CLARK COUNTY MULTIPLE SPECIES HABITAT CONSERVATION PLAN AMENDMENT

VOLUME I

JULY, 2026

ACKNOWLEDGMENTS

The Clark County Desert Conservation Program and the MSHCP Permittees gratefully acknowledges the contributions of the many partners and consultants whose expertise and dedication were instrumental in the development of this MSHCP Amendment. The Program also thanks its staff, whose sustained effort and commitment carried this Amendment to completion.

We extend our sincere appreciation to our partner agencies, the U.S. Fish and Wildlife Service, and the Bureau of Land Management, for their guidance and collaboration throughout this effort.

We thank WRA Environmental Consultants for their role in assisting the County with preparing the MSHCP Amendment document and coordinating with the U.S. Fish and Wildlife Service and the Bureau of Land Management.

We thank the University of Nevada, Reno, and Dr. Ken Nussear and his team for their work preparing the species distribution models.

We acknowledge Economic & Planning Systems, Inc. for developing the funding analysis.

We are grateful to Southwest Decision Resources for providing facilitation services to support outreach and stakeholder engagement. We recognize WSB (formerly Alta Sciences & Engineering, Inc.) for their assistance in developing the habitat functionality models and the conservation strategy.

Finally, we thank all the consultants and partners who assisted with the collection of species data to support the development of the species distribution models and the conservation strategy: SWCA Environmental Consultants, BEC Environmental, Inc., Ironwood Consulting, the U.S. Geological Survey, Austin Peay State University, and the Nevada Department of Wildlife.

Clark County MSHCP Permitees

Submitted by:

desert conservation
PROGRAM

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ACRONYMS & ABBREVIATIONS

ACEC	Area of Critical Environmental Concern
Act	Southern Nevada Economic Development and Conservation Act
ADR	alternative dispute resolution
AFY	acre-feet per year
AMM	Avoidance and Minimization Measure
AMR	Adaptive Management Report
APLIC	Avian Power Line Interaction Committee
BBS	Breeding Bird Survey
BCC	Board of County Commissioners
BCCE	Boulder City Conservation Easement
BGO	Biological Goal and Objective
BGEPA	Bald and Golden Eagle Protection Act of 1940
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice
CAC	Community Advisory Committee
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species
CMA	Cooperative Management Agreement
Covered Species	Species covered by this plan
CSDSG	Cool Semi Desert Scrub and Grassland
DCP	Desert Conservation Program
DES	Department of Environment and Sustainability
Disposal EIS	Las Vegas Valley Disposal Boundary Environmental Impact Statement
District	Clark County Water Reclamation District
eDNA	environmental DNA
EDRR	Early Detection Rapid Response
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FR	Federal Register
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act
GAM	generalized additive models
GBBO	Great Basin Bird Observatory
GBIF	Global Biodiversity Information Facility
GBM	generalized boosted regression models
GCMs	General Construction Measures
GS	Gypsiferous Soils
Handbook	Habitat Conservation Planning and Incidental Take Permit Processing Handbook
HCP	Habitat Conservation Plan
HD	Hydrology Dependent
HMAs	Herd Management Areas
hPa	Vapor Pressure Deficit Maximum
IA	Implementation Agreement

IPCC	Intergovernmental Panel on Climate Change
ITP	incidental take permit
IUCN	International Union for Conservation of Nature
LDS	line-distance sampling
Long-term HCP	Desert Conservation Plan
m	meters
MAMP	Monitoring and Adaptive Management Plan
MBTA	Migratory Bird Treaty Act of 1918
MDS	Mojave Desert Scrub
MPH	miles per hour
MSHCP	Multiple Species Habitat Conservation Plan
MSHCP Amendment	Clark County Multi-Species Habitat Conservation Plan Amendment
NAC	Nevada Administrative Codes
NCA	National Conservation Areas
NDF	Nevada Division of Forestry
NDNH	Nevada Division of Natural Heritage
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHDPlus	National Hydrography Dataset Plus
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRA	National Recreation Area
NRS	Nevada Revised Statute
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
OHV	off-highway vehicle
OSM	OpenStreetMap
PDMs	Project Design Measures
Permitees	Clark County and the cities of Las Vegas, Henderson, North Las Vegas, Mesquite, and Boulder City
PEL	Planning and Environmental Linkages
PF	Playa Fringe
POTA	Point of Tentative Agreement
R&PP	Recreation and Public Purposes Act of 1926
RF	random forests
RM	Riparian Marsh
RMP	Resource Management Plan
RRMP	Riparian Reserves Management Plan
RW	Riparian Woodland
Sandy	Sandy Soils
SEZ	Solar Energy Zone
Short-term HCP	Short-term Habitat Conservation Plan for the Desert Tortoise
SMA	Special Management Area
SNPLMA	Southern Nevada Public Land Management Act
SNRPC	Southern Nevada Regional Planning Coalition
SNWA	Southern Nevada Water Agency
SRMA	Special Recreation Management Area

s-SDMs	Stacked SDMs
Task Force	Clark County Community Growth Task Force
TNC	The Nature Conservancy
TUSK	Tule Springs Fossil Beds National Monument
USAF	U.S. Air Force
USBR	U.S. Bureau of Reclamation
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USNVC	U.S. National Vegetation Classification
VES	visual-encounter surveys
WBS	Wind-Blown Sand

1.0 INTRODUCTION

1.1 Overview and Background

The Clark County Desert Conservation Program (DCP), acting as the program administrator for the Multiple Species Habitat Conservation Plan (MSHCP), has prepared an MSHCP Amendment on behalf of Clark County and the cities of Las Vegas, Henderson, North Las Vegas, Mesquite, and Boulder City (Permittees).[1]

Through a comprehensive conservation program, the MSHCP Amendment will ensure the conservation of the species covered by this plan (Covered Species) and the mitigation of impacts to Covered Species within Clark County. Completion of this plan will include implementation of a streamlined land use permitting process that addresses regulatory compliance issues. The MSHCP Amendment is intended to meet all requirements of the Endangered Species Act of 1973, as amended (16 United States Code [USC] §1531 et seq.) (ESA).

The U.S. Fish and Wildlife Service (USFWS) issued the current MSHCP incidental take permit (ITP) (permit number TE034927-0) on November 22, 2000, authorizing take of 78 species. The ITP became effective February 1, 2001 (USFWS 2001). Implementation of the MSHCP since the effective date in 2001 has provided the Permittees with considerable experience and insight regarding potential improvements to the structure and implementation of the MSHCP which are addressed in this plan.

1.1.1 MSHCP Mission Statement

The Permittees have developed a statement of goals that has guided development of this plan. These goals include:

- Contribute to the recovery and ensure the long-term viability of Covered Species in the Plan Area by protecting and managing high quality and ecologically significant habitat.
- Facilitate planned development in exchange for payment of a development mitigation fee that creates a standardized and predictable permitting process without unforeseen mitigation obligations.
- Promote awareness and appreciation of the Plan Area's natural and cultural history and provide environmental education opportunities for the public.
- Meet all applicable regulations and policies of the ESA and USFWS.
- Address future environmental conditions through the implementation of monitoring and adaptive management.

1.1.2 Short-term Habitat Conservation Plan

On April 2, 1990, the Mojave population of the desert tortoise (*Gopherus agassizii*) was listed as threatened by the USFWS (USFWS 1990), bringing it under full protection of the ESA. The listing was based on concerns regarding the possible spread of an upper respiratory tract disease, loss of habitat to urban development and agriculture, potential degradation of habitat by grazing and off-highway vehicle (OHV) use, illegal collection, excessive predation of juvenile tortoises by common ravens, and other contributing factors (USFWS 1990). The April 1990 listing was preceded by an emergency listing of the tortoise as endangered on August 4, 1989

[1] Nevada Department of Transportation is a Permittee under the 2000 MSHCP, but will not continue their participation as Permittee under the MSHCP Amendment, and will instead seek incidental take coverage under their own permit or through the certificate of inclusion process described in Chapter 9.

(USFWS 1989). The desert tortoise is also categorized as “protected” pursuant to Nevada Revised Statute (NRS) 501.110 and Nevada Administrative Codes (NAC) 503.080 and 503.090.

Early in September 1989, Clark County, in cooperation with the other Permittees, took the lead on developing an application for an ITP pursuant to the provisions of Section 10(a)(1)(B) of the ESA. Shortly thereafter, the Permittees entered into an interlocal agreement wherein the Permittees agreed to fund the preparation of a Habitat Conservation Plan (HCP) to provide conservation measures for the desert tortoise. The HCP was prepared in support of obtaining a Section 10(a)(1)(B) permit which would allow the incidental take of desert tortoises (Clark County 1991). The interlocal agreement designated the County as the lead agency responsible for developing and implementing the compliance program. That plan was designated the Short-term Habitat Conservation Plan for the Desert Tortoise (Short-term HCP). On August 24, 1991, the Short-term HCP was approved, and an ITP was issued (PRT 756260) for an initial term of three years. During this time, the Permittees agreed to continue working to develop appropriate additional conservation measures for the desert tortoise and to apply for a long-term permit with a term of 30 years.

1.1.3 Desert Conservation Plan (Long-term HCP)

Over the next several years, the Permittees continued to work on the long-term HCP for the desert tortoise (Clark County 1994). On or about August 5, 1995, the Desert Conservation Plan (Long-term HCP) was approved, and a new ITP (PRT 801045) was issued by the USFWS to allow the incidental take of desert tortoises for a term of 30 years (USFWS 1995). In addition to providing funds to implement conservation measures for the desert tortoise, the Long-term HCP provided funds (up to $250,000 per year) for conservation measures (primarily collection of data and inventories regarding species likely to be listed in the near future) for species other than the desert tortoise. However, neither that provision nor the ITP allowed the incidental take of species other than the desert tortoise.

Shortly after the listing of the desert tortoise, the USFWS issued a Biological Opinion (USFWS File No. 1-5-91-F-112) analyzing the impacts of the disposal of up to 42,240 acres of Bureau of Land Management (BLM) administered land in southern Nevada. In April 1996, USFWS updated the 1991 Biological Opinion to consider the impacts of BLM’s disposal of an additional 125,000 acres (USFWS File No. 1-5-96-F-023). The 1996 Biological Opinion determined that most of the land within the Las Vegas Valley identified for disposal was highly fragmented and impacted, particularly the 4,000-acre exclusionary zone identified in the Long-term HCP, which the USFWS determined did not contain suitable habitat for the desert tortoise. Later in 1996, the BLM requested an amendment to the 1996 Biological Opinion to receive mitigation through the Section 10/HCP process for impacts to desert tortoise habitat resulting from disposal actions.

1.1.4 MSHCP

In May of 1996, the Permittees began discussing preparation of a multiple species habitat conservation plan and applying to the USFWS for one or more ITPs to allow the incidental take of species in addition to the desert tortoise. In August 1996, the Board of County Commissioners (BCC) and the City Councils of the Permittees authorized the preparation of the Clark County MSHCP by means of an amendment to the existing interlocal agreement. In addition to amending the interlocal agreement to allow the expenditure of funds for species other than the desert tortoise, it was necessary to amend state law to allow the expenditure (NRS Section 244.386). The Nevada State Legislature passed the amendment in 1997.

In May 1998, BLM finalized the Las Vegas Resource Management Plan (RMP; BLM 1998). An RMP ensures that public lands under the jurisdiction of the BLM are managed in accordance with the intent of Congress as stated in the Federal Land Policy and Management Act (FLPMA) (43 USC 1701 et seq.), based on multiple use and sustained yield. The Las Vegas RMP included 16 different disposal boundaries throughout southern Nevada, including the Las Vegas Valley (BLM 1998). Shortly thereafter, Congress passed the Southern Nevada Public Land Management Act (SNPLMA), which outlined specific procedures for the disposal of BLM land within the Las Vegas Valley disposal boundary and directed that the proceeds be made available for a variety of projects and entities in Nevada, including the "development and implementation of a multi-species habitat conservation plan in Clark County, Nevada". The Las Vegas RMP and associated USFWS Biological Opinion concluded that impacts resulting from the disposal of BLM land authorized by the Las Vegas RMP and SNPLMA would be adequately minimized and mitigated through implementation of the Clark County MSHCP.

In November 2000, the Permittees completed the Clark County MSHCP for incidental take coverage of up to 145,000 acres of any "non-federal land, or land that may become non-federal" in Clark County. The determination of 145,000 acres was based in part on the amount of land available within the Las Vegas Valley disposal boundary as defined by SNPLMA. On November 22, 2000, the USFWS issued an ITP authorizing take of 78 species across up to 145,000 acres identified in the MSHCP (PRT TE034927-0), which superseded the Clark County Desert Conservation Plan and its permit (PRT 801045). The ITP became effective February 1, 2001 (USFWS 2001).

1.1.5 MSHCP Amendment

Early Land Management Changes (2002 to 2004)

Roughly one year after issuance of the ITP, Congress passed the Clark County Conservation of Public Land and Natural Resources Act of 2002 (PL 107-282), which among other provisions, expanded the Las Vegas Valley Disposal Boundary by approximately 22,000 acres. The legislation also resulted in changes to existing Wilderness Study Areas and Instant Study Areas that were incorporated into the MSHCP Reserve System. In response to these changes in land use management and status, the BLM commissioned a "Management Change Analysis" to evaluate whether the changes had produced any "adverse effects" on species or habitat covered under the MSHCP. The analysis concluded that no additional mitigation was required (RECON 2008).

In December 2004, the BLM released the *Las Vegas Valley Disposal Boundary Environmental Impact Statement* (Disposal EIS) to evaluate the environmental consequences of disposing BLM lands within the established disposal boundary (BLM 2004). The BLM determined that "the disposal action and subsequent transfer of title do not have direct impacts because these administrative actions do not cause any change in the environment" and that any impacts associated with disposal actions "would occur subsequent to disposal." The agency anticipated that impacts to desert tortoise and other Covered Species resulting from development on disposed BLM lands would be minimized and mitigated through the Clark County MSHCP. In its 2004 Biological Opinion (USFWS File No. 1-5-96-F-023.R3), the USFWS determined that the land disposal action would "not reduce appreciably the likelihood of survival and recovery" of the desert tortoise, in part because mitigation and ESA compliance for impacts associated with disposal would be provided through the MSHCP.

Emerging Concerns and Direction to Amend (2005 to 2007)

The expansion of the SNPLMA disposal boundary and continued rapid growth in Clark County increased concerns among community stakeholders that the 145,000-acre cap would be insufficient for the 30-year permit term and could trigger a rapid "race-to-the-bottom" as developers competed to secure entitlements before the cap was reached. In 2005, the Clark County Community Growth Task Force (Task Force) recognized that more land was available within the SNPLMA disposal boundary than the MSHCP cap allowed. The Task Force recommended that the Permittees explore increasing the MSHCP acreage authorization to align with the available land base.

The following year, Clark County convened the 2006 DCP Advisory Committee to develop recommendations on funding priorities, work plan and budget, major policy issues, and other implementation issues. Over eight months of deliberation, the Advisory Committee recommended that the Permittees evaluate alternatives for revising the MSHCP, ITP, and Implementing Agreement to more effectively balance the needs of growth and conservation in Clark County. Specific recommendations included:

- Modifying the acreage cap to address the gap between developable land and the amount permitted under the ITP;
- Reassessing the overall Conservation Strategy to determine whether mitigation should continue to be implemented on federal land;
- Reassessing the Covered Species list and associated Covered Activities in the MSHCP; and
- Reviewing MSHCP implementation to improve efficiency, accountability, and transparency.

Acting on the recommendations of the Task Force and the DCP Advisory Committee, the BCC directed the DCP on June 17, 2007 to initiate the process to amend the MSHCP and ITP. By that point, more than 45 percent of the development authorized under the 30-year permit had been used in less than seven years, and incidental take was substantially outpacing the projections used during original plan development.

Scoping, Stakeholder Engagement, and Recession-Era Slowdown (2009 to 2019)

On September 30, 2009, USFWS published a Notice of Intent in the Federal Register (74 FR 50239) announcing its intent to prepare an Environmental Impact Statement under the National Environmental Policy Act (NEPA) for the proposed MSHCP Amendment. Public scoping meetings were held that October in Las Vegas, Searchlight, Henderson, and Moapa. The scoping notice identified the Permittees' objectives as increasing authorized habitat disturbance, expanding the conservation program to minimize and mitigate the increased impacts, reducing the number of covered species, and extending the permit term to 50 years.

On February 3, 2009, the BCC established the DCP Community Advisory Committee (CAC) to provide policy recommendations on the proposed amendment. The CAC operated by consensus and was composed of representatives from a broad cross-section of community stakeholders, including local governments, the development community, conservation organizations, and other interest groups. Members were drawn from the following stakeholder categories (number of representatives in parentheses):

- Nevada Taxpayers Association (1)
- Gaming Industry (1)

- Homebuilder (1)
- OHV (1)
- Rural community (2)
- Banking (1)
- Business (1)
- Developer (1)
- Education (1)
- Small Business (1)
- Senior (1)
- Union (1)
- Environmental (2)
- Tribal representative (1)
- Southern Nevada residents (5)

The DCP administered the CAC and coordinated technical and administrative support from staff, Permittees, USFWS, and BLM as needed. Neutral facilitation services were used to keep meetings focused and productive. Topics addressed by the CAC included covered species, mitigation scenarios, funding mechanisms, and implementation strategies. The CAC ultimately produced final recommendations addressing the acreage cap, covered species list, conservation strategy, and program implementation (MSHCP CAC 2010).

Progress on the amendment slowed substantially during the Great Recession, when development activity in Clark County dropped sharply and pressure on the acreage cap eased. As the regional economy recovered through the 2010s, however, the pace of development resumed, and demand for new entitlements again outstripped the remaining permitted acreage. By the early 2020s, only a small fraction of the original 145,000-acre authorization remained available, while approximately 215,000 acres of undeveloped non-federal land, or land that could become non-federal through ongoing or future BLM disposal, was identified as potentially needing incidental take coverage.

Reserve System Framework and the Conservation Strategy

Through ongoing negotiations with USFWS and other stakeholder agencies, the DCP developed a proposed framework for the MSHCP Amendment that bases the Conservation Strategy on a Reserve System consisting primarily of federal lands. Mitigation under the proposed amendment includes enhanced conservation activities and active habitat management implemented within designated Reserve System Units. Each Reserve System Unit is intended to be governed by a long-term cooperative management agreement (CMA) jointly developed and implemented by BLM and Clark County, with oversight from USFWS.

The proposed amendment also reflects substantial revisions to the original plan, including: an increase of approximately 215,000 additional acres of authorized incidental take; a reduction in the Covered Species list from 78 species to a focused subset of 28 species considered most vulnerable to non-federal development; an extension of the permit term to 50 years; and an increased per-acre mitigation fee to support the expanded conservation program.

Draft Plan Release and Public Engagement (2024 to 2025)

On September 3, 2024, the BCC directed the DCP to initiate a public engagement and stakeholder outreach process to solicit feedback on the draft MSHCP Amendment application package (Clark County 2024). The DCP released a Draft MSHCP Amendment in December 2024 and conducted a structured public engagement process from December 2024 through February 2025. Engagement activities included four virtual public information sessions, six focus group meetings

(one in person and five virtual), and seven stakeholder interviews. A total of 81 participants representing 51 agencies, organizations, and businesses took part in the engagement events. Findings were summarized in the *Clark County MSHCP Public Engagement Report* (SDR 2025). On April 1, 2025, the BCC received a report on feedback gathered through the public engagement and stakeholder outreach process and directed staff to proceed with finalizing the MSHCP Amendment (Clark County 2025a). Key themes from the engagement process included broad support for completing the MSHCP Amendment to avoid lapse of regional incidental take coverage, suggestions for refinement of the proposed Reserve System boundaries and Covered Species list, concerns from the development community regarding the proposed increase in the per-acre mitigation fee, and a stated need for continued public education about the MSHCP. The DCP incorporated this feedback into the amendment package.

Avoidance and Minimization Measures Work Group (2025 to 2026)

A central element of the feedback received during the public engagement process was a request from local jurisdictions and the development community to discuss the proposed Avoidance and Minimization Measures (AMMs) in detail prior to finalization of the MSHCP Amendment. The USFWS's requirements for AMMs under the amended MSHCP are substantially more rigorous than those under the current MSHCP and will necessitate new policies and actions by the County, local jurisdictions, and developers. In response to this feedback, on April 1, 2025, the BCC also directed staff to convene a work group to review and refine the proposed AMMs (Clark County 2025a). From August through November 2025, the DCP convened the AMM Work Group with representatives of the Permittees, major homebuilder and industrial development associations, and major utilities, with facilitation by a neutral third-party facilitator. Through seven meetings, the Work Group reviewed each proposed AMM, identified topics that may require updates to local building codes and ordinances, and refined AMM language to ensure feasibility of implementation across Clark County (SDR 2026).

The Work Group reached consensus on all proposed AMMs with the exception of the measures related to the western burrowing owl (*Athene cunicularia hypugaea*) and, by extension, the question of whether to retain the burrowing owl as a Covered Species under the amended MSHCP. The Work Group submitted its final report to the DCP in December 2025, documenting the review process, the refined AMMs, and the unresolved burrowing owl issue (SDR 2026). On March 17, 2026, the BCC received a presentation on the Work Group process and outcomes, approved the final AMMs as recommended by the Work Group, directed that the burrowing owl be retained as a Covered Species under the amended MSHCP, and directed staff to incorporate the final AMMs into the MSHCP Amendment application package and to continue working with jurisdictions and developers to develop supplemental implementation documents (Clark County 2026). The final AMMs as approved by the BCC are presented in Chapter 6 of this MSHCP Amendment.

Federal Legislation: The Southern Nevada Economic Development and Conservation Act

The Southern Nevada Economic Development and Conservation Act (the Act) would establish Special Management Areas (SMAs); federal lands administered by BLM and collaboratively managed with Clark County that would form the federal-land component of the Reserve System under the MSHCP Amendment. The Act has been introduced in three successive Congresses by Senator Catherine Cortez Masto: first as S.567 in the 117th Congress (introduced March 3, 2021), then as S.4457 in the 118th Congress (introduced June 5, 2024), and most recently as S.1005 in the 119th Congress (introduced March 12, 2025). Companion legislation has been introduced in

the U.S. House of Representatives in each Congress, including H.R.2134 in the 119th Congress (introduced by Representative Susie Lee, with Representative Mark Amodei as cosponsor).

The 118th Congress version (S.4457) advanced out of the Senate Committee on Energy and Natural Resources with bipartisan support but did not receive a floor vote before the end of the Congress. The current version (S.1005) remains referred to the Senate Committee on Energy and Natural Resources and has not been enacted. In the absence of legislative passage, the land use designations necessary to implement the MSHCP Amendment Conservation Strategy on federal lands will be established through administrative processes via an update to the BLM's 1998 Las Vegas RMP. The Reserve System is expected to be finalized following submittal of the MSHCP Amendment application, with each Reserve System Unit governed by a CMA collaboratively developed and implemented by BLM and Clark County, under USFWS oversight.

Amendment Number One: Tule Springs Fossil Beds National Monument (2014 to 2026)

A separate, narrowly scoped minor amendment to the MSHCP and ITP was directed by Congress through Section 3092 of the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015 (Public Law 113–291), enacted on December 19, 2014. Section 3092 established the 22,650-acre Tule Springs Fossil Beds National Monument (TUSK) in the Upper Las Vegas Wash north of the cities of Las Vegas and North Las Vegas, transferred administrative jurisdiction of the lands from the BLM to the National Park Service (NPS), and directed the Secretary of the Interior to credit, on an acre-for-acre basis, the 22,650 acres of land conserved for the Monument toward the development of additional non-Federal land within Clark County through an amendment to the MSHCP. Section 3092(a)(2)(F)(ii) further provided that nothing in the Act "otherwise limits, alters, modifies, or amends" the MSHCP.

On November 20, 2025, the Director of the Clark County Department of Environment and Sustainability, acting as agent for the Permittees, submitted a request to the USFWS Pacific Southwest Region to effectuate the congressional directive by amending the MSHCP and ITP to increase the level of authorized incidental take from 145,000 acres to 167,650 acres and to acknowledge that the 22,650-acre increase is mitigated through the establishment of TUSK as a unit of the National Park System (Clark County 2025b). The request was accompanied by a document titled *Amendment Number One* (October 2025), which set forth the specific revisions to Sections 2.1, 2.3, 2.4, and 2.7 of Chapter 2 of the MSHCP necessary to reflect the increase in developable acreage and the integration of TUSK into the MSHCP Reserve System. On March 18, 2026, the USFWS issued a Note to the File acknowledging the congressionally directed amendment, increasing developable acreage from 145,000 to 167,650 acres (of which 152,650 acres are subject to fee collection), and confirming that, because Section 3092 affords the Secretary no discretion as to how to undertake the amendment, the action is a nondiscretionary ministerial action that does not require additional public notice, NEPA analysis, or Section 7 consultation (USFWS 2026).

Amendment Number One is limited to the actions directed by Section 3092 and is independent of the broader MSHCP Amendment that is the subject of this document. The 167,650-acre take authorization established under Amendment Number One reflects the developable acreage in effect at the time of the present MSHCP Amendment's preparation. Upon approval of the MSHCP Amendment and issuance of an amended ITP, the revised acreage authorization, Conservation Strategy, and Reserve System framework described in this plan will supersede the terms established under Amendment Number One.

1.1.6 Environmental Impact Statement

Issuance of an ITP by the USFWS is a federal action requiring environmental review pursuant to NEPA. Early consultations among the USFWS and Clark County determined that preparation of an Environmental Impact Statement (EIS) would be needed to adequately assess the environmental consequences of approving the MSHCP Amendment and issuing an ITP. The primary purpose of an EIS document is to serve as an analysis and decision-making tool to ensure that the policies and goals defined in NEPA are incorporated into the ongoing programs and actions of the federal government. An EIS provides a full and reasoned discussion of the significant environmental impacts. In addition, it will inform decision makers and the public of the reasonable and feasible alternatives that were considered in an effort to avoid or minimize adverse impacts, or enhance the quality of the human environment. An EIS is prepared for actions with a federal nexus if there is a "potential to significantly affect the quality of the human environment".

At the time of the initiation of the preparation of the MSHCP Amendment, the Council on Environmental Quality (CEQ) regulations required that "federal agencies shall make diligent efforts to involve the public in preparing and implementing their NEPA procedures." These efforts involve an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. This process is termed scoping. As soon as practicable after its decision to prepare an EIS, and before the scoping process, the lead agency shall publish a Notice of Intent in the Federal Register. In addition, as part of the scoping process the lead agency shall invite the participation of affected federal, state, and local agencies, any affected Native American tribe, the proponent of the action, and other interested persons. The lead agency shall then determine the scope and the significant issues to be analyzed in depth in the EIS.

The Notice of Intent to prepare an EIS for the MSHCP Amendment was published in the Federal Register, Volume 74, Number 188 on September 30, 2009 (USFWS 2009). The Notice of Intent contained a brief description of the proposed action, the locations, dates, and times of the public scoping meetings, mailing addresses for submittal of written comments, and the deadline for submittal of comments. Legal notices and classified advertisements were published in Clark County newspapers announcing the locations, dates, and times for the Draft EIS public scoping meetings. The newspaper advertisements also contained a brief description of the Proposed Action and the mailing address for submittal of written comments. Additionally, USFWS mailed "Dear Interested Party" letters to individuals and organizations that have previously expressed an interest in the MSHCP or in USFWS-proposed actions.

The USFWS hosted four public scoping meetings to provide the public with an opportunity to learn about the proposed Amendment and to provide comments. The scoping meetings were held on October 19, 21, 22, and 26, 2009, in Las Vegas, Searchlight, Henderson and Moapa, respectively. The meetings allowed attendees the opportunity to provide comments regarding issues of concern and the alternatives that should be discussed in the EIS. Forty-six members of the public attended the scoping meetings, and 28 individual comment letters were received from agencies, organizations, and private citizens. An Administrative Draft EIS was prepared but a public Draft EIS was never released. A new scoping period will be conducted, and a new Notice of Intent will be issued by the USFWS following the submission of the MSHCP Amendment application package. The EIS will include an alternatives analysis.

1.2 Purpose and Need

The MSHCP Amendment will provide for improvements in implementation of the MSHCP based on lessons learned while also extending incidental take coverage to lands subject to disposal and development that are not currently covered under the MSHCP.

The MSHCP Amendment will help advance a number of regional environmental and economic objectives. By identifying priority areas for conservation and other areas for future development, the MSHCP Amendment will provide much needed certainty to the land use and development process and help achieve a sensible balance between natural resource conservation and economic growth in the region.

Specifically, the overall objectives of the Amendment are to:

- Obtain coverage for acres that are not currently permitted for take in Clark County. There are approximately 220,000 acres of land potentially available for development, and proposed federal legislation and other initiatives could increase this up to 255,000 acres. Absent a permit amendment, individual landowners will be required to develop individual Habitat Conservation Plans (HCPs) and obtain individual permits.
- Revise the number of species covered by the MSHCP to focus on those species most at risk. The Permittees have re-evaluated the list of Covered Species in order to more effectively administer the conservation actions and to refocus attention on those species most at risk and most directly impacted by Covered Activities.
- Revise the Conservation Strategy to improve mitigation effectiveness and accountability. The Conservation Strategy has been revised to mitigate for the increased levels of habitat disturbance and to provide greater transparency and accountability for mitigation accomplishments.
- Restructure the MSHCP to improve efficiency and reduce bureaucracy. In an independent review of MSHCP program management, potential conflict of interest issues and other management inefficiencies were identified. To address these issues, the implementation structure of program management has been re-evaluated.
- Increase the Permit Term to 50 years. Increasing the Permit Term to 50 years would provide the Permittees with long-term assurances and also preclude the need to prepare a new MSHCP and ITP application sooner.

1.3 MSHCP Amendment Plan Area

The MSHCP Amendment Plan Area includes all of Clark County excluding Department of Defense lands. Clark County is located in the southernmost tip of Nevada. It is bordered on the north by Lincoln County, Nevada; on the east by Mojave County, Arizona; on the southwest by San Bernardino and Inyo counties, California; and on the west by Nye County, Nevada, as shown in Figure 1-1. The MSHCP Amendment will provide coverage under Section 10(a) for Covered Species on non-federal lands and land that may become non-federal in the Plan Area. The MSHCP Amendment will not provide for incidental take on federal lands or resulting from federal actions on non-federal lands. Clark County covers approximately 5,159,540 acres (8,062 square miles), or about 7 percent of the state's total area; the Plan Area encompasses 4,768,846 acres (7,451 square miles), or about 92 percent of the County. Figure 1-2 shows the location of potentially developable lands in the Plan Area (i.e., Impact Area) by land ownership. Figure 1-3 depicts the potentially developable lands relative to the MSHCP Amendment Reserve System. The potentially developable lands comprise all undeveloped lands under private, County, and state ownership, and federal lands planned for disposal and transfer to private or public entities for development.

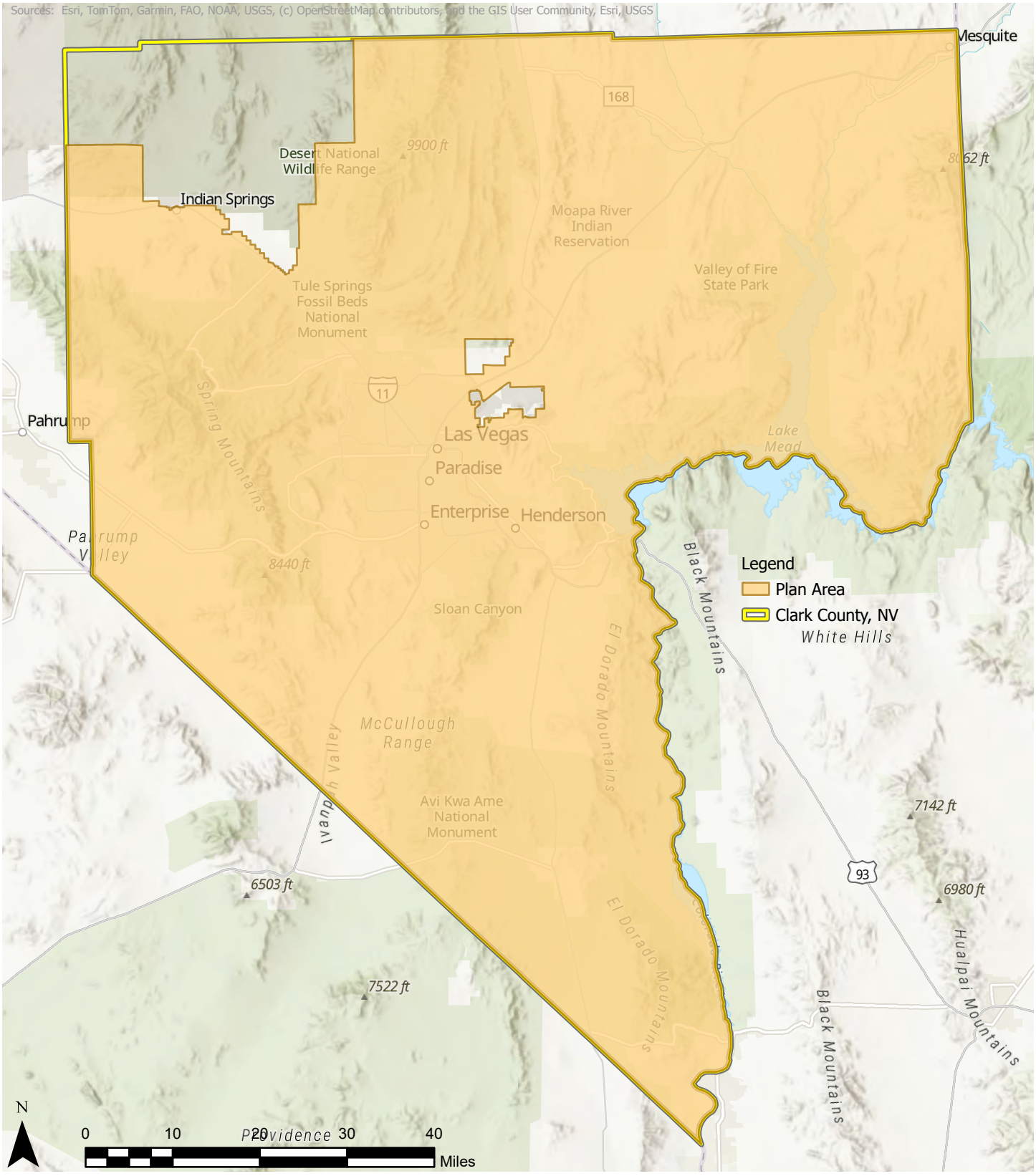

Figure 1-1. Plan Area

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Clark County, NV,
Department of Environment and Sustainability
Desert Conservation Program

Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

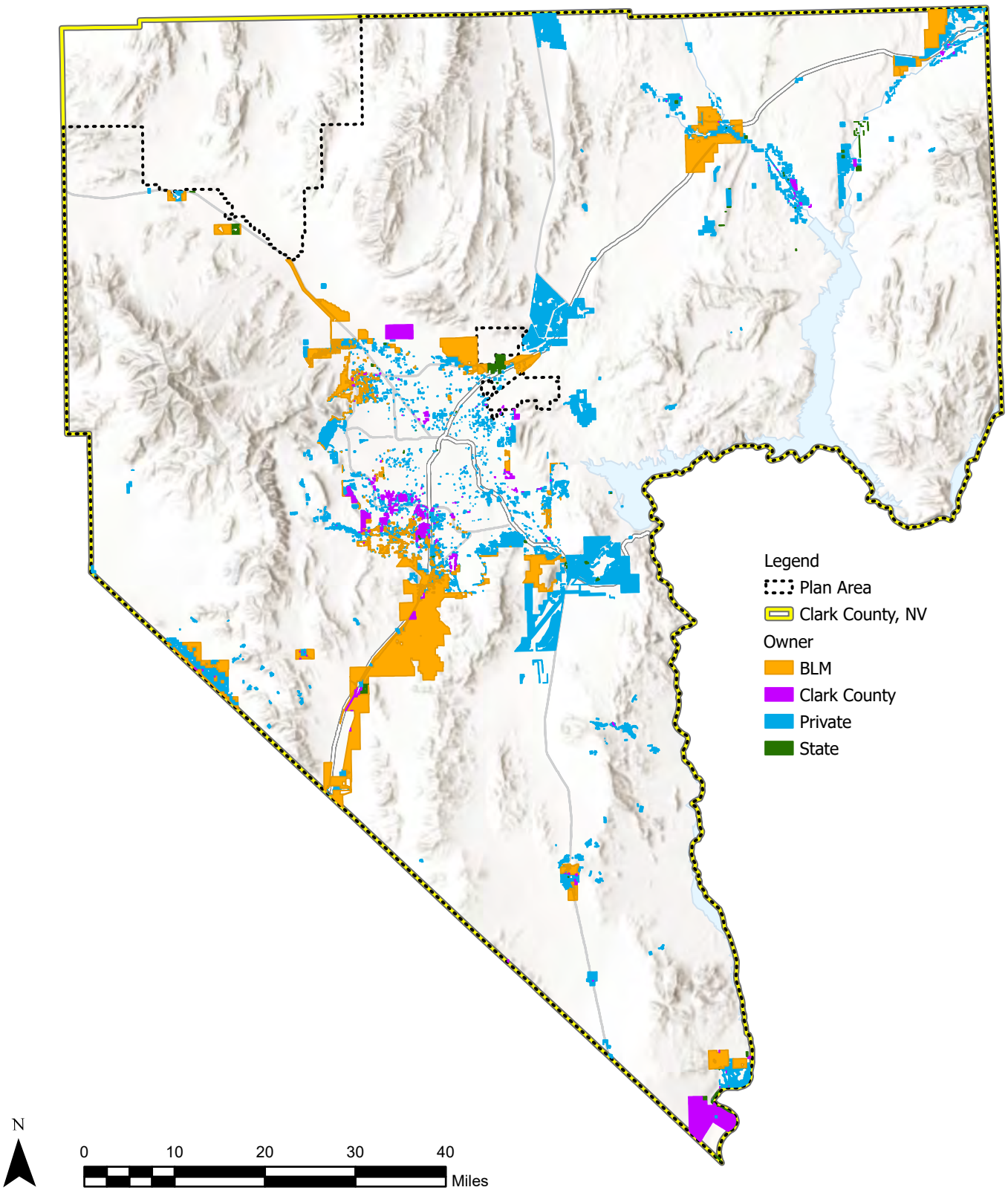

Figure 1-2. Impact Area and Land Ownership

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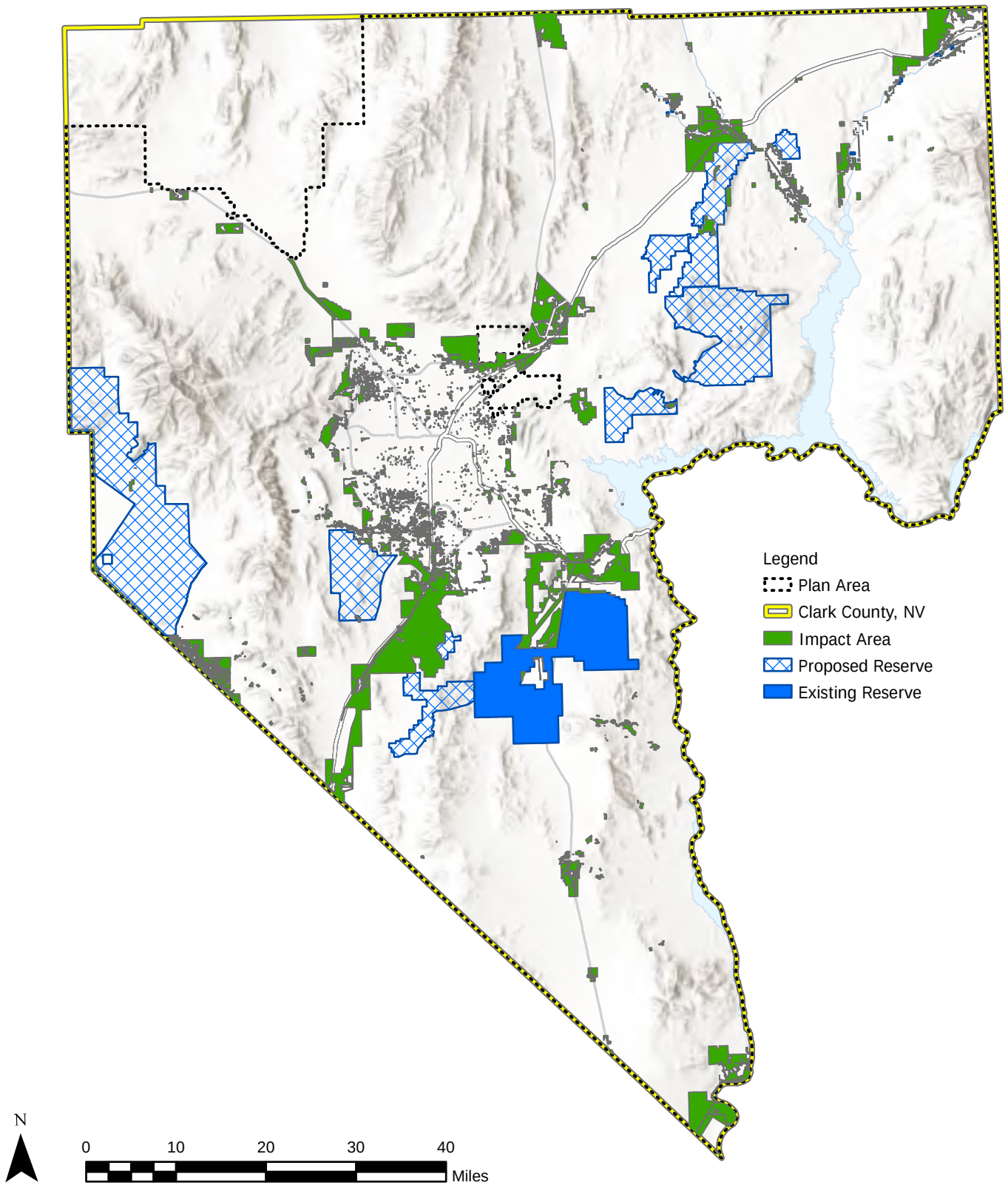

Figure 1-3. Impacts and Reserve System

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of the data delineated herein.

Clark County, NV,
Department of Environment and Sustainability
Desert Conservation Program

1.4 Covered Species

Covered Species are covered by the MSHCP Amendment and the ITP. In the case of this MSHCP Amendment, the Covered Species include unlisted species that may become listed in the future. Covered Species are discussed in detail in Chapter 3 of this MSHCP Amendment, but are listed here for reference:

1.4.1 Covered Plants

- Sticky ringstem (*Anulocaulis leiosolenus* var. *leiosolenus*)
- Las Vegas bearpoppy (*Arctomecon californica*)
- Threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)
- Blue Diamond cholla (*Cylindropuntia multigeniculata*)
- Silverleaf sunray (*Enceliopsis argophylla*)
- Pahrump Valley buckwheat (*Eriogonum bifurcatum*)
- Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*)
- Sticky buckwheat (*Eriogonum viscidulum*)
- White-margined beardtongue (*Penstemon albomarginatus*)
- Eastern Joshua tree (*Yucca jaegeriana*)

1.4.2 Reptiles

- Mojave Desert tortoise (*Gopherus agassizii*)
- Gila monster (*Heloderma suspectum*)

1.4.3 Amphibians

- Arizona toad (*Anaxyrus microscaphus)*

1.4.4 Birds

- Golden eagle (*Aquila chrysaetos*)
- Western burrowing owl (*Athene cunicularia hypugaea*)
- Yellow-billed cuckoo (*Coccyzus americanus*)
- Gilded flicker (*Colaptes chrysoides*)
- Southwestern willow flycatcher (*Empidonax traillii extimus*)
- Loggerhead shrike (*Lanius ludovicianus*)
- Yuma Ridgway's rail (*Rallus obsoletus yumanensis*)
- Bendire's thrasher (*Toxostoma bendirei*)
- LeConte's thrasher (*Toxostoma lecontei*)
- Bell's vireo (*Vireo bellii*)

1.4.5 Mammals

- Desert pocket mouse (*Chaetodipus penicillatus)*
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- Spotted bat (*Euderma maculatum*)

1.4.6 Invertebrates

- Mojave poppy bee (*Perdita meconis*)

- Monarch butterfly (*Danaus plexippus*)

1.5 Covered Activities

Covered Activities are activities that will be conducted by Permittees for which take is authorized in the ITP. Covered Activities are described in detail in Chapter 2 of this MSHCP Amendment and include the following categories and types:

1.5.1 New Covered Activities:

- New residential, industrial, and commercial structures
- Public and private infrastructure
- Renewable energy
- Agricultural conversion and new facilities
- Recreational facilities and use
- Emergency activities

1.5.2 Ongoing and Existing Activities:

- Operation and maintenance of infrastructure
- Recreational facilities
- Extractive uses
- Habitat management
- Education and interpretation
- Ongoing agricultural activities

1.5.3 Covered Activities inside the Reserve System:

- Reserve System management, monitoring, and scientific research activities
- Emergency, safety, and police services
- Infrastructure maintenance
- Emergency repairs
- Public access and recreation
- Collection of flora and fauna

1.6 Permit Duration

The Permittees are requesting a 50-year ITP term based on the projected timeframe for buildout consistent with participant planning processes. Given the difficulty of predicting urban development trends, a 50-year permit is reasonable and necessary to provide sufficient time to implement the plan and to fund and implement the Conservation Strategy. In setting an ITP term, USFWS considers the expected duration of Covered Activities, the anticipated effects on Covered Species, the scientific and commercial data underlying the conservation program, the time needed to achieve its benefits, and the extent to which the program incorporates adaptive management.

A summary of major local planning documents and their respective time horizons is provided in Table 1-1. Urban development consistent with County and City General Plans accounts for a majority of the take that will occur from Covered Activities addressed under the MSHCP Amendment. The Permittees predict that the Plan Area contains enough potentially developable land to support at least 50 years of urban development.

- Clark County, Nevada has a population of approximately 2,398,871 and is approximately 8,000 square miles in size.
- Mesquite, Nevada (Clark County) is 80 miles northeast of Las Vegas, has a population of approximately 23,599 and is approximately 32 square miles in size.
- Henderson, Nevada (Clark County) is the second-largest city in Nevada, is 16 miles southeast of Las Vegas, has a population of approximately 350,039 and is approximately 107 square miles in size.
- Boulder City, Nevada, (Clark County) is approximately 26 miles southeast of Las Vegas, has a population of approximately 15,029 and is approximately 208 square miles in size.
- Las Vegas, Nevada (Clark County) is the largest city in Nevada, has a population of approximately 678,922 and is approximately 135 square miles in size.
- North Las Vegas, Nevada (Clark County), is immediately north of Las Vegas, has a population of approximately 294,034, and is approximately 101 square miles in size. (U.S. Census Bureau 2026)

Table 1-1. Local planning documents and planning horizons incorporated into development of the MSHCP Amendment

Planning Document	Date Completed/Adopted	Planning Horizon
Transform Clark County Master Plan	Adopted November 2021	20 years, Living
The Future of Mesquite: Vision 2045	January 2026	20 years
Boulder City Master Plan	December 2003, updated February 2015	20 years
City of Henderson Comprehensive Plan	July 2017, Amended May 2025	20 years
City of Las Vegas 2050 Master Plan	July 2021	30 years
City of North Las Vegas Comprehensive Master Plan	November 2006, most recently amended August 2020	20 years

Timelines for funding and completing potential capital improvement and infrastructure projects often extend for decades. A Permit Term that allows for the completion of Covered Activities that are associated with construction of planned capital improvement and infrastructure projects, such as water delivery and water treatment facilities and flood control structures will likely take more than four decades to fund and complete. A longer Permit Term is necessary to anticipate and adequately mitigate the impacts of these projects on the Covered Species.

Recurring maintenance activities, such as road maintenance and upkeep of flood control and storm drainage facilities, are expected to continue in perpetuity and may affect the Covered Species throughout the Permit Term. Authorization is therefore needed for the full term.

The Permit Term must also accommodate the development and funding of the Reserve System and implementation of adaptive management for the Conservation Strategy and associated monitoring programs. Habitat re-establishment/establishment actions are expected to take a significant portion of the term.

In summary, the 50-year Permit Term provides sufficient time to accomplish the following critical elements of the MSHCP Amendment:

- Fully implement the current general plans of the cities and the County;
- Fully implement the capital and infrastructure projects that are covered by the plan;
- Implement the ongoing maintenance activities;
- Allow sufficient time to implement the Conservation Strategy;
- Secure all necessary funding for MSHCP Amendment implementation during the Permit Term and secure funds during the Permit Term to fund the Conservation Strategy in perpetuity;
- Develop an effective Reserve System maintenance, monitoring, and adaptive management program that will be implemented in perpetuity.

1.7 Alternatives to the Taking

Section 10 of the ESA and its regulations require that an HCP describe actions considered as alternatives to the take that would result from the proposed action and the reasons those alternatives are not being adopted. Following the submission of the MSHCP Amendment, an EIS will be issued which will include an analysis of alternative actions that describe a range of development scenarios and also provide a range of species conservation alternatives. The focus of the alternatives analysis is to identify the reasonable and feasible alternative that meets the purpose and need of the project and provides the conservation outcome commensurate with the impacts.

1.8 Coordination with Federal and State Agencies

Given the scope and complexity of amending a large, regional HCP and its potential to affect numerous agencies and stakeholder groups, developing a diverse base of participants was critical. However, bringing all conceivable decision-makers and stakeholders together as one group would be administratively unwieldy and would not accurately reflect the scope of each participant's role in the process. As a result, the DCP, in cooperation with the Permittees, established an informal structure for permit amendment consisting of various teams and working groups necessary for the development of the MSHCP Amendment. This structure included regular meetings with the Permittees, USFWS, BLM, and the formation of a CAC to provide recommendations to the BCC and the Permittees on issues relevant to the permit amendment process. As the development of the MSHCP Amendment proceeded, the CAC disbanded and the DCP continued to meet regularly with Permittees, USFWS, and BLM.

The DCP coordinated with the USFWS and BLM throughout the development of the MSHCP Amendment to ensure alignment with agency regulations and policies. An Implementing Agreement that defines the roles and responsibilities of DCP, USFWS, and BLM for implementation of the MSHCP Amendment will be signed by all three entities following the submission and approval of the MSHCP Amendment. USFWS, DCP, and BLM also have agreed to collaborate in the development of CMAs which dictate management and funding requirements for each of the Reserve System Units. As part of the MSHCP Conservation Strategy, DCP will carry out conservation actions on BLM-administered federal lands within the Reserve System in collaboration with BLM and with oversight from USFWS.

1.9 Summary of Relevant Laws and Regulations

1.9.1 Federal Endangered Species Act

The ESA has three major components relevant to the MSHCP Amendment. These include the Section 7 requirement that federal agencies ensure, in consultation with the federal fish and wildlife agencies, that their actions are not likely to jeopardize the continued existence of species or result in adverse modification or destruction of Critical Habitat; the Section 9 prohibition against the "taking" of listed species; and the Section 10 provisions that provide for the permitting of non-federal entities for the incidental take of listed species.

Section 7 of the ESA provides that each federal agency must ensure, in consultation with the Secretary of Interior or Commerce, that any actions authorized, funded, or carried out by the agency are not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of Critical Habitat (16 USC § 1536(a)(2)). Section 7 requires federal agencies to engage in formal consultation with the USFWS for any proposed actions that are likely to adversely affect listed species. A biological opinion is issued by the USFWS at the completion of formal consultation. The biological opinion can conclude that the project as proposed is either likely or not likely to jeopardize the continued existence of the species. If the biological opinion concludes "no jeopardy," the action can proceed as proposed. If the biological opinion concludes "jeopardy," the USFWS will identify "reasonable and prudent alternatives" to the proposed action that would avoid jeopardizing the species. Included in the biological opinion is an incidental take statement that authorizes a specified level of take anticipated to result from the proposed action. The incidental take statement contains "reasonable and prudent measures" that are designed to minimize the level of incidental take and that must be implemented as a condition of the take authorization (50 Code of Federal Regulations (CFR) § 402.14(i)(5)).

Section 9(a)(1)(B) of the ESA prohibits the take by any person of any endangered fish or wildlife species and the take of threatened fish or wildlife species. The ESA prohibits the take of any listed threatened fish or wildlife species in violation of any regulation promulgated by the USFWS. "Take" is defined broadly to mean harass, harm, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct (16 USC § 1532). The take prohibitions of the ESA apply unless take is otherwise specifically authorized or permitted pursuant to the provisions of Section 7 or Section 10 of the ESA. The protections for listed plant species under the ESA are more limited than for fish and wildlife[2].

Section 10 of the ESA specifically addresses the authorization for take by non-federal entities through the development of an HCP. For those actions for which no federal nexus exists, private individuals, corporations, state and local government agencies, and other non-federal entities who wish to conduct otherwise lawful activities that may incidentally take a listed species must first obtain a Section 10 ITP from the USFWS. The non-federal entity is required to develop an HCP as part of the permit application process.

[2] Section 9(a)(2)(B) of the ESA prohibits removal, possession, or malicious damage or destruction of endangered plants in areas under federal jurisdiction, as well as actions that remove, cut, dig up, damage, or destroy endangered plants in areas outside of federal jurisdiction in violation of any state law or regulation, including state criminal trespass law. Protection for threatened plant species is limited to areas under federal jurisdiction. 50 CFR § 17.71(a). The ESA section 7(a)(2) prohibition against jeopardy applies to plants, wildlife, and fish equally, and USFWS and NMFS may not issue a section 10(a)(1)(B) permit if the issuance of that permit would result in jeopardy to any listed species.

The MSHCP Amendment is intended to meet all regulatory requirements necessary for the USFWS to issue a Section 10 ITP to allow incidental take of proposed Covered Species that are listed under the ESA because of Covered Activities undertaken by the Permittees.

1.9.1.1 Compliance with the 2016 Habitat Conservation Planning and Incidental Take Permit Processing Handbook

In December 2016, the USFWS and National Marine Fisheries Service (NMFS) published the Habitat Conservation Planning and Incidental Take Permit Processing Handbook (Handbook) to present the current standards, best practices and guidance for HCP development and implementation (USFWS and NMFS 2016). The Handbook includes information on the purpose and evolution of the HCP program and related laws and regulations. It provides an overview of the HCP planning process and addresses key questions about the application process and communication with federal and state agencies and other stakeholders. Additionally, the Handbook explains requirements and recommendations pertaining to Covered Activities, Covered Species, Plan Area, Take Calculations, Conservation Strategy and Monitoring and Adaptive Management.

This MSHCP Amendment was developed to align with the requirements and recommendations of the Handbook. Additionally, USFWS was engaged throughout the development of the MSHCP Amendment to ensure that criteria in the Handbook were being met.

1.9.2 National Environmental Policy Act

The purpose of NEPA is to ensure that federal agencies consider the environmental impacts of their actions and decisions (42 USC § 4371 et seq.). NEPA requires that the federal government use all practicable means and measures to protect environmental values and makes environmental protection a part of the mandate of every federal agency and department. To accomplish this goal, NEPA establishes a process and approach to identify the environmental impacts associated with proposed federal actions that significantly affect the quality of the human environment. The permitting of the MSHCP Amendment by USFWS under section 10(a)(1)(B) constitutes a federal action subject to NEPA.

1.9.3 Federal Land Policy Management Act

FLPMA directs the Secretary of the Interior to develop, maintain, and, where appropriate, revise plans for the use of public lands. Furthermore, the Code of Federal Regulations requires all resource management authorizations and actions to conform to an approved land use plan. Where a proposed action does not conform but warrants further consideration, the land use plan may be amended. Plan amendments require compliance with NEPA and must comply with the public involvement, interagency coordination, and consistency requirements of federal planning regulations. FLPMA also requires the Secretary to report to Congress any management decision or action that excludes one or more principal land uses for two or more years on 100,000 acres or more of public lands. In addition, any permanent exclusion of principal uses of public lands on 100,000 acres or more must be approved in a land use plan.

1.9.4 Nevada Revised Statutes

In 1969, revision of a Nevada Revised Statute expanded the state's requirement to classify wildlife; reptile classification became either protected or unprotected. Currently, protected species may be further classified as sensitive, threatened, or endangered. Policies and regulations necessary to the preservation, protection, management, and restoration of wildlife and habitat are

established by the Nevada Board of Wildlife Commissioners through adoption of rules and regulations as set forth in the Nevada Administrative Code.

The desert tortoise has been classified as protected since 1969 (NRS 501.110) and is further classified as threatened (NAC 503.080) with protective regulations primarily afforded in NACs 503.090 and 503.093. Five plant species occurring in Clark County are listed as critically endangered by the State of Nevada (NRS 527.270, 527.050). These include the Las Vegas bearpoppy (*Arctomecon californica*), threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*), unusual catseye (*Cryptantha insolita*), sticky buckwheat (*Eriogonum viscidulum*), and Blue Diamond cholla (*Cylindropuntia multigeniculata*). As such, “no member of its kind may be removed or destroyed at any time by any means except under special permit issued by the state forester.” The Nevada Division of Forestry (NDF) also regulates the collection of cactus and yucca through permit requirements under NRS 527.070.

Early in the HCP planning process, the County and the Cities decided that the most practical, efficient, and fair way of providing long-term financing for the HCP would be the imposition of a development fee on development of property in Clark County, payable when developed and subject to permitting by Clark County. However, the laws of the state of Nevada did not authorize the imposition of such a fee. Therefore, during the 1991 session of the Nevada State Legislature, Clark County proposed an addition to Chapter 244 of the NRS, which would allow such an imposition.

On May 10, 1991, the legislature passed NRS 244.386, which allowed the imposition of development fees to be utilized exclusively for the conservation of “species or subspecies of wildlife that has been declared endangered or threatened pursuant to the Federal Endangered Species Act.” During the 1995 and 1997 sessions of the legislature, NRS Section 244.386 was further amended to provide that the development fee could be imposed and expended upon conservation measures affecting any and all species “which have been determined by a committee, appointed by the Board of County Commissioners, to be likely to have a significant impact upon the economy and lifestyles of the residents of the County, if listed as threatened or endangered.” This allowed the preparation and implementation of the MSHCP and this MSHCP Amendment, which addresses both listed and currently unlisted species.

During the 2025 session of the Nevada state legislature, NRS Section 244.386 was further amended to provide that the development fee could be increased to ensure adequate funding in proportion to the anticipated needs of the MSHCP Amendment.

1.9.5 Local Ordinances

The Permittees will approve the MSHCP Amendment prior to its submittal to the USFWS. In addition, Clark County and the five cities applying for the Section 10(a)(1)(B) permit will adopt ordinances that facilitate the implementation of the MSHCP Amendment, including the imposition of a mitigation fee of up to $2,134 per gross acre for development permits for all non-federal property located within Clark County, for a total of up to 215,000 acres of development. Details on the mitigation fee can be found in Chapter 8 (Section 8.2.1.1, Disturbance Fee). Property owners will be required to complete a land disturbance report prior to the issuance of a development permit.

2.0 COVERED ACTIVITIES

This chapter describes the Covered Activities that may occur within the MSHCP Amendment Plan Area and for which incidental take authorization is requested by the MSHCP Amendment Permittees. Activities which have a federal nexus for ESA Section 7 consultation are not covered under this MSHCP Amendment. Activities which occur within Waters of the United States may not always require a Clean Water Act Section 404 permit or necessitate other federal oversight depending on activity description; therefore, some activities within Waters of the United States including those conducted by Southern Nevada Water Authority (SNWA) may not have a federal nexus. Those activities which do not require a Clean Water Act Section 404 permit or do not have another federal nexus are included as Covered Activities.

All Covered Activities must adhere to federal, state, and local laws and regulations. An entity seeking to implement one or more of the Covered Activities described in this chapter, within the Plan Area, may be able to obtain take coverage under the MSHCP Amendment through their city or county permitting process (receipt of project approvals through a Permittee). If an activity is not a Covered Activity and the proponent of the activity would like to obtain coverage for the activity through the MSHCP Amendment, the process to request coverage and potentially obtain a Certificate of Inclusion is described in Chapter 9, Administration. The MSHCP Amendment will cover up to 215,000 acres of new ground-disturbing activities which can come from any of the Covered Activities described in this Chapter. Impacts resulting from Covered Activities are described and analyzed in Chapter 5, Potential Biological Impacts and Take Assessment. Chapter 6, Conservation Strategy describes the avoidance, minimization, and mitigation measures that will be implemented in association with the Covered Activities to ensure the long-term viability of Covered Species and their habitats.

Covered Activities are organized into three categories below:

- 2.1 New Covered Activities Outside of the Reserve System
- 2.2 Ongoing and Existing Covered Activities Outside of the Reserve System
- 2.3 Covered Activities Inside the Reserve System.

2.1 New Covered Activities Outside of the Reserve System

Descriptions of Covered Activities here are mostly qualitative. Additional quantitative assessments of Covered Activity footprints and scope are described in the impact analysis methodology in Chapter 5. The following activities are projected to occur within the Plan Area over the ITP term and may temporarily or permanently adversely affect Covered Species or their habitats. Subject to the terms and conditions of the MSHCP Amendment, any take resulting from these activities will be authorized by the ITP issued pursuant to the MSHCP Amendment.

2.1.1 Residential, Industrial, and Commercial Structures

The MSHCP Amendment and ITP will provide coverage for all activities associated with locally approved public and private development occurring on non-federal lands which do not otherwise have a federal nexus. This includes residential, commercial, and industrial projects. Infrastructure related to development is described in Section 2.1.2. Operation and maintenance of new structures and facilities is described in Section 2.2.1.

2.1.2 Public and Private Infrastructure

Existing and new public and private infrastructure development that does not have a federal nexus is covered under the MSHCP Amendment. This type of development includes infrastructure directly related to residential, industrial, or commercial development but may involve public works projects or other projects that serve the broader community. These projects may include the construction of roadways and bridges[1]; landscaping and trails; natural gas, water, and electric production, storage, and conveyance facilities including those related to renewable energy; transportation-related facilities; underground and aerial telecommunications infrastructure; stormwater, wastewater, and water collection, treatment, and conveyance facilities; and erosion and sediment control and stream stabilization structures.

SNWA manages water resources, and SNWA projects within the Plan Area which do not require a Clean Water Act Section 404 permit will be covered under the MSHCP Amendment. Potential Covered Activities performed by SNWA (and potentially other agency members of the Las Vegas Valley Watershed Advisory Committee) related to the Las Vegas Wash include but are not limited to:

- Weir and bank protection construction activities such as ingress/egress access (road blading and maintenance); staging; material storage and hauling; pre-construction vegetation and ground clearing; grading/excavation; and habitat restoration/improvements.
- General hauling and stockpiling of materials including rock riprap; cleared vegetation; trash; debris; and sediment.
- Habitat restoration/improvements including removing exotic species, clearing and grubbing, and planting native species.
- Road and trail construction on SNWA infrastructure lands for pedestrian, horse, and street-legal vehicle uses.

Operation and maintenance of existing and new infrastructure is described in Section 2.2.1.

2.1.3 Renewable Energy

As energy demand in the region continues to grow, greater emphasis will be placed on renewable energy as a source to meet that demand. The development of solar, wind, and geothermal energy, as well as associated transmission lines within the Plan Area on non-federal land is expected to occur in the foreseeable future. The development of the infrastructure to produce and distribute renewable energy will be a Covered Activity under the MSHCP Amendment as described in Section 2.1.2.

2.1.4 Agricultural Conversion and New Facilities used in Agricultural Operations

Further conversion of natural lands to agricultural uses within the Plan Area is expected to be limited. Although it is not anticipated that agricultural activity will increase significantly beyond current levels, the MSHCP Amendment provides coverage for the conversion of undeveloped private land to irrigated or cultivated agricultural or grazing uses. This category of activities also includes the development of new agriculture-related facilities and structures that occur in currently

[1] Nevada Department of Transportation (NDOT) projects would not be covered, unless the agency applies for a certificate of inclusion.

undeveloped areas or that significantly expand the footprint of existing development, and the construction of infrastructure associated with such facilities and structures. Examples of such facilities, structures, and infrastructure include fences, barns, corrals, stables, storage buildings, other agricultural primary and accessory structures, wells, irrigation ditches, water pipelines, and utilities.

2.1.5 Recreational Facilities and Use

In response to the expected population growth in the region, new recreational facilities will be developed within the Plan Area. Development of those facilities is covered under the MSHCP Amendment. It is expected that these facilities will include athletic fields, golf courses, playgrounds, picnic areas, nature centers, campgrounds, trails, equestrian areas, overlooks, parks, pavilions, restrooms, and recreation centers. Signage, landscaping, and infrastructure necessary to support these facilities are also covered. Operation and maintenance of non-federal lands for OHV use will be considered a Covered Activity only in authorized OHV areas within the Plan Area, i.e., Nellis Dunes OHV Recreation Area and the Boulder City Conservation Easement (BCCE). OHV use on non-federal lands outside of designated OHV areas will not be a Covered Activity under the MSHCP Amendment. Special events such as organized races within the BCCE are not Covered Activities and are not authorized under the MSHCP Amendment. The installation of appropriate signage and access control facilities in conjunction with OHV area use will be included as a Covered Activity under the MSHCP Amendment. Operation and maintenance of these facilities is described in Section 2.2.2.

2.1.6 Emergency Activities

The MSHCP Amendment covers emergency activities, which may include, but are not limited to: repairs of critically imperiled or broken utility lines, or utility failures; repairs of structures damaged by floods or wildfires where such repairs cannot be delayed due to the imminent loss of life or property; cleanup of spilled hazardous materials and/or waste; repair, replacement, and/or removal of failed structures and associated facilities; repair of structures that are imminently in danger of serious damage or failure; response to accidents; and emergency road closures and reroutes. These emergency activities are necessary to prevent and/or minimize loss of human life or property, critical infrastructure, or sensitive natural resources. By their nature, these events cannot be planned for or directed to areas with less sensitive resources.

Illegal activities like oil spills or wastewater releases are not considered Covered Activities. These will be addressed as Unforeseen Circumstances, but any take of listed species and the mitigation of effects would be addressed under other federal authorities, such as the Federal Water Pollution Control Act or Natural Resource Damage Assessment and Restoration Act.

2.2 Ongoing and Existing Activities Outside of the Reserve System

Certain ongoing or existing activities that occur within the Plan Area may potentially affect Covered Species and their habitats. Generally, these activities involve the operation, maintenance, or repair of existing infrastructure and other facilities, and tend to occur on a routine, regularly scheduled, normal and standard basis or in accordance with regulatory requirements. The sub-sections below define categories of ongoing or existing activities that are covered by the MSHCP Amendment.

2.2.1 Operation and Maintenance of Infrastructure

The operation, maintenance, repair, rehabilitation, and replacement of public and private infrastructure and related facilities that support private development or serve the general public and do not otherwise have a federal nexus are covered by the MSHCP Amendment. This infrastructure may include local highways, roads, bridges, culverts, and other transportation infrastructure; water and other service-related facilities, including flood control and stormwater management facilities, and stream stabilization features (e.g., riprap or drop structures); wastewater treatment, conveyance, and disposal facilities; and natural gas, electrical and telecommunications infrastructure. Activities associated with these operations may involve grading, paving, and resurfacing; construction, repair, rehabilitation, and maintenance of guard rails; signage; bank stabilization, stream restoration and improvement, and channel realignment; road sweeping, sanding, de-icing, and snow removal; lighting; drainage measures associated with roads; maintenance of ditches, back-slopes, and shoulders, including seeding, mowing, weed and dust management; fence repair; delineator post repair; striping; curbing; utility line and facilities repair; and fire hydrant maintenance.

SNWA routine and emergency weir operations and maintenance are Covered Activities including manual and mechanical clearing of vegetation, trash, debris, and silt from the channel, banks and weirs; repairing weir and bank protection facilities; additional installation of erosion control measures (e.g., down drains, sedimentation or stormwater basins). Beyond those activities listed above, the development of the comprehensive integrated flood control system for Clark County by the Clark County Regional Flood Control District and all the activities it entails (Clark County Regional Flood Control District 2026, and any subsequent documents replacing these documents) which do not have a federal nexus will be Covered Activities under the MSHCP Amendment.

2.2.2 Recreational Facilities

A variety of County and city-run recreational facilities are located within the Plan Area. The MSHCP Amendment covers the management, operation, rehabilitation, replacement, repair, maintenance, and ongoing use of existing recreational facilities. These facilities may include, but are not limited to: golf courses, parks, trails, campgrounds, recreation centers, athletic fields, playgrounds, picnic areas, overlooks, and equestrian areas.

2.2.3 Surface Extractive Uses

The MSHCP Amendment covers new surface extractive use activities and the operation and maintenance of existing surface extractive use facilities (e.g., materials such as sand, gravel, limestone, clay, granite, and fill materials) on non-federal lands where BLM does not have retained mineral rights. In locations where BLM has retained mineral rights, the Section 7 process will be available to permit incidental take of listed species; therefore, the MSHCP Amendment does not cover surface extractive uses in these locations. These existing extractive use activities are expected to continue for the duration of the permit. Mining or subsurface extractive use is not a Covered Activity.

2.2.4 Habitat Management

Habitat management is an integral component of the MSHCP Amendment and will occur in accordance with the provisions of the MSHCP Amendment as described in Chapter 6. The MSHCP Amendment covers all habitat management activities undertaken for the purpose of

benefiting Covered Species and other sensitive resources. Habitat management activities shall be conducted in accordance with MSHCP Amendment approved guidelines. Covered Activities include conducting habitat assessments and population surveys, restoration, enhancement, and creation of habitat, scientific investigation into species' biological characteristics, and all other management and monitoring activities prescribed by the MSHCP Amendment. These activities are not restricted to the Reserve System.

2.2.5 Education and Interpretation

Programs that are designed to provide the public with an increased awareness and understanding of Covered Species, as well as other environmental and natural resource issues, are covered by the MSHCP Amendment. Public outreach efforts related to this MSHCP Amendment may include opportunities for the public to participate in educational and interpretive programs. Activities relating to such programs may include guided field trips, workshops, habitat monitoring, and other observational activities.

2.2.6 Ongoing Agricultural Activities

Ongoing agricultural activities involve practices customary and necessary for the continuation of existing agricultural operations. These activities include grazing, crop rotation, plowing, fencing, seeding, cultivating, minor drainage modification, burning, mowing, and harvesting. Application of fertilizer, herbicide, and/or pesticide for agricultural purposes is not a Covered Activity.

2.3 Covered Activities Inside the Reserve System

Incidental take of Covered Species may occur within the boundaries of the Reserve System because of land management activities. The Reserve System is made up of both public and private lands and described further in Chapter 6. Activities occurring within the federal Reserve System Units will be subject to review under NEPA and Section 7 of the ESA and will be governed by the CMAs for each Reserve Unit. The following section describes the Covered Activities that may result in incidental take in the non-federal Reserve System.

2.3.1 Reserve System Management, Monitoring and Scientific Research Activities

Management techniques, including but not limited to, law enforcement, fuel modification, fire management, weed control, access control, public use and recreation, and habitat enhancement and restoration may cause incidental take in the Reserve System. Monitoring and scientific research activities may also cause incidental take. These include but are not limited to capture and relocation to prevent injury or death, trapping and handling, enhancement of plant propagation, and the use of recorded vocalizations. Pesticide and herbicide use is allowable in the Reserve System if needed to achieve Biological Goals and Objectives and will be applied by a licensed and authorized applicator in accordance with applicable laws and regulations and label recommendations. As a result of the limited, law- and label-abiding application, pesticide and herbicide use as part of the Reserve System management is not expected to result in take of Covered Species and is not a Covered Activity.

The DCP may adopt rules for the management and research of the Reserve System to protect Covered Species and their habitat, in accordance with the respective Reserve Unit CMAs. Reserve management, monitoring, and research activities shall be designed to avoid or reduce impacts to Covered Species and their habitat to the greatest extent practicable. In addition, as

appropriate, these activities are subject to the avoidance and minimization measures described in Chapter 6.

2.3.2 Emergency, Safety and Police Services

Local, state, and federal law enforcement entities will be allowed access to the Reserve System as necessary to enforce applicable laws. Medical, rescue, firefighting operations, and other emergency service providers will be allowed access to the Reserve System to carry out operations necessary for the health, safety, and welfare of the public. Local law enforcement agencies and other entities such as the National Guard or Immigration and Naturalization Service operating within the Reserve System are subject to existing state and federal laws. The MSHCP Amendment will not create additional permit requirements for these entities beyond those of existing state and federal laws.

2.3.3 Infrastructure Construction and Maintenance

The Reserve System is designated as a right-of-way avoidance area with the exception of existing rights-of-way and existing designated transportation and utility corridors. However, necessary and unavoidable infrastructure and improvements may need to be conducted in the Reserve System for the health, safety, and welfare of the public. Maintenance and upgrades to existing energy infrastructure that do not involve increasing the infrastructure footprint are a Covered Activity. Such upgrades are required to adhere to Avian Power Line Interaction Committee (APLIC) guidelines. The DCP does not have authority to restrict establishment of or construction within new rights-of-way on BLM land within the Reserve System. The CMAs between BLM, USFWS, and the County address rights-of-way and will include requirements to minimize impacts.

The issuance of new rights-of-way and the construction of improvements, facilities, and infrastructure within private lands of the Reserve System, which may have adverse impacts to the Reserve System, shall only be allowed after it has been demonstrated to the DCP and USFWS that the proposed use cannot reasonably be located outside the Reserve System and only after the project has incorporated measures to avoid or reduce impacts to Covered Species and their habitat. The DCP may adopt rules for the construction of unavoidable infrastructure as necessary in order to effectively manage the Reserve System and protect Covered Species and their habitat. In addition, as appropriate, these activities shall be subject to the avoidance and minimization measures described in Chapter 6, Conservation Program, and any other such measures deemed appropriate by the DCP and/or USFWS to minimize and mitigate the adverse impacts to the Reserve System to the greatest extent practicable.

2.3.4 Emergency Repairs

Public infrastructure facilities and utilities are currently located in areas within the Reserve System and may be constructed in the future in the Reserve System in accordance with the Covered Activities described above. From time to time, emergency repairs may be required to these facilities as necessary for the health, safety, and welfare of the public.

2.3.4.1 Emergency Repairs on Non-Federal Lands

Emergency repair activities on non-federal lands within the Reserve System shall be a Covered Activity. The following procedures will be employed for emergency repairs that occur on non-federal lands outside the boundaries of existing cleared areas in the Reserve System:

- The entity(s) initiating the emergency repair will notify the DCP that a repair is necessary; after-the-fact notification will occur within 72 hours for emergency repairs that must be carried out immediately for the protection of public health and safety.
- Immediately upon notification, the DCP will conduct a site visit with emergency repair staff to assess the situation and determine if the repair may affect MSHCP resources. Recommendations will be made regarding methods for implementing the emergency repair while minimizing environmental impacts, including any necessary post-repair restoration efforts resulting from actual repair activities. Sensitive areas will be flagged in the field to assist in providing direction for repair crews.
- If necessary, the DCP will conduct on-site monitoring during the repair.
- Upon completion of the repair, the DCP will assess and document on-site conditions and include such documentation in the administrative record of the MSHCP Amendment; if warranted, restoration plans will be prepared for areas disturbed by the repair and the DCP will oversee implementation of such plans.

2.3.4.2 Emergency Repairs on Federal Lands

Emergency repair activities that occur on public lands within the Reserve System are not included as a Covered Activity. The CMAs and Implementing Agreement between BLM, USFWS, and the County will address communication and documentation of emergency activities on these lands for the purposes of MSHCP Amendment administrative reporting.

2.3.5 Public Access and Recreation

Public access and recreation rules for each Reserve System Unit will be subject to CMAs and the Las Vegas Resource Management Plan (BLM 1998 as amended or subsequent document replacing this). Reserve System Units, including the nine federal land Reserve Units and the BCCE, shall be open to the public. Privately owned riparian reserves within the Reserve System may be open to the public on a case-by-case basis.

All roads and trails in the Reserve System shall be designated as either “open” or “closed.” Within the federal Reserve Units, this will occur through a formal travel and transportation planning process, subject to NEPA. All public access within the Reserve System shall be via roads and trails designated as “open.” Maintenance and improvements to open roads and trails, and installation and maintenance of kiosks, signs, fences and barriers to manage public access within the non-federal Reserve Units is a Covered Activity in the MSHCP Amendment. No new roads or trails will be authorized except to provide access to private property or where no feasible alternative exists and the action is considered a necessary and unavoidable infrastructure as described in Section 2.3.3.

The DCP may adopt rules for public access activities as necessary to effectively manage the Reserve System and protect Covered Species and their habitat. Management and maintenance of public access shall be designed to avoid or reduce impacts to Covered Species and resources to the greatest extent possible. In addition, as appropriate, these activities are subject to the avoidance and minimization measures described in Chapter 6.

Non-consumptive public access and recreation activities that may result in incidental take within the Reserve System include, but are not limited to: hiking, bird watching, mountain biking and horseback riding on designated open trails, photography, picnicking and camping in designated areas, OHV and motorized vehicle use (restricted to 25 miles per hour [mph] or less on designated

open roads and trails), hunting and trapping as allowed by permit by the State of Nevada, and geocaching and orienteering, limited to existing locations and designated open roads and trails. These activities may result in limited incidental take; however, they are not expected to adversely impact Covered Species or their habitat within the Reserve System such that population declines would result. Other recreational uses and activities not defined herein shall be allowed on a case-by-case basis as determined by the BLM and DCP to be consistent with the purposes of the MSHCP Amendment. The DCP may adopt rules for all recreational activities as necessary to effectively manage recreation in the Reserve System and protect Covered Species and their habitat.

Organized recreational events on public lands within the Reserve System will be subject to BLM permitting and requirements defined in the BLM's Resource Management Plan (BLM 1998 as amended or subsequent document replacing this) and CMAs.

Recreational activities shall be managed to avoid or reduce impacts to Covered Species and resources. In addition, as appropriate, these activities are subject to the avoidance and minimization measures described in Chapter 6.

2.3.6 Collection of Flora and Fauna

Incidental take from non-commercial and casual collection of vegetation and biological specimens will only be authorized within the Reserve System on a case-by-case basis by permit issued by the DCP and relevant state and federal agencies when consistent with the purposes of the MSHCP Amendment. The DCP may adopt rules for non-commercial and casual collection activities as necessary in order to effectively manage collection in the Reserve System and protect Covered Species and their habitat. Non-commercial and casual collection shall be managed to avoid or reduce impacts to Covered Species and resources. In addition, as appropriate, these activities are subject to the avoidance and minimization measures described in Chapter 6.

Commercial collection of flora and fauna shall be prohibited unless allowed by Nevada Revised Statute, in which case it shall be a Covered Activity. The DCP may adopt rules for commercial collection activities in the Reserve System as necessary to effectively manage this activity and protect Covered Species and their habitat. Commercial collection activities shall be managed to avoid or reduce impacts to Covered Species and resources. In addition, as appropriate, these activities are subject to the avoidance and minimization measures described in Chapter 6.

2.3.7 Activities not Covered by the Incidental Take Permit in the Reserve System

Activities listed below are not covered by the MSHCP Amendment, but in some cases may be authorized through other regulatory processes.

- Motorized travel off designated open roads.
- Competitive and organized motor vehicle activities.
- Travel on or maintenance of closed roads and trails.
- Mining or surface extractive activities.
- Military maneuvers.
- Construction of new energy development or production (other than as described in Section 2.3.3).
- Clearing for agriculture.

- Landfills and refuse disposal.
- Grazing by cattle, burros, horses, and domestic sheep unless specifically allowed in the BLM's Resource Management Plan.
- Commercial flora and/or fauna harvest or collection, unless authorized by state or federal regulations.
- Non-commercial collection of vegetation, except by permit issued by the DCP, and relevant state and federal agencies.
- Non-commercial collection of biological specimens, except by permit issued by the DCP and relevant state and federal agencies.
- Dumping, littering.
- Depositing of captive or displaced desert tortoises or other animals in the Reserve System, except pursuant to desert tortoise translocation and population augmentation authorized by the USFWS.
- Uncontrolled dogs.
- Discharge of firearms, except in connection with licensed and permitted hunting or trapping and target shooting in designated areas.
- Issuance of additional rights-of-way or construction of any physical improvement, except as provided in Section 2.3.3 above.

3.0 COVERED SPECIES

This chapter summarizes the baseline information for the covered species in the Plan Area and the habitat models later used in Chapter 5 to quantify impacts and mitigation.

3.1 Ecosystems

The MSHCP Amendment Plan Area encompasses a broad and ecologically diverse landscape. To systematically describe and map the ecosystems present within the Plan Area, the Amendment characterizes biological resources using the division level (Level 4) of the U.S. National Vegetation Classification (USNVC), the standardized national classification maintained under the National Vegetation Classification Standard (NVCS) for consistent description and reporting of vegetation across the United States (Faber-Langendoen et al. 2025; USNVC Database Version 3.0 2025). At the division level, the USNVC groups vegetation into broad combinations of dominant and diagnostic growth forms and plant species that reflect biogeographic differences in composition, mesoclimate, geology, substrates, hydrology, and disturbance regimes. Each division is treated in this Plan as an ecosystem and described in detail in Chapter 4.

The USNVC classification used in the Amendment reflects a series of changes over time in how the Plan's ecosystems have been defined and mapped. The original 2000 MSHCP organized the Plan Area into eleven ecosystems (alpine, bristlecone pine, mixed conifer, pinyon-juniper, sagebrush, blackbrush, salt desert scrub, Mojave desert scrub, mesquite/catclaw, desert riparian/aquatic, and springs), each treated as an ecological zone arrayed by elevation and range, together with an "other" category for features such as sand dunes, gypsum soils, rock outcrops, dry lake beds, and playas (RECON 2000). These ecosystems were delineated using native vegetative habitat associations derived from the statewide Gap Analysis Program (Homer 1996) and mapped from the corresponding Gap Analysis land cover dataset (RECON 2000). This vegetation-based, ecological-zone framework served as the organizing structure for habitat conservation planning throughout the original Plan.

The boundaries of these eleven ecosystems were refined over the following decade as mapping methods and source data improved. Heaton et al. (2011) updated and refined the ecosystem boundaries within Clark County using remote sensing classification (applying the AdaBoost algorithm to spectral and topographic data), a newly developed county-wide geomorphology dataset, texture metrics derived from high-resolution imagery, and additional field data collection. That effort was not intended to define new ecosystems or redefine existing ones, but to produce a more accurate spatial representation of the same eleven ecosystems, and the resulting models achieved higher overall mapping accuracy than the original Gap Analysis coverage (Heaton et al. 2011). The work confirmed that the broad ecological pattern of the County was well established, and found that the greatest mapping uncertainty occurred along transitions between ecosystems, particularly across elevation gradients and between desert scrub types.

For the Amendment, the Program moved from this locally defined, vegetation-based framework to the USNVC, a national standard for classifying vegetation. Using the USNVC places the Plan's ecosystems within a nationally recognized classification, improves comparability with other regional planning and monitoring efforts, and allows the classification to be updated as the USNVC is revised. The Plan Area's ecosystems are now defined as USNVC divisions and mapped from the Cogan Technology, Inc. Taxonomic Classification for Vegetation Map for Clark County Project (Cogan Technology, Inc. 2022), with vegetation map units crosswalked to USNVC divisions. The ecosystems recognized under the Amendment correspond closely to those used in the original Plan, but are now defined as USNVC divisions. For example, the warm desert scrub

formerly mapped as Mojave desert scrub, salt desert scrub, and blackbrush is now included within the North American Warm Desert Scrub and Grassland division.

The USNVC organizes vegetation into a tiered hierarchy, with divisions representing a broad physiognomic and biogeographic level of classification. Twelve USNVC ecosystem divisions have been identified as occurring within the Plan Area, spanning a range from high-elevation alpine tundra to warm desert scrublands and from wetland marshes to interior chaparral. In addition, Chapter 4 describes one transitional category (Urban Interface Mojave Desert Scrub) and two non-vegetated land cover categories (Vacant and Developed) that together account for a substantial portion of the Plan Area (Figure 3-1). The 15 ecosystems further described in Chapter 4, within the Plan Area are:

- Californian Forest and Woodland
- North American Warm Desert Scrub and Grassland
- North American Western Interior Brackish Marsh, Playa and Shrubland
- Rocky Mountain Forest and Woodland
- Southwestern North American Warm Desert Freshwater Marsh and Bosque
- Western North American Alpine Tundra
- Western North American Cool Semi-Desert Scrub and Grassland
- Western North American Grassland and Shrubland
- Western North American Interior Chaparral
- Western North American Interior Flooded Forest
- Western North American Pinyon – Juniper Woodland and Scrub
- Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland
- Urban Interface Mojave Desert Scrub
- Vacant
- Developed

3.2 Critical Habitat

Critical Habitat has been finalized for two covered species, desert tortoise (USFWS 1994b) and southwestern willow flycatcher (USFWS 2013), both with Critical Habitat within the Plan Area, as shown in Figure 3-2. Critical Habitat for western yellow-billed cuckoo and monarch butterfly has been proposed, but no proposed Critical Habitat for these species is within the Plan Area (USFWS 2020, 2024a). Critical Habitat descriptions are provided in the species descriptions below for desert tortoise and southwestern willow flycatcher (Sections 3.5.21.2 and 3.5.19.2).

Esri, CGIAR, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

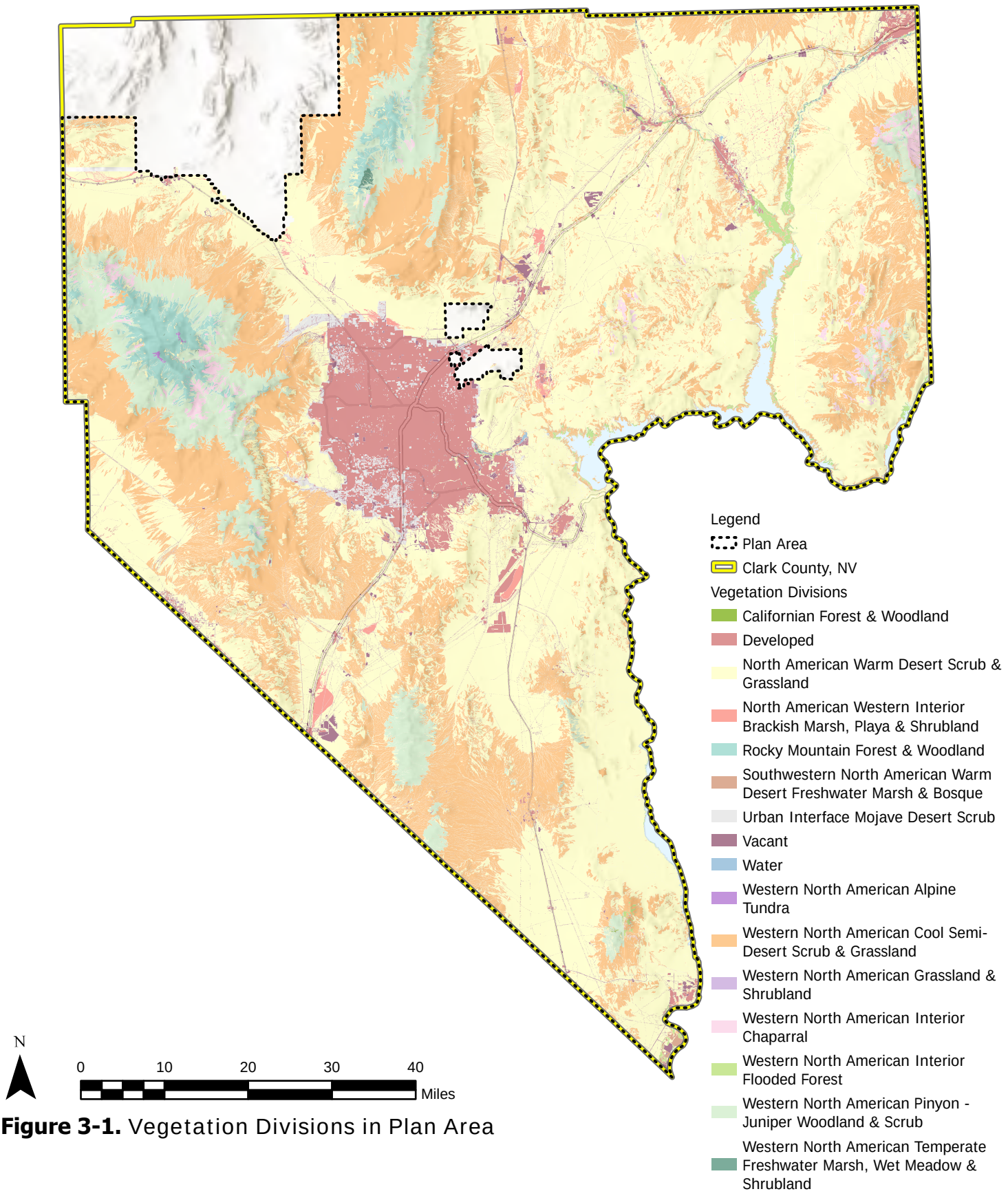

Figure 3-1. Vegetation Divisions in Plan Area

Scale: 1:1,000,000

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Clark County, NV,
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Desert Conservation Program

Esri, CGIAR, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

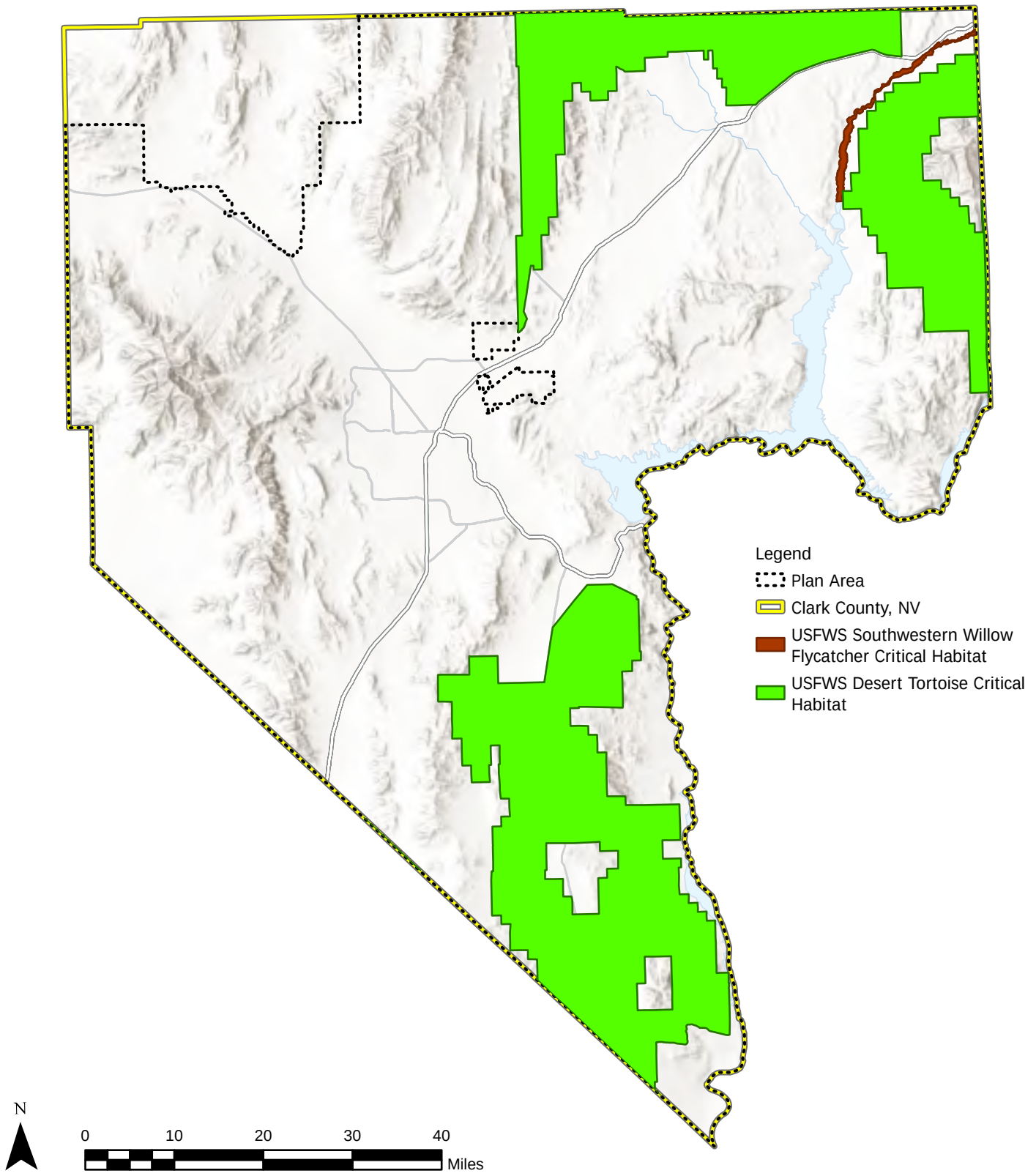

Figure 3-2. Critical Habitat in Plan Area

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of the data delineated herein.

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Desert Conservation Program

3.3 Recovery Plans

Recovery plans have been published for three covered species: desert tortoise (USFWS 2011), southwestern willow flycatcher (USFWS 2002), and Yuma Ridgway's rail (USFWS 2009). The latter has not been finalized.

3.3.1 Desert Tortoise

The recovery plan for desert tortoise was revised in 2011 (USFWS 2011) and provided updated information on the species, threats, and management since the initial recovery plan was published in 1994 (USFWS 1994a). Factors identified for species recovery include high adult survivorship, maintenance of genetic variability and ecological heterogeneity to allow adaptation, and preservation of contiguous and connected habitats. Based on this, three recovery goals were identified:

1. Demography. Maintain self-sustaining populations of desert tortoises within each recovery unit into the future.
    a. Criterion 1. Rates of population change for desert tortoises are increasing over at least 25 years, as measured:
        i. By extensive, range-wide monitoring across tortoise conservation areas within each recovery unit, and
        ii. By direct monitoring and estimation of vital rates (recruitment, survival) from demographic study areas within each recovery unit.
2. Distribution. Maintain well-distributed populations of desert tortoises throughout each recovery unit.
    a. Criterion 2. Distribution of desert tortoises throughout each tortoise conservation area is increasing over at least 25 years.
3. Habitat. Ensure that habitat within each recovery unit is protected and managed to support long-term viability of desert tortoise populations.
    a. Criterion 3. The quantity of desert tortoise habitat within each desert tortoise conservation area is maintained with no net loss until tortoise population viability is ensured. When parameters relating habitat quality to tortoise populations are defined and a mechanism to track these parameters established, the condition of desert tortoise habitat should also be demonstrably improving.

Recovery units were revised from the initial 1994 Recovery Plan, and there are a total of five Recovery Units (USFWS 2011). The Plan Area is predominantly within the Northeastern Mojave and Eastern Mojave Recovery Units, but the southern tip of the Plan Area is within the Colorado Desert Recovery Unit. Recovery Actions described to achieve the recovery goals and criteria but are not defined by recovery unit. Recovery Actions include conserving intact habitat; increase law enforcement; restore desert tortoise habitat; restrict, designate, and fence roads; connect functional habitat; minimize impacts to tortoises from livestock grazing; monitor population growth and distribution within recovery units; conduct research on the restoration of desert tortoise habitat; and improve demographic models. The Conservation Strategy for the MSHCP Amendment (see Chapter 6) incorporates many of the Recovery Actions outlined in the Revised Recovery Plan to work towards the species recovery within the three Northeastern, Eastern and Colorado Desert Recovery Units.

3.3.2 Southwestern Willow Flycatcher

The recovery plan for southwestern willow flycatcher was finalized in 2002 (USFWS 2002), and the primary cause for the species decline was identified as loss and modification of habitat.

Recovery objectives and criteria are described in terms of minimum number of territories and geographic distribution of the territories to support metapopulation dynamics. A total of nine Recovery Actions were described:

1. Increase and improve occupied, suitable, and potential breeding habitat;
2. Increase metapopulation demographic stability;
3. Improve demographic parameters;
4. Minimize threats to wintering and migration habitat;
5. Survey and monitor;
6. Conduct research;
7. Provide public education and outreach;
8. Assure implementation of laws, policies, and agreements that benefit the flycatcher; and
9. Track recovery progress.

Six Recovery Units with internal Management Units are described in the 2002 Recovery Plan. The Plan Area contains a portion of the Lower Colorado River Recovery Unit and portions of five Management Units (Middle Colorado, Virgin, Pahranagat, Hoover - Parker). Locations within the Plan Area which are identified to focus recovery efforts because of existing and potentially suitable habitat are:

1. Virgin River between Littlefield, AZ and Lake Mead delta, NV (Virgin Management Unit, Lower Colorado River Recovery Unit)
2. Muddy River from headwaters to Interstate Route 15 (Pahranagat Management Unit, Lower Colorado River Recovery Unit)
3. Muddy River from Overton Wildlife Management Area to Lake Mead (Pahranagat Management Unit, Lower Colorado River Recovery Unit)

The step-down narrative for the Recovery Actions for increasing and improving suitable and potentially suitable habitat include management of fire and livestock grazing to maintain habitat quality; restoration of groundwater, base flows, and flooding; management of exotic plant species; protect areas from recreation; development and enhancement of habitat near extant populations; and management of brown-headed cowbird parasitism. The Conservation Strategy for the MSHCP Amendment (see Chapter 6) incorporates many of the Recovery Actions outlined in the 2002 Recovery Plan to work towards the species recovery within the Lower Colorado River Recovery Unit.

3.3.3 Yuma Ridgway's Rail

The recovery plan for the Yuma Ridgway's rail was finalized in 1983, and a revision was drafted in 2009 but has not been finalized. The primary threat identified in the 1983 Recovery Plan is marsh habitat loss from water diversions and the need to actively maintain remaining habitat in the altered systems. Recovery criteria include development of management plans, surveys documenting stable or increasing populations, and water contracts providing water to support occupied habitats. The Recovery Actions identified to satisfy the criteria area:

1. Determine the minimum number of breeding birds in the U.S. that provides for a statistically and genetically secure population.
2. Provide for coordinated annual surveys of populations in core habitat areas in the U.S. with expansion to other habitats as appropriate.
3. Cooperate with agencies in Mexico to survey populations there.

4. Refine knowledge of physical factors that provide for suitable habitat to contribute to management actions and creation of new habitat areas.
5. Refine knowledge of habitat use to ensure protection and management of sufficient habitat to support desired U.S. population levels.
6. Determine the level of risk to Yuma Ridgway's rail from existing and potential levels of selenium in occupied habitats.
7. Identify migration pathways between the three core populations to assess metapopulation status and contribute to determinations on minimum population size and habitat necessary to support that population.
8. Ensure that existing core habitat areas and newly created habitats are protected and managed for long-term habitat suitability.
9. Through the Recovery Implementation Team, collaborate on research and monitoring to effectively implement the plan and address issues affecting the species in Mexico.
10. Work with all potential partners to develop cooperative conservation efforts to support the implementation of the plan and recovery of the species.
11. Use adaptive management to update and revise the plan or tasks as pertinent new information becomes available.

No recovery units or management areas were identified. This species is narrowly distributed, and the focus is on the Recovery Actions identified above throughout its range. Marsh habitat associated with the Virgin and Colorado Rivers in the Plan Area are within the range of this species as described below in Section 3.5.22. The Conservation Strategy for the MSHCP Amendment (Chapter 6) incorporates many of the Recovery Actions outlined in the 2009 Draft Revised Recovery Plan to work towards the species recovery.

3.4 Covered Species Habitat Models

Habitat suitability models were developed for all 28 covered species within Clark County to predict and define the distribution of potentially suitable habitat (SWECO 2018; Nussear and Simandle 2020; Nussear et al. 2024; Simandle and Nussear 2025). These models informed three core elements of this plan: understanding the spatial distribution of suitable habitat within the Plan Area, estimating potential effects from Covered Activities (Chapter 5), and developing the Conservation Strategy (Chapter 6). Detailed model methods including environmental covariates, species life history requirements, and full model results, are provided in Appendix A. A summary of species habitat requirements and model results is presented in this chapter.

All models were built using the best available information. Occurrence and observational data were compiled from public databases, public agencies, and species experts, and a conceptual model for each species was developed through scientific literature review. Environmental covariates were then selected based on *a priori* hypotheses tied to each species' ecological requirements. Initial models were developed in 2018 and 2020 (SWECO 2018; Nussear and Simandle 2020). Subsequent field verification efforts funded by the DCP between 2020 and 2025 generated additional occurrence data across all 28 species, which combined with research-grade observations from iNaturalist and the Global Biodiversity Information Facility (GBIF) were used to refine and improve the models in later updates (Nussear et al. 2024; Simandle and Nussear 2025). The most recent updates also incorporated the NVCS spatial vegetation dataset (Cogan Technologies, Inc. 2022).

Models were constructed using an ensemble approach that integrates four statistical algorithms: generalized additive models (GAM), random forests (RF), MaxEnt, and generalized boosted regression models (GBM). Ensemble modeling reduces susceptibility to the biases and limitations

inherent in any single method while broadening the range of environmental response functions that can be detected (Araújo and New 2006). Each covered species was modeled twice, once using the base environmental covariates alone and once adding the NVCS vegetation dataset as a categorical predictor. Because that layer is categorical, algorithms that cannot accommodate a categorical predictor, such as GAM, were not carried into the vegetation-inclusive run, and additional algorithms were excluded where they did not converge or did not meet the ensemble performance threshold. As a result, the vegetation-inclusive run for a given species may rely on fewer than four algorithms.

The vegetation-inclusive run was used as the governing model for all covered species except the western burrowing owl (*Athene cunicularia hypugaea*). For the burrowing owl, many occurrence records fell near the edge of or outside the mapped vegetation layer and within disturbed areas. Because a large proportion of the undeveloped occurrence points lay outside the vegetation layer, the vegetation-inclusive model was skewed toward developed areas, and this bias was compounded by edge effects along the layer boundary. The base model, without the vegetation layer, was therefore used for the western burrowing owl.

Maps depicting the habitat suitability models and Plan Area boundary are included in each covered species summary in this chapter. The final habitat suitability model outputs were overlain with the vegetation divisions (further described in Chapter 4) within Clark County, and habitat suitability categories (high, medium, and low suitability) are shown in a table below for each species. These habitat suitability models informed the covered species analysis and were used to calculate the total acreage of suitable habitat within the Plan Area and within lands already managed for conservation, including federally designated areas such as National Conservation Areas, National Monuments, and Areas of Critical Environmental Concern, as well as state and locally managed areas such as Valley of Fire State Park and the Clark County Wetlands Park. This information illustrates what proportion of each species' suitable habitat already falls within protected status. Acreage calculations for the Plan Area and conserved lands are provided within each species summary section below. Lands managed for resource conservation are shown in Figure 4-6 and described in detail in Chapter 4, section 4.1.5.2.

3.5 Covered Species Analysis

As part of the MSHCP Amendment, the Permittees re-evaluated the species list adopted under the original 2000 MSHCP to focus coverage on those species most likely to be at risk, most likely to be affected by Covered Activities during the permit term, and/or most likely to be listed under the federal ESA. The analysis and its results are documented in the Covered Species Analysis Report (WRA 2026), summarized below.

A comprehensive list of more than 400 plant and animal species potentially occurring in or near southern Nevada was assembled, drawing from the 231 species addressed by the original MSHCP (78 Covered Species, 102 Evaluation Species, and 51 Watch List Species), prior covered species analyses, federal and state special-status species lists, and other relevant sources. From this initial list, 68 species were carried forward for detailed evaluation against four criteria applied in a stepwise manner: (1) range, requiring known or likely occurrence within the revised Plan Area during the permit term; (2) status, requiring federal or state listing, candidate status, or a reasonable likelihood of listing within the 50-year permit term; (3) impacts, requiring that at least a portion of the species' distribution overlap private land or land that will become private and be subject to Covered Activities; and (4) data, requiring sufficient information on life history, habitat requirements, and Plan Area occurrence to evaluate impacts and develop scientifically defensible conservation measures. Recommendations were further informed by consultation with species

experts and with the USFWS, Nevada Department of Wildlife (NDOW), NDF, and Nevada Division of Natural Heritage (NDNH).

Of the 68 species evaluated in detail, 28 met all four criteria and are recommended for coverage under the MSHCP Amendment: 13 are currently Covered Species, 9 are current Evaluation Species, 2 are current Watch List Species, and 1 was not previously considered. The MSHCP Amendment will eliminate the Evaluation Species and Watch List Species categories. The 28 recommended Covered Species are the subject of the species summaries that follow.

3.6 Covered Species

3.6.1 Sticky Ringstem (Anulocaulis leiosolenus var. leiosolenus)

3.6.1.1 Habitat Requirements

Sticky ringstem (*Anulocaulis leiosolenus* var. *leiosolenus*) occurs on gypsum outcrops, rolling hills, and terraces within a matrix of Mojave Desert scrub (primarily creosote bush and white bursage) and salt desert scrub ecological systems (Niles et al. 1999 in TNC 2007). Across its range it grows on hillsides and flats with alluvium, gypsum, limestone, rocky, slate, or clay soils (Hernández-Ledesma et al. 2010). In the Mojave Desert, occurrences range from 373 to 717 m (1,223 to 2,352 ft) in elevation (TNC 2007). Denser stands of sticky ringstem are associated with cryptogamic crusts, which stabilize soils and support germination and seedling establishment (Ladyman et al. 1998 in TNC 2007).

3.6.1.2 Occurrences within the Plan Area

Rare plant surveys recorded sticky ringstem at one location in Mud Wash, two locations in Echo Junction, and two locations at Bitter Spring (Ironwood 2022). These occurrences covered approximately 7.8 ha (19.2 ac) of occupied area and 90 individuals. Elevations ranged from 464 to 620 m (1,522 to 2,034 ft). Common associated species recorded across multiple occurrences included Las Vegas bearpoppy (*Arctomecon californica*), silverleaf sunray (*Enceliopsis argophylla*), Torrey's ephedra (*Ephedra torreyana*), and Fremont indigo bush (*Psorothamnus fremontii*).

Surveys in 2023 documented sticky ringstem at Bitter Springs North and Echo Hills North, both new occurrence records. Both occurrences fall within areas classified as optimal habitat suitability by the species-specific habitat model provided by the DCP. Together they covered approximately 0.06 ha (0.16 ac) and 11 individuals, at elevations ranging from 551 to 581 m (1,807 to 1,906 ft). Common associated species recorded across the occurrences included Las Vegas bearpoppy (*Arctomecon californica*), silverleaf sunray (*Enceliopsis argophylla*), creosote bush (*Larrea tridentata*), Parry's sandpaper plant (*Petalonyx parryi*), and Fremont indigo bush (*Psorothamnus fremontii*) (Ironwood 2023a).

3.6.1.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Average Minimum Temperature
- Average Spring Maximum Temperature
- Soil Gypsum Content
- Normalized Difference Vegetation Index (NDVI) Amplitude

- Soil Silt Content
- Slope
- Vegetation Divisions

Soil gypsum content and average spring maximum temperature were the most influential predictors in the vegetation-inclusive model, with average minimum temperature and Normalized Difference Vegetation Index amplitude contributing in the Random Forest model (Nussear et al. 2024).

3.6.1.4 Modeled Habitat Distribution

Predicted suitable habitat for sticky ringstem is concentrated in the Muddy River and Moapa area and near Lake Mead, with reduced predicted habitat west of Las Vegas in the vegetation-inclusive model (Figure 3-3). Occurrence points fell predominantly within the North American Warm Desert Scrub and Grassland, followed by the Western North American Cool Semi-Desert Scrub and Grassland (Nussear et al. 2024) (Table 3-1).

Table 3-1. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for sticky ringstem (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
17,740.86	65,757.88	32,146.63	16,366.54	55,575.69	23,947.12

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

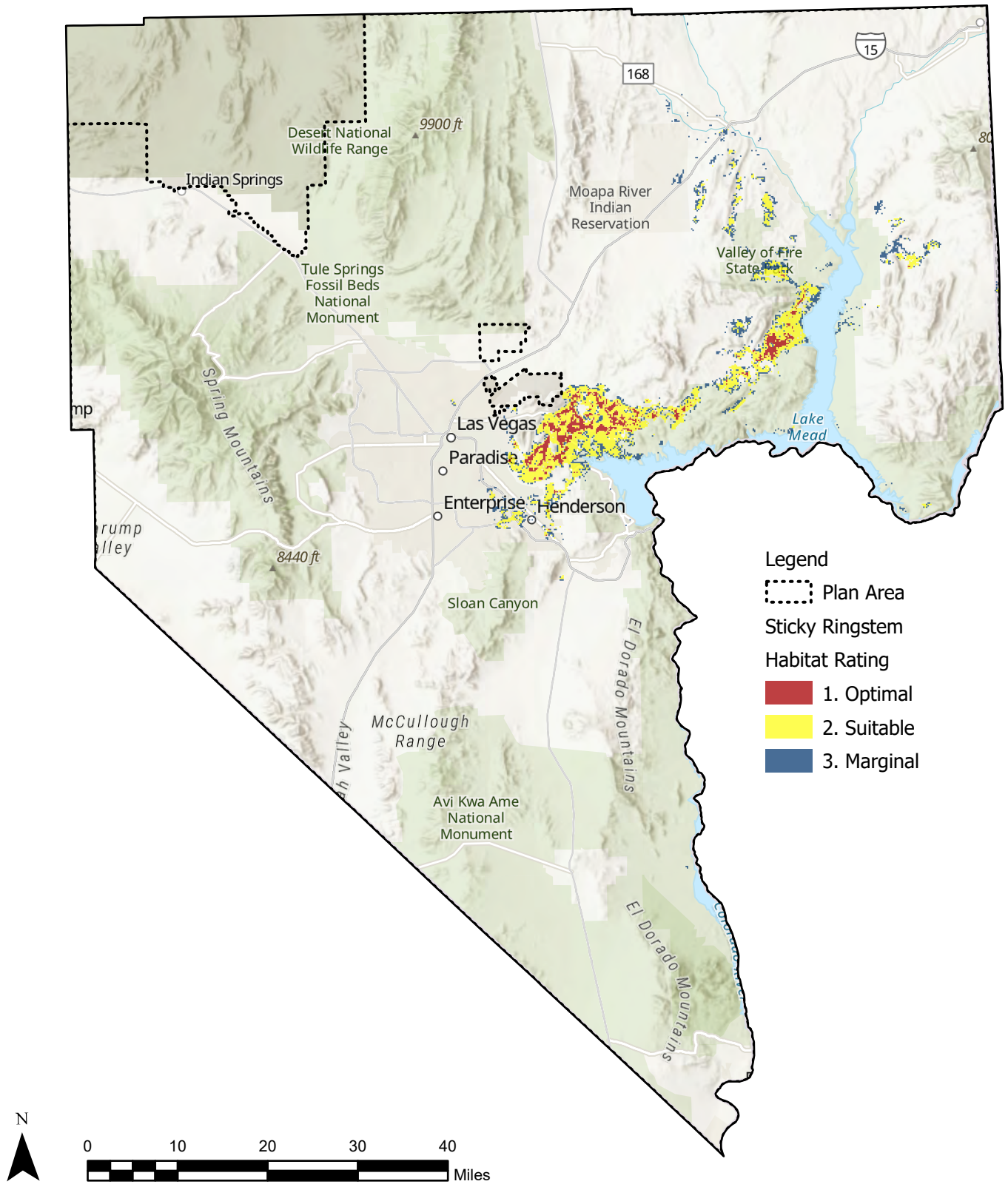

Figure 3-3. Sticky Ringstem Habitat Suitability Model and Plan Area

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3.6.2 Las Vegas Bearpoppy (Arctomecon californica)

3.6.2.1 Habitat Requirements

Las Vegas bearpoppy inhabits sparsely vegetated, low-competition areas within creosote bush (*Larrea tridentata*) and saltbush (*Atriplex* spp.) dominated communities where physical soil crusts limit shrub establishment (Thompson and Smith 1997; Megill et al. 2011). Early studies characterized this species as a gypsum obligate restricted to soils with up to 69 percent gypsum content (Meyer 1987 in Mistretta et al. 1996); however, more recent research has established that Las Vegas bearpoppy is a gypsovag, capable of growing on soils with or without gypsum. Of 2,575 documented observations, 65.4 percent occur on gypsic soils and 34.5 percent occur on calcareous soils derived from limestone parent material (Childers 2004; Drohan and Merkler 2009; Stosich et al. 2022). Occupied soils share distinctive physical characteristics: whitish in color, fluffy and spongy in texture, and forming raised crusts that are easily disturbed, with higher sulfur, calcium, and soluble salt content and lower phosphorus than surrounding soils (Thompson and Smith 1997). Geomorphic surface type and fine-scale soil map unit are better predictors of occurrence than soil chemistry alone, and petrocalcic horizons at approximately 30 cm depth augment available soil moisture within the rooting zone (Duniway et al. 2010; Stosich et al. 2022).

The species is positively associated with shadscale (*Atriplex confertifolia*) and co-occurs frequently with silverleaf sunray (*Enceliopsis argophylla*) and sticky ringstem (*Anulocaulis leiosolenus*) (Megill et al. 2011; Ironwood 2022, 2023a). A well-developed cryptogamic crust is commonly present in occupied habitat and may promote seedling establishment (Morefield 2001; Bailey 2019). Population abundance is highly variable across years and responds strongly to precipitation pulses; long-lived soil seed reserves (viable for up to 19 years) allow populations to persist through extended dry periods when no adult plants are visible aboveground (TNC 2007; Stosich et al. 2022). Seed set is reduced in fragmented populations due to limited specialist pollinator availability, particularly the Mojave poppy bee (*Perdita meconis*), the primary pollinator of this species (Portman et al. 2018; Cornelisse 2018).

3.6.2.2 Occurrences within the Plan Area

Historical and current occurrence data for the Las Vegas bearpoppy within Clark County are found throughout the Las Vegas Valley, extending through the northeast portion of the County, primarily within and adjacent to Lake Mead National Recreation Area. Surveys supporting development of the species' habitat model were conducted in 2020, 2021, and 2023.

During the 2020 surveys, Las Vegas bearpoppy was documented at four locations within St. Thomas Point, encompassing approximately 34 acres (14 ha) of occupied area and 690 individuals across an elevation range of 415 to 462 m (1,362 to 1,516 ft) (Ironwood 2021).

During the 2021 surveys, Las Vegas bearpoppy was documented at six locations within the Echo Junction, Bitter Spring, and Gold Butte West areas, encompassing approximately 22.9 acres (9.3 ha) of occupied area and 579 individuals across an elevation range of 464 to 621 m (1,522 to 2,037 ft) (Ironwood 2022).

During the 2023 surveys, Las Vegas bearpoppy was documented at Bitter Springs North and Echo Hills North, encompassing approximately 0.1 acre (0.04 ha) of occupied area and seven individuals across an elevation range of 550 to 574 m (1,804 to 1,883 ft) (Ironwood 2023a). The reduced detections relative to prior survey years are consistent with below-average precipitation in 2022 and 2023 and reflect normal precipitation-driven population fluctuation rather than long-term decline (Stosich et al. 2022).

3.6.2.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Additive, MaxEnt, Generalized Boosted Regression, and Random Forest models (Nussear et al. 2024):

- Average Spring Maximum Temperature
- Soil Gypsum Content
- Normalized Difference Vegetation Index (NDVI) Amplitude
- Soil Silt Content
- Coefficient of Variation of Winter Precipitation

The most influential predictors of habitat suitability were soil gypsum content, average spring maximum temperature, and the coefficient of variation of winter precipitation (Nussear et al. 2024).

3.6.2.4 Modeled Habitat Distribution

Predicted high-suitability habitat for Las Vegas bearpoppy occurs on exposed gypsum substrates across the Las Vegas Valley and the northeastern portion of Clark County, with the largest concentrations within and adjacent to Lake Mead National Recreation Area, Rainbow Gardens, St. Thomas Point, the Bitter Spring and Echo Junction areas, Gold Butte, and Valley of Fire State Park (Figure 3-4). Bearpoppy locations were largely within North American Warm Desert Scrub and Grassland, with lower presence in Western North American Cool Semi-Desert Scrub and Grassland and in lands classified as developed (Nussear et al. 2024) (Table 3-2).

Table 3-2. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for Las Vegas bearpoppy (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
66,691.64	346,203.18	79,568.92	33,808.55	154,232.25	32,505.82

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

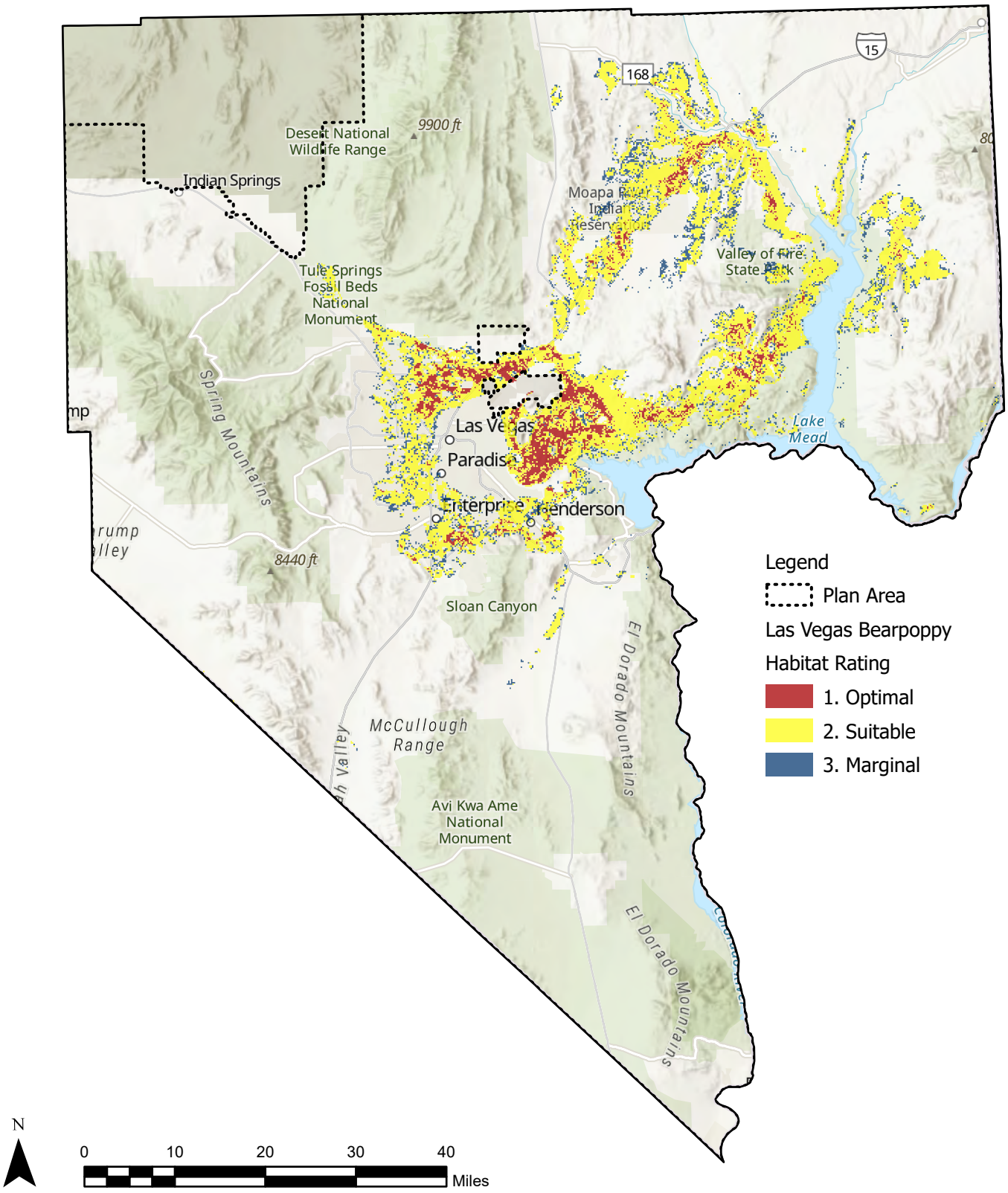

Figure 3-4. Las Vegas Bearpoppy Habitat Suitability Model and Plan Area

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3.6.3 Threecorner Milkvetch (Astragalus geyeri var. triquetrus)

3.6.3.1 Habitat Requirements

Threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*) occurs on sandy aeolian and fluvial deposits derived from the Muddy Creek Formation (TNC 2007). It has been found on deep sand and unconsolidated dunes as well as areas of stabilized sand with cemented or hardened surfaces (Niles et al. 1995 in TNC 2007). The species occurs at elevations from 350 to 850 m (1,150 to 2,790 ft) (NatureServe 2026a).

3.6.3.2 Occurrences within the Plan Area

Historical and current occurrence data for threecorner milkvetch within Clark County are concentrated in the northeast portion of the County, along the Overton Arm and continuing north along the Muddy and Virgin River drainages, with additional populations within the Moapa Indian Reservation and the California Wash area to the south of the reservation. Surveys to support development of the species habitat model were carried out in 2020, 2021, 2022, and 2023.

During the 2020 surveys, threecorner milkvetch was found at 14 locations within six survey areas: Halfway Wash, Logandale Trails, Moapa Indian Reservation, South Mormon Mesa, St. Thomas Point, and Virgin River. These occurrences encompassed approximately 259 individuals (Ironwood 2021).

The species was not detected during the 2021 or 2022 survey seasons. The absence of detections is consistent with the species' dependence on adequate winter and spring precipitation for germination; those years did not receive sufficient precipitation to trigger germination (Ironwood 2022).

During the 2023 surveys, threecorner milkvetch was found at the East Mormon Private and West Mormon 2 survey areas, both of which represent new occurrence records. A total of 14 individuals were documented across the two occurrences (Ironwood 2023a). The lower number of individuals detected in 2023 compared with 2020 is consistent with the species' precipitation-dependent germination, as the 2022 to 2023 season received winter precipitation approaching, but spring precipitation well below, the levels recorded in 2019 to 2020 (Ironwood 2023a).

3.6.3.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Winter Precipitation
- Winter Minimum Temperature
- Normalized Difference Vegetation Index (NDVI) Amplitude
- Slope
- Silica Index
- Soil Sand Content
- Vegetation Divisions

The silica index was the most influential predictor across the model algorithms (Nussear et al. 2024)

3.6.3.4 Modeled Habitat Distribution

Predicted suitable habitat for threecorner milkvetch is concentrated in the northeastern extent of Clark County, particularly the Virgin and Muddy River area, Mormon Mesa, and Moapa (Figure 3-5). Additional medium and high suitability habitat is predicted north of Lake Mead and in the Ivanpah Valley. Vegetation associated with threecorner milkvetch localities was largely within North American Warm Desert Scrub and Grassland (Nussear et al. 2024) (Table 3-3).

Table 3-3. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for threecorner milkvetch (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
28,112	189,287	67,642	9,232	73,577	30,380

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

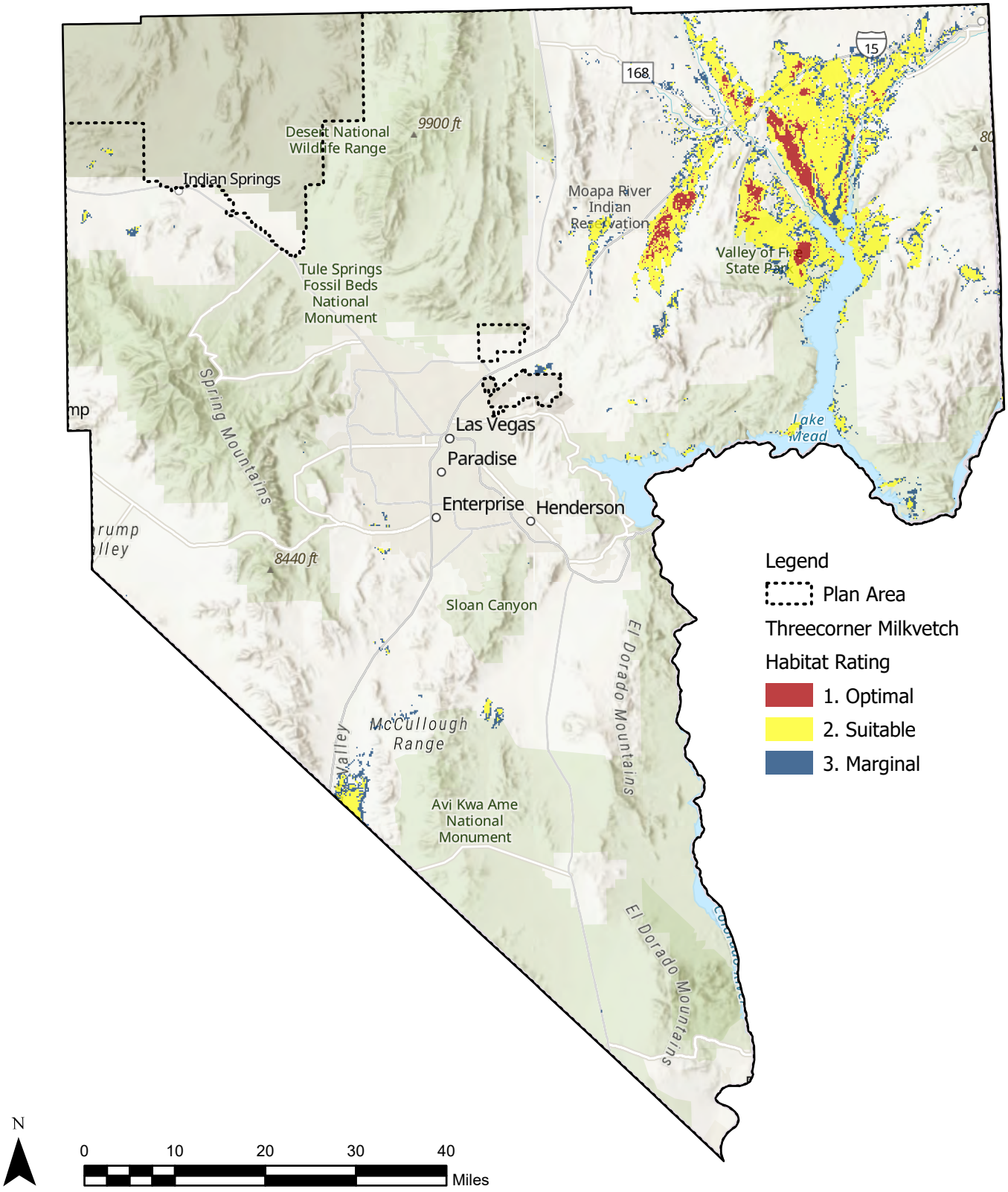

Figure 3-5. Threecorner Milkvetch Habitat Suitability Model and Plan Area

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3.6.4 Blue Diamond Cholla (Cylindropuntia multigeniculata)

3.6.4.1 Habitat Requirements

Blue Diamond cholla (*Cylindropuntia multigeniculata*) typically grows on steep slopes or washes of any aspect, where it is associated with minimal vegetative cover and rocky soils derived from limestone, granite, basalt, or rhyolite (Baker 2005). The type locality at Blue Diamond Hill (Clark County, Nevada) supports plants rooted in a mix of limestone, dolostone, gypsiferous red shale, and claystone, with an average annual precipitation of approximately 239 mm and mean annual temperatures ranging from approximately 9.5°C (49.1°F) (minimum) to 23.4°C (74.1°F) (maximum) (Scoles-Sciulla et al. 2023).

Blue Diamond cholla occurs in Joshua tree (*Yucca jaegeriana*) woodland and Mojave Desert scrubland on rocky slopes, in associations that include creosote bush, white bursage, blackbrush (*Coleogyne ramosissima*), and *Yucca* spp. (Baker 2005, 2016; Scoles-Sciulla et al. 2023). Documented occurrences within Clark County span an elevation range of 1,035 to 1,400 m (3,396 to 4,593 ft) (Baker 2005, 2016), and 2023 surveys documented occupied habitat across a broader mean range of 787 to 1,573 m (2,582 to 5,160 ft) within the Plan Area (Ironwood 2024). The adult root system is fibrous, with shallow lateral roots that quickly develop short-lived root hairs after precipitation, allowing the plant to use shallow soil moisture from small rainfall pulses (Scoles-Sciulla et al. 2023). Adult plants are typically found outside the canopy of shrubs, although seedlings and establishing joints of related *Cylindropuntia* species often establish under nurse plants where soil moisture and organic matter are higher (Scoles-Sciulla et al. 2023).

3.6.4.2 Occurrences within the Plan Area

Occurrence data for Blue Diamond cholla come from several disjunct areas, including the eastern portions of Red Rock Canyon National Conservation Area and Blue Diamond Hill, the Sloan Canyon National Conservation Area and the McCullough Range to the south, the Las Vegas and Sheep ranges within the Desert National Wildlife Refuge, and the Indian Hills area of Lake Mead National Recreation Area and Gold Butte National Monument. Surveys supporting development of the species habitat model were conducted in 2020, 2021, 2022, and 2023.

In 2020, Blue Diamond cholla was detected at a single location within the Frozen Toe Road survey area, in a plant community dominated by desert almond (*Prunus fasciculata*), cliffrose (*Purshia stansburiana*), and Joshua tree (Ironwood 2021).

The 2021 survey detected the species at six locations: three in North Clark County, one in the Desert National Wildlife Refuge, one in the McCullough Mountains, and one at Summit Pass (Ironwood 2022). All six occurrences fell within areas modeled as low to medium habitat suitability under the initial species habitat model, and none within areas modeled as high suitability (SWECO 2018; Ironwood 2022). The largest occurrence, at Summit Pass within Gold Butte National Monument, represented the largest known population of the species at that time (Ironwood 2022).

Additional targeted surveys for Blue Diamond cholla were conducted in 2022 and 2023 (Ironwood 2023b, 2024). These surveys were structured around the initial habitat suitability model and identified 17 general survey areas totaling approximately 20,208 ha (49,934 acres) across Clark County (SWECO 2018; Ironwood 2023b).

The 2022 surveys covered five of the 17 survey areas, encompassing 9,265 ha (22,894 acres) in total, including 5,129 ha (12,675 acres) of modeled habitat. No Blue Diamond cholla were

detected, and the negative data were used to refine the habitat suitability model and the species' distribution within the County (Ironwood 2023b).

The 2023 surveys targeted the remaining 12 survey areas, along with an opportunistic survey at Gann/Walker Spring, and covered 18,002 ha (44,483 acres) in total, including 11,830 ha (29,233 acres) of modeled habitat. Five new occurrence records were documented at Wamp Spring, Gann/Walker Spring, Jumbo, and Summit Pass. Surveys at Summit Pass, first documented in 2021, substantially expanded the known occupied area at that site. Across all 2023 survey areas, the total occupied area was approximately 2,086 ha (5,154 acres), with an estimated 52,068 individuals, at a mean elevation range of 787 to 1,573 m (2,582 to 5,160 ft) (Ironwood 2024). These surveys extended the known range north and east, to within approximately 16 km (10 mi) of Lincoln County, Nevada, and within a few kilometers of the Arizona border (Ironwood 2024).

3.6.4.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Fractional Component Bare Ground
- Depth to Bedrock
- Normalized Difference Vegetation Index Length of Season
- Slope
- Soil First Principal Component
- Absolute Minimum Temperature
- Vapor Pressure Deficit Maximum
- Soil pH
- Silica Index
- Gypsum Content
- Vegetation Divisions

3.6.4.4 Modeled Habitat Distribution

Areas of high habitat suitability for *Cylindropuntia multigeniculata* are broadly distributed across Clark County (Figure 3-6). High suitability generally occurs at mid elevations, whereas suitability is low in valleys and lowlands and at the highest elevations. Highly suitable habitat is found around the periphery of the Sheep Range and adjacent areas of the Las Vegas Range, in the Muddy Mountains, and along the Spring Mountains and the McCullough Range. Moderately suitable habitat is distributed throughout this region (Simandle and Nussear 2025) (Table 3-4).

Table 3-4. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for Blue Diamond cholla (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
15,994	89,801	79,675	15,978	77,188	63,702

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

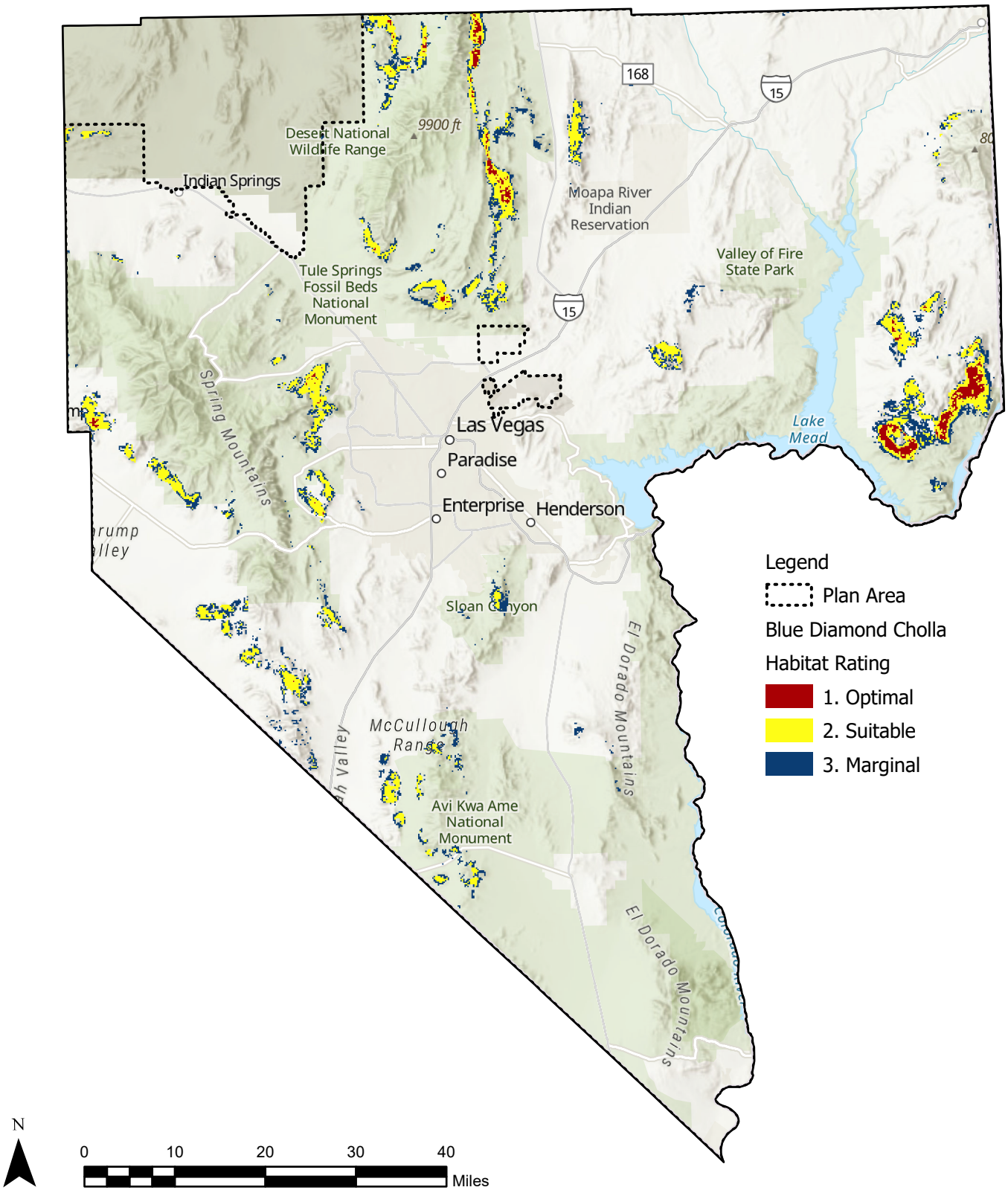

Figure 3-6 Blue Diamond Cholla Habitat Suitability Model and Plan Area

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3.6.5 Silverleaf Sunray (Enceliopsis argophylla)

3.6.5.1 Habitat Requirements

Silverleaf sunray (*Enceliopsis argophylla*) is a perennial forb of dry, open, relatively barren desert habitats. It occurs on gypsum cliffs and badlands, volcanic gravelly slopes, sandy washes, and stony plains and hillsides, generally within the creosote-bursage zone, at elevations of approximately 1,000 to 1,500 m (3,281 to 4,921 ft) (SWECO 2018). The largest populations occupy gypsum soils with well-developed biotic crusts and frequently co-occur with Las Vegas bearpoppy (*Arctomecon californica*); these gypsum and sandy soils are fragile and sensitive to surface disturbance. Common perennial associates include catclaw acacia (*Senegalia greggii*), white bursage (*Ambrosia dumosa*), Torrey ephedra (*Ephedra torreyana*), big galleta (*Pleuraphis rigida*), and Fremont indigo bush (*Psorothamnus fremontii*) (Bangle et al. 2010).

3.6.5.2 Occurrences within the Plan Area

Silverleaf sunray is a local endemic that occurs almost entirely within Clark County, Nevada, with a limited range extension into Mohave County, Arizona, near Lake Mead and the Grand Canyon-Parashant National Monument area. An estimated 61 occurrences are documented rangewide, the majority concentrated near Lake Mead National Recreation Area (NatureServe 2026b). Within Clark County, the species occurs in the Rainbow Gardens area and extends through the northeastern portion of the County.

Rare plant surveys conducted for the Desert Conservation Program in 2020, 2021, and 2023 documented numerous occurrences of silverleaf sunray within the Plan Area. The 2020 survey recorded the species at St. Thomas Point (Ironwood 2021). The 2021 survey recorded it at Gold Butte, Gold Butte West, Mud Wash, Echo Junction, Bitter Spring, and West Lake Mead (Ironwood 2022). The 2023 survey recorded it at Arrow Canyon, Bitter Springs North, Echo Hills North, and Lava, all of which were new occurrence records (Ironwood 2023a).

3.6.5.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Winter Minimum Temperature
- Gypsum Potential
- Normalized Difference Vegetation Index (NDVI) Maximum
- Surface Texture (ATI)
- Winter Precipitation
- Roughness (TRI)
- Vegetation

The most influential predictors in this model were gypsum potential, winter minimum temperature, and NDVI maximum (Nussear et al. 2024).

3.6.5.4 Modeled Habitat Distribution

Predicted suitable habitat for silverleaf sunray is broadly distributed across north-central Clark County, including the north shore of Lake Mead, with the highest-suitability habitat concentrated in gypsum-influenced landscapes near Lake Mead National Recreation Area (Figure 3-7). The vegetation associated with silverleaf sunray localities was predominantly North American Warm

Desert Scrub and Grassland, with smaller elements of Western North American Cool Semi-Desert Scrub and Grassland (Nussear et al. 2024) (Table 3-5).

Table 3-5. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for silverleaf sunray (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
40,035	155,843	83,282	37,321	114,904	51,129

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

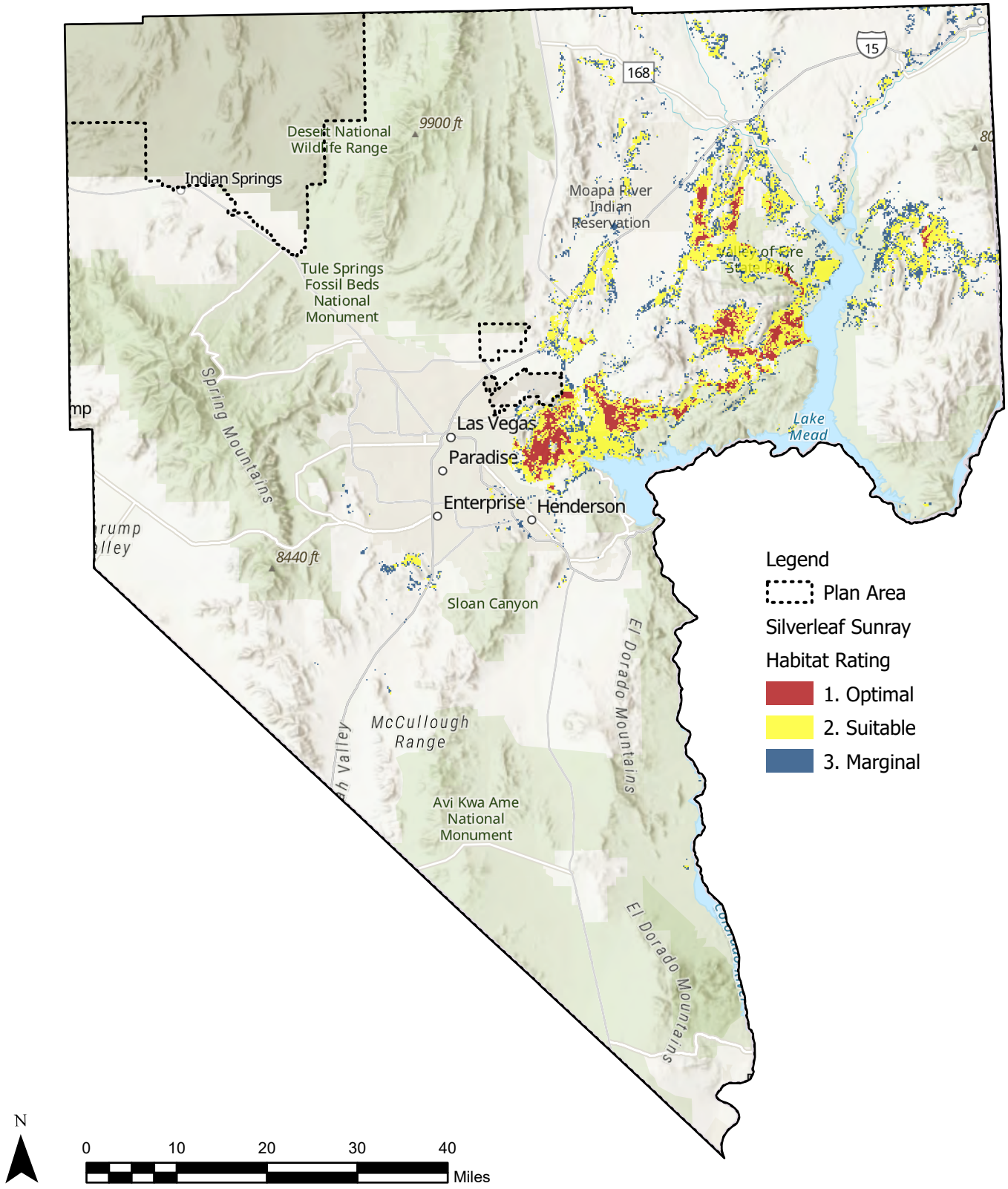

Figure 3-7. Silverleaf Sunray Habitat Suitability Model and Plan Area

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3.6.6 Pahrump Valley Buckwheat (Eriogonum bifurcatum)

3.6.6.1 Habitat Requirements

Pahrump Valley buckwheat (*Eriogonum bifurcatum*) occurs in valley bottoms, playa margins, and adjacent shore terraces on substrates that are typically saline, heavy clay, or silty hardpan soils derived from Quaternary alluvial deposits. The species occupies a narrow elevational range of approximately 700 to 853 m (2,297 to 2,800 ft), with known occurrences averaging approximately 778 m in elevation (TNC 2007). Occurrences are most prevalent on flat ground; where the species occurs on slopes, it is most common on southwest to northwest exposures and rarely occurs on slopes steeper than 14 degrees (TNC 2007). Common shrub associates in occupied habitat include shadscale (*Atriplex confertifolia*), desert holly (*Atriplex hymenelytra*), western honey mesquite (*Prosopis glandulosa* var. *torreyana*), Torrey sea-blite (*Suaeda torreyana*), and spiny hopsage (*Grayia spinosa*) (TNC 2007). Pahrump Valley buckwheat is a seed-banking annual that exhibits wide population fluctuations between years, with abundance strongly correlated to winter precipitation (TNC 2007).

3.6.6.2 Occurrences within the Plan Area

Occurrence data for Pahrump Valley buckwheat within Clark County are largely concentrated in Sandy Valley along the Nevada/California border, with an additional documented occurrence adjacent to Tecopa Road near the Clark/Nye County line. Targeted surveys were conducted in 2020, 2021, and 2023.

The 2020 survey found Pahrump Valley buckwheat at the Pahrump, Sandy Valley, and Stateline PEAL survey areas, totaling 17,573 individuals occupying 12.79 acres across an elevation range of 804 to 893 m (2,638 to 2,930 ft). Common associates at multiple occurrences included shadscale, desert holly, Nevada joint fir, creosote bush, and desert pepperweed (*Lepidium fremontii*) (Ironwood 2021).

Pahrump Valley buckwheat was not detected during 2021 surveys despite efforts targeting suitable habitat. This absence was attributed to drought conditions, as annual precipitation in both 2020 and 2021 fell below the 30-year average. The above-average precipitation of 2019 is thought to have stimulated germination during the 2020 growing season, while two consecutive below-average years suppressed annual plant populations in 2021 (Ironwood 2022).

Surveys in 2023 found Pahrump Valley buckwheat at the Near Sandy Valley and Rural ERBI survey areas, with four occurrences totaling approximately 246.8 acres (99.8 ha) and an estimated 92,064 individuals. Three of the four occurrences were within 0.5 mi of an existing record, and the largest single occurrence covered approximately 234.4 acres at Near Sandy Valley. Mean elevation across occurrences ranged from 796 to 828 m (2,611 to 2,716 ft). Common associated species at multiple occurrences included white bursage, shadscale, little desert trumpet (*Eriogonum trichopes*), and creosote bush (Ironwood 2023a). NatureServe ranks Pahrump Valley buckwheat as imperiled (S2) in Nevada (NatureServe 2026c).

3.6.6.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Average Maximum Temperature
- Soil Clay Content

- Extreme Minimum Temperature
- Slope
- Soil Silt Content
- Vegetation Divisions

Slope, extreme minimum temperature, and average maximum temperature were the most influential predictors in the vegetation-inclusive model (Nussear et al. 2024)

3.6.6.4 Modeled Habitat Distribution

Predicted suitable habitat for Pahrump Valley buckwheat in Clark County is concentrated in and around Sandy Valley along the Nevada/California border (Figure 3-8). The vegetation-inclusive ensemble model identifies a small additional patch of suitable habitat near the Corn Creek area along the U.S. 95 corridor. Modeled localities were most strongly associated with North American Warm Desert Scrub and Grassland vegetation (Nussear et al. 2024) (Table 3-6).

Table 3-6. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for Pahrump Valley buckwheat (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
1,314	6,786	6,920	-	1,520	4,171

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

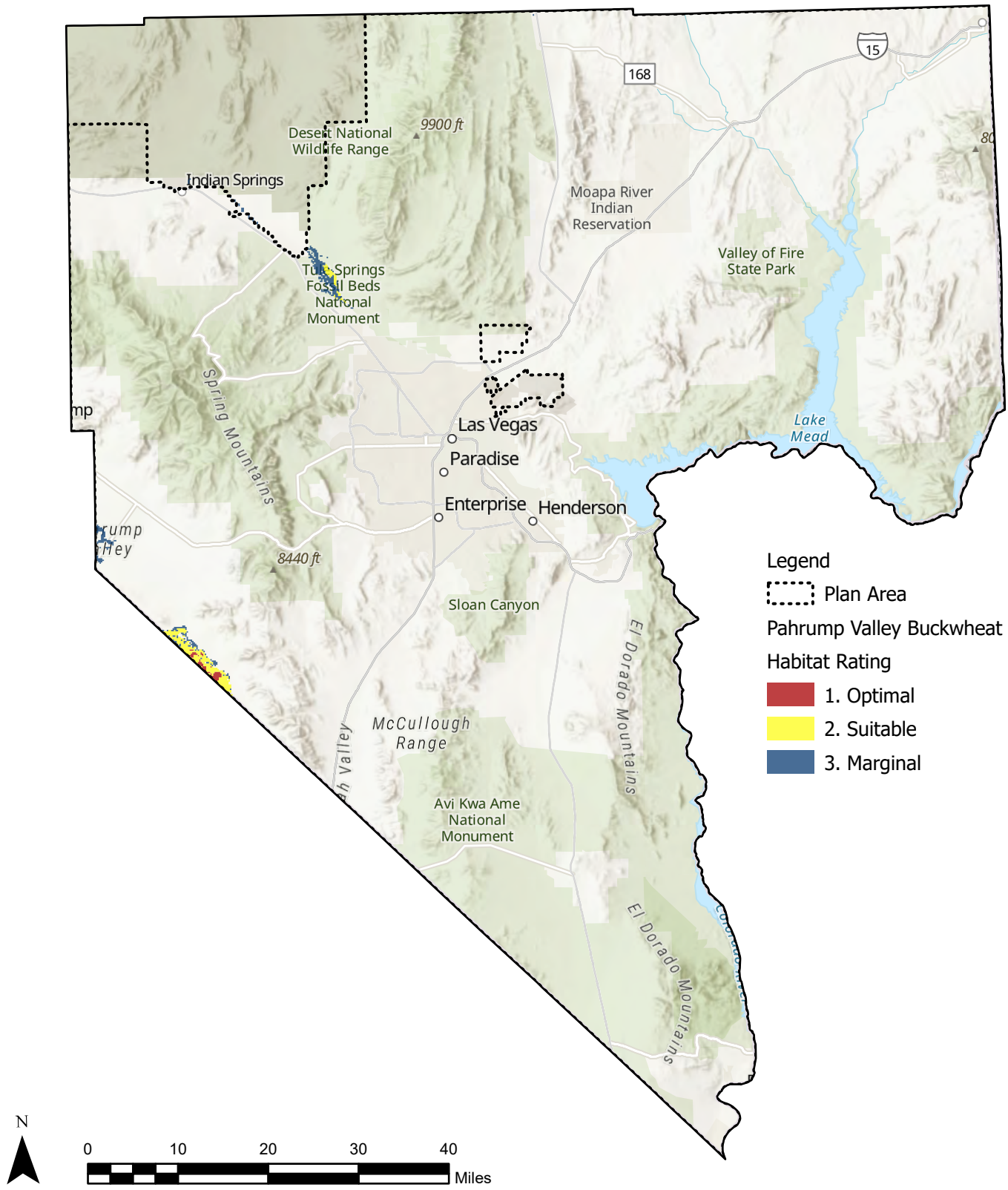

Figure 3-8. Pahrump Valley Buckwheat Habitat Suitability Model and Plan Area

Scale: 1:1,000,000

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3.6.7 Las Vegas Buckwheat (Eriogonum corymbosum var. nilesii)

3.6.7.1 Habitat Requirements

Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*) occurs in the Lake Mead National Recreation Area of east Clark County, the Las Vegas Valley, Toquop Wash in Lincoln County, and Coyote Springs Valley in both Clark and Lincoln counties, Nevada. This species is strongly associated with soils with high gypsum content, clay beds, or high-boron content shales. Las Vegas buckwheat typically occurs with other gypsophilic species on sparsely vegetated sites with cryptogamic soil crusts, at elevations ranging from 200 to 850 m (656 to 2,789 ft) (Meyer 1986, Drohan and Merkler 2009, USFWS 2014a). The species often forms low mounds or outcrops in washes and drainages, or in areas of generally low relief, often with *Arctomecon californica* and other gypsum-tolerant species, surrounded by white bursage, desert prince's plume (*Stanleya pinnata*), shadscale, Torrey's ephedra, creosote bush, Gregg acacia (*Acacia greggii*), Torrey sea-blite, and Fremont's dalea (NNHP 2004).

3.6.7.2 Occurrences within the Plan Area

Historic and current occurrence data for Las Vegas buckwheat within Clark County are located within the Las Vegas Valley, the Bowl of Fire, Bitter Springs Valley, White Basin, in the central region of Gold Butte National Monument, and in the Coyote Springs Valley. Surveys to support development of the species habitat model were carried out in 2020, 2021, and 2023.

Las Vegas buckwheat was not encountered during the 2020 survey (Ironwood 2021), and surveys were not completed in the species' expected range in that year due to unfavorable drought conditions that limited identification opportunities for this taxon.

Rare plant surveys in 2021 identified a single inconclusive occurrence of Las Vegas buckwheat at one location in Gold Butte. The identification was not confirmed due to morphological similarity between Las Vegas buckwheat and *Eriogonum corymbosum* var. *aureum* and the poor condition of specimens resulting from drought conditions during fieldwork (Ellis et al. 2018, Ironwood 2022). Surveyors recommended revisiting the occurrence under improved conditions and collecting voucher specimens for herbarium deposit to support taxonomic review (Ironwood 2022).

Las Vegas buckwheat was not encountered during the 2023 survey season, despite targeted surveying of suitable habitat in the species' expected range around Las Vegas and to the northeast in the Gold Butte National Monument and Mesquite areas (Ironwood 2023a).

3.6.7.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Additive, MaxEnt, Generalized Boosted Regression, and Random Forest models (Nussear et al. 2024):

- Average Maximum Temperature
- Gypsum Content
- Normalized Difference Vegetation Index (NDVI) Amplitude
- NDVI Maximum
- Soil Silt Content
- Start of Season (Day)
- Coefficient of Variation of Winter Precipitation

The most influential predictors in the base model were coefficient of variation of winter precipitation and average maximum temperature, with gypsum content and NDVI amplitude also contributing substantially (Nussear et al. 2024).

3.6.7.4 Modeled Habitat Distribution

High-suitability habitat is predicted to occur in urban Las Vegas and south of Coyote Springs, with pockets of medium-suitability habitat east of the Las Vegas Valley, in the Muddy Mountains, and west of the Weiser Valley, Indian Springs Valley, Three Lakes Valley, and the northwestern end of the Las Vegas Valley (Figure 3-9). The vegetation associated with Las Vegas buckwheat localities was largely attributed to Land Use and Development, with secondary attribution to North American Warm Desert Scrub and Grassland and Western North American Cool Semi-Desert Scrub and Grassland (Nussear et al. 2024) (Table 3-7).

Table 3-7. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for Las Vegas buckwheat (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
16,888	70,940	60,986	803	13,204	23,267

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

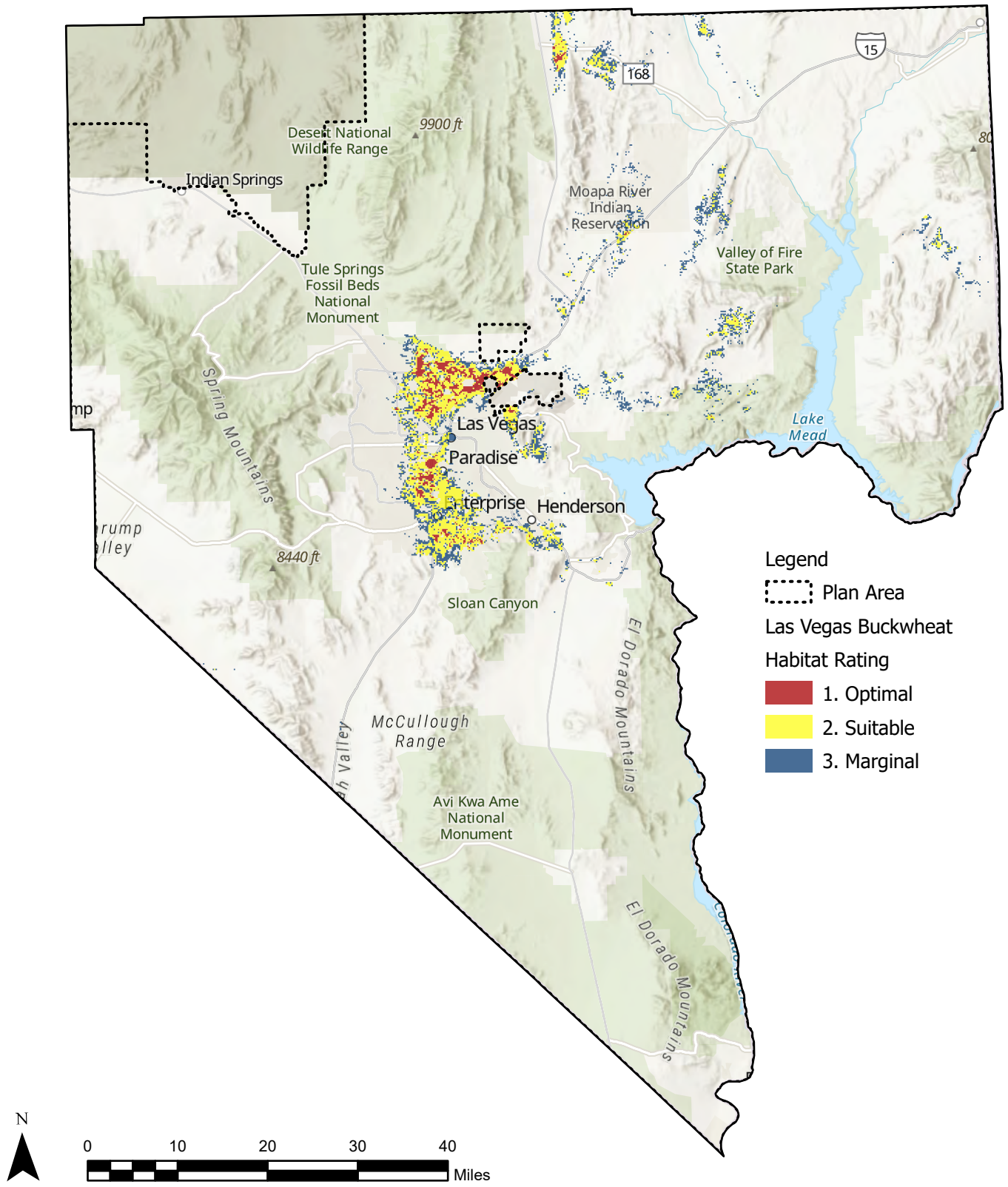

Figure 3-9. Las Vegas Buckwheat Habitat Suitability Model and Plan Area

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3.6.8 Sticky Buckwheat (Eriogonum viscidulum)

3.6.8.1 Habitat Requirements

Sticky buckwheat (*Eriogonum viscidulum*) occurs primarily in Clark County, Nevada, but some populations also occur in adjacent Lincoln County, Nevada and the extreme northwest corner of Mohave County, Arizona (TNC 2007). The species grows in deep, loose sandy soils, including dunes, open beach sand, sandy slopes along the Lake Mead shoreline, sandy dry washes, roadsides, and sandy flats and slopes within shrub communities (Morefield 2001, TNC 2007). It is strictly dependent on sand dunes or deep sand in Nevada and can withstand moderate temporary disturbance (Morefield 2001). Recorded elevations range from approximately 366 to 767 m (1,200 to 2,515 ft) (TNC 2007), and common associates include white bursage, creosote bush, big galleta, Torrey's jointfir, and Fremont indigo bush (Morefield 2001).

3.6.8.2 Occurrences within the Plan Area

Within Clark County, sticky buckwheat occurrences are concentrated in the northeastern portion of the County around the confluence of the Muddy and Virgin Rivers and extend south along Lake Mead (TNC 2007). Rare plant surveys within the Plan Area were conducted in 2020, 2021, and 2023. Because sticky buckwheat is an annual, population size and the number of observable occurrences fluctuate considerably from year to year depending on seasonal precipitation (NatureServe 2026d).

Surveys in 2020 detected sticky buckwheat in the Halfway Wash and South Mormon Mesa survey areas (Ironwood 2021). The species was not encountered during the 2021 survey despite targeted searches of suitable habitat, an absence attributed to consecutive years of below-average precipitation that suppressed germination of this annual species (Ironwood 2022). Surveys in 2023 detected sticky buckwheat in the East Mormon 2, West Mormon 2, and West Mormon 3 survey areas, two of which were new records for the Plan Area (Ironwood 2023a).

3.6.8.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Average Spring Maximum Temperature
- Depth to Bedrock
- Percentage of Coarse Fragments
- Soil Sand Content
- Coefficient of Variation of Winter Precipitation
- Vegetation Divisions

The most influential predictors in the vegetation-inclusive model were average spring maximum temperature, percentage of coarse fragments, and coefficient of variation of winter precipitation (Nussear et al. 2024).

3.6.8.4 Modeled Habitat Distribution

Predicted suitable habitat for sticky buckwheat is concentrated in the northeastern portion of Clark County, in and around the confluence of the Muddy and Virgin Rivers, and extends into the Muddy Mountains and adjacent sandy habitats in the eastern part of the County (Figure 3-10). The vegetation-inclusive model associated high-suitability habitat more closely with the Muddy and

Virgin River areas than the base model. Modeled localities were most commonly associated with North American Warm Desert Scrub and Grassland and Western North American Cool Semi-Desert Scrub and Grassland vegetation types (Nussear et al. 2024) (Table 3-8).

Table 3-8. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for sticky buckwheat (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
74,675	157,405	25,285	36,899	74,729	13,701

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

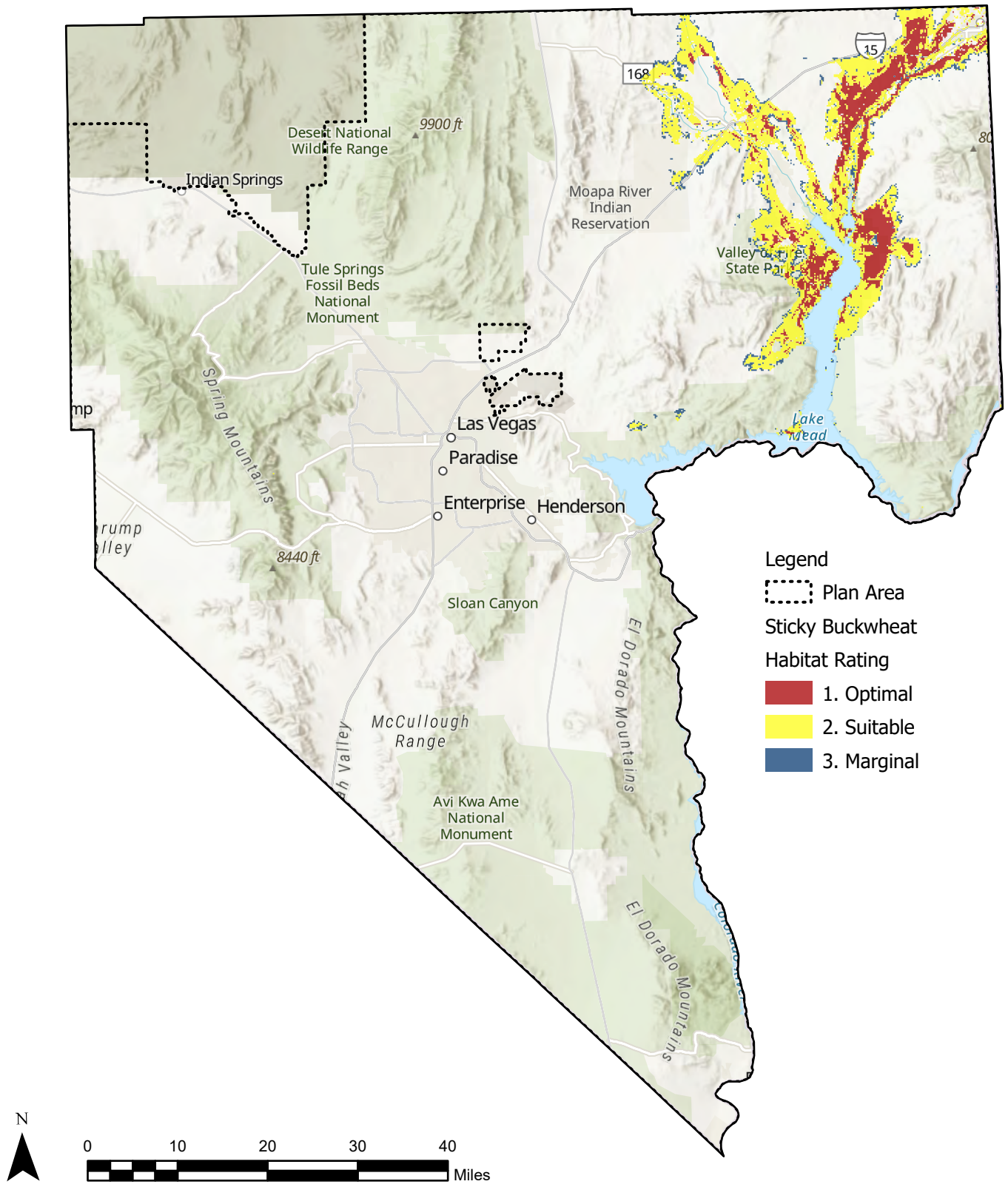

Figure 3-10. Sticky Buckwheat Habitat Suitability Model and Plan Area

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3.6.9 White-margined Beardtongue (Penstemon albomarginatus)

3.6.9.1 Habitat Requirements

White-margined beardtongue (*Penstemon albomarginatus*) occurs in Clark and Nye Counties, Nevada; San Bernardino County, California; and Mohave County, Arizona, at elevations ranging from approximately 2,750 to 5,890 feet (838 to 1,795 m) in Nevada (Morefield 2001), with occurrences in Clark County documented between approximately 2,805 and 2,985 feet (855 to 910 m) (Ironwood 2023a). It grows in sandy substrates at the base of hills and mountains in wind-blown areas, including stabilized sand dunes, sand sheets, and loose sand washes. It may also occur in fine alluvial sand in wide canyon bottoms and washes within a creosote bush scrub community, where deep, stabilized sands support the species' long taproot (Ironwood 2021; NatureServe 2026e). In California, white-margined penstemon is found in deep, stabilized alluvial sands; in Nevada, it occurs where shrub cover is less than 20 percent and where there is an accumulation of carbonates in the surface soil (Etyemezian et al. 2010). The species is most frequently associated with creosote bush, white bursage, and big galleta vegetation associations (Smith 2001; Ironwood 2020). The species' deep taproot system makes it dependent on substrates where stable, deep sands can hold the root in place (NatureServe 2026e).

3.6.9.2 Occurrences within the Plan Area

Within the Plan Area, white-margined beardtongue occurs in southern Clark County, where it is distributed among four population groups separated by intervening hills: Ivanpah Valley, Hidden Valley, Roach Lake, and Jean Lake (TNC 2007; DeFalco et al. 2023). Suitable sandy habitat in Clark County is limited, and the species has narrow habitat requirements (Ironwood 2021). Surveys to support development of the habitat suitability model were conducted in 2020, 2021, and 2023.

The 2020 survey recorded white-margined beardtongue at four locations in the Jean Dry Lake survey area (Ironwood 2021). The species was not encountered during the 2021 survey, when two consecutive years of below-average precipitation were noted as having reduced the abundance and vigor of perennial plants across the survey areas (Ironwood 2022). The 2023 survey documented the species at the Hidden Valley Disposal and Jean Lake East survey areas, including one new occurrence record (Ironwood 2023a).

3.6.9.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for white-margined beardtongue included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Depth to Bedrock
- Soil Sand Content
- Extreme Minimum Temperature
- Slope
- Winter Precipitation
- Coefficient of Variation of Winter Precipitation
- Vegetation Divisions

The most influential predictors in this model were the Coefficient of Variation of Winter Precipitation, Depth to Bedrock, and Soil Sand Content (Nussear et al. 2024)

3.6.9.4 Modeled Habitat Distribution

Predicted suitable habitat for white-margined beardtongue in Clark County is concentrated along the Interstate 15 corridor, concordant with known localities, with limited predicted habitat around the perimeter of Las Vegas (Figure 3-11). Modeled localities were associated predominantly with North American Warm Desert Scrub and Grassland and Western North American Cool Semi-Desert Scrub and Grassland vegetation types (Nussear et al. 2024) (Table 3-9).

Table 3-9. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for White-margined beardtongue (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
8,695	29,445	18,037	3,567	9,322	5,306

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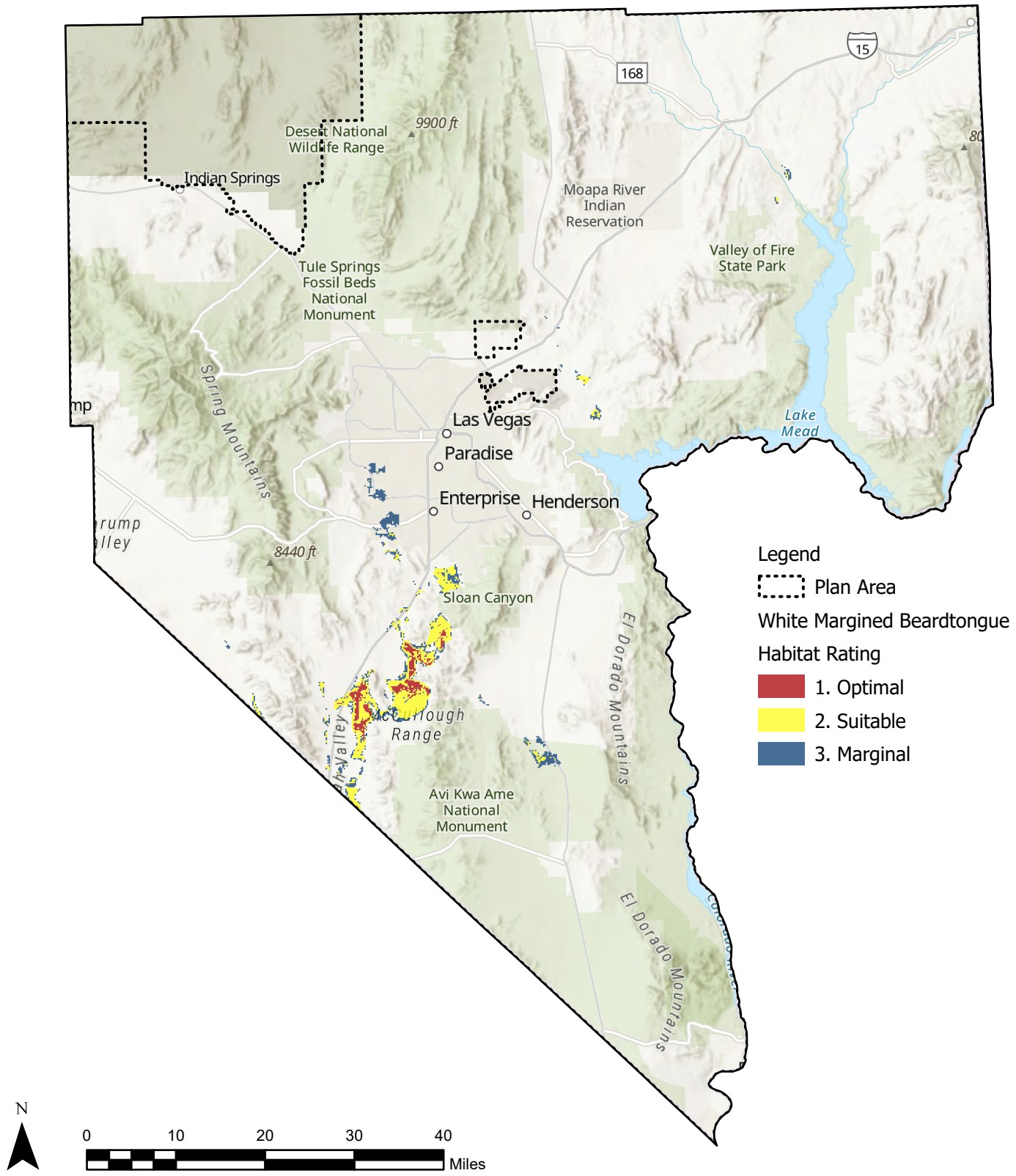

Figure 3-11. White Margined Beardtongue Habitat Suitability Model and Plan Area

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3.6.10 Eastern Joshua Tree (Yucca jaegeriana)

3.6.10.1 Habitat Requirements

The eastern Joshua tree (*Yucca jaegeriana*) is a near-endemic of the Mojave Desert, occurring in Arizona, California, Nevada, and Utah, and is the only Joshua tree species known to occur in Clark County (Lenz 2007, SWECO 2018, NatureServe 2026f). It is a habitat generalist, occurring on flats, gentle slopes, mesas, and bajadas on a variety of substrates, typically igneous but also silty, loamy, or sandy soils, within plant communities ranging from Yellow Pine Forest to Sonoran Desert (Lenz 2007, USFWS 2018). Within Clark County the species occurs across a range of soil origins, including granite, volcanic, sandstone, and various limestone substrates including dolomite, but generally not in the very fine soils of playas in lower valley bottoms (SWECO 2018). Joshua trees in Clark County typically occur at elevations of 762 to 1,372 m (2,500 to 4,500 ft) (Benson and Darrow 1981, Rowlands 1978, Cole et al. 2011).

The species tolerates a wide range of temperatures, with winter lows of approximately 4°C (39°F) and summer highs of approximately 46°C (110°F), and has some tolerance for saline and alkaline soils (USFWS 2018). It tends to occur where precipitation is distributed relatively consistently throughout the year, although total annual precipitation varies across its range (Lenz 2007, USFWS 2018). Successful reproduction depends on obligate pollination by the yucca moth (*Tegeticula antithetica*), which distinguishes *Y. jaegeriana* from the western Joshua tree (*Y. brevifolia*), pollinated by *T. synthetica* (Pellmyr and Segraves 2003). In Clark County, young eastern Joshua trees establish beneath nurse plants such as white bursage (*Ambrosia dumosa*) and blackbrush (*Coleogyne ramosissima*), and the species co-occurs with other yuccas including banana yucca (*Yucca baccata*) and Mojave yucca (*Yucca schidigera*) (SWECO 2018, Lenz 2007).

3.6.10.2 Occurrences within the Plan Area

Eastern Joshua trees are widespread throughout the Plan Area, occupying higher-elevation valley bottoms, bajadas, and lower mountain slopes (SWECO 2018). The most extensive and robust populations occur along U.S. Highway 93 north and south of Searchlight and westward to the California state line, an area that includes Clark County's Joshua Tree Highway and extends across low passes in the McCullough Mountains toward Sheep Mountain (SWECO 2018). Additional stands occur around the western base of the Virgin Mountains and at similar elevations within Gold Butte National Monument, on Mormon Mesa to the north, in the valleys and bajadas between the Arrow Canyon Range and the Desert Range, on the Nevada Test and Training Range, and across much of the desert habitat on the north side of the Spring Mountains and south of State Route 95; Joshua trees nearly encompass the Spring Mountains, Mount Potosi, and the Stateline Mountains (SWECO 2018). Locality data compiled for the habitat suitability model consisted of a very large number of records with a high degree of spatial overlap; spatial thinning reduced the dataset to 54,653 records used for model training and testing (Simandle and Nussear 2025). NatureServe ranks the eastern Joshua tree as vulnerable to apparently secure in Nevada (S3S4) (NatureServe 2026f).

3.6.10.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Percentage of Coarse Fragments
- Soil First Principal Component

- Minimum Temperature
- Vapor Pressure Deficit Maximum
- Winter Precipitation
- Coefficient of Variation of Winter Precipitation
- Vegetation Divisions
- Soil pH

The most influential predictors in the model were the Vapor Pressure Deficit Maximum, Minimum Temperature, Coefficient of Variation of Winter Precipitation, and the Soil First Principal Component (Simandle and Nussear 2025).

3.6.10.4 Modeled Habitat Distribution

Highly suitable habitat for the eastern Joshua tree is broadly distributed across Clark County (Figure 3-12). The primary areas of highly suitable habitat occur at mid-range elevations, with suitability generally high along the periphery of mountain ranges and low in valley bottoms and at extreme elevations (Simandle and Nussear 2025) (Table 3-10).

Table 3-10. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted suitability for Eastern Joshua tree (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
613,751	1,085,262	291,686	440,607	795,719	198,560

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

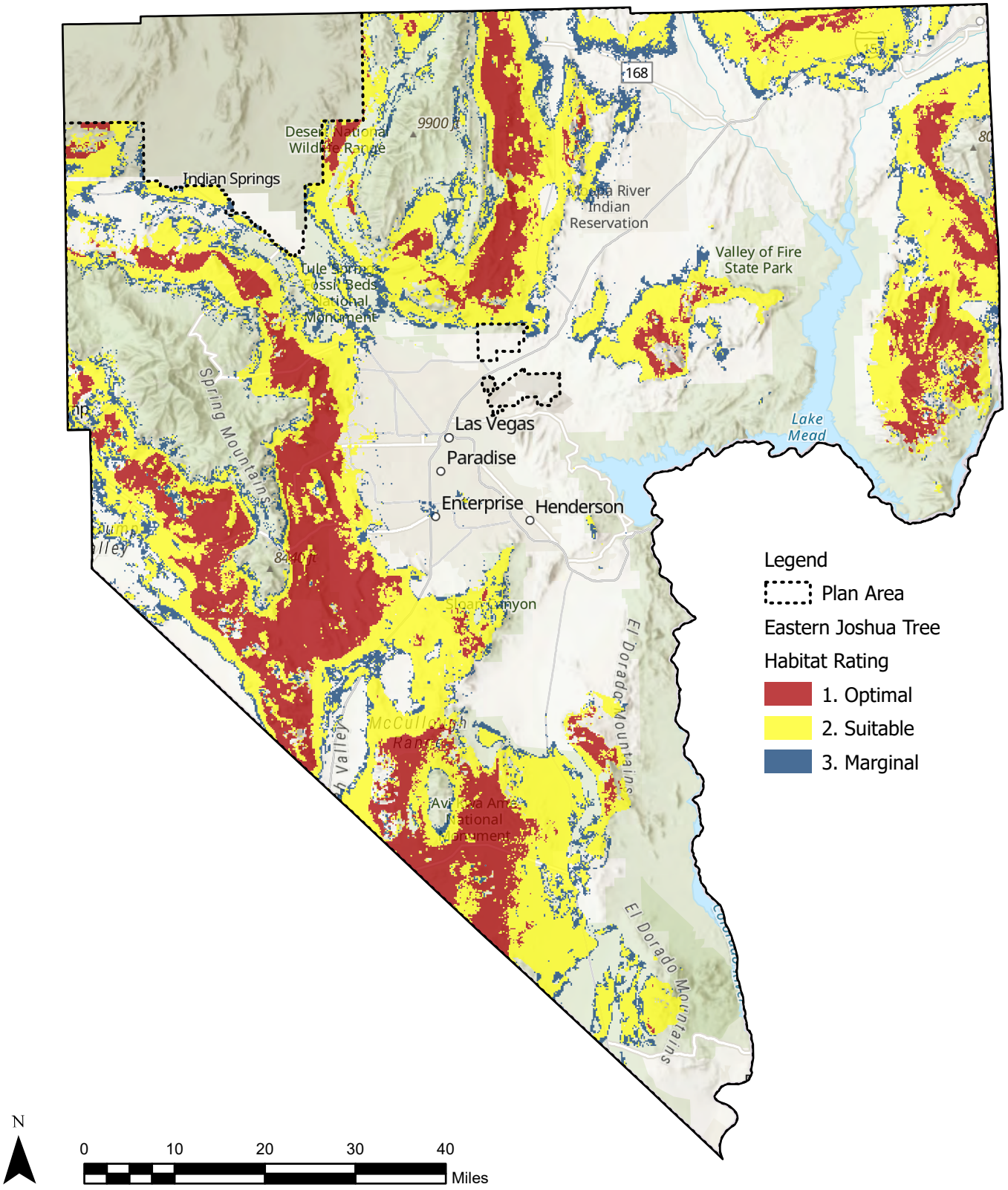

Figure 3-12. Eastern Joshua Tree Habitat Suitability Model and Plan Area

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3.6.11 Arizona Toad (Anaxyrus microscaphus)

3.6.11.1 Habitat Requirements

The Arizona toad (*Anaxyrus microscaphus*) is a riparian obligate associated with lotic aquatic systems, occupying habitats that range from lowland desert washes to higher-elevation pine-oak zones. It uses rocky stream courses and stream corridors bordered by willows and cottonwoods, and breeds in shallow, low-gradient springs and streams (Stebbins 2003, Schwaner and Sullivan 2005). The species depends on shallow, perennial river and stream reaches with sandy, open floodplains, and this specificity makes it more sensitive to flow reductions and drying than most other toads in the region (Oyler-McCance et al. 2024). Recent habitat modeling in southern Nevada, northwestern Arizona, and southwestern Utah identified riparian tree and shrub cover, actual evapotranspiration, and stream permanence as the three strongest predictors of suitable habitat, together explaining 89 percent of importance in the final model (Stemp and Hossack 2026).

3.6.11.2 Occurrences within the Plan Area

In Nevada, the Arizona toad is restricted to the Meadow Valley Wash, Beaver Dam Wash, and Virgin River drainages and was historically present in the Las Vegas Valley, where it is now believed extirpated (NDOW 2022, Bradford et al. 2005). Clark County lies at the far western edge of the species' range, along the Virgin River corridor. Within Nevada, the species is ranked S2 (Imperiled) by NatureServe (NatureServe 2026g).

A two-year study funded by the Clark County Desert Conservation Program and conducted during 2024 to 2025 provided the first systematic assessment of Arizona toad distribution in Clark County, using visual encounter surveys and environmental DNA (eDNA) methods (Stemp and Hossack 2026). No Arizona toads were detected in Clark County through visual encounter surveys. Environmental DNA methods, however, detected Arizona toad DNA at six sites within the County, all along the Virgin River between the Arizona state line and its confluence with the Muddy River at Lake Mead. These detections represent the first confirmed evidence of the species in Clark County in approximately 40 years (Stemp and Hossack 2026).

Three of the detections occurred on Clark County-owned or adjacent properties: the Bunkerville East Riparian Reserve (2024), the Mormon Mesa South Riparian Reserve (2025), and the Electric Avenue property (2025). After the 2024 detection at Bunkerville East, crews revisited the site in 2025 and found it dry; the species was not detected there that year but was detected at Electric Avenue, less than 1 km (0.6 mi) downstream in an area with extensive slow backwaters and side channels. An additional eDNA detection in Calico Basin at Red Rock Canyon National Conservation Area was considered inconclusive because it rested on a single, weakly positive filter at a site geographically isolated from other verified records (Stemp and Hossack 2026). Because the eDNA assay targets maternally inherited mitochondrial DNA, it cannot distinguish Arizona toads from Arizona toad x Woodhouse’s toad (*Anaxyrus woodhousii*) hybrids, so the extent of any hybridization at these sites remains uncertain (Stemp and Hossack 2026).

3.6.11.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Additive, MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Aspect

- Fractional Component Bare Ground
- Depth to Bedrock
- Coefficient of Variation of Minimum Temperature
- Slope
- Soil First Principal Component
- Minimum Temperature
- Vapor Pressure Deficit Maximum
- Coefficient of Variation of Winter Precipitation
- Distance to Water

The most influential predictors were the Coefficient of Variation of Winter Precipitation, the Coefficient of Variation of Minimum Temperature, Distance to Water, and the Soil First Principal Component, with the Coefficient of Variation of Winter Precipitation contributing most strongly across the component models (Simandle and Nussear 2025)

3.6.11.4 Modeled Habitat Distribution

Highly suitable habitat for the Arizona toad is predicted to occur in northeast Clark County near the Muddy River at Moapa and along the extent of the Meadow Valley Wash and the Virgin River within the County (Figure 3-13; Simandle and Nussear 2025) (Table 3-11).

Table 3-11. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for Arizona Toad (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
-	-	28,158	-	-	13,394

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

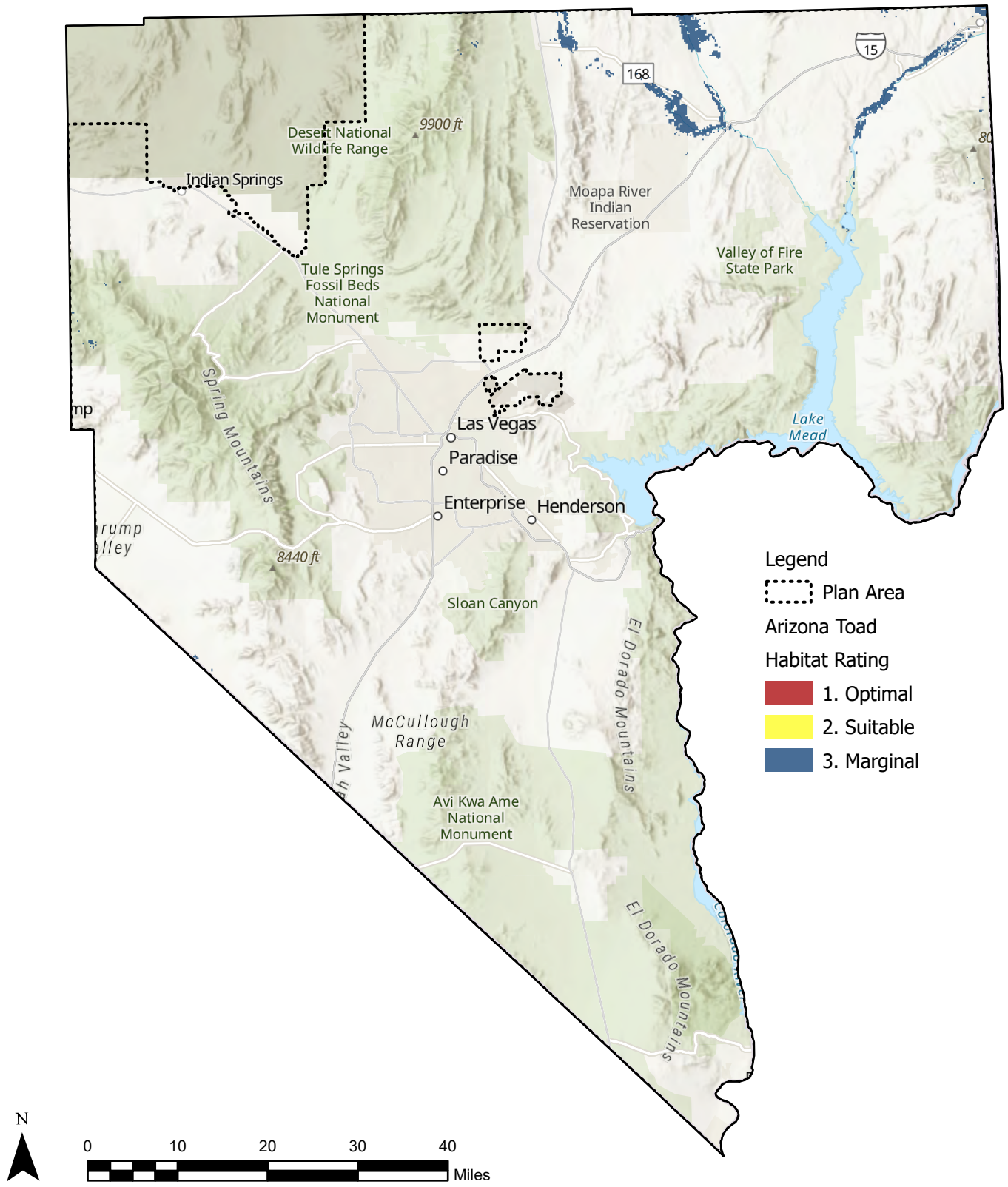

Figure 3-13. Arizona Toad Habitat Suitability Model and Plan Area

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3.6.12 Golden Eagle (Aquila chrysaetos)

3.6.12.1 Habitat Requirements

The golden eagle (*Aquila chrysaetos*) inhabits open and semi-open country, including grasslands, sagebrush shrublands, tundra, sparse woodland, and barren areas, particularly in hilly or mountainous terrain where sufficient mammalian prey and suitable nest sites occur (NatureServe 2026h). In Nevada, the only habitats routinely avoided are forests, large agricultural areas, and urban areas (GBBO 2010). Major habitat types used in the state include salt desert shrub, low-elevation sagebrush-dominated shrubland, Mojave mid-elevation mixed desert scrub, Mojave warm desert, montane shrublands, and cliffs and canyons (NDOW 2022). Nesting habitat requires cliffs or other elevated substrates that provide a commanding view of the surrounding landscape, and all known nests in Clark County are located on cliff substrate (Nussear 2020). Breeding-season territories range from 20 to 54 km^2 (7.7 to 20.8 mi^2) across most of the species' range, though home ranges in the Mojave Desert of southern California have averaged approximately 308 km^2 (119 mi^2; Braham et al. 2015). Occupied nests may be spaced less than 1 km (0.6 mi) apart in high-density populations with abundant nest substrate and prey (Kochert et al. 2002), but known adjacent nests in Clark County are considerably further apart, reflecting the lower density and open terrain of the Mojave Desert region (Nussear 2020). Foraging habitat encompasses most habitat types occurring across the county, with expansive Mojave Desert scrub in the valley bottoms and outwash plains, together with mountain slopes and peaks, serving as primary foraging areas (Nussear 2020). Primary prey consists of black-tailed jackrabbits and cottontail rabbits, supplemented by a wide range of other small to medium-sized mammals, birds, and reptiles taken opportunistically (NDOW 2022).

3.6.12.2 Occurrences within the Plan Area

In Clark County, golden eagles nest in limited numbers throughout, and every major mountain range and several smaller ones support resident birds, with multiple nests documented from the Spring Mountains, Newberry Mountains, and McCullough Mountains (Nussear 2020). Foraging has been recorded across most habitat types in the county, and eagles have been observed flying over the city of Las Vegas (Nussear 2020). NatureServe ranks the species as apparently secure in Nevada (S4; NatureServe 2026h). Localized territory monitoring in Nevada from 2015 to 2021 documented annual territory occupancy greater than 97 percent (NDOW 2022).

SWCA conducted focused golden eagle surveys in Clark County in 2021 and 2022 (SWCA 2021a, 2022a). In 2021, surveyors recorded 14 detections across 10 sites, at estimated distances of 138 to 6,880 m (450 to 22,570 ft; average 1,976 m [6,480 ft]); including incidental observations, 12 of 18 detections (67 percent) fell within predicted foraging habitat, and detections formed a diagonal band across southern Clark County from Pahrump Valley to the Colorado River (SWCA 2021a). Four detections occurred within the MSHCP Amendment Reserve System, two within the Boulder City Conservation Easement and two within proposed reserve system additions (SWCA 2021a). In 2022, surveyors recorded 12 detections, four of which involved two individuals soaring together; all birds were in flight, and no foraging behavior was observed (SWCA 2022a). Nine of 11 in-county detections (82 percent) were within predicted foraging habitat, with detections concentrated near the Spring Mountains and Sheep Mountains, at an average estimated distance of 2,693 m (8,840 ft; range 150 to 10,000 m [490 to 32,810 ft]) (SWCA 2022a).

3.6.12.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for the golden eagle included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Average Minimum Temperature
- Average Spring Maximum Temperature
- Depth to Bedrock
- Distance to Cliffs
- Slope
- Soil Silt Content
- Topographic Position Index
- Vegetation Divisions

Topographic Position Index was the most influential predictor in the vegetation-inclusive models, with slope and average spring maximum temperature also contributing substantially to predicted nesting habitat (Nussear et al. 2024)

3.6.12.4 Modeled Habitat Distribution

The habitat suitability model predicts nesting habitat only; foraging areas are understood to encompass expansive open areas throughout the county (Figure 3-14). Predicted high-suitability nesting habitat in Clark County occurs primarily within mountain ranges and cliff-bearing terrain. Incorporating the vegetation layer produced a more spatially constrained habitat prediction than the model without vegetation, while leaving the predictions in the mountain ranges where most nesting localities occur largely unchanged (Nussear et al. 2024). The vegetation types most strongly associated with golden eagle locality points were North American Warm Desert Scrub and Grassland and Western North American Cool Semi-Desert Scrub and Grassland (Nussear et al. 2024) (Table 3-12).

Table 3-12. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the golden eagle (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
85,033	295,860	69,493	53,648	210,059	50,591

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

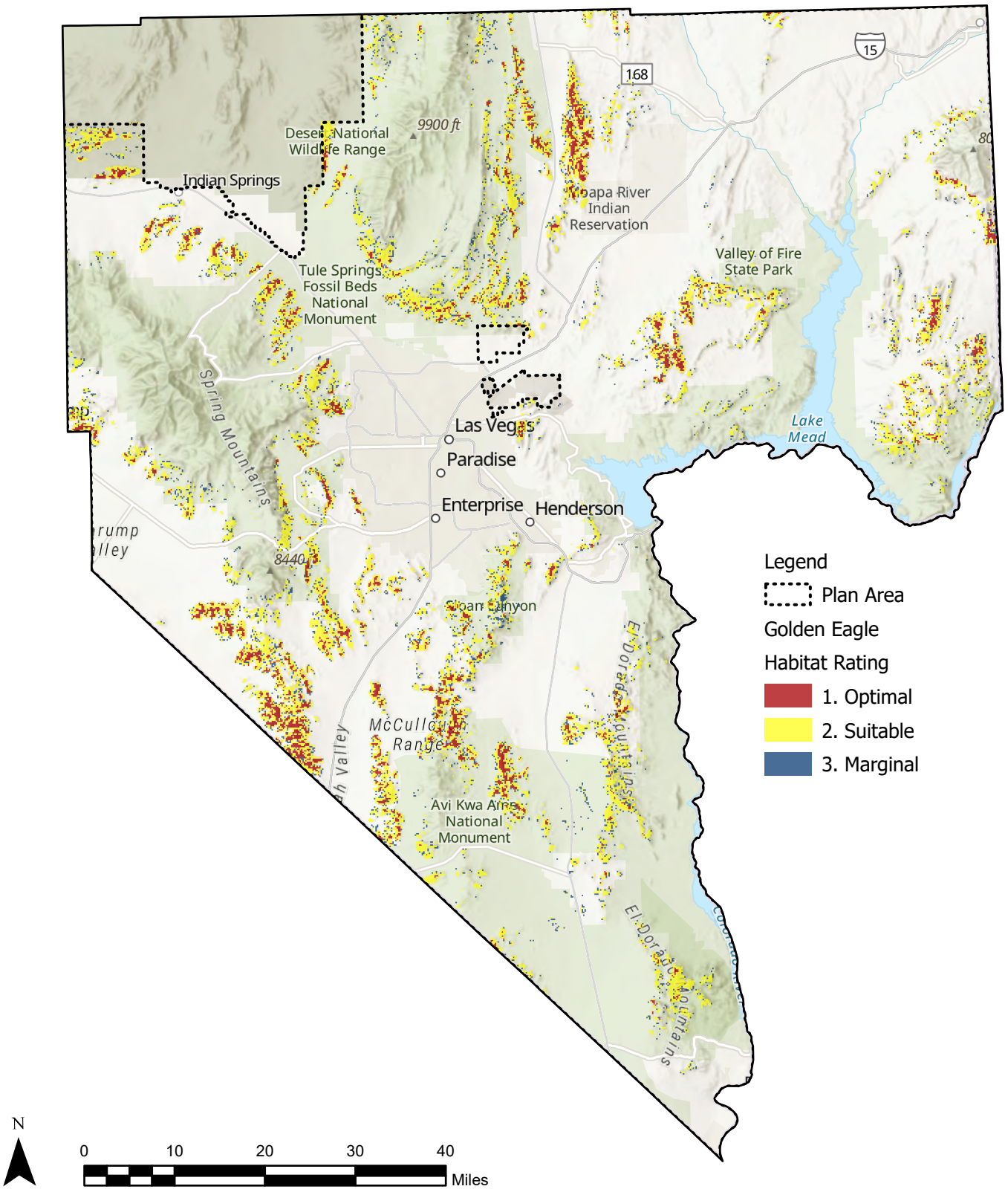

Figure 3-14. Golden Eagle Habitat Suitability Model and Plan Area

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3.6.13 Western Burrowing Owl (Athene cunicularia hypugaea)

3.6.13.1 Habitat Requirements

The western burrowing owl (*Athene cunicularia hypugaea*) is one of two subspecies of burrowing owl found in the United States, with a range that extends across most of western North America from south-central Manitoba south to Brownsville, Texas, west to the California coast, and north to southern British Columbia (Neel 1999). It favors open, arid, and treeless landscapes with low vegetation across lower-elevation habitats and is a breeding resident throughout southern Nevada. Some individuals remain year-round, but most migrate to the southern United States and Mexico during the winter months (Haug et al. 1993). The species does not excavate its own burrows and depends on burrows created by other fossorial animals such as ground squirrels, skunks, and foxes, so it is most common where suitable burrows already exist (Floyd et al. 2007). In the Mojave and Sonoran deserts, burrowing owls also use the burrows of desert tortoise (*Gopherus agassizii*) (Klute et al. 2003; McDonald et al. 2004). Within Clark County, use of Mojave desert tortoise burrows for nesting and shelter is most common, and the distribution of burrowing owls in the County largely overlaps that of the Mojave desert tortoise.

Burrowing owls are fairly tolerant of human disturbance. They breed around the margins of agricultural lands and use crop and pasture areas for foraging during the breeding season (Neel 1999), and they also breed in isolated desert patches within urban landscapes, at times nesting in man-made structures (Manville 2009).

3.6.13.2 Occurrences within the Plan Area

Burrowing owl localities occur throughout most of the low-elevation areas of the County, with concentrations along the eastern edge of the County south of Las Vegas and throughout the Las Vegas Valley, and smaller clusters at Apex, Mormon Mesa, northern Gold Butte, and Trout Canyon. Records are sparse in the northwestern County, where survey coverage on the Nellis Bombing Range and the Nevada National Security Site has been limited. Low densities of owls were recorded in desert scrub habitats, with no owls detected in blackbrush or pinyon-juniper habitats, while higher numbers were recorded at Gold Butte, Piute Valley, the eastern slopes of Eldorado Valley, and the bajadas on the western side of Lake Mohave (Crowe and Longshore 2010). The habitat suitability model compiled 382 point localities for the species, distributed largely in a north-to-south band through the center of the County (Nussear et al. 2024).

More recent targeted surveys were conducted in 2021 and 2022 for the Desert Conservation Program (SWCA 2021a; SWCA 2022a). During the 2021 avian surveys across 30 sites in Clark County, surveyors recorded four western burrowing owl detections: two during a formal area-search survey and two as incidental observations (SWCA 2021a). The two survey detections were of two individuals observed within a single subplot at the Needles Highway site, the only surveyed subplot intersecting habitat modeled as optimal for the species by the initial species habitat suitability model. The highest breeding evidence recorded was a pair in suitable habitat, associated with one of the incidental detections, indicating possible but unconfirmed breeding. A possibly occupied burrow was also located at the Sandy Valley site; it showed signs of recent use, including whitewash and a pellet near the entrance, but was obstructed by spiderwebs on two successive visits, and no owls were observed there. This burrow was located more than 9 km (5.6 mi) outside predicted habitat.

During the 2022 surveys, two western burrowing owl detections were recorded across 30 sites and 569 ha (1,406 acres) of surveyed area in Clark County (SWCA 2022a). Both detections were of calling individuals; one was within predicted suitable habitat, and one was in habitat modeled

as unsuitable by the initial species habitat suitability model but within approximately 217 m (712 ft) of predicted marginal habitat. This repeated a pattern from 2021, in which half of all burrowing owl detections were outside predicted habitat, indicating that the species may use a broader area of Clark County than the initial habitat distribution model predicted (SWCA 2022a). The 2022 surveys also documented potentially suitable burrows throughout Clark County at a scale exceeding the model predictions. Burrows of appropriate size for western burrowing owl were recorded at 38 of 66 surveyed subplots (58 percent), yet predicted habitat covered only 33 percent of the surveyed area. Fifteen of the subplots with burrows overlapped predicted habitat, and the remaining burrow-containing subplots fell outside it, reinforcing the likelihood that the initial model underrepresented available nesting substrate across the County (SWCA 2022a). The surveys noted that both winter and summer precipitation influence western burrowing owl occurrence probability in Clark County (Crowe and Longshore 2010), and that the prolonged drought during 2020 to 2022, the driest two-year period on record for the County, may have depressed occupancy and detectability relative to wetter years (SWCA 2022a).

The USFWS Urban Burrowing Owl Monitoring Project established a three-year monitoring program, continued with the Red Rock Audubon Society, to track the nesting success and general population trend of burrowing owls in the Las Vegas Valley. Burrowing owls have bred successfully within some urbanized areas of Las Vegas and Pahrump (Manville 2009; Red Rock Audubon 2016). The current status and most recent results of this monitoring program are not publicly available, so the success of urban-nesting pairs relative to non-urban pairs remains unknown.

Studies of urban burrowing owl populations have documented greater nesting success and longer breeding periods among urban owls than among rural owls (Cavalli et al. 2024). This capacity to persist in modified environments indicates that areas on the urban fringe, including portions of the Impact Areas associated with ongoing development, warrant targeted survey effort rather than being assumed unsuitable for the species.

3.6.13.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Additive, MaxEnt, Generalized Boosted Regression, and Random Forest models (Nussear et al. 2024):

- Winter Precipitation
- Winter Minimum Temperature
- Normalized Difference Vegetation Index (NDVI) Amplitude
- Slope
- Percentage of Coarse Fragments

Slope and Winter Minimum Temperature were the most influential predictors across the modeled algorithms (Nussear et al. 2024)

3.6.13.4 Modeled Habitat Distribution

The habitat suitability model for western burrowing owl showed similar predictions for the models with and without the vegetation layer, with most modeled habitat concentrated in the flat valley bottoms of the County. Predicted suitable habitat occurs throughout southern and northeastern Clark County, concentrated in valley floors and bajadas (Figure 3-15). Areas of highest predicted suitability include the northern Las Vegas Valley, the eastern Eldorado Valley, Ivanpah Valley,

most of Piute Valley, the bajadas above Laughlin, the Cottonwood Cove to Nelson corridor, and Apex. Moderate to high suitability is also predicted along the Interstate 15 corridor, through Moapa Valley, Mormon Mesa, the Virgin and Muddy River valleys, the valley east of Searchlight extending to the Colorado River, and Gold Butte (Nussear et al. 2024) (Table 3-13).

Table 3-13. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the western burrowing owl (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
363,105	891,623	401,647	103,249	479,694	222,098

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

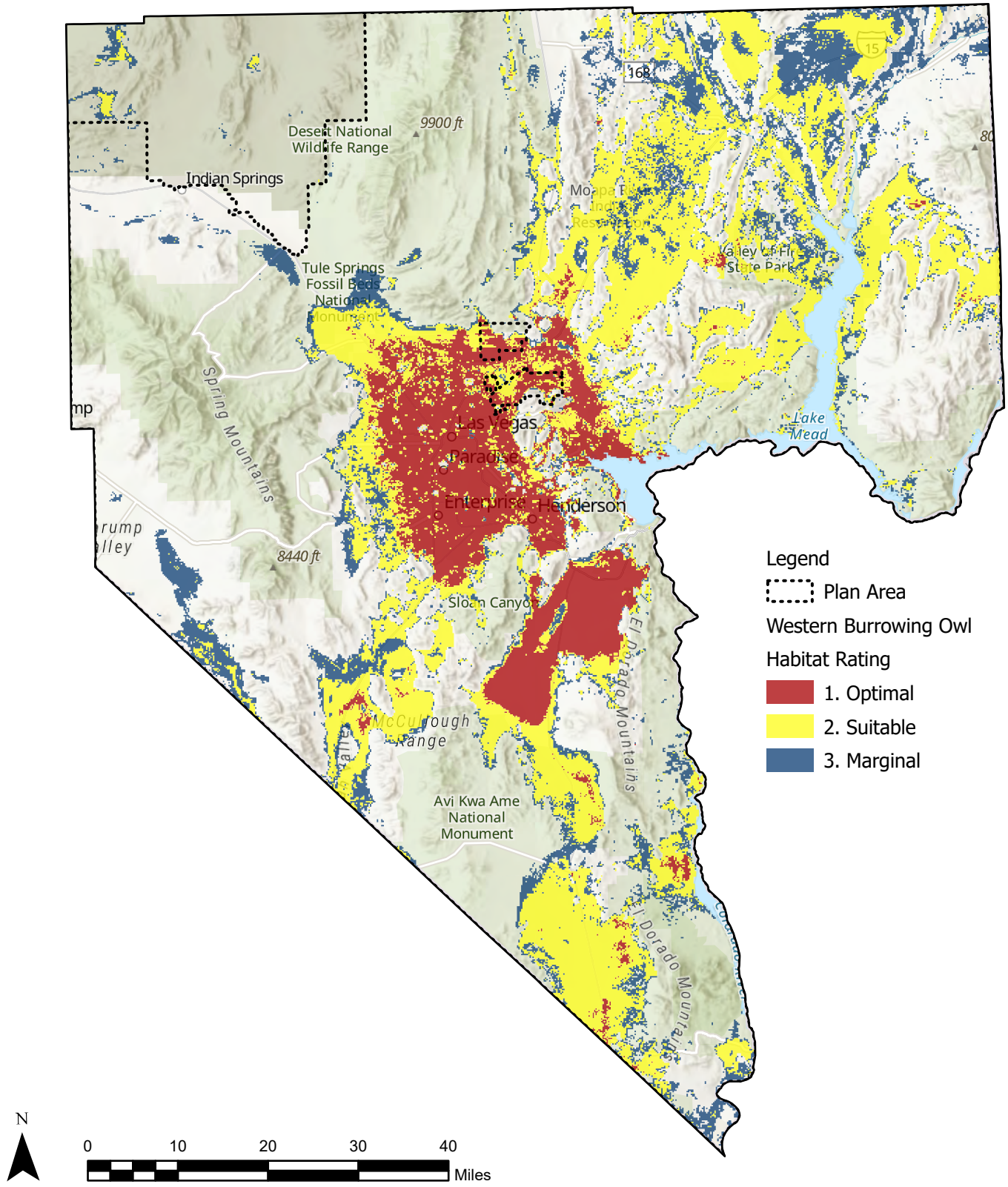

Figure 3-15. Western Burrowing Owl Habitat Suitability Model and Plan Area

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3.6.14 Desert Pocket Mouse (Chaetodipus penicillatus)

3.6.14.1 Habitat Requirements

The desert pocket mouse occurs in low-elevation Mojave Desert habitats of southern Nevada, southern California, the northern Baja Peninsula, northwestern Mexico, and east to southwestern Texas. Southern Nevada represents the northernmost extent of the species' range (Burt and Grossenheider 1976; NDOW 2022).

Two subspecies occur in Clark County. *C. p. sobrinus* occupies the Colorado River watershed in Nevada, with its range potentially extending into southwestern Utah and northwestern Arizona. *C. p. penicillatus*, which predominates to the south, overlaps with *C. p. sobrinus* in an introgression zone near Laughlin. The southern boundary of *C. p. sobrinus* has been debated, with placements ranging from Davis Dam (Hoffmeister 1986) to as far north as Searchlight (Hall 1995). Genomic analyses confirm that some admixture between the two subspecies occurs in southern Clark County (BEC Environmental 2023).

Across its range, the desert pocket mouse occupies open desert environments with sparse vegetation and soft alluvial, sandy, or silty soils. In Nevada it is associated with Mojave Warm Desert, Mojave Mid-Elevation Mixed Desert Scrub, and riparian and wetland habitat types, showing particular affinity for creosote bush (*Larrea tridentata*) and saltbush (*Atriplex* spp.) communities, mesquite bosques, and desert washes, and also using yucca, mesquite, catclaw, and short-grass associations (NDOW 2022). It strongly prefers rock-free bottomland soils along rivers, streams, desert washes, and valleys over rocky terrain, and its densities increase with shrub cover and diversity (NDOW 2022; SWECO 2018). The elevational range in Clark County is 36 to 1,585 m (118 to 5,200 ft) (SWECO 2018).

3.6.14.2 Occurrences within the Plan Area

A small-mammal inventory of the Riparian Reserve System units along the Muddy and Virgin Rivers in 2020 recorded 27 desert pocket mouse captures across five of the six units surveyed: 4 at Muddy River, 1 at Mormon Mesa, 3 at Bunkerville West, 8 at Bunkerville East, and 11 at Riverside, with no captures at the Mesquite West unit (BEC Environmental 2020).

All confirmed records of the desert pocket mouse in Nevada fall within the Colorado River watershed. Targeted protocol surveys across Clark County in 2021 completed 4,160 trap-nights at 35 trapping sites in 11 target areas and captured 729 small mammals of 13 species, including 87 desert pocket mice at 13 of the 35 sites within 4 of the 11 target areas. All captures occurred within the Colorado River watershed, and the species was not detected at sites outside the watershed despite modeled suitable habitat there (BEC Environmental 2021). Captures were concentrated in sandy or silty lowlands, floodplains, and shorelines near permanent or ephemeral water, in shrub communities of quailbush (*Atriplex lentiformis*), tamarisk (*Tamarix* spp.), arrowweed (*Pluchea sericea*), and mesquite (*Prosopis* spp.) (BEC Environmental 2021).

Survey and genomic data together identify three geographically distinct populations within the county: a Muddy/Virgin Rivers population along the Muddy River, Virgin River, and Colorado River north of Lake Mead; a Las Vegas Wetlands population at the Springs Preserve and Las Vegas Wash wetlands; and a Laughlin population along the lower Colorado River near Laughlin. An analysis of molecular variance apportioned approximately 37 percent of total genetic variation among the three groups, a level consistent with substantial, long-term isolation. The Laughlin population also represents a probable zone of introgression with *C. p. penicillatus* from populations to the south (BEC Environmental 2023).

3.6.14.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for the desert pocket mouse included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Average Minimum Temperature
- Coefficient of Variation of Winter Precipitation
- Normalized Difference Vegetation Index (NDVI) Maximum
- Percentage of Coarse Fragments
- Soil Clay Content
- Soil Silt Content
- Start of Season (Day)
- Vegetation Divisions
- Winter Precipitation

Winter Precipitation and Vegetation Divisions were the most influential predictors in the model, followed by Average Minimum Temperature (Nussear et al. 2024).

3.6.14.4 Modeled Habitat Distribution

Within Clark County, predicted suitable habitat for the desert pocket mouse is concentrated in the lower-elevation drainages of the eastern county, including the Moapa Valley, the Muddy and Virgin River corridors, the Las Vegas Wash, and the shorelines of Lake Mead and the Colorado River, where the areas of highest suitability align closely with the known occurrences (Figure 3-16). The model also identified potential habitat along the I-15 corridor between Moapa and Las Vegas and southward through the Ivanpah and Eldorado valleys, although few or no occurrences have been documented in those areas. Vegetation at modeled locality points was predominantly North American Warm Desert Scrub and Grassland, with lesser contributions from Land Use and Development and Western North American Interior Flooded Forest (Nussear et al. 2024) (Table 3-14).

Table 3-14. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the desert pocket mouse (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
65,987	81,360	127,216	9,437	12,916	39,343

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

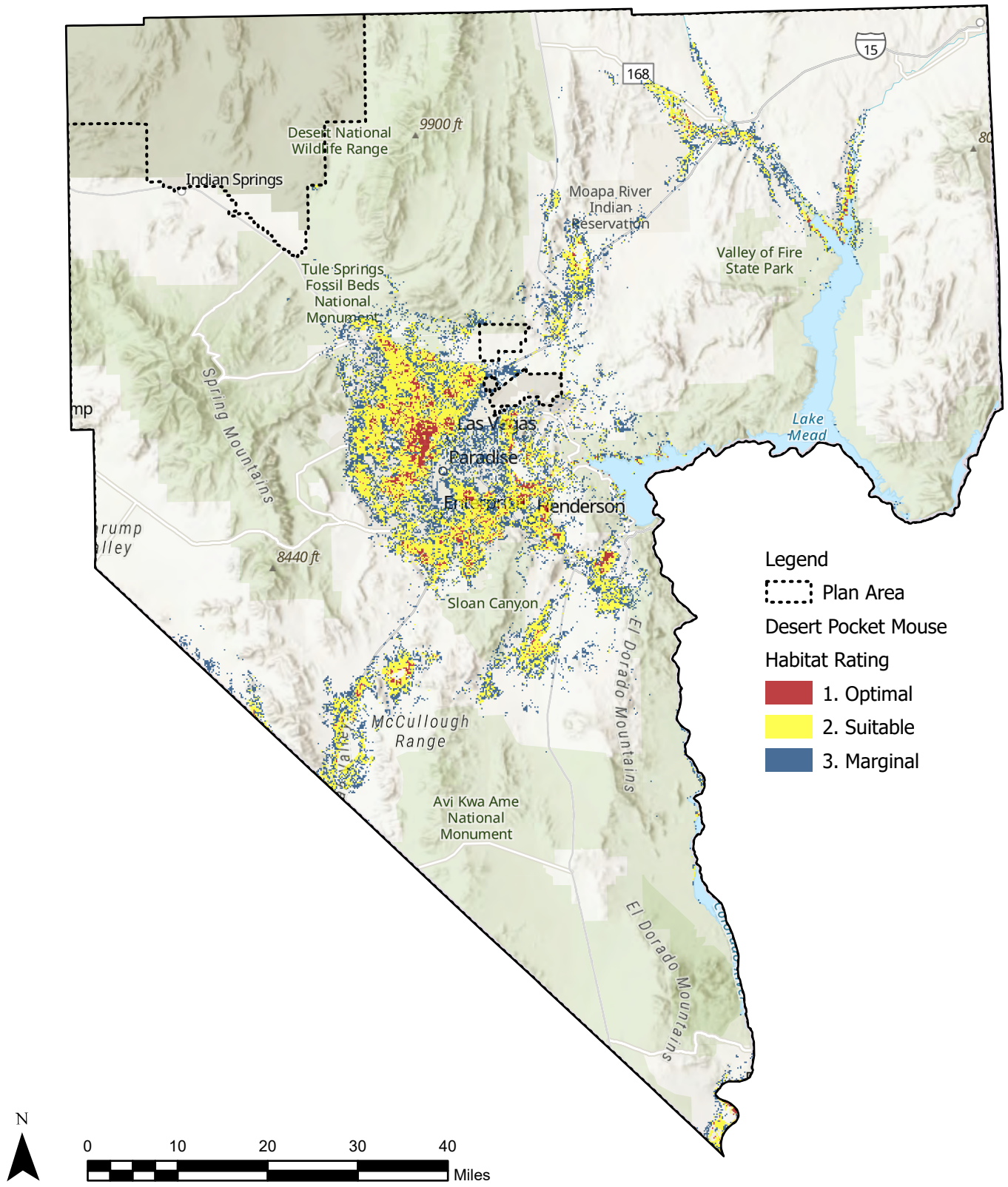

Figure 3-16. Desert Pocket Mouse Habitat Suitability Model and Plan Area

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Desert Conservation Program

3.6.15 Yellow-billed Cuckoo (Coccyzus americanus)

3.6.15.1 Habitat Requirements

The yellow-billed cuckoo (*Coccyzus americanus*) is a Neotropical migrant that breeds throughout the U.S., southeastern Canada, northern Mexico, and the Caribbean region. In the western U.S., the species is much less common than in the eastern portion of its range and is limited primarily to low-elevation riparian habitat consisting of open woodlands with a dense understory. Yellow-billed cuckoos require large tracts of riparian forest for nesting and foraging and show a strong preference for nesting in areas with at least 10 ha (25 acres) of contiguous forest (Wiggins 2005). The species also nests in early to mid-successional riparian habitats (USFWS 2020). In the West, cuckoos are most often found in desert riparian woodlands composed primarily of mature cottonwoods with an extensive willow understory, with nesting occurring in thick willows and foraging in cottonwoods. Optimal breeding habitat generally exceeds 81 ha (200 acres), is at least 100 m (328 ft) in width, and has a minimum canopy closure of 65 percent (Laymon et al. 1997). Cuckoo home ranges are generally at least 40 ha (99 acres) and often exceed 80 ha (198 acres) (USFWS 2020). Critical habitat has been designated for the western yellow-billed cuckoo, but no critical habitat units were designated within Nevada (USFWS 2020).

3.6.15.2 Occurrences within the Plan Area

Very little suitable habitat for yellow-billed cuckoos remains in Clark County due to the conversion of land for agriculture and urban development. The species is a rare summer resident in southern Nevada, with only two breeding sites confirmed in Clark County (McKernan and Braden 2001; Floyd et al. 2007) prior to a third location being confirmed in 2019 (SWCA 2019). Historically, yellow-billed cuckoos were thought to occur statewide in appropriate habitat; however, current breeding in Nevada is limited to sporadic events in woody riparian areas along the Muddy and Virgin Rivers in southern Nevada (NDOW 2022).

A series of surveys conducted from 2000 to 2006 detected yellow-billed cuckoos in Corn Creek and Moapa Valley during most survey years, but breeding was not confirmed at either of these sites (Klinger and Furtek 2007). The USGS also detected cuckoos in the Overton Wildlife Management Area but was unable to confirm breeding, and cuckoos were not detected around Lake Mohave despite the existence of suitable habitat (Johnson et al. 2007). Yellow-billed cuckoo has also been detected in the Las Vegas Wash, with breeding unconfirmed in the early survey years. The Nevada Breeding Bird Atlas reported breeding cuckoos on a private ranch on the upper Muddy River (Floyd et al. 2007). Breeding was confirmed along the Virgin River in 2001 during surveys conducted by the San Bernardino County Museum (McKernan and Braden 2001) and was confirmed again in 2019 (SWCA 2019). The San Bernardino County Museum also detected cuckoos in the Mormon Mesa area of the Virgin River in 2006 and 2007 (Braden et al. 2007, 2008, 2009). Surveys from 2017 to 2019 detected yellow-billed cuckoos in similar areas of the Muddy and Virgin Rivers (SWCA 2019).

Yellow-billed cuckoo surveys across the Riparian Reserve Units in 2020 resulted in five detections during protocol surveys and two additional incidental detections recorded during southwestern willow flycatcher (*Empidonax traillii extimus*) surveys (SWCA 2020). Detections occurred at the Mesquite West Parcel (Parcel 1-A), Mormon Mesa Parcel 5-A, and the Muddy River subunit. Protocol surveys yielded no cuckoo detections across the Riparian Reserve Units in 2021 or 2022, with only a single incidental detection recorded in each year (SWCA 2021b, 2022b).

In 2023, yellow-billed cuckoo surveys resulted in 13 protocol detections, along with four additional incidental detections, across multiple parcels in the reserve system (SWCA 2023a). Detections

were recorded at Mesquite Parcel 1-A (three detections), Bunkerville East Parcels 2-A through 2-G (one detection), Bunkerville West Parcels 2-K through 2-M (two detections), Riverside Parcels 3-A and 3-B (two detections across two survey periods, qualifying the area as a possible breeding territory), Mormon Mesa Parcel 5-A (six detections across multiple survey periods, qualifying the area as a probable breeding territory based on the proximity and timing of detections), and Muddy River Parcels A through E (three detections across two survey periods, qualifying as a possible breeding territory). No detections were recorded at Mormon Mesa South in 2023. These results represented the highest number of cuckoo detections recorded within the Clark County Riparian Reserves to date and were notable for including the first detections at Bunkerville Parcels 2-K through 2-M and the Riverside subunit.

Yellow-billed cuckoo surveys across the Riparian Reserve Units in 2024 resulted in three protocol detections and one incidental detection (SWCA 2024a). One detection was recorded at each of the following locations: Mesquite Parcel 1-A (an incidental detection just west of the parcel boundary during flycatcher monitoring), Bunkerville West Parcels 2-K through 2-M, Riverside Parcels 3-A and 3-B, and Muddy River Parcels A through H. Two of the 2024 detections, at Bunkerville West and Riverside, occurred in the same general areas as detections recorded in 2023, suggesting continued use of these locations. No detections were recorded at Bunkerville East, Bunkerville West Parcels 2-I and 2-J, or Mormon Mesa Parcel 5-A in 2024. Because only one detection occurred at each set of parcels, no possible or probable breeding territories were identified. The reduction in total detections from 2023 (17 combined) to 2024 (4 combined) may reflect reduced habitat suitability in some areas, particularly at Mormon Mesa, where tamarisk dieback from leaf beetle defoliation has degraded canopy conditions, along with the irruptive behavior and low site fidelity characteristic of the species (NDOW 2022).

Yellow-billed cuckoo surveys across the Riparian Reserve Units in 2025 resulted in two protocol detections and two additional incidental detections (SWCA 2025). One protocol detection was recorded at the Riverside subunit (Parcels 3-A and 3-B) and one at the Muddy River subunit. The Muddy River detection, in the mesquite bosque adjoining the eastern border of Parcel F, was the first cuckoo detection recorded at that location. The two incidental detections were recorded at Mesquite and at the Mormon Mesa subunit during flycatcher monitoring. No detections were recorded at the Bunkerville East or Bunkerville West subunits in 2025. Because only one detection occurred at each subunit, no possible or probable breeding territories were identified. The continued presence of cuckoos at Riverside in each of the last three survey years (2023 to 2025) suggests that the mesquite bosque within that subunit may provide foraging or stopover habitat, even though it lacks the vegetation structure typically associated with breeding. The pattern of low detection numbers and single-season occurrences at most parcels is consistent with the irruptive movement and limited site fidelity characteristic of western yellow-billed cuckoos (NDOW 2022; SWCA 2025).

Yellow-billed cuckoo surveys are also conducted along the Las Vegas Wash. A cuckoo was recorded there for the first time in the 2022 to 2023 survey year (GBBO 2024), and a single cuckoo was detected in 2024 in a native-dominated riparian patch that also supported the study area's two southwestern willow flycatcher territories that year (van Dooremolen et al. 2025). The Las Vegas Wash has recorded probable breeding territories in 2017 and 2023 and possible breeding territories in 2019, 2020, and 2021, and cuckoos have been detected there in most years since protocol surveys began in 2013, making it among the most consistently productive cuckoo survey sites in Nevada (van Dooremolen et al. 2025).

3.6.15.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Additive, MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Coefficient of Variation of Minimum Temperature
- Depth to Bedrock
- Fractional Component Sage
- Fractional Component Shrub
- Soil First Principal Component
- Absolute Minimum Temperature
- Vapor Pressure Deficit Maximum
- Distance to Water
- Vegetation Divisions
- Coefficient of Variation of Winter Precipitation

The most influential predictors in the model were Depth to Bedrock, Absolute Minimum Temperature, Coefficient of Variation of Minimum Temperature, and Coefficient of Variation of Winter Precipitation (Simandle and Nussear 2025)

3.6.15.4 Modeled Habitat Distribution

Highly suitable habitat for yellow-billed cuckoo is restricted to areas near the Meadow Valley Wash, the Muddy River, and the Virgin River (Figure 3-17). A smaller area of suitable habitat occurs on the eastern side of the City of Las Vegas and adjacent portions of the Las Vegas Wash as it joins Lake Mead. High-suitability habitat in the model occurred mostly within Developed and North American Warm Desert Scrub and Grassland vegetation communities (Simandle and Nussear 2025) (Table 3-15).

Table 3-15. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the yellow-billed cuckoo (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
4,508	51,853	34,750	1,780	4,049	2,579

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

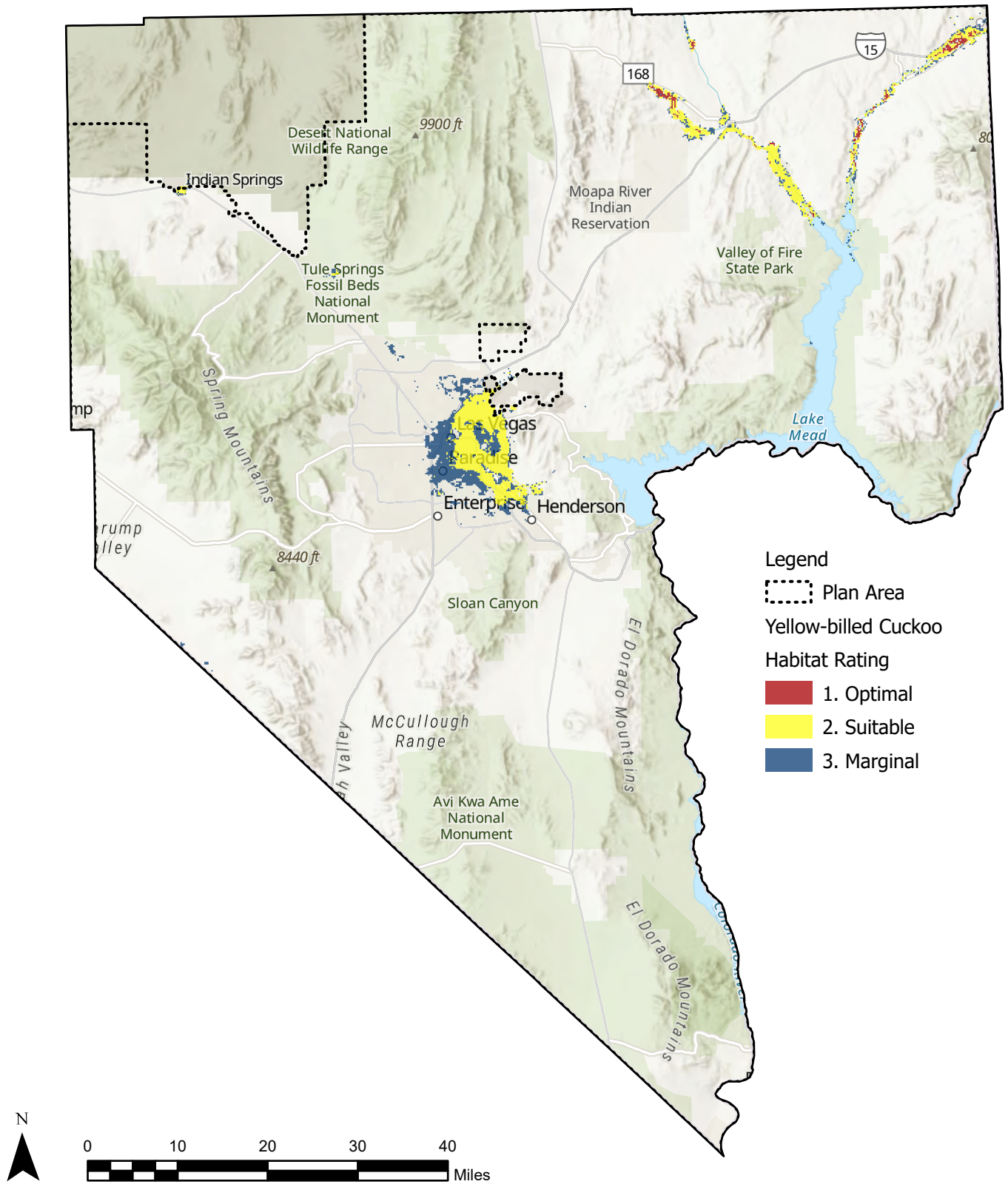

Figure 3-17. Yellow-billed Cuckoo Habitat Suitability Model and Plan Area

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Desert Conservation Program

3.6.16 Gilded Flicker (Colaptes chrysoides)

3.6.16.1 Habitat Requirements

The gilded flicker (*Colaptes chrysoides*) is a habitat specialist of the southwestern United States and northwestern Mexico, and in Nevada it occurs only at the southern tip of Clark County. It is associated with desert riparian corridors of well-developed, tree-lined vegetation, such as those along the lower Colorado River and its tributaries, with Mojave Desert scrub, and occasionally with suburban settings that retain suitable vegetation, including parks and golf courses. Nesting depends on large columnar cacti such as saguaro (*Carnegiea gigantea*) across most of the range, or on Joshua tree (*Yucca brevifolia*) and other tall trees such as Fremont cottonwood (*Populus fremontii*), in which the birds excavate large nest cavities. In Nevada, where saguaro is absent, the gilded flicker is closely tied to dense stands of mature Joshua trees and other tall yuccas that provide nesting substrate, and it will not breed where adequate substrate is unavailable (GBBO 2010; NDOW 2022). The species also requires open ground, including bare soil, lawns, or golf course fairways, where it forages for invertebrates such as ants and beetles (Turner 2006). Although the gilded flicker nests in large riparian trees elsewhere in its range, this behavior has not been documented in Nevada (Corman and Wise-Gervais 2005; NDOW 2022). In addition to nest sites, the species may be limited by prey availability; it forages on the ground for ants and other invertebrates, occasionally takes insects in flight, and may obtain water from succulent vegetation rather than from open water (Kerpez and Smith 1990; NDOW 2022).

3.6.16.2 Occurrences within the Plan Area

In Nevada, the gilded flicker is restricted to the extreme southern portion of Clark County, where it is a non-migratory resident occurring primarily in the Piute and Eldorado Valleys. The core of the distribution is centered on the southern Highland and Eldorado mountain ranges just north and northwest of Searchlight (Ammon 2015; NDOW 2022). The species historically occupied riparian gallery forests along the lower Colorado River, but those populations have been absent for more than 40 years (NDOW 2022). Nevada supports less than 2 percent of the rangewide population, and the State ranks the species as critically imperiled (S1) (NDOW 2022).

Early occurrence records in Clark County were sparse. The Atlas of the Breeding Birds of Nevada recorded roughly 20 pairs in the foothills of the Eldorado Range (Floyd et al. 2007), and subsequent predictive-modeling surveys documented 10 sightings in the southern Highland and Eldorado mountain ranges over about two decades, including breeding evidence north and northwest of Searchlight and a probable breeding location south of the Highland Range near Walking Box Ranch (Ammon 2015).

Focused surveys for the gilded flicker were conducted in Clark County in 2021 and 2022 (SWCA 2021a, 2022a). The 2021 effort produced six detections at three sites, McCullough Mountain, the Highland Range, and Bird Springs; the largest and densest Joshua trees and most of the detections were at McCullough Mountain, and a pair was recorded at the Highland Range (SWCA 2021a). The more extensive 2022 surveys recorded 44 detections across ten sites and substantially expanded the documented range, with new clusters near the Lucy Gray, Crescent Peak, and Middle Piute Valley areas and confirmed breeding at the New York Mountains and Crescent Peak sites. Elevations of detections ranged from 1,044 m to 1,431 m (3,425 ft to 4,694 ft) (SWCA 2022a).

The habitat suitability model compiled occurrence records for the species from earlier modeling efforts along with research-grade iNaturalist observations and Clark County records (Nussear et al. 2024). Rangewide, Breeding Bird Survey data indicate a long-term population decline of

roughly 54 to 58 percent from 1970 to 2014, and Partners in Flight placed the species on its Yellow Watch List (Rosenberg et al. 2016), although more recent data indicate a short-term increase from 2011 to 2021 (Fink et al. 2023).

3.6.16.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for the gilded flicker included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Coefficient of Variation of Winter Precipitation
- Distance to Cliffs
- Flow Accumulation
- Normalized Difference Vegetation Index (NDVI) Amplitude
- NDVI Length of Season
- NDVI Maximum
- Slope
- Vegetation Divisions
- Winter Precipitation

The variables that contributed most to the model were Winter Precipitation and the Coefficient of Variation of Winter Precipitation, with the Vegetation Divisions layer also making a substantial contribution (Nussear et al. 2024).

3.6.16.4 Modeled Habitat Distribution

Most of the modeled habitat for the gilded flicker occurs in the southernmost portions of the County, consistent with the species' known occurrence near the Highland and Eldorado mountain ranges (Figure 3-18). Including the vegetation layer reduced predicted habitat in the northern parts of the County while leaving the southern predictions, where most localities occur, largely unchanged. The models also identified bands of suitable habitat along the southern uplands surrounding the Spring Range near Trout Canyon and Red Rock and along the southern margins of the Sheep Range, although no occurrences have been confirmed in those northern areas. The vegetation types most strongly associated with gilded flicker localities were Western North American Cool Semi-Desert Scrub and Grassland and North American Warm Desert Scrub and Grassland (Nussear et al. 2024) (Table 3-16).

Table 3-16. Ecosystems within the Plan Area and the area (acres) of Low, Medium, and High predicted habitat suitability within each ecosystem for the gilded flicker (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
24,362	97,707	22,270	22,724	74,302	16,348

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

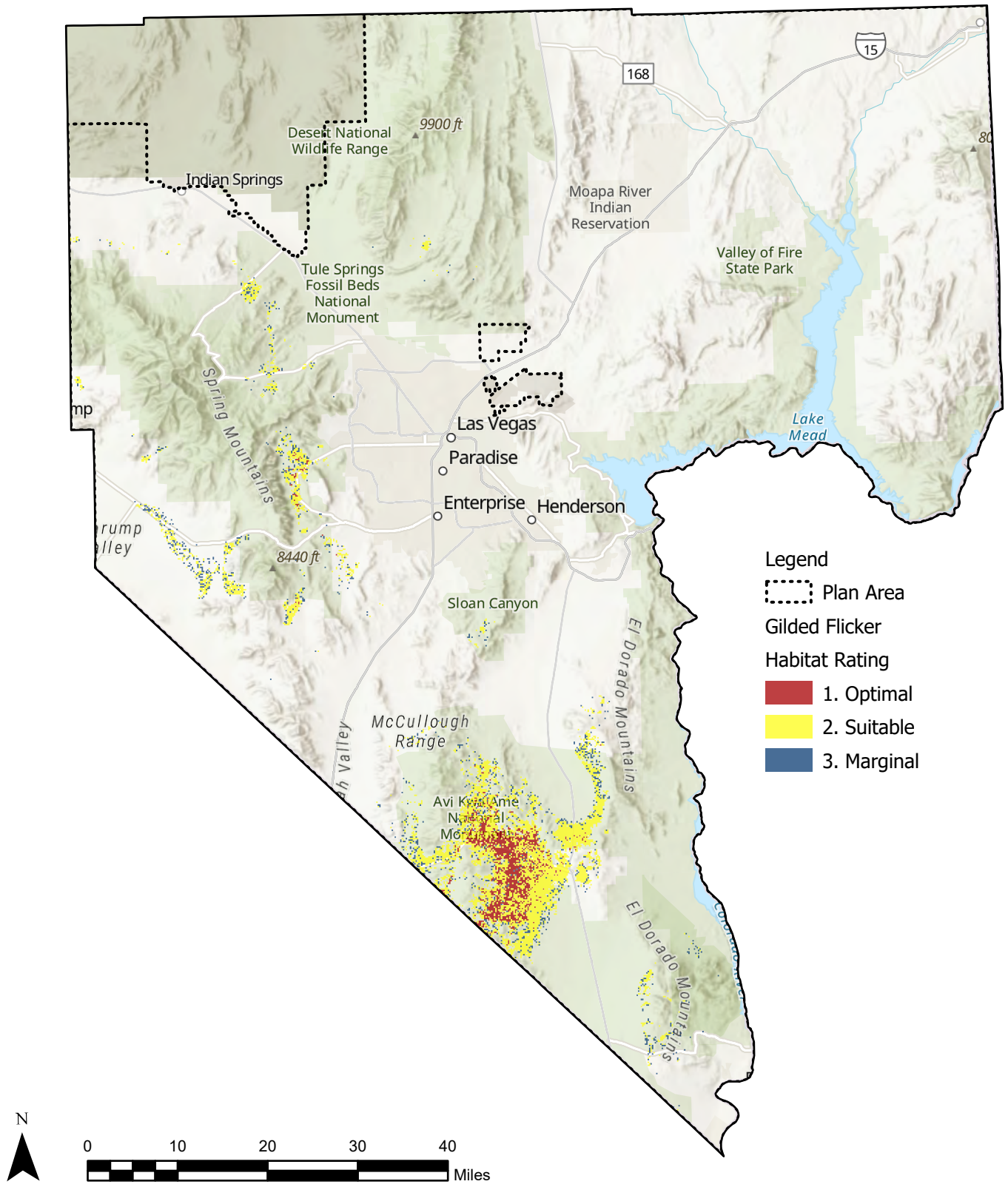

Figure 3-18. Gilded Flicker Habitat Suitability Model and Plan Area

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3.6.17 Townsend's Big-eared Bat (Corynorhinus townsendii)

3.6.17.1 Habitat Requirements

Townsend's big-eared bats (Corynorhinus townsendii) occur throughout Nevada, from low desert to high mountain habitats, and are found in a wide variety of habitats from pine woodlands to desert scrub, though they are uncommon in extreme desert settings (Marzurek 2004; NDOW 2022). In Nevada, the habitats this species occupies include juniper-mountain mahogany, sagebrush, desert scrub, agricultural areas, and occasionally urban areas, at elevations from 210 to 3,500 m (689 to 11,483 ft) (Rahn 2000; NDOW 2022). They roost in large open caves, abandoned mines, tunnels, and buildings, and their distribution within Nevada is strongly correlated with the availability of abandoned mines and caves. Suitable roosting habitat is a primary limiting factor in their distribution (Bradley et al. 2006; NDOW 2022).

3.6.17.2 Occurrences within the Plan Area

Townsend's big-eared bats have historically been documented near the eastern end of Lake Mead and in the Newberry Mountains (RECON 2000), and were captured and acoustically recorded in the upper Muddy River during Colorado River Corridor surveys in 2006, when the species was considered rare in that area (Williams et al. 2006). The locality database for this species has historically held fewer records than those of other modeled bat species, and the greatest concentrations of verified localities in the Mojave Desert region occur in the Spring Mountains of western Clark County (SWECO 2018). Occurrence in the lowlands is thought to be primarily for foraging. The compiled occurrence dataset used for the updated habitat suitability model consisted of 225 locality records within the buffered modeling area, thinned to 133 records for model training and testing (Simandle and Nussear 2025). NatureServe ranks the species as imperiled (S2) in Nevada (NatureServe 2026i).

Targeted bat acoustic and roost surveys conducted for the Clark County Desert Conservation Program in 2022 and 2023 (Year 1) and in 2023 and 2024 (Year 2) substantially expanded the known occurrence records for this species in Clark County. Across both survey years, Townsend's big-eared bat was detected acoustically at 29 survey locations across Clark County (SWCA 2025) and was documented at 26 of 40 roost survey locations in Year 1 and 33 of 64 in Year 2 (SWCA 2023b; SWCA 2024b). Acoustic detections were concentrated in lower-elevation warm desert riparian corridors along the Muddy River and at ephemeral springs in mid-elevation foothills within pinyon-juniper woodland, and confirmed that the species forages across a broad elevational gradient. Roost surveys documented varied seasonal use, including day, night, maternity, brood-rearing, swarming, late-season, and hibernation activity. In Year 1, a maternity colony of approximately 75 individuals was found in an abandoned mine during summer surveys, and 10 adult individuals were documented hibernating during winter surveys. In Year 2, two active maternity colonies totaling approximately 32 individuals were documented within the Desert Tortoise Protective Corridor Special Management Area, and no individuals were observed during winter surveys (SWCA 2023b; SWCA 2024b). Across both years, 96 to 97 percent of roost detection locations fell within areas modeled as unsuitable habitat, which indicates that the availability of suitable subsurface roost structures, primarily abandoned mine adits and complexes, is a more reliable predictor of occurrence for this species than surrounding vegetation type (SWCA 2023b; SWCA 2024b). Relative to the data used to develop the initial habitat suitability model, these surveys produced a 92 percent increase in the sample size of detections (SWECO 2018; SWCA 2024b). An additional eight occurrence records from Gold Butte National Monument were identified through review of Nevada Division of Minerals data (NDOM 2022, as

cited in SWCA 2024b), further supporting the interpretation that the species is more broadly distributed across Clark County than previously recognized.

3.6.17.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the MaxEnt and Random Forest models (Simandle and Nussear 2025):

- Distance to Cliffs
- Fractional Component Bare Ground
- Depth to Bedrock
- Coefficient of Variation of Minimum Temperature
- Slope
- Soil First Principal Component
- Absolute Minimum Temperature
- Vapor Pressure Deficit Maximum
- Coefficient of Variation of Winter Precipitation
- Vegetation Divisions
- Distance to Water

The most influential predictors of modeled habitat suitability were the Coefficient of Variation of Winter Precipitation, Slope, the Coefficient of Variation of Minimum Temperature, and Distance to Water (Simandle and Nussear 2025)

3.6.17.4 Modeled Habitat Distribution

Predicted suitable habitat for Townsend's big-eared bat is broadly distributed across Clark County, generally occurring at higher elevations, with low suitability in valleys and lowlands (Figure 3-19). Highly suitable habitat occurs across the Spring Mountains and adjacent areas of the Birdsprings Range, and along the Las Vegas Range, Sheep Range, and Muddy Mountains. Moderately suitable habitat is widely distributed throughout the region (Simandle and Nussear 2025) (Table 3-17).

Table 3-17. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the Townsend's big-eared bat (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
70,748	565,161	248,675	44,261	433,077	195,643

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

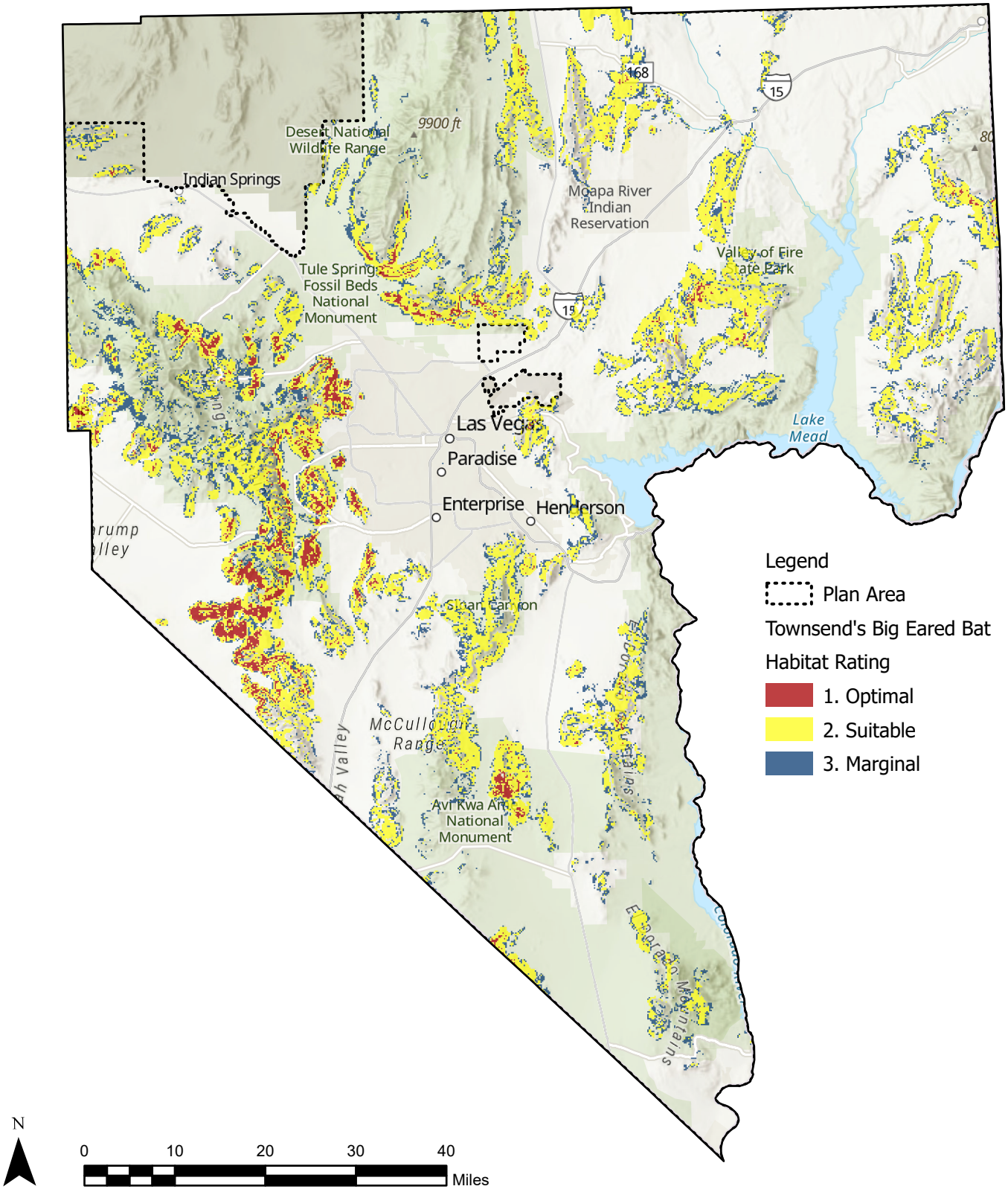

Figure 3-19 Townsend's Big-Eared Bat Habitat Suitability Model and Plan Area

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3.6.18 Monarch butterfly (Danaus plexippus)

3.6.18.1 Habitat Requirements

The monarch butterfly (*Danaus plexippus*) is native to North America and depends on milkweed (*Asclepias* spp.) as its larval host plant (USFWS 2024b). Two migratory populations occur in North America, eastern and western, separated by the Rocky Mountains; sufficient contact between them means they are not considered genetically distinct (Freedman et al. 2021). Eastern monarchs breed east of the Rocky Mountains and overwinter in fir forests in central Mexico, while western monarchs breed west of the Rockies and overwinter in coastal groves from California into northern Baja California, Mexico. Over the course of the breeding season, monarchs expand from their overwintering sites across the lower 48 states and into southern Canada. In the arid western United States, including southern Nevada, monarchs are most likely to occur near sources of moisture such as meadows, riparian areas, and springs, and in human-modified habitats such as parks, gardens, and agricultural areas where milkweed is present (James 2024).

Monarchs require milkweed during the breeding phase, nectar resources throughout breeding and migration, and suitable overwintering habitat for migratory populations. Milkweed is essential for both oviposition and larval development, and adult monarchs depend on a diversity of nectar-producing plants. In western North America, nectar and milkweed resources are often concentrated along riparian corridors and in mesic habitats embedded within more arid landscapes, and milkweed can serve as the primary adult nectar source in the most arid portions of the western range (USFWS 2024b). Nevada does not contain the habitat features that monarchs require for overwintering and does not support overwintering monarchs. In Clark County, suitable breeding habitat is generally associated with mid-elevation areas that support milkweed and nectar resources, with suitability declining in low-elevation valleys and at the highest elevations (Simandle and Nussear 2025).

3.6.18.2 Occurrences within the Plan Area

There are no population-level abundance data for the monarch butterfly in Nevada, and the state population is not actively monitored or censused. Nevada supports breeding monarchs only, and no overwintering sites have been documented in the state (WAFWA 2019); NatureServe assigns the species a Nevada rank of S3B, denoting a vulnerable breeding population (NatureServe 2026j). In southern Nevada, documented breeding activity in the Mojave Desert near Lake Mead is one of the few known inland breeding locales for the western population (Morris et al. 2015). Citizen-science observations from iNaturalist recorded 28 monarch observations in Clark County in 2024 (iNaturalist 2024), and the habitat suitability model for the species compiled monarch occurrence records from iNaturalist, GBIF, and Clark County data (Simandle and Nussear 2025). These records indicate presence but are insufficient for population-level assessment.

Because monarchs depend on milkweed (*Asclepias* spp.) as a larval host plant, the presence and distribution of milkweed is a primary indicator of breeding habitat suitability in Clark County. During 2023 rare plant surveys across approximately 5,055 ha (12,492 acres) of upland and wetland habitat, botanists recorded nine incidental milkweed occurrences representing four species (Ironwood 2023a). Desert milkweed (*Asclepias erosa*) was the most frequently encountered, recorded at five locations across the Spring Mountains, Pahrump Valley, Gold Butte, and Muddy Mountains areas. Showy milkweed (*Asclepias speciosa*) and Mojave milkweed (*Asclepias nyctaginifolia*) were each recorded at one location in the southern County, and rush milkweed (*Asclepias subulata*) was documented at two locations along the Colorado River, a corridor associated with fall migration by western monarchs (WAFWA 2019).

Because all milkweed occurrences were detected incidentally during targeted rare plant surveys, this approach likely underrepresents total milkweed availability in Clark County, particularly for species associated with wetlands and riparian areas. Optimal timing for dedicated milkweed and monarch surveys in Clark County is April to June, when milkweed is most detectable and monarch breeding activity is most likely.

3.6.18.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for the monarch butterfly included the following habitat variables in the MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Aspect
- Coefficient of Variation of Minimum Temperature
- Slope
- Vapor Pressure Deficit Maximum
- Winter Precipitation
- Coefficient of Variation of Winter Precipitation
- Soil pH
- Silica Index
- Gypsum Content
- Distance to Water
- Milkweed
- Vegetation Divisions

The most influential predictors in the model were modeled milkweed suitability, aspect, the silica index, and the coefficient of variation of winter precipitation (Simandle and Nussear 2025).

3.6.18.4 Modeled Habitat Distribution

Predicted suitable habitat for the monarch butterfly is broadly distributed across Clark County, with the highest-suitability habitat occurring at mid-level elevations and suitability declining in valleys and lowlands and at the highest elevations (Figure 3-20). High-quality habitat is predicted around the southeastern periphery of the South McCullough Mountains, north of the Muddy Mountains, and near the Muddy River at Overton. Medium-quality habitat is distributed broadly throughout the County (Simandle and Nussear 2025) (Table 3-18).

Table 3-18. Ecosystems within the Plan Area and the area (acres) of Low, Medium, and High predicted habitat suitability within each ecosystem for the monarch butterfly (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
112,071	270,071	37,751	82,628	165,580	23,612

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

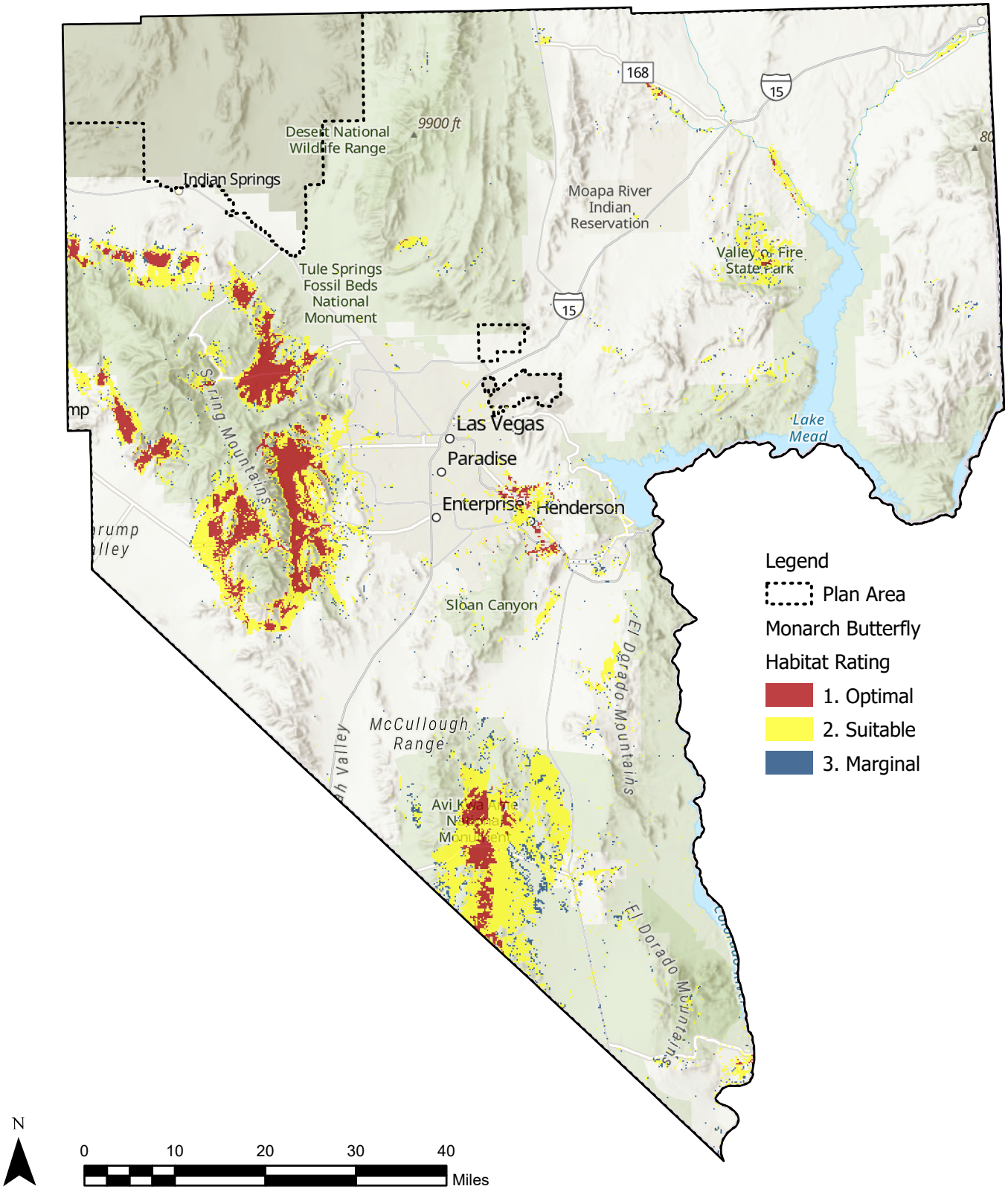

Figure 3-20 Monarch Butterfly Habitat Suitability Model and Plan Area

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3.6.19 Southwestern Willow Flycatcher (Empidonax traillii extimus)

3.6.19.1 Habitat Requirements

The southwestern willow flycatcher is one of four currently recognized subspecies of willow flycatcher and was listed as federally endangered under the Endangered Species Act (ESA) in 1995 (USFWS 1995). At the species level, the willow flycatcher is a breeding resident throughout much of the United States and southern Canada and winters from Mexico south to northwestern Colombia (USFWS 1995). The southwestern subspecies inhabits riparian habitat in the southwestern United States (SWECO 2018).

The southwestern willow flycatcher is a small neotropical migrant that breeds in riparian habitat associated with surface water or saturated soils. It occupies primarily cottonwood (*Populus* spp.) and willow (*Salix* spp.) woodlands and became adapted to introduced salt cedar (*Tamarix* spp.) as native willow communities declined during the twentieth century (Durst et al. 2008). Territories range from near sea level to over 2,600 m (8,530 ft) in elevation, although most occur below 1,600 m (5,249 ft) (Durst et al. 2008).

Within Clark County, preferred breeding habitat consists of dense riparian vegetation near watercourses and wetlands, including willow, cottonwood, tamarisk, and Russian olive (Nussear and Simandle 2020). The primary constituent elements of designated critical habitat are riparian vegetation with dense foliage and an adequate supply of insect prey (USFWS 2013a).

3.6.19.2 Occurrences within the Plan Area

Critical habitat for the southwestern willow flycatcher is designated along the Virgin River in Clark County (USFWS 2013a). The subspecies has been recorded at 19 breeding sites supporting up to 97 territories in Clark County (USFWS 2014), and it breeds and migrates along the Colorado River, the Virgin River above Lake Mead, the Muddy River, the Las Vegas Wash, and the Meadow Valley Wash (GBBO 2010, Nussear and Simandle 2020). NatureServe ranks the subspecies as S1B in Nevada, indicating a critically imperiled breeding population (NatureServe 2026k).

Since 2020, the Clark County Desert Conservation Program has conducted annual monitoring across managed riparian reserves, including the Mesquite West, Bunkerville, Riverside, and Mormon Mesa reserves. Annual detections have ranged from 18 to 28 flycatchers, with fledgling success ranging from 1 to 26 birds (SWCA 2020, 2021b, 2022b, 2023a, 2024a, 2025). In 2025, 26 adults were detected, 23 of them at intensively monitored sites, and eight nesting pairs at Mesquite West produced 10 nesting attempts that yielded eight fledglings (SWCA 2025).

A brown-headed cowbird (*Molothrus ater*) control program was initiated in 2020. Before control, nest parasitism ranged from 33 to 67 percent, averaging 50 percent, and fecundity was below 1.0 young per female. Following control, parasitism declined to an all-time low of 8 percent in 2023, 9 percent in 2024, and 13 percent in 2025, and nest success, productivity, and fecundity were significantly higher during the 2021 to 2025 control period, with fecundity rising to 1.61 young per female (SWCA 2025).

Surveys along the Las Vegas Wash have been conducted since 1998, led by the Southern Nevada Water Authority under the Las Vegas Wash Coordination Committee. Channel stabilization and native revegetation since the late 1990s have increased habitat suitability. In 2024, three resident flycatchers held two territories in native-dominated habitat above the Historic Lateral Weir, and one pair fledged one young, representing the second confirmed fledgling in 27 years at the site. Of 143 adults recorded over 27 years, 12 residents established territories, 10 of

them within the past four years, reflecting habitat maturation following reconstruction of the weir in 2018 (van Dooremolen et al. 2025).

For the habitat suitability modeling effort, 601 occurrence records within the buffered modeling area were compiled from prior survey efforts, iNaturalist, the Global Biodiversity Information Facility, and data supplied by the County (Simandle and Nussear 2025).

3.6.19.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for the southwestern willow flycatcher included the following habitat variables in the Generalized Additive, MaxEnt, and Random Forest models (Simandle and Nussear 2025):

- Percentage of Coarse Fragments
- Coefficient of Variation of Minimum Temperature
- Slope
- Soil First Principal Component
- Absolute Minimum Temperature
- Vapor Pressure Deficit Maximum
- Coefficient of Variation of Winter Precipitation
- Soil pH
- Silica Index
- Distance to Water
- Vegetation Divisions

The most influential predictors were the Percentage of Coarse Fragments, the Coefficient of Variation of Winter Precipitation, the Coefficient of Variation of Minimum Temperature, and the Silica Index (Simandle and Nussear 2025)

3.6.19.4 Modeled Habitat Distribution

Predicted highly suitable habitat for the southwestern willow flycatcher is limited in distribution across Clark County (Figure 3-21). The primary areas occur near the Meadow Valley Wash, the Muddy River, and the Virgin River, with additional patches in the northwest Las Vegas Valley, Indian Springs Valley, and near Sandy Valley (Simandle and Nussear 2025) (Table 3-19).

Table 3-19. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the southwestern willow flycatcher (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
216	59,737	134,376	41	16,025	57,742

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

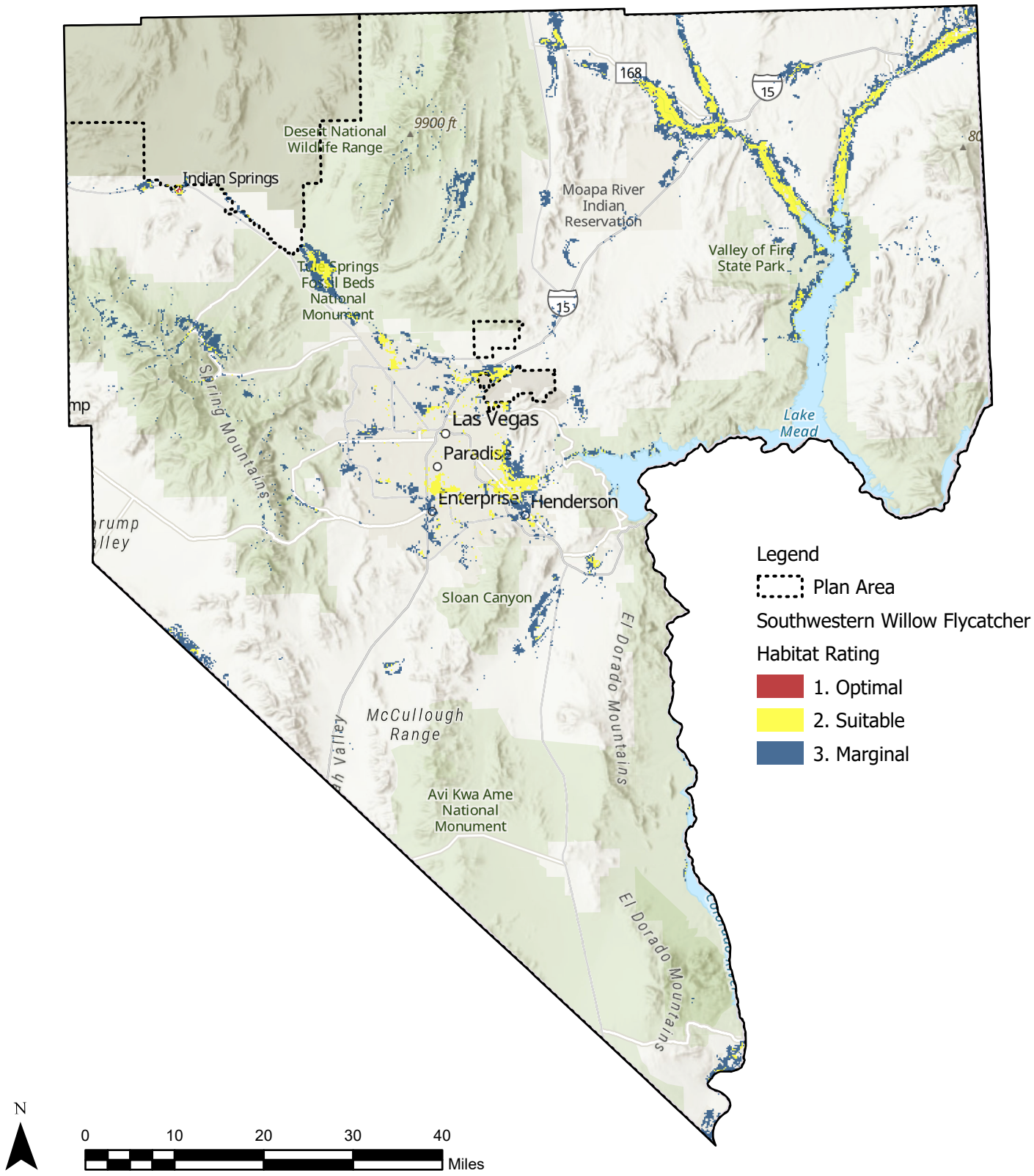

Figure 3-21 Southwestern Willow Flycatcher Habitat Suitability Model and Plan Area

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3.6.20 Spotted Bat (Euderma maculatum)

3.6.20.1 Habitat Requirements

Spotted bats (*Euderma maculatum*) occupy a wide variety of habitats, from desert scrub and pinyon-juniper woodland to conifer and mixed conifer forests, riparian forests, and sub-alpine meadows (Chambers and Herder 2005). Within Nevada, the species occurs across an elevational range of approximately 540 to 2,130 m (1,771 to 6,986 ft) (NBWG 2024). The species is closely associated with dry, rough desert country (Watkins 1977) and uses rocky cliffs, caves, and cave-like structures, as well as houses and urban high-rise buildings that mimic natural cliffs (Geluso 2000; Sherwin and Gannon 2005; Bradley et al. 2006). Along the Muddy River in the upper Moapa Valley, spotted bats were observed foraging primarily over mesquite habitat and secondarily over riparian marsh (Williams 2001; Williams et al. 2006). Springs and areas of open water also provide important foraging habitat, and the species has been recorded foraging in the canyons of the Colorado River drainage system (Chambers et al. 2011).

3.6.20.2 Occurrences within the Plan Area

Within Clark County, spotted bat was historically detected primarily within mesquite bosque and emergent marsh in the Warm Springs Natural Area, as well as in suitable habitats along the Colorado River and Las Vegas Wash (Bradley et al. 2006; Eckberg and Foster 2011). Geluso (2000) also reported six records from urban areas in Las Vegas. Targeted acoustic surveys conducted in 2022 (Year 1; SWCA 2023b) and 2024 (Year 2; SWCA 2024b) substantially expanded the number of occurrence records for this species within Clark County. Year 1 surveys resulted in 189 spotted bat acoustic detections at four locations along the Muddy River in north-central Clark County, all within areas modeled by the initial habitat suitability model (SWECO 2018) as predicted foraging habitat. Most of these detections (180 recordings) were concentrated at a survey location near the Town of Moapa, where repeated feeding trills were recorded across multiple detector-nights, indicating consistent foraging use of the adjacent agricultural fields and warm desert riparian woodland along the Muddy River channel. Year 2 surveys yielded an additional 76 spotted bat recordings at eight locations in north-central Clark County, including sites within the Bitter Springs and Mesa Milkvetch reserve units. Multiple detections at locations within the Overton Wildlife Management Area, adjacent to managed and fallowed alfalfa fields along the Muddy River, again reflected repeated foraging use across multiple detector-nights. Year 2 also documented spotted bat detections at rocky upland sites with cliff habitat and at remote spring features with nearby roosting habitat, expanding the range of detected habitat types to include roosting, flight area, and open water classes in addition to foraging habitat. Together, the Year 1 and Year 2 surveys represent a 1,200 percent increase in the sample size of detections within undisturbed, non-urban habitat areas relative to the occurrence data used to develop the initial habitat suitability model (SWCA 2024b). Predicted foraging and roosting habitat comprises a much larger portion of Clark County than has been surveyed to date, and this species is likely more widespread than these preliminary data indicate.

3.6.20.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for the spotted bat included the following habitat variables in the Generalized Additive, MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Aspect
- Fractional Component Bare Ground

- Depth to Bedrock
- Percentage of Coarse Fragments
- Coefficient of Variation of Minimum Temperature
- Precipitation
- Slope
- Soil First Principal Component
- Absolute Minimum Temperature
- Vapor Pressure Deficit Maximum
- Winter Precipitation
- Coefficient of Variation of Winter Precipitation

The most influential predictors were the Coefficient of Variation of Minimum Temperature, the Soil First Principal Component, the Fractional Component Bare Ground, and the Coefficient of Variation of Winter Precipitation (Simandle and Nussear 2025).

3.6.20.4 Modeled Habitat Distribution

Areas of high predicted habitat suitability for the spotted bat are somewhat narrowly distributed across Clark County (Figure 3-22). The highest-suitability habitat occurs near the Virgin River, the Muddy River, and the Meadow Valley Wash in northeastern Clark County, with additional patches of suitable habitat in and around the City of Las Vegas (Simandle and Nussear 2025) (Table 3-20).

Table 3-20. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the spotted bat (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
52,821	164,202	38,528	739	38,233	19,303

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

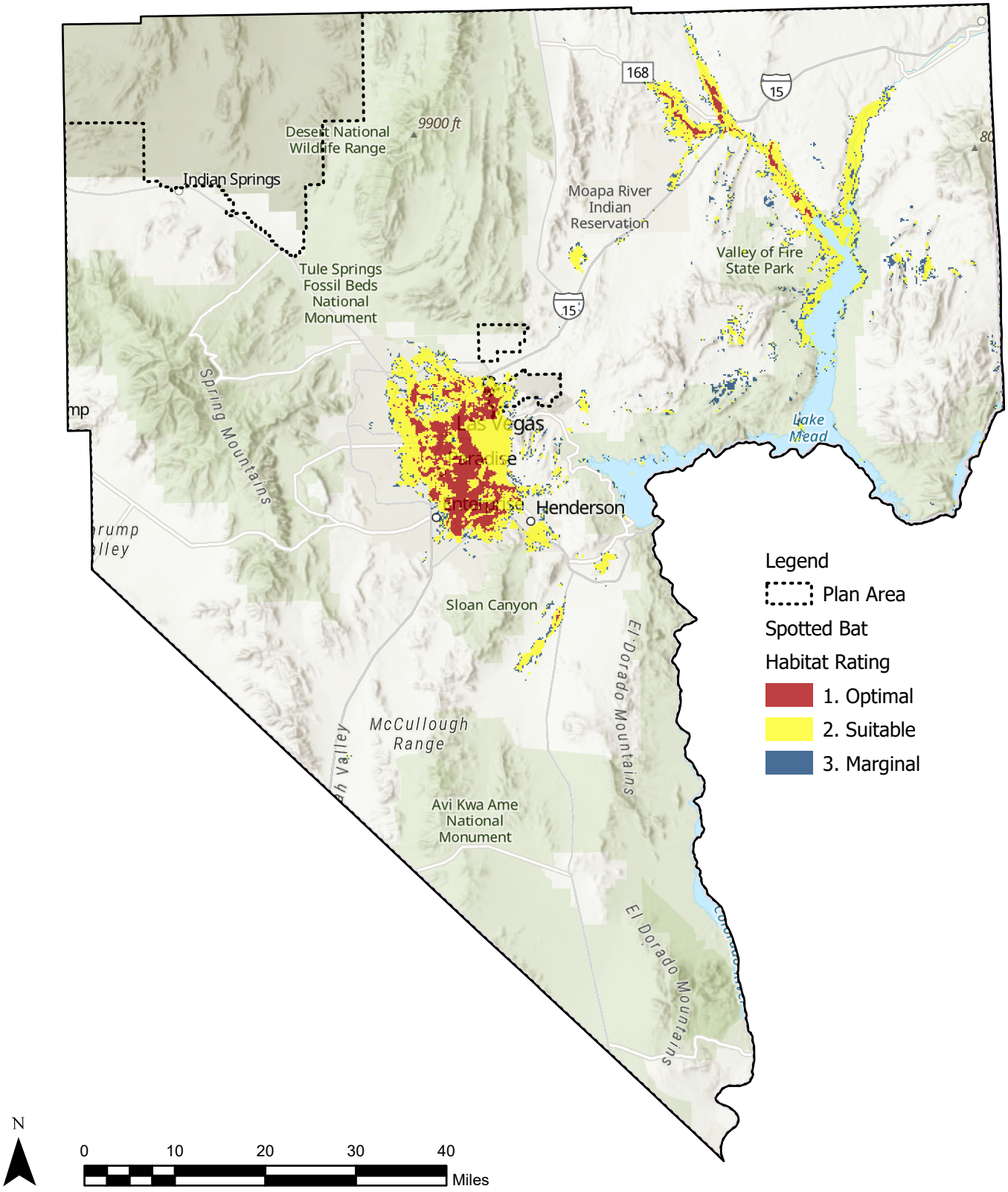

Figure 3-22 Spotted Bat Habitat Suitability Model and Plan Area

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3.6.21 Mojave Desert Tortoise (Gopherus agassizii)

3.6.21.1 Habitat Requirements

The Mojave Desert tortoise (*Gopherus agassizii*) occurs primarily north and west of the Colorado River in the Mojave Desert of southwestern Utah, southern Nevada, and southeastern California, with additional populations documented east of the Colorado River in northwestern Arizona (USFWS 2022). In Nevada, the species occupies the southern portion of the state, where the Mojave Desert ecotype occurs and ground temperatures exceed 15°C (59°F) during winter (NDOW 2022). Its elevational range in Nevada extends from near sea level to approximately 1,050 m (3,445 ft) (NDOW 2022).

Mojave Desert tortoises occupy a variety of landform types across their range, including valley bottoms, lower slopes, upper slopes, mountain slopes, and mountain passes (Nussear and Simandle 2020). They occur across habitats ranging from sandy flats and alluvial fans to rocky foothills, washes, and canyons. At lower elevations, habitats are typically dominated by creosote bush scrub, while at higher elevations tortoises may occur in blackbrush and juniper woodland ecotones (NDOW 2022). The major habitat types are classified as Mojave Warm Desert and Mojave Mid-Elevation Mixed Desert Scrub (NDOW 2022).

Soil type is an important determinant of desert tortoise habitat suitability. Within Mojave desert scrub, desert tortoises prefer sandy loam soils and tend to avoid overly sandy soils with low water retention or soils where they cannot construct burrows or access caliche dens (NDOW 2022). Suitable substrates for burrowing, nesting, and overwintering are therefore a fundamental physical habitat requirement. Young tortoises commonly use existing rodent burrows rather than excavating their own (NDOW 2022).

Vegetation cover is essential for thermoregulation, predator avoidance, and water conservation. Tortoises use self-excavated burrows as well as rock shelters, dense plant cover, and artificial shade structures to regulate body temperature and reduce water loss (NDOW 2022). Desert tortoises are obligate herbivores and prefer habitats with an abundance of annual forbs and browse vegetation. They consume a wide variety of herbaceous plants, particularly flowering annuals, as well as perennial grasses, shrubs, and cacti. Although tortoises can consume dry vegetation, they depend primarily on fresh spring vegetation for most of their caloric and water requirements (NDOW 2022; USFWS 2022).

Mojave Desert tortoises spend up to 95 percent of their lives underground, using burrows as refugia during winter brumation, temperature extremes, and periods of inactivity. Peak surface activity occurs when ambient temperatures are between 26 and 34°C (79 and 93°F); tortoises return to burrows when temperatures fall outside this range and emerge during and after rainstorms to drink (NDOW 2022). Tortoises show fidelity to their burrows but are capable of traveling greater distances when searching for mates. Sufficient space to support viable, well-distributed populations, along with connectivity between population groups, is therefore a fundamental landscape-level habitat requirement (USFWS 2022). Clark County contains portions of the Eastern Mojave and Northeastern Mojave Recovery Units and therefore represents a key component of habitat supporting the overall range of the species (USFWS 2022).

3.6.21.2 Occurrences within the Plan Area

With over 113,000 occurrence points recorded in Clark County, the desert tortoise is the most thoroughly documented of the Covered Species. These records have been compiled from long-term Desert Conservation Program monitoring, Clark County survey data, and research-grade

citizen-science observations (Nussear et al. 2024). Within the Plan Area, tortoises occur primarily throughout the broad, lower-elevation valleys, with higher numbers of records in the Hidden, Pahrump, Ivanpah, Eldorado, and Piute valleys. NatureServe ranks the desert tortoise as S2S3 (Imperiled to Vulnerable) in Nevada (NatureServe 2026l). BLM ACECs, National Park Service lands, other lands allocated for resource conservation such as the Boulder City Conservation Easement, and additional conserved lands provide an extensive network of habitats managed directly or indirectly for desert tortoise conservation.

Critical Habitat for desert tortoise was designated in 1994 (USFWS 1994b). The Plan Area contains the Mormon Mesa, Gold Butte-Pakoon, and Piute-Eldorado Critical Habitat Units. Approximately 955,953 acres of formally designated desert tortoise Critical Habitat occur in Clark County, representing approximately 14.5 percent of the species' range-wide total of designated Critical Habitat (USFWS 1994). The primary constituent elements, or physical and biological features, described in the Critical Habitat designation (USFWS 1994) include sufficient space to support viable populations within each of the six recovery units; sufficient quantity and quality of forage species and the proper soil conditions for growth of those species; suitable substrates for burrowing, nesting, and overwintering; burrows, caliche caves, and other shelter sites; sufficient vegetation for shelter from temperature extremes and predators; and habitat protected from disturbance and human-caused mortality.

3.6.21.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Random Forest model (Nussear et al. 2024):

- Average Maximum Temperature
- Depth to Bedrock
- Soil Sand Content
- Slope
- Winter Precipitation
- Coefficient of Variation of Winter Precipitation
- Vegetation Divisions

The most influential predictors in the model were Soil Sand Content, Winter Precipitation, and Depth to Bedrock (Nussear et al. 2024).

3.6.21.4 Modeled Habitat Distribution

Nussear et al. (2024) modeled desert tortoise habitat suitability across Clark County. Predicted suitable habitat is distributed broadly across the lower bajadas and valley floors of the county, with the highest predicted suitability occurring in Mojave Desert Scrub, Blackbrush, Mesquite Acacia, and Salt Desert Scrub communities and smaller amounts in Desert Riparian ecosystems; moderate suitability extends into these same ecosystems and a small portion of the Pinyon-Juniper ecosystem (Figure 3-23; Nussear and Simandle 2020). Predicted suitability is lowest in the higher-elevation mountainous areas, including the Spring and Sheep ranges, Lucy Grey Mountains, Virgin Mountains, and southern Gold Butte (Nussear and Simandle 2020). Desert tortoise localities were most frequently associated with the North American Warm Desert Scrub and Grassland and Western North American Cool Semi-Desert Scrub and Grassland vegetation associations (Nussear et al. 2024) (Table 3-21).

Table 3-21. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for Mojave Desert tortoise (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
233,855	1,172,828	132,353	200,619	714,302	80,873

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

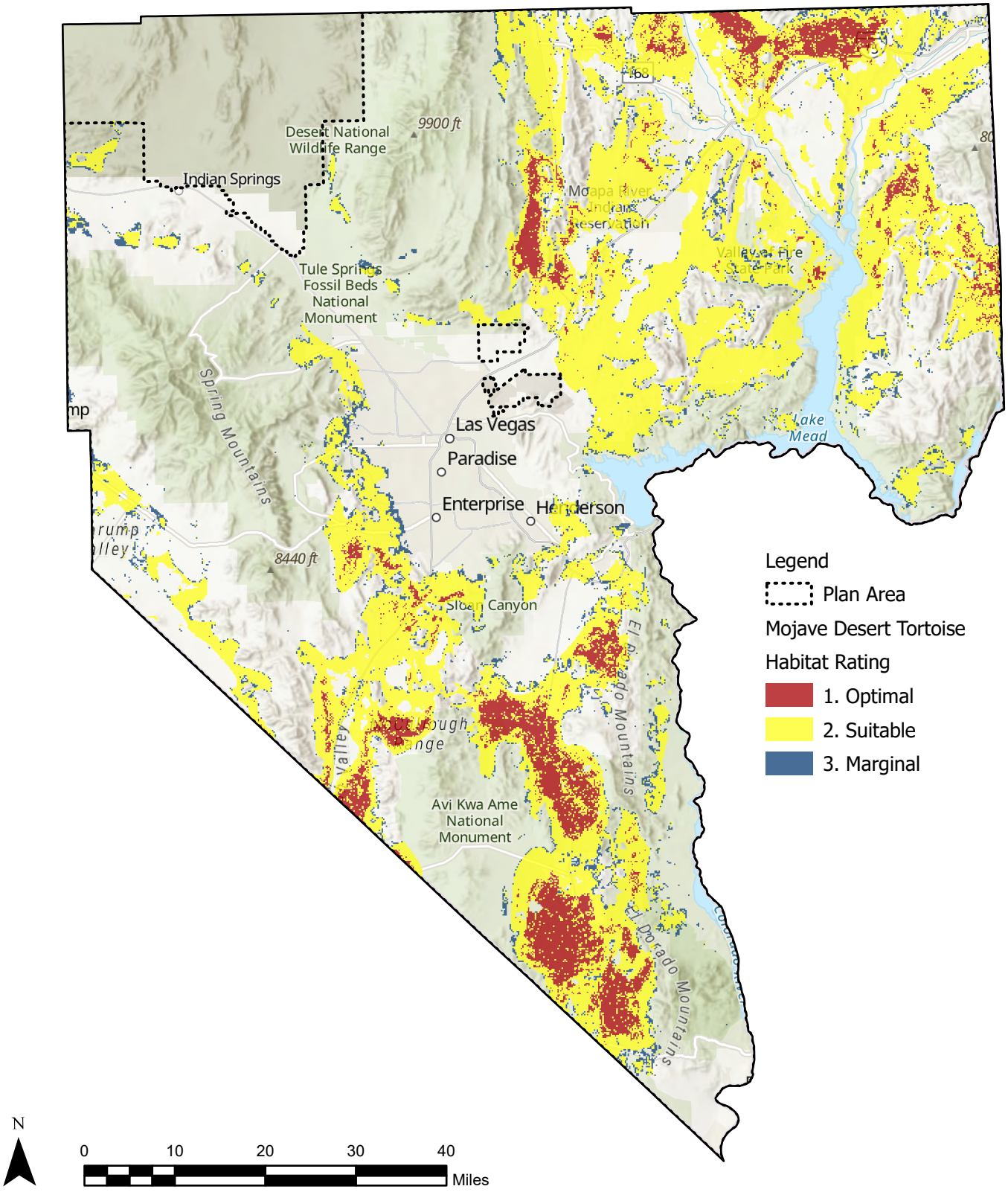

Figure 3-23. Mojave Desert Tortoise Habitat Suitability Model and Plan Area

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3.6.22 Gila Monster (Heloderma suspectum)

3.6.22.1 Habitat Requirements

The Gila monster (*Heloderma suspectum*) occupies rocky desert scrub habitats characterized by shrubby, grassy, and succulent vegetation (NDOW 2022). Suitable habitat consists of complex, rocky landscapes of upland desert scrub adjacent to foraging sites that support appropriate prey (Beck 1990, Gienger 2003). The species occurs most frequently on the lower slopes of mountains and foothills, particularly where these areas are juxtaposed with washes and canyon bottoms (Beck 1990, Gienger 2003). In Nevada, Gila monsters occur primarily in Mojave Warm Desert and Mojave Mid-Elevation Mixed Desert Scrub vegetation types, and most localities are associated with desert wash, spring, and riparian areas, including those along the lower Colorado River drainage (Funk 1966, Lovich and Beaman 2007, NDOW 2022). Across their range, Gila monsters occur at elevations of approximately 762 to 1,524 m (2,500 to 5,000 ft) (Bogert and del Campo 1956, Funk 1966).

Sub-surface shelter sites are a critical habitat component. Gila monsters do not excavate their own shelters and instead use sandstone crevices, rocky slopes and debris flows, rodent burrows, and desert tortoise burrows (Gienger et al. 2021). In Clark County, sandstone crevices and rocky slopes together accounted for approximately 85 percent of shelters used, rodent burrows for approximately 12 percent, and desert tortoise burrows for approximately 3 percent (Gienger et al. 2021). Shelter depth is the attribute most strongly associated with seasonal shelter selection, and individuals select progressively deeper shelters as surface temperatures rise through spring and summer, which allows them to avoid potentially lethal surface conditions (Gienger et al. 2021). Selected shelters are more thermally stable than comparable unused shelters and, in one Clark County study, never exceeded 40°C (104°F), whereas the critical thermal maximum for the species is 42.5°C (108.5°F) (Bogert and del Campo 1956, Gienger et al. 2021).

Gila monsters typically overwinter at more elevated positions on rocky slopes, in rocky outcrops, or below cliffs, often sharing these sites with other reptiles such as rattlesnakes and desert tortoises, and they occupy adjacent lower valleys and alluvial fans during summer where the prey base is larger (Jennings and Hayes 2004). Individuals show strong fidelity to specific refuge locations across seasons and years, so landscapes that contain complexes of thermally suitable shelter features are an important component of habitat for the species (Gienger et al. 2021).

3.6.22.2 Occurrences within the Plan Area

Approximately 25 percent of the Gila monster's range occurs in Clark County, which lies at the northern extent of the species' distribution (Stebbins 2003). Within the County, the distribution of the Gila monster is generally coincident with that of the Mojave desert tortoise and the common chuckwalla (*Sauromalus ater*), although detailed information on distribution and relative abundance in Nevada remains limited (NDOW 2022). Recent survey work indicates that the species is more common than previously expected in the McCullough Mountains.

Gila monsters spend up to 98 percent of their lives underground, which makes them difficult to detect, and infrequent observations should not be interpreted as a low likelihood of occurrence (Beck and Jennings 2003). The habitat suitability model compiled 3,157 Gila monster locality records, drawn from earlier modeling efforts, research-grade iNaturalist and GBIF observations, and data supplied by Clark County; these records were spatially thinned to 501 records for model training and testing (Simandle and Nussear 2025).

Genetic assessment of Clark County populations identifies northeastern Clark County,

encompassing Moapa Valley, the Valley of Fire, the Muddy Mountains, Gale Hills, and the Dry Lake Range, as a regional stronghold and a historic zone of admixture between the Nevada and Utah genetic clusters (Wood and Vandergast 2023). Populations to the west and east of Las Vegas, including those in the Calico and Blue Diamond Hills and in the North McCullough and Sloan Canyon areas, remain connected by a narrow corridor of suitable habitat that is bisected by State Route 160 and Interstate 15 (Wood and Vandergast 2023).

A 2025 genetic sampling effort surveyed 11 sites across Clark County from April through July 2025, covering 391 km (243 mi) of visual encounter transects across 739 hours of search time and 375 individual surveys, and yielded 14 live encounters of Gila monsters (Gienger 2025). The species is ranked S2 (imperiled) in Nevada (NatureServe 2026m).

3.6.22.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Additive, MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Aspect
- Fractional Component Bare Ground
- Coefficient of Variation of Minimum Temperature
- Slope
- Soil First Principal Component
- Minimum Temperature
- Vapor Pressure Deficit Maximum
- Coefficient of Variation of Winter Precipitation
- Distance to Cliffs
- Vegetation Divisions

The most influential predictors of Gila monster habitat suitability were the Coefficient of Variation of Winter Precipitation, the Vapor Pressure Deficit Maximum, the Distance to Cliffs, and the Coefficient of Variation of Minimum Temperature (Simandle and Nussear 2025).

3.6.22.4 Modeled Habitat Distribution

Modeled habitat suitability for the Gila monster is broadly distributed across Clark County. Highly suitable habitat occurs at mid to higher elevations, whereas suitability is low in valleys and lowlands (Figure 3-24). Within the County, highly suitable habitat is concentrated in the Sheep Range and adjacent portions of the Las Vegas Range, in the Muddy Mountains, along the southeast edge of the Spring Mountains, and in the McCullough Range, with moderately suitable habitat distributed widely throughout the region (Simandle and Nussear 2025) (Table 3-21).

Table 3-22. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the Gila monster (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
174,786	540,517	306,497	112,052	376,512	211,231

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

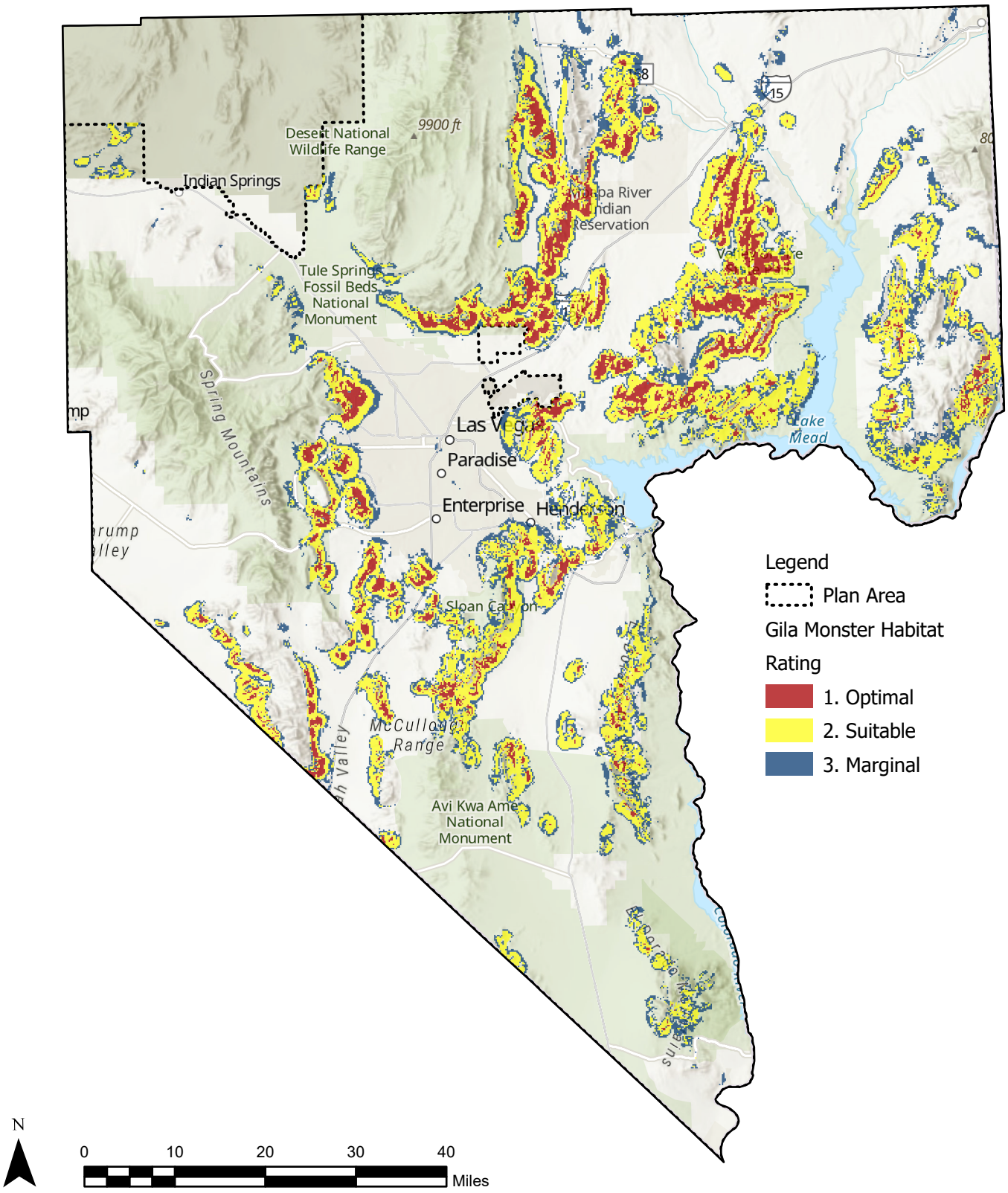

Figure 3-24 Gila Monster Habitat Suitability Model and Plan Area

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3.6.23 Loggerhead Shrike (Lanius ludovicianus)

3.6.23.1 Habitat Requirements

The loggerhead shrike (*Lanius ludovicianus*) is a medium-sized, predatory songbird and a year-round resident throughout Nevada. It occupies open to semi-open habitats characterized by low vegetation, elevated hunting perches, and access to prey. Suitable environments include open desert, sagebrush scrub, woodlands, pastures, fencerows and shelterbelts in agricultural fields, orchards, riparian areas, ranches, suburban areas, roadsides, cemeteries, and golf courses (Prescott and Collister 1993, Dechant et al. 2002). Prominent shrubs, fence posts, power lines, and poles that serve as hunting perches are a critical component of suitable habitat (Yosef and Grubb 1994).

As an opportunistic predator, the loggerhead shrike takes a wide variety of prey depending on seasonal availability, including large insects such as grasshoppers, small birds, lizards, mice and other rodents, and carrion (NDOW 2022). Because it lacks the heavy talons of raptors, it impales prey on thorns, spines, or barbed wire to anchor it while feeding (NDOW 2022).

In Clark County and the broader Mojave Desert region, loggerhead shrikes occur throughout desert shrub communities dominated by creosote bush (*Larrea tridentata*), burro brush (*Ambrosia dumosa*), sagebrush (*Artemisia* spp.), or saltbush (*Atriplex* spp.) interspersed with Joshua trees, catclaw, or mesquite (SWECO 2018). The species prefers areas of low slope and high horizontal and vertical structural diversity (Poole 1992 in Dechant et al. 2002). Nesting occurs in thorny or dense shrubs and small trees that provide structural support and concealment; in the Mojave Desert region, Joshua trees (*Yucca brevifolia*), mesquite (*Prosopis* spp.), and catclaw (*Acacia* spp.) are commonly used (Dawson 1923). Impaling stations, where prey is cached on sharp objects, have been documented 7 to 65 m (23 to 213 ft) from nests (Woods 1995.

3.6.23.2 Occurrences within the Plan Area

In Clark County, the loggerhead shrike is widespread and relatively common. It is a year-round resident of desert shrub communities on lower bajadas and valley bottoms and a seasonal visitor to lower mountain slopes of semi-open woodlands (Blake 1984). The species has been documented in all major ecosystem types in the county except alpine, bristlecone pine, and mixed conifer (Ammon 2015).

During avian point-count surveys conducted across Clark County Desert Conservation Program properties from 2018 to 2025, the loggerhead shrike was recorded at multiple locations (SWCA 2025). Within the Riparian Reserve Units, the species was detected at the Mormon Mesa subunit and incidentally at the Bunkerville West and Muddy River subunits. At the BCCE, the loggerhead shrike has been recorded every year since surveys began there in 2018 (SWCA 2025).

Targeted surveys for the loggerhead shrike were conducted in 2021 and 2022 to verify and refine the initial species habitat suitability model (Nussear and Simandle 2020). The 2021 surveys produced 62 detections at 23 subplots across 18 sites in Clark County (SWCA 2021a). Of the 62 detections, 90 percent (56) fell within predicted habitat, with 18 in habitat modeled as optimal, 36 in habitat modeled as suitable, and two in habitat modeled as marginal; the remaining six detections were outside predicted habitat but within 600 m (1,969 ft) of it (SWCA 2021a). The results do not suggest a poor model fit, because the few detections outside predicted habitat may reflect variable food availability rather than habitat structure, given the species' raptorial foraging habits (SWCA 2021a; Yosef 2020). Confirmed breeding, including recently fledged young, was observed in habitat modeled as suitable on the edge of optimal habitat (SWCA 2021a).

The 2022 surveys produced 62 detections across 13 sites, making the loggerhead shrike the most abundant and most widespread of the target species that year (SWCA 2022a). Confirmed breeding behavior, including nest building, carrying food, family groups, and recently fledged young, was observed at multiple locations (SWCA 2022a). Although 91 percent of the area surveyed was predicted habitat, detections were associated with only 11 percent of the surveyed area, which may reflect reduced prey availability during prolonged drought as well as rangewide population declines (SWCA 2022a; Yosef 2020).

3.6.23.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Random Forest model (Nussear et al. 2024):

- Winter Precipitation
- Coefficient of Variation of Winter Precipitation
- Average Spring Maximum Temperature
- Slope
- Normalized Difference Vegetation Index (NDVI) Start of Season
- Flow Accumulation
- Vegetation Divisions

Flow accumulation and slope were the most influential predictors of habitat suitability for the loggerhead shrike (Nussear et al. 2024).

3.6.23.4 Modeled Habitat Distribution

Predicted suitable habitat for the loggerhead shrike is widespread throughout Clark County. Areas of medium- and high-suitability habitat occur across the county, and high-suitability habitat is found within all major ecosystem types except alpine, bristlecone pine, and mixed conifer, with the Mojave Desert Scrub and Blackbrush ecosystems containing the largest areas of predicted high-suitability habitat (Figure 3-25). Vegetation associated with modeled habitat for the species falls mostly within North American Warm Desert Scrub and Grassland, followed by Western North American Cool Semi-Desert Scrub and Grassland, and Land Use and Development (Nussear et al. 2024) (Table 3-23).

Table 3-23. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the loggerhead shrike (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
956,860	1,748,244	190,306	608,760	1,011,101	122,026

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

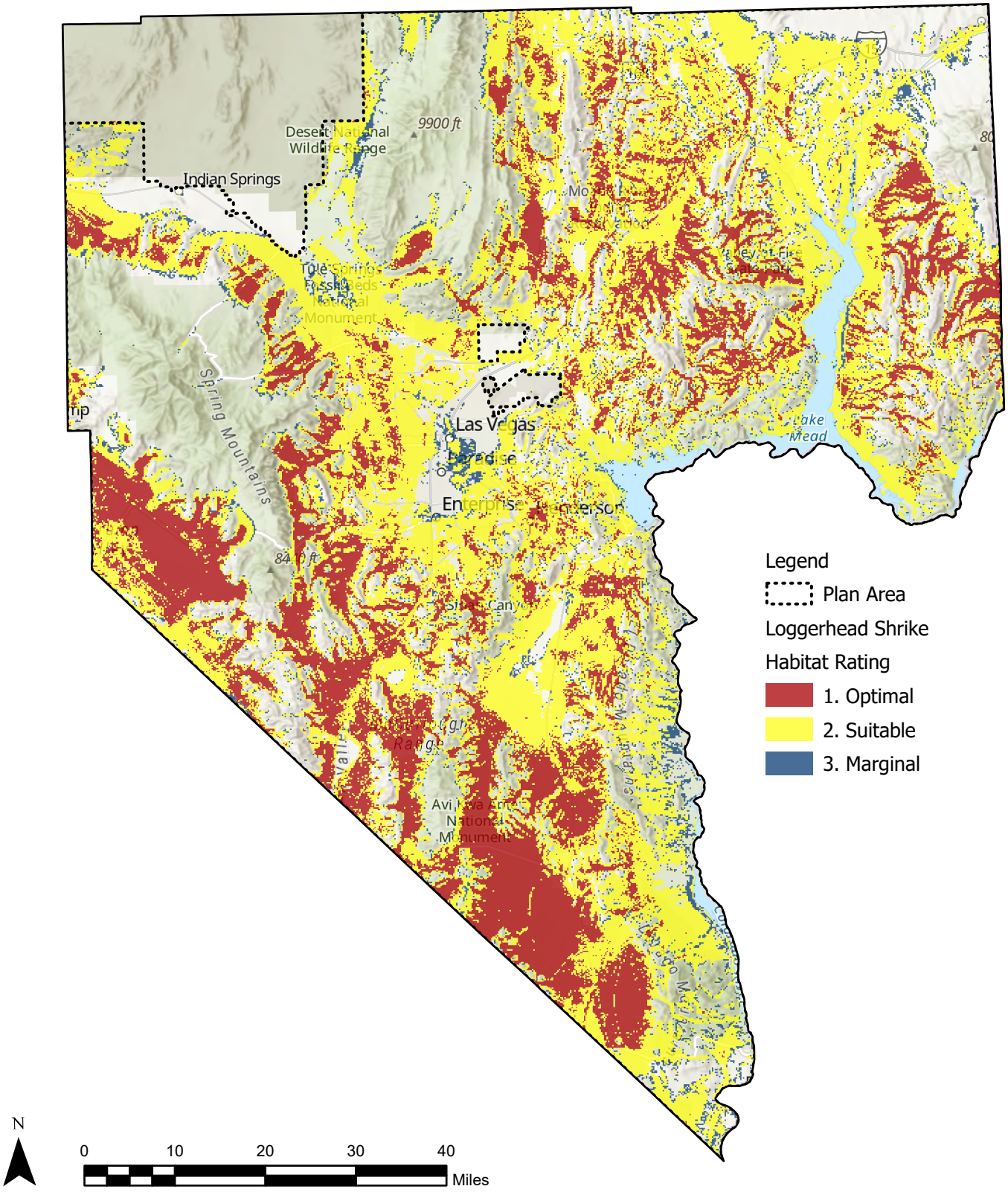

Figure 3-25. Loggerhead Shrike Habitat Suitability Model and Plan Area

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3.6.24 Mojave Poppy Bee (Perdita meconis)

3.6.24.1 Habitat Requirements

The Mojave poppy bee (*Perdita meconis*) is a habitat specialist that occurs only where its obligate host plants, poppies in the genera *Arctomecon* and *Argemone*, are present (TNC 2007). Within Clark County it is most strongly associated with the Las Vegas bearpoppy (*Arctomecon californica*), a short-lived gypsophile perennial, and its suitable habitat is largely restricted to gypsum soils that support dense patches of these host plants at lower to mid elevations (Sardiñas and Kremen 2014). These gypsum substrates contain 18 to 69 percent gypsum (Megill 2007) and are typically covered by low-growing biological soil crusts of lichen, moss, and cyanobacteria (Harper and Van Buren 2004). The species occurs within gypsum-tolerant herbaceous plant communities embedded in creosote bush, saltbush, and occasionally blackbrush scrub (TNC 2007).

The Mojave poppy bee is a strict pollen specialist on its poppy hosts, and host plant availability is the primary factor limiting its distribution (Griswold et al. 2026). Adults are active only during the short spring bloom of the host plants, forage mainly in the early morning, and are rarely observed after noon. The bee can remain dormant as an immature in its ground nest for multiple years, which allows it to persist through drought and years of poor bloom but also means that reliable status assessment requires multiple years of survey. More than a third of surveyed Las Vegas bearpoppy populations declined severely between 2020 and 2023, with no accompanying bee detections; these declines were most pronounced west of the Virgin River arm of Lake Mead, while the most robust host plant populations and bee detections were concentrated to the east within Gold Butte National Monument (Griswold et al. 2026).

3.6.24.2 Occurrences within the Plan Area

The earliest records of the Mojave poppy bee in Clark County come from studies of the reproductive ecology of the Las Vegas bearpoppy (Tepedino and Hickerson 1996). Those surveys did not detect the bee at sites in the Las Vegas Valley but found it at all nine sites examined near Lake Mead, extending from Pabco Road north and east to St. Thomas (Tepedino and Hickerson 1996). A survey of rare bees in Clark County in 1998 expanded the known range northward to the vicinity of Coyote Springs (Griswold et al. 1999), and a subsequent survey extended it eastward to the Virgin River arm of Lake Mead in what is now Gold Butte National Monument (Griswold et al. 2006).

Most recently, surveys across Clark County in 2022 and 2023 documented the species at a mix of historic and newly recorded sites (Griswold et al. 2026). Detections varied sharply between the two years: the bee was found at only two sites in 2022 but in good numbers at multiple sites in 2023, spanning Gold Butte National Monument, the west side of the Virgin River arm of Lake Mead, the area east of Las Vegas near Pabco, and the vicinity of Sandy Valley. The 2023 surveys substantially increased the documented distribution within Gold Butte National Monument (Griswold et al. 2026).

3.6.24.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression, MaxEnt, and Random Forest models (Simandle and Nussear 2025):

- Fractional Component Bare Ground

- Coefficient of Variation of Minimum Temperature
- Slope
- Minimum Temperature
- Vapor Pressure Deficit Maximum
- Coefficient of Variation of Winter Precipitation
- Soil pH
- Silica Index
- Gypsum Content
- Distance to Water
- Vegetation Divisions

The most influential predictors of suitable habitat were Gypsum Content, Silica Index, Coefficient of Variation of Winter Precipitation, and Coefficient of Variation of Minimum Temperature (Simandle and Nussear 2025).

3.6.24.4 Modeled Habitat Distribution

Predicted suitable habitat is concentrated in northeastern Clark County at lower to mid elevations and is absent from the county's high-elevation areas (Figure 3-26). The largest area of highly suitable habitat extends from Rainbow Gardens northeast to the southern periphery of the Virgin Mountains, with smaller areas east of the Bird Spring Range and along the southern shore of Lake Mead near the Big Gypsum Ledges (Simandle and Nussear 2025) (Table 3-24)..

Table 3-24. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the Mojave poppy bee (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
15,145	152,976	135,408	14,929	129,899	77,157

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

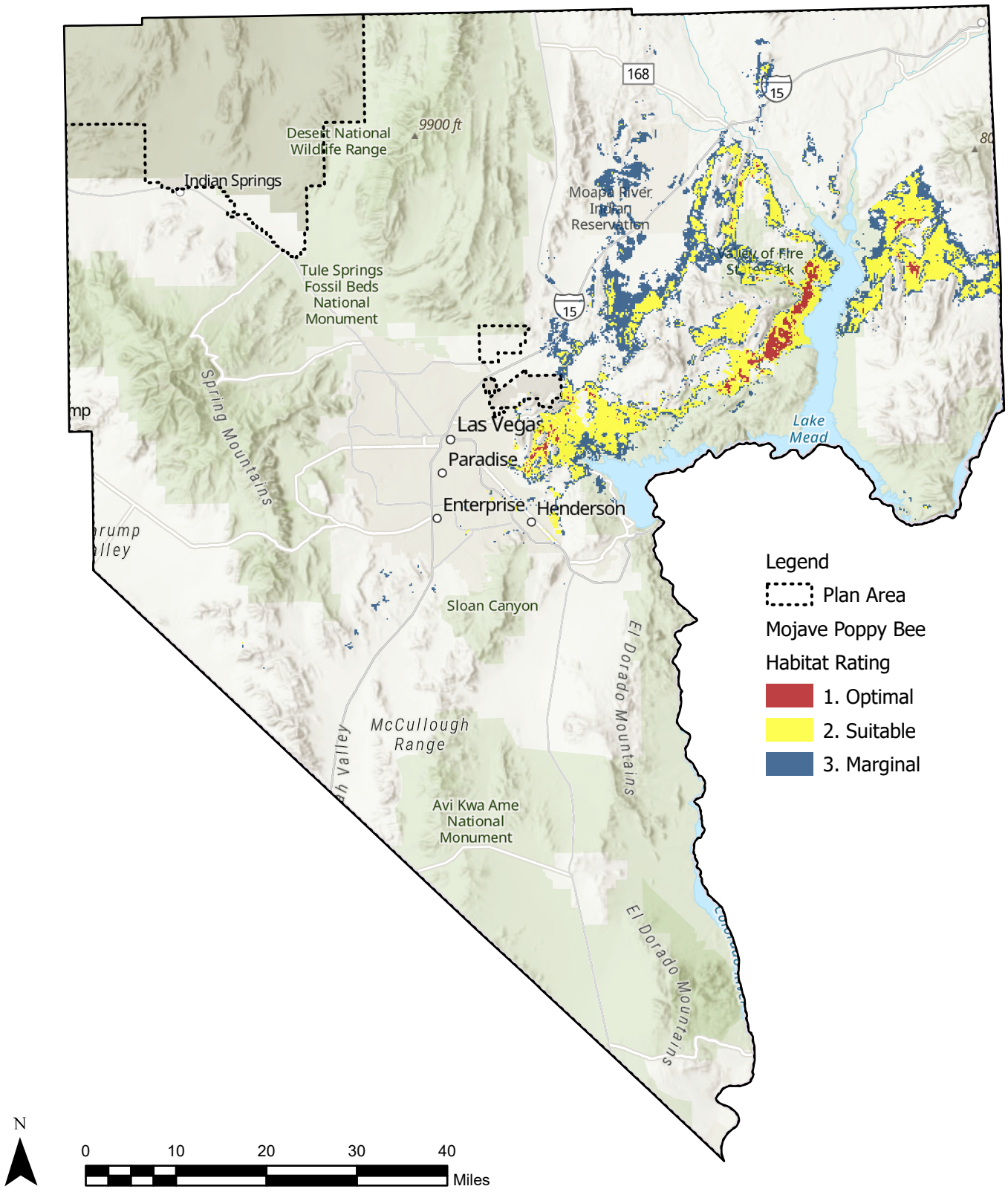

Figure 3-26 Mojave Poppy Bee Habitat Suitability Model and Plan Area

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3.6.25 Yuma Ridgway's Rail (Rallus obsoletus yumanensis)

3.6.25.1 Habitat Requirements

The Yuma Ridgway's rail (*Rallus obsoletus yumanensis*) is the only subspecies of Ridgway's rail present in Clark County and represents the northernmost occurrences of the subspecies (NDOW 2022). It is an obligate wetland species with narrow habitat requirements, occupying freshwater and alkali marshes dominated by stands of emergent vegetation and interspersed with areas of open water and drier, upland benches (Eddleman and Conway 2020). Preferred cover consists of moderately dense stands of cattail (*Typha* spp.) and bulrush (*Schoenoplectus* spp.), with sedges (*Cyperaceae*) providing additional nesting cover, and the subspecies avoids both open water and densely overgrown stands (Eddleman and Conway 2020). Nesting requires a wet, densely vegetated substrate such as mudflats or drainage bottoms, and vegetation density is considered the critical element of suitable nesting habitat (NDOW 2022). Within Clark County, the subspecies occurs in marshes along rivers, backwaters, and drains or sumps supported by irrigation water, at elevations ranging from below sea level to approximately 396 m (1,300 ft) (Nussear and Simandle 2020). Winter habitat in Nevada is similar to breeding habitat, and documented migratory stopover sites include sparse desert areas such as arroyos with creosote (*Larrea tridentata*) and mesquite (*Prosopis* spp.), as well as agricultural fields (Harrity and Conway 2020).

3.6.25.2 Occurrences within the Plan Area

The Yuma Ridgway's rail is the only subspecies of Ridgway's rail present in Clark County, where occurrences are concentrated in freshwater marshes along the Virgin, Muddy, and Colorado Rivers and the Las Vegas Wash (Garnett et al. 2004, van Dooremolen 2015).

The lower Virgin River and Muddy River are considered among the more important areas for the rail within Clark County, and nesting of multiple pairs was confirmed in 2001 at Big Marsh along the western portion of the Virgin River, one of the seven Important Bird Areas of Clark County (Nussear and Simandle 2020). Regular but reportedly decreasing occurrences were documented in this area between 1999 and 2003, with annual counts ranging from 2 to 32 individuals and averaging 13.6 (Garnett et al. 2004). Targeted surveys for the subspecies have been conducted along the Las Vegas Wash since 2000, transitioning in 2008 to a secretive marsh bird protocol that covers six species and is carried out in April and May (NDOW 2022). Lone individuals were recorded in 1998, 2005 to 2006, 2015 to 2017, and 2020, and no more than one individual was confirmed in the Las Vegas Wash project area in any year prior to 2021. Detections then increased, with five individuals confirmed in 2021, seven in 2022, and six in 2023, associated with habitat enhancement by the Las Vegas Wash Coordination Committee and Clark County that included bulrush plantings and constructed wetland ponds (van Dooremolen et al. 2024). Long-term point-count monitoring by the Great Basin Bird Observatory corroborates this increase, with Ridgway's rail recorded at the Las Vegas Wash during the 2022 to 2023 survey year for the first time in the program's standardized point-count record and detected in both the breeding season and the fall transition period (GBBO 2024). NatureServe assigns the subspecies a Nevada subnational rank of S1B, indicating critical imperilment as a breeding population within the state (NatureServe 2026n).

3.6.25.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for the Yuma Ridgway's rail included the following habitat variables in the MaxEnt, Generalized Boosted Regression, and Random Forest models (Simandle and Nussear 2025):

- Aspect
- Fractional Component Bare Ground
- Depth to Bedrock
- Percentage of Coarse Fragments
- Coefficient of Variation of Minimum Temperature
- Soil First Principal Component
- Absolute Minimum Temperature
- Vapor Pressure Deficit Maximum
- Coefficient of Variation of Winter Precipitation
- Vegetation Divisions

The most influential predictors in the model were the coefficient of variation of winter precipitation, the coefficient of variation of minimum temperature, and the soil first principal component (Simandle and Nussear 2025).

3.6.25.4 Modeled Habitat Distribution

Areas of high habitat suitability for the Yuma Ridgway's rail are rare and narrowly distributed in Clark County (Figure 3-27). The model that incorporates Clark County vegetation divisions identifies highly suitable habitat on the eastern side of the City of Las Vegas, including North Las Vegas, Sunrise Manor, East Las Vegas, and Paradise. Because the environmental predictor variables are not represented correctly in urban areas, predictions in and around the City of Las Vegas should be interpreted with caution (Simandle and Nussear 2025) (Table 3-25).

Table 3-25. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the Yuma Ridgway's rail (Simandle and Nussear 2025)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
5,050	11,119	170	-	-	15

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, (c) OpenStreetMap contributors, and the GIS User Community, Esri, USGS

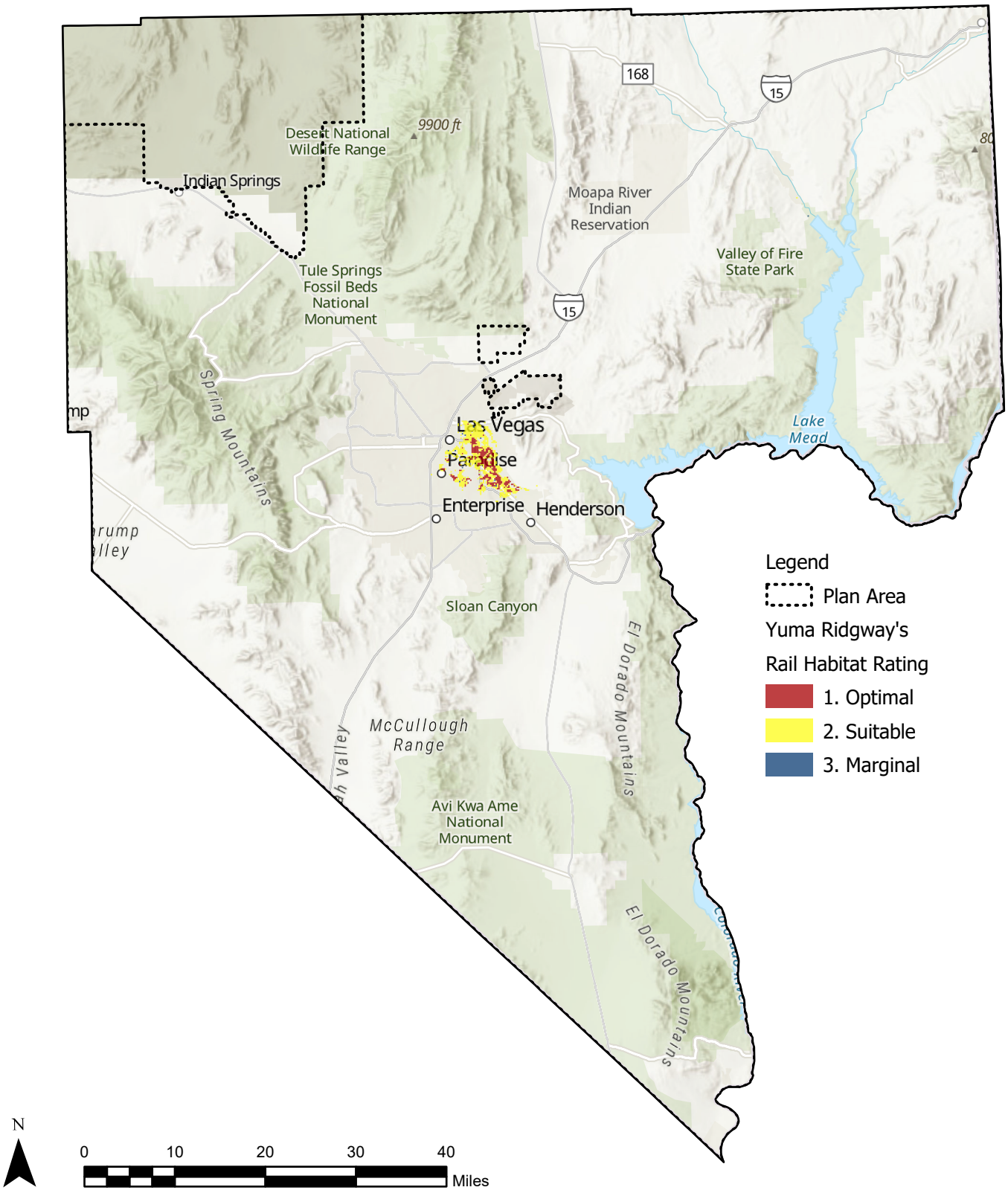

Figure 3-27 Yuma Ridgway's Rail Habitat Suitability Model and Plan Area

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3.6.26 Bendire's Thrasher (Toxostoma bendirei)

3.6.26.1 Habitat Requirements

Bendire's thrasher (*Toxostoma bendirei*) is a migratory songbird of the North American warm deserts, breeding from southeastern California and southern Nevada east through New Mexico and wintering primarily in southern Arizona and Sonora, Mexico. Within Clark County the species is a breeding resident, arriving in February and departing for wintering grounds in late July through August (NDOW 2022). It occupies open, arid desert scrub with scattered large shrubs or cacti and expanses of bare ground, generally from sea level to 1,800 m (5,906 ft), and avoids dense vegetation such as riparian woodland (England and Laudenslayer 1993). The presence of large, scattered shrubs or cacti interspersed with open ground is a structural prerequisite for occupancy, and at least one large cholla (*Cylindropuntia* spp.), yucca, or spinescent shrub such as palo verde, mesquite, catclaw acacia (*Senegalia wrightii*), or desert-thorn (*Lycium* spp.) is almost always present (England and Laudenslayer 1993). In Nevada, the species is closely tied to intact Mojave Desert scrub, particularly Joshua tree and yucca landscapes with abundant cholla, and all confirmed nests in the state have been placed in cactus or other spiny vegetation (GBBO 2013; NDOW 2022). Nests are built low in vegetation, approximately 1 m above the ground (Brown 1901). The species forages primarily on the ground, gleaning and probing for insects and other arthropods and occasionally taking fruit (England and Laudenslayer 1993).

3.6.26.2 Occurrences within the Plan Area

Within Clark County, Bendire's thrasher is largely restricted to the western half of the southernmost portions of the county, with additional localities along the lower slopes of the Sheep and Spring Ranges. Scattered records also occur in the northern and eastern portions of the county, including near Mesquite, though these generally fall outside the areas of highest predicted habitat suitability (Nussear and Simandle 2020). NatureServe ranks the species as critically imperiled in Nevada (S1B), with the B qualifier denoting a breeding-population rank (NatureServe 2026o). The occurrence records compiled for the county's habitat suitability model were drawn from earlier modeling datasets, research-grade iNaturalist observations, and County-supplied records, and the roughly 120 detections in the model input dataset are concentrated in the large patch of predicted optimal habitat near Searchlight, at the southern end of the county (Nussear et al. 2024; SWCA 2022a).

County-wide avian surveys for the proposed avian covered species followed the 300 by 300 m area-search protocol of the Desert Thrasher Working Group, with three repeat visits per site to maximize detection of these secretive species (Desert Thrasher Working Group 2018). Surveys in 2021 produced three detections of Bendire's thrasher, all at a single subplot within the Highland Range site, one per survey round. The subplot fell within modeled optimal habitat, and the pattern of a singing bird present 7 or more days across the repeated visits indicated probable breeding (SWCA 2021a). The low total was somewhat unexpected, since 77 percent of surveyed subplots intersected predicted habitat. The winter of 2020 to 2021 was exceptionally dry, with a record 240 consecutive days without measurable precipitation recorded in Las Vegas between April 20 and December 17, 2020 (National Weather Service 2021), and dry winters are known to delay breeding phenology and reduce breeding activity in this species (Desert Thrasher Working Group 2018). Field observations also indicated that some areas mapped as predicted habitat lacked the large cholla, yucca, or spinescent shrubs needed for nesting, which suggests that the model may overestimate suitable habitat in parts of the county (SWCA 2021a).

Surveys in 2022 produced six detections, two during area searches and four incidental, all concentrated within an approximately 220 km² (85 mi²) area of southern Clark County near

Searchlight. Of the area surveyed that year, 447 ha (1,105 acres), or 78 percent, was predicted Bendire's thrasher habitat, and all detections fell within predicted habitat (SWCA 2022a). Three of the detections were more than 2.5 km (1.6 mi) from any existing record in the model input dataset, establishing new occurrence records at the New York Mountains, North Searchlight, and Middle Piute Valley sites. The two area-search detections, at the New York Mountains and North Searchlight sites, were of non-singing individuals and provided only evidence of presence, while one incidental detection of a pair in suitable habitat indicated probable breeding nearby (SWCA 2022a). Taken together, the 2021 and 2022 results are consistent with the distribution of records used to build the habitat suitability model, with detections concentrated in and around the largest patch of predicted optimal habitat at the southern end of the county (SWCA 2022a).

3.6.26.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Distance to Cliffs
- Normalized Difference Vegetation Index (NDVI) Amplitude
- NDVI Maximum
- Winter Precipitation
- Coefficient of Variation of Winter Precipitation
- Slope
- Flow Accumulation
- Vegetation Divisions

Within this vegetation-inclusive model, the Vegetation Divisions layer, Winter Precipitation, Slope, and Flow Accumulation contributed most to the predicted habitat suitability (Nussear et al. 2024).

3.6.26.4 Modeled Habitat Distribution

Predicted suitable habitat for Bendire's thrasher is concentrated in the western half of the southernmost portions of Clark County, consistent with the species' known distribution in upland Mojave Desert scrub and blackbrush, with additional suitability along the bajadas surrounding the Spring and Sheep Ranges and near Mesquite (Figure 3-28). The vegetation-inclusive model extends predicted habitat farther into the northeastern portion of the county. Vegetation associated with modeled locality points was predominantly western North American cool semi-desert scrub and grassland and North American warm desert scrub and grassland (Nussear et al. 2024) (Table 3-26).

Table 3-26. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the Bendire's thrasher (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
77,191	623,165	170,885	64,208	440,412	105,730

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

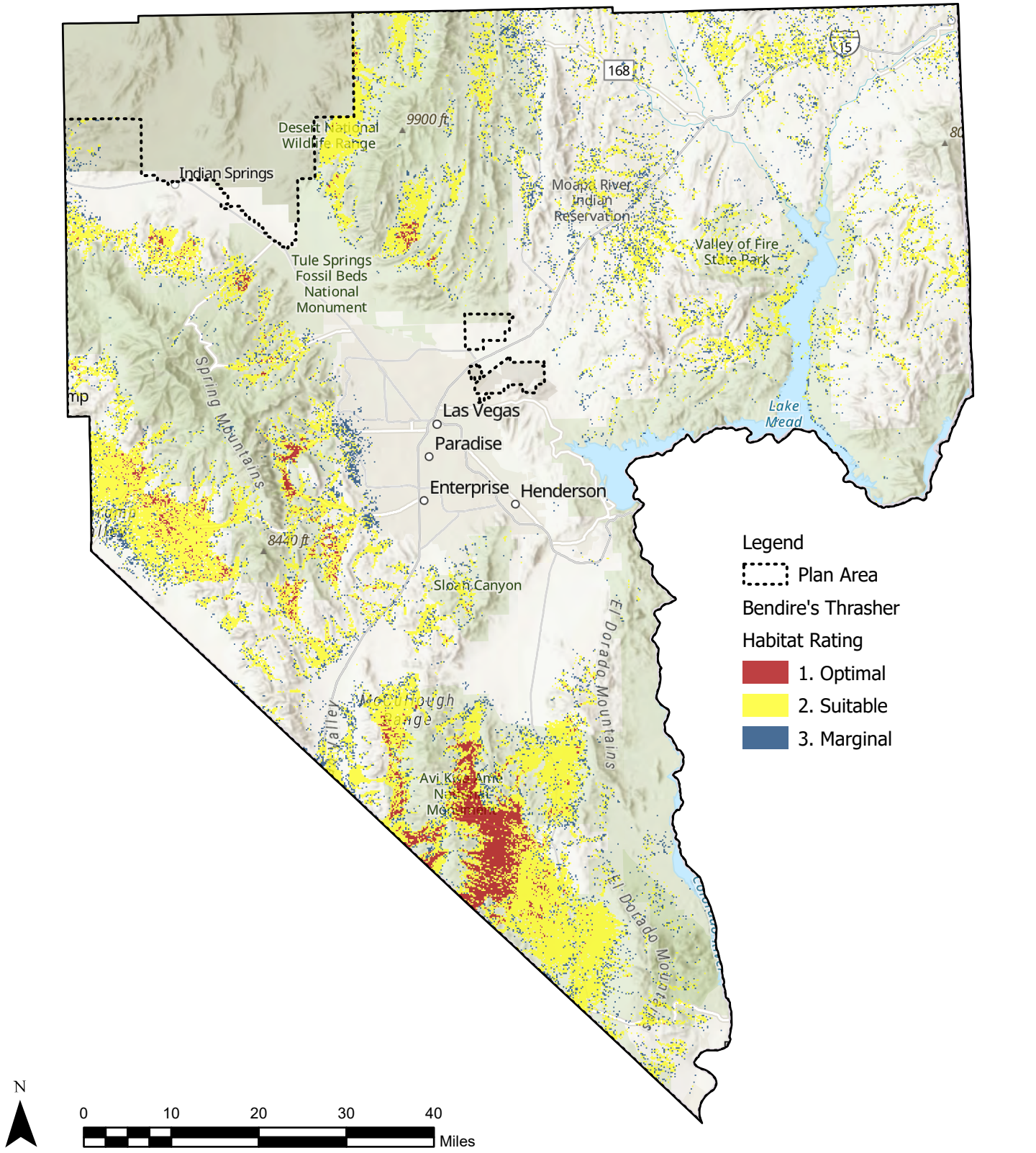

Figure 3-28. Bendire's Thrasher Habitat Suitability Model and Plan Area

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3.6.27 LeConte's Thrasher (Toxostoma lecontei)

3.6.27.1 Habitat Requirements

LeConte's thrasher (*Toxostoma lecontei*) occupies open, sparsely vegetated desert habitat, including desert flats, dunes, alluvial fans, and gently rolling terrain across the southwestern United States and northwestern Mexico. Within Clark County, the species occurs on gently sloping ground, generally less than 4 degrees, with silty or sandy, often alkaline soils (Sheppard 1970; Fletcher 2009). Occupied stands are typically dominated by saltbush (*Atriplex* spp.) and cholla (*Opuntia* spp.), with low shrub cover and little seasonal herbaceous growth; the species rarely uses stands composed entirely of creosote bush (*Larrea tridentata*) and is negatively associated with blackbrush and pinyon-juniper communities on steeper slopes (Fletcher 2009). Accumulated litter beneath shrubs is an important foraging substrate that shelters the invertebrate prey making up most of the diet, including scorpions, beetles, grasshoppers, spiders, moths and their larvae, and occasionally small lizards (Sheppard 1970).

3.6.27.2 Occurrences within the Plan Area

LeConte's thrasher occurs throughout the lower-elevation valleys of the Plan Area, with only a few records above approximately 1,220 m (4,000 ft). The greatest concentration of records lies south of the Las Vegas metropolitan area, in Mojave Desert scrub of the Ivanpah, Piute, and Eldorado valleys. The species has also been recorded in the Pahrump and Mesquite valleys to the southwest, near Indian Springs to the northwest, and at scattered locations across the north-central and northeastern Plan Area.

Systematic surveys at 432 randomly distributed sites across Clark County from 2005 to 2007 documented detections at 41 locations, along with 24 incidental records (Fletcher 2009). An occupied nest was recorded on Mormon Mesa during late-1800s surveys, but the species was not detected there in the later effort (Fisher 1893; Fletcher 2009). The largest continuous area without detections covered most of Gold Butte and the Virgin River Valley, in contrast to late-1800s records from the Virgin River Valley that point to a subsequent loss from that area (Fisher 1893; Fletcher 2009). Annual point-count surveys at the Boulder City Conservation Easement have detected LeConte's thrasher consistently since 2018 (SWCA 2025).

In 2021, targeted area-search surveys at 30 randomly selected sites across the county recorded 49 LeConte's thrasher detections, 26 during area searches and 23 incidental, at 16 subplots across 11 sites (SWCA 2021a). All detections fell within predicted habitat, 34 in habitat modeled as optimal and 15 in habitat modeled as suitable, and the highest breeding evidence was a family group in optimal habitat (SWCA 2021a). Surveys at 30 additional sites in 2022 recorded 16 detections, seven during area searches and nine incidental, with breeding confirmed by an active nest with young and an individual carrying food (SWCA 2022a). Detection rates were lower in 2022 than in 2021, consistent with reduced nesting during the prolonged 2020 to 2022 drought, since breeding effort in this species tracks precipitation (Corman 2005).

Targeted surveys at Tule Springs Fossil Beds National Monument in the Las Vegas Valley from 2021 to 2023 found that habitat use shifted with rainfall. In a dry year the species was restricted to flat saltbush stands, whereas after a wet winter it occupied rockier Mojave Desert scrub on steeper terrain, where breeding was later confirmed (Simmons 2024). The habitat suitability model for the species compiled 605 occurrence records from prior modeling datasets, iNaturalist research-grade observations, and Clark County records within the buffered modeling area, thinned to 388 localities for analysis (Nussear et al. 2024). NatureServe ranks LeConte's thrasher as imperiled (S2) in Nevada (NatureServe 2026p).

3.6.27.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Random Forest models (Nussear et al. 2024):

- Flow Accumulation
- Normalized Difference Vegetation Index (NDVI) Length of Season
- Winter Precipitation
- Coefficient of Variation of Winter Precipitation
- Coefficient of Variation of Average Spring Maximum Temperature
- Slope
- Vegetation Divisions

The most influential predictors were the coefficient of variation of winter precipitation, slope, and flow accumulation (Nussear et al. 2024).

3.6.27.4 Modeled Habitat Distribution

Predicted suitable habitat for LeConte's thrasher is widespread across the lower-elevation valleys of southern and western Clark County (Figure 3-29). High-suitability habitat is concentrated in the Pahrump and Sandy valleys, Ivanpah Valley, south of Jean Dry Lake, the valley south of Sloan Canyon, the northwestern bajada of Eldorado Valley, the vicinity of Corn Creek, and near Indian Springs, with smaller, less connected patches near Mormon Mesa and Mesquite. Vegetation at occupied localities was predominantly North American Warm Desert Ruderal Grassland and North American Warm Desert Scrub and Grassland, with Western North American Cool Semi-Desert Scrub and Grassland and other associations at lower prevalence (Nussear et al. 2024) (Table 3-27).

Table 3-27. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the LeConte's thrasher (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
216,498	664,684	191,296	150,249	321,674	77,116

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

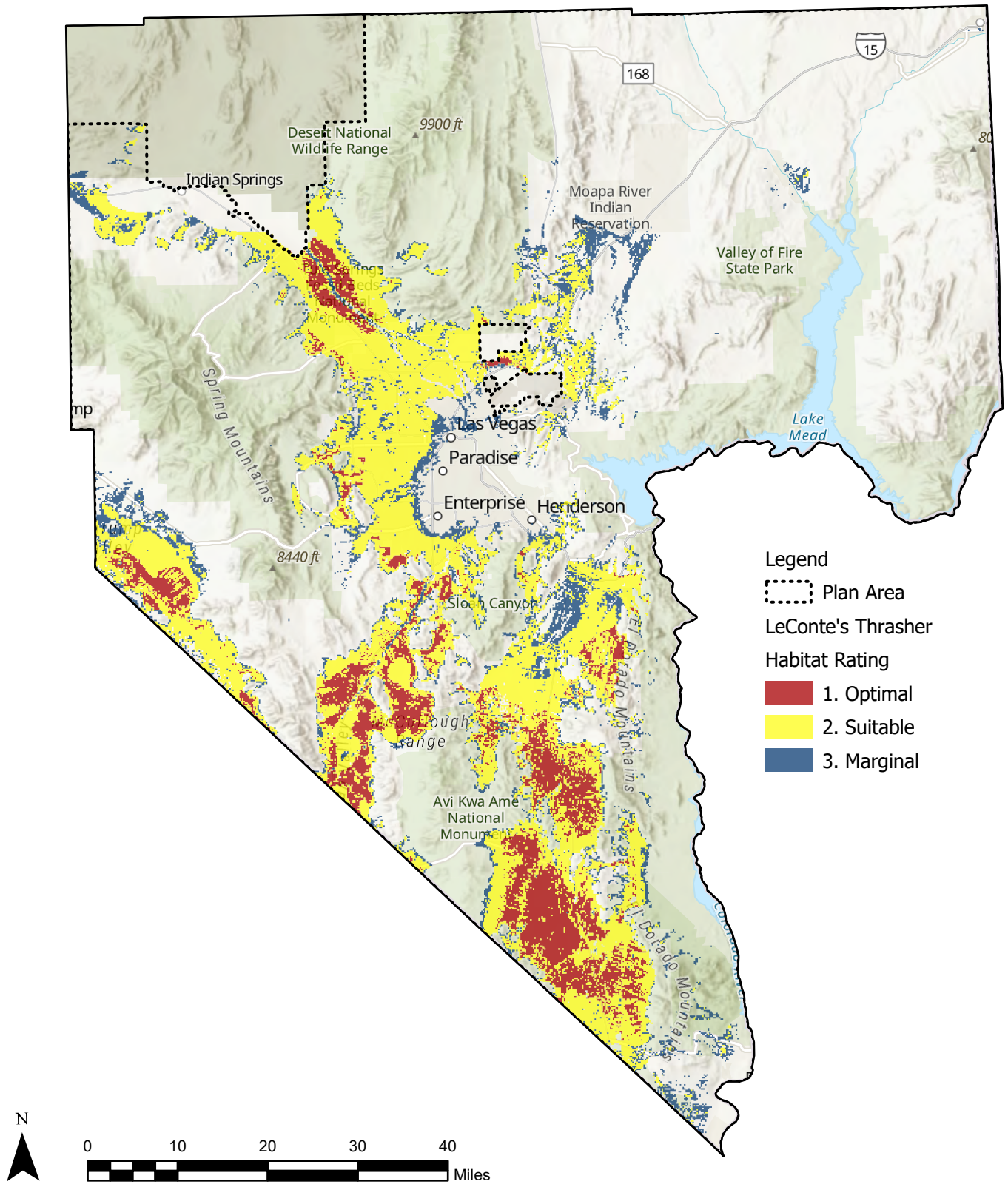

Figure 3-29. LeConte's Thrasher Habitat Suitability Model and Plan Area

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3.6.28 Bell's Vireo (Vireo bellii)

3.6.28.1 Habitat Requirements

Bell's vireo (*Vireo bellii*) breeds across North America, from the Great Plains into the southwestern United States, west to coastal southern California, and south into Mexico and Central America (Kus et al. 2020). In Nevada, the species occurs almost exclusively in riparian areas of the southern part of the state, concentrated in habitats adjacent to surface water along the Virgin, Muddy, and Colorado rivers and at isolated spring complexes large enough to sustain riparian woodlands (NDOW 2022). The subspecies present in southern Nevada is the Arizona Bell's vireo (*V. b. arizonae*), which is associated with the Colorado River drainage (NDOW 2022). The species favors low, shrubby vegetation characteristic of early successional riparian stages, with a well-developed to dense shrub layer 0.6 to 3 m (2 to 10 ft) in height, which is the most critical structural component of nesting habitat (Kus et al. 2020). Understory associates in the Mojave and Sonoran deserts include mule-fat (*Baccharis salicifolia*), arrowweed (*Pluchea sericea*), mesquite (*Prosopis* spp.), and tamarisk (*Tamarix* spp.), with palo verde (*Parkinsonia* spp.) and netleaf hackberry (*Celtis reticulata*) common in wooded desert washes (Kus et al. 2020). In Nevada, the species will nest in tamarisk where other vegetation is absent (NDOW 2022). Bell's vireo is primarily found below 1,300 m (4,265 ft) (Kus et al. 2020).

3.6.28.2 Occurrences within the Plan Area

Avian surveys conducted by SWCA from 2016 through 2025 have documented Arizona Bell's vireo along riparian corridors and desert washes throughout the County, including the Virgin and Muddy rivers in the northeastern portion of the County, the southern tip of the County between the Newberry Mountains and the Colorado River, the Las Vegas Wash, and scattered mesquite bosques north and west of Las Vegas. Nearly two-thirds of all detections have occurred in desert riparian habitat along the Virgin and Muddy river drainages (SWCA 2022a, 2024a, 2025). In Nevada, *V. b. arizonae* is ranked S2B (imperiled, breeding), the "B" denoting a breeding-population rank consistent with the species' breeding-only status in the state (NDOW 2022).

Point-count surveys on Clark County MSHCP Riparian Reserve units in 2020 recorded Arizona Bell's vireo at all five subunits surveyed (Mesquite West, Bunkerville, Riverside, Mormon Mesa, and Muddy River), with a combined 39 detections; the species was the most abundantly detected covered bird at the Riverside subunit (SWCA 2020). Targeted area-search surveys in 2021 and 2022 were conducted to refine the initial habitat suitability model (Nussear and Simandle 2020). In 2021, surveys at 30 randomly selected sites across the County recorded the species at one subplot during formal area searches, with 11 additional incidental detections; all but one detection fell within predicted optimal or suitable habitat, and all were associated with riparian vegetation along the Virgin River, lower Las Vegas Wash, or lower Colorado River (SWCA 2021a). Key habitat components were absent from 27 of the 30 sites, and the results indicated that the initial model overestimated suitable habitat in the County, predicting presence in ecosystems the species does not use for breeding, such as Mojave desert scrub, blackbrush, pinyon-juniper, and sagebrush, and at elevations above 1,300 m (4,265 ft) (SWCA 2021a).

In 2022, surveys were expanded to 30 sites, nine of which were selected to target Bell's vireo (SWCA 2022a). Surveyors recorded 32 detections during area searches and 8 incidental detections; 79 percent of County detections were in predicted suitable habitat and 13 percent were in predicted optimal habitat. Nearly all detections (95 percent) were concentrated at Meadow Valley Wash, the widest drainage surveyed, which held the most extensive contiguous desert riparian habitat and was the only site with surface water present. Persistent singing and

repeated multiple-individual detections across all three visits indicated occupied breeding territories at this site, while single detections at Wheeler Camp Spring and Creeks were attributed to migrants (SWCA 2022a). Together, the 2021 and 2022 results indicate that breeding Bell's vireo in the County is associated with the largest, most contiguous patches of desert riparian habitat, while smaller and more fragmented patches appear to support migration use only (SWCA 2022a). Point-count surveys in 2025 continued to detect the species at the Bunkerville East, Riverside, Mormon Mesa South, and Muddy River subunits, with singing individuals in appropriate breeding-season habitat at each subunit where it was detected (SWCA 2025).

3.6.28.3 Modeled Habitat Variables and Characteristics

The habitat suitability model for this species included the following habitat variables in the Generalized Boosted Regression and Random Forest models (Nussear et al. 2024):

- Average Maximum Temperature
- Average Spring Maximum Temperature
- Normalized Difference Vegetation Index (NDVI) Amplitude
- Winter Precipitation
- Slope
- Topographic Position Index
- Soil Silt Content
- Vegetation Divisions

Average maximum temperature, average spring maximum temperature, soil silt content, and topographic position were the most influential predictors of habitat suitability for this species (Nussear et al. 2024).

3.6.28.4 Modeled Habitat Distribution

Areas of medium- and high-suitability habitat are predicted to occur in central Clark County, including the Las Vegas Valley and the Muddy River, Virgin River, and lower Colorado River drainages, with the highest-suitability habitat concentrated along the riparian corridors of these drainages and the shorelines of Lake Mead (Figure 3-30). The predominant vegetation association at occurrence locations was North American Warm Desert Scrub and Grassland (Nussear et al. 2024) (Table 3-28).

Table 3-2829. Acres within the Plan Area and Conserved Lands of Low, Medium, and High predicted habitat suitability for the Bell's vireo (Nussear et al. 2024)

Plan Area			Conserved Area		
High	**Medium**	**Low**	**High**	**Medium**	**Low**
16,325	231,900	193,467	8,854	179,240	136,373

Esri, USGS, California State Parks, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USFWS

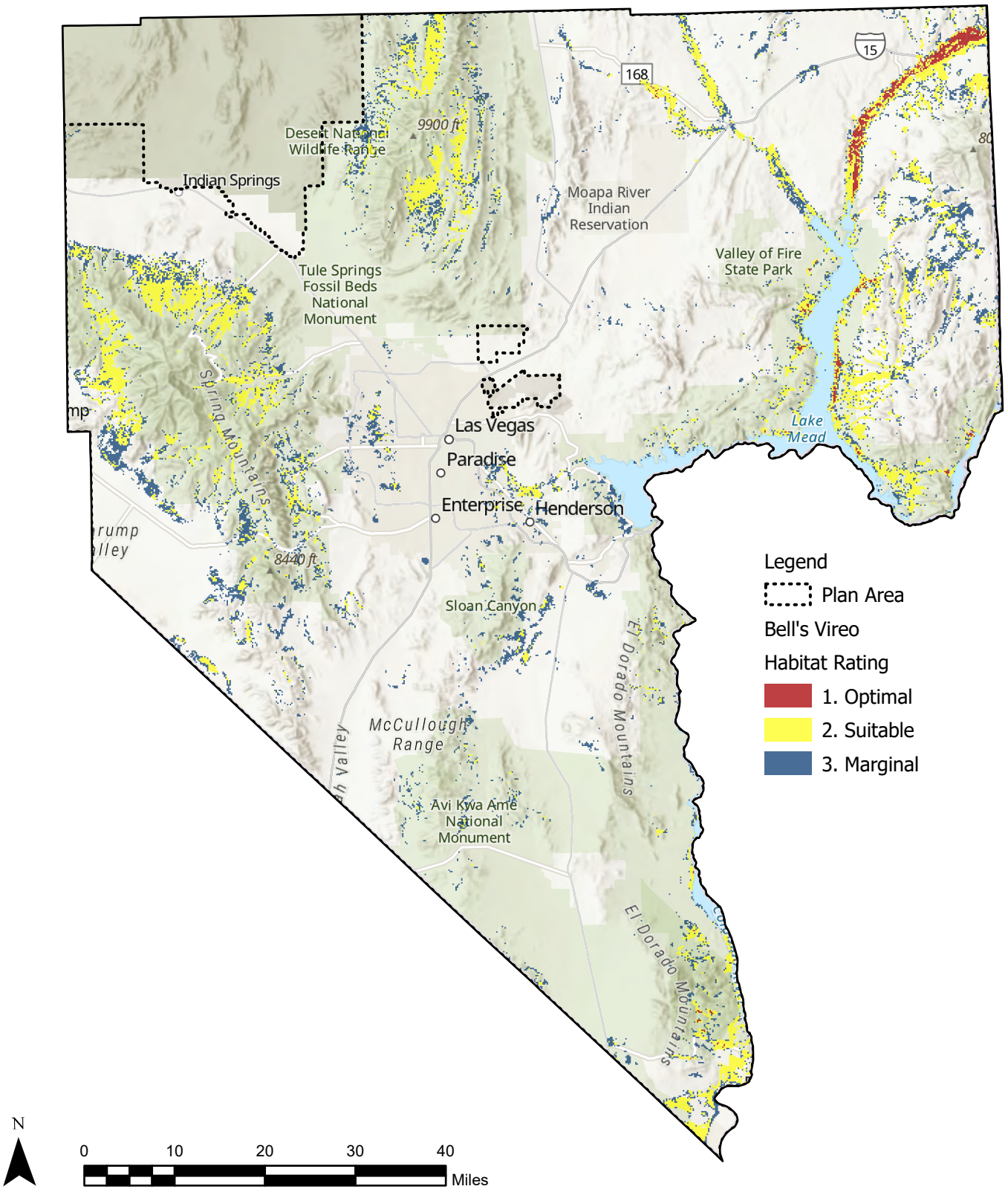

Figure 3-30. Bell's Vireo Habitat Suitability Model and Plan Area

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3.7 Species in the Plan Area That Aren't Requested for Coverage

To identify the covered species, a broad list of plants and animals that occur in the Plan Area was prepared by the County. This analysis drew from a comprehensive list of over 400 species including 231 species addressed by the Clark County MSHCP, previous efforts (PBS&J 2009; SWECO 2018a; SWECO 2018b; Nussear and Simandle 2020; Nussear 2020; WRA 2020; Nussear et al. 2024 and Simandle and Nussear 2025), and overall review of species potentially occurring in or near southern Nevada to systematically evaluate the inclusion of these species. The overall species reviewed are provided as Attachment A, which is the source from which the 68 species reviewed in this document is based. In addition, other species that merited consideration based on recent status or scientific information from a variety of sources were included in the revised evaluation matrix. Information used included but was not limited to:

- Species listed or proposed for listing as threatened or endangered under the federal ESA;
- Candidates for future listing as threatened or endangered under the federal ESA;
- Plant species fully protected by the State of Nevada (Nevada Administrative Code: NAC 527 including revisions);
- Mammals, birds, fish, amphibians, and reptiles listed as protected, endangered, or sensitive by the State of Nevada (Nevada Administrative Code: NAC 503);
- Nevada Division of Natural Heritage Plant and Animal Watch and Track Lists (NDNH 2024 and 2025);
- Nevada Division of Natural Heritage Climate Change Vulnerability Index 4.0 (NDNH 2024);
- Nevada Wildlife Action Plan (NDOW 2022);
- U.S. Forest Service Region 4 Sensitive Species List (USFS 2016);
- Bureau of Land Management Nevada Sensitive Species Lists (2023);
- Great Basin Bird Observatory Nevada Comprehensive Bird Conservation Plan (2010); '
- The Nature Conservancy's "Conservation Management Strategy for Nine Low Elevation Plants in Clark County" (2007);
- Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora list (2025);
- International Union for Conservation of Nature Red List of Threatened Species version
- 4 (2025); and
- For species occurring outside Clark County, their Federal and/or State status in adjacent states.

Criteria were applied to the list of special-status species that could occur in the amended Plan Area to determine which species should be covered by the MSHCP Amendment. The criteria were range, status (listed under the Federal ESA or state of Nevada, or likely to be listed under either statute during the permit term), impacts (species likely to be adversely affected by covered activities), and data (sufficient data to adequately evaluate impacts to the species and develop a conservation strategy for the species). The range of the species was considered to include the proposed Plan Area if the species is known to occur, or is likely to occur, within the proposed Plan Area based on credible evidence, or the species is not currently known in the proposed Plan Area but is expected in the proposed Plan Area during the permit term (e.g., through range expansion, recovery actions, or reintroduction to historic range). Species not recommended for coverage did not meet one or more of the criteria listed.

The Plan Area boundaries were modified from the current MSHCP boundaries to exclude areas above the 4,000-foot elevation contour and lands managed by the Department of Defense. The

Permittees determined that they would not propose including covered activities above 4,000 feet. Further, much of the land above 4,000 feet in Clark County is already managed for conservation purposes by state and/or federal land management agencies. The majority of development in Clark County is concentrated in the Las Vegas Valley, most of which is below 2,800 feet. Therefore, species that occur exclusively in habitats above 4,000 feet are not likely to be adversely affected by the proposed actions, and providing those species with the additional protection that would be afforded by the MSHCP does not appear necessary. Those species found to have ranges entirely outside the revised boundary were excluded from further consideration in the amended MSHCP.

4.0 ENVIRONMENTAL SETTING AND BIOLOGICAL RESOURCES

This chapter presents an overview of the physical, environmental, and biological setting of the Plan Area. It describes the overall physical and biological conditions upon which the potential biological impacts and take assessment for the Covered Species (Chapter 5) and Conservation Strategy (Chapter 6) are based.

Clark County is Nevada's most populated county, with an estimated 2020 population of 2.4 million or about 73 percent of the state total (U.S. Census Bureau 2024). The Plan Area includes all of Clark County, Nevada, exclusive of Department of Defense lands. Covered Activities under the MSHCP Amendment are limited to lands below 4,000 feet in elevation, with the exception of conservation actions, which may occur throughout the Permit Area, including on non-federal Reserve System Units that extend above 4,000 feet to support climate change adaptation planning.

The majority of Clark County's population (96 percent) is concentrated in the Las Vegas Valley, as is the region's urban development. The Las Vegas Valley is generally defined by the Las Vegas Valley Hydrographic Basin 13-212, as shown in Figure 4-1, and includes the cities of Henderson, Las Vegas, and North Las Vegas (Guillory and Brantley 2015). Including the adjacent Boulder City, the Las Vegas Metropolitan Area covers about 1,571 square miles, or about 20 percent of Clark County.

4.1 Environmental Setting

4.1.1 Climate

Southern Nevada has an arid climate, with low precipitation, low humidity, and predominantly clear skies. Summers are hot during the day and mild at night; the average daily summer temperature in Las Vegas during the 1991 to 2020 period was approximately 91 degrees Fahrenheit (NOAA 2024). Winter temperatures drop below freezing on roughly 12 days each year, and the coldest months, December and January, have an average daily temperature of about 49 degrees Fahrenheit (NOAA 2024). Spring and autumn are moderate, averaging about 80 degrees Fahrenheit.

The growing season (or frost-free period) averages 304 days with the first killing frost in late November and the last in early March. Mean annual precipitation is 4.18 inches (NOAA 2024) and falls primarily during the summer and winter months. The number of days with measurable precipitation (0.01 inch or more) averages 26.5 days per year (National Weather Service 2026).

Within the Las Vegas Valley, average daily temperatures range from 75 to 104 degrees Fahrenheit in summer and from 39 to 62 degrees Fahrenheit in winter (NOAA 2024). Due to the rain shadow effect of the Sierra Nevada Range and Spring Mountains to the west, moisture associated with storms originating in the Pacific Ocean rarely reaches the Las Vegas Valley. Humidity is normally low, averaging 30 percent, but moist tropical air from the southwest invades the area from mid- to late summer, producing thunderstorms and flash floods. Inversions, or periods of stagnant air masses, occur during winter months and may persist for several days to a week.

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, USGS

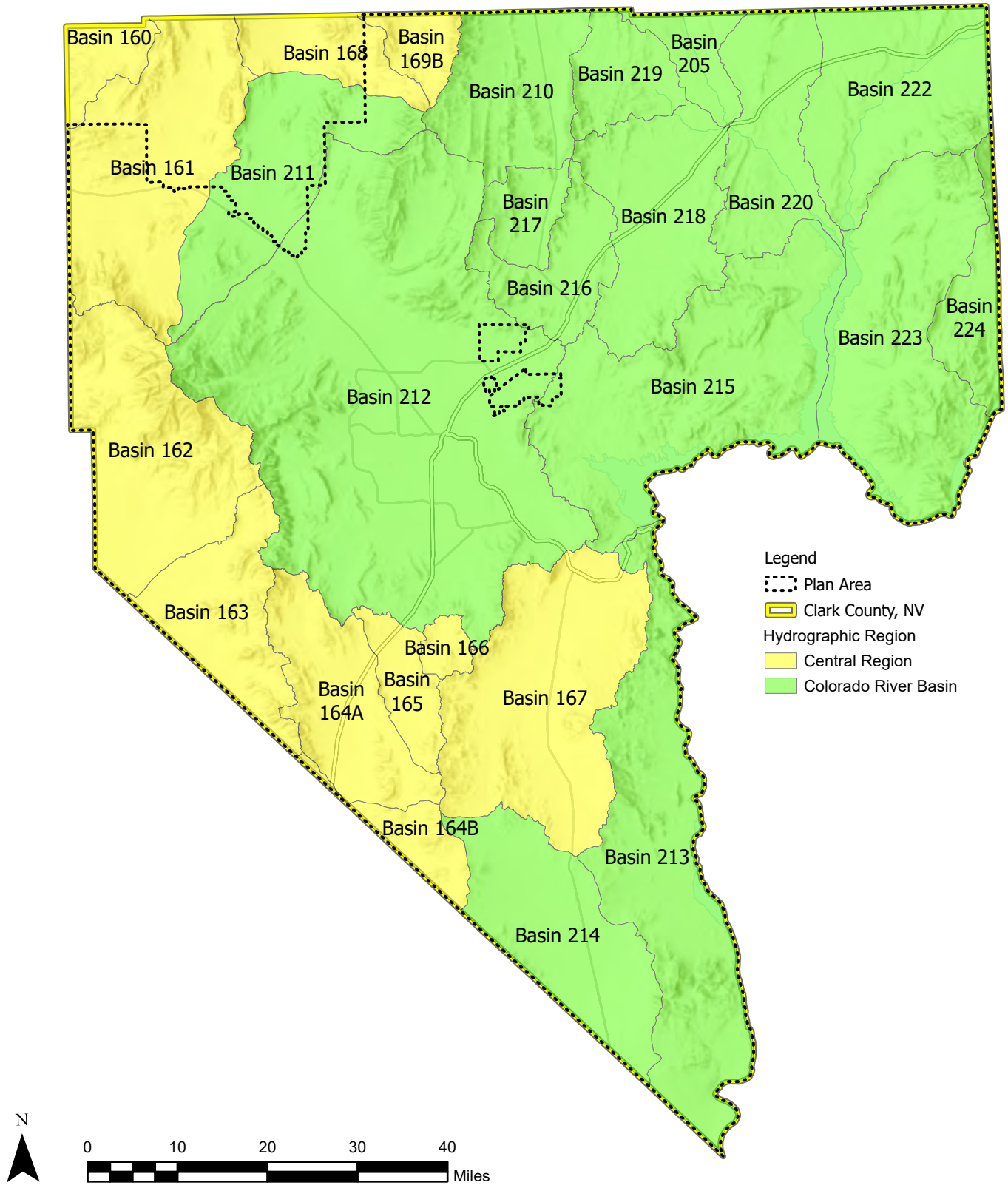

Figure 4-1. Hydrographic Basins in the Plan Area

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4.1.2 Topography/Geology

Elevations within Clark County range from 450 feet above mean sea level along the Colorado River to 11,918 feet at Charleston Peak. Much of the County displays Great Basin topography: north-south trending mountain ranges separated by long, narrow desert valleys. The mountain ranges are generally steep and composed primarily of bedrock. Wide alluvial fans extend from the base of the mountains to basin lowlands, which have been filling with sediment since the mountains formed and are now surfaced with fine sand, silt, and clay.

Development authorized under the MSHCP Amendment is restricted to the Impact Area below 4,000 feet, although conservation actions may occur throughout the Permit Area at any elevation.

The Las Vegas Valley extends in a northwest-southeast direction, bounded by the Spring Mountains to the west; the Pintwater, Desert, Sheep, and Las Vegas mountains to the north; Frenchman Mountain to the east; and the Bird Spring and McCullough mountain ranges to the south. The Valley drains to the south and then east through Las Vegas Wash to Lake Mead and the Colorado River. Valley elevations range from 4,500 feet at the upper boundaries of the alluvial fan to 1,800 feet in the basin lowland. Topography in the Plan Area is shown in Figure 4-2.

4.1.3 Hydrology/Streams, Rivers, and Drainages

Most of Clark County lies within the Colorado River Basin Hydrographic Area of Nevada, with a portion in the Central Region Hydrographic Area (Lopes and Evetts 2004). The Las Vegas Valley Basin is the major watershed and contains the urbanized portions of the Valley.

Subsurface hydrology in the Valley is characterized by laterally moving groundwater and artesian aquifers. Recharge results from precipitation in the Spring Mountains and Sheep Range, urban irrigation, treatment plant effluent, and some upward flow from deep artesian aquifers.

Surface flow on the Valley's alluvial fans is concentrated but frequently shifts location, and the topography and soils favor sheet runoff over channelized flow. As a result, pronounced gullies and ravines rarely develop, and flash floods are a recurrent hazard.

Clark County lies within the basin and range physiographic province that covers most of Nevada and parts of northwestern Arizona. The principal surface drainages are the Muddy River, Virgin River, Las Vegas Wash, and the Colorado River, which has been impounded to form Lake Mead and Lake Mojave. Perennial and intermittent streams in the County are shown in Figure 4-3. Las Vegas Wash is the only perennial stream in the Las Vegas Valley and one of few in the County.

The Muddy River is approximately 32 miles long. It originates about 60 miles northeast of Las Vegas as a series of thermal springs in the Moapa Valley, fed by groundwater discharge from a regional carbonate aquifer, and flows southeast into Lake Mead near Overton. Near the town of Moapa, it collects flow from Meadow Valley Wash, an ephemeral drainage originating in Lincoln County. The Virgin River heads in Utah, crosses the northwest corner of Arizona, and flows roughly 40 miles across Clark County before terminating in Lake Mead. Near Bunkerville, it collects flow from Toquop Wash, an ephemeral drainage originating in western Lincoln County.

The upper Las Vegas Wash drainage collects stormwater runoff from the Sheep Mountains, Spring Mountains, and alluvial fans north of the City of North Las Vegas. Spring Mountain runoff

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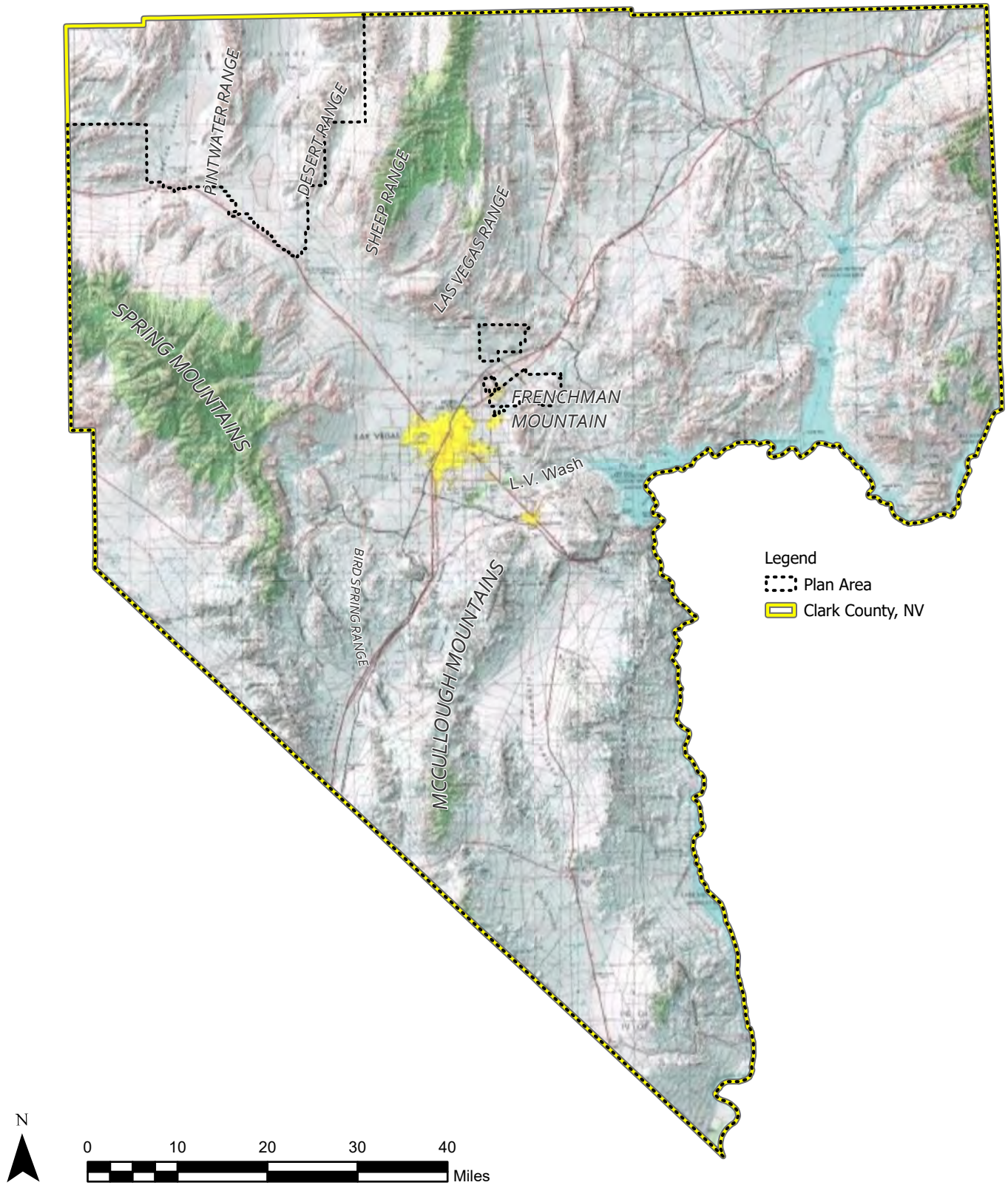

Figure 4-2. Topography in the Plan Area

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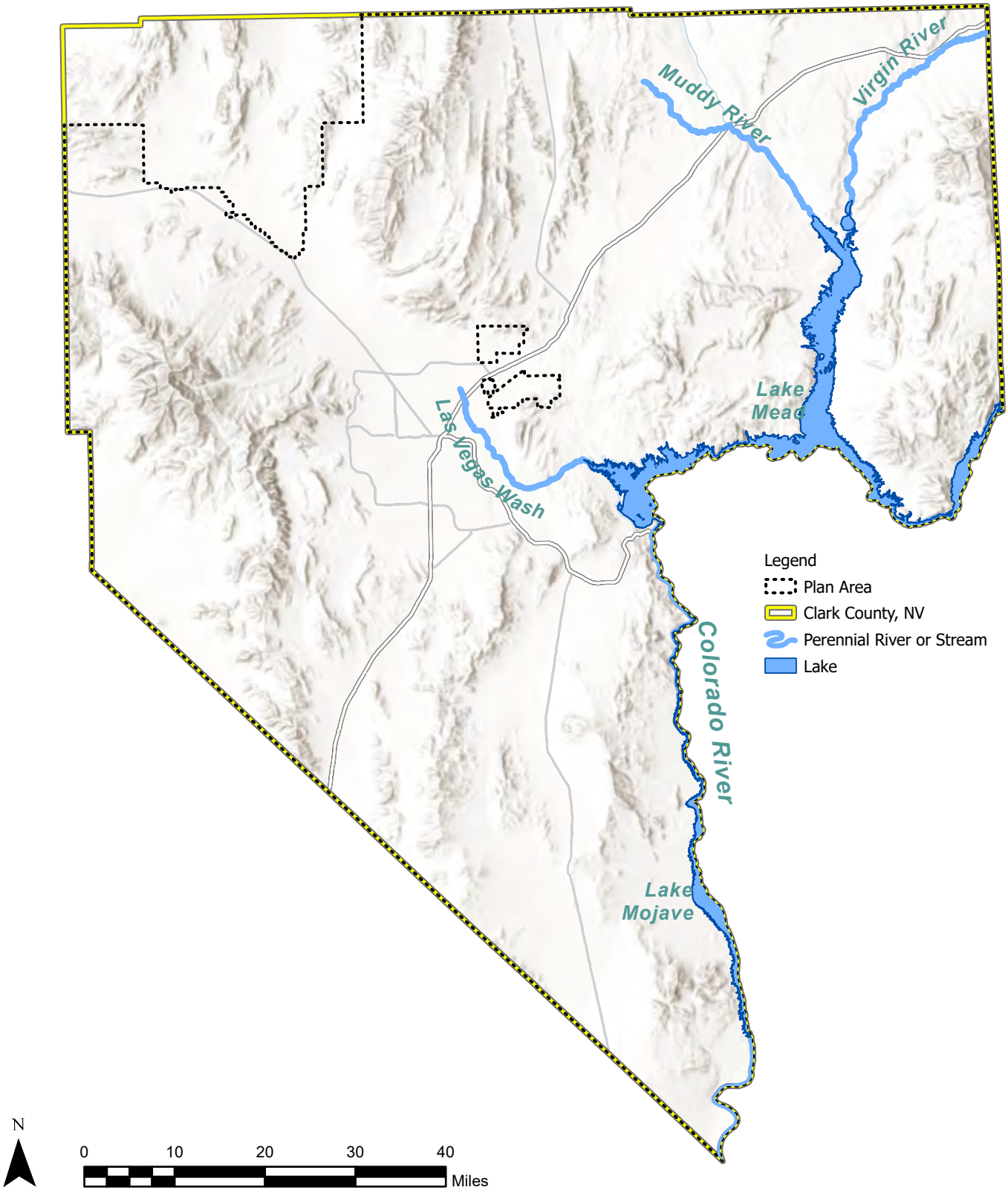

Figure 4-3. Perennial and Intermittent Streams in the Plan Area

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flows east overland from Kyle Canyon. Flows on the north side of Kyle Canyon Road cross the Tonopah Highway and enter the head of the upper Las Vegas Wash. Flows from Sheep Mountain travel west to meet the northern Kyle Canyon and Lee Canyon flows.

Several drainages that feed Las Vegas Wash, including Duck Creek, Flamingo Wash, Pittman Wash, and Sloan Channel, originate west of Las Vegas and flow east. Within urban areas, these ephemeral channels are channelized and often lined to convey flood flow into Lake Mead, and they also carry nuisance flow from residential runoff. Davis Dam in Laughlin impounds the Colorado River to form Lake Mohave. Clark County also contains several closed hydrologic basins that terminate in playas, including Dry Lake, Roach Lake, Hidden Valley playa, and Dry Lake Valley playa.

4.1.4 Water Quality/Water Quantity

4.1.4.1 Water Quantity

Water supplies in Clark County are drawn from the Virgin, Muddy, and Colorado Rivers, groundwater, and wastewater reuse. Colorado River water is highly regulated. Nevada's net mainstream depletion is capped at 300,000 acre-feet per year unless the Secretary of the Interior declares a surplus, in which case Nevada may consumptively use more. Approximately 90 percent of the area's drinking water comes from the Colorado River via Lake Mead.

The Las Vegas Valley relies on the water resources available to SNWA together with groundwater from local wells. SNWA's 2026 Water Resource Plan (SNWA 2026) evaluates the range of plausible supply and demand scenarios over a 50-year planning horizon and sets out management strategies to meet them. SNWA is responsible for determining water supply needs and mitigating impacts from water use.

SNWA is party to several agreements that manage shortage and protect critical reservoir elevations on the Colorado River: the 2007 Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, the 2019 Lower Basin Drought Contingency Plan, and Minute 323, a binational agreement under the 1944 water treaty between the United States and Mexico. Together, these agreements establish shortage sharing and water conservation contributions that increase as Lake Mead declines. Nevada's combined shortage reduction and Drought Contingency Plan contribution ranges from 8,000 acre-feet per year (AFY) at or below Lake Mead elevation 1,090 feet to 30,000 AFY below elevation 1,025 feet. A Tier 1 shortage has been in effect since 2022, reducing Nevada's available Colorado River supply by 21,000 AFY. In May 2024, the Secretary of the Interior signed the 2024 Near-term Operations Record of Decision, implementing the Lower Basin's commitment to conserve 3.0 million acre-feet through 2026 as Reservoir Protection Conservation to address critical elevations at Lake Mead and Lake Powell. The Interim Guidelines and Drought Contingency Plan expire at the end of 2026, and post-2026 operations are the subject of ongoing negotiations among the seven Colorado River Basin States and the federal government. SNWA does not anticipate near-term customer impacts from shortage declarations because of community response efforts, but additional reductions to Nevada's Colorado River supply may be required under post-2026 operations (SNWA 2026).

4.1.4.2 Water Quality

The federal Safe Drinking Water Act of 1974 requires actions to protect drinking water and its sources, including rivers, lakes, reservoirs, springs, and groundwater wells. After being drawn from Lake Mead, water is delivered to one of two SNWA treatment facilities: the Alfred Merritt Smith Water Treatment Facility, built in 1971, and the River Mountains Water Treatment Facility, built in 2002.

SNWA manages the region's water resources and treatment but does not distribute water to customers. Distribution and compliance with Federal and State water quality standards are the responsibility of the Big Bend Water District, the City of Boulder City (Permittee), the City of Henderson (Permittee), the City of North Las Vegas (Permittee), and the Las Vegas Valley Water District.

After indoor use, wastewater is sent to treatment facilities before being discharged back into Lake Mead. The Clark County Water Reclamation District, a member of SNWA, is the largest wastewater treatment agency in Southern Nevada and treats wastewater from unincorporated parts of Clark County within the Las Vegas Valley, including most of the Las Vegas Strip, as well as the communities of Blue Diamond, Moapa Valley, Indian Springs, Laughlin, and Searchlight. The District operates seven treatment facilities: the Flamingo Water Resource Center, the Desert Breeze Water Resource Center, the Indian Springs Treatment Facility, the Laughlin Water Resource Center, the Moapa Valley Treatment Facility, the Searchlight Treatment Ponds, and the Blue Diamond Treatment Ponds.

The final stages of wastewater treatment often use ponds and weirs to slow flow, creating wetland areas where treated water re-enters natural water systems at locations along Las Vegas Wash, Lake Mead, and the Colorado River. These ponds and wetlands provide habitat for a variety of plant and wildlife species. Approximately 45 percent of the water used in the SNWA service area is returned as highly treated wastewater, and approximately 99 percent of that wastewater is recycled, either directly for non-potable uses such as park and golf course irrigation or indirectly through discharge to Lake Mead for return-flow credits. These credits allow Nevada to divert more than its 300,000 acre-foot-per-year apportionment provided that consumptive use does not exceed the authorized annual amount.

4.1.5 Existing Land Use

4.1.5.1 Land Management

Approximately 88 percent of the land in Clark County is managed by eight federal agencies, five of which are within the Department of the Interior (BLM 2014a; Clark County 2021). The eight agencies and their land management roles are summarized below.

- BLM administers 2,628,393 acres (50.9 percent of the County).
- The NPS administers a total of 606,436 acres (11.8 percent of the County), including the Lake Mead National Recreation Area (NRA), which is 585,746 acres.
- The U.S. Bureau of Reclamation (USBR), whose primary mission is water supply and power generation, manages 46,951 acres (0.9 percent of the County).
- USFWS manages 516,487 acres (10 percent of the County), mainly in the Desert National Wildlife Refuge (NWR).

- The Department of Defense, U.S. Air Force (USAF) manages 388,740 acres (7.5 percent of the County), which includes Nellis Air Force Base, Nellis Air Force Range, Nellis Small Arms Range, and the Indian Springs Air Force Auxiliary Field.
- The U.S. Forest Service (USFS), an agency of the Department of Agriculture, manages approximately 279,653 acres (5.4 percent of the County) in the Spring Mountains NRA of the Humboldt-Toiyabe National Forest.
- The U.S. Bureau of Indian Affairs (BIA), an agency of the Department of the Interior, manages approximately 80,677 acres (1.6 percent of the County), including the Moapa Indian Reservation.
- The Department of Energy manages approximately 4,313 acres (0.1 percent of the County).

Lands held by the State of Nevada, local government, and private parties comprise 11.7 percent of the County's area, or approximately 607,904 acres. Major state holdings include Valley of Fire and Spring Mountain Ranch State Parks. Local government holdings consist primarily of parks, office complexes, and storage and maintenance facilities. Sixty percent of all state, local government, and private holdings are in the Las Vegas Valley (BLM 2014a).

4.1.5.2 Urban and Developed Land Use

The Las Vegas Valley contains the great majority of urban and developed land use in Clark County and is the principal area in which impacts authorized under the MSHCP Amendment are anticipated to occur. As described in Section 4.1, the Las Vegas Metropolitan Area covers approximately 1,571 square miles, or about 20 percent of the County, and includes the cities of Las Vegas (Permittee), Henderson (Permittee), North Las Vegas (Permittee), Boulder City (Permittee), and unincorporated portions of Clark County (Permittee). Outside the Valley, urban and developed land uses are concentrated in smaller communities including Mesquite (Permittee), Laughlin, Moapa Valley (Logandale and Overton), Searchlight, Indian Springs, and Blue Diamond.

The orderly conversion of BLM-administered public lands to private and municipal ownership for development within the Las Vegas Valley is governed by the Southern Nevada Public Land Management Act (SNPLMA, Public Law 105-263, as amended). SNPLMA authorizes the Secretary of the Interior to dispose of public lands within a congressionally designated disposal boundary in the Las Vegas Valley through competitive sale at fair market value, and to convey lands at less than fair market value under the Recreation and Public Purposes Act of 1926 (R&PP) for parks, schools, public facilities, and affordable housing (BLM 2025). Parcels move forward through a joint selection process: the local jurisdiction nominates eligible lands to BLM, which adjudicates the parcel, completes appraisals, and publishes a Notice of Realty Action in the Federal Register before a competitive online auction (BLM 2025). Since enactment in 1998, approximately 44,000 acres have been sold or conveyed from federal ownership through SNPLMA land sales and R&PP leases and patents combined. As of the start of Fiscal Year 2025, approximately 27,000 acres remain eligible for disposal within the disposal boundary (BLM 2025).

SNPLMA disposal lands are the primary source of newly developable acreage in the Las Vegas Valley. SNPLMA disposals, R&PP conveyances, and the municipal and private development that follows them therefore represent the most significant ongoing conversion of natural habitat to urban and developed land use in the Plan Area. SNPLMA also generates the funding that

supports some of the conservation actions implemented in the Plan Area. Revenue from SNPLMA land sales is distributed to the State of Nevada General Education Fund (5 percent) and the Southern Nevada Water Authority (10 percent), with the remaining 85 percent deposited in a special account available to the Secretary of the Interior. Authorized uses of that account expressly include implementation of the Clark County MSHCP, along with acquisition of environmentally sensitive lands, capital improvements, conservation initiatives, parks, trails, and natural areas, hazardous fuels reduction, and other regional conservation programs (BLM 2025).

Outside the Las Vegas Valley disposal boundary, urban and developed land use in the Plan Area is more limited and is generally confined to existing private inholdings, R&PP conveyances, and public lands within administratively designated disposal boundaries transferred under the FLPMA of 1976 (Public Law 94-579). Approximately 96 percent of the County's population resides in the Las Vegas Valley, and population and development outside the Valley are projected to remain a smaller share of the County total over the 50-year permit term, although localized growth in outlying areas is expected to continue.

4.1.5.3 Lands Managed for Resource Conservation

A substantial portion of the Plan Area is already managed for resource conservation under federal, state, and local authorities, providing long-term protection for native plant communities, wildlife habitat, watersheds, cultural resources, and scenic values. These lands form the conservation context within which the Covered Species addressed by the MSHCP Amendment occur. Many Covered Species have a majority of their suitable habitat in Clark County on these lands, and the distribution of suitable habitat across them is a central consideration in evaluating species status and in developing the Conservation Strategy presented in Chapter 6. Lands managed for resource conservation in the Plan Area are shown in Figure 4-4.

Federally managed lands account for the majority of conserved acreage in Clark County and are administered by BLM, NPS, USFS, and USFWS. They include National Conservation Areas (NCAs), National Monuments, National Recreation Areas, National Wildlife Refuges, congressionally designated Wilderness Areas, and Areas of Critical Environmental Concern (ACECs) designated by BLM. Prominent examples include Red Rock Canyon NCA, Sloan Canyon NCA, Gold Butte National Monument, Lake Mead NRA, Spring Mountains NRA, Desert NWR, and Moapa Valley NWR. ACECs are a particularly important tool for protecting sensitive resources on BLM-administered lands, and several ACECs in the Plan Area were established specifically to conserve habitat for Covered Species and other sensitive resources, including habitat for the Mojave desert tortoise (*Gopherus agassizii*), Las Vegas bearpoppy (*Arctomecon californica*), and rare plants of gypsum soils. Wilderness Areas and lands within the National Wildlife Refuge System are managed primarily for primitive, non-motorized, dispersed recreational use, while NCAs, National Monuments, and NRAs are managed for both conservation and a broad spectrum of recreational uses. ACECs are managed for conservation and limited recreational use, with special management considerations to protect habitat, sensitive wildlife and plants, cultural resources, paleontological resources, and geologic features.

State and locally managed lands complement the federal conservation estate and provide additional habitat protection within and adjacent to the urban landscape. They include Nevada State Parks such as Valley of Fire and Spring Mountain Ranch, NDOW Wildlife Management Areas, and locally managed resource lands such as Clark County Wetlands Park and Warm

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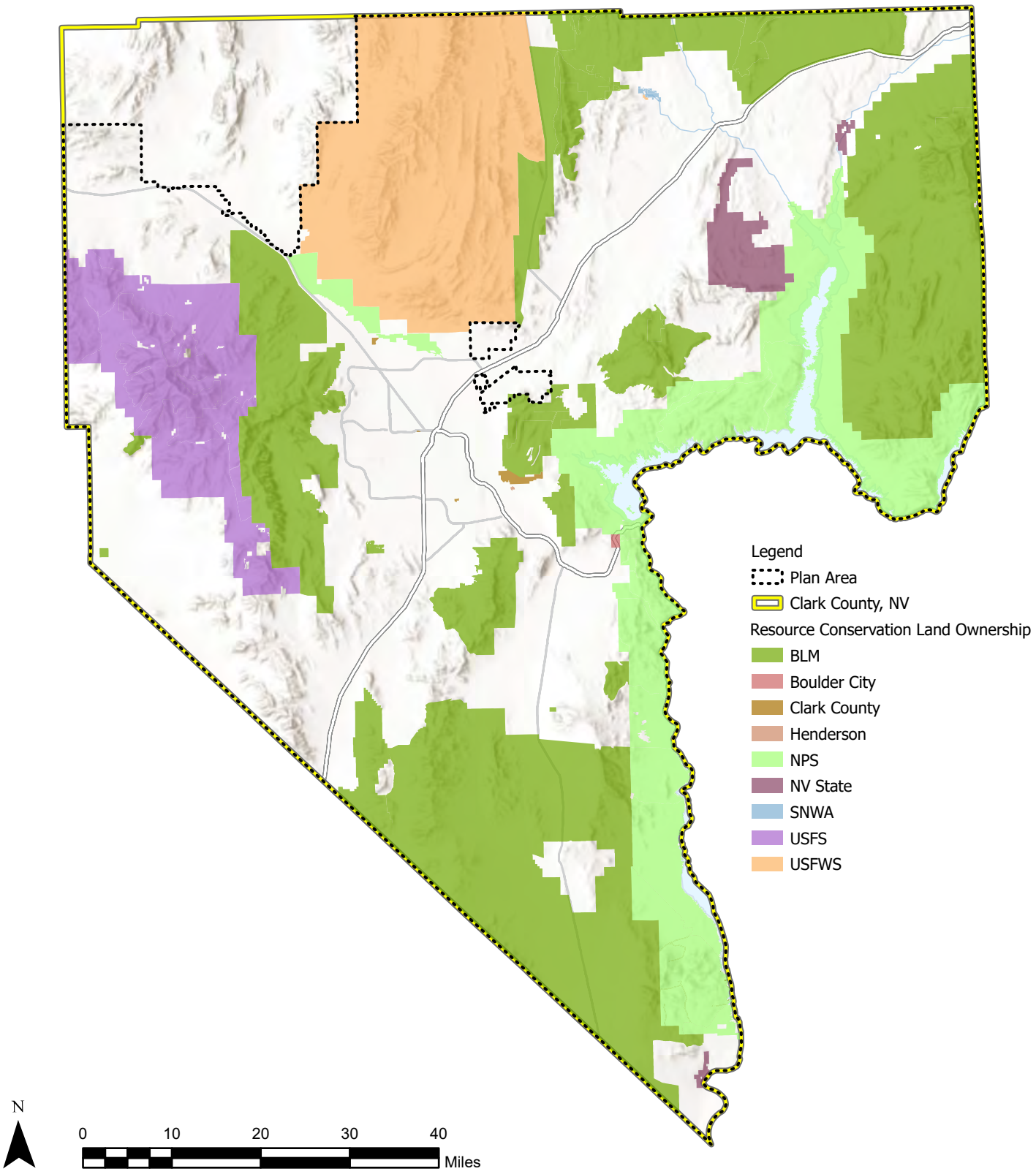

Figure 4-4. Existing Lands Managed for Resource Conservation in the Plan Area

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Springs Natural Area. Although smaller in acreage than federal conservation lands, state and local conservation lands often protect habitats that are poorly represented on federal lands, including riparian corridors, springs, wetlands, and lower-elevation valley habitats. They provide important refugia for species whose ranges overlap substantially with developed or developing parts of the County.

Lands managed for resource conservation are reported separately from the existing MSHCP Reserve System and the proposed Reserve System Additions throughout the MSHCP Amendment. The conservation purposes for which they are managed contribute substantially to the persistence of Covered Species and to the long-term ecological integrity of the Plan Area. The acreage of each ecosystem (USNVC division) within lands managed for resource conservation is summarized in Table 4-1, and ecosystem-level breakdowns by managing entity appear in the tables that accompany each ecosystem description in Section 4.2.2. Additional detail on the contribution of these lands to suitable habitat for individual Covered Species is provided in Appendix A.

4.1.5.4 Renewable Energy Development

Utility-scale renewable energy development on BLM-administered lands is a substantial and growing land use in Clark County and represents one of the most significant changes in the regional land use pattern since the original MSHCP was approved in 2000. Renewable energy development on public lands is authorized under FLPMA through right-of-way grants, and in Clark County is implemented primarily by the BLM Las Vegas Field Office under the 1998 Las Vegas RMP, as amended. Solar photovoltaic development accounts for nearly all utility-scale renewable energy land use in the County, on both federal and non-federal lands; wind and geothermal development are limited or absent. The largest concentrations of solar development occur on BLM-administered lands northeast of Las Vegas and on City of Boulder City (Permittee) lands in the southeastern portion of the County, with additional projects sited on private and other non-federal lands along major transmission corridors.

Solar permitting on BLM-administered lands in Clark County is governed by the BLM Western Solar Plan, originally adopted in 2012 and updated through the Final Programmatic Environmental Impact Statement and Resource Management Plan Amendments for Utility-Scale Solar Energy Development (BLM 2024a). The Record of Decision approving the updated Plan was signed on December 20, 2024 (BLM 2024a). The updated Plan covers 11 western states, including Nevada, and identifies approximately 31 million acres as available for utility-scale solar right-of-way applications across the planning area, of which approximately 700,000 acres are anticipated to be developed by 2045 (BLM 2024a). Lands made available under the updated Plan are generally located near existing transmission infrastructure and on previously disturbed lands, and the Plan excludes specially designated lands, lands with important cultural resources, and designated critical habitat. The updated Plan does not authorize any individual solar projects; each proposed project remains subject to site-specific environmental review under NEPA, consultation under Section 7 of the ESA where applicable, and other federal, state, and local authorizations.

Within Clark County, the principal area designated for solar development under the Western Solar Plan is the Dry Lake Solar Energy Zone (SEZ), located in Dry Lake Valley northeast of Las Vegas on BLM-administered land within the Southern Nevada District. The Dry Lake SEZ encompasses approximately 5,717 developable acres within a larger SEZ boundary. The SEZ

was configured during the 2012 PEIS process to reduce impacts to Mojave desert tortoise and to avoid conflicts with military operations (BLM 2012). The Dry Lake Solar Regional Mitigation Strategy, finalized in 2014, established a regional offsite mitigation framework for projects sited within the SEZ (BLM 2014b). In 2014, BLM held a competitive auction for six parcels totaling approximately 3,083 acres within the SEZ, and the resulting right-of-way grants supported development of the first utility-scale solar projects permitted under the streamlined SEZ leasing process. Variance Areas designated under the 2012 Plan, where solar applications could be considered case-by-case outside SEZs, were eliminated as a category under the 2024 update; lands are now characterized as either available for application or excluded.

Existing utility-scale solar projects on BLM-administered lands in Clark County include facilities within and outside the Dry Lake SEZ, occupying several thousand acres of formerly undeveloped Mojave Desert habitat. Recent authorizations include the Dry Lake East Energy Center Solar Project, which received BLM right-of-way authorization for up to 200 megawatts of generation and up to 600 megawatts of battery storage on approximately 1,635 acres within the Dry Lake East Designated Leasing Area (BLM 2024b). Additional solar and solar-plus-storage projects authorized in Clark County in late 2024 and early 2025 include Rough Hat Clark Solar (approximately 2,400 acres) and other projects on lands previously identified as suitable for solar development. Lands within the National Park System, the National Wildlife Refuge System, congressionally designated Wilderness Areas, and ACECs are generally excluded from solar development under both the 2012 and 2024 Western Solar Plans.

Outside the federal estate, the most significant concentration of utility-scale solar development in the Plan Area is on City of Boulder City lands. Over the past two decades, the City has leased thousands of acres of City-owned desert land to private solar developers, and lease revenues now fund essential municipal services. Of Boulder City's 135,880 acres, approximately 12.5 percent (17,107 acres) is zoned Energy Resources, and an additional 1,595 acres of City-owned land was identified through the 2024 Land Management Process List as available for future renewable energy and utility uses (City of Boulder City 2024). Solar projects on Boulder City and other non-federal lands are a Covered Activity under the MSHCP Amendment.

The pace and extent of future solar development in Clark County over the term of the MSHCP Amendment are uncertain and will depend on individual project authorizations, market conditions, transmission availability, and federal policy direction. The 2024 Western Solar Plan remains the governing programmatic framework for BLM-administered lands as of the date of this MSHCP Amendment, although recent federal actions have changed the review status of some proposed solar projects on BLM lands in Nevada, and ongoing changes in policy direction may affect the rate at which projects are authorized. For purposes of describing existing land use conditions, the regulatory framework established by the Western Solar Plan, the footprint of currently authorized and operating solar projects on BLM-administered lands in Clark County, and the existing solar projects on non-federal lands are treated as the baseline.

4.1.5.5 Existing Highways and Connectivity

Three interstate highways cross Clark County: I-15, I-215, and I-515/I-11. The Interstate-designated portions of I-215 and I-515/I-11 are 11.2 and 13.2 miles long, respectively, and are largely confined to the urban limits of the Las Vegas metropolitan area (NDOT 2026a). The Clark County 215 beltway (CC-215), which carries the I-215 designation on its southern segment, totals approximately 50 miles around the Las Vegas Valley. I-515 transitions to I-11, which extends

approximately 54 miles from the Henderson Interchange south through Boulder City (which it bypasses) to the Arizona border (NDOT 2026a). I-15 is a major transcontinental highway extending more than 1,470 miles through 6 states and varying between six and ten lanes wide. Within Clark County, I-15 is approximately 124 miles long and bisects the County diagonally from the California border in the southwest to the Arizona border in the northeast. Between the California border and the Las Vegas metropolitan area, I-15 is six lanes wide, with a concrete K-rail barrier between the north and south directional lanes along most of its length. North of Las Vegas, between the metropolitan area and the Arizona border, I-15 is four lanes, with a cable barrier system in the sections that have barriers. The segment of I-15 through Clark County is annually the most heavily trafficked road segment in Nevada (NDOT 2025).

U.S. Highways 93 and 95 are also major highways within the County, which contains approximately 341 miles of State Routes (NDOT 2026a). US-95 is four lanes and undivided through most of Clark County and becomes four divided lanes north of Las Vegas. Highways in the Plan Area are shown in Figure 4-5. US-93 has tortoise fencing installed along most of its length north of Las Vegas, and US-95 has tortoise fencing installed west of approximately Cactus Springs. An extension of I-11 through the Las Vegas metropolitan area is planned. The I-11 Las Vegas Metropolitan Area Planning and Environmental Linkages (PEL) study, initiated in 2021, identified the central corridor (currently I-515 and US-95) as the future I-11 alignment between the Henderson Interchange (I-515/I-215) and the vicinity of Kyle Canyon Road on US-95 (NDOT 2026b). In 2025, NDOT completed an I-11 Feasibility Study for the segment between Kyle Canyon Road and Mercury Highway, advancing concept-level design and PEL documentation in support of converting US-95 to an access-controlled interstate (NDOT 2026b). North of Las Vegas, NDOT's 2018 I-11 Northern Nevada Alternatives Analysis, building on the 2014 I-11 and Intermountain West Corridor Study, identified recommended corridor alternatives between the northwest edge of the Las Vegas Valley and I-80 in western Nevada for advancement into future NEPA studies (NDOT 2026b). To date, the transition along the existing I-515/US-93 segment from the Henderson Interchange to the Arizona border has been predominantly limited to signage updates and was largely completed prior to 2026.

Roads and railways act as barriers to species movement, leading to loss of connectivity, habitat fragmentation, and reduced genetic diversity (McGarigal et al. 2005; Dutcher et al. 2019). Fragmentation by roads may be particularly detrimental to reptiles and amphibians (Jochimsen et al. 2004). Proximity to roads and roadside fencing has been shown to affect the movement and behavior of Mojave desert tortoise which contributes to ongoing regional and range-wide population declines (Peaden et al. 2017; Allison and McLuckie 2018; Dutcher et al. 2019; Gray et al. 2019). Forward-in-time genetic simulations of desert tortoise connectivity at 17 locations within Clark County estimated that, under current disturbance conditions, 9 of the 17 modeled locations would maintain high levels of genetic connectivity, while 5 would fail to maintain genetic connectivity through time; under future disturbance projections, only 5 of 17 locations are projected to maintain high genetic connectivity, with 8 of 17 failing (Dutcher et al. 2019). At the range-wide scale, contemporary movement-based connectivity modeling has identified pinch points and important linkages across the species' range, including within Clark County (Gray et al. 2019). Together, these analyses indicate that baseline conditions in the Plan Area already include areas of reduced connectivity attributable to existing roads and other disturbance.

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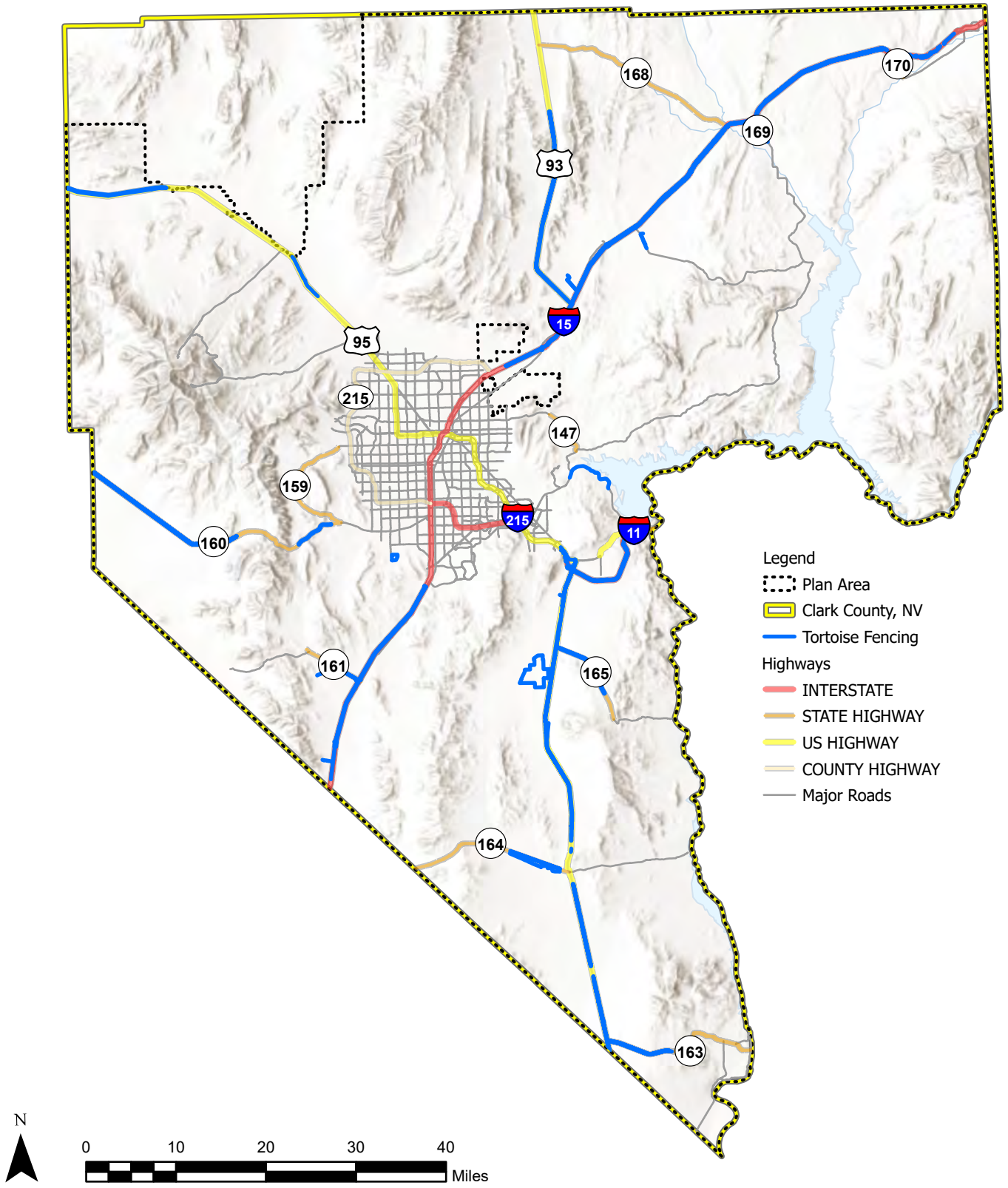

Figure 4-5. Highways in the Plan Area

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Wildlife crossings are currently in place on major roadways in Clark County in the form of culverts managed for connectivity. NDOT has been required to install tortoise roadside barrier fencing on several major roads throughout the County. Fencing has been installed along most of I-15, with the exception of the Las Vegas metropolitan area, to connect or reconnect tortoise habitat by directing individuals to safe crossings at culverts (RECON 2022). Approximately 512 miles of tortoise fencing are installed along major roadways in Clark County (K. Jenkins, personal communication, April 18, 2024). The MSHCP Amendment covers new highways, highway maintenance, and other NDOT activities; the existing highway and roadway structure is important context for environmental and Covered Species demographic baseline conditions. This coverage is described in more detail in Chapter 2.

4.2 Biological Resources: Wildlife and Vegetation

The Plan Area spans the transition between the Mojave and Great Basin deserts and ranges in elevation from about 500 feet along the Colorado River to nearly 12,000 feet at Charleston Peak. This combination of biogeographic position and topographic relief produces diverse vegetation communities and wildlife assemblages, which together form the biological foundation for the Conservation Strategy. This section characterizes those resources, with particular attention to the ecosystems that support the 28 species proposed for coverage under the Amendment and the principal threats and stressors acting on those ecosystems.

The section is organized around an ecosystem framework. As used here, an ecosystem is an area in which biotic and abiotic components interact through trophic and spatial relationships. Ecosystems are typically defined by one or more dominant plant species, often a tree or shrub, but each contains a variety of vegetation communities and land cover types. As described in Section 3.1, ecosystems in the Plan Area are classified using the division level of the USNVC. Organizing the description of biological resources by ecosystem rather than by individual species or vegetation community supports a management approach that benefits Covered Species and other species sharing the same habitats.

Section 4.2.1 summarizes the wildlife, fish, and vegetation of the Plan Area at a regional scale, including overall species richness, the principal habitat associations of Covered Species, and the broad threats and stressors operating across the landscape. Section 4.2.2 then describes each ecosystem in turn, addressing its general ecological setting, the USNVC group-level land cover types that compose it within the Plan Area, the Covered Species associated with it, the threats and stressors that affect it, and the existing management and land ownership pattern.

4.2.1.1 Wildlife

Clark County lies within the Mojave Basin and Range ecoregion of southern Nevada, a hot desert dominated by creosote scrub, succulents, and yucca–blackbrush community types, with isolated montane and subalpine communities occurring on the higher mountain ranges that rise above the surrounding desert basins (NDOW 2022). The Plan Area supports a wide range of native vertebrate, invertebrate, and plant taxa distributed across these communities, with overall richness, the relative contribution of different taxonomic groups, and the spatial distribution of species varying substantially with elevation, landform, vegetation type, and proximity to water (Harju et al. 2023; NDOW 2022).

Clark County's biological richness reflects its position at the convergence of two major North American deserts and the topographic relief that lifts elevations from below 500 feet along the

Colorado River to nearly 12,000 feet at Charleston Peak. Although the Plan Area is dominated by Mojave Desert vegetation and fauna, Great Basin influences are pronounced at higher elevations and in the northern part of the County, producing a transitional zone in which species typical of warm and cool deserts overlap (NDOW 2022). The Spring Mountains and Sheep Range function as biogeographic "sky islands," supporting montane and subalpine assemblages, including endemic invertebrates, small mammals, and plants, that are isolated from similar communities elsewhere in the region by the surrounding desert basins.

Recent spatial analyses confirm that low-elevation species richness is highest along perennial and intermittent watercourses and within the Las Vegas Valley, with the Muddy and Virgin River corridors functioning as especially important biodiversity hotspots (Harju et al. 2023). These results are consistent with the long-recognized role of springs, riparian zones, and washes as concentrating habitats for wildlife in arid systems. The Mojave Desert Ecoregion as a whole supports remarkable biological diversity. The California portion alone is home to at least 439 vertebrate species and subspecies, 14 of which are endemic and 28 federally listed as threatened or endangered. Its flora includes some 250 species of annual herbaceous plants, at least 80 of them endemic. The Nature Conservancy's ecoregional assessment identified 521 species (122 animals and 399 plants) and 44 ecological systems as conservation targets across the four-state region (Randall et al. 2010). Within the Plan Area, riparian and spring-fed habitats are disproportionately important. Although they comprise a small fraction of the total acreage, they support the majority of the County's amphibians and fish and provide breeding, foraging, and stopover habitat for a large share of resident and migratory bird species.

The 2022 Nevada State Wildlife Action Plan identifies 367 Species of Greatest Conservation Need statewide, with a substantial subset occurring in the Mojave Basin and Range ecoregion that encompasses the Plan Area (NDOW 2022). The number of Mojave-associated Species of Greatest Conservation Need has grown since the prior 2012 plan, partly because terrestrial invertebrates such as bees, butterflies, and other pollinators were added to the list for the first time, and partly because of documented declines in formerly common taxa. Threats to wildlife in the Plan Area, summarized using the International Union for Conservation of Nature (IUCN) Threats Classification framework adopted by the Nevada State Wildlife Action Plan, include residential and commercial development, transportation and energy infrastructure, human intrusion and disturbance (including off-highway vehicle use and unauthorized recreation), invasive species, altered fire regimes, and climate change.

The most pervasive habitat-level stressor across the Plan Area's lower-elevation Mojave systems is the establishment and spread of nonnative annual grasses, primarily red brome (*Bromus rubens*), cheatgrass (*Bromus tectorum*), and Mediterranean grass (*Schismus barbatus*). These grasses have converted historically fire-resistant creosote bush and blackbrush communities into a fire-prone fuel matrix, producing a positive feedback in which repeated fire favors further invasion (NDOW 2022). Climate projections for southern Nevada indicate continued warming, more frequent and prolonged drought, and increased fire frequency. Together, these are expected to reduce the suitable area for native shrubland species and elevate physiological stress on cold-adapted species at the upper-elevation margins of their ranges. Ecosystem-level threats and stressors are described in greater detail by ecosystem in Section 4.2.2.

The Covered Species addressed under the MSHCP Amendment include mammals, birds, reptiles, amphibians, invertebrates, and plants. Each is described in detail in Appendix A, including its status and distribution, habitat characteristics and use, and occurrence in the Plan

Area. The associations between Covered Species and the ecosystems described in Section 4.2.2 form the basis for the ecosystem-level conservation framework presented in Chapter 6. An ecosystem-level approach to conservation management benefits Covered Species and other species inhabiting each ecosystem, and helps avoid the conflicts that can arise when management decisions are driven by individual species.

4.2.2 Vegetation

This section characterizes the vegetation of the Plan Area at the ecosystem scale and describes the land cover types, Covered Species, threats and stressors, and existing land management within each ecosystem. Ecosystems are shown in Figure 4-6 and acreages are summarized in Table 4-1.

As introduced in Section 3.1, ecosystems in the Plan Area are characterized using the division level (Level 4) of the USNVC. The division level was selected because it provides a meaningful spatial and ecological unit that captures the dominant vegetation and ecological drivers of southern Nevada while remaining practical for landscape-scale management and reporting (Muldavin et al. 2025; USNVC Database Version 3.0 2025). The primary spatial source for mapping these ecosystems is Cogan Technology, Inc.'s Taxonomic Classification for Vegetation Map for Clark County Project (Cogan Technology, Inc. 2020), with vegetation map units crosswalked to USNVC divisions. Within each division are finer-scale vegetation units, including macrogroups, groups, alliances, and associations, that together represent the variety of land cover types occurring across the Plan Area. Land cover groups and acreages are derived from the spatial dataset prepared for the MSHCP Amendment using NatureServe and LANDFIRE source data crosswalked to USNVC 3.0 (Muldavin et al. 2025; Cogan Technology, Inc. 2020).

Each division is described below in terms of its general ecological setting, the USNVC group-level land cover types that compose it within the Plan Area, the Covered Species associated with it, the primary threats and stressors that affect it, and the existing management and land ownership pattern across the Plan Area. Some descriptions note how a division relates to the ecosystems used in the original 2000 MSHCP, since the USNVC divisions used here generally combine those earlier vegetation-based ecosystems under the national classification (see Section 3.1). Two non-vegetated land cover categories, Developed and Vacant, are also described in this section because they account for a substantial portion of the Plan Area, occur in close proximity to natural ecosystems, and have direct relevance to Plan implementation, mitigation, and Reserve System management. Urban Interface Mojave Desert Scrub, a transitional category mapped separately because of its distinctive management context, is also included.

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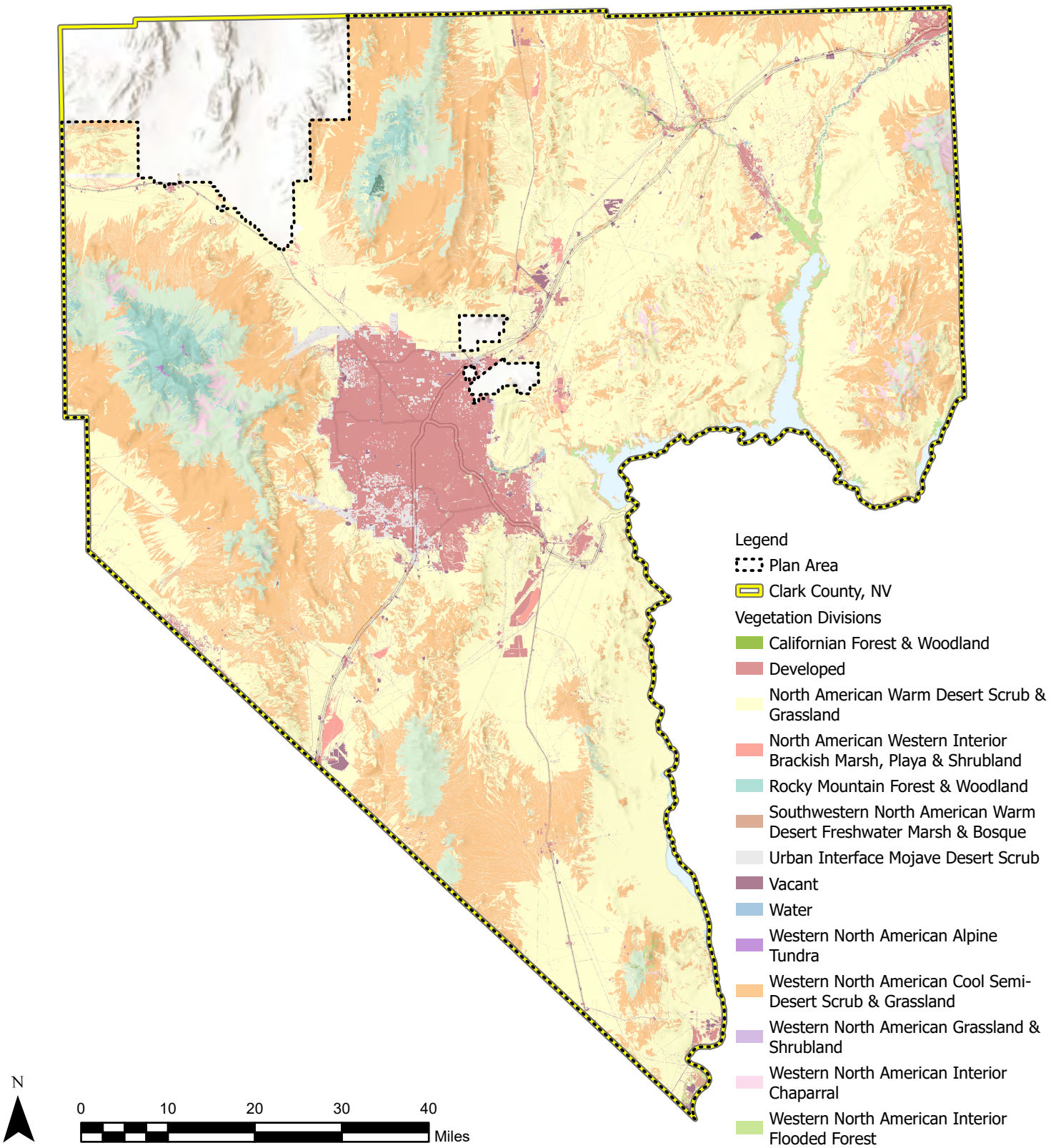

Figure 4-6. Ecosystems in the Plan Area

Table 4-1. Areal Extent of Ecosystems (USNVC Divisions) and Land Use Categories in the Plan Area, Clark County, Nevada

Ecosystem (USNVC Division)	Total in Plan Area (acres)	Acres within Lands Managed for Resource Conservation	Acres in Existing Reserve System	Acres in Reserve System Additions
North American Warm Desert Scrub and Grassland	2,552,919	1,436,912	84,445	206,577
Western North American Cool Semi-Desert Scrub and Grassland	1,292,974	920,095	1,642	95,041
Western North American Pinyon – Juniper Woodland and Scrub	280,686	273,514	0	325
Rocky Mountain Forest and Woodland	73,851	73,008	0	0
Western North American Interior Chaparral	40,355	39,176	0	468
Urban Interface Mojave Desert Scrub	37,944	4,462	35	97
Western North American Interior Flooded Forest	25,521	19,812	74	23
North American Western Interior Brackish Marsh, Playa and Shrubland	18,241	3,574	21	68
Southwestern North American Warm Desert Freshwater Marsh and Bosque	6,333	1,292	57	303
Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland	2,791	2,225	75	0
Californian Forest and Woodland	601	553	0	0
Western North American Alpine Tundra	523	442	0	0
Western North American Grassland and Shrubland	216	216	0	0
Vacant	73,687	15,286	1,409	2,331
Developed	275,272	1,041	328	1
Total	**4,681,914**	**2,791,608**	**88,086**	**305,234**

4.2.2.1 North American Warm Desert Scrub and Grassland

The North American Warm Desert Scrub and Grassland division is the most extensive ecosystem in the Plan Area, encompassing approximately 2,552,919 acres. It corresponds to the warm desert vegetation of the Mojave and Sonoran regions and is geographically and floristically intermediate between the Great Basin Desert to the north and the Sonoran Desert to the south. In the Plan Area, the division ranges from approximately sea level along the Colorado River up

to about 4,000 feet on bajadas and lower mountain slopes, occasionally extending higher on south-facing exposures. It contains the bulk of the warm desert scrub vegetation that historically was described in this Plan as Mojave Desert scrub, salt desert scrub, and blackbrush at lower elevations.

Vegetation is dominated by the creosote bush (*Larrea tridentata*) – white bursage (*Ambrosia dumosa*) community on bajadas and valley floors, with a diverse mixture of additional shrubs and cacti. Common species include Mojave yucca (*Yucca schidigera*), brittlebush (*Encelia farinosa*), Nevada jointfir (*Ephedra nevadensis*), spiny hopsage (*Grayia spinosa*), indigo bush (*Psorothamnus fremontii*), all-scale (*Atriplex polycarpa*), shadscale saltbush (*Atriplex confertifolia*), and ratany (*Krameria erecta* and *K. grayi*). The Eastern Joshua tree (*Yucca jaegeriana*), endemic to the Mojave Desert, is a distinctive component of the division. Winter annuals that germinate in response to sufficient cool-season precipitation form a prominent part of the flora in most years.

The North American Warm Desert Scrub and Grassland division includes the following USNVC group-level land cover types within the Plan Area:

- Dune Vegetation
- Mojave – Sonoran Bajada and Valley Desert Scrub
- Mojave – Sonoran Bajada and Valley Desert Scrub and Intermountain Basins Cliff, Scree and Badland Sparse Vegetation
- Mojave – Sonoran Bajada and Valley Desert Scrub and Intermountain Shadscale – Saltbush Scrub
- Mojave Mid-Elevation Mixed Desert Scrub and Mojave – Sonoran Bajada and Valley Desert Scrub
- North American Warm Desert Ruderal Grassland
- North American Warm Semi-Desert Dune and Sand Flats
- Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope

4.2.2.1.1 Covered Species Associations

Covered Species found in the North American Warm Desert Scrub and Grassland division include:

- desert pocket mouse (*Chaetodipus penicillatus*)
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- spotted bat (*Euderma maculatum*)
- golden eagle (*Aquila chrysaetos*)
- western burrowing owl (*Athene cunicularia hypugaea*)
- yellow-billed cuckoo (*Coccyzus americanus*)
- gilded flicker (*Colaptes chrysoides*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)

- loggerhead shrike (*Lanius ludovicianus*)
- Yuma Ridgway's rail (*Rallus obsoletus yumanensis*)
- Bendire's thrasher (*Toxostoma bendirei*)
- LeConte's thrasher (*Toxostoma lecontei*)
- Bell's vireo (*Vireo bellii*)
- Mojave Desert tortoise (*Gopherus agassizii*)
- Gila monster (*Heloderma suspectum*)
- Mojave poppy bee (*Perdita meconis*)
- monarch butterfly (*Danaus plexippus*)
- sticky ringstem (*Anulocaulis leiosolenus* var. *leiosolenus*)
- Las Vegas bearpoppy (*Arctomecon californica*)
- threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)
- blue diamond cholla (*Cylindropuntia multigeniculata*)
- silverleaf sunray (*Enceliopsis argophylla*)
- Pahrump Valley buckwheat (*Eriogonum bifurcatum*)
- Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*)
- sticky buckwheat (*Eriogonum viscidulum*)
- white-margined beardtongue (*Penstemon albomarginatus*)
- Eastern Joshua tree (*Yucca jaegeriana*)

The structural and floristic diversity of this division provides breeding, foraging, dispersal, and migration habitat for a wide range of species. The varied bajada and valley desert scrub land cover types provide habitat for desert tortoise foraging and burrowing, particularly where washes and caliche substrates are present. Western burrowing owl and Gila monster commonly use caliche caves and small mammal burrows on alluvial slopes. Bendire's thrasher and LeConte's thrasher occur across multiple desert scrub and shrubland land cover types, especially where shadscale, mixed salt desert scrub, or sparsely vegetated dunes are present. Loggerhead shrike uses thorny shrublands for nesting, and gilded flicker has been documented nesting in mature Joshua trees and other tall yuccas. Sandy desert flats with sparse vegetation support desert pocket mouse populations. Several plant Covered Species are tied to specific soil and substrate conditions: sticky ringstem and Las Vegas bearpoppy are most strongly associated with gypsum soils and cryptobiotic crusts in the Las Vegas Valley, Overton Arm, and other areas in northeastern Clark County, while Mojave poppy bee follows the distribution of *Arctomecon* host plants. Threecorner milkvetch, white-margined beardtongue, and sticky buckwheat are largely confined to specific dune and sand flat substrates.

4.2.2.1.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the North American Warm Desert Scrub and Grassland division are:

- Habitat loss, degradation, and fragmentation due to urban and agricultural development.
- Habitat degradation and vegetation community conversion due to fire and fire management.
- Habitat modification due to dispersed and concentrated recreational activities, including OHV use.
- Habitat degradation and fragmentation due to road construction and maintenance.
- Habitat loss and fragmentation from utility infrastructure development and maintenance, including solar and wind energy projects and utility-line construction.
- Livestock grazing.
- Military activities.
- Mining.
- Woodcutting.
- Water development and use in springs and ephemeral drainages embedded within the division.
- Habitat degradation and increased fire risk resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species, especially nonnative annual grasses and Sahara mustard.

4.2.2.1.3 Existing Management

The major landowners of the North American Warm Desert Scrub and Grassland division in the Plan Area are BLM, NPS, USFWS, BIA, and Boulder City. Private lands account for approximately 3 percent of the total. Approximately 67 percent of the 2,552,919 acres of this division within the Plan Area is either currently managed for resource conservation, included in the existing Reserve System, or proposed for inclusion in the new Reserve System additions (Table 4-2). This includes 767,693 acres on BLM-administered lands managed for conservation outside the Reserve System (such as Wilderness Areas, NCAs, and ACECs); 424,854 acres on NPS-managed lands (Lake Mead NRA); 168,567 acres on USFWS-managed lands (Desert NWR and Moapa Valley NWR); and 84,035 acres in the Existing Reserve System (including the Boulder City Conservation Easement). An additional 206,577 acres are proposed for inclusion in the new Reserve System.

Lands within Wilderness Areas and the National Wildlife Refuge System are managed for primitive, non-motorized, dispersed recreational use. Lake Mead NRA, the NCAs, and Nevada State Parks are managed for both conservation and a broad spectrum of recreational uses, such as developed camping areas and designated motorized vehicle use on roads and trails. ACECs are managed for conservation and limited recreational uses with special management considerations to protect habitat, sensitive wildlife and plants, cultural resources, paleontology, and geologic features. On private lands, recreational uses such as camping, OHV use, and private residential and commercial recreational uses are permitted subject to applicable local regulations.

Table 4-2. North American Warm Desert Scrub and Grassland Land Ownership in the Plan Area

Entity	Total Acres of North American Warm Desert Scrub and Grassland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	67,452	0	0	0
Bureau of Land Management	1,602,829	767,693	0	206,043
Bureau of Reclamation	36,797	19,091	0	0
Department of Energy	3,754	0	0	0
Fish and Wildlife Service	169,063	168,567	0	0
Forest Service	8,660	8,653	0	0
Local Government	108,311	42	84,445	1
National Park Service	428,582	424,854	0	0
Nevada State	43,442	43,014	0	0
Private	84,030	4,997	0	534
Total	**2,552,919**	**1,436,912**	**84,445**	**206,577**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.2 Western North American Cool Semi-Desert Scrub and Grassland

The Western North American Cool Semi-Desert Scrub and Grassland division covers approximately 1,292,974 acres in the Plan Area, making it the second most extensive ecosystem within the County. It occupies upper bajadas, foothills, and lower mountain slopes between roughly 3,000 and 7,000 feet, forming a transitional zone between the warm desert scrub of the lower elevations and the pinyon-juniper woodlands above. This division corresponds approximately to the cool semi-desert vegetation that was previously described in this Plan as the blackbrush and sagebrush ecosystems, and to portions of the salt desert scrub ecosystem at higher elevations.

Vegetation in this division is structurally and floristically diverse, reflecting the bioregional transition between the Mojave and Great Basin deserts. Blackbrush (*Coleogyne ramosissima*) is the dominant shrub on rocky, well-drained slopes and upper bajadas, often forming nearly monotypic stands. Big sagebrush (*Artemisia tridentata*), black sagebrush (*Artemisia nova*), and other *Artemisia* species dominate at higher elevations and on cooler aspects. Common shrub associates include shadscale saltbush, fourwing saltbush (*Atriplex canescens*), winterfat (*Krascheninnikovia lanata*), greasewood (*Sarcobatus vermiculatus*) on alkaline sites, jointfirs, snakeweed (*Gutierrezia sarothrae*), and Utah juniper (*Juniperus osteosperma*) at the upper

elevation limit. Native bunchgrasses, including Indian ricegrass (*Achnatherum hymenoides*) and galleta (*Pleuraphis jamesii*), are characteristic in less disturbed stands.

The Western North American Cool Semi-Desert Scrub and Grassland division includes the following USNVC group-level land cover types within the Plan Area:

- Beach and Barren Sand Draw-down Area
- Great Basin – Intermountain Shrub and Herb Wash-Arroyo
- Great Basin-Intermountain Tall Sagebrush Steppe and Shrubland
- Intermountain Basins Big Sagebrush Shrubland
- Intermountain Basins Cliff, Scree and Badland Sparse Vegetation
- Intermountain Basins Montane Sagebrush Steppe
- Intermountain Semi-Desert Grassland
- Intermountain Semi-Desert Steppe and Shrubland
- Intermountain Semi-Desert Steppe and Shrubland and Intermountain Semi-Desert Grassland
- Intermountain Shadscale – Saltbush Scrub
- Mixed Grasslands
- Mojave – Sonoran Bajada and Valley Desert Scrub and North American Warm Desert Ruderal Grassland
- Mojave Mid-Elevation Mixed Desert Scrub
- North American Warm Desert Playa
- North American Warm Semi-Desert Cliff, Scree and Pavement Sparse Vegetation
- Sonora-Mojave Mixed Salt Desert Scrub

4.2.2.2.1 Covered Species Associations

Covered Species found in the Western North American Cool Semi-Desert Scrub and Grassland division include:

- desert pocket mouse (*Chaetodipus penicillatus*)
- Townsend's big-eared bat (*Corynorhinus townsendii*)
- spotted bat (*Euderma maculatum*)
- golden eagle (*Aquila chrysaetos*)
- western burrowing owl (*Athene cunicularia hypugaea*)
- yellow-billed cuckoo (*Coccyzus americanus*)
- gilded flicker (*Colaptes chrysoides*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)
- loggerhead shrike (*Lanius ludovicianus*)

- Yuma Ridgway's rail (*Rallus obsoletus yumanensis*)
- Bendire's thrasher (*Toxostoma bendirei*)
- LeConte's thrasher (*Toxostoma lecontei*)
- Bell's vireo (*Vireo bellii*)
- Mojave Desert tortoise (*Gopherus agassizii*)
- Gila monster (*Heloderma suspectum*)
- Mojave poppy bee (*Perdita meconis*)
- monarch butterfly (*Danaus plexippus*)
- sticky ringstem (*Anulocaulis leiosolenus* var. *leiosolenus*)
- Las Vegas bearpoppy (*Arctomecon californica*)
- threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)
- blue diamond cholla (*Cylindropuntia multigeniculata*)
- silverleaf sunray (*Enceliopsis argophylla*)
- Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*)
- sticky buckwheat (*Eriogonum viscidulum*)
- white-margined beardtongue (*Penstemon albomarginatus*)
- Eastern Joshua tree (*Yucca jaegeriana*)

This division provides extensive habitat for the Mojave Desert tortoise, including foraging, sheltering, and dispersal habitat in shadscale-saltbush scrub, shrub and herb wash-arroyo, mid-elevation mixed desert scrub, and sparsely vegetated cliff and scree types. The thorny shrublands and Joshua tree stands within the division support loggerhead shrike nesting and gilded flicker breeding. Bat species, including spotted bat and Townsend's big-eared bat, use this division for foraging in the uplands adjacent to caves, cliffs, and rock features. The mixed grassland, semi-desert grassland, and saltbush land cover types support LeConte's thrasher and western burrowing owl. Plant Covered Species largely follow specific substrate associations: sticky ringstem and Las Vegas bearpoppy are tied to gypsiferous soils, while threecorner milkvetch, white-margined beardtongue, and sticky buckwheat are restricted to dune and sand flat substrates within this division.

4.2.2.2.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Western North American Cool Semi-Desert Scrub and Grassland division are:

- Habitat degradation and vegetation community conversion due to fire and fire management. Blackbrush stands are particularly susceptible, as fire typically kills all aboveground plant parts and destroys the soil seedbank, with very slow recovery (Brooks et al. 2007).
- Habitat modification due to dispersed and concentrated recreational activities and development, including OHV use.

- Habitat degradation and fragmentation due to road construction and maintenance.
- Habitat loss and fragmentation from utility infrastructure development and maintenance, including solar and wind energy projects and utility-line construction.
- Livestock grazing.
- Mining.
- Woodcutting.
- Habitat degradation and increased fire risk resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species, especially nonnative annual grasses such as red brome and cheatgrass.

4.2.2.2.3 Existing Management

The major landowners of the Western North American Cool Semi-Desert Scrub and Grassland division in the Plan Area are the BLM, the USFWS, the USFS, and the NPS. Private lands account for less than 2 percent of the total. Approximately 78 percent of the 1,292,974 acres of this division within the Plan Area is either currently managed for resource conservation, included in the Existing Reserve System, or proposed for inclusion in the New Reserve System (Table 4-3). This includes 501,991 acres on BLM-administered lands; 251,326 acres on USFWS-managed lands (Desert NWR); 80,931 acres on USFS-managed lands (Spring Mountains NRA and the Mt. Charleston, La Madre Mountain, and Rainbow Mountain Wilderness Areas); and 72,872 acres on NPS-managed lands. An additional 95,041 acres are proposed for inclusion in the New Reserve System.

The Conservation Agreement for the Spring Mountains NRA identifies general management actions for mid-elevation ecosystems within this division, including recreation site monitoring, campground management, environmental education programs, fire management, focusing recreation development outside sensitive areas, habitat restoration and enhancement at recreation sites, wild horse and burro management, and implementation of a weed management strategy. Wilderness Areas and Refuge lands are managed for primitive, non-motorized, dispersed recreational use, while NCAs and ACECs are managed under the conditions described above.

Table 4-3. Western North American Cool Semi-Desert Scrub and Grassland Land Ownership in the Plan Area

Entity	Total Acres of Western North American Cool Semi-Desert Scrub and Grassland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	6,244	0	0	0
Bureau of Land Management	837,908	501,991	0	94,620

Entity	Total Acres of Western North American Cool Semi-Desert Scrub and Grassland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Reclamation	7,033	3,391	0	0
Department of Energy	2	0	0	0
Fish and Wildlife Service	251,330	251,326	0	0
Forest Service	80,938	80,931	0	0
Local Government	3,786	0	1,642	0
National Park Service	75,679	72,872	0	0
Nevada State	6,971	6,940	0	0
Private	23,083	2,644	0	421
Total	**1,292,974**	**920,095**	**1,642**	**95,041**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.3 Western North American Pinyon – Juniper Woodland and Scrub

The Western North American Pinyon – Juniper Woodland and Scrub division occupies approximately 280,686 acres in the Plan Area. It corresponds to the open woodlands dominated by single-leaf pinyon (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*), generally found at elevations between 4,500 and 8,000 feet on rocky slopes, mesas, and lower mountain flanks throughout the Spring, Sheep, Virgin, and McCullough mountain ranges and the Desert NWR complex. This division replaces the previously described pinyon-juniper ecosystem in this Plan.

Pinyon and juniper are typically codominant, although either species may dominate locally depending on aspect, soil depth, and disturbance history. Understory shrubs commonly include big sagebrush, black sagebrush, mountain mahogany (*Cercocarpus* spp.), Stansbury cliffrose (*Purshia stansburyana*), antelope bitterbrush (*Purshia tridentata*), Mormon tea (*Ephedra viridis*), and snakeweed. The herbaceous layer typically includes native bunchgrasses such as Indian ricegrass, blue grama (*Bouteloua gracilis*), and needle-and-thread (*Hesperostipa comata*). Pinyon-juniper woodlands provide important hard mast (pinyon nuts), thermal cover, and structural complexity, all of which contribute to a high diversity of associated wildlife species.

The Western North American Pinyon – Juniper Woodland and Scrub division includes the following USNVC group-level land cover types within the Plan Area:

- Colorado Plateau – Great Basin Juniper Open Woodland

- Colorado Plateau Pinyon – Juniper Woodland
- Great Basin Pinyon – Juniper Woodland

4.2.2.3.1 Covered Species Associations

Covered Species found in the Western North American Pinyon – Juniper Woodland and Scrub division include:

- Townsend's big-eared bat (*Corynorhinus townsendii*)
- golden eagle (*Aquila chrysaetos*)
- yellow-billed cuckoo (*Coccyzus americanus*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)
- loggerhead shrike (*Lanius ludovicianus*)
- Bendire's thrasher (*Toxostoma bendirei*)
- Bell's vireo (*Vireo bellii*)
- monarch butterfly (*Danaus plexippus*)
- blue diamond cholla (*Cylindropuntia multigeniculata*)
- Eastern Joshua tree (*Yucca jaegeriana*)

Pinyon-juniper woodlands provide nesting and foraging habitat for golden eagle, particularly along cliff and ridge interfaces. Townsend's big-eared bat uses pinyon-juniper as foraging habitat adjacent to cave and mine roost sites in the surrounding mountains. Bendire's thrasher uses the more open woodland and shrub-woodland transitions. Loggerhead shrike, blue diamond cholla, and Eastern Joshua tree all occur near the lower-elevation transition zone where pinyon-juniper grades into mid-elevation desert scrub. Bell's vireo and southwestern willow flycatcher use riparian stringers within the division as breeding and foraging habitat where streams or springs persist within or adjacent to woodland stands.

4.2.2.3.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Western North American Pinyon – Juniper Woodland and Scrub division are:

- Habitat degradation and vegetation community conversion due to fire and fire management, including high-severity fires that exceed the historical fire regime and convert woodlands to non-native annual grasslands.
- Habitat modification due to dispersed and concentrated recreational activities and development.
- Habitat degradation and fragmentation due to road construction and maintenance.
- Habitat loss and fragmentation from utility infrastructure development and maintenance, including utility-line construction.
- Mining.
- Woodcutting and Christmas tree harvesting.

- Tree mortality and stand-level decline associated with drought, insect outbreaks, and climate change.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species, especially nonnative annual grasses.

4.2.2.3.3 Existing Management

The major landowners of the Western North American Pinyon – Juniper Woodland and Scrub division in the Plan Area are the USFS, the BLM, and the USFWS. Private lands account for less than 1 percent of the total. Approximately 98 percent of the 280,686 acres of this division within the Plan Area is currently managed for resource conservation outside the Reserve System (Table 4-4). This includes 116,988 acres on USFS-managed lands (Spring Mountains NRA and associated Wilderness Areas); 84,072 acres on BLM-administered lands; and 71,972 acres on USFWS-managed lands (Desert NWR). The Conservation Agreement for the Spring Mountains NRA includes management direction relevant to pinyon-juniper woodlands. Wilderness Areas and Refuge lands are managed for primitive, non-motorized, dispersed recreational use; NCAs and ACECs are managed under the conditions described in earlier sections.

Table 4-4. Western North American Pinyon – Juniper Woodland and Scrub Land Ownership in the Plan Area

Entity	Total Acres of Western North American Pinyon – Juniper Woodland and Scrub	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Land Management	88,834	84,072	0	325
Bureau of Reclamation	1	1	0	0
Fish and Wildlife Service	71,972	71,972	0	0
Forest Service	116,998	116,988	0	0
Local Government	55	0	0	0
National Park Service	201	201	0	0
Nevada State	124	124	0	0
Private	2,501	155	0	0
Total	**280,686**	**273,514**	**0**	**325**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.4 Rocky Mountain Forest and Woodland

The Rocky Mountain Forest and Woodland division covers approximately 73,851 acres in the Plan Area, occurring almost exclusively in the higher elevations of the Spring Mountains and the Sheep Range. It encompasses the montane and subalpine conifer forest types previously described in this Plan as the bristlecone pine and mixed conifer ecosystems. Elevations range

from approximately 7,000 feet at the lower montane forest interface to over 11,900 feet at the summit of Mt. Charleston.

This division includes mid-elevation mixed conifer forests dominated by white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Douglas-fir (*Pseudotsuga menziesii*), and quaking aspen (*Populus tremuloides*); upper-montane and subalpine forests dominated by Engelmann spruce (*Picea engelmannii*), bristlecone pine (*Pinus longaeva*), and limber pine (*Pinus flexilis*); and forest openings supporting subalpine meadows. Bristlecone pine in the Spring Mountains is among the oldest living trees in the world, with some individuals exceeding 4,000 years in age. The understory typically includes shrubs such as currants (*Ribes* spp.) and snowberry (*Symphoricarpos* spp.) and a diverse herbaceous flora that includes several local endemics. These forests provide critical thermal cover, water yield, and habitat heterogeneity in an otherwise arid landscape.

The Rocky Mountain Forest and Woodland division includes the following USNVC group-level land cover types within the Plan Area:

- Intermountain Basins Subalpine Limber Pine – Bristlecone Pine Woodland
- Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland

4.2.2.4.1 Covered Species Associations

Covered Species found in the Rocky Mountain Forest and Woodland division include:

- Townsend's big-eared bat (*Corynorhinus townsendii*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)
- monarch butterfly (*Danaus plexippus*)

The high-elevation forests of this division provide foraging habitat for Townsend's big-eared bat, particularly in the vicinity of caves, abandoned mine adits, and rock outcrops that serve as roost sites. Monarch butterflies use mountain meadows and forest openings supporting milkweeds and nectar resources during their migration. The southwestern willow flycatcher does not breed in this division, but where riparian stringers of willow and cottonwood are embedded within montane drainages, they may provide migratory stopover habitat. The forest as a whole supports the highest concentration of locally endemic plant species in Clark County and is identified as a priority area under the Conservation Agreement for the Spring Mountains NRA.

4.2.2.4.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Rocky Mountain Forest and Woodland division are:

- High-severity wildfire and altered fire regimes resulting from a combination of fuels accumulation, drought, and climate change.
- Habitat modification due to dispersed and concentrated recreational activities and development, including trails, and dispersed camping.

- Tree mortality and stand-level decline associated with drought, insect outbreaks, and climate change.
- Habitat fragmentation from highway, road, and trail construction and maintenance.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species.
- Disturbance from feral horses and burros in subalpine meadow systems.

4.2.2.4.3 Existing Management

The major landowners of the Rocky Mountain Forest and Woodland division in the Plan Area are the USFS, the USFWS, and the BLM. Approximately 99 percent of the 73,851 acres of this division within the Plan Area is currently managed for resource conservation outside the Reserve System (Table 4-5). This includes 54,828 acres on USFS-managed lands (predominantly Spring Mountains NRA and the Mt. Charleston, La Madre Mountain, and Rainbow Mountain Wilderness Areas); 17,003 acres on USFWS-managed lands (Desert NWR); and 1,176 acres on BLM-administered lands. The Conservation Agreement for the Spring Mountains NRA, finalized in 1998, identifies management actions for these high-elevation ecosystems, including recreation site monitoring, campground management, environmental education programs, fire management, focusing recreation development outside sensitive areas, habitat restoration and enhancement at recreation sites, wild horse management, and implementation of a weed management strategy.

Table 4-5. Rocky Mountain Forest and Woodland Land Ownership in the Plan Area

Entity	Total Acres of Rocky Mountain Forest and Woodland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Land Management	1,176	1,176	0	0
Fish and Wildlife Service	17,003	17,003	0	0
Forest Service	54,828	54,828	0	0
Local Government	40	0	0	0
Private	803	0	0	0
Total	**73,851**	**73,008**	**0**	**0**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.5 Western North American Interior Chaparral

The Western North American Interior Chaparral division occupies approximately 40,355 acres in the Plan Area. It is characterized by dense, often nearly impenetrable, evergreen sclerophyllous shrublands occurring on warm, dry, often rocky slopes between approximately 4,000 and 6,500 feet, primarily in the Spring Mountains, Virgin Mountains, and Newberry Mountains. In Clark County, this division is represented largely by the Western Madrean Chaparral group.

Dominant species commonly include shrub live oak (*Quercus turbinella*), Stansbury cliffrose, mountain mahogany species, manzanita (*Arctostaphylos* spp.), desert ceanothus (*Ceanothus greggii*), silktassel (*Garrya flavescens*), and apache plume (*Fallugia paradoxa*). The shrub canopy is generally tall and dense, with limited herbaceous understory due to dense shading and sclerophyllous leaf litter. This division provides important structural cover and forage for wildlife and is highly fire-adapted, with most dominant species capable of resprouting after fire.

The Western North American Interior Chaparral division includes the following USNVC group-level land cover types within the Plan Area:

- Western Madrean Chaparral

4.2.2.5.1 Covered Species Associations

Covered Species found in the Western North American Interior Chaparral division include:

- Townsend's big-eared bat (*Corynorhinus townsendii*)
- loggerhead shrike (*Lanius ludovicianus*)
- Bell's vireo (*Vireo bellii*)
- blue diamond cholla (*Cylindropuntia multigeniculata*)

The dense thorny structure of chaparral provides high-quality nesting cover for Bell's vireo, particularly where chaparral grades into riparian or wash-arroyo habitats. Loggerhead shrike uses thorny shrubs as nest substrate and as food caches. Blue diamond cholla occurs at the lower-elevation transition where chaparral grades into mid-elevation desert scrub. Townsend's big-eared bat forages in chaparral landscapes adjacent to cave and rock-feature roost sites.

4.2.2.5.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Western North American Interior Chaparral division are:

- Habitat degradation and vegetation community conversion due to high-severity fire and altered fire return intervals.
- Habitat modification due to dispersed and concentrated recreational activities, including OHV use.
- Habitat degradation and fragmentation due to road construction and maintenance.
- Habitat loss and fragmentation from utility infrastructure development and maintenance.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species.

4.2.2.5.3 Existing Management

The major landowners of the Western North American Interior Chaparral division in the Plan Area are the BLM and the USFS. Private lands account for less than 1 percent of the total. Approximately 98 percent of the 40,355 acres of this division within the Plan Area is currently managed for resource conservation outside the Reserve System (Table 4-6). This includes 19,985 acres on BLM-administered lands (including Wilderness Areas, NCAs, and ACECs) and 16,641 acres on USFS-managed lands. An additional 468 acres are proposed for inclusion in the

New Reserve System. Wilderness Areas are managed for primitive, non-motorized, dispersed recreational use, while NCAs and ACECs are managed under the conditions described in earlier sections.

Table 4-6. Western North American Interior Chaparral Land Ownership in the Plan Area

Entity	Total Acres of Western North American Interior Chaparral	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Land Management	20,875	19,985	0	468
Bureau of Reclamation	232	232	0	0
Fish and Wildlife Service	1,673	1,673	0	0
Forest Service	16,641	16,641	0	0
National Park Service	418	418	0	0
Nevada State	225	225	0	0
Private	290	1	0	0
Total	**40,355**	**39,176**	**0**	**468**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.6 Western North American Interior Flooded Forest

The Western North American Interior Flooded Forest division covers approximately 25,521 acres in the Plan Area. It occurs along the Virgin and Muddy Rivers, the lower Las Vegas Wash, the Colorado River corridor below Hoover Dam, and at scattered springs and seeps throughout the County. This division contains the desert riparian woodland and shrubland vegetation that was previously described in this Plan as the desert riparian ecosystem and parts of the mesquite/acacia ecosystem.

Native riparian forests and woodlands are dominated by Fremont cottonwood (*Populus fremontii*), Goodding's willow (*Salix gooddingii*), velvet ash (*Fraxinus velutina*), and desert willow (*Chilopsis linearis*), with an understory of sandbar willow (*Salix exigua*), arrowweed (*Pluchea sericea*), seepwillow (*Baccharis salicifolia*), and quailbush (*Atriplex lentiformis*). Mesquite bosques composed of honey mesquite (*Prosopis glandulosa*), screwbean mesquite (*P. pubescens*), and catclaw acacia (*Senegalia greggii*), formerly classified within this Plan as the mesquite/acacia ecosystem, are now treated as land cover types within this division because of their dependence on shallow groundwater and floodplain processes. Non-native saltcedar (*Tamarix* spp.) has invaded many riparian communities in southern Nevada, in some places forming homogeneous stands that displace native vegetation.

The Western North American Interior Flooded Forest division includes the following USNVC group-level land cover types within the Plan Area:

- Interior West Ruderal and Riparian Forest and Scrub

- Sonoran Paloverde – Mixed Cacti Desert Scrub
- Western Interior Riparian Forest and Woodland
- Western Interior Riparian Forest and Woodland and Interior West Ruderal Riparian Forest and Scrub

4.2.2.6.1 Covered Species Associations

Covered Species found in the Western North American Interior Flooded Forest division include:

- desert pocket mouse (*Chaetodipus penicillatus*)
- spotted bat (*Euderma maculatum*)
- western burrowing owl (*Athene cunicularia hypugaea*)
- yellow-billed cuckoo (*Coccyzus americanus*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)
- loggerhead shrike (*Lanius ludovicianus*)
- Yuma Ridgway's rail (*Rallus obsoletus yumanensis*)
- Bell's vireo (*Vireo bellii*)
- Arizona toad (*Anaxyrus microscaphus*)
- monarch butterfly (*Danaus plexippus*)
- threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)
- sticky buckwheat (*Eriogonum viscidulum*)

This division provides the only breeding habitat in the Plan Area for the federally endangered southwestern willow flycatcher and the federally threatened yellow-billed cuckoo (Western Distinct Population Segment), both of which require high-canopy willow and cottonwood riparian forest. Bell's vireo also breeds in riparian shrubland and tall thicket components of this division. Mesquite bosques within the division provide nesting and foraging habitat for Bell's vireo, yellow-billed cuckoo, and a range of other migratory songbirds, as well as movement corridors for desert tortoise and other terrestrial wildlife. Arizona toad uses perennial pools and slow-moving water within riparian woodlands for breeding. Spotted bat forages along riparian corridors. Where dune and sand flat substrates are embedded along river and wash margins, sticky buckwheat and threecorner milkvetch may also occur within the division.

4.2.2.6.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Western North American Interior Flooded Forest division are:

- Habitat loss, degradation, and fragmentation due to urban and agricultural development.
- Habitat degradation and vegetation community conversion due to fire and fire management; riparian wildfires often favor saltcedar over native species.
- Habitat modification due to dispersed and concentrated recreational activities and development.

- Habitat fragmentation and degradation from highway, road, and trail construction and maintenance.
- Livestock grazing (including trespass and feral livestock) and feral horse and burro use in riparian corridors.
- Mining, especially of alluvial sands and gravels.
- Woodcutting, particularly of mesquite and screwbean mesquite.
- Water development, diversion, channelization, and flood control altering hydrologic regimes that sustain native riparian vegetation.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species, especially saltcedar and giant reed.

4.2.2.6.3 Existing Management

The major landowners of the Western North American Interior Flooded Forest division in the Plan Area are the NPS, BIA, the BLM, and Clark County. Private lands account for approximately 9 percent of the total. Approximately 78 percent of the 25,521 acres of this division within the Plan Area is either currently managed for resource conservation, included in the Existing Reserve System, or proposed for inclusion in the New Reserve System (Table 4-7). This includes 18,553 acres on NPS-managed lands (Lake Mead NRA), 244 acres on BLM-administered lands (Virgin River and Mormon Mesa ACECs), and 35 acres on Clark County lands managed for resource conservation. An additional 23 acres are proposed for inclusion in the New Reserve System.

The majority of the riparian habitat in the Plan Area is subject to regulation under the federal Clean Water Act and the “no-net-loss” policies established for wetland habitats. These regulations are applicable to both federal and non-federal lands, including Native American reservations and private lands, and generally require avoidance, minimization, or mitigation of any impacts on this habitat. SNWA maintains a stewardship plan for the Warm Springs Natural Area that focuses on habitat restoration, fish and wildlife management, and educational and recreational areas. The Clark County Wetlands Park is managed to protect and enhance wetlands for wildlife habitat, environmental education, and recreation, including riparian and mesquite restoration projects developed in cooperation with the Natural Resources Conservation Service. The BLM Mesquite and Acacia Conservation Management Strategy identifies management actions for mesquite and acacia woodlands, including protecting existing woodlands on public lands, securing additional woodlands through acquisitions or conservation easements, restoration efforts, monitoring of habitat and species inventory, reducing human disturbance, and promoting public awareness.

Table 4-7. Western North American Interior Flooded Forest Land Ownership in the Plan Area

Entity	Total Acres of Western North American Interior Flooded Forest	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	949	0	0	0
Bureau of Land Management	1,470	244	0	23
Bureau of Reclamation	222	61	0	0
Department of Energy	18	0	0	0
Fish and Wildlife Service	21	20	0	0
Forest Service	38	38	0	0
Local Government	586	35	74	0
National Park Service	19,451	18,553	0	0
Nevada State	565	348	0	0
Private	2,202	513	0	1
Total	**25,521**	**19,812**	**74**	**23**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.7 North American Western Interior Brackish Marsh, Playa and Shrubland

The North American Western Interior Brackish Marsh, Playa and Shrubland division covers approximately 18,241 acres in the Plan Area. It corresponds to dry lake beds (playas), saline and alkaline marshes, and adjacent salt-tolerant shrublands that develop in closed basins and on poorly drained, salt-impacted substrates. This division includes the dry lake bed/playa ecosystem previously described in this Plan and contains saline and alkaline wetland features that were also previously associated with the salt desert scrub ecosystem.

Playas in the Plan Area form in undrained desert basins where shallow surface water accumulates periodically and evaporates rapidly, leaving deposits of soluble salts and thin layers of fine clay, silt, or sand. Most playas are largely unvegetated or sparsely vegetated. Surrounding alkaline-saline marshes and shrublands support a limited diversity of salt-tolerant plant species, including iodine bush (*Allenrolfea occidentalis*), inkweed (*Suaeda moquinii*), quailbush, fourwing saltbush, and saltgrass (*Distichlis spicata*). Greasewood may dominate where the water table is shallow but soils are not strongly saline at the surface.

The North American Western Interior Brackish Marsh, Playa and Shrubland division includes the following USNVC group-level land cover types within the Plan Area:

- North American Desert Alkaline-Saline Marsh and Playa
- North American Desert Alkaline-Saline Wet Scrub

4.2.2.7.1 Covered Species Associations

Covered Species found in the North American Western Interior Brackish Marsh, Playa and Shrubland division include:

- desert pocket mouse (*Chaetodipus penicillatus*)
- western burrowing owl (*Athene cunicularia hypugaea*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)
- monarch butterfly (*Danaus plexippus*)
- sticky ringstem (*Anulocaulis leiosolenus* var. *leiosolenus*)
- threecorner milkvetch (*Astragalus geyeri* var. *triquetrus*)
- Pahrump Valley buckwheat (*Eriogonum bifurcatum*)
- Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*)

Pahrump Valley buckwheat is the Covered Species most strongly associated with this division, occurring on alkaline-saline marsh, playa, and adjacent fine-textured substrates in the southwestern portion of the County near Sandy Valley and in the Pahrump Valley. Las Vegas buckwheat and sticky ringstem occur where gypsiferous outcrops are embedded within the alkaline-saline complex. Western burrowing owl uses the short-stature vegetation surrounding playas where small mammal burrows are present, and desert pocket mouse uses sandy and silty edges of playa systems. Where alkaline marsh holds standing water seasonally, southwestern willow flycatcher may use adjacent saltcedar and willow thickets as migratory stopover habitat.

4.2.2.7.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the North American Western Interior Brackish Marsh, Playa and Shrubland division are:

- Habitat degradation due to agricultural development.
- Habitat loss and fragmentation from utility infrastructure development and maintenance, including solar energy projects sited on flat playa-margin landforms.
- Use of pesticides and herbicides in adjacent agricultural and residential areas.
- Habitat modification and fragmentation due to dispersed and concentrated recreational use, including OHV use on playa surfaces.
- Habitat degradation due to groundwater pumping and surface-water diversion that alter hydrology supporting alkaline marshes.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species.

4.2.2.7.3 Existing Management

The major landowners of the North American Western Interior Brackish Marsh, Playa and Shrubland division in the Plan Area are the BLM, Clark County, and private landowners. Private lands account for approximately 25 percent of the total. Approximately 20 percent of the 18,241 acres of this division within the Plan Area is currently managed for resource conservation outside the Reserve System (Table 4-8). This includes 1,601 acres on NPS-managed lands and 1,456 acres on BLM-administered lands. An additional 68 acres are proposed for inclusion in the New Reserve System. Playas and alkaline marshes embedded in BLM-managed Wilderness Areas and ACECs are managed under conditions described in earlier sections. Where alkaline marsh systems support hydrologic features regulated under the federal Clean Water Act, additional protection is afforded.

Table 4-8. North American Western Interior Brackish Marsh, Playa and Shrubland Land Ownership in the Plan Area

Entity	Total Acres of North American Western Interior Brackish Marsh, Playa and Shrubland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	2	0	0	0
Bureau of Land Management	8,783	1,456	0	68
Bureau of Reclamation	54	0	0	0
Clark County	2,905	0	0	0
Clark County / Boulder City	21	0	21	0
Fish and Wildlife Service	288	243	0	0
National Park Service	1,608	1,601	0	0
Private	4,580	274	0	0
Total	**18,241**	**3,574**	**21**	**68**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.8 Southwestern North American Warm Desert Freshwater Marsh and Bosque

The Southwestern North American Warm Desert Freshwater Marsh and Bosque division covers approximately 6,333 acres in the Plan Area. It includes warm desert freshwater wetlands and the mesquite-dominated low bosques that occupy the warmest and lowest portions of the Plan Area along the Virgin and Muddy Rivers, the lower Las Vegas Wash, and at perennial springs and seeps. This division shares some land cover composition with the Western North American

Interior Flooded Forest division but is distinguished by warmer-climate signatures and a stronger representation of bosque-forming species.

Vegetation in this division includes both freshwater marshes dominated by emergent species such as bulrushes (*Schoenoplectus* spp.), cattails (*Typha* spp.), and common reed (*Phragmites australis*), and mesquite bosques dominated by honey mesquite, screwbean mesquite, and catclaw acacia. Both communities depend on shallow groundwater and on persistent or seasonal surface water. Common shrub associates in the bosques include desert willow, pale wolfberry (*Lycium pallidum*), bladdersage (*Salazaria mexicana*), burrobush (*Hymenoclea salsola*), and sweetbush (*Bebbia juncea*). Desert mistletoe, parasitic on mesquite and catclaw acacia, is often common. The dense, linear thickets of the bosques provide critical shelter and movement corridors for wildlife in an otherwise open desert landscape.

The Southwestern North American Warm Desert Freshwater Marsh and Bosque division includes the following USNVC group-level land cover types within the Plan Area:

- North American Warm Desert Riparian Low Bosque and Shrubland
- North American Warm Desert Riparian Mesquite Bosque

4.2.2.8.1 Covered Species Associations

Covered Species found in the Southwestern North American Warm Desert Freshwater Marsh and Bosque division include:

- desert pocket mouse (*Chaetodipus penicillatus*)
- spotted bat (*Euderma maculatum*)
- yellow-billed cuckoo (*Coccyzus americanus*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)
- Bell's vireo (*Vireo bellii*)
- Arizona toad (*Anaxyrus microscaphus*)
- Pahrump Valley buckwheat (*Eriogonum bifurcatum*)
- sticky buckwheat (*Eriogonum viscidulum*)

Mesquite bosques within this division provide essential breeding and foraging habitat for Bell's vireo and yellow-billed cuckoo, both of which depend on dense riparian thicket structure. Southwestern willow flycatcher uses willow- and saltcedar-dominated thickets at marsh and bosque margins for breeding and migratory stopover. Arizona toad uses perennial pools, slow-moving water, and saturated marsh edges for breeding and foraging. Spotted bat forages along bosque-marsh corridors. Desert pocket mouse uses the sandy substrates that frequently underlie bosques. Pahrump Valley buckwheat and sticky buckwheat may occur on alkaline or sandy substrates immediately adjacent to marsh systems in some valley settings.

4.2.2.8.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Southwestern North American Warm Desert Freshwater Marsh and Bosque division are:

- Habitat loss, degradation, and fragmentation due to urban and agricultural development.
- Habitat degradation and vegetation community conversion due to fire and fire management; riparian and marsh fires often favor saltcedar and other invasives over native species.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species, especially saltcedar, giant reed, and brome grasses.
- Water development, diversion, channelization, and groundwater pumping that alter the hydrologic regimes sustaining marsh and bosque vegetation.
- Livestock grazing (including trespass and feral livestock) and feral horse and burro use.
- Woodcutting of mesquite and screwbean mesquite.
- Habitat degradation and fragmentation from construction, proliferation, and maintenance of roads and rights-of-way (including casual OHV use).
- Construction, operation, and maintenance of mines and sand and gravel pits.
- Habitat modification due to recreational activities.

4.2.2.8.3 Existing Management

The major landowners of the Southwestern North American Warm Desert Freshwater Marsh and Bosque division in the Plan Area are the BLM, BIA, Clark County, and private landowners. Private lands account for approximately 19 percent of the total. Approximately 26 percent of the 6,333 acres of this division within the Plan Area is either currently managed for resource conservation, included in the Existing Reserve System, or proposed for inclusion in the New Reserve System (Table 4-9). This includes 797 acres on BLM-administered lands and 198 acres on Nevada State lands managed for resource conservation. An additional 303 acres are proposed for inclusion in the New Reserve System. Marsh and bosque habitat is also subject to regulation under the federal Clean Water Act and “no-net-loss” policies for wetland habitats. The SNWA Warm Springs Natural Area stewardship plan, the Clark County Wetlands Park management plan, and the BLM Mesquite and Acacia Conservation Management Strategy each identify management actions relevant to this division, including habitat restoration, water-rights management, and invasive species control.

Table 4-9. Southwestern North American Warm Desert Freshwater Marsh and Bosque Land Ownership in the Plan Area

Entity	Total Acres of Southwestern North American Warm Desert Freshwater Marsh and Bosque	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	889	0	0	0
Bureau of Land Management	2,668	797	0	303

Entity	Total Acres of Southwestern North American Warm Desert Freshwater Marsh and Bosque	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Reclamation	74	18	0	0
Fish and Wildlife Service	21	21	0	0
Local Government	1,293	0	57	0
Nevada State	210	198	0	0
Private	1,177	258	0	0
Total	**6,333**	**1,292**	**57**	**303**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.9 Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland

The Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland division covers approximately 2,791 acres in the Plan Area. It includes temperate freshwater marshes, wet meadows, and shrub-dominated wetlands that occur at mid- to high elevations in association with springs, seeps, and stream margins, primarily in the Spring Mountains and Sheep Range and at higher-elevation portions of the Desert NWR.

Vegetation in this division includes a mosaic of emergent marsh, sedge- and rush-dominated wet meadow, and willow-dominated wetland shrubland. Common species include sedges (*Carex* spp.), rushes (*Juncus* spp.), spikerushes (*Eleocharis* spp.), bulrushes, and a variety of forbs. Shrub-dominated stands typically include sandbar willow and other *Salix* species. These small but ecologically disproportionate features support local biodiversity hotspots, provide breeding habitat for amphibians, and serve as essential watering and foraging sites for wildlife in an arid landscape.

The Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland division includes the following USNVC group-level land cover types within the Plan Area:

- Arid West Interior Freshwater Marsh and Wet Meadow
- Rocky Mountain Alpine-Montane Wet Meadow
- Western North American Ruderal Marsh, Wet Meadow and Shrubland

4.2.2.9.1 Covered Species Associations

Covered Species found in the Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland division include:

- yellow-billed cuckoo (*Coccyzus americanus*)
- southwestern willow flycatcher (*Empidonax traillii extimus*)

- Yuma Ridgway's rail (*Rallus obsoletus yumanensis*)
- Bell's vireo (*Vireo bellii*)
- Arizona toad (*Anaxyrus microscaphus*)

Marshes and wet meadows within this division provide essential breeding and foraging habitat for Arizona toad, particularly where perennial pools and slow-moving water are present. Where willow-dominated wetland shrubland is present, southwestern willow flycatcher and Bell's vireo may use these features as breeding habitat. Yuma Ridgway's rail uses denser emergent marsh stands. Yellow-billed cuckoo may use riparian forest fringes adjacent to marsh systems for breeding and migratory stopover.

4.2.2.9.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland division are:

- Habitat loss, degradation, and fragmentation due to urban and agricultural development.
- Water development, diversion, and groundwater pumping that alter hydrologic regimes supporting marsh and wet meadow vegetation.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species.
- Livestock grazing and feral horse and burro use, which can compact saturated soils, alter species composition, and reduce wetland extent.
- Habitat modification due to dispersed and concentrated recreational activities.
- Habitat fragmentation and degradation from road and trail construction and maintenance in the vicinity of springs and meadows.

4.2.2.9.3 Existing Management

The major landowners of the Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland division in the Plan Area are the USFWS, the BLM, and private landowners. Private lands account for approximately 16 percent of the total. Approximately 84 percent of the 2,791 acres of this division within the Plan Area is either currently managed for resource conservation or included in the Existing Reserve System (Table 4-10). This includes 1,266 acres on USFWS-managed lands (Desert NWR), 394 acres on BLM-administered lands, and 75 acres in the Existing Reserve System. Marsh and wet meadow habitat is also subject to regulation under the federal Clean Water Act and "no-net-loss" policies for wetland habitats. The Conservation Agreement for the Spring Mountains NRA identifies management actions for high-elevation springs and meadows, and the SNWA Warm Springs Natural Area stewardship plan and Clark County Wetlands Park management plan each address management of warmer-climate wetland features that may grade between this division and the Southwestern North American Warm Desert Freshwater Marsh and Bosque division.

Table 4-10. Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland Land Ownership in the Plan Area

Entity	Total Acres of Western North American Temperate Freshwater Marsh, Wet Meadow and Shrubland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	28	0	0	0
Bureau of Land Management	571	394	0	0
Bureau of Reclamation	84	12	0	0
Department of Energy	5	0	0	0
Fish and Wildlife Service	1,266	1,266	0	0
Forest Service	149	149	0	0
Local Government	75	0	75	0
National Park Service	11	0	0	0
Nevada State	155	152	0	0
Private	447	252	0	0
Total	**2,791**	**2,225**	**75**	**0**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.10 Californian Forest and Woodland

The Californian Forest and Woodland division has limited representation in the Plan Area, occupying approximately 601 acres on the western edge of the County. It includes broadleaf forest and woodland vegetation more characteristic of the Californian floristic region, occurring in Clark County only as small outliers on cooler, mesic sites where edaphic and microclimatic conditions support Californian-affinity species. Within the Plan Area, this division is represented by the Californian Broadleaf Forest and Woodland group, characterized by broadleaf trees and large shrubs occurring on rocky slopes and protected drainages.

The Californian Forest and Woodland division includes the following USNVC group-level land cover types within the Plan Area:

- Californian Broadleaf Forest and Woodland

4.2.2.10.1 Covered Species Associations

Covered Species found in the Californian Forest and Woodland division include:

- monarch butterfly (*Danaus plexippus*)

Although limited in extent, this division can provide nectar resources and migratory stopover habitat for monarch butterfly. The structural and floristic diversity of this small but distinctive division contributes to overall habitat heterogeneity in the western portion of the Plan Area.

4.2.2.10.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Californian Forest and Woodland division are:

- Habitat degradation and vegetation community conversion due to fire and altered fire regimes.
- Habitat modification due to dispersed and concentrated recreational activities, including OHV use.
- Habitat fragmentation from road and trail construction and maintenance.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species.
- Tree and shrub mortality associated with drought and climate change.

4.2.2.10.3 Existing Management

The 601 acres of Californian Forest and Woodland in the Plan Area occur entirely on BLM-administered lands, of which 553 acres (approximately 92 percent) are managed for resource conservation outside the Reserve System (Table 4-11). These BLM-managed lands include Wilderness Areas, NCAs, and ACECs, which are managed under the conditions described in earlier sections.

Table 4-11. Californian Forest and Woodland Land Ownership in the Plan Area

Entity	Total Acres of Californian Forest and Woodland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Land Management	601	553	0	0
Total	**601**	**553**	**0**	**0**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.11 Western North American Alpine Tundra

The Western North American Alpine Tundra division has very limited representation in the Plan Area, occupying approximately 523 acres at the highest elevations of the Spring Mountains, primarily near the summit of Mt. Charleston (11,918 feet). It corresponds to the alpine and subalpine meadow vegetation that occurs above treeline and was previously described in this Plan as the alpine ecosystem.

Vegetation is composed of low-stature graminoid- and forb-dominated communities adapted to short growing seasons, persistent winter snowpack, and exposure to wind and freezing

temperatures. Common species include alpine sedges, bluegrasses (*Poa* spp.), and a diverse forb assemblage that includes several local endemics. Despite its small extent, this division supports a disproportionate share of the Plan Area's local plant endemism and provides unique habitat heterogeneity.

The Western North American Alpine Tundra division includes the following USNVC group-level land cover types within the Plan Area:

- Rocky Mountain Subalpine Mesic Meadow

4.2.2.11.1 Covered Species Associations

Covered Species found in the Western North American Alpine Tundra division include:

No Covered Species are specifically associated with the Western North American Alpine Tundra division in the Plan Area. The division is, however, a high-priority area for conservation under the Conservation Agreement for the Spring Mountains NRA because it supports a high concentration of local plant endemics and contributes to the structural and ecological diversity of the high-elevation conservation network.

4.2.2.11.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Western North American Alpine Tundra division are:

- Habitat modification due to recreational activities, including foot traffic, trail erosion, and dispersed camping.
- Climate change effects, including upslope encroachment of subalpine forest, shifting precipitation regimes, and reduced snowpack persistence.
- Habitat degradation from feral horses and unauthorized livestock use.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species.

4.2.2.11.3 Existing Management

The 523 acres of Western North American Alpine Tundra in the Plan Area occur predominantly on USFS-managed lands (442 acres, or approximately 85 percent), with the remainder on private inholdings (Table 4-12). All 442 acres of USFS-managed alpine tundra are managed for resource conservation under the Spring Mountains NRA designation and the associated Conservation Agreement, which identifies management direction relevant to high-elevation systems.

Table 4-12. Western North American Alpine Tundra Land Ownership in the Plan Area

Entity	Total Acres of Western North American Alpine Tundra	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Forest Service	442	442	0	0
Private	81	0	0	0
Total	**523**	**442**	**0**	**0**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.12 Western North American Grassland and Shrubland

The Western North American Grassland and Shrubland division has very limited representation in the Plan Area, occupying approximately 216 acres. It is represented in Clark County by the Southern Rocky Mountain Mountain-mahogany – Mixed Foothill Shrubland group, occurring on dry, often rocky foothill slopes at elevations between approximately 5,000 and 7,500 feet.

Vegetation is dominated by mountain mahogany (*Cercocarpus* spp.) and a variety of associated shrubs that may include serviceberry (*Amelanchier* spp.), antelope bitterbrush, snowberry, and currants. This division provides habitat heterogeneity and forage resources at the transition zone between pinyon-juniper woodlands above and lower-elevation desert scrub below.

The Western North American Grassland and Shrubland division includes the following USNVC group-level land cover types within the Plan Area:

- Southern Rocky Mountain Mountain-mahogany – Mixed Foothill Shrubland

4.2.2.12.1 Covered Species Associations

Covered Species found in the Western North American Grassland and Shrubland division include:

- monarch butterfly (*Danaus plexippus*)

Although limited in extent, this division can provide nectar resources and migratory stopover habitat for monarch butterfly.

4.2.2.12.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Western North American Grassland and Shrubland division are:

- Habitat degradation and vegetation community conversion due to fire and altered fire regimes.
- Habitat modification due to dispersed and concentrated recreational activities, including OHV use.
- Livestock grazing.
- Habitat degradation resulting from the introduction of, competition from, and encroachment of nonnative invasive plant species, including nonnative annual grasses.

4.2.2.12.3 Existing Management

All 216 acres of Western North American Grassland and Shrubland in the Plan Area occur on BLM-administered lands managed for resource conservation outside the Reserve System (Table 4-13). These lands include Wilderness Areas, NCAs, and ACECs and are managed under the conditions described in earlier sections.

Table 4-13. Western North American Grassland and Shrubland Land Ownership in the Plan Area

Entity	Total Acres of Western North American Grassland and Shrubland	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Land Management	216	216	0	0
Total	**216**	**216**	**0**	**0**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.13 Urban Interface Mojave Desert Scrub

Urban Interface Mojave Desert Scrub is a transitional category covering approximately 37,944 acres in the Plan Area. It corresponds to Mojave Desert scrub vegetation that has been altered by adjacent urban development through edge effects, including fragmentation, fire, recreational use, infrastructure encroachment, fugitive disturbance, and elevated nonnative plant cover. While retaining a structural composition similar to the North American Warm Desert Scrub and Grassland division, urban interface scrub differs in ecological condition and management context. It is mapped as a separate category in this Plan because of its distinctive management needs and its role as a buffer between developed areas and intact natural ecosystems.

Vegetation typically retains creosote bush, white bursage, Joshua tree, and other diagnostic Mojave species, but with reduced cover, lower structural complexity, and elevated representation of nonnative annual grasses (including red brome and Mediterranean grass) and forbs (including Sahara mustard). Soils are often disturbed, compacted, or supplemented with fugitive runoff from urban infrastructure.

4.2.2.13.1 Covered Species Associations

Covered Species found in the Urban Interface Mojave Desert Scrub division include:

- golden eagle (*Aquila chrysaetos*)
- western burrowing owl (*Athene cunicularia hypugaea*)
- loggerhead shrike (*Lanius ludovicianus*)
- Mojave Desert tortoise (*Gopherus agassizii*)

Although the principal vegetation composition is similar to the Warm Desert Scrub and Grassland division, the elevated disturbance levels and proximity to development associated with Urban Interface Mojave Desert Scrub generally make it of limited value for sensitive Covered Species. However, in some locations it may continue to provide marginal foraging or dispersal habitat for Mojave Desert tortoise, golden eagle, loggerhead shrike, western burrowing owl, and other species characteristic of the broader Mojave Desert. Plant Covered Species occurrences within the urban interface are generally remnant populations of pre-development distributions and are typically of higher conservation concern because of their fragmented condition.

4.2.2.13.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Urban Interface Mojave Desert Scrub division are:

- Continued conversion to developed land uses.
- Habitat degradation and vegetation community conversion due to fire and fire management; the urban interface is the primary location of human-caused ignitions in the Plan Area.
- Habitat modification due to high levels of dispersed and concentrated recreational use, including informal trails and OHV use.
- Habitat fragmentation from road, trail, and infrastructure proliferation.
- Light, noise, and water pollution from adjacent development.
- Habitat degradation due to invasive species, particularly nonnative annual grasses, Sahara mustard, and ornamental species escaping from cultivated landscaping.
- Wildlife mortality and disturbance from domestic animals and human activity.

4.2.2.13.3 Existing Management

Urban Interface Mojave Desert Scrub occurs on a wide mix of ownerships, with the largest shares on private lands (49 percent) and BLM-administered lands (33 percent). Approximately 12 percent of the 37,944 acres of urban interface scrub within the Plan Area is currently managed for resource conservation outside the Reserve System, included in the Existing Reserve System, or proposed for inclusion in the New Reserve System (Table 4-14). Management of this category focuses on edge protection, fuels management, invasive species control, and avoidance and minimization of further encroachment by development.

Table 4-14. Urban Interface Mojave Desert Scrub Land Ownership in the Plan Area

Entity	Total Acres of Urban Interface Mojave Desert Scrub	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	136	0	0	0
Bureau of Land Management	12,370	3,040	0	97
Bureau of Reclamation	255	66	0	0
Department of Energy	3	0	0	0
Fish and Wildlife Service	3	3	0	0
Forest Service	6	2	0	0
Local Government	480	142	0	0
National Park Service	562	557	0	0
Nevada State	38	34	0	0

Entity	Total Acres of Urban Interface Mojave Desert Scrub	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Private	18,452	620	0	0
Total	**37,944**	**4,462**	**35**	**97**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.14 Developed

The Developed land cover category covers approximately 275,272 acres in the Plan Area. It includes lands that have been converted from natural vegetation to urban, suburban, residential, commercial, industrial, transportation, or intensively managed open-space uses. Developed lands are concentrated in the Las Vegas Valley and in the smaller incorporated areas of Boulder City, Henderson, North Las Vegas, Mesquite, and Laughlin.

Vegetation, where present, is largely cultivated and consists of ornamental landscaping, irrigated turf, golf courses, parks, and managed open space. Native vegetation typically occurs only as remnants on undeveloped parcels or as inclusions within larger developed footprints. Developed lands are described in this Plan because they account for a substantial portion of the Plan Area, intersect Plan implementation through mitigation, and include parks and open spaces that may host limited natural resource values.

4.2.2.14.1 Covered Species Associations

Covered Species found in the Developed division include:

- Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*)

Developed lands generally do not provide breeding or foraging habitat for the Covered Species. However, some Covered Species, particularly the more mobile birds and bats, may transit developed areas during foraging or migration. Limited individual occurrences of Covered Species may persist in undeveloped parcels embedded within the developed footprint, particularly remnant populations of plant Covered Species such as Las Vegas buckwheat. Covered Species occurrences on developed parcels are addressed under the Plan's incidental take provisions and are subject to standard avoidance, minimization, and mitigation measures.

4.2.2.14.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Developed division are:

- Continued conversion of natural vegetation to developed uses, primarily affecting Urban Interface Mojave Desert Scrub and the adjacent Warm Desert Scrub and Grassland division.
- Habitat fragmentation and edge effects extending into surrounding ecosystems.
- Light, noise, and water pollution affecting adjacent natural areas.
- Increased incidence of human-caused fires originating from developed areas.

- Source populations of nonnative invasive plant and animal species that disperse into adjacent ecosystems.

4.2.2.14.3 Existing Management

Because Developed land cover represents lands already converted from natural vegetation, the term “threats and stressors” applies primarily to adjacent natural ecosystems rather than to the Developed category itself.

Developed lands in the Plan Area are owned and managed by a wide mix of public and private entities, with the largest share on private land (91 percent of the total), followed by Clark County, the City of Las Vegas, and the BLM. A small portion of developed lands is included in the Existing Reserve System (328 acres) or proposed for inclusion in the New Reserve System (1 acre); these are typically Reserve System parcels that contain developed infrastructure related to monitoring, recreation access, or interpretive programs (Table 4-15). On private and municipal Developed lands, recreational uses, residential and commercial activities, and infrastructure operations are permitted in accordance with applicable local regulations.

Table 4-15. Developed Land Ownership in the Plan Area

Entity	Total Acres of Developed	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Land Management	1,098	43	0	0
Bureau of Reclamation	104	0	0	0
Department of Energy	1	0	0	0
Forest Service	24	23	0	0
Local Government	23,237	47	328	0
National Park Service	501	501	0	0
Nevada State	53	0	0	0
Private	250,254	428	0	1
Total	**275,272**	**1,041**	**328**	**1**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

4.2.2.15 Vacant

The Vacant land cover category covers approximately 73,687 acres in the Plan Area. It includes parcels that lack established vegetation as a result of past disturbance, are zoned or platted for development but have not yet been developed, or are otherwise classified as vacant in the spatial dataset prepared for the MSHCP Amendment. Vacant lands typically occur in or adjacent to the developed footprint, in disposal-boundary lands within the Las Vegas Valley, on historically disturbed sites including former agricultural fields and graded parcels, and within rights-of-way.

Vegetation on Vacant lands is highly variable, ranging from largely bare ground to ruderal communities dominated by nonnative annual grasses and forbs. In some cases, remnant native vegetation persists, particularly on parcels with limited prior disturbance. Vacant lands are described in this Plan because of their substantial extent within the Plan Area and because they are routinely involved in Plan implementation through development applications, mitigation, and Reserve System acquisition.

4.2.2.15.1 Covered Species Associations

Covered Species found in the Vacant division include:

- western burrowing owl (*Athene cunicularia hypugaea*)
- loggerhead shrike (*Lanius ludovicianus*)

Vacant lands generally do not provide high-quality habitat for the Covered Species. However, where remnant native vegetation persists, Vacant parcels may support individual occurrences or marginal habitat for the more disturbance-tolerant Covered Species, particularly western burrowing owl, loggerhead shrike, and remnant populations of plant Covered Species. Covered Species occurrences on Vacant parcels are addressed under the Plan's incidental take provisions and are subject to standard avoidance, minimization, and mitigation measures.

4.2.2.15.2 Threats and Stressors to the Ecosystem

The primary threats and stressors to the Vacant division are:

- Conversion of remnant native vegetation to developed uses through future development of vacant parcels.
- Habitat degradation and increased fire risk resulting from accumulation of nonnative annual grasses and other invasive plants.
- Continued degradation through illegal dumping, OHV use, and other unauthorized activities.
- Source populations of nonnative invasive plant species that disperse into adjacent ecosystems.
- Edge effects on adjacent natural ecosystems.

4.2.2.15.3 Existing Management

Vacant lands in the Plan Area are owned and managed by a wide mix of public and private entities, with the largest shares on BLM-administered lands (60 percent) and private lands (21 percent). Approximately 24 percent of the 73,687 acres of Vacant lands within the Plan Area is currently managed for resource conservation outside the Reserve System, included in the Existing Reserve System, or proposed for inclusion in the New Reserve System (Table 4-16). Vacant lands within BLM Wilderness Areas, NCAs, ACECs, and within USFS- and USFWS-managed lands are managed under the conditions described in earlier sections. On private and municipal Vacant lands, future use is governed by applicable local zoning and entitlement processes; mitigation requirements applicable to such conversions are addressed elsewhere in this Plan.

Table 4-16. Vacant Land Ownership in the Plan Area

Entity	Total Acres of Vacant	Acres Managed for Resource Conservation*	Acres in the Existing Reserve System	Acres in Reserve System Additions
Bureau of Indian Affairs	4,907	0	0	0
Bureau of Land Management	44,466	11,759	0	2,309
Bureau of Reclamation	1,692	322	0	0
Department of Energy	527	0	0	0
Fish and Wildlife Service	314	311	0	0
Forest Service	928	926	0	0
Local Government	4,127	24	1,409	0
National Park Service	588	575	0	0
Nevada State	486	340	0	0
Private	15,653	1,030	0	22
Total	**73,687**	**15,286**	**1,409**	**2,331**

** Excludes lands in the Existing Reserve System and the Reserve System Additions.*

5.0 POTENTIAL BIOLOGICAL IMPACTS AND TAKE ASSESSMENT

This chapter summarizes the baseline information for the MSHCP Amendment Covered Activities in the MSHCP Amendment Plan Area, ways in which the Covered Activities may affect Covered Species, and the habitat functionality models used in this chapter to quantify impacts and mitigation for the Covered Species. The analysis presented in this chapter addresses all Covered Activities that will be implemented within the Plan Area over the proposed 50-year Permit Term. Effects are analyzed under the assumption of maximum effects of the MSHCP Amendment Covered Activities on land cover types, Covered Species, and their habitats.

5.1 Species Effects Definitions

Effects of the action are all consequences to listed species or critical habitat that are caused by the Covered Activities, including the consequences of other activities that are caused by the Covered Activities (50 CFR 402.02). To understand potential effects the analysis identifies stressors from Covered Activities and how species or their habitats may be exposed to these stressors and respond to them. Stressors are typically described as any physical, chemical, or biological alteration of the environment that induces a measurable adverse response in an organism, negatively affecting its breeding, feeding, or sheltering capabilities. Effects to species and/or their habitat can be permanent or temporary, as well as direct or indirect.

5.1.1 Permanent Effects

Permanent effects can be direct or indirect. Direct effects are typically described as those caused by the activity and occur at the same time and place as the activity. Effects that are caused by or will result from the activity and are later in time or occur outside the immediate area involved in the action but are still reasonably certain to occur (50 CFR 402.02), are typically described as indirect effects. Environmental stressors resulting from Covered Activities can permanently affect species by directly harming, harassing, killing, or injuring an individual of any Covered Species, or by directly removing, modifying, or degrading an ecosystem type that provides habitat for a Covered Species.

Stressors resulting from Covered Activities can also affect species later in time or at a distance (indirectly) when activities modify or degrade species habitat over time. This can eventually cause a significant modification and complete loss of value of the habitat for significant biological processes such as breeding, feeding, or sheltering. While more difficult to quantify and track, indirect impacts can substantially affect species habitat, especially if multiple indirect or direct impacts work cumulatively to degrade the habitat. Direct and indirect permanent effects analyzed include (1) effects from Covered Activities that have a duration exceeding 1 year, and (2) effects from ground-disturbing Covered Activities with a duration of less than 1 year, but the disturbed ecosystem or species modeled habitat requires more than 1 year to be restored to pre-activity condition (regardless if restoration begins immediately following end of the ground disturbance).

5.1.2 Temporary Effects

Temporary effects alter an ecosystem or species habitat for less than 1 year, and the disturbed area or adjacent area recovers or is restored to pre-project habitat conditions within 1 year of completing the ground disturbance (e.g., prescribed burning, construction staging areas, and construction dust).

5.1.3 Incidental Take

Effects of Covered Activities will result in the incidental take of Covered Species. “Incidental take” is the take of fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity (50 CFR 17.3). The ESA defines “take” as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (16 U.S.C. 1532(19)).

“Harm” in the ESA definition of “take” means an act that actually kills or injures wildlife. Such acts may include significant habitat modifications or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. “Harass” in the ESA definition of “take” means an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Although “harass” is defined as take, it is not a form of take permitted under Section 10(a)(1)(B) of the ESA (USFWS 2018), and is therefore, not included in the take analysis for the MSHCP Amendment or discussed further in this chapter.

The effects analysis in this chapter considers a significant modification to be removal of an MSHCP Amendment natural ecosystem type and conversion to another ecosystem type; for example, Mojave Desert scrub converted to a developed ecosystem type would be a significant modification. This effects analysis considers significant degradation to an MSHCP Amendment ecosystem type to be when the ecosystem type remains, but an ecological function is adversely affected to the extent that the ecosystem type is unlikely to provide Covered Species habitat. For example, damage to cryptobiotic soil can alter soil stability, soil-surface nutrient levels, and water retention (Mistretta et al. 1996). This can lead to spread of invasive species that outcompete native species essential to Covered Species shelter and survival. Significant modification or degradation to habitat can result in harming, wounding, killing, or capturing of Covered Species.

Section 5.2 discusses specific environmental stressors for each of the major categories of Covered Activities that will temporarily or permanently affect species and result in “take.”

The USFWS designates critical habitat in specific areas that are essential to the conservation of a listed species. Under Section 7(a)(2) of the ESA, federal agencies must ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. Because issuance of an ITP under Section 10(a)(1)(B) is a federal action, USFWS's permit decision on the MSHCP Amendment will be subject to Section 7 consultation, including analysis of effects on designated critical habitat for Covered Species. Section 3(5)(A) of the ESA defines “critical habitat,” in part, as “the specific areas within the geographical area occupied by the species, at the time it is listed…, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection.” ESA critical habitat rules use the term “constituent elements” or physical and biological features of critical habitat to define areas “that are essential to the conservation of the species,” including, but not limited to, “roost sites, nesting grounds, spawning sites, feeding sites, seasonal wetland or dryland, water quality or quantity, host species or plant pollinator, geological formation, vegetation type, tide, and specific soil types” (50 CFR 424.12). Covered Activities are analyzed to ensure that the constituent elements of designated critical habitat units will not be directly or indirectly destroyed or adversely modified to the extent that the value of the species’ designated critical habitat is appreciably diminished as a whole (50 CFR 402.02). As discussed in Sections 3.5.14.2 and 3.5.20.2, two Covered Species have one or more designated critical

habitat units located within the Plan Area. Therefore, this chapter also quantifies the acres of critical habitat affected by the proposed Covered Activities.

Prohibitions for plant species listed under the ESA on non-federal lands are limited to import, export, or sale of plants. On federal lands removal, possession, or malicious damage or destruction is prohibited. Under Nevada state law (NAC 527), a permit is required for activities that may remove or destroy fully protected plant species or which may disturb management areas for these plant species. This chapter includes analysis of effects to plant species to ensure that Covered Activities would not result in jeopardy to Covered Species of plants and provide detail necessary to receive permits for impacts to Covered Species of plants which are designated fully protected native flora under Nevada state law.

5.2 Environmental Stressors from Covered Activities

This section describes how environmental stressors resulting from a Covered Activity affects ecosystems, species habitats, and individuals of Covered Species. The effects of these environmental stressors on Covered Species, species habitats, and ecosystems are analyzed in Sections 5.3 through 5.5, and the amount of take the Permittees are requesting under the ITP is summarized in Section 5.6. Twenty-five (25) environmental stressors are described below, organized by: (1) environmental stressors that would occur on an ongoing and permanent basis during operation of a Covered Activity over the Permit Term, and (2) those that would be temporary and occur only during and immediately after construction or implementation of a Covered Activity.

5.2.1 Permanent Environmental Stressors of Covered Activities Outline

The following permanent environmental stressors that could result from Covered Activities were identified:

- Loss of ecosystems and Covered Species habitat (habitat conversion)
- Habitat fragmentation
- Invasive plants and animals
- Predators
- Noise
- Artificial Lighting at Night
- Increased human activity
- Increased wildfire
- Collisions with wildlife, including collisions with vehicles, machinery, above ground utilities, and wind turbines
- Increased impermeable surfaces
- Alterations to hydrology
- Collection for the Reserve System
- “Heat island” effect
- Impacts to air quality.

5.2.2 Temporary Environmental Stressors during Construction of Covered Activities Outline

The following temporary environmental stressors that could result from Covered Activities were identified:

- Construction noise
- Construction ground vibration

- Construction lighting
- Construction dust
- Increased human presence
- Construction trash and debris
- Temporary reduction in water quality
- Vegetation removal or disturbance
- Soil disturbance
- Capture and handling of Covered Species for relocation during implementation of Covered Activities

Tables 5-1, 5-2, and 5-3 present a matrix identifying which environmental stressors could result from the various Covered Activities. Table 5-1 shows New Activities proposed to be covered by the permit amendment, Table 5-2 shows activities associated with Operations and Maintenance outside of the Reserve System, and Table 5-3 shows covered activities inside the Reserve System.

5.2.3 Permanent Environmental Stressors of Covered Activities

5.2.3.1 Loss of Ecosystems and Covered Species Habitat (Habitat Conversion)

New development, infrastructure, and renewable energy projects result in conversion from undeveloped (potentially suitable) to developed (unsuitable) ecosystem types. The loss of natural ecosystems in the Plan Area results in less habitat for species to nest, den, or forage which can reduce species populations and distribution depending on the extent of habitat conversion. Covered Activities which would permanently convert ecosystems to developed include construction of private and public infrastructure; new residential, industrial, and commercial structures; recreational facilities and use; agricultural conversion and new facilities used in agricultural operations; development of renewable energy; and fuel modification and fire management. In addition, conversion to developed and disturbed habitats can increase isolation and fragmentation of habitats and change habitat conditions in adjacent habitat such that wildlife and plant community structure may be transformed. These stressors are described in the following Section 5.2.3.2.

5.2.3.2 Habitat Fragmentation

Habitat fragmentation is the reduction of large continuous habitat into smaller patches that are separated or isolated from similar habitat patches (Crooks et al. 2017). This fragmentation and isolation of plant and wildlife populations and their habitat can affect wildlife movement and dispersal, plant seed dispersal, and movement and dispersal of plant pollinators. Fragmentation may cause extinction of local populations through reduction in total habitat area, which reduces effective population sizes; isolation of local populations, which affects dispersal and immigration rates; and reduction in population size or fitness through “edge effects” changing habitat conditions (Wilcox and Murphy 1985; Wilcove et al. 1986, Crooks et al. 2017). Local extinctions of species can also cause extinctions of other species in and adjacent to the habitat patch (Wilcox and Murphy 1985).

Table 5-1. New Covered Activities

Covered Activity	Temporary Environmental Stressors										Permanent Environmental Stressors														
	Construction Noise	Construction Ground Vibration	Construction Lighting	Construction Dust	Increased Human Presence	Construction Trash and Debris	Temporary Reduction in Water Quality	Vegetation Removal or Disturbance	Soil Disturbance	Capture and Handling for Relocation	Habitat Fragmentation	Habitat Conversion	Invasive Plants	Invasive Animals	Predators	Persistent Ground Vibration and Noise	Artificial Lighting at Night	Increased Human Activity	Increased Wildfire	Collisions with Wildlife	Increased Impermeable Surfaces	Alterations to Hydrology	Collection for Reserve System	"Heat Island" Effect	Air Quality
New residential, industrial, and commercial structures - Construction	X	X	X	X	X	X	X	X	X	X	X	X	X												
New infrastructure - Construction	X	X	X	X	X	X	X	X	X	X	X	X	X												
Las Vegas Wash - Operations and maintenance	X	X	X	X	X	X	X	X	X	X		X	X	X	X			X		X		X			
Recreational facilities and infrastructure- Construction	X	X	X	X	X	X		X	X	X	X	X													
OHV use in designated areas											X	X	X			X		X		X					X
Conversion of undeveloped private land, construction of facilities, structures, and infrastructure	X	X	X	X	X	X	X	X	X	X	X	X	X												
Renewable energy - Construction	X	X	X	X	X	X		X	X	X	X	X	X								X				
Renewable energy infrastructure - Construction	X	X	X	X	X	X	X	X	X	X	X	X	X												
Emergency repairs and clean-up	X	X	X	X	X	X	X	X	X	X	X	X	X								X	X			

Table 5-2. Operations and Maintenance Outside the Reserve System

Covered Activity	Temporary Environmental Stressors										Permanent Environmental Stressors														
	Construction Noise	Construction Ground Vibration	Construction Lighting	Construction Dust	Increased Human Presence	Construction Trash and Debris	Temporary Reduction in Water Quality	Vegetation Removal or Disturbance	Soil Disturbance	Capture and Handling for Relocation	Habitat Fragmentation	Habitat Conversion	Invasive Plants	Invasive Animals	Predators	Persistent Ground Vibration and Noise	Artificial Lighting at Night	Increased Human Activity	Increased Wildfire	Collisions with Wildlife	Increased Impermeable Surfaces	Alterations to Hydrology	Collection for Reserve System	"Heat Island" Effect	Air Quality
New residential, industrial, and Commercial Structures													X	X	X	X	X	X	X		X	X		X	X
New and existing infrastructure	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X	X		X	X	X			
New renewable energy and associated infrastructure													X	X		X	X	X		X				X	
Agricultural lands, facilities, and infrastructure	X	X		X	X		X	X	X				X	X	X	X	X	X	X	X		X			X
Las Vegas Valley comprehensive integrated flood control system	X	X	X	X	X	X	X	X	X	X			X									X			
New and existing recreational facilities rehabilitation, repair, replacement, and maintenance	X	X	X	X	X	X		X	X			X	X								X				
New and existing recreational facilities operation													X	X	X	X	X	X	X	X		X			X
Existing mines and quarries on non-federal lands								X	X				X	X	X	X	X	X		X		X			X
Habitat assessments, population surveys, observational, and scientific investigations					X			X		X								X							
Restoration, enhancement, and creation of habitat	X	X	X	X	X	X	X	X	X	X												X			
Guided field trips and workshops					X			X										X							

Table 5-3. Covered Activities inside the Reserve System

Covered Activity	Temporary Environmental Stressors										Permanent Environmental Stressors														
	Construction Noise	Construction Ground Vibration	Construction Lighting	Construction Dust	Increased Human Presence	Construction Trash and Debris	Temporary Reduction in Water Quality	Vegetation Removal or Disturbance	Soil Disturbance	Capture and Handling for Relocation	Habitat Fragmentation	Habitat Conversion	Invasive Plants	Invasive Animals	Predators	Persistent Ground Vibration and Noise	Artificial Lighting at Night	Increased Human Activity	Increased Wildfire	Collisions with Wildlife	Increased Impermeable Surfaces	Alterations to Hydrology	Collection for Reserve System	"Heat Island" Effect	Air Quality
Fuel modification, fire management, and weed control	X	X	X	X	X	X	X	X	X	X	X														
Access control installation	X	X	X	X	X	X		X	X																
Habitat enhancement and restoration	X	X	X	X	X	X	X	X	X	X												X			
Habitat assessments, population surveys, observational, and scientific investigations					X			X		X								X							
Medical, rescue, firefighting operations, law enforcement, and other emergency services					X			X	X				X												
Infrastructure maintenance and new ROWs	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X	X				
Repairs to public infrastructure facilities and utilities	X	X	X	X	X	X	X	X	X	X			X									X			
Public access, open roads and trails	X	X	X	X	X	X		X	X				X	X	X	X		X	X	X					X
Road, trail, and public access maintenance	X	X	X	X	X	X	X	X	X	X			X												
Collection of flora and fauna					X			X	X									X		X			X		

Fragmentation can result in adjustments to individual wildlife movements including within a home range and dispersal or migratory events. For example, many species will either not cross roads, drainages, disturbed lands, and urbanized areas or do so infrequently or unsuccessfully. The need to cross roads also increases the risk of vehicle collisions, especially for small mammals, reptiles, and low- or slow-flying birds (Andrews et al. 2008, Peaden et al. 2017). Roadway mortality or limitations on species movement leads to a variety of problems, including reduction and isolation of populations. As an example, fencing along highways to reduce desert tortoise mortality inhibits the movement patterns of other reptiles and small mammals. Isolated populations are vulnerable to negative demographic trends, including genetic bottlenecks, genetic drift, inbreeding depression, and stochastic events. This MSHCP Amendment does not include activities conducted by or maintained by NDOT such as interstate highways. The existing interstates and the impaired connectivity they cause are part of the environmental baseline described in Chapter 4, and any new impacts from them are not part of this MSHCP. Roads that may be part of Covered Activities in this MSHCP Amendment are local or County roads. These smaller roads are anticipated to have less impact on species connectivity and the genetic health of populations, but mortality may still occur. Roadways often have indirect effects which result in habitat degradation adjacent to the roadways including increased disturbance, pollution, presence of invasive species, noise, and lighting (Andrews et al. 2008). These changes in turn can affect ecological functions and the long-term viability of species, including those which are dependent upon the affected species. These ecosystem relationships can include predator/prey interactions, pollination/seed dispersal, or ecosystem engineers such as burrow construction which provides habitat for other species.

Other linear features such as non-wildlife friendly fencing or transmission lines can also alter the movement and feeding patterns of species. This alteration of movement and feeding patterns could add additional stressors on the habitat of Covered Species such as longer foraging or dispersal efforts or loss of access to higher quality foraging habitat which can reduce fitness of individuals and cause harm or mortality. Fences and transmission lines can also provide roost or perch sites for predators or allow invasive species to spread farther from developed areas. Common ravens (*Corvus corax*) and other avian predators of desert tortoise utilize the additional, or in some habitats, novel perch sites, resulting in a potential for increased “take” from the installation via predation. However, not all fencing is detrimental, and well-designed roadside fencing can be beneficial in mitigating effects of roads on some species (Peaden et al. 2017).

Edge effects adjacent to development can result in local ecosystem community changes as some species may be considered tolerant or even benefit from disturbance while others are sensitive (Rottenborn 1999, Agha et al. 2017). Disturbance-tolerant species may out-compete resident native species for resources (e.g., habitat, food, nesting locations) or directly prey on or parasitize the native residents. These can be native species that have higher densities surrounding developed areas or non-native species which do not meet the definition of invasive. Ravens are a disturbance-tolerant species which preys on desert tortoise, and their populations have been increasing across the North American continent with higher trends in the warm desert region in which Clark County is set (Harju et al. 2021).

5.2.3.3 Invasive Plants and Animals

5.2.3.3.1 Plants

Disturbance related to development, including roads, utility corridors and other infrastructure, can assist in the spread of invasive, non-native plant species which can reduce habitat quality for species through many pathways, ultimately changing ecological functions and adversely affecting

native species through displacement or habitat alteration. Invasive plant species are often identified as an indirect “edge effect” of new development because invasive plants generally colonize modified or otherwise disturbed zones between development and remaining natural areas. However, invasive species can colonize virtually any area that is subject to some kind of disturbance, such as road shoulders, staging areas for maintenance or operations activities, clearings along utility easements, areas affected by fire, and fire breaks. Nearly all Covered Activities have potential to facilitate invasive plant establishment.

Non-native invasive plant species can alter ecosystem processes, such as nutrient cycling, hydrologic cycles, frequencies of wildfires, and erosion and sediment deposition (Powell 1999, Bossard et al. 2000). Invasive plants interfere in ecosystem functions by outcompeting and displacing native plants and wildlife by providing refuge for non-native animals and by hybridizing with native species (Bossard et al. 2000). The non-native plants often have fewer nutrients than native plants and may have more restricted seasonal availability than the variety of native plants that are displaced. These changes can affect food availability and overall health of Covered Species. Alteration of food availability for herbivorous species, such as desert tortoises, can affect body condition, immune functions, growth rates, and survival of individuals (Drake et al. 2016). Increased presence of invasive grasses also increases the inter-shrub fuels that increase fire risk (Van Linn et al. 2013). In the Mojave Desert, invasive plants such as red brome (*Bromus madritenis* ssp. *rubens*), Mediterranean grass (*Schismus barbata*) and mustards, including Sahara mustard (*Brassica tournefortii*) and African malcomia (*Malcomia africana),* have increased the size and frequency of wildfires, particularly in the last two decades (TNC 2007). In some areas of Clark County, repeated burning has eliminated perennial plants and converted the native plant communities into annual exotic grasslands, perhaps irreversibly (Brooks and Matchett, 2003, Brooks et al. 2003).

Riparian and wetland ecosystems are also extremely vulnerable to invasive plants because of the highly effective transport of invasive species along rivers and streams. Invasive species can dominate the biomass of riparian and wetland communities where they become established, virtually choking out the native vegetation and some species have the potential to reduce water availability. Invasive plants commonly found in wetlands, riparian systems, and/or waterways in the Plan Area include tamarisk/salt cedar (*Tamarix ramosissima),* Eurasian water milfoil (*Myriophyllum spicatum)*, giant Salvinia (*Salvinia molesta*), and hydrilla (*Hydrilla verticillata*) (Las Vegas Wash Project Coordination Team 2009). In addition to wetland systems, changes in water availability from development and agriculture can facilitate invasion of non-native plant species (Suazo et al. 2012).

5.2.3.3.2 Animals

Development can facilitate the introduction or spread of non-native animal species that are invasive. Invasive wildlife can negatively affect extant native wildlife and plants in many ways. Common non-native species may thrive in disturbed or otherwise marginal habitats and can harm Covered Species through predation, competition, and displacement.

New development will increase the number of pet cats and dogs and increase the potential for stray and feral animals. Feral cats and dogs at the interface between habitat for Covered Species and residential development can have significant predation effects on native wildlife, including burrowing owl and other covered migratory birds (Churcher and Lawton 1987, Loss et al. 2013, Yen et al. 2019). Increased availability of water can also facilitate invasive species including the Argentine ant (*Linepithema humile*), which can displace native ants and other invertebrates, indirectly affecting food resources for native wildlife. Some of these non-native species may also

have the potential to spread diseases and parasites to other native wildlife. Domestic cats and dogs may be vectors for diseases that affect native wildlife, such as canine distemper, panleukopenia, and rabies (Foley et al. 1999; Florida Fish and Wildlife Conservation Commission 2003).

5.2.3.4 Predators

In addition to invasive animal species, there are several disturbance-tolerant predators, such as common ravens, skunks, coyotes (*Canis latrans*), raccoons (*Procyon lotor*), and foxes (*Vulpes* spp.) within Clark County. Ravens, as discussed above, are expanding their range, are highly associated with human disturbance and infrastructure, and are an effective predator of desert tortoise and other wildlife. Corvid birds such as ravens and the American crow (*Corvus brachyrhynchos*) have expanded their geographical distribution with the aid of irrigation, agricultural, landscaping, transmission lines, and organic trash accumulation that accompanies human encroachment. Nest sites are often located along elevated anthropogenic structures such as utility poles and towers, billboards, and abandoned buildings (Liebezeit and George 2002). The population density of ravens and crows in the Mojave Desert has been subsidized by such anthropogenic resources, where they pose a threat as subsidized predators of Mojave Desert tortoise (Kristan and Boarman 2003).

Other native predator densities may also increase in proximity to development due to the increased availability of resources that are usually limiting in desert environments, such as food and water. Native predators gain access to increased refuse around human habitations, and prey species (rodents and cottontail rabbits) increase around parks and golf courses. Disturbance including dirt roads has also been shown to support an increase in predators from surrounding habitats, although the mechanisms are still unknown (Agha et al. 2017). These subsidized predators continue to prey on native wildlife during drought years that would normally cause decreases of predators (Esque et al. 2010). These species can out-compete smaller native species for available resources and increase predation rates, thus reducing the distribution and populations of vulnerable native species (Crooks and Soulé 1999).

5.2.3.5 Noise

Residential, commercial and infrastructure development can result in persistent noise above ambient or baseline conditions. Increases in noise primarily result from increased traffic volumes. Other sources of development-related increases in noise that may affect native wildlife include operation of landscape maintenance equipment and tools (e.g., mowers, trimmers), active recreation at parks (particularly at night), loud music from vehicles and residences, and on-site heavy equipment and machinery use for operations and maintenance of facilities and infrastructure.

Some of these noise sources, such as traffic noise, are relatively constant (although with daily cycles related to peak traffic periods), and some wildlife species may habituate and adapt to the chronic ambient noise levels, while others may avoid noisy areas. Other noise sources are more occasional or discrete and are more likely to startle wildlife and at least temporarily disrupt their behavior at the time. Noise may affect wildlife in several ways that disrupt both their behavior and physiology in complex and interactive ways and result in harm or mortality of Covered Species. Effects include startling or annoying, raising stress levels, interrupting sleep and rest, interfering with acoustic communications including predator alarms, interfering with prey detection, and in the case of loud abrupt noises, causing permanent injury to the auditory system (Dooling 2006; Barrass and Cohn 1984; Brattstrom and Bondello 1983).

5.2.3.6 Artificial Lighting at Night

Ecological light pollution associated with development, also known as artificial lighting at night, will increase ambient light and direct glare and glow from lighted buildings, streetlights, and security lights. These light pollution types are persistent or constant, and lighting from vehicles may be persistent along major roads but inconsistent in rural or recreational areas.

Longcore and Rich (2004) address the ecological effects of light pollution at three levels: (1) behavioral and population ecology, (2) community ecology, and (3) large-scale ecosystem functions. Effects at the behavioral and population ecology level include orientation/ disorientation and attraction/repulsion, reproduction, and communication, and are the main effects of lighting related to construction activities. Orientation and disorientation are especially pronounced for nocturnally migrating birds during foggy conditions and/or when the cloud ceiling is low. Ogden (1996) suggested that structures located at critical points along migratory routes may present a greater hazard than those located elsewhere. Rich and Longcore (2006) suggest that artificial alterations to the diurnal/nocturnal schedule can impact physiology and behavior, including singing, reproductive cycles, migration timing, and activity length. Attraction to lights affects birds, which may suffer injury or mortality due to collisions with permanent lighted structures. Many insects are attracted to light sources, resulting in high numbers of prey being taken by nocturnal insectivores; urban-adapted bats and burrowing owl have been noted to concentrate foraging in some areas with artificial night lighting (Rodriguez et al. 2021). Repulsion of nocturnal wildlife by lights is probably quite common and may cause them to avoid lighted areas in their normal home ranges. Stone et al. (2009) and Kuijper et al. (2008) found that some bat species tended to avoid lit areas or were otherwise disturbed by artificial light during nightly commutes to foraging grounds. Research is sparse on lighting effects on reptiles, but some nocturnal predatory reptiles may benefit from increased visibility of prey species such as insects attracted to lighting. Conversely, nocturnal prey species may decrease their activity resulting from increased risk of predation or decreased foraging success. Night lighting has been shown to prolong periods of activity in diurnal reptiles (Rich and Longcore 2006). Because light may interfere with sleep, it can be stressful and may disrupt normal biological rhythms and raise the level of stress hormones, which may in turn affect reproductive capacity.

Invertebrates may also be impacted by lighting which can change prey availability or type for other wildlife species. Davies et al. (2017) experimented with effects to invertebrate assemblages in a grassland ecosystem which had no previous nighttime lighting and observed that even LED lighting did result in changes to the invertebrate assemblage. Changes to invertebrate populations may indirectly impact foraging of some bird and bat species especially those which are not generalist foragers. Lighting can also indirectly affect vegetation communities, potentially by altering the behavior of seed dispersers (e.g., small rodents and ants); other potential plant dispersers, such as larger mammals and birds that transport seeds and plant parts over longer distances; and nocturnal pollinators.

5.2.3.7 Increased Human Activity

Residential, commercial, and agricultural development and public access to natural areas result in permanent increases in human activity related to the development. Increased human presence in and/or near habitat for Covered Species may affect behavioral patterns and physiology of wildlife including chronic increases of stress hormones (Zollinger et al. 2011, Kleist et al. 2018, Senzaki et al. 2020). Similar to noise and lighting effects, permanent increases in human activity from adjacent development may disturb Covered Species at night during their rest or sleep periods, annoying them and causing harm to them if they abandon nests or burrows.

Abandonment (even temporary) of active nests or burrows increases the risk of mortality to eggs and dependent young including through exposure to predation (Miller and Knight 1998).

Human activity in habitats adjacent to residential and commercial development and in and adjacent to recreational facilities or infrastructure may also result in trampling of vegetation and compaction of soils. Disturbance can directly impact Covered Species and indirectly degrade habitat quality as soil compaction can affect burrowing ability, collapse burrows, or destroy suitable habitat for plant Covered Species with sensitivity to soil disturbance. Increased human activity may also increase the amount of trash and debris adjacent to development and in and adjacent to recreational facilities or infrastructure which is often an attractant for mesopredators or other disturbance-tolerant species.

Off-road vehicle use including all-terrain vehicles and dirt bikes can also result in increased soil erosion that can alter soil texture in habitat for Covered Species. Increases in sand can result from OHV disturbance of cryptobiotic soil crusts as the underlying soils become exposed and subject to wind effects blowing the sand into new areas downwind. This, in turn, results in a reduction of soils appropriate for burrowing. For example, desert tortoises find it difficult to maintain burrows in sandy soils because they collapse easily, and areas of pure sand soils were found to support very little tortoise activity (Baxter 1987).

5.2.3.8 Increased Wildfire

Increased wildfire risk is associated with human activity related to residential, commercial, and recreational development, operations and maintenance of facilities and infrastructure, and habitat maintenance. Fires resulting from human activities include accidental ignitions from vehicles, sparks from equipment (e.g., mowers striking rocks), cigarettes, children playing with matches, etc., and intentional ignitions (i.e., arson). Fires also may be ignited by mechanical or structural failures such as downed or arcing power lines. Wildfire management (e.g., fuel management, grading, fire line construction) can also affect plant and animals through ground disturbance. The effects of a single desert fire on the native vegetation may persist for 50 years, or more (TNC 2007). In some areas of Clark County, repeated burning has eliminated perennial plants and converted the native plant communities into annual exotic grasslands, perhaps irreversibly (Brooks and Matchett 2003, Brooks et al. 2003).

5.2.3.9 Vehicle and Aerial Collisions with Wildlife

The increase in roads and increase in capacity of roads from residential, commercial, recreational, and infrastructure development and operations and maintenance of infrastructure may increase the risk of vehicle collisions where wildlife use or attempt to cross roadways especially in movement or migration corridors. Wildlife may be able to cross unpaved, two-lane, and lower-speed roads in relative safety, but high traffic roads such as interstate highways or major thoroughfares in rural locations have a high potential for vehicle strikes resulting in injury or mortality. Vehicle speeds, traffic volume and frequency, accessibility of cover, structure of the road (e.g., whether the road is raised or at grade level with the surrounding environment), barrier fencing to prevent access to a roadway or to prevent roadway crossing, and availability of alternative crossings, such as bridges and culverts all influence the rate of wildlife-vehicle collisions (Dodd et al. 2004, Peaden et al. 2017). Use of vehicles and machinery off-road for agriculture (e.g., tractors, plows, balers), recreation (e.g., golf carts, OHVs), and landscaping (e.g., mowers, weed whippers) can also result in collisions with wildlife and trampling of native plants.

Wind turbines, associated with renewable energy production, are also known to cause mortality of a variety of bird and bat species from collisions. Wind turbines can also have direct impacts to bats through barotrauma (barotrauma results from exposure to extremely low-pressure areas around moving propellers that cause severe trauma to the delicate bats (Cryan and Barclay 2009, Cryan 2011). Development of new wind turbine facilities in the Plan Area is anticipated to be rare but if constructed may result in wildlife collisions with bird and bat Covered Species.

Above ground utilities, such as power lines, transmission towers, and utility poles can cause collisions, entanglements, and electrocution of birds, especially raptors (Franson et al. 1995; Lehman et al. 2007). Power poles are an attractant to raptors, especially at locations with few natural perches, because they provide an aid to habitat surveillance for prey (APLIC 2006). Areas of higher prey density may increase the attraction to these features. The broad wingspan of large raptors, such as golden eagles increase their risk of electrocution by allowing them to span, or bridge, the distances between the different phased electrical lines (APLIC 2006). The rates of golden eagle electrocutions may have declined during the past 30 years due to utility company efforts to reduce risk (APLIC 2006). However, electrocution risk is still great on many older or non-retrofitted utility lines in rural areas of Nevada (Joe Barnes and Cris Tomlinson – NDOW, Pers. Comm.).

5.2.3.10 Increased Impermeable Surfaces and Alterations to Hydrology

Habitat conversion described above in Section 5.2.3.1, predominantly converts land to impermeable surfaces which result in increased runoff of precipitation. This often creates higher discharge or flow rate during and after storm events compared with baseline or pre-development conditions. Higher discharge and flow create scour and/or incision of local creeks and washes, increased sediment loads downstream, and alterations of downstream hydrology. Impermeable surfaces also decrease the rate of groundwater recharge, and may indirectly limit or reduce water supply.

Covered Activities could result in hydrologic and water quality-related effects associated with construction of culverts and bridges; maintenance, realignment, widening, extension, or abandonment and removal of culverts and bridges; stream restoration and bank stabilization; or other stream-crossing facilities. Stream-crossing structures have the potential to narrow stream channels or restrict flow and natural channel fluctuations. The obstructions to natural springs and seep flows can also lower the water table, which in turn can affect groundwater-dependent native plants and riparian vegetation.

Some of these hydrologic effects are partially addressed through the regional planning efforts of the Clark County Regional Flood Control District. The District prepares and periodically updates Master Plans that identify flood control solutions accounting for both existing and future development within the Plan Area. Master Plan facilities such as detention basins and engineered channels are designed to attenuate peak discharges, reduce downstream scour and sediment transport, and manage stormwater runoff from impermeable surfaces.

Pollutant discharge from residential and commercial development is not analyzed as use of chemicals such as herbicides is not a Covered Activity. The Environmental Protection Agency regulates pollutant discharge through the National Pollutant Discharge Elimination System (NPDES) implemented in Clark County by the Nevada Division of Environmental Protection. Clark County is developing a strategy for sustainable growth (All-in Clark County, https://allinclarkcounty.com) which includes sustainable water use, water pollution prevention, and natural resource management which may reduce impacts to hydrology and water quality.

5.2.3.11 "Heat Island" Effect

Heat islands occur in developed areas that experience higher temperatures than surrounding areas. Manmade structures, such as buildings and pavement, both absorb and re-emit more of the sun's heat than natural landscapes. Developed areas, where manmade structures are highly concentrated and bare soil and vegetation are limited, become "islands" of higher temperatures relative to surrounding natural areas. Solar panel arrays can also produce heat islands in potentially suitable desert and scrub habitat for Covered Species; temperatures over solar panel arrays can be 3 to 4 ºC warmer than adjacent wildlands at night (Gafford et al. 2016). The heat island effect induced by large-scale solar panel arrays can negatively affect behavior of species that occur in proximity to proposed solar energy projects. Large scale solar installations are not anticipated by Permittees, and nearly all utility-scale solar projects are on BLM-managed lands which trigger nexus for Section 7 consultation. Tryjanowski (2013) found the heat island effect was changing the arrival times in urban to earlier versus rural settings due to the higher temperatures causing earlier vegetation and invertebrate development.

5.2.3.12 Air Quality

Increases in the development footprint related to infrastructure, residential development, agricultural conversion, and industrial and commercial facilities can result in permanent negative effects to air quality. Development and its associated increase in transportation will likely increase local sources of nitrogenous air pollutants. Nitrogen deposition facilitates the growth of non-native plant species, especially invasive annual grasses in low-biomass ecosystems. This situation represents a potentially significant effect to native vegetation communities and wildlife habitat in proximity to development and transportation corridors where nitrogen deposition can be locally elevated. Pollution can also have indirect effects on plant pollinators and ability to recognize plants or decrease available nutrients in plants. Air quality in Clark County is regulated by the Clark County Department of Environment and Sustainability, Division of Air Quality, which administers the air pollution control program under the Clark County Air Quality Regulations. Department of Environment and Sustainability regulatory programs, together with the County's All-in Clark County Community Sustainability and Climate Action Plan, provide a framework that may reduce some of these impacts over time.

5.2.3.13 Collection of Flora and Fauna in the Reserve System

Collection of flora and fauna within the Reserve System could result in effects to Covered Species as described above from increased human activity, vehicle collisions, and incidental capture and release. Incidental take from non-commercial and casual collection of vegetation and biological specimens will only be authorized within the Reserve System on a case-by-case basis via permit issuance from the Plan Administrator and relevant state and federal agencies when consistent with the purposes of the MSHCP Amendment. Effects from approval-based collection of flora and fauna is not anticipated to result in measurable population level effects.

5.2.4 Temporary Environmental Stressors During Construction of Covered Activities

5.2.4.1 Construction Noise

Construction of Covered Activities will generate noise from vegetation clearing, grading or earthmoving, equipment and vehicle operation, pile driving, and excavation or trenching activities. The noise may affect behavioral patterns of wildlife Covered Species in several ways. Excessive sound levels may affect Covered Species in several ways including annoy and cause species to abandon nests and young; noise can raise the level of stress hormones, interfering with sleep

and other activities; intense noise can cause permanent injury to the auditory system; and noise can interfere with acoustic communication by masking important sounds or sound components (Dooling 2006, Rasmussen et al. 2009, Barber et al. 2010). Loud noise, such as off-road vehicles, may damage the hearing of some terrestrial species (Berry 1980; Brattstrom and Bondello 1983).

5.2.4.2 Construction Ground Vibration

Ground vibration will be generated during Covered Activities construction, including grading and earthmoving, excavation, pile driving, trenching, and tunneling. Behavioral patterns of Covered Species may be affected including direct disturbance to species in burrows or dens, including desert tortoise and western burrowing owl, causing them to abandon these areas. If disruptions occur during hibernation or extreme high temperatures, abandonment of burrows can expose species to predation, extreme conditions, or cause them to burn calories when energy efficiency is key to winter survival. Excessive vibration might also cause the collapse of burrow systems and dens of fossorial species in areas with highly friable soils.

5.2.4.3 Construction Lighting

Ecological light pollution directly associated with construction ultimately would be temporary, but could last several months for some construction activities. Other lighting effects may be short term or unexpected. Lighting during construction primarily would occur from vehicular use, but also may be used for security and public safety and off-hours equipment maintenance (e.g., at staging areas). Nighttime construction lighting typically involves high-intensity lighting systems that may have very wide lightsheds and high glare values. Potential effects of lighting are covered above in Section 5.2.3.6.

5.2.4.4 Construction Dust

Dust generated by Covered Activities, especially vegetation clearing and grading and earthmoving, can affect Covered Species in adjacent habitats. The increased amount of dust on plant species can decrease the rate of photosynthesis and, depending on exposure amount and duration, may result in plant mortality by blocking or reducing light, respiration, and transpiration; increased penetration of phytotoxic gaseous pollutants; and increased incidence of pests and diseases. Loss of plant vigor and productivity can indirectly affect wildlife Covered Species that depend on plants for food or refuge. Construction-related fugitive dust in Clark County is regulated under Section 94 of the Clark County Air Quality Regulations, which is administered by the Department of Environment and Sustainability, Division of Air Quality. Soil-disturbing or construction activities of 0.25 acres or greater, mechanized trenching of 100 feet or greater, and mechanical demolition of structures of 1,000 square feet or greater require a Dust Control Operating Permit and an approved Dust Mitigation Plan that identifies the best management practices to be used at the site. These requirements help limit the amount of fugitive dust generated by Covered Activities and reduce associated effects on adjacent Covered Species habitat.

5.2.4.5 Increased Human Presence

Construction, operations and maintenance, and habitat restoration activities will temporarily increase human presence and activity at these locations related to access and conducting the Covered Activities. Emergency, safety, and police services related to law enforcement, medical rescue, firefighting operations, and other emergency services can also increase human presence in normally undisturbed areas. Behavioral patterns and physiology of wildlife may be affected as described above for permanent stressors of human activity, noise and lighting. However, these

effects would be temporary, and often distinct in relation to emergency services. Disturbance as a result of human presence can result in injury or mortality to wildlife Covered Species as a result of nest or burrow abandonment, predation, or collision with vehicles.

5.2.4.6 Construction Trash and Debris

Development, operations and maintenance, recreation, and habitat restoration construction might cause trash and other non-toxic debris to enter species habitat. Trash and debris can degrade vegetation communities, wildlife habitat, and attract mesopredators. Trash and debris include discarded construction-related materials and that generated by construction personnel, such as food packaging and cigarette butts. Trash may be left on-site or dispersed by wind into adjacent habitats. Ravens and coyotes are known predators of desert tortoise and may be attracted to trash left on-site or dispersed nearby. This may temporarily increase predator activity near construction sites and result in short-term higher predation rates in the area.

5.2.4.7 Temporary Reduction in Water Quality

Temporary hydrologic alterations potentially occurring from construction of Covered Activities are anticipated to be limited. Activities within streams and rivers would frequently trigger a federal permit and consultation on endangered species via Section 7 and not be a Covered Activity. However, some in-water work in waters that are not under federal jurisdiction may occur and may require temporary diversions or impoundments of surface waters and thus remove or degrade wetland and aquatic habitats during the period of diversion or impoundment. Installation of water diversions or in-water work including coffer dams installation to isolate the work area may contribute to localized increases in turbidity and mobilization of substrate. Turbidity increases are expected to be localized and distinct events as diversions are installed. Dewatering and other temporary water diversion activities are not anticipated to be common and are associated with infrastructure repair and restoration activities.

Construction of Covered Activities may result in temporary release of contaminants in uplands during activities such as vegetation clearing, grading and earthmoving, excavation, trenching and tunneling, pouring concrete or asphalt, landscaping, and equipment and vehicle refueling and maintenance. Best management practices (BMPs) will be required; however, some chemical and toxic compound pollution (fuel, oil, lubricants, paints, release agents, and other construction materials) may be accidentally released and temporarily affect the health of upland vegetation communities, covered wildlife habitats, or covered wildlife species. This is not anticipated to be a common stressor with implementation of construction BMPs for containment and regular equipment inspection.

5.2.4.8 Vegetation Removal or Disturbance

Temporary vegetation removal is often required for equipment access and staging during construction, maintenance, and habitat restoration and improvements. This is considered temporary as revegetation or replanting post-disturbance would restore habitat and not result in permanent loss of vegetation. Emergency, safety, and police services related to law enforcement, medical rescue, firefighting operations, and other emergency services can also result in disturbance to vegetation. Vegetation removal can result in a temporary loss of nest or sheltering habitat for Covered Species, as well as increasing the potential for non-native plant species invasion.

5.2.4.9 Soil Disturbance

Activities related to development, such as grading and earthmoving, excavation, trenching and tunneling, and tilling, can result in temporary soil disturbance. Soil disturbance can increase soil surface erosion, which in turn can contribute to deterioration of overall surface water quality. Frequent soil disturbance can permanently alter soil structure, resulting in changes to soil quality, productivity, and erosional properties. Soil disturbance in gypsum soil outcrops can also result in damage to cryptobiotic soil crusts, which are critical for the maintenance of seed banks and soil-surface nutrient levels and water retention necessary for Covered Species occurring on gypsum soils, such as Las Vegas bearpoppy (*Arctomecon californica*) (Mistretta et al. 1996). Soil disturbance can also affect habitat quality for other Covered Species, such as desert tortoise, burrowing owl, and many other species of reptiles, amphibians, and insects that use rodent burrows as refugia and aestivation and hibernation habitat. Soil disturbance can also increase the potential for invasion of non-native plant species.

5.2.4.10 Capture and Handling for Relocation

Construction and other Covered Activities including habitat restoration and enhancement, habitat monitoring and scientific research within the Reserve System may encounter Covered Species. Following protocols outlined in the Conservation Strategy (Chapter 6), it may be necessary to move Covered Species out of harm's way. Capture and handling of Covered Species for relocation would be authorized to reduce potential for injury or mortality during Covered Activities.

5.3 Overview of Habitat Group Impacts

The primary purpose for quantifying Take in an HCP is to provide a foundation for conducting the impact analysis. The MSHCP Amendment Permittees propose the use of a surrogate measure, the Habitat Functional Score, to quantify the amount of take, conduct the impact analysis, and mitigate impacts from Covered Activities. The Habitat Functional Score formula described in sections 5.4.1 and 5.4.2 considers positive variables that are known indicators of habitat health, including the SDMs described in Chapter 3, and negative variables that are known indicators of habitat degradation, and calculates the quality of the habitat in a particular area (Table 5-4 below). The use of acres of habitat as a surrogate for take is widely accepted but fails to consider the quality of the habitat. The Habitat Functional Score addresses this issue by adjusting impact areas with weighted habitat value factors.

The Habitat Functional Score was calculated for 10 different habitat groups that are representative of the Covered Species within the Plan Area (Table 5-4). Because the formula uses different variables and weights for each habitat group, functional scores cannot be directly compared between groups. Take analysis is done at the habitat group level for each of the ten groups.

The 289,563-acre Impact Area comprises all undeveloped private land, County and State-owned lands identified for potential projects, and federal lands identified to be sold or transferred (disposed) after the MSHCP Amendment ITP is issued. All development and habitat conversion covered under this MSHCP Amendment will occur within the area shown in Figure 5-1 unless another amendment is approved. The level of amendment documentation required will be based on the area changes requested and determination by the Service. Amendment and other administrative processes are discussed in Chapter 9.

Low Impact Areas are primarily managed for conservation and recreation use. Significant habitat loss is not anticipated within these areas, though minimal impacts may occur where recreation access improvements, small facility additions (such as new picnic areas or trails), or infrastructure

necessary for safety or community needs are determined to be important. Species and habitat management activities may also occur in the Low Impact Area and will be Covered Activities under this MSHCP Amendment. Temporary and indirect effects to Covered Species may result from human use and ongoing management. Functional scores for each habitat group within the Impact Area, Low Impact Area, and proposed Reserve System are presented in Table 5-4.

Areas already graded and authorized for take under the 2000 MSHCP but not yet constructed are considered developed and included in the urban/disturbed category for this analysis. Approximately 35,000 acres of the Impact Area represent remaining permitted impacts under the 2000 MSHCP. The specific locations of these remaining impacts within the Impact Area are not known; however, the functional score for each habitat group within the Impact Area is sufficient to encompass them. If the 35,000 acres of remaining 2000 MSHCP impacts are not developed prior to the expiration of the associated ITP in 2031, the amount of take requested under the MSHCP Amendment for each habitat group will not change. The total functional score of each habitat group within the 289,563-acre Impact Area represents the maximum possible functional score loss permitted under this Amendment.

Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

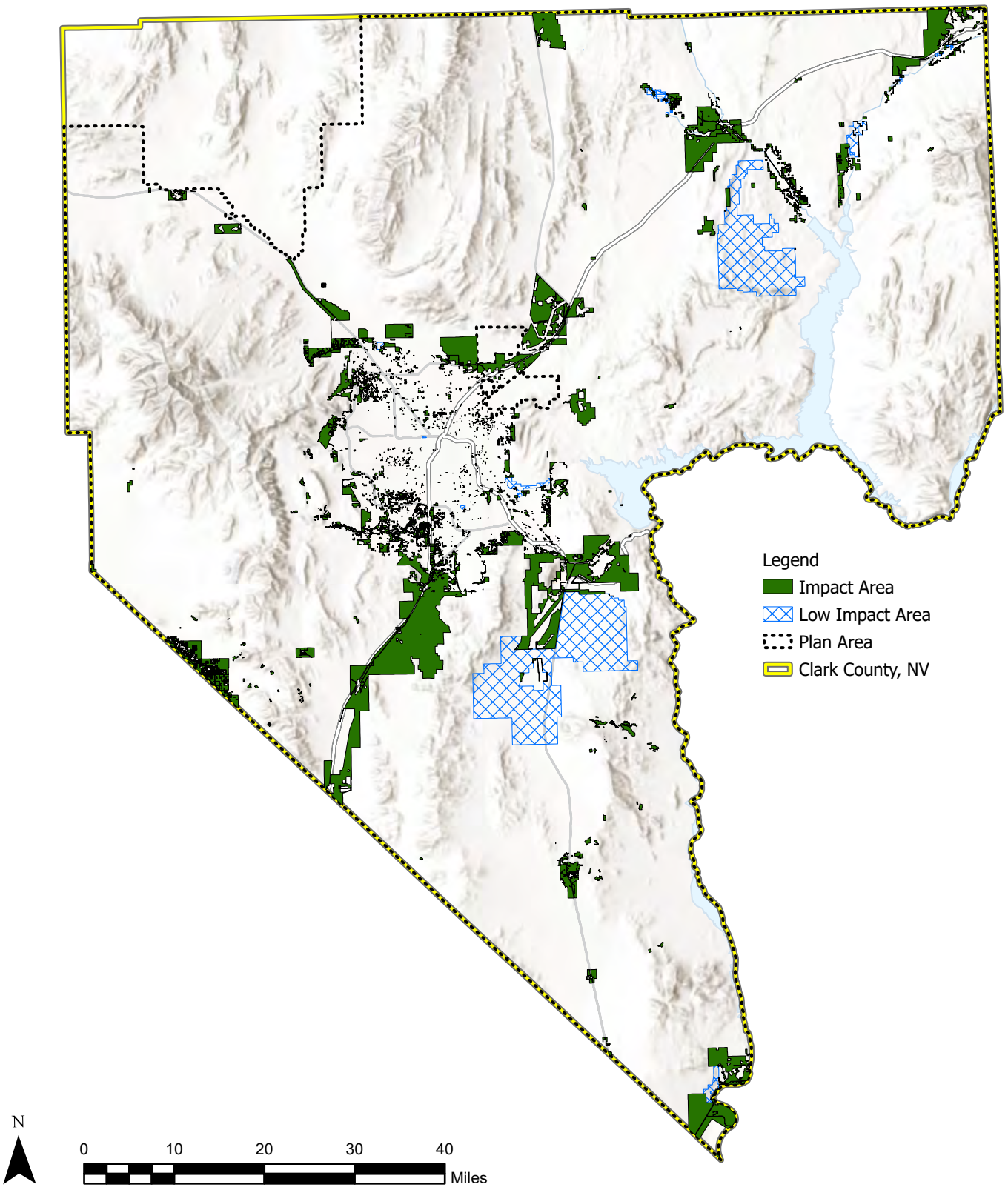

Figure 5-1. Impact Area and Plan Area

Scale: 1:1,000,000

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Clark County, NV,
Department of Environment and Sustainability
Desert Conservation Program

Table 5-4. Comparison of Functional Scores for Impact Areas and the Reserve System

Habitat Groups		Functional Scores		
	Pixel Size	Impact Area	Low Impact Area	Reserve System Area*
Arid Shrubland Habitat Functionality	250m x 250m	10,271	7,568	15,335
Cool Semi Desert Scrub and Grassland Habitat Functionality	250m x 250m	808	461	4,071
Gypsiferous Habitat Functionality	250m x 250m	1,433	1,404	3,381
Hydrology Dependent Habitat Functionality	250m x 250m	2,064	1,711	2,185
Mojave Desert Scrub Habitat Functionality	250m x 250m	4,122	3,698	5,400
Playa Fringe Habitat Functionality	250m x 250m	150	0	396
Riparian Marsh Habitat Functionality	30m x 30m	3,726	4,330	168
Riparian Woodland Habitat Functionality	30m x 30m	11,082	8,207	3,644
Sandy Habitat Functionality	250m x 250m	366	479	352
Wind-Blown Sand Habitat Functionality	250m x 250m	453	360	432

*Does not include the existing MSHCP Reserve System.

5.4 Habitat Functionality Analysis to Estimate Take and Impacts

Estimation of the numbers of Covered Species that would be incidentally taken by Covered Activities is not possible given the available data on each species and their distributions within the Plan Area. In these instances, habitat is often the surrogate chosen to quantify take levels. Take, as described below, will be done at the landscape level to estimate take and impacts for all Covered Activities, and provide for the maximum amount of conversion that will occur within the Plan Area. In addition, most proposed impacts are adjacent to or near existing developed areas to build off existing infrastructure. These areas near existing development are often already degraded from the direct and indirect effects of human activities. As such not only habitat, but habitat quality, is used as a surrogate to quantify the amount of incidental take that is likely to occur as a result of Covered Activities.

Covered Activities in the Low Impact Area are predominantly temporary disturbance and conversion of habitat is extremely limited and anticipated to be no more than 1 percent of the total area. Take in most instances within the Low Impact Area is anticipated to be limited to harassment (not permitted under Section 10) and capture to move out of harm's way during management activities.

Habitat quantification as described below can be used to understand locations that may be of higher conservation value for species aid in targeting areas for conservation actions or acquisition. In Clark County, nearly all land is under public management or ownership, and much of the proposed Impact Area will need to go through a public BLM disposal process to transfer ownership to private holdings prior to development. Through the early phases of this process, the review of lands more critical and valuable to species has been conducted and the current proposed Impact Area has avoided these areas. This early selection process for lands to be disposed has been in coordination with the BLM and Service as described in Chapter 1. In addition, when the lands go through the formal disposal procedures, the Service under Section 7 interagency consultation will provide an opinion or concurrence that the disposal of the selected lands would not result in jeopardy to listed species and may require mitigation for any effects or take which may occur as a result of the transfer. During consultation, the Service can also request for the disposal land boundaries to be adjusted to avoid higher value habitat and this process is also described in Chapter 1. Therefore, the proposed Impact Area has already avoided lands with higher conservation value through the disposal selection process. Although the habitat quantification model is not intended to further adjust the proposed Impact Area, it has been used to target areas for the Reserve System and will continue to be used as such for the Riparian Reserve System which will necessitate land acquisition to complete the Conservation Strategy. This is further described in Chapter 6.

5.4.1 Habitat Quality Quantification

Incidental take of Covered Species will occur during implementation of the MSHCP Amendment. Take must be quantified where possible to meet the regulatory requirements to then minimize and mitigate these impacts. Analysis of impacts to Covered Species habitats is often used as a proxy to estimate take for HCPs at this scale; however, this type of analysis is completed under the assumption that all locations provide similar habitat quality for Covered Species, that every acre provides the same habitat quality or potential to support a Covered Species. Roads or other infrastructure can degrade habitat quality and impacts adjacent to already disturbed or developed habitats may not be the same level of impact as those farther from disturbance. To improve the understanding of impacts and compare impacted, avoided, and mitigation lands adjusted to account for habitat quality instead of solely on acreage, a Habitat Functional Score, is proposed and described below.

To track take of each individual Covered Species simplifies the interactions of species and habitats and does not account for overlap in habitat use by species or dependence of some Covered Species on each other for foraging, nesting, or other needs. An example is burrowing owl use of desert tortoise burrows in the Mojave Desert Scrub (MDS) habitat group (Klute et al. 2003, McDonald et al. 2004), and loss of desert tortoise habitat or declines in the desert tortoise population can impact burrowing owl. Quantification of habitat quality through the calculation of a Habitat Functional Score, was conducted to provide a more holistic analysis of species, ecosystems, and habitat quality variation. The ability to calculate the Habitat Functional Score facilitates the comparison between differing locations, quality, and amounts of habitats when conducting take and mitigation analyses. This type of quantification to estimate impacts will promote the Guiding Principles for Landscape-scale Mitigation (Clement et al. 2014) including the ability to incorporate the landscape scale for conservation planning and mitigation, promote certainty in planning and review, allow for advanced mitigation planning, and promote transparency and consistency. Additional information on the Conservation Strategy and mitigation approach is described in Chapter 6.

In the habitat functionality analysis, species were grouped based on similar habitat associations within the Plan Area from the SDMs described in Chapter 3 (Table 5-4). For some species, habitat associations alone were not an appropriate approximation for providing a framework of landscape-level interactions of species and habitats. For example, most plant species were grouped based on substrate or other dependencies necessary for suitable growth conditions as these conditions are often much narrower than the broader ecosystem classifications. The ecosystem association or species groupings were then used to create specific habitat functionality models with features specific to each group which may create high quality habitat or result in a degradation of habitat quality. The groupings also allow the take analysis to focus on multiple species which share similar habitat types in one model and reduces the need to conduct multiple single species analyses for an impact at a single location. This will simplify take and mitigation tracking during implementation of the MSHCP Amendment.

For each habitat group category, the approach to quantify habitat quality and estimate the functionality was a geospatial weighted overlay model. The set of data layers included varies by habitat group and is selected to reflect the ecological characteristics that define quality habitat for each group. Layers that contribute positively to habitat quality (habitat quality layers) generally include the stacked SDMs and, depending on the group, designated critical habitat boundaries, vegetation cover classes from the Clark County Land Cover dataset, vegetation height (vertical structure) from LANDFIRE, hydrologic features from the National Hydrography Dataset (NHD) and National Wetland Inventory (NWI), watershed basins, soil potential layers (gypsiferous or sandy), surficial geology, and landscape connectivity. Layers that contribute negatively to habitat quality (habitat degradation layers) include proximity to major and minor roads, proximity to transmission line corridors, recent and historic fires, BLM grazing allotments, and the cumulative presence of nine non-native invasive plant species. In addition, an urban and open water mask is applied multiplicatively to the final score, so that pixels mapped as urban, disturbed, or open water are set to zero regardless of other layer values. Environmental variables already included in the SDMs (such as temperature and precipitation) were specifically excluded from the habitat functionality models to avoid duplicating their influence. SDMs show the probability that habitat in a location is suitable and are on a 0 to 1 scale. In keeping with a similar scale, each habitat quality and habitat degradation layer was rescaled to a 0 to 1 range with 0 providing no quality (or no degradation) and 1 representing the highest quality (or highest degradation). Each layer was then assigned a weight reflecting its expected importance to habitat function for the group. Some habitat degradation layers, such as roads and transmission lines, were treated as having indirect effects that decline with distance from the feature. Distance at which indirect effects were no longer anticipated to be detectable from background levels was set based on literature reviews. The habitat quality value decreased or increased from the feature until the minimum or maximum habitat quality (0 or 1) was reached at a pre-determined distance.

Data from SDMs only includes probabilities that were at the threshold for low potential for suitable habitat or higher. Thresholds were defined for each species in the SDM reports (Nussear et al. 2024; Simandle and Nussear 2025). To create a single layer for groups with multiple species, the raw SDM probability rasters were stacked (summed) by habitat group. Stacked SDMs (s-SDMs) approximate expected species richness at the assemblage level. Species observation locations were intentionally not included as a separate covariate in the habitat functionality models, because observation data reflect a combination of true species presence, sampling effort, and detection probability that is already accounted for, where possible, by the SDMs.

The incorporated datasets and the habitat quality values assigned are described in more detail in each of the group analyses below in Section 5.5. The datasets included in the habitat functionality models, along with their associated weights and processing rules were set based on expert

opinion, feedback from the Service, and an external scientific review of the modeling approach conducted in 2025 (Alta Science & Engineering 2025). For each habitat group, the prepared geospatial layers were combined using a common equation structure: the weighted sum of the habitat quality layers minus the weighted sum of the habitat degradation layers, normalized by the sum of the habitat quality weights, and then multiplied by the urban and open water mask. Any negative values resulting from this calculation are reset to zero, so that the final Habitat Functional Score for each pixel falls on a scale from 0 (no habitat function) to a positive upper bound that varies by habitat group. The full equation, layers, and weights for each habitat group are presented in Section 5.5. Functional Scores were calculated for each of the 10 Habitat Groups that represent covered species. The Functional Score of each of the ten Habitat Groups across the Plan Area, including the Proposed Impact Area, the Proposed Low Impact Area, and the Proposed Reserve System Area. Impacts to Habitat Groups in different areas can be directly compared using the Habitat Functional Score within a given habitat group.

$$(\sum(Hab.Quality * Weight) - \sum(Hab.Degradation * Weight)/\sum Hab.Quality\ Weights) * Urban = Habitat\ Functionality$$

5.4.2 Functional Score

The total functional score for each of the habitat functionality models is the sum of the per-pixel scores across the modeled area. Pixel resolution is 250 m × 250 m for all habitat groups except Riparian Marsh and Riparian Woodland, which use a 30 m × 30 m pixel; in each case the resolution matches that of the underlying SDMs. The Habitat Functional Score will be used by the DCP to track and report impacts to Covered Species habitat over the term of the permit. For example, the total Habitat Functional Score for Mojave Desert Scrub habitat in the Proposed Impact Area is 4,122. Each project carried out under the MSHCP Amendment will have a known footprint, and the functional score for that footprint can be calculated by summing the per-pixel scores within the project area. As projects are implemented, the cumulative functional score lost within each Habitat Group will be tallied and compared against the functional score of the same Habitat Group within the Proposed Reserve System. This comparison provides a more meaningful accounting of impacts than acres alone, because 5 acres of habitat in the Impact Area may not be equivalent in function to 5 acres in the Reserve System. The Habitat Functional Score is therefore a tracking and reporting tool: it does not, by itself, define project-specific mitigation. Mitigation under the MSHCP Amendment is implemented through the broader suite of Conservation Strategy actions described in Chapter 6. Where the comparison between impacted and conserved functional scores indicates that habitat function within the Reserve System is not keeping pace with cumulative loss in the Impact Area, the DCP may trigger additional restoration activities or other adaptive management actions, as described in Chapter 6.

5.5 Anticipated Take of Covered Species

5.5.1 Mojave Desert Scrub (MDS) Habitat Functionality Analysis

The species chosen for the Mojave Desert scrub habitat group were those with the highest proportion of suitable habitat predicted within the Mojave Desert scrub based on SDMs (Nussear et al. 2024; Simandle and Nussear 2025). Species associated with the Mojave Desert scrub habitat group are shown in Table 5-5 and include:

- Gila monster (*Heloderma suspectum*)
- burrowing owl (*Athene cunicularia*)
- desert tortoise (*Gopherus agassizii)*

- LeConte's thrasher (*Toxostoma lecontei*)

All layers used in the Habitat Functionality Analysis and the layer values are included in Table 5-5 and described below. The SDMs (Nussear et al. 2024; Simandle and Nussear 2025) were included as described above in Section 5.4.1.

The Habitat Functionality Score utilized multiple datasets in addition to SDMs for Gila monster, burrowing owl, desert tortoise, and LeConte's thrasher. These included National Hydrography Dataset (NHDPlus) streamlines (USGS 2018a, USGS 2018b, USGS 2018c), presence of desert tortoise critical habitat (USFWS 1994), habitat connectivity (Gray et al. 2019), proximity to transmission line corridors, proximity to major roads, proximity to minor roads, historic fires, invasive species (McMahon et al. 2021), and land cover mask excluding Urban/Water (Gray et al. 2019). For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. The weighted value of each layer to the habitat quality model was based on scientific opinion on the potential level of influence of that layer for the species in the group.

The roads layer was created to account for indirect disturbance to species and habitat that may reduce habitat quality, such as noise, air quality, increased wildfire risk, and the spread of invasive plants. Multiple road datasets were used to construct the Major and Minor roads layers. The master roads layers included county roads, highways, BLM roads, and Lake Mead Approved roads from OpenStreetMap (OSM), BLM, and National Park System Roads datasets. A habitat value of 0 was given at 1 mile or greater from the road; this number steadily increased with proximity to the road until a maximum value of 1 was reached at the road. A weight of -0.5 was assigned to Major Roads, and -0.25 was assigned to Minor Roads.

The hydrology layer was created using the USGS NHDPlus. A value of 0 was given at 125m or greater from a NHD flowline, and a value of 1 was assigned within 125m of the flowline. This layer was assigned a weight of 0.4. Desert tortoise critical habitat was assigned a discreet value of 0 outside critical habitat and 1 inside critical habitat. This layer was assigned a weight of 0.25.

Two layers covered historic fires; fires from 2021 to 2023 were assigned a value of 0.5 and a maximum weight of -0.25. Fires from 2005 to 2020 were assigned a value of 1 and a maximum weight of -0.5 (NIFC 2024).

The invasive species layer contains survey data from USFS (McMahon et al. 2021) for nine invasive species with known effects on Mojave Desert Scrub habitat. The species included in this layer are: cheatgrass, red brome, redstem stork's bill, Halogeton, broadleaved pepperweed, bulbous bluegrass, Russian thistle, Mediterranean grass, and tall tumble mustard. The invasives layer is weighted at -1 with each species carrying a weight of -0.111.

The final layer was the urban and open water mask that filtered out areas of unsuitable habitat due to development or being open water.

Table 5-5. Mojave Desert Scrub Functionality Model Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	4 (Combined)	1 (per model)	Sum of up to 4	4
Banded Gila monster (HESU) SDM	0	1	1	1 per model	1
Western Burrowing Owl (ATCU) SDM	0	1	1	1 per model	1
Leconte's Thrasher (TOLE) SDM	0	1	1	1 per model	1
Mojave Desert Tortoise (GOAG) SDM	0	1	1	1 per model	1
NHD Flowlines	0 Areas outside 125m buffer	1 Areas within 125m buffer	0.4	1 per pixel	0.4
Tortoise Critical Habitat	0 Outside Critical Habitat	1 Inside Critical Habitat	0.25	1 per pixel	0.25
Habitat Connectivity	0 (Values below Mean)	1 (Max values)	0.5	Scales from 0 to 1	0.5
Transmission Line Corridors	0 at 3218 meters (2 miles) from line	1 At a line	-0.3	1 at line, linear decay to 0 at 2 miles	-0.3
Proximity to Major Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.5	1 at road, linear decay to 0 at 1 mile	-0.5
Proximity to Minor Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.25	1 at road, linear decay to 0 at 1 mile	-0.25
Historic Fires (Summary)	0	1	-0.5	Max of 0.5 or 1	-0.5
Fires: 2021 to 2023	0	0.5	-0.5 (applied in final eq)	0.5 per pixel	-0.25
Fires: 2005 to 2020	0	1	-0.5 (applied in final eq)	1 per pixel	-0.5

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Invasive Species (Summary)	0	9 (Combined)	-0.111 (1/9) per model	Sum of up to 9	-1
Cheatgrass (BRTE)	0	1	-0.111	1 per model	-0.111
Red brome (BRRU2)	0	1	-0.111	1 per model	-0.111
Redstem stork's bill (ERCI6)	0	1	-0.111	1 per model	-0.111
Halogeton (HAGL)	0	1	-0.111	1 per model	-0.111
Broadleaved pepperweed (LEPE2)	0	1	-0.111	1 per model	-0.111
Bulbous bluegrass (POBU)	0	1	-0.111	1 per model	-0.111
Russian thistle (SATR12)	0	1	-0.111	1 per model	-0.111
Mediterranean grass (SCBA)	0	1	-0.111	1 per model	-0.111
Tall tumble mustard (SIAL2)	0	1	-0.111	1 per model	-0.111
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

Formula

$$V = \frac{(M \times w_m + NHD \times w_{NHD} + CH \times w_{CH} + C \times w_C) - (T \times w_T + R \times w_R + Fire \times w_F + I \times w_I)}{n \times w_m + w_{NHD} + w_{CH} + w_C} \times U$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-6. Formula Legend

Symbol	Description
M	Model_Sum raster
w_m	Models weight
n	Count of species models

NHD	NHD Flowlines binary raster
w_{NHD}	NHD weight
CH	GOAG Critical Habitat
w_{CH}	Critical Habitat weight
C	Connectivity raster
w_c	Connectivity weight
T	Transmission Lines Raster
w_t	Transmission Line weight
R	Road-effect raster
w_r	Road weight final
$Fire$	Fire Raster
w_F	Fire weight
I	Invasive species Sum raster
w_i	Invasive weight
U	Urban/Water mask

5.5.1.1 Results

The functional score of MDS habitat in the Plan Area is 13,220 (see Table 5-4 Section 5.3). The functional score of MDS habitat in the Proposed Impact Area is 4,122, which is the maximum amount of MDS habitat take that will occur under the Amendment. This is less than the combined functional score the Low Impact Area (3,698) and the Proposed Reserve System (5,400). The Low Impact Areas will receive low-level disturbance through management activities and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a reduction of 36.98 in the functional score of the Low Impact Area. The results of the habitat functionality model are depicted in Figure 5-2.

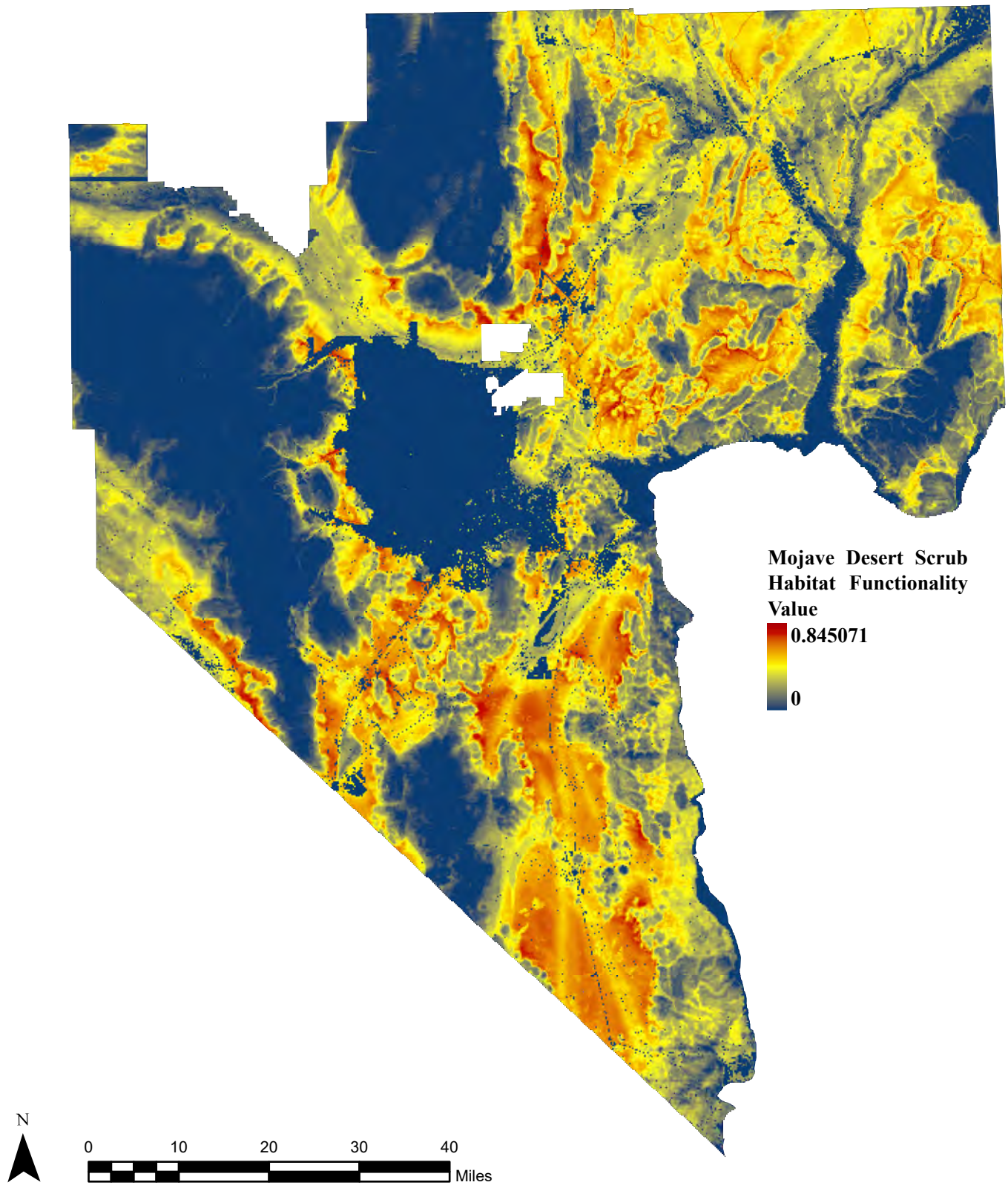

Figure 5-2. Mojave Desert Scrub Habitat Functionality

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5.5.2 Arid Shrubland Habitat Functionality Analysis

A single species is included in the Arid Shrubland habitat group: the loggerhead shrike.

In addition to the data included in the SDMs (Nussear et al. 2024), this analysis used the land cover mask for urban, disturbed and open water areas. All layers used and their relative values are included in Table 5-7 and described below.

Table 5-7. Arid Shrubland Habitat Quality Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	1 (Combined)	1	Sum of up to 1	1
Loggerhead Shrike (LALU) SDM	0	1	1	1 per model	1
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Calculation	0	1	N/A	N/A	N/A

Formula:

$$HF_{out} = M \times U$$

Table 5-8. Formula Legend

Symbol	Description
M	Model_Sum raster
U	Urban/Water mask

5.5.2.1 Results

The functional score of Arid Shrubland habitat in the Plan Area is 33,174 (see Table 5-4 Section 5.3). The functional score of Arid Shrubland habitat in the Proposed Impact Area is 10,271, which is the maximum amount of Arid Shrubland habitat take that will occur under the Amendment. This is less than the combined functional score of the Low Impact Area (7,568) and the Proposed Reserve System (15,335). The Low Impact Area will receive low-level disturbance through management activities and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a loss of up to 75.68 in the

functional score of Arid Shrubland in the Low Impact Area. The results of the habitat functionality model are depicted in Figure 5-3.

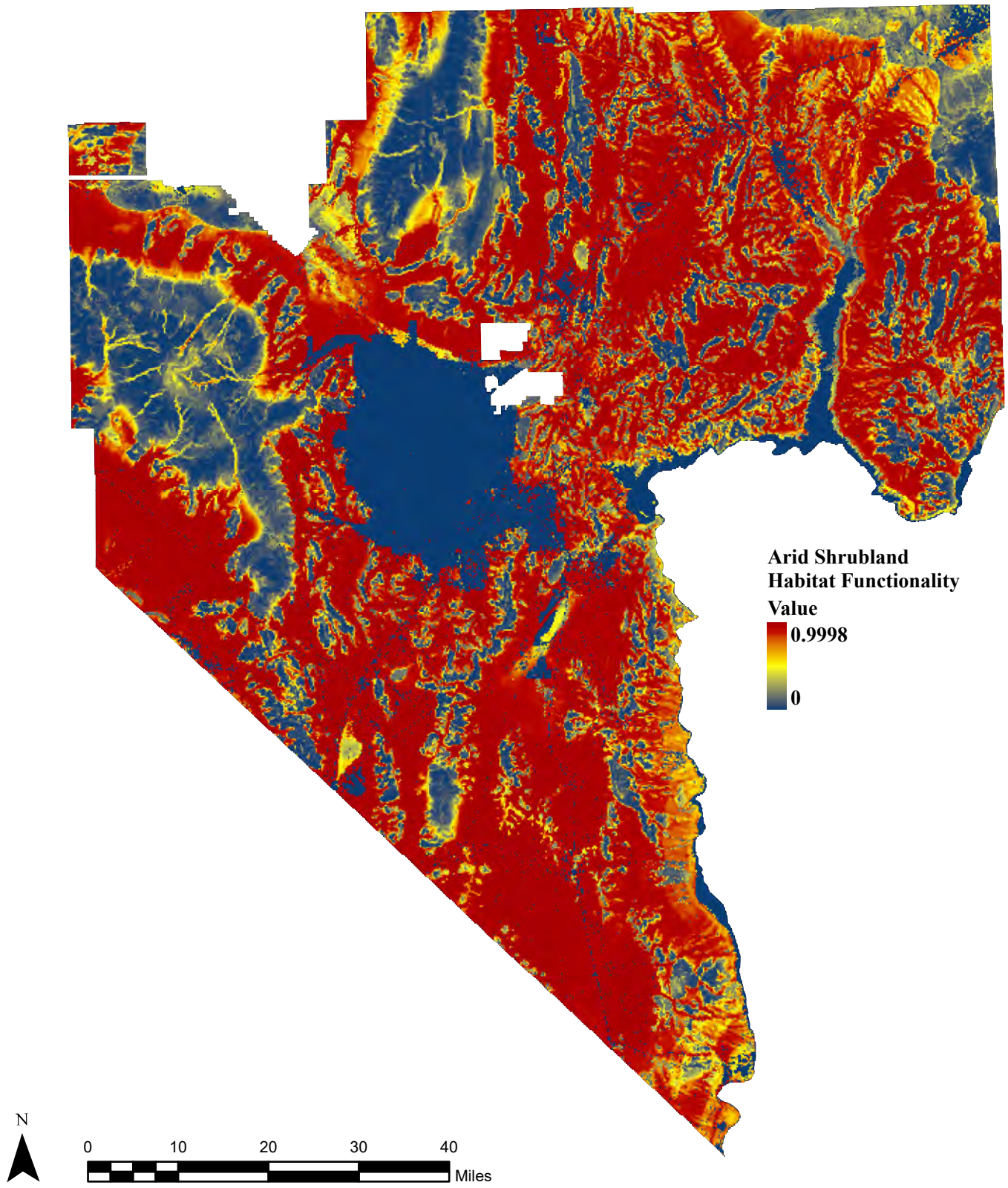

Figure 5-3. Arid Shrubland Habitat Functionality

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5.5.3 Cool Semi Desert Scrub and Grassland (CSDSG) Habitat Functionality Analysis

The species included in the CSDSG habitat group are:

- Bendire's thrasher
- Blue Diamond cholla
- eastern Joshua tree
- gilded flicker
- golden eagle

In addition to the data included in the SDMs (Nussear et al. 2024; Simandle and Nussear 2025), other datasets included in this analysis are proximity to roads, historic fires, BLM grazing allotments, invasive species, and land cover mask. All layers used, and their relative values are included in Table 5-9**.** and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided.

Table 5-9. Cool Semi Desert Scrub and Grassland Habitat Quality Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	**0**	**5 (Combined)**	**1 (per model)**	**Sum of up to 5**	**5**
Bendire's Thrasher (TOBE) SDM	0	1	1	1 per model	1
Blue Diamond cholla (CYMU) SDM	0	1	1	1 per model	1
Eastern Joshua tree (YUJA) SDM	0	1	1	1 per model	1
Gilded Flicker (COCH) SDM	0	1	1	1 per model	1
Golden Eagle (AQCH) SDM	0	1	1	1 per model	1
Proximity to Major Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.75	1 at road, linear decay to 0 at 1 mile	-0.75

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Proximity to Minor Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.375	1 at road, linear decay to 0 at 1 mile	-0.375
Historic Fires	0 Areas not subjected to fire	1 Areas subjected to fire	-1	Presence = 1, Absence = 0	-1
BLM grazing allotments	0 Areas outside current allotments	1 Areas within current allotments	-0.5	Presence = 1, Absence = 0	-0.5
All Invasive Species (Summary)	**0**	**9 (Combined)**	**-0.111 (1/9) per model**	**Sum of up to 9**	**-1**
Cheatgrass (BRTE)	0	1	-0.111	1 per model	-0.111
Red brome (BRRU2)	0	1	-0.111	1 per model	-0.111
Redstem stork's bill (ERCI6)	0	1	-0.111	1 per model	-0.111
Halogeton (HAGL)	0	1	-0.111	1 per model	-0.111
Broadleaved pepperweed (LEPE2)	0	1	-0.111	1 per model	-0.111
Bulbous bluegrass (POBU)	0	1	-0.111	1 per model	-0.111
Russian thistle (SATR12)	0	1	-0.111	1 per model	-0.111
Mediterranean grass (SCBA)	0	1	-0.111	1 per model	-0.111

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Tall tumble mustard (SIAL2)	0	1	-0.111	1 per model	-0.111
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

The Major and Minor road layers are described above in Section 5.5.1. The Major roads layer was designated a weight of -0.75 and the Minor roads layer was designated a weight of -0.375 for this model.

The Historic Fires layer contains data from the National Interagency Fire Center database. This layer converts fire polygons to a binary raster where 0 equals areas not subjected to fire and 1 equaling areas that have been subjected to fire. The Historic Fires layer is designated a weight of -1.

The BLM grazing allotments layer contains data from the BLM Geo Business Hub. It converts polygons to a binary raster where 0 equals areas outside of current allotments and 1 equals areas within current allotments. This layer is designated a model weight of -0.5.

The invasive species layer contains survey data from USFS (McMahon et al. 2021) for nine invasive species with known effects on Cool Semi Desert Scrub and Grassland habitat. The species included in this layer are: cheatgrass, red brome, redstem stork's bill, Halogeton, Broadleaved pepperweed, bulbous bluegrass, Russian thistle, Mediterranean grass, and tall tumble mustard. The invasives layer is weighted at -1 with each species carrying a weight of -0.111.

The final layer is the urban/water mask that filters out urban, disturbed, and open water landcover types from the NPS 2021 Coarse Level Vegetation Mapping data set.

Formula:

$$V = \frac{(M \times w_m) - (R \times w_r + G \times w_G + F \times w_F + I \times w_I)}{n \times w_m} \times U$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-10. Formula Legend

Symbol	Description
M	Model_Sum raster
w_m	Models weight
n	Count of species models
R	road-effect raster
w_r	Road Weight
G	Grazing raster
w^G	Grazing weight
F	Fire raster
w^f	Fire weight
I	Invasive species Sum raster
w_i	Invasive weight
U	Urban/Water mask

5.5.3.1 Results

The functional score of CSDSG habitat in the Plan Area is 5,340 (see Table 5-4, Section 5.3). The functional score of CSDSG habitat in the Proposed Impact Area is 808, which is the maximum amount of CSDSG habitat take that will occur under the Amendment. This is less than the combined functional score in the Low Impact Area (461) and the Proposed Reserve System (4,071). The Low Impact Areas will receive low-level disturbance through management activities and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a reduction of up to 4.61 in the functional score of the Low Impact Area. The results of the habitat functionality model are depicted in Figure 5-4.

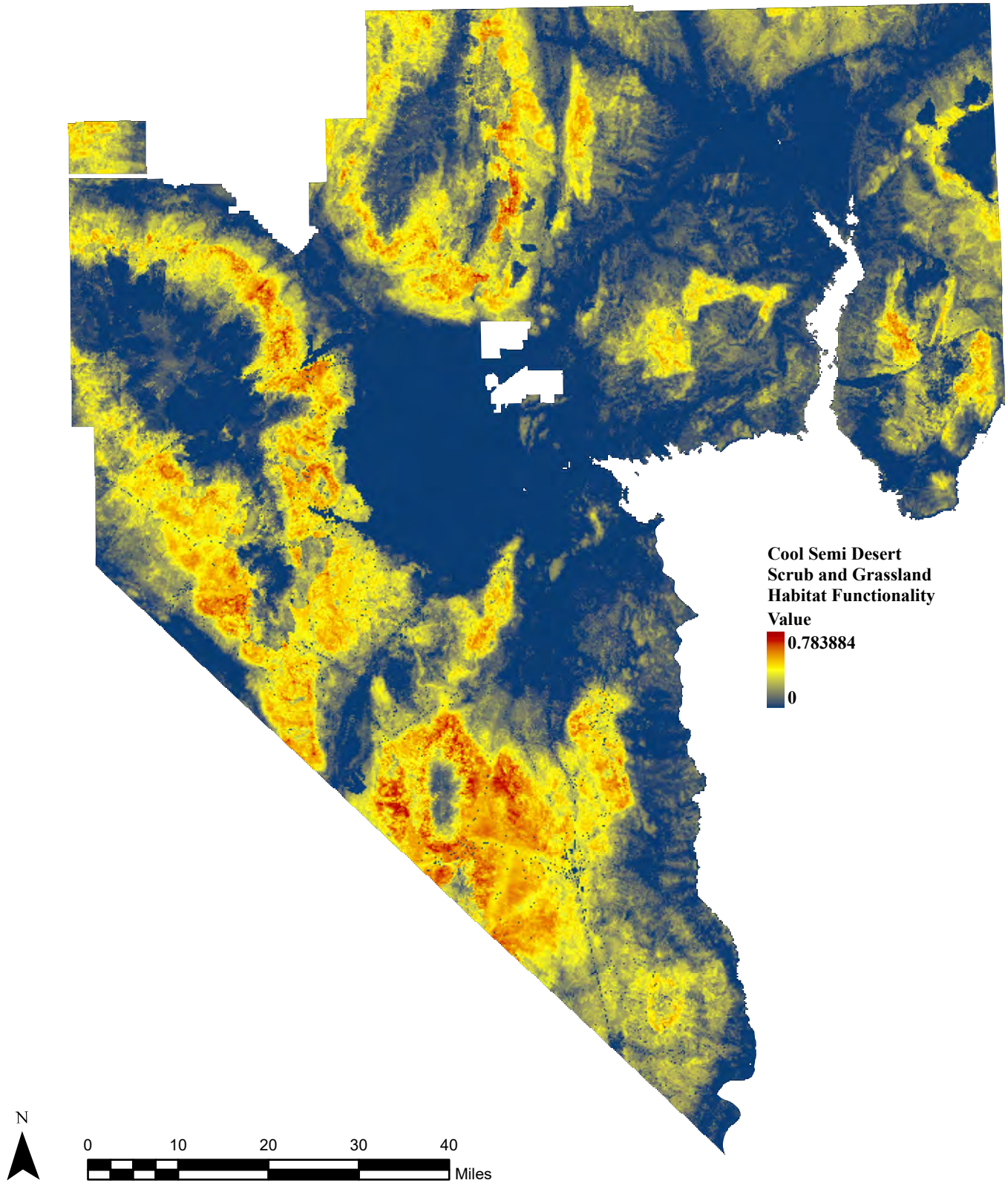

Figure 5-4. Cool Semi Desert Scrub and Grassland Habitat Functionality

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5.5.4 Gypsiferous Soils (GS) Habitat Functionality Analysis

The species in the GS habitat group include:

- Las Vegas bearpoppy
- Las Vegas buckwheat
- Mojave poppy bee
- silverleaf sunray
- sticky ringstem

In addition to the data included in the SDMs (Nussear et al. 2024; Simandle and Nussear 2025), this analysis included areas with low, medium and high potential for gypsum soils; proximity to roads, invasive species and land cover mask. All layers used, and their relative values are included in Table 5-11 and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. More information on the data included is provided below.

Table 5-11. Gypsiferous Soils Habitat Quality Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	5 (Combined)	1 (per model)	Sum of up to 5	5
Las Vegas Bearpoppy (ARCA) SDM	0	1	1	1 per model	1
Las Vegas Buckwheat (ERCO) SDM	0	1	1	1 per model	1
Mojave poppy bee (PEME) SDM	0	1	1	1 per model	1
Silverleaf Sunray (ENAR) SDM	0	1	1	1 per model	1
Sticky Ringstem (ANLE) SDM	0	1	1	1 per model	1

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Gypsiferous Soils (Summary)	0	0.75 (Max internal value)	0.75	Max of 0.75, 0.6, or 0.4	0.5625 (Max Impact)
High Potential Gypsum	0 Areas with no potential for gypsum soils	0.75 Areas with high potential for gypsum soils	0.75 (applied in final eq)	0.75 per pixel	0.5625
Medium Potential Gypsum	0 Areas with no potential for gypsum soils	0.6 Areas with medium potential for gypsum soils	0.75 (applied in final eq)	0.6 per pixel	0.45
Low Potential Gypsum	0 Areas with no potential for gypsum soils	0.4 Areas with low potential for gypsum soils	0.75 (applied in final eq)	0.4 per pixel	0.3
Proximity to Major Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.75	1 at road, linear decay to 0 at 1 mile	-0.75
Proximity to Minor Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.375	1 at road, linear decay to 0 at 1 mile	-0.375
All Invasive Species (Summary)	0	9 (Combined)	-0.111 (1/9) per model	Sum of up to 9	-1
Cheatgrass (BRTE)	0	1	-0.111	1 per model	-0.111
Red brome (BRRU2)	0	1	-0.111	1 per model	-0.111
Redstem stork's bill (ERCI6)	0	1	-0.111	1 per model	-0.111
Halogeton (HAGL)	0	1	-0.111	1 per model	-0.111

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Broadleaved pepperweed (LEPE2)	0	1	-0.111	1 per model	-0.111
Bulbous bluegrass (POBU)	0	1	-0.111	1 per model	-0.111
Russian thistle (SATR12)	0	1	-0.111	1 per model	-0.111
Mediterranean grass (SCBA)	0	1	-0.111	1 per model	-0.111
Tall tumble mustard (SIAL2)	0	1	-0.111	1 per model	-0.111
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

The Gypsiferous Soils layer is sourced from the GIS dataset developed by DCP project # 2005-TSG-574Q-EPR Review. Areas with no potential for Gypsum soils receive a value of 0, areas with high potential for gypsum soils receive a 0.75, medium a value of 0.6, and low a value of 0.4. The gypsum soils layer is weighted at 0.75.

Variables that decrease the value of the habitat begin with the proximity to Major and Minor roads layers, described above in Section 5.5.1. The Major roads layer was designated a weight of -0.75 and the Minor roads layer was designated a weight of -0.375 for the model.

The invasive species layer contains survey data from USFS (McMahon et al. 2021) for nine invasive species with known effects on Gypsiferous habitat. The species included in this layer are: cheatgrass, red brome, redstem stork's bill, Halogeton, Broadleaved pepperweed, bulbous bluegrass, Russian thistle, Mediterranean grass, and tall tumble mustard. The invasives layer is weighted at -1 with each species carrying a weight of -0.111.

The final layer is the urban/water mask that filters out urban, disturbed, and open water landcover types from the NPS 2021 Coarse Level Vegetation Mapping data set.

Formula:

$$V = \frac{(M \times w_m + S \times w_S) - (R \times w_R + I \times w_I)}{n \times w_m + w_S} \times U$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-12. Formula Legend

Symbol	Description
M	Model_Sum raster
w_m	Models weight
n	Count of species models
S	Gypsiferous soils
w_s	Soil weight
R	Road-effect raster
w_r	Road weight final
I	Invasive species Sum raster
w_i	Invasive weight
U	Urban/Water mask

5.5.4.1 Results

The functional score of GS habitat in the Plan Area is 6,218 (see Table 5-4 Section 5.3). The functional score of GS habitat in the Proposed Impact Area is 1,433, which is the maximum amount of GS habitat take that will occur under the Amendment. This is less than the combined functional score in the Low Impact Area (1,404) and the Proposed Reserve System (3,381). The Low Impact Area will receive low-level disturbance through management activities and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a reduction of up to 14.04 in the functional score of the Low Impact Area

The results of the habitat functionality model are depicted in Figure 5-5.

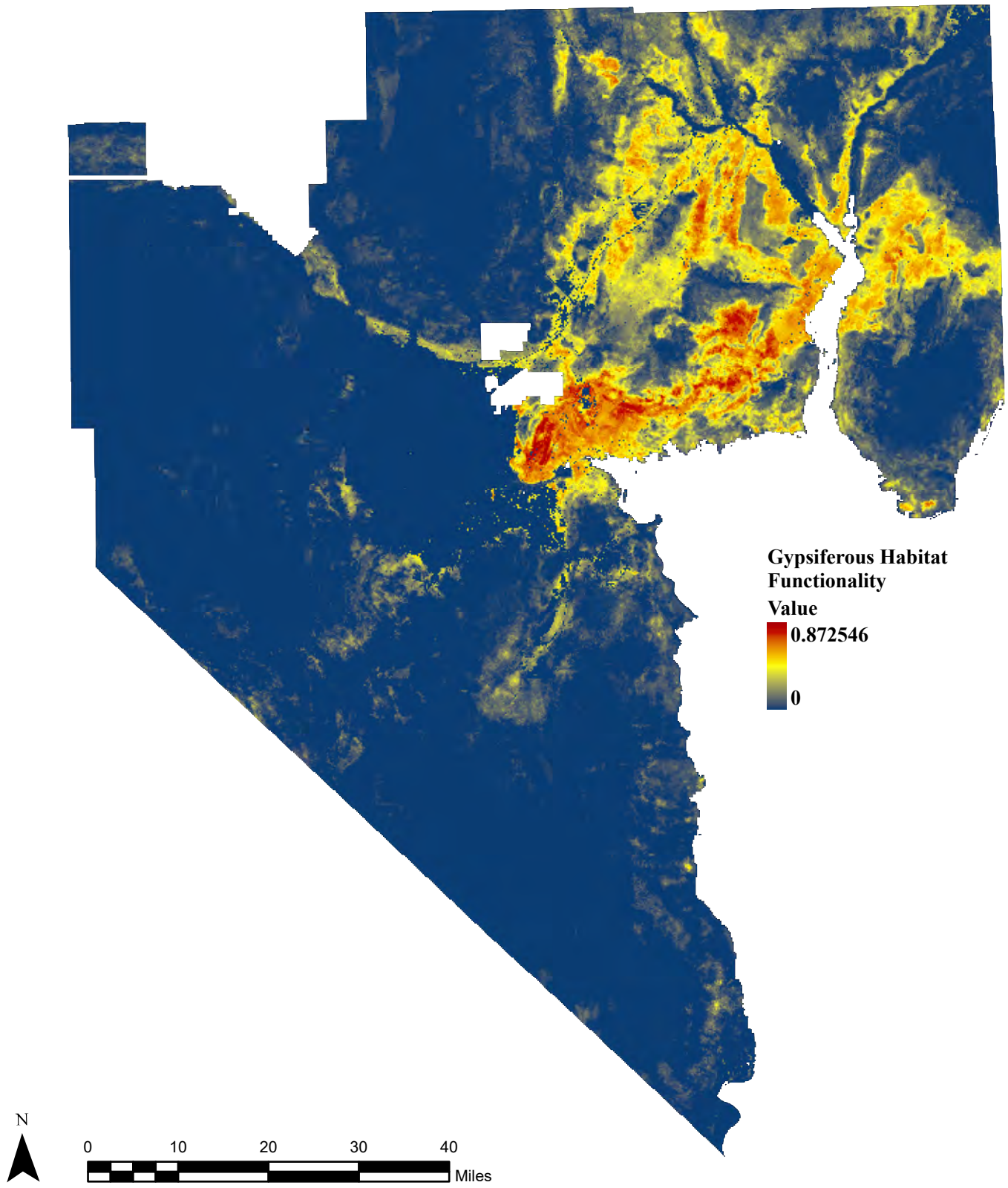

Figure 5-5. Gypsiferous Habitat Functionality

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5.5.5 Hydrology Dependent (HD) Habitat Functionality Analysis

The species included in the hydrology dependent habitat group are:

- desert pocket mouse
- spotted bat

In addition to the habitat suitability models (Nussear et al. 2024; Simandle and Nussear 2025), other data sets included in this analysis Clark County Land Cover, National Wetlands Inventory of streams, Proximity to Major and Minor roads, and a land cover mask for urban, disturbed, and open water areas. All layers used, and their relative values are included in Table 5-13**.** and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. More information on the data included is provided below.

Table 5-13. Hydrology Dependent Habitat Quality Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	2 (Combined)	1 (per model)	Sum of up to 2	2
Desert Pocket Mouse (CHPE) SDM	0	1	1	1 per model	1
Spotted bat (EUMA) SDM	0	1	1	1 per model	1
Clark Co Land Cover 2022 (Vegetation)	0 Areas outside selected land cover classes	1 Areas within selected land cover classes	0.8	1 per pixel	0.8
North American Desert Alkaline-Saline Marsh and Playa					
North American Warm Desert Playa					
Arid West Interior Freshwater					

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Marsh & Wet Meadow					
North American Desert Alkaline-Saline Wet Scrub					
Western North American Ruderal Marsh, Wet Meadow and Shrubland					
NWI Streams & Watersheds (Summary)	0	1 (Max internal value)	1	Mean of Streams and Watersheds	1
Watershed Basins (WBDHU10)	0 Areas outside 125m buffer of active watersheds	1 Areas within 125m buffer of active watersheds	1 (applied to MEAN)	1 per pixel	0.5 (if alone)
NWI Streams (Riverine)	0 Areas outside 125m buffer of active streams	1 Areas within 125m buffer of active streams	1 (applied to MEAN)	1 per pixel	0.5 (if alone)
Proximity to Major Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.75	1 at road, linear decay to 0 at 1 mile	-0.75
Proximity to Minor Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.375	1 at road, linear decay to 0 at 1 mile	-0.375
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

The Vegetation layer is sourced from the Clark County Land Cover (2022). The model used 5 specific layers from Playa, Marsh, and Wet Scrub classes and converted them to a binary raster of 0 or 1. A value of 0 was assigned to all areas outside selected land cover classes and a value of 1 to areas within selected land cover classes. The five classes selected are North American Desert Alkaline-Saline Marsh and Playa, North American Warm Desert Playa, Arid West Interior Freshwater Marsh and Wet Meadow, North American Desert Alkaline-Saline Wet Scrub, and Western North American Ruderal Marsh, Wet Meadow and Shrubland. The entire layer is weighted at 0.8.

The National Wetlands Inventory Streams and Watershed layer is sourced from the NWI database and species occurrence data. The occurrence data is used to select intersecting watersheds, the layer then intersects Riverine NWI features with selected watersheds and buffers both by 125m. The layer is the mean of value for streams and watersheds. Watershed Basins (WBDHU10) area valued at 0 or 1 with 0 representing areas outside the 125m buffer of active watersheds and 1 representing areas within the 125m buffer. NWI Streams is the same with a value of 0 applying to areas outside the 125m buffer of active streams and 1 for areas within the 125m buffer. Each carry a weight of 0.5 alone and 1 together.

The Major and Minor Road layers are described above in Section 5.5.1. The Major roads layer was designated a weight of -0.75 and the Minor roads layer was designated a weight of -0.375 for the model.

The final layer is the urban/water mask that filters out urban, disturbed, and open water landcover types from the NPS 2021 Coarse Level Vegetation Mapping data set.

Formula:

$$V = \frac{(M \times w_m + Veg \times w_V + NWI \times w_{NWI}) - (R \times w_R)}{n \times w_m + w_V + w_{NWI}} \times U$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-14. Formula Legend

Symbol	Description
M	Model_Sum raster
w_m	Models weight
n	Count of species models
Veg	Vegetation type raster
w_v	Vegetation weight
NWI	NWI raster
w_{NWI}	NWI weight
R	Inverted road-effect raster

Symbol	Description
w_r	Road weight final
U	Urban/Water mask

5.5.5.1 Results

The functional score of HD habitat in the Plan Area is 5,960 (see Table 5-4 Section 5.3). The functional score of HD habitat in the Proposed Impact Area is 2,064, which is the maximum amount of HD habitat take that will occur under the Amendment. This is less than the combined functional score of the Low Impact Area (1,711) and the Proposed Reserve System (2,185). The Low Impact Area will receive low-level disturbance through management activities and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a reduction of up to 17.11 in the functional score of the Low Impact Area. The results of the habitat functionality model are depicted in Figure 5-6.

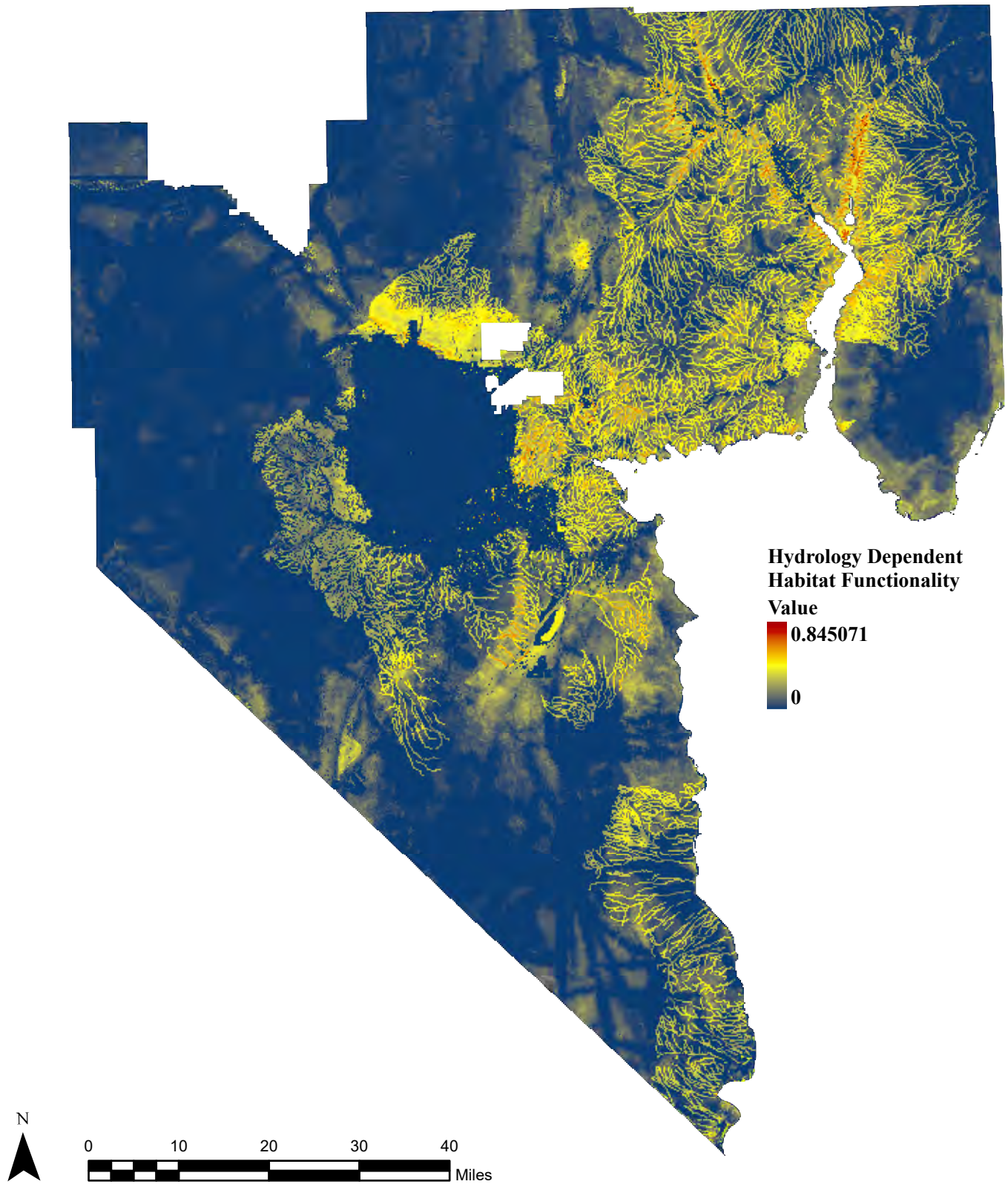

Figure 5-6. Hydrology Dependent Habitat Functionality

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5.5.6 Playa Fringe (PF) Habitat Functionality Analysis

A single species is included in the Playa Fringe habitat group: Pahrump Valley buckwheat.

In addition to the SDM for Pahrump valley buckwheat (Nussear et al. 2024) other data sets included in this analysis were vegetation, National Wetlands Inventory streams, Proximity to Major and Minor Roads, invasive species, and a watershed mask. All layers used and their relative values are included in Table 5-15 and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. More information on the data included is provided below.

Table 5-15. Playa Fringe Habitat Functionality Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	1 (Combined)	1 (per model)	Sum of up to 1	1
Pahrump Valley Buckwheat (ERBI) SDM	0	1	1	1 per model	1
Clark Co Land Cover 2022 (Vegetation)	0 Areas outside selected land cover classes	1 Areas within selected land cover classes	0.25	1 per pixel	0.25
North American Desert Alkaline-Saline Marsh and Playa					
North American Warm Desert Playa					
North American Warm Semi-Desert Dune and Sand Flats					
NWI Streams (Riverine)	0 Areas outside 125m buffer of active streams	1 Areas within 125m buffer of active streams	1	1 per pixel	1
Proximity to Major Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.25	1 at road, linear decay to 0 at 1 mile	-0.25

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Proximity to Minor Roads	0 at 1609 meters (1 mile) from a road	1 At a road	-0.125	1 at road, linear decay to 0 at 1 mile	-0.125
All Invasive Species (Summary)	0	9 (Combined)	-0.111 (1/9) per model	Sum of up to 9	-1
Cheatgrass (BRTE)	0	1	-0.111	1 per model	-0.111
Red brome (BRRU2)	0	1	-0.111	1 per model	-0.111
Redstem stork's bill (ERCI6)	0	1	-0.111	1 per model	-0.111
Halogeton (HAGL)	0	1	-0.111	1 per model	-0.111
Broadleaved pepperweed (LEPE2)	0	1	-0.111	1 per model	-0.111
Bulbous bluegrass (POBU)	0	1	-0.111	1 per model	-0.111
Russian thistle (SATR12)	0	1	-0.111	1 per model	-0.111
Mediterranean grass (SCBA)	0	1	-0.111	1 per model	-0.111
Tall tumble mustard (SIAL2)	0	1	-0.111	1 per model	-0.111
Watershed Mask (3 Valleys)	Outside Target Valleys (0)	Inside Target Valleys (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

The vegetation layer is made up of three specific Playa/Dune vegetation classes from Clark County Land Cover (2022). The North American Desert Alkaline-Saline Marsh and Playa, North American Warm Desert Playa, and North American Warm Semi-Desert Dune and Sand Flats layers were merged and areas within the selected land cover classes were assigned a value of 1. All other areas were valued at zero, the vegetation layer has a weight of 0.25.

The Streams layer is pulled from the National Wetlands Inventory database and filters for "Riverine" wetlands. This layer is buffered by 125m and converted to a binary raster with one representing areas within the 125m buffer for active streams and zero representing areas outside the buffer area. The streams layer is designated a weight of 1 in the model.

The Major and Minor road layers are described above in Section 5.5.1. The Major roads layer was designated a weight of -0.25 and the Minor roads layer was designated a weight of -0.125 for the model.

The invasive species layer contains survey data from USFS (McMahon et al. 2021) for nine invasive species with known effects on Sandy habitat. The species included in this layer are: cheatgrass, red brome, redstem stork's bill, Halogeton, Broadleaved pepperweed, bulbous bluegrass, Russian thistle, Mediterranean grass, and tall tumble mustard. The invasives layer is weighted at -1 with each species carrying a weight of -0.111.

The Watershed Mask selects the Mesquite, Stewart, and Pahrump Valleys from WBDHU10. All areas outside target valleys are excluded from the habitat functionality analysis.

Formula:

$$V = \frac{(M \times w_m + Veg \times w_V + NWI \times w_{NWI}) - (R \times \boldsymbol{w}_{\mathrm{r}} + I \times w_I)}{n \times w_m + w_V + w_{NWI}} \times Basin$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-16. Formula Legend

Symbol	Description
M	Model_Sum raster
w_m	Models weight
n	Count of species models
Veg	Vegetation raster
w_v	Vegetation weight
NWI	NWI riverine raster
w_{NWI}	NWI weight
R	Road-effect raster
w_r	Road weight
I	Invasive species Sum raster
w_i	Invasive weight
$Basin$	3-Valley basin mask (Mesquite/Stewart/Pahrump)

5.5.6.1 Results

The functional score of Playa Fringe habitat in the Plan Area is 546 (see Table 5-4 Section 5.3). The functional score of PF habitat in the Proposed Impact Area is 150, which is the maximum amount of PF habitat take that will occur under the Amendment. This is less than the combined functional score in the Low Impact Area (0) and the Proposed Reserve System (396). The results of the habitat functionality model are depicted in Figure 5-7.

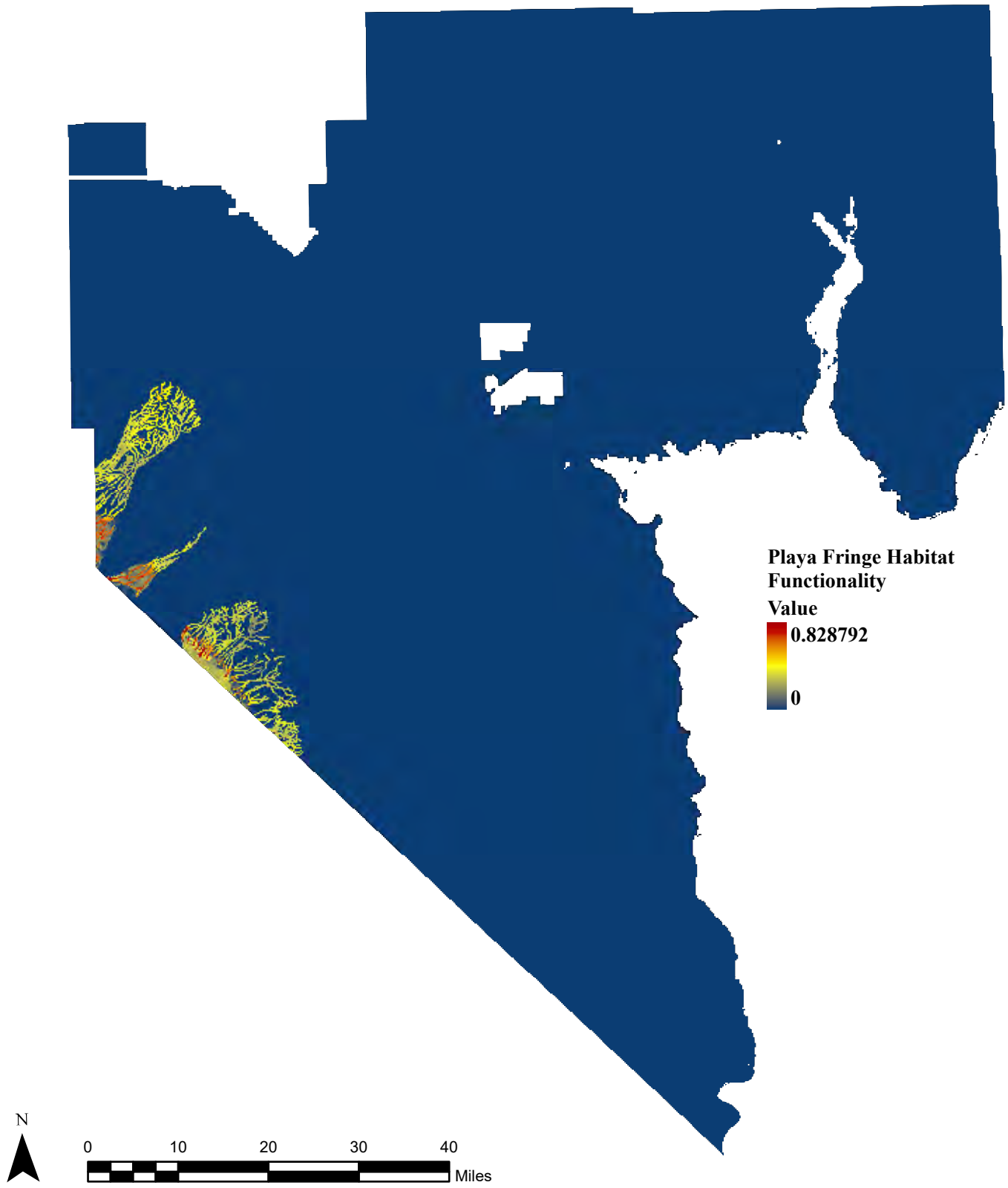

Figure 5-7. Playa Fringe Habitat Functionality

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5.5.7 Riparian Marsh (RM) Habitat Functionality Analysis

One species is included in Riparian Marsh habitat group: Yuma Ridgway's rail.

In addition to the SDM (Simandle and Nussear 2025) other data sets included in this analysis were vegetation, vegetation height, a Federal Emergency Management Agency (FEMA) flood zone mask, and the urban/open water mask. All layers used and their relative values are included in Table 5-17**.** and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. More information on the data included is provided below.

Table 5-17. Riparian Marsh Habitat Functionality Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	1 (Combined)	1 (per model)	Sum of up to 1	1
Ridgway's rail (RAOB) SDM	0	1	1	1 per model	1
Composite Vegetation Score (Summary)	0	1 (Max internal value)	1	Maximum of 4 classes	1
Ruderal Marsh, Wet Meadow & Shrubland	0 Outside 30m buffer	1 Inside 30m buffer	1 (internal)	1	1
Freshwater Marsh & Wet Meadow	0 Outside 30m buffer	0.75 Inside 30m buffer	1 (internal)	0.75	0.75
Warm Desert Riparian Low Bosque	0 Outside 30m buffer	0.25 Inside 30m buffer	1 (internal)	0.25	0.25
Interior West Ruderal & Riparian Forest	0 Outside 30m buffer	0.25 Inside 30m buffer	1 (internal)	0.25	0.25
Vegetation Height (Vertical Structure)	0 for height <0.5m or >1.5m	1 for height 0.5m to 1.5m	1	1 per pixel	1
Floodzone Mask (Perennial Streams)	Outside selected Floodzones (0)	Inside selected Floodzones (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

The vegetation layer incorporates data from Clark County Landcover (2022). The layer merges four distinct vegetation classes, each buffered by 30m. The vegetation classes included are Ruderal Marsh, Wet Meadow and Shrubland; Freshwater Marsh and Wet Meadow; Warm Desert

Riparian Low Bosque; and Interior West Ruderal and Riparian Forest. The weight of the combined layer is one.

The vegetation height layer incorporates data from the LANDFIRE Existing Vegetation Height map tool. Vegetation from 0.5m to 1.5m is assigned a value of 1 and areas with vegetation heights <0.5m or >1.5m are assigned a value of zero.

The flood zone mask filters FEMA flood zones A, AO, and AE intersecting perennial NHD flowlines/areas and converts them to a binary raster with 1 representing areas in selected flood zones and 0 being assigned to areas outside the selected flood zones.

Formula:

$$V = \frac{M \times w_m + Veg \times w_V + LF \times w_{LF}}{w_V + w_{LF} + n \times w_m} \times U \times FZ$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-18. Formula Legend

Symbol	Description
M	Ridgway's Rail SDM
w_m	Models weight
n	Count of species models
Veg	Vegetation Raster
w_v	Vegetation weight
LF	LANDFIRE EVH
w_{LF}	LANDFIRE weight
FZ	FEMA Flood zone × perennial stream mask
U	Urban/Water mask

5.5.7.1 Results

The functional score of Riparian Marsh habitat in the Plan Area is 8,224(see Table 5-4 Section 5.3). The functional score of RM habitat in the Proposed Impact Area is 3,726, which is the maximum amount of RM habitat take that will occur under the Amendment. This is less than the combined functional score of the Low Impact Area (4,330) and the Proposed Reserve System Area (168). The Low Impact Area will receive low-level disturbance through management and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a reduction of up to 43.3 in the functional score of the Low Impact Area. The results of the habitat functionality model are depicted in Figure 5-8.

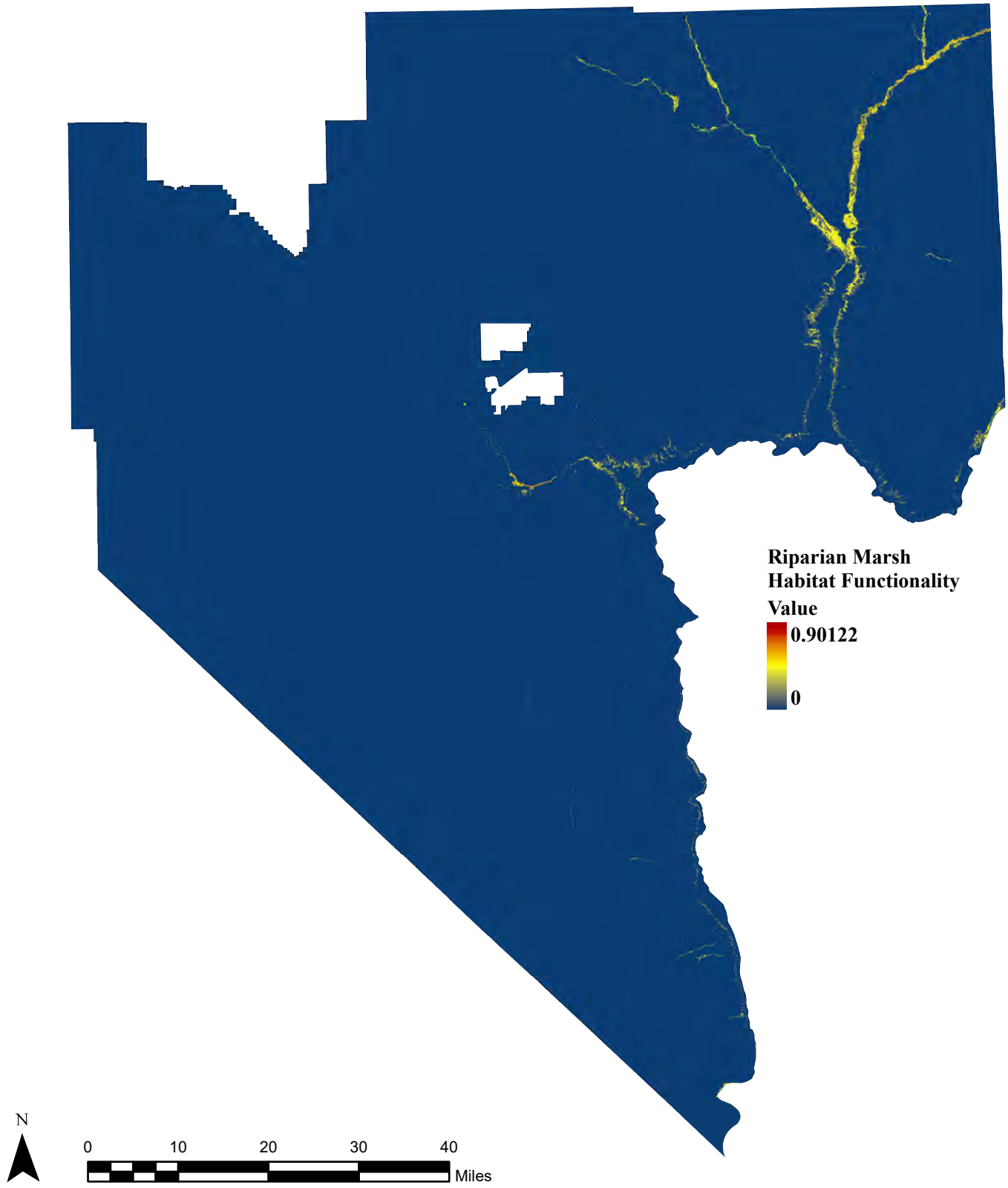

Figure 5-8. Riparian Marsh Habitat Functionality

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5.5.8 Riparian Woodland (RW) Habitat Functionality Analysis

The species included in the RW habitat group model are:

- southwestern willow flycatcher
- yellow-billed cuckoo

In addition to the SDMs for southwestern willow flycatcher and yellow-billed cuckoo (Simandle and Nussear 2025), other data sets included in this analysis were vegetation, critical habitat for southwestern willow flycatcher, vegetation height from Landfire data, a mask for areas outside of flood zones, and the urban/open water landcover mask. All layers used and their relative values are included in Table 5-19 and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. More information on the data included is provided below.

The vegetation layer takes data from Clark County Landcover (2022) and selects, buffers, and merges three vegetation classes. The classes are: Western Interior Riparian Forest and Woodland, Warm Desert Riparian High Bosque, and Warm Desert Riparian Mesquite Bosque. This data layer is weighted at one for the model.

The southwestern willow flycatcher data is from the USFWS critical habitat mapper. This data layer has a weight of one for the model. Areas inside critical habitat boundaries carry a value of 1 and areas outside of critical habitat boundaries carry a value of zero.

Table 5-19. Riparian Woodland Habitat Functionality Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	1 (Combined)	1 (per model)	Sum of up to 2	1
Southwestern Willow Flycatcher (EMTR) SDM	0	1	1	1	1
Yellow-billed Cuckoo (COAM) SDM	0	1	1	1	1
Composite Vegetation Score (Summary)	0	1 (Max internal value)	1	Maximum of 3 classes	1
Western Interior Riparian Forest & Woodland	0 Outside 100ft buffer	1 Inside 100ft buffer	1 (internal)	1	1
Warm Desert Riparian High Bosque	0 Outside 100ft buffer	0.75 Inside 100ft buffer	1 (internal)	0.75	0.75
Warm Desert Riparian Mesquite Bosque	0 Outside 100ft buffer	0.5 Inside 100ft buffer	1 (internal)	0.5	0.5
Critical Habitat for EMTR	0 Outside Critical Habitat	1 Inside Critical Habitat	1	1 per pixel	1

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Vegetation Height (Vertical Structure)	0 for height <3m or >22m	1 for height 3m to 21m	1	1 per pixel	1
Floodzone Mask (Perennial Streams)	Outside selected Floodzones (0)	Inside selected Floodzones (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

The Vegetation Height data layer is sourced from the LANDFIRE Existing Vegetation Height map tool. For the model, tree heights of 3m-21m are assigned a value of one and all other heights (shrubs/herbs) are assigned a value of zero.

The flood zone mask filters FEMA flood zones A, AO, and AE intersecting perennial NHD flowlines/areas and converts them to a binary raster with 1 representing areas in selected flood zones and 0 being assigned to areas outside the selected flood zones.

The final layer is the urban/water mask that filters out urban and open water landcover types from the NPS 2021 Coarse Level Vegetation Mapping data set.

Formula

$$V = \frac{M \times w_m + Veg \times w_V + CH \times w_{CH} + LF \times w_{LF}}{w_V + w_{CH} + w_{LF} + n \times w_m} \times U \times FZ$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-20. Formula Legend

Symbol	Description
M	Model_Sum raster
w_m	Models weight
n	Count of species models
Veg	Vegetation Raster
w_v	Vegetation weight
CH	EMTR Critical Habitat
w_{CH}	Critical Habitat weight

Symbol	Description
LF	LANDFIRE EVH
w_{LF}	LANDFIRE weight
U	Urban mask
FZ	FEMA Flood zone mask

5.5.8.1 Results

The functional score of Riparian Woodland habitat in the Plan Area is 22,933(see Table 5-4 Section 5.3). The functional score of RW habitat in the Proposed Impact Area is 11,082, which is the maximum amount of RW habitat take that will occur under the Amendment. This is less than the combined functional score of the Low Impact Area (8,207) and the Proposed Reserve System (3,644). The Low Impact Area will receive low-level disturbance through management and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a loss of up to 82.07 in functional score. The results of the habitat functionality model are depicted in Figure 5-9.

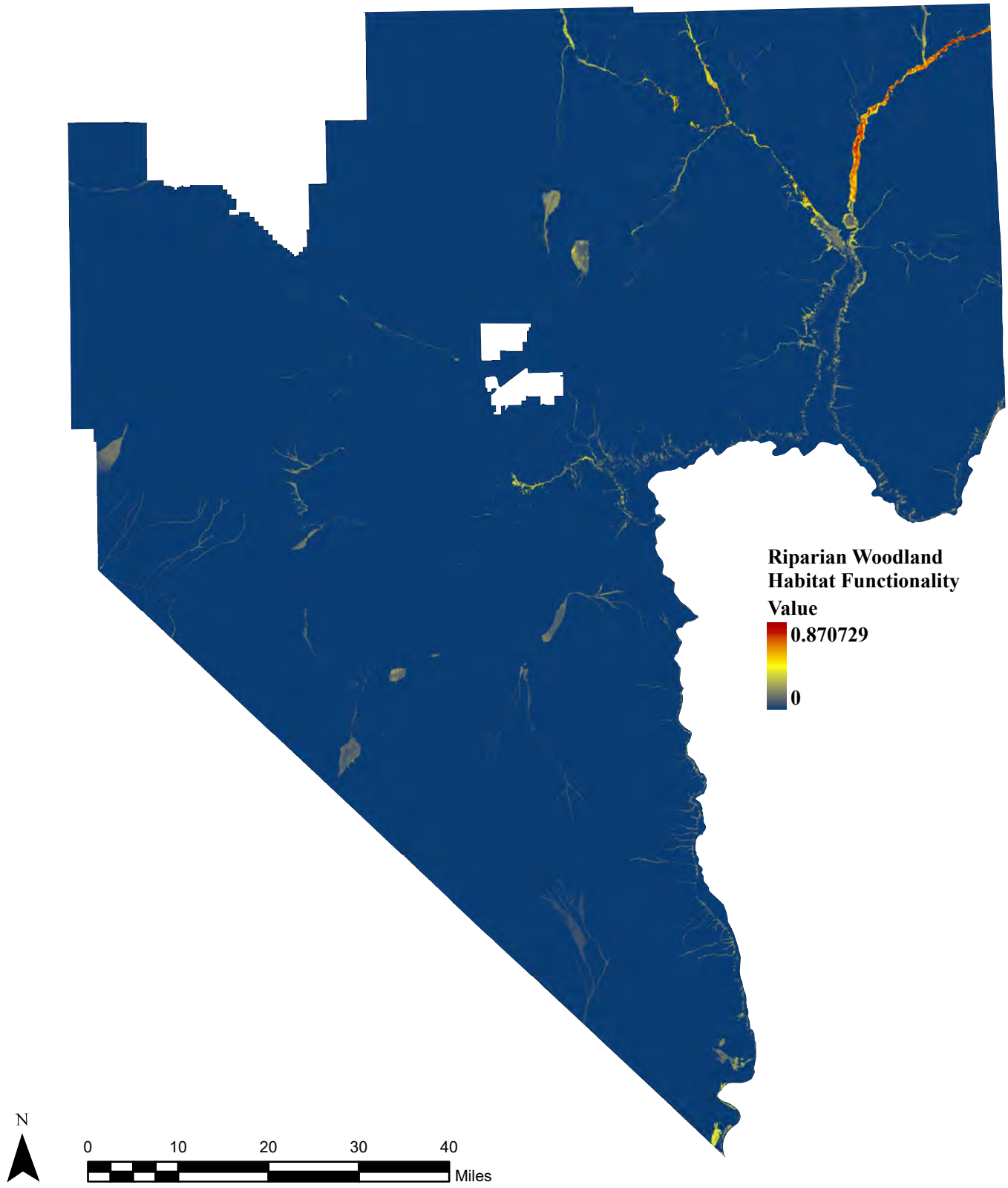

Figure 5-9. Riparian Woodland Habitat Functionality

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5.5.9 Sandy Soils (Sandy) Habitat Functionality Analysis

Two species are associated with the Sandy habitat group:

- white-margined beardtongue
- sticky buckwheat

In addition to the SDMs for white-margined beardtongue and sticky buckwheat (Nussear et al. 2024), other data sets included in this analysis were potential for sandy soils, Vegetation, proximity to Major and Minor roads, invasive species occurrence data and a land cover mask that excludes certain land cover types. All layers used and their relative values are included in Table 5-21 and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. More information on the data included is provided below.

High sand content within the soil is a key attribute of sticky buckwheat and white-margined beardtongue habitat (NatureServe 2020a, NatureServe 2020b, Etyemezian et al. 2010, TNC 2007). A soils dataset facilitating identification of potentially sandy soils locations was used (Sandy_Soils_Full_Classify dataset within the habitat models geodatabase). The dataset identifies potentially sandy soils using ASTER Thermal Infrared imagery (five bands), the 2010 Clark County 1:150,000 scale surficial geology map, and NRCS SSURGO soils particle size data. Per the metadata provided, three categories for potential of sandy soil occurrence are given: high, medium, and low. Areas with high, medium, and low potential for sandy soils were given values of 1 and weighted 0.8, 0.4, and 0.2 respectively.

The vegetation layer incorporates data from the Clark County Land Cover (2022). It selects three sand/dune classes and buffers them by 100ft. The vegetation layer is weighted at 0.8 in the equation.

The Major and Minor Roads layers are described above in Section 5.5.1. The Major roads layer was designated a weight of -0.75 and the Minor roads layer was designated a weight of -0.75 for the model.

The invasive species layer contains survey data from USFS (McMahon et al. 2021) for nine invasive species with known effects on Sandy habitat. The species included in this layer are: cheatgrass, red brome, redstem stork's bill, Halogeton, Broadleaved pepperweed, bulbous bluegrass, Russian thistle, Mediterranean grass, and tall tumble mustard. The invasives layer is weighted at -1 with each species carrying a weight of -0.111.

The final layer is the Land Cover Mask which excludes urban and open water areas from the model.

Table 5-21. Sandy Soil Habitat Functionality Model Layers, Descriptions, and Values

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	2 (Combined)	1	Sum of up to 2	2
White-Margined Beardtongue (PEAL) SDM	0	1	1	1 per model	1
Sticky Buckwheat (ERVI) SDM	0	1	1	1 per model	1
Sandy Soils (Summary)	0	0.8 (Max internal value)	0.8	Max of 0.8, 0.4, or 0.2	0.64
High Potential Sandy Soils	0	0.8	0.8 (eq)	0.8	0.64
Medium Potential Sandy Soils	0	0.4	0.8 (eq)	0.4	0.32
Low Potential Sandy Soils	0	0.2	0.8 (eq)	0.2	0.16
Clark Co Land Cover 2022 (Vegetation)	0 Outside selected classes	1 Inside selected classes	0.8	1 per pixel	0.8
Proximity to Major Roads	0 at 1609m (1 mile)	1 At a road	-0.75	Linear decay to 0 at 1 mile	-0.75
Proximity to Minor Roads	0 at 804m (0.5 miles)	1 At a road	-0.75	Linear decay to 0 at 0.5 miles	-0.75
All Invasive Species (Summary)	0	9 (Combined)	-0.111 (1/9)	Sum of up to 9	-1
Cheatgrass (BRTE)	0	1	-0.111	1 per model	-0.111
Red brome (BRRU2)	0	1	-0.111	1 per model	-0.111
Redstem stork's bill (ERCI6)	0	1	-0.111	1 per model	-0.111
Halogeton (HAGL)	0	1	-0.111	1 per model	-0.111
Broadleaved pepperweed (LEPE2)	0	1	-0.111	1 per model	-0.111
Bulbous bluegrass (POBU)	0	1	-0.111	1 per model	-0.111
Russian thistle (SATR12)	0	1	-0.111	1 per model	-0.111
Mediterranean grass (SCBA)	0	1	-0.111	1 per model	-0.111
Tall tumble mustard (SIAL2)	0	1	-0.111	1 per model	-0.111
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

Formula:

$$V = \frac{(M \times w_m + S \times w_S + Veg \times w_V) - (R \times w_R + I \times w_I)}{n \times w_m + w_S + w_V} \times U$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-22. Formula Legend

Symbol	Description
M	Model_Sum raster
w_m	Models weight
n	Count of species models
S	Sandy soils
w_s	Sandy soil weight
Veg	Vegetation raster
w_v	Vegetation weight
R	Road-effect raster
w_r	Road weight final
I	Invasive species Sum raster
w_i	Invasive weight
U	Urban/Water mask

5.5.9.1 Results

The functional score of Sandy habitat in the Plan Area is 1,197 (see Table 5-4, Section 5.3). The functional score of Sandy habitat in the Proposed Impact Area is 366, which is the maximum amount of Sandy habitat take that will occur under the Amendment. This is less than the combined functional score of the Low Impact Area (479) and the Proposed Reserve System (352). The Low Impact Area will receive low-level disturbance through management and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a loss of up to 4.79 in functional score. The results of the habitat functionality model are depicted in Figure 5-10.

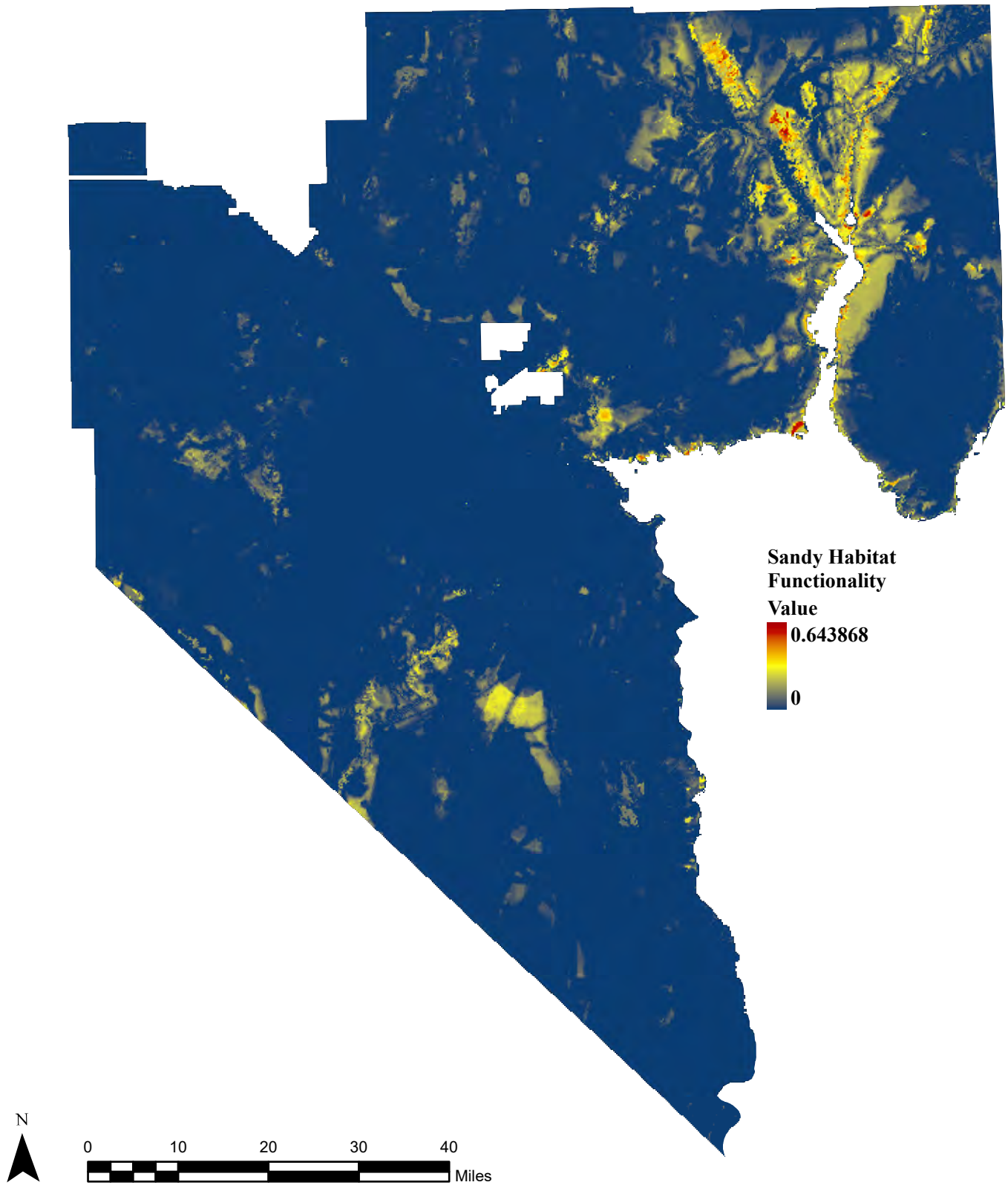

Figure 5-10. Sandy Habitat Functionality

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5.5.10 Wind-Blown Sand (WBS) Habitat Functionality Analysis

Only one species is included in the WBS habitat group:

- threecorner milkvetch (*Astragalus geyeri* var. *triquetras*)

In addition to the habitat suitability model (Nussear et al. 2024), other data layers used in this analysis were geology, vegetation, proximity to roads, and invasive species occurrence. All layers used and their relative values are included in Table 5-23 and described below. For the data layers in which indirect effects on habitat quality were included, the distances at which the layer is valued at 0 and 1 are provided. More information on the data included is provided below.

Threecorner milkvetch occurs exclusively on substratum consisting of wind-blown sand derived from the Muddy Creek Formation, and it is necessary to conserve the source of its required substratum and the depositional process to conserve the species (NNHP 2001, NPS 2010a, TNC 2007). Impacts to the sediment source could cause changes to the species habitat and affect threecorner milkvetch.

The geology layer selects the Muddy Creek Formation and was sourced from the Nevada Geologic Layer dataset. Areas designated as Active Dune Sand represent a value of one and all other areas are zero. The geology layer has a designated weight of 0.5 for the model.

Table 5-23. Wind-Blown Sand Habitat Functionality Layers

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
All Species-specific models (Summary)	0	1 (Combined)	1	Sum of up to 1	1
Threecorner Milkvetch (ASGETR) SDM	0	1	1	1 per model	1
Geology (Active Dune Sand)	0 Outside selected classes	1 (Max internal value)	0.5	1 per pixel	0.5
Clark Co Land Cover 2022 (Vegetation)	0 Outside selected class	1 (Max internal value)	0.8	1 per pixel	0.8
Proximity to Major Roads	0 at 1609m (1 mile)	1 At a road	-0.5	Linear decay to 0 at 1 mile	-0.5
Proximity to Minor Roads	0 at 804m (0.5 miles)	1 At a road	-0.25	Linear decay to 0 at 0.5 miles	-0.25
All Invasive Species (Summary)	0	9 (Combined)	-0.111 (1/9)	Sum of up to 9	-1

Description	Minimum Value (0)	Maximum Value (1)	Weight	Value	Max Weight Impact
Cheatgrass (BRTE)	0	1	-0.111	1 per model	-0.111
Red brome (BRRU2)	0	1	-0.111	1 per model	-0.111
Redstem stork's bill (ERCI6)	0	1	-0.111	1 per model	-0.111
Halogeton (HAGL)	0	1	-0.111	1 per model	-0.111
Broadleaved pepperweed (LEPE2)	0	1	-0.111	1 per model	-0.111
Bulbous bluegrass (POBU)	0	1	-0.111	1 per model	-0.111
Russian thistle (SATR12)	0	1	-0.111	1 per model	-0.111
Mediterranean grass (SCBA)	0	1	-0.111	1 per model	-0.111
Tall tumble mustard (SIAL2)	0	1	-0.111	1 per model	-0.111
Land Cover Mask	Urban/Water (0)	Habitat (1)	Multiplier	0 (Exclude) or 1 (Include)	Mask
Final Restrict to Positive Values	0	N/A	N/A	N/A	N/A

The vegetation layer in the model is sourced from Clark Co Land Cover 2022 and selects “Beach and Barren Sand Draw-down Area” with a buffer of 100ft. These land cover types and the surrounding 100-foot buffer were valued at 1 and given a model weight of 0.8.

The proximity to major roads and proximity to minor roads layers were created to account for indirect disturbance to species and habitat that may reduce habitat quality, such as air quality, increased wildfire risk, and the spread of invasive plants. The division of roads into major and minor accounts for the differing effects on species and habitat depending on road size and traffic volume. The Major roads layer is weighted at -0.5 and the minor roads layer is weighted at -0.25.

The invasive species layer contains survey data from USFS (McMahon et al. 2021) for nine invasive species with known effects on threecorner milkvetch and WBS habitat. The species included in this layer are: cheatgrass, red brome, redstem stork’s bill, Halogeton, broadleaved pepperweed, bulbous bluegrass, Russian thistle, Mediterranean grass, and tall tumble mustard. The invasives layer is weighted at -1 with each species carrying a weight of -0.111.

The final layer is the Land Cover Mask which excludes urban and open water areas from the model.

Formula:

$$V = \frac{(M \times w_m + Veg \times w_V + Geol \times w_G) - (R \times w_R + I \times w_I)}{n \times w_m + w_V + w_G} \times U$$

Final Output:

$$HF_{out} = \max(0, V)$$

Table 5-24. Formula Legend

Symbol	Description
M	1 model (Threecorner Milkvetch)
w_m	Model weight
n	Count of species models
Veg	Vegetation raster
w_v	Vegetation weight
Geol	Geology (Muddy Creek Fm)
w^G	Geology weight
R	Road-effect raster
w_r	Road weight final
I	Invasive species Sum raster
w_i	Invasive weight
U	Urban/Water mask

5.5.10.1 Results

The functional score of WBS habitat in the Plan Area is 1,245 (see Table 5-4 Section 5.3). The functional score of WBS habitat in the Proposed Impact Area is 453, which is the maximum amount of WBS habitat take that will occur. This is less than the combined functional score of the Low Impact Area (360) and the Proposed Reserve System (432). The Low Impact Area will receive low-level disturbance through management and recreational use. It is estimated that 1 percent of the Low Impact Area may be converted as a part of management activities; this represents a loss of up to 3.6 in functional score. The results of the habitat functionality model are depicted in Figure 5-11.

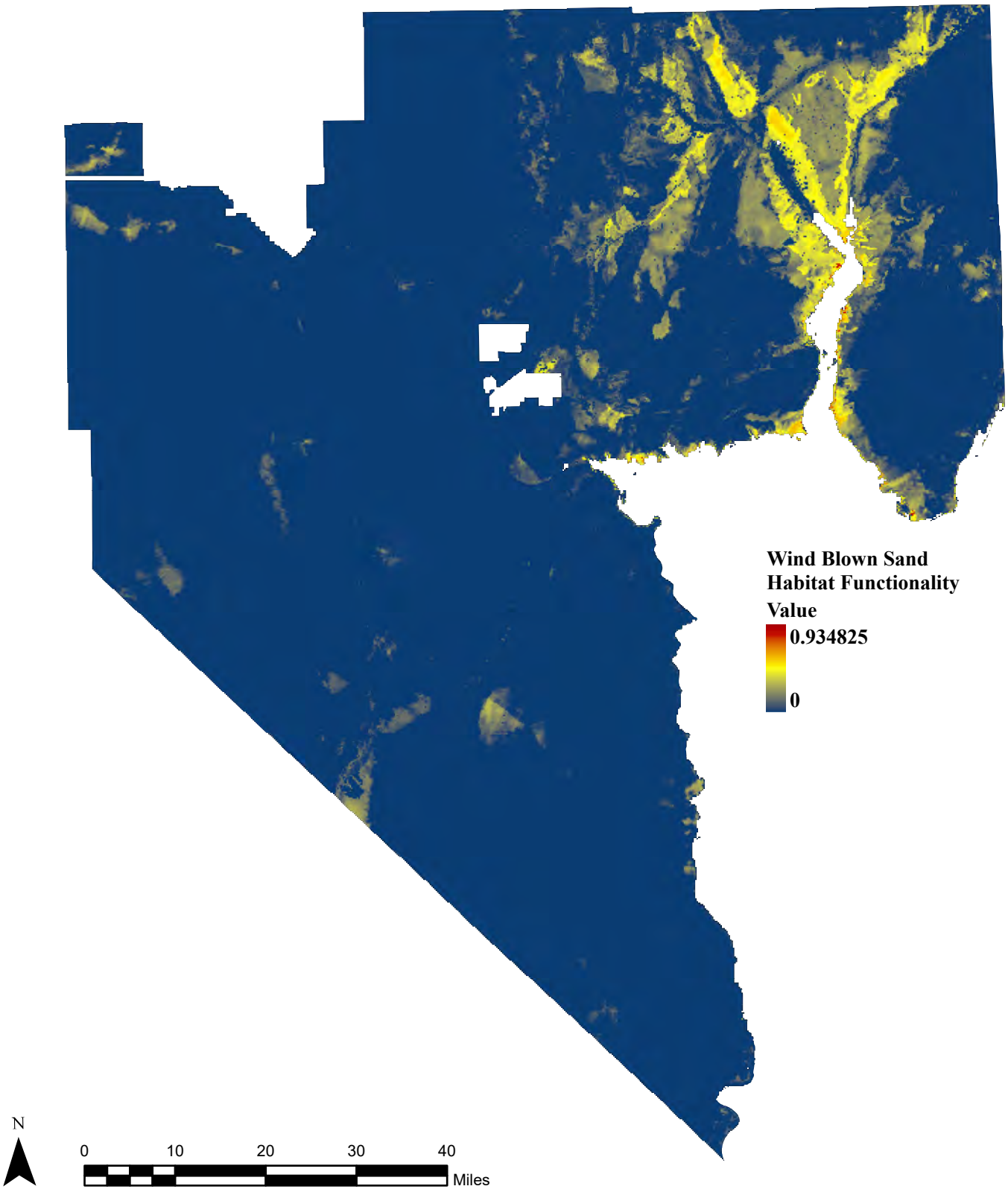

Figure 5-11. Wind Blown Sand Habitat Functionality

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5.6 Anticipated Impacts to Designated Critical Habitat

Critical habitat is present for two species in the Plan Area, and Covered Activities are proposed which may result in impacts to designated critical habitat. Table 5-25 describes the estimated acreage of impacts to designated critical habitat for both desert tortoise and southwestern willow flycatcher, and Figure 5-12 shows the Impact and Low Impact Areas in relation to Critical Habitat. Impacts from Covered Activities may include loss of critical habitat through conversion as well as degradation of adjacent critical habitat. A summary of potential impacts from Covered Activities is briefly described below.

Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

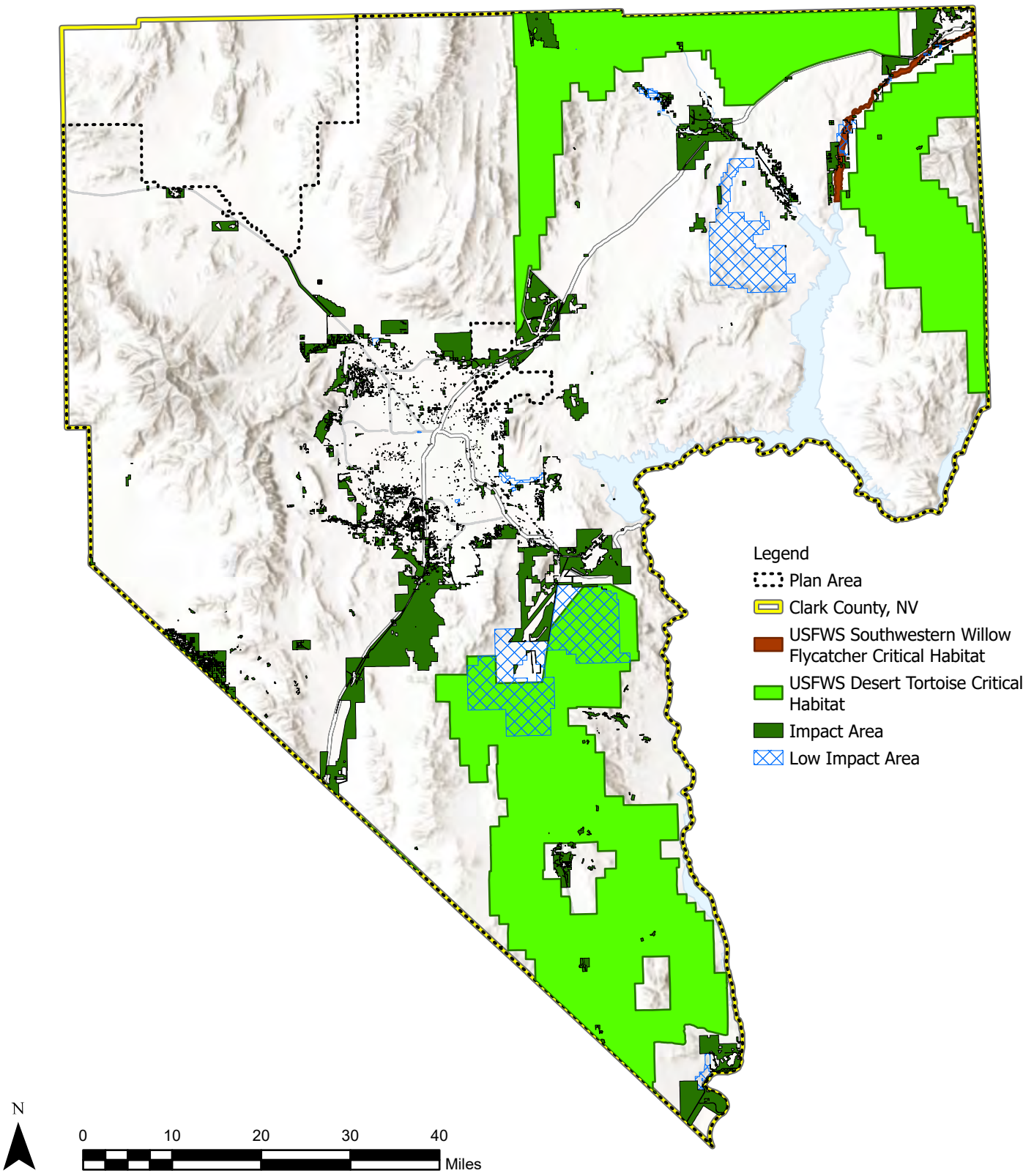

Figure 5-12. Critical Habitat and Impact Area in Plan Area

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Table 5-25. Designated Critical Habitat within the Plan Area and Proposed Impacts

Species	Total Acres Designated	Acres in the Plan Area	Acres in the Development Area	Percent in the Development Area	Acres in the Low Impact Area
Desert tortoise	6,446,200	933,323	9,293	0.1	68,971
Southwestern willow flycatcher	208,973	8,008	1,055	0.5	1,306

5.6.1 Mojave Desert Tortoise

A total of 6,446,200 acres throughout the range of desert tortoise were designated as critical habitat (USFWS 1994). Three critical habitat units are present within the Plan Area, Gold Butte-Pakoon Unit, Mormon Mesa Unit, and the Piute-Eldorado Unit, encompassing approximately 933,323 acres (14.5 percent) of designated desert tortoise critical habitat (Table 5-26). The proposed Development Area encompasses less than 2 percent of the total area in a unit.

Table 5-26. Desert Tortoise Critical Habitat Potential Impacts by Unit

Critical Habitat Unit Name	Total Acres Designated	Acres in the Plan Area	Acres in the Development Area	Percent in the Development Area	Acres in the Low Impact Area
Gold Butte-Pakoon	488,985	190,479	536	0.1	0
Ivanpah	633,706	0	0	0	0
Mormon Mesa	429,476	245,324	6,479	1.5	1
Piute-Eldorado	969,988	497,444	2,278	0.2	68,970

The physical and biological features that support nesting, foraging, sheltering, dispersal, and/or gene flow are essential to the conservation of the desert tortoise as defined in the final critical habitat rule (USFWS 1994). These features are further defined by:

- Sufficient space to support viable populations within each of the six recovery units and provide for movements, dispersal, and gene flow
- Sufficient quantity and quality of forage species and the proper soil conditions to provide for the growth of such species
- Suitable substrates for burrowing, nesting, and dormant periods
- Burrows, caliche caves, and other shelter sites
- Sufficient vegetation for shelter from temperature extremes and predators
- Habitat protected from disturbance and human-caused mortality

Covered Activities under the MSHCP Amendment may result in the permanent loss of 9,304 acres (0.14 percent) of the total 6,446,200 acres of desert tortoise critical habitat and 0.01 percent of the critical habitat in the Plan Area (Table 5-26). The entirety of designated critical habitat within the proposed Development Area is under private landownership and not currently under public management such as BLM land planned for disposal. This estimate provides for the maximum

potential impact area. As shown on Figure 5-12, proposed impacts are dispersed and the loss would not result in barriers to movement within critical habitat units. In addition, avoidance and minimization measures are included and described in Chapter 6 in order to reduce potential for indirect impacts of Covered Activities on adjacent habitat. Measures include project design best practices to limit edge effects of Covered Activities such as lighting or increased human disturbance. A loss of 0.14 percent of total critical habitat would not reduce the capacity of the critical habitat units to support viable populations of desert tortoise or eliminate other physical and biological features such that the functions of critical habitat would be lost. Covered Activities would not result in an adverse modification to any of the three critical habitat units as a whole or desert tortoise critical habitat as a whole.

5.6.2 Southwestern Willow Flycatcher

A total of 1,227 stream miles encompassing an estimated 208,973 acres of critical habitat has been designated for the southwestern willow flycatcher in Arizona, California, Colorado, Nevada, New Mexico, and Utah (USFWS 2013). The Plan Area contains 30 miles of the 94-mile Virgin Management Unit, and 3.8 percent of the total designated critical habitat. The physical and biological features determined to be essential for the conservation of southwestern willow flycatcher are riparian vegetation with dense thickets and foliage in tree or shrub canopies, and insect prey populations (USFWS 2013). These features support roost sites and nesting grounds, and may be influenced by seasonal wetlands, water quality, and soil type amongst other factors. The Virgin River Management Unit is designated for metapopulation stability, gene flow and connectivity, and potential for population growth and colonization (USFWS 2013).

Covered Activities under the MSHCP Amendment that may affect southwestern willow flycatcher critical habitat include development along streams and riparian areas, and there is potential for indirect effects from agricultural conversion, wells, and irrigation ditches supporting riparian vegetation. Operation and maintenance of public and private infrastructure could also affect critical habitat although only new infrastructure is anticipated to potentially result in a loss of critical habitat, and maintenance is restricted to temporary effects.

Covered Activities would permanently impact and potentially result in permanent loss of 1,055 acres (10.9 percent) of the 9,643-acre Virgin Management Unit, and 0.5 percent of the total 208,973 acres of southwestern willow flycatcher critical habitat (Table 5-25). This estimate provides for the maximum potential impact area. Proposed impact areas are shown in relation to critical habitat in Figure 5-12. The loss would not result in barriers to movement within the critical habitat unit. In addition, avoidance and minimization measures are included and described in Chapter 6 in order to reduce potential for indirect impacts of Covered Activities on adjacent habitat. Measures include project design best practices to limit edge effects of Covered Activities such as lighting or increased human disturbance. A loss of 0.5 percent of total critical habitat would not reduce the capacity of the critical habitat units to support viable populations of southwestern willow flycatcher or eliminate other physical and biological features such that the functions of critical habitat would be lost. Covered Activities would not result in an adverse modification to the Virgin Management Unit as a whole or southwestern willow flycatcher critical habitat as a whole.

5.7 Anticipated Impacts of the Taking

The effects to species are described in Section 5.2 above and an estimate of proposed impacts using habitat Functionality Scores is provided in Section 5.5. The analyses presented in this chapter are based on best available information regarding species and effects of Covered Activities. The avoidance and minimization measures described in Chapter 6 will be implemented

by Covered Activities to minimize direct and indirect impacts on species and their habitats including habitats adjacent to Covered Activities. Measures include project design best practices to limit edge effects of Covered Activities such as lighting, noise, or other disturbances. Chapter 6 also describes the Reserve System to be managed as part of the MSHCP Amendment to mitigate for unavoidable take.

Several of the species' habitat groups are comprised completely of plant species for which there are no take prohibitions. These groups are wind-blown sand, sandy soil, and playa fringe. For these groups the analysis shows that a small percentage of the habitats may be converted, and the Covered Activities are not anticipated to result in jeopardy for the Covered Plant Species.

The MSHCP Amendment will result in habitat loss as a result of Covered Activities, and indirect effects may result in habitat degradation; however, these impacts will be minimized and compensated or mitigated for based on the Conservation Strategy (Chapter 6). The Reserve System and Low Impact Area will provide at a minimum, an equal amount of habitat functionality, as measured by the Habitat Functional Score for Covered Wildlife Species, and in many instances substantially more habitat functionality than the areas proposed to be impacted. Overall, the Conservation Strategy will manage and restore habitats to further improve habitat quality for Covered Species to maintain stable or increasing populations within the Reserve System and meet the MSHCP Amendment's Biological Goals and Objectives. The MSHCP Amendment will not reduce the likelihood of survival and may contribute to the recovery of Covered Species.

6.0 CONSERVATION PROGRAM

The MSHCP Conservation Strategy defines what the program will achieve through its Biological Goals and how those Goals will be achieved through measurable, incremental Biological Objectives. The Conservation Strategy also describes the Measures that will be taken to avoid and minimize take and to restore and protect Conservation Values. The Monitoring and Adaptive Management Strategy defines how MSHCP progress is monitored and tracked and how needs for adjustments are identified and acted upon to ensure the long-term conservation of the Covered Species. Finally, the reporting framework of the Conservation Strategy stipulates how program outcomes are reported over time. The Conservation Strategy is based on the needs of Covered Species, with attention to the overall conservation landscape and its potential to change over time. The landscape-scale Conservation Strategy will be achieved through establishment of the Reserve System, which includes public lands (BLM ACECs or other designations, as applicable) and private lands within the Plan Area.

Biological Goals and Objectives are described in Section 6.1. Biological Goals define what the MSHCP will accomplish and lay the foundation of the Conservation Strategy. Biological Objectives describe the measurable outcomes that must be achieved to collectively reach the Biological Goals, connecting the overarching vision for the program to on-the-ground conservation and mitigation actions.

The Conservation Measures (Avoidance and Minimization) section (6.2) describes the measures that will be taken to ensure that Covered Activities avoid and minimize take of Covered Species, consistent with Federal ESA Section 10[a][2][A][ii]. The Conservation Measures are grouped into three categories: Project Design, General Construction, and Species-Specific. Project Design Measures reduce stressors that could result in indirect impacts or take of Covered Species following implementation or construction of a Covered Activity. General Construction Measures minimize impacts and stressors to Covered Species and their habitats during construction or implementation of all Covered Activities. Species-Specific Measures are additional measures required before or during implementation of Covered Activities when disturbance occurs in an area designated as potentially occupied by a Covered Species.

The Measures to Mitigate Unavoidable Take section (6.3) describes the Reserve System, which mitigates take that occurs after AMMs have been implemented. The Reserve System includes both federal and private lands but is predominantly federal, reflecting the land ownership composition of the Plan Area. The Reserve System and associated mitigation actions, including restoration, enhancement, and land acquisition, are central to the Biological Goals and Objectives (BGOs) and are needed for successful implementation of the MSHCP.

The Monitoring and Adaptive Management Plan (MAMP) section (6.4) includes biological effectiveness monitoring, compliance monitoring, and an adaptive management plan. Monitoring results inform whether BGOs are being met and whether corrective actions or adjustments are needed.

The final section of the Conservation Strategy (6.5) describes the MSHCP reporting framework. Reporting requirements address project status and impacts; take; avoidance, minimization, and monitoring; and changed circumstances.

Each element of the Conservation Strategy, and particularly the BGOs, was developed to align with the following DCP values (Alta 2020). These values are embedded in all DCP projects and day-to-day activities. Although they are not strictly biological in nature, their importance to successful implementation of the MSHCP and the BGOs should not be undervalued.

- Commitment to stakeholder inclusion (e.g., by expanding collaborations across multiple jurisdictions, engaging with stakeholders early in the process).
- Holistic approach to conservation and management that considers the multiple uses within Clark County.
- Commitment to learning and adapting that promotes the conservation of species.

6.1 Biological Goals and Objectives

The MSHCP Amendment BGOs have been developed through successive iterations, beginning with those in the 2000 MSHCP. In April 2016, DCP staff and the independent Science Advisor Panel revised the original BGOs during a joint workshop, with the intent that the revised set could be tested and refined for applicability to the MSHCP Amendment. The workshop applied a structured, category-based framework organized around riparian and desert upland habitats and evaluated each candidate goal and objective against six criteria: relevance to the MSHCP, achievability, affordability, durability of the underlying lands, measurability, and biological information quality (Science Advisor Panel 2016). That effort produced four goals and 11 objectives for riparian habitat and four goals and 13 objectives for desert upland habitat, which were finalized in 2017 and informed the Monitoring and Adaptive Management Plan (MAMP).

The Science Advisor Panel produced a further draft revision in September 2020 (Science Advisor Panel 2020) as part of the MAMP Adaptive Management Evaluation Process, refining the BGOs to be more scientifically meaningful, quantifiable, and practical to implement. The BGOs and MAMP were then reviewed and revised in 2022, and the BGOs were finalized in the 2023 MAMP (Alta 2023), which consolidated them into three overarching goals supported by 14 objectives addressing habitat quality and quantity, Covered Species populations, and community and stakeholder engagement. The BGOs presented in this chapter are derived from these prior efforts and additionally incorporate climate change and regional threats analyses, habitat suitability mapping, and an understanding of existing conditions and Critical Habitat. They are also designed to meet the SMART principles set out in the USFWS and NMFS Habitat Conservation Planning Handbook (2016), under which objectives must be specific, measurable, achievable, result-oriented, and time-fixed.

Biological Goals lay the foundation of the Conservation Strategy by defining what the MSHCP will accomplish, and all other components of the Conservation Strategy are based on these Goals. Biological Objectives are the measurable, incremental steps that must be completed to achieve the Biological Goals. They are based on the needs of Covered Species but also consider the broader conservation context and anticipated future changes to the landscape.

The Biological Goals and corresponding Biological Objectives are summarized in Table 6-1 and described in more detail below. Most BGOs are specific to the Reserve System, though some apply to the broader Plan Area to improve habitat management and reduce impacts in collaboration with other public entities that oversee non-Reserve System lands. These broader BGOs help ensure the long-term conservation of the listed species.

Table 6-1. Summary of SMART BGOs for the MSHCP

Goals and Objectives			AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring /Timing	Ideal Result	Time-fixed Reporting
Biological Goal 1. Maintain or improve habitat quality and quantity within Reserve System lands to promote resiliency, redundancy, and representation for Covered Species.						
Objectives	1.1	Utilize invasive species treatment methods to maintain or decrease the eight-year average area requiring weed management.	Section 6.2.2 • GCM-4 (erosion control) • GCM-5 (weed management plan)	Section 6.4.1.1.1 The DCP will participate in the Early Detection Rapid Response (EDRR) Program in cooperation with Clark County Vector Control or other applicable agencies/entities. Methods for establishing baseline conditions (within first three years after MSHCP Amendment implementation), and for monitoring and measuring changes in the eight-year average acreage treated will be detailed in a Weed Management Plan to be developed and approved by the	Maintain or decrease invasives	Annual Progress Report - EDRR Program activities will be reported in the year they are completed, and will be appended to the Weed Management Plan. Five-Year Monitoring Report - the eight-year average area requiring treatment and any weed management actions in the preceding five years will be reported. Other - Any additional details to be included in Annual Progress or Five-Year Monitoring Reports will be detailed in the Weed Management Plan and the EDRR Program.

Goals and Objectives			AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring /Timing	Ideal Result	Time-fixed Reporting
				USFWS within the first two years after baseline conditions are established.		
	1.2	Acquire riparian acreage at an equivalent rate as take over the life of the permit. An eight-year lag after riparian acreage is developed is allowed to account for the willing-seller, willing-buyer basis of property exchange, within the life of the permit.	N/A	Section 6.4.1.1.2 Use habitat functionality assessments outlined in Chapter 5 to measure and compare riparian impacts and mitigation, and to target habitat acquisition in high quality areas at the landscape level. Use the site-specific Restoration Crediting Methodology (Appendix F) to measure credits for habitat improvement from riparian restoration or enhancement activities at the site level.	1:1 ratio of acquired to impacted acreage	Annual Progress Report – Will include habitat functionality assessment, summary of impacts and preserved riparian habitat in the Reserve System, and summary of credits gained from site-specific Restoration Credit Methodology.

Goals and Objectives		AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring /Timing	Ideal Result	Time-fixed Reporting
1.3	Protect, restore, or otherwise increase the quality and quantity of habitat for MSHCP Covered Species, as determined by the monitoring methods, definition of quality, and timeframes specified in the MAMP. Essential sediment sources for threecorner milkvetch and sticky buckwheat habitat will be identified when possible.	Section 6.2.1 Project Design Measures. Section 6.2.2 General Construction Measures Section 6.2.3 Species-Specific Measures	Section 6.4.1.1.2 Use the quantitative methods detailed in the MAMP and habitat functionality assessments outlined in Chapter 5 to measure habitat quality at the landscape scale and use the site-specific Restoration Crediting Methodology (Appendix F) to measure habitat improvements from restoration or enhancement activities at the site level. Review species habitat functionality models every five years.	Increased quality/quantity of habitat	Annual Progress Report – Habitat monitoring results will be presented. Essential sediment source review included in Annual Progress Report in the year it is completed. Five-Year Monitoring Report – Will summarize existing habitat quality changes in the Plan Area, including impacts and the Reserve System. Changes measured by habitat functionality assessments and site-specific Restoration Credit Methodology. First Five-Year Monitoring Report will include summary of review and any recommendations for avoidance. Subsequent Five-Year Monitoring Reports will include status updates of impacts to the sediment sources, if any, to support habitat for threecorner milkvetch and sticky buckwheat.

Goals and Objectives			AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring /Timing	Ideal Result	Time-fixed Reporting
	1.4	Incorporate natural ecological, hydrological, and geomorphological processes into restoration design and implementation to maintain ecological integrity, ecosystem function, and biological diversity. Include consideration that climate change may result in significant changes in these processes over historical frequencies and magnitudes. Review incorporation using project-level worksheets.	N/A	Section 6.4.1.3 DCP will measure the incorporation of (at least three) processes into restoration design and implementation by providing a count of projects where these processes were incorporated.	Improved restoration success	Annual Progress Report - Document that all projects incorporated appropriate natural processes using best available scientific and commercial information. Five-Year Monitoring Report - Review incorporation of objectives using project-level worksheets.
	1.5	Identify critical uncertainties (e.g., climate change, human population growth) of MSHCP-funded projects on DCP Reserve System lands and report on them in biennial updates to the DCP Reserve System Management Plans. The aim is to be explicitly cognizant of large-scale conditions that may derail MSHCP-funded projects' success.	N/A	Section 6.4.1.1.3 DCP will measure the identification of uncertainties in Reserve System projects by including descriptions of uncertainties in updates to management plans.	Improved management success	Management Plan Updates – Update sections describing critical uncertainties when Reserve System management plans are updated to maintain awareness of changing conditions and risks.

Goals and Objectives			AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring /Timing	Ideal Result	Time-fixed Reporting
	1.6	Incorporate concepts of ecosystem redundancy and representation to promote ecological resiliency in the updates to the DCP Reserve System Land Management Plans.	N/A	DCP will measure incorporation of at least two ecosystem redundancy/representation concepts by including them in management plan updates.	Improved management success	Management Plan Updates – Update sections describing ecosystem redundancy and representation when Reserve System management plans are updated.
	1.7	Protect and enhance connectivity (e.g., road restoration, culvert placement) within DCP Reserve System lands for desert tortoise and other high priority Covered Species. Review and report on the status of these projects.	Section 6.2.1 • PDM-1 • PDM-2 • PDM-3	Section 6.4.1.1.4 DCP will complete a Connectivity Management Plan identifying key locations and actions for maintaining or enhancing connectivity within the first three years of MSHCP Amendment implementation.	Improved connectivity	Annual Progress Report - Document completion of connectivity improvement projects in Annual Progress Reports in the year conducted. Five-Year Monitoring Reports - summarize all improvements made within the previous five years. Connectivity Management Plan will be updated every five years at a minimum to include new opportunities, threats, and potential projects for the next five years of implementation.

Goals and Objectives			AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring /Timing	Ideal Result	Time-fixed Reporting
Biological Goal 2: Maintain stable or increasing populations of Covered Species occurring within DCP Reserve System lands.						
Objective	2.1	Monitor covered wildlife species as described in the MAMP. Report quantitative population data, as described in the MAMP, for Covered Species annually in the Annual Progress Report and report statistical analyses of population trends in each Five-Year Monitoring Report.	Section 6.2.3 Species-specific AMMs	6.4.1.2 Species Monitoring DCP will survey and report on Covered Species following methods detailed in the MAMP.	Collect actionable data	Annual Progress Report - all survey results will be included. Five-Year Monitoring Report – will include updates on management, restoration, and enhancement activities, and updates on habitat suitability model review. Five-Year Reports will include statistical analysis of Covered Species monitoring data.

Goals and Objectives		AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring/Timing	Ideal Result	Time-fixed Reporting
2.2	Conduct surveys for covered plant species as described in the MAMP. Protect, conserve, and monitor known occurrences of these species annually. Report quantitative population data as described in the MAMP annually in the Annual Progress Report, and report statistical analyses of population trends in each Five-Year Monitoring Report.	Section 6.2.1 – 6.2.3 Project design, general construction, and species-specific AMMs	Section 6.4.1.1.3 The DCP will review and identify essential sediment sources, if found, for threecorner milkvetch and sticky buckwheat habitats within the first year of MSHCP Amendment implementation. Section 6.4.1.2 DCP will survey and report on Covered Species following methods detailed in the MAMP. Species monitoring protocols/methodologies to be peer-reviewed by the Science Advisor Panel within the first 18 months of MSHCP Amendment implementation or prior to first monitoring surveys, whichever comes first.	Collect actionable data	Annual Progress Report – report survey results in the year surveys were conducted. Five-Year Monitoring Report - Reports will include a summary of survey results and an analysis of population trends in the Reserve System. Any additional data noted in species monitoring protocols will also be included. Statistical analysis of population trends will be included in each Five-Year Report.

Goals and Objectives			AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring/Timing	Ideal Result	Time-fixed Reporting
	2.3	Translocate and augment desert tortoise populations in accordance with USFWS guidance through translocation programs that achieve survivorship rates within 20 percentage points of resident tortoise survival rates in the same areas (or with survivorship as prescribed by revisions to USFWS guidance; USFWS 2020). Report survivorship data annually in the Annual Progress Report and report analysis on aggregated translocated tortoise survivorship compared to aggregated resident tortoise survivorship in every Five-Year Monitoring Report.	N/A	DCP will translocate and monitor survival of desert tortoises, quantifying translocation events and survival rates.	Equivalent survivorship	Annual Progress Report - Report survivorship data annually Five-Year Monitoring Report - Report analysis on aggregated translocated tortoise survivorship compared to aggregated resident tortoise survivorship.

Goals and Objectives		AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring/Timing	Ideal Result	Time-fixed Reporting
2.4	Ensure the best available scientific information is being evaluated and incorporated into population management efforts for Covered Species, including monitoring methods and identification of critical uncertainties (e.g., climate change, human population growth), by completing a focused literature review (or Systematic Review) and updating it in each Five-Year Monitoring Report.	N/A	Motivation is to ensure that the best available science is reviewed and incorporated into the monitoring and management efforts described in the MAMP. Review and incorporation is measured by the number of updates and changes, which can occur more frequently than the Five-Year Monitoring Report.	Best available scientific information is used	Five-Year Monitoring Report – Update literature review on new Covered Species ecology, new monitoring methods and technology, and new critical uncertainties. Changes to monitoring and management efforts as a result of the literature review should also be reported on.

		Goals and Objectives	AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring/Timing	Ideal Result	Time-fixed Reporting
Biological Goal 3: Foster community and stakeholder engagement to maintain or improve Covered Species populations and their habitats						
Objectives	3.1	Develop and disseminate educational materials that cover the following topics: 1) the value of the desert ecosystem in Clark County; 2) promote responsible recreation; 3) promote following development procedures; and 4) avoid and minimize impacts to the environment. Summarize outreach efforts in the Annual Progress Report. Re-evaluate material's relevance (branding, technology, social and recreation trends, etc.) in every Five-Year Monitoring Report.	Section 6.2.4 Outreach Program	Section 6.4.1.3 DCP will develop education materials on the four topics to be disseminated. Development and dissemination efforts will be measured by a list of the products developed/disseminated.	Public and developer education	Annual Progress Report - A summary of outreach activities will be provided. Five-Year Monitoring Report – Include assessment of educational materials to maximize their relevance and effectiveness.
	3.2	Protect habitats within the BCCE from unauthorized land use through vigilance (by patrolling an average of at least 100 hours each month) and education (by providing information during encounters). Compile and report data annually.	N/A	Section 6.4.1.3 Law enforcement presence will be measured by the hours / month, numbers, and descriptions of encounters.	Reduce unauthorized uses	Annual Progress Report - The patrol hours within the Reserve System, any additional data per Reserve System lands, and number of incidents in Reserve System lands within the reporting year will be documented in the Annual Progress Report.

Goals and Objectives			AMMs Supporting Objective (if applicable)	Specific, Measurable, Achievable Monitoring/Timing	Ideal Result	Time-fixed Reporting
	3.3	Provide info to permitted users about BMPs to comply with the avoidance & minimization measures and associated reporting procedures	Section 6.2.2 – 6.2.3 General construction and species-specific AMMs Section 6.2.4.1 Developer Outreach	Section 6.4.1.3 Education will be measured by a count of educated permitted users, or a count of events held.	Education of permitted users	Annual Progress Report - A summary or list of BMPs provided to permitted users in the preceding year. Report number of projects permitted each year.

Biological Goal 1. *Maintain or improve habitat quality and quantity within DCP Reserve System lands to promote resiliency, redundancy, and representation for Covered Species.*

This goal extends habitat management, habitat improvement, and the avoidance and minimization of project impacts to the entire Plan Area. Although some of these objectives reach beyond the County's direct control, they are intended to foster collaboration with the Permittees and other natural resource management entities and to enable the MSHCP to support other regional conservation efforts. Such collaboration will improve landscape-scale planning and the long-term viability of Covered Species.

Objective 1.1. Utilize invasive species treatment methods to maintain or decrease the eight-year average area requiring weed management.

This objective recognizes the threat posed by invasive plant species and seeks to prevent their spread and establishment in new areas of the Reserve System. Non-native species, and invasive species in particular, can degrade habitat quality in pernicious ways: outcompeting native food species, altering fire regimes to the detriment of Covered Species populations or their habitat, and reducing the utility of road culverts designed for wildlife movement (RECON 2022). The inventory, removal, and long-term control of invasive and non-native plant species will help ensure the integrity and proper functioning of Reserve System lands. A sub-objective has been identified to support completion of Objective 1.1:

- *A Weed Management Plan will be developed for describing baseline conditions and identifying essential areas for targeting weed control to promote resiliency, redundancy, and representation of Covered Species. The Weed Management Plan will be approved by the USFWS within the first two years of MSHCP Amendment implementation.*

Objective 1.2. Acquire riparian acreage at an equivalent rate as take over the life of the permit. An eight-year lag after riparian acreage is developed is allowed to account for the willing-seller, willing-buyer basis of property exchange, within the life of the permit.

This objective aims to increase the area and habitat quality of riparian Reserve System lands as direct mitigation for development-related loss of riparian habitat. Acquired riparian habitat must be equivalent to or greater in quality and quantity than habitat lost to Covered Activities, as determined by the landscape-level habitat functionality assessments described in Chapter 5. The habitat functionality assessment will be used to record the Habitat Quality Index for acquired properties and conservation easements for MSHCP reporting, and it also serves as a tool for identifying high-quality riparian habitat to target for Reserve System acquisition or conservation easements.

Restoration and enhancement actions will also be conducted to improve the quality of acquired riparian habitat. Habitat quality improvements achieved through these actions will be assessed using the site-specific Restoration Crediting Methodology (Appendix F), which assigns mitigation credit to a project post-restoration. Use of a consistent crediting methodology will help maintain and increase riparian habitat in the Plan Area.

Objective 1.3: Protect, restore, or otherwise increase the quality and quantity of habitat for MSHCP Covered Species, as determined by the monitoring methods, definition of quality, and timeframes specified in the MAMP.

The purpose of this objective is to achieve the long-term conservation and recovery of Covered Species' habitats by protecting existing habitat and restoring degraded habitat. Covered Species

need suitable habitat that provides the environmental conditions (e.g., substrate, elevation, vegetation communities) in which their populations can be maintained or increased over time.

Multiple landscape-level factors often influence habitat suitability for a species within its range (Bellamy et al. 2013; Heller and Zavaleta 2009). Species habitat functionality models can improve understanding of the environmental variables (e.g., soils, elevation, topography, slope, and climate) correlated with species presence, supporting distribution predictions and landscape-level conservation planning (Benito Garzon et al. 2006; Fourcade et al. 2014; Bellamy et al. 2013). Habitat suitability models are described in Appendix A and Chapter 3 and provide species-specific estimates of potential suitable habitat within the Plan Area. Given the large number of Covered Species and their varying habitat requirements, habitat functionality assessments were developed to incorporate these models and are described in Chapter 5. The assessments provide consistent methods to quantify habitat quality, accounting for factors such as impervious land cover, fragmentation, and proximity to water, and allow for improved comparisons of impacted and mitigation habitats. The DCP will use the habitat functionality assessments to evaluate the habitat quality of impacted and protected habitats and to demonstrate higher Habitat Quality Indices for protected habitats relative to impacted habitats. Site-specific measurements of habitat quality improvements to Riparian Reserve Units achieved through restoration, enhancement, or other efforts will be measured using the Restoration Crediting Methodology (Appendix F).

The habitat functionality models will be updated every five years, and new data on Covered Species distributions and other relevant information will be incorporated into the revised models. This objective ensures that the most up-to-date information is considered in management activities. To verify that the habitat functionality models are being reviewed regularly, the following sub-objectives have been identified:

- *Covered Species habitat functionality models will be reviewed every five years for topics including new occurrence data, accuracy with known distribution, and new data on important environmental variables.*
- *If new data for a Covered Species may influence the habitat functionality model results, the model for this species will be revised to include this data.*

Objective 1.4. Incorporate natural ecological, hydrological, and geomorphological processes into restoration design and implementation to maintain ecological integrity, ecosystem function, and biological diversity. Include consideration that climate change may result in significant changes in these processes over historical frequencies and magnitudes.

Natural ecological processes are inherent in the functioning habitat that Covered Species require, so incorporating these processes into restoration design increases the likelihood of achieving functional habitat and overall restoration success. Restoration failures can often be attributed to a lack of consideration of erosion, water table depth, and flood and scouring events. Restoration efforts should incorporate ecological processes into design and implementation to support the goal of maintaining, improving, and expanding habitat for Covered Species. Restoration of natural ecological and hydrological processes may include restoring sediment transport, encouraging natural recruitment of native vegetation, increasing groundwater recharge, increasing primary productivity, and allowing for natural hydrological regimes. Through annual reviews of all restoration projects, the DCP can verify that restoration efforts incorporate appropriate design components to promote ecological processes and that this objective is being met.

Objective 1.5. Identify critical uncertainties (e.g., climate change, human population growth) of MSHCP-funded projects on DCP Reserve System lands and report on them in biennial updates to the DCP Reserve System Management Plans.

The motivation of this objective is to ensure that large-scale critical uncertainties, which are essentially unforeseen circumstances that might negatively impact or impede management actions, are regularly assessed. Due to the length of the Permit, future critical uncertainties may not be identifiable at the beginning of the Permit, and thus regular assessment is necessary.

Objective 1.6. Incorporate concepts of ecosystem redundancy and representation to promote ecological resiliency in the biennial updates to the DCP Reserve System Management Plans.

This objective is intended to ensure that management of the Reserve System is proactively and consistently designed to maximize long-term stability and effectiveness of the management actions. Ad hoc actions aimed at treating immediate symptoms are unlikely to succeed when they are misaligned with broader ecological processes that can either reinforce or counteract desired management outcomes.

Objective 1.7. Protect and enhance connectivity (e.g., road restoration, culvert placement) within DCP Reserve System lands for desert tortoise and other high priority Covered Species.

This objective is meant to ensure that Covered Species can safely move through habitat corridors and achieve sufficient genetic exchange for species population resilience, redundancy, and representation. Infrastructure related to Covered Activities will be designed and implemented to increase connectivity in high priority corridors, and existing infrastructure within Permittee's authority may be modified in identified high priority corridors. Additional methods may also be outlined such as facilitated migration or translocations as determined by the best available science to maintain genetic exchange and species population resilience. The following sub-objectives are identified to support achievement of Objective 1.7:

- *A Connectivity Management Plan (RECON 2022) for Clark County was developed focused on desert tortoise. DCP will update this Connectivity Management Plan within the first three years of MSHCP Amendment implementation to incorporate other non-volant wildlife species such as Gila monster and desert pocket mouse. The updated Connectivity Management Plan will include identification of key locations and actions for maintaining or enhancing connectivity under the authority of Permittees and recommendations for maintenance and management of genetic connectivity. Recommendations may include but are not limited to design guidance measures to minimize impacts to wildlife movement, restoration or wildlife corridor improvement projects, or more intense management actions such as translocations to maintain genetic and population connectivity. The updated Connectivity Management Plan will be updated every five years to include new opportunities, threats, and potential projects.*
- *Review and identify if there are key connectivity areas for plant Covered Species within the first five years of MSHCP Amendment implementation.*
- *Update the Connectivity Management Plan every 5 years to incorporate the best available science and to identify projects to improve habitat connectivity and/or genetic exchange of Covered Species populations to be targeted over the next 5-year timeframe.*

Biological Goal 2. Maintain stable or increasing populations of Covered Species occurring within DCP Reserve System lands.

While habitat loss is the direct impact of development, the ultimate biological concern is the fate and sustainability of MSHCP-covered plant and animal populations. If populations are stable or increasing, the fundamental goals of the MSHCP are likely being achieved. Monitoring, managing, augmenting, and protecting populations of Covered Species are actions that can be taken in pursuit of this goal. Stable or increasing populations indicate that conservation and management to offset habitat loss under the MSHCP is resulting in desired benefits to Covered Species.

Objective 2.1. Monitor covered wildlife species as described in the MAMP. Report quantitative population data, as described in the MAMP, for Covered Species in the Annual Progress Report and report statistical analyses of population trends in each Five-Year Monitoring Report.

The purpose of this objective is to ensure that populations are maintained over time and if populations are trending downward, adaptive management actions will be implemented. Monitoring methods and frequency and the approach to calculating annual average will depend on the species. Monitoring efforts may also be limited to certain areas of the Reserve System, which rotate from year to year. For some Covered Species, population data is not available to establish a baseline prior to the start of MSHCP Amendment implementation. For these Covered Species, surveys must be conducted early in MSHCP Amendment implementation to establish the baseline from which future data will be compared for trends. These efforts are described further in Section 6.4, below.

Objective 2.2. Conduct surveys for covered plant species as described in the MAMP. Protect, conserve, and monitor known occurrences of these species annually. Report quantitative population data as described in the MAMP annually in the Annual Progress Report and report statistical analyses of population trends in every Five-Year Monitoring Report.

Several plant species covered by the MSHCP are exceedingly rare or imperiled, and there is little to no knowledge of their true distribution across Clark County. Efforts must be undertaken to identify these populations and conservation measures and management actions must be implemented. Although much of this activity may occur on the Reserve System, identification and protection measures can also be carried out across the Plan Area, as appropriate. For these rare species, statistical analyses should be conducted when sufficient data are available for analysis. For covered plant species with currently known populations, protection measures and annual monitoring should be implemented and reported on annually. Implementation of plant-specific AMMs in Section 6.2.3.1 will assist in achieving this objective, as will the Covered Plant Species Habitat identification and monitoring efforts described in the MAMP (Section 6.4).

Objective 2.3. Translocate and augment desert tortoise populations in accordance with current USFWS guidance (USFWS 2020) through translocation programs that achieve survivorship rates within 20 percentage points of resident tortoise survival rates in the same areas (or with other survivorship as prescribed by future changes to USFWS guidance). Report survivorship data in the Annual Progress Report and report analysis on aggregated translocated tortoise survivorship compared to aggregated resident tortoise survivorship in every Five-Year Monitoring Report.

Biological Goal 3. *Foster community and stakeholder engagement to maintain or improve Covered Species populations and their habitats.*

Objective 3.1. Develop and disseminate educational materials that cover the following topics: 1) the value of the desert ecosystem in Clark County; 2) promote responsible recreation; 3) promote following development procedures; and 4) avoiding and minimizing impacts to the environment. Report outreach activities in the Annual Project Reports and re-evaluate material's relevance (branding, technology, social and recreation trends, etc.) in each Five-Year Monitoring Report.

This objective is intended to inform the general public, recreational users, and developers about the importance and sensitivity of the desert ecosystem and of restrictions and enforcement measures to avoid, or deter, inappropriate use of the land that may disturb Covered Species or damage their habitat. Education is provided through the DCP's Mojave Max program and through signage at major entrances and junctions of the Reserve System lands.

Objective 3.2. Protect habitats within the BCCE from unauthorized land use through vigilance (by patrolling an average of at least 100 hours each month) and education (by providing information during encounters). Compile and report data in each Annual Progress Report.

While the number of incidents is difficult to control because it is influenced by a variety of factors, the DCP will commit to implementing a certain number of patrol hours for law enforcement to increase the likelihood of detecting unauthorized use, as well as deterring unauthorized use, on Reserve System lands. The number of hours within each Reserve System Unit will not be equal as there are differences in size and public use. The number of hours that DCP will commit on public Reserve System lands will be collaboratively managed and implemented between DCP and BLM as described in the CMAs. The number of patrol hours which this objective commits to is in addition to BLM patrols on public Reserve System lands.

Objective 3.3. Provide information to permitted users (project proponents, construction personnel, researchers, biological consultants) about BMPs for the desert tortoise and associated reporting procedures. If BMPs are developed for other Covered Species, this objective would expand to apply to them also. Compile data and provide a summary or list of BMPs provided to permitted users in the preceding year in each Annual Progress Report. Report number of projects permitted each year.

This objective relates to the general construction and species-specific AMMs (Sections 6.2.2 and 6.2.3 below). Its purpose is to ensure that project proponents are adequately trained and potential impacts to Covered Species are reduced. Ten percent of randomly selected projects will be monitored on an annual basis to ensure implementation of the AMMs.

6.2 Conservation Measures – Avoidance and Minimization

In compliance with Federal ESA Section 10[a][2][A][ii], measures to avoid and minimize take of Covered Species are provided in this section. Project design measures are intended to reduce stressors that can result in indirect impacts to or take of Covered Species. These measures function under Objective 1.3 to meet Biological Goal 1 of maintaining or improving habitat quality for Covered Species within the Plan Area. Construction measures are general measures for all construction projects to minimize impacts to habitats of and temporary stressors to Covered Species. These measures function under Objective 1.3 but also Objective 3.3 to meet Biological Goal 3 to foster community and stakeholder engagement.

Two zones within the Plan Area, Zone A and Zone B, have been designated to guide how AMMs will be implemented (Figure 6-1). Zone A includes areas within highly urbanized and developed boundaries and are generally infill locations or vacant land adjacent to these locations with minimal potential to encounter most Covered Species including desert tortoise. The boundaries of Zone A are based upon areas with a high degree of fragmentation, substantial barriers or hazards to movement for desert tortoise, and findings from an internal 2009 analysis (DCP 2009) that 98 percent of desert tortoises collected in these areas between 1996 and 2009 were pet or stray animals. The Zone A boundary was revised in 2022 in consultation with the USFWS to reflect current development and disturbance areas. Zone A includes measures to minimize indirect effects through project design and construction measures, but clearance surveys are not required for most species because of the low potential to directly encounter Covered Species. The remaining portions of the Plan Area are designated as Zone B and additional species clearance surveys and measures are required.

The following definitions pertain to the AMMs discussed in the following sections:

MSHCP Lead Species Biologist: A person with demonstrated experience working with target species and their habitat including conducting protocol surveys. For desert tortoise, Lead Species Biologists must also have demonstrated experience locating tortoise sign, burrow excavation, and oversight of tortoise fence installation. Resumes will be submitted to the DCP for approval prior to implementing the measures. Qualifications for desert tortoise lead biologists must meet the current USFWS standards. The DCP will also develop a Species Clearance class approved by the USFWS for biologists on desert tortoise biology clearance protocols. All MSHCP Lead Species Biologists must attend this class prior to conducting activities that may result in take covered under the MSHCP Amendment.

MSHCP Assistant Species Biologist: A person with demonstrated experience working with target species and their habitat including conducting protocol surveys. MSHCP Assistant Species Biologists are generally less experienced than MSHCP Lead Species Biologists and must be overseen by an MSHCP Lead Species Biologist when conducting clearance surveys or other activities approved under the MSHCP Amendment. Resumes will be submitted to the DCP for approval prior to implementing the measures. Attendance at the Species Clearance class is also required prior to conducting activities that may result in take covered under the MSHCP Amendment.

6.2.1 Project Design Measures in the Urban-Wildland Interface

The following Project Design Measures (PDMs) apply to the urban-wildland interface area, defined as the area where human development is within 660 feet of undisturbed natural areas, as delineated by the maximum limits of potential development (Figure 6-2). These standards apply

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, USGS

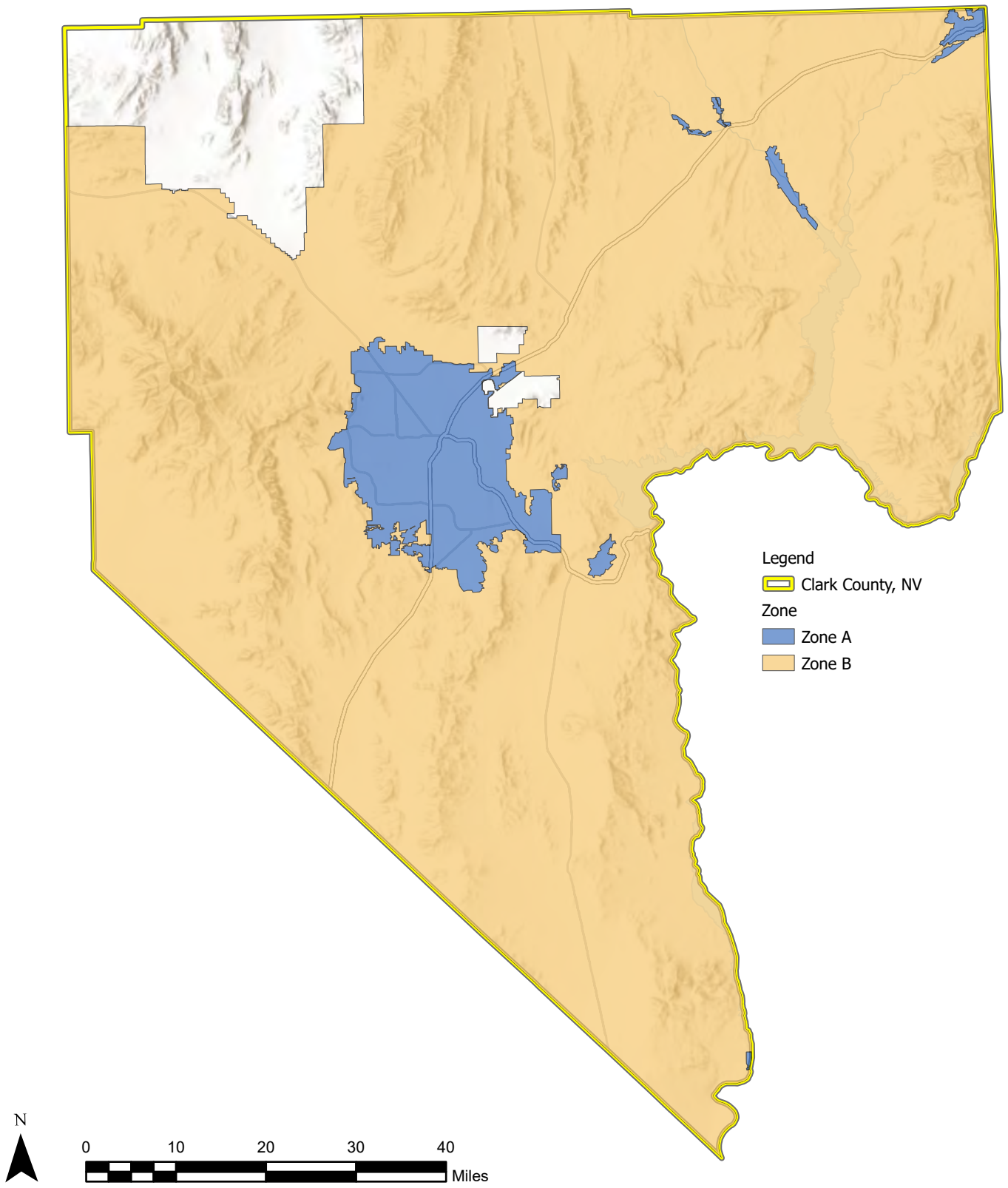

Figure 6-1. Zone A and Zone B

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Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

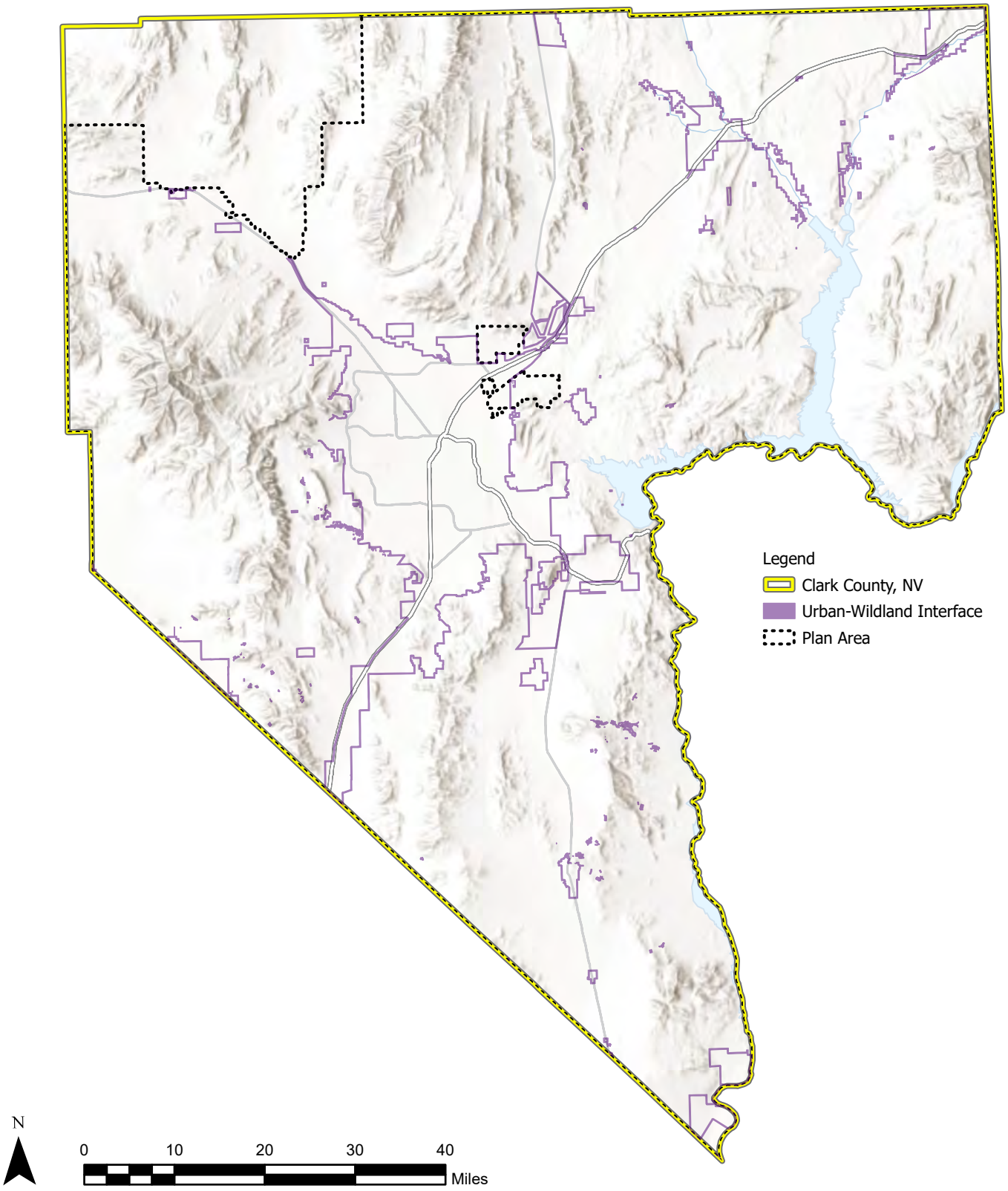

Figure 6-2. Urban-Wildland Interface Area

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to all non-residential developments and to residential developments of two units per acre or more. Design guidelines and recommendations will be provided by the DCP and adopted into the relevant development codes by each jurisdiction. The applicable standards and appropriate locations for PDMs will be determined during the development review process. Implementation of these measures supports Objective 1.3. Unless otherwise specified, the following measures apply to both Zone A and Zone B.

PDM-1 Barriers and Access Points. The following provisions shall be included for the management of unauthorized access, illegal dumping, illegal OHV activity, and other unauthorized uses.

a. Barriers will include installation of tortoise-proof barriers along the outer edge of the interface with wildlands.
b. Requirements that roads not terminate at the boundary of wildlands unless there is a planned access point.
c. Restrictions on the placement of new roads adjacent to wildlands to reduce incidence of domestic pets entering adjacent wildlands, to insulate wildlife that might enter urban areas from risk of vehicular mortality, to discourage desert dumping, and to prevent unauthorized vehicular access to wildlands.
d. If roads must be placed adjacent to natural areas, additional measures will be identified to minimize unauthorized access, illegal OHV use, dumping, wildlife incursions, and minimization of human-caused fire ignition. These may include, but are not necessarily limited to, the following:

    1. Fencing, including potential for tortoise fencing.
    2. Reduced speed limits.
    3. Warning signage.

e. Restriction on the allowance of access points, except where there are existing or planned trails, trailheads, visitor centers, and/or other approved public recreation areas.
f. Prohibition on the allowance of private gates from an individual homeowner's property into wildlands.

PDM-2. Edge Effects. The following provisions will be included to minimize edge effects onto adjacent wildlands and to protect adjacent habitat for MSHCP Covered Species:

a. Requirements for the use of drought-tolerant and non-invasive species such as those specified in the SNWA and Southern Nevada Regional Planning Coalition (SNRPC) Regional Plant List (2021, or subsequent updated versions). Use of native species is encouraged.
b. Requirements for establishing vegetated landscapes along the outer edge of the urban-wildlife area.
c. Specifications for drainage prescribing that water flows which are directed toward wildland areas incorporate appropriate filtration provisions into project designs to prevent transport of trash and debris into adjacent wildlands.
d. All outdoor lighting shall be designed to minimize light pollution into adjacent habitats and effects on wildlife, except where a Permittee determines lighting is necessary for public safety or security.
e. Signage to indicate that the adjacent wildlands include sensitive habitat and that unauthorized access outside of designated areas is prohibited.

PDM-3. Predator Subsidies. The following provisions will be included to minimize predator (e.g., coyotes, ravens) subsidies.

a. Trash containers. New developments must use wildlife-resistant refuse containers or a wildlife-resistant enclosure for all refuse. The container or enclosure shall be kept closed and secured, except when refuse is being deposited.
b. Utilities. All new or relocated above-ground utility infrastructure—including utility poles, lines, and cell towers—constructed within suitable desert tortoise habitat (as defined by the DCP's species distribution model) shall include measures to mitigate impacts to the desert tortoise and other Covered Species. The map in Figure 6-3 illustrates the areas in which this measure applies. Specific measures will be established at the direction of the authorizing agencies, which may include:

    1. Anti-perching devices or other measures to avoid/minimize their use by predatory avian species.
    2. Application of current APLIC guidance for structure designs to minimize perching surfaces.

6.2.2 General Construction Measures

The following General Construction Measures (GCMs) apply to construction activities within the urban-wildland interface area, defined as the area where human development is within 660 feet of undisturbed natural areas, as delineated by the maximum limits of potential development in each Permittee's jurisdiction. A map of the area is provided in Figure 6-2. These standards apply to all non-residential developments and to residential developments of two units per acre or more.

GCM-1. Night-time lighting. Control night-time lighting at construction sites. All temporary construction lighting (e.g., lighting for security or nighttime equipment maintenance) will be directed away from adjacent natural habitats and designed to minimize light pollution.

GCM-2. Trash management. All food items and scented trash at construction sites will be disposed of in wildlife-resistant containers and removed regularly to reduce attractiveness to opportunistic predators such as ravens, coyotes, and feral dogs. Containers shall be made of durable, non-chewable materials (such as metal or heavy-duty plastic) and shall have a lid that is kept closed to secure the contents. Scented trash includes, but is not limited to, cigarettes, cigars, gum wrappers, tissue, cans, paper, and bags.

GCM-3. Weed management. BMPs for weed management (including noxious weeds) shall be employed to minimize the potential introduction of weeds into the project area. Weed management will be conducted in accordance with all applicable State and County regulations and guidelines, as well as any applicable Weed Management Plan or EDRR Program.

The following GCM applies to all construction activities, regardless of location:

GCM-4. Wildlife Reporting. *(Note this GCM applies to all construction activities regardless of location.)*

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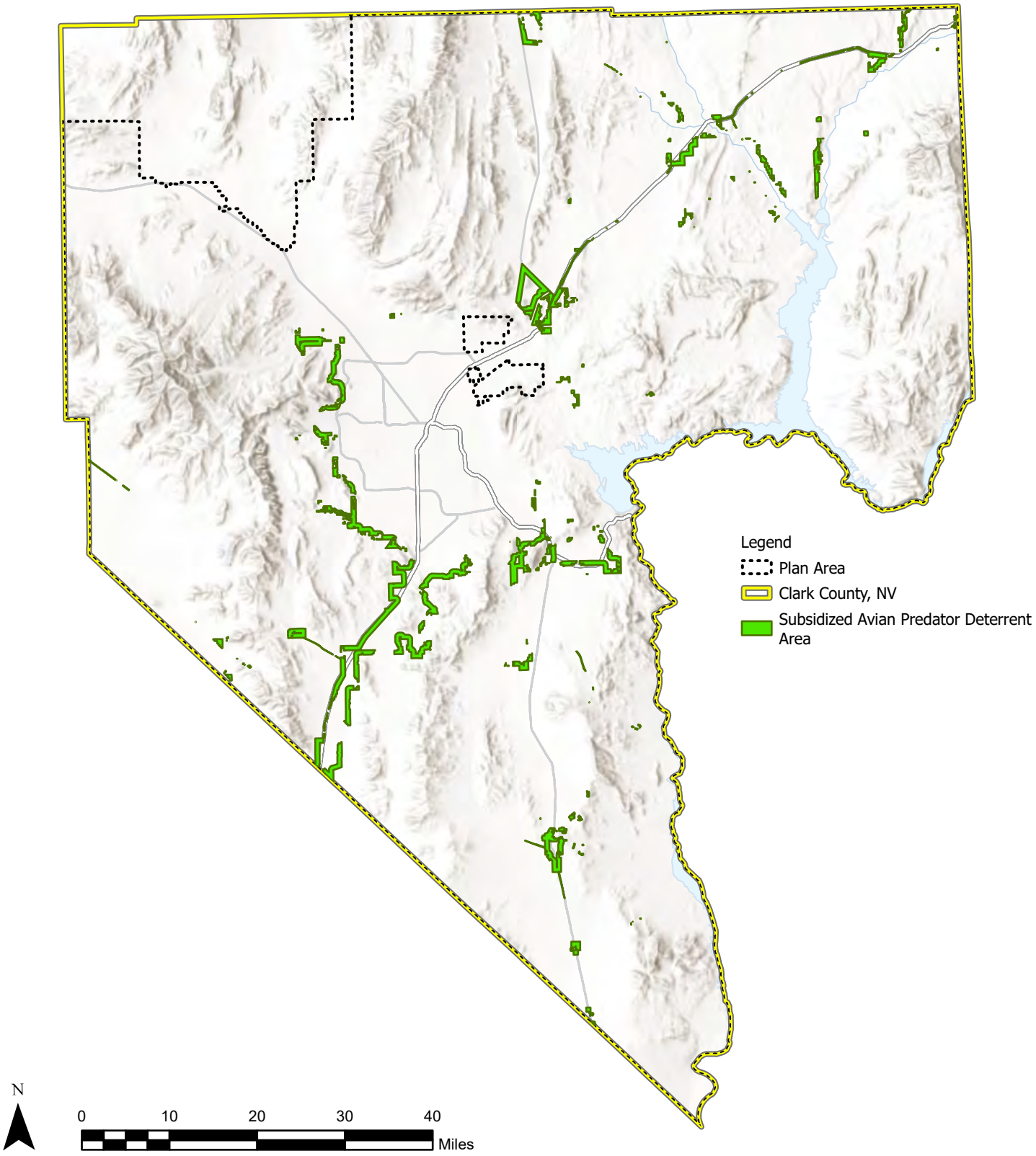

Figure 6-3. Subsidized Avian Predator Deterrent Area

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a. If desert tortoise, Gila monster, or burrowing owl are observed on the site during construction activities, all observances will be reported to the DCP as described in the worker education program (see 6.2.4 OUTREACH-1).
b. Take reporting. If accidental injury or death of any Covered Species occurs, workers will immediately inform the DCP as described in the worker education program (see 6.2.4 OUTREACH-1).

6.2.3 Species-Specific Measures

Additional AMMs for Covered Species will be implemented when disturbance-related project activities (construction or maintenance) occur in areas designated as potentially occupied by the species. Areas with potential for Covered Species occupation are identified by the County; contact the DCP or visit the website to determine whether Covered Species are anticipated to occur on a given parcel or property.

6.2.3.1 Plant Species

Plant Measures in All Locations

Some Covered Activities may occur in areas that support occurrences of Covered Plant Species. To minimize loss of genetic diversity within these rare plant taxa, seed collection will be attempted where practicable, or, where determined suitable for certain species or sites, transplantation or vegetative propagation will be used instead. Seed collection protocols are described in Appendix B, and transplantation and vegetative propagation protocols will be added to Appendix B if these techniques are developed and approved for use. Collection locations will be prioritized using the habitat suitability models and known occurrences for Covered Species. Clark County will coordinate species searches and seed collection by qualified personnel. Collected seeds will be stored in an appropriate facility and made available for restoration activities within the Reserve System or for other restoration, propagation, or research efforts. Collected seeds will also be integrated into Rare Plant Propagation efforts to facilitate their use in responding to landscape-scale disturbances such as invasive species infestations and altered fire regimes. Where practicable, voucher specimens of plants from occurrences where seed has been collected will be obtained prior to disturbance and deposited in an appropriate facility.

PLANT-1. Seed collection on BLM disposal lands. On BLM-administered parcels identified for sale or auction within disposal boundaries, the DCP will coordinate with BLM to conduct seed collection where habitat suitability models indicate suitable habitat, before the land transfers into private ownership. One hundred percent of the available mature seed will be collected, as practicable given seasonal and climatic factors such as drought. Seeds will be collected and stored for use in restoration and research projects. Seed collection and storage protocols are described in Appendix B.

PLANT-2. Seed collection on private lands. On private property, the DCP will be notified of planned disturbance when project plans are submitted to a Permittee for review and approval. If a project is proposed in areas likely to support Covered Plant Species based on habitat suitability models, the DCP will conduct seed collection prior to disturbance, as practicable given seasonal and climatic factors such as drought. Seeds will be collected and stored for use in restoration and research projects. Seed collection and storage protocols are described in Appendix B.

Plant Measures for the Non-Federal Reserve System

Covered Activities on non-federal Reserve System lands are predominantly focused on restoration and habitat management, however, these activities may still result in impacts to Covered Species; therefore, in addition to the seed collection protocols, Covered Activities on non-federal Reserve System lands shall implement the following measures:

PLANT-3. Plant monitoring. Baseline monitoring of vegetation shall be performed by the project proponent, their qualified consultant, or an MSHCP Lead Species Biologist prior to any project disturbance in order to document the pre-project conditions.

a. Photo points shall be established to document the pre-construction and post-construction restoration state of the vegetation and soil.
    i. Pre-construction photos shall take place prior to any project disturbance.
    ii. Post-construction photos shall take place within 30 days following completion of all project activities including demobilization.

PLANT-4. Covered Plant Species Survey.

a. If a project site is within 25 feet of or within known or modeled low, medium, or high suitable habitat for Covered Plant Species, a Covered Plant Species survey shall be conducted within the appropriate survey period based on target species by an MSHCP Lead Species Biologist
b. Within the project site (including all areas of potential disturbance), and in a buffer zone of a minimum of 25 feet around the project site, all known and modeled habitat for covered plants shall be surveyed.
c. Surveys shall consist of transect lines that cover 100 percent of known or modeled habitat.
d. Transect lines walked and plant individuals encountered shall be recorded as GPS point features and delivered to the DCP in ESRI ArcGIS compatible files.
e. A summary of findings shall be provided to the DCP.

PLANT-5. Use of Covered Plant Species. If necessary, updated project site survey maps to change or add Covered Plant Species avoidance areas based upon Covered Plant Species survey results shall be produced and provided to the DCP.

PLANT-6. Survey and maps. Project crew shall have a copy of the final project site survey maps at all times.

PLANT-7. Covered Plant avoidance. If Covered Plant Species are detected during the surveys, these areas shall be fenced by a 25-foot buffer and signed.

a. Signage shall indicate that no disturbance may take place within the fenced avoidance area.
b. Avoidance area fencing shall remain in place until all project and restoration activities are completed.

PLANT-8. Covered plant impact minimization. If avoidance is not feasible, all available mature seeds of Covered Plant Species to be impacted shall be collected following the protocols in Appendix B. Seed collection should be timed appropriately for the target species. The DCP may grant exceptions to seed collection on a case-by-case basis for projects such as emergency maintenance.

a. For locations that have minor disturbance such as driving or crushing and no soil removal, following completion of all project activities including fence removal, the disturbed areas shall be reseeded with Covered Plant Species seeds collected prior to the disturbance. Seeded areas shall be raked or dragged to cover the seeds with approximately 1 inch (2.54 centimeter) of surface soil material.
b. For locations that require soil disturbance, these additional measures will be implemented:
    i. Vertical mulch scraping and salvage prior to disturbance: Live and dead above-ground vegetation materials shall be scraped and stored within the project site for future use as vertical mulch.
    ii. Soil layer(s) salvage prior to disturbance: (a) the top 4 inches

(10.16 centimeters) of surface soil shall be scraped and stored in uncompacted piles no more than 4 feet (1.22 meters) high within the project site and (b) to the extent practical, root crowns and roots of perennial vegetation shall be left in place to assist recovery of the area post-construction.

1. If a depth greater than 4 inches of soil is to be disturbed, each subsurface soil layer shall be salvaged and stored separately. The salvaged topsoil shall not be mixed with deeper soils as this decreases the viability of seeds found in the topsoil (Scoles-Sciulla and DeFalco 2009).

iii. Following completion of project activities, (a) salvaged soil shall be replaced in proper order, mixing slightly with the top 1 inch (2.54 centimeters) of the lower layer, (b) decompact soils by ripping and/or harrowing soils in areas that were impacted and/or compacted by the project, unless that compaction is part of the approved project design, and (c) recontour soils to restore natural drainage patterns, or recontour to conform to approved project design.

iv. Replace vertical mulch and reseed: Position vertical mulch to mimic the density and vertical structure of vegetation prior to construction, burying each dead shrub or cactus partially to reduce loss to wind, and then reseed as described in PLANT-8a.

Plant Measures on the Federal Reserve System

Overall management of the Federal Reserve System lands will be described in the BLM RMP and in the Reserve Unit management plan developed for each unit. These planning processes are subject to compliance with the ESA and NEPA. Activities within Federal Reserve System lands are considered federal actions and are not eligible for coverage under the MSHCP.

6.2.3.2 Desert Tortoise

The following measures **apply in Zone B,** where suitable habitat exists according to the DCP's species distribution models, to minimize impacts to desert tortoise during ground disturbance:

DT-1. Tortoise surveys and avoidance. Survey and clearance protocols are further described in Appendix C.

a. A survey of the entire project area shall be conducted by an MSHCP Lead Species Biologist to locate and remove desert tortoises prior to grading or actions which might result in harm to desert tortoises.
b. If desert tortoises are found and must be handled to relocate from the project site, handling will adhere to the protocols described in Appendix C.
c. Tortoise burrows shall be cleared of tortoises and eggs by an MSHCP Lead Species Biologist and then collapsed. Any desert tortoise eggs found will be relocated by an MSHCP Lead Species Biologist. Burrow excavation protocols and tortoise egg protocols are described in Appendix C.
d. Tortoise burrows that occur immediately outside of the project area that can be avoided by construction activities shall be clearly marked to prevent crushing.

DT-2. Tortoise response. If tortoises are found after the clearance survey has been conducted, construction workers will be trained on what to do in the worker education session described in 6.2.4 OUTREACH-1.

DT-3. Vehicle inspection. Any time a vehicle is parked, regardless of whether the engine is engaged, the ground around and under the vehicle shall be inspected for desert tortoise and other wildlife before moving the vehicle.

6.2.3.3 Gila Monster

GILA-1. Gila monster response. If a Gila monster is spotted on a construction site, construction workers shall temporarily cease activities in the immediate vicinity to avoid harming the animal and shall contact the DCP. The DCP will coordinate with NDOW biologists to determine the final disposition of the animal. Current NDOW guidance will be followed, such as capturing and detaining the Gila monster in a cool, shaded environment (below 85 °F) until an NDOW biologist arrives for documentation, marking, and measurement. During construction worker education (Section 6.2.4, OUTREACH-1), workers will be advised not to attempt to pick up or otherwise make contact with Gila monsters encountered on construction sites.

6.2.3.4 Riparian Birds

To avoid or minimize direct impacts (i.e., take of individuals) from Covered Activities on Bell's vireo, southwestern willow flycatcher, western yellow-billed cuckoo, and Yuma Ridgway's rail (collectively, riparian birds), developers will be required to implement the procedures discussed below within suitable riparian habitat along the Virgin River, Muddy River, Overton Arm, and Las Vegas Wash and surrounding 100 feet (Figure 6-4). Suitable riparian habitat is defined by the species distribution models.

RB-1. Riparian bird avoidance and surveys. Initial ground-disturbing activities (e.g., grubbing, clearing, grading) within suitable habitat shall be avoided during the breeding seasons for Yuma Ridgway's rail (February to early July), Bell's vireo (March 15 through August), southwestern willow flycatcher (May to mid-August), and yellow-billed cuckoo (June through August). Project applicants will be notified of this restriction during the development review process.

a. Prior to mass grading, demarcate or fence all suitable habitats to be avoided to prevent disturbance of these areas by earth-moving or construction equipment.
b. If initial ground-disturbing activities cannot be avoided during the nesting season, the project proponent may have a qualified biologist conduct surveys to detect nesting of Covered Species. If active nests of Covered Species are detected, a nest buffer will be implemented in consultation with the DCP and USFWS. If no active nests of Covered Species are detected, initial ground-disturbing activities may be conducted within the breeding season.

Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri, USGS

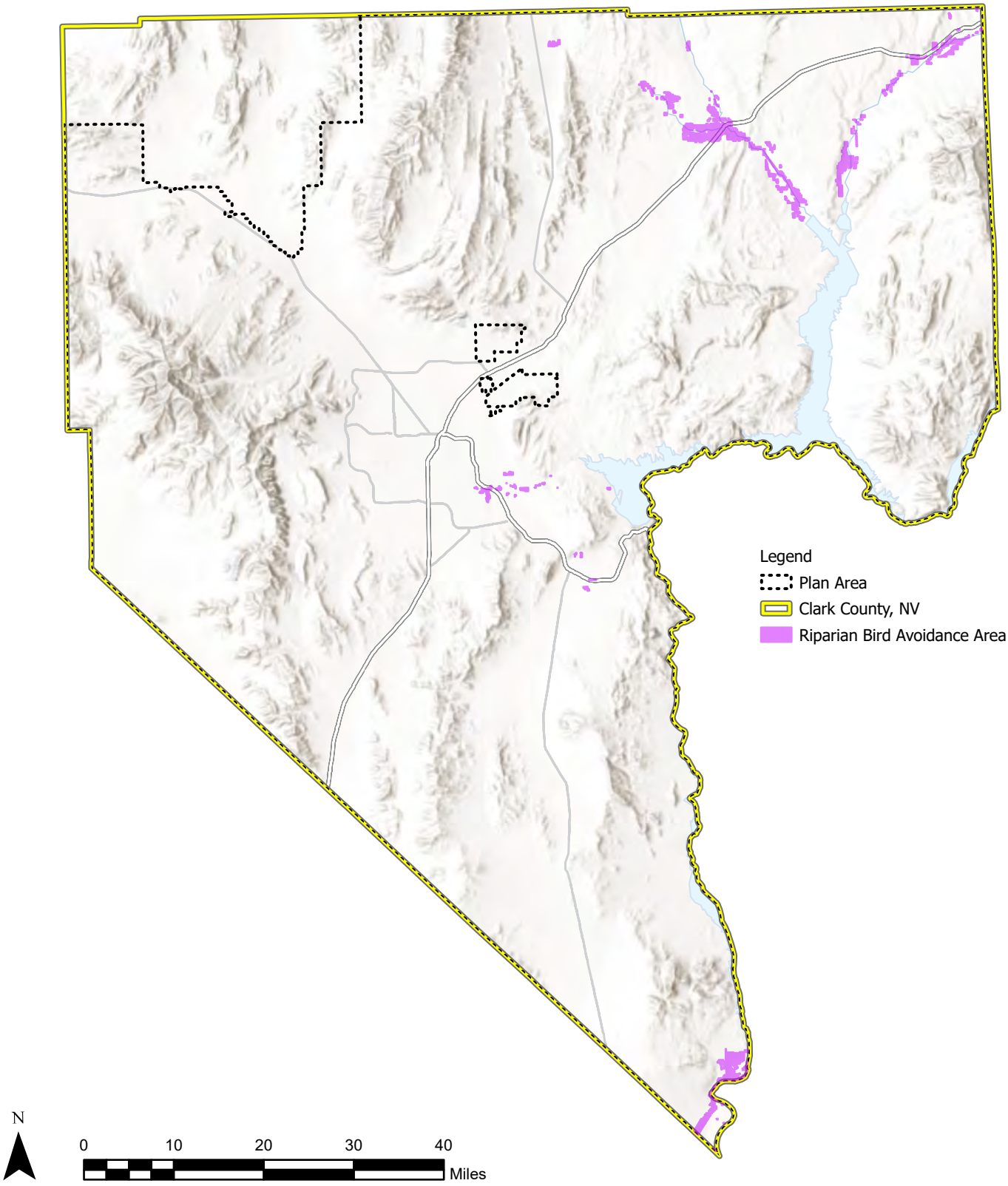

Figure 6-4. Riparian Bird Avoidance Area

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c. Biologist qualifications will be submitted to the DCP for approval and USFWS survey guidelines and protocols will be followed. Survey results will be submitted to the DCP within 10 days of survey completion.

RB-2. Riparian bird conservation measures. Project design, general conservation measures, and BMPs will be implemented during construction or maintenance activities to avoid and minimize effects from erosion, pollution, and sedimentation on downstream riparian habitat. Project applicants will be notified of this requirement during the development review process. The DCP will provide design guidelines and recommended measures.

6.2.3.5 Golden Eagle

The Plan Area is outside of most areas identified as suitable nesting habitat (Chapter 3, Figure 3-15); however, there are recorded nest sites within the Plan Area. DCP will maintain maps of nest locations to be updated annually through data coordination with other agencies such as NDOW. To minimize impacts to potential nest locations that are within the Plan Area, the following shall be implemented:

GOEA-1. Golden eagle surveys and response. If Covered Activities are to occur within 0.25-mile of documented golden eagle nest, and activities must occur during the nesting season, surveys will be conducted following standard methods by an MSHCP Lead Species Biologist to determine if a golden eagle nest is active within 0.25 mile.

a. If a nest is detected and determined to be active, a 0.25-mile buffer will be established, and Covered Activities will not occur within the buffer until an MSHCP Lead Species Biologist determines the chicks have fledged or the nest is otherwise inactive.

6.2.3.6 Burrowing Owl

The following measures shall be implemented in areas of potential burrowing owl suitable habitat (Chapter 3, Figure 3-16). Potential suitable burrowing owl habitat is defined by the species distribution model:

BUOW-1. Burrowing owl surveys and response. Burrowing owl clearance surveys will be performed by an MSHCP Lead Species Biologist. If the project area is located within Zone B, the burrowing owl survey will be conducted concurrent with desert tortoise clearance surveys. Survey and burrow clearance protocols are described in Appendix D. Coordination for surveys and exclusion may begin prior to the breeding season (February 1 – August 31) and ahead of the required surveys in order to allow more time for owl removal and burrow excavation or closure ahead of the breeding season and to avoid construction delays.

a. If burrowing owl is determined to occupy the project site and is confirmed to not be a breeding owl (outside the nesting season or determined to be a non-breeding owl), passive relocation of the burrowing owl(s) and burrow excavation may be conducted as described in Appendix D.
b. If burrowing owls are determined to occupy the project site and are confirmed to be breeding, a 330-foot (100 meter) nest buffer will be established. Appendix D describes monitoring methods to confirm when a nest is no longer active. Once the nest is inactive, passive exclusion and burrow excavation may be conducted as described in Appendix D.
c. If owls are to be avoided but found nesting within 165 feet (50 meters) of the project site, it is recommended that visual screens or other measures are implemented to limit disturbance of the owls without evicting them from the occupied burrows.

Process for Burrowing Owl and Desert Tortoise Surveys (Developed by AMM Work Group)**:**

1. As part of initial application, developers notify DCP that development is planned, share parcel number, and provide estimated ground-disturbance date (this is part of application checklist).
2. 30-60 days prior to the anticipated ground disturbance date, DCP makes a "confirmation call" to the project proponent to confirm the ground-disturbance date. Multiple calls are made if construction is delayed.
3. Depending on construction timeline, DCP conducts surveys within 30 days of ground disturbance.
4. DCP notifies developer and appropriate local jurisdiction when surveys have been completed, and ESA requirements have been met.

6.2.3.7 Bats

Avoidance of riparian habitat will reduce impacts on water and foraging sources for Townsend's big-eared bat and spotted bat. DCP will maintain maps of roost locations to be updated annually through data coordination with other agencies such as NDOW. To minimize impacts to roost locations that are within the Plan Area, the following shall be implemented:

BAT-1. Bat surveys. In areas with known roost habitat, an MSHCP Lead Species Biologist will conduct a pre-construction survey to determine whether potential roost habitat is present in areas to be impacted. If roosts are detected, the roost type will be identified as maternity, hibernation, or a day or night roost not associated with maternity or hibernation. Roost information, including location and structure type, will be recorded and used to update species habitat suitability models.

a. If a maternity or winter hibernaculum roost site is detected, and Covered Activities will occur during the maternity or hibernation season, a follow-up survey may be necessary to determine if the roost site is occupied.
b. If an occupied maternity or winter hibernaculum site is present, Covered Activities will not occur until the roost is vacated, or outside of the maternity or hibernation periods and bats are safely evicted as described in the following measure.

BAT-2. Eviction methods. If a roost is determined to be a non-maternity and non-hibernaculum day or night roost, or if eviction occurs outside of the maternity and hibernation seasons, eviction methods may be used to remove bats from the impact area. An MSHCP Lead Species Biologist will use safe eviction methods to remove bats where direct impacts cannot be avoided. A Bat Eviction Plan will be prepared prior to implementation. Once bats are evicted and the roosts are cleared, Covered Activities may proceed.

6.2.4 Outreach

To minimize impacts under the MSHCP and to achieve the objectives under Biological Goal 3, Clark County will raise awareness of Covered Species and the required AMMs through outreach to a range of stakeholders, including Permittee planning departments, developers, construction workers, and the general public.

OUTREACH-1. Training and certification program. The DCP will provide a training and certification program for all on-site personnel conducting Covered Activities. The program will provide training and outreach to construction workers to increase their awareness of desert tortoises and other Covered Species that may be encountered at project sites and to inform them

of the actions to take if these species are found on site. This includes appropriate handling of any desert tortoise encountered on site and the procedure for calling the Clark County Wild Tortoise Assistance Line (702-593-9027) to schedule pickup of the tortoise.

OUTREACH-2. AMM Outreach. The DCP will provide outreach on the required AMMs directly to developers and homebuilders through activities such as targeted media campaigns, printed materials, and training events. Outreach will cover topics such as desert tortoise clearance requirements, other Covered Species measures, riparian construction seasonal restrictions, urban-wildland design guidelines, and other topics as deemed necessary by the DCP.

OUTREACH-3. Covered Species Outreach. Building public appreciation for MSHCP Covered Species among Clark County residents is important. To educate the public on what to do when encountering a desert tortoise in the wild and on ways to minimize their own impact on the desert environment, the program will provide outreach related to Covered Species and protection of the Mojave Desert. Educational programming may include the Mojave Max program, mass media campaigns, printed materials, school programs, community science engagements, and other items as deemed necessary by the DCP. Educational materials and signage will also be posted in the Reserve System to inform recreational users.

6.3 Measures to Mitigate the Unavoidable Take

A central component of the Conservation Strategy is the establishment and management of a Reserve System, which is the primary means of mitigating the impacts of Covered Activities on Covered Species. The Reserve System is being assembled through the application of selection criteria, supporting data and analysis, and a habitat quality analysis (described in Section 5.4) to ensure that lands included in the Reserve System provide habitat value equal to or greater than that being impacted by Covered Activities under the MSHCP Amendment.

Roughly 89 percent of Clark County is owned and managed by the federal government. BLM manages the largest portion, approximately 2.7 million acres (52.8 percent of the County). The amount and location of remaining state, local, and private land is insufficient to create a viable Reserve System capable of protecting and enhancing Covered Species and their ecosystems to the extent needed to mitigate the impacts of Covered Activities to the maximum extent practicable. The Reserve System is therefore composed of both public and private lands (Figure 6-5). It consists primarily of more than 305,000 acres of BLM-managed land that will continue to be administered by BLM but managed in collaboration with the Permittees through CMAs for each BLM-managed Reserve System Unit. Management of this land will shift from undesignated multiple-use or disposal status to special management status.

Private and local government lands are included in the Reserve System where it is feasible for the County to acquire them or place them under easement. These lands include the BCCE and County-owned riparian habitat along the Muddy and Virgin Rivers (the Riparian Reserve Units), which are managed to benefit Covered Species. To date, approximately 88,000 acres of private land have been incorporated into the Reserve System, including 781 acres of Riparian Reserve Unit lands that provide a head start on mitigation for the MSHCP Amendment. The BCCE was purchased by Clark County in 1995 to mitigate effects on the desert tortoise (*Gopherus agassizii*) and is now managed to provide mitigation for other Covered Species as well. Private land available for acquisition from willing sellers, in fee title or through conservation easements, is included in the Reserve System to protect high-quality habitat for Covered Species from development pressure and to provide riparian and other restoration opportunities.

Reserve System lands will be managed to maintain habitat quality, reduce threats, and avoid harm to Covered Species. The Riparian Reserve Units and the BCCE each have specific management plans with management goals, objectives, actions, and effectiveness measures (Appendices X and Y). Management of, and restrictions on, the federally owned portion of the Reserve System will be defined in the BLM's anticipated Las Vegas RMP revision, the CMAs for each Reserve Unit, and other applicable mechanisms in place for appropriate management of Reserve Units. The CMAs will detail the roles and responsibilities of each party participating in the collaborative management of the Reserve Units and will operate alongside the individual management plans.

Proposed ACECs, the Riparian Reserve Units and the BCCE are referred to in this MSHCP Amendment as Reserve Units and collectively as the Reserve System.

6.3.1 Federal Land

Most of the Reserve System consists of federally owned, BLM-administered land that is managed in collaboration with the Permittees through an Implementation Agreement (IA) and Reserve Unit-specific CMAs. The process of designing the federal portion of the Reserve System has been iterative and has spanned many years. Management of, and restrictions on, this portion of the Reserve System will be defined in the BLM's anticipated Las Vegas RMP revision, the CMAs for

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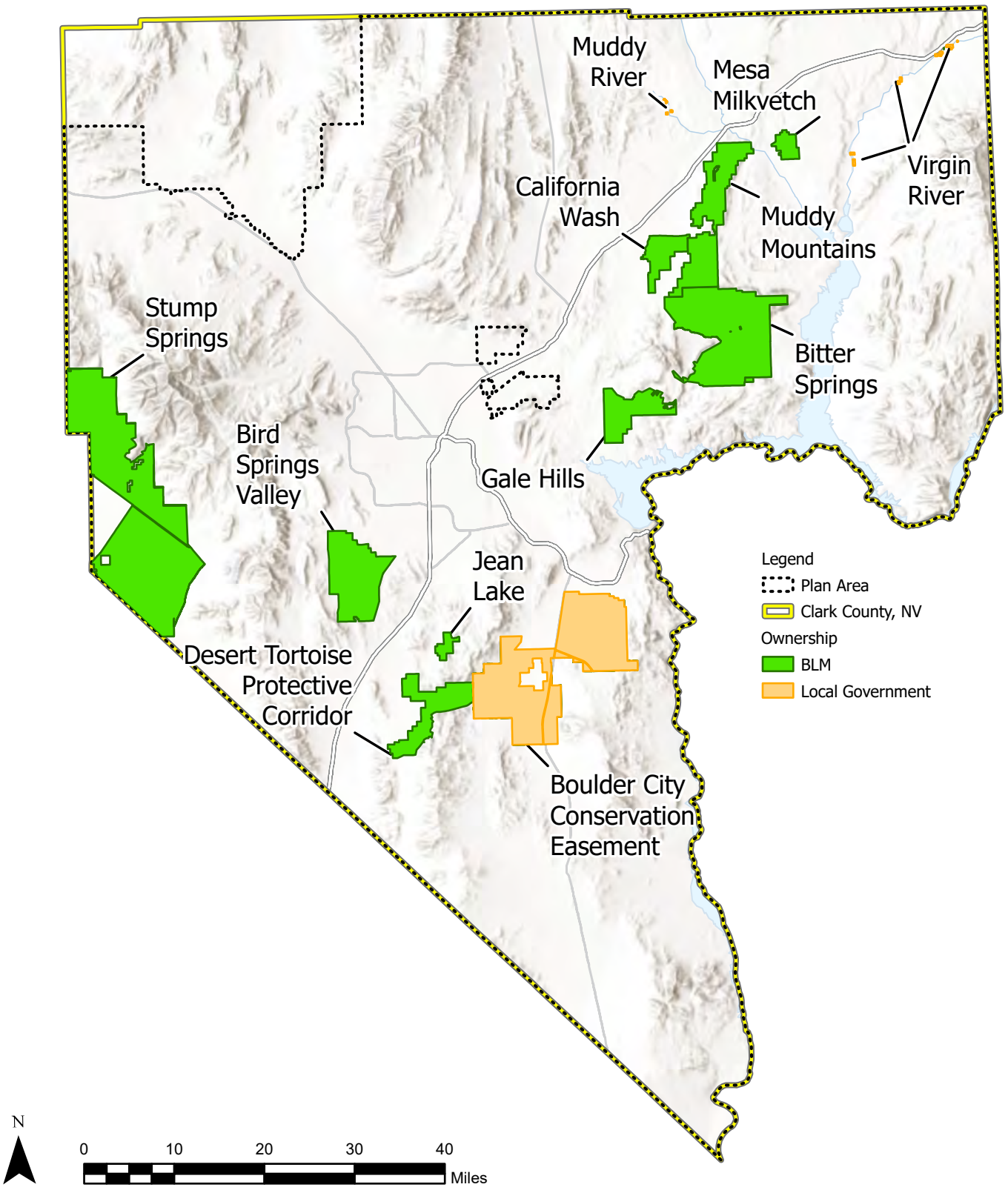

Figure 6-5. Reserve System Land Ownership

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each Reserve Unit, and other applicable mechanisms in place for appropriate management of Reserve Units. The sections that follow describe the federal land Reserve System design methodology and process and provide descriptions of the individual Reserve Units, including their ecological characteristics, mitigation values, and management.

6.3.1.1 Federal Land - Reserve System Design

The Reserve System has been developed through an iterative process. Initially, candidate Reserve Units were identified by screening potentially available land based on ownership, jurisdiction, and land management categories, and then evaluating these areas against predetermined Reserve Design Criteria and species habitat models that incorporated occurrence and distribution information. The initial Reserve Units were nominated for designation as ACECs through the BLM's anticipated Las Vegas RMP revision process. BLM then refined the nominated ACEC boundaries, after which DCP reassessed and further refined the boundaries to ensure sufficient high-quality habitat. This review incorporated habitat for species that were subsequently added for coverage and avoided potential conflicts with anticipated development and infrastructure projects. Because the timeline for the BLM Las Vegas RMP revision did not align with the schedule needed to finalize the MSHCP Amendment and issue the ITP, the nine reviewed and refined ACEC nominations will be resubmitted following submittal of the MSHCP Amendment and incorporated into the next revision of the Las Vegas RMP. Each design phase for the federal portion of the Reserve System is described in greater detail below.

6.3.1.1.1 Initial Reserve System Design

As a starting point, ownership data, jurisdiction data, and designated land management categories were integrated into a GIS data layer and classified into 30 land-use types. Although Covered Activities and their associated impacts will not occur above 4,000 feet, elevation was not used to limit the pool of land considered for inclusion in the Reserve System, preserving flexibility to evaluate a wider range of reserve design alternatives. Areas considered for further review were predominantly under BLM management or in non-federal ownership. Based on this classification, approximately 2.5 million acres were considered potentially available for inclusion in the reserve design.

Reserve Design Criteria

The following reserve design criteria were developed based on principles of conservation biology (Soule and Wilcox 1980; Soule and Simberloff 1986; Primack 1993; Noss et al. 2012; Margules and Pressey 2000; Groom et al. 2006) to evaluate areas for inclusion in the Reserve System. All land selected for the Reserve System met one or more of these criteria, and most lands met multiple criteria.

1. Provide high quality habitat for Covered Species at the local level. High quality is defined using various parameters such as high abundance and diversity of native species, intact natural processes and ecosystem functions, and few roads or other evidence of human disturbances.

2. Be large enough to support sustainable populations of Covered Species, maximize the protection of biodiversity, and mitigate impacts of Covered Activities. Large reserves tend to support more species for longer periods of time than small reserves, are more resilient to environmental changes (e.g., fires, droughts, climate change) contain a range of environmental gradients (see Criterion 4, below). Large reserves are generally more cost-effective to manage on a per-acre basis and allow for better large-scale management treatments and the maintenance of natural disturbance regimes, such as flooding.

3. Provide connectivity to other high-priority conserved lands for Covered Species within or outside of the Plan Area, or provide buffers between high-value conserved lands and areas where impacts are likely to occur. Connectivity facilitates the exchange of genetic material, species migration, dispersal, and colonization; and increases the integrity of the network of reserves (i.e., reducing the extent of reserve edge that is in contact with adjacent land uses). Linking reserves may require acquisition of disturbed habitats that can be restored to facilitate better habitat and wildlife movement value. Preserving connectivity will also tend to minimize habitat fragmentation. When adjacent to existing urban areas or planned urban areas, the Reserve System should include buffer lands within its boundaries in order to reduce indirect effects on Covered Species and ecosystems from urban development.

4. Provide a diversity of contiguous environmental gradients (e.g., topography, elevation, soil types, geologic substrates, slopes, and aspects) to allow for shifting species distributions in response to gradual and catastrophic events (e.g., fire, prolonged drought, severe flooding) or anthropogenic change (e.g., climate change).

5. Provide opportunities for habitat enhancement and restoration for the long-term benefit of Covered Species. Degraded communities may need to be protected to capture unique habitats or populations of Covered Species, to link Reserve Units together or with other protected sites, or to provide opportunities for habitat restoration.

6. Minimize the length of land use edges detrimental to the Reserve System, such as urban development, highways, and mines to minimize the indirect effects of adjacent land uses on the Reserve resources and to minimize management costs. Reserves should tend toward round or square configurations rather than long and narrow ones, except for where low area-to-perimeter ratios are appropriate, such as riparian systems or movement corridors.

Biological Data and Habitat Suitability Models

As is typical for large-scale conservation planning efforts, comprehensive biological data were not available throughout the Plan Area. Limitations on time, funding, and survey access require conservation planners to rely on best available data and surrogates to estimate the distribution of suitable habitat for most species. Areas recommended for special protective designation in the Conservation Management Strategy for Nine Low Elevation Rare Plants in Clark County (TNC 2007) were taken into consideration, along with GIS-based habitat suitability models that were used to characterize the probable distribution of habitat for Covered Species.

The species habitat suitability models used for initial Reserve System assembly drew on a range of habitat attributes, including vegetation, ecosystem, satellite imagery, geology, and soil type. The models were not based solely on occurrence data, which are often limited or incomplete; instead, occurrence data were used to test and validate them. The species distribution models depict known locations, occupied habitat, and potential or predicted habitat for each Covered Species. The models do not include species abundance data, and the underlying occurrence data are not comprehensive because systematic surveys have not been conducted throughout the entire Plan Area. Additional background and the limitations of each individual species model are described in Appendix A.

Reserve Analysis

The Reserve Design Criteria, biological data, and habitat suitability models were then analyzed against the lands identified for potential inclusion in the Reserve System, as described in the

stepwise process below.

1. Overlay each habitat-suitability model on the potential Reserve System lands map and analyze the distribution of each species individually and of all species viewed together.

2. Evaluate the distribution of the high-priority species first (e.g., desert tortoise), then identify “hot spots” where habitat for the high-priority species overlaps most or all of the other desert species. Avoid areas with high OHV use, or high likelihood of future solar-energy development.

3. Delineate Reserve Units on public lands that are large, contiguous blocks of habitat, preferably at least 100,000 acres each.

4. Avoid including private land in the non-riparian Reserve System where possible. Although private land was included in the review category, private land was avoided because it is typically distributed on small and scattered parcels and is often partially developed or disturbed (or more likely to be during the permit term).

After potential Reserve Units were identified, GIS overlay analysis was used to calculate the acres of modeled habitat conserved within each alternative Reserve Unit. This quantitative analysis informed evaluation of the relative merits of each Reserve Unit for conserving each Covered Species and contributing to the conservation goals of the MSHCP Amendment. Reserve Units were designed so that the Reserve System would total at least 215,000 acres, equivalent to the take authorization requested under the MSHCP Amendment. It was also recognized that continued management of the BCCE could provide conservation benefits for species in addition to the desert tortoise.

6.3.1.1.2 BLM Refinement of Reserve Unit Boundaries

BLM reviewed the relevance and importance of each existing and nominated ACEC, as defined in 43 CFR 1610.7-2 and BLM Manual 1613, and evaluated whether the boundaries or management of existing ACECs should be changed. At the time of the evaluation, there were 22 existing ACECs totaling 974,531 acres and 21 ACEC nominations. A draft revision of the Las Vegas RMP was published in 2014 but was never finalized.

Through this process, BLM developed a range of alternatives for ACEC boundaries, sizes, and management prescriptions, which are documented in the 2014 Draft Las Vegas RMP. Clark County subsequently adopted the ACEC boundaries as refined by BLM.

6.3.1.1.3 DCP Reassessment of ACECs

DCP reassessed the Reserve System design as the list of Covered Species continued to evolve and as plans were developed for infrastructure and development projects that could conflict with the proposed Reserve System. To ensure sufficient high-quality habitat, the Gale Hills, Desert Tortoise Protective Corridor, and Mesa Milkvetch ACECs were added to the proposed Reserve System. Gale Hills and Mesa Milkvetch were added to increase habitat for Covered Plants, and the Desert Tortoise Protective Corridor was added in exchange for the Ivanpah ACEC to eliminate conflict with a flood control infrastructure project associated with the Southern Nevada Supplemental Airport. The California Wash Reserve Unit boundary was also adjusted to avoid conflict with a solar development project, and the Stump Springs boundary was expanded to improve connectivity of desert tortoise habitat. The MSHCP Amendment will adopt these nine nominated ACECs, in addition to the existing BCCE and Riparian Reserve Units, as further described in this chapter.

6.3.1.2 Federal Land – Reserve System Description

The Reserve System currently includes nine proposed ACECs that will be administered by BLM as defined in the upcoming Las Vegas RMP revision. Each Reserve System Unit is described below, including its mitigation values as expressed in the habitat Functional Score, which was calculated as described in Section 5.4. Figure 6-6 shows all Reserve Units in the Plan Area and the distribution of ecosystems, Figure 6-7 shows the Reserve Units with land cover types, and Figure 6-8 displays the Reserve Units and shows how they connect or extend existing conservation lands. Table 6-3 at the end of this section presents the Functional Score of each ecosystem/habitat group by Reserve Unit. Following Section 6.3.5 below, Figures 6-11 through 6-20 show the habitat functionality results across the Reserve System.

6.3.1.2.1 Stump Springs

Stump Springs proposed Reserve Unit (Stump Springs) is currently an undesignated multiple-use area in the western portion of Clark County. The Stump Springs proposed Reserve Unit covers 125,592 acres and is located in western Clark County north and east of the town of Sandy Valley. The southwestern boundary borders California, and the northwestern boundary generally follows the watershed of Wheeler Wash leading to one of the springs. One paved road crosses the area: Nevada Highway 160 in the northern portion of the unit. Several well-used, unpaved roads used to access Sandy Valley also cross Stump Springs. To the south, the unit boundary is adjacent to private lands in the town of Sandy Valley.

The remainder of Stump Springs is bordered by federal lands. Lands administered by the BLM lie to the southeast and north, and USFS lands—the Spring Mountains NRA portion of Humboldt-Toiyabe National Forest—also borders the unit on the north and east. At its northernmost edge, Stump Springs borders the proposed Mt. Stirling Wilderness area. The proposed Stump Springs Reserve Unit will ensure high quality habitat remains connected and will maintain linkages to existing conservation areas managed by the BLM and USFS.

The majority of Stump Springs lies on the floor of Pahrump Valley; the valley floor is at an elevation of 2,700 ft to 3,000 ft. The unit ascends the northeastern slopes of Pahrump Valley in foothills of the Spring Mountains, reaching a high point of about 6,400 ft in its northern portions. Smaller isolated hills and ridges occur in the southern portion of the Stump Springs. The major drainage direction is northeast to southwest; major named washes include Wheeler Wash, Lovell Wash, and Potosi Wash.

There are known occurrences of desert tortoise, loggerhead shrike, golden eagle, western burrowing owl, Le Conte's thrasher, Bendire's thrasher and Bell's vireo within this unit. Covered Plants occurring in Stump Springs include Pahrump Valley buckwheat and Joshua tree.

For mitigation purposes, the Functional Score of Ecosystem/Habitat groups within this Reserve Unit are included in Table 6-3. The predominant groups are Arid Shrubland (6,623), Cool Semi Desert Scrub and Grassland (2,083), Mojave Desert Scrub (1,435) and Riparian Woodland (3,173). This unit also contains Gypsiferous (24), Hydrology Dependent (109), Playa Fringe (396), Sandy (33) and Wind-Blown Sand (44) habitats.

6.3.1.2.2 Bird Springs Valley

The Bird Springs Valley proposed Reserve Unit (Bird Springs Valley) is approximately 31,383 acres west of Interstate 15. It is bordered to the east by the Sloan Mining District) and the west by the Red Rock Canyon National Conservation Area. This area includes low mountainous areas to valley floor terrain. The elevation ranges from approximately 2,600 ft to a high of 4,600 ft. A

Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

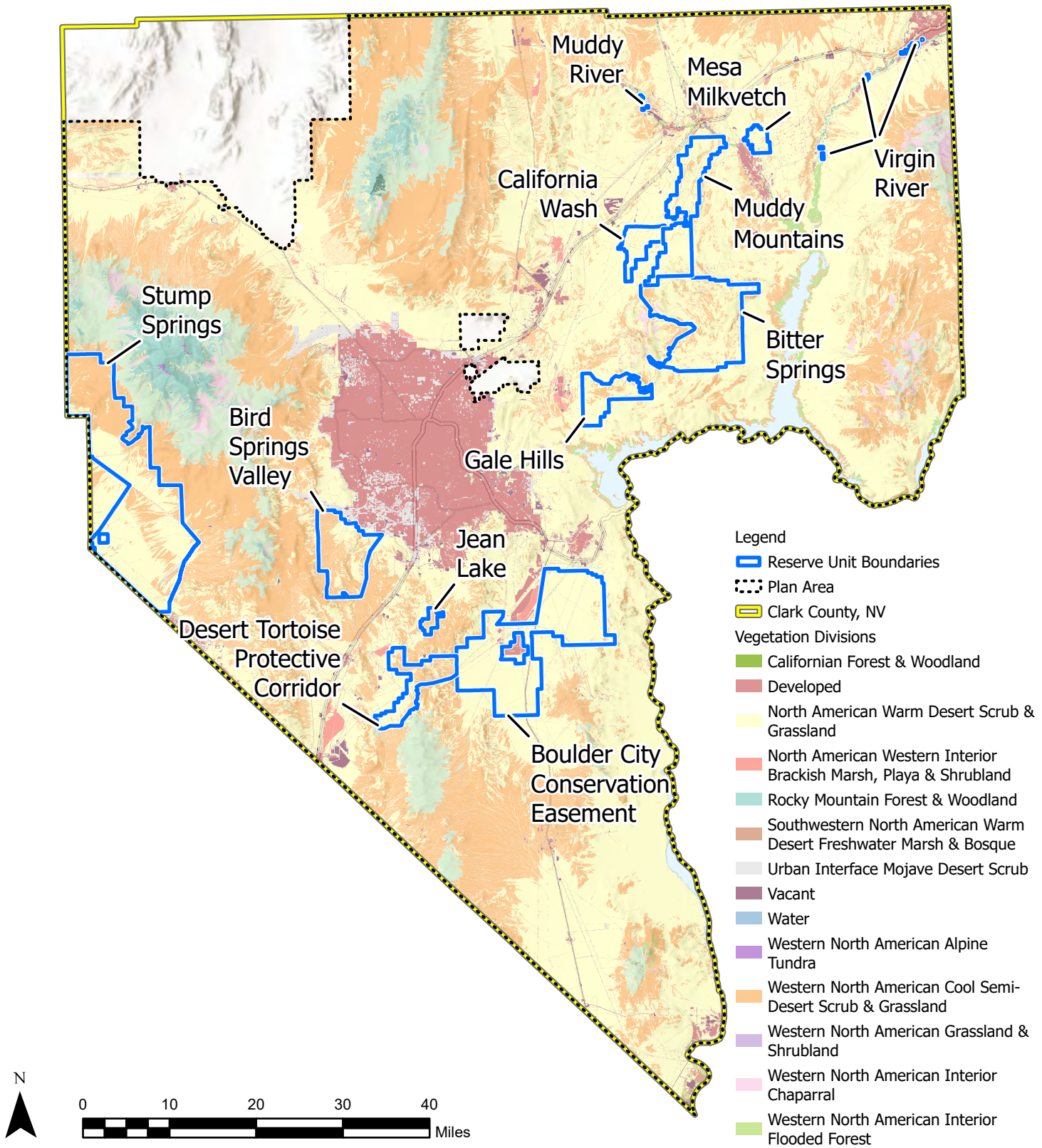

Figure 6-6. Reserve System and Ecosystems in Plan Area

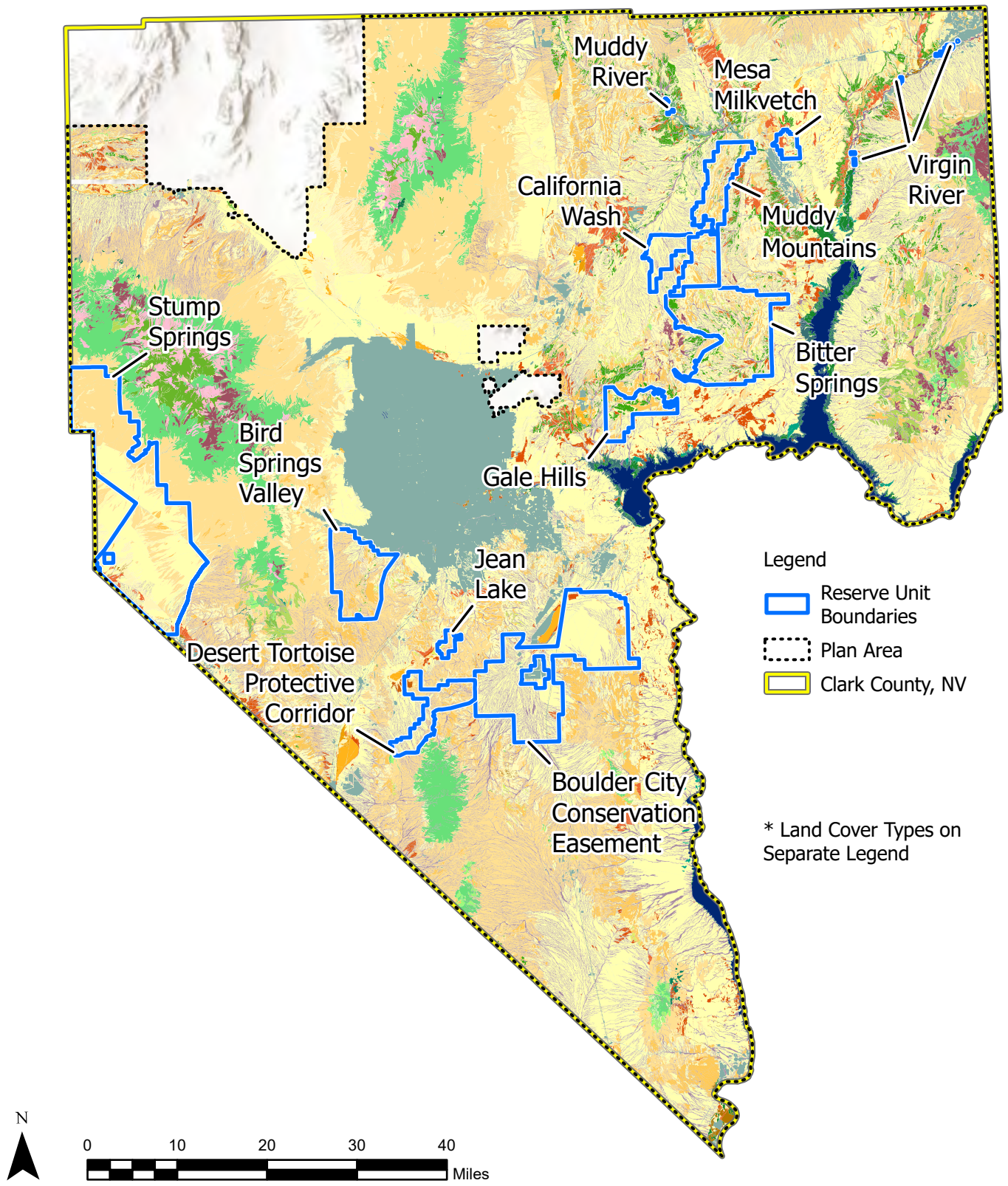

Figure 6-7. Reserve System and Land Cover in Plan Area

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Reserve System and Land Cover in Plan Area

Legend

- Reserve Unit Boundaries
- Plan Area
- Clark County, NV

Land Cover

- Arid West Interior Freshwater Marsh & Wet Meadow
- Beach and Barren Sand Draw-down Area
- Californian Broadleaf Forest and Woodland
- Colorado Plateau - Great Basin Juniper Open Woodland
- Colorado Plateau Pinyon - Juniper Woodland
- Developed, Open Space - Low Intensity
- Dune Vegetation
- Great Basin - Intermountain Shrub and Herb Wash-Arroyo
- Great Basin Pinyon - Juniper Woodland
- Great Basin-Intermountain Tall Sagebrush Steppe and Shrubland
- Interior West Ruderal and Riparian Forest and Scrub
- Intermountain Basins Big Sagebrush Shrubland
- Intermountain Basins Cliff, Scree and Badland Sparse Vegetation
- Intermountain Basins Montane Sagebrush Steppe
- Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland
- Intermountain Semi-Desert Grassland
- Intermountain Semi-Desert Steppe and Shrubland
- Intermountain Semi-Desert Steppe and Shrubland and Intermountain Semi-Desert Grassland
- Intermountain Shadscale - Saltbush Scrub
- Mixed Grasslands
- Mojave - Sonoran Bajada and Valley Desert Scrub
- Mojave - Sonoran Bajada and Valley Desert Scrub and Intermountain Basins Cliff, Scree and Badland Sparse Vegetation
- Mojave - Sonoran Bajada and Valley Desert Scrub and Intermountain Shadscale - Saltbush Scrub
- Mojave - Sonoran Bajada and Valley Desert Scrub and North American Warm Desert Ruderal Grassland
- Mojave Mid-Elevation Mixed Desert Scrub
- Mojave Mid-Elevation Mixed Desert Scrub and Mojave - Sonoran Bajada and Valley Desert Scrub
- North American Desert Alkaline-Saline Marsh and Playa
- North American Desert Alkaline-Saline Wet Scrub
- North American Warm Desert Playa
- North American Warm Desert Riparian Low Bosque and Shrubland
- North American Warm Desert Riparian Mesquite Bosque
- North American Warm Desert Ruderal Grassland
- North American Warm Semi-Desert Cliff, Scree and Pavement Sparse Vegetation
- North American Warm Semi-Desert Dune and Sand Flats
- Open Water
- Rocky Mountain Alpine-Montane Wet Meadow
- Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
- Rocky Mountain Subalpine Mesic Meadow
- Sonora-Mojave Mixed Salt Desert Scrub
- Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland
- Urban/ Disturbed
- Warm Semi-Desert Shrub and Herb Dry Wash and Colluvial Slope
- Western Interior Riparian Forest and Woodland
- Western Interior Riparian Forest and Woodland and Interior West Ruderal Riparian Forest and Scrub
- Western Madrean Chaparral
- Western North American Ruderal Marsh, Wet Meadow and Shrubland

Esri, CGIAR, USGS, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

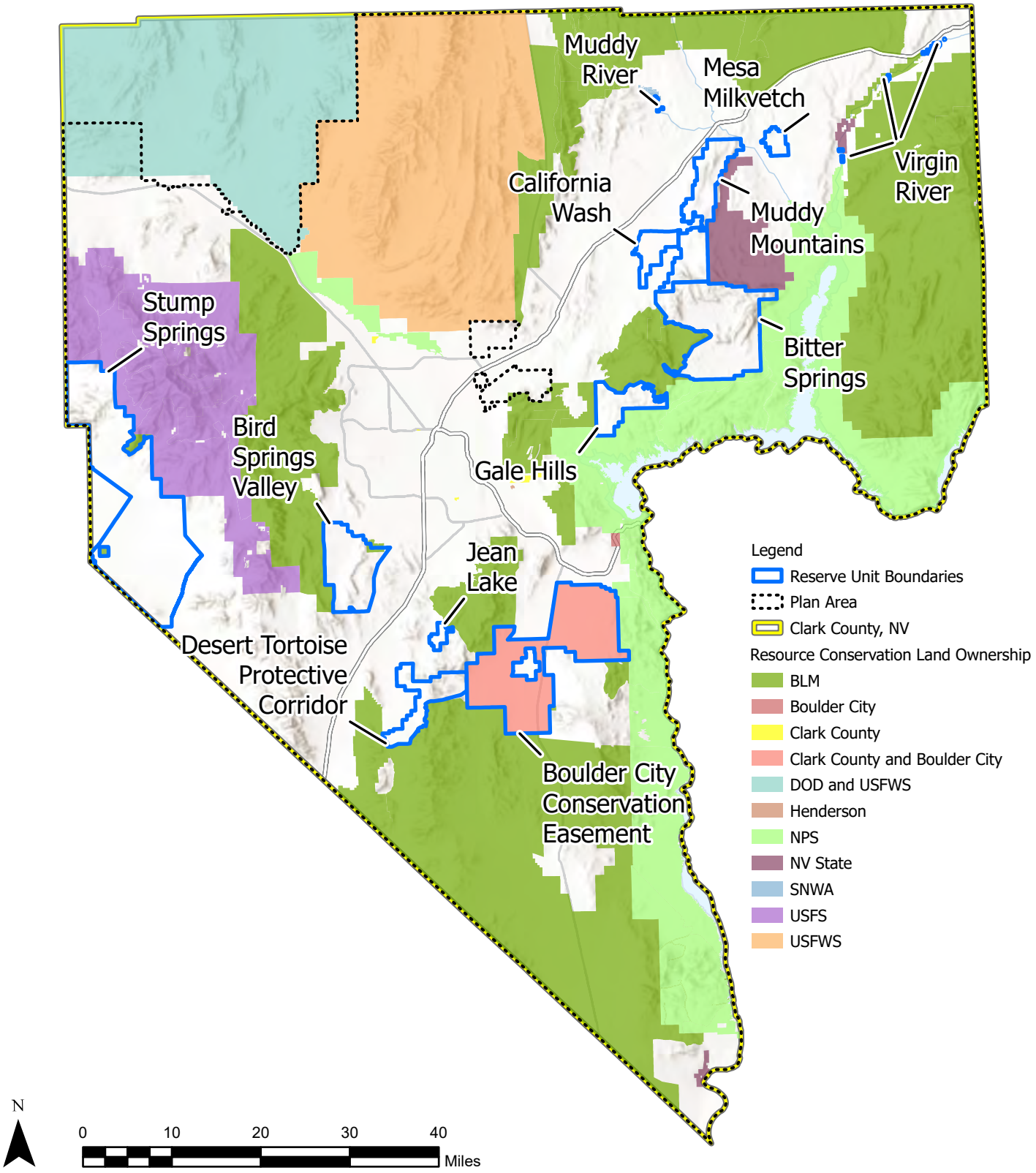

Figure 6-8. Reserve System and Existing Lands Managed for Resource Conservation

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Desert Conservation Program

set of low mountain ridges bisects the area, and both portions of the area generally drain from the southwest to the northeast.

Golden eagles (and their nests) have been documented within this unit, as well as desert tortoise and loggerhead shrike. Documented plant species include Joshua tree.

For mitigation purposes, the Functional Score of Ecosystem/Habitat groups within this Reserve Unit are included in Table 6-3. The predominant groups are Arid Shrubland (1,653), Cool Semi Desert Scrub and Grassland (715) and Mojave Desert Scrub (620). This unit also contains Gypsiferous (95), Riparian Woodland (7), and Wind-Blown Sand habitats (3).

6.3.1.2.3 Desert Tortoise Protective Corridor

The proposed Desert Tortoise Protective Corridor (Corridor) Reserve Unit encompasses 19,710 acres in the southwest portion of the Plan Area, southeast of Interstate 15, approximately 4.5 miles due east of the Town of Jean. The Corridor is roughly "y"-shaped and connects with the BCCE to the northeast, between Interstate 15 and Highway 164, to the southwest. At this border, the unit overlaps with the proposed Lucy Gray Wilderness Area. The Corridor also abuts the South McCullough proposed Wilderness Addition to the north. The unit includes portions of the McCullough Range and flat, low-lying desert basins. Elevations within the Corridor range from about 2,300 to nearly 4,400 feet.

The Corridor has been identified as a high priority area to provide connectivity for genetic exchange for desert tortoise and was designed to function as a key corridor for this species. In addition to desert tortoise, golden eagle, desert pocket mouse, Gila monster, loggerhead shrike, Le Conte's thrasher, Joshua tree, and white-margined beardtongue have all been documented to occur within this unit.

For mitigation purposes, the Functional Score of Ecosystem/Habitat groups within this Reserve Unit are included in Table 6-3. The predominant ecosystem groups are Arid Shrubland (959), Cool Semi Desert Scrub and Grassland (353), Hydrology Dependent Habitat (103) and Mojave Desert Scrub (414).

6.3.1.2.4 Jean Lake

The proposed Jean Lake Reserve Unit (Jean Lake) encompasses approximately 2,644 acres in the southern portion of the Plan Area, southeast of Interstate 15 and roughly 7.5 miles due south of the City of Las Vegas. It is located roughly 2.5 miles north of the Desert Tortoise Protective Corridor and 4 miles west of the BCCE. It also borders the Sloan Canyon National Conservation Area to the north. The eastern boundary of Jean Lake also encompasses a small portion of the McCullough Range. It is the smallest proposed Reserve Unit, and the majority of Jean Lake occurs in a flat desert basin containing a dry wash. Elevations in Jean Lake range from 2,995 to 3,861 feet.

High densities of white-margined beardtongue have been documented within Jean Lake in suitable sandy soil habitat.

For mitigation purposes, the Functional Score of Ecosystem/Habitat group within this Reserve Unit are included in Table 6-3. The predominant habitat types include Arid Shrubland (143), Cool Semi Desert Scrub and Grassland (26), Sandy (26) and Mojave Desert Scrub (75). The unit also contains Hydrology Dependent (3).

6.3.1.2.5 Gale Hills

The proposed Gale Hills Reserve Unit (Gale Hills) covers 16,350 acres in central Clark County. Gale Hills is currently an undesignated multiple-use area situated on the Gale Hills and portions of Government Wash and West End Wash. The unit shares a southern and western boundary with the Lake Mead National Recreation Area, and it overlaps with the proposed Muddy Mountains Wilderness Area. It also overlaps with NPS Wilderness to the south. Gale Hills is situated southeast of Muddy Peak and south of the upper reaches of Government Wash. The Bowl of Fire and Pinto Valley are to the east, and to the south are Callville Bay and Las Vegas Bay. To the west is Gypsum Wash and its associated development. Gale Hills ranges in elevation from a minimum of 1,427 ft to a maximum of 3,015 ft. There are no major roads in the Gale Hills unit; however, the entire southern boundary is in close proximity to Northshore Road.

The proposed Gale Hills Reserve Unit has documented occurrences of four Covered Species, including Las Vegas bearpoppy, silverleaf sunray, desert tortoise, and desert pocket mouse.

For mitigation purposes, the Functional Score of each ecosystem/habitat group within this Reserve Unit are included in Table 6-3. The predominant habitat types are Arid Shrubland (788), Gypsiferous (632), Hydrology Dependent (304), and Mojave Desert Scrub (491). Las Vegas bearpoppy and silverleaf sunray are both associated with gypsiferous soil habitat. The unit also contains Riparian Woodland (2), Sandy (40), and Wind-blown Sand habitat (67).

6.3.1.2.6 California Wash

The proposed California Wash Reserve Unit (California Wash) is located in the northeast portion of the County, close to the Bitter Springs and Muddy Mountains. It overlaps with the proposed Moapa Indian River Reservation expansion and lies southeast of Highway 15, between Las Vegas and Moapa. One of the smaller proposed Reserve Units, California Wash is just 10,117 acres. Positioned between the Muddy Mountains and the Sheep Range, the terrain is relatively flat and only changes 500 feet in elevation, from 2,000 to 2,500 feet. California Wash is currently BLM-managed with no additional designation.

There have been documented occurrences of desert tortoise, loggerhead shrike and threecorner milkvetch in the California Wash.

For mitigation purposes, the Functional Scores of each ecosystem/habitat group within this Reserve Unit are included in Table 6-3. The predominant habitat types are Arid Shrubland (629), Gypsiferous (177), Hydrology Dependent (106), Mojave Desert Scrub (198) and Wind-blown Sand (120). The unit also contains Cool Semi Desert Scrub and Grassland (42), Riparian Woodland (52), and Sandy Habitat (9).

6.3.1.2.7 Bitter Springs

The proposed Bitter Springs Reserve Unit (Bitter Springs) encompasses approximately 61,800 acres in the eastern portion of the Plan Area, approximately 12 miles southeast of Interstate 15. The southern and eastern boundaries of Bitter Springs are adjacent and generally parallel to Northshore Road. The northern boundary of Bitter Springs is contiguous with the proposed Muddy Mountains Reserve Unit. Bitter Springs is located within the Muddy Mountains, and contains West Longwell Ridge, East Longwell Ridge, and East Longwell Ridge South. Elevations within the Bitter Springs range from approximately 1,500 to 4,400 feet.

Desert tortoise, loggerhead shrike, sticky ringstem, Las Vegas bearpoppy, silverleaf sunray, Las Vegas buckwheat, and sticky buckwheat have all been documented within Bitter Springs.

For mitigation purposes, the Functional Scores of each ecosystem/habitat group within this Reserve Unit are included in Table 6-3. The predominant habitat types are Arid Shrubland (2,818), Cool Semi Desert Scrub and Grassland (674), Gypsiferous (1,561), Hydrology Dependent (805), Mojave Desert Scrub (1,408), and Riparian Woodland (268). The unit also contains Riparian Marsh (64), Sandy (84), and Wind-blown Sand habitat (27).

6.3.1.2.8 Muddy Mountains

The proposed Muddy Mountains Reserve Unit (Muddy Mountains) is currently an undesignated multiple-use area in the northeastern portion of Clark County. The unit covers approximately 31,400 acres and is located south of the town of Moapa and west of the town of Moapa Valley. The southern boundary abuts the proposed Bitter Springs Reserve Unit, and the northern boundary crosses the Muddy River just below the confluence of the Meadow Valley Wash and the Muddy River. The eastern boundary generally follows the eastern edge of Valley of Fire State Park. The western boundary partially shares a border with the Moapa River Indian Reservation, with the remainder consisting of BLM-administered lands. One paved road, Valley of Fire Highway, crosses the southern portion of the unit. The Muddy Mountains Reserve Unit will help ensure that functional habitat remains connected and will maintain linkages to existing conservation areas managed by the State of Nevada, BLM, NPS, and USFS.

The southern half of the proposed Muddy Mountains Reserve Unit is comprised of the upper reaches of tributaries to the California Wash, while the northern half of the proposed unit is bounded by the California Ridge to the west and the Weiser Ridge to the East. The southernmost portion of the Muddy Mountains ascends into the northern slopes of the Muddy Mountains. The elevation within the Muddy Mountains proposed Reserve Unit ranges from a low point of about 1,440 ft to a high point of about 4,120 ft.

The proposed Muddy Mountains Reserve Unit has documented occurrences of six Covered Species, including the Las Vegas bearpoppy, silverleaf sunray, desert tortoise, loggerhead shrike, Bell's vireo, and Townsend's big-eared bat. Las Vegas bearpoppy and silverleaf sunray are both associated with gypsiferous soil habitat. Desert tortoise, loggerhead shrike, Bell's vireo, and Townsend's big-eared bat are associated with the Mojave Desert scrub and arid shrubland habitats.

For mitigation purposes, the Functional Scores of ecosystem/habitat groups within this Reserve Unit are included in Table 6-3. The predominant habitat types are Arid Shrubland (1,502), Cool Semi Desert Scrub (136), Gypsiferous Habitat (851), Hydrology Dependent (411), Riparian Marsh (103), and Riparian Woodland (143). This Unit also contains Sandy (41) and Wind-Blown Sand (45) habitats.

6.3.1.2.9 Mesa Milkvetch

The proposed Mesa Milkvetch Reserve Unit (Mesa Milkvetch), located in the northeastern portion of Clark County, is currently within the Moapa Valley disposal boundary but will be removed from disposal status and placed into conservation status. The unit covers approximately 4,200 acres adjacent to the Muddy River, just east of the town of Moapa Valley and north of the Overton Wildlife Management Area. It lies between the developed areas along the Muddy River's eastern bank and the southwestern most ridge of Mormon Mesa, extending just north of Bowman Reservoir and nearly south to the Overton Wildlife Management Area and Lake Mead National Recreation Area. The unit is bisected by Mormon Mesa Road and Whipple Avenue and contains a network of less developed roads. Elevation within the unit varies minimally, ranging from approximately 1,400 to 2,000 feet.

The proposed Mesa Milkvetch Reserve Unit has documented occurrences of two Covered Species, threecorner milkvetch and silverleaf sunray.

For mitigation purposes, the Functional Scores of ecosystem/habitat groups within this proposed Reserve Unit are included in Table 6-3. The predominant habitat types are Arid Shrubland (221) and Wind-Blown Sand (121). This unit also contains Cool Semi Desert Scrub and Grassland (3), Gypsiferous (38), Hydrology Dependent (57), Mojave Desert Scrub (40), and Sandy habitat (84).

6.3.1.3 Federal Land – Reserve System Management

Reserve management is designed to maintain and enhance habitat for Covered Species and other native species, native biological diversity, and ecosystem function. Habitat management, including ecosystem enhancement and restoration, is a key component of maintaining habitat quality in the Reserve System for mitigating impacts on Covered Species.

Management of the Reserve System Units will be defined in the BLM's upcoming Las Vegas RMP revision, the CMAs for each Reserve Unit, and other applicable mechanisms in place for the appropriate management of the Reserve System. Reserve System Units must be managed to conserve, protect, and enhance the purposes for which each unit is established and in accordance with the Federal Land Policy and Management Act of 1976 and any other applicable law. Provisions include:

- Motorized Vehicles – Except as needed for emergency response or administrative purposes, the use of motorized vehicles in the Reserve System Units shall be permitted only on roads and motorized routes designated for the use of motorized vehicles in the management plan.
- New Roads – No new permanent or temporary roads or other motorized vehicle routes shall be constructed within the Reserve System Units after the date of enactment of the MSHCP Amendment.
- Interests in land which become part of a Reserve System Unit shall be withdrawn including those for mineral leases.

Following enactment of the MSHCP Amendment, the Secretary of the Interior shall enter into a CMA with the County providing for the joint management and long-term protection of the Reserve System Units and the development of management plans for each Reserve System Unit. The management plans will address habitat restoration and enhancement, law enforcement, invasive plant management, fire control and response, and recreational use and public access. Management goals, objectives, and actions will be developed in alignment with the overall BGOs of the MSHCP Amendment. Provisions of the IA and CMAs will be incorporated into an amendment to the Las Vegas RMP during its upcoming revision process.

6.3.2 Boulder City Conservation Easement – Design, Description and Management

In addition to the public BLM lands, the proposed Reserve System includes the BCCE, which is predominantly Mojave Desert scrub. The BCCE is an 87,310-acre easement purchased by Clark County from Boulder City in 1995 to protect the desert tortoise and other species. Boulder City is responsible for permitting activities under city ordinances, while Clark County provides law enforcement and management. The BCCE is located in the Eldorado Valley, south and southwest of the populated portions of Boulder City. The land slopes gently toward the Eldorado Dry Lake Bed, and most of the BCCE lies between 1,800 and 2,500 feet in elevation.

U.S. Highway 95 runs north-south through and adjacent to portions of the BCCE, and Nevada State Highway 165 (Nelson Road) runs east-west through the easement. The BCCE contains 105

miles of unpaved roads open for regulated vehicle use, with an additional 202 miles of unpaved roads closed by signage or restoration. The easement is bordered on the south, west, and southeast by BLM-administered lands, including the Sloan Canyon National Conservation Area to the west, and by Lake Mead NRA to the east.

Much of the BCCE has been designated as desert tortoise critical habitat by the USFWS, and occurrences of the species have been documented. The BCCE also provides suitable habitat for the western burrowing owl, with occurrences recorded throughout the easement. Gila monster, loggerhead shrike, and Le Conte's thrasher have also been documented within this proposed Reserve Unit. The BCCE has not been systematically surveyed for Covered Plant Species.

For mitigation purposes, the Functional Scores of ecosystem/habitat groups within this proposed Reserve Unit are included in Table 6-3. The predominant habitat types are Arid Shrubland (4,977), Cool Semi Desert Scrub and Grassland (313), Gypsiferous (320), Hydrology Dependent (1,028), Mojave Desert Scrub (2,568), Riparian Woodland (1,103), and Sandy (265). The BCCE also contains Riparian Marsh (62) and Wind-Blown Sand (77) habitats.

The BCCE Management Plan (DCP 2023a; Appendix E) defines management goals, objectives, and actions for the BCCE and was developed in alignment with the existing MSHCP BGOs. The BCCE management goals and objectives are listed below; management actions and associated details are provided in the management plan. The management plan will be updated to reflect the MSHCP Amendment BGOs following its approval, and future updated plan versions will supersede preceding versions as they are released.

Goal 1: Protect and manage the BCCE for the desert tortoise and its habitat.

- Objective 1.0 - Restore and enhance habitat for desert tortoise
- Objective 2.0 - Install and maintain infrastructure that controls tortoise movement
- Objective 3.0 - Identify and decrease direct stressors to desert tortoise, as needed

Goal 2: Protect and manage the BCCE for other MSHCP Covered Species.

- Objectives to be developed.

Goal 3: Manage the property and public uses to meet conservation obligations and legal requirements.

- Objective 4.0 - Promote a road network that supports conservation and provides appropriate access for management and public use
- Objective 5.0 - Provide law enforcement
- Objective 6.0 - Control invasive plant species and noxious weeds
- Objective 7.0 - Promote responsible recreation and inform the public on current activities
- Objective 8.0 - Manage allowable uses
- Objective 9.0 - Manage prohibited uses

6.3.3 Riparian Reserve Units

Condition K of the Section 10(a)(1)(B) ITP associated with the existing MSHCP conditions the take of covered avian species on the acquisition of private lands in desert riparian habitats along the Muddy and Virgin Rivers and the Meadow Valley Wash (USFWS 2001). These riparian systems are being targeted because of their existing bird habitat and the development pressure they face. Because much of the riparian habitat in Clark County is privately owned, voluntary acquisitions and conservation easements from willing sellers are being pursued to meet habitat

protection targets, either through purchase of fee title or through conservation easements. Riparian restoration will also improve habitat quality and contribute to the recovery of the covered bird species.

6.3.3.1 Riparian Reserve Units – Design

To date, the DCP has acquired properties totaling 662 acres of riparian habitat along the Muddy and Virgin Rivers, as shown in Figures 6-19 and 6-20. Meadow Valley Wash properties have not yet been included in the Riparian Reserve Units because willing sellers of suitable habitat have not been identified. The Lower Las Vegas Wash and the Lower Colorado River also provide riparian and marsh bird habitat within the Plan Area but have not been targeted for acquisition under the existing MSHCP because of ongoing conservation and management efforts (including the Lower Colorado River MSHCP), low development risk, and limited acquisition opportunities.

The Nature Conservancy (TNC) assisted Clark County in implementing the early riparian land acquisition program for the existing MSHCP. From 2002 to 2004, TNC acquired nine parcels totaling 116.5 acres from willing sellers, using funds from the SNPLMA account for the purchase of environmentally sensitive lands. TNC managed these properties until they were transferred to Clark County in 2010 and 2011.

Clark County has also acquired 545.5 acres of property in the lower Virgin River watershed across five sites: Bunkerville East, Bunkerville West, Mesquite (sometimes referred to as Mesquite West), Mormon Mesa, and Riverside. The Mormon Mesa property was the first Virgin River parcel acquired by Clark County, transferred from the Clark County Parks and Recreation Department to the DCP in 2011. Since then, 15 additional parcels have been acquired as properties from willing private sellers have become available. These already-acquired lands will continue to be part of the Reserve System and managed to benefit Covered Species. XX acres have been acquired in excess of mitigation requirements for the existing MSHCP and provide a head start on the MSHCP Amendment's mitigation needs for riparian habitats.

Unlike the publicly owned portion of the Reserve System, which has clearly defined boundaries, the riparian areas are incorporated into the Reserve System over time based on the availability of willing sellers and on the completion of accurate surveys and legal descriptions. The DCP developed an acquisition selection tool to rank and prioritize properties based on the environmental and administrative criteria listed in Table 6-2 below.

Table 6-2. Acquisition Selection Criteria

Administrative Criteria
Ease of management Complexity of land acquisition process Potential for degradation of habitat if not purchased for conservation
Environmental Criteria
Species evaluation Proximity to sensitive lands Restoration Potential

Habitat functionality assessments are another key component of assembling the proposed Riparian Reserve Units. Using the habitat functionality analysis, DCP will ensure that mitigation

lands provide desert riparian habitat equal to or greater than that of the desert riparian ecosystem impacted. The Riparian Reserve Unit descriptions that follow include functional scores for the proposed units acquired to date, which are summarized in Table 6-3. Because the Reserve System will require additional Riparian Reserve Units to meet the mitigation requirements of the MSHCP Amendment, protection of riparian habitats will occur prior to impacts at a rate and level that keeps mitigation consistent with and ahead of the rate of impact, in accordance with the USFWS Stay Ahead Provision. Riparian restoration projects will also be conducted with the goal of increasing suitable breeding habitat for riparian birds. Mitigation credits for successful restoration projects, as defined by the success criteria generally described in Appendix F, will be calculated in addition to the preservation credits estimated through the landscape-level analyses of habitat functionality. The MSHCP Amendment will first estimate mitigation achieved through preservation (as measured by habitat Functionality Scores), and additional mitigation credit may then be granted upon successful completion of restoration projects that provide habitat uplift or improvement.

6.3.3.2 Riparian Reserve Units Description

Each of the Riparian Reserve Units are described below, including size, location, surrounding land uses, ecosystem and habitat value, and habitat Functionality Scores.

6.3.3.2.1 Muddy River Reserve Unit

The Muddy River Reserve Unit (Muddy River) is located in northeastern Mojave Desert ecosystem within Moapa Valley and consists of multiple properties (Figure 6-9). The properties consist of approximately 116 acres, including riparian habitat along the Muddy River, which were acquired to conserve habitat for various riparian bird species, including the southwestern willow flycatcher and Yuma Ridgway's rail. Yellow-billed cuckoo, southwestern willow flycatcher, and loggerhead shrike have been documented in this Reserve Unit. The Muddy River Reserve is surrounded by BLM, USFWS and tribal lands, SNWA conservation lands, and lands used for residential, agricultural and commercial purposes. The elevation ranges from 1,520 to 1,800 feet, with a narrow to moderately wide floodplain along the river and steep slopes climbing up to the surrounding mesas.

For mitigation purposes, the Functional Scores of ecosystem/habitat groups within this Reserve Unit are included in Table 6-3. The predominant habitat types are Riparian Marsh (78) and Riparian Woodland (106). The Unit also contains Arid Shrubland (6), Gypsiferous (1), Hydrology Dependent (2) and Mojave Desert Scrub (1) habitats.

6.3.3.2.2 Virgin River Reserve Unit

Clark County currently owns approximately 550 acres in the Virgin River Reserve Unit (Figure 6-10). This includes an 80-acre parcel on the lower reach of the Virgin River that consists of approximately 67 acres of riparian habitat within the 100-year floodplain and 13 acres of Mojave Desert Scrub habitats. Adjacent land uses include golf courses, residential neighborhoods, agriculture, BLM multi-use, and wildlife habitat protection within the Overton Wildlife Management Area. Much of the surrounding land is managed by BLM, NPS, and NDOW. Elevations range from 1,260 to 1,600 feet; the floodplain is relatively flat, but there are steeper climbs from the floodplain to the surrounding uplands (Orr et al. 2013).

This Reserve Unit has documented occurrences of the desert pocket mouse, yellow-billed cuckoo, southwestern willow flycatcher, loggerhead shrike, Bell's vireo, threecorner milkvetch and sticky buckwheat. The dominant vegetation type in this riparian zone is tamarisk and the unit is located in Critical Habitat for the southwestern willow flycatcher.

Figure 6-9. Muddy River Reserve

Legend

- Plan Area
- Reserve Unit Boundaries
- Clark County, NV

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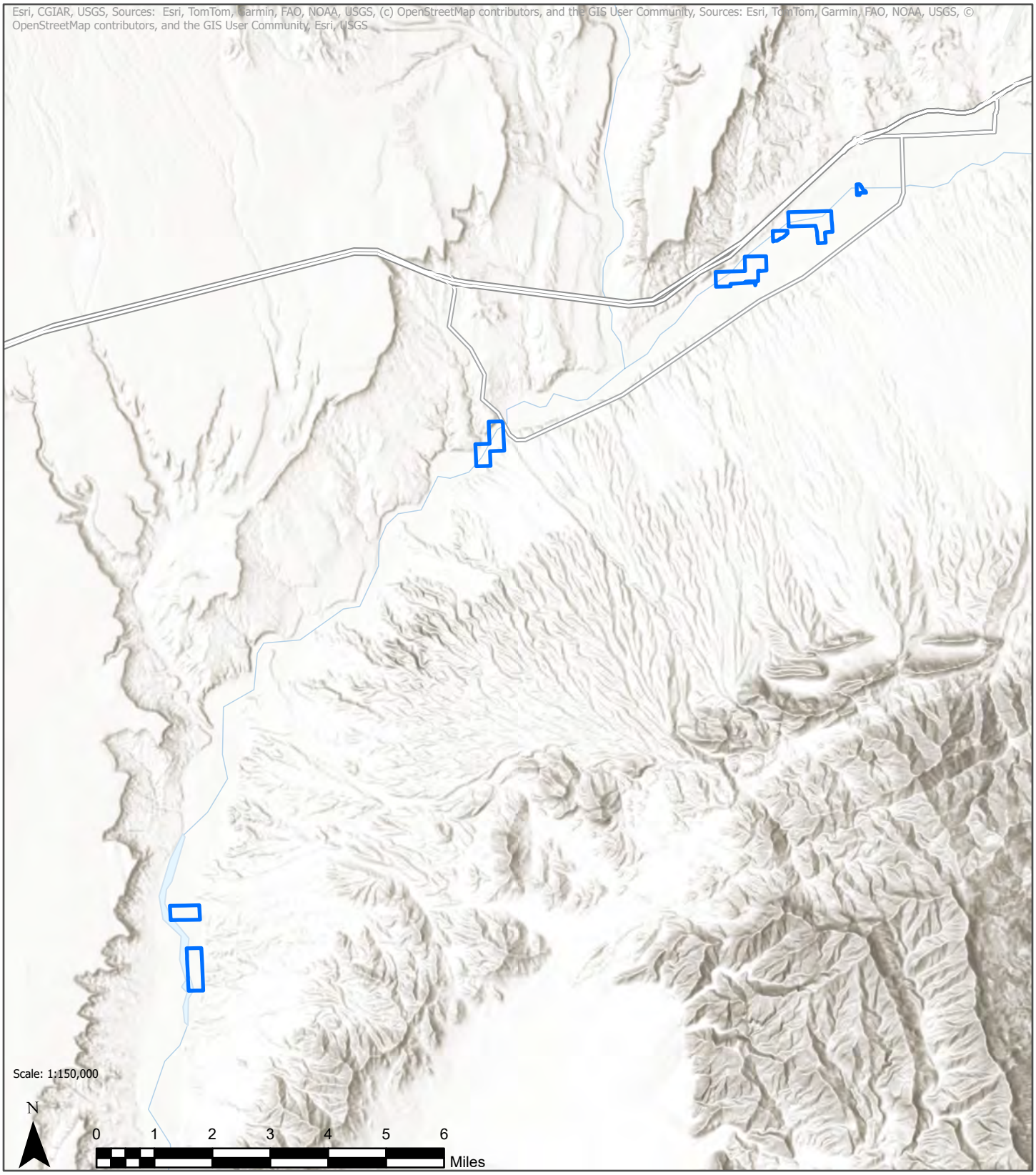

Figure 6-10. Virgin River Reserve

Legend
- Plan Area
- Virgin River Reserve Unit
- Clark County, NV

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For mitigation purposes, the Functional Scores of ecosystem/habitat groups within this Reserve Unit are included in Table 6-3. The predominant habitat types in the Virgin River Reserve Unit are Riparian Marsh (951) and Riparian Woodland (1,678). The Unit also contains Arid Shrubland (36), Cool Semi Desert Scrub and Grassland (1), Hydrology Dependent (9), Mojave Desert Scrub (6), Sandy Habitat (5), and Wind-Blown Sand Habitat (3).

6.3.3.3 Riparian Reserves Management

The Riparian Reserves Management Plan (DCP 2023b; Appendix G) includes management goals, objectives and actions that relate to the BGOs of the existing MSHCP. The goals and objectives are listed below and the management actions and associated details can be found in the Riparian Reserves Management Plan. The management plan will be updated to reflect the MSHCP Amendment BGOs following its approval, and future updated plan versions will supersede preceding plans as they are released.

Goal 1: Maintain or improve habitat quality with Reserve System lands to promote resiliency, redundancy, and representation for Covered Species.

- Objective 1.1 – Utilize invasive species treatment methods to maintain or decrease the eight-year average area requiring weed management.

- Objective 1.2 – Acquire riparian acreage at an equivalent rate as take over the life of the permit. An eight-year lag after riparian acreage is developed is allowed to account for the willing-seller, willing-buyer basis of property exchange, within the life of the permit.

- Objective 1.3 – Protect, restore, or otherwise increase the quality and quantity of habitat for MSHCP Covered Species, as determined by the monitoring methods, definition of quality, and timeframes specified in the MAMP.

- Objective 1.4 – Incorporate natural ecological, hydrological, and geomorphological processes into restoration design and implementation to maintain ecological integrity, ecosystem function, and biological diversity. Include consideration that climate change may result in significant changes in these processes over historical frequencies and magnitudes.

- Objective 1.5 – Identify critical uncertainties (e.g., climate change, human population growth) of MSHCP-funded projects on DCP reserve system lands and report on them in updates to the DCP Reserve System Management Plans.

- Objective 1.6 – Incorporate concepts of ecosystem redundancy and representation to promote ecological resiliency in the updates to the DCP Reserve System Land Management Plans.

- Objective 1.7 – Protect and enhance connectivity (i.e., road restoration, culvert placement) within DCP reserve system lands for desert tortoise and other high priority Covered Species.

Goal 2: Maintain stable or increasing populations of Covered Species occurring within DCP reserve system lands.

- Objective 2.1 – Monitor covered wildlife species as described in the MAMP. Report quantitative population data, as described in the MAMP, for Covered Species in the

Annual Progress Report and report statistical analyses of population trends in each Five-Year Monitoring Report.

- Objective 2.2 – Conduct surveys for covered plant species as described in the MAMP. Protect, conserve, and monitor known occurrences of these species annually. Report quantitative population data as described in the MAMP annually in the Annual Progress Report and report statistical analyses of population trends in every Five-Year Monitoring Report.
- Objective 2.3 – Translocate and augment desert tortoise populations in accordance with current USFWS guidance (USFWS 2020) through translocation programs that achieve survivorship rates within 20 percentage points of resident tortoise survival rates in the same areas (or with other survivorship as prescribed by future changes to USFWS guidance). Report survivorship data in the Annual Progress Report and report analysis on aggregated translocated tortoise survivorship compared to aggregated resident tortoise survivorship in every Five-Year Monitoring Report.
- Objective 2.4 – Ensure the best available scientific information is being evaluated and incorporated into population management efforts for Covered Species, including monitoring methods and identification of critical uncertainties (e.g., climate change, human population growth), by completing a focused literature review (or Systematic Review) in each Five-Year Monitoring Report.

Goal 3: Foster community and stakeholder engagement to maintain or improve Covered Species populations and their habitats

- Objective 3.1 – Develop and disseminate educational materials that cover the following topics: 1) the value of the desert ecosystem in Clark County; 2) promoting responsible recreation; 3) promoting following development procedures; and 4) avoiding and minimizing impacts to the environment. Re-evaluate material's relevance quadrennially (branding, technology, social and recreation trends, etc.) in each Five-Year Monitoring Report.
- Objective 3.2 – Protect habitats within the BCCE from unauthorized land use through vigilance (by patrolling an average of at least 100 hours each month) and education (by providing information during encounters). Compile and report data in each Annual Progress Report.
- Objective 3.3 – Provide information to permitted users (project proponents, construction personnel, researchers, biological consultants) about BMPs for the desert tortoise and associated reporting procedures. If BMPs are developed for other Covered Species, this objective would expand to apply to them also. Compile data and provide a summary or list of BMPs provided to permitted users in the preceding year in each Annual Progress Report. Report number of projects permitted each year.

Additional non-federal Reserve Units are expected to be added to the Reserve System over time through acquisition and conservation easements, consistent with the MSHCP Amendment Conservation Strategy. As expansion of the Reserve System occurs, new Riparian Reserve Units will be incorporated into the Riparian Reserves Management Plan and new management plans will be developed and/or updated, similar to the BCCE Management Plan.

6.3.4 Advance Mitigation

In addition to the Reserve System lands described above, the DCP is pursuing advance mitigation actions to support implementation of the MSHCP Amendment. Advance mitigation refers to conservation actions initiated prior to the impacts they offset, providing quantifiable benefits to Covered Species and their habitats ahead of take. These actions support compliance with the

USFWS Stay Ahead Provision by ensuring that mitigation occurs at a rate and level consistent with, or ahead of, the rate of impact from Covered Activities. The two advance mitigation actions described below are the establishment of a State OHV registration program and the acquisition of urban parcels to preserve burrowing owl nesting habitat.

6.3.4.1 Off-Highway Vehicle Registration Program

In 2009, Clark County committed start-up funding of $500,000 to enable implementation of State legislation requiring the licensing and registration of OHVs in Nevada. The legislation (Senate Bill 394, approved by the Nevada State Legislature on June 2, 2009) authorized the Nevada Department of Motor Vehicles to require OHV owners to obtain certificates of title and registration and to collect associated fees. Without the seed funding from Clark County, the enabling legislation would have expired in July 2011, and no program regulating OHV use in Nevada would have been implemented for the foreseeable future. The County's contribution transmitted funds to the Revolving Account for the Assistance of the Nevada Department of Motor Vehicles, allowing the program to become operational.

The Nevada OHV registration program is administered by the Nevada Commission on Off-Highway Vehicles within the Department of Conservation and Natural Resources. Program revenue is used in part to mitigate the adverse environmental impacts of OHV activities, with up to 18 percent of revenue allocated to the restoration of areas damaged by OHV use. Regulations promulgated for the program require that habitat restoration projects meet specific requirements. Through a Point of Tentative Agreement (POTA) executed on July 15, 2009, the County's $500,000 contribution is credited toward mitigation requirements under the MSHCP Amendment.

6.3.4.2 Acquisition of Urban Reserve Parcels

The DCP is pursuing the acquisition of two privately owned properties in the northwest Las Vegas Valley, totaling approximately 6.14 acres, that support one of the most productive known burrowing owl (*Athene cunicularia hypugaea*) concentration areas in the urbanizing Las Vegas Valley. The properties, collectively referred to as the Rainbow Owl Preserve, have produced more than 100 fledged burrowing owl chicks since 2016. The properties are currently monitored and maintained by community volunteers with technical assistance from the USFWS Partners for Fish and Wildlife Program, and this stewardship framework will be retained following acquisition.

Acquisition is proposed through an off-cycle nomination submitted to the BLM for funding under the SNPLMA Multi-Species Habitat Conservation Plan category, in the amount of $3,058,550. Following acquisition, the properties will be incorporated into the MSHCP Reserve System and managed in perpetuity, consistent with the terms of the Section 10(a)(1)(B) ITP and the SNPLMA Implementation Agreement. The acquisition will provide advance mitigation for the burrowing owl, a proposed Covered Species under the MSHCP Amendment, and will contribute to the expansion of the Reserve System that is central to the resource stewardship strategy of the MSHCP Amendment. Although the project remains in the nomination phase and has not been completed, the Landowner Agreement that established habitat protections on the properties expires in August 2026, making timely acquisition important to prevent habitat loss prior to MSHCP Amendment implementation.

6.3.5 Reserve System Habitat Functionality Summary

Table 6-3 below presents the habitat Functionality Scores for each ecosystem/habitat group across all Reserve Units (also shown below in Figures 6-11 through 6-20). The habitat groups are not necessarily mutually exclusive and may overlap in some instances because vegetation characteristics can span more than one habitat group.

Table 6-4 relates the habitat Functionality Scores of the proposed Reserve System (presented above) to the habitat Functionality Scores of proposed impacts from Chapter 5. As noted above, the habitat groups overlap in some instances. As the MSHCP Amendment continues to acquire and conserve private lands through easements or purchase, the habitat Functionality Scores for these habitat groups will increase to meet or exceed the proposed impacts. Restoration projects will also be conducted, and successfully completed projects will generate additional mitigation credits for the relevant habitat groups. Mitigation will be conducted at a pace that keeps it at or ahead of impacts, in compliance with the USFWS Stay Ahead Provision.

Table 6-3. Functional Score of Ecosystem/Habitat Group by Reserve Unit

Reserve Unit	Arid Shrubland Habitat Functionality	Cool Semi Desert Scrub and Grassland Habitat Functionality	Gypsiferous Habitat Functionality	Hydrology Dependent Habitat Functionality	Mojave Desert Scrub Habitat Functionality	Playa Fringe Habitat Functionality	Riparian Marsh Habitat Functionality	Riparian Woodland Habitat Functionality	Sandy Habitat Functionality	Wind-Blown Sand Habitat Functionality
Pixel Size	**250m x 250m**	**250m x 250m**	**250m x 250m**	**250m x 250m**	**250m x 250m**	**250m x 250m**	**30m x 30m**	**30m x 30m**	**250m x 250m**	**250m x 250m**
Bird Springs Valley	1,653	715	95	285	620	-	-	7	0	3
Bitter Springs	2,818	674	1,561	805	1,408	-	64	268	84	27
California Wash	629	42	177	106	198	-	-	52	9	120
Desert Tortoise Protective Corridor	959	353	4	103	414	-	-	-	36	6
Gale Hills	788	40	632	304	491	-	0	2	40	67
Jean Lake	143	26	0	3	75	-	-	-	26	0
Mesa Milkvetch	221	3	38	57	40	-	-	-	84	121
Muddy Mountains	1,502	136	851	411	718	-	103	143	41	45
Stump Springs	6,623	2,083	24	109	1,435	396	-	3,173	33	44
TOTAL Proposed Reserve Units Functional Score	**15,335**	**4,071**	**3,381**	**2,185**	**5,400**	**396**	**168**	**3,644**	**352**	**432**
BCCE	4,977	313	320	1,028	2,568	-	62	1,103	265	77
Muddy River	6	0	1	2	1	-	78	106	0	0
Virgin River	36	1	0	9	6	-	951	1,678	5	3
TOTAL Existing Reserve Units Functional Score	**5,019**	**314**	**321**	**1,040**	**2,575**	**0**	**1,092**	**2,888**	**270**	**80**
Grand Total	**20,354**	**4,385**	**3,702**	**3,225**	**7,975**	**396**	**1,260**	**6,532**	**622**	**512**

Table 6-4. Comparison of Functional Scores for Proposed Impact and Conservation

Ecosystem or Habitat Groups		Functional Scores		
	Pixel Size	Proposed Impact Area	Proposed Low Impact Area	Proposed Reserve System Area
Arid Shrubland Habitat Functionality	**250m x 250m**	10,271	7,568	15,335
Cool Semi Desert Scrub and Grassland Habitat Functionality	**250m x 250m**	808	461	4,071
Gypsiferous Habitat Functionality	**250m x 250m**	1,433	1,404	3,381
Hydrology Dependent Habitat Functionality	**250m x 250m**	2,064	1,711	2,185
Mojave Desert Scrub Habitat Functionality	**250m x 250m**	4,122	3,698	5,400
Playa Fringe Habitat Functionality	**250m x 250m**	150	0	396
Riparian Marsh Habitat Functionality	**30m x 30m**	3,726	4,330	168
Riparian Woodland Habitat Functionality	**30m x 30m**	11,082	8,207	3,644
Sandy Habitat Functionality	**250m x 250m**	366	479	352
Wind-Blown Sand Habitat Functionality	**250m x 250m**	453	360	432

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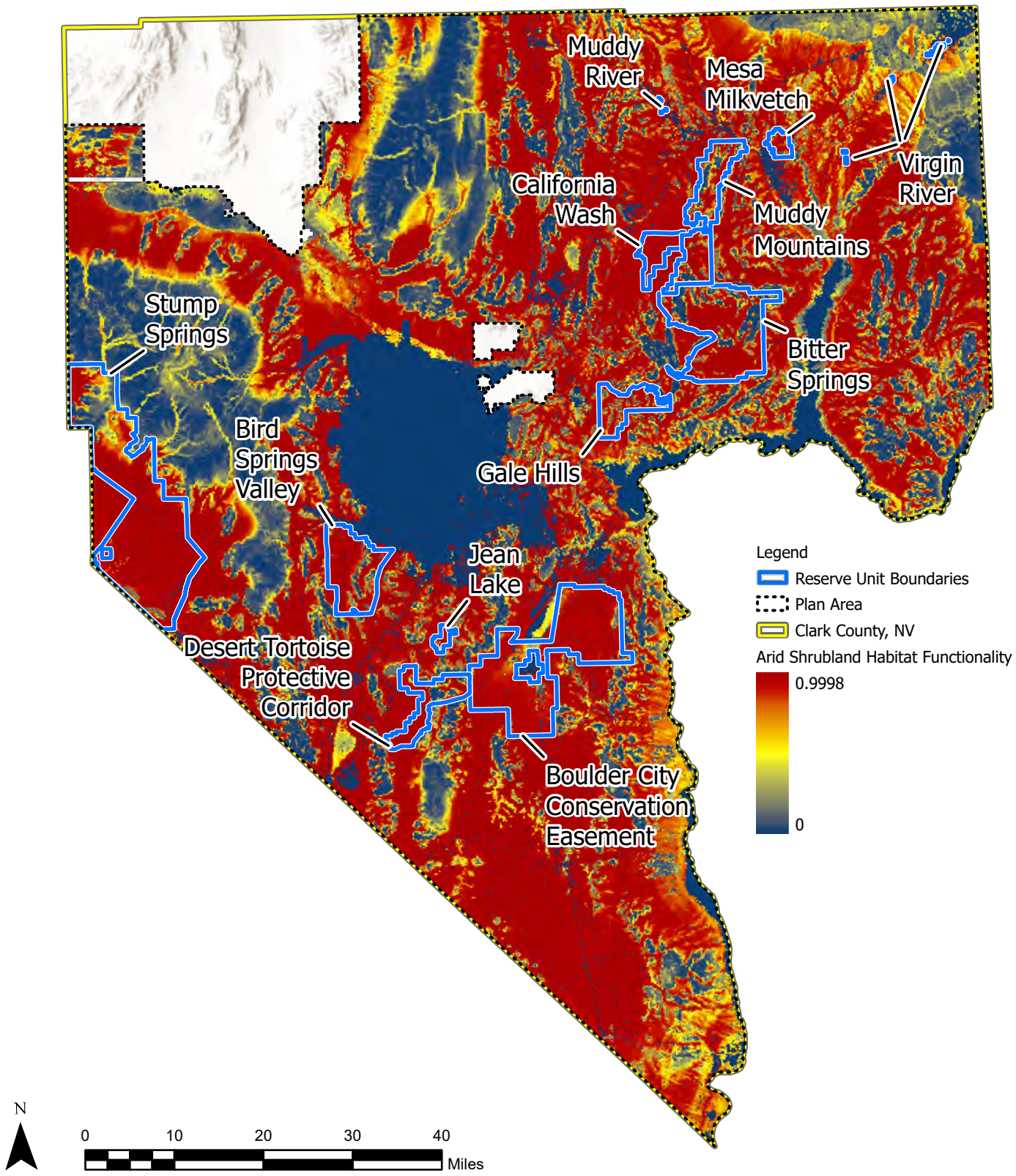

Figure 6-11. Reserve System and Arid Shrubland Habitat Functionality

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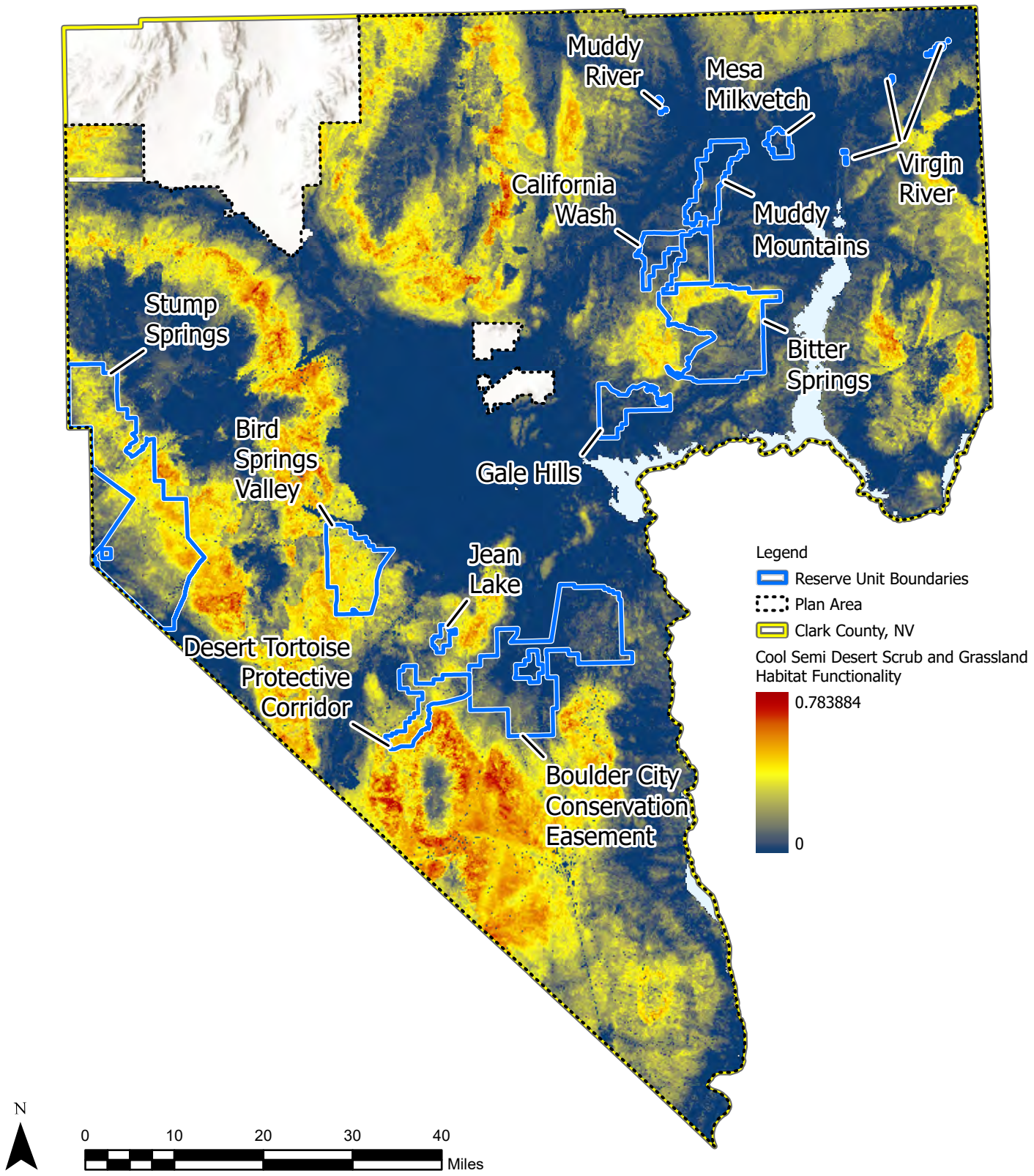

Figure 6-12. Reserve System and Cool Semi Desert Scrub and Grassland Habitat Functionality

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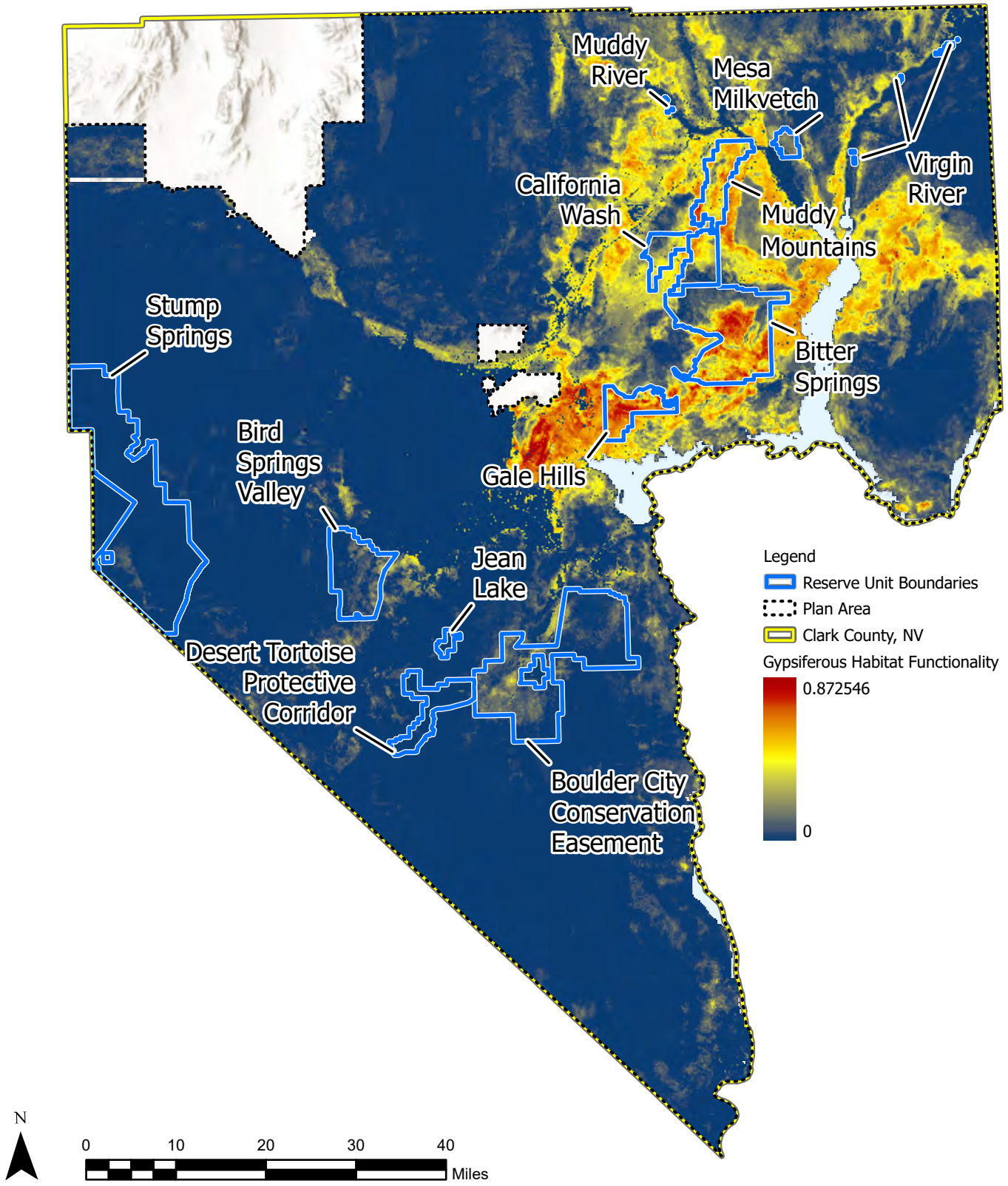

Figure 6-13. Reserve System and Gypsiferous Habitat Functionality

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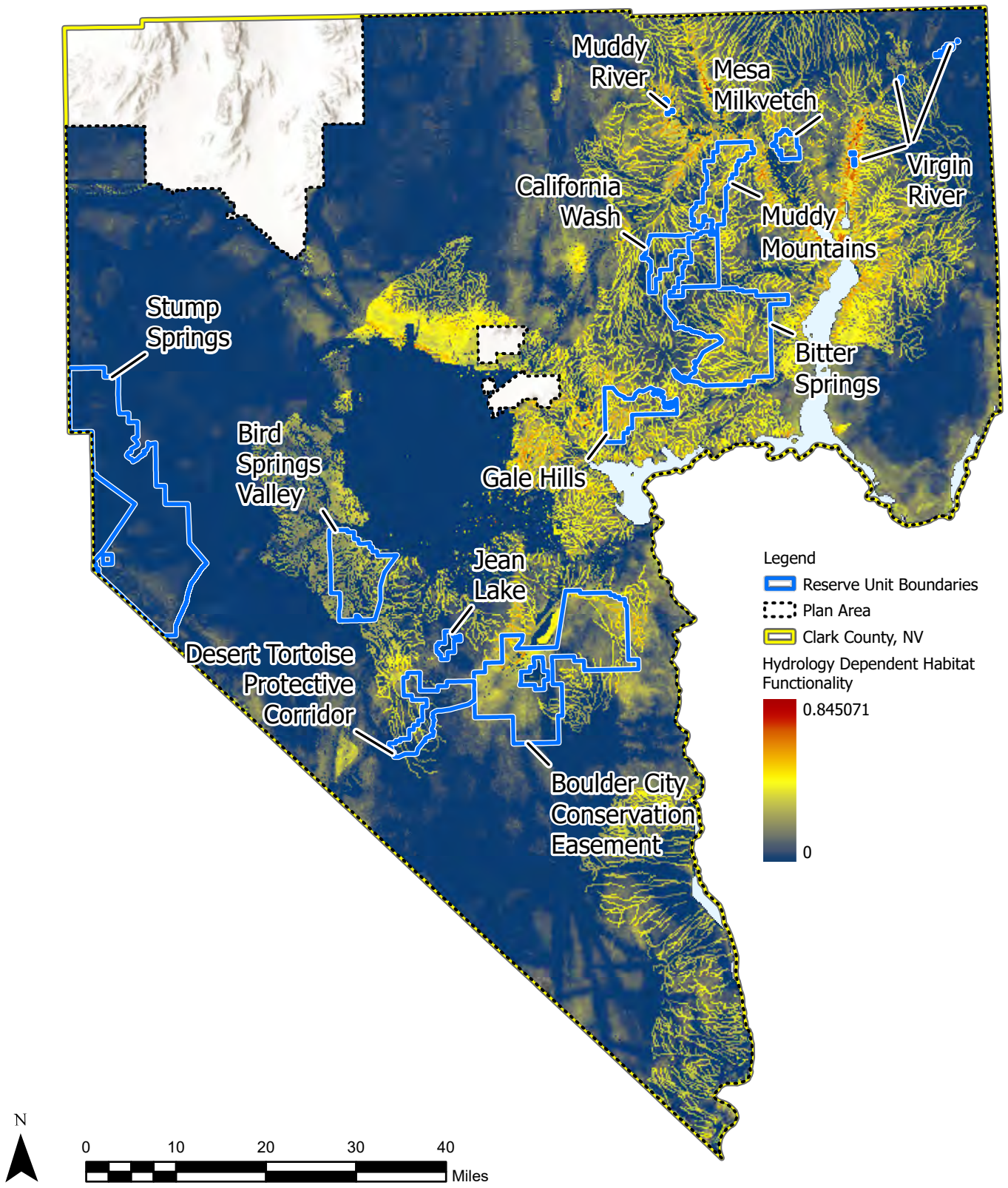

Figure 6-14. Reserve System and Hydrology Dependent Habitat Functionality

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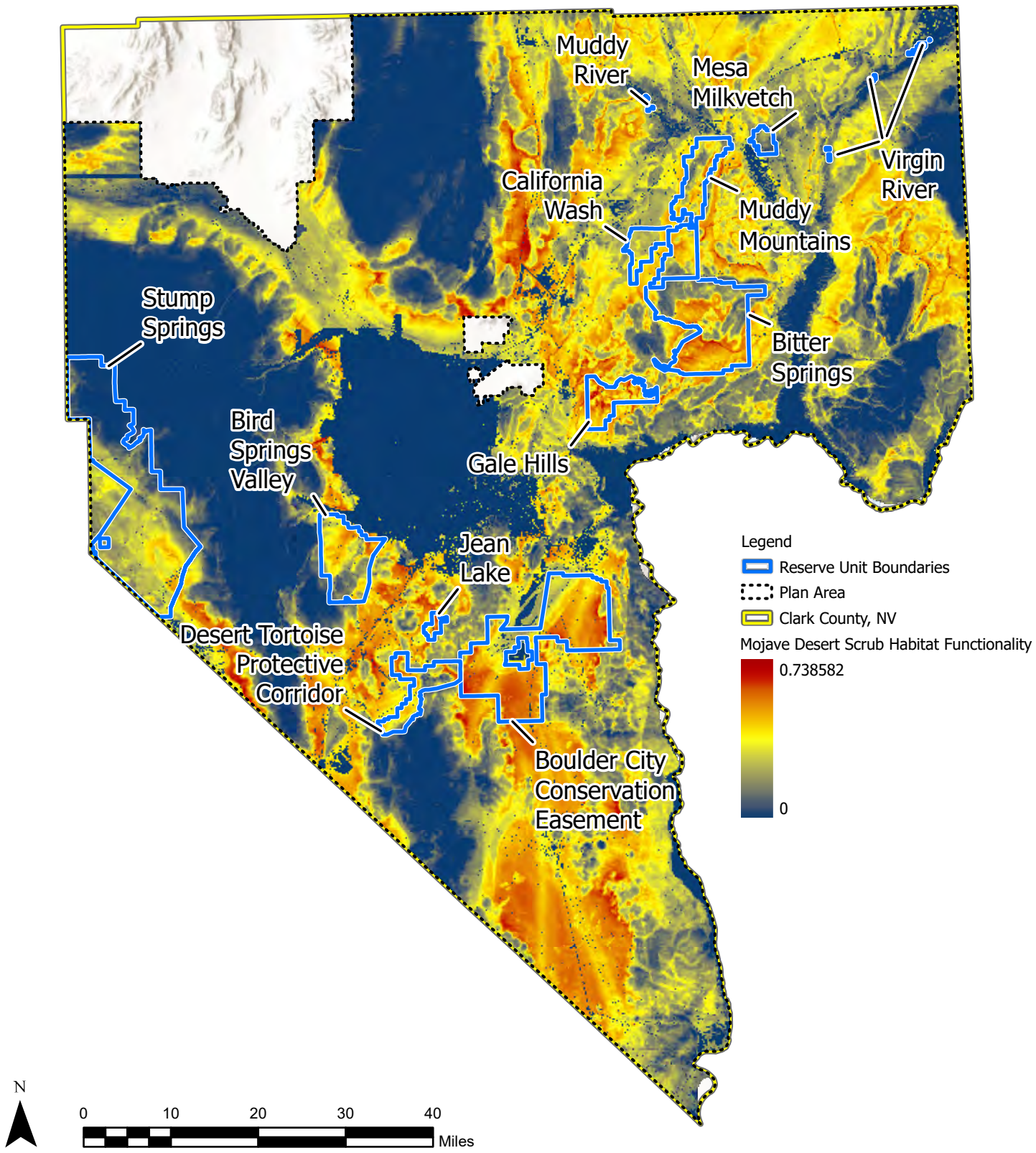

Figure 6-15. Reserve System and Mojave Desert Scrub Habitat Functionality

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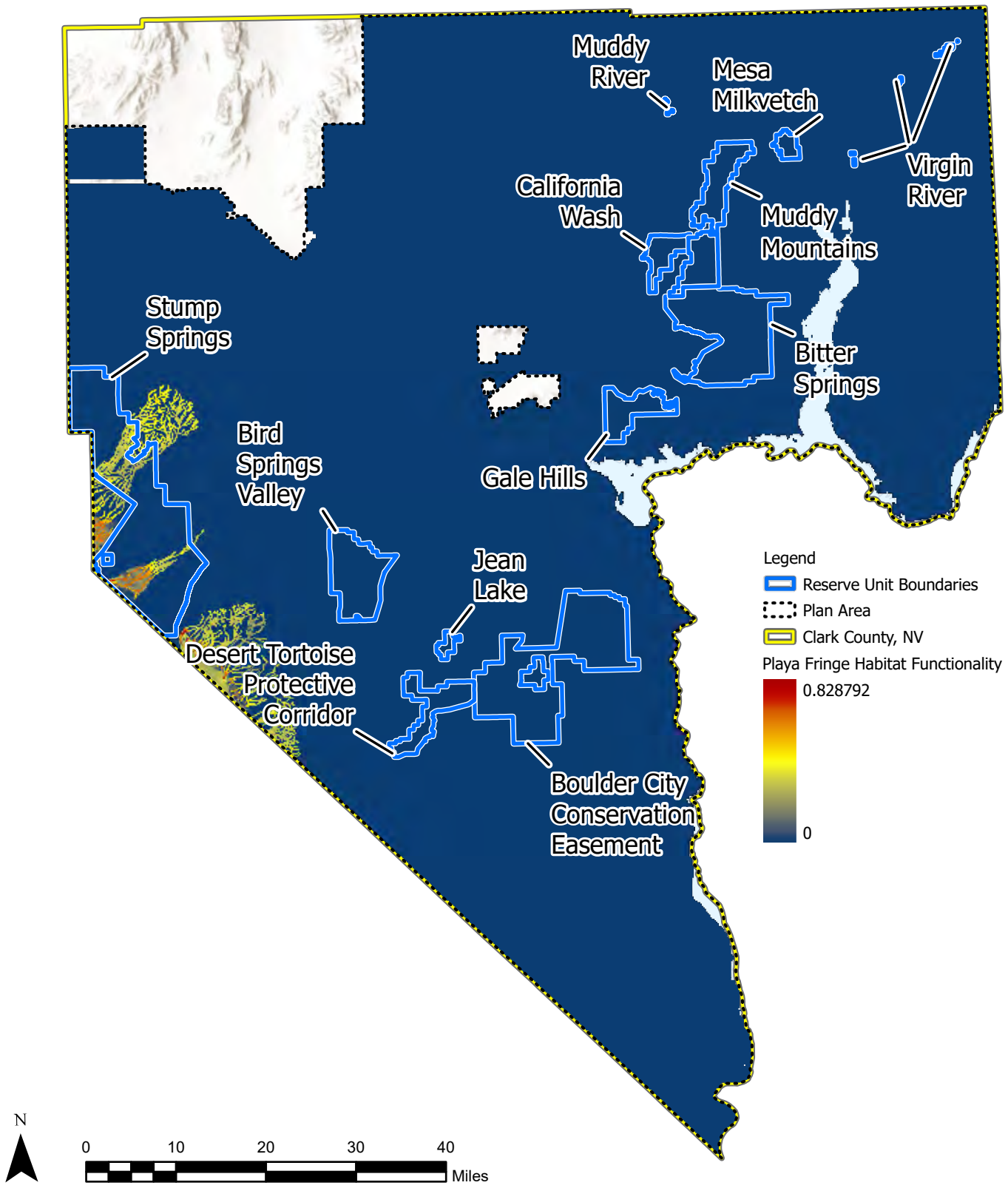

Figure 6-16. Reserve System and Playa Fringe Habitat Functionality

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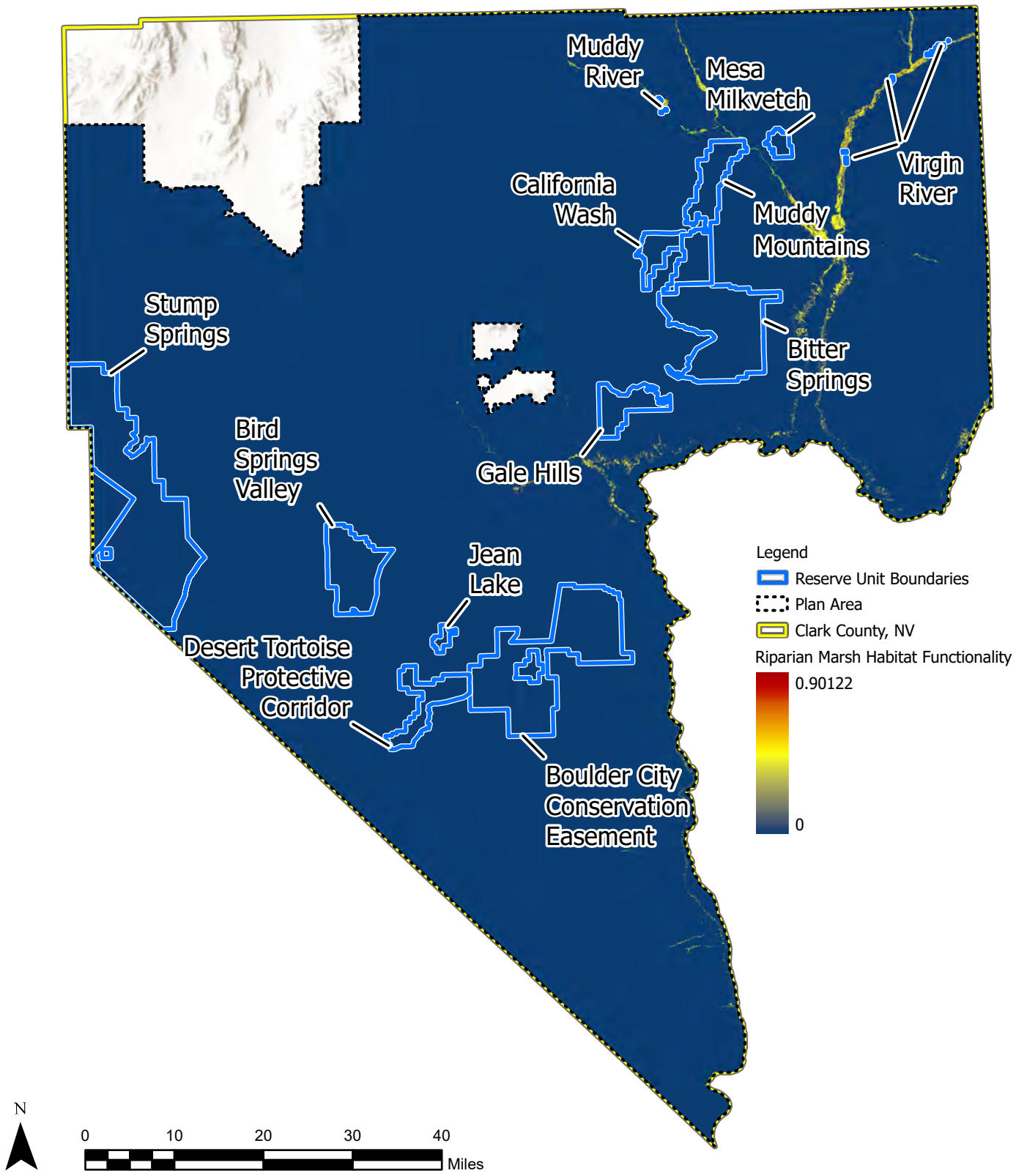

Figure 6-17. Reserve System and Riparian Marsh Habitat Functionality

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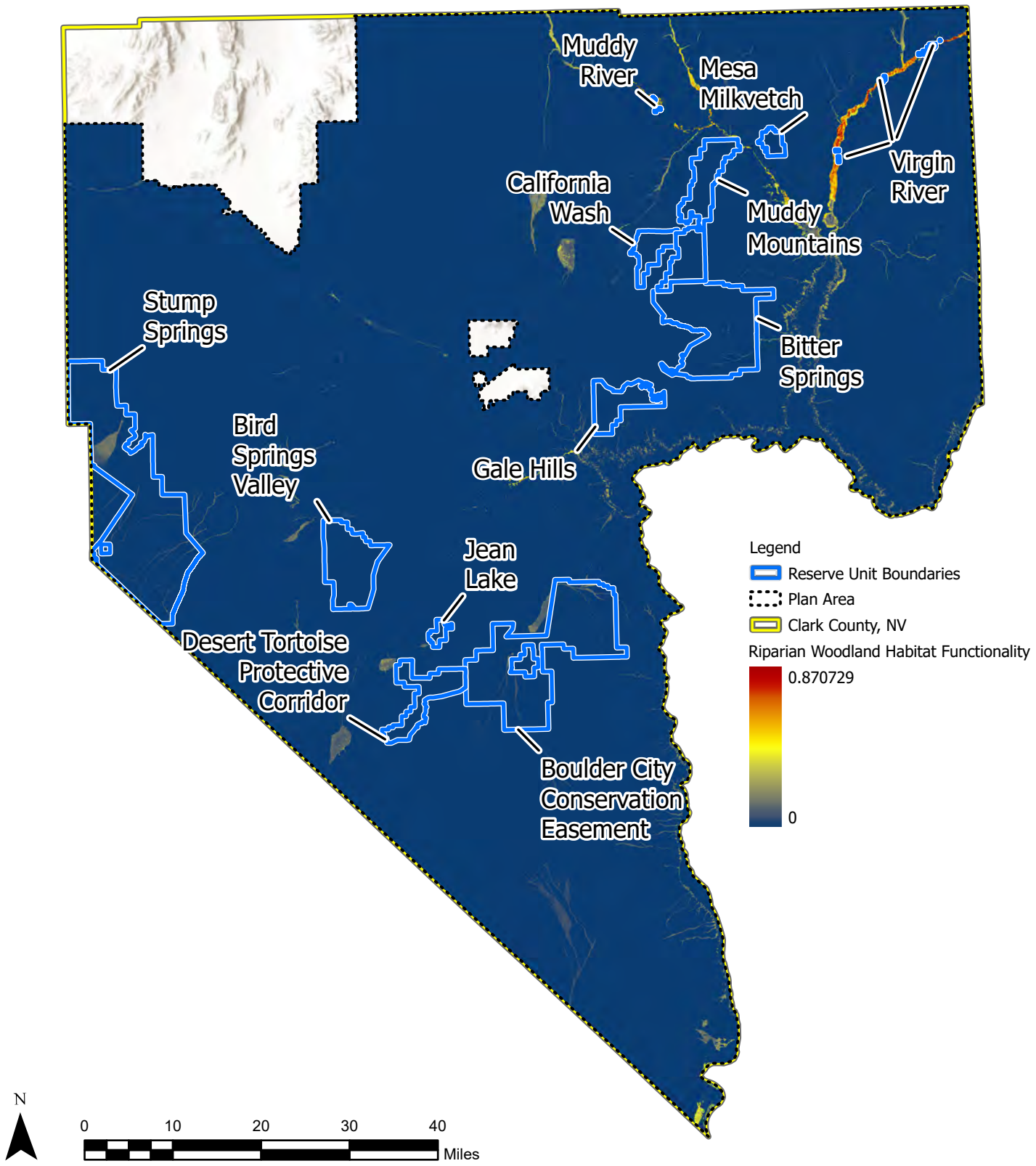

Figure 6-18. Reserve System and Riparian Woodland Habitat Functionality

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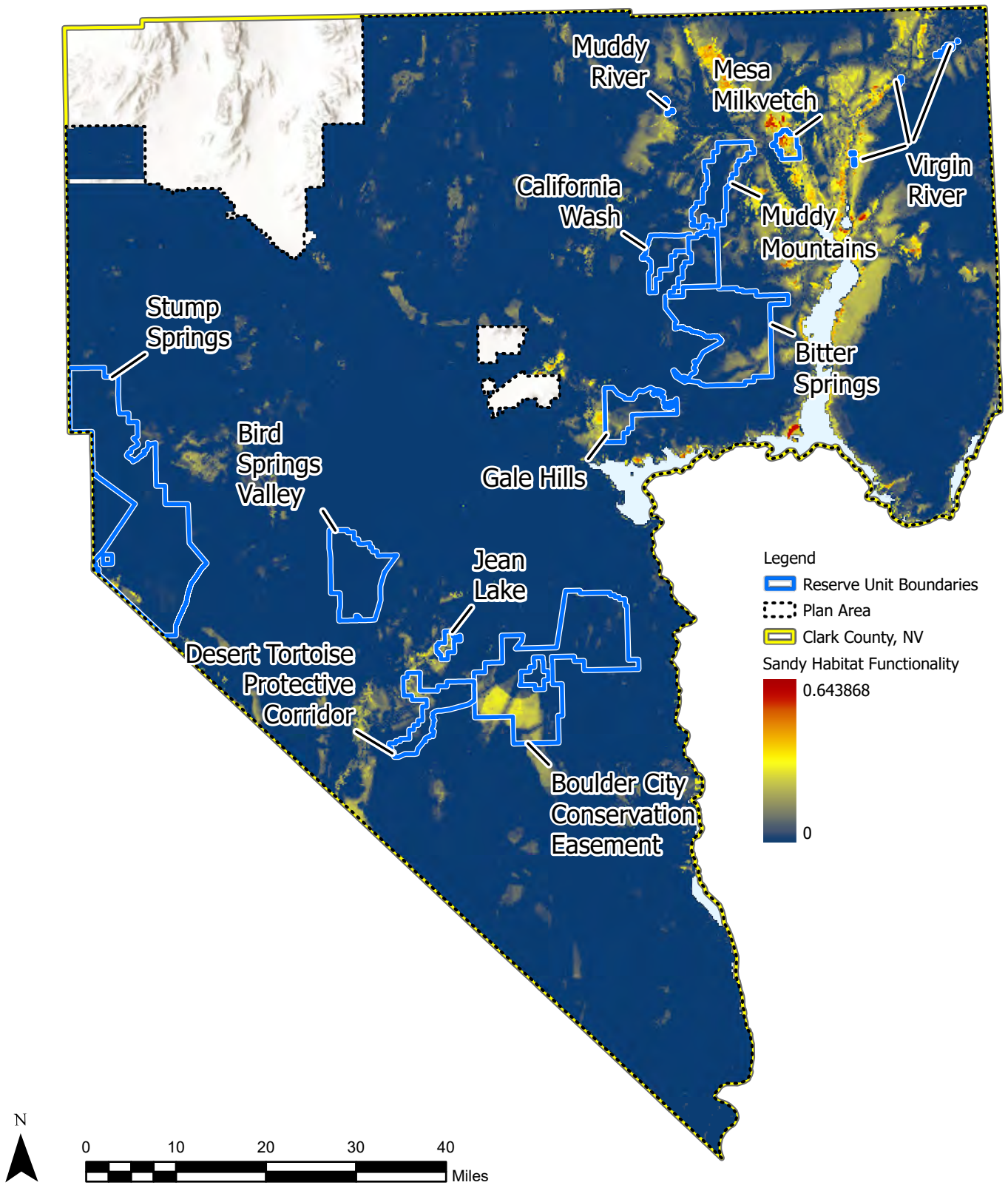

Figure 6-19. Reserve System and Sandy Habitat Functionality

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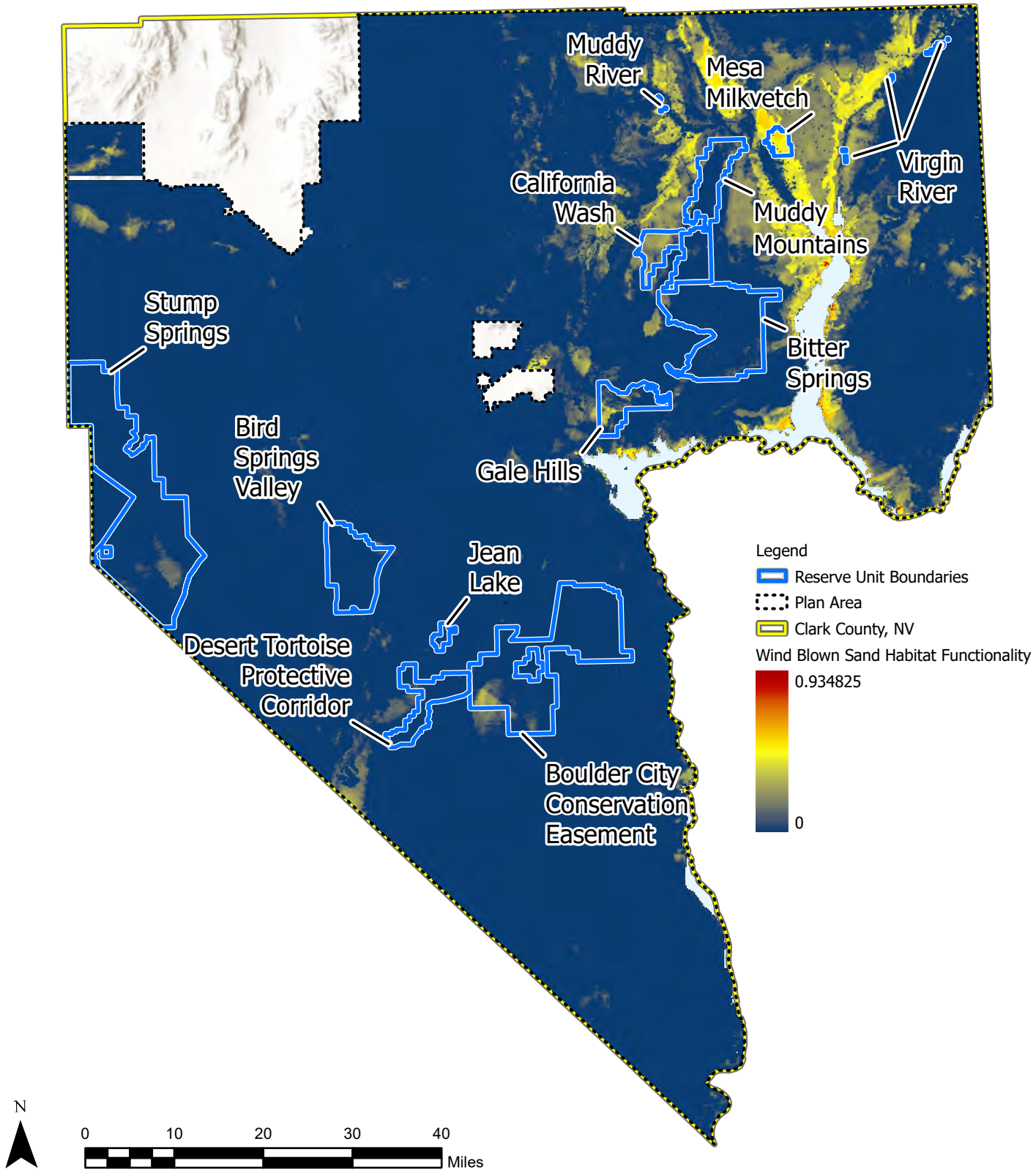

Figure 6-20. Reserve System and Wind Blown Sand Habitat Functionality

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6.4 Monitoring and Adaptive Management Plan

The MAMP is an integral component of the MSHCP Amendment's Conservation Strategy. Data collected and analyzed through the MAMP indicate whether the Permittees are complying with their ITP, whether progress is being made toward the BGOs, whether the conservation program is effectively minimizing and mitigating impacts, and whether adjustments are needed through adaptive management (USFWS 2016). The MAMP also assesses the status of Covered Species, natural communities, and ecosystem processes within the Plan Area. Each component of monitoring is designed with a clear purpose and is intended to inform MSHCP Amendment management decisions.

Monitoring is conducted for three purposes: (1) baseline, (2) compliance, and (3) effectiveness. Baseline monitoring is conducted, as needed, to establish conditions at the start of the permit, though additional baseline data may need to be collected as the Conservation Strategy is modified over time. Baseline monitoring is not intended to be comprehensive but rather to provide targeted information for assessing changes to natural systems or species populations over time. The need for baseline data is evaluated relative to existing information and monitoring efforts.

Compliance monitoring ensures that Permittees are complying with permit terms and conditions, the MSHCP Amendment document, and the associated Implementation Agreement. Compliance monitoring may address implementation of avoidance, minimization, and mitigation measures; specific reporting requirements of the permits; tracking of incidental take of Covered Species; and progress toward achieving the BGOs.

Effectiveness monitoring evaluates how natural systems and Covered Species are responding to the management actions taken through the Conservation Strategy and whether progress is being made toward achieving the BGOs. Monitoring and management approaches for individual Covered Species are presented below, with additional monitoring protocol details provided in the appendices.

Adaptive management is an approach to addressing uncertainty in natural resources management (USFWS 2016). The process entails identifying areas of uncertainty, exploring alternative approaches to meeting management objectives, implementing those alternatives, monitoring the outcomes of management actions, and using the results to update knowledge and make further adjustments as needed (Williams et al. 2009). All monitoring and management actions are conducted within an adaptive framework, but a specific adaptive management evaluation cycle is triggered when monitoring indicates that goals or objectives may not be achieved. This process, described below, is used when there is uncertainty about the corrective actions needed to ensure successful achievement of the BGOs. Because the overall adaptive management process relies on monitoring results and iteratively shapes the monitoring approach, these two elements of the Conservation Strategy are presented together in this section.

The reporting of monitoring results is described in Section 6.5, Reporting.

6.4.1 Monitoring Plan

The monitoring plan is organized by BGO to ensure that monitoring efforts have a clear and specific purpose. Table 6-1 above lists each BGO, any applicable supporting objectives, AMMs related to the objective, monitoring and timing considerations (described in further detail below), and the associated reporting requirements. In some cases, more than one objective is associated with a single monitoring approach. Monitoring for some objectives pertains to compliance, monitoring for others pertains to effectiveness, and some pertains to both. If baseline monitoring is required, it is described in the monitoring approach narrative.

Depending on the objective, monitoring may occur across the entire Plan Area or only within the Reserve System; the scale of monitoring is described in the monitoring approach narrative. Although monitoring across the Plan Area provides a broader understanding of species and habitat status and regional trends, the DCP cannot access all land across the Plan Area and monitoring funding is limited. Monitoring is therefore typically conducted within the Reserve System or in an otherwise targeted manner to document progress toward the BGOs. If monitoring results indicate significant population declines or habitat degradation within the Reserve System, additional monitoring may be initiated outside the Reserve System to help identify contributing causes and determine whether adaptive management is needed. The Science Advisor Panel will review the monitoring data and recommend whether monitoring outside the Reserve System should be pursued.

Monitoring data will be collected by either DCP staff or external contractors. Specific data collection methods will be determined at the beginning of each monitoring effort. Any future modifications to monitoring methods will be made, as necessary, in consultation with DCP staff and the independent Science Advisor Panel to ensure continuity of monitoring results.

All data will be stored by the DCP and made available to other Permittees. Analysis of monitoring results for reporting purposes may occur at any time but will be conducted at minimum annually for habitat conversion and other incidental take measurements, and every five to ten years as part of the Adaptive Management Report for other analyses. These analyses serve as benchmarks for conservation progress and inform progress toward achieving the BGOs, as further described in Section 6.4.2.

6.4.1.1 Habitat Monitoring

Habitat monitoring is conducted to ensure that the Conservation Strategy achieves the BGOs related to habitat quality for Covered Species. Habitat monitoring includes invasive species monitoring, habitat quality monitoring, and Covered Plant Species habitat monitoring.

6.4.1.1.1 Invasive Species Monitoring

Non-native invasive plant species can alter ecosystem processes such as nutrient cycling, hydrologic cycles, wildfire frequency, and erosion and sediment deposition (Powell 1999; Bossard et al. 2000). Common and non-native animal species may also thrive in disturbed or otherwise marginal habitats and can harm Covered Species through predation, competition, and displacement. In the Mojave Desert, invasive plants including red brome (*Bromus madritenis* ssp. *rubens*), Mediterranean grass (*Schismus barbata*), Sahara mustard (*Brassica tournefortii*), and African malcomia (*Malcomia africana*) have increased the size and frequency of wildfires (TNC 2007; Fusco et al. 2019). In riparian areas, common invasive plants include tamarisk/salt cedar (*Tamarix ramosissima*), Eurasian water milfoil (*Myriophyllum spicatum*), giant Salvinia (*Salvinia molesta*), and hydrilla (*Hydrilla verticillata*) (Las Vegas Wash Project Coordination Team 2009).

In cooperation with Clark County Vector Control, the DCP will participate in the statewide EDRR Program led by the Nevada Department of Agriculture. Clark County Vector Control handles control of state-listed noxious weeds on County lands and rights-of-way and will implement statewide EDRR methods to monitor and respond to newly identified invasive or potentially invasive species establishing outside of landscaped areas (Objective 1.1). Existing database tracking tools such as the Early Detection and Distribution Mapping System (https://www.eddmaps.org/), along with other collaborative tools, will be used to engage the public and land managers in identifying and tracking invasive species. Additional agencies and groups for collaboration may include the Nevada Weed Management Association and other stakeholders

in the Southern Nevada Cooperative Weed Management Area.

To assess progress toward Objective 1.1, the acreage covered by invasive plant species in the Reserve System will be evaluated in the first three years of MSHCP Amendment implementation to establish baseline conditions. These baseline conditions will be used to measure changes in invasive plant cover over time. Monitoring methods and details will be specified in a Weed Management Plan, to be developed and approved within two years of the completion of baseline invasive plant surveys, addressing the management of invasive plant species on Reserve System lands. Management actions will be included in the Annual Progress Report, along with any additional details required by the Weed Management Plan.

6.4.1.1.2 Habitat Function

Habitat functionality models were developed for Covered Species and are to be reviewed and updated with current spatial and remote-sensed data every five years. These models provide information on the distribution of potentially suitable habitat for Covered Species in the Plan Area using the best available scientific data, and they feed into the habitat functionality methods used to assess habitat quality for take and mitigation estimation and tracking. The methods are described in Chapter 5, with more detail specific to the Reserve System provided in Section 6.3.

Under Objectives 1.2 and 1.3, the habitat functionality methods will be used to inform management of Covered Species habitat, evaluate the quantity and quality of riparian habitat in the Reserve System relative to impacts from Covered Activities, and measure the overall quantity and quality of suitable habitat for Covered Species in the Reserve System over time. The habitat functionality results for the Reserve System shown in Table 6-3 provide the baseline habitat function and quality. To meet Objective 1.3, the values in Table 6-3 (Section 6.3) must remain similar to or increase from baseline.

For Objectives 1.2 and 1.3, the source data and methods underlying both the habitat suitability models and the habitat functionality methodology will be reviewed every five years to determine whether revisions are necessary, including incorporation of current occurrence datasets, roads, development boundaries, additional LiDAR datasets for riparian ecosystems, or other new data determined to influence habitat quality for a specific Covered Species or group.

The habitat functionality assessment evaluates habitat quality at the landscape level. Within the Riparian Reserve Units, a habitat uplift tracking system will also be used to measure and credit changes in habitat quality, providing site-specific assessments and quantifying improvements resulting from restoration actions. Habitat uplift tracking will be included in the Annual Progress Reports. Together, the habitat functionality assessment and habitat uplift tracking will be used to evaluate progress toward Objective 1.3, with results included in the Five-Year Monitoring Report.

6.4.1.1.3 Covered Plant Species Habitat

The species habitat functionality models developed for the MSHCP Amendment will be the focus of monitoring for all Covered Plant Species; however, a subset of these species requires additional, targeted monitoring. Psammophile species, including threecorner milkvetch and sticky buckwheat, require loose sandy soils to grow. Sediment sources for threecorner milkvetch and sticky buckwheat will be identified within the first year of MSHCP Amendment implementation and reported in the Annual Progress Report. Once identified, impacts to these areas from Covered Activities will be avoided to the extent feasible, depending on the Permittee's authority and jurisdiction. Where avoidance is not practical, minimization and mitigation measures will be implemented to the extent practicable. The Five-Year Monitoring Report will document the identification of sediment sources, their protection status, and impacts to these habitats over time.

In addition, the extent of occupied and potentially suitable habitat for gypsophile species will be monitored every two years relative to baseline conditions and ongoing development impacts, with results included in the subsequent Annual Progress Reports.

6.4.1.1.4 Connectivity

To meet Objective 1.7, the DCP will identify corridors that are high priority for connectivity and genetic exchange for non-volant wildlife Covered Species (desert tortoise, Gila monster, and desert pocket mouse) within the first three years of MSHCP Amendment implementation. Key corridors for Covered Plant Species, such as those supporting seed dispersal, will be identified within the first five years. These corridors will be incorporated into updates of the habitat quality assessment described in Chapter 5 and Section 6.3 to capture the habitat quality value of these areas. Most high-priority connectivity areas, however, fall outside the Reserve System, where the DCP has limited ability to influence land management. The DCP will remain aware of high-priority connectivity areas in case conservation opportunities arise, but these areas are not expected to be a primary focus of management and conservation actions.

6.4.1.2 Species Monitoring

Species monitoring is conducted to evaluate the effectiveness of the Conservation Strategy and to assess whether Covered Species populations are stable or increasing within Reserve System lands relative to baseline conditions (Objectives 2.1 and 2.2). A species-specific monitoring plan may include a range of methods to measure species occupancy and population trends.

Some species (e.g., threatened and endangered species) have specific survey protocols that must be followed to accurately assess occupancy and trends. Several species or groups of species may be monitored simultaneously using a single survey method. Surveys will be conducted in each proposed Reserve System Unit in which habitat for the species is present. The sections below describe recommended methods for baseline and ongoing monitoring of Covered Species, and Table 6-5 categorizes species by their general habitat and monitoring method. Final long-term monitoring protocols will be developed for each species or group and peer-reviewed by the Science Advisor Panel within the first 18 months of MSHCP Amendment implementation, as identified in the table. Following collection of baseline data, survey frequency will be set based on species and the associated monitoring approach. Survey results will be reported in the Annual Progress Report for the year in which the survey is conducted, and Five-Year Monitoring Reports will include a summary of survey results and an analysis of population trends within the Reserve System, along with any additional data specified in the species monitoring protocols. Survey schedules may be adjusted after baseline data collection is complete to avoid concurrent survey or monitoring schedules across all species (i.e., efforts staggered among years).

Table 6-5. Summary of Monitoring Methods and Status for 28 MSHCP-Covered Species

Common Name	Scientific Name	Monitoring method
Birds		
Golden eagle	*Aquila chrysaetos*	Point count/passive acoustic
Western burrowing owl	*Athene cunicularia hypugaea*	Point count/passive acoustic
Yellow-billed cuckoo	*Coccyzus americanus*	Protocol survey[a]
Southwestern willow flycatcher	*Empidonax traillii extimus*	Protocol survey[b]

Common Name	Scientific Name	Monitoring method
Gilded flicker	*Colaptes chrysoides*	Point count/passive acoustic
Loggerhead shrike	*Lanius ludovicianus*	Point count/passive acoustic
Yuma Ridgway's rail	*Rallus obsoletus yumanensis*	Protocol survey[c]
Bendire's thrasher	*Toxostoma bendirei*	Point count/passive acoustic
LeConte's thrasher	*Toxostoma lecontei*	Point count/passive acoustic
Bell's vireo	*Vireo bellii*	Point count/passive acoustic
Mammals		
Desert pocket mouse	*Chaetodipus penicillatus*	Species-specific[d]
Townsend's big-eared bat	*Corynorhinus townsendii*	Passive acoustic
Spotted bat	*Euderma maculatum*	Passive acoustic
Reptiles/Amphibians		
Arizona toad	*Anaxyrus microscaphus*	Species-specific[e]
Desert tortoise	*Gopherus agassizii*	USFWS rangewide
Gila monster	*Heloderma suspectum*	Species habitat model and assessments[d]
Invertebrates		
Mojave poppy bee	*Perdita meconis*	Species-specific[d]
Monarch butterfly	*Danaus plexippus*	Species-specific[d]
Plants		
Blue Diamond cholla	*Cylindropuntia multigeniculata*	Species-specific[d]
Las Vegas bearpoppy	*Arctomecon californica*	Species-specific[d]
Pahrump Valley buckwheat	*Eriogonum bifurcatum*	Species-specific[d]
Silverleaf sunray	*Enceliopsis argophylla*	Species-specific[d]
Sticky ringstem	*Anulocaulis leiosolenus*	Species-specific[d]
Threecorner milkvetch	*Astragalus geyeri* var. *triquetrus*	Species-specific[d]
Las Vegas buckwheat	*Eriogonum corymbosum* var. *nilesii*	Species-specific[d]
Sticky buckwheat	*Eriogonum viscidulum*	Species-specific[d]
White-margined beardtongue	*Penstemon albomarginatus*	Species-specific[d]

Common Name	Scientific Name	Monitoring method
Eastern Joshua tree	*Yucca jaegeriana*	Species-specific[d]

[a] See Halterman et al. (2016) for survey protocol details.
[b] See Sogge et al. (2010) for survey protocol details.
[c] See Conway (2009) for survey protocol details.
[a] Species-specific methods depend on each species. See discussion in text for general methods. Detailed monitoring methods to be developed within the first 18 months of MSHCP Amendment implementation.

[e] See Hossack and Stemp (2024) for survey protocol details.

6.4.1.2.1 Golden Eagle (*Aquila chrysaetos*)

Golden eagle nesting is anticipated to be extremely rare in the Plan Area, and impacts are restricted to foraging habitat. Opportunities to monitor golden eagle nests are therefore limited, although impacts to historical nest locations will be reported. Golden eagles are also unlikely to be detected reliably via point count or passive acoustic monitoring. Monitoring for golden eagle will instead focus on foraging habitat in the Reserve System and will use species-specific habitat models and periodic habitat assessments. Habitat assessment data and survey frequency will be established in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation.

6.4.1.2.2 Burrowing Owl (*Athene cunicularia hypugaea*)

Surveys for burrowing owls shall be located within identified suitable habitat in the Reserve System, according to existing models. Surveys may include transect surveys for burrows or visual scanning at survey points or driving routes for presence/absence. Future developments in passive acoustic monitoring may also prove useful. Survey methods and sampling frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation. Survey results will be presented in that year's Annual Progress Report with any statistical analysis on trends provided in the Five-Year Monitoring Report.

6.4.1.2.3 Yellow-Billed Cuckoo (*Coccyzus americanus*)

Yellow-billed cuckoos are difficult to detect during traditional avian surveys; therefore, protocol-level surveys must be conducted to adequately detect the species. Protocol surveys will be conducted covering all riparian habitat properties in the Reserve System. The USFWS-approved survey protocol (Halterman et al. 2016) consists of surveying a minimum of four times during the breeding season: once between June 15 – July 1, twice between July 1 – July 31, and once between July 31 – Aug 15. There is a minimum of 12 and a maximum of 15 days between surveys at a site. Surveys are conducted using call-playback methods in suitable or potentially suitable cottonwood-willow habitat. A survey station should be established in each patch of potentially suitable habitat > 5 ha and >300 m from the nearest other patch. The number of survey stations depends on the amount of potentially suitable breeding habitat but should be high enough to allow for robust statistical inference on the proportion of occupied survey sites on riparian Reserve System lands. Station locations should be determined prior to June 15, and the same survey stations should be surveyed in consecutive years, where possible. While other methods (e.g., passive acoustic) for monitoring yellow-billed cuckoo are being tested, at this point they lack sufficient accuracy for population monitoring (Beauregard et al. 2024). New methods may be used in the future.

Surveys for the yellow-billed cuckoo and southwestern willow flycatcher may not be conducted simultaneously (i.e., each species requires a separate survey effort). Surveyors must attend a training session and hold the appropriate state and federal permits to conduct the surveys. See Halterman et al. (2016) for survey protocol details. For new land acquired in the Reserve System,

surveys will be conducted annually for 3 years to provide baseline data on the species in the Reserve System. Following completion of baseline data collection, surveys will be conducted once a year.

6.4.1.2.4 Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

Southwestern willow flycatcher must follow the USFWS-approved survey protocol (Sogge et al. 2010). Protocol surveys will be conducted covering all riparian habitat properties in the Reserve System. Surveys consist of a minimum of three surveys during the breeding season: once between May 15 – May 31, once between June 1 – June 24, and once between June 24 – July 17. Surveys must occur a minimum of five days apart. Surveys should occur in suitable or potentially suitable breeding habitat and should be conducted from within, rather than adjacent to, the patch of potentially suitable habitat. The number of survey sites depends on the amount of potentially suitable breeding habitat but should be high enough to allow for robust statistical inference on the proportion of occupied survey sites on riparian Reserve System lands. Surveys for yellow-billed cuckoos and southwestern willow flycatchers may not be conducted simultaneously (i.e., each species requires a separate survey effort). Surveyors must attend a training session and hold the appropriate state and federal permits to conduct these surveys. Surveyors should be experienced at differentiating calls and appearance of similar species, such as other *Empidonax* flycatchers. Consult Sogge et al. (2010) for additional details on survey methods and descriptions of potentially suitable habitat. For new land acquired in the Reserve System, surveys will be conducted annually for three years to provide baseline data on the species in the Reserve System. Following completion of baseline data collection, surveys will be conducted once a year.

6.4.1.2.5 Yuma Ridgway's Rail (*Rallus obsoletus yumanensis*)

Marsh birds such as the Yuma Ridgway's rail are difficult to detect during standard point count surveys, so playback recordings are used to elicit responses from cryptic marsh birds that may be present at a given site. The North American Marsh Bird Survey Protocol (Conway 2009) provides a standardized protocol methodology to be used for surveying Yuma Ridgway's rails in marsh habitats. This USFWS-approved survey protocol consists of conducting a minimum of three surveys early in the breeding season, prior to the vocalization of that years' young, to obtain counts of adults present during the breeding season. A survey route should be established with the number of point locations per route determined by the time it takes for a surveyor to complete these routes within the rails' most vocal periods of the day (i.e., two hours surrounding sunrise and two hours surrounding sunset). Point locations should be a minimum of 400 meters apart; points closer than 400 meters risk the possibility of call broadcasts at one point affecting the distribution of birds at adjacent points. Following completion of baseline data collection, surveys will be conducted once a year. For a detailed discussion on survey methods, see Conway (2009). As technology improves, passive acoustic monitoring may also be possible for Yuma Ridgway's rail as lengthy deployments may accommodate infrequent calls. Survey methods and routes will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation.

6.4.1.2.6 Other MSHCP-Covered Bird Species

Other MSHCP Amendment-covered bird species include the Bell's vireo (*Vireo bellii*), gilded flicker (*Colaptes chrysoides*), loggerhead shrike (*Lanius ludovicianus*), Bendire's thrasher (*Toxostoma bendirei*), and LeConte's thrasher (*Toxostoma lecontei*). Bell's vireo occur in cottonwood-willow habitat and associated desert washes composed of shrubby woodland habitat, such as mesquite, oak, and non-native tamarisk. Gilded flickers are found in open desert scrub with a Joshua tree component, while the shrike and thrashers are found in various open desert scrub and blackbrush habitats.

Surveys for these species should be conducted according to standard point count survey and/or passive acoustic methods (Ralph et al. 1995, Rosenstock et al. 2002, MacKenzie 2006) in suitable or potentially suitable habitat within Reserve System lands. Survey stations should be established in suitable habitat, spaced a minimum of 250 m apart. Point count methods allow for the estimation of species occupancy or abundance/density estimation (e.g., distance sampling, count regression models, N-mixture modeling incorporating imperfect detection [Royle 2004]). A sufficient number of point count stations should be determined on Reserve System lands to allow for robust statistical inference. Multiple visits, separated by a minimum of five days, should be made to each station during the general bird breeding season (early-mid April through mid-June). Surveys in the Reserve System will be conducted in a staggered fashion, such that half of sites are surveyed each year and thus individual sites are surveyed every other year. Survey stations and sampling frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation. Survey results will be presented in each Annual Progress Report with statistical analyses on population trends presented in every Five-Year Monitoring Report.

6.4.1.2.7 Arizona Toad (*Anaxyrus microscaphus*)

The Arizona toad has potential to occur in Riparian Marsh, Riparian Woodland and Hydrology-Dependent ecosystem/habitats within the Plan Area. Monitoring shall include standardized visual-encounter surveys (VES) conducted in suitable habitat within Reserve System lands (Hossack and Stemp 2024). VES will include diurnal and nocturnal site visits conducted between April 1 and August 1. The surveyors shall estimate the age, reproductive status, and hybrid status of captured individuals (see species description in Chapter 3). Hybrid status will be assessed using hybrid scoring detailed in Hossack and Stemp (2024), and shape of parotoid glands per Sullivan (1986). Specific sampling design and frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation.

6.4.1.2.8 Desert Tortoise (*Gopherus agassizii*)

Various methods have been used to sample desert tortoise populations across their range. Sampling desert tortoises, however, is challenging due to their low capture probability as related to their fossorial life history, cryptic nature, and patchy spatial distribution. Previous desert tortoise survey methods include belt transects, occupancy (Zylstra and Steidl 2009, Zylstra et al. 2010, Harju 2019, Harju and Cambrin 2023), study plots of varying size (1 mi^2, 1 km^2, 1 ha) (Keith et al. 2008), and line-distance sampling (Anderson et al. 2001, Averill-Murray and Averill-Murray 2005).

DCP will conduct range-wide line-distance sampling (LDS) within the 6 tortoise conservation areas that occur in Clark County. DCP will also conduct mark-recapture demography sampling within Clark County. DCP will replace LDS and mark-recapture monitoring techniques with spatial capture-recapture if the latter becomes the accepted protocol for monitoring desert tortoise populations in the future. Likewise, DCP will replace LDS and mark-recapture with any other protocol that becomes the future standard, as specified in Recovery Plan or by the Desert Tortoise Recovery Office. Occupancy sampling will not occur on the BCCE or other Reserve Units. Plot design and sampling frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation

6.4.1.2.9 Gila monster (*Heloderma suspectum*)

Gila monster is a rarely observed species and a standardized survey protocol has not been developed. Monitoring for Gila monster shall be focused on ensuring suitable habitat is maintained in the Reserve System and will utilize species-specific habitat models and occasional habitat

assessments. Habitat assessment data and survey frequency will be established in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation. The survey capabilities will be reviewed every five years, and protocols may be modified to include presence/absence or population level surveys should non-invasive techniques such as environmental DNA sampling be developed in the future.

6.4.1.2.10 Desert Pocket Mouse (*Chaetodipus penicillatus*)

The desert pocket mouse occurs throughout Clark County in sandy soils of creosote bush and saltbush communities, mesquite bosques, desert washes, and warm desert scrub. Historic records for this species are limited. Surveys for this species shall involve live trapping and should focus on known historic locations in the Reserve System where habitat remains and in ecosystems where modeling identified high functionality, including Mojave Desert Scrub, Riparian Woodland, Riparian Marsh, Cool Semi Desert Scrub and Grassland, and Arid Shrubland. Trap line locations and sampling frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation.

6.4.1.2.11 Townsend's Big-Eared Bat (*Corynorhinus townsendii*) and Spotted Bat (*Euderma maculatum*)

The two MSHCP-covered bat species (Townsend's big-eared bat, spotted bat), use a wide variety of habitats within the Plan Area for foraging, from forested areas to riparian corridors and open desert scrub. Both species may use buildings for day or maternity roosts; spotted bats also typically use crevices within cliff faces for roost sites, and Townsend's big-eared bats are also typically found in large open caves and in abandoned mines and tunnels. Aligning bat survey methods with the North American Bat Monitoring Program (Loeb et al. 2015; https://www.nabatmonitoring.org) would support data-sharing across the region.

For any survey stations for which baseline data do not exist, a minimum of two years of data will be collected to provide a baseline. After baseline data have been collected, sampling locations and frequency will follow the design described in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation. Survey results will be reported in each Annual Progress Report, and pertinent statistical analyses will be provided in each Five-Year Monitoring Report.

6.4.1.2.12 Mojave Poppy Bee (*Perdita meconis*)

Within the Plan Area, the current known range of the Mojave poppy bee is restricted to the Lake Mead National Recreation Area and adjacent BLM lands. This species is range-limited by the availability of suitable host plants (poppies in the genera *Arctomecon* and *Argemone*), and the presence of suitable nesting substrate (gypsum soils with intact cryptogamic crusts). Adults are active for only a few weeks in the spring, when host plants are blooming; surveys will be conducted when adults are active as other life stages occur underground. Survey areas, field methods, and sampling frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation. Survey results will be shared in each Annual Progress Report and pertinent statistical analyses will be provided in each Five-Year Monitoring Report.

6.4.1.2.13 Monarch butterfly (*Danaus plexippus*)

Suitable breeding habitat for monarch butterflies has been modeled across the western United States with habitat associations for the western spring migration occurring in parts of Nevada, including areas within Clark County (Dilts et al. 2019). Breeding habitat for monarch butterflies

within the Plan Area is in regions where its larval host plant species, milkweed (*Asclepias* spp.), are abundant. Previous analyses of monarch distributions have demonstrated high associations with habitat along rivers (Dingle et al. 2005) and suggest riparian corridors and the adjacent habitat will be important zones for monitoring within the Plan Area.

All life history stages of the monarch butterfly occur during the spring and summer months in regions of Nevada and no overwintering populations have been observed. Monitoring surveys will therefore be conducted during the breeding season (April through October) when monarchs are most abundant.

A minimum of two years of data will be collected to provide a baseline. After baseline data have been collected, sampling will follow methods as detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation. Survey results will be shared in each Annual Progress Report and pertinent statistical analyses will be provided in each Five-Year Monitoring Report.

6.4.1.2.14 Eastern Joshua Tree (*Yucca jaegeriana*)

Eastern Joshua trees are widespread and abundant where they occur throughout the Plan Area, in Arid Shrubland, Cool Semi Desert Scrub and Grassland and Mojave Desert Scrub habitats. This species is slow-growing and long-lived; therefore, monitoring of population trends will include a combination of monitoring of distribution, plant survival, and population age structure. Species distribution will be provided through fine-scale vegetation monitoring conducted by the DCP. A subset of population areas will be selected for long-term demographic monitoring.

Percent survival will be measured by monitoring tagged individuals along established transects over time. Age structure will be determined by sampling heights of trees through similar line transect sampling, as change in height over time can be predicted by a point-intercept equation (Gilliland et al. 2006). Recruitment will be evaluated by establishing and monitoring permanently marked demographic study plots (Esque et al. 2010). Use of drone or other remote sensing technology will also be reviewed for efficacy across the Reserve System. The baseline distribution of Joshua trees within the Reserve System will be mapped within the first year. Long-term monitoring transects will then be established in each Reserve System Unit containing this species, and surveys will be conducted a minimum of every five years focusing on population survival and age structure. Remote sensing of Reserve Unit populations may also detect catastrophic losses (e.g., due to wildfire, drought, or disease; Esque et al. 2023). Transect locations and sampling frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation.

6.4.1.2.15 Other Covered Plants (Nine Species)

The status of MSHCP-covered plant species populations should be monitored to ensure compliance with Objective 2.2 and identification of essential populations for protection. The status of acquisitions, restoration and enhancement of Pahrump Valley buckwheat habitat will be tracked relative to impacts to its habitat to assess progress towards Objective 1.3.

The additional nine MSHCP-covered plants for monitoring include Blue Diamond cholla (*Cylindropuntia multigeniculata*), Las Vegas bearpoppy (*Arctomecon californica*), Pahrump Valley buckwheat (*Eriogonum bifurcatum*), Silverleaf sunray (*Enceliopsis argophylla*), Sticky ringstem (*Anulocaulis leiosolenus*), Threecorner milkvetch (*Astragalus geyeri* var*. triquetrus*), Las Vegas buckwheat (*Eriogonum corymbosum* var*. nilesii*), sticky buckwheat (*Eriogonum viscidulum*) and White-margined beardtongue (*Penstemon albomarginatus*). If and when these populations are located in the Reserve System lands, quantitative methods shall be developed. It is critical that

flexibility and care be used in developing the monitoring plan, as several Covered Species are likely to occur in sensitive areas (e.g., high coverage of biological crusts), thus monitoring methods may require a light footprint. For example, low- level drone surveys may be sufficient to map the areal extent of populations of MSHCP Amendment-covered plant species. Useful quantitative methods include line-point intercept, canopy gap intercept, and multi-scale quadrats. Qualitative methods could include photo points and general indicators of desert upland ecosystem health. Multi-year comparisons of abundance can be used to estimate population trends for these species. Survey locations, methods, and sampling frequency will be detailed in a final monitoring protocol to be developed within 18 months of MSHCP Amendment implementation. Survey results will be shared in each Annual Progress Report and pertinent statistical analyses will be provided in each Five-Year Monitoring Report.

6.4.1.3 Engagement and Oversight

The DCP will document its annual process for reviewing all restoration projects and a subsample of permitted projects, for engaging key partner agencies in reviewing projects on jointly managed land, and for ensuring that projects follow best practices for protecting and managing Covered Species. The DCP will also document the distribution of educational materials, the upkeep of signage, and the number of patrol hours in the Annual Progress Report under Objectives 3.1 and 3.2. The requirement that Covered Activity project designs minimize indirect effects will be adopted into code by each Permittee jurisdiction, including Clark County, and will be monitored and enforced through Code Enforcement. To the extent that monitoring and enforcement for Objectives 3.1 and 3.2 is covered by Code Enforcement, the DCP will not be required to conduct additional monitoring for the activities discussed in this paragraph.

6.4.2 Adaptive Management Plan

Adaptive Management is a tool for addressing uncertainty in the conservation and management of Covered Species and their habitat (USFWS 2016). Uncertainties may pertain to factors such as ecosystem function, the effectiveness of management actions, occupancy, survey approaches, models, or changing climatic conditions. Adaptive Management is the process of identifying problems, designing and implementing strategies, monitoring and evaluating results, and adjusting the approach as necessary to improve outcomes over time (USFWS 2016). Adjustments could include changes to AMMs, updates to models, or use of different monitoring methods. Adaptive Management is integrated with the MAMP because it relies on evaluating monitoring results and making programmatic decisions based on those results, which may in turn lead to changes in the MAMP itself.

The Adaptive Management Evaluation process occurs every five years, and the Adaptive Management Action process is implemented as necessary actions or changes are identified through that evaluation. The Adaptive Management Action process continues until actions have proven successful in resolving or improving the issue. The frequency of monitoring efforts pertaining to the action may be modified or increased as needed.

Within each five-year evaluation period, annual reports of data are produced, and analysis of monitoring data may occur at any time. The Five-Year Monitoring Report captures the findings of the Science Advisor Panel's review of recent MSHCP Amendment projects, reports, and datasets. The Panel analyzes land use trends, habitat loss, the effectiveness of management actions in meeting the BGOs, and population trends and ecosystem health, and provides recommendations to the DCP for improving elements of the MSHCP Amendment. More in-depth analysis, including quantification and reporting focused on progress toward the BGOs, occurs as part of the Adaptive Management Evaluation process.

This Adaptive Management Plan provides the basis for determining whether conservation actions are successfully achieving the BGOs and maintaining or increasing populations of Covered Species and their habitats.

6.4.2.1 Thresholds for MSHCP Covered Species and Habitat

A key component of Adaptive Management is evaluating species population monitoring results against pre-defined thresholds. This process provides additional information on the effectiveness of the Conservation Strategy and safeguards against the possibility that Covered Species fare poorly despite successful implementation of the MSHCP Amendment.

Thresholds are assessed against species- and habitat-specific monitoring results that are tied to specific BGOs, as part of each Five-Year Monitoring Report. Thresholds are defined as statistically significant measurements of failing populations (such as significant declines in abundance, density, or occupancy rate) and are defined separately for each monitored metric. 'Target' or 'desired' conditions are not defined because, from a statistical standpoint, a failure to detect a significant trend does not necessarily indicate the absence of a trend; a result of "no trend identified" could be either good (e.g., populations are at a steady state) or bad (e.g., insufficient data to detect a declining trend).

In addition, constantly increasing populations are not realistic in perpetuity and are therefore not defined as a desired condition. Only thresholds are defined, so that if there is statistical evidence that a monitored population or habitat is faring poorly, the DCP and independent Science Advisor Panel will assess the causes and possible remedies for the decline(s).

For each threshold, the evaluation process should involve the following steps:

1) compile all relevant monitoring data

2) conduct appropriate statistical analysis to compare trends within the Reserve System

3) compare results with the associated threshold

4a) if a threshold is not exceeded, no action is required, or

4b) if a threshold has been exceeded, begin assessing why

5) through this assessment process:

i) collect information and identify factors contributing to current results and trends, including trends in off-Reserve System lands

ii) evaluate and implement alternative approaches for achieving the BGOs related to that threshold

iii) monitor results related to that BGO to determine whether or not the alternative is resulting in improved outcomes.

This assessment process may also involve engaging stakeholders to evaluate the reasons for the failure and identify strategies for improvement.

Several caveats should be considered when assessing the monitoring data. First, conservation projects conducted to date occur at multiple spatial scales. Some projects occur only within the Reserve System, and their benefits are expected to be realized within the Reserve System.

Others occur without a specific spatial scale (e.g., public information and education), and their benefits may extend across the entire Plan Area. Second, long-term trends in habitat and Covered Species populations are influenced by both local processes (e.g., development, restoration) and regional processes (e.g., long-term drought cycles). When a threshold is exceeded, a critical component of the MAMP is the capacity to assess the status of populations and habitats both within and outside the Reserve System, to distinguish the effects of conservation actions from the larger influence of regional factors. Third, both plant and animal populations can experience time lags in responding to conservation actions, particularly for long-lived species with low reproductive rates such as the desert tortoise; the full benefits of conservation actions are therefore expected to take multiple years to manifest.

Table 6-6 below lists all Covered Species and habitats, the related objective, and the associated thresholds. Objectives 1.4, 1.5, 1.6, 3.1, 3.2, and 3.3, which are discussed in the Engagement and Oversight monitoring Section 6.4.1.3 above, are not included in Table 6-6 because defining specific thresholds is not useful for evaluating these objectives; whether they are being achieved can be answered by a simple “yes” or “no.” These objectives will be reviewed as part of the Five-Year Monitoring Report.

6.1.1.1 Stakeholder Involvement

Regular, constructive stakeholder involvement is critical to the success of both the monitoring and the adaptive management components of this plan. Stakeholders may offer insight into species ecology, the strengths and weaknesses of existing monitoring methods, and emerging monitoring methods. They can also be invaluable in the adaptive management process, particularly when the Adaptive Management Action process is initiated, by helping identify causes of problems and proposing projects and solutions to remedy undesired conditions for species and their habitats. Incorporating stakeholder involvement therefore improves the overall quality and effectiveness of the MAMP. This involvement is already part of MSHCP implementation (e.g., annual project proposals and review of Annual Progress Reports and Five-Year Monitoring Reports), and the DCP may also engage stakeholders on an as-needed basis.

Table 6-6. Covered Species and Habitat Monitoring and Associated Thresholds

Monitoring Plan Section	Monitoring Survey	Species/ Habitat	Related Objective	Threshold
6.4.1.1.1 Invasive Species Monitoring	TBD[a]	Invasive Species	1.1,	Newly established invasive plant species
			1.1	Increasing cover of invasive plant species requiring treatment relative to baseline.
6.4.1.1.2 Habitat Function	Habitat Functionality Assessment	Riparian	1.2, 1.3	Decreasing riparian habitat function and quantity across reserve lands during assessment period
	Habitat Functionality Assessment	All Covered Species Habitats	1.3	Decreasing habitat function across reserve lands during the assessment period
6.4.1.2 Species Monitoring	Rangewide monitoring	Desert tortoise	2.1	Decreasing metric across desert upland reserve lands during the assessment period
	Protocol survey	Yellow-billed cuckoo	2.1	Decreasing detections during the breeding season across riparian reserve lands during the assessment period
		Southwestern willow flycatcher		
		Western burrowing owl	2.1	Decreasing detections during the breeding season across reserve lands during the assessment period
		Ridgway's rail	2.1	Decreasing detections during the breeding season across marsh areas in reserve lands during the assessment period
	Point count/ Passive Acoustic	Gilded flicker	2.1	Decreasing occupancy or abundance across reserve lands during the assessment period
		Loggerhead shrike	2.1	
		Bendire's thrasher	2.1	
		Le Conte's thrasher	2.1	
		Bell's vireo	2.1	
	Species-specific	Golden eagle	2.1	Decreasing suitable foraging habitat across reserve lands during the assessment period
		Gila monster	2.1	Decreasing suitable habitat across reserve lands during the assessment period
		Desert pocket mouse	2.1	Decreasing breeding detections across reserve lands during the assessment period

Monitoring Plan Section	Monitoring Survey	Species/ Habitat	Related Objective	Threshold
6.4.1.2 Species Monitoring (continued)	Passive acoustic	Townsend's big-eared bat	2.1	Decreasing number of sampling stations with acoustic detections across reserve lands during the assessment period
		Spotted bat		
	Floral visitation rates	Mojave poppy bee	2.1	Decreasing visitation rate in known areas of occurrence across reserve lands during the assessment period
	Visual encounter	Monarch butterfly	2.1	Decreasing numbers of monarch adults, eggs, and larvae in survey areas across reserve lands during the assessment period
		Arizona toad	2.1	Decreasing suitable habitat across reserve lands during the assessment period
6.4.1.1.3 Covered Plant Species Habitat and 6.4.1.2.11 Other Plants	Distribution, survival, and seedling recruitment	Joshua tree	2.2	Decreasing metrics across desert upland reserve lands during the assessment period
	Species-specific	Sticky buckwheat	2.2	Sediment sources have not been identified, and impacts are not being avoided to the greatest extent feasible within three years of implementation.
		Threecorner milkvetch	2.2	
		Pahrump Valley buckwheat	2.2	Essential occupied habitat has not been acquired, restored or enhanced within one year of implementation.
		Gypsophile Species	2.2	Decline by 10% in the Gypsiferous Habitat Functionality Score over five years within reserve lands
		Blue Diamond cholla	2.2	Decreasing metrics across desert upland reserve lands during the assessment period[b]
		Silverleaf sunray	2.2	
		Las Vegas bearpoppy	2.2	
		Las Vegas buckwheat	2.2	
		Sticky ringstem	2.2	
		Sticky buckwheat	2.2	
		White-margined beardtongue	2.2	

[a]To be decided during the development of the Weed Management Plan and EDRR Program. Some candidate species include red brome, Mediterranean grass, Sahara mustard, African malcomia, tamarisk/salt cedar, Eurasian water milfoil, giant Salvinia, and hydrilla.

[b]To be decided: Final monitoring methods and sampling protocols to be developed within 18 months of MSHCP Amendment implementation.

6.4.2.2 Revisions to Monitoring and Adaptive Management Plan

This document is intended to function as a handbook for designing and implementing the MSHCP Amendment monitoring and adaptive management process. Because Adaptive Management should be an active and engaged process, revisions to this MAMP may be warranted in the future. For example, new monitoring techniques or ecosystem indicators may be developed, or the Adaptive Management Evaluation or Action processes may need to be revised. The MAMP is therefore a 'living document' and should be reviewed, revised, and updated as needed. Revisions and the rationale for them should be documented in the Five-Year Monitoring Reports.

A critical caveat in revising this MAMP is that any future modifications to monitoring methods must be implemented so that previous monitoring data remain directly comparable to new data. New methods should be run simultaneously with old methods for more than one year to allow statistical adjustment for any method-dependent biases in the resulting data (e.g., in relative abundance comparisons). If cost prevents full spatiotemporal overlap of old and new methods, any newly observed patterns in the monitored metric may reflect methodology, underlying changes in the population, or a combination of both. Some temporal overlap is therefore strongly recommended; for example, half of the sites could be monitored with the old methodology and half with the new methodology for two years before transitioning to the new methodology at all sites. This approach will ensure continuity in the estimates of species and habitat trends.

6.5 Reporting

The DCP will prepare planning documents and implementation reports on a regular basis to demonstrate compliance with the MSHCP Amendment and its associated authorizations, to convey monitoring data, and to facilitate interagency coordination, scientific exchange, and public outreach. The USFWS handbook requires reporting that provides information on Permittee compliance with the permit and HCP, progress toward meeting the BGOs, effectiveness of the HCP conservation program, and any need for adaptive management to improve the conservation program. Reporting frequency varies with the scale and timeframe of the HCP. Over the term of the MSHCP Amendment, the DCP will submit annual reports focused on compliance and progress and, every five years, a more detailed report summarizing monitoring and effectiveness. These reports to the USFWS serve the following purposes:

- Provide the necessary data and information to demonstrate that the MSHCP is being properly implemented
- Identify the effect of MSHCP Amendment implementation on Covered Species and on the effectiveness of the Conservation Strategy at advancing the MSHCP's BGOs
- Document actions taken under the adaptive management program (e.g., process, decisions, changes, results, corrective actions)
- Describe schedules and costs related to the implementation of actions over five-year timeframes

Throughout the course of MSHCP Amendment implementation, the DCP will prepare and submit the following documents to the USFWS:

- Annual Progress Report
- Annual Project Symposium
- Five-Year Monitoring Report
- Adaptive Management Report

Together, these documents will enable interested public and private stakeholders, and the general public, to assess the progress and performance of the MSHCP toward meeting the BGOs on an ongoing basis and to make informed recommendations to the DCP regarding MSHCP Amendment implementation. To support access to this information, all of these reports will be made publicly available. Additional information on each report is provided below.

6.5.1 Annual Progress Reports

This section describes the contents of the Annual Progress Reports, which must be prepared by the DCP and submitted to the USFWS for permit compliance documentation. The Annual Progress Report will be the primary document supporting the USFWS-required status reports for permit continuance, and its primary focus will be quantifying impacts of Covered Activities, the status of Reserve System lands, and financial analysis. Information identified in Table 6-1 for inclusion in the Annual Progress Report is also listed below for clarity. At a minimum, each Annual Progress Report will include the following information:

- Number and acreage of each Covered Activity implemented during the reporting period (per Chapter 2). Reporting will include a map of Covered Activity locations.
- A year-to-date and cumulative summary of impacts to modeled habitat functionality assessments (Chapter 5 methodology) for Covered Species habitat quality. For the gypsophile Covered Species group, provide the percentage of cumulative impacts in

comparison to baseline conditions at the start of the MSHCP Amendment. Reporting will include a map of impacted areas.

- A year-to-date and cumulative summary of the total impacts to Critical Habitat of desert tortoise and southwestern willow flycatcher and to Covered Species plant occurrences. Reporting will include a map of Critical Habitat impacts.
- Describe the review of sediment sources for threecorner milkvetch and sticky buckwheat habitats, results, and recommendations for management, if any.
- A description of all restoration and enhancement implemented during the reporting period and documentation that all projects were reviewed and incorporated natural processes where appropriate. Reporting will identify restoration and enhancement efforts conducted within the ACEC Reserve System lands, non-ACEC Reserve System lands, and outside of the Reserve System. Reporting will include a map of restoration and enhancement project locations.
- A year-to-date and cumulative summary of the acreage and habitat functionality assessment acreage of riparian or other habitat preserved, restored, and/or enhanced outside of the ACEC Reserve System. The success rate for restoration and enhancement projects will also be documented.
    - For each riparian Reserve System parcel acquired, whether it was purchased in fee title or protected under a conservation easement will be documented. If conservation easements were used, the report will describe who holds the easements.
    - Maps and GIS shapefiles will be provided identifying which parcels have been acquired and whether acquisition was via fee title or easement.
    - The extent of modeled habitat quality (habitat functionality assessment) preserved and added to the Reserve System will be calculated by overlaying the most current habitat functionality assessment.
    - Reporting will include a map of modeled habitat quality (habitat functionality assessment) for each newly added Reserve System area.
- A copy of all easements recorded during the reporting year. Reporting will include a map of easements.
- A summary of all Townsend's big-eared bat or spotted bat maternity roosts observed in the Plan Area during the reporting year.
- Any new populations of plant Covered Species detected during the reporting year will be described and maps included.
- A description of all connectivity improvement projects or other connectivity analyses that were completed during the reporting year.
- A summary of monitoring results conducted during the reporting period, including species status and trends, if appropriate.
- A summary of compliance with General Construction and Species-Specific Measures for the projects reviewed in the reporting year.
- A description of the adaptive management process utilized during the reporting period.
- A summary of the recommendations or advice provided by the USFWS and Science Advisory Committee regarding adaptive management and monitoring.
- Any items noted to be reported annually in the Weed Management Plan and Connectivity Management Plan shall be included.
- The patrol hours implemented by the MSHCP and number of incidents on Reserve System lands.
- A summary of outreach and education related to wild desert tortoises conducted in the reporting year.

- An accounting of all revenues received, spent, and an assessment of progress towards total revenue goals. Funding from local, state, and federal sources must be tracked separately. Any fee adjustments must also be reported.
- A summary of any administrative changes, minor modifications, or major amendments proposed or approved during the reporting year.

6.5.2 Annual Project Symposium

In addition to the Annual Progress Reports described above, the DCP will host an Annual Project Symposium for the public. The Symposium will provide progress summaries of the MSHCP Amendment, including any amendments or modifications, and presentations on projects funded by the MSHCP Amendment, including monitoring and other research topics. The purpose of the Symposium is to foster data sharing, collaboration, and stakeholder engagement.

6.5.3 Five-Year Monitoring Report

Every five years, a more detailed analysis of the compliance and effectiveness monitoring of the Conservation Strategy will be conducted and reported in a document separate from the Annual Progress Report. Information identified in Table 6-1 for inclusion in the Five-Year Monitoring Report is also listed below for clarity. The Five-Year Monitoring Report will include the following:

- A summary of all restoration and enhancement activities undertaken on and off the Reserve System and a discussion of the management issues facing the DCP.
- A review and analysis of all connectivity improvement projects or analyses that were conducted in the five-year reporting period. Analysis should include determination of success of the project and recommendations for future projects. Review the Connectivity Management Plan, and provide recommendations for updates to the Plan, if any.
- A summary of all monitoring survey results and an analysis of population trends in the Reserve System. Table 6-3 should be reviewed, and documentation will include whether thresholds are being exceeded and whether adaptive management is required.
- A summary of all Townsend’s big-eared bat or spotted bat maternity roosts observed in the Plan Area during Covered Activities or monitoring efforts.
- A summary of all essential plant Covered Species' locations within the Permit Area, if impacts have occurred in these locations, and management concerns, if any. A map will be included showing locations of these populations.
- A summary of the changes in habitat quality over the previous five years based on the habitat functionality assessment.
- An assessment of the efficacy of the MSHCP private Reserve Management Program (for riparian and other non-ACEC Reserve System properties), including lessons learned and recommended changes to the Reserve Management Program based on interpretation of monitoring results and research findings.
- An assessment of the efficacy of habitat restoration and/or enhancement methods in achieving performance objectives (if applicable) and recommended changes to improve the efficacy of the methods.
- An assessment of Reserve System lands and the actions undertaken by the DCP to document the additional support the MSHCP funds provide in managing Reserves for Covered Species.
- A summary of impacts, if any, to sediment sources for threecorner milkvetch and sticky buckwheat habitats, and whether there are any management recommendations.

- A description of all MSHCP special studies undertaken during the five-year reporting period; a summary of study results; and a description of integration with monitoring, assessment, and compliance elements.
- A description of all monitoring as described in Section 6.4 completed during the five-year reporting period including species statuses and trends.
- A summary of outreach related to wild desert tortoises and an assessment of effectiveness of materials with recommendations on revisions of materials or strategy, if needed.
- An assessment of the appropriateness of any monitoring targets and triggers (Table 6-3) based on the results of monitoring, and recommended changes to these criteria.
- A description of any actions taken or expected regarding changed circumstances, including remedial actions.
- A description of any changed and unforeseen circumstances that arose and responses taken.
- Any items noted to be reported every five years in the Weed Management Plan and Connectivity Management Plan shall be included in the Five-Year Monitoring Report.

6.5.4 Adaptive Management Report

Every two years, a detailed analysis of the compliance and effectiveness monitoring of the Conservation Strategy will be conducted and reported in a document separate from the Annual Progress Report and the Five-Year Monitoring Report. Information identified in Table 6-1 for inclusion in the Adaptive Management Report (AMR) is also listed below for clarity. The Adaptive Management Report will include the following:

- A summary of all natural ecological, hydrological, and geomorphological processes incorporated into restoration design. Reviewed quadrennially as part of every other AMR (Objective 1.4).
- A review and status report on all connectivity enhancement and protection projects for desert tortoise and other high priority Covered Species. Reviewed and reported quadrennially as part of every other AMR (Objective 1.7).
- Quantitative population data for all covered wildlife species included biennially in every AMR (Objective 2.1).
- A statistical analysis of population trends will be provided quadrennially in every other AMR (Objective 2.1).
- Quantitative population data from all known occurrences of covered plant species will be provided biennially in every AMR (Objective 2.2).
- Statistical analysis of population trends will be reported quadrennially in every other AMR (Objective 2.2)
- Survivorship of translocated desert tortoises will be reported biennially in every AMR (Objective 2.3).
- Statistical analysis of aggregated translocated tortoise survivorship compared to aggregated resident tortoise survivorship will be reported quadrennially in every other AMR (Objective 2.4).
- Data on unauthorized land use from monthly 100-hour patrols in the BCCE will be reported quadrennially in every other AMR (Objective 3.2).
- Data on the implementation of BMPs for desert tortoise will be reported quadrennially in every other AMR (Objective 3.3).

7.0 REGULATORY ASSURANCES

This chapter addresses regulatory assurances to Permittees and private landowners under the MSHCP Amendment during the Permit Term. The regulatory assurances afforded to the Permittees (the "No Surprises" assurances) are provided under the authority of the Endangered Species Act and are intended to limit costs and clarify expectations and responsibilities associated with conservation and mitigation measures, particularly if circumstances change or unforeseen circumstances arise. These assurances do not limit or constrain the USFWS, or any other public agency, from taking additional actions to protect or conserve species covered by the MSHCP, at no additional cost to the Permittees. The assurances to private landowners within the Plan Area clarify the intentions and limitations of the DCP in acquiring and placing conservation easements on private properties for incorporation into the Reserve System.

7.1 Assurance to the Permittees: The No Surprises Rule

The federal No Surprises Rule of 1998 (63 FR 8859) and associated amendments to federal regulations (50 CFR 17.3, 17.22, and 17.32) provides assurances to ESA Section 10 permit holders. The rule states that if a Permittee is properly implementing an HCP that has been approved by USFWS, no additional commitment of resources or restrictions, beyond what has already been specified in the plan, will be required by the federal government, should unforeseen circumstances arise. If the status of a Covered Species unexpectedly declines, the primary obligation for undertaking additional conservation measures lies with the federal government, other government agencies, or other non-federal landowners who have not yet developed HCPs. If circumstances change during the Permit Term, as discussed in Section 7.2, the actions required of the Permittees are outlined to delineate and clarify the necessary modifications.

In the event of unforeseen circumstances, the USFWS may require additional measures, provided they are limited to modifications within the Reserve System or to the HCP's operating conservation program for the affected species, and provided that these measures do not involve additional financial commitments or resource restrictions without the consent of the Permittee. The assurances provided by the No Surprises Rule are not absolute, as specified in the ESA's "Permit Revocation" rule. Under that rule, if a Covered Species is threatened with extinction, assurances may be nullified and the USFWS may revoke the HCP permit. The USFWS may exercise this authority even if a Permittee is in compliance with the terms and conditions of the permit, if continuation of the permitted activity would appreciably reduce the likelihood of the survival and recovery of the species.

A key component of the No Surprises Rule is the distinction between "changed circumstances" and "unforeseen circumstances." The No Surprises Rule defines changed circumstances as "changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the USFWS and that can be planned for." The regulations require that potential changed circumstances be identified and assessed in the HCP and that preventive and remedial measures be developed in response. In this way, the USFWS has assurance that Permittees will take specific actions if changed circumstances arise, and the Permittees have a clear understanding of their potential future responsibilities.

Unforeseen circumstances are defined in the No Surprises Rule as "changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the Service at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of the Covered Species." Because they cannot be anticipated, unforeseen circumstances are not planned for specifically. If an unforeseen circumstance does arise, the USFWS must demonstrate,

based on scientific evidence, that the unforeseen circumstance exists. The USFWS may then determine that additional conservation and mitigation measures are necessary to address it. However, the USFWS cannot require the commitment of additional land, water, or financial resources, or impose new restrictions on the use of natural resources. Rather, the USFWS will work with the Permittees to address the circumstance by implementing or adjusting measures that maintain the original terms of the HCP to the maximum extent possible, and HCP resources may be redirected to meet these needs. Federal agencies may also take additional actions at their own expense to protect the Covered Species.

7.2 Changed and Unforeseen Circumstances

The USFWS and the Permittees agree that the changed circumstances defined in this section of the MSHCP Amendment represent all changed circumstances to be addressed by the Permittees. These provisions reflect changes that can reasonably be anticipated to occur within the Reserve System, which the Permittees have established to offset impacts from Covered Activities.

The changed circumstances discussion begins with an overview of climate change trends and projections for the Plan Area because each changed circumstance relates to climate change. Following this overview, each of the changed circumstances listed below are presented in detail:

1. Extreme Heat
2. Precipitation Changes
3. Repetitive and Severe Fire
4. Invasion by Invasive Species
5. New Species Listing
6. Disease

Each defined changed circumstance includes an assessment of risk, a description of preventative measures, and a summary of planned responses. Preventative measures are undertaken by the Permittees to reduce the potential for a changed circumstance to occur or to reduce the potential for habitat damage if one does occur. Planned responses are the specific actions that will be undertaken in the event of a changed circumstance. Planned responses will not include any actions beyond those expressly identified in this chapter, nor will they apply to any event not specifically identified as a changed circumstance.

Each changed circumstance description also explains when a change exceeds what could reasonably be anticipated and therefore becomes an “unforeseen circumstance,” which does not require specific preventative measures or planned responses. In a few instances, this threshold is not defined because too many unknowns remain at this time.

Finally, changed and unforeseen circumstances may arise beyond those analyzed in this chapter. Illegal or accidental incidents such as oil spills or wastewater releases may occur, but cannot reasonably be planned for. Take resulting from such events would not be covered by the MSHCP and would instead be managed by other permitting authorities under Section 7 of the Endangered Species Act. However, if these events cause habitat conditions within the Reserve System to change, the resulting habitat changes may be considered a changed or unforeseen circumstance to be managed under the MSHCP.

7.2.1 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified. . . by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer" (Lee at al. 2023). The effects of climate change are becoming increasingly evident in the Plan Area and are projected to continue throughout the Permit Term. Precipitation patterns are expected to become more extreme, with prolonged dry periods followed by heavy rain and flooding. An overall decrease in precipitation, along with changes in rainfall and snowpack, is expected to reduce water availability and alter habitats in the region. Average temperatures have already risen in the region, and this trend is projected to continue, with ongoing increases in the frequency of extremely hot days. Climate change has also contributed to the expansion of invasive species and to larger, more severe, and more frequent wildfires, which further alter habitats and increase risks to Covered Species. As pressures intensify, Covered Species become more susceptible to disease, and altered habitats and ecosystem processes may make non-covered species vulnerable to ESA-listing, which could require an amendment to the MSHCP to cover additional species. Climate change is also likely to alter human behavior related to energy use and farming practices, such as irrigation, groundwater pumping, and overall land conversion, which could require further modifications to the MSHCP.

Anticipated climate change trends and their effects on individual species in the Plan Area were analyzed as part of Chapter 3 Covered Species. This analysis is presented in the Climate Change Worksheets, Appendix H. It addressed how ecosystems and species may adapt to climate change, how Covered Activities interact with climate change, and what management measures, biological goals, and objectives can enable the MSHCP to adequately monitor, prepare for, and respond to it.

7.2.2 Extreme Heat

Climate change is projected to raise average temperatures in the Plan Area during the Permit Term, including more frequent hot days (>32.2°C or 90°F) and extreme hot days (>37.8°C or 100°F; Pan et al. 2011). These conditions are likely to alter habitats and may significantly affect Covered Species.

7.2.2.1 Risk Assessment

A 2022 climate vulnerability assessment by All-In Clark County categorized the County's aquatic/riparian habitats as highly vulnerable to extreme heat, with the County's woodland/forest and desert habitats assessed as moderately vulnerable (Kim Lundgren Associates 2022). Over the course of the 21st century, average temperatures in the Great Basin and Mojave Deserts have increased by 1 to 4ºC/1.8 to 7.2ºF (Redmond 2010). In a business-as-usual (high emissions) scenario, climate modeling predicts that by 2050 average annual temperatures in Clark County will increase 8.9% (an increase of 3.1ºC/5.7ºF) and days with a heat index over 100ºF will increase by 238% from 15 to 35.8 days relative to the baseline period from 1971 to 2000. The same model and scenario predicts that by 2050, days with a heat index above 105ºF in Clark County will increase annually by 573% from the historical (1971 to 2000) value of 3.5 days to 23.6 days (Climate Toolbox 2025).

Extreme heat throughout the County could have wide-ranging effects on Covered Species, including decreased reproduction and increased mortality (Breshears et al. 2021, Elmore et al. 2017). Plants may experience lower water turgor, stunted growth, susceptibility to desiccation,

and reduced seed set (Breshears et al. 2021, Hatfield and Prueger 2015). Wildlife may reduce activity to avoid extreme temperatures and may experience increased physiological stress and greater susceptibility to disease (Elmore et al. 2017). For the Mojave desert tortoise, prolonged periods of abnormally hot weather (heat waves, generally 2 to 5 days) may reduce reproductive success through various pathways, from physiological stress to altered sex ratios of offspring (Butler 2019). Extreme heat will also increase human energy use for cooling, which could drive development of additional energy infrastructure to support long-term changes in energy demand (Bell et al. 2024). Human activity may shift from daylight to evening and nighttime hours when temperatures are cooler, which could in turn increase the need for artificial lighting. Together, these effects are anticipated to alter habitat quality and decrease the long-term viability of Covered Species. Conversely, extreme heat could ultimately reduce development demand if emigration from the County exceeds immigration due to an inhospitable climate.

7.2.2.2 Preventative Measures and Planned Responses

While preventing extreme heat is beyond the scope of the MSHCP Amendment, measures can be taken to accommodate habitat and species range shifts, primarily in elevation but also in absolute location and aspect use within the Reserve System. Thermal refugia can be incorporated into the restoration design for riparian and upland habitats. Maintaining connectivity within the Reserve System is also important to allow species and habitats to shift to future climate refugia and potentially suitable habitat. The current Reserve System spans heterogeneous habitats and elevations (~1,000 ft to ~6,000 ft), including elevations higher than those currently occupied by Covered Species, which allows for both horizontal and vertical migration (Feldmeier et al. 2020). For example, the Desert Tortoise Protective Corridor Reserve Unit, which encompasses 19,710 acres in the southwest portion of the Plan Area, was designed to function as a key corridor (horizontal migration) for the desert tortoise. The Stump Springs proposed Reserve Unit was expanded in the MSHCP Amendment to include important connectivity areas and elevations >4,000 feet to allow for elevational range shifts (vertical migration) of Covered Species. Monitoring of habitat quality, connectivity, and Covered Species will provide data on range shifts and inform appropriate management responses (Biological Objectives 1.3, 1.7, and 2.1), which may include reconsideration of priority restoration areas and designs, or other redirection of MSHCP resources, to respond to elevational or geographic range shifts of Covered Species caused by extreme heat.

7.2.2.3 Changed and Unforeseen Circumstances

Defining unforeseen circumstances for extreme heat is difficult because species responses cannot be reliably anticipated. Table 7-1 shows historical and projected seasonal mean temperatures for Clark County. The historical mean seasonal temperature data include records from 1971 to 2000. The projections for 2050 and 2080 are means of five North America-based climate scenarios: GFDL-ESM2M.rcp85, GFDL-ESM2G.rcp85, CanESM2.rcp85, and CCSM4.rcp85 (Climate Toolbox 2025). Based on these data and models, average annual County-wide mean temperatures exceeding the mean plus standard deviation of predicted future temperatures listed in Table 7-1 will be considered an unforeseen circumstance. Data collected through the MAMP, including biological and botanical surveys, will enable the DCP to monitor temperature trends annually and to detect the effects of extreme heat on Covered Species and their habitats. For example, extreme heat has been shown to be lethal to desert passerines in Nevada via dehydration (Albright et al. 2017). Planned responses will be developed depending on the effects detected.

Table 7-1. Historical and Projected Mean Seasonal Temperatures (°F) in Clark County with standard deviations reported in parentheses

	Winter Dec-Feb	**Spring** Mar-May	**Summer** Jun-Aug	**Fall** Sept-Nov	**Annual**
Historical Mean 1971-2000	45.76	62.03	83.19	64.62	63.90
Historical Mean 2000-2024	48.53	65.93	88.24	68.45	67.79
Projected Mean 2050	50.50 (±1.10)	67.10 (±1.00)	89.47 (±1.56)	70.21 (±0.84)	69.32 (±1.10)
Projected Mean 2080	53.16 (±1.56)	69.41 (±1.49)	92.82 (±2.02)	73.54 (±1.07)	72.23 (±1.50)

7.2.3 Changes in Precipitation Patterns

As temperatures rise with climate change, precipitation patterns are expected to become more extreme, with longer dry periods producing drought conditions and heavy, sustained precipitation producing flooding. These extreme patterns could alter habitats and harm Covered Species. For example, under low precipitation conditions, Covered Plant Species may produce little or no seed, and germination may not occur.

7.2.3.1 Risk Assessment

Precipitation estimates within the Plan Area over the next half-century vary by model. In general, precipitation in the California and Nevada deserts is predicted to decrease in spring and summer and increase in winter relative to the previous century (Kalansky et al. 2018, Pan et al. 2011, Redmond 2010). Although winter precipitation is projected to increase, snowpack is expected to decrease by approximately 15 percent by mid-century due to rising minimum temperatures (Pan et al. 2011). In the Great Basin, north of the Plan Area, snowmelt is already occurring 10 to 15 days earlier than it did 50 years ago (Ryan et al. 2008). Annual precipitation is projected to decrease by up to 5 percent in the northern portion of the Plan Area and up to 10 percent in the southern portion (Runkle et al. 2022).

Greater precipitation variability in the southwestern United States (Diffenbaugh et al. 2008) is predicted to drive a drying trend (Seager et al. 2007), which in turn will reduce runoff and streamflow (Milly et al. 2005). In Clark County, precipitation is highly variable from year to year, with annual totals driven largely by rare extreme precipitation events (95th percentile or above), which themselves vary considerably by region (Kalansky et al. 2018). Between 1979 and 2024, average annual rainfall in Clark County was 6.7 inches, with a decreasing trend of -0.8 inches per decade (Climate Toolbox 2025). Projections indicate increasing frequency of extreme precipitation events: approximately 30 more 95th percentile precipitation events and 15 more 99th percentile precipitation events are expected in 2010 to 2039 compared to baseline conditions from 1976 to 2005 (Kalansky et al. 2018). More frequent or longer dry periods than typically seen over the last century, interspersed with more frequent (>2 per year) storms producing higher-than-average precipitation (2 inches per hour) and high winds, may ultimately increase the frequency of both droughts and floods within the Plan Area (Yu et al. 2023). Table 7-2 shows that rainfall is projected to increase in winter (0.2 to 0.6 inches per year) and decrease in spring and summer, with the greatest declines occurring in spring (-0.02 to -0.04 inches per year). Fall precipitation is expected to change the least.

Table 7-2. Predicted Change in Clark County Rainfall by the End of the Century (in.)

30-year Period	Winter	Spring	Summer	Fall	Annual
Historical Model Average (1976-2005)	2.2 in	1.6 in	1.4 in	1.5 in	6.7 in
2010-2039	0.2/0.3	-0.1/-0.2	0/-0.1	0/0.1	0.1/0.1
2020-2049	0.2/0.3	-0.1/-0.2	-0.1/-0.1	0/0	0.1/0
2030-2059	0.3/0.3	-0.1/-0.2	0/-0.2	0.1/0.1	0.4/0.1
2040-2069	0.3/0.2	-0.2/-0.3	0/-0.1	0.1/-0.1	0.2/-0.3
2050-2079	0.3/0.2	-0.1/-0.3	0/-0.1	0/0	0.2/-0.2
2060-2089	0.2/0.3	-0.2/-0.4	0/-0.1	0/0	0.1/-0.3
2070-2099	0.2/0.6	-0.1/-0.4	0/-0.2	0.2/0.1	0.3/0.1

Table 2. Recreated from Kalansky et al. 2018. The seasonal precipitation change in inches relative to 1976 to 2005 model historical climatology for Clark County. Table shows the 30-year ensemble average of six GCMs projections. The first row is the ensemble average value of the historical model runs. Black values are for RCP4.5 ("significant greenhouse gas reductions") and red values are RCP8.5 ("business as usual").

Increased variability in precipitation (amount, timing, and duration) and more severe and frequent floods could lead to local population declines of Covered Species and to permanent alteration of habitat quality. Seasonal deviations in water availability, driven by seasonal changes in precipitation, the onset and amount of snowmelt, and the duration and intensity of prolonged heat, may cause physiological stress; precipitation variability may also disrupt the reproductive success of Covered Plant Species by altering the timing of phenological events (Hassan et al. 2023). Prey availability for carnivores could also be reduced if the timing of precipitation significantly alters the plant growth that supports populations of herbivorous species. More frequent and severe precipitation may result in flooding, erosion, and scour, which can cause temporary or permanent conversion of habitat quality in floodplains, as well as local declines of Covered Species populations in affected areas (Anderson 1983). The timing of extreme precipitation may also cause direct mortality of Covered Species and alter nesting behavior of birds such as the Yuma Ridgway's rail (Anderson 1983).

Longer, more frequent, and more intense droughts may affect Covered Species and habitat by reducing groundwater availability (Bradford et al. 2020) and surface flows (Siirila-Woodburn et al. 2021). A decrease in water availability could convert riparian and desert wash habitat, affecting the distribution of Covered Species that rely on these habitat types (Anderson 1983). For example, the Muddy River is spring-fed; lowering of the groundwater table may affect downstream riparian habitat and surface flows. Spring-dependent and riparian Covered Species may experience significant water stress during droughts, and decreased humidity and canopy cover in riparian corridors could degrade habitat quality, including prey abundance for riparian bird species.

Drought-related changes in soil properties may adversely affect Covered Plant Species and reduce foraging opportunities for Covered Wildlife Species. Increased evapotranspiration and loss of soil moisture may raise soil salinity. Ground subsidence from a lowering water table may also disturb soils and soil crusts, creating additional opportunities for colonization by invasive plants.

Variability in precipitation could also alter irrigation needs and timing for human activities such as agriculture, golf courses, and other landscaping and recreation (Asif et al. 2023). Additional

infrastructure to provide reliable water sources, and changes to water-use policies, may be needed to address a less predictable supply (Siirila-Woodburn et al. 2021). Agricultural systems may need to convert to alternate crops or land uses based on groundwater availability. The Southern Nevada Water Authority manages water use and is responsible for water permitting and mitigation in Clark County. Although water use is not a Covered Activity under the MSHCP Amendment, changes in water use may alter habitat conditions for Covered Species. The cost of development could also increase as water becomes scarcer, potentially limiting future development. More frequent and severe floods may increase the need for water-quality monitoring and post-flood cleanup programs, and may require changes to disaster planning and prevention programs. Infrastructure repair and maintenance to address flood damage may cause significant economic stress.

7.2.3.2 Preventative Measures and Planned Responses

Measures to prevent drought or floods are beyond the scope of this MSHCP Amendment, but these events can be anticipated and responses can be planned. Habitat alteration caused by extreme precipitation in DCP's Riparian Reserve Units will need to be inspected to determine the extent to which Covered Species or their habitats have been affected. If deemed necessary, the DCP will implement protective measures and repairs to secure sites, such as installing fencing or pumps. Additional remediation measures, such as erosion control, reseeding, and replanting, will be developed to address site recovery. Within 1 year of a flood event, an assessment will be made to evaluate whether additional habitat restoration is necessary. The site will be monitored annually for a time frame specified in the 1-year assessment.

If adverse effects of drought on Covered Species or habitat are suspected within the Reserve System, monitoring of Covered Species and habitat quality will be used to determine whether corrective actions are necessary. Corrective actions could include habitat restoration, invasive species management, supplemental watering, and seed collection.

7.2.3.3 Changed and Unforeseen Circumstances

Precipitation changes will be considered a changed circumstance until one or more of the following thresholds are met or exceeded, at which point they will be considered unforeseen:

- Two or more 100-year flood events occur within 10 years of each other. FEMA defines a 100-year flood as a flood event with a 1 percent chance of being equaled or exceeded in any given year.
- Prolonged drought results in desiccation of 30 percent of individuals of a Covered Plant Species with no seed production, and no signs of new germination are observed for 5 years for annual species or 10 years for perennial species.
- Prolonged drought or flooding results in the permanent conversion of more than 20 percent of an ecosystem type within the Reserve System within 5 years or less, or in the destruction of a key connectivity corridor in the Reserve System.
- Flooding results in the extirpation of more than 40 percent of the population of a Covered Species.
- Water levels at Lake Mead increase to inundate known populations of threecorner milkvetch (TNC 2007) for two consecutive years.

7.2.4 Repetitive & Severe Fire

Increasingly repetitive and severe fire is expected in the Plan Area during the Permit Term as a result of changing precipitation patterns, drought, and more frequent and prolonged periods of abnormally hot weather. Changing vegetation under these conditions is also anticipated to contribute to more severe wildfires. Increased wildfire incidence and severity has the potential to degrade habitat and undermine Covered Species' viability and recovery, particularly in certain ecosystems.

7.2.4.1 Risk Assessment

In the Mojave Desert, larger and more frequent fires are predicted as a result of high winter rainfall, which increases the productivity of non-native annual grasses, coupled with low summer rainfall, which produces hot, dry conditions (Brooks and Chambers 2011). Invasive plants such as red brome (*Bromus madritenis* ssp. *rubens*), Mediterranean grass (*Schismus barbata*) and mustards, including Sahara mustard (*Brassica tournefortii*) and African malcomia (*Malcomia africana)* have increased the probability of larger and more frequent wildfires (D'Antonio and Vitousek 1992, Brooks et al. 2004, TNC 2007). In some areas of Clark County, repeated fires have eliminated perennial plants and converted native plant communities into non-native annual grasslands, perhaps irreversibly (Brooks and Matchett 2003, Brooks and Matchett 2006, Brooks et al. 2003). This creates a positive feedback loop between repeated fires and the establishment and expansion of non-native annual grasses. Although most models predict an increase in fire frequency in the west, some models (Randall et al 2010, Westerling and Bryant 2008) predict that more frequent drought will reduce fine fuel buildup, thereby decreasing wildfire frequency and intensity. This scenario appears unlikely given the current spread of non-native annual grasses but may occur in areas not yet invaded by these grasses.

More frequent, larger fires in Mojave desert scrub and blackbrush ecosystems, driven by invasion and expansion of non-native grasses and mustards, could further promote the spread of these invasive species. This synergistic effect could ultimately convert Mojave desert scrub, blackbrush, and Joshua tree woodland to non-native grassland. Fires could destroy above-ground plant tissue and native seed banks of non-fire-adapted blackbrush ecosystem species. Severe fires may also damage or destroy cryptogamic crusts in Mojave desert scrub ecosystems, which are critical for maintaining seed banks and soil-surface nutrient levels, and which facilitate the water retention necessary for Covered Species occurring on gypsum soils (Mistretta et al. 1996). This conversion of habitat would also reduce the availability of forage species for Covered Species in Mojave desert scrub, such as the Mojave desert tortoise.

Fires in low- to mid-elevation shrublands can reduce short-term evapotranspiration, leading to increased groundwater recharge and post-fire runoff and erosion. This runoff could alter riparian geomorphology, sedimentation, and water chemistry (Rhodes et al. 2011). Fires may also promote the spread of tamarisk and other invasive species in riparian ecosystems, which in turn facilitate further fire spread and reduce habitat quantity and quality for Covered Species (Shafroth et al. 2002, Dwire and Kauffman 2003, Busch and Smith 1995).

A more severe fire regime could reduce human activity in recently burned areas and concentrate it in unburned areas. More frequent and larger fires may also require greater emphasis on fire management, as well as new water-quality standards and management strategies in post-fire riparian ecosystems.

7.2.4.2 Preventative Measures and Planned Responses

Fire prevention will focus on managing the spread of invasive plant species (Objective 1.1), including non-native grasses and mustards known to increase fire risk. Weed management will be addressed as part of the CMA for each Reserve System Unit and will identify essential areas for weed control to promote the resiliency, redundancy, and representation of Covered Species. The weed management responsibilities described in each CMA will be developed through consultation between the DCP and BLM, taking into account existing BLM fire management and prevention plans.

In cooperation with Clark County Vector Control, the DCP will participate in the statewide EDRR Program led by the Nevada Department of Agriculture for newly detected non-native and potentially invasive plant species establishing outside of landscaped areas (Objective 1.1). Each CMA will include measures contributing to the EDRR Program. At the wildland-urban interface, measures will also be taken to curb potential ignition sources. If roads must be placed adjacent to natural areas, fencing, reduced speed limits, and warning signage will be implemented to reduce the risk of fire ignition (Avoidance and Minimization Project Design Measure PDM-1).

To prepare for an increase in the severity and intensity of wildfires, seed collection of Covered Plant Species will be attempted where practical, with transplantation or vegetative propagation used where determined suitable for certain species or sites, as detailed in the Seed Collection Protocol (Appendix B). Collected seeds will be integrated into Rare Plant Propagation efforts for use in responding to landscape-scale disturbances such as invasive species infestations and altered fire regimes. An increased habitat restoration effort may also be needed to ensure the resiliency, redundancy, and representation of Covered Species habitat, particularly for species with formally designated Critical Habitat within the Plan Area.

7.2.4.3 Changed and Unforeseen Circumstances

Repetitive and severe fire will be considered a changed circumstance until it results in the permanent conversion of more than 15 percent of total habitat within the Reserve System for one or more Covered Species in a span of 5 years or less, or in the destruction of a key connectivity corridor. A model by Eichenwald et al. (2020), analyzing climate data from 1986 to 2008, calculated that on average 3.6 percent of habitat area for 24 federally listed vertebrates, including desert tortoise, transitioned from suitable to unsuitable in any given year; thus, a 15 percent decline in 5 years or less would exceed the observed historical background rate of habitat loss. Key corridors will be identified within the first three years of MSHCP implementation for non-volant (incapable of flight) but highly mobile Covered Species, such as desert tortoise and Gila monster, and within the first five years for Covered Plant Species (Objective 1.7).

7.2.5 Invasion by Invasive Species

Invasive plants and wildlife already occur in the Plan Area and have the potential to expand their distributions and become more prevalent as the climate changes. Invasive species can negatively impact Covered Species by competing for resources, altering ecosystem processes, and exacerbating other threats such as wildfire and predation. Invasive plants typically provide less nutritional forage than native vegetation, which can slow the growth and weaken the immune response of individual Covered Species. Actions may be taken to reduce the threats posed by invasive plants and wildlife.

7.2.5.1 Risk Assessment

Many invasive plant and wildlife species currently occur within the Plan Area and pose a variety of direct and indirect threats to Covered Species. Few of the existing invasive species are likely to be eradicated during the Permit Term, and new invasive species will likely establish populations while others expand their range within the Plan Area. Invasive plants are likely to negatively affect Covered Species by altering ecosystem processes such as nutrient cycling, hydrologic cycles, the frequency and intensity of wildfires, and erosion and sediment deposition (Bossard et al. 2000). Invasive annual grasses and mustards, in particular, are likely to increase the size, frequency, and intensity of wildfires. Invasive plants are also likely to degrade aquatic and riparian habitats and may permanently convert them to conditions unsuitable for some Covered Species. Invasive wildlife species such as the house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*) are likely to impact some Covered Species through resource competition. Other invasive species, such as the common raven (*Corvus corax*) and the American crow (*Corvus brachyrhynchos*), directly affect desert tortoise populations through predation. Covered Bird Species are likely to be impacted by brood parasitism of the invasive Brown-headed cowbird (*Molothrus ater*). Displacement of native ants and other native invertebrates by the Argentine ant (*Linepithema humile*) is likely to affect Covered Species indirectly, by altering food resources, and directly, through injury or predation. Covered Species dependent on wetland and riparian habitat could be negatively affected by wild horses (*Equus caballus*), burros (*E. asinus*), and illegal/feral cattle (*Bos taurus*) through alteration of riparian areas and reduced forage. As the climate changes, all ecosystems and habitat features associated with Covered Species are at risk of increased pressure from invasive plant and wildlife species.

7.2.5.2 Preventative Measures and Planned Responses

As described in the Avoidance and Minimization Measures (Section 6.2), and the MAMP (Section 6.4.1.1.1), the Plan Administrator will take the following steps to manage invasive species at or below the baseline conditions:

- Invasive species management will be addressed as part of each Reserve System Unit's CMA to identify essential areas for weed control that promote the resiliency, redundancy, and representation of Covered Species.
- Project design measures and general construction measures, such as GCM-3, will be implemented for all construction projects to minimize impacts to Covered Species habitats, reduce temporary stressors on Covered Species, and limit the potential for introduction or spread of invasive species during construction.
- In cooperation with Clark County Vector Control, the DCP will participate in the statewide EDRR Program led by the Nevada Department of Agriculture to monitor and respond to newly identified invasive or potentially invasive species establishing outside of landscaped areas.

Non-native wildlife will be managed in collaboration with BLM, as described in the CMAs for each Reserve System Unit. Two Reserve System Units overlap with BLM Herd Management Areas (HMAs): Stump Springs overlaps with the Wheeler Pass HMA (containing 47 to 66 wild horses and 20 to 35 wild burros), and Bird Springs Valley overlaps with a portion of the Red Rock HMA (containing 16 to 27 wild horses and 29 to 49 wild burros; BLM 2022). If non-native wildlife negatively affect Covered Species in the Reserve System, DCP will alert BLM in accordance with CMA protocols. Although BLM is ultimately responsible for wild horse and burro management, the County may erect fences or implement other management practices to protect sensitive habitats, as determined in consultation with BLM through CMA management.

7.2.5.3 Changed and Unforeseen Circumstances

No unforeseen circumstances are defined for invasive plant or wildlife species. The adaptive management process will allow for management of any newly established invasive species or any change in the conditions or distribution of existing ones. Early eradication of invasive species in the Plan Area will occur through the statewide EDRR Program led by the Nevada Department of Agriculture, in which the DCP will participate in cooperation with Clark County Vector Control. The program will include worker and public education, invasive species monitoring methods, and a response protocol for newly identified invasive or potentially invasive species (Chapter 6.4).

7.2.6 Change in Disease Prevalence or Virulence

As the climate changes, both the risk of disease to Covered Species and their susceptibility to it may increase. It is therefore important to recognize species currently at risk and to identify changes in the prevalence or virulence of new or increasingly detrimental diseases in the Plan Area.

7.2.6.1 Risk Assessment

Because Covered Species typically have small or declining populations, they are at higher risk of collapse from disease; exposure to a newly occurring disease, or to one that has increased in virulence, may pose an imminent threat to many Covered Species. For example, the upper respiratory tract disease currently threatening desert tortoise populations is likely to increase in prevalence and virulence as climate-related stress on the species rises.

7.2.6.2 Preventative Measures and Planned Responses

The preventative measures and planned responses described in this MSHCP Amendment will minimize the risk to Covered Species from a disease outbreak or introduction, as well as from the increased pressures of Covered Activities. DCP will coordinate with NDOW, NDF, and USFWS to establish a notification system for disease outbreaks and introductions. If a known high-risk disease emerges within the Plan Area for the first time, or if an existing outbreak increases in virulence, disease prevalence and virulence monitoring will be incorporated into Covered Species monitoring through adaptive management, as described in the MAMP (Section 6.4.1.2). For the upper respiratory tract disease, desert tortoise handling protocols incorporate sanitary techniques and other protective measures to prevent disease spread (USFWS 2024). If a disease outbreak occurs, Reserve System landowners, the agencies, and the Science Advisor Panel will be consulted on a response plan as part of the adaptive management process.

7.2.6.3 Changed and Unforeseen Circumstances

A 40 percent decline in the population of a Covered Species within the Reserve System caused by a disease is considered an unforeseen circumstance. In that event, the DCP, the USFWS, and the Science Advisor Panel will be consulted on a remediation plan.

7.2.7 New Listing of Species Not Covered by the Plan

Climate change will alter conditions in the Plan Area, including the magnitude, pace, and impacts of fire, temperature changes, precipitation patterns, invasive species, and disease. These changes may increase or accelerate risks to species, potentially leading to ESA-listing for species not currently covered by the MSHCP Amendment. If a new species is listed, or is proposed for

listing, and MSHCP implementation could adversely affect that species, the situation will be considered a changed circumstance and addressed accordingly.

7.2.7.1 Risk Assessment

As part of the development of this MSHCP Amendment, the list of Covered Species was reevaluated. The purpose was to reduce the number of Covered Species so that mitigation actions and resources can be prioritized for those most at risk within the Plan Area during the Permit Term. Among the factors considered was whether to incorporate species not currently federally listed under the ESA but that may become listed during the Permit Term due to habitat degradation and population declines. Following this reevaluation, 23 non-ESA-listed species are now included as Covered Species. These non-ESA-listed Covered Species are presented in Table 7-3 by current federal status.

Table 7-3. Listing Status of Non-ESA Listed Covered Species

Listing Status	Species
Not Federally Listed	Gila monster (*Heloderma suspectum*)
	golden eagle (*Aquila chrysaetos*)
	western burrowing owl (*Athene cunicularia hypugea*)
	gilded flicker (*Colaptes chrysoides*)
	loggerhead shrike (*Lanius ludovicianus*)
	Bell's vireo (*Vireo bellii*)
	desert pocket mouse (*Chaetodipus penicillatus*)
	Townsend's big-eared bat (*Corynorhinus townsendii*)
	spotted bat (*Euderma maculatum*)
	sticky ringstem (*Anulocaulis leiosolenus* var*. leiosolenus*)
	silverleaf sunray (*Enceliopsis argophylla*)
	Las Vegas buckwheat (*Eriogonum corymbosum* var*. nilesii*)
	blue diamond cholla (*Cylindropuntia multigeniculata*)
	Pahrump Valley buckwheat (*Eriogonum bifurcatum*)
	sticky buckwheat (*Eriogonum viscidulum*)
	Eastern Joshua tree (*Yucca jaegeriana*)
Under Federal Review	Mojave poppy bee (*Perdita meconis*)
	Arizona toad (*Anaxyrus microscaphus*)
	threecorner milkvetch (*Astragalus geyeri* var*. triquetrus*)
	white margined beardtongue (*Penstemon*
	Bendire's thrasher (*Toxostoma bendirei*)
	LeConte’s thrasher (*Toxostoma lecontei)*
Federal Proposed Threatened	monarch butterfly (*Danaus plexippus*)

By incorporating species that are not currently federally listed but may become listed during the Permit Term, this reevaluation minimizes the risk that additional species will be ESA-listed without already being covered by the MSHCP. Nonetheless, the preventative measures and planned responses described in the following section will be implemented to mitigate the risk of potential changed circumstances.

7.2.7.2 Preventative Measures and Planned Responses

Implementation of the Conservation Strategy and the associated BGOs and MAMP is considered a general preventative measure because it maintains or improves habitat quality for Covered Species while avoiding, minimizing, and mitigating impacts from Covered Activities. Given the range of ecosystems and habitats protected, non-covered species that could be ESA-listed in the future will also benefit. If the Conservation Strategy is implemented effectively and adaptive management is applied, the risk of additional ESA listings within the Plan Area is minimized.

If the USFWS finds that listing is warranted for a new species, it will notify the DCP. This notification will trigger a planned response under the MSHCP Amendment, beginning with mapping the species' habitat within the Plan Area, quantifying its extent, and determining the species' conservation risks and needs. The DCP will then determine how the Conservation Strategy can be modified to address those risks and needs.

If a new species is ESA-listed, the Permittees, with assistance from USFWS, will evaluate the potential effects of Covered Activities on the newly listed species and any designated Critical Habitat. If adverse effects are likely during implementation of Covered Activities, the Permittees will implement measures identified by USFWS to avoid take of the newly listed species and modification of any newly designated Critical Habitat, until the HCP and ITP are amended to include the species or until USFWS notifies the Permittees that such measures are no longer needed. The Permittees will coordinate with USFWS to incorporate the newly listed species as a Covered Species through an MSHCP and ITP amendment, or to apply for individual take coverage for activities affecting the species or its habitat. The MSHCP may need to incorporate new avoidance and minimization measures for the newly Covered Species and to quantify qualified acres of impacts and mitigation within the Reserve System to ensure the species' habitat is adequately maintained and improved. If the Permittees choose not to include the newly listed species in the MSHCP Amendment, individual project proponents will need to apply for individual take coverage under the ESA for their project activities.

7.2.7.3 Changed and Unforeseen Circumstances

If a new species listing requires habitat to be conserved beyond the lands currently within or proposed for the Reserve System, it will be considered an unforeseen circumstance. This could occur because a newly listed species requires habitat not currently included in the Reserve System, or because habitat within the Reserve System becomes degraded or altered to the point where it can no longer support the species' survival. Neither scenario is reasonably expected within the Permit Term, so no additional unforeseen circumstances beyond those identified above are anticipated at this time.

7.3 Assurances for Private Landowners

The MSHCP provides assurances to private landowners that clarify the rules governing how the DCP may acquire properties and place conservation easements on them for inclusion in the Reserve System.

7.3.1 Willing Sellers

The DCP will acquire land for the MSHCP Reserve System only from willing sellers. The DCP will not require a landowner to sell or place a conservation easement on their property, and will not use condemnation or eminent domain to acquire properties. The DCP also cannot require changes to land use or zoning designations to facilitate implementation of the Conservation

Strategy, and no single parcel of land is required to satisfy that Strategy. Acquisition and easement prices paid by the DCP will reflect market rates for comparable properties.

7.3.2 Public Notification of County Acquisitions

As with all County acquisitions, when the County acquires property for the Reserve System, notice will be given to the public through publication of the Board of County Commissioners agendas, and the public may provide comments through this process.

7.3.3 No Public Access to Conservation Easements Held by Private Landowners

The public will not be permitted to access privately owned properties incorporated into the Reserve System through a conservation easement. The DCP and its contractors will, however, be granted access to conduct necessary monitoring and management, consistent with the MAMP.

8.0 PLAN IMPLEMENTATION COSTS AND FUNDING

This chapter describes the costs of implementing the MSHCP Amendment and the Permittees' commitment to fund implementation through the sources, mechanisms, and assurances described below. Total implementation costs are estimated at approximately $459 million in 2026 constant dollars, an annual average of approximately $9.2 million over the 50-year ITP term. A development disturbance fee of $2,134 to $2,294 per acre, adjusted annually for inflation, is estimated to be sufficient to cover these costs. The ITP will authorize up to 215,000 acres of additional development in Clark County. Cost and funding information presented in this chapter are sourced from the Funding Analysis of the Clark County Desert Conservation Program MSHCP Amendment (Economic and Planning Systems, Inc. 2026) and on details provided in Chapters 6 (Conservation Strategy), 7 (Changed and Unforeseen Circumstances), and 9 (Administration).

Implementation has been divided into the following cost categories, which were analyzed to support funding assurances and to estimate the endowment required for long-term management after the ITP expires. Costs are described in Section 8.1, and funding in Section 8.2.

- General Administration and Reporting
- Avoidance and Minimization Measures & Public Outreach
- Monitoring and Adaptive Management Program
- Reserve System Management
    - Habitat Restoration and Enhancement
    - Land Acquisition
    - Management
- Changed Circumstances
- Endowment

8.1 Summary of MSHCP Amendment Costs and Budget

Costs for administration, management, and monitoring are organized by the cost categories shown in Table 8-1, which reflect the components of the Conservation Strategy. For many items, current costs to implement the 2000 MSHCP, such as County staffing levels and roles, contractor rates, and restoration project costs, provided a baseline that was then adjusted based on the level of effort anticipated under the MSHCP Amendment. As described in Chapter 9, the DCP will serve as implementing entity.

Some activities support more than one component of implementation; for example, monitoring and surveys may serve both the Avoidance and Minimization Measures and the Monitoring and Adaptive Management Program. In such cases, costs were allocated to a single, most-applicable category to avoid duplication. Costs within Reserve System Management are further organized by the three reserve types: Existing Reserves, New Riparian Reserves, and Proposed Reserve System Units.

Table 8-1 provides cost categories, information sources and components used to determine costs for each category, and total plan cost for the categories. Total plan costs include staffing (salaries, benefits, overhead, etc.) as well as non-staffing costs (contractors, equipment, materials, etc.). Annual ongoing costs and one-time or periodic costs over the MSHCP Amendment ITP term are included such as vehicle purchases, land acquisition, and contracts with law enforcement or biological contractors.

Table 8-1. Implementation Cost Categories and Total 50-Year Cost (in 2026 dollars)*

Cost Category	Description	Information Source(s)	Total Plan Cost
General Administration	Administer the plan including, including but not limited to: · Outside legal counsel; · Updating the GIS/Species Distribution models; · GIS and technology support and imagery acquisition; · Budget, finance, and administrative support; · Grants and mitigation fee management; · Contract management and purchasing; and · Overall program administration.	· DCP organizational chart for MSHCP Amendment implementation · DCP staff salaries and associated costs for 2025-2026 budget	$50,523,370
Avoidance and Minimization Measures (AMMs) (including Public Outreach)	Measures to avoid and minimize impacts to covered species including: · Project Design Measures · General Construction Measures including fencing and best management practices; · Species Protection Measures including pre- project surveys, seed collection and transplantation, and salvage and translocation of desert tortoise; · Outreach programs for Developers and the Public	· MSHP Amendment Conservation Measures-Avoidance and Minimization (Chapter 6.2) · DCP Avoidance and Minimization Workbook identifying roles/responsibilities for AMM implementation (i.e., developer, DCP staff, consultants or contractors) · DCP organizational chart for implementation of MSHCP Amendment · DCP staff salaries and associated costs for 2025-2026 budget	$70,922,967
Monitoring and Adaptive Management Program	Implement monitoring and adaptive management as part of the MSHCP Amendment. **Monitoring** is anticipated to include baseline, compliance, and effectiveness monitoring, as described in Chapter 6.4 of the MSHCP Amendment, which calls for monitoring of the following: · Habitat quality for covered species, including invasive species, covered plant species sediment source habitat monitoring, and habitat quality monitoring; · Connectivity · Species-specific monitoring for 28 Covered Species. · **Adaptive Management** includes a suite of coordinated actions to evaluate and improve effectiveness of the MSHCP Amendment over time including: · Preparation of annual Adaptive Management Reports and implementation of an Adaptive Management Evaluation every five years; · Stakeholder engagement and coordination including an annual symposia; · Updates to the Monitoring and Adaptive Management Plan at least every five years; and · Engaging the Science Advisor Panel to inform the adaptive management process.	· MSHCP Amendment- Monitoring and Adaptive Management Plan (Chapter 6.4) · DCP organizational chart for implementation of MSHCP Amendment · DCP staff salaries and associated costs for 2025-2026 budget · DCP estimates for non-staff costs including Science Advisor Panel engagement, consultant and contractor-led monitoring, and development of the connectivity plan, etc.	$113,990,353
Changed and Unforseen Circumstances	Conduct management actions to address changed and unforseen circumstances identified in the MSHCP Amendment, which are: · Extreme Temperature and Heat Waves; · Precipitation Changes; · Repetitive and Severe Fire; · Invasion by Invasive Species; · New Species Listing; and · Disease. The MSHCP Amendment identifies the planned responses including monitoring and additional management actions, as well as preventative actions, to address each of these circumstances.	MSHCP Amendment- Changed and Unforeseen Circumstances (Section 7.2)	$13,050,294

Cost Category		Description	Information Source(s)	Total Plan Cost
Reserve System Management	**Habitat Restoration and Enhancement**	Restoration and enhancement are key components to maintaining habitat quality in the Reserve for mitigation impacts on the Covered Species in the MSHCP Amendment. The management plans developed for the new reserves (Proposed Reserve System Units, described below) will identify the restoration and enhancement activities, which will also be conducted by the Riparian Reserves Management Plan and Boulder City Conservation Easement (BCCE) Management Plan.	· MSHCP Amendment- Measures to Mitigate Unavoidable Take (Chapter 6.3) · DCP organizational chart for implementation of MSHCP Amendment · DCP staff salaries and associated costs for 2025-2026 budget	$22,192,708
	Land Acquisition	Protect an estimated 600 acres of additional riparian habitat to mitigate impacts of riparian habitat at a 1:1 ratio. Protection of 600 acres of riparian habitat is anticipated to require 900 total of land, based on an analysis that parcels containing riparian habitat average 33% other habitat, such that three acres must be acquired to protect 2 acres of riparian habitat.	· Land appraisals and acquisition costs provided by DCP · DCP analysis of habitat composition on parcels with riparian habitat	$4,252,500
	Management of Existing Reserves	Manage the 88,095 acres of existing reserves, which include the 87,310-acre Boulder City Conservation Easement (BCCE) per the BCCE Management Plan, and the 785 acres of existing riparian reserve units per Riparian Reserves Management Plan. Management includes (but is not limited to): · general land management (e.g., fence repair, debris clean up); · weed management; and · law enforcement.	· MSHCP Amendment- Measures to Mitigate Unavoidable Take (Chapter 6.3) · DCP budget for BCCE management for 2025-2026 contracts for land management, weed management and law enforcement and Riparian Reservescontracts for land management and weed management · DCP organizational chart for implementation of MSHCP Amendment · DCP staff, contractor, equipment, and material costs	$130,502,943
	Management of Proposed Reserve System Units	Establish and then conduct ongoing management within the 305,242 acres contained with the nine new reserves (Future Reserve Units) that will be located within land currently managed by the Bureau of Land Management, and that will serve as reserves as part of the MSHCP Amendment conservation program. **Reserve establishment** is anticipated to include the following: · Preparation and public review and approval of planning documents, including: o Resource Management Plan amendment; o Proposed Reserve System Unit plans, including travel and transportation plans; o National Environmental Policy Act (NEPA) compliance; o Legal descriptions and maps; · Baseline surveys of the reserves to document initial conditions of the habitat and species populations; · Initial management including exotic plant control, debris removal, and fence installation. **Reserve management** includes implementation of the Proposed Reserve System Unit plans which are anticipated to include fence repair and new fence installation, exotic plant management, and ongoing debris removal.	· MSHCP Amendment- Measures to Mitigate Unavoidable Take (Chapter 6.3) · Estimated costs from the BLM to establish the reserves including: o Resource Management Plan amendment; o National Environmental Policy Act (NEPA) compliance; o Proposed Reserve System Unit plans, including travel and transportation plans; o Legal descriptions and maps; and o Baseline surveys. · Estimated costs for initial management activities, including exotic plant control, debris removal, and fence installation were based on similar existing DCP contracts. · Estimated costs to conduct ongoing habitat management in the new proposed Reserve System Units, which were based on the per-acre costs to manage the BCCE which features similar upland habitat but were increased to reflect anticipated degraded condition due to lack of intensive, prior management.	
	Management of New Riparian Reserves	Manage an estimated 900 acres of land that is projected to be acquired to protect 600 acres of new riparian habitat to offset the anticipated impacts of 600 acres of impacts of the covered activities to riparian communities at a 1:1 ratio.	· MSHCP Amendment- Measures to Mitigate Unavoidable Take (Chapter 6.3) · DCP costs to manage existing riparian reserves · DCP organizational chart for implementation of MSHCP Amendment · DCP staff salaries and associated costs for 2025-2026 budget	
Endowment		Establish a non-wasting account that will be used to fund ongoing management and monitoring in perpetuity.	· MSHCP Amendment- Measures to Mitigate Unavoidable Take (Chapter 6.3) · MSHCP Amendment- Implementation (Chapter 9)	$53,387,616

* Data sourced from EPS 2026, Tables 1 and 3

8.1.1 Administration and Overall Staffing Costs

DCP staff will administer the MSHCP Amendment. Staffing is anticipated to require 21 full-time employees during the first five years of implementation, decreasing to 20 full-time employees for the remaining 45 years of the permit term. The team will include biologists, program coordinators, technicians, and specialists, overseen by a program administrator, and will support General Administration, Adaptive Management, Avoidance and Minimization Measures (including Public Outreach), Habitat Restoration and Enhancement, Reserve System Management, Geographic Information System analysis, Changed Circumstances, and other plan activities. In 2026 dollars, annual average staffing costs (including benefits and overhead) are approximately $3.53 million for the first five years and $3.38 million for the remaining 45 years, totaling $171.54 million over the 50-year permit term.

Staffing costs are allocated to the category that aligns with each position's primary responsibilities, even where the position contributes to secondary activities. For example, DCP administrative staff are allocated to General Administration and Reporting, although they also support land acquisition for the Riparian Reserve System and tasks associated with establishing the endowment. The Public Outreach Coordinator, by contrast, is allocated to Avoidance and Minimization Measures.

8.1.2 One-time and Periodic Contracting Costs

Beyond staffing, implementation will require contracted services for both recurring and discrete activities. Ongoing contract costs include those that recur annually, such as contracts with the Science Advisor Panel and annual surveys or sampling not conducted by DCP staff. One-time and periodic costs include start-up activities such as baseline surveys, as well as periodic work occurring throughout the 50-year permit term such as reserve law enforcement, reserve clean-up, and specialized biological services including monitoring and adaptive management (EPS 2026). Many of these costs are similar to those incurred under the 2000 MSHCP, and the frequency and unit costs of comparable work informed the MSHCP Amendment estimates.

Combined ongoing and one-time or periodic expenditures are anticipated to average approximately $4.45 million per year and total approximately $223 million over the 50-year permit term. The majority of these funds support contracts for Adaptive Management ($72.62 million), Public Outreach ($8.31 million), Reserve System Management ($112.6 million), Changed Circumstances ($11.26 million), and accumulation of the Endowment for in-perpetuity reserve management ($53.39 million). Equipment and materials are also included in these categories, including vehicles used to implement Avoidance and Minimization Measures, Reserve System Management, and Monitoring and Adaptive Management. DCP will maintain a fleet of five vehicles, each with an approximate five-year service life; assuming staggered replacement on a rolling basis, one vehicle will be purchased each year over the 50-year permit term, for a total of $3.09 million. Vehicles are tracked as a separate cost category. Other cost categories are detailed below.

8.1.3 Reserve System Management

Management of the Reserve System includes several components such as project-specific or one-time costs for habitat restoration and enhancement, periodic costs for land acquisition, and on-going costs for land management.

8.1.3.1 Habitat Restoration and Enhancement

Impacts from the Covered Activities on Covered Species habitats will be mitigated in the MSHCP Amendment through management, restoration, and enhancement of existing protected private, non-federal, and federal lands. This cost analysis assumes that DCP staff costs associated with habitat restoration and enhancement efforts will require an average of $343,854 per year. Additional costs associated with contractors, equipment, materials for planning and construction of projects are estimated to average $100,000 per year. Over the MSHCP Amendment's 50-year term, the total cost is estimated to be $22.19 million (Table 8-1).

8.1.3.2 Land Acquisition

Riparian habitat impacts will be mitigated through acquisition of land or placement of conservation easements on private lands. The habitat quantification models described in Chapter 5 will be applied to mitigate at a 1:1 ratio based on the Habitat Functionality Score of impacted and preserved lands. For purposes of cost estimation, one acre of riparian mitigation was assumed for each acre impacted by Covered Activities, with mitigation fulfilled entirely through land acquisition. Where land cannot be acquired from willing sellers or easement holders, mitigation will be achieved through restoration and enhancement, the costs of which are captured under the preceding category.

DCP records for the 2000 MSHCP show an average annual disturbance of about 12 acres of riparian habitat from 2019 to 2025[1] (DCP data provided to EPS, EPS 2026). Assuming this rate continues, Covered Activities are anticipated to impact 600 acres of riparian habitat over the 50-year permit term, an amount less than the riparian habitat present within the Development Area and consistent with a realistic estimate of potential impacts. To offset these impacts, the DCP will acquire an average of 12 acres of riparian habitat annually. Because it is typically infeasible to acquire parcels consisting entirely of riparian land, approximately 18 acres of total land must be purchased to secure 12 riparian acres. At an average 2026 land cost of $4,500 per acre and 5 percent transaction costs (EPS 2026), the annual cost of acquiring 18 acres is approximately $85,050, totaling $4.25 million over 50 years (Table 8-1).

8.1.3.3 Reserve System Management

The MSHCP Amendment's Reserve System Management costs include the ongoing costs of the existing reserves on private lands, the BCCE and Muddy and Virgin River Riparian Reserve Units, as well as costs associated with the new proposed Reserve System Units. New Reserve System Units will include approximately 305,242 acres in nine proposed units of BLM-administered lands and acquired private lands, which will be incorporated into the Riparian Reserve System.

[1] The 2019 to 2025 range was used to analyze the rate of riparian habitat disturbance because it coincides with the most current and accurate vegetation spatial dataset (Cogan Technologies 2020). Disturbance estimates from earlier years relied on less accurate spatial data (RECON 2000; Heaton et al. 2011) and were therefore excluded.

8.1.3.3.1 Non-Federal Reserve System Lands

Existing reserve management costs are anticipated to remain consistent with current ongoing management costs. The estimate is approximately $440,000 per year, or a weighted average of $4.79 per acre across the 87,310 acres in the BCCE and 785 acres in the existing Riparian Reserve Units. Management costs for new lands in the Riparian Reserve Units are anticipated to total approximately $116,943 per year, or $255 per acre for 900 acres. This is similar to the existing Riparian Reserve Unit management costs. Costs include law enforcement, maintenance (e.g., fence repairs, site clean-ups), and weed management contracts.

8.1.3.3.2 Federal Reserve System Lands

Costs to manage the proposed Reserve System Units will include initial costs to establish the reserves, and ongoing reserve management costs. The initial costs will include:

- Development of management plans, maps, legal descriptions, and NEPA compliance documents necessary to establish the reserves; and
- Start-up land management activities anticipated to be more intensive than ongoing management, such as initial weed management, debris removal, and fence installation.

Proposed Reserve System Unit planning costs are estimated to be $5.15 million and are assumed to occur over the first five years of the MSHCP Amendment implementation.

The integration of the new Reserve System Units into the DCP will also require extensive initial investments in fencing, clean-up, and weed management during the first five years, when habitat conditions are anticipated to be more degraded and thus require higher costs than for similar activities in the BCCE, which has been subject to annual management for decades. The initial investment of approximately $12.5 million to improve habitat conditions is expected to lower costs for ongoing management after the initial five-year period.

- Fencing: The proposed Reserve System Units will require an estimated $9.75 million in new fencing, to cover a total of 65 miles in the nine proposed Units at a cost of $150,000 per mile for post-and-cable fencing as well as desert tortoise fencing.
- Clean-Up Costs: Upfront costs to clean up debris in the proposed Reserve System Units are estimated at a total of $450,000, based on current costs of $10,000 per clean-up site and an average of one clean-up site in each of the nine proposed Units each year, or a total of 45 clean-up sites in the first five years.
- Weed Management: Initial weed management in the proposed Reserve System Units is estimated to cost $450,000 per year for five years, to control initially dense or widespread infestations, after which the proposed Units would be subject to annual weed management at lower costs. Total costs are anticipated to be $2,250,000 for the first five years of weed management.

Ongoing management of the nine proposed Reserve System Units is estimated to require a total of $58 million for the MSHCP Amendment's 50-year term, based on existing reserve management costs and a review of management costs for other regional habitat conservation plans. Management of the proposed Reserve System Units is assumed to cost less as habitat conditions improve, management issues are abated, and the work becomes more efficient. Costs are shown in Table 8-2 sourced from Table 13 in EPS 2026.

Table 8-2. Proposed Reserve System Unit Management Costs

Proposed Unit	Acres	Annual Reserve Management Costs[1] Year 1-10	Annual Reserve Management Costs[2] Year 11-30	Annual Reserve Management Costs[3] Year 31-50	50-Year Total Cost
Mesa Milkvetch	4,237	$21,185	$16,948	$12,711	**$805,030**
Tortoise Corridor	19,710	$98,550	$78,840	$59,130	**$3,744,900**
Bird Spring Valley	31,383	$156,915	$125,532	$94,149	**$5,962,770**
Muddy Mountains	33,418	$167,090	$133,672	$100,254	**$6,349,420**
Bitter Springs	61,790	$308,950	$247,160	$185,370	**$11,740,100**
Gale Hills	16,351	$81,755	$65,404	$49,053	**$3,106,690**
Jean Lake	2,644	$13,220	$10,576	$7,932	**$502,360**
California Wash	10,117	$50,585	$40,468	$30,351	**$1,922,230**
Stump Springs	125,592	$627,960	$502,368	$376,776	**$23,862,480**
Total	**305,242**	**$1,526,210**	**$1,220,968**	**$915,726**	**$57,995,980**

[1] Assumes average per acre per year management cost of $5.00 per acre.
[2] Assumes average per acre per year management cost of $4.00 per acre.
[3] Assumes average per acre per year management cost of $3.00 per acre.

8.1.3.4 Changed and Unforeseen Circumstances

Chapter 7 describes the changed and unforeseen circumstances that the MSHCP Amendment will address, and the associated costs are summarized in Table 8-1. Because the nature and timing of these events cannot be predicted, exact costs are difficult to estimate; initial monitoring or assessment may also be required to determine the appropriate response. The analysis assumes that monitoring, habitat restoration, enhancement, and management triggered by such events will require 10 percent of ongoing Reserve System management costs. If actual costs begin to exceed this allocation, additional cost and funding analyses may be warranted. This contingency funding is built into the disturbance fee calculation (Table 8-4) and the Program Fund rather than being secured through a separate financial instrument, consistent with the USFWS HCP Handbook (Sections 11.1.4 and 11.3.2), which directs that contingency funding be incorporated into the HCP itself.

8.1.4 Endowment

A non-wasting endowment will fund management of the Reserve System in perpetuity following the expiration of the ITP, consistent with the long-term management funding mechanism described in the USFWS HCP Handbook (Section 11.3.3.E). The endowment is sized so that earnings on the principal, rather than the principal itself, will fund ongoing post-permit management costs, thereby maintaining the corpus of the fund. An estimated $53.4 million must be accumulated during the term of the ITP to support post-permit management of the BCCE, the Riparian Reserve Units, the proposed Reserve System Units, and other associated costs. The County will hold the endowment during the permit term and may transfer it to a qualified third party for in-perpetuity management thereafter.

Table 8-3 is sourced from EPS 2026 (Table 14) and shows the estimated endowment funding requirement based on the following assumptions:

- The County will hold the endowment funds during the term of the ITP. Given expected limitations on the types of investments that the County will be able to make using the

endowment funds, this analysis assumes that the endowment funds will not accrue interest over-and-above inflation during the term of the ITP (i.e., the net capitalization rate is 0 percent). As a result, all required endowment funding must be generated through land disturbance mitigation fees.

- At the end of the term of the ITP, it is assumed that the Reserve System and its management will be turned over to a non-profit third party who will also receive the endowment to support the ongoing management costs.
- Post-permit, interest from the endowment will be required to cover the ongoing reserve management costs of approximately $1.9 million each year (2026 constant dollar terms). It is assumed that the endowment will not need to fund any ongoing monitoring or staffing costs.
- Based on consultant experience with other regional Habitat Conservation Plans that are building post-permit endowments, a non-depleting post-permit endowment interest rate of 3.5 percent is assumed.
- A total post-permit endowment of $53.4 million is required to generate $1.9 million annually at a 3.5 percent interest rate.

Table 8-3. Ongoing Post-Permit Management Costs and Endowment Calculation

Cost Category	Annual Costs*
BCCE Non-Staff Management Costs	$217,984
Riparian Non-Staff Management Costs[1]	$411,299
Proposed Reserve System Unit Management	$915,726
Water Rights Consultant	$12,500
Early Detection Rapid Response	$100,000
Ongoing Clean-up (all reserves)	$52,764
Ongoing Fencing Maintenance (all reserves)	$158,293
Total	**$1,868,567**
Required Post-Permit Endowment Amount[2]	**$53,387,616**
Accrued Interest Revenues during Permit Period[3] (over and above inflation)	$0
Required Post-Permit Endowment Fee-Funding[4]	**$53,387,616**

* Annual costs associated with Reserve System management at end of permit term (Constant 2026 Dollars) excluding costs associated with permanent DCP staff. A non-profit entity is assumed to take on management responsibilities at end of permit term with endowment.
(1) Includes cost to manage existing and new riparian reserve land.
(2) Endowment required to generate non-depleting annual revenues to cover ongoing costs assuming an average annual net interest rate return of 3.5% (after inflation and charges).
(3) Assumes County investment of Post-Permit Endowment funds obtains interest at the rate of inflation and not above it.
(4) Endowment funding required from mitigation fees.

8.2 Funding Sources and Mechanisms

Funding to implement the MSHCP Amendment will be provided primarily through the collection of disturbance fees and interest accrued on those fees and on endowment funds. The disturbance fee serves as the assured funding source for the program. Additional sources, including SNPLMA,

license plate fees, other grants, and land donations or exchanges, have the potential to supplement or offset program costs and are described in Section 8.2.2.

8.2.1 Assured Funding Sources

8.2.1.1 Disturbance Fee

The Permittees will collect a disturbance fee from private landowners as mitigation for land disturbance authorized through their development review and permitting processes, providing take coverage under the MSHCP Amendment. The fee, codified in local ordinance for each of the Permittees, applies to disturbance of non-federal property within Clark County, pursuant to the provisions set forth in Chapter 9. Authorized under Nevada Revised Statutes (NRS) 244.386, the disturbance fee is the primary funding source for the MSHCP Amendment. NRS 244.386 has been amended to allow the fee to be set based on an economic analysis of program costs and to be adjusted annually for inflation beginning in Fiscal Year 2026-2027, using the Consumer Price Index for All Urban Consumers, West Region (All Items), published by the U.S. Department of Labor.

The disturbance fee applies only to Covered Activities and will not be imposed on land disturbance that is not subject to a permit or to the jurisdiction of the Permittees, such as surface mining on private property and the conversion of desert lands to agriculture. Where such activities are later converted to a use that does require a building or grading permit, the fee will be assessed at the time of conversion; in the interim, incidental take of Covered Species by the landowner or user remains covered under the Section 10(a) Permit(s). If a project is not subject to a Permittee's development review but the proponent seeks take coverage under the MSHCP Amendment (e.g., activities conducted by the Nevada DOT that lack a federal nexus) the proponent may apply to the DCP for a Participation Agreement and Certificate of Inclusion, through which the fee will be assessed (see Chapter 9). Once paid, the disturbance fee will not be reassessed for the same land even if subsequent permits or disturbance are required for new development. Accordingly, the fee is assumed to be paid once for the 215,000 acres of development covered under the MSHCP Amendment.

Table 8-4 presents the per-acre disturbance fee calculation by cost category (EPS 2026), in 2026 constant dollars, to cover both implementation costs and the post-permit endowment. The total fee is estimated at $2,294 per acre under a 200,000-acre development scenario and $2,134 per acre under a 215,000-acre scenario. Of these totals, $2,027 and $1,886 per acre, respectively, cover the $458,822,753 in implementation costs over the 50-year permit term, and $267 and $248 per acre, respectively are required to cover the post-permit endowment cost of $53,387,616.

Table 8-4. Detailed Fee Estimate (2026 Dollars)

Item	50-Year Total	Per Acre Fee (200,000 acres)	Per Acre Fee (215,000 acres)
Permit Term Costs			
General Administration	$50,523,370	$253	$235
Avoidance and Minimization Measures/ Outreach	$70,922,967	$355	$330
Monitoring and Adaptive Management Program	$110,900,353	$555	$516
Reserve System Management			
Habitat Restoration and Enhancement	$22,192,708	$111	$103
Land Acquisition	$4,252,500	$21	$20
Management	$130,502,943	$653	$607
Changed Circumstances	$13,050,294	$65	$61
Subtotal	**$405,435,136**	**$2,027**	**$1,886**
Post-Permit Endowment	$53,387,616	$267	$248
Total Cost	**$458,822,753**	**$2,294**	**$2,134**

8.2.1.2 Program Fund and Interest

All disturbance fees collected by Clark County will be deposited into the Program Fund, which was established under the 2000 MSHCP and will roll over for continued use under the MSHCP Amendment. The Fund is anticipated to hold $8 to $12 million at the start of the MSHCP Amendment term, providing a source of funding to meet the anticipated higher costs of initial implementation. Principal and income shall be used exclusively for Administration and Conservation Strategy activities, including avoidance, minimization, and mitigation measures; public outreach; and Reserve System monitoring and management, as outlined in Chapter 6. Interest accruing on Program Fund balances will be retained within the Fund and used for MSHCP Amendment implementation.

The disturbance fees collected under the MSHCP Amendment will be deposited into this existing Program Fund and will accrue to cover the post-permit endowment cost of $53,387,616. Funds remaining in the Program Fund at the conclusion of the term of the ITP will be retained by the County in an interest-bearing account and expended in cooperation with the USFWS solely and exclusively for in-perpetuity management of the Reserve System in accordance with the Conservation Strategy.

8.2.2 Potential Additional Funding Sources

The DCP has historically pursued, and may continue to pursue, several supplemental funding sources, including SNPLMA, license plate fees, other grants, and land donations or exchanges. These sources are not relied upon to meet the MSHCP Amendment's funding obligations; rather, they have the potential to supplement or offset program costs by supporting activities such as large-scale habitat restoration or enhancement, land acquisition during the early phases of implementation, or other components of the Conservation Strategy. Revenues realized from these sources may be factored into subsequent funding analyses and disturbance fee adjustments. Each potential source is described below.

8.2.2.1 Southern Nevada Public Lands Management Act (SNPLMA)

SNPLMA (Public Law 105-263, as amended) authorizes BLM to dispose of certain public lands within a defined disposal boundary in Clark County. After distributions to the State of Nevada general education program (5 percent) and SNWA (10 percent), the remaining proceeds from these land sales are deposited into a special account in the U.S. Treasury that is available to the Secretary of the Interior, without further appropriation, for purposes enumerated in the Act. Section 4(e)(3)(A)(iii) of SNPLMA specifically identifies the development and implementation of a multi-species habitat conservation plan in Clark County as an authorized use of the special account. Funds are awarded through a competitive nomination process administered by BLM in coordination with the SNPLMA Executive Committee. The DCP has successfully secured SNPLMA funding for implementation of the 2000 MSHCP and anticipates continuing to nominate eligible MSHCP Amendment activities, including habitat restoration and enhancement, land acquisition, and Reserve System management, for SNPLMA funding. SNPLMA awards are not assured and depend on land sale revenues, programmatic priorities, and competitive selection; any funds received through this source would supplement or offset costs that would otherwise be funded through the disturbance fee.

8.2.2.2 License Plate Fees

A special license plates program is offered through the Nevada Department of Motor Vehicles. Proceeds from the sale of the “Desert Tortoise” license plate are deposited into the Program Fund described above for MSHCP Amendment implementation including public outreach. Funds from license plates vary annually.

8.2.2.3 Other Grant Funding

The DCP will continue to seek grant funding for MSHCP Amendment implementation from a variety of federal, state and other sources, including foundations whose conservation goals are consistent with the DCP.

8.2.2.4 Land Donation or Exchange

Clark County will also allow donations and voluntary dedications of private property for mitigation lands to be incorporated into the Reserve System. Clark County also reserves the right to exchange lands which are not included in the Reserve System with other entities including municipalities, BLM and private property owners. Some of the lands received through land exchanges may later be permanently protected and incorporated into the Reserve System.

8.2.3 Funding Assurances

Section 10(a)(2)(B)(iii) of the Endangered Species Act requires that an applicant ensure adequate funding for HCP implementation will be provided. The USFWS HCP Handbook (Chapter 11) provides guidance on funding assurances and identifies funding mechanisms and approaches commonly used by regional, municipally led HCPs of long-term duration. This section describes the funding assurances established for the MSHCP Amendment, which are designed to demonstrate that adequate funding will be available to implement the Conservation Strategy over the 50-year permit term and to manage the Reserve System in perpetuity following the permit term.

8.2.3.1 Statutory Authority and Demonstrated Ability to Collect Fees

Clark County has both the statutory authority and the demonstrated administrative capacity to collect and administer the disturbance fee. NRS 244.386, as amended, authorizes Clark County to impose the disturbance fee in an amount based on an economic analysis of the cost of carrying out the program, and to adjust the fee annually for inflation. The fee is codified in Clark County Code of Ordinances subsection 30.32.040(a)(13)(B) and is collected by the Permittees through their existing development review and permitting processes, as described in Chapter 9. Over more than two decades of administering the 2000 MSHCP, Clark County has continuously collected the disturbance fee, deposited the proceeds into the Program Fund, and expended those funds for plan implementation in coordination with USFWS. This established record of fee collection and program administration provides assurance that the fee mechanism will continue to function effectively under the MSHCP Amendment.

8.2.3.2 Fee Adjustment Mechanisms

Because the MSHCP Amendment is a long-term plan, the USFWS HCP Handbook (Section 11.1.3) recommends that the fee structure include a mechanism for regular adjustments so that fees keep pace with implementation costs. The MSHCP Amendment incorporates two complementary adjustment mechanisms. First, beginning in Fiscal Year 2026-2027, the disturbance fee may be adjusted annually for inflation using the Consumer Price Index for All Urban Consumers, West Region (All Items), as authorized by NRS 244.386 and described in Section 8.2.1.1. Second, no less than once every ten years over the permit term, the DCP will conduct a comprehensive review of program costs and revenues to assess whether the inflation-adjusted fee, together with Program Fund balances, projected supplemental revenues, and the trajectory of implementation, remains sufficient to meet remaining obligations. The review will consider observed rates and patterns of development; actual costs incurred for staffing, contracting, land acquisition, and reserve management; performance of the Program Fund and accrued endowment balances; revenues received from supplemental sources (Section 8.2.2); and any divergence between general inflation and the costs of land, services, or other inputs specific to plan implementation. Any fee adjustments arising from this review will be implemented through the procedures in NRS 244.386 and the Clark County Code of Ordinances.

8.2.3.3 Non-Wasting Endowment for Post-Permit Management

The non-wasting endowment described in Sections 8.1.4 and 8.2.1.2 serves as the funding assurance for perpetual post-permit management of the Reserve System. The USFWS HCP Handbook (Section 11.3.3.E) identifies non-wasting endowments as a preferred mechanism for providing this type of assurance under HCPs. Because the endowment will be accumulated through disturbance fee revenues during the permit term and is sized so that earnings rather than principal cover ongoing management costs, it provides a self-sustaining funding source that does not depend on continued fee collection or appropriations after the ITP expires.

8.2.3.4 Contingency Funding for Changed Circumstances

As described in Section 8.1.3.4 and Chapter 7, contingency funding for changed and unforeseen circumstances is built directly into the disturbance fee calculation (Table 8-4) rather than being assured through a separate financial instrument. This approach is consistent with the USFWS HCP Handbook (Sections 11.1.4 and 11.3.2), which directs that contingency funding be incorporated into the HCP. The 10 percent allocation of ongoing Reserve System management costs is designed to cover routine response actions; if costs associated with changed and unforeseen circumstances are anticipated to materially exceed this allocation, the comprehensive

fee review described in Section 8.2.3.2 provides the mechanism for evaluating whether fee adjustments or other actions are warranted.

9.0 IMPLEMENTATION AND ADMINISTRATION

This chapter describes the structure, roles, rules, and processes governing implementation and administration of the MSHCP Amendment. Implementation of the MSHCP Amendment will begin upon execution of the IA and issuance of the Section 10(a)(1)(B) ITP and adoption of local implementing ordinances.

9.1 Implementation Structure

9.1.1 Permittees

The entities that receive incidental take authorization for activities covered under the MSHCP Amendment are referred to collectively as the "Permittees." The Permittees are Clark County, Boulder City, City of Henderson, City of Las Vegas, City of Mesquite, and City of North Las Vegas. Permittees are responsible for ensuring that Covered Activities under their land use authorities comply with the MSHCP Amendment and ITP, and that all local land use ordinances are consistent with the MSHCP Amendment. On a monthly basis, and as further described in the interlocal agreement, Permittees shall submit to the DCP the Land Disturbance Forms for grading permits issued during the reporting period. Each Land Disturbance Form documents the assessor parcel number(s) for which the grading permit was issued, the total number of acres of disturbance authorized, and the fees paid. The DCP uses this information to track take of Covered Species habitat as described in Section 9.4.

9.1.2 Executive Committee

The Executive Committee will consist of representatives appointed by each of the Permittees. Each Executive Committee member has authority to speak on behalf of their respective organization. The members and terms of the Executive Committee will be documented in an interlocal agreement between the Permittees. The Executive Committee is the established forum for the Plan Administrator to provide regular updates to the Permittees on implementation of the MSHCP Amendment and ITP, to review financial expenditures, and to discuss significant issues requiring input from Permittees (such as a major amendment or litigation).

9.1.3 Plan Administrator

The DCP, administered by the Clark County Department of Environment and Sustainability (DES), administers the MSHCP Amendment and ITP, and the Director of DES serves as the Plan Administrator (Clark County Code Section 2.76.110). A different entity could serve as Plan Administrator in the future if the Permittees and Executive Committee agree and the change is formalized through an interlocal agreement and notification to the USFWS.

The DCP will employ a Program Administrator to lead day-to-day implementation and administration. The Program Administrator will report to the Plan Administrator and will be responsible for coordination, oversight, reporting, and other standard administrative activities required to carry out the MSHCP Amendment. Specific responsibilities include ensuring that the Conservation Strategy and MAMP are effectively implemented, as well as work planning, budgeting, reporting, and public outreach.

Detailed Roles and Responsibilities for the DCP:

1. Maintain administrative capacity, including office space and qualified staff, and oversee contractors.

2. Establish and manage budgets and oversee expenditures in accordance with the Budget Preparation process described below.
3. Contract and coordinate with the Science Advisor Panel.
4. Serve as the primary point of coordination with partner agencies, stakeholders, and the public:
    a. Coordinate with Permittees to ensure compliance with the MSHCP Amendment, ITP, and the updated terms of both the ITP and the IA.
    b. Coordinate with USFWS on compliance reporting as described in Section 9.6.2 and as needed to ensure proper implementation of the MSHCP Amendment.
    c. Coordinate with NDOW and NDF as needed for species information and management.
    d. Coordinate with the BLM as described in the IA and Conservation Strategy to ensure proper management of BLM-managed lands within the Reserve System.
    e. Implement a public outreach program to raise community awareness of and support for the MSHCP Amendment and Reserve System as described in the Conservation Strategy, and hold annual symposia to provide updates on MSHCP Amendment implementation.
5. Consult with the Office of the District Attorney for advice, counsel, and defense of the MSHCP Amendment against legal challenges.
6. Oversee and manage Plan Amendments.
7. Implement the Conservation Strategy as described in Chapter 6, including:
    a. Ensure implementation of AMMs;
    b. Manage the Reserve System, including land and easement acquisition, habitat restoration planning and implementation, coordination with the BLM to complete RMP revisions and CMAs as described in the IA, and species and habitat monitoring;
    c. Identify and implement adaptive management actions as needed; and
    d. Maintain the monitoring data as described in Chapter 6.
8. Collect MSHCP Amendment disturbance fees at the per-acre rate established in Chapter 8, Plan Implementation Costs and Funding.
9. Manage the MSHCP Fund.
10. Implement measures to respond to Changed Circumstances.
11. Ensure regulatory compliance.
    a. Maintain permits and authorizations.
    b. Prepare and submit all compliance reporting as described in Section 9.6.2 including:
        i. Track take of species and species habitat; and
        ii. Track habitat conserved, restored, or enhanced in the Reserve System.

9.1.4 MSHCP Fund

All costs associated with MSHCP Amendment implementation and fulfilling the roles and responsibilities described above shall be borne by the MSHCP Fund, established to implement the MSHCP Amendment, or by funds made available through SNPLMA and other sources. As

described in Chapter 8, Plan Implementation costs and Funding, the MSHCP Fund can accept funding from a variety of sources and is not limited to disturbance fees. Additional funding sources may include the County charitable license plate program, grants, and ESA Section 6 funds. MSHCP Fund monies from the existing MSHCP will be carried over to the MSHCP Amendment.

9.1.5 Budget Preparation

Under the direction of the Plan Administrator, the Program Administrator will prepare an annual budget and may solicit funding recommendations from the Executive Committee, USFWS, BLM, NDF, or other agencies as appropriate. The annual budget will be presented to USFWS and approved by the BCC prior to implementation.

9.1.6 Science Advisor Panel

The Science Advisor Panel is contracted by the DCP to ensure that the MSHCP Amendment is designed and implemented consistent with the best available scientific information and to provide independent scientific review of MSHCP Amendment actions and decisions. The panel will support the MAMP by reviewing technical documents, building scientific capacity and resources, and providing adaptive management recommendations.

9.1.7 Wildlife Agencies

USFWS is the permitting agency pursuant to the ESA and its implementing regulations (USFWS 2016). USFWS will ensure that implementation is consistent with regulatory authorizations issued pursuant to the MSHCP Amendment and will provide input on implementation to the DCP. USFWS retains responsibility for overseeing and enforcing the terms and conditions of these regulatory authorizations, and for modifying, suspending, or revoking them as needed. The USFWS Las Vegas Field Office oversees implementation and coordination with the DCP, with USFWS Regional Office involvement and direction as necessary. USFWS will:

1. Participate in budget preparation.
2. Review and approve MSHCP Amendment monitoring protocols.
3. Review and approve any modifications to the AMMs described in Chapter 6.
4. Be signatory to the IA for the MSHCP Amendment and comply with all agreed-upon roles and responsibilities.
5. Be signatory to CMAs for federal lands in the Reserve System and comply with all agreed-upon roles and responsibilities.
6. Coordinate with DCP on adaptive management actions.

Although NDOW is not a permitting agency, it is included as a wildlife agency because of its cooperative role in implementation of the MSHCP Amendment. NDOW will be signatory to the IA for the MSHCP Amendment and will comply with all agreed-upon roles and responsibilities. NDOW will:

1. Coordinate with the DCP on Covered Wildlife Species survey data within the Plan Area, or data outside the Plan Area that may affect the proper functioning of the MSHCP Amendment.
2. Participate in the review of annual budget or funding recommendations as needed.
3. Alert the DCP to disease outbreaks or other significant disease information with potential to harm Covered Wildlife Species populations, including documentation of new disease threats.

9.1.8 Land Management Agencies

BLM will be signatory to the IA for the MSHCP Amendment and comply with all agreed-upon roles and responsibilities. BLM will collaborate with USFWS and the DCP to develop and implement CMAs for each federal Reserve System Unit, enabling cooperative management of BLM-administered lands within the Reserve System.

9.2 Implementing Agreement

The IA, signed by the Permittees, USFWS, BLM, NDF and NDOW (the Parties), governs administration and implementation of the MSHCP Amendment. The IA ensures the cooperative implementation of the MSHCP Amendment by the Parties, describes remedies and recourse available should any party fail to perform its obligations set forth in the IA, and provides legal and procedural assurances to the Permittees.

All Parties are responsible for working together to ensure efficient and effective implementation of the MSHCP Amendment and will work in good faith to resolve any issues that arise. The Parties will notify and negotiate in accordance with the informal dispute resolution process described in the IA, unless another resolution process is agreed upon or one party has initiated administrative proceedings or suit in federal court. If any issues cannot be resolved through negotiations, the Parties will consider non-binding mediation and other alternative dispute resolution (ADR) processes in accordance with the ADR policies of the Eighth Judicial District Court of Clark County.

9.3 Local Implementing Ordinances

Each Permittee has an existing local ordinance implementing the current MSHCP and authorizing collection of mitigation fees within its jurisdiction. Upon implementation of the MSHCP Amendment, the Permittees will update or revise their existing ordinances as needed to implement the MSHCP Amendment, including the fee collection process described in Section 9.5. The ordinances may reference the ITP, IA, MSHCP Amendment, and the local jurisdiction's obligations under the MSHCP Amendment. In an interlocal agreement, Permittees will commit to developing ordinance language consistent with that of other Permittees' ordinances.

9.4 Receiving Take Authorization

Participation in the MSHCP Amendment by private property owners is voluntary and is initiated by submitting a Land Disturbance Form. For projects subject to the grading permit process, the applicant submits the Land Disturbance Form with appropriate fee payment to the Permittee with land use authority over the project. For Covered Activities not subject to the grading permit process, the applicant submits the Land Disturbance Form with appropriate fee payment to the DCP. Each Permittee, or the DCP, is responsible for the review and approval of applications within its jurisdiction. Upon determination that the project proponent has complied with the terms of the MSHCP Amendment, primarily by submitting the required fees and including and implementing all appropriate AMMs, the Permittee or the DCP will issue take authorization to the project proponent in the form of a Certificate of Inclusion.

The Certificate of Inclusion documents that the project proponent has paid the required mitigation fees, has completed any required coordination with the DCP to comply with AMMs, and identifies the AMMs applicable to the property that must be adhered to during the Covered Activity. The Certificate of Inclusion provides incidental take coverage under the MSHCP Amendment and ITP and includes a commitment, enforceable by the DCP and USFWS, to abide by the applicable

provisions and terms of the MSHCP Amendment and ITP. Once issued, the project proponent is considered a Certificate holder. A standardized Certificate of Inclusion form will be available on the DCP website. If the property covered by a Certificate of Inclusion is sold prior to disturbance, the Certificate holder may request either a refund of mitigation fees paid or a transfer of incidental take coverage to the new property owner. The Certificate of Inclusion will describe the procedures for requesting a refund or transferring take coverage to another party. Apart from this property-sale provision, Certificate holders cannot extend their take coverage to third-party project proponents or to any other entity wishing to implement an MSHCP Covered Activity.

Mitigation fees are collected at the per-acre rate established in Chapter 8, Plan Implementation Costs and Funding. Each Permittee collects mitigation fees for Covered Activities within its jurisdiction, and the DCP collects mitigation fees for Covered Activities not subject to a Permittee's grading permit process. On a monthly basis, each Permittee remits the collected fees to the DCP, along with the Land Disturbance Forms and a summary of acres disturbed during the reporting period. The DCP deposits the fees into the MSHCP Fund and uses the Land Disturbance Forms to track take of Covered Species habitat. The DCP, in coordination with the Permittees, may adjust the operational details of the fee collection process (such as reporting formats, deposit methods, and reconciliation procedures) as needed to improve efficiency and accuracy. Such operational adjustments do not constitute a modification or amendment to the MSHCP Amendment and do not require USFWS approval.

The fee collection process will also include procedures for refunds. Refunds may be issued when a project is cancelled or withdrawn prior to disturbance, or when fees were mistakenly paid. For example, a project proponent may inadvertently pay mitigation fees for a project located on federal land that is not subject to the MSHCP Amendment. Refund procedures will be maintained by the DCP and may be adjusted as needed without triggering a modification or amendment to the MSHCP Amendment.

There is no exemption from mitigation fees for municipal or other governmental projects under the MSHCP Amendment. All Covered Activities resulting in disturbance of non-federal land within the Plan Area are subject to the mitigation fee, regardless of whether the project proponent is a private party or a public entity.

The City of Mesquite Fee Exemption Boundary, established under the current MSHCP and concurred with by the USFWS in 2019, is carried forward under the MSHCP Amendment. The exemption applies to lands within the City of Mesquite that were historically developed or redeveloped prior to the listing of the desert tortoise and that fall within the boundary depicted in Figure 9-1. Covered Activities occurring within the exemption boundary are not subject to the mitigation fee.

9.4.1 Non-compliance

The DCP may suspend or revoke a Certificate of Inclusion for any participant that fails to comply with its terms and conditions or with ITP avoidance measures. The DCP will notify the participant of any non-compliance. If the notified participant has not corrected the non-compliance within 30 days, the DCP will notify USFWS, which will determine whether the participant has engaged in an unauthorized taking of a listed species. If the DCP and USFWS determine that revocation or suspension of take authorization or a Certificate of Inclusion is necessary, the DCP will notify the participant and explain the grounds for the suspension or revocation. The notification may describe any additional actions the participant can take to maintain the authorization, if applicable. The Permittees will not be deemed out of compliance because of the failure of a property owner

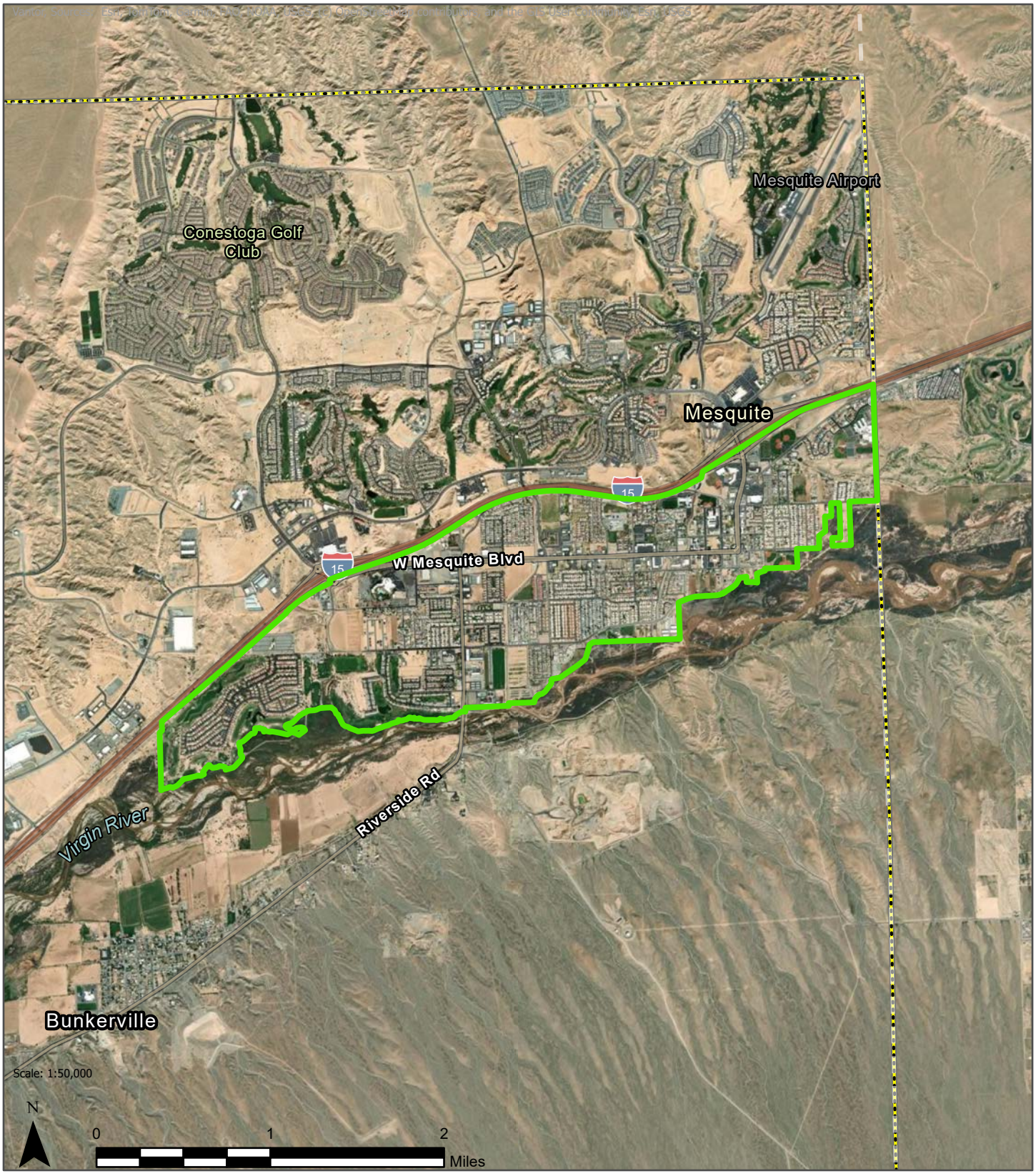

Figure 9-1. Mesquite Fee Exemption Area

Legend

- Plan Area
- Clark County, NV
- Mesquite Fee Exemption Area

Clark County, NV,
Department of Environment and Sustainability
Desert Conservation Program

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or project proponent (such as a Certificate holder) to comply with its MSHCP Amendment and ITP obligations.

9.5 Migratory Birds

The Migratory Bird Treaty Act of 1918 (MBTA; 16 USC 703-712), as amended, prohibits non-permitted taking, killing, or possessing migratory birds or any parts, nests, or eggs of such birds. The MSHCP Amendment and associated ITP also constitute a Special Purpose Permit (50 CFR 21.95) for take of bird Covered Species listed under the federal ESA, as described in the MSHCP Amendment and ITP.

On April 11, 2025, the U.S. Department of the Interior withdrew Solicitor's Opinion M-37065 and reinstated Solicitor's Opinion M-37050 (originally issued in 2017), which concluded that the MBTA does not prohibit "incidental take," defined as the accidental or unintended killing of migratory birds during otherwise lawful activities such as energy development, construction, or infrastructure operation (DOI 2025). As a result, federal MBTA enforcement is currently focused on intentional actions directed at birds, rather than accidental mortality from industrial activities. The scope of the MBTA's take prohibition remains the subject of a federal circuit court split and may be revisited by future administrations or by Congress.

The Bald and Golden Eagle Protection Act of 1940 (BGEPA; 16 U.S. Government Code [USC] 668-668d), as amended, prohibits the non-permitted take, killing, and commerce of bald or golden eagles, including possessing their parts, feathers, nests, or eggs. No take of golden eagle (*Aquila chrysaetos*) is anticipated, and the MSHCP Amendment and ITP do not constitute a Bald and Golden Eagle Protection Act permit. Take of ESA-listed birds, except for golden eagle, will not be a violation of the MBTA. Should any of the bird Covered Species become listed under the ESA during the term of the ITP, the ITP would also constitute a Special Purpose Permit under the MBTA for those species. The Conservation Strategy will also provide a significant benefit to migratory bird resources, a requirement of the Special Purpose Permit. Compliance with the MSHCP Amendment is therefore consistent with MBTA Special Purpose Permit requirements.

9.6 Conservation Strategy

The Reserve System serves as the primary means of mitigating impacts of Covered Activities on Covered Species within the Plan Area. Most of the Reserve System consists of BLM-owned and administered lands, managed in collaboration with the DCP through CMAs.

The Habitat Functionality Analysis, as described in Chapters 5 and 6, was used to make habitat quality assessments and calculate the Functional Scores of Covered Species habitat for each Reserve Unit for mitigation planning purposes. The restoration crediting methodology as described in Appendix F applies exclusively to impacts in riparian habitats and will be used to calculate mitigation credit per acre for riparian habitat impacts as restoration and enhancement actions are implemented and pre-defined success criteria are achieved.

9.6.1 Reserve Acquisition Process

For portions of the Reserve System outside federally managed lands, the DCP may acquire properties within the Plan Area for inclusion in the Reserve System by fee title or conservation easement. Selection criteria for property acquisition will be based on the BGOs, Habitat Functionality Scores, and mitigation needs as determined by the DCP in coordination with USFWS. The DCP will evaluate and rank candidate properties according to acquisition selection and priority criteria, coordinate with applicable County departments and committees on appraisal

and approval, and complete acquisition in accordance with applicable law and County procedures and policies. The specific internal steps and responsible County entities involved in the acquisition process are operational in nature and may be updated over the term of the ITP without modification or amendment of the MSHCP Amendment. Acquired property may be formally held by Clark County through the DCP or other County departments. A complete description of property acquisition criteria and process is available in the Riparian Reserves Management Plan (RRMP), Expansion Criteria, and in Appendix B of the RRMP.

Land will only be acquired from willing sellers. At no time will the DCP seek to use condemnation or eminent domain to require landowners to sell their property for the purposes of the MSHCP Amendment. Offers from individuals or other entities to gift land for inclusion in the Reserve System may be accepted by the DCP.

9.6.2 Stay Ahead Provisions for Riparian Habitats

The MSHCP Amendment is designed to provide Reserve System lands as mitigation for the impacts of Covered Activities. Mitigation is assessed using the Habitat Functional Score and restoration crediting methodology described in Chapters 5 and 6 and is tracked relative to impacts by habitat group, as described in Chapter 5. The Stay Ahead Provision requires that mitigation be implemented before or concurrent with, and commensurate with, impacts within each habitat group. For most habitat groups, mitigation land is available within the Reserve System at the start of MSHCP Amendment implementation and prior to anticipated impacts. Mitigation for habitat groups associated with riparian species, however, including the Riparian Marsh and Riparian Woodland habitat groups, which support southwestern willow flycatcher, yellow-billed cuckoo, Yuma Ridgway's rail, and Arizona toad, will require acquisitions and conservation easements during implementation, as well as restoration and enhancement of lands already within the Reserve System. The Riparian Reserve System will be managed such that lands are brought into the Reserve System or restored at a pace that stays ahead of or remains concurrent with impacts to these riparian habitat groups, as measured by the Habitat Functional Score for each group, so that taking "will not appreciably reduce the likelihood of the survival and recovery of any Covered Species in the wild" (ESA Section 10(a)(2)(B)(iv)).

The DCP will monitor compliance with the Stay Ahead Provision. If the DCP determines that the Stay Ahead Provision is not being met or is at risk of non-compliance, the following steps will be taken:

- A mitigation deficit of 5 percent shall be allowed for any habitat group. This will provide limited flexibility for meeting the Stay Ahead Provision mitigation assessment.
- If a mitigation deficit exceeds the 5 percent allowance, the DCP will meet with Permittees and USFWS. The DCP may freeze further take authorizations while strategies for returning to compliance with the Stay Ahead Provision are determined.
- The DCP will provide Permittees with a list of potential actions to regain compliance. Example actions include delaying further approval of Covered Activities within the habitat group that is in mitigation deficit until pending land acquisition agreements close; expediting delivery from funding sources or partnerships to increase land acquisition; increasing outreach to landowners to improve land acquisition; and restoring and enhancing land to earn credits. Covered Activities within the habitat group in mitigation deficit may still be approved during the freeze or pause in authorizations if project proponents provide land in lieu of fees that the DCP determines suitable for the Reserve System.

- The freeze on authorizations for Covered Activities and acceptance of fee payments will be removed once the DCP and USFWS determine that the risk of non-compliance with the Stay Ahead Provision has been eliminated.

9.6.3 Conservation Easements

Voluntary, permanent conservation easements on private lands may be used to satisfy mitigation requirements, particularly for the Riparian Reserve System. Entities such as the Permittees or land trusts may serve as the easement holder, but the DCP must be granted the right to enforce the easement and access to conduct monitoring. Where the DCP is the easement holder, it cannot also serve as the enforcing party; in such cases, the DCP will serve as the enforcing party and a separate entity will hold the easement. Conservation easements may be purchased from a private party and placed on land that remains in private ownership, or on Permittee-owned land that is part of the Reserve System. The DCP will set guidelines and requirements for conservation easements, defining easements as perpetual and voluntary, describing the role of the easement holder, outlining the contents of an easement, and addressing other easement characteristics and definitions.

9.6.4 Pre-MSHCP Amendment Reserve System Lands

To support the Stay Ahead Provision, some lands within the Riparian Reserve System have been enrolled prior to MSHCP Amendment implementation, or “pre-permit.” These pre-permit Reserve System lands are owned in fee title by Clark County, as well as one property acquired by conservation easement, and consist of properties for which the purchase was recorded as mitigation under the current MSHCP. These lands will be included and managed as part of the MSHCP Amendment Reserve System, and only restoration and enhancement activities occurring after MSHCP Amendment implementation will be recorded as mitigation under the MSHCP Amendment. Prior to expiration of the current MSHCP in 2031, it is also feasible that additional lands could be purchased but not recorded as mitigation under the current MSHCP, with the intent of building the MSHCP Amendment Reserve System ahead of implementation. If such acquisitions occur, those lands will also be included and managed as part of the Reserve System, and the acquisition, restoration, and enhancement of those lands will all be recorded as mitigation under the MSHCP Amendment.

9.7 Monitoring and Reporting

9.7.1 Monitoring and Adaptive Management Plan

Adaptive management is an approach to addressing uncertainty in natural resources management (USFWS 2016). The process entails identifying areas of uncertainty, exploring alternative approaches to meeting management objectives, implementing those alternatives, monitoring to learn the outcomes of management actions, and using the results to update knowledge and adjust management actions as needed (DOI 2009). Because the adaptive management process relies on monitoring results and iteratively shapes the monitoring approach, these two elements of the Conservation Strategy are presented together in this section.

The MAMP is an integral component of the MSHCP’s Conservation Strategy. Data collected and analyzed through the MAMP provide information on Permittees’ compliance with their ITP, progress toward achieving the BGOs, the effectiveness of the conservation program at minimizing and mitigating impacts, and whether adjustments are needed to improve the Conservation Strategy through adaptive management (USFWS 2016). The MAMP is also designed to assess the status of Covered Species, natural communities, and ecosystem processes within the Plan

Area. Each component of monitoring is designed with a specific purpose and to inform MSHCP Amendment management decisions.

Monitoring data will be collected by either DCP staff or external contractors. Specific data collection methods will be determined at the start of each monitoring effort. Any future modifications to monitoring methods will be made in consultation with DCP staff and the independent Science Advisor Panel to ensure continuity of monitoring results.

All data will be stored by the DCP and made available to Permittees and USFWS. Analysis of monitoring results for reporting purposes can occur at any time. At a minimum, analysis will be annual for habitat conversion and other incidental take measurements, biennial as part of the Adaptive Management Report, and every five years as part of the Five-Year Monitoring Report. These analyses serve as benchmarks for conservation progress and inform progress toward achieving the BGOs, as further described in Chapter 6, Section 6.4.2.

The Adaptive Management Evaluation process occurs every five years. The Adaptive Management Action process is implemented as necessary actions or changes are identified through the evaluation, and continues until the actions have proven successful in resolving or improving the issue. The frequency of monitoring efforts pertaining to a given action may also be modified or increased as needed.

Within each five-year evaluation period, annual reports of data are produced and analysis of monitoring data can occur at any time. The Five-Year Monitoring Report captures the findings of the Science Advisor Panel's review of recent MSHCP Amendment projects, reports, and datasets. The Science Advisor Panel analyzes land use trends, habitat loss, the effectiveness of management actions in meeting BGOs, population trends, and ecosystem health, and makes recommendations to the DCP for improving elements of the MSHCP Amendment. More in-depth analysis, including quantification and reporting focused on progress toward achieving the BGOs, occurs as part of the Adaptive Management Evaluation process.

Constructive engagement with USFWS, land managers and land management agencies, state agencies such as NDOW and NDF, researchers working on Covered Species, and biological consultants or other biologists conducting surveys and management activities is critical to the success of the monitoring and adaptive management portions of this plan. These stakeholders may offer insight into species ecology, identify strengths and weaknesses of existing monitoring methods, and contribute emerging monitoring techniques. They may also prove invaluable in the adaptive management process, particularly if the Adaptive Management Action process must be initiated, by helping identify causes of problems and potential projects and solutions to remedy undesired conditions of species and their habitats. The DCP will incorporate stakeholder involvement where warranted to improve the overall quality and effectiveness of the MAMP.

9.7.2 Reporting

The DCP will prepare an Annual Progress Report and submit it to USFWS as permit compliance documentation. The report will summarize the previous year's activities and all activities implemented since ITP issuance, including the acreage of impacts to modeled habitat quantification assessments, information on direct harm or mortality of individuals of each Covered Species, acreage of modeled habitat protected under the MSHCP Amendment, Reserve land management actions implemented, monitoring results, adaptive management protocols implemented that year, and habitat re-establishment and establishment activities. Details on the content of the annual report are provided in Chapter 6, Section 6.5.1, Annual Progress Reports.

In addition to the Annual Progress Reports, the DCP will host an Annual Project Symposium for the public. The Symposium will provide progress summaries of the MSHCP Amendment, including any amendments or modifications, and presentations of MSHCP Amendment-funded projects, including monitoring and other research topics. The Symposium is intended to foster data sharing, collaboration, and stakeholder and public engagement.

Every five years, a more detailed analysis of compliance and effectiveness monitoring of the Conservation Strategy will be conducted and reported as a separate document from the Annual Progress Report. Information to be included in the Five-Year Monitoring Report is detailed in Chapter 6, Section 6.5.3.

Every two years, a detailed analysis of compliance and effectiveness monitoring of the Conservation Strategy will be conducted and reported in an Adaptive Management Report, separate from the Annual Progress Report and the Five-Year Monitoring Report. The Adaptive Management Report will include quantitative population data for covered wildlife and plant species, survivorship data for translocated desert tortoises, and other items tied to the BGOs, with statistical analyses of population trends and other quadrennial items provided in every other report. Information to be included in the Adaptive Management Report is detailed in Chapter 6, Section 6.5.4.

9.8 Renewals, Modifications and Amendments

Permittees are seeking take authorization from the USFWS for a term of 50 years. The Permittees may apply for renewal prior to the ITP's expiration, allowing ample time for review and processing of the renewal application.

During the ITP's 50-year term, administrative revisions and updates, minor modifications, and substantive amendments to the MSHCP Amendment may be necessary. Modifications can be requested by a Permittee or USFWS at any time but are not anticipated to occur on a regular basis. Requests for modification must be made in accordance with USFWS regulations and the IA. There are three types of modifications: administrative revisions (Section 9.8.1), minor modifications (Section 9.8.2), and formal amendments (Section 9.8.3). Each is defined below with examples.

9.8.1 Administrative Revisions

Administrative revisions are minor, non-substantive changes or updates that do not require modification or amendment of the MSHCP Amendment and do not trigger new NEPA analysis. Administrative revisions do not require USFWS approval. They will be made in writing, documented by the DCP, and summarized in each annual report. The Plan Administrator will make the final determination of whether a change is an administrative revision or a minor modification. Examples of administrative revisions include:

- Clerical corrections including land ownership records and in maps and exhibits
- Adaptive management changes developed through and consistent with the MAMP (Chapter 6)
- Changes in day-to-day management of the Reserve System
- Adjustments to monitoring designs and protocols to be consistent with current USFWS protocols
- Various administrative activities with no substantial effect to the MSHCP Amendment

9.8.2 Minor Modifications

Minor modifications are more substantial than administrative revisions but are not expected to change the scale or scope of the MSHCP Amendment or Covered Activities. They should not adversely affect the impact assessments, level of take, or Conservation Strategy, nor should they affect the DCP's ability to achieve the Conservation Strategy commitments of the MSHCP Amendment. Minor modifications may be proposed by any Permittee, through the Plan Administrator, or by the USFWS. They can be made at any time and do not require a formal amendment to the MSHCP Amendment, nor do they trigger new NEPA analysis, Section 7 review, or additional public notice. Minor modifications do, however, require formal correspondence with USFWS.

A minor modification proposal must detail the nature of the proposed modification, provide a rationale for why it would not change the impact analysis, and describe how it would be consistent with the Conservation Strategy. The receiving party (DCP or USFWS) will use reasonable efforts to respond within 30 days of receipt. Proposed minor modifications will become effective within 30 days upon the other party's written approval. If the receiving party determines that the proposal lacks specific information, it may request additional information to evaluate the request. If the receiving party is the USFWS, the agency may deny the modification and will provide an explanation for the denial to the proposing Permittee. The denial recipient may submit comments in response within 60 days of denial notification. Minor modifications include changes to incorporate new information, technical advances, and other circumstances, including:

- Changes to the impact area that do not require increased take authorization
- Changes to Avoidance and Minimization boundaries
- Updates to vegetation and species occurrence maps consistent with expectations of the Conservation Strategy or as a result of implementation of the MAMP
- Other minor changes beyond the scope of administrative revisions, but not requiring a formal amendment

9.8.3 Formal Amendments

Formal amendments are revisions to the MSHCP Amendment that are more substantial than administrative revisions or minor modifications. They are expected to occur rarely, if at all. A formal amendment requires a corresponding amendment to the ITP. Amendments may be proposed by any Permittee through the Plan Administrator. Amendments to the MSHCP Amendment and the ITP will follow the Section 10 ESA formal review process, including a NEPA review, Federal Register notices, and a new internal Section 7 consultation with USFWS, and will result in new findings prepared by USFWS. The appropriate documentation for NEPA compliance will be based on the amendment proposal, and a new scoping process may be determined necessary. Examples of changes that would require a formal amendment include:

- Changes to the Plan Area boundary that could allow or result in additional incidental take of a Covered Species or habitat, or that could cause permitted take amounts to be exceeded
- Changes to Covered Species
- Changes to Covered Activities that could result in additional impacts not considered in the previous impact analysis or not already covered by the ITP
- Changes to the level of or a different form of take
- Significant changes to the Conservation Strategy including mitigation measures
- Substantive changes to implementation schedules

- Changes to funding that affect ability of a Permittee to implement the MSHCP Amendment
- Addition of a Permittee to the MSHCP Amendment

Upon agreement of the Permittees and after approval by the BCC, USFWS will be consulted to determine the need for an amendment. If USFWS concurs that a formal amendment is appropriate and warranted, the DCP may submit a formal application to USFWS. The DCP will prepare a proposal detailing the purpose and nature of the proposed amendment, an assessment of impacts, alternatives, additional conservation measures, and any documentation needed to process the proposal, including any environmental studies required to support NEPA analyses. Amendments must be approved by all Permittees. If additional scoping is deemed necessary, USFWS will publish a Notice of Intent in the Federal Register to initiate the scoping process. Upon submission of a completed application package, USFWS will initiate the NEPA and MSHCP Amendment review process. After a public comment period, USFWS may approve or deny the ITP amendment application.

9.9 Permit Suspension or Revocation

The USFWS Regional Office may, in accordance with applicable federal law, suspend or revoke all or part of the ITP if any Permittee is out of compliance with the MSHCP Amendment, the IA, or the ITP. Revocation or suspension of the ITP for a non-compliant Permittee will not affect ITP coverage for compliant Permittees. If continuation of Covered Activities would appreciably reduce the likelihood of the survival and recovery of the species in the wild, USFWS may suspend or revoke the ITP (50 CFR 13.27 and 13.28). As discussed in Section 9.2 and in the IA, the USFWS and Permittees will meet to remedy non-compliance with the MSHCP Amendment goals and objectives or to resolve differences. If the USFWS determines that permit revocation or suspension is necessary, it will notify the DCP and Permittees. The notification will explain the rationale for the suspension or revocation and, where applicable, will identify additional actions the Permittees can take to maintain the ITP.

If the ITP is revoked, the Permittees are obligated to fulfill all outstanding mitigation requirements, including management and monitoring of the Reserve System in perpetuity, for any take that occurred prior to revocation. For example, if the Permittees are behind on compliance with the Stay Ahead Provision for land acquisition or restoration, they will be required to meet this obligation. See the IA for additional details.

9.10 Near-Term Implementation Actions and Timeframes

Near-term implementation actions, milestones, and target timeframes for the MSHCP Amendment are listed in Table 9-1:

Table 9-1. MSHCP Near-term Implementation Actions, Milestones and Timeframes

Action/ Milestone/ Deadline	Responsible Party	Timeframe
Review and identify essential sediment sources for threecorner milkvetch and sticky buckwheat	DCP	Within first year of issuance of the ITP
Final Covered Species long-term monitoring protocols/methods	DCP	Within 18 months of issuance of the ITP
Develop Connectivity Management Plan	DCP	Within first 3 years of issuance of the ITP
Revise Las Vegas Valley Resource Management Plan to be consistent with the IA and Reserve System Unit CMAs	BLM	Within 1 year of issuance of the ITP
Final CMAs for joint management of each Reserve System Unit	DCP, BLM, USFWS	Within 2 years of issuance of the ITP
Develop Reserve Unit Management Plans	DCP, BLM, USFWS	Within 3 years of issuance of the ITP

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10.6 Chapter Six

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