Western Regional Partnership (WRP) Mojave Project

Geographic Information System (GIS) Suitability Analysis Report for the WRP Mojave Project

This report provides information on the GIS analysis conducted to identify lands within the Mojave Desert ecoregion that are important to the military mission and for habitat conservation.

Prepared for: WRP Natural Resource Committee
May 2014

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May 2013

Executive Summary

This report details the Geographic Information System (GIS) analysis used to identify areas beneficial to conservation and military testing and training within the Mojave Desert Ecoregion, using input from the Western Regional Partnership (WRP) Natural Resource Committee's Mojave Project Team. The analysis, with Mojave Team input, identified the following six potential wildlife corridors important to Department of Defense testing and training and to habitat conservation:

- Twentynine Palms – Southwest Corridor
- Twentynine Palms – Western Corridor
- Twentynine Palms – Northern Corridor
- Twentynine Palms – Southeast Corridor
- Edwards Air Force Base
- China Lake

This report provides important information on each corridor and on how the GIS analysis was conducted.

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WRP Natural Resources Committee's Mojave Project

The Western Regional Partnership (WRP) identified the Mojave Region as one of two important regions to collaborate on broad-based regional planning. This area was identified for its significant wildlife, military testing and training, renewable energy development and other infrastructure.

Project Goals:

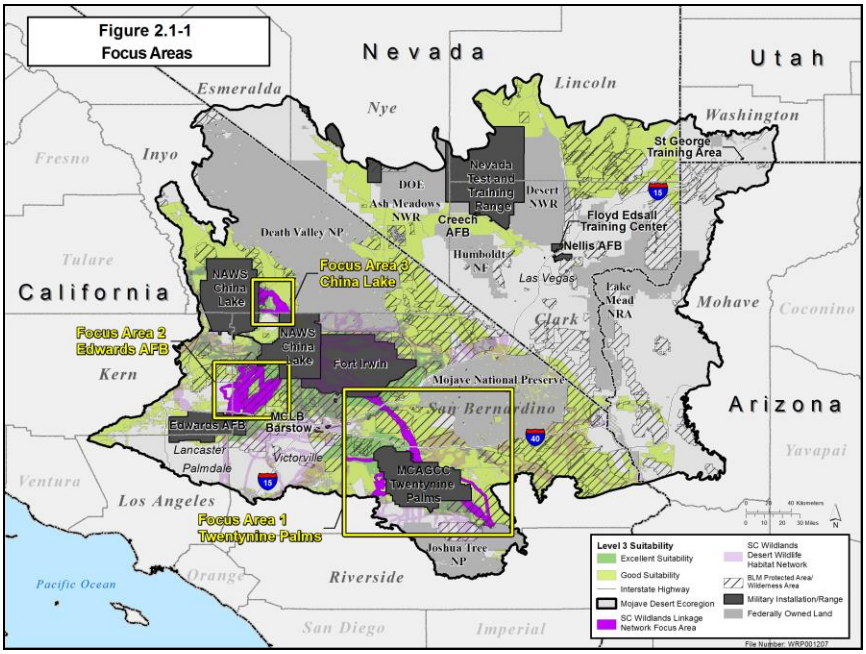
- Identify areas important to both **ecological and military values**, through GIS Analysis with partner input.
- Examine appropriate locations for conservation easements and other projects to enhance habitat, reduce loss potential and improve connectivity and support the military mission.

Relevance of the Mojave Region to the Project Goals:

- An important ecosystem, home to a tremendous diversity of plants and animals, including many threatened and endangered species. Approximately 80 percent of the desert, around 25 million acres, is publicly owned and contains two national parks, one national preserve, 72 wilderness areas, 14 state parks and extensive holdings of public lands managed by the Bureau of Land Management.
- The area includes significant military testing and training. There are eight military installations and ranges, as well as two National Guard sites and multiple areas within military training route corridors and special use airspace.

WRP Mojave GIS Suitability Analysis Report:

- Identified important military and conservation land within the Mojave ecoregion.
- Includes information on how the GIS analysis was conducted and accompanying maps, data sources and areas of cultural sensitivity.
- The analysis recommends six corridors in three focus areas for further action:
  - Twentynine Palms
    - Southwest Corridor
    - Western Corridor
    - Northern Corridor
    - Southeast Corridor
  - Edwards AFB
  - China Lake



Twentynine Palms Focus Area:

- Recommended focus area of four corridors comprises 514.31 square miles

- All four corridors are near MCAGCC Twentynine Palms, contain multiple Military Training Routes (MTRs) and Special Use Airspace (SUA) and include areas of cultural sensitivity. The majority of the land in this area is managed by BLM.
- The northern corridor is close to Desert Tortoise and Fringe-toed Lizard Critical Habitat. The western corridor is near Desert Tortoise Critical Habitat, Rodman Mountains Wilderness Area, and Ord-Rodman Desert Wildlife Management Area (DWMA). The southwest corridor is completely within Desert Tortoise Critical Habitat. The southeast corridor is located north of the Joshua Tree National Park, which also is designated as Desert Tortoise critical habitat and includes the following Wilderness Areas: Mojave Fringe-Toed Lizard ACEC, Cleghorn Lakes Wilderness, and Sheephole Valley Wilderness.

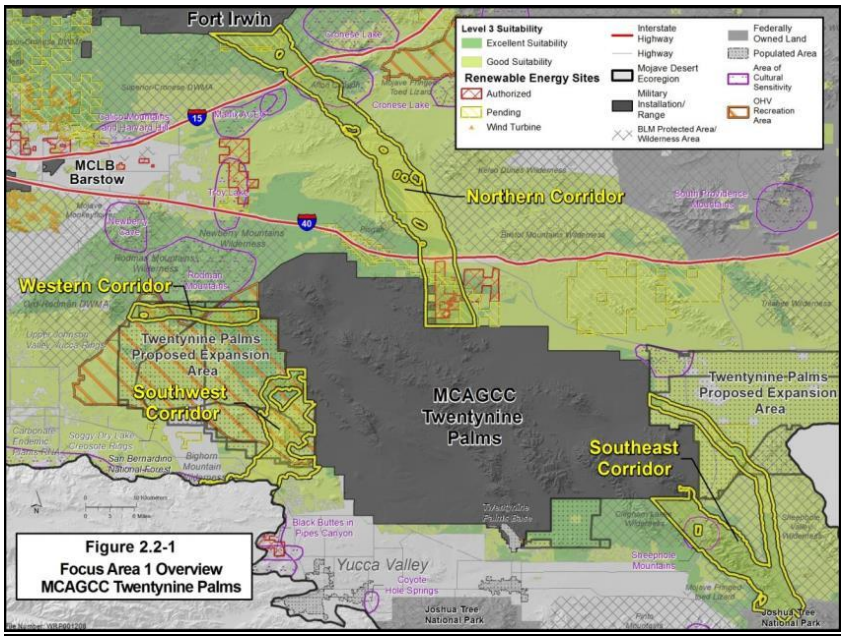


Figure 2.2-1
Focus Area 1 Overview
MCAGCC Twentynine Palms

Edwards AFB Focus Area:

- Recommended focus area is 460.44 square miles
- The area is close to Edwards AFB and NAWS China Lake and contains multiple Military Training Routes (MTRs) and Special Use Airspace (SUA) and includes areas of cultural sensitivity. The majority of the land in this area is managed by BLM.
- The area is within Desert Tortoise Critical Habitat and multiple wilderness areas.

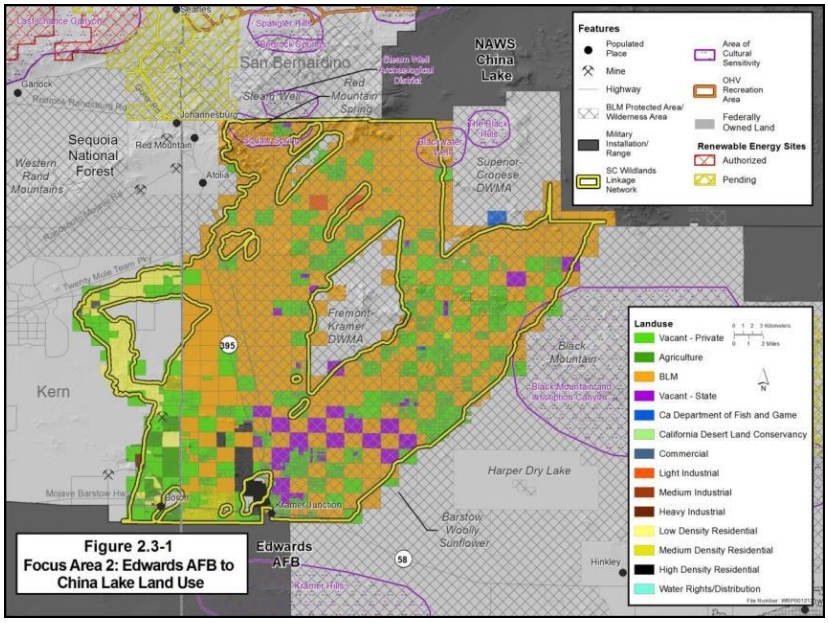


Figure 2.3-1
Focus Area 2: Edwards AFB to China Lake Land Use

China Lake Focus Area:

- Recommended focus area is 180.23 square miles

- The area is near the southeast and northwest portions of NAWS China Lake and contains multiple Military Training Routes (MTRs), Special Use Airspace (SUA) and areas of cultural sensitivity. The majority of the land in this area is managed by BLM.
- The area is within Inyo California Towhee Critical Habitat.

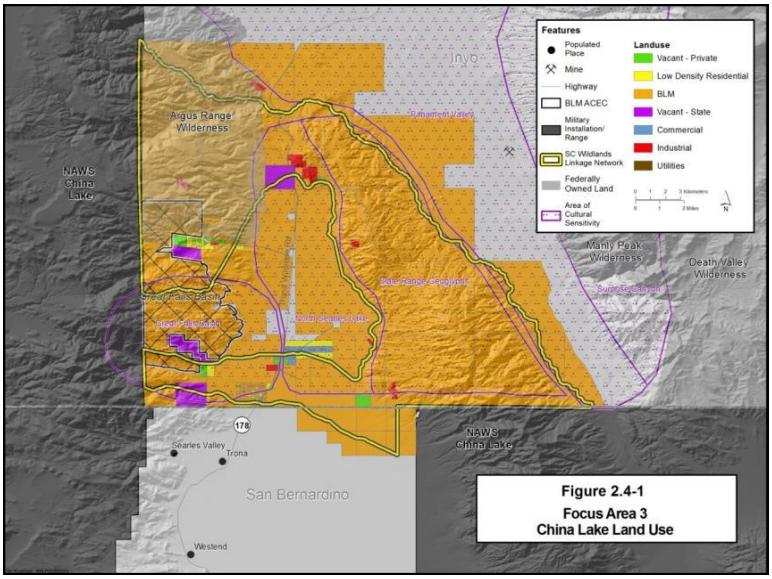
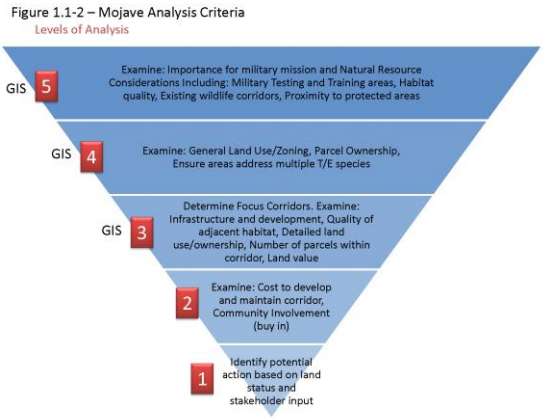


Figure 2.4-1
Focus Area 3
China Lake Land Use

Completed Efforts

- Approximately 750 GIS data layers providing coverage within the Mojave ecoregion were gathered and published in the WRP Web Mapping Application, which can be found on the WRP website (https://www.wrpinfo.org).
- At the project kick-off meeting in May 2012, WRP Partners provided information on their related efforts and highlighted challenges. Project criteria for GIS analysis were developed and ranked into five levels with each level narrowing potential suitable lands until parcel-level focus areas could be identified.
- The WRP Mojave project team participated in numerous calls to review the GIS analysis and provide further input.
- Developed the GIS Suitability Analysis for the WRP Mojave Project with extensive WRP partner input. This analysis:
    - Identified lands that were beneficial for both military and conservation missions.
    - Compared suitable land use types. Land use types that were not classified as suitable, such as commercial, industrial, and residential areas, were excluded from further analysis.
    - Examined the areas of disturbance, such as urban population, projected urban development, transportation, and infrastructure. Lands that were classified as disturbed were excluded from further analysis and considered undesirable for habitat conservation.



Future Steps:

- Work as collaborative partners to protect important habitat and corridors.
- Final recommendations and report will be presented to the WRP Principals at their 2014 meeting.

Section 1: Mojave Suitability Analysis Summary

Section 1.1 Project Overview

The Mojave Desert Ecoregion was identified by Western Regional Partnership (WRP) as an important region to collaborate on broad-based regional planning due to its significant wildlife, military testing and training, renewable energy development, and other infrastructure (Figure 1.1-1). This project is led by the WRP Natural Resources Committee, which identified opportunities to enhance habitat, reduce loss potential, and improve connectivity, thus benefiting both ecological and military values. A plan was developed to examine appropriate locations for conservation easements and other projects.

The first phase of the Mojave Project focused on the collection of Geographic Information System (GIS) data to assist with planning efforts. Approximately 750 GIS data layers providing coverage within the Mojave ecoregion were gathered and published in the WRP Web Mapping Application, which can be found on the WRP website (https://www.wrpinfo.org). This data is downloadable and can be searched by keyword or filtered to show only data layers that are relevant to the Mojave Desert ecoregion.

Phase two of the project consisted of utilizing the collected data for GIS analyses to examine the relationship between military testing and training and critical habitat areas. At the project kick-off meeting in May 2012, WRP Partners provided information on their related efforts and highlighted challenges. Project criteria for GIS analysis were developed and ranked into five levels with each level narrowing potential suitable lands until parcel-level focus areas could be identified (Figure 1.1-2).

The level 5 analysis identified common lands that were beneficial for both military and conservation missions. This model examined areas that shared the characteristics of being within a military testing and training area, within critical habitat area, close proximity to lands that were already protected (national parks), and within areas of good habitat quality (wildlife connectivity corridors).

The level 4 analysis compared suitable land use types, such as vacant land, to the results of the level 5 analysis. Land use types that were not classified as suitable, such as commercial, industrial, and residential areas, were excluded from consideration in level 4 analysis.

The level 3 analysis examined the areas of disturbance, such as urban population, projected urban development, transportation, and infrastructure. Lands that were classified as disturbances were excluded from level 3 analysis and considered undesirable for habitat conservation.

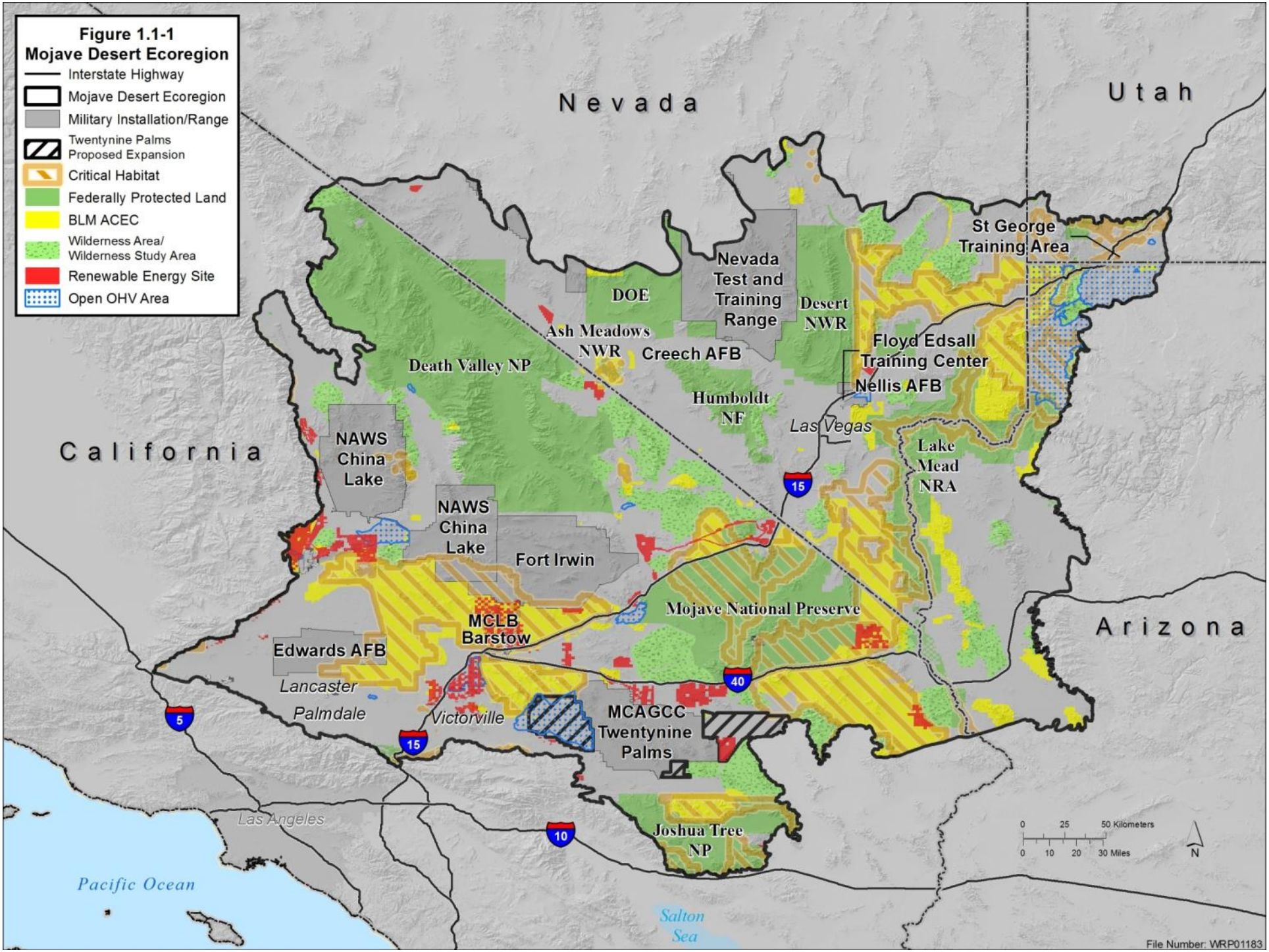
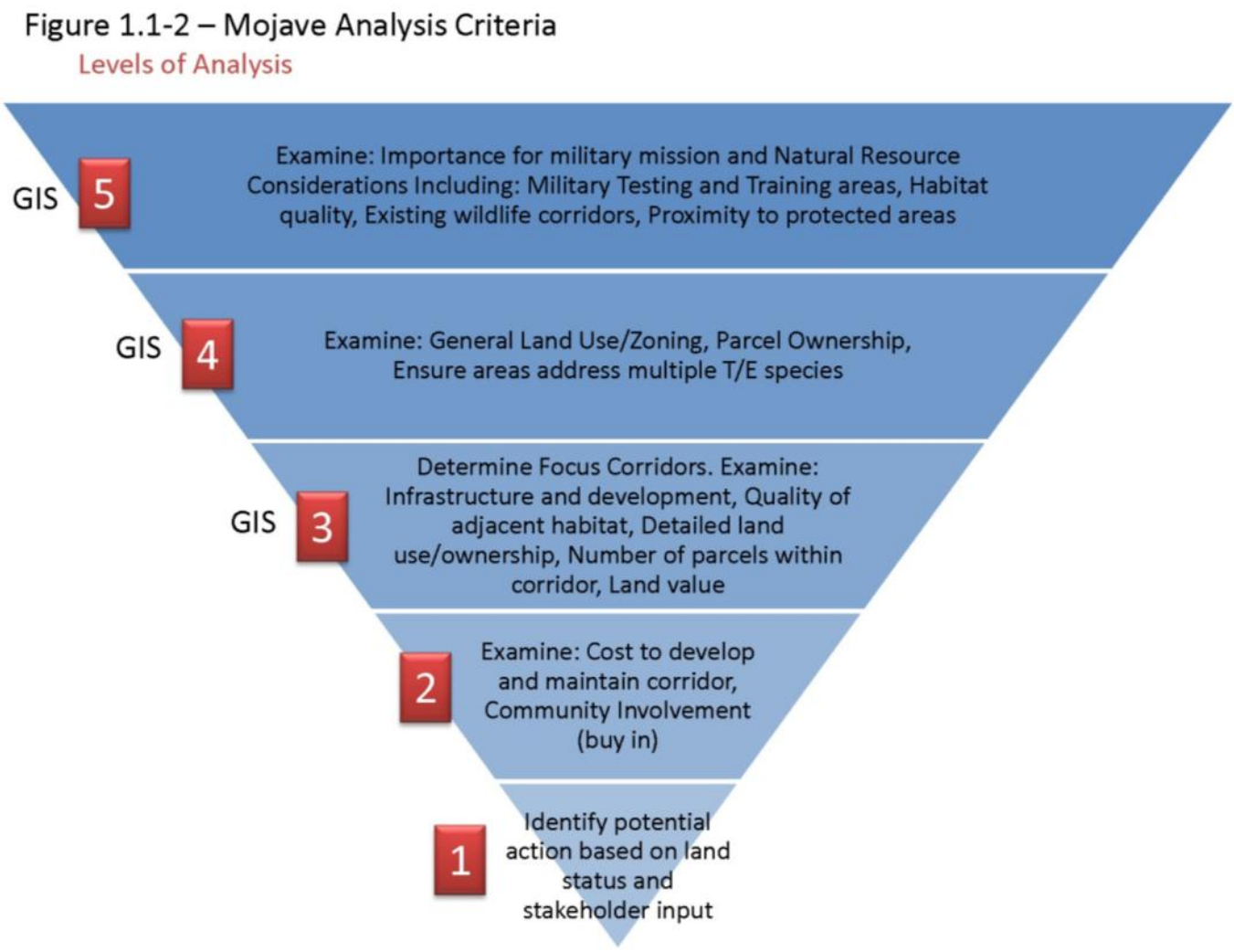


Figure 1.1-1
Mojave Desert Ecoregion
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
Twentynine Palms Proposed Expansion
Critical Habitat
Federally Protected Land
BLM ACEC
Wilderness Area/ Wilderness Study Area
Renewable Energy Site
Open OHV Area
Nevada
Utah
California
Arizona
St George Training Area
Nevada Test and Training Range
DOE
Desert NWR
Ash Meadows NWR
Creech AFB
Floyd Edsall Training Center
Nellis AFB
Death Valley NP
Humboldt NF
Las Vegas
Lake Mead NRA
NAWS China Lake
NAWS China Lake
Fort Irwin
Mojave National Preserve
MCLB Barstow
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Joshua Tree NP
Las Angeles
Pacific Ocean
Salton Sea
0 25 50 Kilometers
0 10 20 30 Miles
N
File Number: WRP01183

Figure 1.1-2 – Mojave Analysis Criteria



Section 1.2 Level 5 Analysis: Department of Defense and Habitat Conservation Common Areas

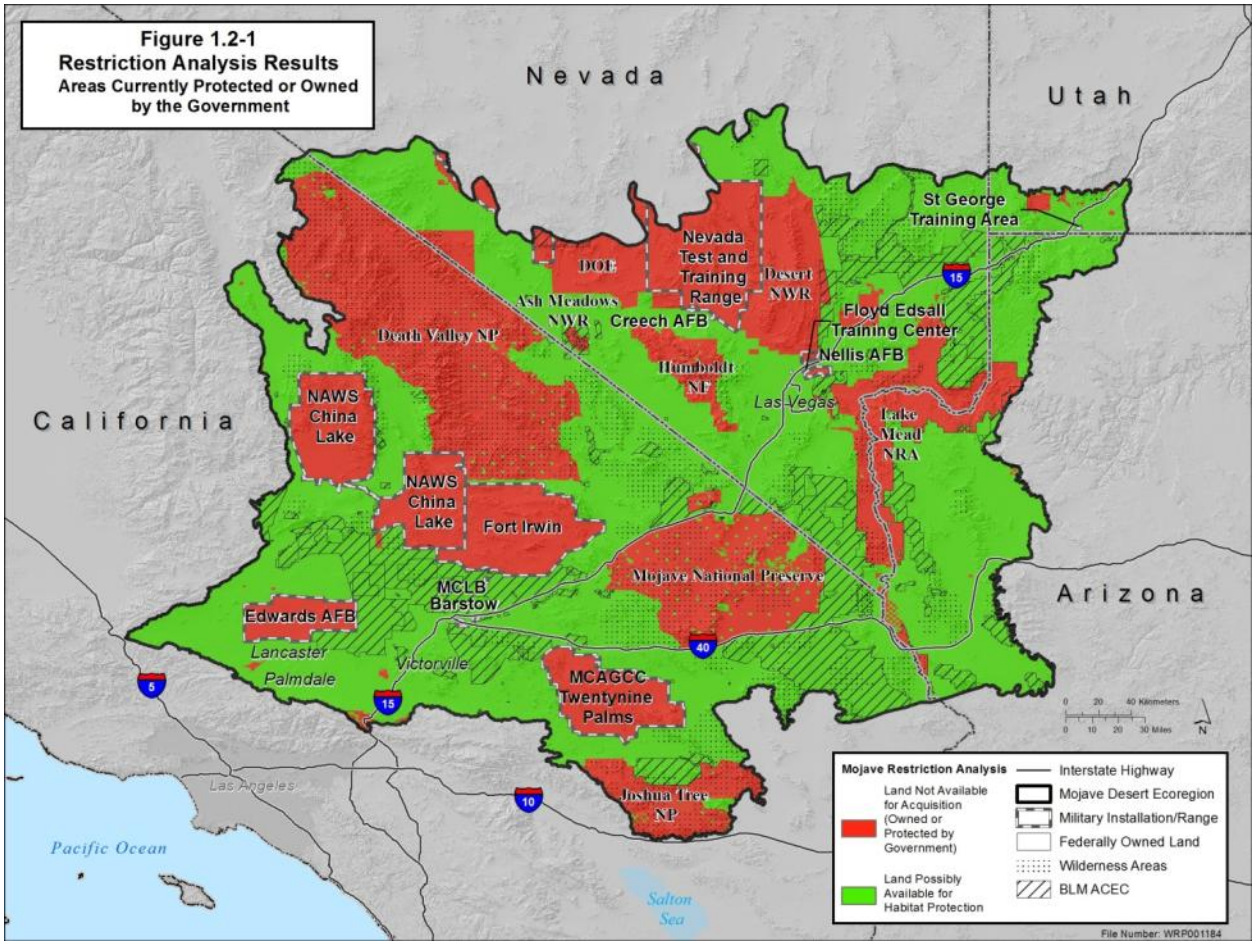
Introduction

Level 5 analysis focused on identifying lands within areas utilized by the Department of Defense (DoD) for testing and training and proximity to conservation areas for threatened and endangered species.

Restriction Analysis

The first step in this analysis was to determine areas that could be immediately ruled out so the model would only focus on available lands. The Mojave Project Team decided that the lands not to be considered in the model should be areas within military installations and ranges and areas that were already protected by the federal government, such as national

parks. Since these areas were already owned or protected by the federal government it was deemed not necessary to include in the model (Figure 1.2-1).



However, the Mojave Project Team determined Bureau of Land Management (BLM) Areas of Critical Concern (ACEC) should be included in the model since they may be developed.

Data Considerations

The analysis considered areas that were important to the DoD mission and also important for threatened and endangered species habitat conservation.

The DoD considerations included areas within military testing and training areas, such as special use airspace (SUA) and military training route (MTR) corridors (Figure 1.2-2). The areas in close proximity to the military installations and ranges were important, so a 25-mile buffer was created around all Air Force, Army, Army National Guard, Marine Corps, and Navy sites. These buffered areas were ranked and input into the model (Figure 1.2-3).

For species habitat conservation the Team decided that three important data sets to include into the model were critical habitat areas, wildlife desert connectivity corridor areas, and

habitat quality (See Appendix A for all GIS source data). The Team decided that areas within close proximity to currently protected lands should be included since it may be easier to buffer out from existing conservation lands (Figure 1.2-4).

Ranking the Data

Each dataset was given a ranking between 1 and 5 to distinguish suitability, with 5 being excellent suitability and 1 being no suitability. These rankings were based on input provided by the Mojave Project Team.

Low level SUA and MTRs with a floor less than 1,000 feet above ground level (AGL) were given a ranking of 5 due to potential threats to DoD aviation activities, while all other airspace areas were given a rating of 4. The rest of the Mojave region was given a ranking of 1, ensuring only lands supporting military testing and training would be included in the analysis results (Figure 1.2-5).

The areas around the installations were buffered at 5-mile intervals. The Level 5 Rankings table explains the ranking classifications. Figure 1.2-3 shows the Military Installations Buffers map.

Level 5 Rankings

Department of Defense Area Rankings		
Data Set	Classification	Rank
Special Use Airspace Ranked by Height Above Ground Level (AGL)	Low Level - Less than 1,000 ft AGL	5
	Above 1,000 ft AGL	4
	Areas with no Airspace	1
MTR Corridors Ranked by Height Above Ground Level (AGL)	Low Level - Less than 1,000 ft AGL	5
	Above 1,000 ft AGL	4
	Areas with no Airspace	1
Military Installations 5 mile buffers	Within 5 Miles	5
	5-10 Miles	4
	10-15 Miles	3
	15-20 miles	2
	Beyond 20 miles	1
Habitat Conservation Area Rankings		
Data Set	Classification	Rank
Wildlife Connectivity Corridors 1/2 mile buffers	Within Corridors	5
	0.5-1 miles	4
	1-2 miles	3
	2-3 miles	2
	beyond 3 miles	1
Critical Habitat Areas Reclassified Distance by natural neighbor	0 - 3 miles	5
	3 - 12 miles	4
	12 - 23 miles	3
	23 - 40 miles	2
	beyond 40 miles	1
Mojave Ecological Assessment Reclassified Values	Ecological Core	5
	Ecologically Intact	4
	Moderately Degraded	3
	Highly Converted	1

The habitat conservation areas, which consist of critical habitat for threatened and endangered species, wildlife connectivity corridors, proximity to existing protected areas, and the Mojave Ecological Assessment, were ranked by proximity buffer rings with buffers near these areas ranking higher. See the Level 5 Rankings table for more information.

Suitability Analysis

The GIS model overlays all of the ranked input data and compares the different areas and their rankings. Each consideration is assigned a weighted value so that it can have a greater or lesser influence on the output of the model. Both DoD and conservation considerations were weighted at 50 percent. Figure 1.2-6 displays the breakdown of how all the input data were weighted.

The suitability model returns an output displaying lands ranked 1 to 5, with 5 being the most suitable lands and 1 being no suitability. Figure 1.2-7 provides the level 5 analysis results.

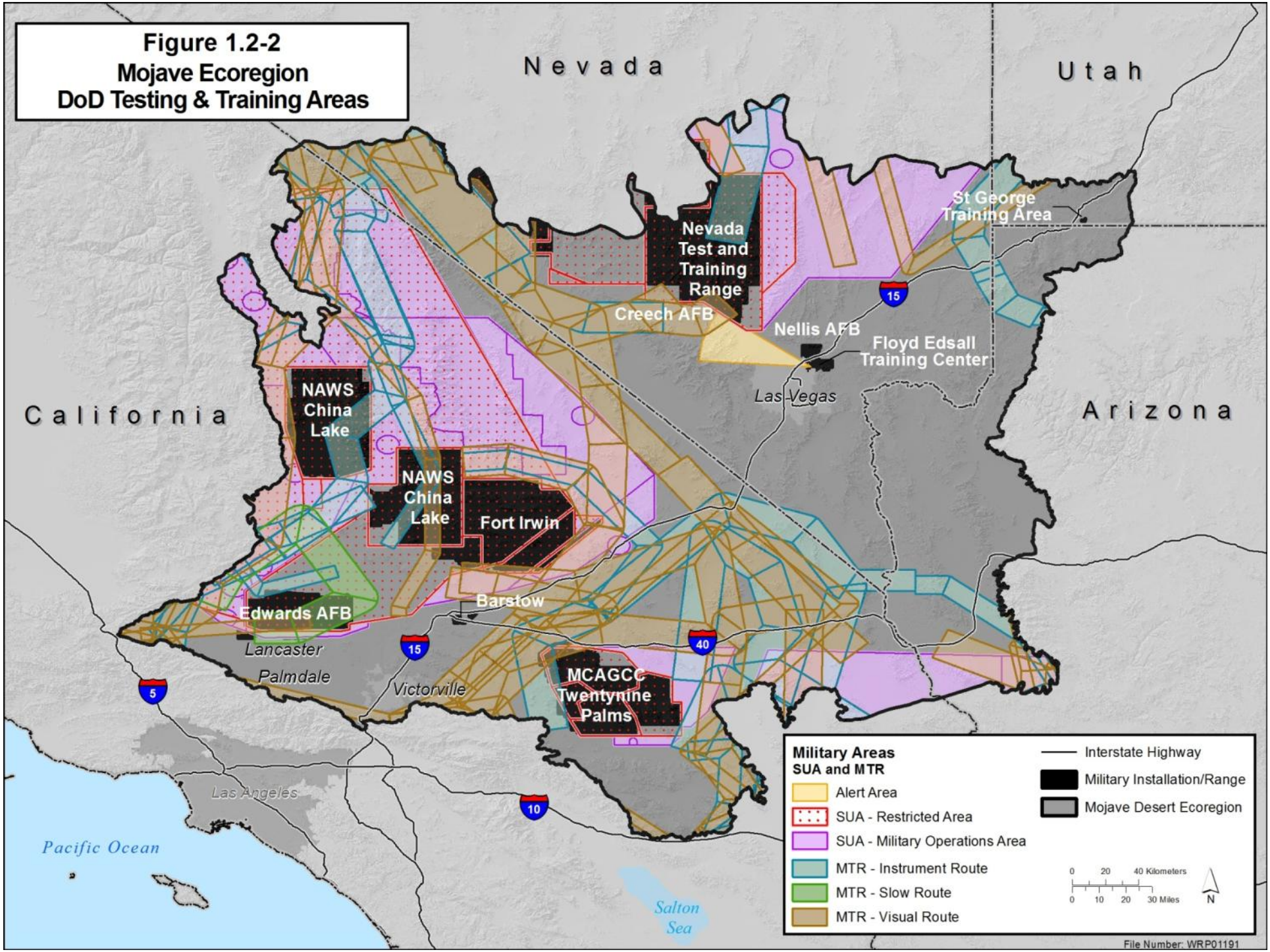


Figure 1.2-2
Mojave Ecoregion
DoD Testing & Training Areas
Nevada
Utah
California
Arizona
St George Training Area
Nevada Test and Training Range
Creech AFB
Nellis AFB
Floyd Edsall Training Center
Las Vegas
NAWS China Lake
NAWS China Lake
Fort Irwin
Barstow
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Las Angeles
Pacific Ocean
Salton Sea
15
40
5
10
Military Areas
SUA and MTR
Alert Area
SUA - Restricted Area
SUA - Military Operations Area
MTR - Instrument Route
MTR - Slow Route
MTR - Visual Route
Interstate Highway
Military Installation/Range
Mojave Desert Ecoregion
0 20 40 Kilometers
0 10 20 30 Miles
N
File Number: WRP01191

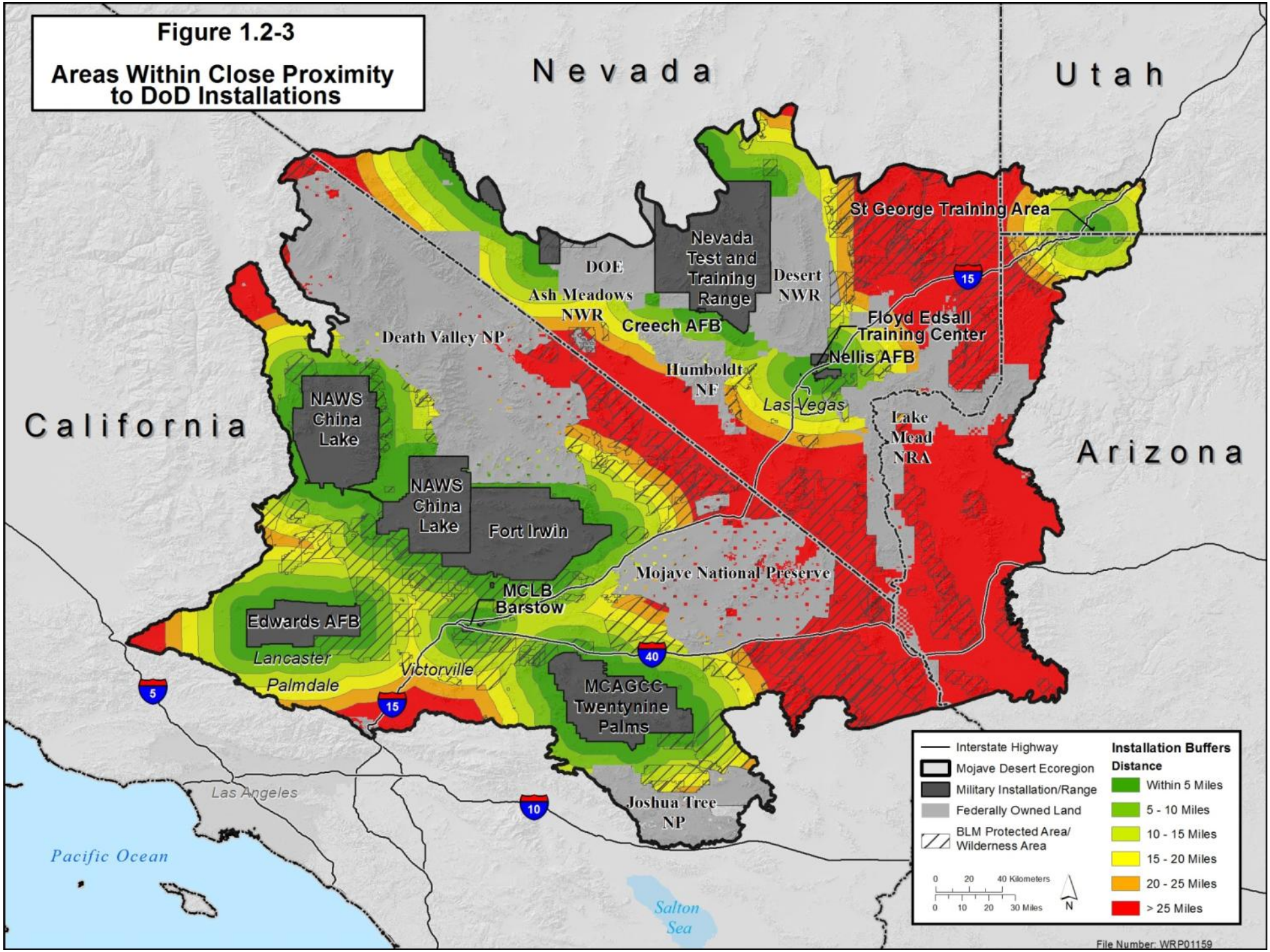


Figure 1.2-3
Areas Within Close Proximity to DoD Installations
Nevada
Utah
California
Arizona
St George Training Area
Nevada Test and Training Range
DOE
Ash Meadows NWR
Desert NWR
Creech AFB
Floyd Edsall Training Center
Nellis AFB
Death Valley NP
Humboldt NF
Las Vegas
Lake Mead NRA
NAWS China Lake
NAWS China Lake
Fort Irwin
Mojave National Preserve
MCLB Barstow
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Joshua Tree NP
Las Angeles
Pacific Ocean
Salton Sea
15
40
5
15
10
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
Federally Owned Land
BLM Protected Area/ Wilderness Area
Installation Buffers
Distance
Within 5 Miles
5 - 10 Miles
10 - 15 Miles
15 - 20 Miles
20 - 25 Miles
> 25 Miles
0 20 40 Kilometers
0 10 20 30 Miles
N
File Number: WRP01159

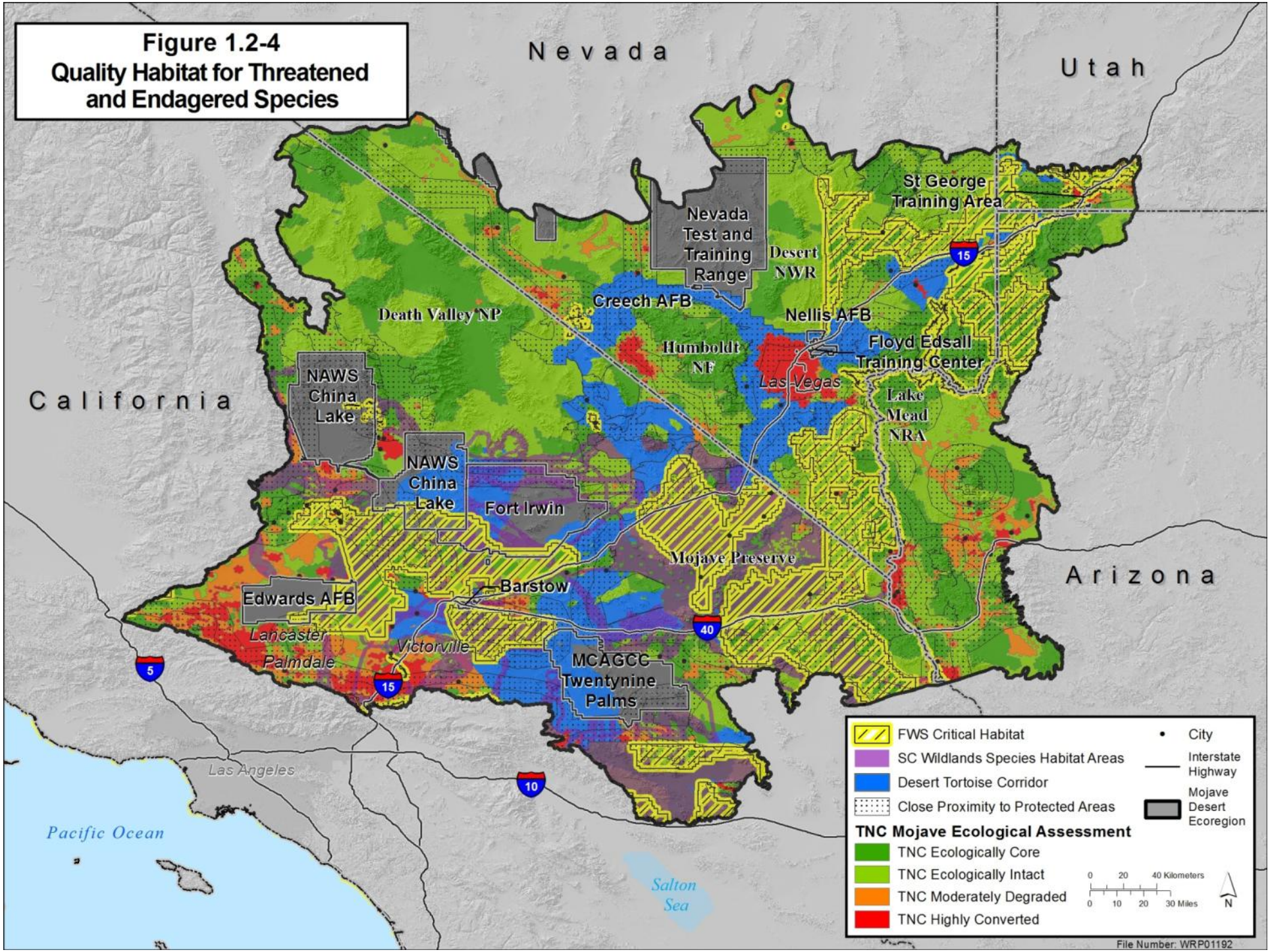


Figure 1.2-4
Quality Habitat for Threatened and Endagered Species
Nevada
Utah
California
Arizona
St George Training Area
Nevada Test and Training Range
Desert NWR
Creech AFB
Nellis AFB
Death Valley NP
Humboldt NF
Floyd Edsall Training Center
Las Vegas
NAWS China Lake
Lake Mead NRA
NAWS China Lake
Fort Irwin
Mojave Preserve
Barstow
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Las Angeles
Pacific Ocean
Salton Sea
FWS Critical Habitat
SC Wildlands Species Habitat Areas
Desert Tortoise Corridor
Close Proximity to Protected Areas
TNC Mojave Ecological Assessment
TNC Ecologically Core
TNC Ecologically Intact
TNC Moderately Degraded
TNC Highly Converted
City
Interstate Highway
Mojave Desert Ecoregion
0 20 40 Kilometers
0 10 20 30 Miles
N
File Number: WRP01192

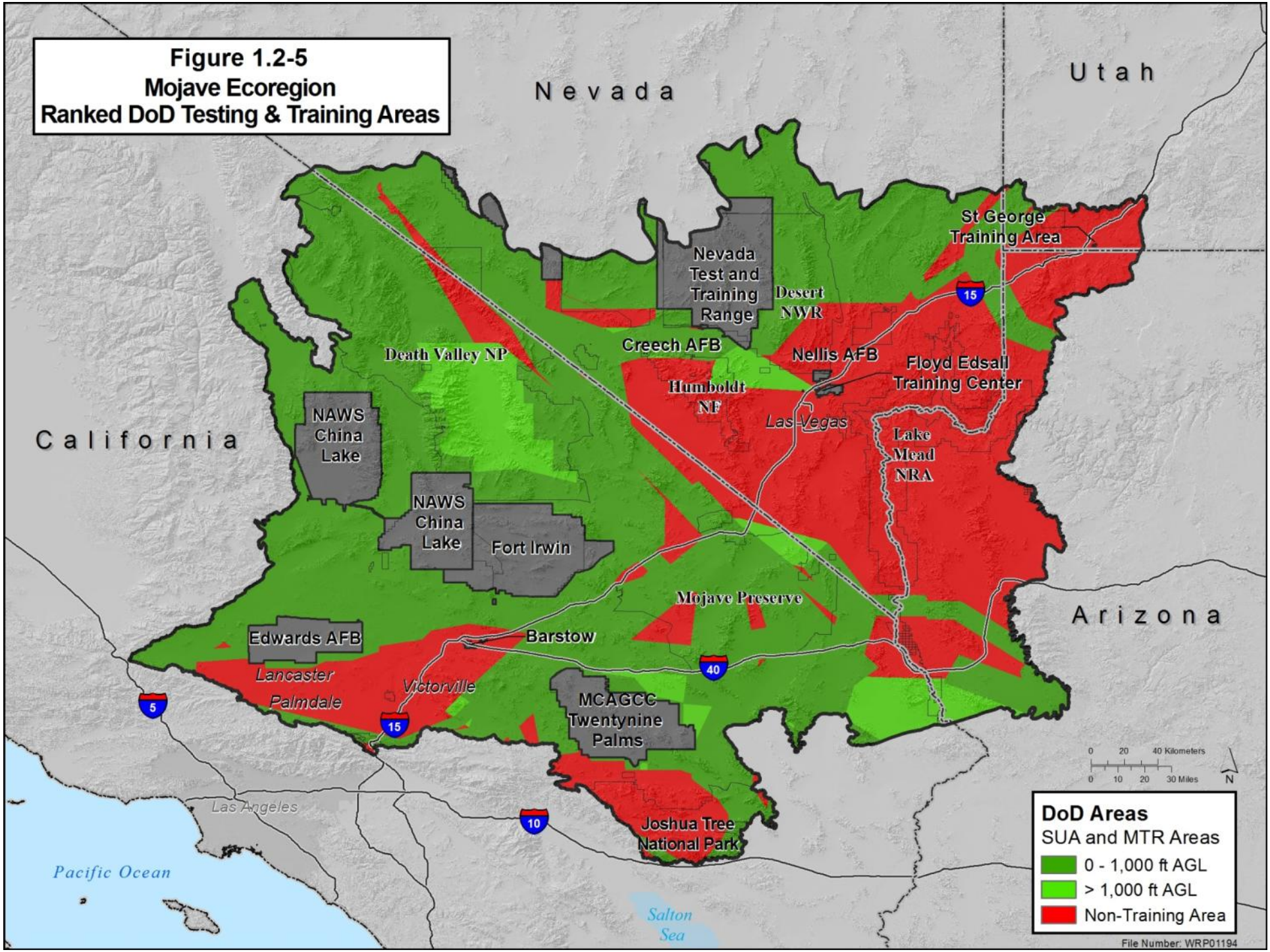
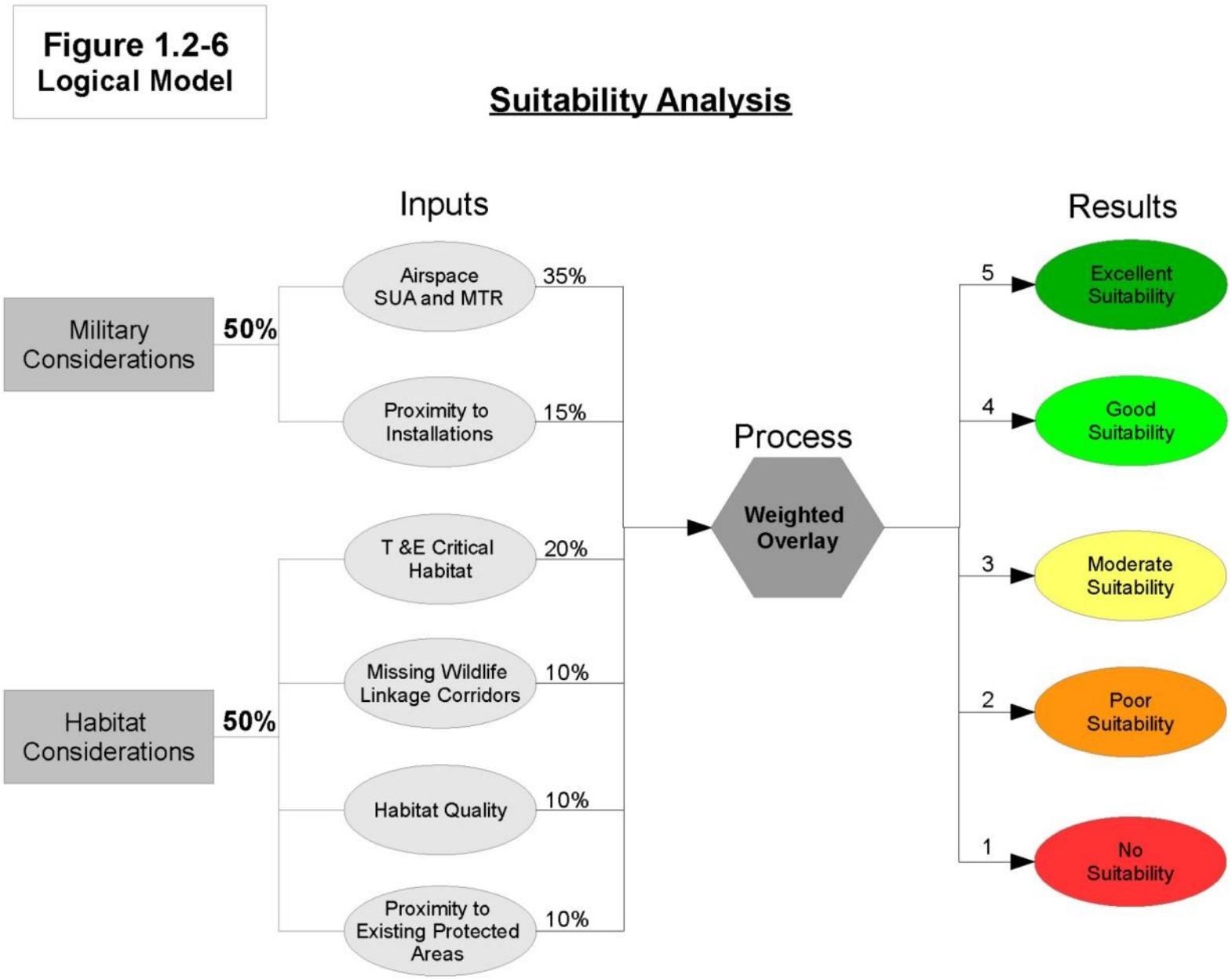


Figure 1.2-5
Mojave Ecoregion
Ranked DoD Testing & Training Areas
Nevada
Utah
California
Arizona
St George
Training Area
Nevada
Test and
Training
Range
Desert
NWR
Creech AFB
Nellis AFB
Floyd Edsall
Training Center
Death Valley NP
Humboldt
NF
Las Vegas
Lake
Mead
NRA
NAWS
China
Lake
NAWS
China
Lake
Fort Irwin
Mojave Preserve
Edwards AFB
Barstow
Lancaster
Palmdale
Victorville
MCAGCC
Twentynine
Palms
Joshua Tree
National Park
Las Angeles
Pacific Ocean
Salton
Sea
5
15
40
10
15
0 20 40 Kilometers
0 10 20 30 Miles
N
DoD Areas
SUA and MTR Areas
0 - 1,000 ft AGL
> 1,000 ft AGL
Non-Training Area
File Number: WRP01194

Figure 1.2-6
Logical Model



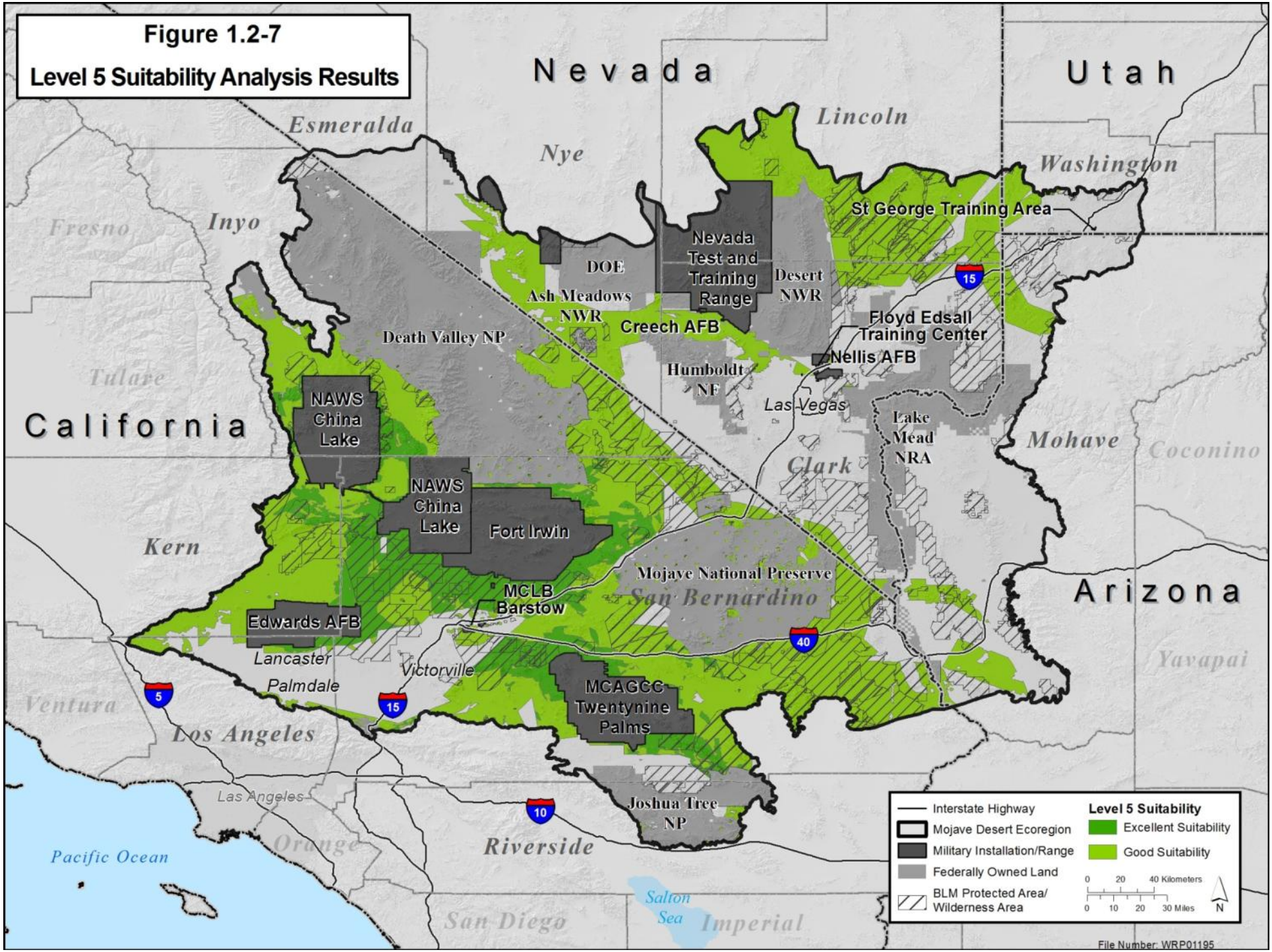


Figure 1.2-7
Level 5 Suitability Analysis Results
Nevada
Utah
California
Arizona
Esmeralda
Nye
Lincoln
Washington
Fresno
Inyo
Tulare
Kern
Ventura
Los Angeles
Las Angeles
Orange
San Diego
Riverside
San Bernardino
Mohave
Coconino
Yavapai
Clark
Pacific Ocean
Salton Sea
Imperial
St George Training Area
Nevada Test and Training Range
DOE
Ash Meadows NWR
Desert NWR
Creech AFB
Floyd Edsall Training Center
Nellis AFB
Death Valley NP
Humboldt NF
Las Vegas
Lake Mead NRA
NAWS China Lake
NAWS China Lake
Fort Irwin
Mojave National Preserve
MCLB Barstow
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Joshua Tree NP
15
40
5
15
10
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
Federally Owned Land
BLM Protected Area/ Wilderness Area
Level 5 Suitability
Excellent Suitability
Good Suitability
0 20 40 Kilometers
0 10 20 30 Miles
N
File Number: WRP01195

Section 1.3 Level 4 Analysis: Land Use

Introduction

The level 4 analysis examined land use within the areas from the level 5 analysis results. Land use was an important consideration because certain types were more suitable for conservation, potential acquisition, or protection status change through policy.

Land Use Data Acquisition

The most detailed land use data, such as zoning or parcel data sets with zoning codes, typically come from the county level. Not all counties maintain quality GIS data sets or are willing to share their data. There were multiple land use data sets available at a less detailed scale that were used when county data was not available. The less detailed data sets consisted of statewide and regional land use. To ensure full coverage of the project area, the statewide layers were used. If more detailed data could be obtained, it replaced the less detailed state or regional data. The land use table breaks down the different levels of data that were available for each county. Ideally, zoning data would have been used for all counties, but due to time restraints and lack of availability, it was not possible. The largest county within the Mojave Desert Ecoregion, San Bernardino County, had the most detailed land use data layer that was completed to the parcel level. Areas that fell within lands that were managed by BLM were replaced by a data set created and maintained by BLM. For details on data sources, see Appendix A.

Land Use Data For Each County

County	Land Use Source	Level of Detail
Inyo California	California General Plans	Statewide
Kern California	Kern County Zoning	County Wide
Los Angeles California	Southern California Land Use	Regional
Riverside California	Riverside County Zoning	County Wide
San Bernardino California	San Bernardino Parcels	Parcel
Clarke Nevada	Nevada Land Ownership	Statewide
Lincoln Nevada	Nevada Land Ownership	Statewide
Nye Nevada	Nevada Land Ownership	Statewide
Washington Utah	Utah Land Ownership	Statewide
Mohave Arizona	Mohave County Parcels	Parcel

Land Use Data Normalization and Ranking

Each data set that was acquired was created by a different source with various classification types. In order to be input into the model, all layers would need to have each land use type classified the same. For example, the different classification names for residential land were high density residential, low density residential, mixed development, mobile home, etc. For the purposes of this analysis, all of these areas were classified as residential.

Land Use Rankings	
Land Use Type	Rank
Vacant, Agriculture, Very Low Density Residential	5
BLM, Other Federal Land	4
State Land	3
County, Municipal Land	2
Residential, Planned Development, Industrial, Commercial	1

Once the data was normalized and all of the areas had a common classification structure, the next step was to rank the different land use types. The lands were ranked 1 to 5, with 5 being the most suitable lands for possible protection and 1 being no suitability. The land use rankings that the Mojave Project Team decided on can be found in the land use ranking table. Figure 1-3.1 details the Mojave land use map.

The ranked land use data was input into the GIS model to find areas of high suitability for land use within the areas from the level 5 analysis results. This process eliminated areas that were not a good fit to consider protecting due to development or ownership (Figure 1-3.2).

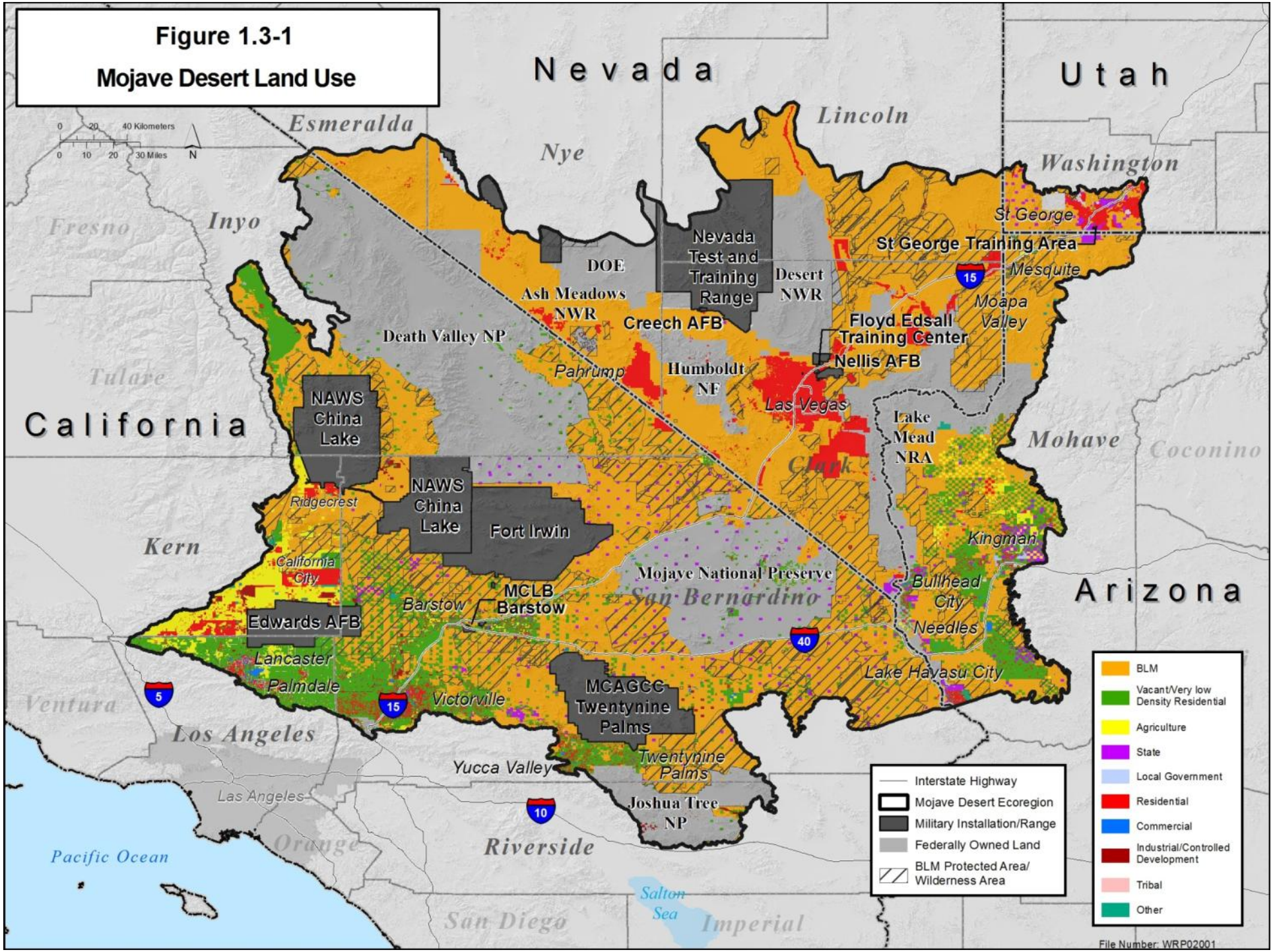


Figure 1.3-1
Mojave Desert Land Use
0 20 40 Kilometers
0 10 20 30 Miles
N
Nevada
Utah
California
Arizona
Esmeralda
Nye
Lincoln
Washington
Inyo
Fresno
Tulare
Kern
Ventura
Los Angeles
San Bernardino
Riverside
Orange
San Diego
Imperial
Las Angeles
Clark
Mohave
Coconino
Pacific Ocean
Salton Sea
Nevada Test and Training Range
DOE
Desert NWR
Ash Meadows NWR
Creech AFB
Death Valley NP
Pahrump
Humboldt NF
Floyd Edsall Training Center
Nellis AFB
St George
St George Training Area
Mesquite
Moapa Valley
Las Vegas
Lake Mead NRA
NAWS China Lake
Ridgecrest
Fort Irwin
California City
Mojave National Preserve
MCLB Barstow
Barstow
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Twentynine Palms
Yucca Valley
Joshua Tree NP
Kingman
Bullhead City
Needles
Lake Havasu City
15
40
5
10
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
Federally Owned Land
BLM Protected Area/ Wilderness Area
BLM
Vacant/Very low Density Residential
Agriculture
State
Local Government
Residential
Commercial
Industrial/Controlled Development
Tribal
Other
File Number: WRP02001

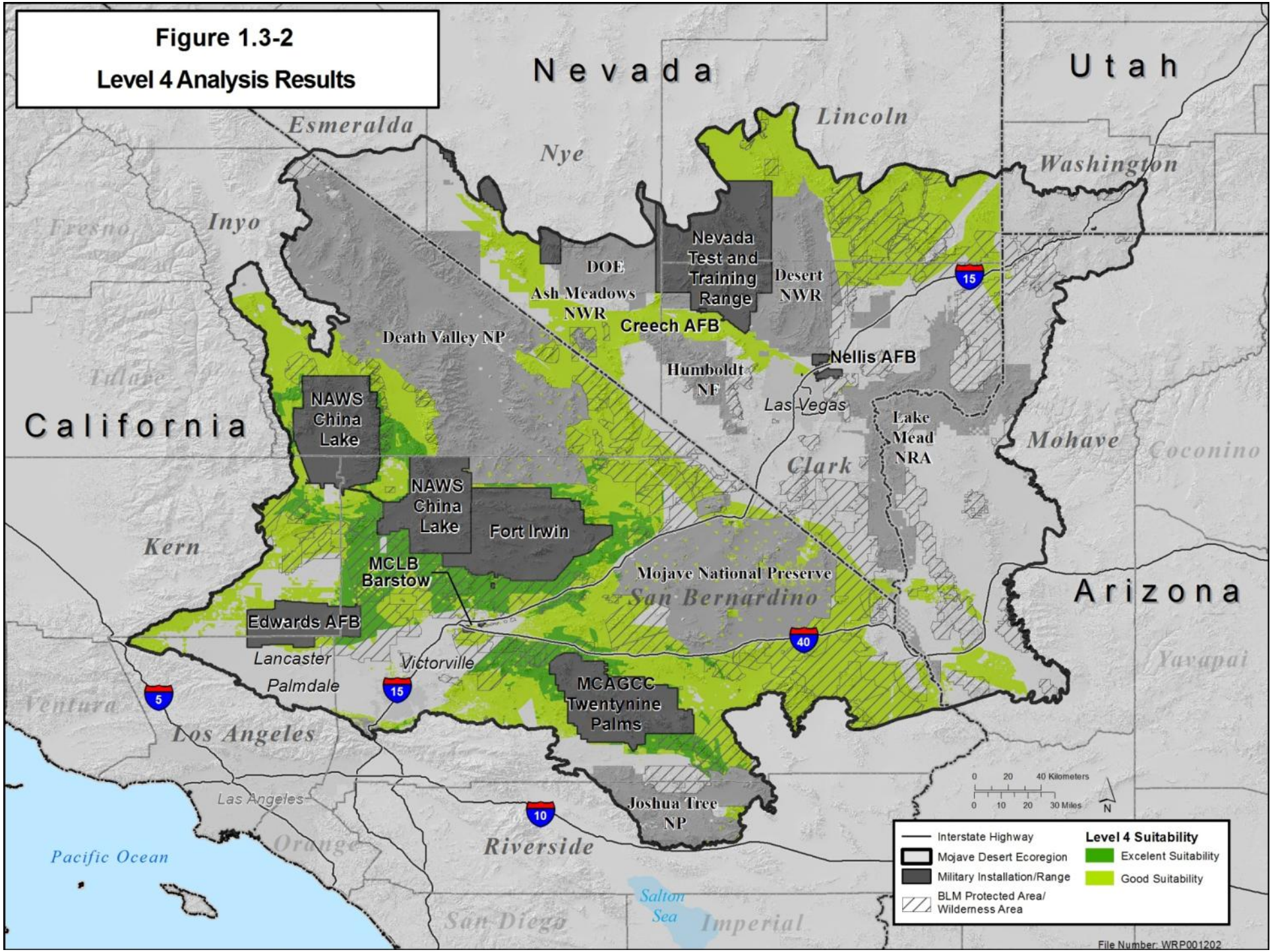


Figure 1.3-2
Level 4 Analysis Results
Nevada
Utah
California
Arizona
Esmeralda
Nye
Lincoln
Washington
Inyo
Fresno
Tulare
Kern
Death Valley NP
DOE
Ash Meadows NWR
Nevada Test and Training Range
Desert NWR
Creech AFB
Nellis AFB
Humboldt NF
Las Vegas
Lake Mead NRA
Mohave
Coconino
Clark
NAWS China Lake
NAWS China Lake
Fort Irwin
MCLB Barstow
Mojave National Preserve
San Bernardino
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Yavapai
Ventura
Los Angeles
Las Angeles
Orange
Riverside
Joshua Tree NP
Pacific Ocean
Salton Sea
San Diego
Imperial
5
15
40
10
0 20 40 Kilometers
0 10 20 30 Miles
N
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
BLM Protected Area/ Wilderness Area
Level 4 Suitability
Excelent Suitability
Good Suitability
File Number: WRP001202

Section 1.4 Level 3 Analysis: Areas of Disturbance and Projected Population Growth

Introduction

The level 3 analysis examined the areas of disturbance within the Mojave region and projected urban population growth for 2020 and 2050. The Mojave Project Team decided that areas of disturbance, which include urban areas, transportation, and infrastructure, should be classified as unsuitable for habitat lands for threatened and endangered species.

Projected urban population growth was important because the Team did not want to focus on lands that could likely have some sort of development begin in the next few years while plans to conserve the area were ongoing. It was also important to see the potential urban growth areas when planning on creating buffer areas for installations and military testing and training areas.

Areas of Disturbance

The areas of disturbance within the Mojave region consist of populated urban areas, transportation, and other activities such as mining sites (Figure 1.4-1).

For this portion of the analysis, the Mojave Ecological Assessment data layer was utilized because its highly converted lands data were a good representation of the areas of disturbance. The data had been an input in the level 5 analysis but was not highly ranked. For the level 3 analysis, the data were weighted heavier to ensure that all areas of disturbance were taken out of the suitability results.

Projected Urban Growth

At the time of this analysis, projected urban growth data was only available for California. Two data sets were utilized to represent projected urban growth for the region. The first data set was developed by Dr. John Landis at University of California, Berkeley, and it predicted the projected urban area growth for 2020. The other data set was developed by Dr. James Thorne at the University of California, Davis, and it predicted the projected urban area growth for 2050.

The 2020 projected growth areas were excluded from the suitability results because these lands represent regions that could be in development before any protective action could take place. The 2050 projected urban growth areas were not completely eliminated because, though the timeframe is far off, it still shows areas that will trend towards development and not a suitable habitat for species (Figure 1.4-2).

Once all the data was input into the model, the level 3 results were generated. The Team examined these results on a series of maps, comparing the areas of high suitability to the wildlife connectivity corridors to narrow down focus areas (Figure 1.4-3). Through a series of discussions, the group decided on three focus areas that are discussed in the next section.

Areas with high level of renewable energy development were examined on maps to give the Team situational awareness to where these sites were when deciding on potential focus areas (Figure 1.4-4).

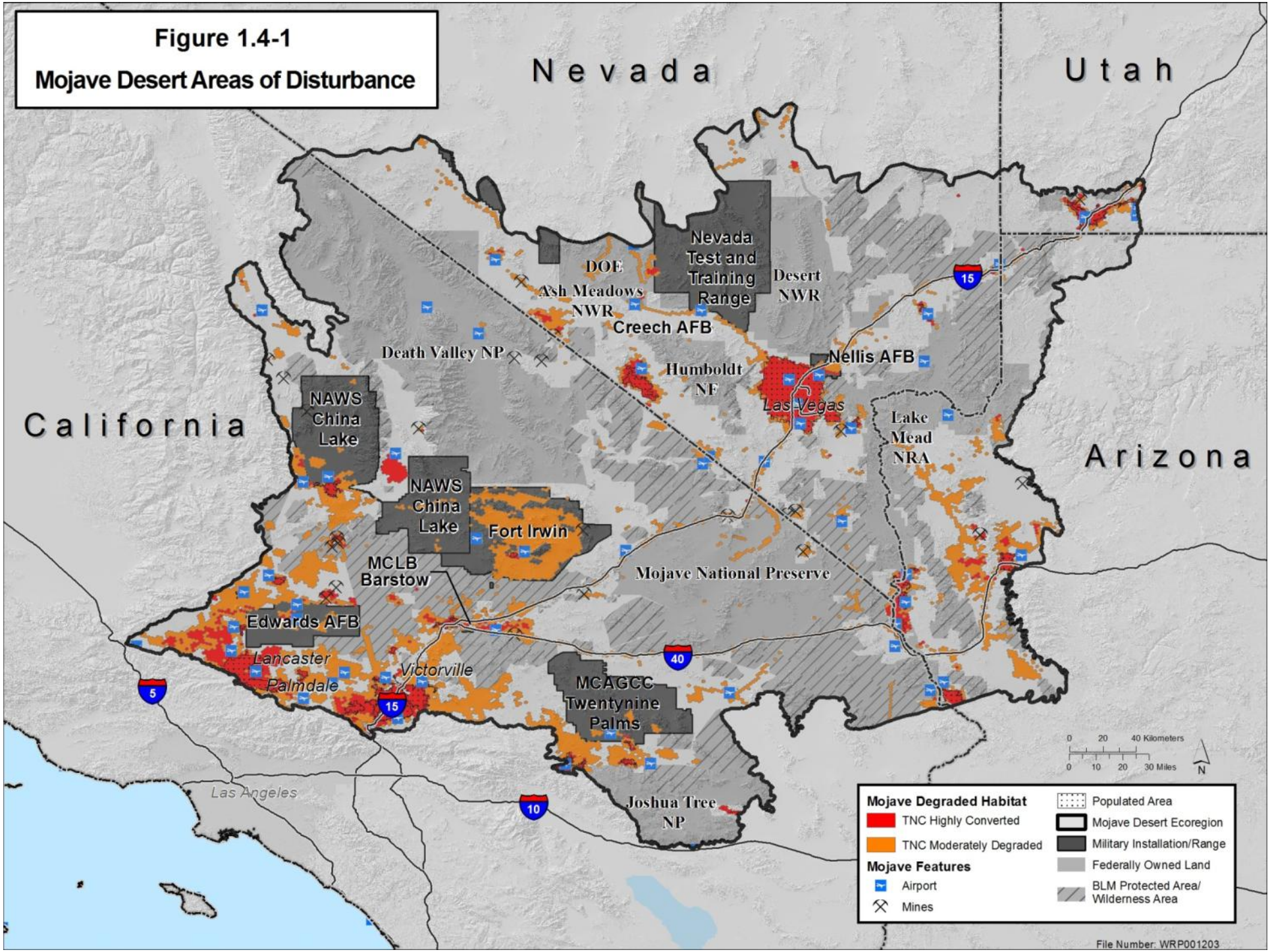


Figure 1.4-1
Mojave Desert Areas of Disturbance
Nevada
Utah
California
Arizona
Nevada Test and Training Range
DOE
Ash Meadows NWR
Creech AFB
Desert NWR
Death Valley NP
Humboldt NF
Nellis AFB
Las Vegas
Lake Mead NRA
NAWS China Lake
NAWS China Lake
Fort Irwin
MCLB Barstow
Mojave National Preserve
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Joshua Tree NP
Las Angeles
5
15
40
10
0 20 40 Kilometers
0 10 20 30 Miles
N
Mojave Degraded Habitat
TNC Highly Converted
TNC Moderately Degraded
Mojave Features
Airport
Mines
Populated Area
Mojave Desert Ecoregion
Military Installation/Range
Federally Owned Land
BLM Protected Area/ Wilderness Area
File Number: WRP001203

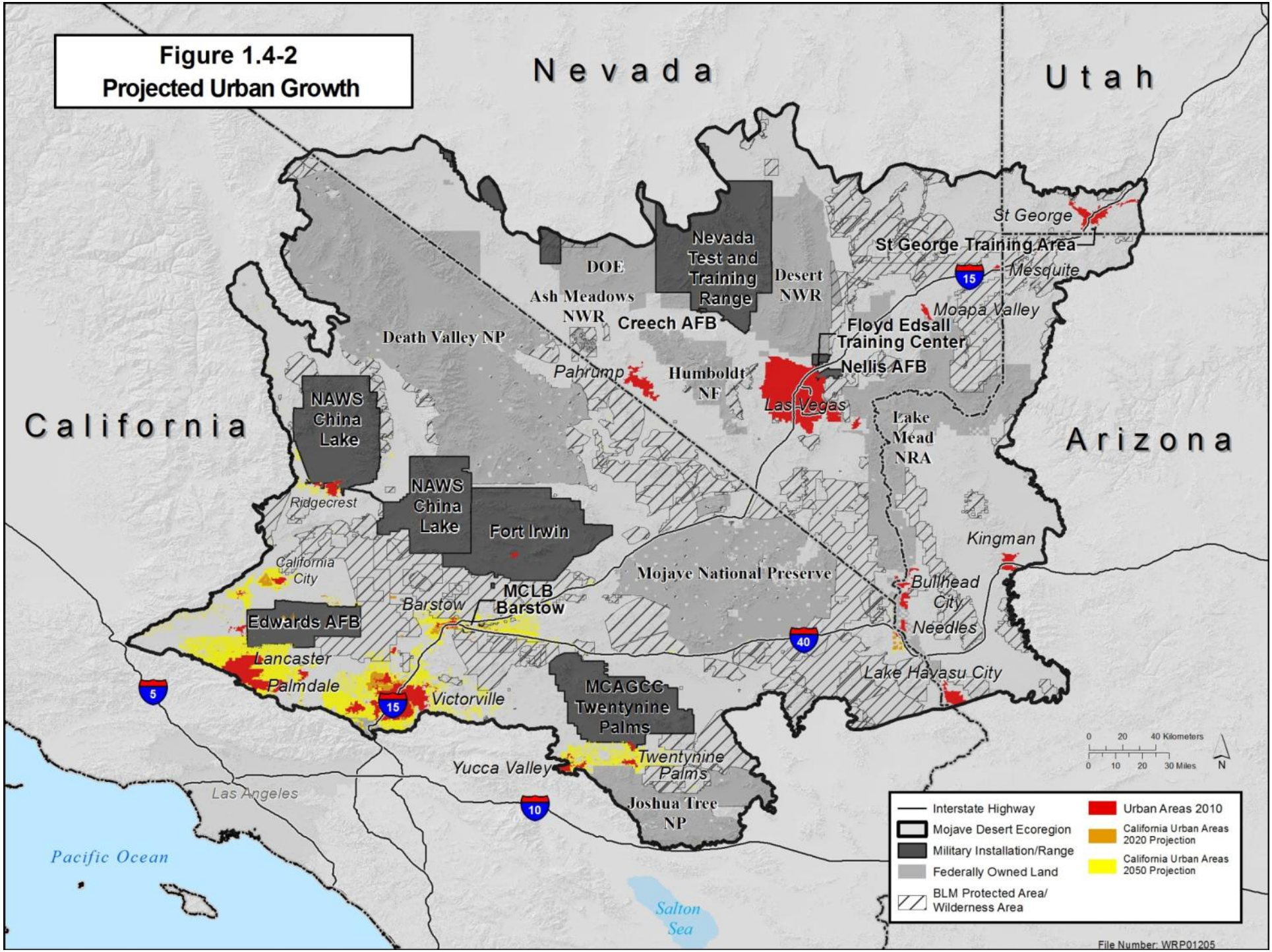


Figure 1.4-2
Projected Urban Growth
Nevada
Utah
California
Arizona
Nevada Test and Training Range
DOE
Ash Meadows NWR
Creech AFB
Desert NWR
Death Valley NP
Pahrump
Humboldt NF
Floyd Edsall Training Center
Nellis AFB
Las Vegas
Lake Mead NRA
St George
St George Training Area
Mesquite
Moapa Valley
NAWS China Lake
Ridgecrest
Fort Irwin
California City
Mojave National Preserve
Kingman
Bullhead City
Needles
Barstow
MCLB Barstow
Edwards AFB
Lancaster
Palmdale
Victorville
Lake Havasu City
MCAGCC Twentynine Palms
Twentynine Palms
Yucca Valley
Joshua Tree NP
Las Angeles
Pacific Ocean
Salton Sea
0 20 40 Kilometers
0 10 20 30 Miles
N
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
Federally Owned Land
BLM Protected Area/ Wilderness Area
Urban Areas 2010
California Urban Areas 2020 Projection
California Urban Areas 2050 Projection
File Number: WRP01205

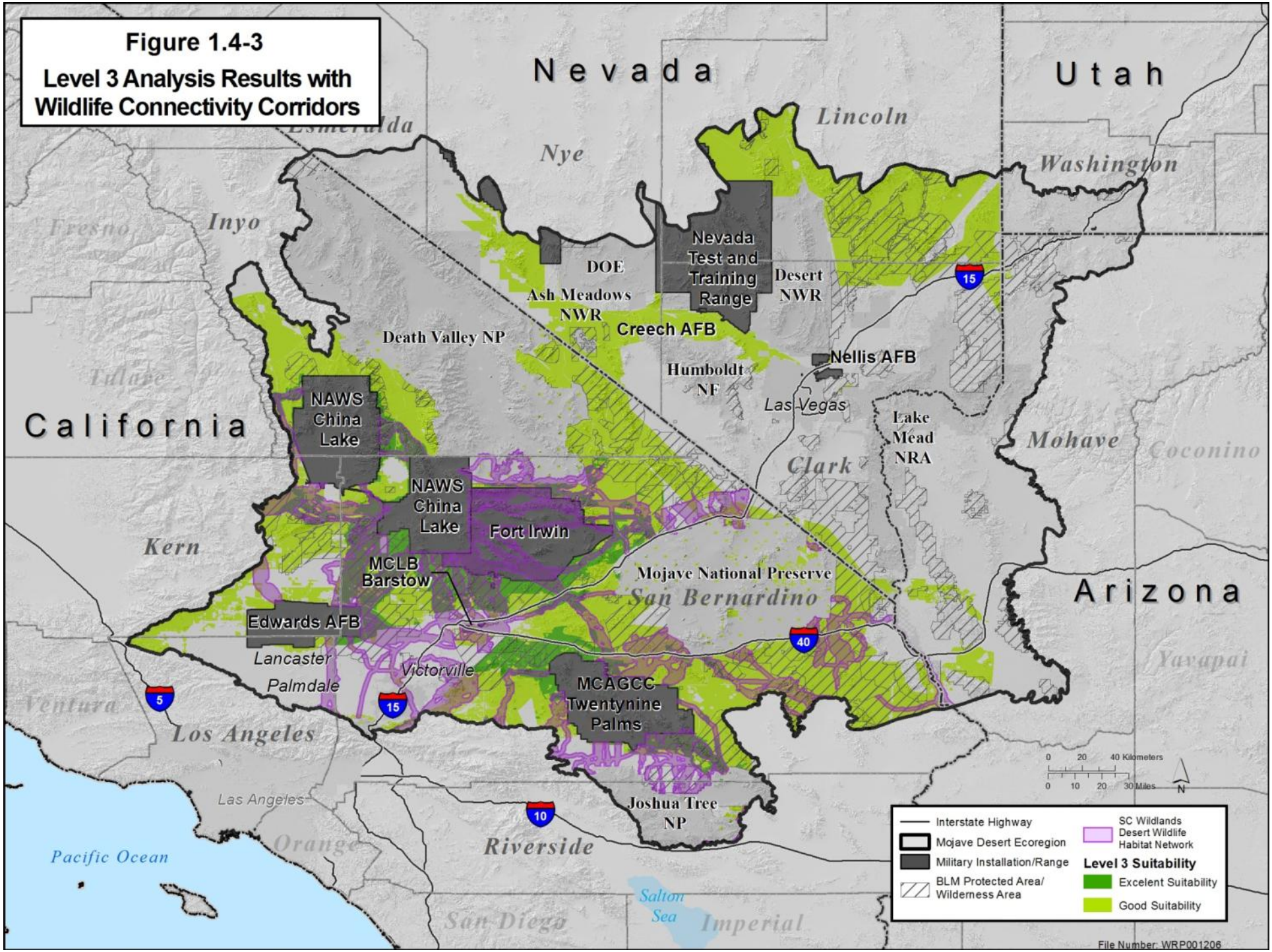


Figure 1.4-3
Level 3 Analysis Results with Wildlife Connectivity Corridors
Nevada
Utah
California
Arizona
Lincoln
Nye
Washington
Inyo
Fresno
Tulare
Kern
Ventura
Los Angeles
San Bernardino
Riverside
Orange
San Diego
Imperial
Clark
Mohave
Coconino
Yavapai
Las Angeles
Pacific Ocean
Salton Sea
Nevada Test and Training Range
DOE
Ash Meadows NWR
Desert NWR
Creech AFB
Death Valley NP
Humboldt NF
Nellis AFB
Las Vegas
Lake Mead NRA
NAWS China Lake
Fort Irwin
MCLB Barstow
Mojave National Preserve
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Joshua Tree NP
15
40
5
10
0 20 40 Kilometers
0 10 20 30 Miles
N
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
BLM Protected Area/ Wilderness Area
SC Wildlands Desert Wildlife Habitat Network
Level 3 Suitability
Excelent Suitability
Good Suitability
File Number: WRP001206

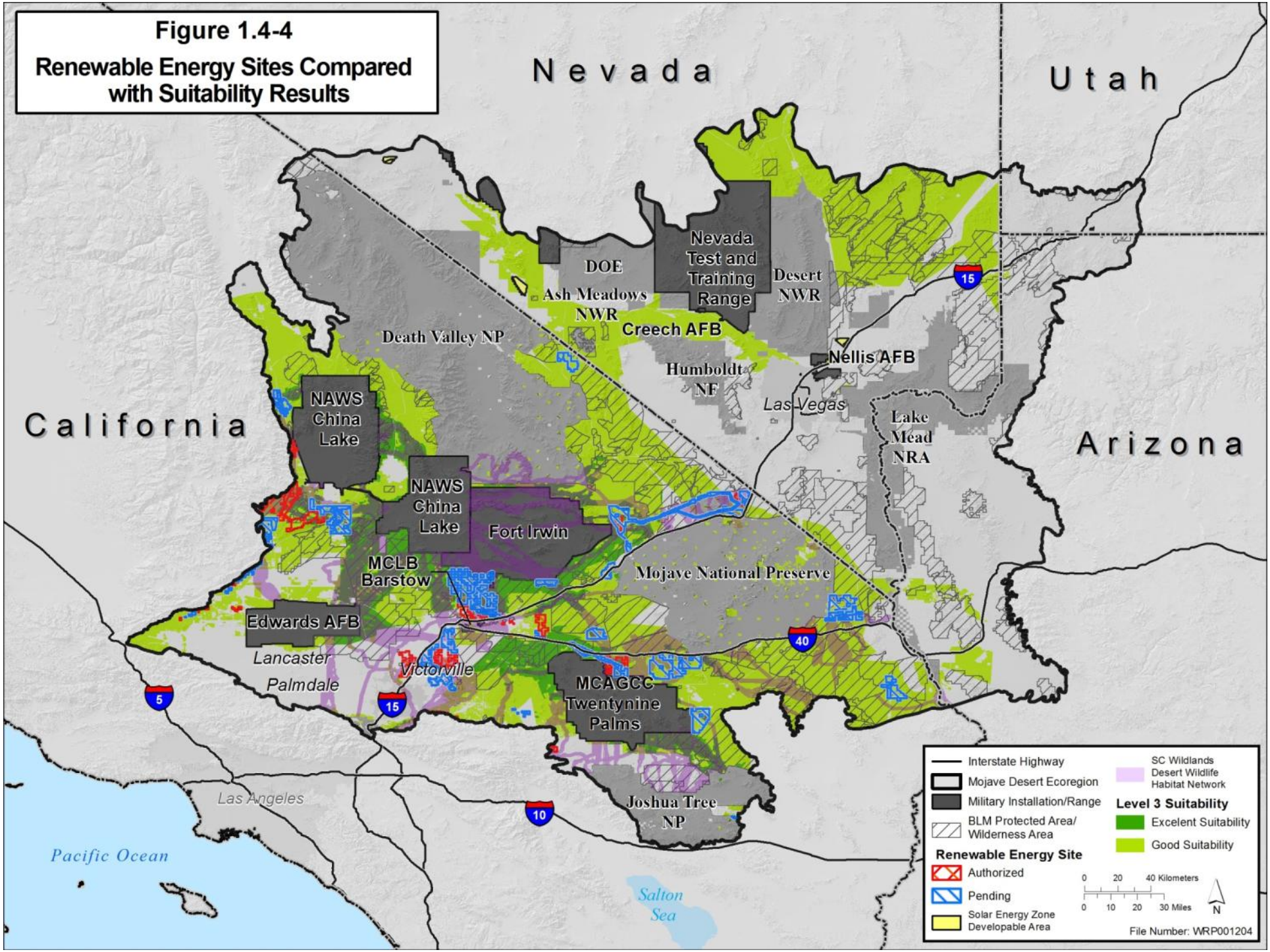


Figure 1.4-4
Renewable Energy Sites Compared with Suitability Results
Nevada
Utah
California
Arizona
Nevada Test and Training Range
DOE
Ash Meadows NWR
Desert NWR
Creech AFB
Death Valley NP
Nellis AFB
Humboldt NF
Las Vegas
Lake Mead NRA
NAWS China Lake
NAWS China Lake
Fort Irwin
MCLB Barstow
Mojave National Preserve
Edwards AFB
Lancaster
Palmdale
Victorville
MCAGCC Twentynine Palms
Joshua Tree NP
Las Angeles
Pacific Ocean
Salton Sea
15
40
5
15
10
Interstate Highway
Mojave Desert Ecoregion
Military Installation/Range
BLM Protected Area/ Wilderness Area
Renewable Energy Site
Authorized
Pending
Solar Energy Zone Developable Area
SC Wildlands Desert Wildlife Habitat Network
Level 3 Suitability
Excelent Suitability
Good Suitability
0 20 40 Kilometers
0 10 20 30 Miles
N
File Number: WRP001204

Section 2: Focus Areas

Section 2.1 Introduction

The WRP Project Team compared the GIS analysis suitability results to the wildlife connectivity corridor areas to locate potential focus areas. Through input from the Project Team and other WRP Partners affiliated with the installations and ranges in the region, three focus areas were created.

Focus Area 1 consisted of three corridors around the Marine Corps Air Ground Combat Center (MCAGCC) Twentynine Palms installation. The three corridors were broken up into the sub-focus areas. The area to the north of the installation was named the northern corridor, the area to the west was named the western corridor, and the area to the southwest was named the southwest corridor.

Focus Area 2 was a corridor that connected Edwards Air Force Base (AFB) and Naval Air Weapons Station (NAWS) China Lake.

Focus Area 3 was a corridor that connected the southeast portion of NAWS China Lake to the northwest portion of the installation (Figure 2.1-1).

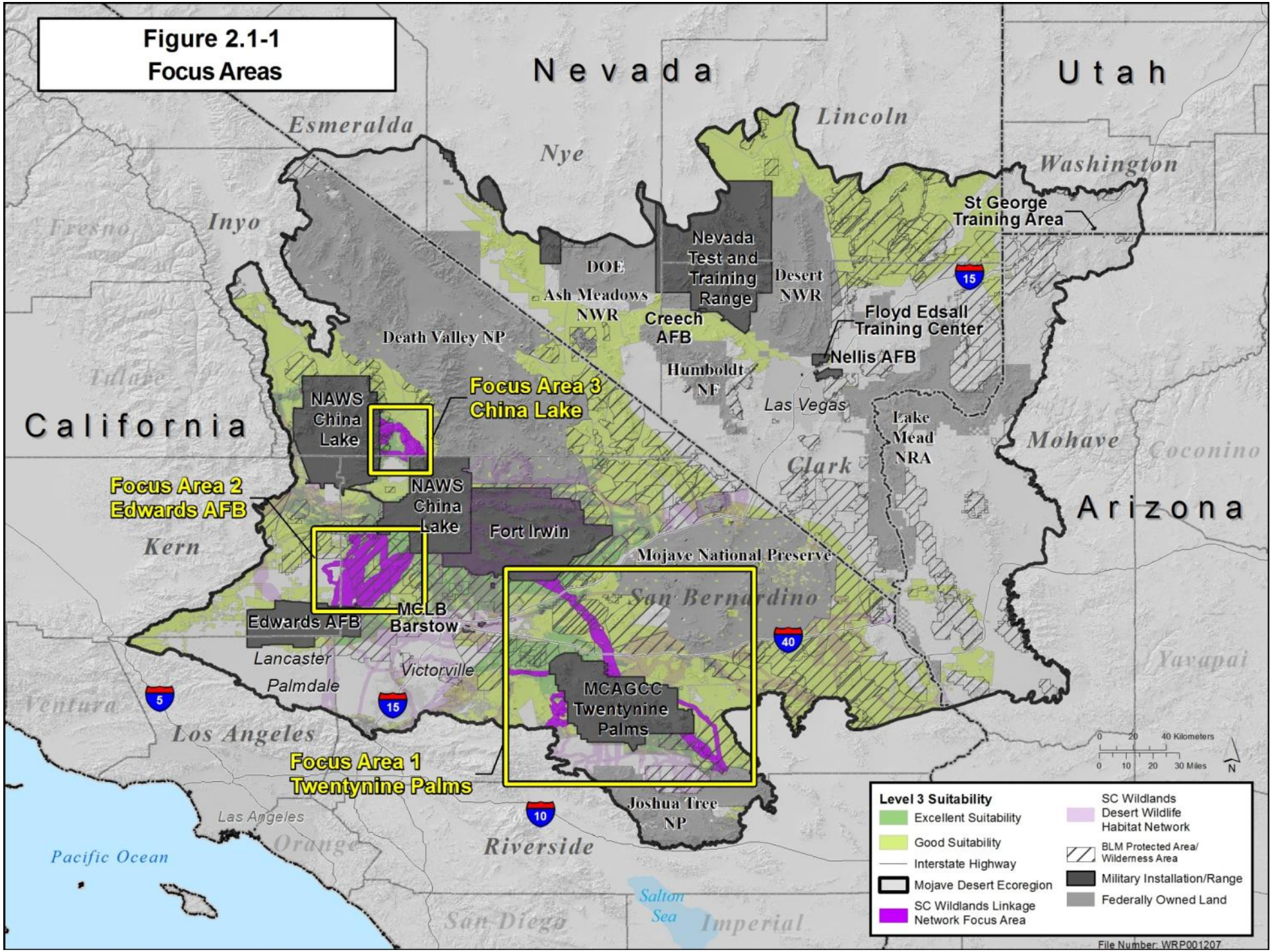


Figure 2.1-1
Focus Areas
Nevada
Utah
California
Arizona
Esmeralda
Nye
Lincoln
Washington
Inyo
Fresno
Tulare
Kern
Ventura
Los Angeles
San Bernardino
Riverside
Orange
San Diego
Imperial
Clark
Mohave
Coconino
Yavapai
Las Angeles
Pacific Ocean
Salton Sea
Lancaster
Palmdale
Victorville
Las Vegas
St George Training Area
Nevada Test and Training Range
DOE
Ash Meadows NWR
Creech AFB
Desert NWR
Floyd Edsall Training Center
Nellis AFB
Humboldt NF
Death Valley NP
Lake Mead NRA
NAWS China Lake
Focus Area 3 China Lake
Focus Area 2 Edwards AFB
Fort Irwin
Mojave National Preserve
Edwards AFB
MCLB Barstow
MCAGCC Twentynine Palms
Focus Area 1 Twentynine Palms
Joshua Tree NP
5
15
10
40
0 20 40 Kilometers
0 10 20 30 Miles
N
Level 3 Suitability
Excellent Suitability
Good Suitability
Interstate Highway
Mojave Desert Ecoregion
SC Wildlands Linkage Network Focus Area
SC Wildlands Desert Wildlife Habitat Network
BLM Protected Area/ Wilderness Area
Military Installation/Range
Federally Owned Land
File Number: WRP001207

Section 2.2 Focus Area 1: Marine Corps Air Ground Combat Center Twentynine Palms Focus Area

Focus Area Description

Focus Area 1 consists of four wildlife connectivity corridors. The lands within these corridors have value for conservation and military interests, but there could be potential issues within these areas.

The northern corridor runs from the northern boundary of the Twentynine Palms installation north to the southern boundary of Fort Irwin. The western corridor runs from the western boundary of the installation 12 miles west, just south of the Rodman Mountain Wilderness. The southwest corridor runs from the western boundary of the installation southwest to the Bighorn Mountain Wilderness. The southeast corridor runs southeast, from the southeast boundary of the installation to the Joshua Tree National Park (Figure 2.2-1).

The majority of the land in these corridors is managed by BLM, though there are multiple parcels within each area that have various land use types. For land use statistics, see tables for each corridor in the following sections for land use maps and Figures 2.2-2, 2.2-3, 2.2-4, and 2.2-5.

Northern Corridor Department of Defense Interest

The northern corridor of Focus Area 1 is in close proximity to the MCAGCC Twentynine Palms and Fort Irwin installations. The testing and training areas within the corridor are MTRs IR212, IR213, VR1214, VR1215, VR1217, VR1218 and VR1265 as well as SUA, such as Barstow Military Operations Area (MOA), Bristol MOA, Silver MOA North, Silver MOA South, R2501N, R2502E, R2502A, and R2508.

Focus Area 1: Twentynine Palms Northern Corridor Land Use

Land Use	Total Parcels	Acreage	Area (Square Miles)	Percent of Total Area
Vacant - Private	253	11,608.47	18.14	8.61%
Vacant - State	7	4,144.49	6.48	3.07%
BLM	232	117,416.21	183.46	87.05%
Industrial	49	1,574.42	2.46	1.17%
Residential	4	90.14	0.14	0.07%
Commercial	6	46.15	0.07	0.03%
Total	551	134,879.89	210.75	100%

Source: San Bernardino County Assessor, July 2, 2012

Northern Corridor Conservation Interest

The northern corridor of Focus Area 1 is near an area that has been designated as an ACEC for the Fringe-toed lizard by BLM and also land that has been classified as critical habitat for the Desert Tortoise, which has been identified as a threatened species by the U.S. Fish and Wildlife Service (USFWS). Potential quality habitat for ten mammal, seven bird, four invertebrate, nine reptile, and six plant species that are sensitive to habitat loss have been identified by SC Wildlands. See Appendix B for the full list of species and potential habitat classification within the focus areas.

The area is also within close proximity to the areas of cultural sensitivity, Manix ACEC and Afton Canyon (Figure 2.2-2). Appendix C provides more information on areas of cultural sensitivity.

Western Corridor Department of Defense Interest

The western corridor of Focus Area 1 is in close proximity to the western boundary of the MCAGCC Twentynine Palms installation. The testing and training areas within the corridor are MTR IR212, IR217, VR1215, VR1217, and VR1218.

Focus Area 1: Twentynine Palms Western Corridor Land Use

Land Use	Total Parcels	Acreage	Area (Square Miles)	Percent of Total Area
Vacant - Private	15	640.57	1.00	2.63%
Vacant - State	1	639.42	1.00	2.62%
BLM	41	22,442.47	35.07	92.05%
Light Industrial	1	658.76	1.03	2.70%
Total	58	24,381.22	38.10	97%

Source: San Bernardino County Assessor, July 2, 2012

Western Corridor Conservation Interest

The western corridor of Focus Area 1 is in close proximity area designated as critical habitat for Desert Tortoise by USFWS. Potential quality habitat for eight mammal, six bird, three invertebrate, seven reptile, and six plant species that are sensitive to habitat loss have been identified by SC Wildlands. See appendix B for the full list of species and potential habitat classification within the focus areas.

The area is also near the Rodman Mountains Wilderness area, Ord-Rodman Desert Wildlife Management Area (DWMA), and the Rodman Mountains ACEC (Figure 2.2-3). Appendix C provides more information on areas of cultural sensitivity.

Southwest Corridor Department of Defense Interest

The southwest corridor of Focus Area 1 is in close proximity to the western boundary of the MCAGCC Twentynine Palms installation. The testing and training areas within the corridor are MTR IR236 and SR390, as well as SUA Panamint MOA, R2508, R2515, and R2524.

Southwest Corridor Conservation Interest

The entire area of the western corridor of Focus Area 1 has been designated as critical habitat for Desert Tortoise by USFWS. Potential quality habitat for seven mammal, six bird, four invertebrate, nine reptile, one amphibian and six plant species that are sensitive to habitat loss have been identified by SC Wildlands. See Appendix B for the full list of species and potential habitat classification within the focus areas.

Focus Area 1: Twentynine Palms Southwest Corridor Land Use

Land Use	Total Parcels	Acreage	Area (Square Miles)	Percent of Total Area
Vacant - Private	210	3,940.42	6.16	7%
Vacant - State	2	1,281.18	2.00	2%
BLM	430	53,050.58	82.89	89%
Rural Residential (Low Density)	349	1,625.69	2.54	3%
Total	991	59,897.87	93.59	100%

Source: San Bernardino County Assessor, July 2, 2012

The area is north of the Bighorn Mountain Wilderness area and is also near the north slope of the San Bernardino Mountains which has been classified as an area of cultural sensitivity (Figure 2.2-4). Appendix C provides more information on areas of cultural sensitivity.

Southeast Corridor Department of Defense Interest

The southeast corridor of Focus Area 1 is in close proximity to the southeastern boundary of MCAGCC Twentynine Palms installation. The testing and training areas within the corridor consist of MTRs IR216, IR250, VR1265, and VR289, as well as SUA Bristol MOA, Sundance MOA, and R2501E.

Focus Area 1: TwentyNine Palms Southeast Corridor Land Use

Land Use	Total Parcels	Acreage	Area (Square Miles)	Percent of Total Area
Vacant - Private	16	2,955.29	4.62	2.67%
BLM	193	105,106.82	164.23	94.99%
Industrial	4	2,593.21	4.05	2.34%
Total	213	110,655.31	172.90	100%

Source: San Bernardino County Assessor, July 2, 2012

Southeast Corridor Conservation Interest

The southeast corridor is located north of the Joshua Tree National Park, which also is designated as Desert Tortoise critical habitat by USFWS. Potential quality habitat for ten mammal, seven bird, four invertebrate, nine reptile, one amphibian and five plant species that are sensitive to habitat loss have been identified by SC Wildlands. See Appendix B for the full list of species and potential habitat classification within the focus areas.

The wilderness areas within the corridor consist of a Mojave Fringe-Toed Lizard ACEC in the southwest of the corridor, Cleghorn Lakes Wilderness and Sheephole Valley Wilderness,

which has also been designated as a cultural sensitive area (Figure 2-2.5). Appendix C provides more information on areas of cultural sensitivity.

Focus Area 1 Potential Issues

Due to the development around the MCAGCC Twentynine Palms installation, there are potential roadblocks in being able to either acquire the land or have it classified as protected.

The northern corridor runs through BLM land that has been authorized or is pending for renewable energy development. Whether or not there are current energy sites on these lands is unknown. The potential wildlife corridor also has to cross over Interstate Highways 40 and 15 before it reaches Fort Irwin.

The western and southwest corridors are located within an area that has been designated as a proposed expansion area for the MCAGCC Twentynine Palms installation. These areas are also located near off-highway vehicle (OHV) recreation areas. It is unclear how the current land use and potential installation expansion would affect the development of wildlife corridors in these areas (Figures 2.2-3 and 2.2-4).

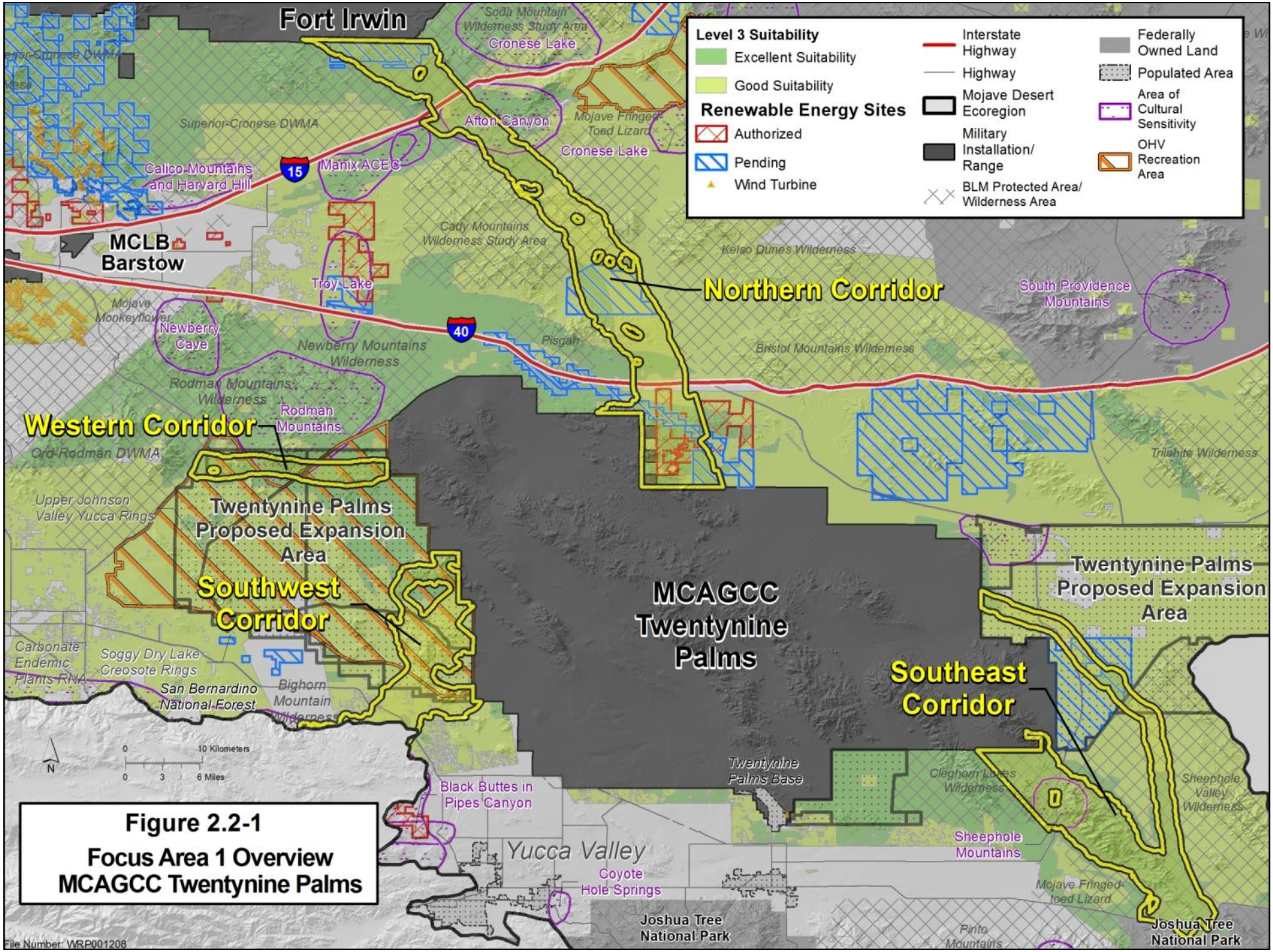


Figure 2.2-1
Focus Area 1 Overview
MCAGCC Twentynine Palms

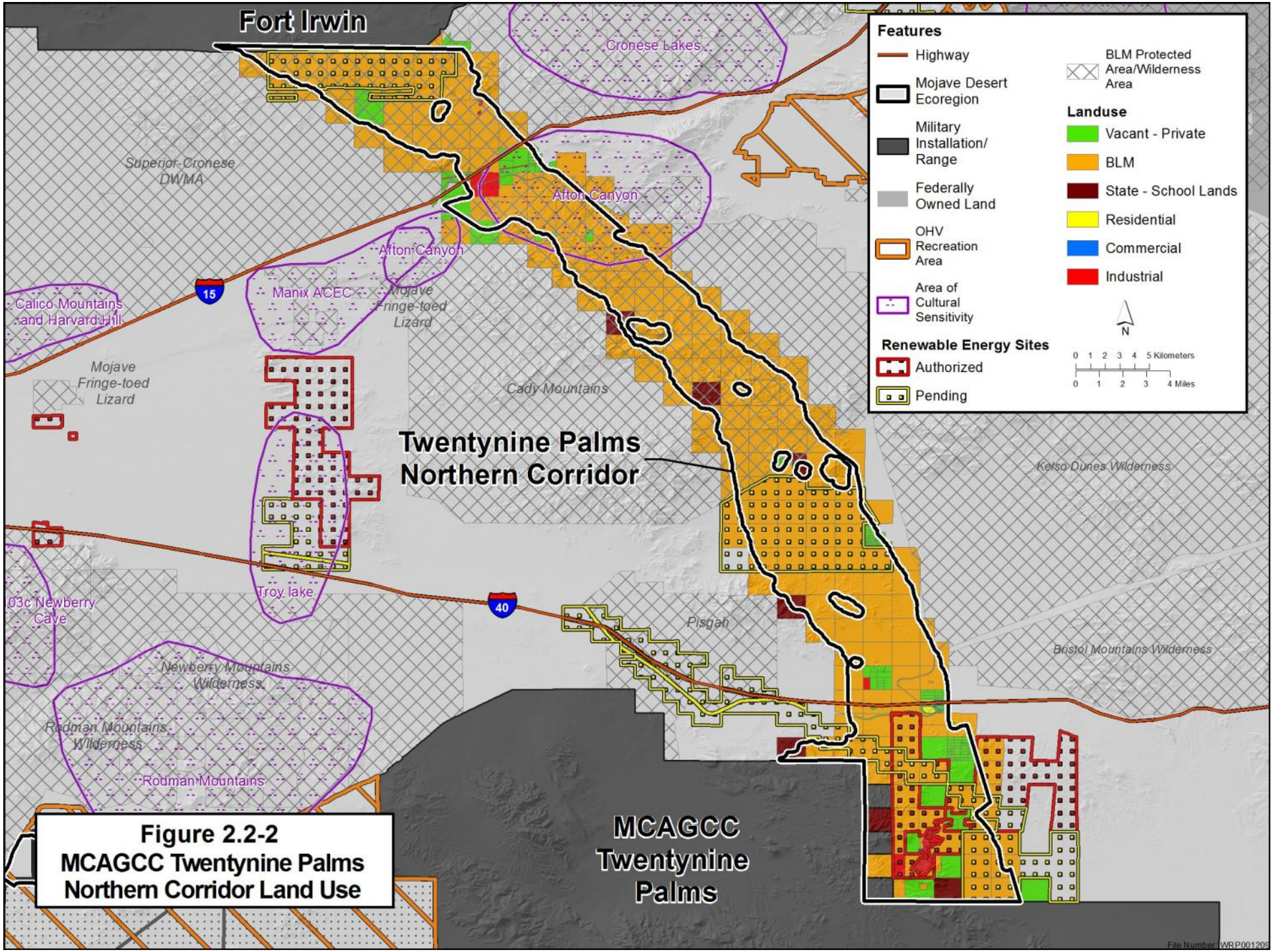


Figure 2.2-2
MCAGCC Twentynine Palms Northern Corridor Land Use

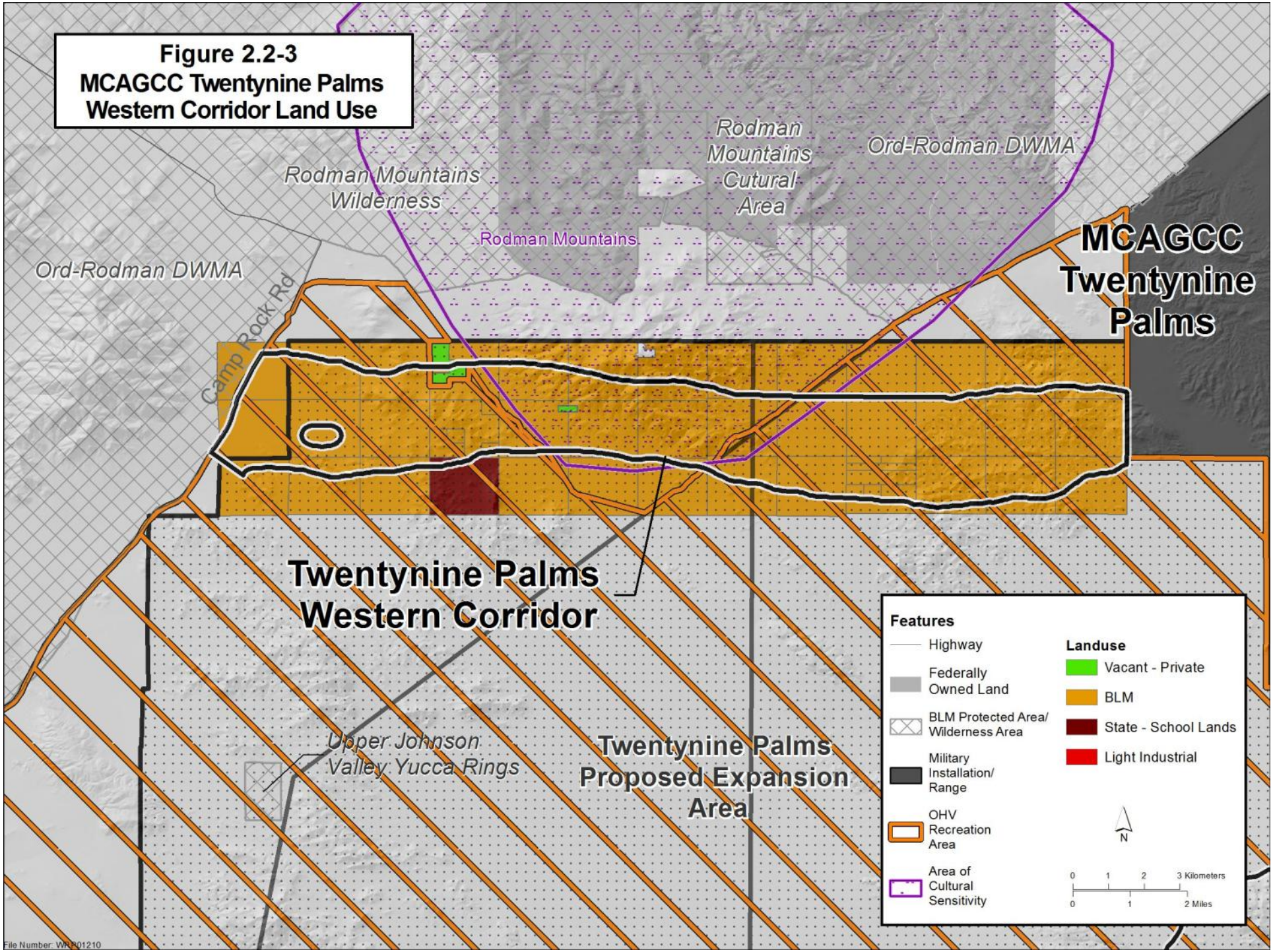


Figure 2.2-3
MCAGCC Twentynine Palms
Western Corridor Land Use
Rodman Mountains Wilderness
Rodman Mountains Cutural Area
Ord-Rodman DWMA
Rodman Mountains
Ord-Rodman DWMA
Camp Rock Rd
MCAGCC Twentynine Palms
Twentynine Palms Western Corridor
Upper Johnson Valley Yucca Rings
Twentynine Palms Proposed Expansion Area
Features
Highway
Federally Owned Land
BLM Protected Area/ Wilderness Area
Military Installation/ Range
OHV Recreation Area
Area of Cultural Sensitivity
Landuse
Vacant - Private
BLM
State - School Lands
Light Industrial
N
0 1 2 3 Kilometers
0 1 2 Miles
File Number: WRR01210

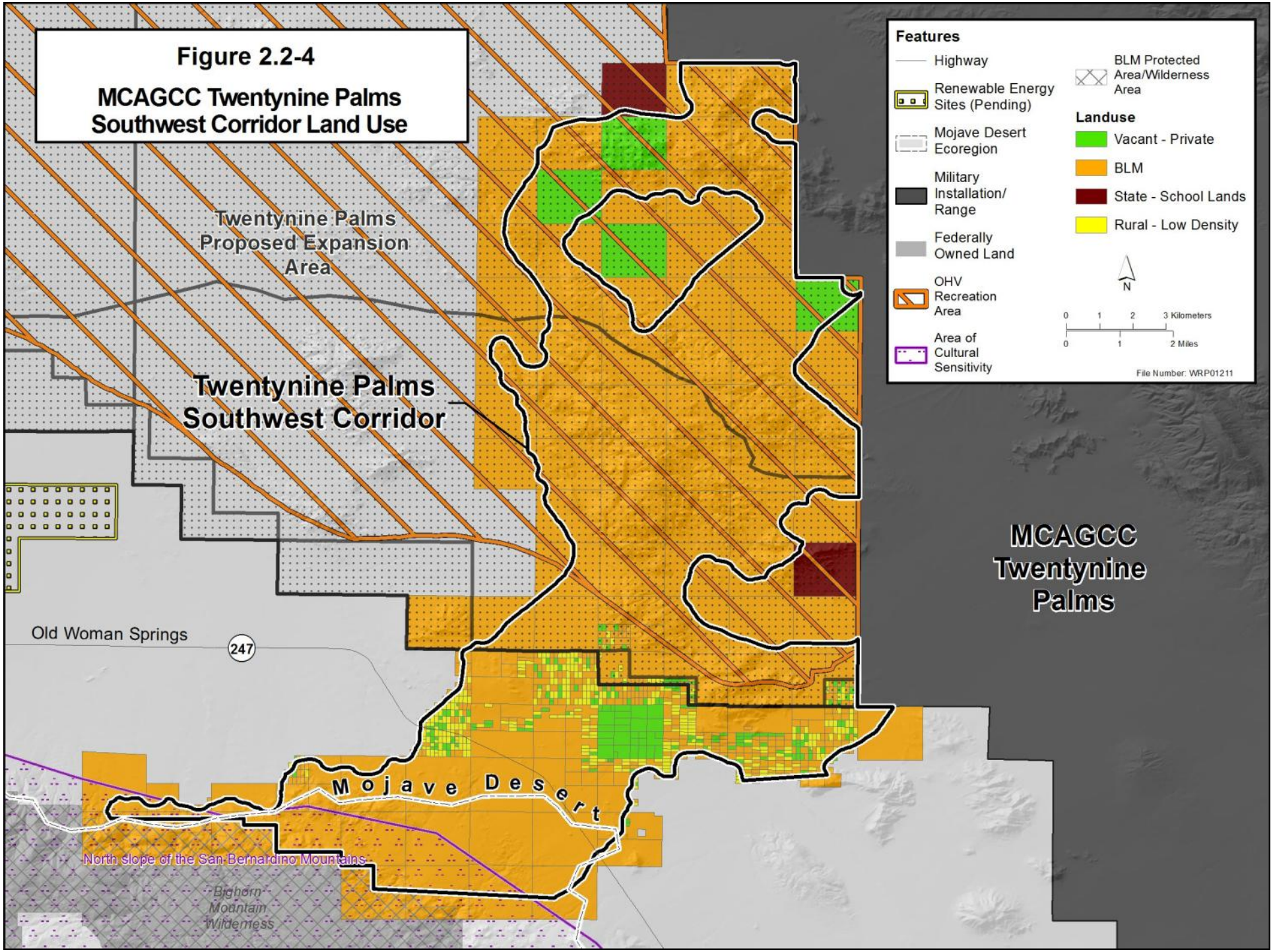


Figure 2.2-4
MCAGCC Twentynine Palms
Southwest Corridor Land Use
Twentynine Palms
Proposed Expansion
Area
Twentynine Palms
Southwest Corridor
MCAGCC
Twentynine
Palms
Old Woman Springs
247
Mojave Desert
North slope of the San Bernardino Mountains
Bighorn
Mountain
Wilderness
Features
Highway
Renewable Energy
Sites (Pending)
Mojave Desert
Ecoregion
Military
Installation/
Range
Federally
Owned Land
OHV
Recreation
Area
Area of
Cultural
Sensitivity
BLM Protected
Area/Wilderness
Area
Landuse
Vacant - Private
BLM
State - School Lands
Rural - Low Density
N
0 1 2 3 Kilometers
0 1 2 Miles
File Number: WRP01211

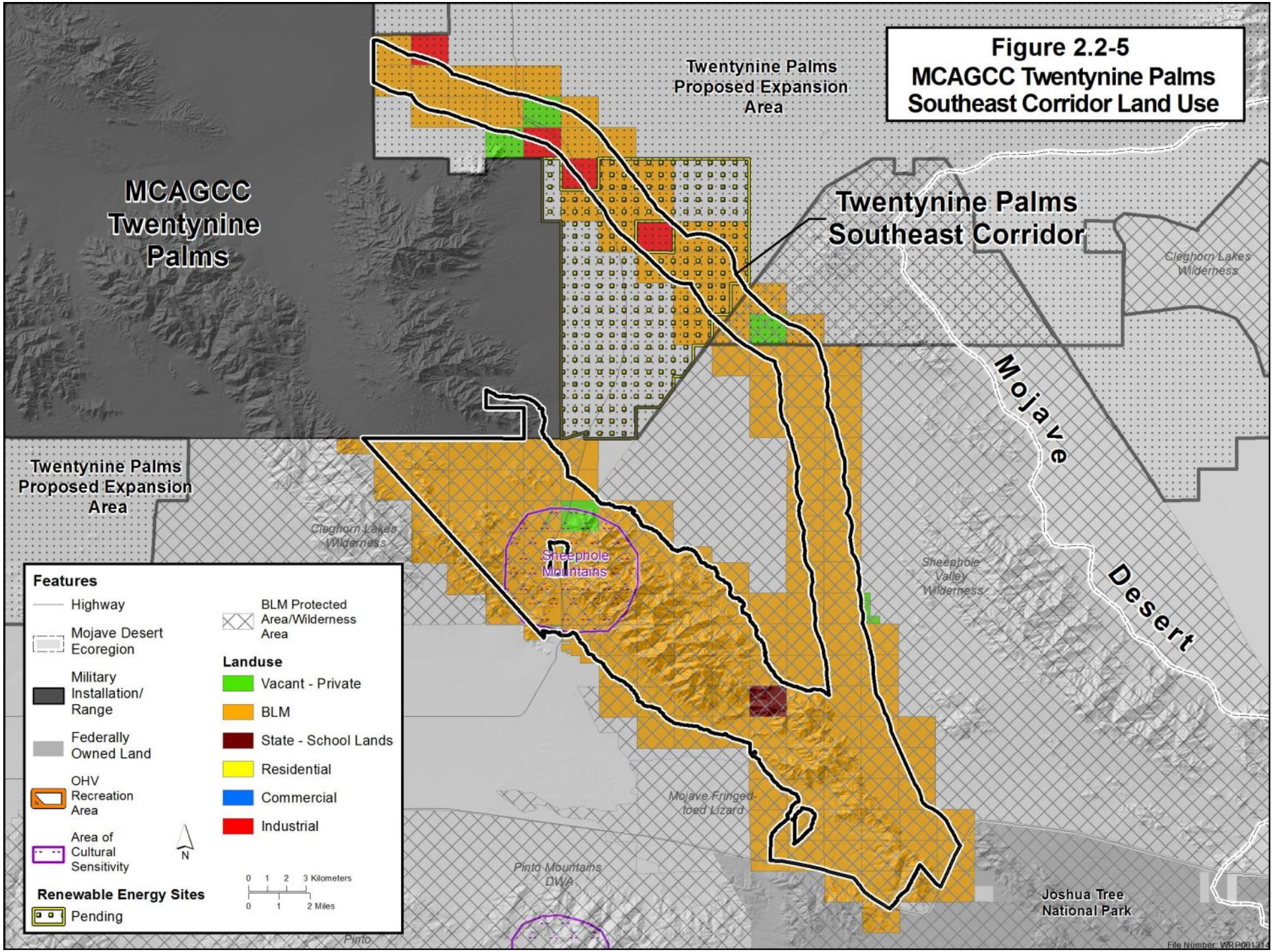


Figure 2.2-5
MCAGCC Twentynine Palms
Southeast Corridor Land Use
Twentynine Palms
Proposed Expansion
Area
MCAGCC
Twentynine
Palms
Twentynine Palms
Southeast Corridor
Cleghorn Lakes
Wilderness
Mojave
Desert
Twentynine Palms
Proposed Expansion
Area
Cleghorn Lakes
Wilderness
Sheephole
Mountains
Sheephole
Valley
Wilderness
Mojave Fringed-
toed Lizard
Pinto Mountains
DWA
Joshua Tree
National Park
Pinto
Features
Highway
Mojave Desert
Ecoregion
Military
Installation/
Range
Federally
Owned Land
OHV
Recreation
Area
Area of
Cultural
Sensitivity
BLM Protected
Area/Wilderness
Area
Landuse
Vacant - Private
BLM
State - School Lands
Residential
Commercial
Industrial
N
0 1 2 3 Kilometers
0 1 2 Miles
Renewable Energy Sites
Pending
File Number: WRP001314

Section 2.3 Focus Area 2: Edwards Air Force Base to Naval Air Weapons Station China Lake

Focus Area Description

Focus Area 2 is a wildlife connectivity corridor that runs from Edwards AFB in the southwest of the corridor up to NAWS China Lake in the northeast. The corridor primarily consists of BLM managed land, but there are parcels throughout the corridor that have other various land use types (Focus Area 2 table). The corridor goes through a BLM ACEC and is near the DWMAs Fremont Kramer and Superior-Cronese (Figure 2.3-1).

Department of Defense Interests

Focus Area 2 is in close proximity to the Edwards AFB and NAWS China Lake installations. The testing and training areas within the corridor are MTRs IR236 and SR 390, as well as SUA, such as Panamint MOA, R2508, R2515, and R2524.

Focus Area 2: Edwards AFB Land Use

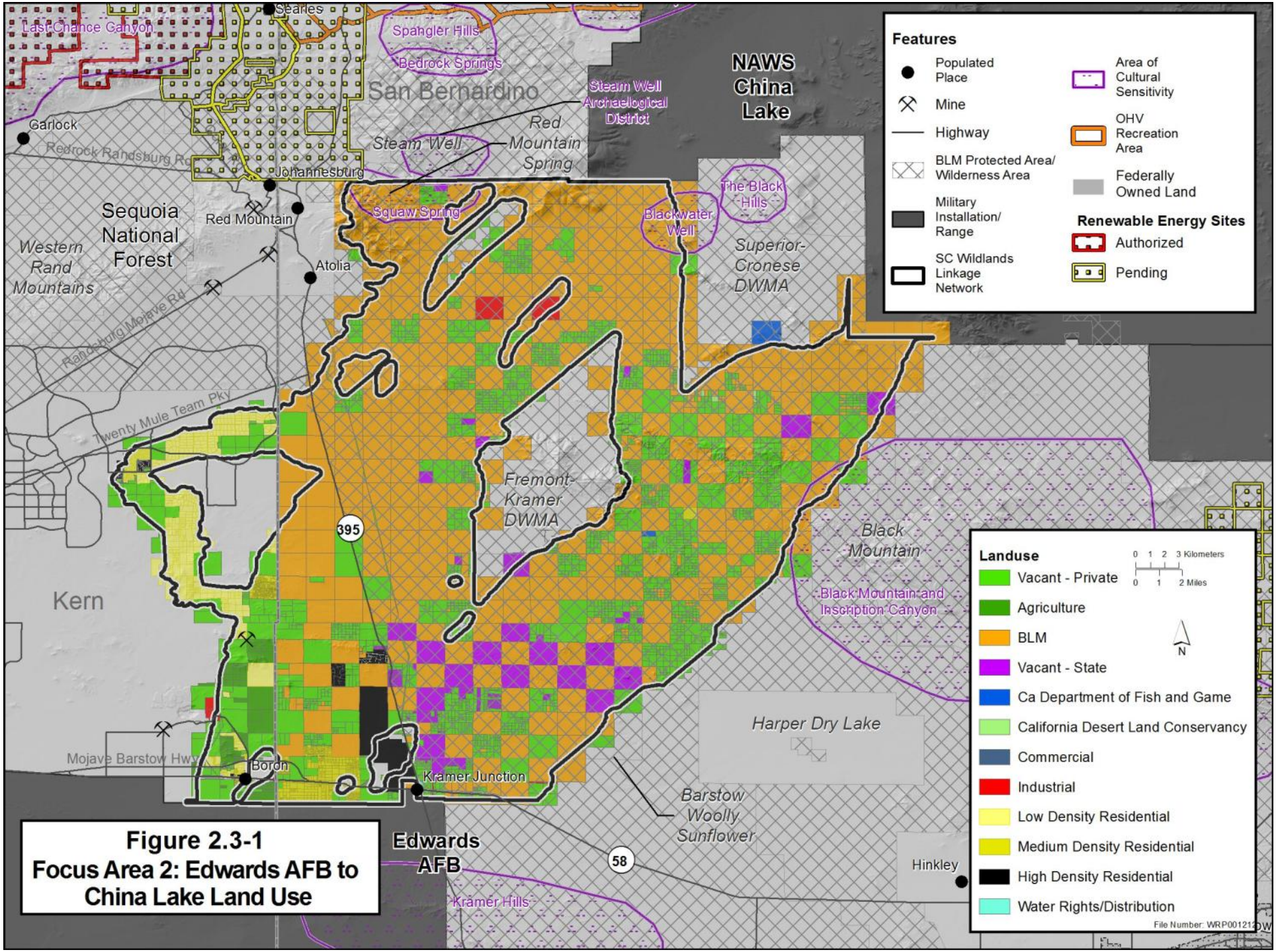
Land Use	Total Parcels	Acreage	Area (Square Miles)	Percent of Total Area
Vacant - Private	2530	81,415.82	127.21	27.63%
Agriculture	114	4,245.32	6.63	1.44%
Vacant - State	81	12,668.46	19.79	4.30%
BLM	431	174,738.26	273.03	59.30%
Ca Department of Fish and Game	2	752.45	1.18	0.26%
Ca Desert Land Conservancy	6	109.86	0.17	0.04%
Commercial	112	47.44	0.07	0.02%
Light Industrial	7	1,352.44	2.11	0.46%
Medium Industrial	6	32.14	0.05	0.01%
Heavy Industrial	3	333.80	0.52	0.11%
Low Density Residential	1000	10,872.81	16.99	3.69%
Medium Density Residential	1666	4,147.57	6.48	1.41%
High Density Residential	1502	3,933.45	6.15	1.33%
Water Rights/ Distribution	5	31.76	0.05	0.01%
Total	7465	294,681.58	460.44	100%

Source: San Bernardino County Assessor, July 2, 2012

Conservation Interests

Focus Area 2 is completely within an area that has been designated as Desert Tortoise critical habitat by USFWS. Potential quality habitat for ten mammal, seven bird, five invertebrate, six reptile, one amphibian and six plant species that are sensitive to habitat loss have been identified by SC Wildlands. See Appendix B for the full list of species and potential habitat classification within the focus areas.

The corridor is also within the proximity of the following areas of cultural sensitivity: Squaw Spring ACEC, Steam Well Archaeological District, The Black Hills, Blackwater Well, The Black Mountain and Inscription Canyon ACEC, Christmas Canyon ACEC, Kramer Hills ACEC, Rainbow Basin and Owl Canyon, Spangler Hills, and Last Chance Canyon ACEC. See Appendix C for more information on areas of cultural sensitivity.


Features
Populated Place
Mine
Highway
BLM Protected Area/ Wilderness Area
Military Installation/ Range
SC Wildlands Linkage Network
Area of Cultural Sensitivity
OHV Recreation Area
Federally Owned Land
Renewable Energy Sites
Authorized
Pending
Landuse
Vacant - Private
Agriculture
BLM
Vacant - State
Ca Department of Fish and Game
California Desert Land Conservancy
Commercial
Industrial
Low Density Residential
Medium Density Residential
High Density Residential
Water Rights/Distribution
0 1 2 3 Kilometers
0 1 2 Miles
N
File Number: WRP001212
Searles
Last Chance Canyon
Spangler Hills
Bedrock Springs
San Bernardino
Steam Well Archaeological District
NAWS China Lake
Garlock
Redrock Randsburg Rd
Steam Well
Red Mountain Spring
Johannesburg
Sequoia National Forest
Red Mountain
Western Rand Mountains
Atolia
Squaw Spring
Blackwater Well
The Black Hills
Superior-Cronese DWMA
Randsburg Mojave Rd
Twenty Mule Team Pky
Fremont-Kramer DWMA
395
Black Mountain
Black Mountain and Inscription Canyon
Kern
Harper Dry Lake
Mojave Barstow Hwy
Boron
Kramer Junction
Barstow Woolly Sunflower
Edwards AFB
58
Hinkley
Kramer Hills
Figure 2.3-1
Focus Area 2: Edwards AFB to China Lake Land Use

Section 2.4 Focus Area 3: Naval Air Weapons Station China Lake

Focus Area Description

Focus Area 3 is a wildlife connectivity corridor that runs from the southeast portion to the northwest portion of NAWS China Lake near the California towns of Searles Valley and Trona. The corridor consists of over 95 percent BLM-managed land, as well as a few other land use types spread throughout the area (Focus Area 3 table). The corridor is west of the Death Valley Wilderness area and runs through the Argus Range Wilderness area and the Great Falls Basin ACEC (Figure 2.4-1).

Focus Area 3: China Lake Land Use

Land Use	Total Parcels	Acreage	Area (Square Miles)	Percent of Total Area
Vacant – Private	28	659.31	1.03	0.57%
Vacant - State	9	2,168.78	3.39	1.88%
BLM	172	110,322.61	172.38	95.65%
Commercial	9	446.08	0.70	0.39%
Industrial	13	747.69	1.17	0.65%
Low Density Residential	58	999.62	1.56	0.87%
Utilities	1	0.92	0.00	0.00%
Total	290	115,345.02	180.23	100%

Source: San Bernardino County Assessor, July 2, 2012 and Inyo County Assessor May 5, 2011

Department of Defense Interests

Focus Area 3 is in close proximity to the NAWS China Lake installation. The testing and training areas within the corridor consist of MTR IR200, IR236, and IR 425, as well as SUA, such as Panamint MOA, R2508, and R2524.

Conservation Interests

Area classified as Inyo California Towhee critical habitat by USFWS is within the Focus Area 2 corridor. Potential quality habitat for nine mammal, three bird, one invertebrate, and six reptile species that are sensitive to habitat loss have been identified by SC Wildlands. See Appendix B for the full list of species and potential habitat classification within the focus areas.

The areas of cultural sensitivity consist of Panamint Valley, North Searles Lake, Slate Range Geoglpys, Surprise Canyon ACEC, and Great Falls Basin. See Appendix C for more information on areas of cultural sensitivity.

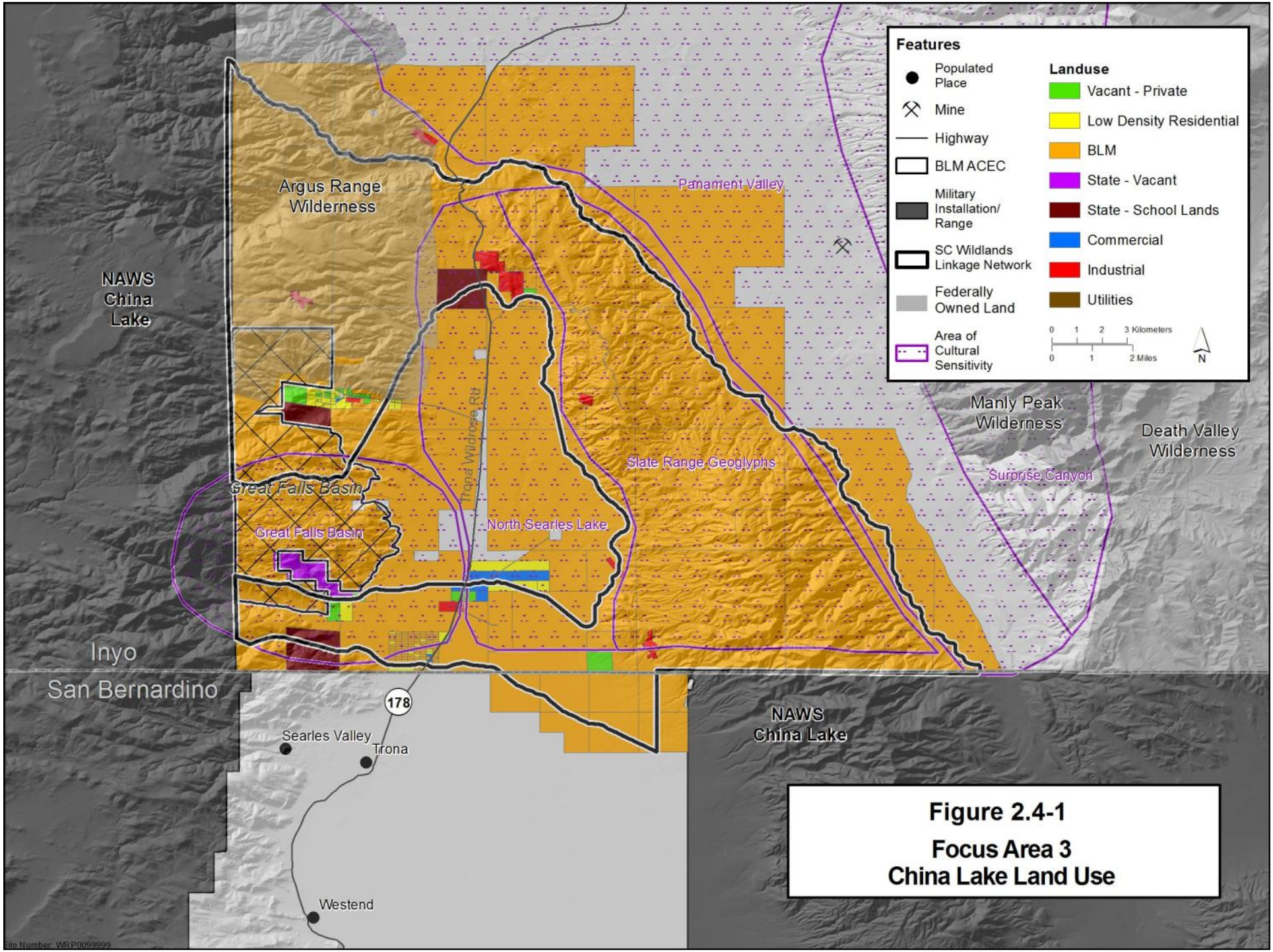


Figure 2.4-1

Focus Area 3
China Lake Land Use

Section 2.5 Desert Renewable Energy Conservation Plan Coordination

Desert Renewable Energy Conservation Plan

The Desert Renewable Energy Conservation Plan (DRECP) is a major component of California's renewable energy planning efforts and focuses on desert regions of several counties such as Imperial, Inyo, Kern, Los Angeles, Riverside, San Bernardino, and San Diego. The goals of the plan are to help provide protection and conservation of desert ecosystems while allowing for appropriate development of renewable energy projects.

Since the WRP and DRECP studies shared some similar goals of determining potential conservation lands, it was important that the two groups coordinated with each other. The WRP focus areas identified by the analysis also aligned with the DRECP conservation plans.

WRP continues to seek DRECP input and coordinate with members participating in the DRECP process. This coordination is especially important because the United States Bureau of Land Management (BLM) is one of the lead agencies involved in DRECP and most of the land within the WRP identified focus areas is managed by BLM. This report and accompanying information has been provided to key DRECP officials. WRP plans to follow up with DRECP officials once its report is complete to best determine next steps regarding integration and implementation.

Section 2.6 Future Analysis

This GIS suitability analysis was completed to guide the WRP Project Team with the decision on which areas to further focus on, with taking action on protecting land from development that is important to endangered and threatened species as well as military testing and training operations.

The next steps in the project are to explore the different methods in protecting the selected corridors, conduct analysis to determine cost to develop and/or maintain the corridors, community involvement (buy in), and identifying potential actions based on land status and stakeholder input.

stakeholder input.

stakeholder input.

Representative Entities involved in the Mojave Project

WRP appreciates all the insightful input and involvement in the WRP Mojave project by the following entities. Of special note is Mr. Rick Kearney, U.S. Fish and Wildlife Service, Pacific Southwest Region and Mr. Tony Parisi, Naval Air Systems Command (NAVAIR) for their leadership.

- Argonne National Laboratory
- Arizona Army National Guard
- Arizona Game & Fish Department
- Arizona Geological Survey
- Arizona Land and Water Trust
- Arizona State Parks
- Arizona State University
- Arizona Wilderness Coalition
- Arizona Zoological Society
- Army
- BIA
- BLM
- Border Patrol
- California Department of Fish and Wildlife
- CEC
- CA Indian Water Commission
- California Governor's OPR
- California Native American Heritage Commission
- California Native Plant Society
- California State Lands Commission
- Campo Band of Mission Indians
- CERES
- Cochise County
- Defenders of Wildlife
- Desert LCC
- Desert Managers Group
- DOE
- EPA
- ESRI
- FAA
- FHWA
- Fort Mojave Indian Tribe
- FWS
- GreenInfo Network
- IDA
- Inter-Tribal Council of CA, Inc.
- Inyo County
- Lincoln County, NV
- MDEP
- Mohave County
- Mojave Desert Land Trust
- National Wildlife Foundation
- NRCS
- NatureServe
- Navy
- Nevada Department of Wildlife
- Nevada Department of Transportation
- Nevada Department of Transportation
- New Mexico Department of Game and Fish
- NOAA
- NPS
- NRCS
- NREL
- Nye County
- ODASD, (TRS)
- ODUSD (I&E) EM
- ODUSD (I&E) REPI Office
- QuadState
- Redlands Institute, University of Redlands
- San Bernardino County
- Santa Fe County
- Science & Collaboration for Connected Wildlands
- Sierra Club
- Sonoran Institute
- SouthWestern Power Group
- The Nature Conservancy
- TRMC
- Trust for Public Lands
- U.S. Army Corps of Engineers
- University of Arizona
- US Air Force
- USFS
- USGS
- USMC
- NatureServe
- Navy
- Neveda Department of Wildlife
- Nevada Department of Transportation
- Nevada Department of Transportation
- New Mexico Department of Game and Fish
- NOAA
- NPS
- NRCS
- NREL
- Nye County
- ODASD, (TRS)
- ODUSD (I&E) EM
- ODUSD (I&E) REPI Office

- QuadState
- Redlands Institute, University of Redlands
- San Bernardino County
- Santa Fe County
- Science & Collaboration for Connected Wildlands
- Sierra Club
- Sonoran Institute
- SouthWestern Power Group
- The Nature Conservancy
- TRMC
- Trust for Public Lands
- U.S. Army Corps of Engineers
- University of Arizona
- US Air Force
- USFS
- USGS
- USMC

Appendix A: Mojave Project Data Sources

Military Data

- Military Installations, Ranges, and Training Areas: Defense Installation Data Infrastructure (DISDI), *National Geospatial Intelligence Agency (NGA),* 2010.
- Military Special Use Airspace (SUA): Digital Aeronautical Flight Information File (DAFIF), *National Geospatial Intelligence Agency (NGA),* July 2012.
- Military Training Route (MTR) Corridors: Digital Aeronautical Flight Information File (DAFIF), *National Geospatial Intelligence Agency (NGA),* July 2012.
- Twentynine Palms Proposed Expansion: Twentynine Palms Study Areas, *United States Marine Corps,* March 2011.

Habitat Data

- Arizona Wildlife Connectivity Corridors: Arizona Wildlife Linkages, *Northern Arizona University.* 2007.
- Desert Tortoise Connectivity Corridors: *United States Fish and Wildlife Services,* 2012.
- Mojave Desert Ecological Assessment: *The Nature Conservancy (TNC),* September 2010.
- Mojave Wildlife Connectivity Corridors: Connectivity Modeling for the California Desert Linkage Network, *Science and Collaboration for Connected Wildlands (SC Wildlands),* 2012.
- United States Critical Habitat: Final Critical Habitat Layer, *United States Fish and Wildlife Services,* 2011.

Land Use/Land Ownership

- Arizona Areas of Critical Environmental Concern: AZ ACEC, *Bureau of Land Management,* July 2010.
- Arizona State Land: *Bureau of Land Management,* 2007.
- California Areas of Critical Environmental Concern: CA ACEC, *Bureau of Land Management,* 2010.
- California Land Use: California General Plans, *California Resource Agency,* April 2004.
- California Wildlife Study Areas: CA WSA, *Bureau of Land Management,* 2012.
- Detailed Federal Agency Land Ownership: Surface Management Status, *Bureau of Land Management,* April 2012.
- General Federal Agency Land Ownership: Western US Fed Owned Land, *Bureau of Land Management,* March 2007.
- Kern County Zoning: *County of Kern Planning Department,* September 2011.
- Mohave County Parcels: Mohave County Assessor Parcels, *Mohave County Assessor,* 2011.
- Nevada Areas of Critical Environmental Concern: NV ACEC, *Bureau of Land Management,* 2011.
- Nevada Land Ownership: *Bureau of Land Management,* August 2010.
- Riverside County Zoning: *Riverside County Transport and Land Management Agency,* March 2008.
- San Bernardino County Land Use: *San Bernardino Associations of Governments (SANBAG),* 2011.
- San Bernardino County Parcels: *San Bernardino County Assessor,* July 2012.
- Southern California Land Use: *Southern California Association of Governments (SCAG),* 2008.
- Urban Areas: TIGER Files, *United States Census Bureau,* 2010.
- Utah Land Ownership: *State of Utah School and Institutional Trust Lands Administration (SITLA),* August 2011.

Cultural and Development Data

- California 2020 Projected Urban Development: Urban Growth Project, *University of Berkley completed for the California Natural Resource Agency,* 2002.
- California 2050 Projected Urban Development: Urban Growth in California: *University of California Davis completed for the California Energy Commission,* 2012.
- Culturally Sensitive Areas: A Contraints Study of Cultural Resource Sensitivity Within the California Desert, *ASM Planning and Research Collaborative (PARC) completed for Mojave Desert Land Trust,* July 2008.
- Renewable Energy Sites: Renewable Energy Project Applications in California, *Bureau of Land Management,* July 2012.
- Solar Energy Zone Developable Areas: Solar Energy Zone Alternative, *Argonne National Laboratory,* November 2011.

Appendix B: Mojave Desert Species Sensitive to Habitat Loss

SC Wildlands Designated Focal Species

The SC Wildlands report title *A Linkage Network for the California Deserts* identified 44 focal species within the California deserts that are sensitive to habitat loss. The report has in-depth information as well as maps that display core habitats for the different mammal, bird, amphibian, reptile, plant, and invertebrate species.

The GIS data representing species corridors that were a result of the SC Wildlands report was a main input for this current study and were used as the final focus areas. The maps within the report were used to create the tables on the following pages that list all of the 44 focal species and what type of habitat, if any, exist within the three focus areas of this analysis.

Source: Penrod, K., P. Beier, E. Garding, and C. Cabañero. 2012. A Linkage Network for the California Deserts. Produced for the Bureau of Land Management and The Wildlands Conservancy. Produced by Science and Collaboration for Connected Wildlands, Fair Oaks, CA www.scwildlands.org and Northern Arizona University, Flagstaff, Arizona http://oak.ucc.nau.edu/pb1/.

Focus Area 1: Twentynine Palms Northern Corridor Species with Potential Habitat within Corridor		
Species		**Potential Habitat**
Mammals		
Mountain lion	*(Puma concolor)*	Move-through
American badger	*(Taxidea taxus)*	Core
Kit fox	*(Vulpes macrotis)*	Core
Ringtail	*(Bassariscus astutus)*	None
Bighorn sheep	*(Ovis canadensis)*	Core
Mule deer	*(Odocoileus hemionus)*	Core
Mojave ground squirrel	*(Spermophilus mohavensis)*	Core
Round-tailed ground squirrel	*(Spermophilus tereticaudus)*	Move-through
Little pocket mouse	*(Perognathus longimembris)*	Core
Desert pocket mouse	*(Chaetodipus pencisillatus)*	Core
Southern grasshopper mouse	*(Onychomy torridus)*	Core
Pallid bat	*(Antrozus pallidus)*	Core
Birds		
Burrowing owl	*(Athene cunicularia)*	Core
Loggerhead shrike	*(Lanius ludovicianus)*	Core
Le Conte's Thrasher	*(Toxostoma lecontei)*	Core
Bendire's Thrasher	*(Toxostoma bendirei)*	Patch
Cactus Wren	*(Campylorhynchus brunneicapillus)*	Core
Black-tailed Gnatchatch	*(Polioptila melanura)*	Move-through
Greater Roadrunner	*(Geococcyx californianus)*	Core
Crissal thrasher	*(Toxostoma crissale coloradense)*	None
Herpetofauna		
Desert Tortoise	*(Gopherus agassizii)*	Core
Chuckwalla	*(Sauromalus obesus obesus)*	Core
Mojave fringe-toed lizard	*(Uma scoparia)*	Move-through
Desert Night Lizard	*(Xantusia vigilis)*	Core
Desert Spiny Lizard	*(Sceloporus magister)*	Core
Great Basin collared lizard	*(Crotaphytus bicinctores)*	Core
Rosy boa	*(Lichanura tribirgata)*	Core
Speckled rattlesnake	*(Crotalus mitchellii)*	Core
Mojave rattlesnake	*(Crotalus scutulatus)*	Core
Red Spotted Toad	*(Anaxyrus punctatus)*	None
Invertebrates		
Ford's swallowtail	*(Papilo indra fordi)*	Core
Bernardino dotted blue	*(Euphilotes bernardino)*	Core
Desert green hairstreak	*(Callophyrs comstocki)*	Core
Desert metalmark	*(Apodemia mejicanus deserti)*	Core
Yucca Moth	*(Tegeticula synthetica)*	None
Plants		
Joshua tree	*(Yucca brevifolia)*	None
Mojave yucca	*(Yucca schidigera)*	Core
Blackbrush	*(Coleogyne ramosissima)*	Core
Arrwweed	*(Pluchea sericea)*	Core
Big galleta grass	*(Pleuraphis rigida)*	Core
Catclaw acacia	*(Acacia greggii)*	Core
Paper bag brush	*(Salazaria mexicana)*	Core
Desert willow	*Chilopsis linearis*	None
Western honey mesquite	*Prosopis glandulosa*	None

Focus Area 1: Twentynine Palms Western Corridor Species with Potential Habitat within Corridor		
Species		**Potential Habitat**
Mammals		
Mountain lion	*(Puma concolor)*	Move-through/Patch
American badger	*(Taxidea taxus)*	Core
Kit fox	*(Vulpes macrotis)*	Core
Ringtail	*(Bassariscus astutus)*	None
Bighorn sheep	*(Ovis canadensis)*	Core
Mule deer	*(Odocoileus hemionus)*	Patch
Mojave ground squirrel	*(Spermophilus mohavensis)*	None
Round-tailed ground squirrel	*(Spermophilus tereticaudus)*	None
Little pocket mouse	*(Perognathus longimembris)*	Core
Desert pocket mouse	*(Chaetodipus pencisillatus)*	None
Southern grasshopper mouse	*(Onychomy torridus)*	Core
Pallid bat	*(Antrozus pallidus)*	Core
Birds		
Burrowing owl	*(Athene cunicularia)*	Core
Loggerhead shrike	*(Lanius ludovicianus)*	Move-through
Le Conte's Thrasher	*(Toxostoma lecontei)*	Core
Bendire's Thrasher	*(Toxostoma bendirei)*	Core
Cactus Wren	*(Campylorhynchus brunneicapillus)*	Core
Black-tailed Gnatchatch	*(Polioptila melanura)*	None
Greater Roadrunner	*(Geococcyx californianus)*	Core
Crissal thrasher	*(Toxostoma crissale coloradense)*	None
Herpetofauna		
Desert Tortoise	*(Gopherus agassizii)*	Core
Chuckwalla	*(Sauromalus obesus obesus)*	Core
Mojave fringe-toed lizard	*(Uma scoparia)*	None
Desert Night Lizard	*(Xantusia vigilis)*	Core
Desert Spiny Lizard	*(Sceloporus magister)*	Core
Great Basin collared lizard	*(Crotaphytus bicinctores)*	Move-through
Rosy boa	*(Lichanura tribirgata)*	Core
Speckled rattlesnake	*(Crotalus mitchellii)*	Core
Mojave rattlesnake	*(Crotalus scutulatus)*	None
Red Spotted Toad	*(Anaxyrus punctatus)*	None
Invertebrates		
Ford's swallowtail	*(Papilo indra fordi)*	None
Bernardino dotted blue	*(Euphilotes bernardino)*	Core
Desert green hairstreak	*(Callophyrs comstocki)*	Core
Desert metalmark	*(Apodemia mejicanus deserti)*	Core
Yucca Moth	*(Tegeticula synthetica)*	None
Plants		
Joshua tree	*(Yucca brevifolia)*	Core
Mojave yucca	*(Yucca schidigera)*	Core
Blackbrush	*(Coleogyne ramosissima)*	Core
Arrwweed	*(Pluchea sericea)*	None
Big galleta grass	*(Pleuraphis rigida)*	Core
Catclaw acacia	*(Acacia greggii)*	Core
Paper bag brush	*(Salazaria mexicana)*	Core
Desert willow	*Chilopsis linearis*	None
Western honey mesquite	*Prosopis glandulosa*	None

Focus Area 1: Twentynine Palms Southwest Corridor Species with Potential Habitat within Corridor		
Species		**Potential Habitat**
Mammals		
Mountain lion	*(Puma concolor)*	Move-through
American badger	*(Taxidea taxus)*	Core
Kit fox	*(Vulpes macrotis)*	Core
Ringtail	*(Bassariscus astutus)*	None
Bighorn sheep	*(Ovis canadensis)*	Patch
Mule deer	*(Odocoileus hemionus)*	Patch
Mojave ground squirrel	*(Spermophilus mohavensis)*	None
Round-tailed ground squirrel	*(Spermophilus tereticaudus)*	None
Little pocket mouse	*(Perognathus longimembris)*	Core
Desert pocket mouse	*(Chaetodipus pencisillatus)*	None
Southern grasshopper mouse	*(Onychomy torridus)*	Core
Pallid bat	*(Antrozus pallidus)*	Core
Birds		
Burrowing owl	*(Athene cunicularia)*	Core
Loggerhead shrike	*(Lanius ludovicianus)*	Core
Le Conte's Thrasher	*(Toxostoma lecontei)*	Core
Bendire's Thrasher	*(Toxostoma bendirei)*	Core
Cactus Wren	*(Campylorhynchus brunneicapillus)*	Core
Black-tailed Gnatchatch	*(Polioptila melanura)*	None
Greater Roadrunner	*(Geococcyx californianus)*	Core
Crissal thrasher	*(Toxostoma crissale coloradense)*	None
Herpetofauna		
Desert Tortoise	*(Gopherus agassizii)*	Core
Chuckwalla	*(Sauromalus obesus obesus)*	Core
Mojave fringe-toed lizard	*(Uma scoparia)*	Core
Desert Night Lizard	*(Xantusia vigilis)*	Core
Desert Spiny Lizard	*(Sceloporus magister)*	Core
Great Basin collared lizard	*(Crotaphytus bicinctores)*	Core
Rosy boa	*(Lichanura tribirgata)*	Core
Speckled rattlesnake	*(Crotalus mitchellii)*	Core
Mojave rattlesnake	*(Crotalus scutulatus)*	Core
Red Spotted Toad	*(Anaxyrus punctatus)*	Core
Invertebrates		
Ford's swallowtail	*(Papilo indra fordi)*	Core
Bernardino dotted blue	*(Euphilotes bernardino)*	Core
Desert green hairstreak	*(Callophyrs comstocki)*	Core
Desert metalmark	*(Apodemia mejicanus deserti)*	Core
Yucca Moth	*(Tegeticula synthetica)*	None
Plants		
Joshua tree	*(Yucca brevifolia)*	Core
Mojave yucca	*(Yucca schidigera)*	Core
Blackbrush	*(Coleogyne ramosissima)*	Core
Arrwweed	*(Pluchea sericea)*	None
Big galleta grass	*(Pleuraphis rigida)*	Core
Catclaw acacia	*(Acacia greggii)*	Core
Paper bag brush	*(Salazaria mexicana)*	Core
Desert willow	*Chilopsis linearis*	None
Western honey mesquite	*Prosopis glandulosa*	None

Focus Area 1: Twentynine Palms Southeast Corridor Species with Potential Habitat within Corridor		
Species		**Potential Habitat**
Mammals		
Mountain lion	*(Puma concolor)*	Move-through
American badger	*(Taxidea taxus)*	Core
Kit fox	*(Vulpes macrotis)*	Core
Ringtail	*(Bassariscus astutus)*	None
Bighorn sheep	*(Ovis canadensis)*	Patch
Mule deer	*(Odocoileus hemionus)*	Core
Mojave ground squirrel	*(Spermophilus mohavensis)*	None
Round-tailed ground squirrel	*(Spermophilus tereticaudus)*	Move-through
Little pocket mouse	*(Perognathus longimembris)*	Core
Desert pocket mouse	*(Chaetodipus pencisillatus)*	Core
Southern grasshopper mouse	*(Onychomy torridus)*	Core
Pallid bat	*(Antrozus pallidus)*	Core
Birds		
Burrowing owl	*(Athene cunicularia)*	Core
Loggerhead shrike	*(Lanius ludovicianus)*	Core
Le Conte's Thrasher	*(Toxostoma lecontei)*	Core
Bendire's Thrasher	*(Toxostoma bendirei)*	Patch
Cactus Wren	*(Campylorhynchus brunneicapillus)*	Core
Black-tailed Gnatchatch	*(Polioptila melanura)*	Move-through
Greater Roadrunner	*(Geococcyx californianus)*	Core
Crissal thrasher	*(Toxostoma crissale coloradense)*	None
Herpetofauna		
Desert Tortoise	*(Gopherus agassizii)*	Core
Chuckwalla	*(Sauromalus obesus obesus)*	Core
Mojave fringe-toed lizard	*(Uma scoparia)*	Move-through
Desert Night Lizard	*(Xantusia vigilis)*	Core
Desert Spiny Lizard	*(Sceloporus magister)*	Core
Great Basin collared lizard	*(Crotaphytus bicinctores)*	Core
Rosy boa	*(Lichanura tribirgata)*	Core
Speckled rattlesnake	*(Crotalus mitchellii)*	Core
Mojave rattlesnake	*(Crotalus scutulatus)*	Core
Red Spotted Toad	*(Anaxyrus punctatus)*	Core
Invertebrates		
Ford's swallowtail	*(Papilo indra fordi)*	Core
Bernardino dotted blue	*(Euphilotes bernardino)*	Core
Desert green hairstreak	*(Callophyrs comstocki)*	Core
Desert metalmark	*(Apodemia mejicanus deserti)*	Core
Yucca Moth	*(Tegeticula synthetica)*	None
Plants		
Joshua tree	*(Yucca brevifolia)*	None
Mojave yucca	*(Yucca schidigera)*	Core
Blackbrush	*(Coleogyne ramosissima)*	None
Arrwweed	*(Pluchea sericea)*	Core
Big galleta grass	*(Pleuraphis rigida)*	Core
Catclaw acacia	*(Acacia greggii)*	Core
Paper bag brush	*(Salazaria mexicana)*	Core
Desert willow	*Chilopsis linearis*	None
Western honey mesquite	*Prosopis glandulosa*	None

Focus Area 2: Edwards AFB Corridor Species with Potential Habitat within Corridor		
Species		**Potential Habitat**
Mammals		
Mountain lion	*(Puma concolor)*	Move-through
American badger	*(Taxidea taxus)*	Core
Kit fox	*(Vulpes macrotis)*	Core
Ringtail	*(Bassariscus astutus)*	None
Bighorn sheep	*(Ovis canadensis)*	Patch
Mule deer	*(Odocoileus hemionus)*	Core
Mojave ground squirrel	*(Spermophilus mohavensis)*	Core
Round-tailed ground squirrel	*(Spermophilus tereticaudus)*	None
Little pocket mouse	*(Perognathus longimembris)*	Core
Desert pocket mouse	*(Chaetodipus pencisillatus)*	Core
Southern grasshopper mouse	*(Onychomy torridus)*	Core
Pallid bat	*(Antrozus pallidus)*	Core
Birds		
Burrowing owl	*(Athene cunicularia)*	Core
Loggerhead shrike	*(Lanius ludovicianus)*	Core
Le Conte's Thrasher	*(Toxostoma lecontei)*	Core
Bendire's Thrasher	*(Toxostoma bendirei)*	Core
Cactus Wren	*(Campylorhynchus brunneicapillus)*	Core
Black-tailed Gnatchatch	*(Polioptila melanura)*	Move-through
Greater Roadrunner	*(Geococcyx californianus)*	Core
Crissal thrasher	*(Toxostoma crissale coloradense)*	None
Herpetofauna		
Desert Tortoise	*(Gopherus agassizii)*	Core
Chuckwalla	*(Sauromalus obesus obesus)*	None
Mojave fringe-toed lizard	*(Uma scoparia)*	None
Desert Night Lizard	*(Xantusia vigilis)*	Core
Desert Spiny Lizard	*(Sceloporus magister)*	Core
Great Basin collared lizard	*(Crotaphytus bicinctores)*	Core
Rosy boa	*(Lichanura tribirgata)*	Core
Speckled rattlesnake	*(Crotalus mitchellii)*	None
Mojave rattlesnake	*(Crotalus scutulatus)*	Core
Red Spotted Toad	*(Anaxyrus punctatus)*	Core
Invertebrates		
Ford's swallowtail	*(Papilo indra fordi)*	Core
Bernardino dotted blue	*(Euphilotes bernardino)*	Core
Desert green hairstreak	*(Callophyrs comstocki)*	Core
Desert metalmark	*(Apodemia mejicanus deserti)*	Core
Yucca Moth	*(Tegeticula synthetica)*	Core
Plants		
Joshua tree	*(Yucca brevifolia)*	Core
Mojave yucca	*(Yucca schidigera)*	Core
Blackbrush	*(Coleogyne ramosissima)*	Core
Arrwweed	*(Pluchea sericea)*	None
Big galleta grass	*(Pleuraphis rigida)*	Core
Catclaw acacia	*(Acacia greggii)*	Core
Paper bag brush	*(Salazaria mexicana)*	Core
Desert willow	*Chilopsis linearis*	None
Western honey mesquite	*Prosopis glandulosa*	None

Focus Area 3: China Lake Corridor Species with Potential Habitat within Corridor		
Species		**Potential Habitat**
Mammals		
Mountain lion	*(Puma concolor)*	Move-through
American badger	*(Taxidea taxus)*	Move-through
Kit fox	*(Vulpes macrotis)*	Core
Ringtail	*(Bassariscus astutus)*	None
Bighorn sheep	*(Ovis canadensis)*	Core
Mule deer	*(Odocoileus hemionus)*	Patch
Mojave ground squirrel	*(Spermophilus mohavensis)*	Patch
Round-tailed ground squirrel	*(Spermophilus tereticaudus)*	None
Little pocket mouse	*(Perognathus longimembris)*	None
Desert pocket mouse	*(Chaetodipus pencisillatus)*	Core
Southern grasshopper mouse	*(Onychomy torridus)*	Patch
Pallid bat	*(Antrozus pallidus)*	Core
Birds		
Burrowing owl	*(Athene cunicularia)*	None
Loggerhead shrike	*(Lanius ludovicianus)*	Move-through
Le Conte's Thrasher	*(Toxostoma lecontei)*	None
Bendire's Thrasher	*(Toxostoma bendirei)*	Patch
Cactus Wren	*Campylorhynchus brunneicapillus*	Patch
Black-tailed Gnatchatch	*(Polioptila melanura)*	None
Greater Roadrunner	*(Geococcyx californianus)*	None
Crissal thrasher	*(Toxostoma crissale coloradense)*	None
Herpetofauna		
Desert Tortoise	*(Gopherus agassizii)*	Move-through
Chuckwalla	*(Sauromalus obesus obesus)*	Core
Mojave fringe-toed lizard	*(Uma scoparia)*	Core
Desert Night Lizard	*(Xantusia vigilis)*	None
Desert Spiny Lizard	*(Sceloporus magister)*	None
Great Basin collared lizard	*(Crotaphytus bicinctores)*	Patch
Rosy boa	*(Lichanura tribirgata)*	Move-through
Speckled rattlesnake	*(Crotalus mitchellii)*	Core
Mojave rattlesnake	*(Crotalus scutulatus)*	None
Red Spotted Toad	*(Anaxyrus punctatus)*	None
Invertebrates		
Ford's swallowtail	*(Papilo indra fordi)*	Core
Bernardino dotted blue	*(Euphilotes bernardino)*	None
Desert green hairstreak	*(Callophyrs comstocki)*	None
Desert metalmark	*(Apodemia mejicanus deserti)*	None
Yucca Moth	*(Tegeticula synthetica)*	None
Plants		
Joshua tree	*(Yucca brevifolia)*	None
Mojave yucca	*(Yucca schidigera)*	None
Blackbrush	*(Coleogyne ramosissima)*	None
Arrwweed	*(Pluchea sericea)*	None
Big galleta grass	*(Pleuraphis rigida)*	None
Catclaw acacia	*(Acacia greggii)*	None
Paper bag brush	*(Salazaria mexicana)*	None
Desert willow	*Chilopsis linearis*	None
Western honey mesquite	*Prosopis glandulosa*	None

Appendix C: Areas of Cultural Sensitivity

Twentynine Palms Northern Corridor Focus Area

The Manix ACEC

The Manix ACEC is referred to as Bassett Point by archaeologists and paleontologists. It is south of Interstate 15 and north of Newberry Springs. It contains a vestige of some of the earliest archaeological sites in the Mojave Desert and, according to archaeologist Fred Budinger, may rival the nearby Calico Hills archaeological district in its antiquity and significance. The site also contains Pleistocene and Holocene era paleontological sites associated with the peopling of America. The BLM has designated a portion of this as an ACEC. The beds of Lake Manix and Lake Mojave traverse a portion of the resource. The California Desert Conservation Area Plan established an ACEC near Manix siding in order to protect paleontological resources. No management plan for this ACEC was ever prepared. Nearby Afton Canyon was established as an ACEC for biological and scenic resources, and it also contains cultural resources.

The Afton Canyon

The Afton Canyon ACEC is situated east of Barstow and West of Baker, California. Archaeological resources are dominated by sites representing the late prehistoric period. These sites include habitation areas and cave sites. Extensive studies have been conducted by Dr. Joan Schneider. The Old Government Road crosses through the ACEC, as does the Burlington Northern/Santa Fe Rail line. The ACEC contains a campground, and much vegetation restoration has occurred along the banks of the Mojave River as it surfaces in the ACEC.

Twentynine Palms Western Corridor Focus Area

The Rodman Mountains ACEC

The Rodman Mountains ACEC is southeast of Barstow and south of Newberry Springs. Both an ACEC and a Wilderness designation cover much of the area, which is rich in prehistoric Native American cultural resources, including rock art (petroglyphs and some pictographs), rock rings, geoglyphs, cairns, trails, habitation sites with midden, and rock shelters. The Newberry Cave archaeological site is situated within a designated wilderness area on the north slope of the Newberry Mountains, north of the Rodman Mountains. It is listed in the National Register of Historic Places (NRHP).

Twentynine Palms Southwest Corridor Focus Area

The North Slope of the San Bernardino Mountains

The north slope of the San Bernardino Mountains contains sites which are scattered much like those in the east-facing canyons of the Sierra Nevada. The entire watershed should be considered to be highly significant until it is adequately inventoried. This includes U.S. Forest Service, BLM, and private lands. Examples of archaeological sites such as the Bobo Springs Maze Petroglyph and the “Willie Boy” Stone Corral indicate that significant sites are present and span the prehistoric and historic periods.

Twentynine Palms Southeast Corridor Focus Area

The Sheephole Mountains

The Sheephole Mountains are virtually unknown, but it appears to some anthropologists that they are discussed within the salt stories of the Chemehuevi Indians. They form the divide between Bristol and Dale Lakes, both of which contain some evidence of the activity of early humans within the California desert.

Edwards AFB Focus Area

Squaw Spring ACEC

Squaw Spring ACEC is now referred to as Red Mountain Spring. The name on maps is considered offensive by the California Native American Heritage Commission and by many Native people. It is a complex of prehistoric archaeological sites situated in a valley and contained on several ridges east of Red Mountain. The district is listed in the NRHP and has recently been extensively mapped and studied by Dr. Mark Allen of California State Polytechnic University, Pomona. Petroglyphs and stacked stone structures are found throughout the district, as well as midden and milling stations. The site complex seems to date from the late prehistoric time period of about 1,000 years ago up until the late 1900s. The foundations of Squaw Spring Well, which supplied water to the gold and silver mines of the tri-cities of Randsburg, Red Mountain (Osdick or Sin City), and Johannesburg, are found along with the prehistoric archaeological sites.

Steam Well Archaeological District

Steam Well Archaeological District is an ACEC in the Lava Mountains. It is primarily a rock art site, with milling stations and scatters of prehistoric artifacts. The site was vandalized in the 1960s, but with the help of volunteers, the BLM removed much of the spray paint. The site is eligible for listing in the NRHP and is managed as such. It is within a designated Wilderness area.

The Black Hills

The Black Hills are south of the China Lake Naval Air Weapons Station's Echo Range, north of Blackwater Well, and east of the Twenty Mule Team Route as it leaves Granite Well and heads towards Boron. The area contains hundreds of talus pits that may have been used for game hunting or religious purposes, as well as petroglyphs. Many of the rocks which form the outlines of the pits are pockmarked as if they were pounded to process food or to make noise. This location is unique for the large numbers of talus pits.

Blackwater Well

Blackwater Well, northeast of Cuddeback Lake, was rejected during the Desert Plan analysis because it was placed in a Class L management category, which was considered adequate protection. The Blackwater Well Archaeological District is listed in the NRHP for its prehistoric archaeology. Over the last decade, all of the ranching-era buildings and watering sites have been removed. Nothing is left of the association with the Twenty Mule Team route. The archaeological sites, dating to over 2,000 years of age, are very sensitive. A deep, rich midden, which is attributable to a prehistoric village, is located near the intermittent spring site. According to local sources, it is called Blackwater Well because the water ran through black soil, which is the midden. The Twenty Mule Team used the water source at times, but the site was not a location of a permanent station.

The Black Mountain and Inscription Canyon ACEC

The Black Mountain and Inscription Canyon ACEC was set aside for the outstanding petroglyphs and rock rings, occupation sites, trial shrines and cairns found throughout this area, as well as the resources contained at Opal Mountain and Milk Dry Lake. The area is listed in the NHRP. The resources are fragile. Inscription Canyon has been significantly vandalized. It was in private ownership until the 1990s. The late Wilson Turner and Gerald S. Smith undertook significant archaeological documentation on behalf of the San Bernardino County Museum through Earthwatch. The late Dr. Robert Heizer assisted in the research in the late 1970s.

Christmas Canyon ACEC

Christmas Canyon ACEC is located on the east side of the Teagle Wash. It has been the subject of intensive inventory by archaeologists Drs. William Clewlow, David Whitley, Eric Ritter, Emma Lou Davis, and Mark Becker, as well as Judyth Reed, David Scott, and Russell Kaldenberg. The inventory was based upon work originally done by Sylvia Winslow and Emma Lou Davis in the 1960s. The area contains artifacts embedded in the desert pavement, stacked stone cairns, Indian trails deeply embedded in the pavement, rock shelters, camp sites, and highly patinated artifacts with extremely early dates that might be associated with the peopling of the Americas. The sites extend into the China Lake Naval Weapons Station, Echo Range and are often associated with embayments that existed when Searles Lake contained water. A master's thesis by Luz Ramirez de Bryson at the University of Wisconsin argued that the area contained water from springs throughout the Holocene Epoch. The ACEC is threatened, because it is adjacent to an OHV Open Area. In 2002, correspondence from the California Office of Historic Preservation to the BLM considered all of the archaeological sites to be eligible for listing in the NRHP.

Bedrock Springs

Bedrock Springs is an ACEC located in the Summit Range on the north edge of the Lava Mountains. It is a relatively small area but possesses an incredible array of archeological resources, including petroglyphs, pictographs, extremely deep midden sites associated with collapsed rock shelters, rock alignments, and milling sites. The major village site has been looted, but BLM did data recovery projects at the site twice in the early 2000s to understand the extent of the looting. The site dated to 2,000 years ago. Faunal materials included bovine (perhaps bison), deer, bird, and fish bones. It has been determined to be eligible for listing in the NRHP.

Kramer Hills ACEC

Kramer Hills ACEC was located on the south side of Highway 58, on both sides of Highway 395. It was removed as an ACEC by a Desert Plan amendment. The area was once rich with aboriginal quarries. Impacts by transmission lines, pipelines, rock hounds, and OHV activities have degraded the resource. Recent work by Dr. William Self and Associates has analyzed the archaeological collections made by Al Mohr and Agnes Bierman at the Kramer Hills quarries in the late 1940s, as well as other lithic sites within the general vicinity. It may be worth a closer look to determine whether the archaeological sites have integrity of materials or location.

Rainbow Basin and Owl Canyon

Rainbow Basin and Owl Canyon are located north of Barstow. Rainbow Basin is a Natural National Landmark and is known for its spectacular geology and fossils. Dr. Mark Sutton has documented some of the archaeology of Owl Canyon. Many of the archaeological resources are lithic scatters and quarries where opal, chalcedony, and agate were found. Fossil Canyon, on the northeast side of Rainbow Basin, contains unique Coso-style petroglyphs carved into the welded tuff. This small archaeological site is listed in the NRHP. Fossil palm fronds are found within these canyons, as well as mammalian fossils dating to over 20 million years ago.

Spangler Hills

Spangler Hills is adjacent to an OHV open area. It contains prehistoric resources associated with the collection of lithic resources, as well as historic mining sites dating to the late 1800s. The area was proposed for ACEC designation but the BLM did not "anticipate additional degradation of cultural resource values because of the irregular topography and lack of roads" (BLM Volume C, Appendix IV, 1980:63). Recent surveys by Giambiastini have found that the area contains more sites than previously reported.

Last Chance Canyon ACEC

Last Chance Canyon ACEC was listed in the NRHP in 1972. It is more than 100 square miles and is located in the Black Hills, El Paso Mountains, and Last Chance Canyon, east of Highway 14. The site diversity is high, including villages, cryptocrystalline quarries, camp sites, burial areas, rock art sites, lithic scatters, milling stations, stacked stone structure, rock shelters, cremations, and historic mining evidence dating from the 1860s to the 1940s. The area includes resources found within a much larger area, bordered by Red Rock Canyon State Park. In earlier times, a petrified forest existed on its western flanks. Recent research by archaeologists Dr. Alan Garfinkle, Alexander Rogers, and Dr. Brian Dillon (University of California, Los Angeles) indicates that the area is one of the most significant in the Mojave Desert. Burro Schmidt's Tunnel is situated in the area and has drawn wide public attention; it is listed in the NRHP as a 20th-century mining site. At the top of El Paso Peak are large rock rings which appear to be related to prehistoric ceremonies. Historic rock hounding activities are notable at some of the opal quarries. The patented Old Dutch Cleanser Mine operated from 1923 to 1947, quarrying pumicite and seismotite, which were used as a household cleaner and as an additive to cement and paint.

China Lake Focus Area

Panamint Valley

Panamint Valley, north of Trona, is wedged between the Argus Mountains of China Lake Naval Air Weapons Station and the Panamint Mountains, which form the western boundary of Death Valley National Park. Much of valley itself and the foothills of the Slate, Argus, and Panamint mountains are managed by BLM. The Desert Protection Act of 1993 transferred the northern portion of Panamint Valley, including Lake Hill Island, north of Highway 178, to the National Park Service (NPS). Much of the valley contains geoglyphs and has seen limited study by Dr. Emma Lou Davis, Daniel McCarthy, and Jay von Werlhof, and most recently by Julie Burcell and Judyth Reed. The area also contains cairns, massive lithic quarries and lithic reduction sites, aboriginal trails, trail markers, and 11 easily identifiable landforms in the southern portion of Panamint Valley that were islands when water stood in the lake. These land forms sit due west of the Briggs Gold Mine and are very visible. Recent radiocarbon dates have provided an age of over 4,000

years for one of the sites. Obsidian and yellow chert dominate the lithic materials which are found scattered throughout the valley. These materials were used prehistorically to make stone tools. Historically, Panamint Valley was also important. The Manly Party of 1849 traversed it, leaving two of their party in its vicinity. The boom town of Ballarat (where a cemetery containing the remains of Seldom Seen Slim Ferge lies on private property) is situated in Panamint Valley. The 1880s town of Reilly is on its western edge, complete with several dozen rock structures, and the Remi Nadeau Shotgun Road runs most of the length of the valley. James Barnes conducted master's research on the townsite of Reilly and at the Anthony Mill ruins in the foothills of the Argus Mountains. The site has been interpreted by the BLM, but most of Panamint Valley has not been inventoried to professional standards. Sentiment exists among some to have the entire valley as far as the China Lake Navy boundary added to Death Valley National Park. The Desert Plan staff recommended that Warm Sulphur Spring and Ballarat be identified as an ACEC. The ACEC would have included the Panamint Stage Station, as well as Post Office Spring. The Stage Station was stabilized and fenced by the National Park Service on behalf of the BLM. The "Chinese Wall" and the townsite of Reilly have also been stabilized by the NPS. The townsite of Ballarat is privately owned. Many of its buildings were made with using tamped earth. Few buildings remain. The Ballarat Cemetery is still in use and contains the burial sites of people such as Seldom Seen Slim Ferge.

North Searles Lake

North Searles Lake, north of Trona and sandwiched in between the Argus Mountains and the Slate Range, contains some of the best intact Pleistocene/Holocene lake sediments, particularly where the stream flow exited Homewood Canyon and deposited sediments against the Slate Range. Artifacts include geoglyphs, massive lithic reduction areas, aboriginal trails, and rock rings. No formal inventory has ever taken place on BLM lands. Immediately south of the BLM holdings, on China Lake Naval Air Weapons Station, is one of the largest stone cairn complexes known in the Mojave Desert. This complex continues into Pilot Knob Valley and was informally inventoried by Dr. Gerald Smith. Based upon casual observation, it appears that these resources may all be related in time. Kish LaPierre has recently studied the stone cairn complex just off the BLM Searles Lake boundary for a master's thesis at California State University, Bakersfield. Jim Fairchild has informally noted many sites during his 45 years working with the Searles Valley Minerals Company, and as a geologist, his interests focus on the distribution of lithics.

State Range Geoglyphs

Slate Range Geoglyphs may be the highest-elevation geoglyphs in the Mojave Desert and may be contain alignments that are both historic and prehistoric. The vista from the site includes North Searles and South Panamint valleys. The immediate area contains a number of prehistoric aboriginal trails as well as 19th and 20th century mining trails and associated cairns. The entire Slate Range has not been surveyed; however, BLM archaeologists and Dr. David Whitley have done casual inventory. The sites are extremely fragile.

Surprise Canyon ACEC

Surprise Canyon ACEC is situated adjacent to the Death Valley National Park. It has been the center of significant controversy in regards to access rights to Panamint City, which is within Death Valley National Park. While the issues surrounding the use of the old road into the Panamint Mining District have overshadowed the other issues, historic mining remains, ethnohistoric archeological sites, and other historic sites are located on both sides of the washed-out road. The area should be considered as significant for historic mining from the 1880s to 1930s and for Native American pinyon-collecting

activities. Pictographs dating to the 1880s are on both sides of the road within the NPS-managed lands, and are also likely to exist within the uninventoried BLM-administered parcels. The entire Panamint Mountains range is significant and needs to be fully analyzed.

Great Falls Basin

Great Falls Basin is an ACEC in the Argus Mountains that was nominated for its wildlife and recreation uses. The area saw significant use by Native Americans and by the Trona Potash Company in the late 1800s and in the 1900s as a source of domestic water. This may be Providence Springs as identified by the Manly Party in 1849, water from which saved the lives of the members of the party. It is a significant resource culturally as well as for wildlife. The nearby Indian Joe Spring is in public ownership and it is also significant for its riparian and historic component. Over 3,000 pounds of fruit was collected in June 1917 from Indian Joe Springs.

Source:
Kaldenberg, Russel L. "A Constraints Study of Cultural Resource Sensitivity Within the California Desert." ASM Planning and Research Collaborative (PARC), Cheyenne, Wyoming.
Prepared for: Mojave Desert Land Trust, Joshua Tree, California. July 2008.

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