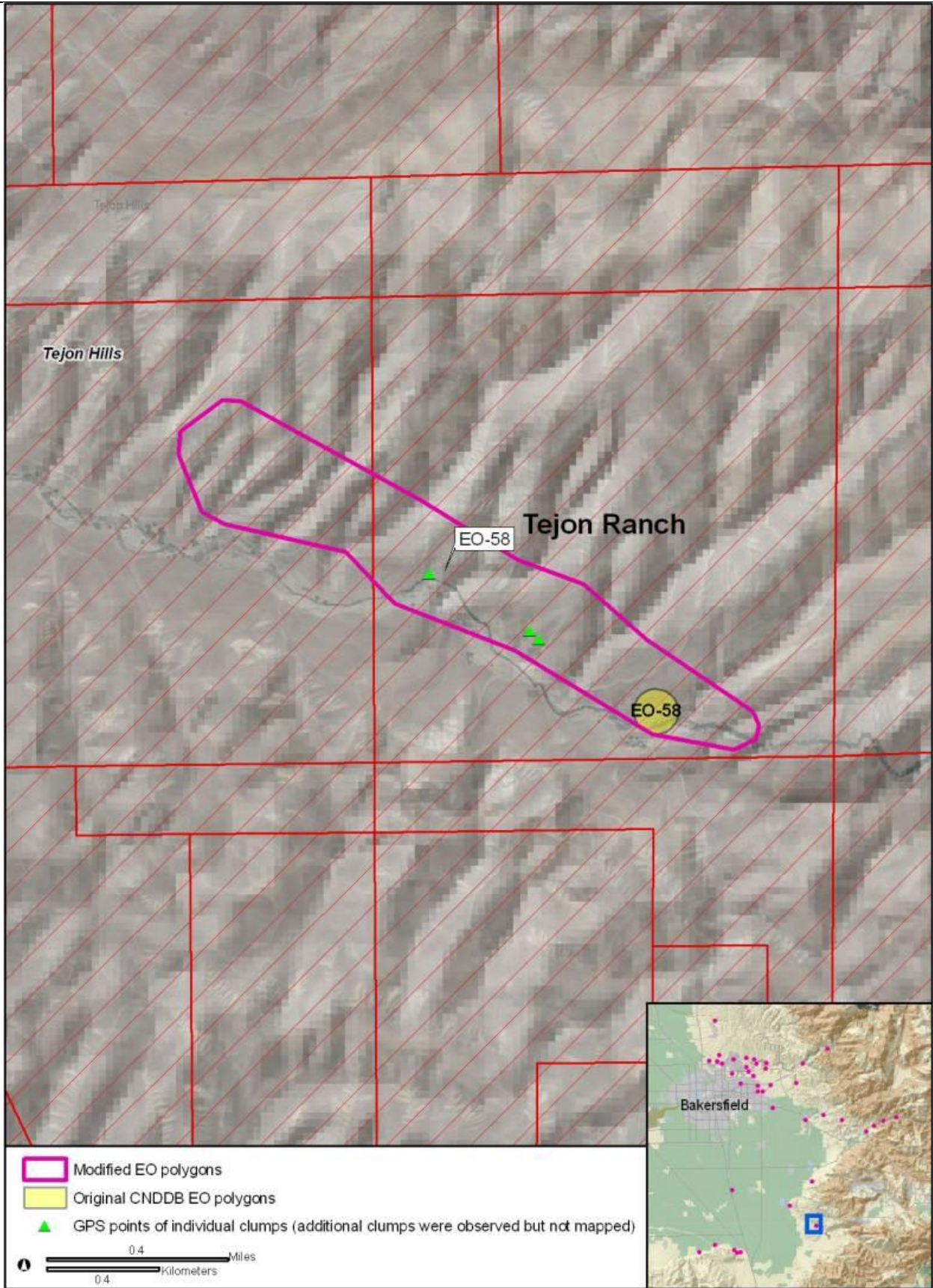
This population is large and seems relatively secure. We estimate that this population has a very high probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 23 points out of 25.

**Recommendations:**

This population is relatively large, appears well managed, and is secure. No specific recommendations are offered for this population.



Map 16. Element Occurrence 21.



Map 17. Element Occurrence 58.

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**ELEMENT OCCURRENCE: 22**

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**Date(s) Surveyed:** December 1, 2010

**Property Ownership:** Private

**Historical Status:**

In 1989, 50 plants were documented in this occurrence.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:** No cactus found – site extirpated.

**Population Extent/Dispersion:**

No cactus found.

**Habitat Conditions/Disturbances:**

While this site does have native, intact habitat we could not find cactus in this area. Previous reports for this site indicate that heavy grazing and flooding may have been a threat to this population.

**Adjacent Land Uses:**

Lands adjacent to this EO are all intact, native foothill habitat.

**Recommendations:**

We are unsure why there is no longer a cactus population at this occurrence. Potentially flooding or intense grazing may have impacted the population. Despite a thorough search on our part, additional surveys may be warranted.



Map 18. Element Occurrence 22.

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**ELEMENT OCCURRENCE: 23**

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**Date(s) Surveyed:** December 1, 2010; April 15, 2011

**Property Ownership:** Private; Conservation Easement purchased by The Nature Conservancy

**Historical Status:**

Moe observed 15 plants in this area in 1989.

**Conservation Status:**

The Nature Conservancy has purchased a Conservation Easement on this property.

**Total Population Size:** ~100 clumps

**Population Extent/Dispersion:**

We found ~60 clumps of cactus on the north side of Caliente Creek Road, ~15 to the west of the property, and ~30 on the south side of the road. The area covered by the cactus in this area is approximately 25 acres.

**Habitat Conditions:**

This occurrence includes habitat in the Caliente Creek bed and adjacent area. The habitat in the area is non-native annual grassland with some scattered scale broom (*Lepidospartum squamatum*), bladderpod (*Isomeris arborea*), foothill pine (*Pinus sabiniana*), blue oak (*Quercus douglasii*), cenanothus (*Cenanothus* spp.), yucca (*Yucca* spp.), and gooseberry (*Ribes* spp.).

**Internal Threats and Disturbances:**

The habitat in this area is largely intact and the only potential disturbances are from grazing and potential flooding of Caliente Creek. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating there are none or very few threatening activities.

**Adjacent Land Uses/External Threats:**

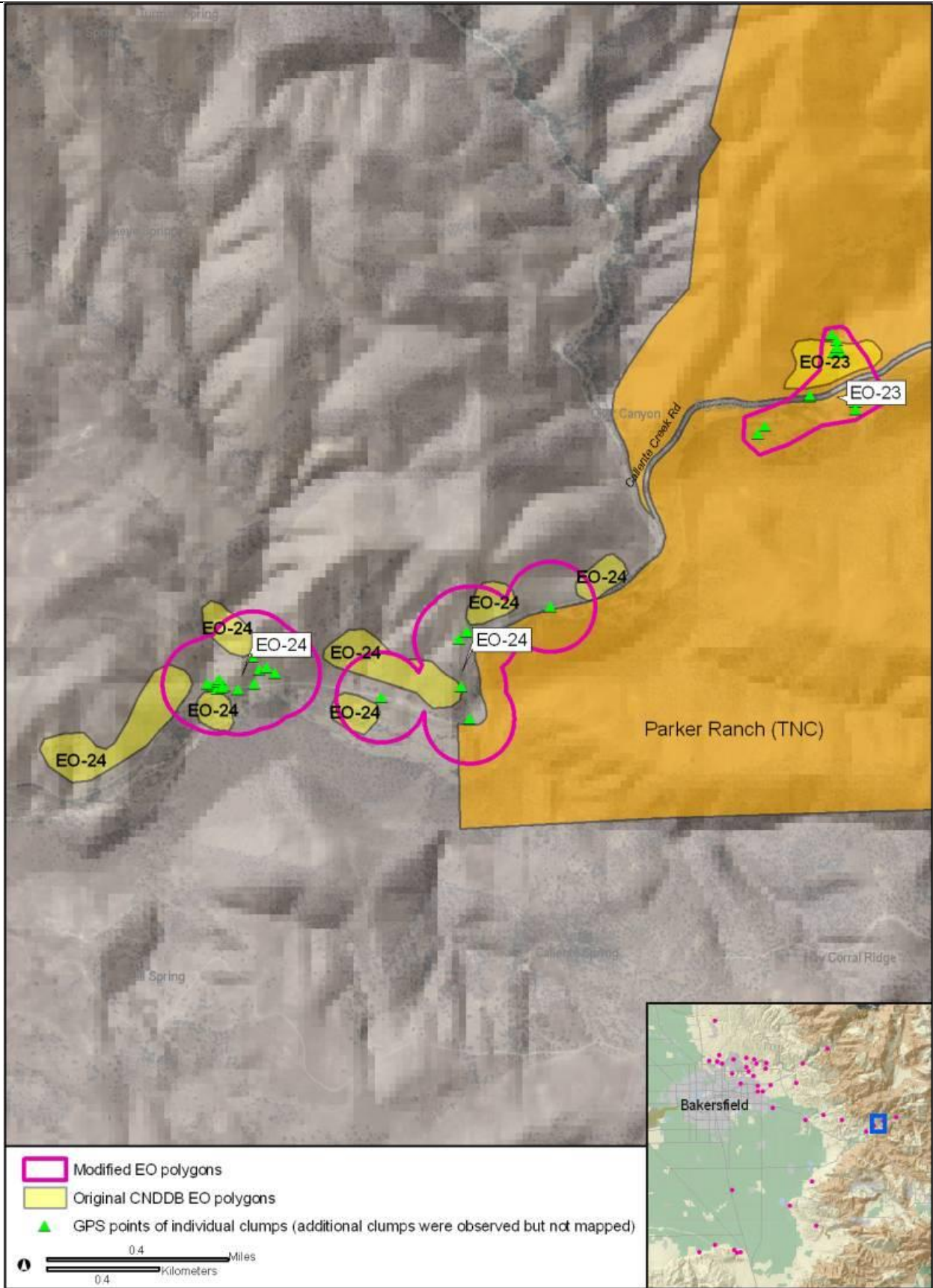
Lands adjacent to this EO include native habitat that are primarily used for grazing. We estimated that the threat level from external disturbances to be a 5, indicating there are none or very few threatening activities.

**Probability of Persistence:**

We estimate that this population has a high probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 12 points out of 25.

**Recommendations:**

We recommend installing fencing around cactus in this area if the number of cattle where the cactus is located will be intensive. We recommend this only to protect cactus for intensive grazing in one concentrated area.



Map 19. Element Occurrence 23.



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**ELEMENT OCCURRENCE: 24**

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**Date(s) Surveyed:** December 1, 2010; April 15, 2011

**Property Ownership:** Private; partially conserved in a Conservation Easement purchased by The Nature Conservancy

**Historical Status:**

Moe observed 24 plants in this area in 1989. He noted that the plants were very trampled.

**Conservation Status:**

The Nature Conservancy has purchased a Conservation Easement on a portion of property covered by this element occurrence. The remaining property is in private ownership.

**Total Population Size:** ~100-200 clumps

**Population Extent/Dispersion:**

This population is widely dispersed along both sides of Caliente Creek Road. The original occurrence map has several polygons dispersed along the road. We found cactus both inside and outside of these polygons on both side of Caliente Creek Road. We estimated that in total there are 100-200 clumps of cactus in this area.

**Habitat Conditions:**

This occurrence includes habitat in the Caliente Creek bed and adjacent slopes. The habitat in the area is non-native annual grassland with some scattered scale broom (*Lepidospartum squamatum*), bladderpd (*Isomeris arborea*), foothill pine (*Pinus sabiniana*), blue oak (*Quercus douglasii*), cenanothus (*Cenanothus* spp.), yucca (*Yucca* spp.), and gooseberry (*Ribes* spp.). The soils in this area are granitic and sandy, and the creek bed can be quite cobbly. The cactus is generally found in the wash and the south facing slopes surrounding the wash.

**Internal Threats and Disturbances:**

The habitat in this area is intact and largely undisturbed. The only potential disturbances are from grazing and potential flooding of Caliente Creek. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating there are none or very few threatening activities.

**Adjacent Land Uses/External Threats:**

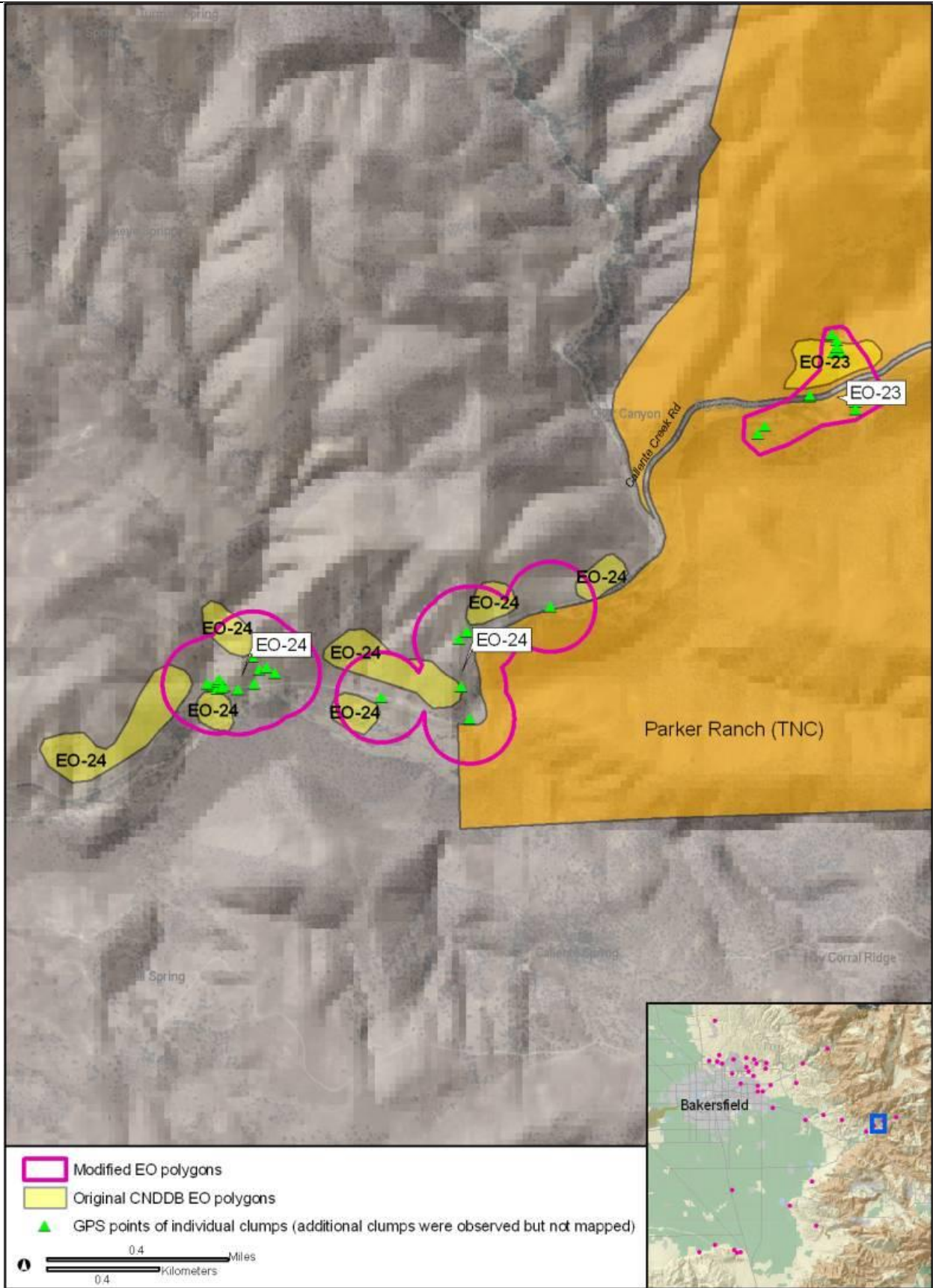
Lands adjacent to this EO include native habitat that are primarily used for grazing. We estimated that the threat level from external disturbances to be a 5, indicating there are none or very few threatening activities.

**Probability of Persistence:**

We estimate that this population has a high probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 12.5 points out of 25.

**Recommendations:**

The only recommendation we have for this population is that it may be beneficial to add some level of fencing around concentrated areas of cactus, depending upon numbers of cattle and areas of concentrated use.



Map 20. Element Occurrence 24.

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**ELEMENT OCCURRENCE: 25 – NORTH OF BENA ROAD**

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**Date(s) Surveyed: November 23, 2010**

**Property Ownership: Private**

**Historical Status:**

Moe observed 2000-3000 plants in this occurrence (both sides of Bena Rd.) in 1989. It is noted in the CNDDDB record that this occurrence may have been impacted in the past by high flood waters.

**Conservation Status:**

The northwestern most portion of this occurrence is part of a buffer around the Kern County's Bena landfill. The land is owned by Kern County and there are no plans to develop this property. The remaining portions of the properties north of Bena Road are all in private ownership.

**Total Population Size: ~300-400**

**Population Extent/Dispersion:**

This occurrence is made up of several polygons north of Bena road. We were able to access the western most of the polygons, but not the eastern most polygons. Although we were not able to access the eastern most polygons, we did see cactus on the properties from the road with binoculars. We estimated that there were at least 20 clumps of cactus that we saw from the road, but we suspect that there very likely are more cactus in the area. We searched for cactus in the two northern most polygons and did not find any clumps in this area. In the large polygon in the center of the occurrence we found 300-400 clumps of cactus on a sandy slope that is likely an extension of the sand ridge geologic feature that crosses Highway 58 (see EO-3).

**Habitat Conditions:**

The habitat where the majority of cactus is found is predominately non-native annual grassland dominated by wild oats (*Avena* spp.). The majority of the cactus is found on the sandy, south facing slope of the sandy ridge that borders Caliente Creek on the north side.

**Internal Threats and Disturbances:**

Disturbances to the cactus in this area are mainly from the roads and traffic. These disturbances appear to mainly come from the cattle feed lot and grazing operations in the area. Intensive grazing could be detrimental to cactus in this area. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating there are none or very few threatening activities.

**Adjacent Land Uses/External Threats:**

Lands adjacent to this EO include native habitat that are primarily used for grazing. To the north and northwest is the Bena landfill, which is surrounded by some natural and grazing lands. Also to the northwest there are some orange groves. To the southwest there is native habitat and some agricultural land. Also to the south and east is the cattle feed lot, as well as some natural habitat that appears to mostly be used for grazing. We estimated that the threat level from external disturbances to be a 4, indicating that there are some threats. We choose this threat level largely because there is some intensive grazing that occurs in the area.

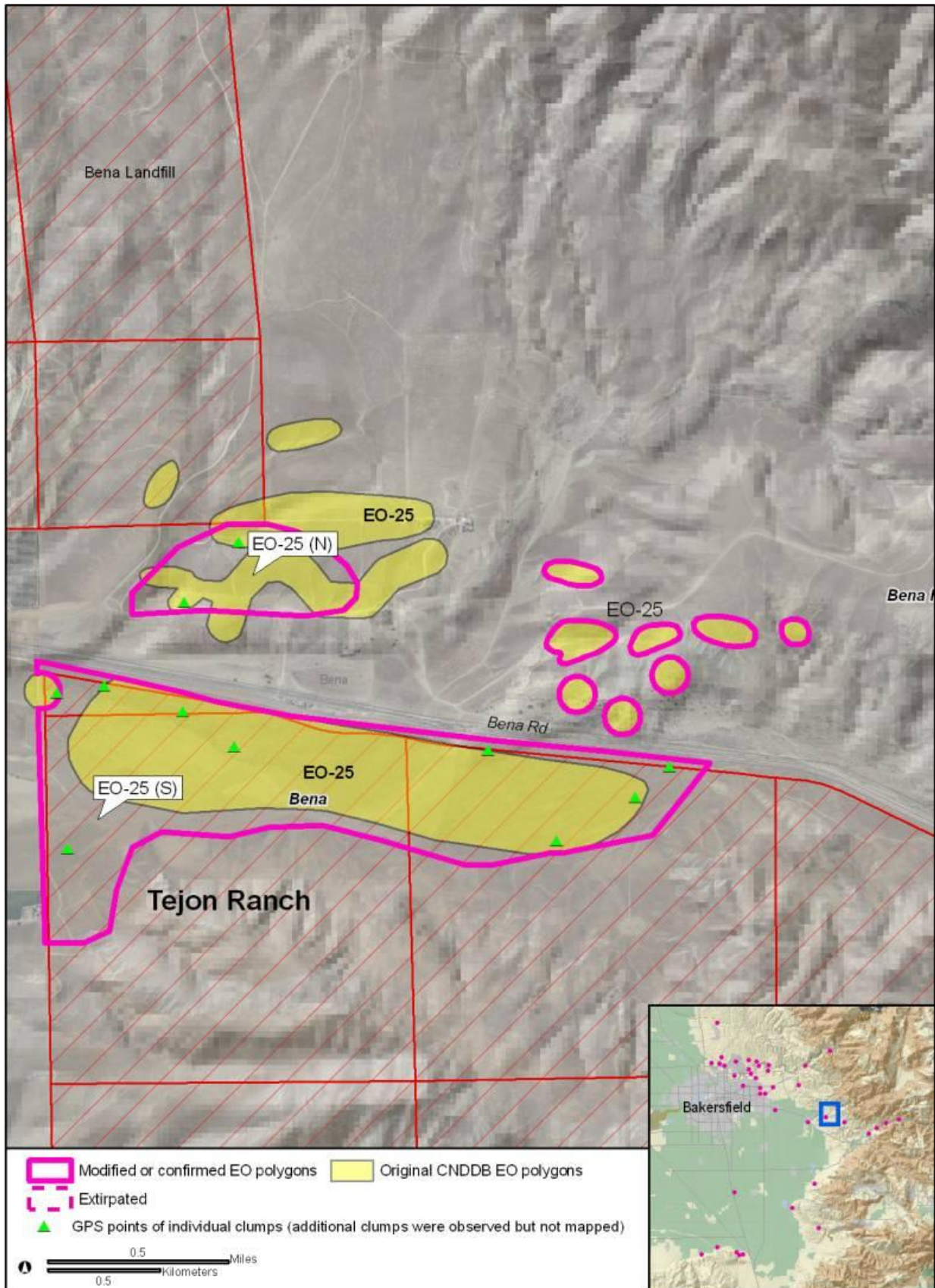
**Probability of Persistence:**

We estimate that this population has a high probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 12 points out of 25.

**Recommendations:**

We recommend that this population be protected through property acquisition or a conservation easement. We feel it is especially important to preserve the 300-400 cactus that we found on what we are considering an extension of sand ridge. Fencing could be installed around concentrated areas of cactus, which might encourage cattle operators and others avoid disturbing the cactus in the area. Finally, because the Bena landfill buffer

areas are secure locations that will be protected in the future, this population could be expanded through translocation of plants into the buffer areas.



Map 21. Element Occurrence 25.

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**ELEMENT OCCURRENCE: 25 – SOUTH OF BENA ROAD**

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**Date(s) Surveyed:** February 28, 2011

**Property Ownership:** Private

**Historical Status:**

Moe observed 2000-3000 plants in this occurrence (both sides of Bena Rd.) in 1989. It is noted in the CNDDDB record that this occurrence may have been impacted in the past by high flood waters.

**Conservation Status:**

This portion of the occurrence that is south of Bena Road is owned by Tejon Ranch and protected through a conservation easement.

**Total Population Size:** ~500

**Population Extent/Dispersion:**

The portion of this occurrence that is south of Bena road is part of a large polygon that extends through the Caliente Creek floodplain. The cactus is distributed sparsely throughout the polygon. We estimated the polygon where cactus occurs is approximately 420 acres.

**Habitat Conditions:**

The habitat where the majority of cactus is found in this portion of the occurrence is predominately non-native annual grassland in a sandy wash with scattered scale broom (*Lepidospartum squamatum*) and bladderpod (*Isomeris arborea*). The majority of the cactus is found in the sandy to cobbly floodplain area and the south facing slopes adjacent to the floodplain.

**Internal Threats and Disturbances:**

Disturbances to the cactus in this area are minimal. There is some grazing that occurs in on this property, but the level of grazing currently looks appropriate. One potential threat to the cactus could come from flooding of Caliente Creek. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating there are none or very few threatening activities.

**Adjacent Land Uses/External Threats:**

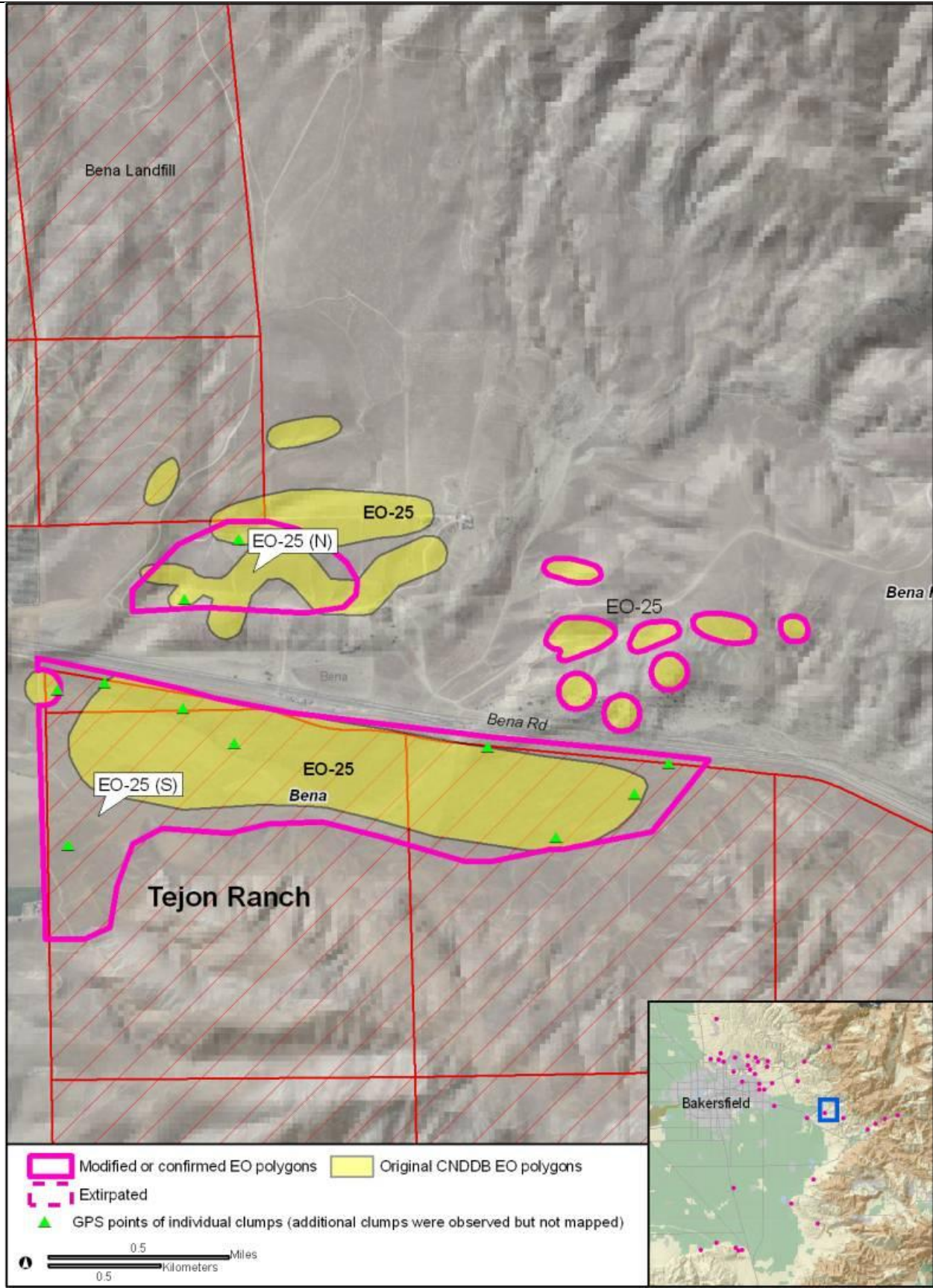
Lands adjacent to this EO include native habitat that are primarily used for grazing. To the north and northwest is the Bena landfill along with some natural and grazing land surrounding the landfill. Also to the northwest there are some orange groves. To the west there is irrigated agriculture. To the southwest is native land and some agricultural land. Also to the south and east is the cattle feed lot, as well as some natural habitat that appears to mostly be used for grazing. We estimated that the threat level from external disturbances to be a 5, indicating there are none or very few threatening activities.

**Probability of Persistence:**

This population seems relatively secure and we estimate that it is has a high probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 23.5 points out of 25.

**Recommendations:**

We recommend continued grazing in this area, since the cactus currently appears to be a healthy population that may be benefiting from current grazing practices. We also suggest that because this location is secure and will be protected in the future, this population could be expanded through translocation.



Map 22. Element Occurrence 25.

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**ELEMENT OCCURRENCE: 26**

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**Date(s) Surveyed:** November 23, 2010 (from adjacent property); May 2011 (aerial survey)

**Property Ownership:** Private

**Historical Status:**

It is unknown when cactus was observed on this property, and believed that it was likely prior to 1987. Moe did not find any cactus in 1989.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:**

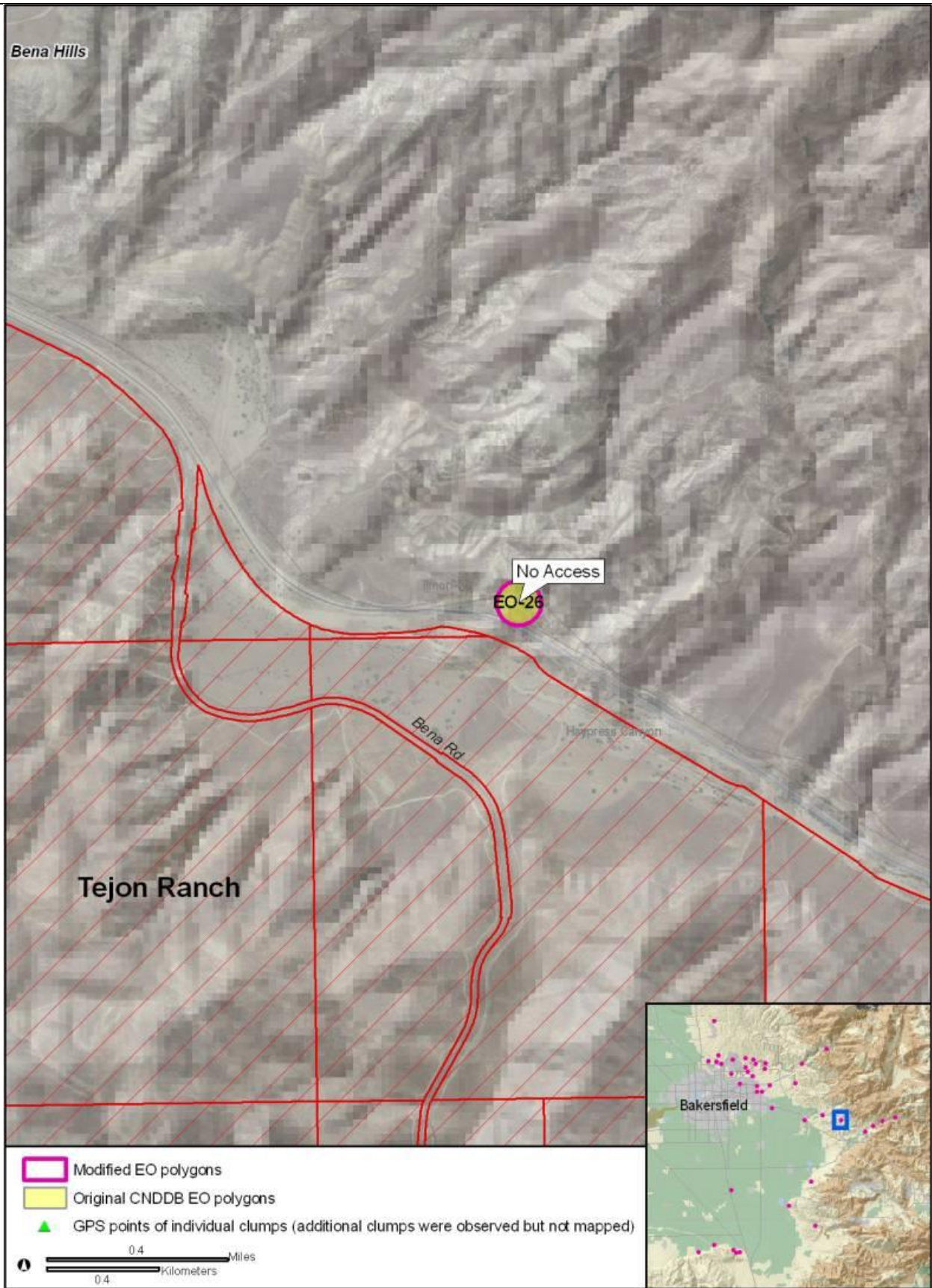
We were unable to gain permission to access this site. We viewed the site from adjacent properties and roads and also flew the site in May 2011. Habitat appears to be extant and intact in this area.

**Habitat Conditions/Disturbances:**

The area is characterized by rolling foothill habitat. The dominant plant community is non-native annual grassland with some scattered saltbush scrub (*Atriplex polycarpa*) and scale broom (*Lepidospartum squamatum*). The occurrence polygon is on a bank just above Caliente Creek. Coarse to cobbly sandy floodplain soils occur in the area.

**Adjacent Land Uses:**

Lands adjacent to this EO are primarily native grazing lands.



Map 23. Element Occurrence 26.



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**ELEMENT OCCURRENCE: 27**

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**Date(s) Surveyed:** December 1, 2010

**Property Ownership:** Private

**Historical Status:**

It is unknown when cactus was observed on this property, but likely was prior to 1987. Moe did not find plants here in 1989. It may be that cactus was observed here prior to the Caliente Creek flood of 1986-1987.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:**

We were unable to find cactus at this location.

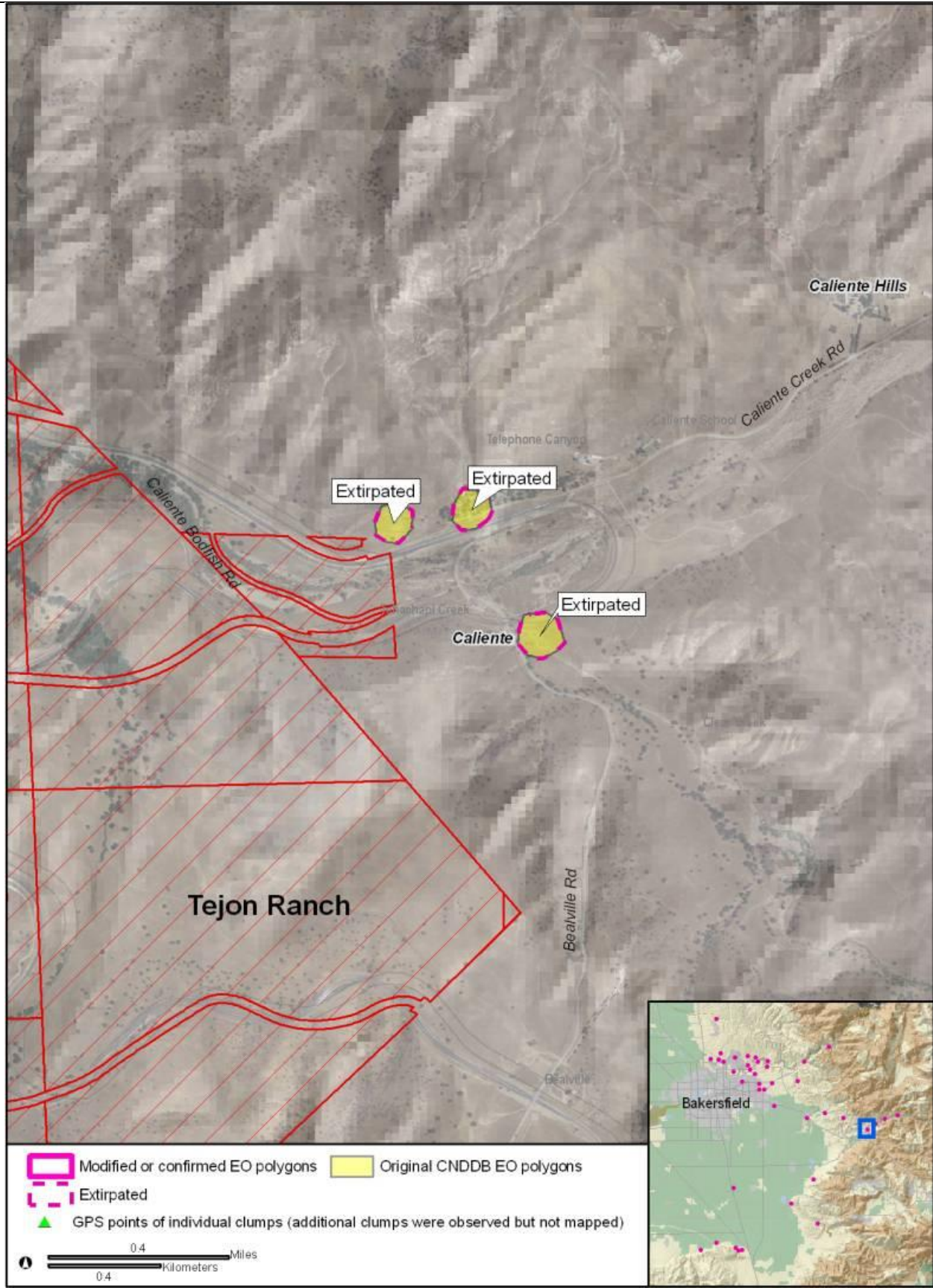
**Habitat Conditions/Disturbances:**

This occurrence includes habitat in the Caliente Creek bed and adjacent habitat. The habitat in the area is non-native annual grassland with some scattered scale broom (*Lepidospartum squamatum*) in the creek bed area.

One of the polygons in this occurrence that is south and east of the railroad tracks is an old, abandoned residential area.

**Adjacent Land Uses:**

Lands adjacent to this EO include native habitat surrounded by railroad tracks and some old, abandoned residential areas.



Map 24. Element Occurrence 27.

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**ELEMENT OCCURRENCE: 28**

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**Date(s) Surveyed: December 17, 2010**

**Property Ownership: Private; PG&E**

**Historical Status:**

In 1989, 200-300 plants were observed by Moe in this area. This population may have been much larger prior to the construction of a hydroelectric dam and associated facilities.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size: 200-250**

**Population Extent/Dispersion:**

This population occurs on the north side of the Kern River just outside the mouth of the Kern River Canyon. The plants occur on a boulder-strewn bank and flood plain, with more plants extending onto the lower foothill slopes on the north side of the canyon mouth. Roughly half the plants occur on land owned by the Nickel Family. The other half occurs on land owned by PG&E and to which we were not granted access. There may be more plants on the PG&E lands than we were able to observe from outside the property. The area covered by the population is approximately 30 acres.

**Habitat Conditions:**

This population occurs on a terrace of the flood plain for the Kern River. The soils are sandy and gravelly. Scattered cheesebush (*Hymenoclea salsola*) and scale-broom (*Lepidospartum squamatum*) occur in the area. The habitat on the Nickel Family parcel is grazed by cattle.

**Internal Threats and Disturbances:**

Disturbances include some roads through the area. Although the population is on a flood plain, flooding may be mostly historic. The flow of the Kern River is heavily regulated by various upstream dams, and water may not reach this population any longer. The extent of activities associated with the hydroelectric facilities is unknown, but there were no obvious disturbances from these activities. There is a PG&E maintenance facility within the eastern side of the population. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating that there were none or very few disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

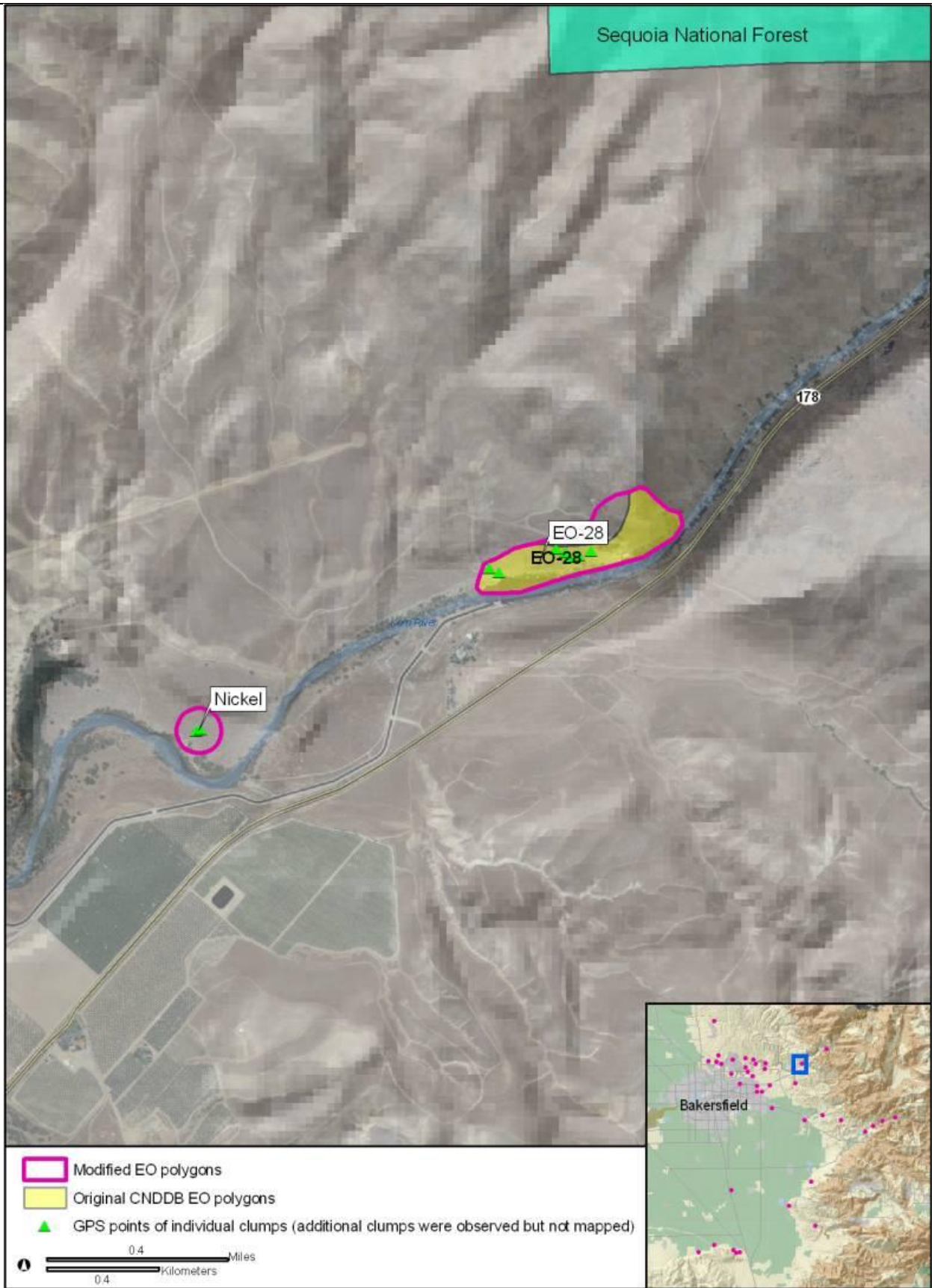
Adjacent land uses include the Kern River corridor to the southeast, south and southwest, and grazing lands in all other directions. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there were none or very few disturbances or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a high probability of persistence in 100 years assuming current conditions remain the same. Public access to this site is highly limited and there are few immediate internal or external threats. Using our ranking system we gave this population 13 points out of 25.

**Recommendations:**

We recommend protection for the population on private land through acquisition or a conservation easement. The Nickel Family currently has no plan to develop this area, and might consider selling a conservation easement on their property. PG&E should be approached to discuss permanent protective measures for cactus on their property. The current grazing practices appear to be beneficial to the cactus and should be continued.



Map 25. Element Occurrence 28.

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**ELEMENT OCCURRENCE: 30**

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**Date(s) Surveyed:** November 22, 2010

**Property Ownership:** Kern County

**Historical Status:**

Bakersfield cactus reportedly was extant on this site prior to 1987. Moe did not find any cactus on the site in 1989, and reported that the site had been scraped clear of vegetation.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:**

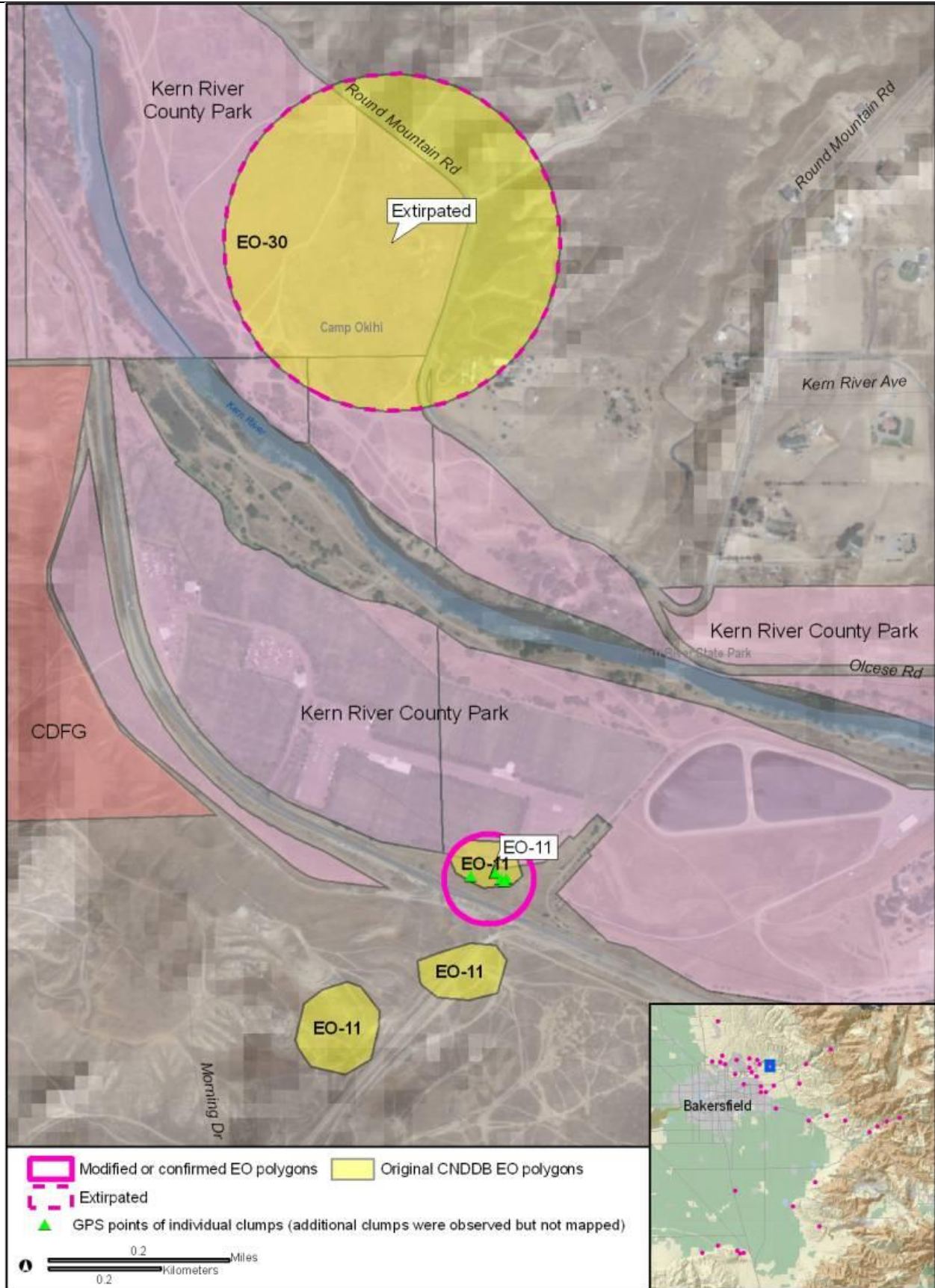
We were unable to find cactus at this location.

**Habitat Conditions/Disturbances:**

The area appears to be part of the historic floodplain for the Kern River. The area is on the north side of the River and south of Round Mountain Road. The area appears to have been repeatedly graded and burned, probably as recently as the previous year. Very little vegetation was present on the area.

**Adjacent Land Uses:**

The Kern River corridor occurs on the south side of the site, and grazing land occurs on the north side. The river corridor appears to receive considerable recreational use.



Map 26. Element Occurrence 30.

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**ELEMENT OCCURRENCE: 32**

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**Date(s) Surveyed:** September 14, 2010

**Property Ownership:** CDFG; Private

**Historical Status:**

Historically, two colonies were mapped north of the Breckenridge Road and west of Cottonwood Creek. This area was known to have cactus from historic collections by Bowden in 1987. In Moe's 1989 status survey no plants were seen in a search of Cottonwood Creek, but 100 plants were observed in the west colony. In 1996, G. Cooley mapped six clusters in an eastern colony, but no comment was made on the number of plants.

**Conservation Status:**

Located in the foothills of northeast Bakersfield, the majority of EO-32 is protected by CDFG. The protected parcel, called the Breckenridge Unit, was purchased through the Metro Bakersfield Habitat Conservation Plan and is 21 acres in size. There also is a few clumps of cacti in a small wash on private property just northeast of the CDFG parcel.

**Total Population Size:** ~106

**Population Extent/Dispersion:**

The population on CDFG property, which is likely the west colony observed by Moe in 1989, has approximately 100 clumps of cactus. These cacti are located within a polygon that is approximately 1.5 acres and the percent cover inside the polygon is roughly 5%. The population in the wash on private property has only 6 large clumps of cactus. These area encompassed by these cacti is less than half an acre.

**Habitat Conditions:**

The main cactus population is located on a southeast facing sandy slope. The site is predominately non-native grassland dominated by wild oats (*Avena* spp.) and bromes (*Bromus* spp.). There is also some scattered cheesebush (*Hymenoclea salsola*) and desert saltbush (*Atriplex polycarpa*). The second population is located on the west facing side of a sandy wash with the same associations.

**Internal Threats and Disturbances:**

Disturbances on the protected CDFG parcel include past trespass grazing, which was not occurring during the time we visited the site, but had occurred in the past. The small population that is on private property is currently being grazed. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating that there were none or very few disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

Adjacent land uses include natural grazing land to the north and northwest. To the west and southwest there is grazing land and an oil production waste-water spreading site (natural land with invasive *Tamarisk* spp.). To the south and southeast is Breckenridge Road as well as a low-density housing development approximately 0.25 miles to the south. To the east and northeast is grazing land, a feedlot, and a small ranch. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there were none or very few disturbances or threatening activities in this area.

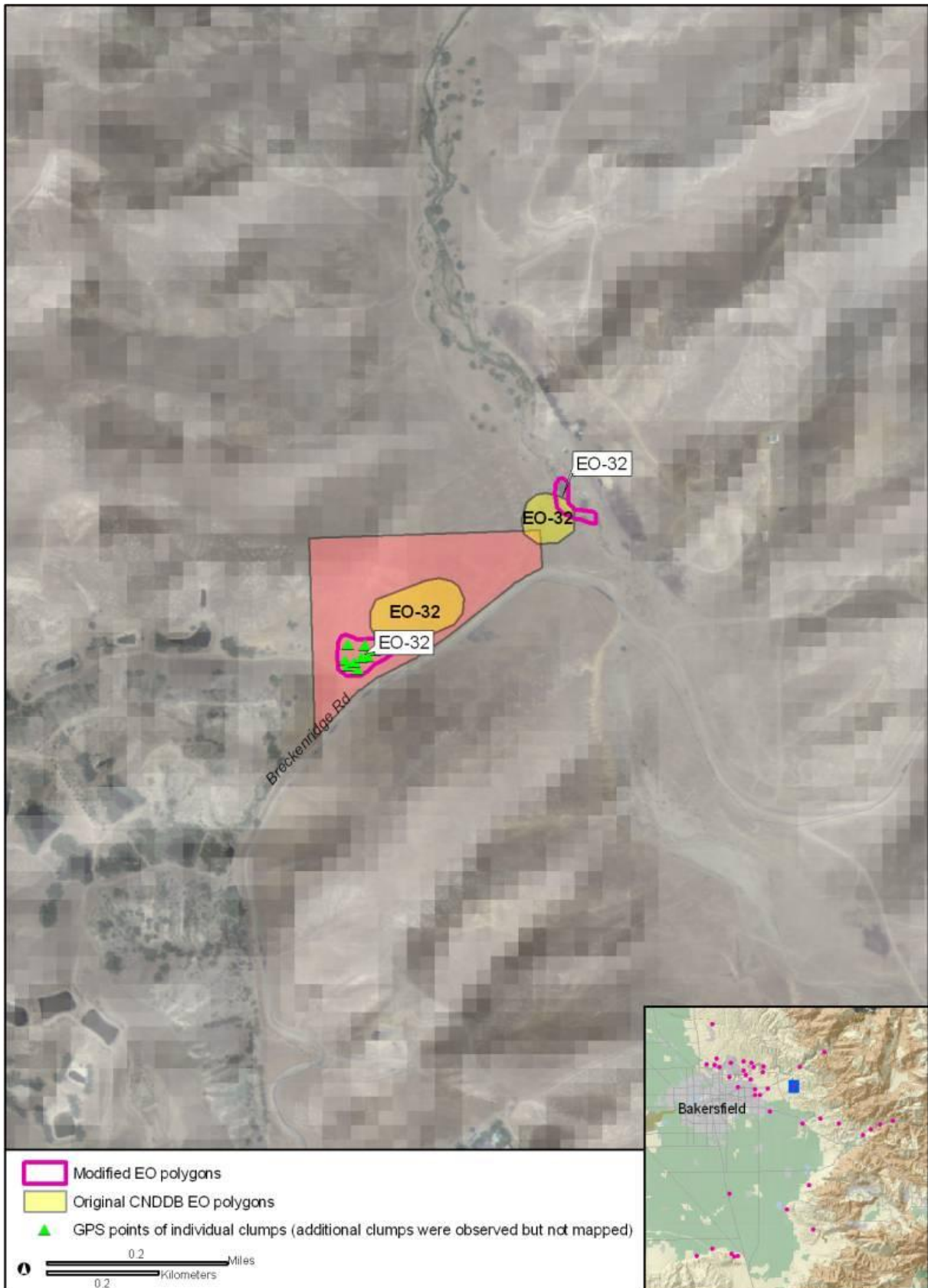
**Probability of Persistence:**

We estimated that this population had a high probability of persistence in 100 years assuming current conditions remain the same. The population mostly protected but is relatively small and also close to a road, which could increase fire risk. Using our ranking system we gave this population 20 points out of 25.

**Recommendations:**

We recommend protection for the population on private land through acquisition or a conservation easement. Grazing or other vegetation management may be beneficial in high rainfall years in which annual vegetation productivity also is high. Furthermore, fencing installed along Breckenridge Road would help to reduce

trespass and dumping that occurs adjacent to the road. Finally, we also suggest that translocation might be used to expand this population to other parts of the protected parcel and better ensure long-term survival.



Map 27. Element Occurrence 32.



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**ELEMENT OCCURRENCE: 36**

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**Date(s) Surveyed:** December 15, 2010; January 12, 2011

**Property Ownership:** California Department of Water Resources; Private

**Historical Status:**

This population consisted of cactus in 6 polygons. About 14,000 plants were observed by Taylor in 1992.

**Conservation Status:**

The conservation status of this population is mixed. All of the cacti found at this site occur on private lands. DWR holds a permanent conservation easement for the largest population segment, but the cacti occurring in all other areas of the site are not protected.

**Total Population Size:** ~5,000

**Population Extent/Dispersion:**

The largest segment of this population occurs just north of the California Aqueduct on private land just west of the San Joaquin Operations and Maintenance Center for DWR. Most of the cacti occur at this site. About 40-50 cacti were observed on private lands south of the main population and just south of the California Aqueduct. Another 20-50 plants were observed on private land just northwest of the main population. A fourth polygon occurs on DWR lands just north of the California Aqueduct and just southwest of the main population. No cacti were found in this area. Two additional polygons occur on private lands approximately 0.5 miles to the west. The habitat in the eastern-most of these 2 polygons has been converted to a vineyard. Three clumps of cactus were observed in the western most polygon as recently as April 2006. The area was grazing land in 2006 and still was during our survey. However, despite thorough searches on 2 different visits, no cacti were found in this area.

**Habitat Conditions:**

Habitat in the 3 areas where cacti were found was relatively intact and grazed by cattle. The soils are a mix of sandy and clay soils. The habitat is primarily saltbush scrub dominated by desert saltbush (*Atriplex polycarpa*) with some goldenbush (*Isocoma* spp.) and groundcover dominated by non-native grasses.

**Internal Threats and Disturbances:**

Few internal threats or disturbances were apparent. The most significant disturbance appeared to be noticeable damage to some cactus plants in the main population from cows. Plants appear to have been kicked or trampled resulting in a number of pads being detached with some being crushed. The number of cattle in this area did not seem to be inordinately high compared to other areas surveyed. Thus, the damage is somewhat unexplained. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 4, indicating that there were some disturbances or threatening activities. This was primarily due to the apparent damage from cattle that we observed.

**Adjacent Land Uses/External Threats:**

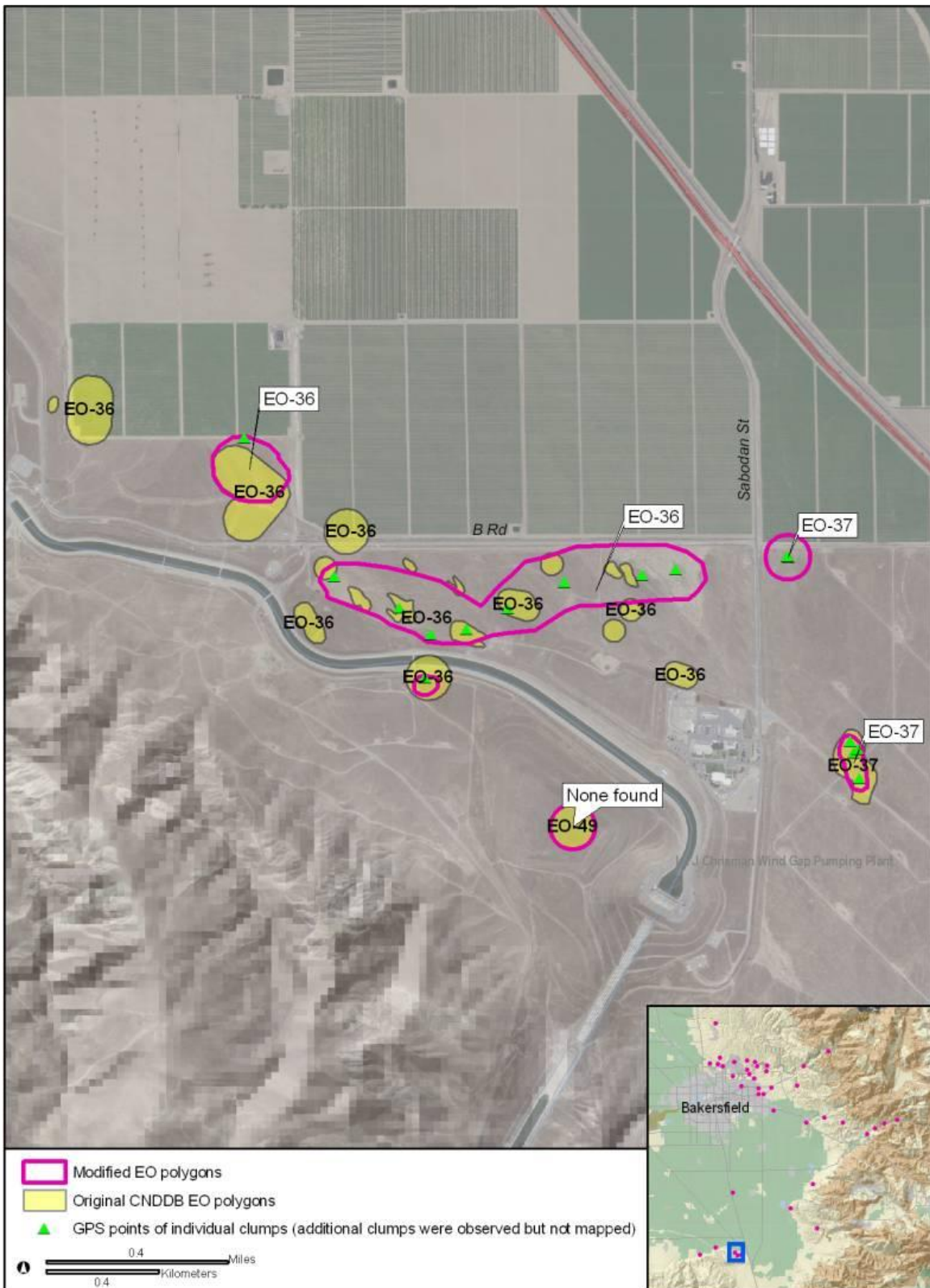
Adjacent land uses include vineyards to the northeast, north, northwest; the Aqueduct ROW to the west, southwest, and south; a maintenance yard to the southeast; and a road and oilfield to the east. However, the cactus occurrences are generally well buffered from adjacent lands, and immediate external threats are probably few, other than possibly long-distance pesticide drift from the agricultural lands. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there were few disturbances or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a high probability of persistence in 100 years assuming current conditions remain the same. A large portion of the population is permanently protected and the lands on the south side of the Aqueduct are unlikely to be converted to other uses. Using our ranking system we gave this population 21.5 points out of 25.

**Recommendations:**

We recommend protection for unprotected portions of the population through acquisition or a conservation easement. The main population should be monitored to determine whether the damage we observed from cattle is infrequent or recurring. If recurring, then grazing practices should be modified in this area to minimize or eliminate impacts. Otherwise, grazing should be continued to reduce competition from non-native grasses.



Map 28. Element Occurrence 36.

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**ELEMENT OCCURRENCE: 37**

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**Date(s) Surveyed: December 15, 2010**

**Property Ownership: Private (currently Vintage Oil)**

**Historical Status:**

Approximately 50-70 plants were observed in this area by Taylor in 1989, Chamberlain in 1991, and Lewis in 1992. Brown reported that no plants were found in 1996.

**Conservation Status:**

This population is currently not protected.

**Total Population Size: ~75-100**

**Population Extent/Dispersion:**

This population occurs in a low-density oil field just east of the San Joaquin Operations and Maintenance Center for DWR. The area occupied is approximately 5-10 acres. Furthermore, location about 0.5 miles north of this population was reported in a survey conducted by The Planning Center in the 1990s. We were able to locate this group (3 plants) and the information is included in this summary.

**Habitat Conditions:**

Habitat in this area consisted of non-native grassland with scattered shrubs including desert saltbush (*Atriplex polycarpa*), goldenbush (*Isocoma* spp.), and cheesebush (*Hymenoclea salsola*). The soils are mostly sandy and gravelly, and the terrain is mostly flat.

**Internal Threats and Disturbances:**

Internal threats and disturbances included dirt roads and low-intensity oil field activities. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 4, indicating that there were some disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

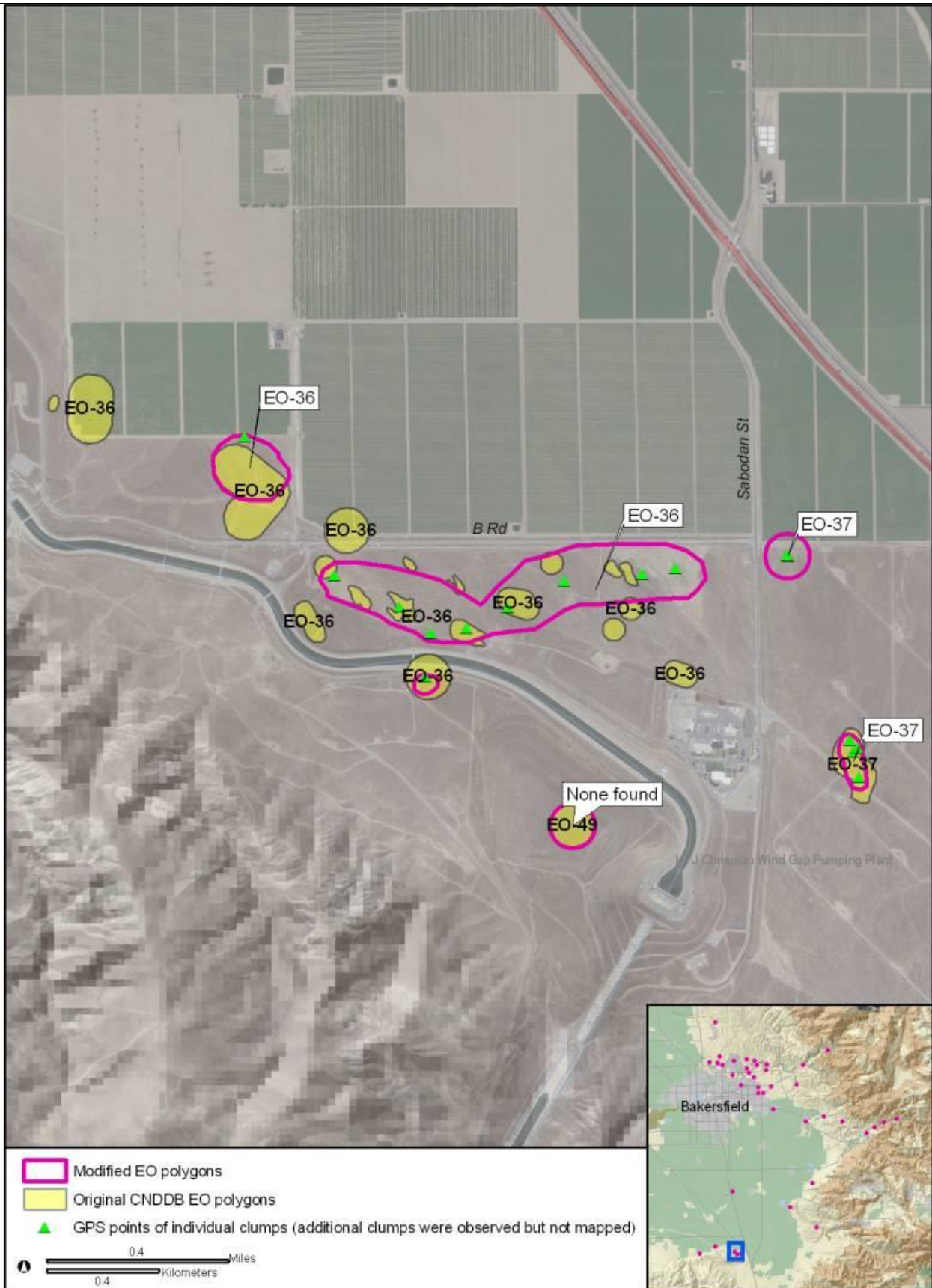
Adjacent land uses primarily include low-density oil field activities on most sides of the population. Vineyards are present to the north and a DWR operations complex is to the west. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there were few disturbances or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a moderate probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 11 points out of 25.

**Recommendations:**

We recommend protection through acquisition or a conservation easement. Grazing should continue to reduce competition from non-native grasses. If this population could be permanently protected, then it might be expanded through translocation.



Map 29. Element Occurrence 37.

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**ELEMENT OCCURRENCE: 38**

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**Date(s) Surveyed: March 9, 2011**

**Property Ownership: Private (Tejon Ranch)**

**Historical Status:**

It is unclear when this site was last visited and assessed. From the CNDDDB record, it appears that Moe may have visited the population in 1989 and reported that it was “extant”, but did not report a population estimate. However, in Moe’s report, the population labeled “038” does not seem to match up with this location.

**Conservation Status:**

This area is protected under a permanent conservation easement. Management of the area is by the Tejon Ranch Conservancy.

**Total Population Size: ~10 plants**

**Population Extent/Dispersion:**

All of the plants in this population are located in about a 2-acre area on a small knoll.

**Habitat Conditions:**

The habitat in this area is primarily non-native annual grassland with dense brome (*Bromus* spp.), wild barley (*Hordeum* spp.), and wild oats (*Avena* spp.). The location is on an alluvial fan with granitic, rocky soils. The entire area is grazed by cattle.

**Internal Threats and Disturbances:**

Currently, there do not appear to be any obvious internal threats to this population. We estimated the extent of area disturbed within the population to be 0-10%, and most of that disturbance consists of existing dirt roads. We estimated the threat level from internal disturbances to be a 5, indicating a very low level of threats.

**Adjacent Land Uses/External Threats:**

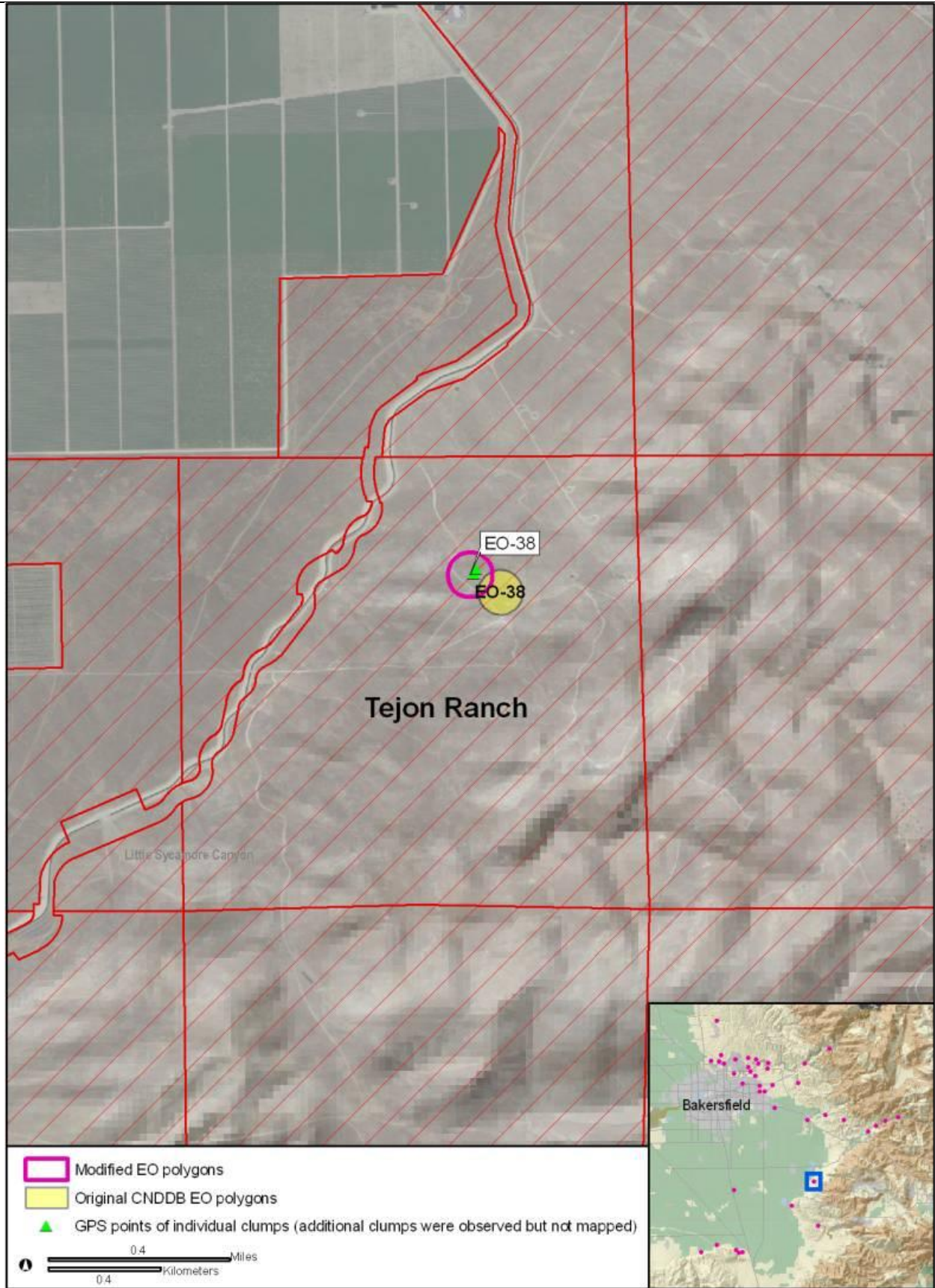
The primary land use in all directions from the areas with cactus is cattle grazing. In general, the population is well buffered within Tejon Ranch lands. We estimated that external threats to be a 5, indicating a very low level of threats.

**Probability of Persistence:**

This population is large and seems relatively secure. We estimate that this population has a high probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 21 points out of 25.

**Recommendations:**

This population is relatively large, appears well managed, and is secure. Grazing should continue to reduce competition from non-native grasses. Translocation might be considered to expand this protected population.



Map 30. Element Occurrence 38.

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**ELEMENT OCCURRENCE: 43**

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**Date(s) Surveyed:** May 2011 (aerial survey)

**Property Ownership:** Private

**Historical Status:**

The last survey date reported is 1987, and 35 plants were reported from this site.

**Conservation Status:**

The parcels in this area are currently not protected.

**Total Population Size:**

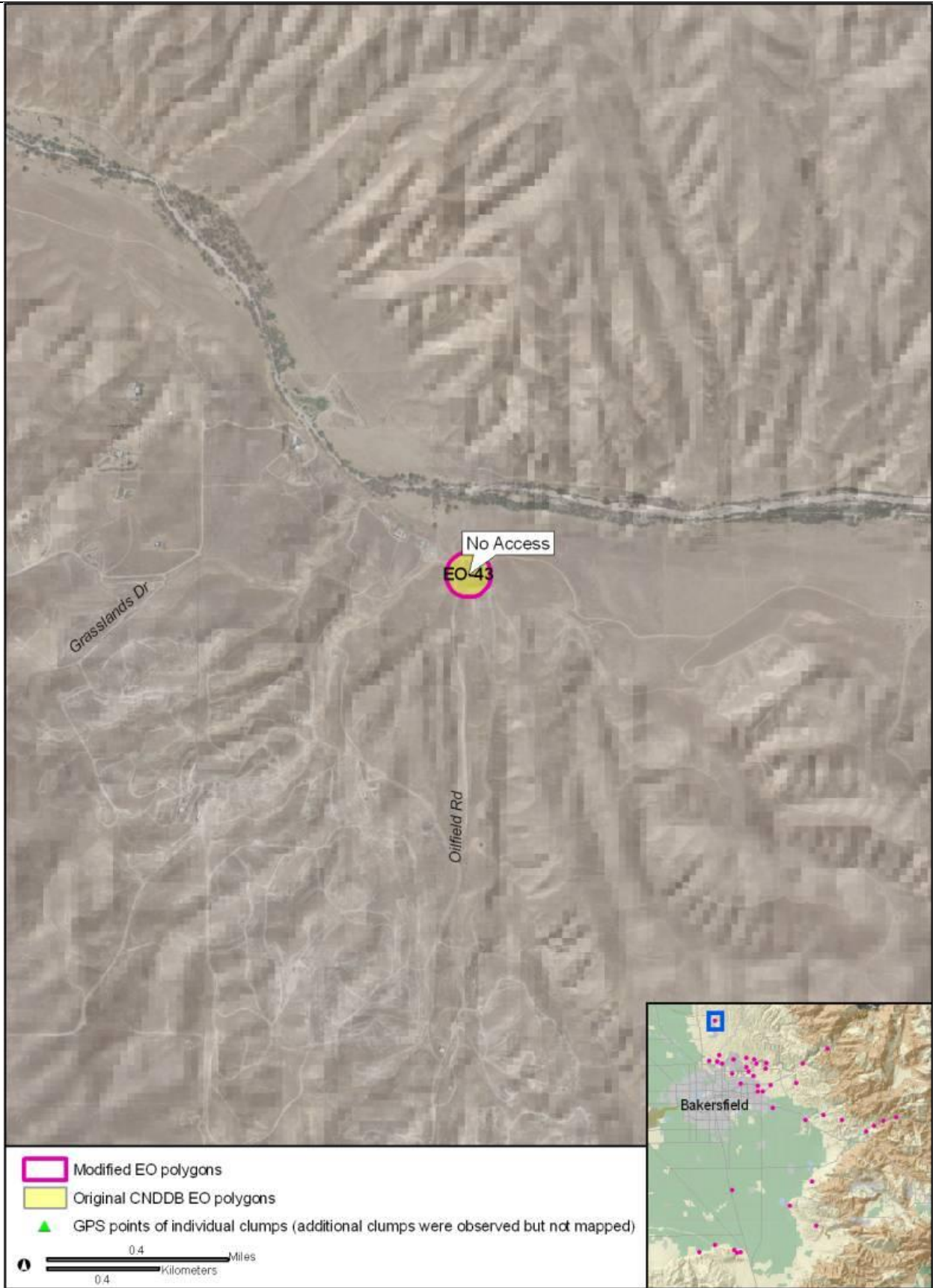
We were unable to gain permission to access this site. We conducted an aerial survey of the site in May 2011. Habitat appears to be extant and intact in this area.

**Habitat Conditions/Disturbances:**

The area is characterized by rolling terrain and the dominant plant community is non-native annual grassland with some scattered saltbush scrub (*Atriplex polycarpa*). The area is grazed by cattle.

**Adjacent Land Uses:**

Lands adjacent to this EO are primarily grazing lands.



Map 31. Element Occurrence 43.



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**ELEMENT OCCURRENCE: 44**

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**Date(s) Surveyed:** January 12, 2011

**Property Ownership:** The Wildlands Conservancy – Windwolves Preserve

**Historical Status:**

Historically this occurrence was recorded in 1991 as 750 clumps. It was noted in the occurrence that the plants were healthy, that there was little disturbance in the area, and that this is one of the largest remaining stands of Bakersfield Cactus.

**Conservation Status:**

This population is on protected property owned by The Wildlands Conservancy. However, there is no permanent conservation easement on this property.

**Total Population Size:** ~750-1000

**Population Extent/Dispersion:**

We estimated that the area with cactus is a bit smaller than the polygon recorded in the CNDDDB occurrence records, but that cactus is fairly dense throughout the polygon. We estimated that coverage by cactus was between 5-25%. The most densely populated area with cactus occurs in a wash that runs through the polygon.

**Habitat Conditions:**

This population is located on alluvial fans emanating out of the Wheeler Ridge Hills and the soils are sandy. The site is predominately non-native grassland dominated by wild oats (*Avena* spp.) and bromes (*Bromus* spp.) with scattered desert saltbush (*Atriplex polycarpa*).

**Internal Threats and Disturbances:**

Because the cactus population is within a preserve, there are relatively few sources of disturbance. A pipeline road traverses the site and may be infrequently used by vehicles. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating that there was none or very few disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

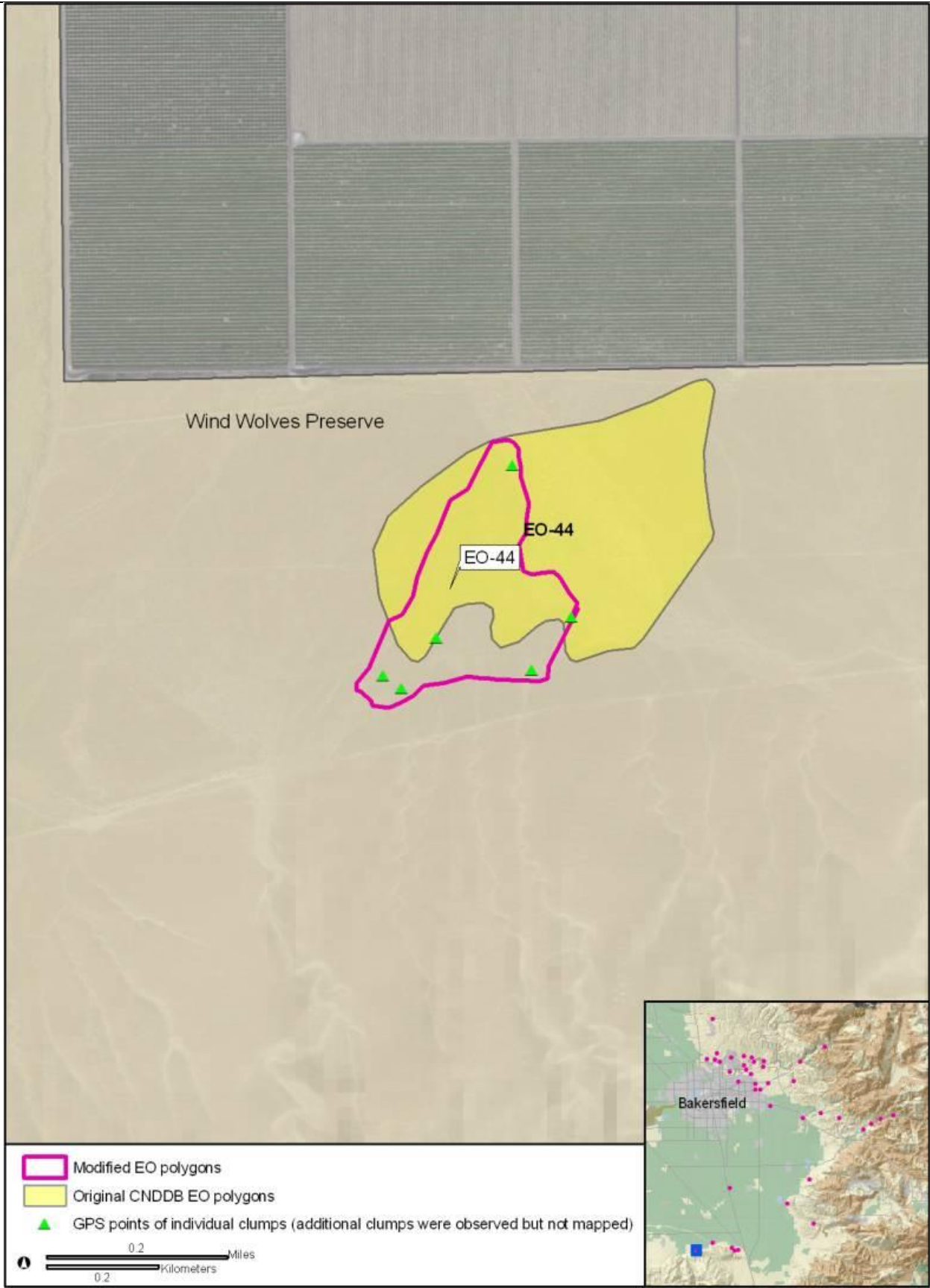
Adjacent land uses include citrus groves to the northeast, north, northwest, and west, and natural lands in all other directions. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there was none or very few disturbances or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a high probability of persistence in 100 years assuming current conditions remain the same. The population is currently and the threats are relatively few. Using our ranking system we gave this population 24 points out of 25.

**Recommendations:**

We recommend permanent protection for the population through a conservation easement. Non-native grasses are dense on this site, and grazing or other vegetation management may be beneficial, particularly in high rainfall years in which annual vegetation productivity also is high. We also suggest that translocation might be used to expand this population and better ensure long-term survival.



Map 32. Element Occurrence 44.

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**ELEMENT OCCURRENCE: 45**

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**Date(s) Surveyed: December 15, 2010**

**Property Ownership: DWR; Private**

**Historical Status:**

This occurrence consists of 2 areas that are on opposite sides of and adjacent to the California Aqueduct. In 1996, 30 clumps were reported on the north side and 13 were reported on the south side in 2005. The occurrence includes the former EO-50.

**Conservation Status:**

The plants in the ROW for the California Aqueduct receive some protection, although it is unclear whether this protection is permanent. The plants on private lands are not protected.

**Total Population Size: ~500-1000**

**Population Extent/Dispersion:**

Within the polygon on the north side of the Aqueduct, we found 21 clumps of cactus. All were within the fence line for the Aqueduct ROW, and occurred in an area approximately 2-3 acres in size. No plants occurred outside of the ROW. The polygon on the south side is actually more extensive than depicted in the CNDDDB. Whereas 13 plants were previously reported from this area, we observed 500-1000. This population covered at least 50 acres and extended close to 0.25 miles south of the ROW. It is possible that there are even more cacti further to the south, east, or west.

**Habitat Conditions:**

The area on the north side of the Aqueduct has sandy soils and probably was disturbed a bit in the past by Aqueduct construction activities. The habitat was primarily non-native grassland with scattered desert saltbush (*Atriplex polycarpa*) and tumbleweed (*Salsola* spp.). The area on the south side of the Aqueduct was located on an alluvial fan with sandy, rocky soils. The habitat was saltbush scrub with desert saltbush, and some cheesebush (*Hymenoclea salsola*). The area is grazed by cattle.

**Internal Threats and Disturbances:**

Disturbances and threats to the area on the north side of the Aqueduct in the ROW include roads and possible herbicide affects. It was obvious that some of the cacti growing along the fence line had been affected by herbicides apparently sprayed along the fence line or adjacent agricultural road, probably for weed control. Disturbances and threats to the area on the south side included some dirt roads, which mostly provided access to powerline towers. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating that there was relatively little disturbance or threatening activities.

**Adjacent Land Uses/External Threats:**

Adjacent land uses for the northern area include citrus groves to the north and the California Aqueduct to the south. Adjacent land uses for the southern area include the California Aqueduct to the north and grazing lands on the other sides. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there was relatively little disturbance or threatening activities in this area.

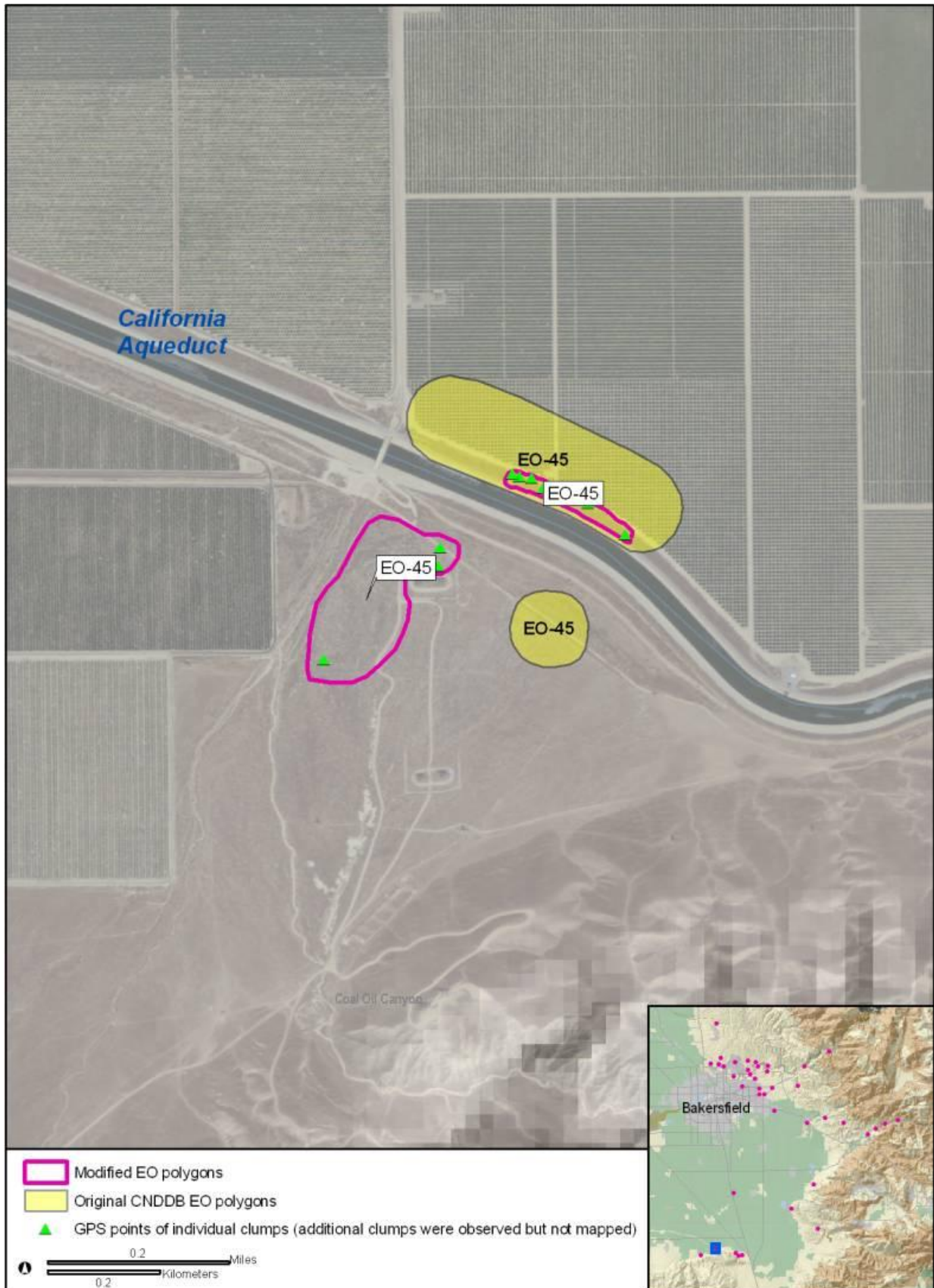
**Probability of Persistence:**

We estimated that this population had a high probability of persistence in 100 years assuming current conditions remain the same. The population is large and the threat of future development is low. Using our ranking system we gave this population 15 points out of 25.

**Recommendations:**

We recommend permanent protection for the population, particularly that portion on the south side of the Aqueduct, through acquisition or a conservation easement. The southern population is among the larger of

remaining cactus populations and appears to be in excellent condition. Grazing should continue to reduce competition from non-native grasses.



Map 33. Element Occurrence 45.

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**ELEMENT OCCURRENCE: 49**

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**Date(s) Surveyed:** December 15, 2010

**Property Ownership:** DWR

**Historical Status:**

This occurrence was first report in 1996, and consisted of 1 cactus clump.

**Conservation Status:**

This area is owned by DWR, but the conservation status is unclear.

**Total Population Size:**

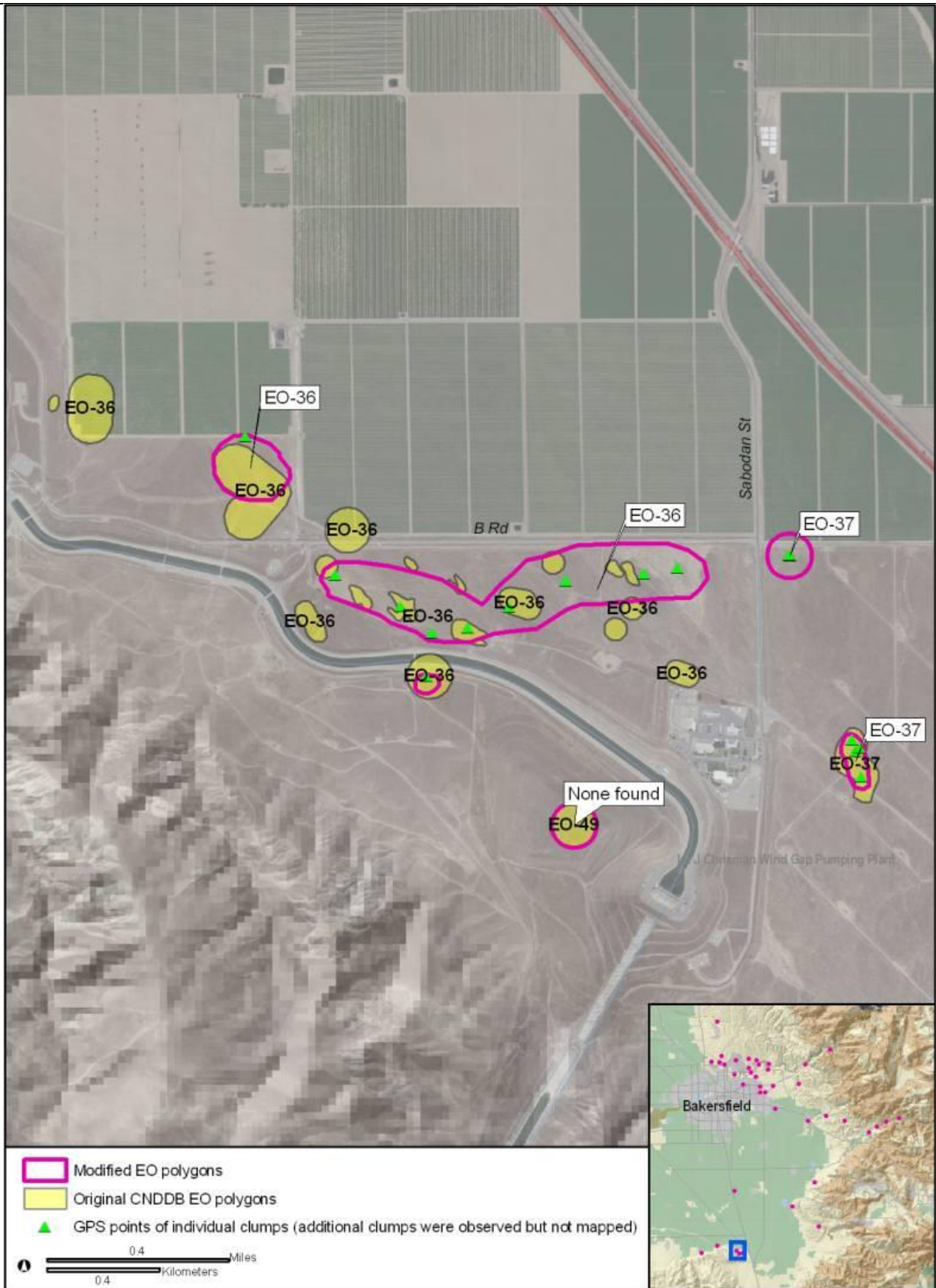
We were unable to find cactus at this location despite searching extensively.

**Habitat Conditions:**

This occurrence is in a large man-made “bowl” that was excavated for a pumping station for the California Aqueduct. The habitat is highly modified and is dominated by non-native grasses with some scattered desert saltbush (*Atriplex polycarpa*).

**Adjacent Land Uses:**

Lands adjacent to this EO include the California Aqueduct and ROW, and grazing lands.



Map 34. Element Occurrence 49.

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**ELEMENT OCCURRENCE: 51**

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**Date(s) Surveyed:** November 30, 2010

**Property Ownership:** U.S. Forest Service

**Historical Status:**

This occurrence appears to have been recorded in the CNDDDB in 2002. While this occurrence has been recorded as Bakersfield cactus, the taxonomy of the cactus in this area is still uncertain.

**Conservation Status:**

Protected by the USFS.

**Total Population Size:** 2

**Population Extent/Dispersion:**

There are two clumps of cactus in this population that are located on the southwest side of the cut bank of Highway 178.

**Habitat Conditions:**

The cactus in this occurrence is located on a rocky slope that is part of a road cut made for Highway 178 through the Kern Canyon. The habitat in this area is a transition zone between non-native annual grassland and valley blue oak woodland that occurs in the San Joaquin Valley foothills. The soil in the area is coarse, granitic sand. The Kern River flows close to the highway at this location.

**Internal Threats and Disturbances:**

Potential threats to this population include roads, traffic, and potential fire risk since the population is in very close proximity to the highway. There is also a day-use area and campground nearby, and human foot traffic may pose some risk to the cactus. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating that there were none or very few disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

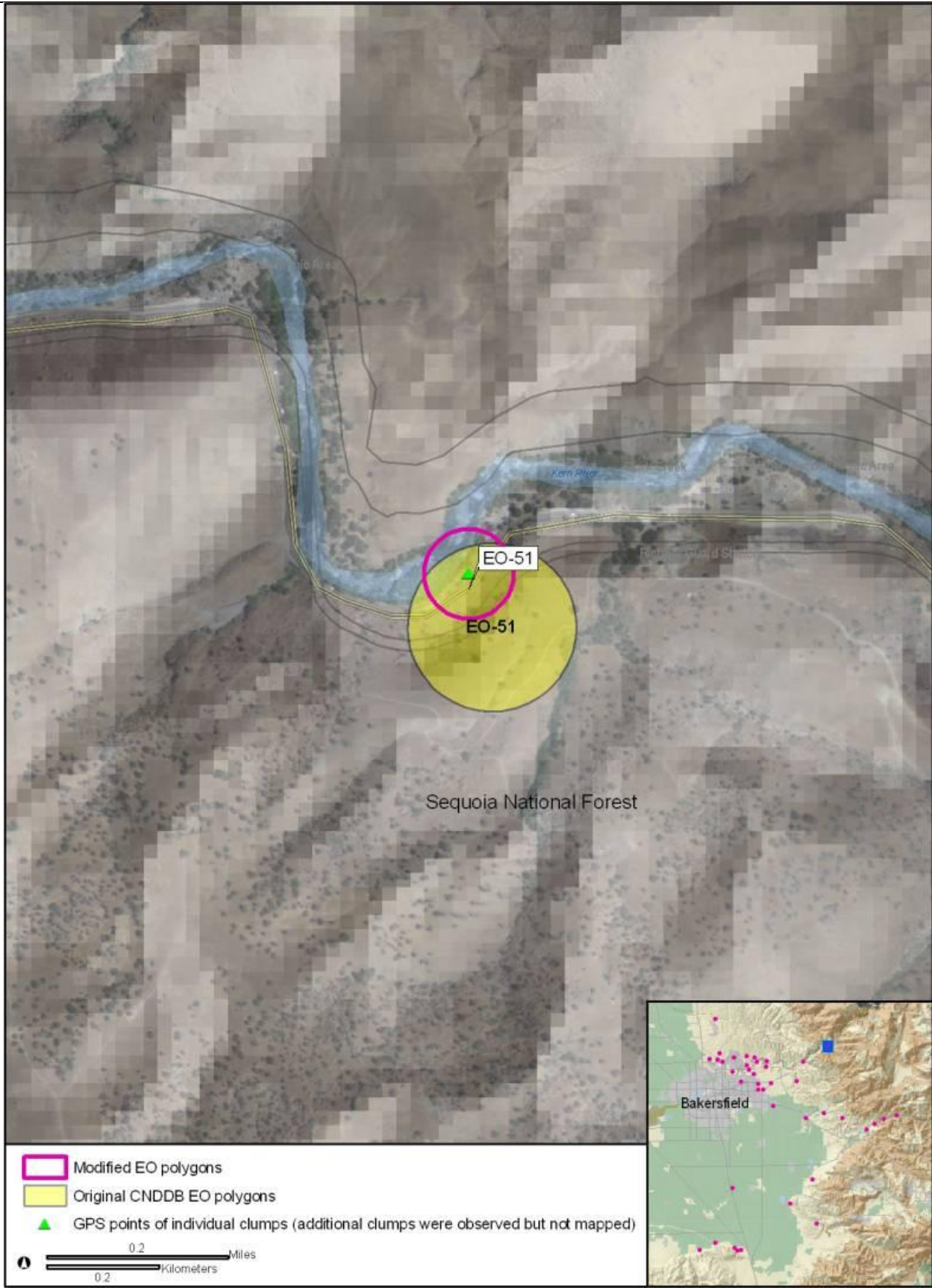
The land adjacent to this occurrence is all owned and managed by the U.S. Forest Service. Grazing occurs on some of these lands. To the west of the cactus is the Kern River and to the northeast is the Lower Richbar day-use area. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there was none or very few disturbances or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a high probability of persistence in 100 years assuming current conditions remain the same. The population is relatively small and also close to a road, which could increase fire risk. Using our ranking system we gave this population 21 points out of 25.

**Recommendations:**

The taxonomic identity of this population should be resolved. There are other clusters of cactus located near this occurrence on USFS land in this area, and it is important to determine whether these should or should not be considered Bakersfield cactus. One recommendation for the protection of this population is to add a fence along the side of the road to prevent any potential trespass issues that could occur in the future.



Map 35. Element Occurrence 51.



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**ELEMENT OCCURRENCE: 59**

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**Date(s) Surveyed:** August 12, 2010

**Property Ownership:** Private; Caltrans

**Historical Status:**

This occurrence appears to have been first documented in 2009. Two clumps were reported present.

**Conservation Status:**

This population is unprotected.

**Total Population Size:** 2

**Population Extent/Dispersion:**

There are two clumps of cactus in this population that are located approximately 20 m west of North Chester Road.

**Habitat Conditions:**

This is a remnant piece of habitat in a small wash with sandy soils. The area is dominated by non-native grasses, including red brome (*Bromus madritensis* spp. *rubens*), ripgut brome (*B. diandrus*), and by short-pod mustard (*Hirschfeldia incana*).

**Internal Threats and Disturbances:**

Potential threats to this population include roads, dumping, and invasive non-native species. The plants are only 20 m from a paved road, and therefore are vulnerable to impacts associated with roads, including runoff of toxic substances, trash, and fire. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 3, indicating that there were moderate disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

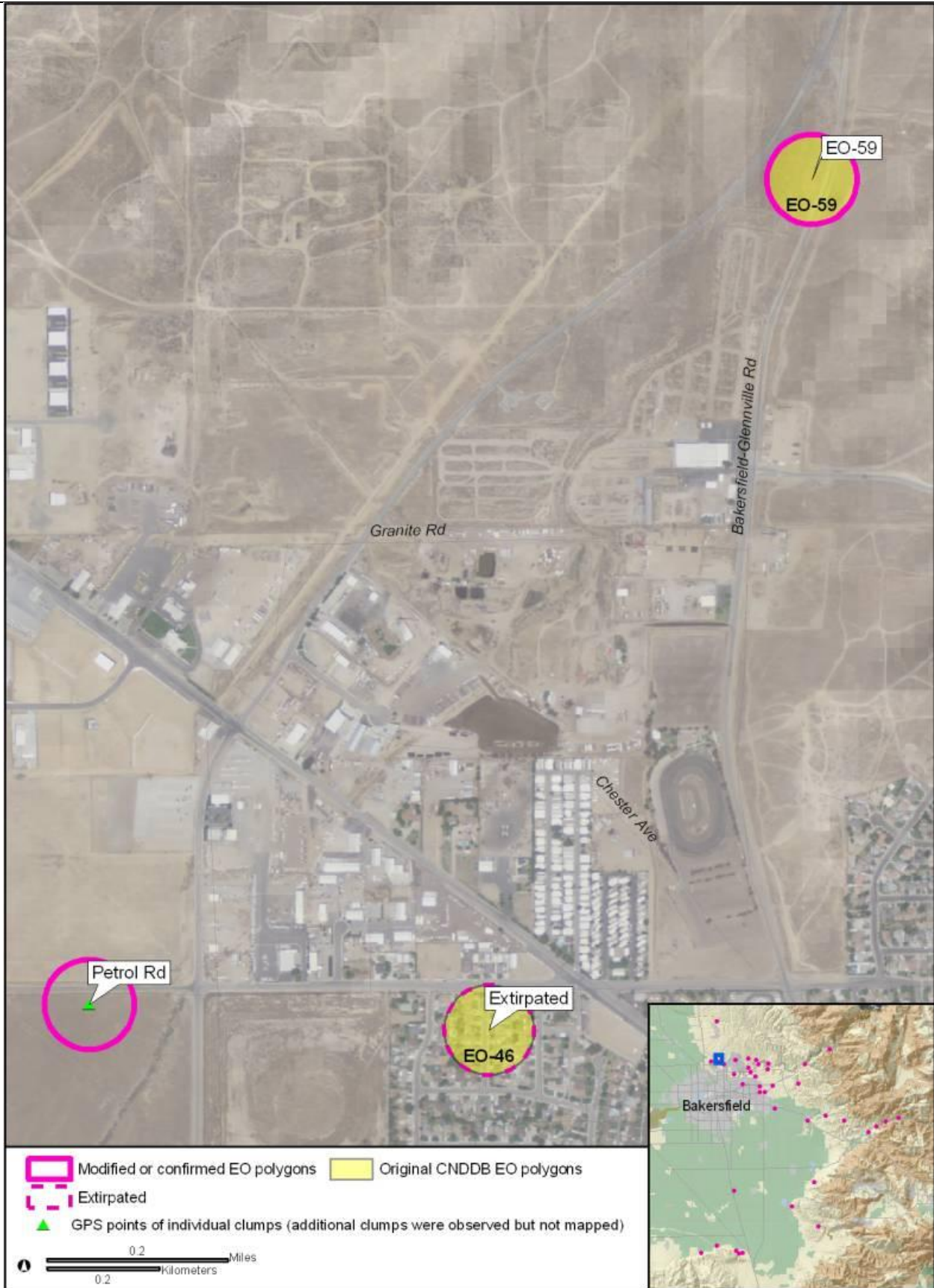
The area with the cactus is bounded on the east by N. Chester Road and on the west by Granite Road. There is low-density oil field activities on the other sides of these roads. There is a small amount of remnant habitat to the north and south of the cacti. Industrial developments are located just 0.1 mile to the south and appear to be expanding northward. We estimated the threat level considering adjacent land uses and external activities to be a 2, indicating that there is a high potential for disturbances or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a low probability of persistence in 100 years assuming current conditions remain the same. The population is very small and also close to 2 roads. Also, there has been considerable industrial development in this area, and this development likely will continue. Using our ranking system we gave this population 7 points out of 25.

**Recommendations:**

This will be a difficult population to protect. The best strategy may be to translocate the plants off of this site and into a protected site.



Map 36. Element Occurrence 59.

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**ELEMENT OCCURRENCE: NEW – NICKEL FAMILY**

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**Date(s) Surveyed:** December 17, 2010

**Property Ownership:** Private (Nickel Family)

**Historical Status:**

This occurrence has not yet been recorded in the CNDDDB.

**Conservation Status:**

This population is not currently protected.

**Total Population Size:** ~20

**Population Extent/Dispersion:**

This population occurs in a 5-10 acre area on a terrace that is part of the floodplain for the Kern River.

**Habitat Conditions:**

This area is a part of the historic flood plain for the Kern River. The soils are sandy with lots of rocks and boulders present. The habitat is mostly non-native grass with scattered scale-broom (*Lepidospartum squamatum*) and cheesebush (*Hymenoclea salsola*). The area is grazed by cattle.

**Internal Threats and Disturbances:**

There are no obvious impacts or internal threats to this population. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 5, indicating that there was no or very few disturbances or threatening activities.

**Adjacent Land Uses/External Threats:**

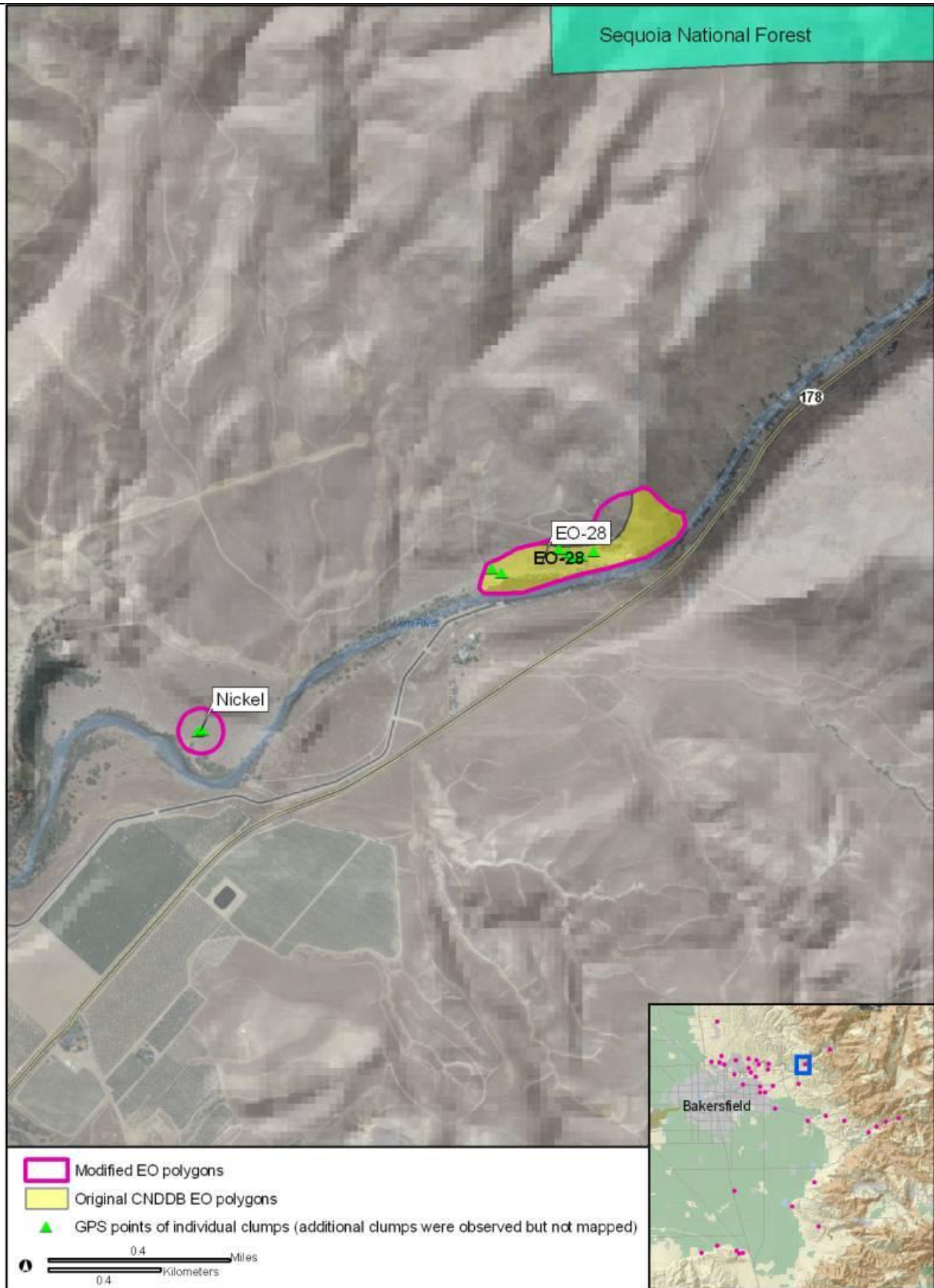
The Kern River bounds this area on the east side. Otherwise, the population is within a large parcel of grazing land. We estimated the threat level considering adjacent land uses and external activities to be a 5, indicating that there were no or very few disturbances or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a moderate probability of persistence in 100 years assuming current conditions remain the same. The population is small and is potentially subject to flooding events from the Kern River. Using our ranking system we gave this population 11 points out of 25.

**Recommendations:**

This population might be conserved through acquisition or conservation easement. The Nickel Family has no plans to develop this area, and might be willing to sell a permanent conservation easement for this area. Grazing should continue to reduce competition from non-native grasses. If conserved, this population potentially could be expanded using translocation.



Map 37. New element occurrence, Nickel Family

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**ELEMENT OCCURRENCE: NEW – PANORAMA VISTA**

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**Date(s) Surveyed:** January 26, 2011

**Property Ownership:** Kern River Corridor Endowment and Holding Company (Panorama Vista Preserve)

**Historical Status:**

This occurrence has not yet been recorded in the CNDDDB.

**Conservation Status:**

This population is within the Panorama Vista Preserve and currently receives some protections, but the lands in the Preserve are not permanently protected.

**Total Population Size:** ~150-200

**Population Extent/Dispersion:**

There is one clump in an old oil sump. Otherwise, all of the plants are in a narrow strip of habitat between the Kern River bike path and the Panorama bluffs. The area with cactus is approximately 1-2 acres in size.

**Habitat Conditions:**

The area with cactus is a remnant piece of habitat. It is located on slopes at the foot of the Panorama Bluffs. There is a fairly thick stand of shrubs including desert saltbush (*Atriplex polycarpa*) and arrowweed (*Pluchea sericea*). Many of the cacti are growing under the shrubs. The soils are sandy.

**Internal Threats and Disturbances:**

Potential threats to this population include foot and equestrian traffic, trash, and erosion from the nearby bluffs. The site is right next to the heavily used Kern River bike path. Human foot traffic in the population is evident. Rocks and soil cascade down from the bluffs, and the bluffs are the site of frequent grass fires. We estimated the extent of area disturbed within the population to be 0-10%. We estimated that the threat level from internal disturbances to be a 4, indicating that there was some disturbance or threatening activities.

**Adjacent Land Uses/External Threats:**

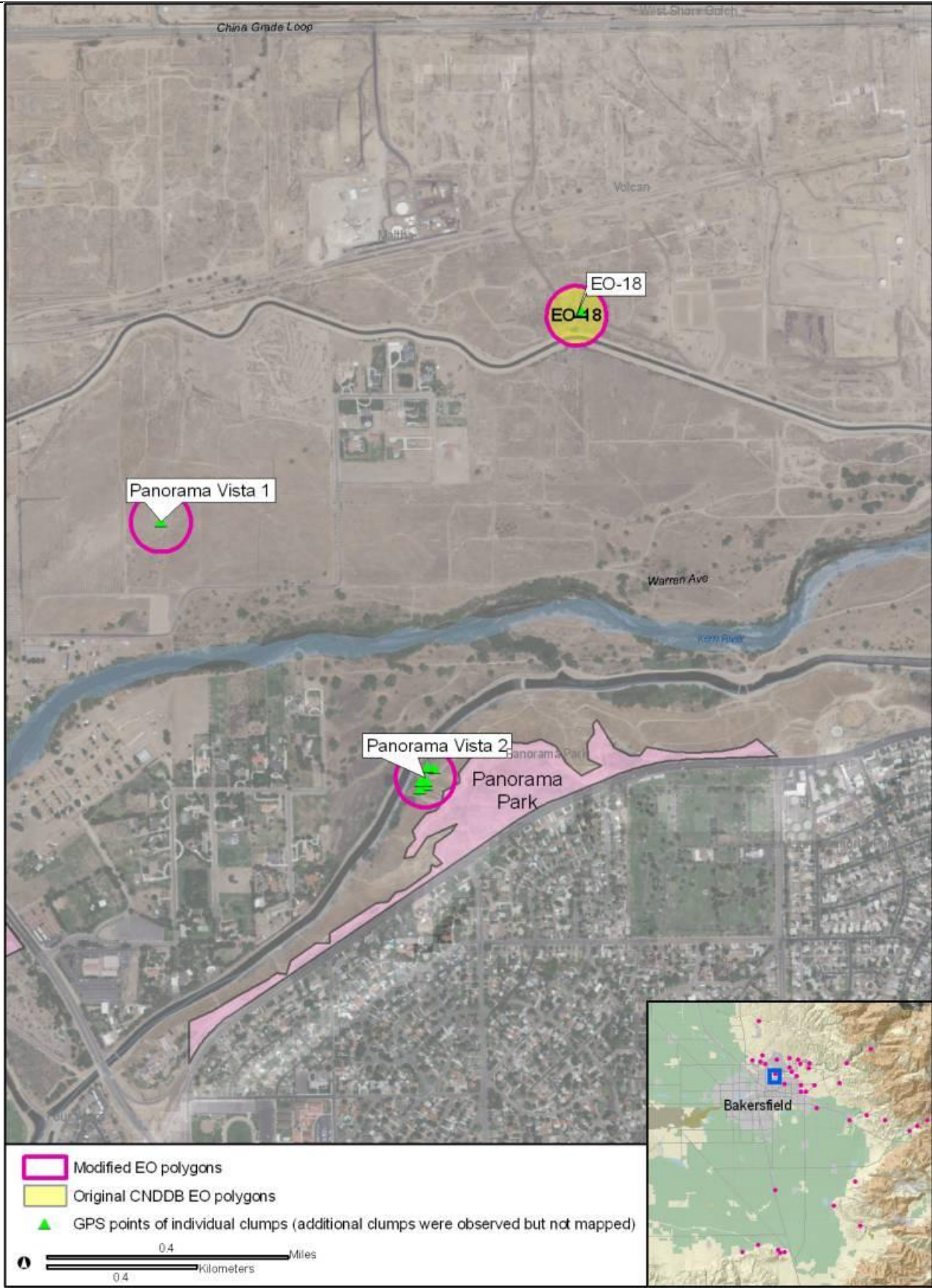
This area is bounded on the north by the Kern River bike path and a canal, and on the south by the Panorama Bluffs. Remnant habitat continues to the east and west. The bike path is heavily used and human foot traffic in the population is evident. Rocks and soil cascade down from the bluffs and could bury some of the cacti. Also, the bluffs are the site of frequent grass fires. We estimated the threat level considering adjacent land uses and external activities to be a 4, indicating that there was some disturbance or threatening activities in this area.

**Probability of Persistence:**

We estimated that this population had a moderate probability of persistence in 100 years assuming current conditions remain the same. Using our ranking system we gave this population 18.5 points out of 25.

**Recommendations:**

This population should be permanently protected through a conservation easement. The Kern River Corridor Enhancement and Holding Company should be approached about this prospect. The population by the bike path might be better protected if fencing were installed to reduce foot traffic and trash in the population. If this population is permanently protected, it might be expanded using transplantation.



Map 38. New element occurrence, Panorama Vista