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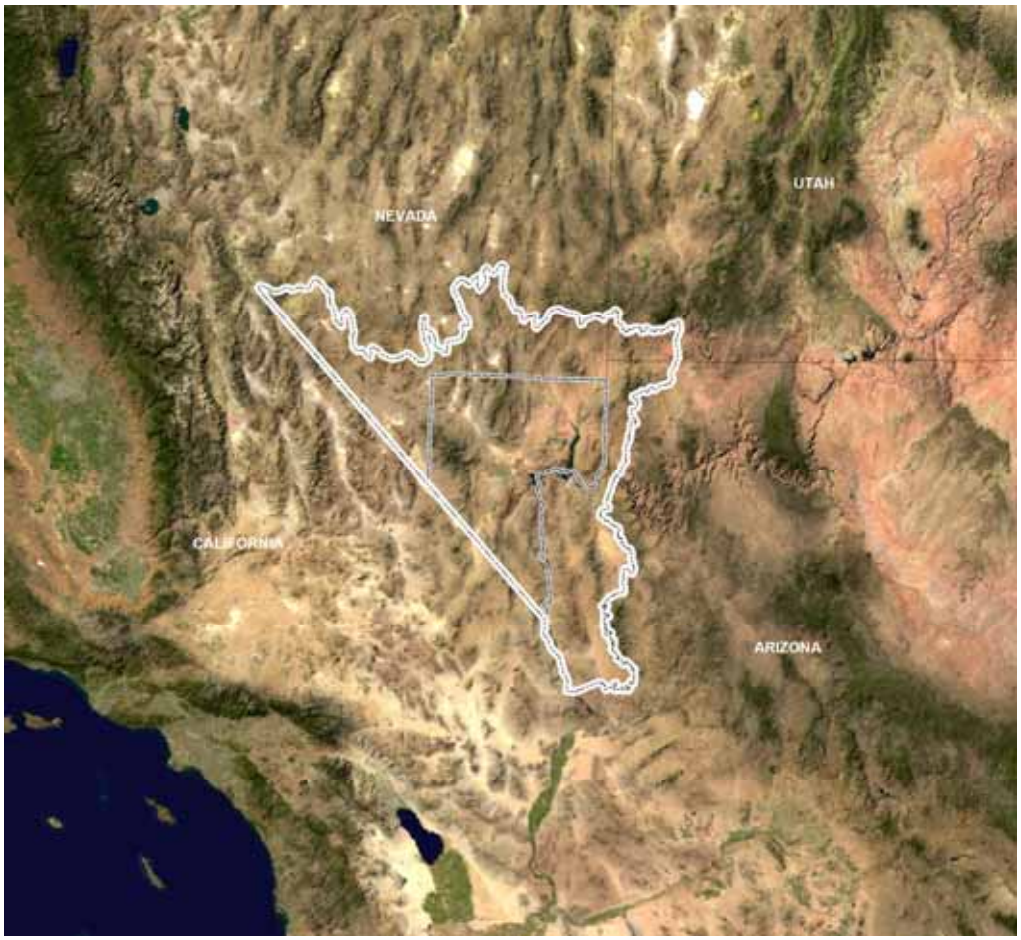
Habitat Distribution Models for 37 Vertebrate Species in the Mojave Desert Ecoregion of Nevada, Arizona, and Utah



RESEARCH AND DEVELOPMENT

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Habitat Distribution Models for 37 Vertebrate Species in the Mojave Desert Ecoregion of Nevada, Arizona, and Utah

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by

Kenneth G. Boykin
New Mexico Cooperative Fish and Wildlife Research Unit
Department of Fish, Wildlife, and Conservation Ecology
New Mexico State University
Las Cruces, New Mexico

David F. Bradford
William G. Kepner
U.S. Environmental Protection Agency
Office of Research and Development
National Exposure Research Laboratory
Environmental Sciences Division
Las Vegas, Nevada

U.S. Environmental Protection Agency
Office of Research and Development
Washington, DC 20460

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Cover: Cover image indicates the study areas of Mojave Desert Ecoregion and Clark County, NV with a backdrop of LANDSAT 7 ETM+ imagery.

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Executive Summary

Conservation planning for a species requires knowledge of the species' population status and distribution. An important step in obtaining this information for many species is the development of models that predict the habitat distribution for the species. Such models can be useful in depicting the amount and location of potential habitat available, and in providing a starting point for designing surveys to obtain more detailed information about population characteristics, distribution, and habitat associations.

Clark County, Nevada, has developed a Multiple Species Habitat Conservation Plan (MSHCP) that addresses 78 species covered by a permit from the US Fish and Wildlife Service, and more than 100 "evaluation" or "watch" species. The MSHCP is designed to reduce the likelihood that a species will become federally listed as endangered or threatened in the future.

The present study was undertaken to develop habitat distribution models for the 37 vertebrate species that are either covered under the MSHCP or identified as high priority evaluation species, using the recently completed habitat models from the Southwest Regional Gap Analysis Project (SWReGAP) as a starting point. A secondary purpose of the project was to evaluate the applicability of the SWReGAP models when applied at a much smaller geographic scale than the 5-state SWReGAP region (i.e., Arizona, Nevada, New Mexico, Utah, and Colorado). Specifically, we focus on the Mojave Desert Ecoregion (exclusive of California) and Clark County, NV.

We reviewed the 37 original SWReGAP habitat models to see if they could be improved for the Mojave Desert Ecoregion by incorporating additional and more specific information, such as datasets that did not cover the entire 5-state SWReGAP area, information not available at the time the SWReGAP models were developed, species occurrence records, and local knowledge. The original and revised models used a deductive (i.e., literature driven) process.

We revised 35 of the 37 original models. The extent of habitat predicted by the original and revised models within the study areas differed widely among the species, although the median change in habitat extent among the species was not great (i.e., increase of 4.1%). Given the greater input and specificity for the revised models than the original models, we find that the revised models would be the better starting point for evaluating habitat distribution for species addressed by the Clark County MSHCP.

Using the revised models, we computed the extent of predicted habitat distributed among land management categories that reflect degree of biodiversity protection (i.e., gap analysis). For most of the 37 species the proportion of habitat in the most protected categories (i.e., Status 1 and 2 of SWReGAP) was much higher for the Mojave Desert Ecoregion and Clark County than for the 5-state SWReGAP region as a whole. The lands in Status 1 and 2 categories combined roughly correspond to the lands assigned by Clark County to its Conservation Management categories of IMA (Intensively Managed Area) and LIMA (Less Intensively Managed Area).

We evaluated the feasibility of developing inductive (i.e., data driven) models using the Maximum Entropy algorithm for four of the 37 species. The inductive models used known occurrence records, which allow development of species-environment associations without precise knowledge of this association. The result is a prediction of habitat distribution by probability values rather than binary representation (i.e., suitable vs. non-suitable). The four

species addressed were the desert iguana *(Dipsosaurus dorsalis)*, common chuckwalla (*Sauromalus ater)*, phainopepla *(Phainopepla nitens*), and desert kangaroo rat *(Dipodomys deserti).*

The resulting inductive models were similar to the original deductive SWReGAP models in that many of the variables used in the original models (e.g., land cover, elevation) were also used in the inductive models. A major difference between them, however, was that for all four species, a variable was included in the inductive models that were not available for the original deductive models. These were a sand coverage (SSURGO soils dataset) for the desert iguana and desert kangaroo rat, a mesquite/acacia bosque coverage for the phainopepla, and a rock outcrop coverage (SSURGO) for the chuckwalla. The inductive models clearly fit the occurrence records better than the deductive models. Although this is not surprising given that the locality records were used to build the inductive models, the differences were substantial. We feel that the inductive models for the four target species provided more accurate and insightful habitat models than the deductive models.

Many taxa addressed by the Clark County MSHCP would be amenable to inductive modeling, beyond the four species addressed herein. For most species, however, critical next steps in habitat modeling would be to conduct a ground-based accuracy assessment of existing models, and further sampling for species locations and habitat associations to improve these models.

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Introduction

Clark County, Nevada, has developed a Multiple Species Habitat Conservation Plan (MSHCP) that addresses 78 "covered" species, and more than 100 "evaluation" or "watch" species (RECON 2000; http://www.accessclarkcounty.com/depts/daqem/epd/Pages/dcp_mshcp.aspx). "Covered" species are those covered by a permit from the US Fish and Wildlife Service (FWS) which, among other things, allows the "take" of any of the species that are federally listed as threatened or endangered, or may become so listed in the future. The MSHCP is designed to reduce the likelihood of a species becoming federally listed in the future.

Clark County is responsible for reporting to FWS on the status and distribution of the species covered by the permit. An important step in obtaining this information for many species is the development of models that predict the habitat distribution for the species. Such models can be useful in depicting the amount and location of potential habitat available, and in providing a starting point for designing field studies to obtain more detailed information about population size, distribution, and habitat associations.

The purpose of the present project was to develop habitat distribution models for the 37 vertebrate species that are either covered under the MSHCP or identified as high priority evaluation species, using the recently completed habitat models from the Southwest Regional Gap Analysis Project (SWReGAP) as a starting point (Prior-Magee et al. 2007). This effort also provided an evaluation of the utility of the SWReGAP models when applied at a scale smaller than the entire 5-state SWReGAP region.

Gap Analysis and the Southwest Regional Gap Analysis Project (SWReGAP)

The Gap Analysis Program (GAP) is a national interagency program that maps the distribution of plant communities and selected animal species and compares these distributions with land stewardship to identify vulnerable biotic elements. GAP uses remote sensing (Landsat 7) and Geographic Information System (GIS) technology to assemble and view large amounts of biological and land management data to identify areas (gaps) where conservation efforts may not be sufficient to maintain diversity of living natural resources (i.e., gap analysis). Historically, GAP has been conducted by individual states; however, this has resulted in inconsistencies in mapped distributions of vegetation types and animal habitat across state lines because of differences in mapping and modeling protocols, and differences in available environmental datasets. In response to these limitations, GAP embarked on a second generation effort to conduct the program at a regional scale, beginning with SWReGAP, which included five southwestern states (Arizona, Colorado, Nevada, New Mexico, and Utah) and comprises nearly one-fifth of the conterminous United States (Prior-Magee et al. 2007; http://fws-nmcfwru.nmsu.edu/swregap/). The primary goals of SWReGAP were to develop a detailed contemporary land cover database, digital maps for land ownership and land management status, and a set of habitat models for terrestrial vertebrate species across the southwestern U.S. The U.S. Environmental Protection Agency (EPA) was a partner with U.S. Geological Survey (and other agencies and universities) in the project and had lead responsibility for the Nevada ecoregional component in the 5-state effort (http://www.epa.gov/nerlesd1/land-sci/gap.htm).

Habitat Modeling and Project Objectives

Two paradigms are common in spatial habitat modeling, i.e., deductive and inductive modeling. Deductive modeling uses literature-based wildlife habitat relationship models to identify potential suitable

habitat. Using this approach, we identified suitable conditions within mappable datasets to derive the habitat maps for the MSHCP species of interest. This is often known as a "top-down approach." SWReGAP used this method in their modeling of 819 terrestrial vertebrates within the Southwest United States (Boykin et al. 2007A). Inductive modeling uses species occurrence locations to statistically identify the species' environmental niche. This has also been termed a "bottom-up approach." Traditionally, inductive modeling has needed both known presence and absence points. However, new techniques have been developed that use presence-only points with pseudo-absence points. One such technique is the algorithm that comprises Maximum Entropy Software (Phillips et al 2006). Hernandez et al. (2006) compared four common inductive modeling algorithms (GARP, Bioclim, Domain, and Maximum Entropy) and identified Maximum Entropy as providing a more accurate model at low sample sizes.

The MSHCP provides conservation for 78 species, and lists another 37 as high priority evaluation species to be considered for coverage under future phases of the plan. Of these, 37 are terrestrial vertebrate species (27 covered species and 10 high priority evaluation species; Table 1). All 37 of these species were modeled within the SWReGAP effort for the five southwestern states (Boykin et al. 2007A). The present study had four objectives concerning habitat models for these species:

1. Create reduced-extent versions of the original SWReGAP models for both the Mojave Desert Ecoregion (exclusive of California) and Clark County, Nevada, for each of the 37 species of interest. Using these datasets we compute gap analysis statistics including area (in hectares) and percent of habitat within land ownership categories and GAP management status categories for both the Mojave Desert Ecoregion and Clark County.

2. Review these reduced-extent models to see if they can be improved for the Mojave Desert Ecoregion by incorporating additional information that was not applicable to the 5-state SWReGAP area (i.e., mesquite-acacia data), information not available at the time the SWReGAP models were developed (e.g., Nevada Breeding Bird Atlas), known locality records, and knowledge of local species-habitat relationships. Using these revised models, we again compute gap analysis statistics for area (in hectares) and percent of habitat within land ownership categories and GAP management status categories for both the Mojave Desert Ecoregion and Clark County. We also compute similar statistics for Clark County using Clark County's Conservation Management categories.

3. Compare the GAP Statistics for Revised and Original SWReGAP Models. This comparison provides an indication of concordance between the original models developed for the 5-state area and those developed for a single ecoregion (Mojave Desert) and a localized area (Clark County). We also evaluate the similarities and differences between Gap statistics for the GAP management status categories and Clark County's Conservation Management categories.

4. Evaluate the feasibility of developing inductive models using existing locality records by developing such models for four of the 37 species using the Maximum Entropy algorithm. The four species are the desert iguana *(Dipsosaurus dorsalis),* common chuckwalla (*Sauromalus ater),* phainopepla *(Phainopepla nitens*), and desert kangaroo rat *(Dipodomys deserti)*. We subsequently compare the distribution of suitable habitat depicted by these inductive models with that depicted by the original and revised deductive models above.

Table 1. Thirty-seven "covered" or "high priority evaluation" vertebrate species addressed in this study.

Taxon	Common Name*	*Scientific Name**
Amphibians	Southwestern toad**	*Bufo microscaphus*
	Relict leopard frog	*Rana onca*
Reptiles	Glossy snake	*Arizona elegans*
	Western banded gecko	*Coleonyx variegatus*
	Sidewinder	*Crotalus cerastes*
	Speckled rattlesnake	*Crotalus mitchellii*
	Mojave rattlesnake	*Crotalus scutulatus*
	Mojave black-collared lizard	*Crotaphytus bicinctores*
	Desert iguana	*Dipsosaurus dorsalis*
	Gilbert's skink	*Eumeces gilberti*
	Long-nosed leopard lizard	*Gambelia wislizenii*
	Desert tortoise	*Gopherus agassizii*
	Gila monster**	*Heloderma suspectum*
	Common kingsnake	*Lampropeltis getula*
	Desert horned lizard**	*Phrynosoma platyrhinos*
	Spotted leaf-nosed snake	*Phyllorhynchus decurtatus*
	Long-nosed snake	*Rhinocheilus lecontei*
	Common chuckwalla**	*Sauromalus ater*
	Western lyre snake	*Trimorphodon biscutatus*
	Desert night lizard**	*Xantusia vigilis*
Birds	Burrowing owl**	*Athene cunicularia*
	Yellow-billed cuckoo	*Coccyzus americanus*
	Willow flycatcher	*Empidonax traillii*
	Peregrine falcon	*Falco peregrinus*
	Blue grosbeak	*Guiraca caerulea*
	Phainopepla	*Phainopepla nitens*
	Summer tanager	*Piranga rubra*
	Vermilion flycatcher	*Pyrocephalus rubinus*
	Bell's vireo	*Vireo bellii*
Mammals	Desert pocket mouse**	*Chaetodipus penicillatus*
	Townsend's big-eared bat**	*Corynorhinus townsendii*
	Desert kangaroo rat**	*Dipodomys deserti*
	Silver-haired bat	*Lasionycteris noctivagans*
	Long-eared myotis	*Myotis evotis*
	Long-legged myotis	*Myotis volans*
	Palmer's chipmunk	*Tamias palmeri*
	Kit fox**	*Vulpes macrotis*

* Names follow Southwest Regional Gap Analysis Project naming convention (Boykin et al. 2007)
** High Priority Evaluation Species

Methods

The project focuses on two geographic areas: (1) the Mojave Desert Ecoregion, as defined by The Nature Conservancy, exclusive of California, and (2) Clark County, Nevada, which is contained within the Mojave Desert Ecoregion (Figure 1). The Mojave Desert Ecoregion encompasses over 5 million hectares within the study unit and Clark County includes over 2 million hectares. The ecoregion as a study area was selected because it provides an ecological context for the Clark County Multiple Species Habitat Conservation Plan.

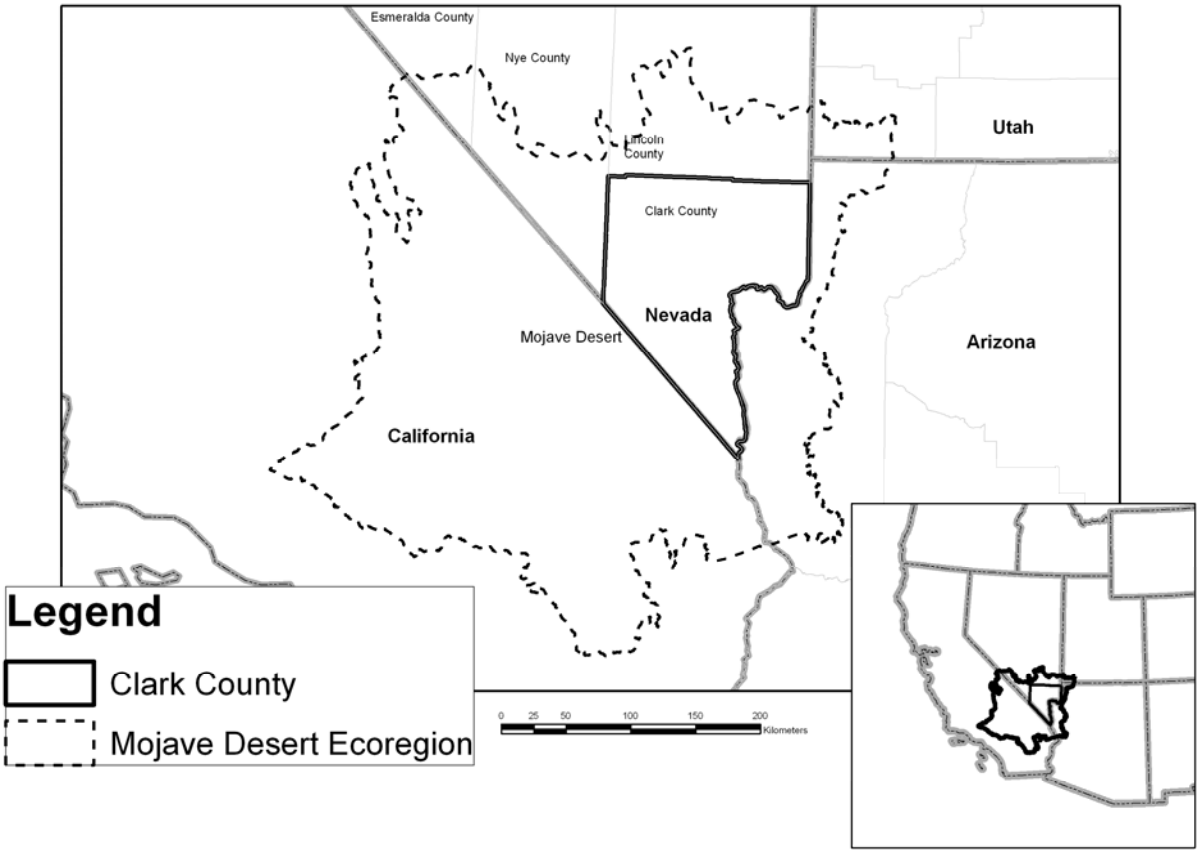


Figure 1. Map of the study areas including Mojave Desert Ecoregion – exclusive of California (dashed line) and Clark County, Nevada (solid bold line).

Reduced-extent Versions of SWReGAP Models

Reduced-extent versions of the original deductive SWReGAP models were created by clipping the original SWReGAP datasets (http://fws-nmcfwru.nmsu.edu/swregap/) to the Mojave Desert Ecoregion as defined by The Nature Conservancy and to the Clark County boundary. ArcGIS 9.2 was used for clipping (Earth Systems Research Institute, Inc., Redlands, CA). Reduced-extent versions were created using the 30-m pixel resolution level dataset as provided by SWReGAP. Metadata for these reduced-extent versions contains detailed processes used to create or modify the data. Reduced-extent versions of original SWReGAP models provided a smaller dataset for visualization and use in generating gap analysis statistics.

Revision of SWReGAP Deductive Models

The original 37 SWReGAP models were reviewed to consider information specific to the Mojave Desert Ecoregion and Clark County. Revisions considered all variables available within the SWReGAP project and included land cover, land form, elevation, slope, aspect, distance to hydrological features (springs, streams, lakes, wetlands), and STATSGO soils data. Model variables were added, modified, or deleted in the model based on specific information for the Mojave Desert Ecoregion or Clark County. Only land cover types mapped within the study area were included in the model (Appendix B). Georeferenced locality records from several sources (see below) and recent literature (e.g., NDOW 2006) were used to further modify the models. Modifications were documented in revised habitat model reports and maps for each species.

Comparison of Gap Analysis Statistics for Mojave Desert and Clark County

We conducted gap analysis specifically for the Mojave Desert Ecoregion study area and Clark County using the revised SWReGAP models. These gap analyses were created by cross-tabulating stewardship categories (Fig. 2) with each habitat model. Thus, the analyses provide the amount of predicted suitable habitat (in hectares) for each species in each SWReGAP management status category or land owner (Ernst et al. 2007) for the Mojave Desert Ecoregion (exclusive of California) and Clark County.

The two primary goals of SWReGAP were to provide an assessment of the management status for certain elements of biodiversity (vegetation communities and animal species) throughout the 5 Southwestern states, and to provide land stewards with information on the representation of these elements on their land so they can make informed decisions about their management practices regarding biodiversity.
To accomplish this, the mapped distributions of vegetation communities were compared to a map of land stewardship. In GAP, the land stewardship map combines attributes of ownership, management, and a measure of intent to maintain biodiversity. These comparisons do not consider viability, but provide a beginning to assess the likelihood of future habitat conversion—the most obvious cause of biodiversity decline. We use the term “stewardship,” because legal ownership of a land area does not necessarily equate to the entity charged with managing the resource. Though we record the management and ownership entities of public lands and privately owned conservation lands, we also acknowledge that these attributes are complex and change rapidly. GAP Management status categories differentiate land parcels into four groups based on long-term maintenance of biodiversity (Ernst et al. 2007). Status 1 and 2 lands are considered to be most protected in regard to long-term management for biodiversity. The four categories are:

> **Status 1:** An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance

events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.

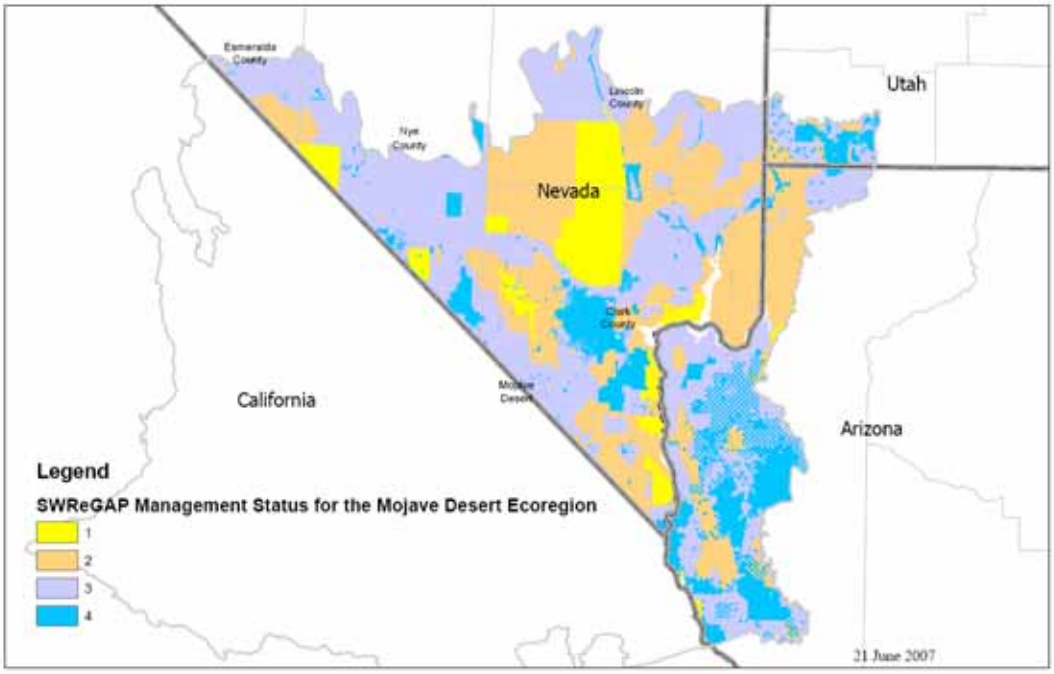
Status 2: An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.

Status 3: An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense type (e.g., mining). It also confers protection to federally listed endangered and threatened species throughout the area.

Status 4: There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types.

Revised deductive habitat models were used to derive new gap analysis statistics for the Mojave Desert Ecoregion and Clark County using the SWReGAP stewardship data layer (Ernst et al. 2007). Statistics were generated for land ownership and GAP management status categories.

For Clark County, statistics were also generated for the Clark County Conservation Management Status (Table 2, Fig. 3) categories (RECON 2000). These four Clark County Conservation Management categories are defined based on management intensity and use. We compared SWReGAP management status categories and Clark County Conservation Management Status categories to understand both the differences and similarities between these datasets.



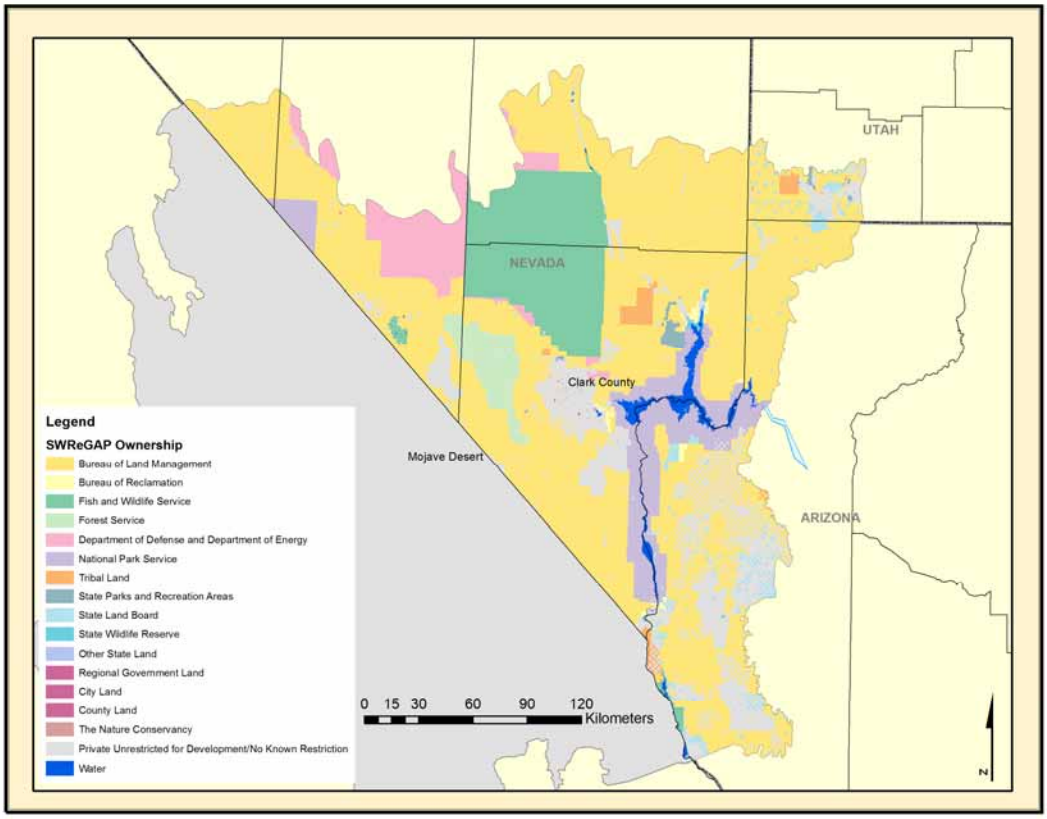


Figure 2. Southwest Regional Gap Analysis Project management status categories (top) and land ownership (below) for the Mojave Desert Ecoregion, exclusive of California. Management status categories as derived from Ernst et al. 2007. Not shown are 34, 800 hectares of Boulder City lands under desert tortoise conservation easement. This conservation easement is not included in analyses.

Table 2. Description of Clark County Conservation Management Status Categories (RECON 2000).

- **Intensively Managed Area (IMA)** - IMAs consist of lands in which management is oriented toward actions that reduce or eliminate potential threats to biological resources, such as wilderness areas, biodiversity hotspots, wilderness study areas, or the conserved/critical habitat areas established for the Mojave Desert tortoise. IMAs will provide an adequate amount and quality of habitats to support viable populations of all of the species covered by the MSHCP. This MSHCP designates the following lands as IMAs:
    - BLM lands committed to conservation of the desert tortoise pursuant to the terms of the DCP
    - All National Park Service lands except those identified as development zone in the GMP and existing minor developments such as parking lots, trailheads, and boat ramps
    - Wilderness, Research Natural Areas (RNAs), Wilderness Study Areas (WSAs), and Instant Study Areas (ISAs) managed by the BLM and the USFS
    - The Desert National Wildlife Range (including portions of NAFR), and other refuges, managed by the USFWS
    - State Wildlife Management Areas located within the plan area
    - State parks located within the plan area (Valley of Fire State Park)
    - Nellis Small Arms Range
- **Less Intensively Managed Area (LIMA)** - LIMAs are lands on which management generally limits the range of uses allowed to primarily low-impact recreational uses. LIMAs will function to augment the habitat in IMAs for some species, as well as providing buffers from areas of more intensive uses and connectivity between IMAs. This MSHCP designates the following areas as LIMAs:
    - BLM lands managed as National Conservation Areas (NCAs)
    - USFS lands managed as the Spring Mountains National Recreation Area
    - Lands within NAFR and NSAR with limited Air Force use and restricted access
    - Target areas on NAFR
    - State parks other than Valley of Fire State Park
- **Multiple Use Managed Area (MUMA)** - MUMAs are lands on which human activities are not precluded and which may, at times, be intense but which nevertheless continue to support significant areas of undisturbed natural vegetation. MUMAs provide connectivity between the populations of species in IMAs and LIMAs, additional habitat for these species, and buffering between the IMAs, LIMAs, and areas of more intensive use. Agricultural lands may, in some situations, provide similar values. This MSHCP designates the following areas as MUMAs:
    - Undesignated BLM lands
- **Unmanaged Area (UMA)** - UMAs are lands on which human activities predominate and which may incidentally support populations of some species. This MSHCP designates the following areas as UMAs:
    - Private lands
    - Indian reservations
    - Intensive/developed recreation use areas
    - Highways and material sites
    - Lands disturbed by previous land uses
    - Mines
    - Landfills
    - Intensive agriculture
    - Nellis Air Force Base and Indian Springs Air Force Auxiliary Field

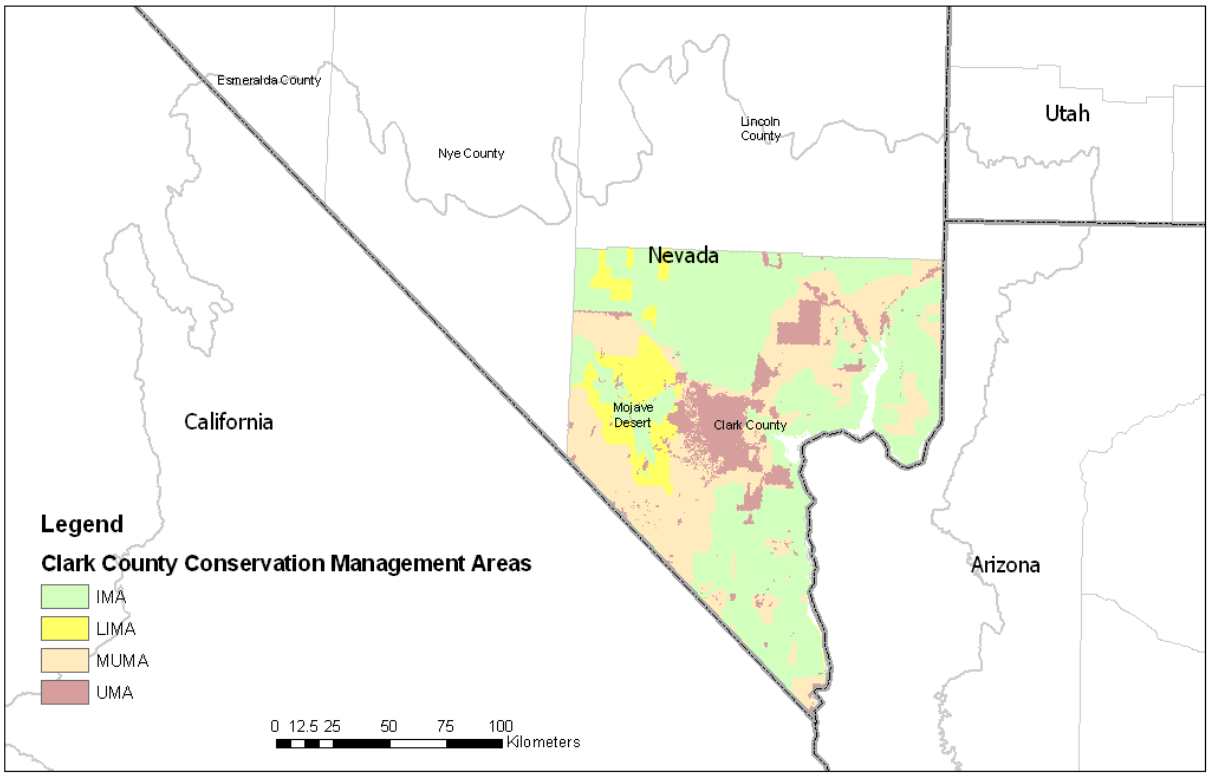


Figure 3. Distribution of Clark County Conservation Management Areas: Intensively Managed Areas (IMA), Less Intensively Managed Areas (LIMA), Multiple Use Managed Area (MUMA), and Unmanaged Area (UMA).

Occurrence Locations for Species

Datasets for georeferenced locality records were collected for all 37 species from Mammal Networked Information System (MaNIS; http://manisnet.org/), Ornithological Networked Information System (OrNIS; http://olla.berkeley.edu/ornisnet/), and Herpnet (http://www.herpnet.org/). A total of 16,234 records for all 37 species were filtered from these sources to identify 2,150 location records for the entire United States. Filtering out records outside of Arizona, Nevada, and Utah, identified 536 records. Within the study area were a total of 236 records of location information.

Locality data for amphibians and reptiles were also obtained from the University of Nevada, Las Vegas (UNLV) Barrick Museum of Natural History, but these data did not contain digital locations. Herpetofauna data for Clark County from the University of Nevada, Reno (UNR) Biological Resources Research Center (BRRC) was obtained, including 770 records from several museums. Data were also provided by the Great Basin Bird Observatory, including Nevada Breeding Bird Atlas data and Nevada Bird Count data. Nevada Department of Wildlife provided additional records for all 37 species. Data from Tereza Jeskova, a Ph.D. candidate at UNLV, provided additional records for the desert kangaroo rat from MANIS that were georectified and other sample points obtained in the course of her studies. Lisa Crampton, a postdoctoral fellow at UNR, provided additional phainopepla occurrence records.

Additional phainopepla records were also provided by Nevada Natural Heritage Program through Jennifer Newmark. Data were compiled for species into an MS Access database and Microsoft Excel file with coordinates converted to Albers for use in Maximum Entropy modeling. Occurrence records were not analyzed for accuracy.

Inductive Modeling

Inductive modeling uses species occurrence points to predict species habitat distribution over the landscape. Maximum Entropy (MaxEnt) is a niche modeling software that identifies probability distributions (Phillips et al. 2004, Phillips et al. 2006). MaxEnt is one of the many newer algorithms that predict suitable habitat using presence-only data. Presence-only data has precluded use of techniques such as logistic regression, which requires absence data. Software such as GARP and MaxEnt use species presence points incorporated with pseudo-absence points (Phillips et al. 2006). We used an iterative approach in Maximum Entropy modeling with eight variables (Appendix A). The 8 variables were elevation (Boykin et al. 2007A), SWReGAP land cover (Lowry et al. 2007), SWReGAP landform (Lowry et al. 2007), percent sand derived from the Soil Survey Geographic (SSURGO) database (NRCS 2006), rock outcrop derived from SSURGO (NRCS 2006), distance to mesquite/acacia bosque habitat inclusive of Clark County derived from the U.S. Bureau of Land Management (Crampton et al. 2006), distance to perennial streams (Boykin et al. 2007A), and slope (Boykin et al. 2007A).

We modified the SWReGAP land cover dataset to exclude urban and agriculture areas. This provided a mask for historical locations within these areas. SSURGO identified polygons with either percent sand or rock outcrop presence for the four species of interest. These datasets were created using the Soil Data Viewer (Version 5.1) extension for ArcGIS to identify percent sand or soil types with rock outcrop in the mapping unit name. The mesquite/acacia dataset was converted to grid using a “distance to” grid algorithm.

Multiple iterations for each of the four species were run to identify the best model in terms of Area Under the Curve (AUC) values, omission error, parsimony, and biological knowledge (Phillips et al. 2006). Variable contributions, response curves and jack-knife variable response also influenced model selection. Variable contributions provide a relative percent of variable contribution to specific model outputs. The variables used in each stepwise iteration were based on the authors’ knowledge of the species and available datasets. Only variables that were biologically relevant were included. Often times a premodeling step in modeling is variable elimination based on correlation (Hernandez et al. 2006). However, we felt all variables were important even given some likely correlation.

AUC values were derived from receiver operating characteristic (ROC) plots. ROC plots can be used to compare model performance and to identify habitat presence or absence thresholds (Guisan and Zimmerman 2000, Phillips et al. 2006). The ROC plot is a plot of sensitivity (true positive fraction) on the y-axis and 1 - specificity (false positive fraction) on the x-axis. Sensitivity represents the absence of omission errors and is a measurement of correctly predicting presence. Specificity represents commission error and is a measure of correctly predicting absence (Fielding and Bell 1997). To derive a threshold, sensitivity is maximized and commission error (1 - specificity) is minimized (Fielding and Bell 1997, Phillips et al. 2006). Models, which depict a probability surface, were converted to binary (presence/absence) using a threshold as defined by the equal sensitivity and specificity metric derived from Maximum Entropy. This allowed visual comparison with deductive models. Omission errors were calculated based on the threshold chosen.

Results and Discussion

Revised SWReGAP Habitat Models

We reviewed the original SWReGAP models for the 37 species and revised 35 of them for the Mojave Desert Ecoregion (relict leopard frog and desert kangaroo rat were not changed). These revised models are provided in Appendix H and at http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/. A description of the revision is provided in the report for each model at this Web site.

The difference in extent of habitat predicted for the revised versus original models varied greatly among the species (Figs. 4 and 5; Appendix G). For the 35 species with revised models, differences in extent of habitat between the models ranged from no change (e.g., long-eared myotis in Clark County) to a large reduction of over 4.0 million hectares in the Mojave Ecoregion (-99%) for the blue grosbeak and to a large addition of 3.7 million hectares in the Mojave Ecoregion for long-nosed snake (Appendix G). The model for blue grosbeak at the scale of the 5-state area was inclusive of many land cover types where the species could occur, whereas the revised model reflected specific information for the Mojave Desert Ecoregion indicating that it occurs primarily in lowland riparian habitat, a habitat of very small extent in the region. For the long-nosed snake we added three land cover types that make up a significant portion of the study area. These include Mojave Mid elevation Mixed Desert Scrub (S060), Sonora-Mojave Creosotebush-White bursage Desert Scrub (S069), and Sonora-Mojave Mixed Salt Desert Scrub (S070).

Model changes included changes to land cover within the study area in 30 models (81%), changes to elevation in 11 models (30%), changes to hydrology in 7 models (19%), landform changes for 5 models (13.5%), soil changes in 3 models (8%), and modifications of Hydrologic Unit Codes (HUC) in 18 models (48.6%).

The extent of predicted habitat changed little for many species. Specifically, changes within -5 to 5% occurred in Clark County for 12 species (32%) and in the Mojave Ecoregion for 10 species (27%; Fig 6). Increases greater than 5% occurred for 16 species in Clark County (43%) and 19 species within the Mojave Ecoregion (51%). Seven and 10 species had changes greater than 50% in Clark County and the Mojave Ecoregion, respectively. Of these, habitat extent of 6 species increased more than 100% at both scales. These species included spotted leaf-nosed snake, western lyre snake, common chuckwalla, yellow-billed cuckoo, and long-nosed snake. Habitat extent increased more than 100% for the desert night lizard at the Clark County scale and for the phainopepla at the Mojave Ecoregion scale. Habitat extent decreased by more than 5% for 8 species in Clark County (22%) and 9 species in the Mojave Ecoregion (24%). Four of these species had decreases greater than 50% including the blue grosbeak, vermillion flycatcher, and summer tanager. The long-legged myotis decreased in habitat extent by more than 50% at the Mojave Ecoregion scale and the southwestern toad decreased in habitat extent by more than 50% at the Clark County scale.

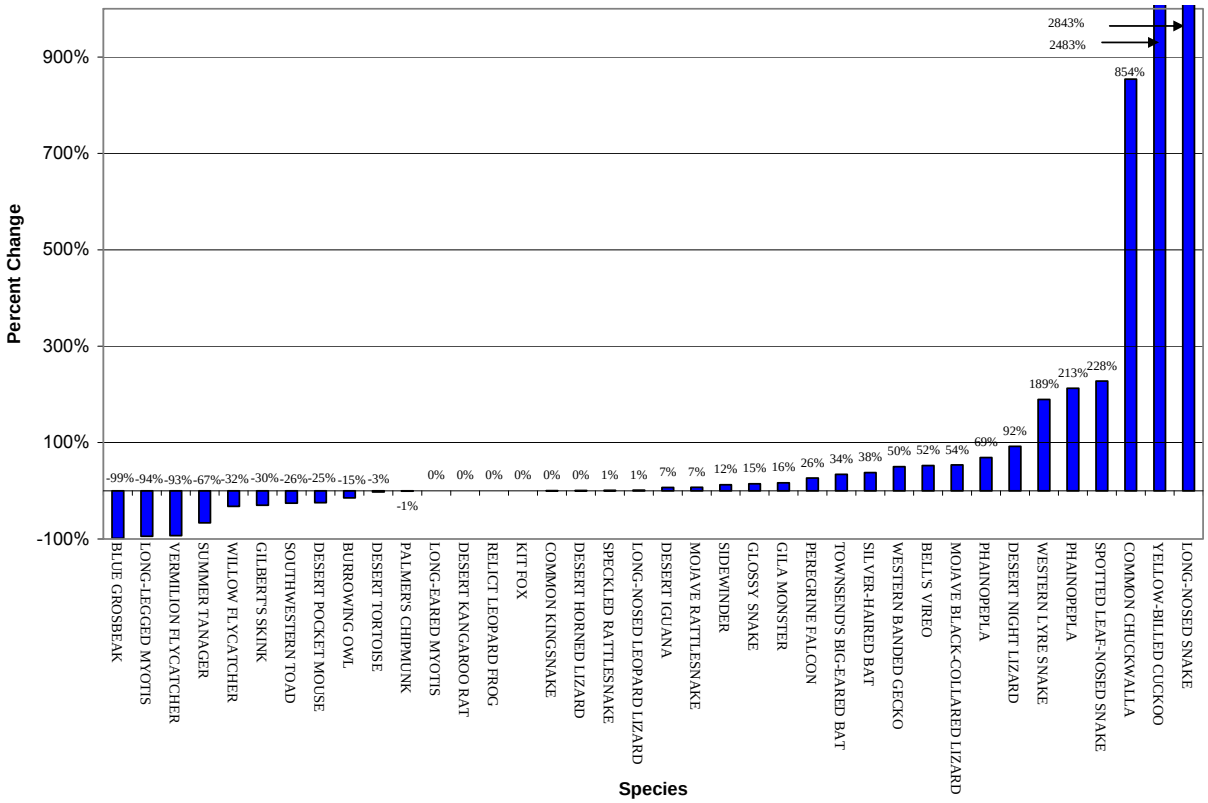


Figure 4. Change in extent of habitat predicted for a species in the revised deductive models relative to the original SWReGAP models in Clark County.

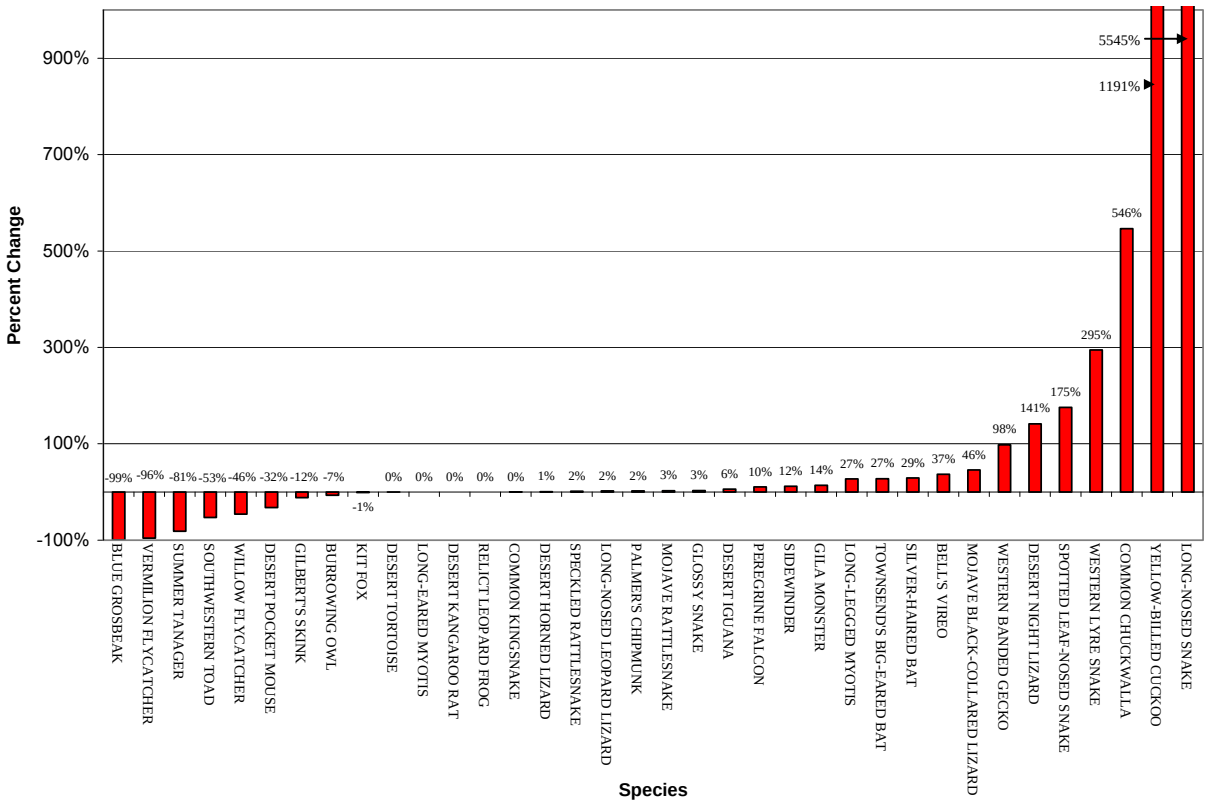


Figure 5. Change in extent of habitat predicted for a species in the revised deductive models relative to the original SWReGAP models in the Mojave Desert Ecoregion.

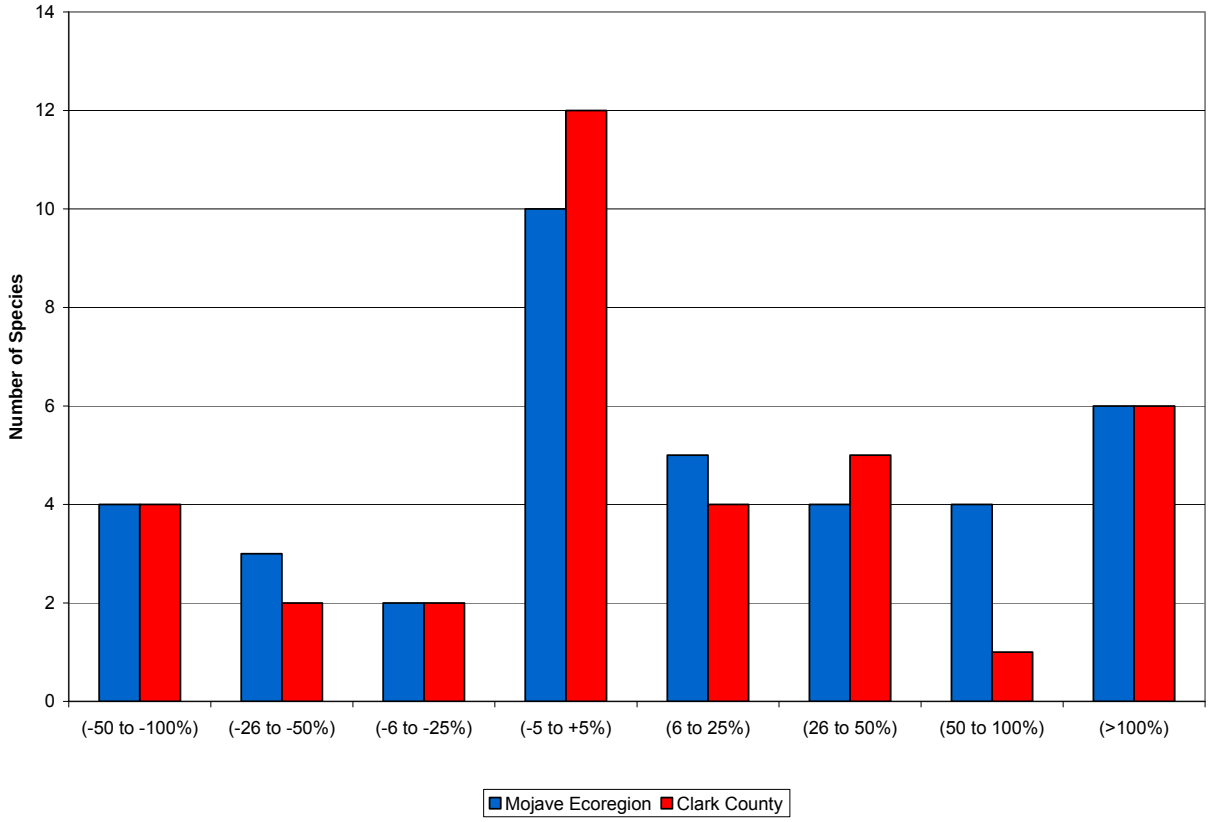


Figure 6. Change in extent of habitat predicted for a species in the revised deductive models relative to the original SWReGAP models.

Land Stewardship (Ownership) and Management Status

The extent of area in each GAP Management Status category for each land ownership category is provided for the Mojave Desert Ecoregion study area (Table 3) and Clark County (Table 4). Bureau of Land Management lands comprise the majority of land (58.5%) within the Mojave Desert Ecoregion, with 38% of that land currently managed as Status 1 or 2 (Table 3). The US Fish and Wildlife Service (12%) and National Park Service (7%) manage the second and fourth largest amounts of land. For the USFWS 100% of their land is currently being managed as a Status 1 or 2. For the Park Service, 59% of their land is currently being managed as a Status 1 or 2. Private lands account for 12% of the land. Overall, 40% of the Mojave Desert Ecoregion excluding the California portion is managed as Status 1 or 2.

Within Clark County, the Bureau of Land Management manages over 54% of the land with 47% of that land currently being managed as either Status 1 or 2. The US Fish and Wildlife Service manages 17% of the land with the entire portion in Status 1 and 2. Private lands account for 10% of the land. Overall, 57% of Clark County is managed as either Status 1 or 2 lands. Therefore a large proportion of both the eastern Mojave Desert Ecoregion and Clark County have permanent protections in place and an operational management plan for biodiversity conservation and management, 40% and 57%, respectively.

Table 3. Area of land in each GAP Management Status category by land ownership for the Mojave Desert Ecoregion study area. Percent for Status 1 and 2 lands combined represents percent of land managed by owner that is in Status 1 and 2.

Land Owner	Status 1 (ha)	Status 2 (ha)	Status 3 (ha)	Status 4 (ha)	Total (ha)	Status 1 & 2 Lands (ha)	(%)
Bureau of Land Management	19,783	1,213,653	2,037,664	-	3,271,100	1,233,436	38%
Bureau of Reclamation	-	-	15,196	5,161	20,357	-	0%
Fish and Wildlife Service	327,999	305,349	-	-	633,347	633,347	100%
Forest Service	27,811	100,923	4,301	-	133,034	128,734	97%
Department of Defense and Department of Energy	-	-	256,321	22,650	278,971	-	0%
National Park Service	123,000	110,958	162,853	-	396,810	233,957	59%
Tribal Land	-	-	30,965	24,371	55,335	-	0%
State Parks and Recreation Areas	-	-	21,790	-	21,790	-	0%
State Land Board	-	2,867	-	89,167	92,035	2,867	3%
State Wildlife Reserve	-	6,021	287	-	6,308	6,021	95%
City Land	-	-	-	573	573	-	0%
County Land	-	-	-	1,434	1,434	-	0%
The Nature Conservancy	1,147	-	573	-	1,720	1,147	67%
Private Unrestricted for Development/No Known Restriction	-	-	287	683,235	683,522	-	0%
Total	499,739	1,739,770	2,530,235	826,591	5,596,336	2,239,509	40%

Table 4. Area of land in each GAP Management Status category by land ownership for the Clark County study area. Percent for Status 1 and 2 lands combined represents percent of land managed by owner that is in Status 1 and 2.

Land Owner	Status 1	Status 2	Status 3	Status 4	Total	Status 1 & 2 Lands	
	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(%)
Bureau of Land Management	6,852	516,120	588,375	-	1,111,346	522,972	47%
Bureau of Reclamation	-	-	14,077	-	14,077	-	0%
Fish and Wildlife Service	200,506	138,716	-	-	339,222	339,222	100%
Forest Service	27,282	85,148	1,059	-	113,489	112,430	99%
Department of Defense and Department of Energy	-	-	17,441	-	17,441	-	0%
National Park Service	74,434	109,067	-	-	183,501	183,501	100%
Tribal Land	-	-	28,902	3,239	32,141	-	0%
State Parks and Recreation Areas	-	-	18,562	-	18,562	-	0%
State Land Board	-	-	-	436	436	-	0%
State Wildlife Reserve	-	5,419	-	-	5,419	5,419	100%
City Land	-	-	-	436	436	-	0%
County Land	-	-	-	1,246	1,246	-	0%
The Nature Conservancy	-	-	62	-	62	-	0%
Private Unrestricted for Development/No Known Restriction	-	-	-	207,918	207,918	-	0%
	-	-	-	-	-		
Total	309,074	854,470	668,477	213,275	2,045,296	1,163,544	57%

Comparison of Gap Management Status and Clark County Management Status

We created matrices (Tables 5A and 5B) for the comparison of extent of area within the Clark County Management categories and the SWReGAP management status categories. The matrix identifies the categories with similar definitions in the two schemes (gray cells) and those with dissimilar definitions (white cells). Comparison of all four categories in each scheme showed poor correspondence between the IMA category and GAP status 1 (Table 5A). For analysis, however, SWReGAP usually combines gap status categories 1 and 2 (Boykin et al 2007B) and Clark County often combines the IMA and LIMA categories (Wainscott personal communication 2007). With these categories combined the two schemes correspond in amount of area fairly well (Table 5B).

Table 5A. Comparison of area (hectares) within GAP Management Status categories and Clark County Management Category within Clark County.

	Clark County			
Gap Status	IMA	LIMA	MUMA	UMA
1	308,488	261	384	760
2	625,346	151,649	69,699	4,378
3	98,887	1,199	514,969	50,510
4	36,433	934	22,807	153,966

Table 5B. Comparison of area (hectares) within GAP Management Status categories (Status 1 and 2 combined) and Clark County Management Category (IMA and LIMA combined) within Clark County.

	Clark County		
Gap Status	IMA and LIMA	MUMA	UMA
1 and 2	1,085,744	70,083	5,138
3	100,086	514,969	50,510
4	37,367	22,807	153,966

GAP Analysis Statistics for Species Habitat Models

Gap analysis statistics provide the amount of suitable habitat (in hectares) and percent of that habitat by land ownership or GAP management status for each species. Gap analysis statistics for each revised species habitat model are provided for the three datasets: SWReGAP management status (Appendix D or at http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalStatusAnalysis.xls), SWReGAP stewardship (i.e., ownership (Appendix E or online at http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalStewardAnalysis.xls), and the Clark County Conservation Management categories (Appendix F, or online at http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalClarkCountyAnalysis.xls).

At the scale of Clark County, only the desert kangaroo rat has less then 20% of its predicted suitable habitat on Status 1 and 2 lands (Figure 7). All other species had over 30% of their predicted suitable habitat on Status 1 and 2 lands. For the Mojave Desert Ecoregion, there were three species (blue grosbeak, phainopepla, and kit fox) that have less then 10% of their predicted suitable habitat on Status 1 and 2 lands (Figure 8). The phainopepla model consisted of three temporal aspects including known year round resident, breeding and breeding in winter. The breeding in winter habitat was the type with less than 10%; the other two temporal aspects had 30 and greater than 40% of habitat. The blue grosbeak habitat was less than 10% for its breeding habitat. Breeding designations are based on regional datasets and may be inaccurate within the study area. All other species had greater than 20% of their habitat on Status 1 and 2 lands.

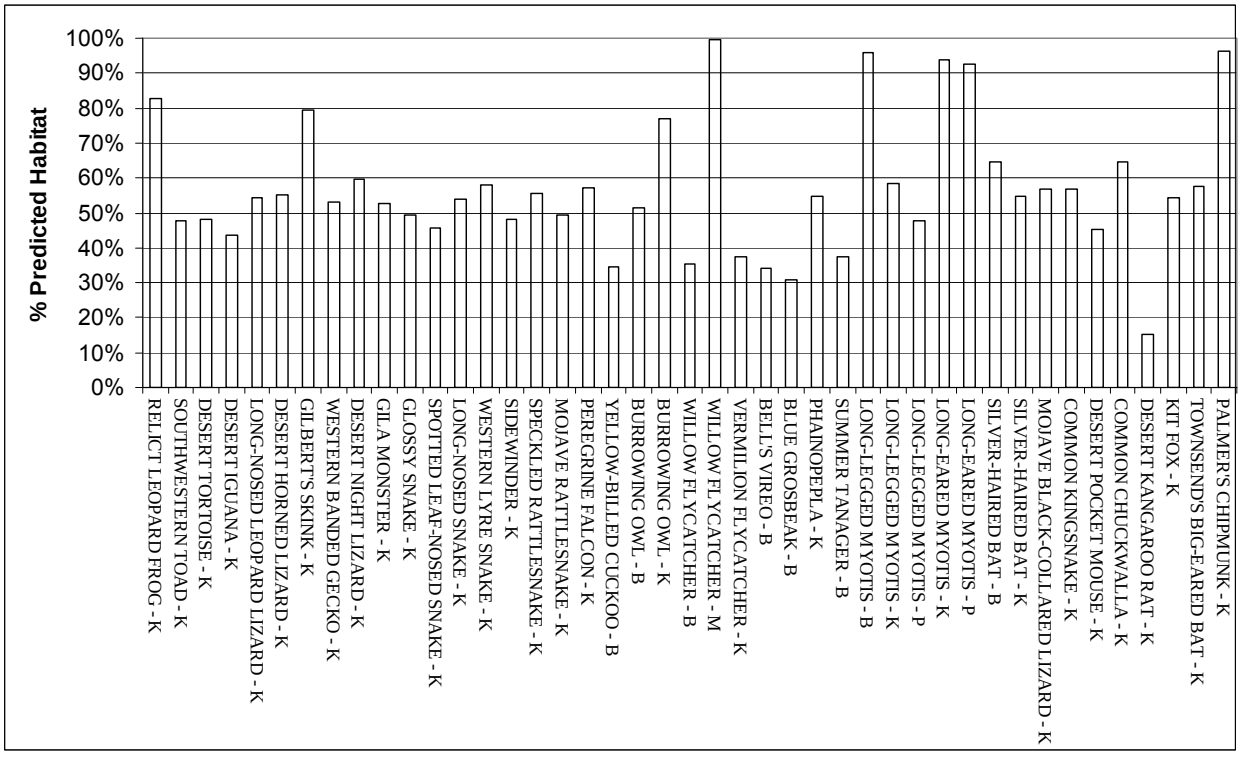


Figure 7. Percentage of predicted suitable habitat from deductive model on Status 1 and 2 lands in Clark County. Letters after species name indicate K=known year round, B=breeding, M=migratory, and P=potential occurrence.

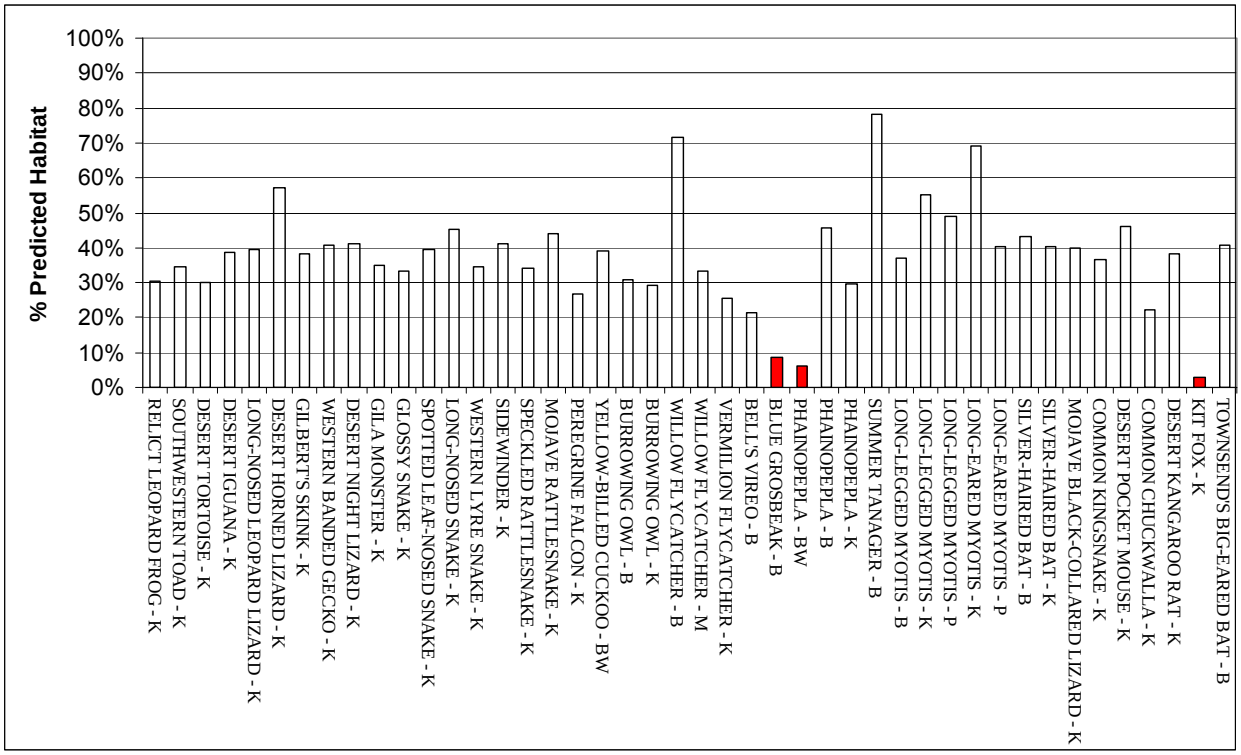


Figure 8. Percentage of predicted suitable habitat from deductive model on Status 1 and 2 lands in the Mojave Desert Ecoregion. Letters after species name indicate K=known year round, B=breeding, M=migratory, BW=breeding in winter, and P=potential occurrence.

Clark County Management Status

We conducted a gap analysis using the existing Clark County Conservation Management Status categories. This provides information specific to Clark County and applicable to the Multiple Species Habitat Conservation Plan. All species had greater than 40% of their habitat in the combined IMA and LIMA categories (Figure 9).

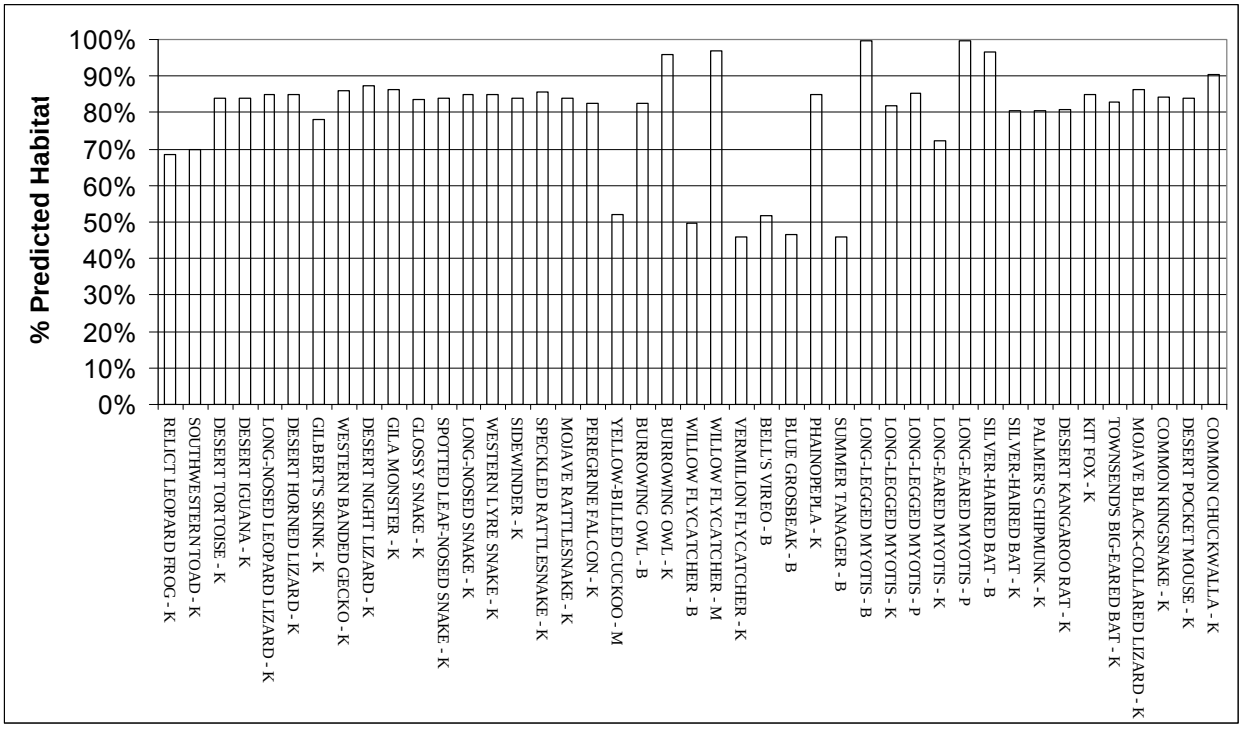


Figure 9. Percentage of predicted suitable habitat from deductive model on IMA and LIMA lands in Clark County. Letters after species name indicate K=known year round, B=breeding, M=migratory, and P=potential occurrence.

Inductive Habitat Models for Four Species

Desert Iguana

For the revised deductive model (Fig. 10) we added one HUC and deleted two (see report on Web site) to be consistent with the distribution of the species in Stebbins (2003) and locality records. We also changed coding for all HUCs from "possible" to "known or expected." We increased maximum elevation from 1060 to 1070 m to be consistent with the published elevation limit in Nevada of 3500 feet (Tanner and Banta 1966). We also deleted one land cover type (Apacherian-Chihuahuan Semi-Desert Grassland and Steppe [S077]) which does not occur within the Mojave Ecoregion and added three types (North American Warm Desert Wash [S020], North American Warm Desert Riparian Woodland and Shrubland [S097], and North American Warm Desert Riparian Mesquite Bosque [S098]; see report at Web site). It was noted that a better soils coverage than STATSGO for sandy soil would likely improve the model.

For inductive habitat modeling, we initially created 10 habitat models with resultant AUC values ranging from 0.914 to 0.951 (Table 6). We used 3,636 occurrence points for creating the model and 913 points to test the model (many of the points were duplicates). The model with the most variables (Mod 9) performed the best (AUC = 0.951), but the association with mesquite (distance to mesquite/acacia) seemed peculiar from a biological standpoint. All models performed well for this species as indicated by AUC values of greater than 0.9. The two models with the next highest AUCs (0.946) had four and five variables, and the two below this (AUC = 0.945) had three and four variables. These latter two models differed only by the inclusion of landform in the four-variable model. For further analysis, we chose the simplest of these, the three-variable model (Figure 10C; Mod 3 in Table 6) with variables of elevation, land cover, and percent sand. The relative contribution of each variable to the model was dominated by elevation (59.4%), with sand (34.6%) and land cover (6.0%) making up progressively smaller proportions. This model was converted to a binary model using the equal sensitivity and specificity threshold of 52.9 (Figure 10D; Table 6). This model had an omission error rate of 11.2% using this threshold. This omission rate identified the percentage of testing sites that were below the identified threshold.

The variables used in the selected inductive model differed from those in the revised deductive model by excluding landform and including percent sand. A comparison of the distribution predicted by the inductive model (binary form; Fig. 10D) with that of the revised deductive model (Fig. 10B) shows that the inductive model predicts much less habitat for the desert iguana than the deductive model, although most of the inductive model overlaps the deductive model (Fig. 11A). The primary reason for the large difference in extent between the two models is likely because the deductive model included the entirety of wide ranging land cover types (e.g., Sonora-Mojave Creosotebush-White Bursage Desert Scrub) and did not include soil characteristics, whereas the inductive model included percent sand from the SSURGO dataset. The distribution of occurrence points match the inductive model much better than deductive model, a finding that is not surprising given that the occurrence points were used to construct the inductive model (Fig. 11B).

A shortcoming of the inductive model is the two "holes" in the study area that could not be modeled because the SSURGO dataset was not available for these areas. These "holes" include the Nellis Bombing Range and a triangular area on the California border (Fig. 11B). Another shortcoming is that no occurrence records were obtained for the main part of the study area in Arizona, which included land cover types virtually unrepresented in Nevada (Fig. 11B). This likely accounts for the lack of habitat for the inductive model for much of the Mojave Desert Ecoregion in Arizona.

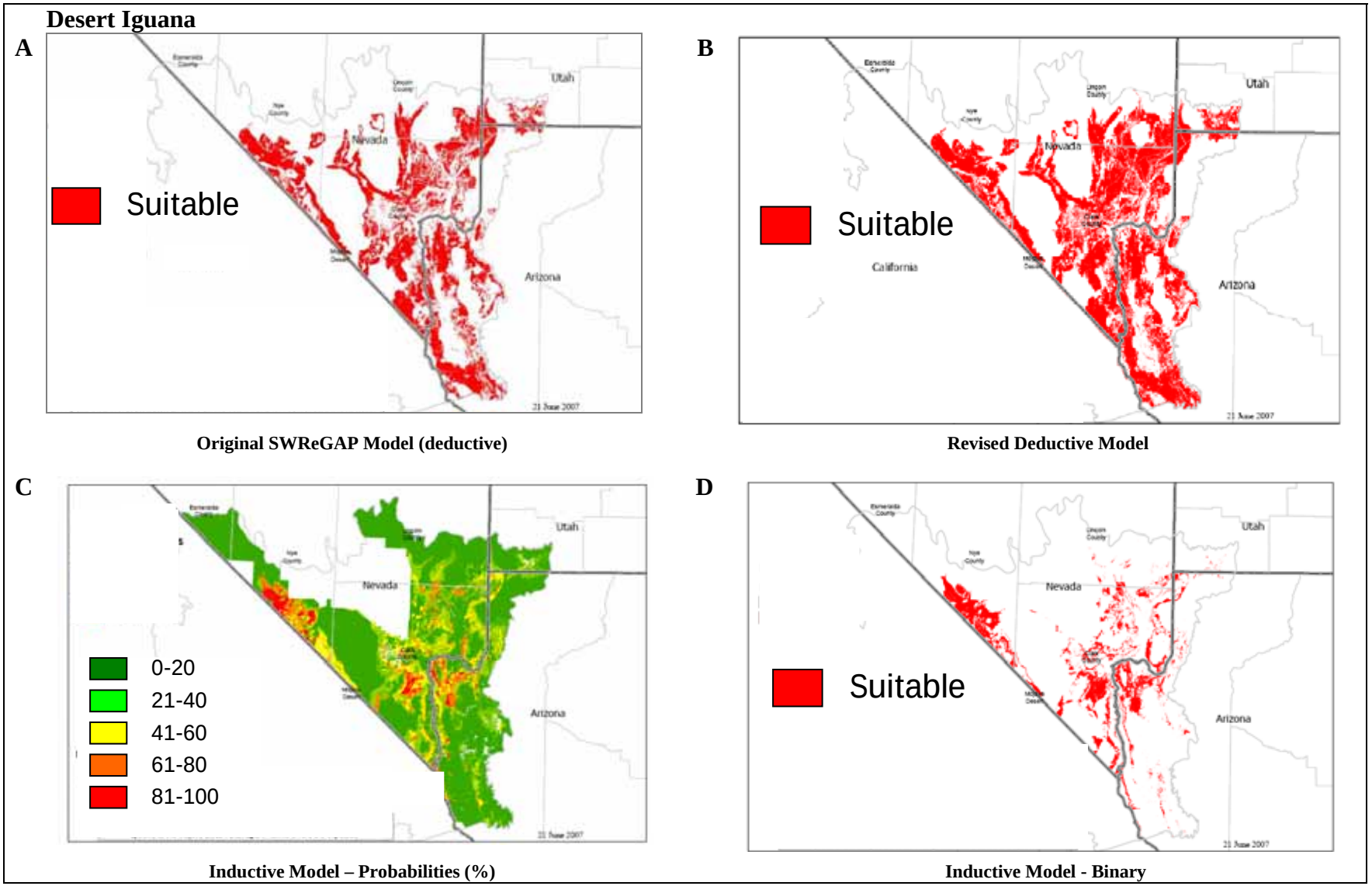


Figure 10. Predicted habitat distribution for the desert iguana in the Mojave Desert Ecoregion: (A) original SWReGAP deductive model, (B) revised deductive model, (C) inductive model represented as probabilities (%) for species occurrence, and (D) inductive model represented in binary fashion (i.e., suitable/not suitable) using a 52.9 threshold. Gray outlines indicate county boundaries and Mojave Desert Ecoregion. For the two inductive models (C and D), portions of the study area could not be modeled due to missing information (see Fig. 11B).

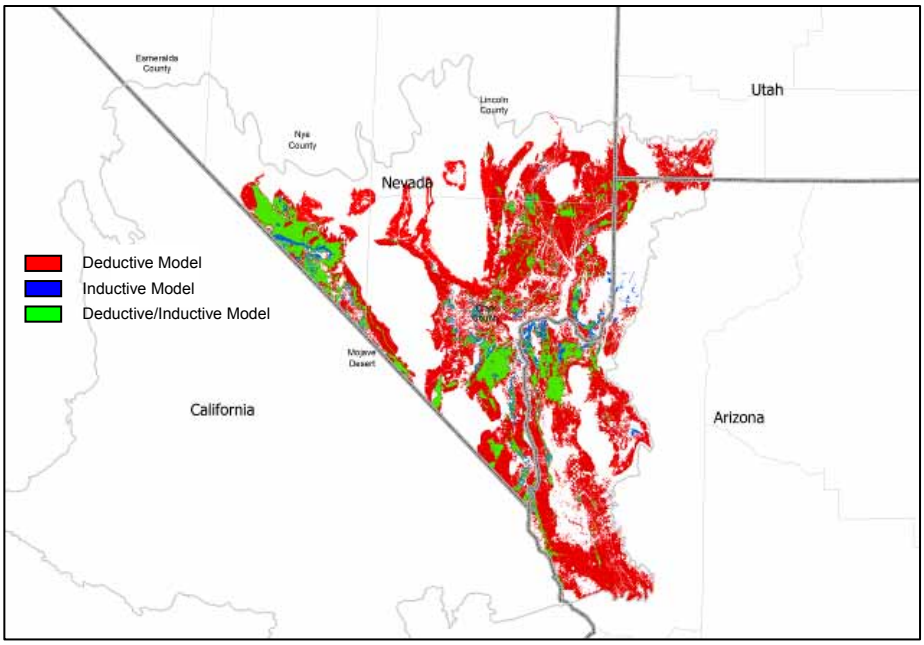
Table 6. Iterations of Maximum Entropy Models for four species within the Mojave Desert Ecoregion. The selected model for each species is italicized. Variables used in models are listed at top.

Model Name	Elevation	Land Cover	Land Form	Sand	Rock	Distance to Mesquite	Distance to Streams	Slope	AUC[1]	Equal[2]	O[3] Rate
Desert Iguana											
SWReGAP*	x	x	x						0.928	44.9	0.139
Mod 1	x	x	x	x					0.945	49.4	0.127
Mod 2	x	x							0.914	48.8	0.125
Mod 3	*x*	*x*		*x*					*0.945*	*52.9*	*0.112*
Mod 4	x			x					0.935	52.2	0.113
Mod 5		x		x					0.926	49.5	0.130
Mod 6	x	x	x	x				x	0.946	49.4	0.127
Mod 7	x	x		x				x	0.946	50.5	0.119
Mod 8	x		x	x				x	0.938	51.7	0.140
Mod 9	x	x	x	x		x		x	0.951	50.4	0.093
Phainopepla											
SWReGAP*		x					x		0.782	40.0	0.278
Mod 1	x	x					x		0.810	41.5	0.259
Mod 2	x	x							0.750	42.3	0.407
Mod 3		x				x			0.902	24.4	0.148
Mod 4	x	x				x			0.904	29.8	0.130
Mod 5		*x*				*x*	*x*		*0.914*	*30.9*	*0.167*
Mod 6						x	x		0.905	29.2	0.150
Mod 7	x	x	x	x		x		x	0.912	30.0	0.208
Desert Kangaroo Rat											
SWReGAP*	x	x							0.771	26.3	0.667
Mod 1	*x*	*x*		*x*					*0.845*	*23.5*	*0.231*
Mod 2	x			x					0.799	24.2	0.429
Mod 3		x		x					0.831	33.6	0.462
Mod 4	x	x	x	x				x	0.865	25.9	0.231
Chuckwalla											
SWReGAP*	x	x							0.768	46.8	0.286
Mod 1	x	x			x				0.805	40.4	0.287
Mod 2	x				x				0.751	41.8	0.373
Mod 3		x			x				0.753	56.1	0.486
Mod 4	x	x	x					x	0.815	35.9	0.297
Mod 5	*x*	*x*	*x*		*x*			*x*	*0.833*	*38.8*	*0.305*

*SWReGAP model indicates variables used in original deductive model in Southwest Regional Gap Analysis Project.
[1]AUC= Area under the Curve metric as derived by Receiver Operator Characteristics (ROC) Plot (see text)
[2]Equal= Equal sensitivity and specificity threshold (see text)
[3] = Omission Rate

Desert Iguana

A



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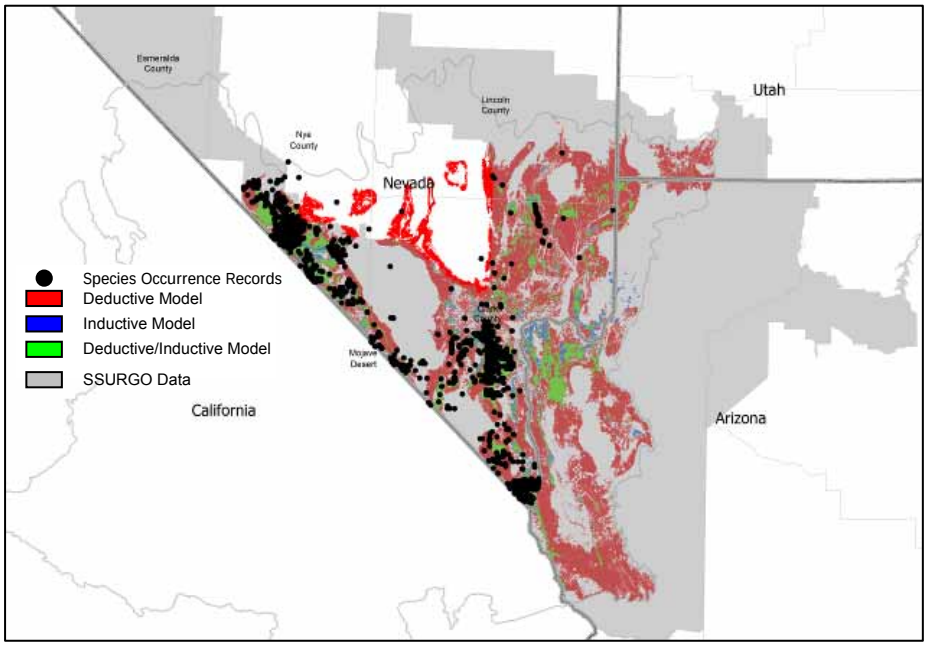


Figure 11. Predicted distribution of suitable habitat for the desert iguana in an overlay of the revised deductive model (from Fig. 10B) and the binary inductive model (from Fig. 10D) showing: (A) models only, and (B) models with occurrence points and distribution of SSURGO soils data.

Phainopepla

For the revised deductive model (Fig. 12B) we added 100 m from wetlands because riparian vegetation in the ecoregion is often associated with the SWReGAP wetlands coverage (e.g., Las Vegas Wash) as well as the coverage for permanent flowing water. Riparian habitat in the region often includes mesquite. Hydrology was identified to be used as an "or" statement with land cover. For land cover we added Sonora-Mojave Creosotebush-White Bursage Desert Scrub because many locality records (Nevada Breeding Bird Atlas [Floyd et al. 2007], Nevada Bird Count, NDOW) were in this land cover type. However, we acknowledge that this inclusion may overestimate the extent of predicted habitat. We also added a new coverage for mesquite/acacia woodlands from Crampton et al. (2006; habitat_merged05.shp). This coverage was identified after completion of the SWReGAP project and was only available for the Nevada portion of the study area. We deleted agriculture as a land cover type because agriculture in the ecoregion has few shrubs or trees. We also deleted a number of land cover types not found in Mojave Ecoregion (see report at Web site).

For the inductive model, we initially created eight habitat models using between two and six variables (Table 6). We used 223 sites for model training and withheld 54 additional sites for testing. The AUC values for these models ranged from 0.782 to 0.914 (Table 6). The highest AUC value (0.914) was associated with the three-variable model (land cover, distance to mesquite, and distance to permanent streams; Figure 12C). This model makes biological sense given the phainopepla's dependence on mistletoe associated with mesquite/acacia vegetation (Crampton et al. 2006), and the common occurrence of this vegetation along desert streams. The relative contribution of each variable to the model was dominated by distance to mesquite (91.0%), with distance to streams (6.5%) and land cover (2.5%) making up smaller proportions. We converted the selected inductive model to a binary model using the equal sensitivity and specificity threshold of 30.9 (Figure 12D). All phainopepla models showed low habitat suitability within Arizona presumably because of the lack of data for occurrence points and lack of mesquite/acacia data in Arizona. We identified a 16.7% omission error with the selected model using the equal sensitivity threshold.

The selected inductive model used the same variables that were used in the revised deductive model with the exception that distance to wetlands was used in the deductive model but not in the inductive model. The regional distance to wetland dataset used was limited in our study areas, with only a few identified wetlands within the entire ecoregion. Despite the use of nearly the same variables, the extent of habitat predicted by the inductive model was much less than that predicted by the revised deductive model, with most of the inductive model overlapping the deductive model (Fig. 13A). The primary reason for the large difference in the extent between the two models appears to be because the deductive model included expansive land cover types such as the Sonora-Mojave Creosotebush-White Bursage Desert Scrub, whereas the inductive model emphasized the mesquite/acacia coverage. The distribution of occurrence points match the inductive model much better than deductive, a finding that is not surprising given that the occurrence points were used to construct the inductive model (Fig. 13B).

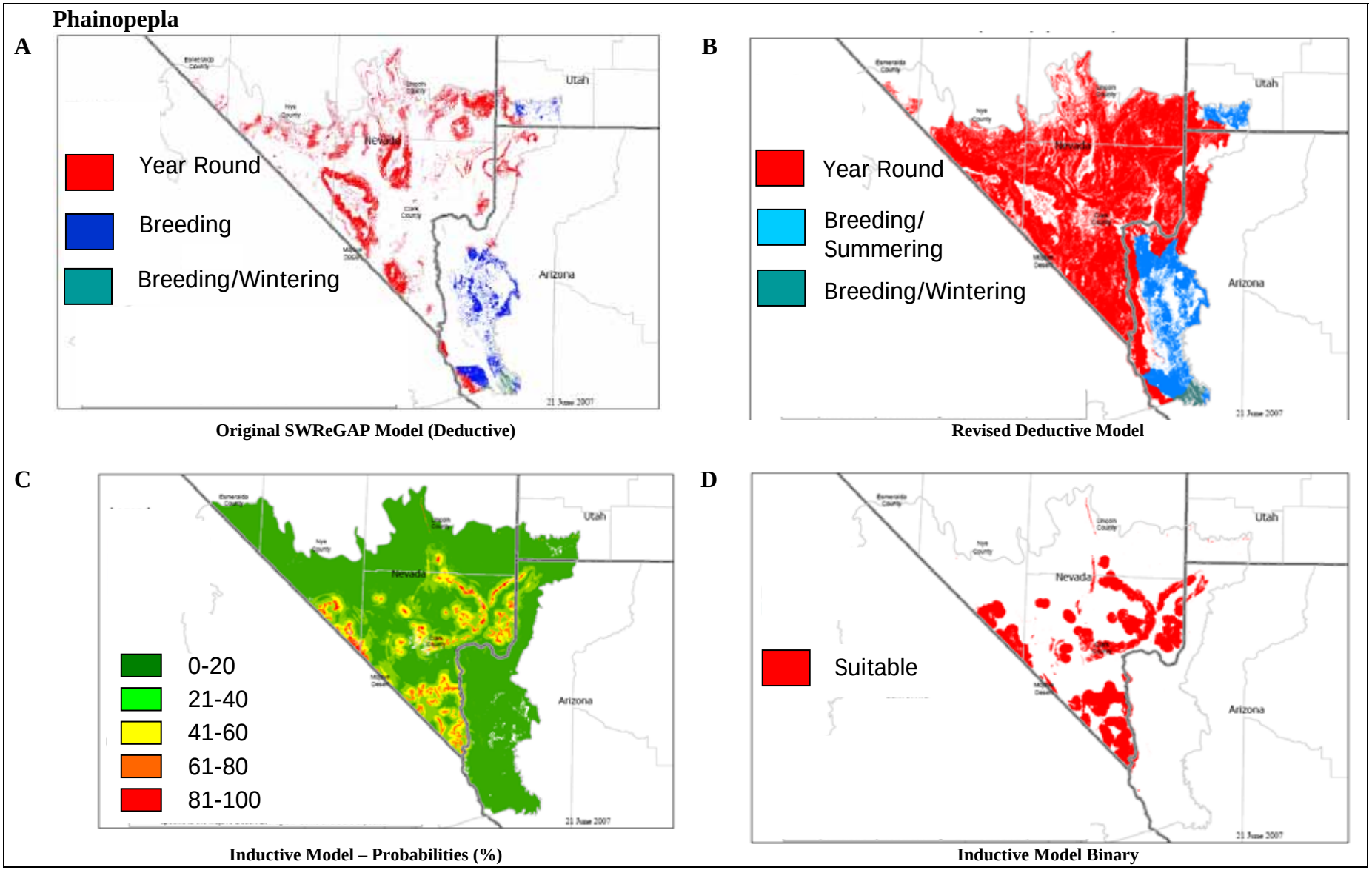
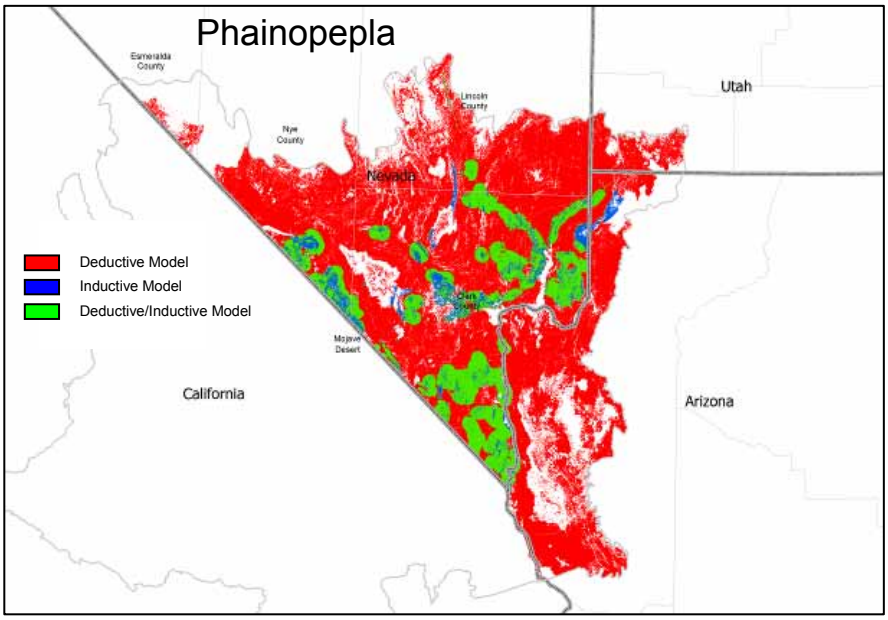


Figure 12. Predicted habitat distribution for phainopepla in the Mojave Desert Ecoregion: (A) original SWReGAP deductive model with suitable (year round), summer breeding, and winter breeding habitat, (B) revised deductive model with suitable (year round), summer breeding, and winter breeding habitat, (C) inductive model represented as probabilities (%) for suitability, and (D) inductive model represented in binary fashion (i.e., suitable/not suitable) using a 30.9 threshold. Gray outlines indicate county boundaries and Mojave Desert Ecoregion.

A



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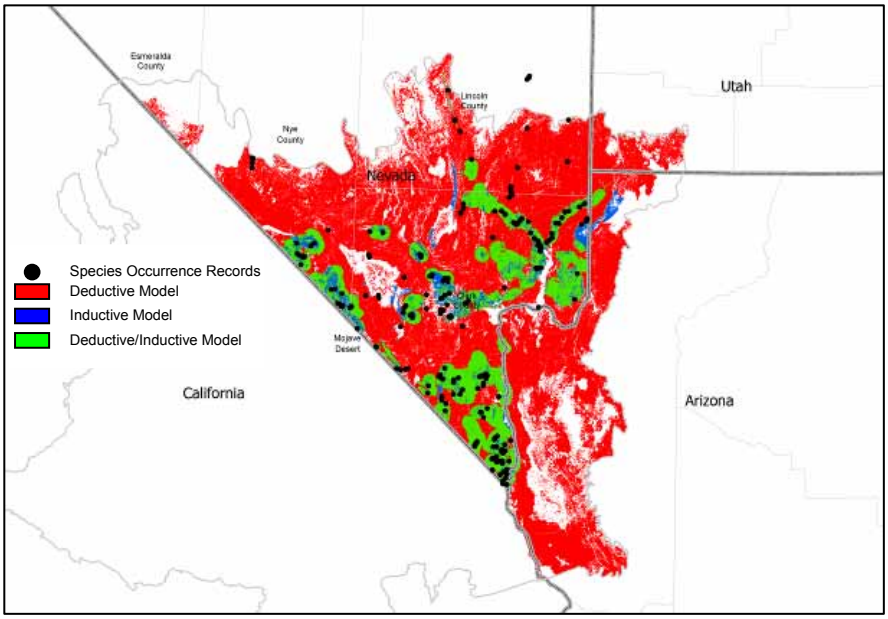


Figure 13. Predicted distribution of suitable habitat for the phainopepla in an overlay of the revised deductive model (from Fig. 12B) and the binary inductive model (from Fig. 12D), showing: (A) models only, and (B) models with occurrence points.

Desert Kangaroo Rat

For the revised deductive model (Fig. 14B) we deleted one land cover type that was not represented in Mojave Desert Ecoregion (Inter-Mountain Basins Wash [S014]). No other changes were made to the model for this species.

For the inductive model, we initially created five habitat models with AUC values ranging from 0.771 to 0.865 (Table 6). We used 50 sites for model training and withheld 13 additional sites for testing. As for the desert iguana models, the highest AUC model had the most variables. The simplest model had the second highest AUC value (Mod 1), with only three variables: elevation, land cover, and percent sand (Figure 14C). An increase in model accuracy (i.e., AUC) occurred when including sand percentage within the model (comparison of SWReGAP model and Mod 1). Increases in AUC were also seen when including land cover (comparison between Mod 3 and Mod 1) or elevation (comparison of Mod 4 and Mod 1). The relative contribution of each variable to the model was dominated by land cover (45.1%), elevation (41.8%), with sand (13.1%) a smaller proportion. We converted the chosen model to a binary model using the equal sensitivity and specificity threshold of 23.5 (Table 6; Figure 14D). We identified a 23.1% omission error with the selected model using the equal sensitivity threshold (Table 6).

The variables used in the inductive model differed from those in the original and revised deductive models by the inclusion of percent sand only in the inductive model. The SSURGO soils data set was not considered in the original SWReGAP models because it was not available throughout the 5-state area. A comparison of the inductive model (binary form; Fig. 14D) with the revised deductive model (Fig. 14B) shows that the inductive model predicts far more habitat for the desert kangaroo than the deductive model (Fig. 15A). This large difference appears to result from the limited land cover types selected for the deductive model, i.e., dunes and wash habitats only. Although the desert kangaroo rat is generally associated with sandy soils, such soils occur in SWReGAP land cover types other than dunes and washes. The inclusion of the SSURGO dataset for percent sand in the inductive model provided information not used in the two deductive models. The distribution of occurrence points match the inductive model much better than the deductive model, a finding that is not surprising given that the occurrence points were used to construct the inductive model (Fig. 15B).

As for the desert iguana, a shortcoming of the inductive model is the two “holes” in the study area that could not be modeled because the SSURGO dataset was not available for these areas (Fig. 15B). A number of locality records occurred within these “holes.” Another shortcoming is that no occurrence records were obtained for the main part of the study area in Arizona, which included land cover types virtually unrepresented in Nevada (Fig. 15B). This may account for the lack of modeled habitat for much of the Mojave Desert Ecoregion in Arizona.

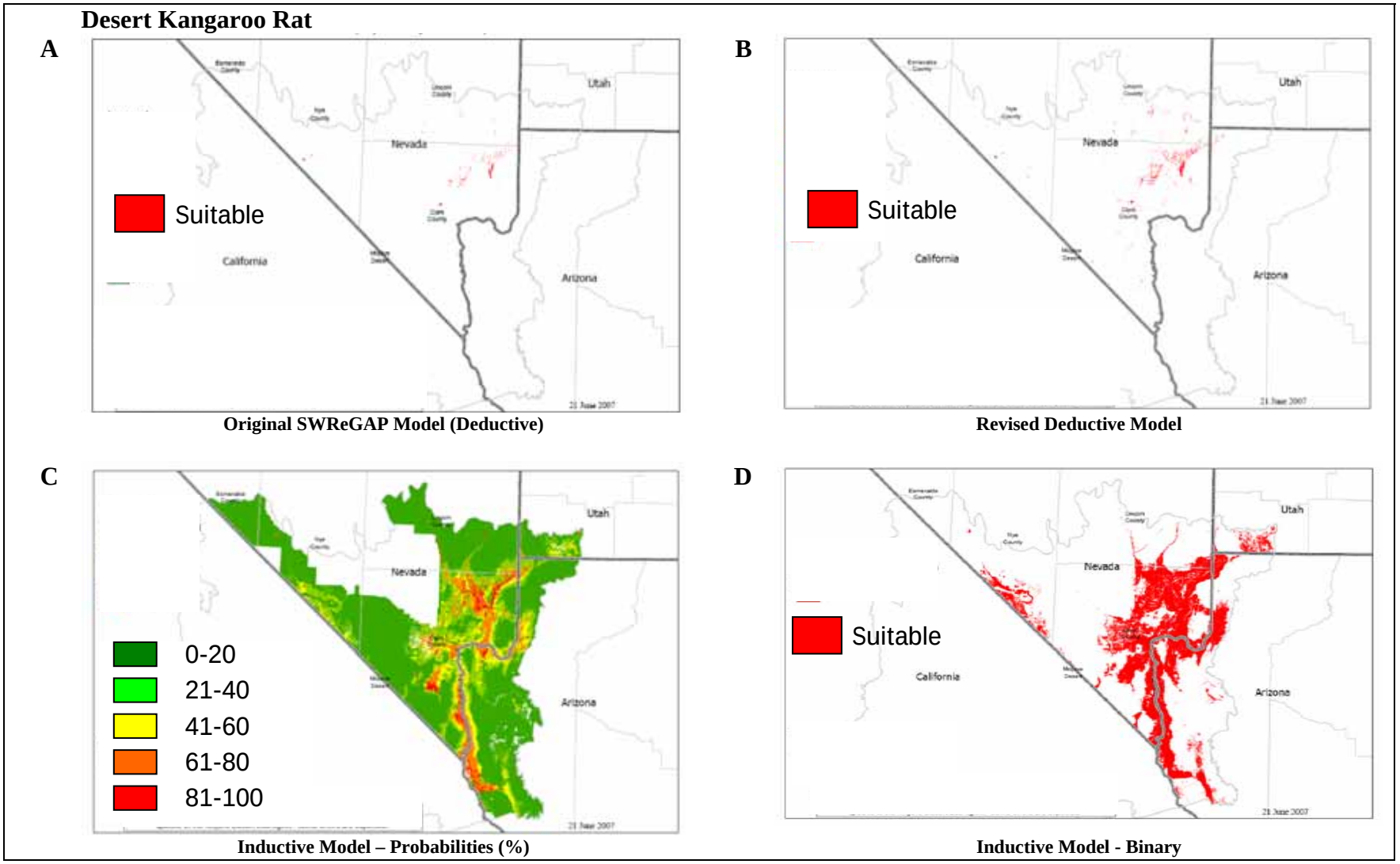
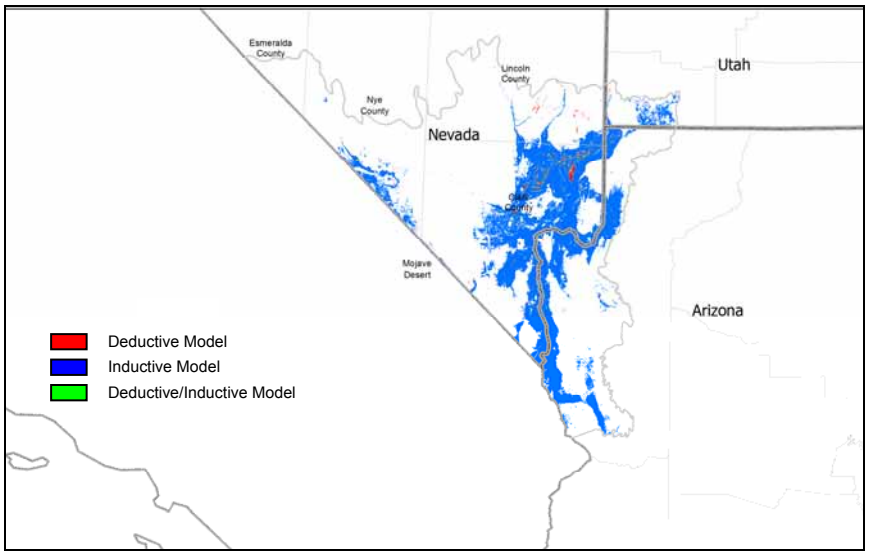


Figure 14. Predicted habitat distribution for the desert kangaroo rat in the Mojave Desert Ecoregion: (A) original SWReGAP deductive model, (B) revised deductive model, (C) inductive model represented as probabilities (%) for suitability, and (D) inductive model represented in binary fashion (i.e., suitable/not suitable) using a 23.5 threshold. Gray outlines indicate county boundaries and Mojave Desert Ecoregion. Visual differences between deductive (A) and (B) models are due to image creation; there are no changes in actual suitable habitat. For the two inductive models, portions of the study could not be modeled due to missing information (see Fig. 15B below).

Desert Kangaroo Rat

A



B

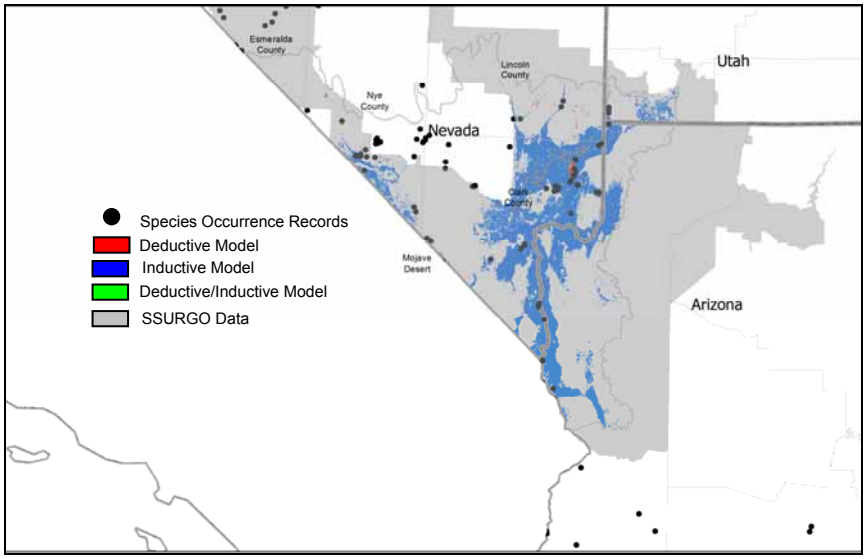


Figure 15. Predicted distribution of suitable habitat for the desert kangaroo rat in an overlay of the revised deductive model (from Fig. 14B) and the binary inductive model (from Fig. 14D) showing: (A) models only, and (B) models with occurrence points and distribution of SSURGO soils data.

Common Chuckwalla

For the revised deductive model (Fig. 16B) we added 3 HUCs to be consistent with locality records and Stebbins (2003; see report at Web site for specific HUCS). We also increased the elevation maximum from 1370 to 1830 m (Stebbins 1985). This increase included nearly all locality records. We also included STATSGO soil polygons with rocky outcrops >15% of area. This overpredicts habitat, but captures most of the locality records. We also added several land cover types that occur below pinyon-juniper communities that could occur in rocky areas. The original land cover types were only cliff, canyon, and outcrops types. We note that the model would be improved with a better layer for rocky outcrops and bouldery areas.

For the inductive model, we initially created nine habitat models with AUC values ranging from 0.751 to 0.899 (Table 6). We used 1797 sites for model training and withheld 449 additional sites for testing (many sites were duplicates). Similar to the desert iguana and desert kangaroo rat, the model with most variables had the highest AUC value. However, two variables (i.e., distance to mesquite and percent sand) had no identified biological relationship with the common chuckwalla. We thus selected Mod 5 to represent the species' habitat, with an AUC value of 0.833 (Figure 16C). The variables in this model were elevation, land cover, land form, rock (SSURGO), and slope. The relative contribution of each variable to the model was dominated by land cover (30.2%), rock (29.3%), and elevation (21.6%) with slope (12.1%) and landform (6.8%) comprising smaller proportions. This model was converted to a binary model using the equal sensitivity and specificity threshold of 38.8 (Figure 16D). We identified a 30.5% omission error with the selected model using the equal sensitivity threshold (Table 6).

Given the chuckwalla's dependency on rocky terrain, we were disappointed that the rock layer generated from the SSURGO dataset did not coincide with a large portion of the locality records for the species. This may be because SSURGO does not include a rock or outcrop layer per se. The rock layer was generated by selecting class names that reflected rock outcrop, which yielded a poor representation of rocky/outcrop terrain.

The inductive model was substantially more complex than the deductive models based on the number of variables included. The original deductive model used elevation and only 3 land cover types. The revised deductive model included elevation, land cover (10 types), and rock outcrop (STATSGO), whereas the inductive model included elevation and land cover, plus land form, slope, and rock (SSURGO). SSURGO was not available for original SWReGAP and was incomplete for our current study area. A comparison of the inductive model (binary form; Fig. 16D) with the revised deductive model (Fig. 16B) shows that the two models predict about the same extent of area (within the area where SSURGO data was available and this comparison can be made). However, the two models predict habitat in different places for much of the area (Fig. 17A). The differences are likely based on the included land cover types and the scale of the rock datasets. These two variables and elevation contributed the most to the inductive model. STATSGO is a coarser dataset than SSURGO, and should lead to increases in commission error. The distribution of occurrence points match the inductive model much better than deductive, a finding that is not surprising given that the occurrence points were used to construct the inductive model (Fig. 17B).

As for the desert iguana and desert kangaroo rat, a shortcoming of the inductive model is the two "holes" in the study area that could not be modeled because the SSURGO dataset was not available for these areas (Fig. 17B). A few locality records occurred within these "holes." Another shortcoming is that no occurrence records were obtained for the main part of the study area in Arizona, which included land cover types virtually unrepresented in Nevada (Fig. 17B). This may account for the lack of modeled habitat for much of the Mojave Desert Ecoregion in Arizona.

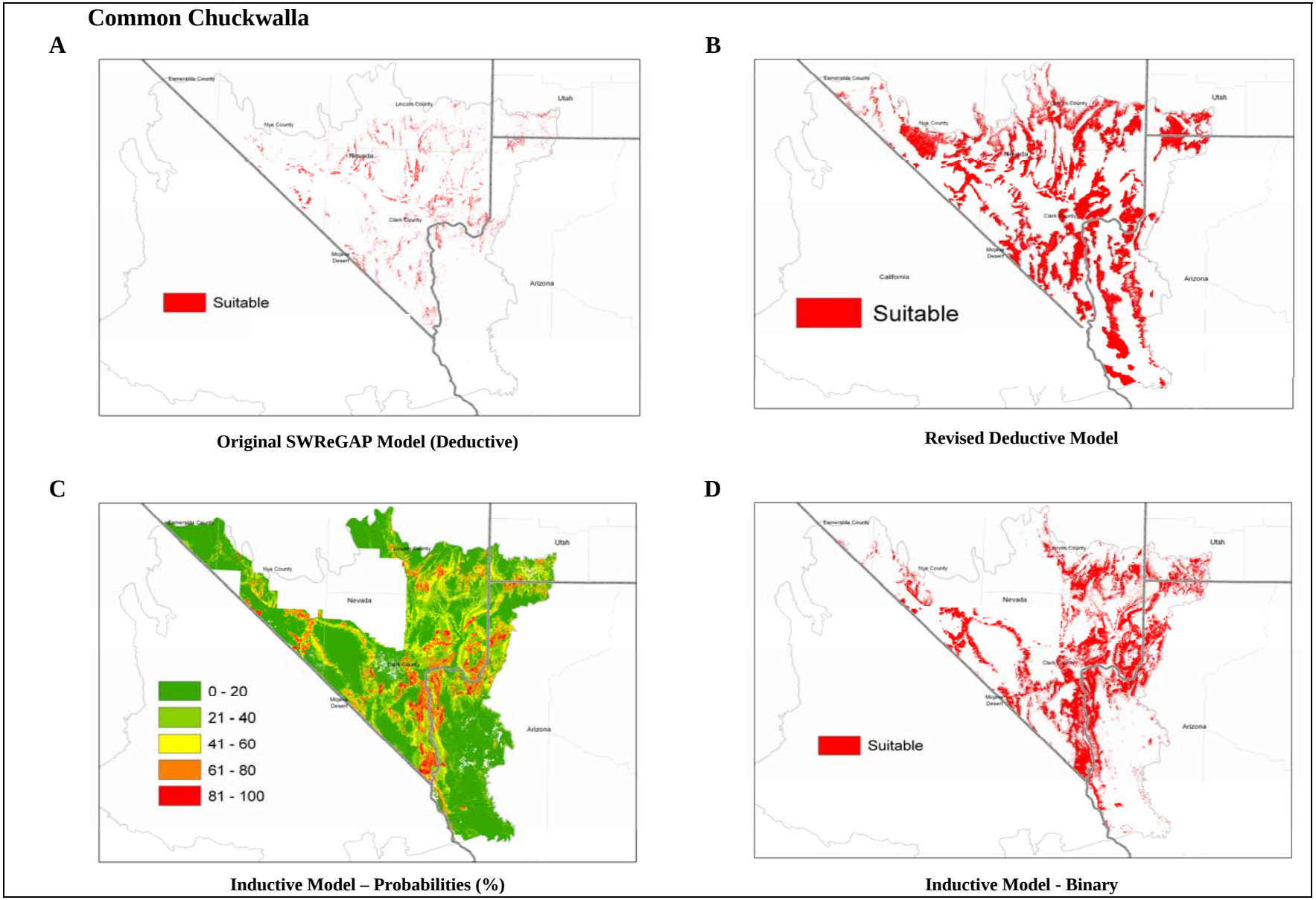
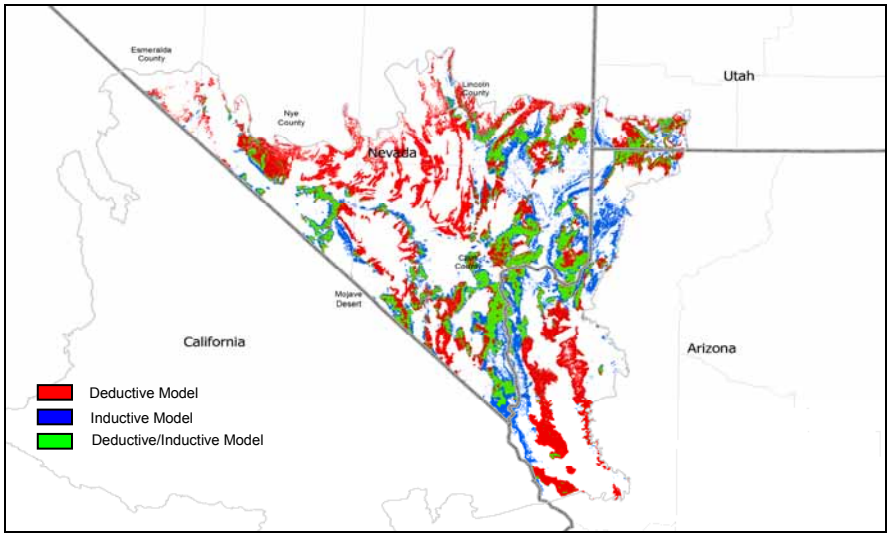


Figure 16. Predicted habitat distribution for the common chuckwalla in the Mojave Desert Ecoregion: (A) original SWReGAP deductive model, (B) revised deductive model, (C) inductive model represented as probabilities for suitability, and (D) inductive model represented in binary fashion (i.e., suitable/not suitable) using a 38.8 threshold. Gray outlines indicate county boundaries and Mojave Desert Ecoregion. For the two inductive models, portions of the study could not be modeled due to missing information (see Fig. 17B below).

Common Chuckwalla

A



B

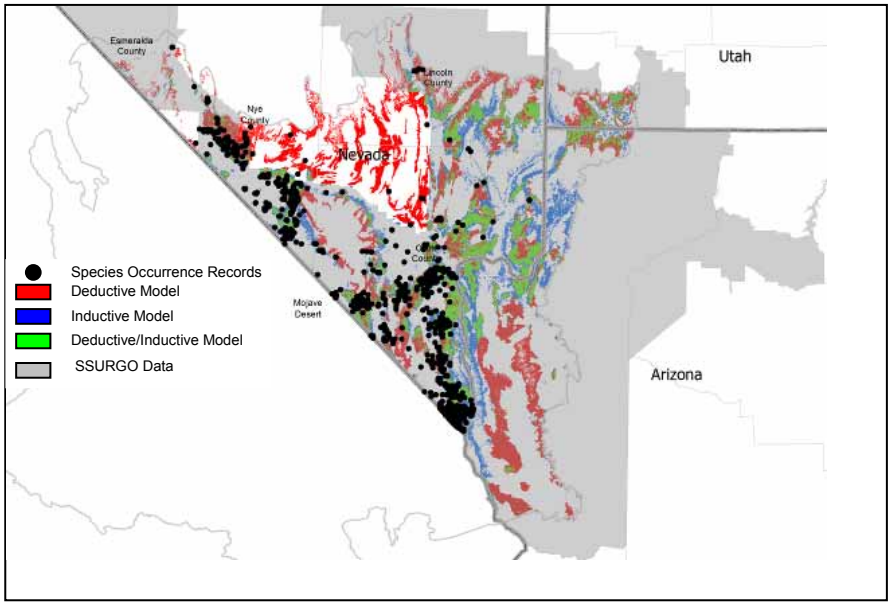


Figure 17. Predicted distribution of suitable habitat for the common chuckwalla in an overlay of the revised deductive model (from Fig. 16B) and the binary inductive model (from Fig. 16D) showing: (A) models only, and (B) models with occurrence points and distribution of SSURGO soils data.

General Discussion

Scale Down of SWReGAP Models

A question at the outset of this project was whether the SWReGAP habitat models, which were developed for use in a large 5-state area, would be applicable within a small portion of this area, specifically the Mojave Desert Ecoregion and Clark County, Nevada. A general answer to that question is yes, based on the finding that the revised deductive models for these specific areas usually retained most of the traits of the original models. With that said, however, we found it appropriate to revise 35 of the 37 original models based on the narrower geographic focus and additional information for the localized area. The extent of habitat predicted by the original and revised models often differed widely, although the median change in habitat extent among the species was not great (i.e., increase of 4.1%). Given the greater input and specificity for the revised models than the original models, the revised deductive models would clearly be the better starting point for evaluating habitat distribution for species addressed by the Clark County Multiple Species Habitat Conservation Plan.

Comparison of SWReGAP & Clark County Management Category Statistics

The Gap Analysis statistics derived for the SWReGAP Management Status categories were generally similar to those derived for MSHCP Conservation Management Areas, yet the two categorization schemes were developed independently. Concordance between the two schemes was strong when the schemes were reduced to three categories. This concordance provides a basis for comparing Gap statistics for MSHCP categories within Nevada or the 5-state region as a whole. Interestingly, the proportion of habitat that is in the most protected categories (i.e., Status 1 and 2 of GAP, which roughly corresponds to IMAs and LIMAs of Clark County) is much higher for most of the 37 species addressed herein for the Mojave Desert Ecoregion and Clark County than for the 5-state region as a whole.

Inductive vs. Deductive Models

The inductive models were similar to the original SWReGAP models in that many of the variables used in the original models were also used in the inductive models. For example, land cover was used in both deductive and the selected inductive models for all four species. However, the inductive model iterations that used only the original SWReGAP model variables were the worst performing models of all iterations in every case (Table 1). The major difference between the inductive and deductive models was that for all four inductive models, a variable was included in the inductive models that was not available for the original deductive models (i.e., mesquite/acacia, or SSURGO sand or rock). Thus, the data-driven inductive models generally corroborated the selection of deductive model variables based on literature, but identified further relationships not found within the literature. Caution must be used as occurrence points were often generated from the same areas as literature derived inputs.

We feel that the inductive models for the four target species more accurately depicted suitable habitat for the species than the original or revised deductive models. The inductive models were driven by known occurrence records, which allow development of species-environment associations without precise knowledge of this association. The locality records clearly fit the inductive models better than the deductive models. Although this is not surprising given that the locality records were used to build the inductive models, the differences were striking. Deductive models predicted habitat in large areas lacking records (e.g., desert iguana) or failed to predict habitat in large areas with known records (e.g., desert kangaroo rat). A key to success in inductive modeling, however, is the availability of accurate and

precise locality records and accurate coverages for key environmental features. For the desert iguana, the imprecision of many locality records may have not had pronounced effects because the land cover and soil types inhabited by this species are often extensive. For the chuckwalla, however, inaccuracies in both the locality records and the rock coverage were thought to be a problem. For the phainopepla we were fortunate in having many precise locality records from sources other than museum records, and a precise coverage for mesquite/acacia habitat. For the desert kangaroo rat, we were also fortunate in having a number of precise locality records, but the total sample size was small. For all four species, it must be noted that an on-the-ground accuracy assessment would be required to quantitatively assess the accuracy of the models.

Limitations of the Inductive Models

A conspicuous limitation to inductive modeling in the present study was lack of complete coverage by the SSURGO soils data set. A particularly large "hole" in the dataset includes the Nellis Bombing Range and Nevada Test Site. A second conspicuous limitation was the paucity of locality records from the Arizona portion of the Mojave Desert Ecoregion. Since two land cover types predominate in this area, but are virtually unrepresented in Nevada, the models predicted this area to be largely unsuitable for all four species. However, this area may indeed contain much suitable habitat for these species. A third limitation was the coarse precision of many of the occurrence records used in model building. The latter concern might be reduced by excluding records with the lowest precision.

Next Steps for Improving Models for the Four Target Species

For conservation planning, habitat models with a known level of accuracy will be required. As suggestions for how to improve currently available habitat models and establish the level of accuracy, we offer the following general steps for the four species addressed by inductive modeling in the present study. (a) Evaluate existing occurrence records more closely for accuracy and precision, and redo the inductive modeling using sets of records with different levels of accuracy/precision. (b) Using the inductive model as a guide, conduct a field study to assess the accuracy of the model. At the same time, obtain precise location data to improve the model and identify key habitat characteristics associated with site occupancy. (c) Obtain or develop spatial datasets for key habitat characteristics identified, either through interpretation of existing datasets (e.g., satellite imagery, SSURGO) or ground surveys. Consider additional datasets, such as the climate datasets under development for use in desert tortoise habitat modeling by USGS (USGS-BRD Western Ecological Research Center, Henderson, Nevada). (d) As new information is obtained for species occurrence and distribution of habitat characteristics, redo inductive modeling and accuracy assessment as an iterative process.

Implications and Suggestions for Conservation Planning

1. Models are required to depict the distribution of suitable habitat.

Conservation planners need to recognize that some sort of model is necessary to estimate the distribution and extent of suitable habitat for a species in a region. For many situations, it is not possible to determine the distribution of the species in all areas. Moreover, even when this is possible, such as taxa with conspicuous habitat affinities or very localized distributions, it is usually difficult to precisely define the conditions associated with presence/absence, and it is impossible to know the future distribution of the species. Thus, a model is required to identify areas with the conditions suitable for the species, which may reflect where the species indeed occurs now or may occur in the near future.

2. Models developed at a large spatial scale can likely be improved for use at a local scale.

Models developed at large spatial scale (e.g., GAP and SWReGAP) are based on a few environmental datasets with widespread coverage, and in most cases only one model for a species is applied to the entire area. In a localized setting, more detailed information for species-habitat associations may be available, and more detailed information may also be available for the distribution of habitat features. In the present study, we revised 35 of the 37 SWReGAP models taking into account local conditions, habitat associations, and datasets available. Ultimately, field studies may fill the key gaps in the large-scale or general models. For example, for the relict leopard frog (*Rana onca*), the conservation team for this species has identified virtually all potentially suitable habitat in the southern Nevada region by surveying for conditions stipulated by the model: permanent water below 1000 m elevation that lacks nonnative fishes, crayfish, and bullfrogs. The SWReGAP model for this species, in contrast, does a poor job of identifying such habitat because of the lack of accurate coverages for permanent water (e.g., permanent vs. ephemeral springs), and lack of coverages for the distributions of the nonnative taxa.

3. Limitations of habitat suitability models.

The development of accurate habitat suitability models is limited by the knowledge of species-habitat associations and by the availability of coverages for the key habitat characteristics. Moreover, models typically do not address habitat quality, condition, or seral stage. Something that must also be kept in mind is that models predict distribution of habitat, not species occurrence or abundance. Interpretations of model predictions must be viewed in context of such limitations.

4. Inductive modeling vs. deductive modeling.

When location data can be obtained, inductive modeling has the potential to yield a more insightful and accurate model than a deductive model. Inductive models may detect associations beyond those available from the literature, and the result is a prediction of habitat distribution by probability values rather than binary representation (i.e., suitable vs. non-suitable). A major concern for inductive modeling, however, is the precision and number of occurrence locations and their distribution throughout the range of the species. Also, some points may be inaccurate. Many taxa addressed by the Clark County MSHCP other than the four addressed in this study would be amenable to inductive modeling.

5. Models drive field studies.

Field studies are an essential part of conservation planning to determine species distribution, population status, habitat associations, life history traits, and other aspects of a species' biology. Existing habitat suitability models can provide a basis for identifying locations for study, developing a sampling design, and identifying habitat characteristics to address. Too often, field studies and locality records are concentrated in areas where a species' abundance is high or habitat conditions are of high quality. Models can be used to identify other areas that represent the range of suitable habitat available. In studies designed to address species-habitat associations, it is important to include habitat variables that can be obtained from existing or derivable datasets. If information for a key habitat characteristic is not available throughout the range of the species in the area of interest (e.g., Clark County), knowledge of the species-habitat association may be of little use in mapping suitable habitat for the species.

6. Accuracy assessment.

Models need to have some type of accuracy assessment to be widely accepted. Moreover, a quantified estimate of a model's accuracy may be important in management decisions or the development of field studies. For inductive models, a fraction of the records can be withheld from model development and used to assess the accuracy of the resulting model. For both inductive and deductive models, a field study can provide the most thorough assessment of accuracy by obtaining new, precise data for both location and habitat characteristics.

7. Iteration in model development.

For a limited number of species, such as some of those within the MSHCP, it may be financially and logistically feasible to conduct an iterative modeling effort. In this effort, data from field work in one year (or other time frame) is used to assess the accuracy of the existing model and to modify this model. Subsequently, new field work is done to test the revised model, and revise it for further testing and improvement. This iterative process would allow the models to be refined as knowledge is gained not only for the presence/absence of the species but also for associations of the species with mappable habitat characteristics. Such an iterative process would represent adaptive management (Williams et al. 2007).

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Appendices

Appendix A.

Datasets Considered in Inductive Modeling

Datasets considered for inductive modeling.

DATA	VARIABLE	RESOLUTION	SOURCE
Land cover*		30-m	Southwest Regional Gap Analysis Project (SWReGAP)
Elevation*		30-m	SWReGAP
Slope*		30-m	SWReGAP
Aspect*		30-m	SWReGAP
Distance to Springs		30-m	SWReGAP
Distance to Streams*		30-m	SWReGAP
Distance to Lakes		30-m	SWReGAP
Distance to Wetlands*		30-m	SWReGAP
Landform*		30-m	SWReGAP
8-digit HUCS		30-m	SWReGAP
Mountain Ranges		30-m	SWReGAP
Soils		30-m	State Soil Geographic Database (STATSGO)
Elevation		10-m	Clark County
Slope		10-m	Clark County
Aspect		10-m	Clark County
Climate	Precip	1000-m	Mojave Desert Ecosystem Project (MDEP)
	Temp Max	1000-m	MDEP
	Temp Min	1000-m	MDEP
	PET	1000-m	MDEP
	PRISM	1000-m	Nevada Geospatial Data Browser (NGDB)
	Mean Daily Max Air Temp	1000-m	NGDB
	Mean Daily Min Air Temp	1000-m	NGDB
	Daily Total Precip	1000-m	NGDB
Mines			MDEP
Mine Shafts			NGDB
Tunnels and Caves			NGDB
Soils	5 coverages		MDEP
Soils*	Percent Sand		Soil Survey Geographic Database (SSURGO)
	Rock Outcrop		SSURGO

* Datasets used in inductive modeling
MDEP = Mojave Desert Ecosystem Project (http://www.mojavedata.gov/)
SWReGAP = Southwest Regional Gap Analysis Project (fws-nmcfwru.nmsu.edu/swregap)
NGDB = Nevada Geospatial Data Browser (http://www.epa.gov/nerlesd1/land-sci/nv_geospatial/nv_geospatial_data_browser.htm)
STATSGO = State Soil Geographic Database (http://soils.usda.gov/survey/geography/statsgo/)
SSURGO = Soil Survey Geographic Database (http://soils.usda.gov/survey/geography/ssurgo/)

Appendix B.

Land Cover Types Mapped within the Mojave Desert Ecoregion for Southwest Regional Gap Analysis Project

Land cover types are referred to as ecological systems in SWReGAP. Descriptions for ecological systems are provided at http://earth.gis.usu.edu/swgap/legend_desc.html

CODE	Ecological System Name
S009	Inter-Mountain Basins Cliff and Canyon
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland
S011	Inter-Mountain Basins Shale Badland
S012	Inter-Mountain Basins Active and Stabilized Dune
S013	Inter-Mountain Basins Volcanic Rock and Cinder Land
S015	Inter-Mountain Basins Playa
S016	North American Warm Desert Bedrock Cliff and Outcrop
S017	North American Warm Desert Badland
S018	North American Warm Desert Active and Stabilized Dune
S019	North American Warm Desert Volcanic Rockland
S020	North American Warm Desert Wash
S021	North American Warm Desert Pavement
S022	North American Warm Desert Playa
S026	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland
S032	Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
S034	Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
S036	Rocky Mountain Ponderosa Pine Woodland
S039	Colorado Plateau Pinyon-Juniper Woodland
S040	Great Basin Pinyon-Juniper Woodland
S045	Inter-Mountain Basins Mat Saltbush Shrubland
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland
S052	Colorado Plateau Pinyon-Juniper Shrubland
S054	Inter-Mountain Basins Big Sagebrush Shrubland
S055	Great Basin Xeric Mixed Sagebrush Shrubland
S057	Mogollon Chaparral
S058	Apacherian-Chihuahuan Mesquite Upland Scrub
S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland
S060	Mojave Mid-Elevation Mixed Desert Scrub
S063	Sonoran Paloverde-Mixed Cacti Desert Scrub
S065	Inter-Mountain Basins Mixed Salt Desert Scrub
S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub
S070	Sonora-Mojave Mixed Salt Desert Scrub
S071	Inter-Mountain Basins Montane Sagebrush Steppe
S075	Inter-Mountain Basins Juniper Savanna
S078	Inter-Mountain Basins Big Sagebrush Steppe
S079	Inter-Mountain Basins Semi-Desert Shrub Steppe
S083	Rocky Mountain Subalpine Mesic Meadow
S085	Southern Rocky Mountain Montane-Subalpine Grassland
S090	Inter-Mountain Basins Semi-Desert Grassland
S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland
S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland

CODE	Ecological System Name
S096	Inter-Mountain Basins Greasewood Flat
S097	North American Warm Desert Riparian Woodland and Shrubland
S098	North American Warm Desert Riparian Mesquite Bosque
S100	North American Arid West Emergent Marsh
S102	Rocky Mountain Alpine-Montane Wet Meadow
S114	Sonora-Mojave-Baja Semi-Desert Chaparral
S118	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland
S129	Sonoran Mid-Elevation Desert Scrub
N11	Open Water
N21	Developed, Open Space - Low Intensity
N22	Developed, Medium - High Intensity
N31	Barren Lands, Non-specific
N80	Agriculture
D02	Recently Burned
D03	Recently Mined or Quarried
D04	Invasive Southwest Riparian Woodland and Shrubland
D06	Invasive Perennial Grassland
D08	Invasive Annual Grassland
D09	Invasive Annual and Biennial Forbland

Appendix C.

Project Outputs

All Data

Description	Online Link
Final Report	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/MSHCP.doc http://www.epa.gov/nerlesd1/land-sci/default.htm
Revised Deductive Habitat Models (240-m)	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/DeductiveModels_New
Revised Deductive Habitat Models (30-m)	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/DedMod30m
Maximum Entropy Models (30-m)	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/Reports
Original Gap Statistics for Clark County and Mojave Desert Ecoregion	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalPrelimGapAnal.xls
New Gap Analysis Stewardship Statistics for Clark County and Mojave Desert Ecoregion (Appendix E)	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalStewardAnalysis.xls
New Gap Analysis Management Status Statistics for Clark County and Mojave Desert Ecoregion (Appendix D)	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalStatusAnalysis.xls
New Gap Analysis for Clark County Conservation Management Status for Clark County (Appendix F)	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalClarkCountyAnalysis.xls
Maximum Entropy Input Datasets	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/InputDatasets
Table of area of predicted habitat with original SWReGAP model and revised model	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/FinalPrePostAnalysis.xls
Table with links for digital data	http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/SpatialData.htm

Appendix D.

Gap Analysis Statistics for Revised Models for Management Status

SWReGAP Common Name	SWReGAP Scientific Name	Range Description	Management Description	Status 1		Status 2		Status 3		Status 4		Total	Status 1 & 2	
				(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)	%
RELICT LEOPARD FROG	Rana onca	K	Mojave Status	45	28.4	106	67.2	7	4.4	0	0.0	158	151	95.6
RELICT LEOPARD FROG	Rana onca	K	Clark County Status	42	26.1	90	56.7	27	17.0	0	0.1	159	132	82.9
SOUTHWESTERN TOAD	Bufo microscaphus	K	Mojave Status	0	0.0	3024	30.6	2353	23.9	4489	45.5	9865	3024	30.6
SOUTHWESTERN TOAD	Bufo microscaphus	K	Clark County Status	0	0.0	1547	47.7	622	19.2	1075	33.1	3244	1547	47.7
DESERT TORTOISE	Gopherus agassizii	K	Mojave Status	204940	6.7	841820	27.7	1474200	48.5	518600	17.1	3039560	1046760	34.4
DESERT TORTOISE	Gopherus agassizii	K	Clark County Status	108900	9.0	474050	39.1	487050	40.2	142190	11.7	1212190	582950	48.1
DESERT IGUANA	Dipsosaurus dorsalis	K	Mojave Status	99351	4.7	539560	25.5	1021300	48.2	457820	21.6	2118031	638911	30.2
DESERT IGUANA	Dipsosaurus dorsalis	K	Clark County Status	54909	6.0	346920	37.6	387590	42.1	132070	14.3	921489	401829	43.6
LONG-NOSED LEOPARD LIZARD	Gambelia wislizenii	K	Mojave Status	357420	7.9	1397500	30.8	2126400	46.8	658180	14.5	4539500	1754920	38.7
LONG-NOSED LEOPARD LIZARD	Gambelia wislizenii	K	Clark County Status	219730	13.2	687160	41.1	609750	36.5	153460	9.2	1670100	906890	54.3
DESERT HORNED LIZARD	Phrynosoma platyrhinos	K	Mojave Status	416860	8.2	1576400	31.1	2385700	47.0	692500	13.7	5071460	1993260	39.3
DESERT HORNED LIZARD	Phrynosoma platyrhinos	K	Clark County Status	244930	13.2	774790	41.9	661540	35.8	167530	9.1	1848790	1019720	55.2
GILBERT'S SKINK	Eumeces gilberti	K	Mojave Status	203370	18.8	415740	38.5	427540	39.6	33711	3.1	1080361	619110	57.3
GILBERT'S SKINK	Eumeces gilberti	K	Clark County Status	140130	31.3	215220	48.0	88925	19.8	4116	0.9	448391	355350	79.3
WESTERN BANDED GECKO	Coleonyx variegatus	K	Mojave Status	314820	7.1	1385300	31.1	2076100	46.6	676810	15.2	4453030	1700120	38.2

SWReGAP Common Name	SWReGAP Scientific Name	Range Description	Management Description	Status 1		Status 2		Status 3		Status 4		Total	Status 1 & 2	
				(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)	%
WESTERN BANDED GECKO	Coleonyx variegatus	K	Clark County Status	185020	11.0	705010	41.9	630230	37.5	161520	9.6	1681780	890030	52.9
DESERT NIGHT LIZARD	Xantusia vigilis	K	Mojave Status	291630	7.8	1246200	33.1	1768100	47.0	455250	12.1	3761180	1537830	40.9
DESERT NIGHT LIZARD	Xantusia vigilis	K	Clark County Status	166380	13.2	584890	46.4	442380	35.1	66296	5.3	1259946	751270	59.6
GILA MONSTER	Heloderma suspectum	K	Mojave Status	248310	6.8	1255600	34.2	1552300	42.3	615560	16.8	3671770	1503910	41.0
GILA MONSTER	Heloderma suspectum	K	Clark County Status	165000	10.5	663740	42.3	591750	37.7	147690	9.4	1568180	828740	52.8
GLOSSY SNAKE	Arizona elegans	K	Mojave Status	231370	6.9	930580	27.9	1613400	48.3	562330	16.8	3337680	1161950	34.8
GLOSSY SNAKE	Arizona elegans	K	Clark County Status	129620	10.2	496830	39.2	498740	39.3	143390	11.3	1268580	626450	49.4
SPOTTED LEAF-NOSED SNAKE	Phyllorhynchus decurtatus	K	Mojave Status	138080	6.0	634320	27.4	1134400	49.0	408470	17.6	2315270	772400	33.4
SPOTTED LEAF-NOSED SNAKE	Phyllorhynchus decurtatus	K	Clark County Status	72079	7.0	398400	38.5	423250	40.9	139880	13.5	1033609	470479	45.5
LONG-NOSED SNAKE	Rhinocheilus lecontei	K	Mojave Status	341150	8.7	1201300	30.7	1814700	46.3	558950	14.3	3916100	1542450	39.4
LONG-NOSED SNAKE	Rhinocheilus lecontei	K	Clark County Status	212050	12.9	676200	41.0	607650	36.8	153940	9.3	1649840	888250	53.8
WESTERN LYRE SNAKE	Trimorphodon biscutatus	K	Mojave Status	353490	8.7	1492500	36.6	1606200	39.4	628010	15.4	4080200	1845990	45.2
WESTERN LYRE SNAKE	Trimorphodon biscutatus	K	Clark County Status	264080	14.6	789310	43.6	609030	33.6	148340	8.2	1810760	1053390	58.2
SIDEWINDER	Crotalus cerastes	K	Mojave Status	211990	7.0	836430	27.7	1449900	48.1	517820	17.2	3016140	1048420	34.8
SIDEWINDER	Crotalus cerastes	K	Clark County Status	113890	9.3	477210	39.0	490810	40.1	142980	11.7	1224890	591100	48.3
SPECKLED RATTLESNAKE	Crotalus mitchellii	K	Mojave Status	351740	8.0	1444500	32.9	1999400	45.6	589420	13.4	4385060	1796240	41.0

SWReGAP Common Name	SWReGAP Scientific Name	Range Description	Management Description	Status 1		Status 2		Status 3		Status 4		Total	Status 1 & 2	
				(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)	%
SPECKLED RATTLESNAKE	Crotalus mitchellii	K	Clark County Status	221440	12.8	740050	42.6	626840	36.1	147360	8.5	1735690	961490	55.4
MOJAVE RATTLESNAKE	Crotalus scutulatus	K	Mojave Status	218380	6.7	887710	27.4	1538100	47.5	593910	18.3	3238100	1106090	34.2
MOJAVE RATTLESNAKE	Crotalus scutulatus	K	Clark County Status	120250	9.9	480580	39.5	474390	39.0	142150	11.7	1217370	600830	49.4
PEREGRINE FALCON	Falco peregrinus	K	Mojave Status	454670	10.1	1521800	33.9	1927900	42.9	587290	13.1	4491660	1976470	44.0
PEREGRINE FALCON	Falco peregrinus	K	Clark County Status	304400	15.5	821830	41.9	633220	32.3	203390	10.4	1962840	1126230	57.4
YELLOW-BILLED CUCKOO	Coccyzus americanus	B	Mojave Status	3398	10.6	5199	16.3	5831	18.2	17530	54.9	31958	8597	26.9
YELLOW-BILLED CUCKOO	Coccyzus americanus	B	Clark County Status	182	1.7	3520	33.0	1583	14.8	5377	50.4	10662	3702	34.7
BURROWING OWL	Athene cunicularia	B	Mojave Status	320040	7.8	1290100	31.3	1982900	48.1	526240	12.8	4119280	1610140	39.1
BURROWING OWL	Athene cunicularia	K	Mojave Status	50400	7.3	162910	23.5	285710	41.2	194850	28.1	693870	213310	30.7
BURROWING OWL	Athene cunicularia	B	Clark County Status	176420	11.1	645070	40.5	591560	37.1	180330	11.3	1593380	821490	51.6
BURROWING OWL	Athene cunicularia	K	Clark County Status	46043	37.8	47826	39.2	22238	18.2	5792	4.8	121899	93869	77.0
WILLOW FLYCATCHER	Empidonax traillii	B	Mojave Status	4935	14.4	5062	14.7	6781	19.7	17607	51.2	34385	9997	29.1
WILLOW FLYCATCHER	Empidonax traillii	M	Mojave Status	72	34.9	75	36.6	55	26.8	4	1.7	206	147	71.5
WILLOW FLYCATCHER	Empidonax traillii	B	Clark County Status	246	2.5	3252	33.0	1291	13.1	5053	51.3	9842	3499	35.5
WILLOW FLYCATCHER	Empidonax traillii	M	Clark County Status	48	51.1	46	48.3	0	0.0	1	0.6	94	94	99.4
VERMILION FLYCATCHER	Pyrocephalus rubinus	K	Mojave Status	3069	17.5	2744	15.6	3645	20.8	8082	46.1	17540	5813	33.1

SWReGAP Common Name	SWReGAP Scientific Name	Range Description	Management Description	Status 1		Status 2		Status 3		Status 4		Total	Status 1 & 2	
				(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)	%
VERMILION FLYCATCHER	Pyrocephalus rubinus	K	Clark County Status	280	5.6	1603	31.9	678	13.5	2464	49.0	5025	1883	37.5
BELL'S VIREO	Vireo bellii	B	Mojave Status	4536	11.6	5461	14.0	9789	25.1	19227	49.3	39014	9997	25.6
BELL'S VIREO	Vireo bellii	B	Clark County Status	132	1.2	3493	33.0	1590	15.0	5377	50.8	10591	3624	34.2
BLUE GROSBEAK	Guiraca caerulea	B	Mojave Status	4754	9.8	5698	11.7	8136	16.7	30035	61.8	48624	10453	21.5
BLUE GROSBEAK	Guiraca caerulea	B	Clark County Status	296	2.3	3661	28.4	1705	13.2	7238	56.1	12900	3958	30.7
PHAINOPEPLA	Phainopepla nitens	W	Mojave Status	0	0.0	3522	8.7	21517	53.3	15364	38.0	40403	3522	8.7
PHAINOPEPLA	Phainopepla nitens	B	Mojave Status	1372	0.3	32302	6.0	235690	43.5	272170	50.3	541534	33674	6.2
PHAINOPEPLA	Phainopepla nitens	K	Mojave Status	336520	10.2	1182600	35.7	1507900	45.5	288020	8.7	3315040	1519120	45.8
PHAINOPEPLA	Phainopepla nitens	B	Clark County Status	0	#DIV/0!	0	#DIV/0!	0	#DIV/0!	0	#DIV/0!	0	0	#DIV/0!
PHAINOPEPLA	Phainopepla nitens	K	Clark County Status	222470	13.5	682700	41.4	595310	36.1	150480	9.1	1650960	905170	54.8
SUMMER TANAGER	Piranga rubra	B	Mojave Status	3069	14.8	3085	14.9	4307	20.8	10221	49.4	20682	6154	29.8
SUMMER TANAGER	Piranga rubra	B	Clark County Status	280	5.6	1612	32.0	678	13.5	2464	49.0	5033	1891	37.6
LONG-LEGGED MYOTIS	Myotis volans	B	Mojave Status	0	0.0	156870	78.0	37886	18.8	6311	3.1	201067	156870	78.0
LONG-LEGGED MYOTIS	Myotis volans	K	Mojave Status	359340	8.7	1166400	28.4	1967500	47.9	616330	15.0	4109570	1525740	37.1
LONG-LEGGED MYOTIS	Myotis volans	P	Mojave Status	99487	23.6	131850	31.3	166820	39.6	22667	5.4	420824	231337	55.0
LONG-LEGGED MYOTIS	Myotis volans	B	Clark County Status	0	0.0	23298	95.7	967	4.0	70	0.3	24334	23298	95.7

SWReGAP Common Name	SWReGAP Scientific Name	Range Description	Management Description	Status 1		Status 2		Status 3		Status 4		Total	Status 1 & 2	
				(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)	%
LONG-LEGGED MYOTIS	Myotis volans	K	Clark County Status	239520	15.8	645380	42.5	465030	30.6	168020	11.1	1517950	884900	58.3
LONG-LEGGED MYOTIS	Myotis volans	P	Clark County Status	59265	20.9	76241	26.9	134720	47.5	13674	4.8	283900	135506	47.7
LONG-EARED MYOTIS	Myotis evotis	K	Mojave Status	83914	17.5	150080	31.3	230920	48.2	13934	2.9	478848	233994	48.9
LONG-EARED MYOTIS	Myotis evotis	P	Mojave Status	388	0.6	42767	68.5	12883	20.6	6422	10.3	62459	43155	69.1
LONG-EARED MYOTIS	Myotis evotis	K	Clark County Status	58946	43.3	68965	50.7	6606	4.9	1522	1.1	136038	127911	94.0
LONG-EARED MYOTIS	Myotis evotis	P	Clark County Status	1	0.0	8329	92.7	619	6.9	39	0.4	8988	8329	92.7
SILVER-HAIRED BAT	Lasionycteris noctivagans	B	Mojave Status	0	0.0	351740	40.5	362730	41.7	154680	17.8	869150	351740	40.5
SILVER-HAIRED BAT	Lasionycteris noctivagans	K	Mojave Status	401190	12.2	1027000	31.1	1567100	47.5	305290	9.2	3300580	1428190	43.3
SILVER-HAIRED BAT	Lasionycteris noctivagans	B	Clark County Status	0	0.0	67870	64.8	32513	31.0	4421	4.2	104804	67870	64.8
SILVER-HAIRED BAT	Lasionycteris noctivagans	K	Clark County Status	247350	15.5	629220	39.4	545850	34.2	175190	11.0	1597610	876570	54.9
MOJAVE BLACK-COLLARED LIZARD	Crotaphytus bicinctores	K	Mojave Status	370660	8.4	1414600	31.9	2091600	47.2	557180	12.6	4434040	1785260	40.3
MOJAVE BLACK-COLLARED LIZARD	Crotaphytus bicinctores	K	Clark County Status	234550	14.4	690030	42.4	587660	36.1	114870	7.1	1627110	924580	56.8
COMMON KINGSNAKE	Lampropeltis getula	K	Mojave Status	446360	8.4	1669500	31.5	2452200	46.3	724750	13.7	5292810	2115860	40.0
COMMON KINGSNAKE	Lampropeltis getula	K	Clark County Status	266980	13.9	819350	42.7	662990	34.5	170470	8.9	1919790	1086330	56.6
DESERT POCKET MOUSE	Chaetodipus penicillatus	K	Mojave Status	123870	5.6	679500	30.9	1036500	47.1	361000	16.4	2200870	803370	36.5
DESERT POCKET MOUSE	Chaetodipus penicillatus	K	Clark County Status	66255	6.5	392270	38.8	416250	41.1	137340	13.6	1012115	458525	45.3

SWReGAP Common Name	SWReGAP Scientific Name	Range Description	Management Description	Status 1		Status 2		Status 3		Status 4		Total	Status 1 & 2	
				(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(ha)	%
COMMON CHUCKWALLA	Sauromalus ater	K	Mojave Status	157810	10.4	545050	35.8	703780	46.3	114250	7.5	1520890	702860	46.2
COMMON CHUCKWALLA	Sauromalus ater	K	Clark County Status	118180	19.7	267990	44.7	193780	32.3	19174	3.2	599124	386170	64.5
DESERT KANGAROO RAT	Dipodomys deserti	K	Mojave Status	952	2.9	6359	19.2	23577	71.2	2242	6.8	33130	7311	22.1
DESERT KANGAROO RAT	Dipodomys deserti	K	Clark County Status	326	1.3	3367	13.8	19532	79.8	1247	5.1	24471	3692	15.1
KIT FOX	Vulpes macrotis	K	Mojave Status	369930	7.7	1456100	30.4	2286800	47.8	671000	14.0	4783830	1826030	38.2
KIT FOX	Vulpes macrotis	K	Clark County Status	221010	13.1	696280	41.3	615360	36.5	153510	9.1	1686160	917290	54.4
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	Mojave Status	0	0.0	1301	2.9	37483	82.8	6472	14.3	45257	1301	2.9
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	Mojave Status	474880	9.4	1569900	31.1	2282900	45.3	713820	14.2	5041500	2044780	40.6
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	Clark County Status	304210	15.6	819080	41.9	632700	32.4	197930	10.1	1953920	1123290	57.5
PALMER'S CHIPMUNK	Tamias palmeri	K	Clark County Status	22095	71.4	7672	24.8	859	2.8	309	1.0	30935	29767	96.2
PALMER'S CHIPMUNK	Tamias palmeri	K	Mojave Status	22069	70.2	8204	26.1	857	2.7	314	1.0	31445	30273	96.3

Table Information

Column Name	Definition
ITIS Code	Integrated Taxonomic Information System number for species
SWReGAP Common Name	Common name used in SWReGAP
SWReGAP Scientific Name	Scientific name used in SWReGAP
Taxa Group	Taxa group a=amphibian, b=bird, m=mammal, r=reptile
Range Description	Range description used in SWReGAP K=Known or probable occurrence, breeding and non-breeding, winter and summer E=Extirpated occurrence, breeding and non-breeding, winter and summer P=Potential occurrence, breeding and non-breeding, winter and summer B=Known or probable occurrence, breeding, summering M=Known or probable occurrence, non-breeding, migratory W=Known or probable occurrence, winter
Management Description	Statistics for Mojave Desert Ecoregion or Clark County
Status 1	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a natural state within which disturbance events (of natural type, frequency, intensity, and legacy) are allowed to proceed without interference or are mimicked through management.
Status 1 (ha)	Predicted suitable habitat in ha
Status 1 (%)	Predicted suitable habitat in category divided by total predicted habitat
Status 2	An area having permanent protection from conversion of natural land cover and a mandated management plan in operation to maintain a primarily natural state, but which may receive uses or management practices that degrade the quality of existing natural communities, including suppression of natural disturbance.
Status 2 (ha)	Predicted suitable habitat in ha
Status 2 (%)	Predicted suitable habitat in category divided by total predicted habitat
Status 3	An area having permanent protection from conversion of natural land cover for the majority of the area, but subject to extractive uses of either a broad, low-intensity type (e.g., logging) or localized intense type (e.g., mining). It also confers protection to federally listed endangered and threatened species throughout the area.
Status 3 (ha)	Predicted suitable habitat in ha
Status 3 (%)	Predicted suitable habitat in category divided by total predicted habitat
Status 4	There are no known public or private institutional mandates or legally recognized easements or deed restrictions held by the managing entity to prevent conversion of natural habitat types to anthropogenic habitat types. The area generally allows conversion to unnatural land cover throughout.
Status 4 (ha)	Predicted suitable habitat in ha
Status 4 (%)	Predicted suitable habitat in category divided by total predicted habitat
Total (ha)	Total Suitable Habitat
Status 1 & 2 (ha)	Predicted suitable habitat in ha for Status 1 and 2 lands
Status 1 & 2 %	Predicted suitable habitat in category divided by total predicted habitat

Appendix E-1.

Gap Analysis Statistics for Revised Models for Stewardship (in hectares)

SWReGAP Common Name	SWReGAP Scientific Name	Range Code Description	Managements Description	BLM	BOR	USFWS	USFS	DOD	NPS	Native American	State parks	State School	State Wildlife	Other State	Reg Gov	City	County	TNC	Private	Water	Total
				(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
RELICT LEOPARD FROG	Rana onca	K	Clark County Ownership	63	0	0	0	0	0	0	0	89	0	0	0	0	0	7	0	0	159
SOUTHWESTERN TOAD	Bufo microscaphus	K	Clark County Ownership	0	0	1073	1	0	0	2	0	1259	0	329	0	0	0	0	0	909	3572
DESERT TORTOISE	Gopherus agassizii	K	Clark County Ownership	94666	161010	139530	8923	6604	57	480	1	745250	28694	1730	12488	0	304	12132	24	2036	1213929
DESERT IGUANA	Dipsosaurus dorsalis	K	Clark County Ownership	95057	68488	129120	8891	0	51	457	0	564600	28758	1734	11950	0	292	11741	10	2062	923211
LONG-NOSED LEOPARD LIZARD	Gambelia wislizenii	K	Clark County Ownership	160670	257020	150700	12323	34498	60	500	1	991240	29875	2481	13424	0	304	16205	26	3258	1672585
DESERT HORNED LIZARD	Phrynosoma platyrhinos	K	Clark County Ownership	182140	300030	164310	13781	35264	110	553	16	1082400	30881	2591	16860	0	317	18379	32	3681	1851347
GILBERT'S SKINK	Eumeces gilberti	K	Clark County Ownership	269	165550	4116	2	91825	0	0	0	186570	0	0	6	0	0	42	6	0	448387
WESTERN BANDED GECKO	Coleonyx variegatus	K	Clark County Ownership	182080	224770	158380	13781	6428	66	540	1	1028200	30879	2591	14671	0	308	17916	32	3681	1684326
DESERT NIGHT LIZARD	Xantusia vigilis	K	Clark County Ownership	319400	265640	64437	1688	28332	23	159	0	848650	4397	7	9802	0	254	4608	18	0	1259955
GILA MONSTER	Heloderma suspectum	K	Clark County Ownership	174270	194330	144700	12553	3230	51	506	0	973960	30153	2532	13793	0	292	17346	25	2981	1570721
GLOSSY SNAKE	Arizona elegans	K	Clark County Ownership	95097	185500	140640	8935	18223	60	482	1	763700	28781	1736	12603	0	304	12176	28	2040	1270306
SPOTTED LEAF-NOSED SNAKE	Phyllorhynchus decurtatus	K	Clark County Ownership	94344	104210	137270	7430	265	57	478	1	637910	25165	1730	12365	0	304	11759	24	2034	1035348
LONG-NOSED SNAKE	Rhinocheilus lecontei	K	Clark County Ownership	155760	248350	150860	11651	31192	60	516	1	988820	30204	1474	13401	0	304	16038	31	2651	1651313
WESTERN LYRE SNAKE	Trimorphodon biscutatus	K	Clark County Ownership	168770	299480	145400	11045	75794	48	504	0	1049200	26621	2530	13674	0	292	16977	25	2975	1813335
SIDEWINDER	Crotalus cerastes	K	Clark County Ownership	94360	165770	139940	8935	8890	60	480	1	750360	29065	1074	12542	0	304	12200	24	1959	1225965
SPECKLED RATTLESNAKE	Crotalus mitchellii	K	Clark County Ownership	169480	262360	144970	12536	31421	51	507	0	1050500	29555	2526	13793	0	292	17243	25	2981	1738240
MOJAVE RATTLESNAKE	Crotalus scutulatus	K	Clark County Ownership	94842	172110	139210	7443	13719	60	480	1	737420	25490	1735	12369	0	304	11836	24	2060	1219103
PEREGRINE FALCON	Falco peregrinus	K	Clark County Ownership	169830	331190	199000	11220	11224	404	1140	16	1072100	27539	43789	16639	1	393	17763	25	3343	2006633
YELLOW-BILLED CUCKOO	Coccyzus americanus	B	Clark County Ownership	1273	49	4376	90	24	3	26	0	2060	1134	771	11	0	0	180	20	1418	11434
BURROWING OWL	Athene cunicularia	B	Clark County Ownership	86673	264480	177090	10421	34736	353	936	1	956980	29632	2303	13795	1	368	15307	29	2587	1595692
BURROWING OWL	Athene cunicularia	K	Clark County Ownership	69728	0	5672	1292	0	0	91	0	44543	29	193	0	0	0	545	0	0	122092
WILLOW FLYCATCHER	Empidonax traillii	B	Clark County Ownership	891	71	4052	77	141	0	31	0	1763	1137	1099	11	0	2	158	20	1488	10941
WILLOW FLYCATCHER	Empidonax traillii	M	Clark County Ownership	0	52	1	0	42	0	0	0	0	0	0	0	0	0	0	0	0	94
VERMILION FLYCATCHER	Pyrocephalus rubinus	K	Clark County Ownership	456	122	2044	65	183	0	28	0	1025	482	15	0	0	0	91	8	520	5040
BELL'S VIREO	Vireo bellii	B	Clark County Ownership	1273	11	4376	90	1	3	26	0	2050	1134	771	11	0	0	180	20	1418	11362
BLUE GROSBEAK	Guiraca caerulea	B	Clark County Ownership	1273	125	6073	90	183	3	32	0	2131	1363	771	11	0	0	180	20	1418	13672
PHAINOPEPLA	Phainopepla nitens	B	Clark County Ownership	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHAINOPEPLA	Phainopepla nitens	K	Clark County Ownership	157440	252280	146770	11678	42317	51	524	0	975880	30697	3217	13215	0	292	15839	42	3936	1654178
SUMMER TANAGER	Piranga rubra	B	Clark County Ownership	456	122	2044	65	183	0	28	0	1033	482	15	0	0	0	91	8	520	5049
LONG-LEGGED MYOTIS	Myotis volans	B	Clark County Ownership	0	0	70	0	0	0	0	0	24265	0	0	0	0	0	0	0	0	24335

SWReGAP Common Name	SWReGAP Scientific Name	Range Code Description	Managements Description	BLM	BOR	USFWS	USFS	DOD	NPS	Native American	State parks	State School	State Wildlife	Other State	Reg Gov	City	County	TNC	Private	Water	Total
				(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
LONG-LEGGED MYOTIS	Myotis volans	K	Clark County Ownership	169380	26285	163990	10180	10541	344	1054	0	773870	2430	43721	13995	1	358	10781	0	3298	1561662
LONG-LEGGED MYOTIS	Myotis volans	P	Clark County Ownership	0	59296	13659	976	0	0	15	0	179130	24410	45	74	0	0	6289	11	41	283945
LONG-EARED MYOTIS	Myotis evotis	K	Clark County Ownership	5	43439	1520	0	66883	0	32	0	24051	2	0	70	0	0	38	0	0	136040
LONG-EARED MYOTIS	Myotis evotis	P	Clark County Ownership	29	0	39	1	0	0	0	0	8917	0	0	0	0	0	1	0	0	8988
SILVER-HAIRED BAT	Lasionycteris noctivagans	B	Clark County Ownership	23	0	4402	3246	0	0	19	0	95672	0	255	0	0	0	0	0	1442	105058
SILVER-HAIRED BAT	Lasionycteris noctivagans	K	Clark County Ownership	949840	32264	171940	6570	10589	349	991	0	835070	26278	38722	14307	1	372	16310	11	1906	1636340
MOJAVE BLACK-COLLARED LIZARD	Crotaphytus bicinctores	K	Clark County Ownership	166570	26032	112470	11780	34719	49	464	1	983880	26027	2304	10976	0	264	16690	24	2876	1629415
COMMON KINGSNAKE	Lampropeltis getula	K	Clark County Ownership	182200	31732	167080	13781	64472	110	555	16	1103700	31145	2919	16860	0	319	18395	32	3764	1922670
DESERT POCKET MOUSE	Chaetodipus penicillatus	K	Clark County Ownership	95426	98826	133870	8900	328	51	464	0	617070	29434	2490	12254	0	227	11902	26	3330	1014598
COMMON CHUCKWALLA	Sauromalus ater	K	Clark County Ownership	87909	10299	19173	3291	11704	0	1	0	359050	1127	297	18504	0	0	11978	0	45	599414
DESERT KANGAROO RAT	Dipodomys deserti	K	Clark County Ownership	321	276	1115	1495	6	0	2	0	17104	3612	6	173	0	0	365	0	2	24477
KIT FOX	Vulpes macrotis	K	Clark County Ownership	159040	26317	150750	12304	34637	57	500	1	1002600	29872	2438	13494	0	304	16185	30	3246	1688628
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	Clark County Ownership	169330	33030	193870	11208	10566	357	1123	1	1079300	27290	43461	14574	1	382	17298	29	3235	1997419
PALMER'S CHIPMUNK	Tamias palmeri	K	Clark County Ownership	0	7516	309	0	22775	0	25	0	310	0	0	0	0	0	0	0	0	30935
RELICT LEOPARD FROG	Rana onca	K	Mojave Ownership	148	0	3	0	0	85	0	7	0	0	0	0	0	0	0	20	0	263
SOUTHWESTERN TOAD	Bufo microscaphus	K	Mojave Ownership	4404	1	0	20	2	0	444	32	139	909	0	0	0	2	0	3908	336	10195
DESERT TORTOISE	Gopherus agassizii	K	Mojave Ownership	1813600	12424	298130	7803	16052	200120	31344	12559	63322	2264	0	1	59	479	279	436230	2438	3041573
DESERT IGUANA	Dipsosaurus dorsalis	K	Mojave Ownership	1252600	12391	115020	24	57603	182570	34112	13222	57066	2205	0	0	53	455	650	389770	2426	2120168
LONG-NOSED LEOPARD LIZARD	Gambelia wislizenii	K	Mojave Ownership	2750200	16388	478650	42846	22158	338850	41159	18904	84968	3731	0	1	62	498	922	540050	3651	4542461
DESERT HORNED LIZARD	Phrynosoma platyrhinos	K	Mojave Ownership	3044800	18676	587120	45119	26893	381520	44976	21749	86921	4382	0	16	113	552	1109	564560	4147	5074691
GILBERT'S SKINK	Eumeces gilberti	K	Mojave Ownership	497380	2	290750	10625	12700	37136	79	42	1511	0	0	0	0	0	6	20039	0	1080194
WESTERN BANDED GECKO	Coleonyx variegatus	K	Mojave Ownership	2687900	18676	428780	9885	22424	370320	44407	21202	87186	4015	0	1	68	539	1015	553990	3825	4456051
DESERT NIGHT LIZARD	Xantusia vigilis	K	Mojave Ownership	2452800	4269	485130	37821	23304	100290	16831	7458	60206	491	0	0	22	157	977	361100	104	3760697
GILA MONSTER	Heloderma suspectum	K	Mojave Ownership	2228600	17447	345690	5812	81323	333650	42839	20408	83075	3523	0	0	53	505	797	507520	3904	3675145
GLOSSY SNAKE	Arizona elegans	K	Mojave Ownership	1949100	12436	357500	20820	20062	207840	37353	14315	73700	2159	0	1	62	480	849	460040	2439	3339715
SPOTTED LEAF-NOSED SNAKE	Phyllorhynchus decurtatus	K	Mojave Ownership	1392300	10934	194600	267	96707	183820	26566	12187	45979	2147	0	1	59	477	279	348620	2339	2317284
LONG-NOSED SNAKE	Rhinocheilus lecontei	K	Mojave Ownership	2343300	14954	443990	39424	20385	278310	42533	18742	73536	2995	0	1	62	514	979	452410	2582	3918183
WESTERN LYRE SNAKE	Trimorphodon biscutatus	K	Mojave Ownership	2405100	15115	486140	89781	96488	323200	40910	19959	85499	3303	0	0	51	503	797	512690	3671	4083207
SIDEWINDER	Crotalus cerastes	K	Mojave Ownership	1796600	11999	305530	10760	16195	180830	37914	14145	66625	2293	0	1	62	479	822	425760	1964	3017735
SPECKLED RATTLESNAKE	Crotalus mitchellii	K	Mojave Ownership	2704300	16581	458210	39090	19838	346700	31057	17277	73058	3490	0	0	49	506	382	495220	3767	4388068
MOJAVE RATTLESNAKE	Crotalus scutulatus	K	Mojave Ownership	1915500	10946	312090	15994	16218	200850	34429	13773	75054	2516	0	1	62	479	822	492970	2692	3240358

SWReGAP Common Name	SWReGAP Scientific Name	Range Code Description	Managements Description	BLM	BOR	USFWS	USFS	DOD	NPS	Native American	State parks	State School	State Wildlife	Other State	Reg Gov	City	County	TNC	Private	Water	Total
				(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)
PEREGRINE FALCON	Falco peregrinus	K	Mojave Ownership	2592600	12811	588150	130020	211860	334530	46226	21128	69448	3669	1	16	409	1138	1068	478020	75867	4566962
YELLOW-BILLED CUCKOO	Coccyzus americanus	B	Mojave Ownership	6482	91	3233	44	13	2450	5065	250	243	1696	0	0	8	26	20	12328	2179	34127
BURROWING OWL	Athene cunicularia	B	Mojave Ownership	2530400	13205	513610	43191	261900	202060	40169	17799	62736	2843	1	1	352	934	986	428390	3300	4121877
BURROWING OWL	Athene cunicularia	K	Mojave Ownership	357040	2715	4325	0	0	135430	47	552	21448	293	0	0	0	91	0	171840	252	694033
WILLOW FLYCATCHER	Empidonax traillii	B	Mojave Ownership	7453	78	4630	182	94	2115	5092	226	249	1772	0	0	5	31	84	12389	2747	37148
WILLOW FLYCATCHER	Empidonax traillii	M	Mojave Ownership	40	0	70	45	33	16	0	0	0	0	0	0	0	0	0	2	0	206
VERMILION FLYCATCHER	Pyrocephalus rubinus	K	Mojave Ownership	4071	66	2822	207	110	1253	1622	102	88	659	0	0	0	28	72	6432	1176	18707
BELL'S VIREO	Vireo bellii	B	Mojave Ownership	10802	91	4247	1	13	2473	4622	218	532	1699	0	0	8	26	84	14189	2207	41213
BLUE GROSBEAK	Guiraca caerulea	B	Mojave Ownership	8990	91	4406	227	125	2492	9471	250	315	1699	0	0	8	32	84	20426	2215	50829
PHAINOPEPLA	Phainopepla nitens	B	Mojave Ownership	25059	0	0	0	0	0	0	0	1199	0	0	0	0	0	0	14146	3	40407
PHAINOPEPLA	Phainopepla nitens	B	Mojave Ownership	249120	2691	797	877	0	14185	9908	2256	37717	109	0	0	0	0	578	223200	68	541506
PHAINOPEPLA	Phainopepla nitens	K	Mojave Ownership	2019900	13051	431700	49950	176070	303120	35717	16309	35830	4339	0	0	59	522	403	227650	5676	3320296
SUMMER TANAGER	Piranga rubra	B	Mojave Ownership	5009	66	2822	227	110	1256	2066	133	147	659	0	0	0	28	72	8076	1184	21854
LONG-LEGGED MYOTIS	Myotis volans	B	Mojave Ownership	192090	0	0	0	0	269	0	0	5611	0	0	0	0	0	0	3026	807	201802
LONG-LEGGED MYOTIS	Myotis volans	K	Mojave Ownership	2289600	14467	462180	122570	245780	362570	17639	14258	75006	3819	1	0	348	1053	1015	498720	74847	4183873
LONG-LEGGED MYOTIS	Myotis volans	K	Mojave Ownership	266920	976	99456	0	74	0	24412	6283	0	41	0	0	0	15	12	22656	45	420889
LONG-EARED MYOTIS	Myotis evotis	K	Mojave Ownership	250280	0	82300	74318	46542	147122	1948	280	2210	86	0	0	0	32	63	6002	1	478772
LONG-EARED MYOTIS	Myotis evotis	P	Mojave Ownership	55289	1	0	0	0	451	8	1	747	0	0	0	0	0	0	5935	0	62432
SILVER-HAIRED BAT	Lasionycteris noctivagans	B	Mojave Ownership	700200	3245	0	0	0	6016	1344	0	40228	1447	0	0	0	20	187	116790	1064	870542
SILVER-HAIRED BAT	Lasionycteris noctivagans	K	Mojave Ownership	1812500	6670	567130	123190	252170	207130	37609	19324	11126	2258	1	0	349	990	854	258660	60210	3360171
MOJAVE BLACK-COLLARED LIZARD	Crotaphytus bicinctores	K	Mojave Ownership	2740700	16464	479110	44153	217350	352170	38200	19632	79279	3384	0	1	52	463	956	441360	3365	4436640
COMMON KINGSNAKE	Lampropeltis getula	K	Mojave Ownership	3185300	18676	596720	79377	269430	385020	50616	21754	90148	4473	0	16	113	554	1120	588610	5258	5297185
DESERT POCKET MOUSE	Chaetodipus penicillatus	K	Mojave Ownership	1342700	12400	179160	367	86916	184800	34259	12365	40281	3690	0	0	58	463	288	302810	3480	2204038
COMMON CHUCKWALLA	Sauromalus ater	K	Mojave Ownership	970460	4653	185640	18585	79103	144050	7468	13827	19354	45	0	0	0	1	706	76721	450	1521062
DESERT KANGAROO RAT	Dipodomys deserti	K	Mojave Ownership	23831	1493	895	8	179	619	3706	365	291	7	0	0	0	2	0	1735	14	33144
KIT FOX	Vulpes macrotis	K	Mojave Ownership	2903400	16369	518000	43208	261200	340990	41946	19074	86951	3806	0	1	60	498	985	546580	3581	4786649
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	B	Mojave Ownership	38777	0	0	0	0	0	0	0	3306	0	0	0	0	0	0	3152	1	45236
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	Mojave Ownership	2933000	15496	599410	12292	262970	365720	45430	20825	81503	3611	1	1	362	1121	1028	587520	74435	5115353
PALMER'S CHIPMUNK	Tamias palmeri	K	Mojave Ownership	310	0	7520	23280	0	0	0	0	0	0	0	0	0	24	0	310	0	31445

Table Information

Column Name	Definition
ITIS Code	Integrated Taxonomic Information System number for species
SWReGAP Common Name	Common name used in SWReGAP
SWReGAP Scientific Name	Scientific name used in SWReGAP
Taxa Group	Taxa group a=amphibian, b=bird, m=mammal, r=reptile
Range Description	Range description used in SWReGAP K= Known or probable occurrence, breeding and non-breeding, winter and summer E=Extirpated occurrence, breeding and non-breeding, winter and summer P=Potential occurrence, breeding and non-breeding, winter and summer B=Known or probable occurrence, breeding, summering M=Known or probable occurrence, non-breeding, migratory W=Known or probable occurrence, winter
Management Description	Statistics for Mojave Desert Ecoregion or Clark County
BLM	predicted suitable habitat in hectares and percent by owner
BOR	predicted suitable habitat in hectares and percent by owner
USFWS	predicted suitable habitat in hectares and percent by owner
USFS	predicted suitable habitat in hectares and percent by owner
DOD	predicted suitable habitat in hectares and percent by owner
NPS	predicted suitable habitat in hectares and percent by owner
Native American	predicted suitable habitat in hectares and percent by owner
State parks	predicted suitable habitat in hectares and percent by owner
State School	predicted suitable habitat in hectares and percent by owner
State Wildlife	predicted suitable habitat in hectares and percent by owner
Other State	predicted suitable habitat in hectares and percent by owner
Reg Gov	predicted suitable habitat in hectares and percent by owner
City	predicted suitable habitat in hectares and percent by owner
County	predicted suitable habitat in hectares and percent by owner
TNC	predicted suitable habitat in hectares and percent by owner
Private	predicted suitable habitat in hectares and percent by owner
Water	predicted suitable habitat in hectares and percent by owner
Total	Total predicted suitable habitat in hectares

Appendix E-2.

Gap Analysis Statistics for Revised Models for Stewardship (in percentage)

Common Name	Scientific Name	Range Description	Management Description	BLM	BOR	FWS	USFS	DOD	NPS	Native American	State parks	State School	State Wildlife	Other State	Reg Gov	City	County	TNC	Private	Water
				(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
RELICT LEOPARD FROG	Rana onca	K	Clark County Ownership	39.4	0.0	0.1	0.0	0.0	0.0	0.0	0.0	56.3	0.0	0.0	0.0	0.0	0.0	4.2	0.0	25.5
SOUTHWESTERN TOAD	Bufo microscaphus	K	Clark County Ownership	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	35.2	0.0	9.2	0.0	0.0	0.0	0.0	0.0	0.2
DESERT TORTOISE	Gopherus agassizii	K	Clark County Ownership	7.8	13.3	11.5	0.7	0.5	0.0	0.0	0.0	61.4	2.4	0.1	1.0	0.0	0.0	1.0	0.0	0.2
DESERT IGUANA	Dipsosaurus dorsalis	K	Clark County Ownership	10.3	7.4	14.0	1.0	0.0	0.0	0.0	0.0	61.2	3.1	0.2	1.3	0.0	0.0	1.3	0.0	0.2
LONG-NOSED LEOPARD LIZARD	Gambelia wislizenii	K	Clark County Ownership	9.6	15.4	9.0	0.7	2.1	0.0	0.0	0.0	59.3	1.8	0.1	0.8	0.0	0.0	1.0	0.0	0.2
DESERT HORNED LIZARD	Phrynosoma platyrhinos	K	Clark County Ownership	9.8	16.2	8.9	0.7	1.9	0.0	0.0	0.0	58.5	1.7	0.1	0.9	0.0	0.0	1.0	0.0	0.0
GILBERT'S SKINK	Eumeces gilberti	K	Clark County Ownership	0.1	36.9	0.9	0.0	20.5	0.0	0.0	0.0	41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
WESTERN BANDED GECKO	Coleonyx variegatus	K	Clark County Ownership	10.8	13.3	9.4	0.8	0.4	0.0	0.0	0.0	61.0	1.8	0.2	0.9	0.0	0.0	1.1	0.0	0.0
DESERT NIGHT LIZARD	Xantusia vigilis	K	Clark County Ownership	2.5	21.1	5.1	0.1	2.2	0.0	0.0	0.0	67.4	0.3	0.0	0.8	0.0	0.0	0.4	0.0	0.2
GILA MONSTER	Heloderma suspectum	K	Clark County Ownership	11.1	12.4	9.2	0.8	0.2	0.0	0.0	0.0	62.0	1.9	0.2	0.9	0.0	0.0	1.1	0.0	0.2
GLOSSY SNAKE	Arizona elegans	K	Clark County Ownership	7.5	14.6	11.1	0.7	1.4	0.0	0.0	0.0	60.1	2.3	0.1	1.0	0.0	0.0	1.0	0.0	0.2
SPOTTED LEAF-NOSED SNAKE	Phyllorhynchus decurtatus	K	Clark County Ownership	9.1	10.1	13.3	0.7	0.0	0.0	0.0	0.0	61.6	2.4	0.2	1.2	0.0	0.0	1.1	0.0	0.2

Common Name	Scientific Name	Range Description	Management Description	BLM	BOR	FWS	USFS	DOD	NPS	Native American	State parks	State School	State Wildlife	Other State	Reg Gov	City	County	TNC	Private	Water
				(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
LONG-NOSED SNAKE	Rhinocheilus lecontei	K	Clark County Ownership	9.4	15.0	9.1	0.7	1.9	0.0	0.0	0.0	59.9	1.8	0.1	0.8	0.0	0.0	1.0	0.0	0.2
WESTERN LYRE SNAKE	Trimorphodon biscutatus	K	Clark County Ownership	9.3	16.5	8.0	0.6	4.2	0.0	0.0	0.0	57.9	1.5	0.1	0.8	0.0	0.0	0.9	0.0	0.2
SIDEWINDER	Crotalus cerastes	K	Clark County Ownership	7.7	13.5	11.4	0.7	0.7	0.0	0.0	0.0	61.2	2.4	0.1	1.0	0.0	0.0	1.0	0.0	0.2
SPECKLED RATTLESNAKE	Crotalus mitchellii	K	Clark County Ownership	9.8	15.1	8.3	0.7	1.8	0.0	0.0	0.0	60.4	1.7	0.1	0.8	0.0	0.0	1.0	0.0	0.2
MOJAVE RATTLESNAKE	Crotalus scutulatus	K	Clark County Ownership	7.8	14.1	11.4	0.6	1.1	0.0	0.0	0.0	60.5	2.1	0.1	1.0	0.0	0.0	1.0	0.0	0.2
PEREGRINE FALCON	Falco peregrinus	K	Clark County Ownership	8.5	16.5	9.9	0.6	5.6	0.0	0.1	0.0	53.4	1.4	2.2	0.8	0.0	0.0	0.9	0.2	12.4
YELLOW-BILLED CUCKOO	Coccyzus americanus	B	Clark County Ownership	11.1	0.4	38.3	0.8	0.2	0.0	0.2	0.0	18.0	9.9	6.7	0.1	0.0	0.0	1.6	0.0	0.2
BURROWING OWL	Athene cunicularia	B	Clark County Ownership	5.4	16.6	11.1	0.7	2.2	0.0	0.1	0.0	60.0	1.9	0.1	0.9	0.0	0.0	1.0	0.0	0.0
BURROWING OWL	Athene cunicularia	K	Clark County Ownership	57.1	0.0	4.6	1.1	0.0	0.0	0.1	0.0	36.5	0.0	0.2	0.0	0.0	0.0	0.4	0.2	13.6
WILLOW FLYCATCHER	Empidonax traillii	B	Clark County Ownership	8.1	0.6	37.0	0.7	1.3	0.0	0.3	0.0	16.1	10.4	10.0	0.1	0.0	0.0	1.4	0.0	0.0
WILLOW FLYCATCHER	Empidonax traillii	M	Clark County Ownership	0.0	54.8	0.6	0.0	44.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	10.3
VERMILION FLYCATCHER	Pyrocephalus rubinus	K	Clark County Ownership	9.1	2.4	40.6	1.3	3.6	0.0	0.6	0.0	20.3	9.6	0.3	0.0	0.0	0.0	1.8	0.2	12.5

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				(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
BELL'S VIREO	Vireo bellii	B	Clark County Ownership	11.2	0.1	38.5	0.8	0.0	0.0	0.2	0.0	18.0	10.0	6.8	0.1	0.0	0.0	1.6	0.1	10.4
BLUE GROSBEAK	Guiraca caerulea	B	Clark County Ownership	9.3	0.9	44.4	0.7	1.3	0.0	0.2	0.0	15.6	10.0	5.6	0.1	0.0	0.0	1.3	0.0	0.0
PHAINOPEPLA	Phainopepla nitens	B	Clark County Ownership	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
PHAINOPEPLA	Phainopepla nitens	K	Clark County Ownership	9.5	15.3	8.9	0.7	2.6	0.0	0.0	0.0	59.0	1.9	0.2	0.8	0.0	0.0	1.0	0.2	10.3
SUMMER TANAGER	Piranga rubra	B	Clark County Ownership	9.0	2.4	40.5	1.3	3.6	0.0	0.5	0.0	20.5	9.6	0.3	0.0	0.0	0.0	1.8	0.0	0.0
LONG-LEGGED MYOTIS	Myotis volans	B	Clark County Ownership	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	99.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
LONG-LEGGED MYOTIS	Myotis volans	K	Clark County Ownership	10.8	16.8	10.5	0.7	6.7	0.0	0.1	0.0	49.6	0.2	2.8	0.9	0.0	0.0	0.7	0.0	0.0
LONG-LEGGED MYOTIS	Myotis volans	P	Clark County Ownership	0.0	20.9	4.8	0.3	0.0	0.0	0.0	0.0	63.1	8.6	0.0	0.0	0.0	0.0	2.2	0.0	0.0
LONG-EARED MYOTIS	Myotis evotis	K	Clark County Ownership	0.0	31.9	1.1	0.0	49.2	0.0	0.0	0.0	17.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
LONG-EARED MYOTIS	Myotis evotis	P	Clark County Ownership	0.3	0.0	0.4	0.0	0.0	0.0	0.0	0.0	99.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4
SILVER-HAIRED BAT	Lasionycteris noctivagans	B	Clark County Ownership	0.0	0.0	4.2	3.1	0.0	0.0	0.0	0.0	91.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1
SILVER-HAIRED BAT	Lasionycteris noctivagans	K	Clark County Ownership	5.8	19.7	10.5	0.4	6.5	0.0	0.1	0.0	51.0	1.6	2.4	0.9	0.0	0.0	1.0	0.0	0.2

Common Name	Scientific Name	Range Description	Management Description	BLM	BOR	FWS	USFS	DOD	NPS	Native American	State parks	State School	State Wildlife	Other State	Reg Gov	City	County	TNC	Private	Water
				(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
MOJAVE BLACK-COLLARED LIZARD	Crotaphytus bicinctores	K	Clark County Ownership	10.2	16.0	6.9	0.7	2.1	0.0	0.0	0.0	60.4	1.6	0.1	0.7	0.0	0.0	1.0	0.0	0.2
COMMON KINGSNAKE	Lampropeltis getula	K	Clark County Ownership	9.5	16.5	8.7	0.7	3.4	0.0	0.0	0.0	57.4	1.6	0.2	0.9	0.0	0.0	1.0	0.0	0.3
DESERT POCKET MOUSE	Chaetodipus penicillatus	K	Clark County Ownership	9.4	9.7	13.2	0.9	0.0	0.0	0.0	0.0	60.8	2.9	0.2	1.2	0.0	0.0	1.2	0.0	0.0
COMMON CHUCKWALLA	Sauromalus ater	K	Clark County Ownership	14.7	17.2	3.2	0.5	2.0	0.0	0.0	0.0	59.9	0.2	0.0	0.3	0.0	0.0	2.0	0.0	0.0
DESERT KANGAROO RAT	Dipodomys deserti	K	Clark County Ownership	1.3	1.1	4.6	6.1	0.0	0.0	0.0	0.0	69.9	14.8	0.0	0.7	0.0	0.0	1.5	0.0	0.2
KIT FOX	Vulpes macrotis	K	Clark County Ownership	9.4	15.6	8.9	0.7	2.1	0.0	0.0	0.0	59.4	1.8	0.1	0.8	0.0	0.0	1.0	0.0	0.2
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	Clark County Ownership	8.5	16.5	9.7	0.6	5.3	0.0	0.1	0.0	54.0	1.4	2.2	0.7	0.0	0.0	0.9	0.0	0.0
PALMER'S CHIPMUNK	Tamias palmeri	K	Clark County Ownership	0.0	24.3	1.0	0.0	73.6	0.0	0.1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
RELICT LEOPARD FROG	Rana onca	K	Mojave Ownership	56.2	0.0	1.3	0.0	0.0	32.5	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	0.0
SOUTHWESTERN TOAD	Bufo microscaphus	K	Mojave Ownership	43.2	0.0	0.0	0.2	0.0	0.0	4.4	0.3	1.4	8.9	0.0	0.0	0.0	0.0	0.0	38.3	3.3
DESERT TORTOISE	Gopherus agassizii	K	Mojave Ownership	59.6	0.4	9.8	0.3	5.3	6.6	1.0	0.4	2.1	0.1	0.0	0.0	0.0	0.0	0.0	14.3	0.1
DESERT IGUANA	Dipsosaurus dorsalis	K	Mojave Ownership	59.1	0.6	5.4	0.0	2.7	8.6	1.6	0.6	2.7	0.1	0.0	0.0	0.0	0.0	0.0	18.4	0.1
LONG-NOSED LEOPARD LIZARD	Gambelia wislizenii	K	Mojave Ownership	60.5	0.4	10.5	0.9	4.9	7.5	0.9	0.4	1.9	0.1	0.0	0.0	0.0	0.0	0.0	11.9	0.1
DESERT HORNED LIZARD	Phrynosoma platyrhinos	K	Mojave Ownership	60.0	0.4	11.6	0.9	5.3	7.5	0.9	0.4	1.7	0.1	0.0	0.0	0.0	0.0	0.0	11.1	0.1

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				(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
GILBERT'S SKINK	Eumeces gilberti	K	Mojave Ownership	46.0	0.0	26.9	9.8	11.8	3.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0
WESTERN BANDED GECKO	Coleonyx variegatus	K	Mojave Ownership	60.3	0.4	9.6	0.2	5.0	8.3	1.0	0.5	2.0	0.1	0.0	0.0	0.0	0.0	0.0	12.4	0.1
DESERT NIGHT LIZARD	Xantusia vigilis	K	Mojave Ownership	65.2	0.1	12.9	1.0	6.2	2.7	0.4	0.2	1.6	0.0	0.0	0.0	0.0	0.0	0.0	9.6	0.0
GILA MONSTER	Heloderma suspectum	K	Mojave Ownership	60.6	0.5	9.4	0.2	2.2	9.1	1.2	0.6	2.3	0.1	0.0	0.0	0.0	0.0	0.0	13.8	0.1
GLOSSY SNAKE	Arizona elegans	K	Mojave Ownership	58.4	0.4	10.7	0.6	6.0	6.2	1.1	0.4	2.2	0.1	0.0	0.0	0.0	0.0	0.0	13.8	0.1
SPOTTED LEAF-NOSED SNAKE	Phyllorhynchus decurtatus	K	Mojave Ownership	60.1	0.5	8.4	0.0	4.2	7.9	1.1	0.5	2.0	0.1	0.0	0.0	0.0	0.0	0.0	15.0	0.1
LONG-NOSED SNAKE	Rhinocheilus lecontei	K	Mojave Ownership	59.8	0.4	11.3	1.0	5.2	7.1	1.1	0.5	1.9	0.1	0.0	0.0	0.0	0.0	0.0	11.5	0.1
WESTERN LYRE SNAKE	Trimorphodon biscutatus	K	Mojave Ownership	58.9	0.4	11.9	2.2	2.4	7.9	1.0	0.5	2.1	0.1	0.0	0.0	0.0	0.0	0.0	12.6	0.1
SIDEWINDER	Crotalus cerastes	K	Mojave Ownership	59.5	0.4	10.1	0.4	5.4	6.0	1.3	0.5	2.2	0.1	0.0	0.0	0.0	0.0	0.0	14.1	0.1
SPECKLED RATTLESNAKE	Crotalus mitchellii	K	Mojave Ownership	61.6	0.4	10.4	0.9	4.5	7.9	0.7	0.4	1.7	0.1	0.0	0.0	0.0	0.0	0.0	11.3	0.1
MOJAVE RATTLESNAKE	Crotalus scutulatus	K	Mojave Ownership	59.1	0.3	9.6	0.5	5.0	6.2	1.1	0.4	2.3	0.1	0.0	0.0	0.0	0.0	0.0	15.2	0.1
PEREGRINE FALCON	Falco peregrinus	K	Mojave Ownership	56.8	0.3	12.9	2.8	4.6	7.3	1.0	0.5	1.5	0.1	0.0	0.0	0.0	0.0	0.0	10.5	1.7
YELLOW-BILLED CUCKOO	Coccyzus americanus	B	Mojave Ownership	19.0	0.3	9.5	0.1	0.0	7.2	14.8	0.7	0.7	5.0	0.0	0.0	0.0	0.1	0.1	36.1	6.4
BURROWING OWL	Athene cunicularia	B	Mojave Ownership	61.4	0.3	12.5	1.0	6.4	4.9	1.0	0.4	1.5	0.1	0.0	0.0	0.0	0.0	0.0	10.4	0.1
BURROWING OWL	Athene cunicularia	K	Mojave Ownership	51.4	0.4	0.6	0.0	0.0	19.5	0.0	0.1	3.1	0.0	0.0	0.0	0.0	0.0	0.0	24.8	0.0
WILLOW FLYCATCHER	Empidonax traillii	B	Mojave Ownership	20.1	0.2	12.5	0.5	0.3	5.7	13.7	0.6	0.7	4.8	0.0	0.0	0.0	0.1	0.2	33.4	7.4
WILLOW FLYCATCHER	Empidonax traillii	M	Mojave Ownership	19.3	0.0	34.1	21.6	16.1	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0

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				(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
VERMILION FLYCATCHER	Pyrocephalus rubinus	K	Mojave Ownership	21.8	0.4	15.1	1.1	0.6	6.7	8.7	0.5	0.5	3.5	0.0	0.0	0.0	0.1	0.4	34.4	6.3
BELL'S VIREO	Vireo bellii	B	Mojave Ownership	26.2	0.2	10.3	0.0	0.0	6.0	11.2	0.5	1.3	4.1	0.0	0.0	0.0	0.1	0.2	34.4	5.4
BLUE GROSBEAK	Guiraca caerulea	B	Mojave Ownership	17.7	0.2	8.7	0.4	0.2	4.9	18.6	0.5	0.6	3.3	0.0	0.0	0.0	0.1	0.2	40.2	4.4
PHAINOPEPLA	Phainopepla nitens	W	Mojave Ownership	62.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0
PHAINOPEPLA	Phainopepla nitens	B	Mojave Ownership	46.0	0.5	0.1	0.2	0.0	2.6	1.8	0.4	7.0	0.0	0.0	0.0	0.0	0.0	0.1	41.2	0.0
PHAINOPEPLA	Phainopepla nitens	K	Mojave Ownership	60.8	0.4	13.0	1.5	5.3	9.1	1.1	0.5	1.1	0.1	0.0	0.0	0.0	0.0	0.0	6.9	0.2
SUMMER TANAGER	Piranga rubra	B	Mojave Ownership	22.9	0.3	12.9	1.0	0.5	5.7	9.5	0.6	0.7	3.0	0.0	0.0	0.0	0.1	0.3	37.0	5.4
LONG-LEGGED MYOTIS	Myotis volans	B	Mojave Ownership	95.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.4
LONG-LEGGED MYOTIS	Myotis volans	K	Mojave Ownership	54.7	0.3	11.0	2.9	5.9	8.7	0.4	0.3	1.8	0.1	0.0	0.0	0.0	0.0	0.0	11.9	1.8
LONG-LEGGED MYOTIS	Myotis volans	P	Mojave Ownership	63.4	0.2	23.6	0.0	0.0	0.0	5.8	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	0.0
LONG-EARED MYOTIS	Myotis evotis	K	Mojave Ownership	52.3	0.0	17.2	15.5	9.7	3.1	0.4	0.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0
LONG-EARED MYOTIS	Myotis evotis	P	Mojave Ownership	88.6	0.0	0.0	0.0	0.0	0.7	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	9.5	0.0
SILVER-HAIRED BAT	Lasionycteris noctivagans	B	Mojave Ownership	80.4	0.4	0.0	0.0	0.0	0.7	0.2	0.0	4.6	0.2	0.0	0.0	0.0	0.0	0.0	13.4	0.1
SILVER-HAIRED BAT	Lasionycteris noctivagans	K	Mojave Ownership	53.9	0.2	16.9	3.7	7.5	6.2	1.1	0.6	0.3	0.1	0.0	0.0	0.0	0.0	0.0	7.7	1.8
MOJAVE BLACK-COLLARED LIZARD	Crotaphytus bicinctores	K	Mojave Ownership	61.8	0.4	10.8	1.0	4.9	7.9	0.9	0.4	1.8	0.1	0.0	0.0	0.0	0.0	0.0	9.9	0.1
COMMON KINGSNAKE	Lampropeltis getula	K	Mojave Ownership	60.1	0.4	11.3	1.5	5.1	7.3	1.0	0.4	1.7	0.1	0.0	0.0	0.0	0.0	0.0	11.1	0.1
DESERT POCKET MOUSE	Chaetodipus penicillatus	K	Mojave Ownership	60.9	0.6	8.1	0.0	3.9	8.4	1.6	0.6	1.8	0.2	0.0	0.0	0.0	0.0	0.0	13.7	0.2

Common Name	Scientific Name	Range Description	Management Description	BLM	BOR	FWS	USFS	DOD	NPS	Native American	State parks	State School	State Wildlife	Other State	Reg Gov	City	County	TNC	Private	Water
				(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
COMMON CHUCKWALLA	Sauromalus ater	K	Mojave Ownership	63.8	0.3	12.2	1.2	5.2	9.5	0.5	0.9	1.3	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0
DESERT KANGAROO RAT	Dipodomys deserti	K	Mojave Ownership	71.9	4.5	2.7	0.0	0.5	1.9	11.2	1.1	0.9	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0
KIT FOX	Vulpes macrotis	K	Mojave Ownership	60.7	0.3	10.8	0.9	5.5	7.1	0.9	0.4	1.8	0.1	0.0	0.0	0.0	0.0	0.0	11.4	0.1
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	B	Mojave Ownership	85.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	Mojave Ownership	57.3	0.3	11.7	2.4	5.1	7.1	0.9	0.4	1.6	0.1	0.0	0.0	0.0	0.0	0.0	11.5	1.5
PALMER'S CHIPMUNK	Tamias palmeri	K	Mojave Ownership	1.0	0.0	23.9	74.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	1.0	0.0

Table Information

Column Name	Definition
ITIS Code	Integrated Taxonomic Information System number for species
SWReGAP Common Name	Common name used in SWReGAP
SWReGAP Scientific Name	Scientific name used in SWReGAP
Taxa Group	Taxa group a=amphibian, b=bird, m=mammal, r=reptile
Range Description	Range description used in SWReGAP K= Known or probable occurrence, breeding and non-breeding, winter and summer E=Extirpated occurrence, breeding and non-breeding, winter and summer P=Potential occurrence, breeding and non-breeding, winter and summer B=Known or probable occurrence, breeding, summering M=Known or probable occurrence, non-breeding, migratory W=Known or probable occurrence, winter
Management Description	Statistics for Mojave Desert Ecoregion or Clark County
BLM	predicted suitable habitat in hectares and percent by owner
BOR	predicted suitable habitat in hectares and percent by owner
USFWS	predicted suitable habitat in hectares and percent by owner
USFS	predicted suitable habitat in hectares and percent by owner
DOD	predicted suitable habitat in hectares and percent by owner
NPS	predicted suitable habitat in hectares and percent by owner
Native American	predicted suitable habitat in hectares and percent by owner
State parks	predicted suitable habitat in hectares and percent by owner
State School	predicted suitable habitat in hectares and percent by owner
State Wildlife	predicted suitable habitat in hectares and percent by owner
Other State	predicted suitable habitat in hectares and percent by owner
Reg Gov	predicted suitable habitat in hectares and percent by owner
City	predicted suitable habitat in hectares and percent by owner
County	predicted suitable habitat in hectares and percent by owner
TNC	predicted suitable habitat in hectares and percent by owner
Private	predicted suitable habitat in hectares and percent by owner
Water	predicted suitable habitat in hectares and percent by owner
Total	Total predicted suitable habitat in hectares

Appendix F.

Gap Analysis Statistics for Clark County Conservation Management Areas

Common Name	Scientific Name	Range Description	IMA		LIMA		MUMA		UMA		Total
			(ha)	%	(ha)	%	(ha)	%	(ha)	%	
RELICT LEOPARD FROG	Rana onca	K		51	19	7		17		24	
SOUTHWESTERN TOAD	Bufo microscaphus	K	135	32	-	0	45	37	63	30	263
DESERT TORTOISE	Gopherus agassizii	K	1,145	50	59,612	5	1,327	35	1,071	11	3,542 1,212,932
DESERT IGUANA	Dipsosaurus dorsalis	K	600,450	49	25,177	3	419,250	35	133,620	13	921,817
LONG-NOSED LEOPARD LIZARD	Gambelia wislizenii	K	453,380	52	103,900	6	319,800	33	123,460	9	1,671,060
DESERT HORNED LIZARD	Phrynosoma platyrhinos	K	874,980	53	116,850	6	544,330	32	147,850	9	1,849,840
GILBERT'S SKINK	Eumeces gilberti	K	975,570	56	93,672	21	593,520	22	163,900	1	449,034
WESTERN BANDED GECKO	Coleonyx variegatus	K	250,940	52	79,409	5	98,967	34	5,455	9	1,682,789
DESERT NIGHT LIZARD	Xantusia vigilis	K	881,660	54	102,700	8	564,000	33	157,720	5	1,260,844
GILA MONSTER	Heloderma suspectum	K	681,820 830,700	53	70,151	4	417,270 524,460	33	59,054 143,900	9	1,569,211
GLOSSY SNAKE	Arizona elegans	K	631,360	50	72,651	6	430,310	34	134,990	11	1,269,311
SPOTTED LEAF-NOSED SNAKE	Phyllorhynchus decurtatus	K	508,370	49	40,003	4	357,780	35	127,780	12	1,033,933
LONG-NOSED SNAKE	Rhinocheilus lecontei	K	860,180	52	100,480	6	542,020	33	148,320	9	1,651,000
WESTERN LYRE SNAKE	Trimorphodon biscutatus	K	982,230	54	133,510	7	553,970	31	142,120	8	1,811,830

Common Name	Scientific Name	Range Description	IMA		LIMA		MUMA		UMA		Total
			(ha)	%	(ha)	%	(ha)	%	(ha)	%	
SIDEWINDER	Crotalus cerastes	K	606,610	49	61,920	5	422,720	34	134,500	11	1,225,750
SPECKLED RATTLESNAKE	Crotalus mitchellii	K	922,140	53	104,140	6	565,760	33	144,730	8	1,736,770
MOJAVE RATTLESNAKE	Crotalus scutulatus	K	611,130	50	66,443	5	410,230	34	130,310	11	1,218,113
PEREGRINE FALCON	Falco peregrinus	K	1,039,600	53	151,260	8	578,130	29	194,840	10	1,963,830
YELLOW-BILLED CUCKOO	Coccyzus americanus	B	3,100	29	100	1	2,544	23	5,105	47	10,848
BURROWING OWL	Athene cunicularia	B	788,140	49	105,380	7	525,470	33	175,620	11	1,594,610
BURROWING OWL	Athene cunicularia	K	93,486	77	872	1	23,351	19	4,097	3	121,807
WILLOW FLYCATCHER	Empidonax traillii	B	2,881	29	160	2	2,111	21	4,925	49	10,076
WILLOW FLYCATCHER	Empidonax traillii	M	91	97	3	3	-	0	1	1	94
VERMILION FLYCATCHER	Pyrocephalus rubinus	K	1,223	25	122	2	1,020	21	2,532	52	4,897
BELL'S VIREO	Vireo bellii	B	3,034	28	91	1	2,547	24	5,105	47	10,777
BLUE GROSBEAK	Guiraca caerulea	B	3,289	25	162	1	2,808	21	6,828	52	13,086
PHAINOPEPLA	Phainopepla nitens	B	-	0	-	0	-	0	-	0	-
PHAINOPEPLA	Phainopepla nitens	K	871,510	53	105,510	6	529,510	32	145,790	9	1,652,320
SUMMER TANAGER	Piranga rubra	B	1,228	25	122	2	1,024	21	2,532	52	4,905

Common Name	Scientific Name	Range Description	IMA		LIMA		MUMA		UMA		Total
			(ha)	%	(ha)	%	(ha)	%	(ha)	%	
LONG-LEGGED MYOTIS	Myotis volans	B	18,613	77	-	0	5,480	23	82	0	24,175
LONG-LEGGED MYOTIS	Myotis volans	K	788,600	52	144,060	9	452,620	30	132,590	9	1,517,870
LONG-LEGGED MYOTIS	Myotis volans	P	153,520	54	-	0	89,557	31	41,436	15	284,513
LONG-EARED MYOTIS	Myotis evotis	K	90,295	66	35,550	26	7,881	6	2,342	2	136,067
LONG-EARED MYOTIS	Myotis evotis	P	2,138	24	-	0	6,665	75	39	0	8,841
SILVER-HAIRED BAT	Lasionycteris noctivagans	B	59,092	57	-	0	41,663	40	3,473	3	104,228
SILVER-HAIRED BAT	Lasionycteris noctivagans	K	801,900	50	143,360	9	482,620	30	171,190	11	1,599,070
MOJAVE BLACK-COLLARED LIZARD	Crotaphytus bicinctores	K	875,090	54	97,224	6	529,470	33	126,330	8	1,628,114
COMMON KINGSNAKE	Lampropeltis getula	K	1,014,400	53	136,120	7	603,300	31	166,940	9	1,920,760
DESERT POCKET MOUSE	Chaetodipus penicillatus	K	500,670	49	35,302	3	348,030	34	128,930	13	1,012,932
COMMON CHUCKWALLA	Sauromalus ater	K	353,900	59	35,721	6	187,820	31	22,353	4	599,794
DESERT KANGAROO RAT	Dipodomys deserti	K	4,083	17	10	0	15,727	64	4,649	19	24,469
KIT FOX	Vulpes macrotis	K	883,230	52	105,920	6	549,800	33	148,150	9	1,687,100
TOWNSEND'S BIG-EARED BAT	Corynorhinus townsendii	K	1,041,100	53	144,990	7	578,910	30	189,860	10	1,954,860
PALMER'S CHIPMUNK	Tamias palmeri	K	24,880	80	5,058	16	-	0	1,006	3	30,944

Table Information

Column Name	Definition
ITIS Code	Integrated Taxonomic Information System number for species
SWReGAP Common Name	Common name used in SWReGAP
SWReGAP Scientific Name	Scientific name used in SWReGAP
Taxa Group	Taxa group a=amphibian, b=bird, m=mammal, r=reptile
Range Description	Range description used in SWReGAP K=Known or probable occurrence, breeding and non-breeding, winter and summer E=Extirpated occurrence, breeding and non-breeding, winter and summer P=Potential occurrence, breeding and non-breeding, winter and summer B=Known or probable occurrence, breeding, summering M=Known or probable occurrence, non-breeding, migratory
Management Description	Statistics for Clark County Conservation Management Areas
IMA	Intensively Managed Areas
IMA (ha)	Predicted suitable habitat in ha
IMA (%)	Predicted suitable habitat in category divided by total predicted habitat
LIMA	Less Intensively Managed Areas
LIMA (ha)	Predicted suitable habitat in ha
LMA (%)	Predicted suitable habitat in category divided by total predicted habitat
MUMA	Multiple Use Managed Areas
MUMA (ha)	Predicted suitable habitat in ha
MUMA (%)	Predicted suitable habitat in category divided by total predicted habitat
UMA	Unmanaged Areas
UMA (ha)	Predicted suitable habitat in ha
UMA (%)	Predicted suitable habitat in category divided by total predicted habitat
Total (ha)	Total Suitable Habitat

Appendix G.

Comparison between Original SWReGAP Deductive Models and Revised Deductive Models

					Original SWReGAP Deductive Model		Revised Deductive Model		Change (Revised - Original)	
ITIS Code	SWReGAP Common Name	SWReGAP Scientific Name	Study Area	Range Description	Area by Range (ha)	Total Area (ha)	Area by Range (ha)	Total Area (ha)	Total (ha)	Percent %
173457	RELICT LEOPARD FROG	*Rana onca*	Mojave	K	263	263	263	263	0	0%
173457	RELICT LEOPARD FROG	*Rana onca*	Clark County	K	159	159	159	159	0	0%
173490	SOUTHWESTERN TOAD	*Bufo microscaphus*	Mojave	K	9544	13,302	9,865	9,865	(3,436)	-26%
173490	SOUTHWESTERN TOAD	*Bufo microscaphus*	Mojave	P	3758					
173490	SOUTHWESTERN TOAD	*Bufo microscaphus*	Clark County	K	4564	6,883	3,244	3,244	(3,639)	-53%
173490	SOUTHWESTERN TOAD	*Bufo microscaphus*	Clark County	P	2318					
173856	DESERT TORTOISE	*Gopherus agassizii*	Mojave	K	2960410	3,118,169	3,039,560	3,039,560	(78,609)	-3%
173856	DESERT TORTOISE	*Gopherus agassizii*	Mojave	P	157759					
173856	DESERT TORTOISE	*Gopherus agassizii*	Clark County	K	1215550	1,215,550	1,212,190	1,212,190	(3,360)	0%
173921	DESERT IGUANA	*Dipsosaurus dorsalis*	Mojave	K	1982497	1,982,497	2,118,031	2,118,031	135,534	7%
173921	DESERT IGUANA	*Dipsosaurus dorsalis*	Clark County	K	869941	869,941	921,489	921,489	51,548	6%
173924	LONG-NOSED LEOPARD LIZARD	*Gambelia wislizenii*	Mojave	K	4485120	4,485,120	4,539,500	4,539,500	54,380	1%
173924	LONG-NOSED LEOPARD LIZARD	*Gambelia wislizenii*	Clark County	K	1632440	1,632,440	1,670,100	1,670,100	37,660	2%
173943	DESERT HORNED LIZARD	*Phrynosoma platyrhinos*	Mojave	K	5048090	5,048,090	5,071,460	5,071,460	23,370	0%
173943	DESERT HORNED LIZARD	*Phrynosoma platyrhinos*	Clark County	K	1838450	1,838,450	1,848,790	1,848,790	10,340	1%

					Original SWReGAP Deductive Model		Revised Deductive Model		Change (Revised - Original)	
ITIS Code	SWReGAP Common Name	SWReGAP Scientific Name	Study Area	Range Description	Area by Range (ha)	Total Area (ha)	Area by Range (ha)	Total Area (ha)	Total (ha)	Percent %
173966	GILBERT'S SKINK	*Eumeces gilberti*	Mojave	K	1545340	1,545,340	1,080,361	1,080,361	(464,979)	-30%
173966	GILBERT'S SKINK	*Eumeces gilberti*	Clark County	K	508267	508,267	448,391	448,391	(59,876)	-12%
174041	WESTERN BANDED GECKO	*Coleonyx variegatus*	Mojave	K	2255320	2,971,740	4,453,030	4,453,030	1,481,290	50%
					716420					
174041	WESTERN BANDED GECKO	*Coleonyx variegatus*	Clark County	K	682628	849,810	1,681,780	1,681,780	831,970	98%
					167182					
174092	DESERT NIGHT LIZARD	*Xantusia vigilis*	Mojave	K	1956530	1,956,530	3,761,180	3,761,180	1,804,650	92%
174092	DESERT NIGHT LIZARD	*Xantusia vigilis*	Clark County	K	521876	521,876	1,259,946	1,259,946	738,070	141%
174113	GILA MONSTER	*Heloderma suspectum*	Mojave	K	3157080	3,157,080	3,671,770	3,671,770	514,690	16%
174113	GILA MONSTER	*Heloderma suspectum*	Clark County	K	1378830	1,378,830	1,568,180	1,568,180	189,350	14%
174202	GLOSSY SNAKE	*Arizona elegans*	Mojave	K	2912720	2,912,720	3,337,680	3,337,680	424,960	15%
174202	GLOSSY SNAKE	*Arizona elegans*	Clark County	K	1232480	1,232,480	1,268,580	1,268,580	36,100	3%
174261	SPOTTED LEAF-NOSED SNAKE	*Phyllorhynchus decurtatus*	Mojave	K	706680	706,680	2,315,270	2,315,270	1,608,590	228%
174261	SPOTTED LEAF-NOSED SNAKE	*Phyllorhynchus decurtatus*	Clark County	K	375211	375,211	1,033,609	1,033,609	658,398	175%
174267	LONG-NOSED SNAKE	*Rhinocheilus lecontei*	Mojave	K	133082	133,082	3,916,100	3,916,100	3,783,018	2843%
174267	LONG-NOSED SNAKE	*Rhinocheilus lecontei*	Clark County	K	29229	29,229	1,649,840	1,649,840	1,620,611	5545%

					Original SWReGAP Deductive Model		Revised Deductive Model		Change (Revised - Original)	
ITIS Code	SWReGAP Common Name	SWReGAP Scientific Name	Study Area	Range Description	Area by Range (ha)	Total Area (ha)	Area by Range (ha)	Total Area (ha)	Total (ha)	Percent %
174291	WESTERN LYRE SNAKE	*Trimorphodon biscutatus*	Mojave	K	1410640	1,410,640	4,080,200	4,080,200	2,669,560	189%
174291	WESTERN LYRE SNAKE	*Trimorphodon biscutatus*	Clark County	K	458805	458,805	1,810,760	1,810,760	1,351,955	295%
174311	SIDEWINDER	*Crotalus cerastes*	Mojave	K	2683000	2,683,000	3,016,140	3,016,140	333,140	12%
174311	SIDEWINDER	*Crotalus cerastes*	Clark County	K	1094968	1,094,968	1,224,890	1,224,890	129,922	12%
174313	SPECKLED RATTLESNAKE	*Crotalus mitchellii*	Mojave	K	4111460	4,347,304	4,385,060	4,385,060	37,756	1%
174313	SPECKLED RATTLESNAKE	*Crotalus mitchellii*	Mojave	P	235844					
174313	SPECKLED RATTLESNAKE	*Crotalus mitchellii*	Clark County	K	1689040	1,707,879	1,735,690	1,735,690	27,811	2%
174313	SPECKLED RATTLESNAKE	*Crotalus mitchellii*	Clark County	P	18839					
174317	MOJAVE RATTLESNAKE	*Crotalus scutulatus*	Mojave	K	3025120	3,025,120	3,238,100	3,238,100	212,980	7%
174317	MOJAVE RATTLESNAKE	*Crotalus scutulatus*	Clark County	K	1187590	1,187,590	1,217,370	1,217,370	29,780	3%
175604	PEREGRINE FALCON	*Falco peregrinus*	Mojave	K	3554150	3,554,150	4,491,660	4,491,660	937,510	26%
175604	PEREGRINE FALCON	*Falco peregrinus*	Clark County	K	1777740	1,777,740	1,962,840	1,962,840	185,100	10%
177831	YELLOW-BILLED CUCKOO	*Coccyzus americanus*	Mojave	B	1237	1,237	31,958	31,958	30,721	2483%
177831	YELLOW-BILLED CUCKOO	*Coccyzus americanus*	Clark County	B	826	826	10,662	10,662	9,836	1191%
177946	BURROWING OWL	*Athene cunicularia*	Mojave	B	4140720	4,834,071	4,119,280	4,813,150	(714,791)	-15%
177946	BURROWING OWL	*Athene cunicularia*	Mojave	K	693351		693,870			

					Original SWReGAP Deductive Model		Revised Deductive Model		Change (Revised - Original)	
ITIS Code	SWReGAP Common Name	SWReGAP Scientific Name	Study Area	Range Description	Area by Range (ha)	Total Area (ha)	Area by Range (ha)	Total Area (ha)	Total (ha)	Percent %
177946	BURROWING OWL	*Athene cunicularia*	Clark County	B	1589090	1,710,605	1,593,380	1,715,279	(117,225)	-7%
177946	BURROWING OWL	*Athene cunicularia*	Clark County	K	121515		121,899			
178341	WILLOW FLYCATCHER	*Empidonax traillii*	Mojave	B	50411	50,820	34,385	34,591	(16,436)	-32%
178341	WILLOW FLYCATCHER	*Empidonax traillii*	Mojave	M	409		206			
178341	WILLOW FLYCATCHER	*Empidonax traillii*	Clark County	B	18039	18,180	9,842	9,936	(8,338)	-46%
178341	WILLOW FLYCATCHER	*Empidonax traillii*	Clark County	M	141		94			
178371	VERMILION FLYCATCHER	*Pyrocephalus rubinus*	Mojave	K	250236	250,236	17,540	17,540	(232,696)	-93%
178371	VERMILION FLYCATCHER	*Pyrocephalus rubinus*	Clark County	K	121333	121,333	5,025	5,025	(116,309)	-96%
179003	BELL'S VIREO	*Vireo bellii*	Mojave	B	25614	25,614	39,014	39,014	13,399	52%
179003	BELL'S VIREO	*Vireo bellii*	Clark County	B	7753	7,753	10,591	10,591	2,838	37%
179145	BLUE GROSBEAK	*Guiraca caerulea*	Mojave	B	4035120	4,038,497	48,624	48,624	(3,989,874)	-99%
179145	BLUE GROSBEAK	*Guiraca caerulea*	Mojave	P	3377					
179145	BLUE GROSBEAK	*Guiraca caerulea*	Clark County	B	1653320	1,653,320	12,900	12,900	(1,640,420)	-99%
179877	PHAINOPEPLA	*Phainopepla nitens*	Mojave	B	29883	344,500	40,403	581,937	237,436	69%
179877	PHAINOPEPLA	*Phainopepla nitens*	Mojave	B	314617		541,534			
179877	PHAINOPEPLA	*Phainopepla nitens*	Mojave	K	1110727	1,588,517	3,315,040	4,966,000	3,377,483	213%

					Original SWReGAP Deductive Model		Revised Deductive Model		Change (Revised - Original)	
ITIS Code	SWReGAP Common Name	SWReGAP Scientific Name	Study Area	Range Description	Area by Range (ha)	Total Area (ha)	Area by Range (ha)	Total Area (ha)	Total (ha)	Percent %
179877	PHAINOPEPLA	*Phainopepla nitens*	Clark County	K	477790		1,650,960			
179888	SUMMER TANAGER	*Piranga rubra*	Mojave	B	61781	61,781	20,682	20,682	(41,099)	-67%
179888	SUMMER TANAGER	*Piranga rubra*	Clark County	B	26915	26,915	5,033	5,033	(21,881)	-81%
179990	LONG-LEGGED MYOTIS	*Myotis volans*	Mojave	B	153947	3,486,927	201,067	4,731,461	(3,285,860)	-94%
179990	LONG-LEGGED MYOTIS	*Myotis volans*	Mojave	K	2988900		4,109,570			
179990	LONG-LEGGED MYOTIS	*Myotis volans*	Mojave	P	344080		420,824			
179990	LONG-LEGGED MYOTIS	*Myotis volans*	Clark County	B	19451	1,436,138	24,334	1,826,184	390,047	27%
179990	LONG-LEGGED MYOTIS	*Myotis volans*	Clark County	K	1168600		1,517,950			
179990	LONG-LEGGED MYOTIS	*Myotis volans*	Clark County	P	248087		283,900			
179995	LONG-EARED MYOTIS	*Myotis evotis*	Mojave	K	478848	541,311	478,848	541,307	(3.45)	0%
			Mojave	P	62463					
179995	LONG-EARED MYOTIS	*Myotis evotis*	Clark County	K	136038	145,026	136,038	145,026	0	0%
			Clark County	P	8988					
180014	SILVER-HAIRED BAT	*Lasionycteris noctivagans*	Mojave	B	571663	62,469,993	869,150	4,169,730	1,138,737	38%
180014			Mojave	K	2459330		3,300,580			
180198	SILVER-HAIRED BAT	*Lasionycteris noctivagans*	Clark County	B	96223	1,318,873 8,988	104,804	1,702,414	383,541	29%

					Original SWReGAP Deductive Model		Revised Deductive Model		Change (Revised - Original)	
ITIS Code	SWReGAP Common Name	SWReGAP Scientific Name	Study Area	Range Description	Area by Range (ha)	Total Area (ha)	Area by Range (ha)	Total Area (ha)	Total (ha)	Percent %
180198			Clark County	K	1222650		1,597,610			
180236	PALMER'S CHIPMUNK	*Tamias palmeri*	Mojave	K	31242	31,242	30,935	30,935	(307)	-1%
180236	PALMER'S CHIPMUNK	*Tamias palmeri*	Clark County	K	30731	30,731	31,445	31,445	714	2%
180606	DESERT KANGAROO RAT	*Dipodomys deserti*	Mojave	K	33130	33,130	33,130	33,130	0	0%
180606	DESERT KANGAROO RAT	*Dipodomys deserti*	Clark County	K	24471	24,471	24,471	24,471	0	0%
203452	KIT FOX	*Vulpes macrotis*	Mojave	K	4780780	4,780,780	4,783,830	4,783,830	3,050	0%
203452	KIT FOX	*Vulpes macrotis*	Clark County	K	1706850	1,706,850	1,686,160	1,686,160	(20,690)	-1%
203452	TOWNSEND'S BIG-EARED BAT	*Corynorhinus townsendii*	Mojave	B	34894	3,791,944	45,257	5,086,757	1,294,813	34%
208791	TOWNSEND'S BIG-EARED BAT	*Corynorhinus townsendii*	Mojave	K	3757050		5,041,500			
208791	TOWNSEND'S BIG-EARED BAT	*Corynorhinus townsendii*	Clark County	K	1534590	1,534,590	1,953,920	1,953,920	419,330	27%
209247	MOJAVE BLACK-COLLARED LIZARD	*Crotaphytus bicinctores*	Mojave	K	2886260	2,886,260	4,434,040	4,434,040	1,547,780	54%
209247	MOJAVE BLACK-COLLARED LIZARD	*Crotaphytus bicinctores*	Clark County	K	1117271	1,117,271	1,627,110	1,627,110	509,839	46%
552486	COMMON KINGSNAKE	*Lampropeltis getula*	Mojave	K	5285430	5,285,430	5,292,810	5,292,810	7,380	0%
552486	COMMON KINGSNAKE	*Lampropeltis getula*	Clark County	K	1915290	1,915,290	1,919,790	1,919,790	4,500	0%
564596	DESERT POCKET MOUSE	*Chaetodipus penicillatus*	Mojave	K	2,923,920	2,923,920	2,200,870	2,200,870	(723,050)	-25%
564596	DESERT POCKET MOUSE	*Chaetodipus penicillatus*	Clark County	K	1,496,110	1,496,110	1,012,115	1,012,115	(483,995)	-32%

					Original SWReGAP Deductive Model		Revised Deductive Model		Change (Revised - Original)	
ITIS Code	SWReGAP Common Name	SWReGAP Scientific Name	Study Area	Range Description	Area by Range	Total Area	Area by Range	Total Area	Total	Percent
					(ha)	(ha)	(ha)	(ha)	(ha)	%
209247	COMMON CHUCKWALLA	*Sauromalus ater*	Mojave	K	159,424	159,424	1,520,890	1,520,890	1,361,466	854%
209247	COMMON CHUCKWALLA	*Sauromalus ater*	Clark County	K	92,718	92,718	599,124	599,124	506,406	546%

Table Information

Column Name		Definition
ITIS code		Integrated Taxonomic Information System number for species
SWReGAP Common Name		Common name used in SWReGAP
SWReGAP Scientific Name		Scientific name used in SWReGAP
Management Description		Statistics for Mojave Desert Ecoregion or Clark County
Range Description		Range description used in SWReGAP K=Known or probable occurrence, breeding and non-breeding, winter and summer E=Extirpated occurrence, breeding and non-breeding, winter and summer P=Potential occurrence, breeding and non-breeding, winter and summer B=Known or probable occurrence, breeding, summering M=Known or probable occurrence, non-breeding, migratory
Original SWReGAP Deductive Model	Area by Range	Predicted habitat by range description for that Management Area
	Total Area	Total predicted habitat for species for that Management Area
Revised Deductive Model	Area by Range	Predicted habitat by range description for that Management Area
	Total	Total predicted habitat for species for that Management Area
Change (Revised - Original)	Total	Area of predicted habitat from model revised for MSHCP minus predicted habitat from original SWReGAP in hectares. Calculations are done using Area of Range if both models predicted these values or by Total Area if not.
		Percentage change [(MSHCP-SWReGAP)/SWReGAP]

Percent

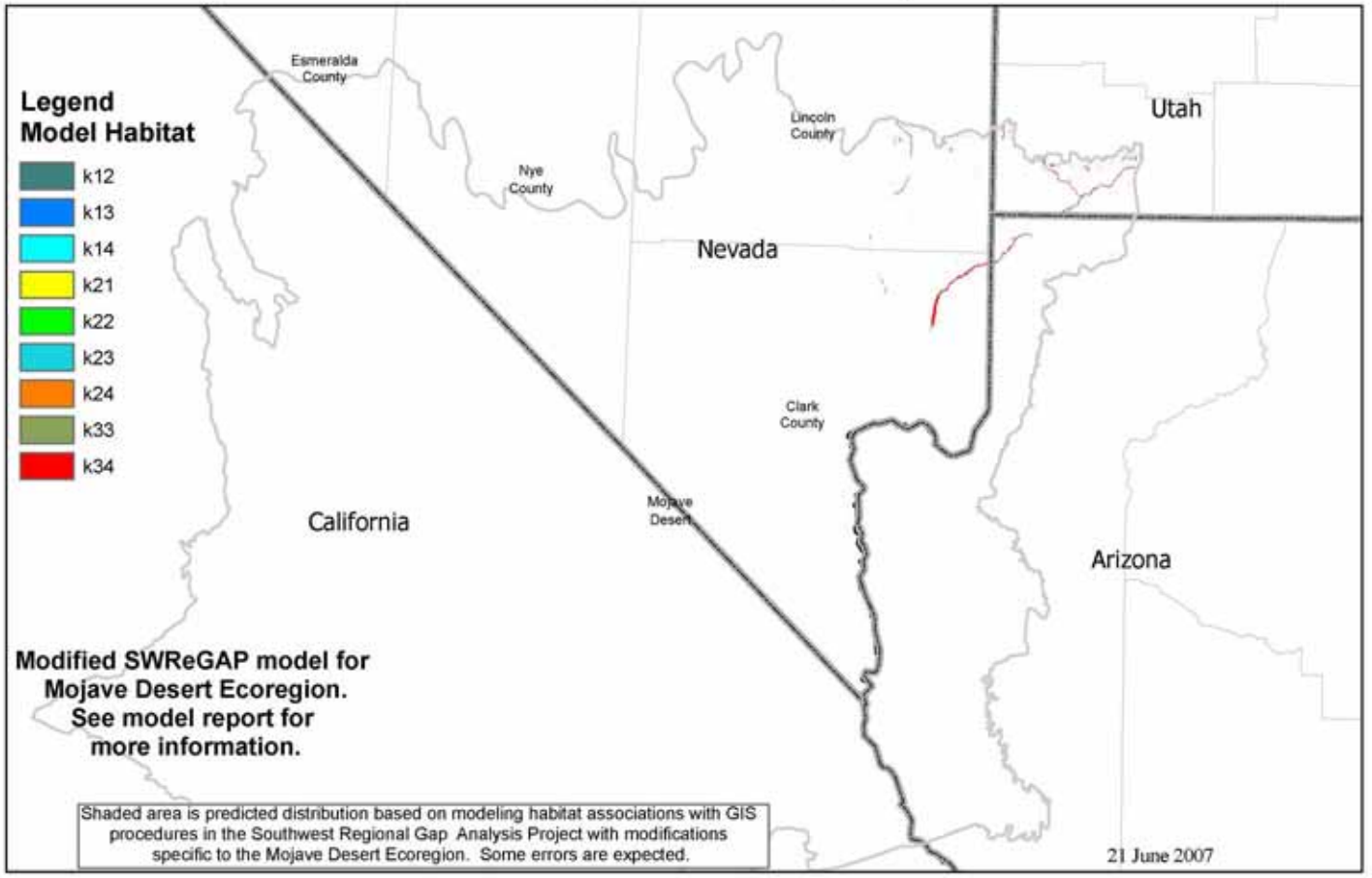
Appendix H.

Revised Deductive Habitat Models for 37 Species

These revised models are provided at http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/. A description of the revision is provided in the report for each model at this Web site.

Taxon	**Common Name***	***Scientific Name****
Amphibians	Southwestern toad**	*Bufo microscaphus*
	Relict leopard frog	*Rana onca*
Reptiles	Glossy snake	*Arizona elegans*
	Western banded gecko	*Coleonyx variegatus*
	Sidewinder	*Crotalus cerastes*
	Speckled rattlesnake	*Crotalus mitchellii*
	Mojave rattlesnake	*Crotalus scutulatus*
	Mojave black-collared lizard	*Crotaphytus bicinctores*
	Desert iguana	*Dipsosaurus dorsalis*
	Gilbert's skink	*Eumeces gilberti*
	Long-nosed leopard lizard	*Gambelia wislizenii*
	Desert tortoise	*Gopherus agassizii*
	Gila monster**	*Heloderma suspectum*
	Common kingsnake	*Lampropeltis getula*
	Desert horned lizard**	*Phrynosoma platyrhinos*
	Spotted leaf-nosed snake	*Phyllorhynchus decurtatus*
	Long-nosed snake	*Rhinocheilus lecontei*
	Common chuckwalla**	*Sauromalus ater*
	Western lyre snake	*Trimorphodon biscutatus*
	Desert night lizard**	*Xantusia vigilis*
Birds	Burrowing owl**	*Athene cunicularia*
	Yellow-billed cuckoo	*Coccyzus americanus*
	Willow flycatcher	*Empidonax traillii*
	Peregrine falcon	*Falco peregrinus*
	Blue grosbeak	*Guiraca caerulea*
	Phainopepla	*Phainopepla nitens*
	Summer tanager	*Piranga rubra*
	Vermilion flycatcher	*Pyrocephalus rubinus*
	Bell's vireo	*Vireo bellii*
Mammals	Desert pocket mouse**	*Chaetodipus penicillatus*
	Townsend's big-eared bat**	*Corynorhinus townsendii*
	Desert kangaroo rat**	*Dipodomys deserti*
	Silver-haired bat	*Lasionycteris noctivagans*
	Long-eared myotis	*Myotis evotis*
	Long-legged myotis	*Myotis volans*
	Palmer's chipmunk	*Tamias palmeri*
	Kit fox**	*Vulpes macrotis*

SOUTHWESTERN TOAD (Bufo microscaphus) ITIS # 173490



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For illustrations purposes this map is presented with a longitude of Central Meridian at -112.

Disclaimer: This is a modified product of the original SWReGAP habitat model. The user assumes the entire risk related to its use of this data. For more information and for related links, see http://fws-nmcfwru.nmsu.edu/kboykin/MSHCP/

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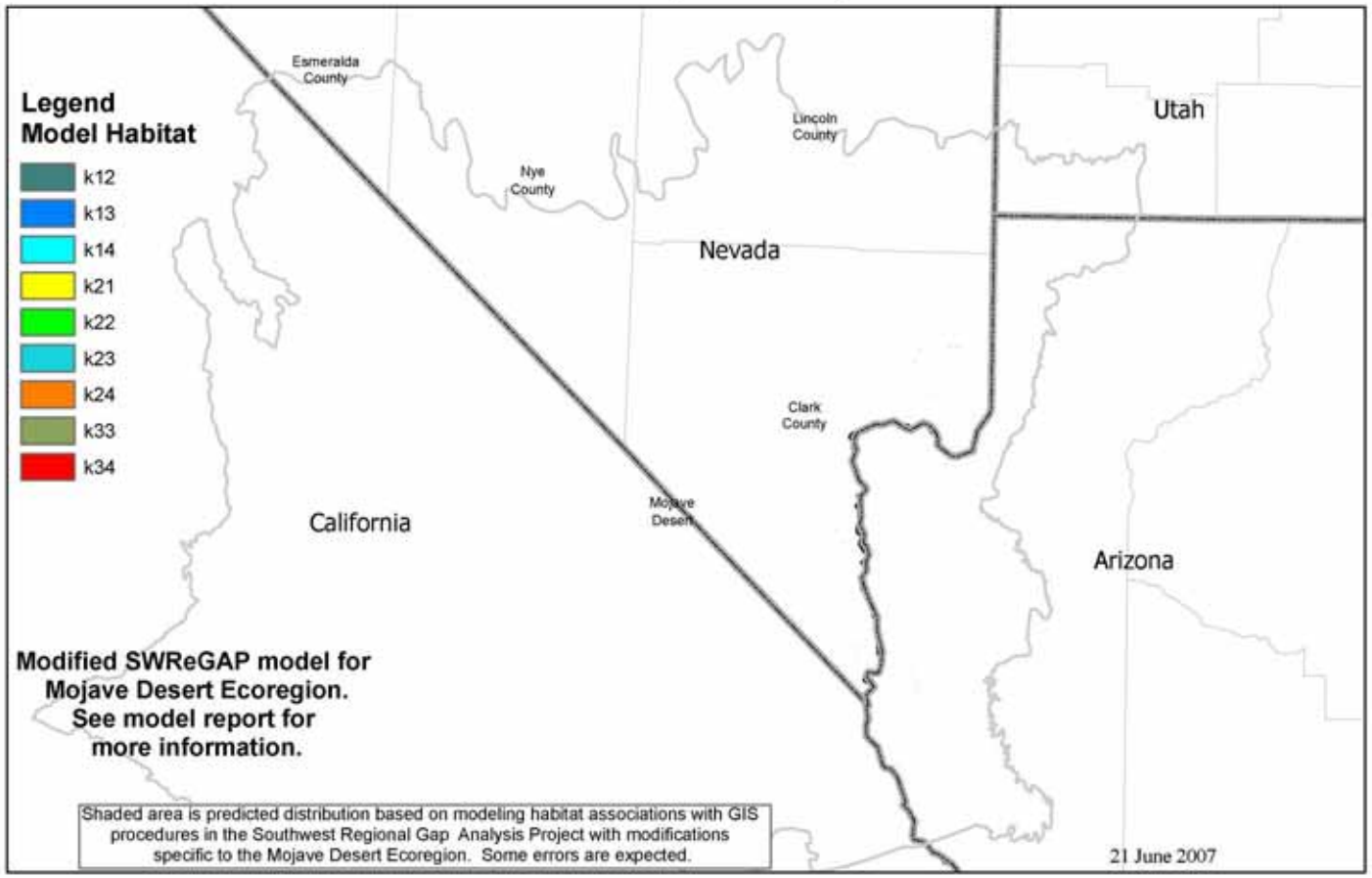
RELICT LEOPARD FROG (Rana onca) ITIS # 173457



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0 15 30 60 90 120
Kilometers

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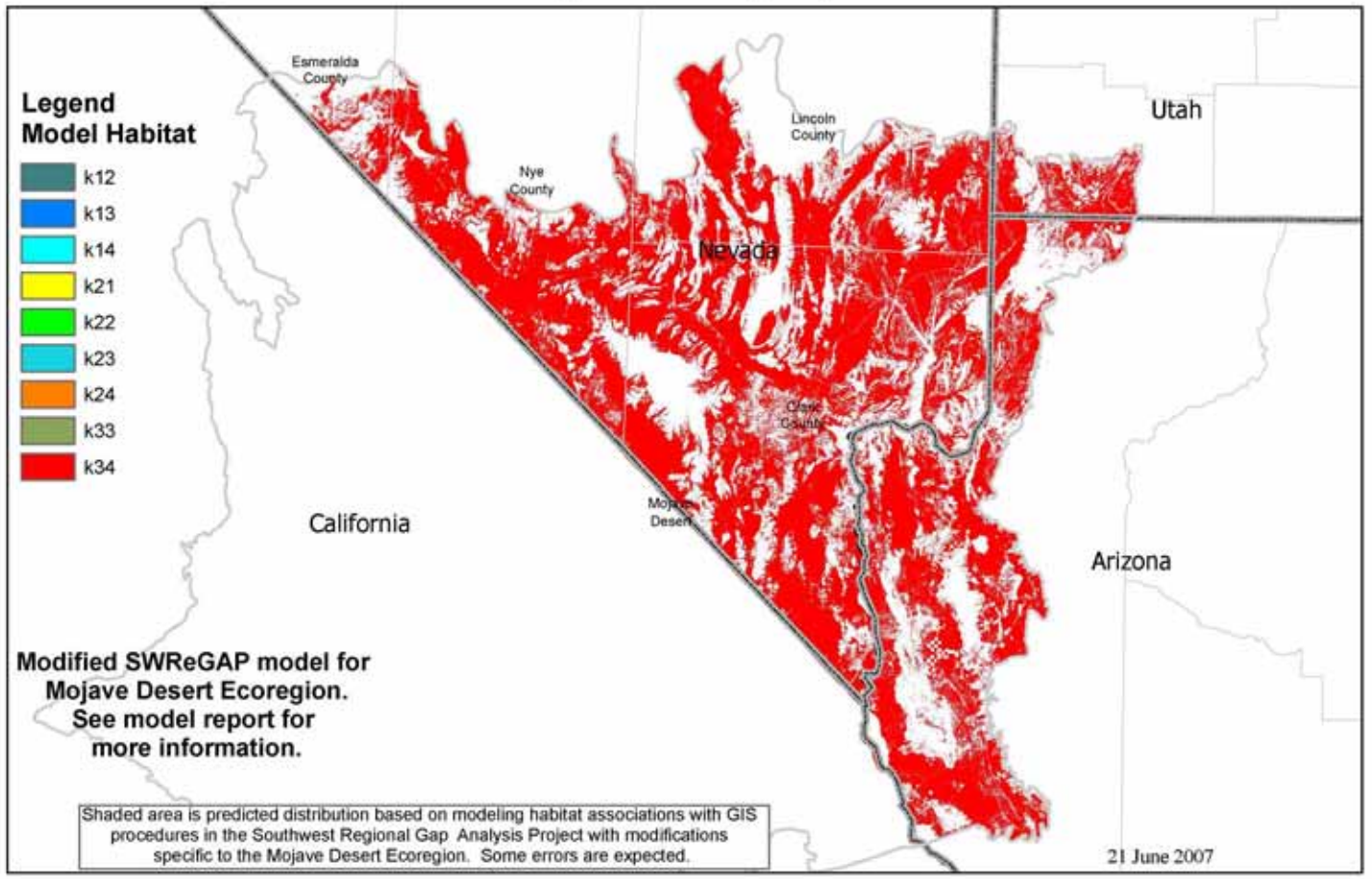
GLOSSY SNAKE (Arizona elegans) ITIS # 174202



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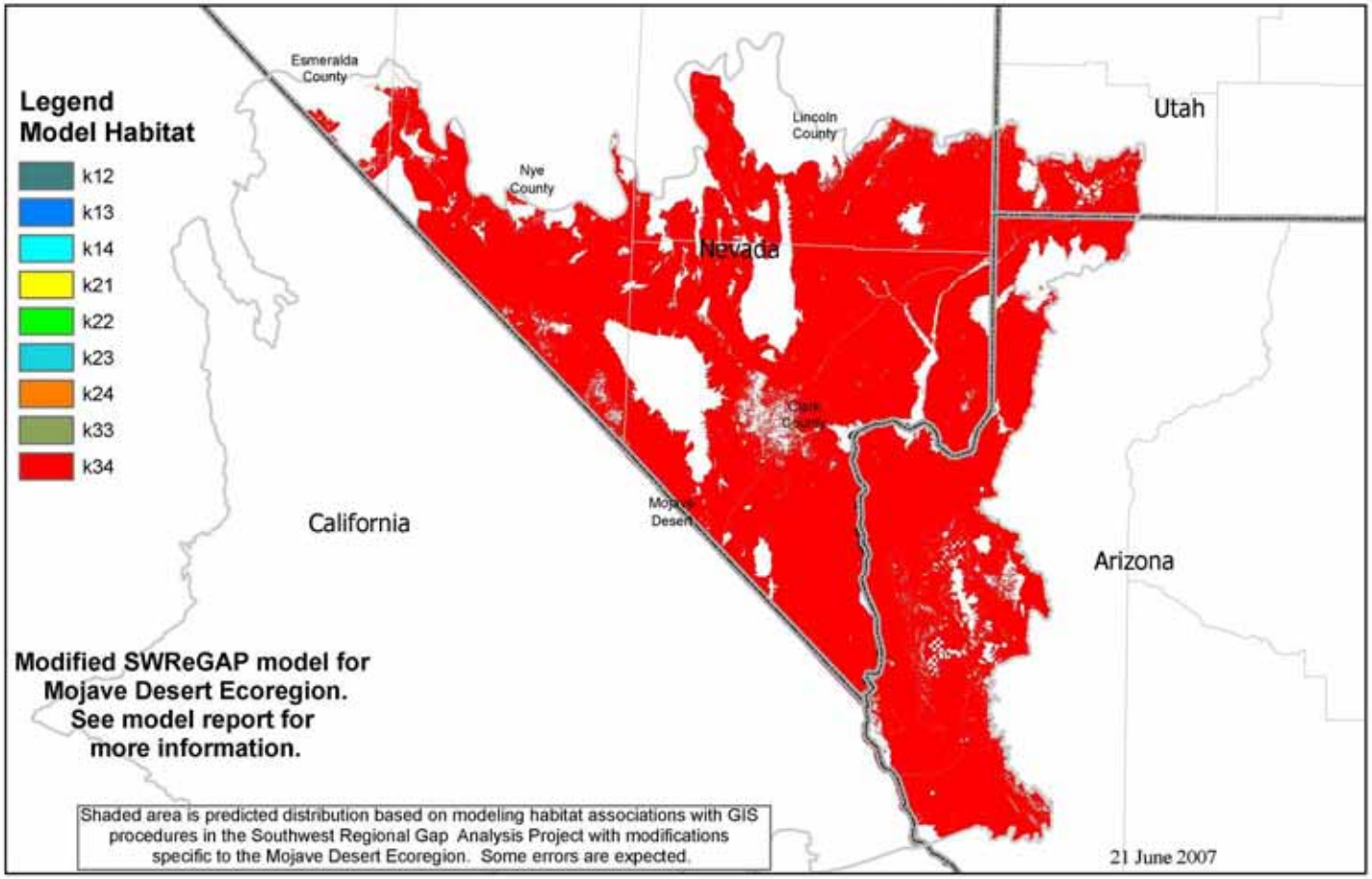
WESTERN BANDED GECKO (Coleonyx variegatus) ITIS # 174041



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For Illustrations purposes this map is presented with a longitude of Central Meridian at -112.

0 15 30 60 90 120 Kilometers

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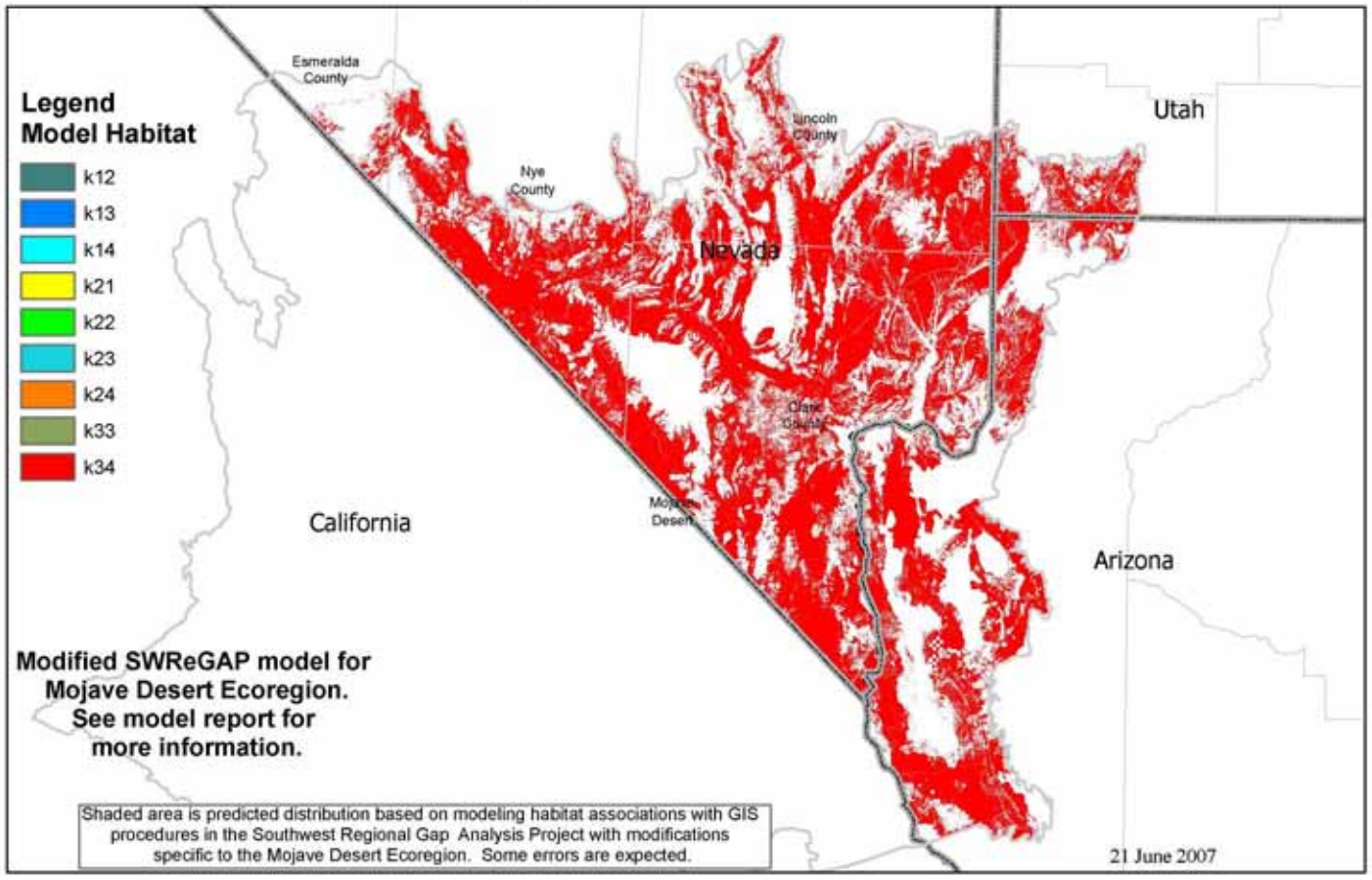
SIDEWINDER (Crotalus cerastes) ITIS # 174311



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For illustrations purposes this map is presented with a longitude of Central Meridian at -112.

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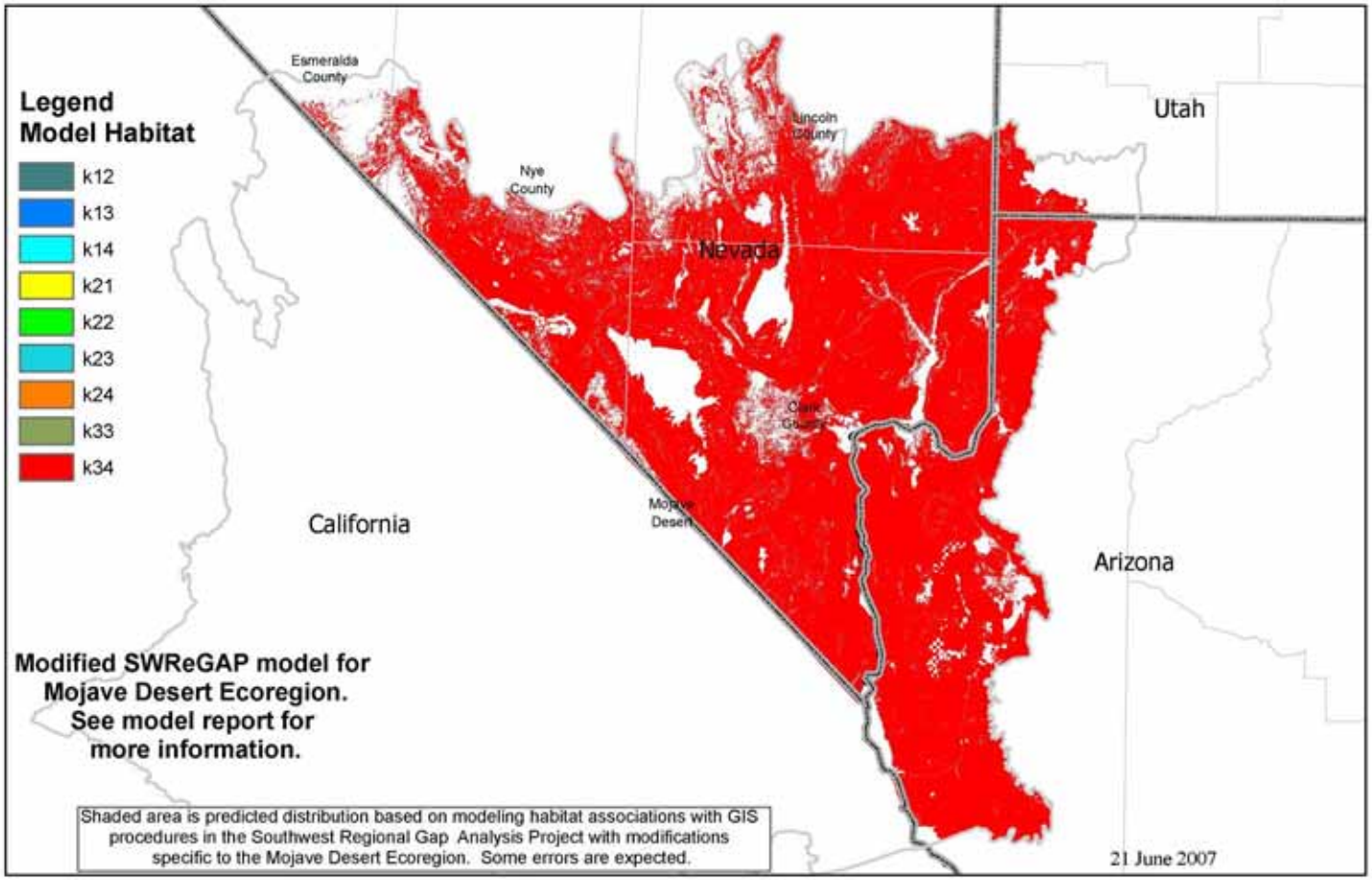
SPECKLED RATTLESNAKE (Crotalus mitchellii) ITIS # 174313



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For illustrations purposes this map is presented with a longitude of Central Meridian at -112.

0 15 30 60 90 120 Kilometers

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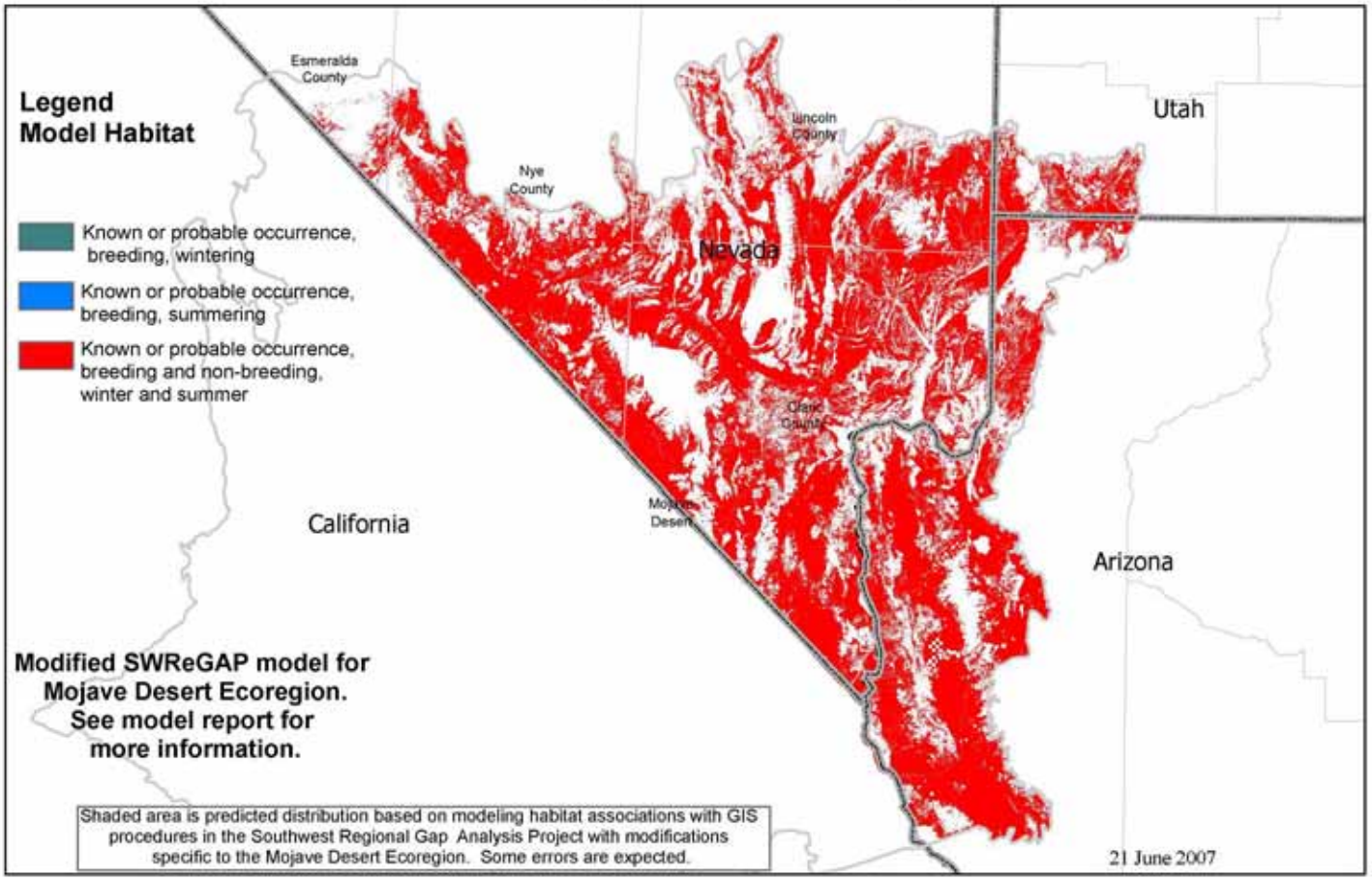
MOJAVE RATTLESNAKE (Crotalus scutulatus) ITIS # 174317



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For Illustrations purposes this map is presented with a longitude of Central Meridian at -112.

0 15 30 60 90 120 Kilometers

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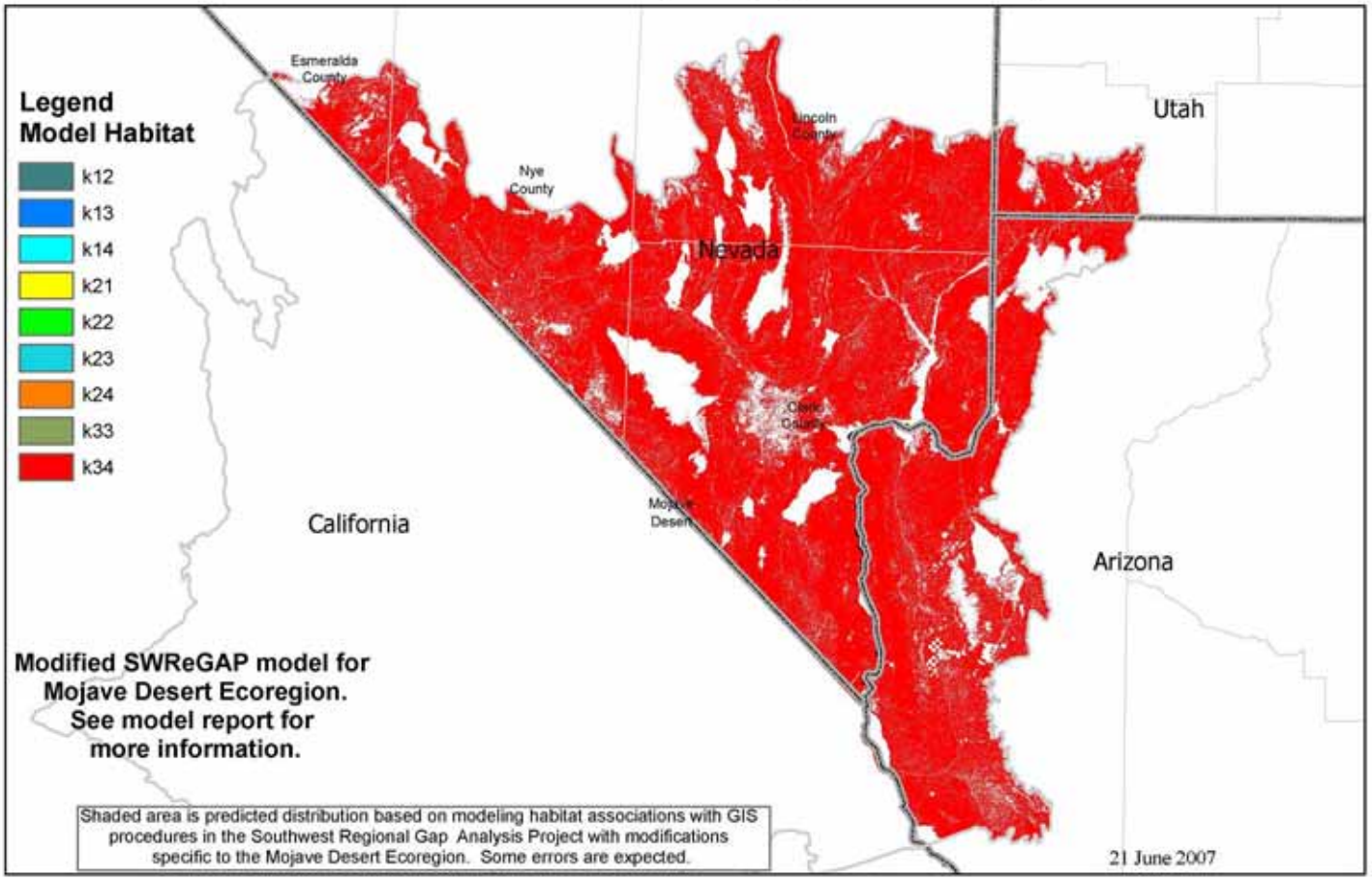
Modified Product of Southwest Regional Gap Analysis Project

MOJAVE BLACK-COLLARED LIZARD (Crotaphytus bicinctores) ITIS # 208791



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
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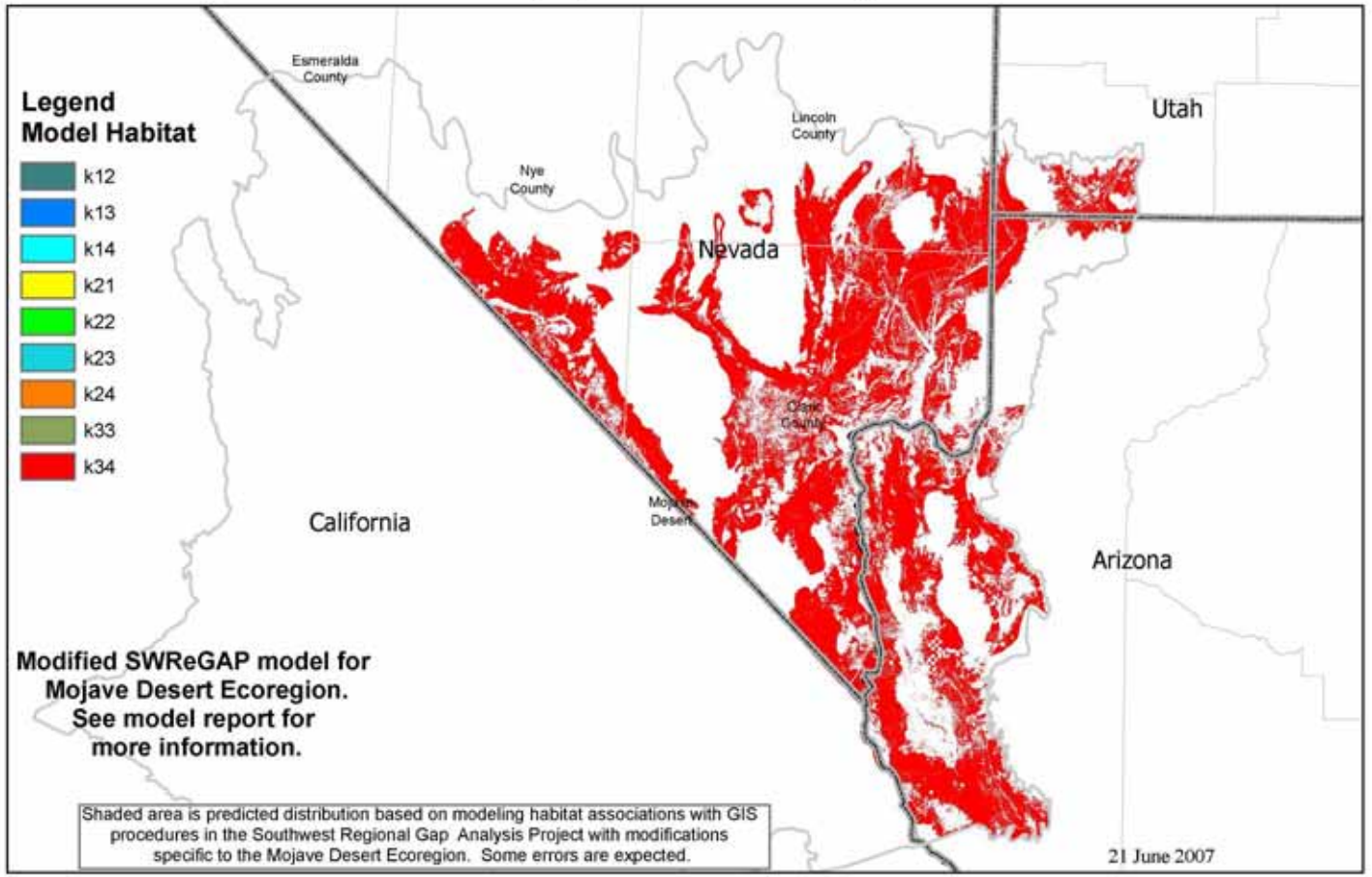
Modified Product of
Southwest Regional Gap Analysis Project

DESERT IGUANA (Dipsosaurus dorsalis) ITIS # 173921



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0 15 30 60 90 120 Kilometers

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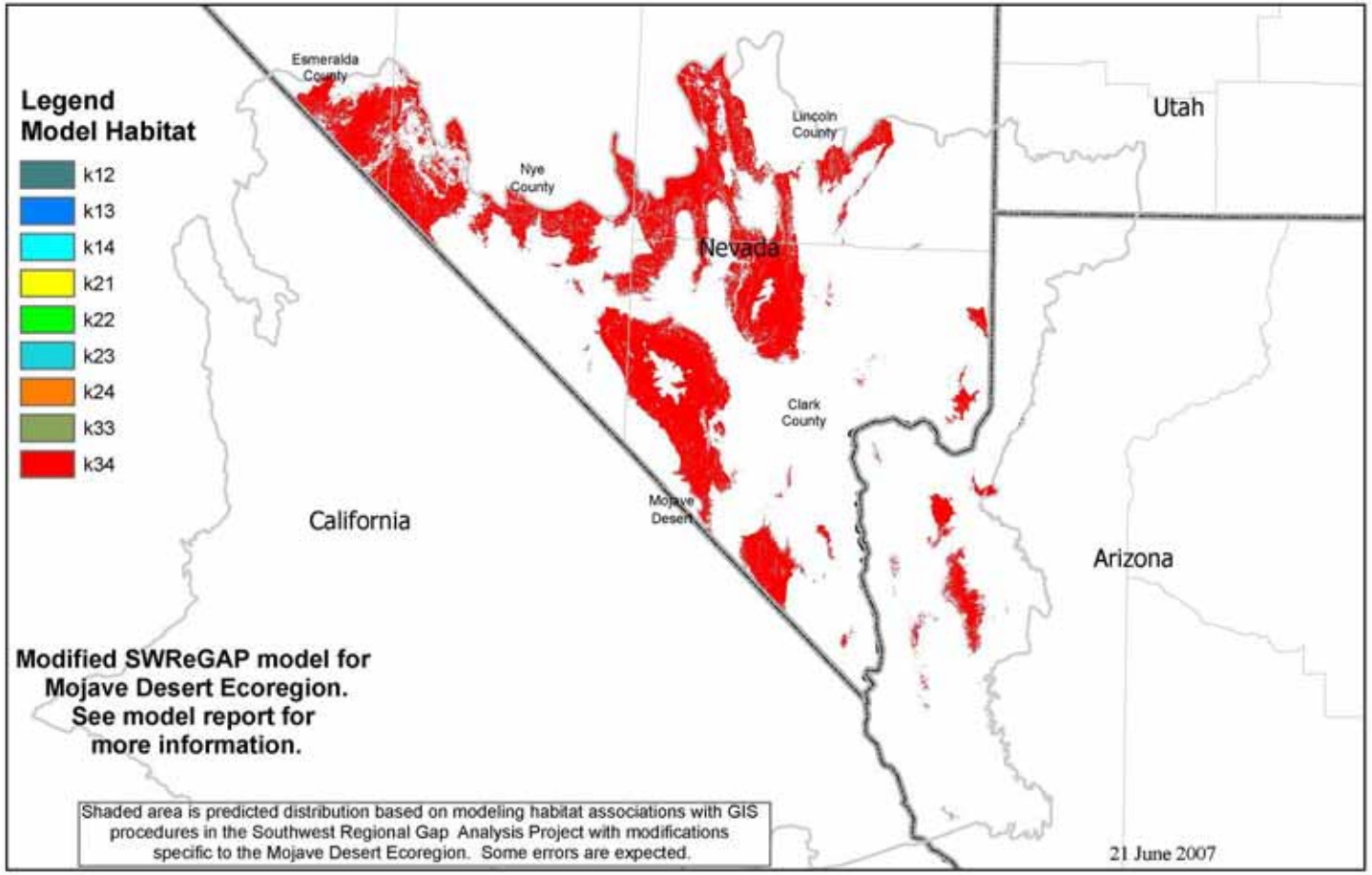
GILBERT'S SKINK (Eumeces gilberti) ITIS # 173966



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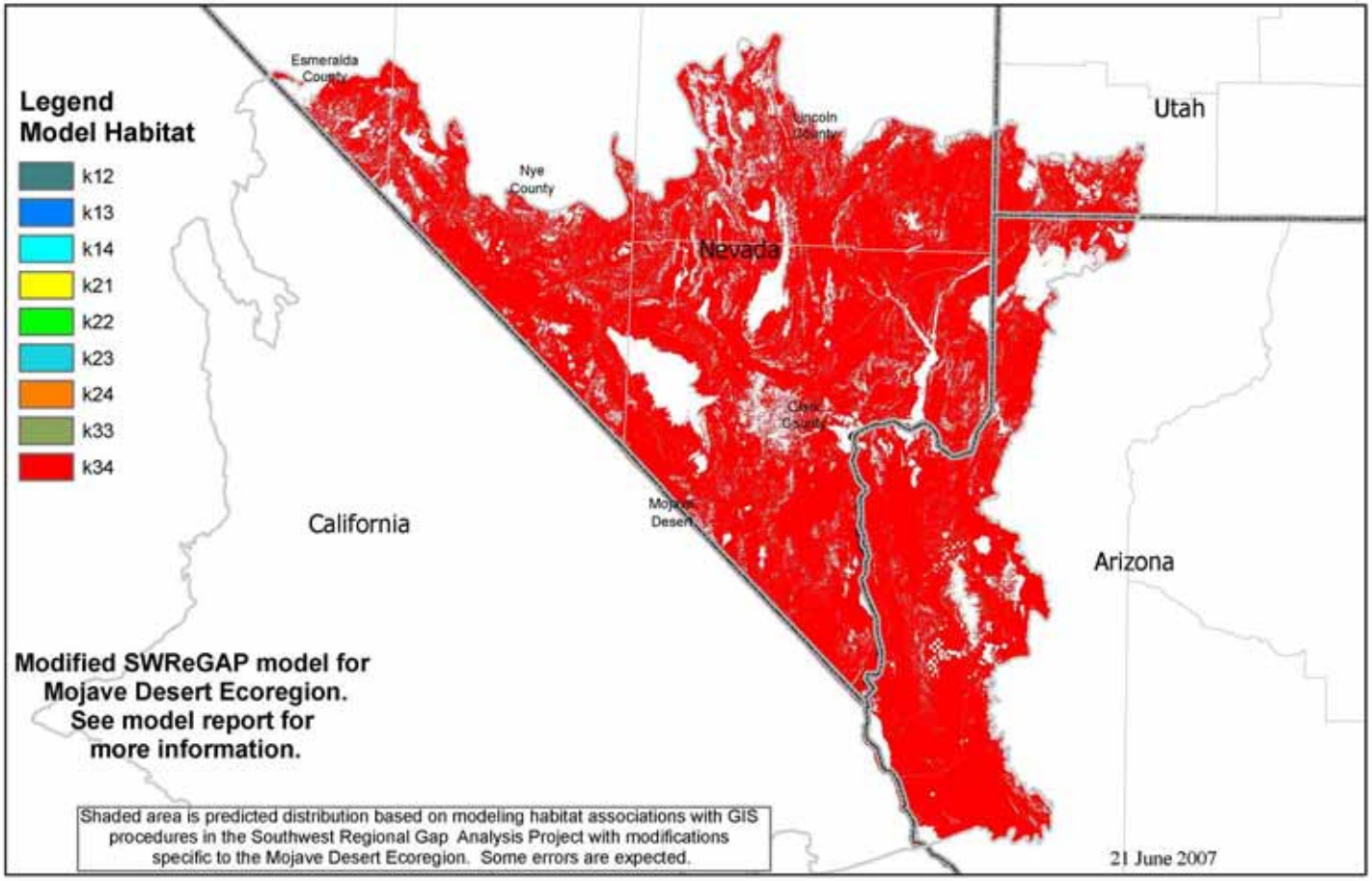
LONG-NOSED LEOPARD LIZARD (Gambelia wislizenii) ITIS # 173924



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
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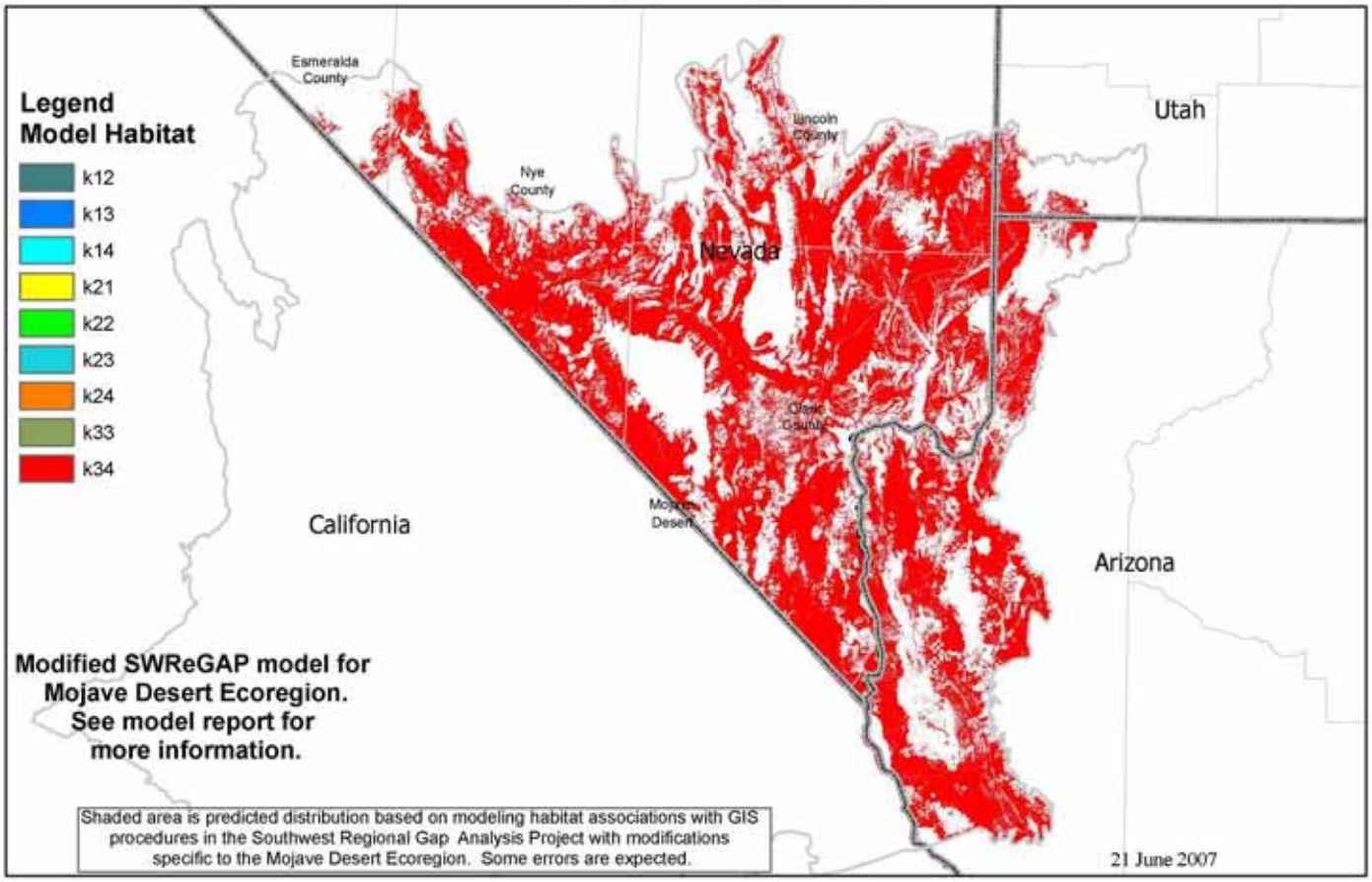
0 15 30 60 90 120 Kilometers

Modified Product of
Southwest Regional Gap Analysis Project

DESERT TORTOISE (Gopherus agassizii) ITIS # 173856



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For illustrations purposes this map is presented with a longitude of Central Meridian at -112.

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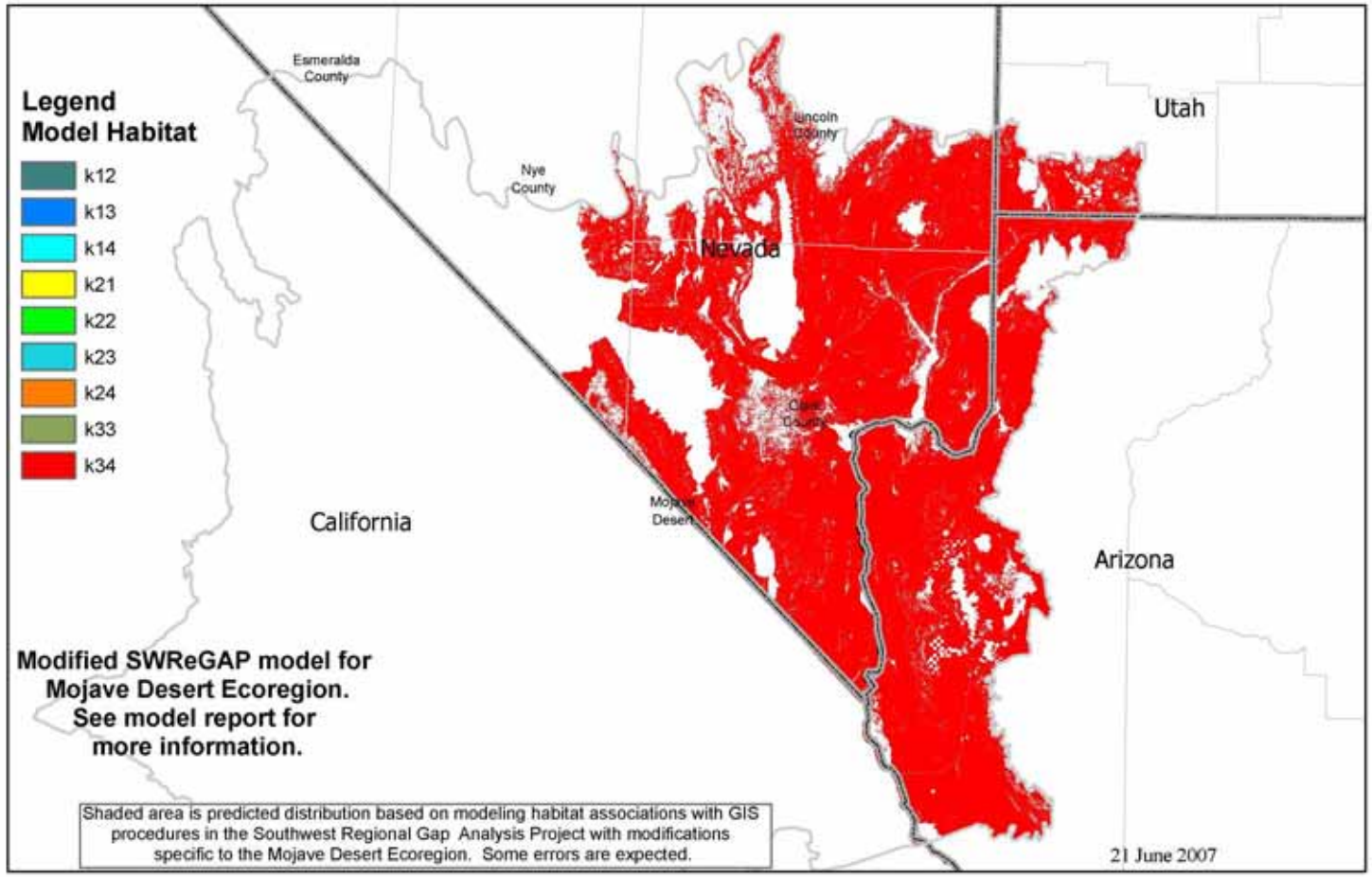
GILA MONSTER (Heloderma suspectum) ITIS # 174113



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For Illustrations purposes this map is presented with a longitude of Central Meridian at -112.

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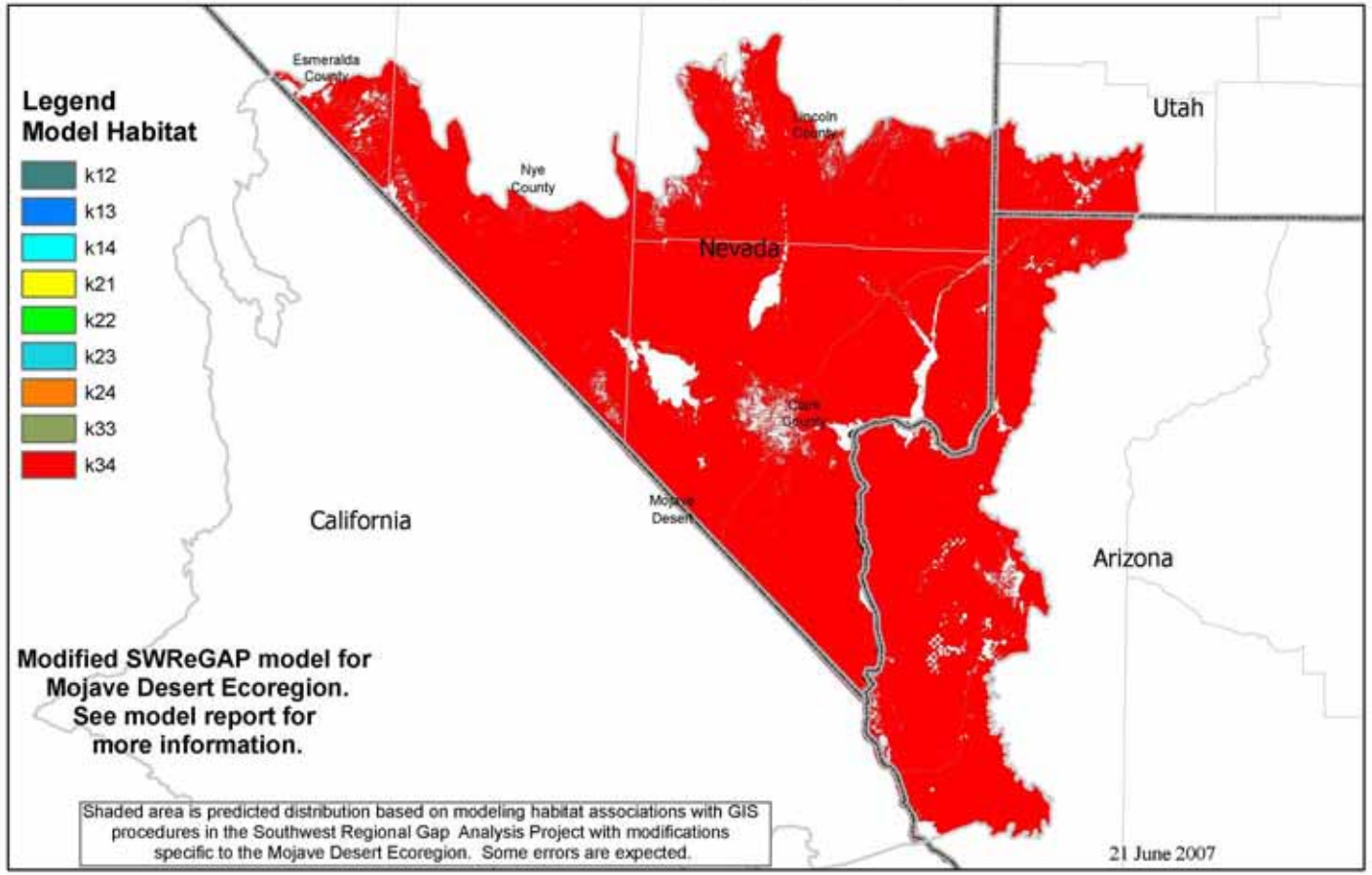
COMMON KINGSNAKE (Lampropeltis getula) ITIS # 209247



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For Illustrations purposes this map is presented with a longitude of Central Meridian at -112.

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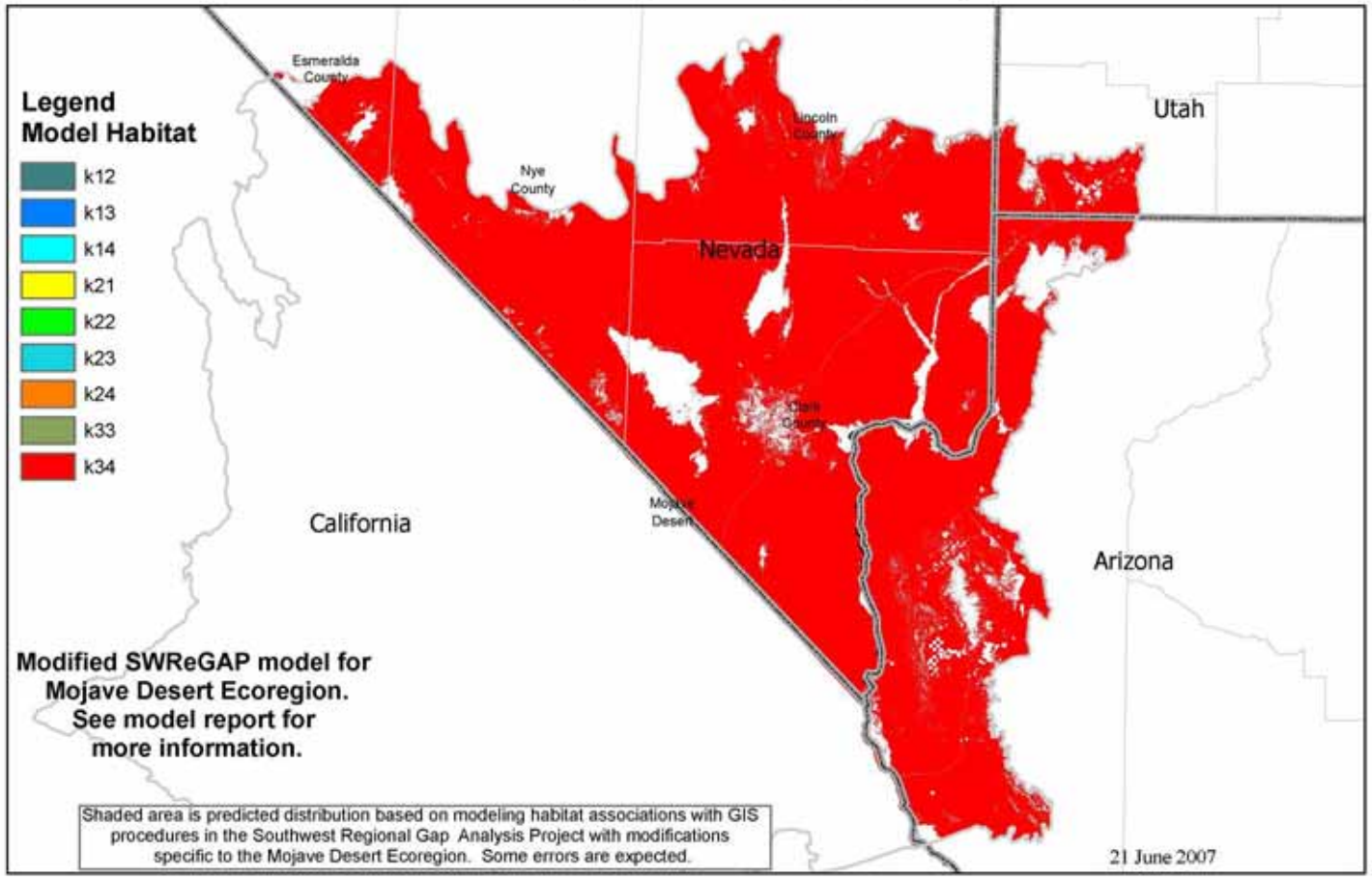
0 15 30 60 90 120
Kilometers

Modified Product of
Southwest Regional Gap Analysis Project

DESERT HORNED LIZARD (Phrynosoma platyrhinos) ITIS # 173943



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
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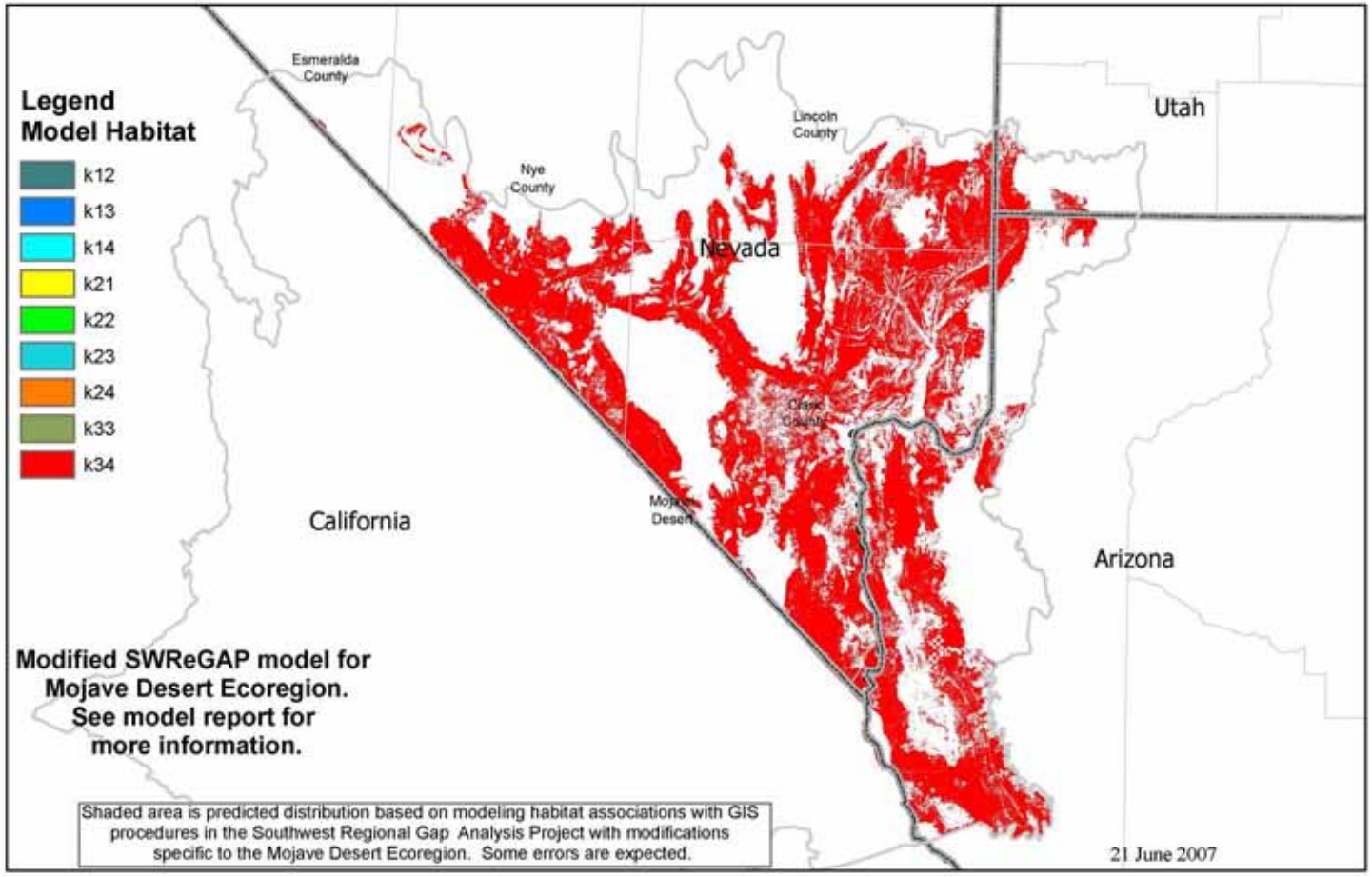
0 15 30 60 90 120 Kilometers

Modified Product of
Southwest Regional Gap Analysis Project

SPOTTED LEAF-NOSED SNAKE (Phyllorhynchus decurtatus) ITIS # 174261



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For illustrations purposes this map is presented with a longitude of Central Meridian at -112.

0 15 30 60 90 120 Kilometers

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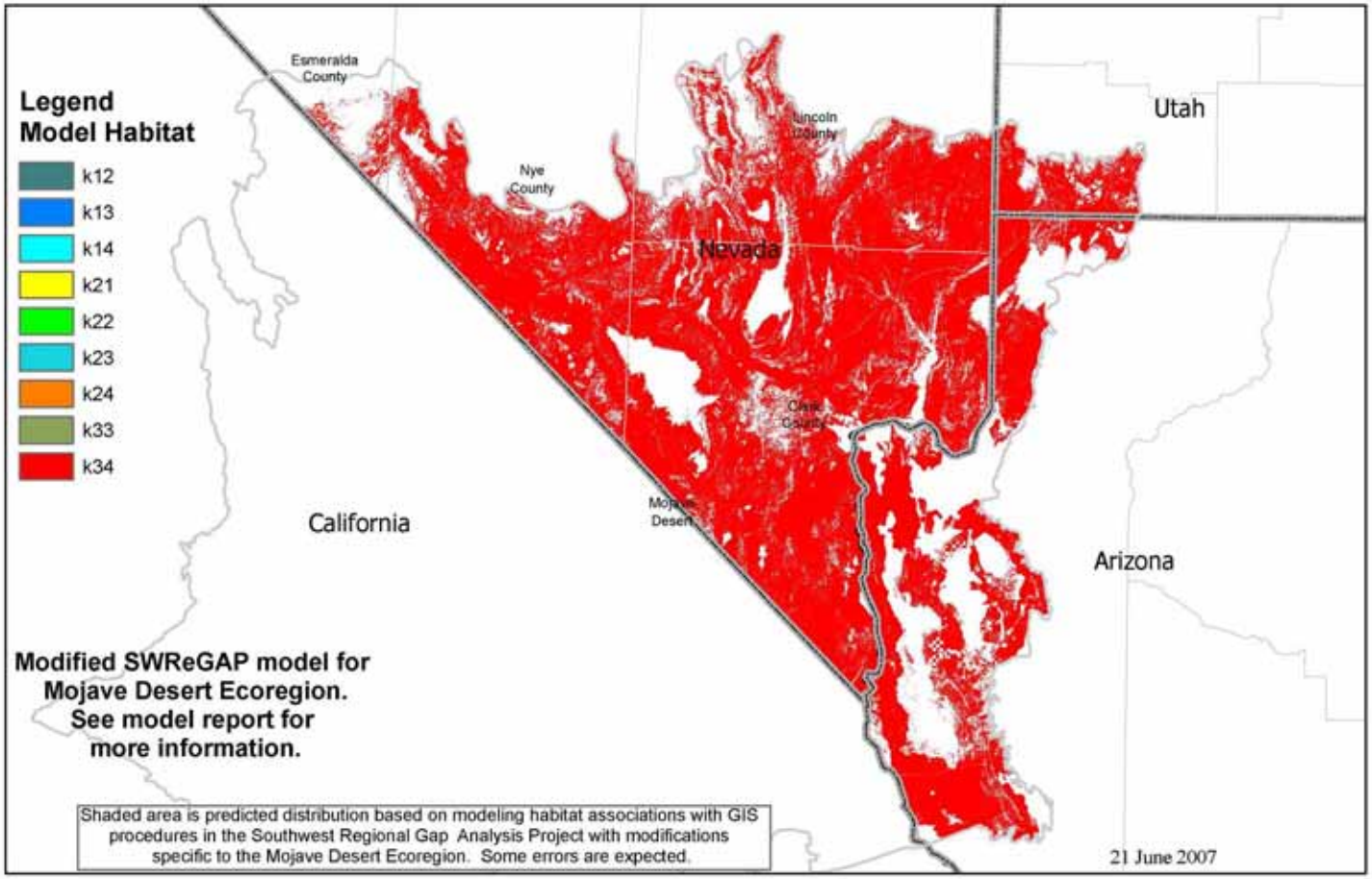
LONG-NOSED SNAKE (Rhinocheilus lecontei) ITIS # 174267



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For Illustrations purposes this map is presented with a longitude of Central Meridian at -112.

0 15 30 60 90 120 Kilometers

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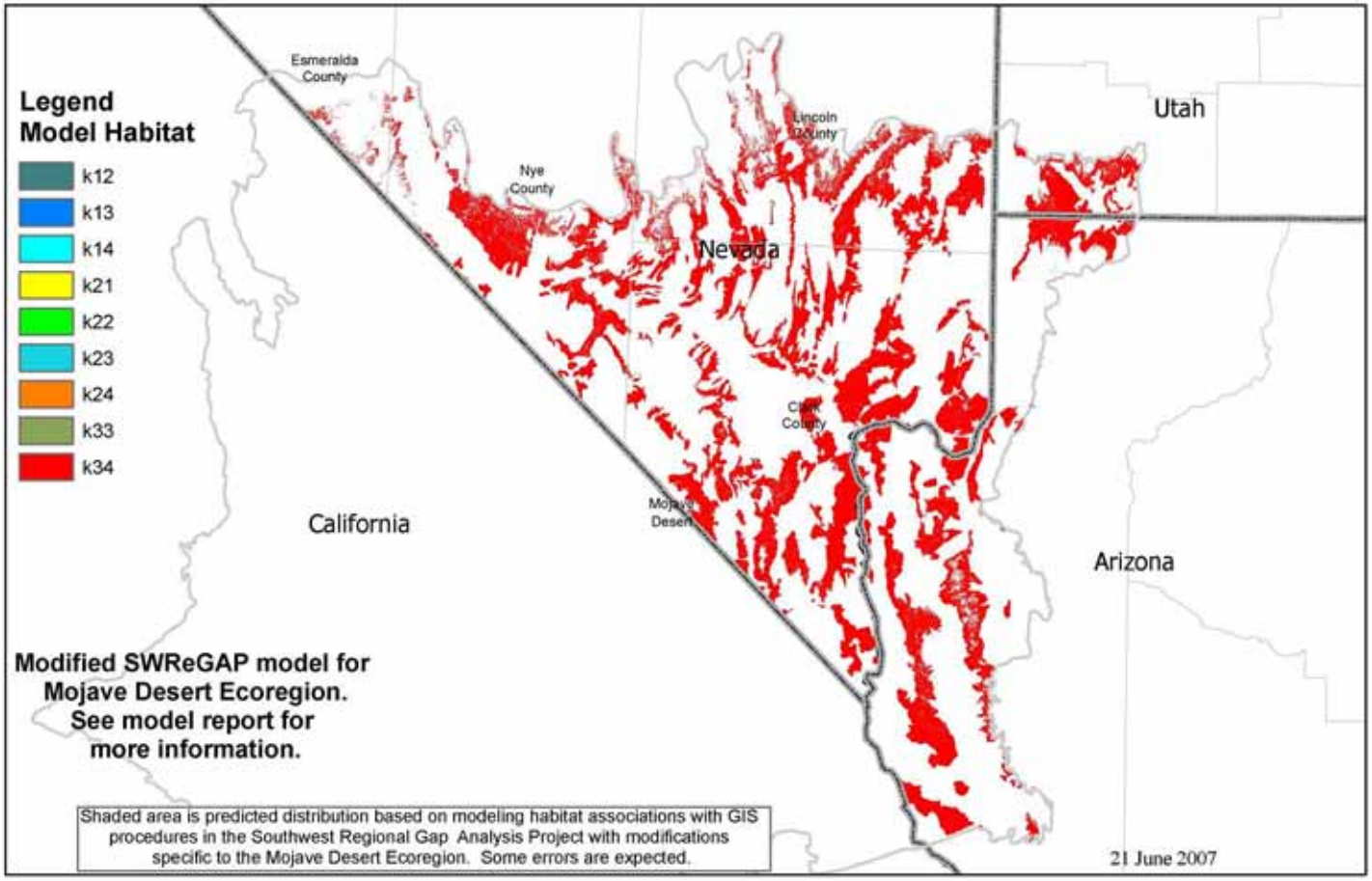
Southwest Regional Gap Analysis Project

COMMON CHUCKWALLA (Sauromalus ater) ITIS # 564596



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For illustrations purposes this map is presented with a longitude of Central Meridian at -112.

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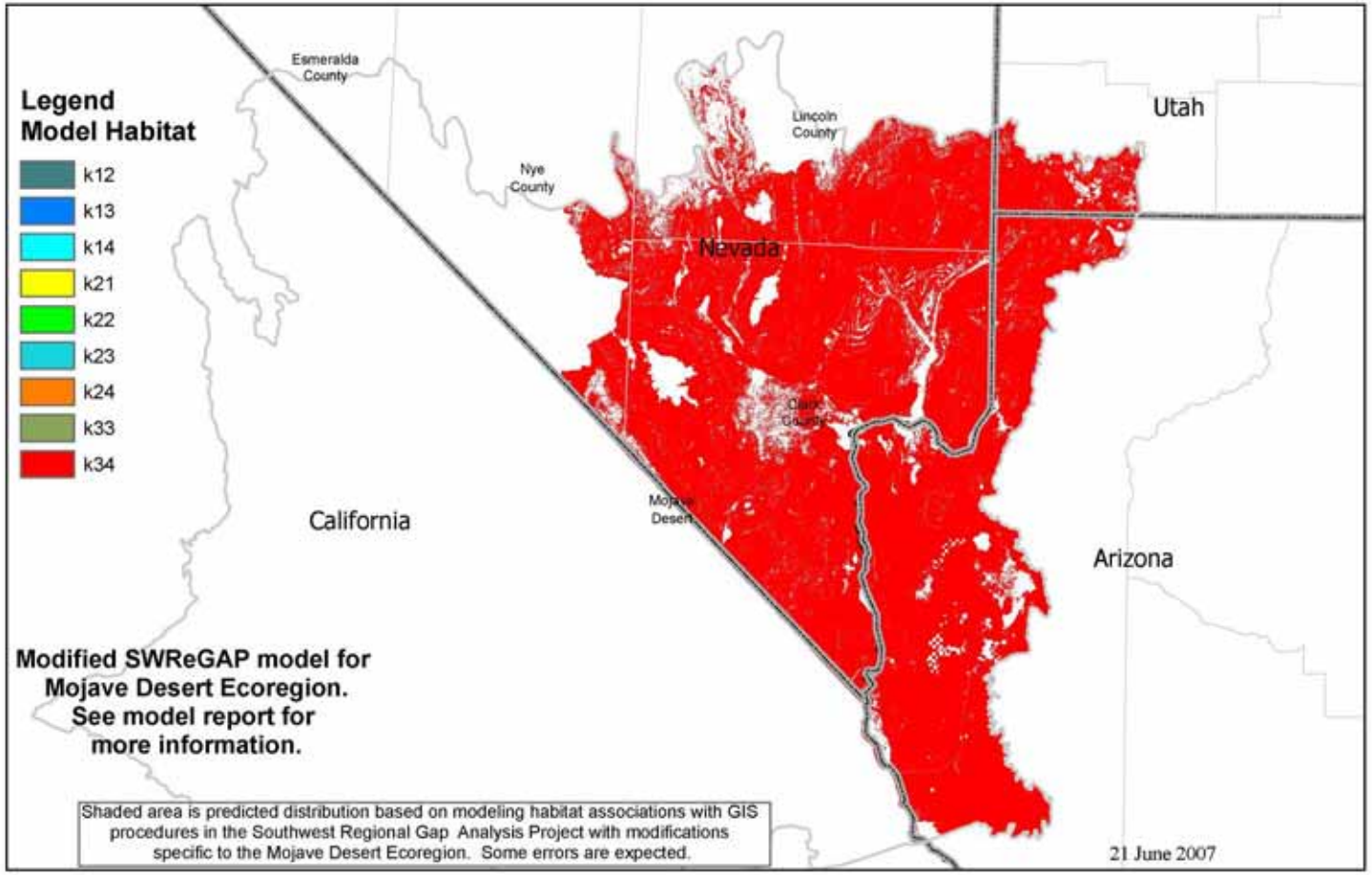
Southwest Regional Gap Analysis Project

WESTERN LYRE SNAKE (Trimorphodon biscutatus) ITIS # 174291



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For Illustrations purposes this map is presented with a longitude of Central Meridian at -112.

0 15 30 60 90 120 Kilometers

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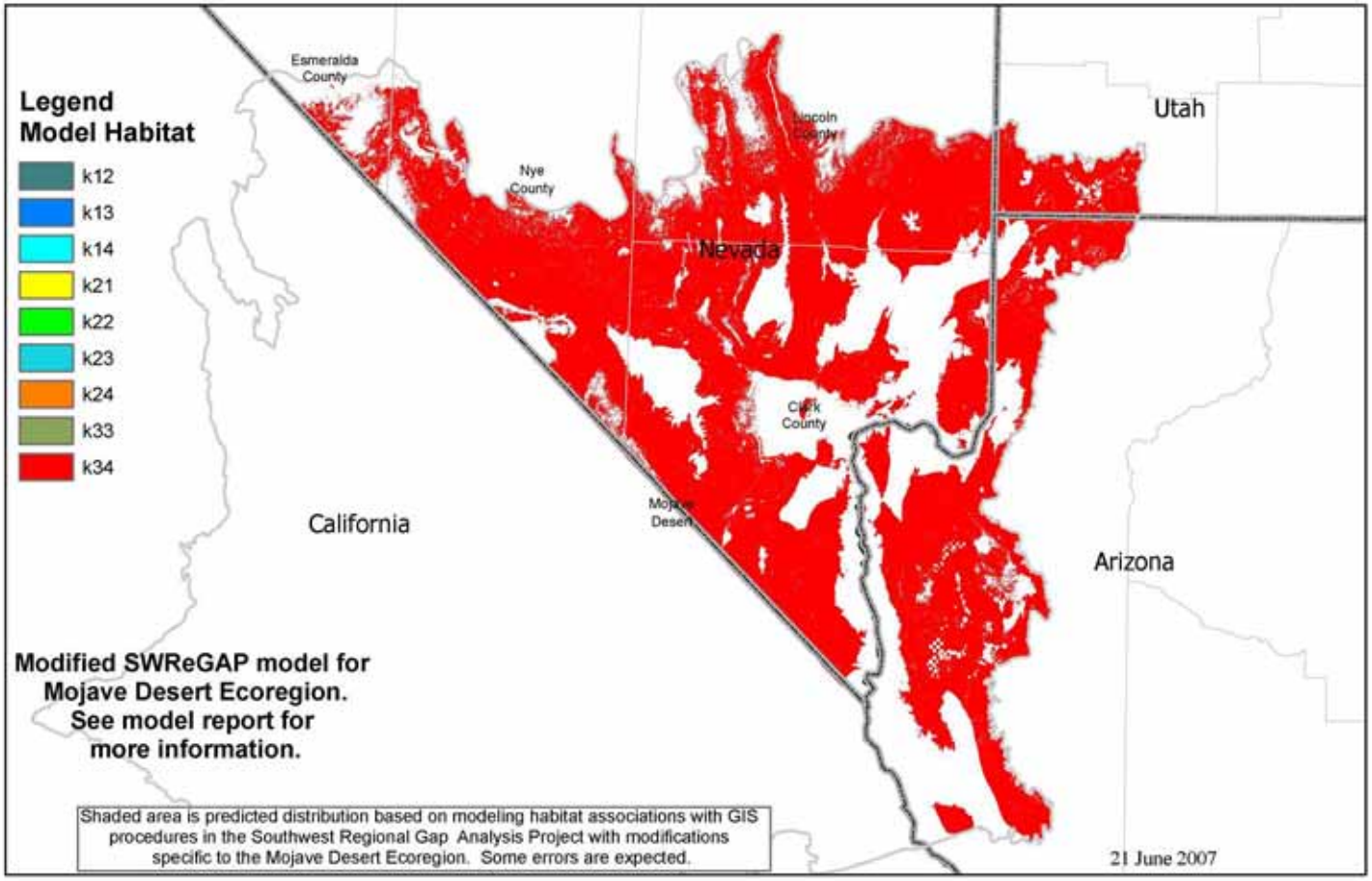
Modified Product of
Southwest Regional Gap Analysis Project

DESERT NIGHT LIZARD (Xantusia vigilis) ITIS # 174092



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
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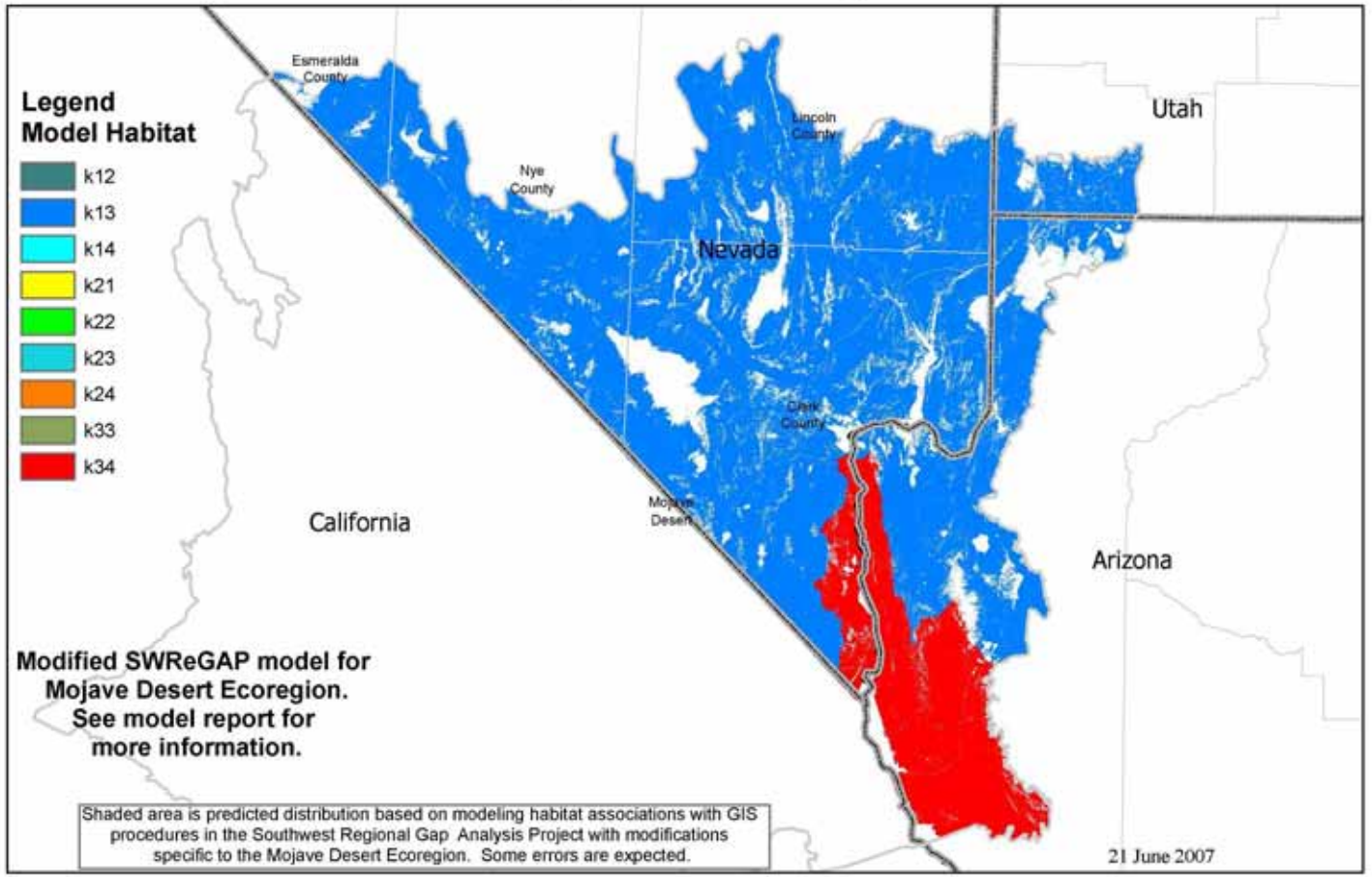
0 15 30 60 90 120 Kilometers

Modified Product of
Southwest Regional Gap Analysis Project

BURROWING OWL (Athene cunicularia) ITIS # 177946



SWReGAP data is projected in Albers Conical Equal Area with a longitude of Central Meridian at -96.
For Illustrations purposes this map is presented with a longitude of Central Meridian at -112.

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0 15 30 60 90 120 Kilometers

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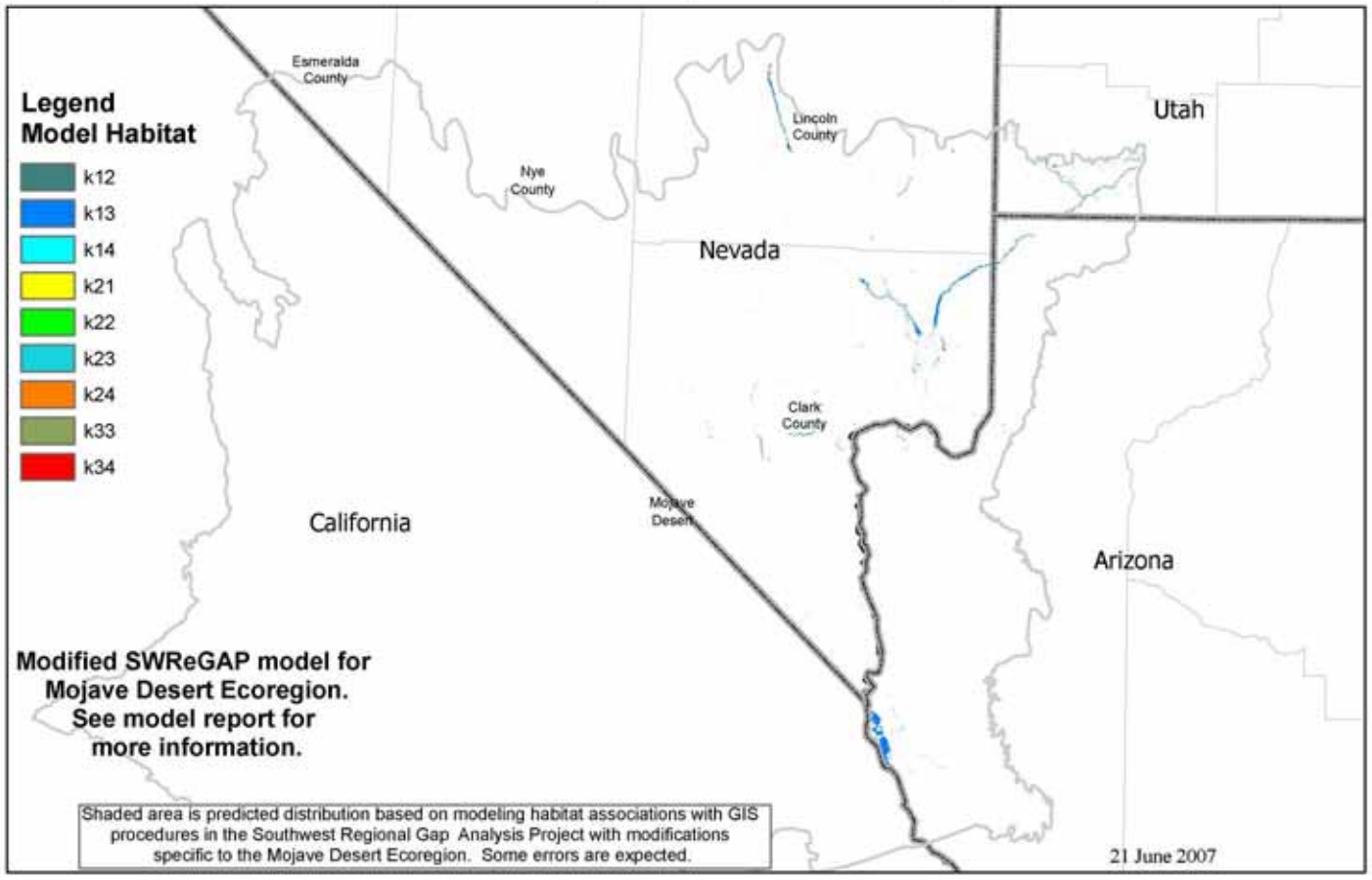
YELLOW-BILLED CUCKOO (Coccyzus americanus) ITIS # 177831



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0 15 30 60 90 120 Kilometers

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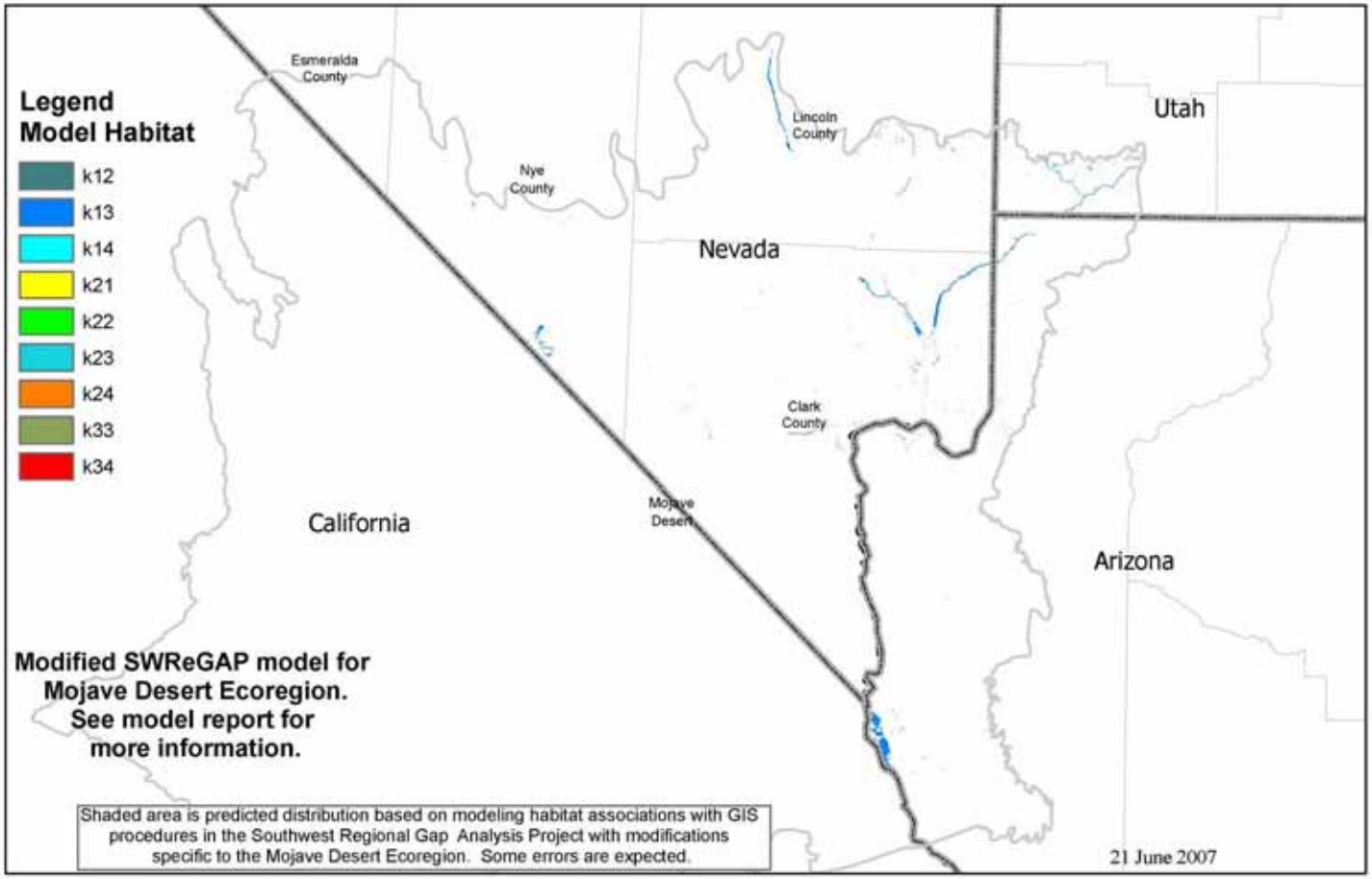
WILLOW FLYCATCHER (Empidonax traillii) ITIS # 178341



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0 15 30 60 90 120 Kilometers

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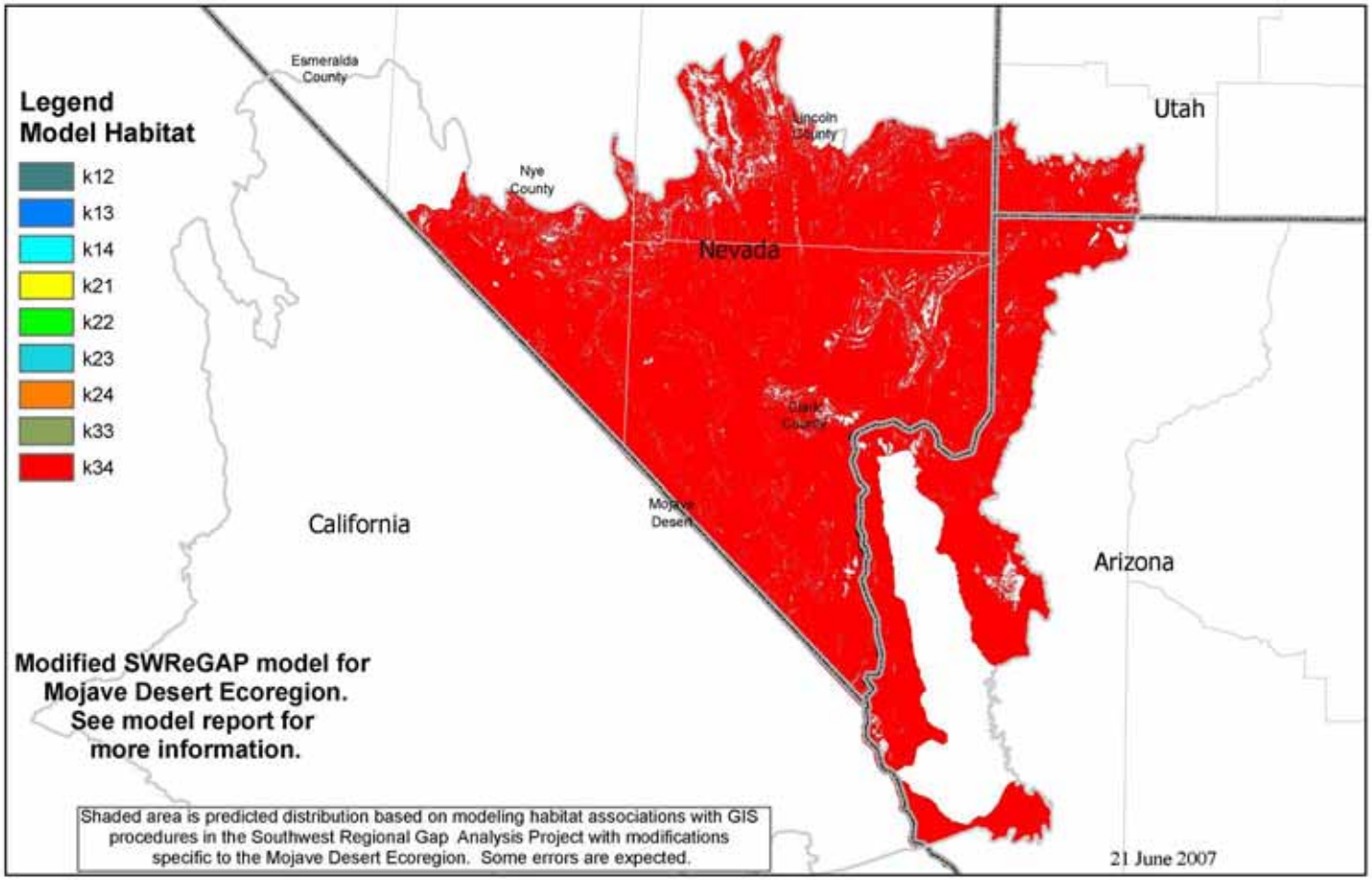
PEREGRINE FALCON (Falco peregrinus) ITIS # 175604



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0 15 30 60 90 120 Kilometers

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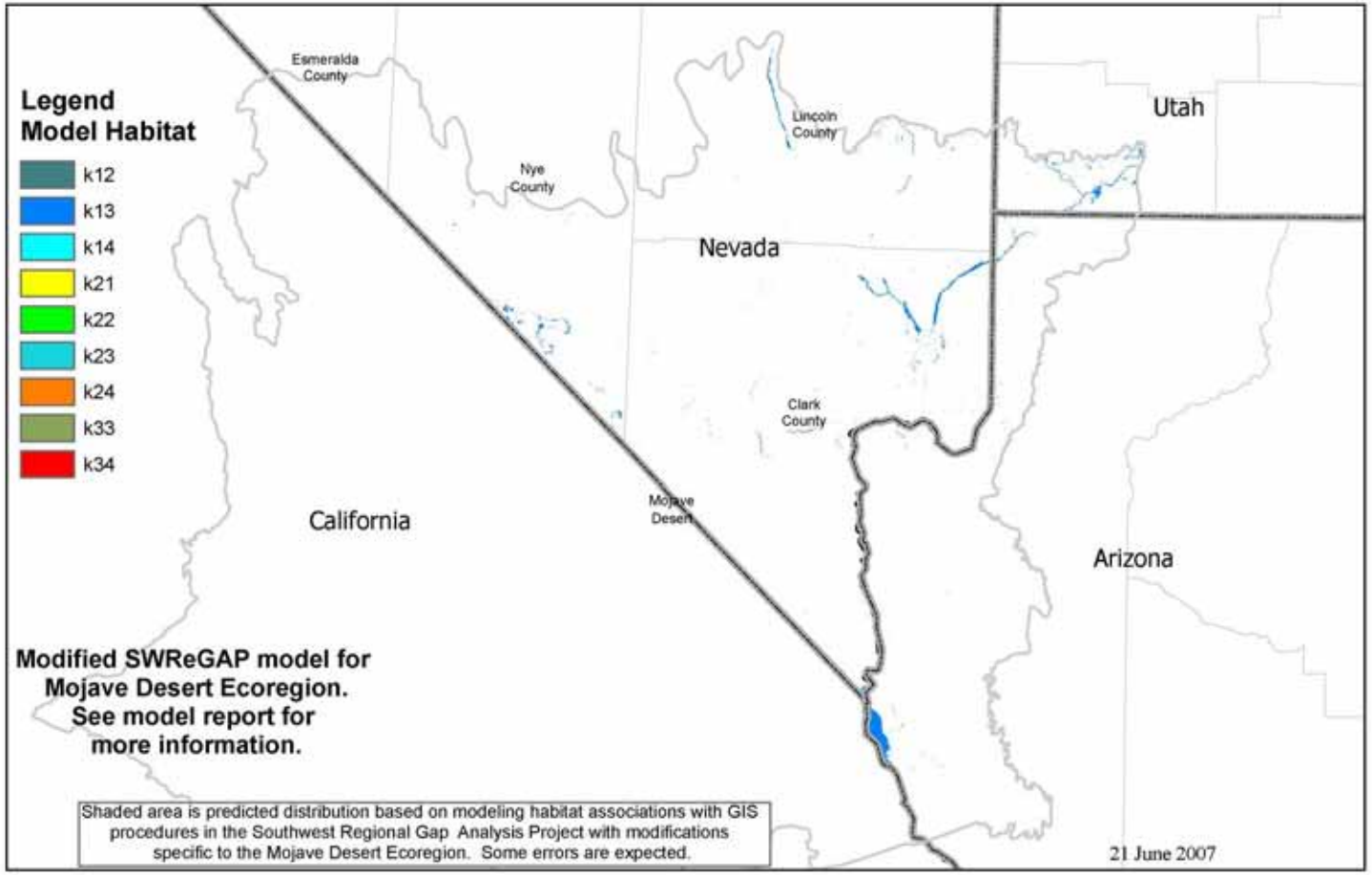
BLUE GROSBEAK (Guiraca caerulea) ITIS # 179145



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0 15 30 60 90 120 Kilometers

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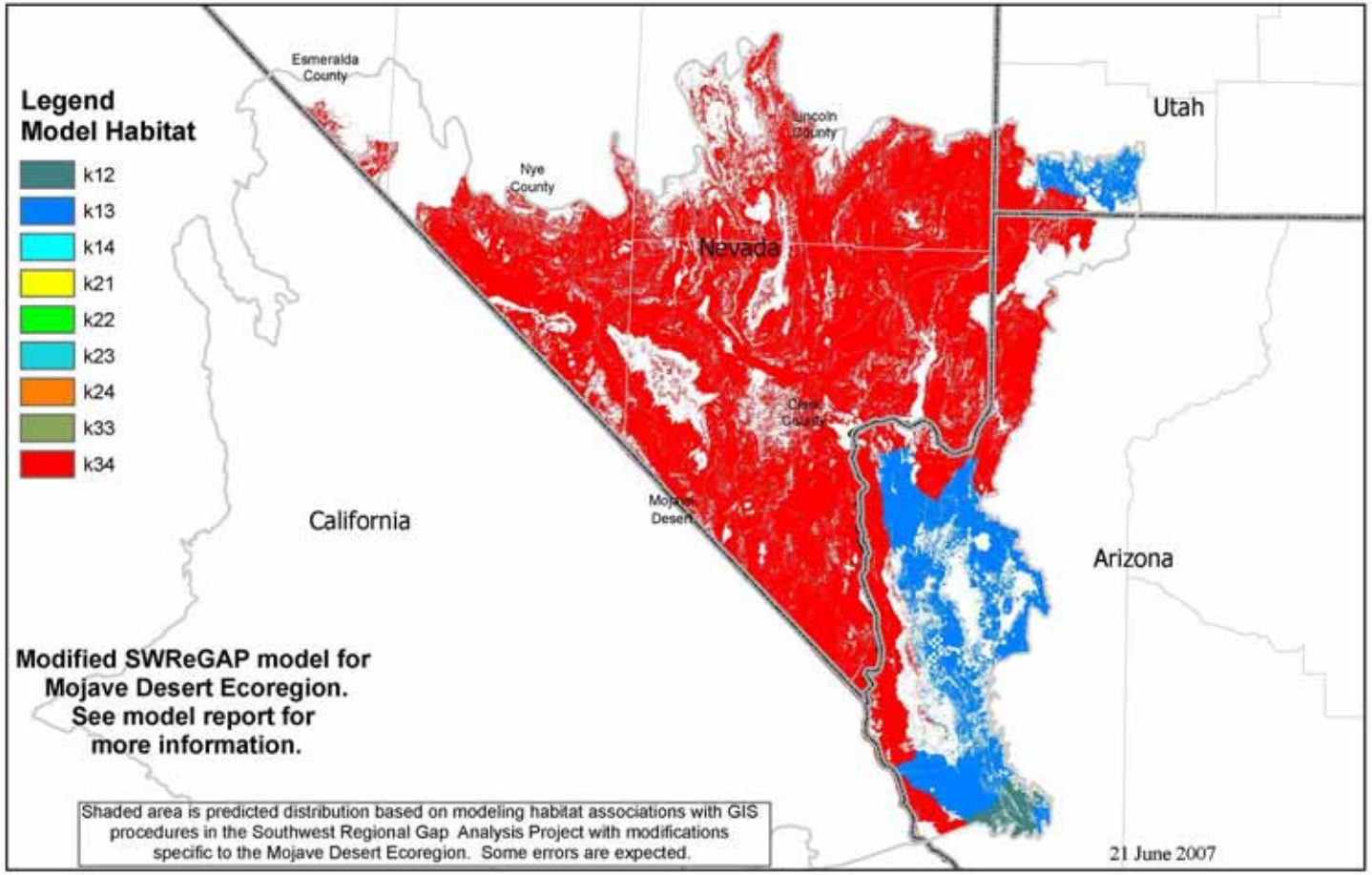
PHAINOPEPLA (Phainopepla nitens) ITIS # 179877



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0 15 30 60 90 120 Kilometers

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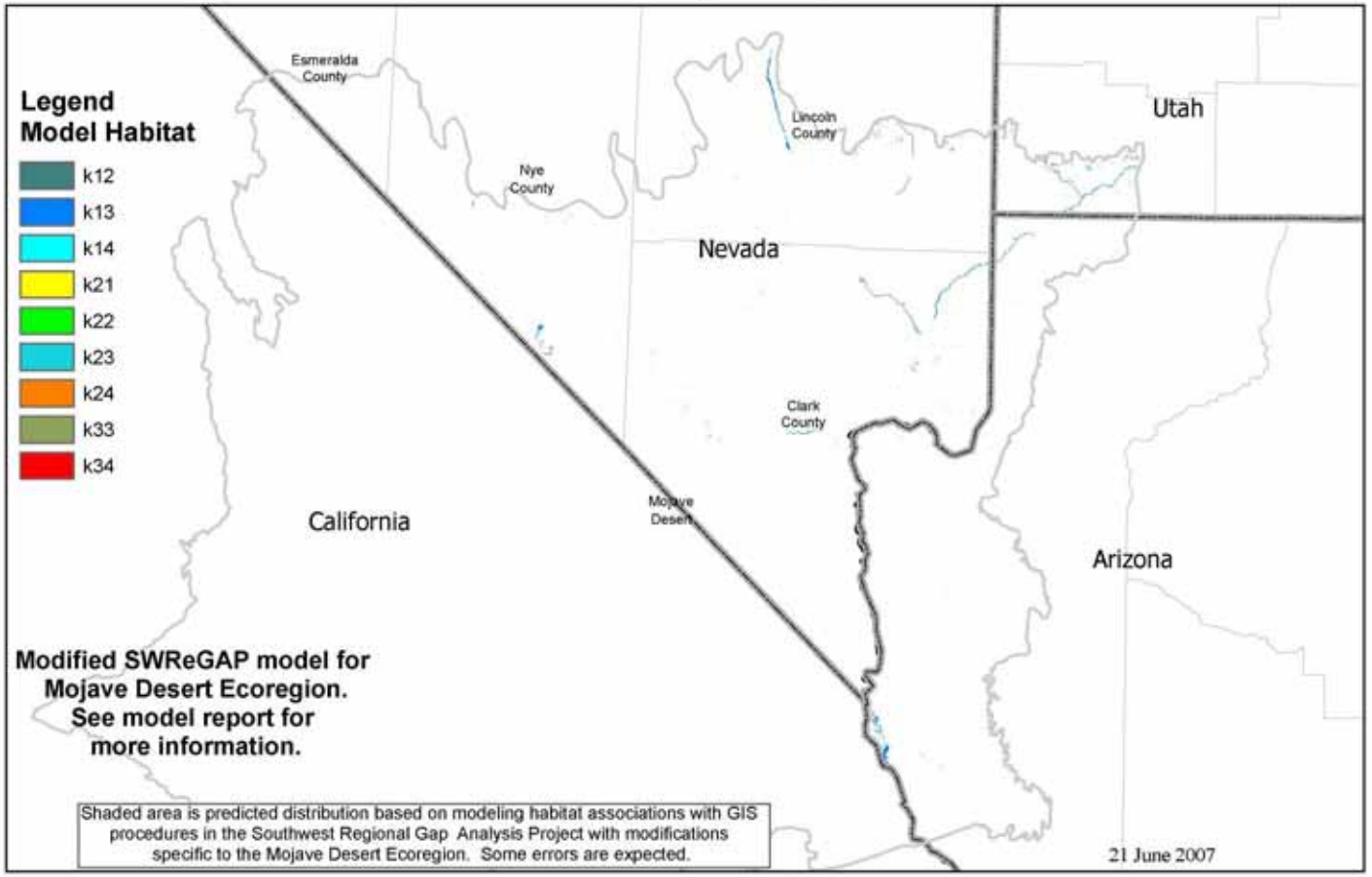
SUMMER TANAGER (Piranga rubra) ITIS # 179888



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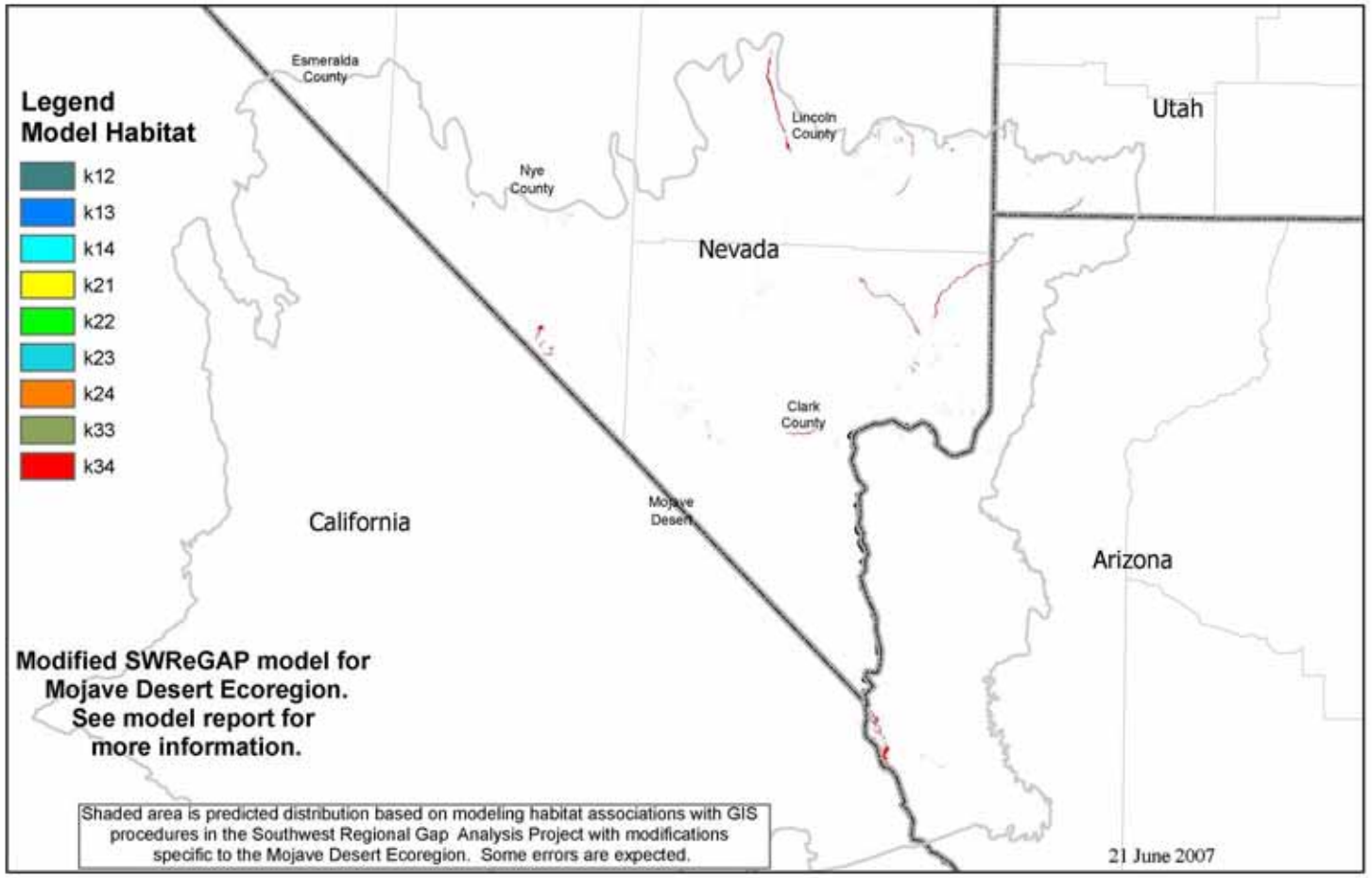
VERMILION FLYCATCHER (Pyrocephalus rubinus) ITIS # 178371



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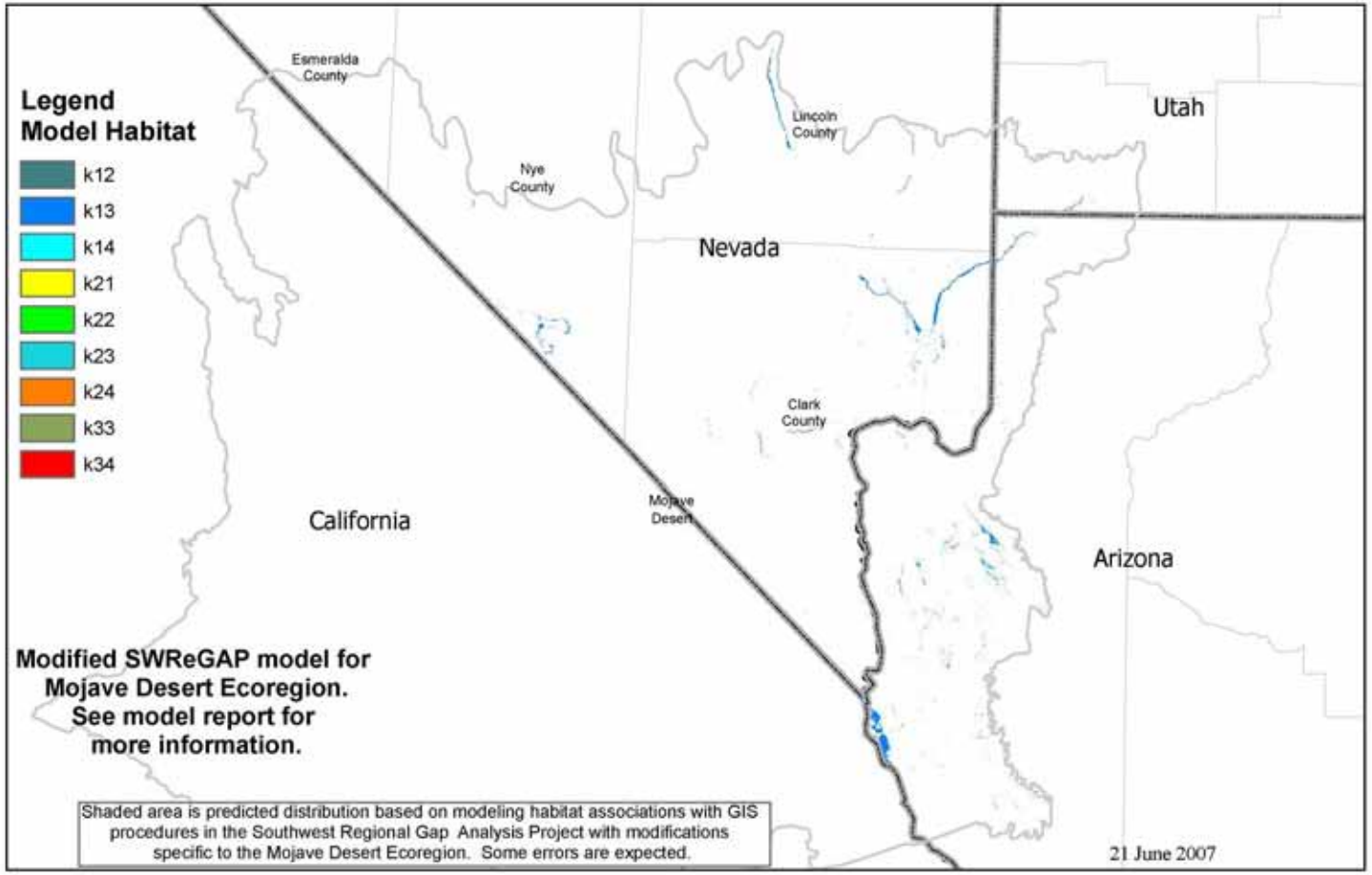
BELL'S VIREO (Vireo bellii) ITIS # 179003



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0 15 30 60 90 120 Kilometers

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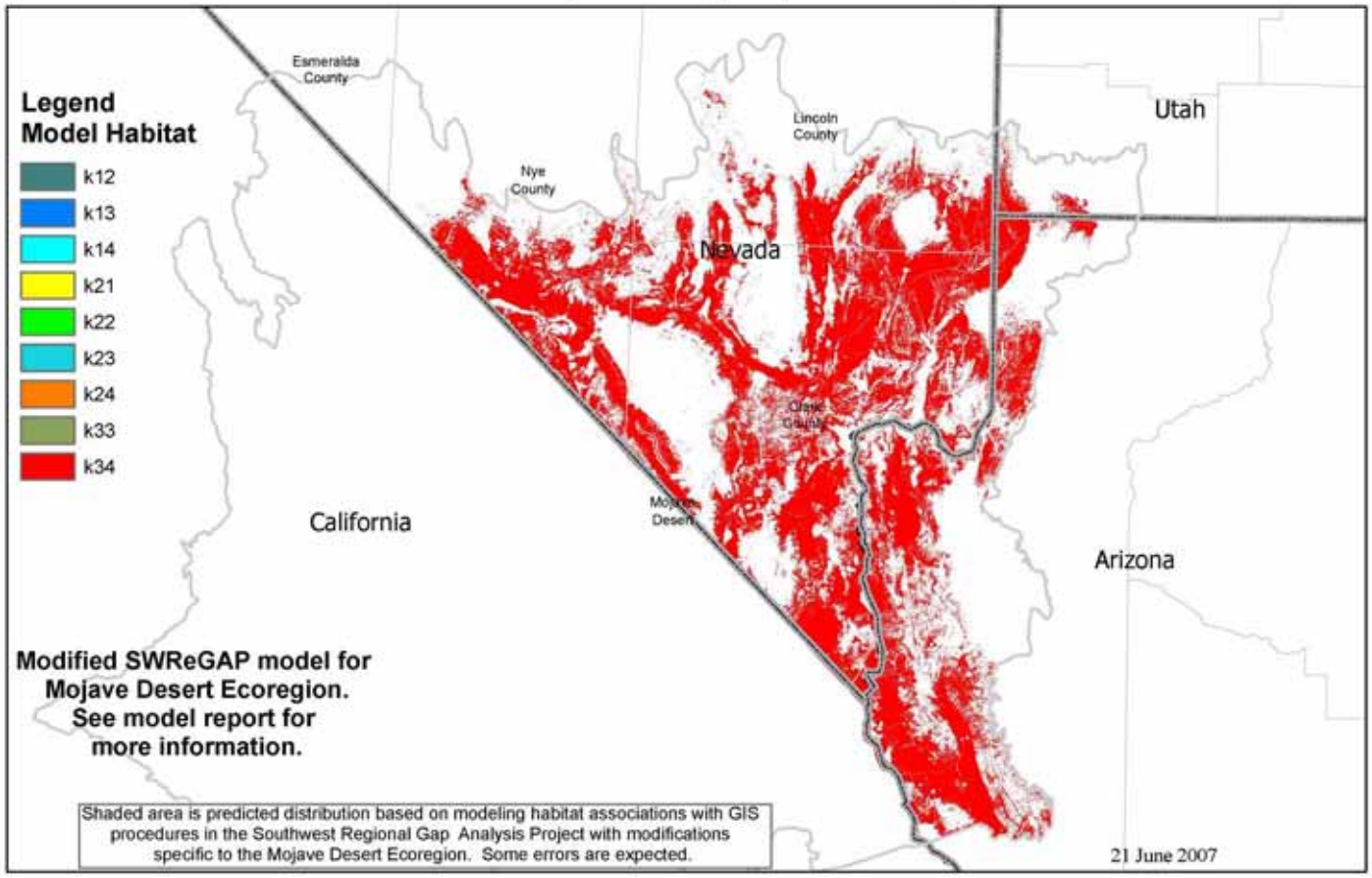
DESERT POCKET MOUSE (Chaetodipus penicillatus) ITIS # 552486



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0 15 30 60 90 120 Kilometers

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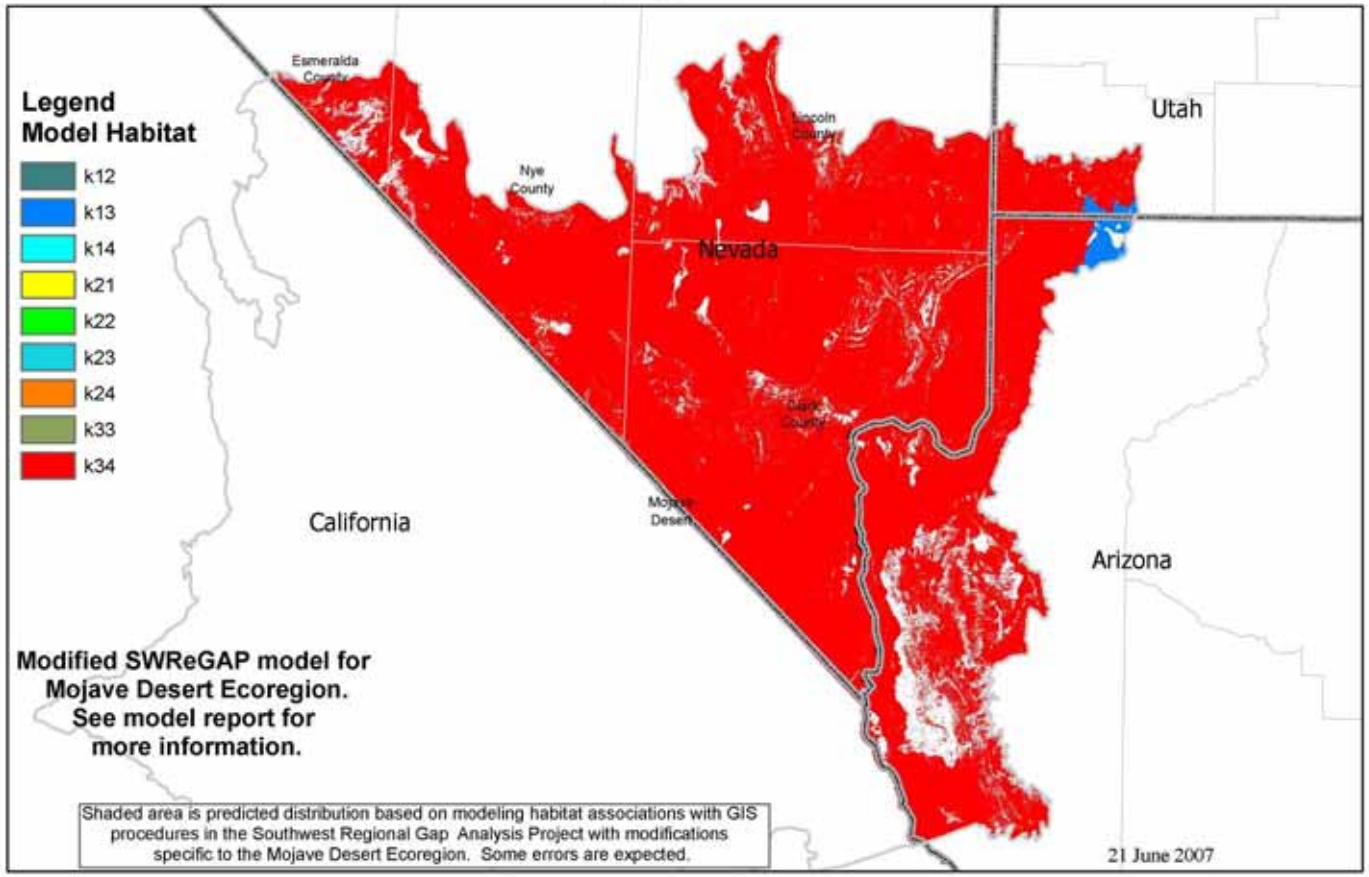
TOWNSEND'S BIG-EARED BAT (Corynorhinus townsendii) ITIS # 203452



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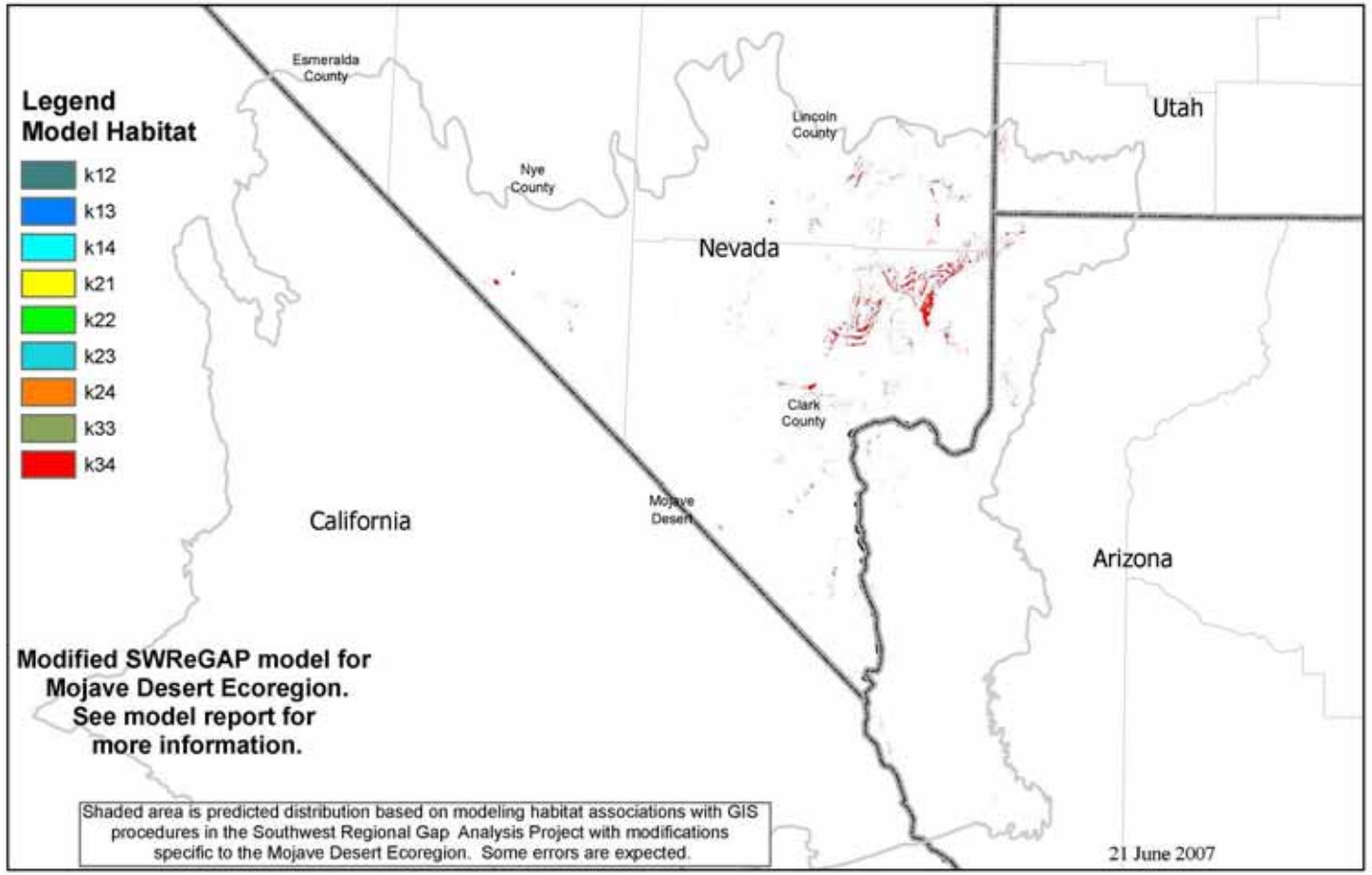
DESERT KANGAROO RAT (Dipodomys deserti) ITIS # 180236



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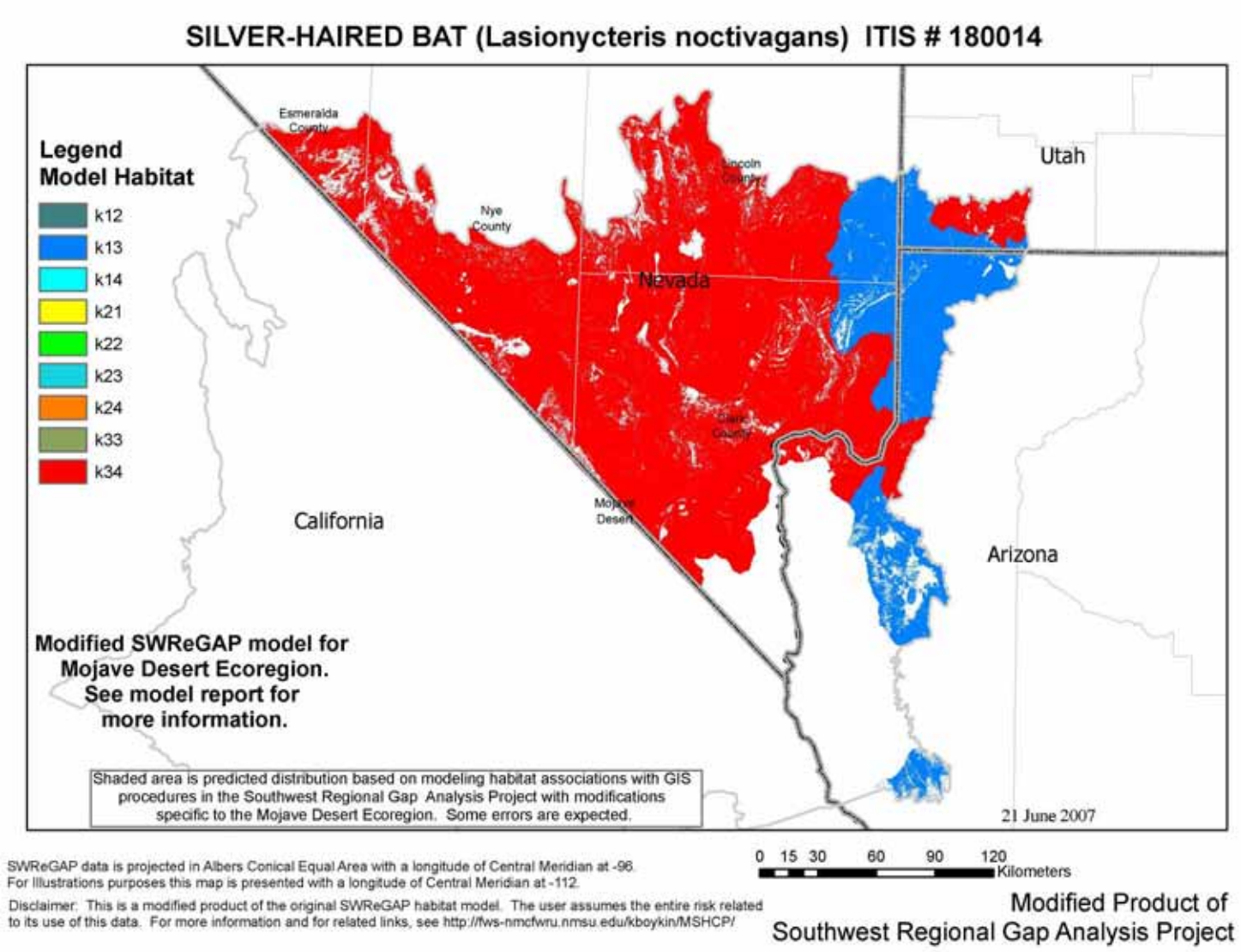
SILVER-HAIRED BAT (Lasionycteris noctivagans) ITIS # 180014
Legend
Model Habitat
k12
k13
k14
k21
k22
k23
k24
k33
k34
Esmeralda County
Nye County
Lincoln County
Clark County
Nevada
Utah
California
Arizona
Mojave Desert
Modified SWReGAP model for Mojave Desert Ecoregion. See model report for more information.
Shaded area is predicted distribution based on modeling habitat associations with GIS procedures in the Southwest Regional Gap Analysis Project with modifications specific to the Mojave Desert Ecoregion. Some errors are expected.
21 June 2007
0 15 30 60 90 120
Kilometers
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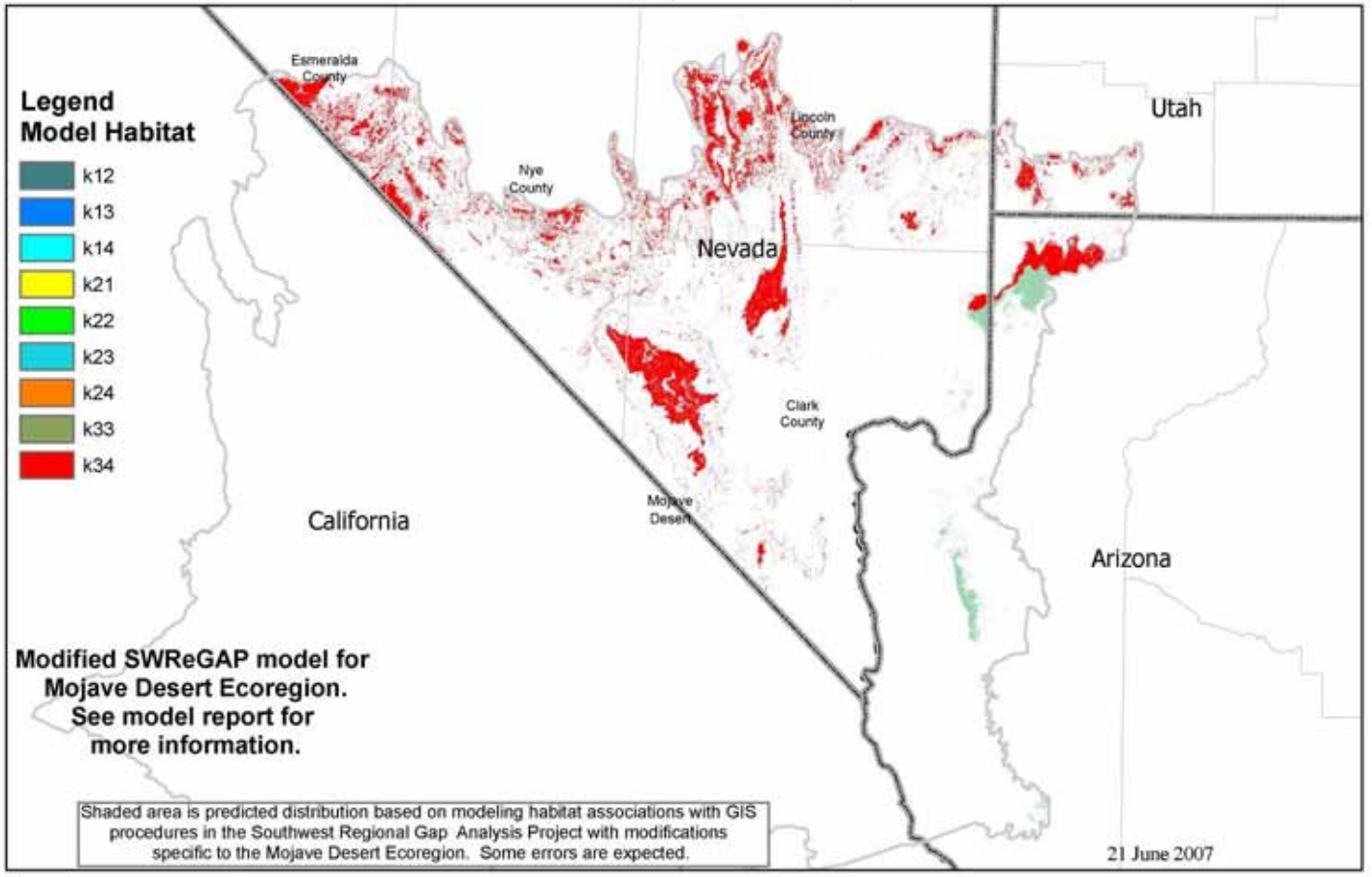
Modified Product of
Southwest Regional Gap Analysis Project

LONG-EARED MYOTIS (Myotis evotis) ITIS # 179995



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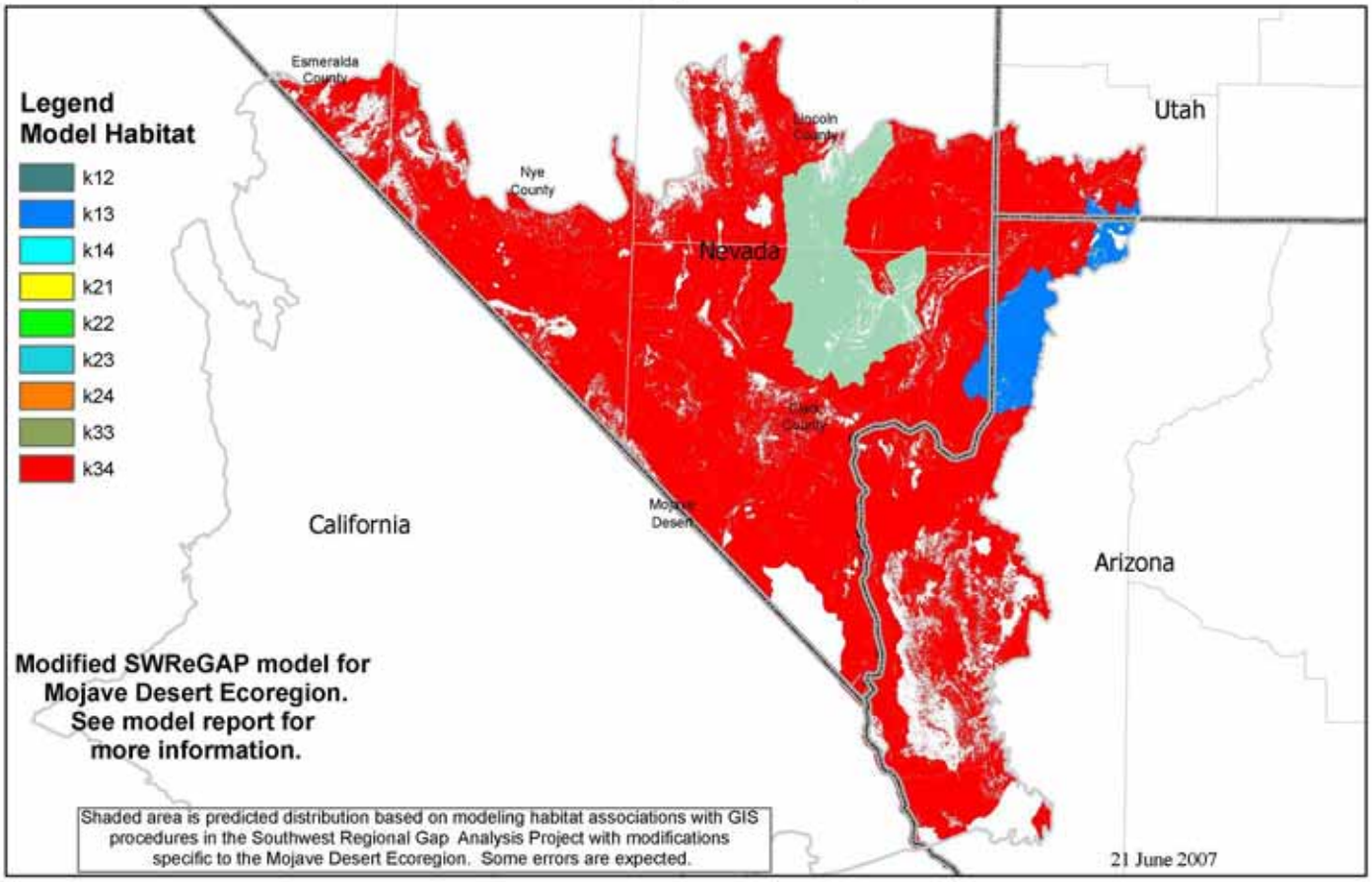
LONG-LEGGED MYOTIS (Myotis volans) ITIS # 179990



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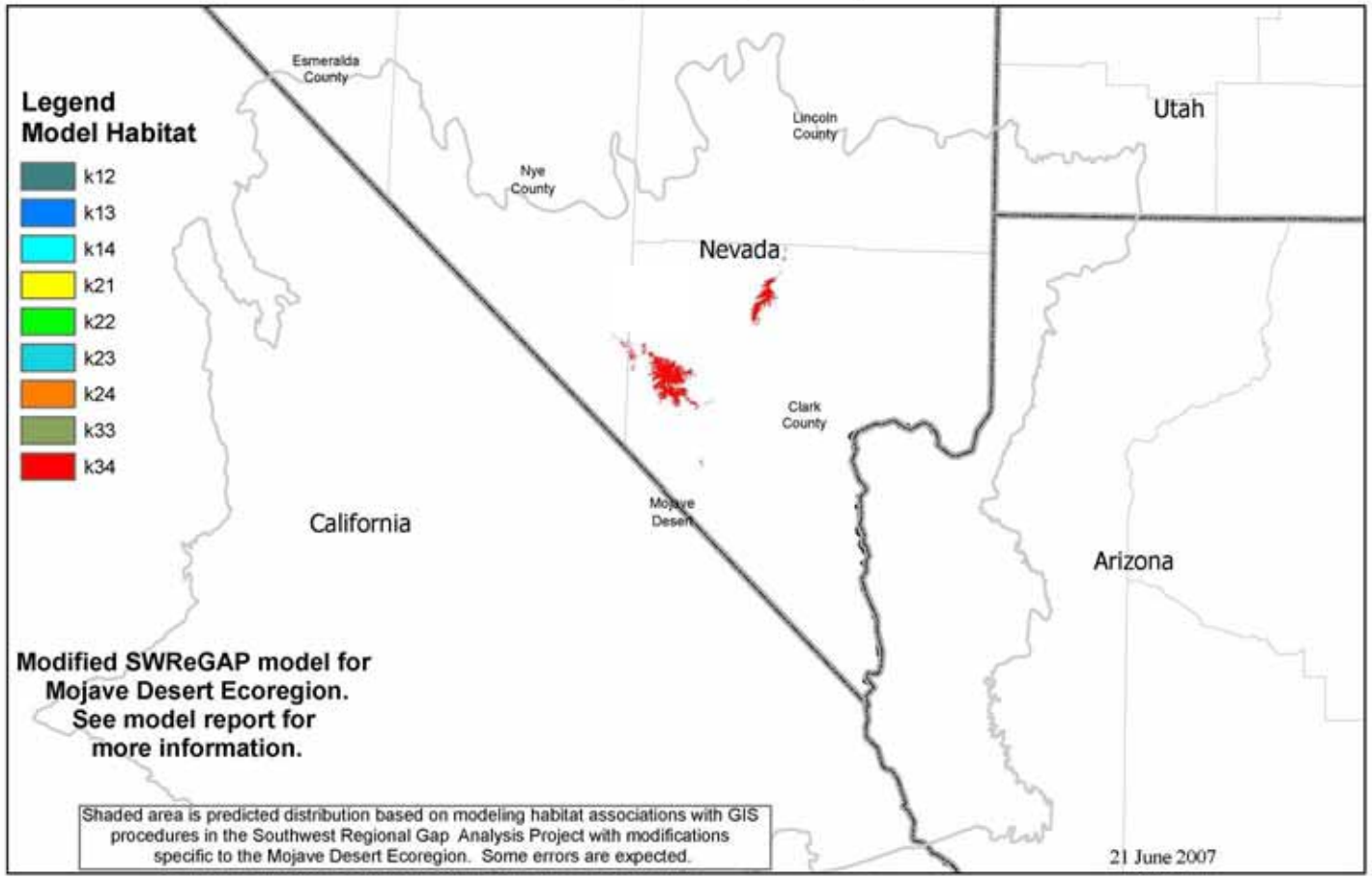
PALMER'S CHIPMUNK (Tamias palmeri) ITIS # 180198



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0 15 30 60 90 120 Kilometers

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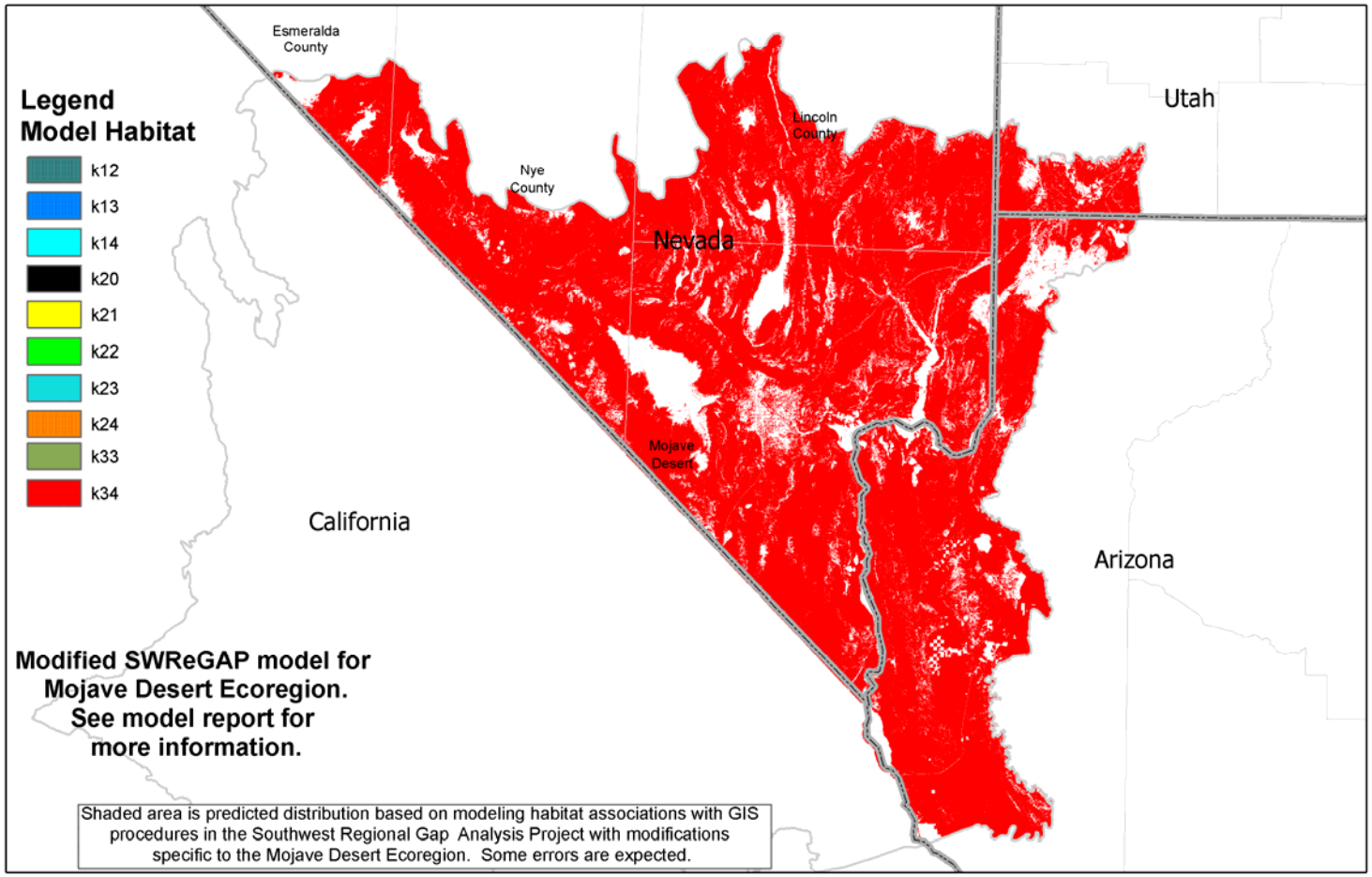
KIT FOX (Vulpes macrotis) ITIS # 180606



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Model habitat codes

Code	Description
k12	Known or probable occurrence, breeding, wintering
k13	Known or probable occurrence, breeding, summering
k14	Known or probable occurrence, breeding, winter and summering
k21	Known or probable occurrence, non-breeding, migratory
k22	Known or probable occurrence, non-breeding, wintering
k23	Known or probable occurrence, non-breeding, summering
k24	Known or probable occurrence, non-breeding, winter and summer
k34	Known or probable occurrence, breeding and non-breeding, winter and summer
p13	Potential occurrence, breeding, summering
p21	Potential occurrence, non-breeding, migratory
p22	Potential occurrence, non-breeding, wintering
p34	Potential occurrence, breeding and non-breeding, winter and summer
x21	Extirpated, non-breeding, migratory
x22	Extirpated, non-breeding, wintering
x34	Extirpated, breeding and non-breeding, winter and summer

United States
Environmental Protection
Agency

Office of Research
and Development (8101R)
Washington, DC 20460

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