Appendix F

Distribution of New Mexico’s Reptiles and Amphibians:

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[includes DVD with electronic data]

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Summary

In our previous effort we used an algorithm based on information theory (MaxEnt) to calculate likelihoods of occurrence for all 124 species of amphibians and reptiles in New Mexico. Several recent studies supported the use of MaxEnt as an algorithm that ranks as the most accurate given presence data only. During preliminary field work in 2007, we have accumulated enough observations and specimens for several species of lizards to start the examination of MaxEnt-derived maps. Analyses of these maps revealed several issues that severely limited the utility of these potential distribution maps. First, the algorithm uses an approach which is understood easily only by people trained in information theory. Furthermore, variables in this algorithm undergo different kinds of transformations, rendering any ecological links to the original modeling variables unclear. Finally, many of our new field observations fell within areas of different likelihoods given by the MaxEnt algorithm. We have therefore chosen to pick a new approach that would take advantage of the spatial information for New Mexico that we already compiled, including known specimens of amphibians and reptiles, environmental data, and new observations. Using principal component analyses, we produced maps of potential habitat and likely distributions of New Mexican amphibians and reptiles. We purposefully used understandable statistical analyses so that the results could be easily explained in an ecological context. We further investigated the validity of these maps by using nearly 1400 new observations of 73 species throughout New Mexico, made during field work supported by this project. Using these field observations, we estimate the likelihood that suitable habitat is actually occupied by the species. We hope that the resulting maps will be accepted and used by a wide range of natural resource management stakeholders.

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Project objectives and goals

The objective of this project was to conduct a rigorous, sampling-based evaluation of the accuracy of a subset of previously developed maps of distribution of New Mexico's amphibians and reptiles. The maps were originally created using an algorithm that outputs a likelihood of occurrence. However, for several species the resulting maps contained substantial outliers from their known distribution. Furthermore, the maps were only representing probabilities which were difficult to interpret without a validation step. Thus, subsequent to evaluation, our goal became to develop a new set of maps that would portray species distribution more accurately and that could be explained in clear and concise ecological terms. We focused on species that are of interest to the state, that is, those treated by NMGDF as species of greatest conservation need. We chose to pick a new approach that would take advantage of the spatial information for New Mexico that we already compiled, including known specimens of amphibians and reptiles, environmental data, and new observations gathered during field surveys.

Description of field surveys

At the beginning of the project (spring and summer 2007), we concentrated on identifying areas where conspicuous species had a high likelihood of being observed, but in areas that were not already known for specimens. In other words, we avoided areas where museum specimens were collected. Museum specimens provide the only major source of information on New Mexico's herpetofauna, since no comprehensive atlas or survey exists for the state.
To fine tune our selection of sampling areas, we also examined published maps and localities of other known specimens. We also took into consideration land ownership and access factors such as travel time. As summer progressed, we adjusted our selections to sample areas that were previously lacking specimens or areas that lacked confirmed presence of conspicuous species. We formed our selections on a square kilometer grid for New Mexico, which matched our map data (see section on Environmental Data Sets).

Between April 2007 and May 2008, we were able to sample in 7051 square kilometers throughout the state. This is in contrast with 4924 square kilometers where specimens of amphibians and reptiles have been documented in the state until 2007. During the course of field work, we observed 1357 individual animals that belong to 73 species of amphibians and reptiles (geographic coordinates listed in Appendix 5). In the majority of cases, most observations were made in square kilometers where a particular species was not observed previously. Across all species, there were a total of 670 square kilometers where a species was not observed before (Appendix 1).

Our field surveys consisted of travelling to several localities in a general area and visually searching for amphibians and reptiles. In this manner, we were able to cover different areas within New Mexico in relatively short amounts of time. Several multi-day trips were required for areas that were further from Albuquerque. Visual encounter surveys are a common surveying technique that works well with open habitats and conspicuous animals (such as lizards or large snakes). Upon observation, we usually relied on hand capture or noosing for capture and examination. Since often snakes are found on roads, either dead or alive, we have also recorded observations of any amphibians or reptiles on roads while driving. In areas where water presence suggested occupancy by amphibians, we used dip nets and waders to thoroughly sample near shore and around banks or canyon bases. For each observed animal we recorded its position with a GPS unit as well as noted species, and sex (if known). In addition, we recorded our own movements with the track feature of the GPS unit. This allowed us to quantify our effort and map areas visited where no observations were made.

Map redevelopment

Our previous efforts at estimating the distribution of potential habitat for the reptiles and amphibians of New Mexico were based upon MaxEnt (Phillips et al 2006), a well regarded computational method with its roots in "machine learning." As we progressed with validating the results of that analysis we were struck with the difficulty of actually understanding what the results were based upon. We also became aware of some fairly significant results that couldn't be reconciled with what we and others knew about the distributions of some of the species. We decided to attempt a completely new analysis from the ground up with two major goals:

1) the production of comprehensive maps of potential suitable habitat and likely distributions of New Mexican amphibians and reptiles, and
2) Basing those maps on understandable and "tweakable" statistical analyses so that the results would be easily explained and hopefully accepted by a wide range of natural resource management stakeholders.

To facilitate evaluation and comparison with the previous analysis, we decided to use the same suite of environmentally relevant variables averaged within each square kilometer of the state of New Mexico.

Description of variables

The environmental variables that we used in this study can be divided into four major categories: measures related to climate, topography, soils and vegetation (Table 1). Using geographic information system software, we transformed all data into a common spatial resolution of 0.0083333333 degrees, equivalent to approximately 1km^2 on the ground. We maintained all data in a geographic projection (unprojected) for ease of data manipulation and consistency with GPS data. Descriptions of all variables, which covered the extent of the entire state of New Mexico, are shown in Appendix 2.

Climate

To represent climate, we used the WorldClim data sets (Hijmans et al 2005). This data archive includes 19 climatic variables: mean annual temperature, mean diurnal temperature range, isothermality (mean diurnal temperature range divided by annual temperature range), temperature seasonality, maximum temperature of the warmest month, minimum temperature of the coldest month, temperature annual range, annual mean precipitation, precipitation of the wettest month, precipitation of the driest month and precipitation seasonality (coefficient of variation), as well as mean temperature and precipitation of the wettest, driest, warmest and coldest quarters. Although these data form a large number of variables, species of amphibians and reptiles are likely to respond strongly to at least some key variables relating to temperature and/or precipitation. Moreover, simple means are often not the best measures to represent climate variability. We therefore used all 19 climatic variables in the analysis (Appendix 2).

Table 1. Summary of data used in species distributions.

Data category	Data type	Data source	Brief description
Climate	Climatic variables	Worldclim http://www.worldclim.org/	Climatic variables describing variation in temperature and precipitation at a resolution of 30 arc-seconds (~1km)
Topography	Elevation	RGIS http://rgis.unm.edu/intro.cfm	Average elevation derived from 30m resolution digital elevation model (DEM)
	Aspect	derived	Aspect derived using above DEM
	Slope	derived	Slope derived using above DEM
Soils	Soil map units	Pennsylvania State University http://www.soilinfo.psu.edu/index.cgi?soil_data&conus	Soil map units from national and regional data sources at 1km resolution
	Geology	RGIS http://rgis.unm.edu/intro.cfm	183 different geological classes from the Geologic Map of New Mexico at a scale of 1:500000. Although each class represents a distinct formation, the variable is ordinal. Smaller numbers represent a younger formation.
Vegetation	Land cover	SWREGAP http://ftp.nr.usu.edu/swgap/	125 categories of modeled natural and semi-natural vegetation types based on 90m resolution data.
	Structure of habitat	University of Maryland http://glcf.umiacs.umd.edu/data/vcf/	Percent of ground that is bare, herbaceous, or tree-covered. Derived from MODIS VCF (vegetation continuous field) product at a 500m resolution.
	Distance from permanent water source	derived	Distance to nearest permanent water source calculated at 1km resolution.

Topography

Elevation and its derivatives are major factors that determine climate for an area. Variables summarizing topography were developed from a statewide digital elevation model distributed by New Mexico Resource Geographic Information System Program (RGIS). Since the original resolution of the elevation data is 30m, elevation for each 1km^2 cell was calculated as the average elevation within that 1km^2. Slope and aspect, as two additional variables, were calculated from this re-sampled grid of elevation.

Soils

Soils are likely to affect many ecological processes and variables such as types of vegetation and likelihood of water accumulation. They are also likely to influence many life history parameters of animals, such as their ability to burrow. To more accurately portray these factors we included two data sets. We used a soil map unit layer developed Miller and White (1998), which is based on a nationwide database created by generalizing soil-survey maps, including published and unpublished detailed soil surveys, county general soil maps, state general soil maps, state major land resource area maps, and, where no soil survey information was available, Landsat imagery. Since major soil characteristics, such as percentage of clay, permeability, texture, or rock content, are mapped as constant within each map unit, we used map units as a categorical variable in analyses. In addition, we included a map of 183 different geological classes for New Mexico, developed by NM Bureau of Geology and Mineral Resources. This data set complements the data on soils well, since it represents the distribution of different types of rock and surficial deposits, as well as locations of geologic structures such as faults and folds. These, in turn, are likely to relate to different types of environments available to different species, such as areas of volcanic rock. In addition, these data also represent relative ages of formations (Appendix 3).

Vegetation

Although traditionally land cover classes are not used in species distribution modeling, different types of vegetation often relate particularly well to vertebrates and are an excellent integrator of more fundamental physical variables such as soils, topography, and climate. To incorporate data on types of vegetation and structural properties of habitat we used three major data sources. We used a land cover map of New Mexico developed by the Southwest ReGAP project (USGS National Gap Analysis Program 2004). This data source relied on satellite imagery and topography to model natural and semi-natural vegetation types into 125 categories (Appendix 4). We treated this variable as categorical and did not arrange categories on an ordinal scale for analysis since the original algorithm (MaxEnt) we used did not require it. In addition to vegetation type, we used data from a satellite sensor that quantifies each square kilometer into percentage that is bare ground, herbaceous cover, and tree-covered. This provides an additional measure of habitat structure rather than composition. Finally, to address the dependence on water of many riparian species, we used a measure of distance from permanent water sources. Using the National Hydrological Database (USGS CITE), we created a grid where each cell is assigned a value that represents distance to nearest permanent water in meters.

Statistical Analyses

Our basic approach followed five steps (detailed descriptions of how the steps were carried out follow the list):

1) Characterize environmental variation across the state based on the mean values of the aforementioned variables for each km^2.
2) For each species, determine characteristics from step #1 that occur in the km^2, as well as the nature of variation in those characteristics, where the presence of the species is documented by a specimen in the Museum of Southwestern Biology's collection of amphibians and reptiles.
3) Using the species-specific summaries from step #2, estimate the likelihood that each km^2 of New Mexico consists of habitat suitable for each of the species. We call the results of this step "Estimates of Habitat Suitability."
4) Test the success of #3 with a large set of new observations and specimens collected during the field work supported by this project.
5) Use the results of step #4 to estimate potential distributions of the species, in other words, estimate the likelihood that suitable habitat is actually occupied by the species.

Characterization of Environmental Variation (Step 1) – We used principal components analysis to reduce the 29 environmental variables (Appendix 2) to five significant (eigenvalues greater than 1) principal components or factors. This method of analysis reduces data dimensionality by performing a covariance analysis between factors. As such, it strives to retain those characteristics of the data set that contribute most to its variance but reduces the number of variables. Each factor is then informative when compared with original data. By examining the "correlations" or "loadings" of the environmental variables with the five principal components (Table 2) we characterized the factors as follows:

Factor 1: Generally a temperature component negatively correlated with altitude. Thus km^2 with high values of Factor 1 (Factor 1 scores) have high temperatures, low elevation, and severe dry seasons as shown by negative correlations with driest month precipitation. Negative scores for Factor 1 would be cooler, higher, with less severe dry seasons.

Factor 2: This is clearly a precipitation factor with high positive loadings of a number of measures of rainfall, a negative loading for the amount of bare ground and a corresponding high loading for the amount of herbaceous cover, and, to a lesser degree, lower temperatures.

Factor 3: The strong negative correlations with thermal seasonality and temperature range coupled with a positive correlation with "Isothermality" demonstrate that Factor 3 measure thermal stability across the year. Areas with high scores for Factor 3 have little annual variation in temperature, and to a lesser degree might be slightly characterized as having a sloping topography.

Factor 4: Primarily appears to indicate strong variation in temperature within a day and perhaps less within a year.

Factor 5: is strongly influenced by geology and areas with high Factor 5 scores are composed of older major formations and southern exposures.

We then assigned each km^2 its score for each factor – providing five different estimates of environmental variation.

Table 2. Rotated Factor Loading Matrix

Environmental Variable*	Factor 1	Environmental Variable	Factor 2	Environmental Variable	Factor 3	Environmental Variable	Factor 4	Environmental Variable	Factor 5
bio08	0.9197	bio18	0.9033	bio04	-0.9037	bio02	0.9251	geology	0.6352
bio01	0.8957	bio16	0.8255	bio07	-0.8798	bio03	0.6850	dem_aspect	-0.6082
dem	-0.8941	bio13	0.8037	bio03	0.6589	bio15	0.3779	bio19	0.2570
bio10	0.8889	bio12	0.7432	bio15	0.4757	bio17	-0.3075	bio09	0.2341
bio11	0.8662	modis_b	-0.7247	bio16	0.4498	bio07	0.3044	dem_slope	-0.1966
bio05	0.8406	modis_h	0.7208	dem_slope	0.4351	bio14	-0.2939	permhydro	0.1844
bio06	0.8379	bio09	-0.6985	bio13	0.4311	soilmu	-0.2830	dem	-0.1835
bio17	-0.8363	bio05	-0.4560	bio06	0.3805	bio09	0.2349	bio12	0.1580
bio19	-0.8337	bio10	-0.3753	bio11	0.3300	bio12	-0.1756	bio11	0.1568
bio14	-0.8102	bio01	-0.3359	bio18	0.3183	modis_t	-0.1741	bio01	0.1518
bio15	0.6890	bio14	0.3093	bio09	0.3144	permhydro	0.1703	modis_t	0.1513
dem_slope	-0.5827	bio17	0.3077	bio19	0.2878	bio04	-0.1643	bio03	0.1469
bio12	-0.5116	bio06	-0.3039	permhydro	0.2713	bio06	-0.1304	bio17	0.1405
landcover	0.5113	bio08	-0.2830	modis_t	0.2552	geology	0.1188	bio06	0.1299
modis_t	-0.4980	bio11	-0.2827	bio12	0.2228	bio10	-0.0922	bio02	0.1282
modis_b	0.3937	bio04	-0.2734	landcover	-0.1975	dem	0.0845	bio15	-0.1257
dem_aspect	-0.3823	dem	0.2482	geology	0.1719	bio18	-0.0719	bio05	0.1256
soilmu	0.3559	permhydro	-0.2461	bio01	0.1514	bio08	-0.0710	bio10	0.1226
permhydro	0.3231	modis_t	0.2244	dem_aspect	0.1510	bio01	-0.0706	bio14	0.1179
bio13	-0.3214	bio07	-0.2182	soilmu	0.1412	dem_slope	-0.0698	bio08	0.1099
bio16	-0.2534	landcover	0.2114	bio05	-0.1178	bio13	0.0583	landcover	-0.0942
modis_h	-0.1598	dem_slope	0.1536	modis_b	-0.0893	bio16	0.0488	soilmu	0.0861
bio18	-0.1558	bio15	0.1490	modis_h	-0.0792	bio05	0.0420	modis_h	0.0811
geology	-0.1140	bio02	-0.1477	bio02	-0.0629	modis_h	0.0419	bio04	-0.0765
bio09	0.1055	soilmu	-0.1168	dem	0.0628	bio11	-0.0267	modis_b	-0.0570
bio03	0.0994	bio19	0.0924	bio14	-0.0554	dem_aspect	0.0175	bio16	0.0570
bio07	-0.0960	dem_aspect	-0.0710	bio17	0.0226	landcover	-0.0095	bio13	0.0321
bio04	0.0935	geology	0.0516	bio10	-0.0126	modis_b	0.0077	bio07	-0.0228
bio02	0.0361	bio03	0.0186	bio08	-0.0093	bio19	0.0066	bio18	0.0027

* Note that the variables are ranked by the absolute value of the loading for each Factor. Negative loadings equate negative correlations.

Species Specific Environmental Characteristics (Step 2) – Once each km^2 was characterized by the five factor scores, we summarized the factor scores for the km^2 occupied by each species. This provides an estimate of the habitat requirements for each species (Table 3).

Factor scores are computed such that their mean value is 0. Thus looking at Table 3, one can quickly see which factors help distinguish the habitat of particular species by identifying the factor with the values furthest from 0. In addition, the shape of the distribution of factor scores could also be helpful in identifying species requirements and we hope to develop that technique further. In this report we use the means. For example, square kilometers where *Plethodon neomexicanus* occur have a mean value of nearly -3 for Factor 1. This indicates cooler, higher areas with less severe dry seasons. The mean value for Factor 4 is nearly -2, indicating great diurnal variation in temperature. The combination of cooler, high altitude areas with great diurnal variation in temperature is hardly surprising for a mountain salamander.

Table 3. Mean and standard deviations for the environmental factor scores where species occur.

Species	Mean Factor 1	Mean Factor 2	Mean Factor 3	Mean Factor 4	Mean Factor 5	s.d. Factor 1	s.d. Factor 2	s.d. Factor 3	s.d. Factor 4	s.d. Factor 5
Acris crepitans	1.1061	0.1758	-0.4047	-0.5056	0.7199	0.1833	0.5484	0.6712	0.5432	0.5086
Ambystoma tigrinum	-0.8737	0.4758	-0.0264	-0.2132	0.3398	1.3827	0.7025	1.1400	1.4022	1.1149
Aneides hardi	-1.1969	1.8950	3.5407	-2.4845	-0.6461	0.3424	0.4321	0.3792	0.4308	0.4862
Apalone mutica	1.0024	1.0424	-1.0006	-0.7766	-0.5341	0.2792	0.2560	0.2180	0.5558	1.2188
Apalone spinifera	0.7420	0.1357	-0.8004	0.0619	0.5020	0.4142	0.6038	0.8970	0.9155	0.8200
Arizona elegans	0.5019	-0.0468	-0.8439	0.0523	0.2426	0.4710	0.7283	0.7370	0.9415	0.7435
Aspidoscelis burti	0.4946	-0.0757	1.8441	0.9667	0.3059	0.1286	0.1742	0.0970	0.1389	0.2680
Aspidoscelis dixoni	0.4272	-0.7288	1.0919	0.9831	0.6295	0.0196	0.0980	0.0771	0.0026	0.4726
Aspidoscelis exsanguis	0.1835	0.1848	0.5281	0.3773	0.1461	0.6281	0.5296	1.1926	1.0631	0.9228
Aspidoscelis flagellicauda	-0.1820	0.0192	1.0336	1.3353	0.9108	0.3793	0.4818	0.6549	0.4824	0.4142
Aspidoscelis gularis	1.0553	0.0154	0.0875	-0.9328	0.9439	0.1247	0.2779	0.4455	0.3904	0.3706
Aspidoscelis inornata	0.4843	-0.1713	-0.2657	-0.1984	0.1696	0.6066	0.6494	0.8343	0.9947	0.8156
Aspidoscelis neomexicana	0.2439	-0.4607	-1.0271	-0.0085	-0.0942	0.3767	0.5083	0.6653	1.0205	0.7566
Aspidoscelis sexlineata	0.8470	0.7172	-0.3340	-0.2509	0.4432	0.2538	0.4996	0.4448	0.4425	0.7710
Aspidoscelis sonorae	0.3347	0.0619	1.9595	0.7805	0.4481	0.3004	0.2328	0.3756	0.2355	0.4541
Aspidoscelis tesselata	0.5295	-0.1636	-0.1941	-0.2911	-0.2390	0.5380	0.7377	0.7926	0.9584	1.0907
Aspidoscelis tigris	0.5262	-0.3421	-0.2142	0.0885	0.4464	0.5340	0.7299	0.7568	1.0415	0.7612
Aspidoscelis uniparens	0.3062	-0.2104	0.4288	0.8797	0.4540	0.4108	0.5047	1.0999	0.7115	0.8641
Aspidoscelis velox	-0.6535	-0.3512	-1.0494	-0.2390	0.0699	0.7180	0.9672	0.8812	1.0847	1.6678
Bogertophis subocularis	0.7080	-0.7062	0.8321	-1.2196	-1.2405	0.1375	0.5282	0.6357	0.7913	0.7200
Bufo alvarius	0.4588	-0.0523	1.5629	0.8949	0.4139	0.1262	0.5918	0.5131	0.2220	0.4201
Bufo boreas	-3.8198	0.7543	0.4438	-2.1266	2.6576	0.2426	0.3863	0.4838	0.5051	0.6959
Bufo cognatus	0.5708	-0.1135	-0.5567	0.4214	0.6034	0.3135	0.6247	1.0917	0.8484	0.7954
Bufo debilis	0.7561	-0.1621	0.2049	-0.0115	0.3921	0.3383	0.8832	0.6915	0.9211	0.9159
Bufo microscaphus	-0.8187	0.5082	1.0109	2.1300	0.5203	0.4774	0.3867	0.5727	0.5538	0.4614
Bufo punctatus	0.2274	-0.1474	0.5708	-0.1413	-0.2101	0.6323	0.6386	1.1634	1.0687	1.0232
Bufo speciosus	0.9564	0.0758	0.1073	-0.7364	0.5453	0.2391	0.4385	0.6676	0.5656	0.6999
Bufo woodhousii	0.1689	0.1312	-0.9380	0.2058	0.3371	0.7585	0.7565	1.0211	1.0806	0.9389
Callisaurus draconoides	0.4419	-0.9123	0.9384	0.9950	0.5725	0.1161	0.3546	0.1473	0.1150	0.6774
Chelydra serpentina	0.7603	0.7991	-0.8053	-0.3059	-0.4489	0.4137	0.5394	0.6183	0.6740	1.0086
Chrysemys picta	0.5179	-0.0290	-1.2802	0.2453	0.4486	0.4248	0.5905	0.7287	0.9252	0.7477
Coleonyx brevis	0.8602	-0.2459	0.6694	-1.2424	-0.1291	0.3039	0.4003	0.7170	0.5952	1.0579
Coleonyx variegatus	0.0694	-0.3141	0.6142	1.5908	1.4136	0.3902	0.3217	0.7075	0.2488	0.8530
Coluber constrictor	0.3777	0.7606	-1.0510	0.3690	-0.2275	0.4919	0.8516	0.8775	0.8760	1.0975
Cophosaurus texanus	0.3897	-0.3253	0.2822	0.2735	0.0751	0.4021	0.5928	0.7899	1.0959	1.1049
Crotalus atrox	0.3989	-0.1571	0.0251	0.1997	0.0386	0.5866	0.6533	1.0385	1.0317	0.8917
Crotalus lepidus	-0.1011	0.1515	1.6457	0.1107	-0.3185	0.6073	0.6727	0.9335	0.9911	0.9092
Crotalus molossus	-0.0168	-0.0557	1.0761	0.1126	-0.3903	0.6820	0.5727	1.0082	1.3632	0.9694
Crotalus scutulatus	0.6615	-0.4875	0.7277	1.0843	1.0448	0.1700	0.2778	0.2014	0.0918	0.5856
Crotalus viridis	0.0895	-0.2199	-0.4346	0.2666	0.1248	0.7401	0.7847	0.8943	1.0158	0.8978
Crotalus willardi	-0.4788	0.9981	3.1102	-0.1269	0.4876	0.1775	0.4856	0.2820	0.3112	0.4434
Crotaphytus collaris	0.0602	-0.1230	-0.1929	-0.1562	-0.1145	0.8107	0.8943	1.0591	1.1045	1.2608
Diadophis punctatus	0.2822	0.2000	0.3455	0.0461	-0.5559	0.4375	0.8020	1.0887	1.0638	0.9211

Species	Mean Factor 1	Mean Factor 2	Mean Factor 3	Mean Factor 4	Mean Factor 5	s.d. Factor 1	s.d. Factor 2	s.d. Factor 3	s.d. Factor 4	s.d. Factor 5
Elaphe emoryi	0.5430	0.2140	-0.3041	-0.7276	-0.1099	0.8177	0.7089	0.8682	0.7409	0.7985
Eleutherodactylus augusti	0.7609	0.0832	-0.3498	-0.0677	0.3034	0.1939	0.3335	0.9018	0.5760	0.7293
Elgaria kingii	-0.3711	0.3544	1.8018	0.8642	0.3072	0.7788	0.5528	0.9858	0.6886	0.7163
Eumeces callicephalus	0.5174	-0.1240	1.8344	0.9943	0.3201	0.0948	0.1166	0.0900	0.1279	0.3491
Eumeces multivirgatus	-0.4935	0.4036	0.2225	-0.9424	0.2179	1.2614	0.6342	1.0490	1.1569	0.8989
Eumeces obsoletus	0.3174	0.2670	-0.3297	-0.4217	-0.0880	0.8003	0.7586	1.1928	0.9752	1.0906
Ficimia cana	0.2292	0.3116	1.1965	1.2851	1.0315	0.3279	0.1853	0.8012	0.8030	0.1938
Gambelia wislizenii	0.3435	-0.6467	-0.6384	0.0399	-0.0800	0.3452	0.4442	0.7483	1.0607	0.6219
Gastrophryne olivacea	0.9843	-0.1810	0.5728	-0.6042	-0.1270	0.1590	0.0912	0.8748	1.7396	0.8585
Gyalopion canum	0.4677	-0.3135	0.3292	0.0702	0.0407	0.4423	0.4857	1.1779	1.1471	0.8997
Heloderma suspectum	0.4351	-0.3810	0.3107	1.6910	1.0871	0.4490	0.3825	0.4386	0.3642	0.2246
Hemidactylus turcicus	0.9738	-0.1417	0.2456	-0.4791	-0.8713	0.3026	0.0109	0.4036	0.0653	0.4099
Heterodon nasicus	0.4869	-0.0218	-0.4071	0.2992	0.4473	0.3877	0.7396	1.0133	0.9331	0.7538
Holbrookia maculata	0.3828	0.0452	-0.2208	-0.0024	0.1909	0.5194	0.8277	1.0570	0.8559	0.8691
Hyla arenicolor	-0.5087	0.3659	1.0704	0.6688	0.2501	0.7180	0.5108	1.0829	1.1629	0.8301
Hyla wrightorum	-1.4369	1.2650	1.6458	1.3482	0.6173	0.5397	0.1686	0.8552	0.8359	0.6396
Hypsiglena torquata	0.4607	-0.0817	-0.2244	-0.1850	0.0733	0.6026	0.8343	0.8884	1.0691	1.0028
Kinosternon flavescens	0.8797	0.4296	-0.3129	-0.3748	0.4084	0.4586	0.7697	0.6646	0.8479	0.8957
Kinosternon sonoriense	-0.0828	0.2185	1.9217	0.8671	0.5573	0.4023	0.3531	0.7373	0.7572	0.3868
Lampropeltis alterna	0.9296	0.0228	1.5358	-2.2506	-1.2114	.	.	.	.	.
Lampropeltis getula	0.6061	-0.1115	-0.4041	0.6391	0.7411	0.3884	0.7143	1.0059	0.9347	0.7347
Lampropeltis pyromelana	-0.6358	0.6156	2.0621	0.9431	0.3021	0.4168	0.6110	0.7541	0.7421	0.6111
Lampropeltis triangulum	-0.0324	0.1687	-0.1691	-0.3553	0.3962	0.9312	0.5312	0.7056	0.8392	0.7703
Leptotyphlops dulcis	0.6530	0.2286	-0.0617	0.0197	-0.1814	0.4606	0.6659	1.1364	0.9694	0.9959
Leptotyphlops humilis	0.5653	-0.5091	0.3027	0.3093	0.3163	0.4898	0.4719	0.5563	0.9051	0.9540
Masticophis bilineatus	0.2002	0.1421	1.9240	0.6239	0.7596	0.3790	0.4801	0.6953	0.3983	0.6291
Masticophis flagellum	0.4757	-0.0348	-0.6218	-0.0563	0.2074	0.4710	0.6674	0.7968	0.9469	0.8431
Masticophis taeniatus	-0.0415	-0.1364	0.3657	0.2184	-0.0892	0.6443	0.6360	0.9588	1.3072	0.9145
Micruroides euryxanthus	-0.0845	-0.3306	0.9167	1.4983	0.7176	0.4089	0.2836	0.3639	0.3682	0.5038
Nerodia erythrogaster	1.2545	0.1542	-0.2168	-0.7322	0.7122	0.1964	0.4254	0.2799	0.1285	0.4596
Opheodrys vernalis	-1.3555	1.0472	0.1919	-0.4834	-0.3055	0.6203	0.6085	0.6864	0.8749	1.1117
Phrynosoma cornutum	0.6765	0.0396	-0.0429	0.1128	0.2531	0.3905	0.8189	0.8668	0.9570	0.9463
Phrynosoma hernandesi	-0.6506	0.2300	0.2788	-0.2300	0.0822	0.9649	0.8890	1.5642	1.4103	1.1151
Phrynosoma modestum	0.4030	-0.2508	-0.3475	0.0078	-0.0108	0.5785	0.6970	0.9190	1.0567	0.9242
Phrynosoma solare	0.6665	0.0005	1.7743	1.0874	0.2907	.	.	.	.	.
Pituophis catenifer	-0.0446	-0.1189	-0.4267	0.2180	0.1650	0.7696	0.7866	1.0776	1.1819	1.1410
Plethodon neomexicanus	-2.8735	0.4666	1.1894	-1.9273	1.3135	0.5315	0.3703	0.4403	0.4539	0.6896
Pseudacris triseriata	-1.0441	0.6013	-0.5692	-0.2345	0.5876	1.5099	0.7321	1.2027	1.2182	1.0800
Pseudemys gorzugi	1.1546	0.0060	0.0334	-0.8189	0.5168	0.3206	0.5167	0.4922	0.7256	0.4497
Rana berlandieri	0.8554	-0.2250	0.8974	-1.2593	-0.4272	0.3178	0.3583	0.9179	0.5208	0.9793
Rana blairi	0.5586	0.7897	-0.4811	0.0282	-0.3113	0.6372	0.5617	0.9585	0.8477	1.0324
Rana catesbeiana	0.1918	0.1070	-0.4290	0.7477	0.4071	0.5765	0.5057	1.3074	1.1660	0.7012
Rana chiricahuensis	-0.5304	0.3961	1.1623	1.7123	0.5501	0.6841	0.3995	0.5894	0.7831	0.8325
Rana pipiens	-0.3058	0.2487	-0.5650	0.3150	0.2338	1.0196	0.7506	1.2023	1.2094	0.8701
Rana yavapaiensis	-0.1849	0.2071	1.4960	1.0670	0.7866	0.2893	0.3618	0.6590	0.5829	0.0903
Rhinocheilus lecontei	0.5728	-0.1068	-0.3959	-0.1121	0.2629	0.4126	0.6407	0.7686	1.0046	0.8781

Species	Mean Factor 1	Mean Factor 2	Mean Factor 3	Mean Factor 4	Mean Factor 5	s.d. Factor 1	s.d. Factor 2	s.d. Factor 3	s.d. Factor 4	s.d. Factor 5
Salvadora deserticola	0.5026	-0.4646	0.4856	0.7542	0.3075	0.3533	0.3823	0.7070	0.8349	0.9945
Salvadora grahamiae	-0.0347	-0.0795	0.5757	0.0344	-0.3116	0.6844	0.5520	1.0802	1.2628	1.0292
Scaphiopus couchii	0.6442	-0.1218	-0.3613	0.2076	0.3197	0.4352	0.7712	0.9035	0.9347	0.8454
Sceloporus arenicolus	0.8113	0.5264	-0.1268	-0.2807	0.5904	0.1150	0.3110	0.2646	0.4561	0.4338
Sceloporus clarkii	-0.1094	0.1170	1.2968	1.2569	0.7460	0.5623	0.4360	0.7163	0.5690	0.5099
Sceloporus graciosus	-0.6104	-1.1700	-1.1864	-0.3390	-0.3792	0.7179	1.0284	0.6325	0.5513	0.8884
Sceloporus jarrovii	-0.0646	0.3696	2.3545	0.4638	0.6468	0.2962	0.4952	0.4950	0.4144	0.6142
Sceloporus magister	0.2611	-0.5436	-0.5961	0.7656	0.0807	0.5265	0.5601	0.8093	0.8056	0.8751
Sceloporus poinsettii	-0.2500	0.4078	1.3117	0.6194	-0.2893	0.7191	0.5837	0.7673	1.2569	0.9221
Sceloporus scalaris	0.4678	0.4427	1.6309	0.7179	1.3198	0.1847	0.2961	0.2948	0.1983	0.6264
Sceloporus undulatus	-0.1693	0.1308	-0.1769	-0.1857	-0.0189	0.9293	0.9099	1.0637	1.0616	1.1055
Sceloporus virgatus	-0.1739	0.5997	2.6174	0.2225	0.5184	0.4241	0.6627	0.7780	0.5246	0.4986
Senticolis triaspis	0.5997	-0.0870	1.7821	1.0567	0.3445	0.0681	0.0763	0.1001	0.0461	0.3929
Sistrurus catenatus	0.4459	-0.2944	-0.5475	-0.0160	0.2341	0.4345	0.7807	0.5521	0.7779	0.6064
Sonora semiannulata	0.7904	0.1324	-0.1727	-0.4883	-0.3166	0.3745	0.8411	0.9581	0.8813	1.1384
Spea bombifrons	0.3649	0.0891	-0.9284	-0.1079	0.1401	0.6191	1.0831	0.7246	0.8168	0.8652
Spea multiplicata	0.0361	-0.2185	-0.2195	0.3333	0.0174	0.6719	0.8126	1.0486	0.9797	1.0238
Tantilla hobartsmithi	0.8237	-0.1556	0.9904	-0.5491	-0.2197	0.3211	0.2425	0.8231	1.1274	0.7197
Tantilla nigriceps	0.5280	0.0310	-0.7340	-0.1267	0.2850	0.4884	0.7916	0.7598	1.0596	0.9280
Tantilla yaquia	0.5269	-0.2311	1.6351	0.9872	0.2708	0.0629	0.3211	0.3789	0.1515	0.3693
Terrapene ornata	0.6978	0.4024	-0.4663	-0.0518	0.3042	0.4372	0.8635	0.8455	0.8379	0.9331
Thamnophis cyrtopsis	-0.0972	0.0412	0.5236	0.6468	0.1528	0.6034	0.5747	1.1957	1.1665	1.2527
Thamnophis elegans	-1.1529	0.4961	0.4149	-0.3117	0.1522	1.1038	0.7720	1.3385	1.6082	1.0921
Thamnophis marcianus	0.8071	0.2159	-0.1896	-0.0568	0.3251	0.3154	0.6875	0.9741	1.0426	0.9714
Thamnophis proximus	0.8815	0.7743	-0.6565	-0.3664	0.7120	0.5955	0.5884	0.7520	0.9429	1.2671
Thamnophis radix	0.5294	1.7628	-1.1480	0.4877	-0.2268	0.3194	0.3761	0.3263	0.7673	0.6616
Thamnophis rufipunctatus	-0.7361	0.3490	1.0553	2.0668	0.5789	0.5046	0.3623	0.4976	0.6008	0.3041
Thamnophis sirtalis	0.4725	-0.0243	-1.6933	0.0922	0.7219	0.3452	0.4906	0.5357	0.8972	0.6224
Trachemys gaigeae	0.6857	-0.4774	-0.2479	0.2556	0.3943	0.2741	0.4529	0.4939	0.8562	1.0411
Trimorphodon biscutatus	0.3444	-0.0501	1.0743	0.7212	0.2031	0.3743	0.5487	0.7257	0.4834	1.2614
Tropidoclonion lineatum	0.1217	0.7649	-0.4503	-0.4612	-0.2742	0.7078	0.6707	0.7605	0.8305	1.1718
Urosaurus ornatus	-0.1998	-0.0118	0.9359	0.7154	0.2178	0.6440	0.5822	1.0411	1.1386	0.9589
Uta stansburiana	0.4000	-0.3481	-0.5711	-0.1155	0.0823	0.5879	0.7959	0.7324	0.8917	0.8309

Habitat Suitability (Step 3) - To establish the characteristics that a species might require (step 2 above) we looked for mean factor scores that were farther from 0. To establish whether or not a particular km^2 might be suitable for a particular species, we measured how similar the mean factor score for the km^2 was to the mean of that species. In order to measure the "distance" a km mean was from the species habitat requirement we used Z scores so that the resulting measures might be conceptually related to probabilities that the habitat was suitable and could be compared across species. To express probabilities from these Z scores, we looked up a value of each Z score in a normal distribution. We established five levels of habitat suitability from these analyses: Completely Suitable, Likely Suitable, Potentially Suitable, Rarely Suitable, and Completely Unsuitable.

Testing the Habitat Suitability (Step 4): Our field work produced over 1,300 observations and specimens from 802 km^2. Six hundred and seventy of those km^2 represent areas where a particular species had not been previously recorded and thus could provide tests for the habitat analysis. Our initial investigations with previously developed maps based on MaxEnt algorithm (see Interim report for this project) suggested great variability of predicted habitat suitability for different species. In other words, probabilities calculated with MaxEnt for square kilometers where a species was observed during field work were ranging from nearly 0% to more than 90%. We compared the probabilities developed with the two methodologies (our new PCA-based method and MaxEnt algorithm) for species where observations during field work occurred in more than 10 new 1-km^2 cells (n=21). We used paired t-tests to compare means of calculated probabilities for each species between the two methods (Table 4).

Table 4. Results of paired t-test comparisons between means of PCA-based and MaxEnt-based calculated probabilities of habitat suitability, calculated for each species from 1-km^2 cells with new observations.

Species	**Number of km^2 cells**	**Mean of PCA-based probability (%)**	**Mean of MaxEnt-based probability (%)**	**P-value of paired t-test**
Arizona elegans	17	41.06	34.44	0.408
Aspidoscelis exsanguis	11	52.13	32.44	0.021
Cophosaurus texanus	47	57.77	46.98	0.018
Crotalus atrox	45	56.29	38.81	0.001
Crotalus scutulatus	12	54.85	78.73	0.001
Crotalus viridis	48	54.85	47.85	0.131
Crotaphytus collaris	57	61.16	29.74	<0.0001
Gambelia wislizenii	14	50.36	20.94	<0.0001
Masticophis flagellum	21	49.2	42.38	0.218
Masticophis taeniatus	10	60.78	24.56	0.013
Phrynosoma cornutum	28	49.64	28.33	<0.0001
Phrynosoma modestum	16	59.33	38.61	0.008
Pituophis catenifer	47	59.9	31.55	<0.0001
Rhinocheilus lecontei	19	40.33	32.27	0.245
Sceloporus magister	22	68.82	20.07	<0.0001
Sceloporus poinsetti	47	63.1	25.61	<0.0001
Sceloporus undulatus	68	54.86	35.05	<0.0001
Sistrurus catenatus	13	43.08	38.7	0.504
Terrapene ornata	17	40.95	49.48	0.307
Urosaurus ornatus	42	54.93	23.03	<0.0001
Uta stansburiana	40	49.76	33.07	<0.0001

For a majority of species (66%), the means of PCA-based probabilities were significantly higher than the means of MaxEnt-based probabilities. Only in one instance (*Crotalus scutulatus*), the mean of MaxEnt-based probabilities was higher for square kilometer cells with new observations. For 28.6% of species analyzed (6 of 21), there were no statistically significant differences between the means of probabilities calculated with the two methodologies. Nevertheless, for new observations of 19 out of 21 species (90.5%) means of PCA-based probabilities were higher than those for based on MaxEnt. These results suggest that the PCA-based methodology is better than MaxEnt at calculating habitat suitability for a species. Put differently, new observations are expected to be found in highly suitable habitats. We found that for a majority of species mean values of habitat suitability were consistently higher when using the PCA-based methodology.

Estimation of Potential Distributions (Step 5) – One criticism of our previous analysis was that some of the identified habitat was very distant from reasonable expectations of occurrence (specifically the situation with *Callisaurus draconoides*). Here we combine the identification of suitable habitat with empirically determined distances from known specimen localities to estimate what areas of suitable habitat are likely to be occupied – thus providing statistically valid estimates of potential distributions. For each 1 km^2 in New Mexico we measured the distance to the nearest 1 km^2 occupied by a species. Thus each 1 km^2 has a different measure for each of the 120+ species. In order to establish what distances are appropriate we analyzed distances among known localities for the species along with our new observations from Step 4. For instances where new observations of species were available, we calculated the distance as 100% or 150% of a maximum distance between a specimen and a new observation. In instances where new observations did not exist for species, we calculated the distance as 100% or 150% of a maximum distance between specimens. We used either 100% or 150% based on species biology (its potential for dispersal) and its known distribution.

Revised maps of distribution

Revised maps of distribution for all 47 reptile and amphibian Species of Greatest Conservation Need, as identified within the Comprehensive Wildlife Conservation Strategy for New Mexico, are included electronically on the enclosed DVD. They are formatted as LZW-compressed TIFF files, a common image file format, easily printed from many image handling applications. In addition, data used to produce these maps, most importantly, calculated habitat suitability for each species, is included as ESRI shapefiles. These data can be easily imported into most Geographic Information Systems for further analyses and manipulation.

For all species, each square kilometer within the state of New Mexico is assigned a habitat suitability value that ranges between 0 and 100. These measures of habitat suitability should not be confused with probabilities of species occurrence. High values of habitat suitability indicate that a particular 1km^2 has environmental characteristics that are very close to that 1km^2 where the species is known to occur. In order to move toward probability of species occurrence, we needed to combine this habitat suitability with potential range. To do this, we looked at outliers of specimens or observations, as explained above, to derive lines beyond which the species is unlikely to be found. We suggest that within those lines, habitat suitability can approach likelihood of occurrence. On the other hand, while areas outside the lines might be highly suitable, they are unlikely to relate to likelihood of occurrence.

In Appendix 6 we include several examples of revised maps of distribution. These can be printed on standard letter paper in portrait format.

Potential uses of maps for conservation planning and monitoring

Maps of species distributions have one of their greatest utilities in planning for conservation and monitoring; however, the maps produced in this project are probabilistic and therefore should be treated as such. Although the maps were developed by using best available data to date, several issues limit their utility. First, the scale of one square kilometer is a compromise between effective use of data and its use in land management. Finer scales require processing of air photographs and detailed knowledge of species populations and movement patterns, whereas coarser scales would not be useful for more practical reasons. For example, land ownership changes too frequently at scales much coarser than 100 km^2. In other words, maps of habitat suitability for a 10km x 10km piece of land would not be useful since it is likely that many land owners share those 100 km^2.

We anticipate that these maps will be useful and that they will be accepted and used by a wide range of people that are involved in natural resource management. The most effective use of maps produced in this project is for comparison of habitat suitability for different species between different areas. Those areas could vary in land ownership and/or status. This can help identify conservation opportunities for certain areas within the state. They are also useful in planning monitoring effort because some areas will have highly suitable habitats for many different species of interest. We do not recommend the use of these maps as a substitute for thorough surveys of species presence. While the maps can guide monitoring efforts, they should be treated as probabilistic expressions of habitat suitability, and within certain limits, as approaching likelihood of occurrence.

Appendices

Appendix 1. Field observations during 2007-2008 summarized by square kilometers

Species observed	Number of sq.km cells	Number of new sq.km cells
Ambystoma tigrinum	7	6
Apalone spinifera	1	1
Arizona elegans	17	17
Aspidoscelis exsanguis	11	11
Aspidoscelis inornata	4	4
Aspidoscelis neomexicana	6	4
Aspidoscelis tesselata	8	7
Aspidoscelis tigris	27	27
Aspidoscelis uniparens	1	1
Aspidoscelis velox	1	1
Bogertophis subocularis	2	2
Bufo alvarius	4	4
Bufo cognatus	7	6
Bufo debilis	1	1
Bufo microscaphus	1	1
Bufo punctatus	2	2
Bufo woodhousii	5	4
Chelydra serpentina	4	4
Coleonyx brevis	1	1
Coleonyx variegatus	1	1
Coluber constrictor	2	2
Cophosaurus texanus	48	47
Crotalus atrox	46	45
Crotalus lepidus	5	5
Crotalus molossus	6	6
Crotalus scutulatus	12	12
Crotalus viridis	48	48
Crotaphytus collaris	57	57
Diadophis punctatus	2	2
Elgaria kingii	5	5
Eumeces multivirgatus	2	2
Eumeces obsoletus	3	3
Gambelia wislizenii	14	14
Gyalopion canum	1	1
Heterodon nasicus	3	2
Holbrookia maculata	8	8
Hyla arenicolor	2	2
Hypsiglena torquata	5	5
Kinosternon flavescens	1	1
Lampropeltis getula	4	3
Leptotyphlops dulcis	1	1
Masticophis flagellum	22	21
Masticophis taeniatus	11	10
Phrynosoma cornutum	28	28
Phrynosoma hernandesi	8	7
Phrynosoma modestum	16	16
Pituophis catenifer	47	47

Plethodon neomexicanus	1	1
Pseudacris triseriata	2	2
Rana blairi	2	2
Rana pipiens	1	1
Rhinocheilus lecontei	19	19
Salvadora deserticola	1	1
Salvadora grahamiae	3	3
Scaphiopus couchi	2	2
Sceloporus clarkii	2	2
Sceloporus magister	22	22
Sceloporus poinsetti	47	47
Sceloporus undulatus	68	58
Sistrurus catenatus	13	13
Spea bombifrons	1	1
Spea multiplicata	2	2
Tantilla nigriceps	4	4
Terrapene ornata	18	17
Thamnophis cyrtopsis	3	2
Thamnophis elegans	10	8
Thamnophis marcianus	2	2
Thamnophis sirtalis	1	1
Trimorphodon biscutatus	1	1
Tropidoclonion lineatum	3	3
Urosaurus ornatus	44	42
Uta stansburiana	61	40

Appendix 2. Detailed listing of variables used in modeling.

Data type	Variable name	Units	Description
Climatic variables	bio01	Degrees Celsius * 100	Annual Mean Temperature
	bio02	Degrees Celsius * 100	Mean Diurnal Range (Mean of monthly (max temp - min temp))
	bio03	Dimensionless	Isothermality (bio02/bio07) (* 100)
	bio04	Dimensionless	Temperature Seasonality (standard deviation *100)
	bio05	Degrees Celsius * 100	Max Temperature of Warmest Month
	bio06	Degrees Celsius * 100	Min Temperature of Coldest Month
	bio07	Degrees Celsius * 100	Temperature Annual Range (bio05-bio06)
	bio08	Degrees Celsius * 100	Mean Temperature of Wettest Quarter
	bio09	Degrees Celsius * 100	Mean Temperature of Driest Quarter
	bio10	Degrees Celsius * 100	Mean Temperature of Warmest Quarter
	bio11	Degrees Celsius * 100	Mean Temperature of Coldest Quarter
	bio12	Millimeters	Annual Precipitation
	bio13	Millimeters	Precipitation of Wettest Month
	bio14	Millimeters	Precipitation of Driest Month
	bio15	Dimensionless	Precipitation Seasonality (Coefficient of Variation)
	bio16	Millimeters	Precipitation of Wettest Quarter
	bio17	Millimeters	Precipitation of Driest Quarter
	bio18	Millimeters	Precipitation of Warmest Quarter
	bio19	Millimeters	Precipitation of Coldest Quarter
Elevation	dem	Meters	average of 30m DEM from RGIS
Aspect	dem_aspect	Degrees (range 0-359, where 90 is East)	aspect derived using elevation DEM
Slope	dem_slope	Degress (range 0-90, where 90 is vertical)	slope derived using elevation DEM
Soil map units	soilmu	Categorical	USGS map unit numbers, which relate to constant soil characteristics, such as soil texture, permeability, water capacity or clay content
Geology	geology	Categorical	183 classes, ordinal when related to formation age (smaller number represents younger formation, see Table 3)

Landcover	landcover	Categorical	90 classes of land cover, including vegetation types related to ecological zones (see Table 4)
Structure of habitat	modis_b	Percentage	Percentage of bare ground
	modis_h	Percentage	Percentage of herbaceous cover
	modis_t	Percentage	Percentage of tree cover
Distance from permanent water source	permhydro	Meters	Distance to permanent water source

Appendix 3. Classes used in the geological map of New Mexico. Note that order of classes represents a chronological order from youngest to oldest for major formations.

Class	Name	Definition
1	&	Pennsylvanian rocks, undivided; in Sangre de Cristo Mountains may include
2	&lc	Lead Camp Formation; San Andres and Organ Mountains
3	&m	Madera Formation (Limestone
4	&me	Madera Limestone, exotic blocks; present only in the Chloride area of Sierra County
5	&ps	Panther Seep Formation; Organ, Franklin, and San Andres Mountains
6	&s	Sandia Formation; predominately clastic unit (commonly arkosic) with minor black shales
7	@	Triassic rocks, undivided; continental red beds
8	@b	Bull Canyon Formation; Norian
9	@c	Chinle Group; Upper Triassic; includes Moenkopi Formation (Middle Triassic) at base in many areas;
10	@cu	Upper Chinle Group, Garita Creek through Redonda Formations, undivided
11	@g	Garita Creek Formation; Carnian
12	@m	Moenkopi Formation; Middle Triassic
13	@r	Redonda Formation
14	@rp	Rock Point Formation of Chinle Group; Upper Triassic.
15	@s	Santa Rosa Formation; Carnian; includes Moenkopi Formation (Middle Triassic) at base in most areas
16	@t	Trujillo Formation; Norian
17	D	Percha Shale; southern Caballo Mountains; includes the Onate and Sly Gap Formations
18	ds	disturbed ground
19	J	Jurassic rocks, Middle and Upper, undivided
20	Je	Entrada Sandstone, Middle Jurassic; Callovian
21	Jm	Morrison Formation; Upper Jurassic nonmarine rocks present only in northern one-third of state
22	Jmsu	Morrison Formation and upper San Rafael Group
23	Jsr	San Rafael Group; consists of Entrada Sandstone, Todilto and Summerville Formations,
24	Jz	Zuni Sandstone; consists of undivided equivalents of the Summerville Formation and Bluff Sandstone;
25	Jze	Zuni and Entrada Sandstones, undivided
26	K	Cretaceous rocks, undivided
27	Ka	Uppermost Cretaceous andesite flows; restricted to southwestern area
28	Kbm	Mancos Formation and Beartooth Quartzite (and Sarten Sandstone); Mancos
29	Kc	Carlile Shale; limited to northeastern area; Turonian-Coniacian
30	Kcc	Crevasse Canyon Formation; coal-bearing units are Dilco and Gibson Coal Members;
31	Kch	Cliff House Sandstone; transgressive marine sandstone; Campanian
32	Kd	Dakota Sandstone; includes Oak Canyon, Cubero, and Paguate Tongues plus Clay Mesa Tongue of Mancos Shale;
33	Kdg	Dakota Group of east-central and northeast New Mexico;
34	Kdm	Intertongued Dakota-Mancos sequence of west-central New Mexico;
35	Kdr	Dakota Sandstone and Rio Salado Tongue of the Mancos Shale.
36	Kg	Gallup Sandstone; generally regressive marine sandstone; Turonian
37	Kgc	Greenhorn Formation and Carlile Shale, undivided; locally includes Graneros Shale
38	Kgg	Graneros Shale and Greenhorn Formation; limited to northeastern area;
39	Kgh	Greenhorn Formation; limited to northeastern area.
40	Kgr	Graneros Shale; limited to northeastern area; Cenomanian
41	Ki	Uppermost Cretaceous intrusive rocks; restricted to Copper Flats area in Sierra County
42	Kkf	Kirtland and Fruitland Formations; coal-bearing, coal primarily in the Fruitland; Campanian to Maastrichtian

43	Kl	Lower Cretaceous, undivided; in northern Lea and Roosevelt Counties includes equivalents of Tucumcari Shale.
44	Kls	Lewis Shale; marine shale and mudstone
45	Klv	La Ventana Tongue of the Cliff House Sandstone
46	Km	Mancos Shale; divided into Upper and Lower parts by Gallup Sandstone
47	Kma	Moreno Hill Formation and Atarque Sandstone; in Salt Lake coal field and extreme southern Zuni basin;
48	Kmc	McRae Formation; Engle basin - Cutter sag area; Maastrichtian
49	Kmf	Menefee Formation; mudstone, shale, and sandstone; coal-bearing
50	Kmg	Gallup Sandstone and underlying D-Cross Tongue of the Mancos Shale; Turonian
51	Kml	Mancos Shale, Lower part
52	Kmm	Mulatto Tongue of Mancos Shale
53	Kmr	Rio Salado Tongue of the Mancos Shale. Overlies Twowells Tongue of Dakota Sandstone;
54	Kms	Satan Tongue of Mancos Shale
55	Kmu	Mancos Shale, Upper part
56	Kmv	Mesaverde Group includes the Gallup Sandstone, Crevasse Canyon Formation,
57	Knf	Fort Hays Limestone Member of Niobrara Formation
58	Kpc	Pictured Cliffs Sandstone; prominent cliff-forming marine sandstone
59	Kpg	Pescado Tongue of the Mancos Shale and Gallup Sandstone; in Zuni Basin only.
60	Kph	Hosta Tongue of Point Lookout Sandstone; transgressive marine sandstone
61	Kpl	Point Lookout Sandstone; regressive marine sandstone in McKinley and Sandoval Counties.
62	Kpn	Pierre Shale and Niobrara Formation
63	Kth	Tres Hermanos Formation; formerly designated as Lower Gallup Sandstone in the Zuni Basin; Turonian
64	Ku	Upper Cretaceous, undivided. Includes Virden Formation in northern Hidalgo County,
65	Kvt	Vermejo Formation and Trinidad Sandstone; Maastrichtian
66	M	Mississippian rocks, undivided; Arroyo Penasco Group in Sangre de Cristo
67	M_	Mississippian through Cambrian rocks, undivided; includes Lake Valley Limestone;
68	MD	Mississippian and Devonian rocks, undivided; includes the Lake Valley Limestone,
69	O_	Ordovician and Cambrian rocks, undivided; includes Bliss Sandstone, El Paso Formation,
70	O_p	Ordovician-Cambrian plutonic rocks of Florida Mountains
71	P	Permian rocks, undivided
72	P&	Permian and Pennsylvanian rocks
73	P&sc	Sangre de Cristo Formation, in Sangre de Cristo Mountains
74	Pa	Abo Formation; red beds, arkosic at base, finer and more mature above;
75	Pat	Artesia Group; shelf facies forming broad south-southeast trending outcrop
76	Pau	Upper part of Abo Formation; Wolfcampian
77	Pay	Abo and Yeso Formations, undivided
78	Pb	Bursum Formation; shale, arkose, and limestone; earliest Permian
79	Pbc	Bell Canyon Formation; basin facies-sandstone, limestone, and shale; Guadalupian
80	Pc	Castile Formation; dominantly anhydrite sequence; Upper Permian
81	Pcc	Cherry Canyon Formation; basin facies-sandstone, limestone, and shale
82	Pco	Cutoff Shale; in Brokeoff Mountains only
83	Pcp	Capitan Formation; Upper Guadalupian age limestone (reef facies)
84	Pct	Cutler Formation; used in northern areas and Chama embayment only
85	Pg	Glorieta Sandstone; texturally and mineralogically mature, high-silica quartz sandstone
86	Pgq	Grayburg and Queen Formations; sandstone, gypsum, anhydrite, dolomite, and red mudstone; Guadalupian
87	Ph	Hueco Formation; limestone unit restricted to south-central area; Pendejo
88	Playa	
89	Pqm	Quartermaster Formation; red sandstone and siltstone; Upper Permian
90	Pqr	Quartermaster and Rustler Formations; Upper Permian
91	Pr	Rustler Formation; siltstone, gypsum, sandstone, and dolomite; Upper Permian

92	Psa	San Andres Formation; limestone and dolomite with minor shale; Guadalupian in south, in part Leonardian to north
93	Psg	San Andres Limestone and Glorieta Sandstone; Guadalupian and Leonardian
94	Psl	Salado Formation; evaporite sequence; Upper Permian
95	Psr	Seven Rivers Formation; gypsum, anhydrite, salt, dolomite, and siltstone; Guadalupian
96	Pty	Yates and Tansill Formations; sandstone, siltstone, limestone, dolomite, and anhydrite; Guadalupian
97	Pvp	Victorio Peak Limestone; in Brokeoff Mountains only
98	Py	Yeso Formation; sandstones, siltstones, anhydrite, gypsum, halite, and dolomite; Leonardian
99	Pys	Yeso, Glorieta and San Andres Formations, undivided
100	Pz	Paleozoic rocks, undivided
101	Qa	Alluvium; upper and middle Quaternary
102	Qa/QTs	Mix
103	Qa/QTsf	Mix
104	Qb	Basalt and andesite flows and locally vent deposits
105	Qbo	Basalt or basaltic andesite; middle and lower Pleistocene
106	Qbt	Bandelier Tuff; Jemez Mountains area only
107	Qd	Glacial deposits; till and outwash: upper and middle Pleistocene
108	Qe	Eolian deposits
109	Qe/Qa	Mix
110	Qe/Qp	Mix
111	Qe/Qpl	Mix
112	Qe/QTs	Mix
113	Qe/QTsf	Mix
114	Qe/Tnb	Mix
115	Qeg	Gypsiferous eolian deposits
116	Ql	Landslide deposits and colluvium
117	Ql/QTs	Mix
118	Qoa	Older alluvial deposits of upland plains and piedmont areas, and calcic soils and eolian cover sediments of High Plains region;
119	Qoa/To	Mix
120	Qp	Piedmont alluvial deposits: upper and middle Quaternary;
121	Qp/QTs	Mix
122	Qp/QTsf	Mix
123	Qp/Tsf	Mix
124	Qpl	Lacustrine and playa-lake deposits;
125	Qr	Silicic volcanic rocks
126	QTb	Basaltic and andesitic volcanics interbedded with Pleistocene and Pliocene sedimentary units
127	QTg	Gila Group
128	QTp	Older piedmont alluvial deposits and shallow basin fill;
129	QTs	Upper Santa Fe Group
130	QTsf	Santa Fe Group, undivided. Basin fill of Rio Grande rift region;
131	QTt	Travertine
132	Qv	Basaltic volcanics; tuff rings, cinders, and proximal lavas
133	Qvr	Valles Rhyolite; Jemez Mountains area only
134	SO	Silurian and Ordovician rocks, undivided
135	SO_	Silurian through Cambrian rocks, undivided
136	Tc	Chuska Sandstone; restricted to Chuska Mountains
137	Tfl	Fence Lake Formation;
138	Thb	Hinsdale Basalt; northern Taos and eastern Rio Arriba Counties; basalt flows interbedded with Los Pinos Formation
139	Ti	Tertiary intrusive rocks; undifferentiated

140	Tif	Middle Tertiary felsic shallow-intrusive rocks; phonolites and trachytes of northeastern N.M.;
141	TKa	Animas Formation; in northeast San Juan Basin
142	TKav	Andesitic volcanics
143	TKi	Paleogene and Upper Cretaceous intrusive rocks;
144	TKpr	Poison Canyon and Raton Formations; undivided
145	TKr	Raton Formation; in Raton Basin; unit contains conformable K/T boundary
146	Tla	Lower Tertiary, (Lower Oligocene and Eocene) andesite and basaltic andesite flows, and associated volcaniclastic units.
147	Tli	Quartz monzonites (Eocene) in the Silver City and Los Pinos Range, intermediate intrusives of the Cooke's Range (Oli gocene), and other
148	Tlp	Los Pinos Formation of Lower Santa Fe Group (Miocene and upper Oligocene);
149	Tlrf	Lower Oligocene silicic (or felsic) flows, domes, and associated pyroclastic rocks and intrusions;
150	Tlrp	Lower Oligocene silicic pyroclastic rocks (ash-flow tuffs) (31-36.5 Ma)
151	Tlv	Lower Oligocene and Eocene volcanic rocks, undifferentiated; dominantly intermediate composition, with interbedded volcaniclastic rocks;
152	Tmb	Basalt and andesite flows; Miocene
153	Tn	Nacimiento Formation; Paleocene, San Juan Basin
154	Tnb	Basalt and andesite flows; Neogene. Includes flows interbedded with Santa Fe and Gila Groups
155	Tnr	Silicic to intermediate volcanic rocks; mainly quartz latite and rhyolite Neogene;
156	Tnv	Neogene volcanic rocks; primarily in Jemez Mountains
157	To	Ogallala Formation, alluvial and eolian deposits, and petrocalcic soils of the southern High Plains;
158	Toa	Ojo Alamo Formation; Paleocene, San Juan Basin
159	Tos	Mostly Oligocene and upper Eocene sedimentary and volcaniclastic sedimentary rocks with local andesitic to intermediate volcanics;
160	Tpb	Basalt and andesite flows; Pliocene
161	Tpc	Poison Canyon Formation; Paleocene, Raton Basin
162	Tps	Paleogene sedimentary units; includes Baca, Galisteo, El Rito, Blanco Basin,
163	Tsf	Lower and Middle Santa Fe Group.
164	Tsj	San Jose Formation; Eocene, San Juan Basin
165	Tual	Upper Oligocene andesites and basaltic andesites (26-29 Ma);
166	Tuau	Lower Miocene and uppermost Oligocene basaltic andesites (22-26 Ma).
167	Tui	Miocene to Oligocene silicic to intermediate intrusive rocks; dikes, stocks, plugs, and diatremes
168	Tuim	Upper and Middle Tertiary mafic intrusive rocks
169	Turf	Upper Oligocene silicic (or felsic) flows and masses and associated pyroclastic rocks;
170	Turp	Upper Oligocene rhyolitic pyroclastic rocks (ash-flow tuffs) (24-29 Ma)
171	Tus	Upper Tertiary sedimentary units;
172	Tuv	Volcanic and some volcaniclastic rocks, undifferentiated; lower Miocene and Upper Oligocene (younger than 29 Ma)
173	Tv	Middle Tertiary volcanic rocks, undifferentiated
174	Water	
175	X	Lower Proterozoic rocks, undivided
176	Xm	Lower Proterozoic metamorphic rocks, dominantly felsic volcanic, volcaniclastic
177	Xmo	Lower Proterozoic metamorphic rocks, dominantly mafic (1720-1760 Ma)
178	Xms	Lower Proterozoic metasedimentary rocks (1650-1700 Ma). Essentially equivalent to Hondo Group;
179	Xmu	Lower Proterozoic metamorphic rocks, undivided
180	Xp	Lower Proterozoic plutonic rocks (older than 1600 Ma)
181	Yp	Middle Proterozoic plutonic rocks (younger than 1600 Ma)

182	Ys	Middle Proterozoic sedimentary rocks of the Sacramento Mountains
183	YXp	Middle and Lower Proterozoic plutonic rocks, undivided

Appendix 4. Description of vegetation types and other classes used in the land cover dataset. Note that only 90 classes out of the 125 in the dataset occur in New Mexico.

Cell value	Database code	Description
0	none	Unclassified
2	S002	Rocky Mountain Alpine Bedrock and Scree
4	S004	Rocky Mountain Alpine Fell-Field
5	S006	Rocky Mountain Cliff and Canyon
7	S008	Western Great Plains Cliff and Outcrop
9	S010	Colorado Plateau Mixed Bedrock Canyon and Tableland
10	S011	Inter-Mountain Basins Shale Badland
11	S012	Inter-Mountain Basins Active and Stabilized Dune
12	S013	Inter-Mountain Basins Volcanic Rock and Cinder Land
13	S014	Inter-Mountain Basins Wash
14	S015	Inter-Mountain Basins Playa
15	S016	North American Warm Desert Bedrock Cliff and Outcrop
17	S018	North American Warm Desert Active and Stabilized Dune
18	S019	North American Warm Desert Volcanic Rockland
19	S020	North American Warm Desert Wash
20	S021	North American Warm Desert Pavement
21	S022	North American Warm Desert Playa
22	S023	Rocky Mountain Aspen Forest and Woodland
23	S024	Rocky Mountain Bigtooth Maple Ravine Woodland
24	S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland
26	S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland
28	S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland
29	S031	Rocky Mountain Lodgepole Pine Forest
30	S032	Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland
32	S034	Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland
33	S035	Madrean Pine-Oak Forest and Woodland
34	S036	Rocky Mountain Ponderosa Pine Woodland
35	S038	Southern Rocky Mountain Pinyon-Juniper Woodland
36	S039	Colorado Plateau Pinyon-Juniper Woodland
38	S042	Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Complex
41	S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland
42	S047	Rocky Mountain Lower Montane-Foothill Shrubland
43	S048	Western Great Plains Sandhill Shrubland
45	S051	Madrean Encinal
48	S054	Inter-Mountain Basins Big Sagebrush Shrubland
50	S056	Colorado Plateau Mixed Low Sagebrush Shrubland
51	S057	Mogollon Chaparral
52	S058	Apacherian-Chihuahuan Mesquite Upland Scrub
53	S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland
55	S061	Chihuahuan Succulent Desert Scrub
56	S062	Chihuahuan Creosotebush, Mixed Desert and Thorn Scrub
57	S063	Sonoran Paloverde-Mixed Cacti Desert Scrub
58	S065	Inter-Mountain Basins Mixed Salt Desert Scrub
59	S068	Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub
60	S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub
62	S071	Inter-Mountain Basins Montane Sagebrush Steppe
63	S074	Southern Rocky Mountain Juniper Woodland and Savanna

64	S075	Inter-Mountain Basins Juniper Savanna
65	S077	Apacherian-Chihuahuan Piedmont Semi-Desert Grassland and Steppe
67	S079	Inter-Mountain Basins Semi-Desert Shrub Steppe
68	S080	Chihuahuan Gypsophilous Grassland and Steppe
69	S081	Rocky Mountain Dry Tundra
70	S083	Rocky Mountain Subalpine Mesic Meadow
71	S085	Southern Rocky Mountain Montane-Subalpine Grassland
72	S086	Western Great Plains Foothill and Piedmont Grassland
74	S088	Western Great Plains Shortgrass Prairie
76	S090	Inter-Mountain Basins Semi-Desert Grassland
77	S091	Rocky Mountain Subalpine-Montane Riparian Shrubland
78	S092	Rocky Mountain Subalpine-Montane Riparian Woodland
79	S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland
80	S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland
81	S095	Western Great Plains Riparian Woodland and Shrubland
82	S096	Inter-Mountain Basins Greasewood Flat
83	S097	North American Warm Desert Riparian Woodland and Shrubland
84	S098	North American Warm Desert Riparian Mesquite Bosque
85	S100	North American Arid West Emergent Marsh
86	S102	Rocky Mountain Alpine-Montane Wet Meadow
89	S108	Western Great Plains Saline Depression Wetland
90	S109	Chihuahuan-Sonoran Desert Bottomland and Swale Grassland
91	S111	Madrean Upper Montane Conifer-Oak Forest and Woodland
92	S112	Madrean Pinyon-Juniper Woodland
93	S113	Chihuahuan Sandy Plains Semi-Desert Grassland
95	S115	Madrean Juniper Savanna
96	S116	Chihuahuan Mixed Salt Desert Scrub
97	S117	Coahuilan Chaparral
105	S129	Sonoran Mid-Elevation Desert Scrub
108	S136	Southern Colorado Plateau Sand Shrubland
109	S138	Western Great Plains Mesquite Woodland and Shrubland
110	N11	Open Water
111	N21	Developed, Open Space - Low Intensity
112	N22	Developed, Medium - High Intensity
113	N31	Barren Lands, Non-specific
114	N80	Agriculture
116	D02	Recently Burned
117	D03	Recently Mined or Quarried
118	D04	Invasive Southwest Riparian Woodland and Shrubland
119	D06	Invasive Perennial Grassland
122	D09	Invasive Annual and Biennial Forbland
123	D10	Recently Logged Areas
124	D11	Recently Chained Pinyon-Juniper Areas

Appendix 5. List of new observations made during field surveys in 2007-2008 (some additional observations included from other efforts). Geographic coordinates were obtained with GPS units in the field.

Genus	**Species**	**Latitude WGS84**	**Longitude WGS84**	**UTM Northing NAD 83**	**UTM Easting NAD83**	**UTM Zone**
Ambystoma	tigrinum	36.3053631	-105.3828064	4017886	465631	13
Ambystoma	tigrinum	34.95459666	-104.5252602	3868110	543344	13
Ambystoma	tigrinum	36.91460422	-104.2052245	4085694	570795	13
Ambystoma	tigrinum	36.76616642	-103.3066723	4070269	651132	13
Ambystoma	tigrinum	33.94928687	-107.5028386	3759355	268703	13
Ambystoma	tigrinum	36.02685289	-104.3926002	3987097	554725	13
Ambystoma	tigrinum	36.55467398	-106.3293085	4046294	381034	13
Apalone	spinifera	36.02543157	-104.3611682	3986957	557558	13
Arizona	elegans	34.391091	-106.686752	3806810	344941	13
Arizona	elegans	34.325926	-106.705222	3799611	343121	13
Arizona	elegans	34.352641	-106.883296	3802863	326792	13
Arizona	elegans	34.407391	-106.881773	3808933	327044	13
Arizona	elegans	34.350974	-106.879569	3802672	327131	13
Arizona	elegans	34.399121	-106.928954	3808097	322690	13
Arizona	elegans	34.395568	-106.895802	3807646	325730	13
Arizona	elegans	34.406511	-106.883126	3808838	326918	13
Arizona	elegans	34.394617	-106.929945	3807600	322589	13
Arizona	elegans	34.392583	-106.899807	3807322	325356	13
Arizona	elegans	34.384491	-106.911861	3806445	324231	13
Arizona	elegans	34.388259	-106.906616	3806854	324721	13
Arizona	elegans	32.148669	-108.3131961	3560077	753413	12
Arizona	elegans	32.12059909	-108.3185434	3556952	752986	12
Arizona	elegans	31.93433393	-108.4024894	3536102	745560	12
Arizona	elegans	32.30713776	-107.8093192	3577948	235487	13
Arizona	elegans	32.33697382	-107.811286	3581261	235388	13
Arizona	elegans	35.43385545	-103.4530428	3922256	640418	13
Arizona	elegans	35.13257406	-106.8199565	3889261	334184	13
Arizona	elegans	33.88578356	-106.7001595	3750792	342775	13
Arizona	elegans	31.90827493	-109.1108828	3531825	678629	12
Arizona	elegans	31.91430738	-109.1377374	3532450	676077	12
Arizona	elegans	35.01847683	-104.6759806	3875140	529560	13
Aspidoscelis	exsanguis	35.18510621	-106.4773566	3894570	365488	13
Aspidoscelis	exsanguis	34.56597308	-106.4367919	3825850	368196	13
Aspidoscelis	exsanguis	35.26593248	-105.3395107	3902587	469119	13
Aspidoscelis	exsanguis	34.67685375	-106.4679183	3838188	365520	13
Aspidoscelis	exsanguis	34.48546548	-107.0046483	3817809	315921	13
Aspidoscelis	exsanguis	34.43922596	-107.0096844	3812690	315356	13
Aspidoscelis	exsanguis	34.43359039	-106.9180387	3811901	323766	13
Aspidoscelis	exsanguis	34.43261758	-106.9203854	3811797	323548	13
Aspidoscelis	exsanguis	34.75246456	-107.3309425	3848067	286638	13
Aspidoscelis	exsanguis	34.3200068	-107.2721005	3799976	290946	13
Aspidoscelis	exsanguis	33.83853368	-106.3057415	3745019	379185	13
Aspidoscelis	inornata	32.57583484	-104.3324049	3604462	562661	13
Aspidoscelis	inornata	33.1129591	-107.1770424	3665918	296869	13

Aspidoscelis	inornata	33.1129591	-107.1770424	3665918	296869	13
Aspidoscelis	inornata	35.24843811	-107.1574674	3902727	303708	13
Aspidoscelis	inornata	35.24870155	-107.1562603	3902754	303819	13
Aspidoscelis	inornata	35.19606588	-107.0887561	3896784	309839	13
Aspidoscelis	inornata	35.19481229	-107.0847595	3896638	310200	13
Aspidoscelis	inornata	35.19518302	-107.0861184	3896681	310077	13
Aspidoscelis	inornata	35.19650501	-107.0848947	3896826	310191	13
Aspidoscelis	neomexicana	35.54854469	-106.786333	3935345	338080	13
Aspidoscelis	neomexicana	33.95067751	-106.9719214	3758438	317778	13
Aspidoscelis	neomexicana	35.42343926	-106.320809	3920803	380094	13
Aspidoscelis	neomexicana	35.25495445	-107.1580085	3903451	303675	13
Aspidoscelis	neomexicana	34.14478471	-106.9646795	3779953	318861	13
Aspidoscelis	neomexicana	34.09646731	-106.8334476	3774369	330865	13
Aspidoscelis	tesselata	33.11297628	-107.1770278	3665920	296870	13
Aspidoscelis	tesselata	33.11297628	-107.1770278	3665920	296870	13
Aspidoscelis	tesselata	32.95823998	-107.2608013	3648926	288683	13
Aspidoscelis	tesselata	32.45496369	-104.3022426	3591081	565580	13
Aspidoscelis	tesselata	32.45413036	-104.300061	3590990	565785	13
Aspidoscelis	tesselata	35.50178306	-106.9238192	3930392	325515	13
Aspidoscelis	tesselata	32.32280815	-107.8671485	3579830	230087	13
Aspidoscelis	tesselata	33.91132976	-106.9642695	3754061	318402	13
Aspidoscelis	tesselata	33.93246196	-107.0129018	3756492	313951	13
Aspidoscelis	tesselata	33.94358005	-106.9988399	3757699	315275	13
Aspidoscelis	tigris	32.59936217	-104.3239757	3607075	563435	13
Aspidoscelis	tigris	34.0978173	-106.8273201	3774509	331433	13
Aspidoscelis	tigris	34.1025607	-106.8219685	3775026	331937	13
Aspidoscelis	tigris	34.10348305	-106.822342	3775129	331904	13
Aspidoscelis	tigris	34.0337415	-106.7694563	3767309	336649	13
Aspidoscelis	tigris	34.03471037	-106.768791	3767415	336712	13
Aspidoscelis	tigris	34.03461574	-106.7684379	3767404	336745	13
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Aspidoscelis	tigris	33.27278917	-106.813875	3682996	331067	13
Aspidoscelis	tigris	35.76818551	-106.2637784	3958973	385763	13
Aspidoscelis	tigris	34.23123239	-107.0107115	3789623	314805	13
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Aspidoscelis	tigris	32.33316726	-107.86319	3580969	230490	13
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Aspidoscelis	tigris	32.33226436	-107.8935017	3580945	227633	13
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Aspidoscelis	tigris	32.32136973	-107.8869404	3579720	228218	13
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Aspidoscelis	tigris	32.32186854	-107.8773094	3579751	229127	13
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Aspidoscelis	tigris	34.14005966	-106.8215893	3779184	332046	13
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Aspidoscelis	uniparens	33.93149788	-107.0127267	3756385	313965	13
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Bogertophis	subocularis	32.4567456	-104.3195457	3591268	563952	13
Bogertophis	subocularis	32.46161733	-104.3208157	3591807	563829	13
Bufo	alvarius	31.90525124	-109.0358382	3531616	685732	12
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Bufo	cognatus	34.95469666	-104.5311647	3868119	542805	13
Bufo	cognatus	32.32147601	-107.8800911	3579715	228864	13
Bufo	cognatus	36.05477015	-104.3785568	3990202	555970	13
Bufo	cognatus	33.56904536	-107.1981338	3716539	295968	13
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Bufo	cognatus	33.83704975	-106.7014764	3745390	342564	13
Bufo	cognatus	31.89124768	-109.0829225	3529984	681306	12
Bufo	debilis	32.44690005	-104.3046278	3590185	565361	13
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Bufo	microscaphus	33.73408	-107.4670576	3735405	271437	13
Bufo	punctatus	33.11570082	-107.1924697	3666252	295436	13
Bufo	punctatus	34.03305285	-106.7695861	3767233	336636	13
Bufo	woodhousii	36.85256707	-103.8998795	4079082	598074	13
Bufo	woodhousii	34.58926169	-106.7394598	3828870	340473	13
Bufo	woodhousii	36.00288332	-104.3461944	3984465	558924	13
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Bufo	woodhousii	35.51158167	-103.5123763	3930795	634902	13
Chelydra	serpentina	35.00453889	-105.7311607	3873790	433283	13
Chelydra	serpentina	36.03085323	-104.3618739	3987558	557490	13
Chelydra	serpentina	35.01253883	-104.4296632	3874582	552036	13
Chelydra	serpentina	36.05481592	-104.3790732	3990206	555924	13
Chelydra	serpentina	36.05481592	-104.3790732	3990206	555924	13
Coleonyx	brevis	32.57099186	-104.3463364	3603917	561356	13
Coleonyx	variegatus	31.87991819	-109.0643672	3528759	683084	12
Coluber	constrictor	36.79392384	-103.9690187	4072507	591981	13
Coluber	constrictor	36.8827255	-103.8779515	4082450	599990	13
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Cophosaurus	texanus	34.14551561	-106.9815638	3780064	317305	13
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Cophosaurus	texanus	34.14430182	-106.984261	3779934	317054	13
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Cophosaurus	texanus	34.14443895	-106.9887931	3779957	316636	13
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Cophosaurus	texanus	34.2440484	-106.9912992	3791009	316621	13
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Cophosaurus	texanus	33.91380703	-106.9423515	3754297	320433	13
Cophosaurus	texanus	33.91350126	-106.9424549	3754264	320423	13
Cophosaurus	texanus	33.93373534	-106.9444013	3756511	320286	13
Cophosaurus	texanus	33.9353129	-106.9479046	3756692	319965	13
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Cophosaurus	texanus	33.91134552	-106.9641829	3754063	318410	13
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Crotalus	atrox	34.397008	-107.034991	3808054	312937	13
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Crotalus	atrox	34.35659	-106.894889	3803321	325734	13
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Crotalus	atrox	32.53713844	-104.3692036	3600151	559232	13
Crotalus	atrox	34.23421307	-106.9759606	3789891	318013	13
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Crotalus	atrox	36.07073332	-104.3347869	3991998	559900	13
Crotalus	atrox	35.7904553	-103.8079964	3961362	607718	13
Crotalus	atrox	33.59344013	-107.1699679	3719189	298639	13
Crotalus	atrox	34.01348479	-106.9351302	3765339	321310	13
Crotalus	atrox	34.02461613	-107.0417777	3766765	311485	13
Crotalus	atrox	33.9004472	-106.7726453	3752532	336099	13
Crotalus	atrox	32.21575079	-108.9517913	3566190	693027	12
Crotalus	atrox	32.21669384	-108.9517803	3566294	693026	12
Crotalus	atrox	31.87290145	-109.052664	3528001	684205	12
Crotalus	atrox	31.9140726	-109.1296957	3532437	676838	12
Crotalus	atrox	31.88354488	-109.0703432	3529151	682511	12
Crotalus	atrox	31.88872355	-109.0788325	3529711	681698	12
Crotalus	atrox	31.90843376	-109.1112022	3531842	678598	12
Crotalus	atrox	31.98970528	-109.0357932	3540980	685566	12
Crotalus	atrox	32.07573219	-108.989594	3550598	689754	12
Crotalus	atrox	32.04998843	-109.0142514	3547701	687479	12
Crotalus	atrox	33.9514489	-106.9701744	3758521	317941	13

Crotalus	atrox	32.01209787	-109.0358105	3543462	685519	12
Crotalus	atrox	32.92242168	-107.5508351	3645573	261470	13
Crotalus	atrox	32.95391307	-107.316767	3648560	283440	13
Crotalus	atrox	33.91779824	-106.9011303	3754669	324253	13
Crotalus	atrox	33.97355567	-107.0014863	3761029	315095	13
Crotalus	atrox	34.14528519	-106.9883022	3780050	316684	13
Crotalus	atrox	34.1230216	-107.1478692	3777879	301917	13
Crotalus	atrox	34.41915348	-106.8401837	3810167	330891	13
Crotalus	atrox	34.45586949	-106.8238732	3814212	332464	13
Crotalus	atrox	35.61961	-106.135826	3942352	397139	13
Crotalus	atrox	35.60924442	-106.1748797	3941244	393588	13
Crotalus	atrox	35.61175891	-106.1740499	3941522	393667	13
Crotalus	atrox	35.65261625	-106.151991	3946030	395718	13
Crotalus	atrox	35.61380787	-106.1765132	3941752	393446	13
Crotalus	atrox	35.61385296	-106.1765322	3941757	393444	13
Crotalus	atrox	35.61381717	-106.1766038	3941753	393438	13
Crotalus	atrox	35.61381516	-106.1766307	3941753	393436	13
Crotalus	atrox	33.83883359	-106.30623	3745053	379141	13
Crotalus	lepidus	33.13830866	-107.1821971	3668739	296446	13
Crotalus	lepidus	34.14382833	-106.9861718	3779885	316877	13
Crotalus	lepidus	33.71434892	-107.5236954	3733344	266135	13
Crotalus	lepidus	33.71521167	-107.5215767	3733435	266334	13
Crotalus	lepidus	33.71401875	-107.5244324	3733309	266066	13
Crotalus	lepidus	33.92878465	-107.3389744	3756723	283797	13
Crotalus	lepidus	33.92947851	-107.3384167	3756799	283851	13
Crotalus	lepidus	33.92947851	-107.3384167	3756799	283851	13
Crotalus	lepidus	33.92947851	-107.3384167	3756799	283851	13
Crotalus	lepidus	31.85492227	-109.1914466	3525780	671108	12
Crotalus	lepidus	34.14553212	-106.9882225	3780078	316691	13
Crotalus	lepidus	32.54479908	-107.2099238	3602978	292482	13
Crotalus	molossus	34.14343648	-106.9858	3779841	316910	13
Crotalus	molossus	33.14936975	-107.2041864	3670009	294421	13
Crotalus	molossus	33.46705302	-107.2471123	3705325	291175	13
Crotalus	molossus	34.34154041	-107.2789959	3802379	290365	13
Crotalus	molossus	31.89606861	-109.1645583	3530385	673575	12
Crotalus	molossus	31.52071718	-109.0140287	3489021	688572	12
Crotalus	molossus	34.0764696	-107.154879	3772730	301162	13
Crotalus	molossus	34.07643129	-107.1548426	3772726	301165	13
Crotalus	scutulatus	31.9794512	-109.0358302	3539843	685583	12
Crotalus	scutulatus	31.95776956	-109.0358769	3537439	685623	12
Crotalus	scutulatus	31.88586406	-109.0741249	3529402	682149	12
Crotalus	scutulatus	31.68971814	-109.1330693	3507558	676946	12
Crotalus	scutulatus	31.570344	-109.2607787	3494125	665051	12
Crotalus	scutulatus	31.91400781	-109.0358083	3532587	685717	12
Crotalus	scutulatus	31.93431566	-109.0357976	3534839	685677	12
Crotalus	scutulatus	31.93581912	-109.0359204	3535005	685663	12
Crotalus	scutulatus	31.870666	-109.0420442	3527771	685214	12
Crotalus	scutulatus	31.99413068	-109.0359128	3541470	685546	12
Crotalus	scutulatus	31.97098003	-109.0359164	3538903	685592	12
Crotalus	scutulatus	31.94966166	-109.0359169	3536540	685635	12

Crotalus	scutulatus	31.93404777	-109.0358382	3534809	685674	12
Crotalus	scutulatus	32.04819261	-109.0158851	3547499	687328	12
Crotalus	scutulatus	31.96575047	-109.0359404	3538324	685600	12
Crotalus	scutulatus	32.00962747	-109.0358127	3543188	685524	12
Crotalus	viridis	34.3494652	-106.6287933	3802106	350195	13
Crotalus	viridis	34.3494652	-106.6287933	3802106	350195	13
Crotalus	viridis	34.4077531	-106.6784595	3808645	345734	13
Crotalus	viridis	34.4077531	-106.6784595	3808645	345734	13
Crotalus	viridis	34.3358153	-106.7001049	3800700	343611	13
Crotalus	viridis	34.3358153	-106.7001049	3800700	343611	13
Crotalus	viridis	34.4183454	-106.7841862	3809986	336036	13
Crotalus	viridis	34.4183454	-106.7841862	3809986	336036	13
Crotalus	viridis	34.397004	-106.893667	3807801	325930	13
Crotalus	viridis	34.406934	-106.877296	3808875	327455	13
Crotalus	viridis	34.406739	-106.857799	3808820	329247	13
Crotalus	viridis	34.389918	-106.903759	3807033	324987	13
Crotalus	viridis	34.334483	-106.630219	3800447	350038	13
Crotalus	viridis	34.338409	-106.629461	3800881	350114	13
Crotalus	viridis	34.336656	-106.723613	3800830	341449	13
Crotalus	viridis	34.334764	-106.730649	3800631	340799	13
Crotalus	viridis	34.403927	-106.678381	3808221	345734	13
Crotalus	viridis	34.334808	-106.631298	3800484	349939	13
Crotalus	viridis	34.334011	-106.742291	3800566	339726	13
Crotalus	viridis	34.336565	-106.629188	3800676	350136	13
Crotalus	viridis	34.33903	-106.6294	3800950	350121	13
Crotalus	viridis	34.336301	-106.630875	3800649	349980	13
Crotalus	viridis	34.348609	-106.621594	3802001	350856	13
Crotalus	viridis	34.337531	-106.629567	3800784	350103	13
Crotalus	viridis	34.339942	-106.625053	3801045	350522	13
Crotalus	viridis	34.407082	-106.678194	3808570	345757	13
Crotalus	viridis	34.332764	-106.725075	3800400	341308	13
Crotalus	viridis	34.355528	-106.688732	3802869	344693	13
Crotalus	viridis	34.344452	-106.725579	3801697	341283	13
Crotalus	viridis	34.402464	-106.92834	3808467	322754	13
Crotalus	viridis	34.404367	-106.861332	3808563	328917	13
Crotalus	viridis	34.38142	-106.923122	3806124	323189	13
Crotalus	viridis	34.40707	-106.877933	3808891	327397	13
Crotalus	viridis	35.38007163	-106.6368652	3916422	351320	13
Crotalus	viridis	31.96864424	-108.4444659	3539812	741501	12
Crotalus	viridis	31.96295712	-108.6763404	3538687	719596	12
Crotalus	viridis	31.96952082	-108.6309977	3539508	723867	12
Crotalus	viridis	35.70243258	-104.2167486	3951227	570857	13
Crotalus	viridis	35.70243258	-104.2167486	3951227	570857	13
Crotalus	viridis	32.33293877	-107.8070754	3580803	235773	13
Crotalus	viridis	33.97271236	-107.3330323	3761583	284458	13
Crotalus	viridis	35.39029629	-103.42281	3917468	643240	13
Crotalus	viridis	35.12783627	-106.7856897	3888679	337297	13
Crotalus	viridis	34.44736512	-106.989304	3813555	317247	13
Crotalus	viridis	31.95209669	-108.7899335	3537258	708884	12
Crotalus	viridis	34.63042765	-107.3811454	3834638	281721	13

Crotalus	viridis	34.15916847	-107.2297548	3782050	294452	13
Crotalus	viridis	34.23571536	-107.4784125	3791070	271731	13
Crotalus	viridis	34.00606949	-107.621145	3765927	257928	13
Crotalus	viridis	33.97478395	-107.6278646	3762472	257218	13
Crotalus	viridis	33.80241875	-107.3730283	3742780	280325	13
Crotalus	viridis	34.01712782	-107.0325951	3765918	312317	13
Crotalus	viridis	32.44436184	-108.6453543	3592132	721356	12
Crotalus	viridis	32.42122737	-108.7252477	3589404	713898	12
Crotalus	viridis	32.17562176	-108.9474049	3561748	693526	12
Crotalus	viridis	32.00299211	-109.0358978	3542453	685529	12
Crotalus	viridis	34.14424407	-106.9679235	3779899	318560	13
Crotalus	viridis	34.07708148	-107.0863953	3772667	307484	13
Crotalus	viridis	35.57945514	-106.1585354	3937923	395030	13
Crotalus	viridis	35.61384131	-106.176569	3941756	393441	13
Crotalus	viridis	33.86684926	-106.5732523	3748506	354480	13
Crotalus	viridis	33.87632919	-106.5778214	3749563	354073	13
Crotalus	viridis	33.84701961	-106.2998696	3745953	379741	13
Crotaphytus	collaris	32.57842527	-104.3349966	3604747	562416	13
Crotaphytus	collaris	32.61585172	-104.2963899	3608920	566012	13
Crotaphytus	collaris	32.78512669	-104.251086	3627714	570130	13
Crotaphytus	collaris	32.77187708	-104.290202	3626220	566477	13
Crotaphytus	collaris	34.1623199	-106.7539289	3781543	338327	13
Crotaphytus	collaris	34.17230484	-106.7317224	3782616	340393	13
Crotaphytus	collaris	33.96659533	-106.7384891	3759813	339382	13
Crotaphytus	collaris	34.07467503	-106.779989	3771865	335755	13
Crotaphytus	collaris	34.07843901	-106.7801102	3772283	335752	13
Crotaphytus	collaris	35.26509052	-105.3372745	3902493	469322	13
Crotaphytus	collaris	35.2658811	-105.339746	3902581	469098	13
Crotaphytus	collaris	35.26565772	-105.3390196	3902556	469164	13
Crotaphytus	collaris	34.11820292	-106.8123976	3776745	332850	13
Crotaphytus	collaris	34.11531561	-106.7999378	3776404	333994	13
Crotaphytus	collaris	34.11183746	-106.7905358	3776003	334854	13
Crotaphytus	collaris	34.086721	-106.7804137	3773202	335740	13
Crotaphytus	collaris	34.07621588	-106.7814129	3772038	335627	13
Crotaphytus	collaris	34.07251309	-106.776499	3771620	336073	13
Crotaphytus	collaris	34.0692822	-106.7767353	3771262	336045	13
Crotaphytus	collaris	34.0590261	-106.774867	3770121	336198	13
Crotaphytus	collaris	34.05556857	-106.7744772	3769737	336227	13
Crotaphytus	collaris	34.0520822	-106.7754367	3769352	336132	13
Crotaphytus	collaris	34.04449775	-106.7753049	3768511	336130	13
Crotaphytus	collaris	34.03449881	-106.7771053	3767405	335944	13
Crotaphytus	collaris	34.03447081	-106.7793804	3767406	335734	13
Crotaphytus	collaris	33.26053902	-106.7789638	3681582	334296	13
Crotaphytus	collaris	33.2632063	-106.7753528	3681872	334637	13
Crotaphytus	collaris	33.17058695	-106.7905172	3671626	333048	13
Crotaphytus	collaris	33.17534678	-106.7595316	3672104	335947	13
Crotaphytus	collaris	33.83560396	-106.682968	3745202	344274	13
Crotaphytus	collaris	35.44706	-105.760952	3922888	430940	13
Crotaphytus	collaris	36.06323445	-104.370772	3991145	556665	13
Crotaphytus	collaris	33.68366528	-105.9256587	3727466	414200	13

Crotaphytus	collaris	33.12559725	-107.1846253	3667334	296190	13
Crotaphytus	collaris	33.10722562	-107.1896781	3665307	295676	13
Crotaphytus	collaris	35.65645684	-104.3762773	3946024	556457	13
Crotaphytus	collaris	35.65465498	-104.3741335	3945826	556653	13
Crotaphytus	collaris	35.60558799	-107.0557602	3942149	313788	13
Crotaphytus	collaris	34.63715496	-106.5834771	3833946	354863	13
Crotaphytus	collaris	34.07149267	-107.1339338	3772137	303083	13
Crotaphytus	collaris	34.07915222	-107.1458269	3773010	302004	13
Crotaphytus	collaris	36.94819973	-103.4685039	4090221	636363	13
Crotaphytus	collaris	34.07117927	-107.1352304	3772105	302963	13
Crotaphytus	collaris	34.07486119	-107.1409836	3772525	302441	13
Crotaphytus	collaris	34.07967065	-107.14259	3773061	302304	13
Crotaphytus	collaris	34.07033371	-107.1317768	3772005	303280	13
Crotaphytus	collaris	36.0712939	-104.3344373	3992061	559931	13
Crotaphytus	collaris	36.01177753	-104.3785087	3985433	556005	13
Crotaphytus	collaris	36.02613347	-104.4633002	3986980	548355	13
Crotaphytus	collaris	34.0791622	-107.1458198	3773011	302004	13
Crotaphytus	collaris	34.08054689	-107.139515	3773152	302589	13
Crotaphytus	collaris	34.75102002	-107.3294917	3847904	286767	13
Crotaphytus	collaris	34.13957804	-106.8224606	3779132	331964	13
Crotaphytus	collaris	34.11827476	-106.8106407	3776750	333012	13
Crotaphytus	collaris	34.05716758	-106.7743507	3769914	336242	13
Crotaphytus	collaris	35.38929448	-106.3100125	3917003	381024	13
Crotaphytus	collaris	35.39072553	-106.3133313	3917166	380725	13
Crotaphytus	collaris	33.94520639	-106.99817	3757879	315340	13
Crotaphytus	collaris	35.2568258	-107.1542419	3903652	304022	13
Crotaphytus	collaris	33.89189104	-107.047939	3752057	310622	13
Crotaphytus	collaris	33.89782442	-107.0665015	3752749	308919	13
Crotaphytus	collaris	33.89782442	-107.0665015	3752749	308919	13
Crotaphytus	collaris	33.91759682	-107.081305	3754969	307594	13
Crotaphytus	collaris	33.90960569	-107.0798056	3754080	307715	13
Crotaphytus	collaris	33.90965573	-107.079799	3754086	307715	13
Crotaphytus	collaris	35.49517737	-106.921612	3929656	325701	13
Crotaphytus	collaris	33.98276855	-106.7724669	3761661	336273	13
Crotaphytus	collaris	35.58008295	-106.1771704	3938012	393342	13
Crotaphytus	collaris	35.57717501	-106.1803359	3937693	393051	13
Crotaphytus	collaris	35.57586199	-106.181361	3937549	392957	13
Crotaphytus	collaris	35.55833928	-106.1771559	3935601	393314	13
Crotaphytus	collaris	35.57679238	-106.1806892	3937651	393019	13
Crotaphytus	collaris	35.57118723	-106.1820303	3937031	392890	13
Crotaphytus	collaris	35.57706621	-106.1797293	3937680	393106	13
Crotaphytus	collaris	35.61329314	-106.1764053	3941695	393455	13
Crotaphytus	collaris	33.85242065	-106.3365686	3746596	376353	13
Crotaphytus	collaris	33.83992692	-106.3383505	3745213	376170	13
Crotaphytus	collaris	33.83541872	-106.3411355	3744716	375906	13
Crotaphytus	collaris	33.83495989	-106.3408424	3744665	375932	13
Diadophis	punctatus	34.345352	-106.620392	3801638	350961	13
Diadophis	punctatus	36.06720119	-104.3719084	3991584	556560	13
Elgaria	kingii	33.88317335	-107.5161665	3752052	267291	13
Elgaria	kingii	33.71486885	-107.5250306	3733404	266013	13

Elgaria	kingii	33.8116406	-107.5852535	3744276	260700	13
Elgaria	kingii	33.81161244	-107.5847278	3744272	260749	13
Elgaria	kingii	33.81216916	-107.5841914	3744333	260800	13
Elgaria	kingii	33.71768533	-107.5174016	3733700	266728	13
Elgaria	kingii	32.88106226	-108.2247024	3641517	759646	12
Eumeces	multivirgatus	33.71993177	-107.5223268	3733960	266277	13
Eumeces	multivirgatus	34.89606299	-106.0695015	3862038	402281	13
Eumeces	obsoletus	35.77914007	-106.2716145	3960198	385070	13
Eumeces	obsoletus	36.93737961	-103.4698945	4089019	636258	13
Eumeces	obsoletus	34.00359666	-106.9898544	3764339	316235	13
Gambelia	wislizenii	34.39737746	-106.6784521	3807494	345716	13
Gambelia	wislizenii	34.10339596	-106.8224042	3775119	331898	13
Gambelia	wislizenii	33.84078699	-106.6804233	3745773	344519	13
Gambelia	wislizenii	34.14501169	-106.9683715	3779984	318521	13
Gambelia	wislizenii	34.14645161	-106.9722163	3780151	318169	13
Gambelia	wislizenii	34.14595239	-106.9707556	3780093	318303	13
Gambelia	wislizenii	34.22563294	-106.9438584	3788882	320952	13
Gambelia	wislizenii	32.31607622	-107.8798775	3579115	228868	13
Gambelia	wislizenii	32.31923914	-107.8662984	3579432	230156	13
Gambelia	wislizenii	32.31723863	-107.8702458	3579220	229778	13
Gambelia	wislizenii	34.63715949	-106.6380323	3834026	349862	13
Gambelia	wislizenii	34.63713896	-106.6145912	3833989	352011	13
Gambelia	wislizenii	34.59139539	-106.6578726	3828980	347960	13
Gambelia	wislizenii	34.59128005	-106.659258	3828970	347833	13
Gambelia	wislizenii	34.24177833	-107.0009606	3790775	315726	13
Gambelia	wislizenii	33.91123228	-106.929592	3753990	321608	13
Gyalopion	canum	33.92437921	-106.9114595	3755416	323312	13
Heterodon	nasicus	36.04792264	-104.3781017	3989442	556016	13
Heterodon	nasicus	32.44758879	-104.305324	3590261	565295	13
Heterodon	nasicus	35.55936984	-106.7713592	3936521	339459	13
Holbrookia	maculata	34.4002881	-106.6626832	3807793	347170	13
Holbrookia	maculata	34.39011002	-106.6614901	3806663	347262	13
Holbrookia	maculata	33.93149494	-107.0128447	3756385	313954	13
Holbrookia	maculata	35.57571748	-106.1744558	3937525	393582	13
Holbrookia	maculata	35.575159	-106.17411	3937463	393613	13
Holbrookia	maculata	35.57537944	-106.1767982	3937490	393369	13
Holbrookia	maculata	35.57191981	-106.173368	3937103	393676	13
Holbrookia	maculata	35.56970045	-106.1731468	3936856	393693	13
Holbrookia	maculata	35.56959081	-106.1739524	3936845	393620	13
Holbrookia	maculata	35.56965091	-106.1740464	3936852	393611	13
Holbrookia	maculata	35.57078364	-106.1799622	3936984	393077	13
Holbrookia	maculata	35.56656084	-106.1769409	3936512	393345	13
Holbrookia	maculata	35.56711413	-106.1766318	3936573	393374	13
Holbrookia	maculata	35.5758205	-106.176239	3937539	393421	13
Hyla	arenicolor	33.71534376	-107.5223648	3733451	266261	13
Hyla	arenicolor	33.71489181	-107.5249613	3733407	266019	13
Hyla	arenicolor	33.71429284	-107.5230386	3733336	266196	13
Hyla	arenicolor	33.82655033	-107.5720332	3745899	261965	13
Hyla	arenicolor	33.71464991	-107.5227566	3733375	266223	13
Hypsiglena	torquata	34.350163	-106.877005	3802578	327365	13

Hypsiglena	torquata	34.00621793	-106.9877151	3764626	316438	13
Hypsiglena	torquata	31.89444554	-109.087864	3530330	680833	12
Hypsiglena	torquata	32.04890926	-109.0151387	3547579	687397	12
Hypsiglena	torquata	32.02355543	-109.0359535	3544732	685483	12
Kinosternon	flavescens	35.15935843	-103.7711463	3891406	611920	13
Lampropeltis	getula	34.4213986	-106.7325211	3810242	340790	13
Lampropeltis	getula	34.4213986	-106.7325211	3810242	340790	13
Lampropeltis	getula	34.391656	-106.901007	3807221	325244	13
Lampropeltis	getula	33.04839606	-107.2764941	3658955	287432	13
Lampropeltis	getula	31.94919286	-109.0358089	3536488	685646	12
Lampropeltis	getula	36.24979332	-102.2125947	4015258	750457	13
Leptotyphlops	dulcis	34.96441313	-104.6595619	3869149	531079	13
Masticophis	flagellum	34.400554	-106.673405	3807839	346185	13
Masticophis	flagellum	34.3469473	-106.6222754	3801817	350790	13
Masticophis	flagellum	34.306962	-106.676161	3797464	345761	13
Masticophis	flagellum	34.274659	-106.901697	3794246	324937	13
Masticophis	flagellum	34.339142	-106.628983	3800962	350160	13
Masticophis	flagellum	34.337667	-106.629783	3800799	350083	13
Masticophis	flagellum	34.362489	-106.622829	3803542	350767	13
Masticophis	flagellum	34.336801	-106.632337	3800707	349847	13
Masticophis	flagellum	34.336429	-106.633463	3800667	349743	13
Masticophis	flagellum	34.405563	-106.870509	3808711	328076	13
Masticophis	flagellum	34.98706807	-105.2001615	3871627	481732	13
Masticophis	flagellum	34.353893	-106.885851	3803007	326559	13
Masticophis	flagellum	34.336473	-106.723056	3800809	341500	13
Masticophis	flagellum	34.33756	-106.718216	3800922	341948	13
Masticophis	flagellum	34.331182	-106.723345	3800222	341464	13
Masticophis	flagellum	34.333521	-106.728227	3800489	341019	13
Masticophis	flagellum	33.01280483	-105.9956348	3653146	407003	13
Masticophis	flagellum	32.61646863	-107.2834827	3611072	285744	13
Masticophis	flagellum	31.95151012	-108.80427	3537166	707530	12
Masticophis	flagellum	35.59476729	-104.4268489	3939154	551920	13
Masticophis	flagellum	35.73707541	-104.1297646	3955136	578692	13
Masticophis	flagellum	34.97930526	-104.8096618	3870764	517373	13
Masticophis	flagellum	34.1219441	-107.2298825	3777922	294350	13
Masticophis	flagellum	35.55690707	-106.7819495	3936265	338495	13
Masticophis	flagellum	35.55690707	-106.7819495	3936265	338495	13
Masticophis	flagellum	31.91406967	-109.1270465	3532441	677089	12
Masticophis	flagellum	34.9492755	-104.6870258	3867462	528577	13
Masticophis	taeniatus	34.03325192	-106.7667418	3767250	336899	13
Masticophis	taeniatus	33.68507545	-105.9238896	3727621	414365	13
Masticophis	taeniatus	34.14351384	-106.9863263	3779850	316862	13
Masticophis	taeniatus	34.49739528	-107.0189967	3819158	314629	13
Masticophis	taeniatus	32.87658608	-107.8683956	3641253	231627	13
Masticophis	taeniatus	35.21715601	-106.4876582	3898139	364603	13
Masticophis	taeniatus	35.22216696	-106.490431	3898698	364359	13
Masticophis	taeniatus	34.15280074	-106.9843533	3780877	317064	13
Masticophis	taeniatus	34.12782828	-107.1572826	3778431	301060	13
Masticophis	taeniatus	33.90915533	-106.9405608	3753778	320589	13
Masticophis	taeniatus	35.60924225	-106.1748863	3941244	393587	13

Masticophis	taeniatus	33.83853469	-106.3057403	3745020	379186	13
Phrynosoma	cornutum	35.02701815	-104.6782673	3876086	529349	13
Phrynosoma	cornutum	32.60998079	-104.3013567	3608266	565550	13
Phrynosoma	cornutum	34.1573594	-106.8023515	3781071	333854	13
Phrynosoma	cornutum	33.99561114	-106.6775396	3762937	345066	13
Phrynosoma	cornutum	35.1699	-106.3841	3892761	373956	13
Phrynosoma	cornutum	34.16413517	-106.8018261	3781822	333915	13
Phrynosoma	cornutum	33.84986719	-106.6781402	3746776	344746	13
Phrynosoma	cornutum	33.23469182	-106.8006204	3678750	332229	13
Phrynosoma	cornutum	34.14426385	-106.9678713	3779901	318565	13
Phrynosoma	cornutum	34.14426385	-106.9678713	3779901	318565	13
Phrynosoma	cornutum	31.67690892	-108.8400214	3506651	704755	12
Phrynosoma	cornutum	31.69477763	-108.8359607	3508640	705101	12
Phrynosoma	cornutum	31.95150333	-108.3335753	3538165	752030	12
Phrynosoma	cornutum	31.98122707	-108.3416381	3541442	751187	12
Phrynosoma	cornutum	33.04460619	-107.2125787	3658408	293393	13
Phrynosoma	cornutum	32.95016661	-107.2581987	3648025	288907	13
Phrynosoma	cornutum	35.30887021	-104.4081389	3907457	553804	13
Phrynosoma	cornutum	35.46696967	-104.4150114	3924987	553076	13
Phrynosoma	cornutum	35.61848598	-104.4259795	3941786	551983	13
Phrynosoma	cornutum	35.65707349	-104.3771128	3946092	556381	13
Phrynosoma	cornutum	32.31161806	-107.8142685	3578457	235034	13
Phrynosoma	cornutum	32.31319327	-107.8159338	3578635	234882	13
Phrynosoma	cornutum	32.34165209	-107.8879318	3581972	228186	13
Phrynosoma	cornutum	35.44864783	-103.4631897	3923883	639472	13
Phrynosoma	cornutum	35.3759743	-103.4136215	3915893	644100	13
Phrynosoma	cornutum	34.43890854	-107.0098492	3812655	315341	13
Phrynosoma	cornutum	33.394597	-107.2665648	3697329	289192	13
Phrynosoma	cornutum	33.36785529	-107.2782246	3694387	288043	13
Phrynosoma	cornutum	33.9548346	-106.9252017	3758817	322105	13
Phrynosoma	cornutum	33.93371246	-106.9421079	3756504	320498	13
Phrynosoma	hernandesi	33.26308552	-106.7823957	3681869	333981	13
Phrynosoma	hernandesi	35.81770303	-106.6032319	3964915	355166	13
Phrynosoma	hernandesi	34.63714985	-106.6321127	3834016	350405	13
Phrynosoma	hernandesi	34.59141182	-106.6499902	3828970	348683	13
Phrynosoma	hernandesi	33.878625	-107.5237549	3751565	266576	13
Phrynosoma	hernandesi	34.08045578	-107.480287	3773853	271140	13
Phrynosoma	hernandesi	35.28336517	-107.5920296	3907549	264264	13
Phrynosoma	hernandesi	35.28336517	-107.5920296	3907549	264264	13
Phrynosoma	hernandesi	35.25282713	-107.1545345	3903209	303986	13
Phrynosoma	modestum	34.40334756	-106.6809004	3808160	345501	13
Phrynosoma	modestum	32.60016055	-104.3233	3607164	563498	13
Phrynosoma	modestum	34.11198808	-106.790659	3776020	334843	13
Phrynosoma	modestum	34.03490248	-106.7743194	3767445	336202	13
Phrynosoma	modestum	34.14481069	-106.9771176	3779978	317714	13
Phrynosoma	modestum	34.15445901	-106.9808807	3781055	317388	13
Phrynosoma	modestum	34.22367308	-106.9411376	3788660	321198	13
Phrynosoma	modestum	34.22442083	-106.944866	3788750	320856	13
Phrynosoma	modestum	32.32694043	-107.8783457	3580316	229044	13
Phrynosoma	modestum	34.14685755	-106.9569983	3780169	319573	13

Phrynosoma	modestum	34.14685755	-106.9569983	3780169	319573	13
Phrynosoma	modestum	34.14685755	-106.9569983	3780169	319573	13
Phrynosoma	modestum	34.14685755	-106.9569983	3780169	319573	13
Phrynosoma	modestum	34.49365754	-107.1341141	3818961	304050	13
Phrynosoma	modestum	34.43653294	-106.9069639	3812208	324790	13
Phrynosoma	modestum	34.60522989	-107.3888875	3831860	280945	13
Phrynosoma	modestum	34.11853527	-106.8122052	3776781	332869	13
Phrynosoma	modestum	34.12123793	-106.809326	3777076	333140	13
Phrynosoma	modestum	34.14435404	-106.9735638	3779921	318041	13
Phrynosoma	modestum	34.14457331	-106.9760074	3779949	317816	13
Phrynosoma	modestum	34.14460089	-106.9760157	3779953	317815	13
Phrynosoma	modestum	34.13939841	-106.9648284	3779356	318836	13
Phrynosoma	modestum	34.13531777	-106.9601714	3778895	319256	13
Pituophis	catenifer	34.322614	-106.640425	3799146	349077	13
Pituophis	catenifer	34.331117	-106.632807	3800077	349793	13
Pituophis	catenifer	34.3470605	-106.6226349	3801831	350758	13
Pituophis	catenifer	34.3470605	-106.6226349	3801831	350758	13
Pituophis	catenifer	34.337433	-106.722029	3800913	341597	13
Pituophis	catenifer	34.337195	-106.699141	3800852	343702	13
Pituophis	catenifer	34.357584	-106.688476	3803096	344721	13
Pituophis	catenifer	35.52731878	-106.1567619	3932138	395122	13
Pituophis	catenifer	34.421333	-106.733747	3810237	340678	13
Pituophis	catenifer	33.01532057	-105.99665	3653426	406911	13
Pituophis	catenifer	34.364328	-106.634203	3803763	349724	13
Pituophis	catenifer	34.337155	-106.627472	3800739	350295	13
Pituophis	catenifer	34.357232	-106.688667	3803058	344702	13
Pituophis	catenifer	35.85048214	-106.6215615	3968578	353570	13
Pituophis	catenifer	34.9091758	-106.0522515	3863476	403872	13
Pituophis	catenifer	32.11099871	-104.4361351	3552878	553196	13
Pituophis	catenifer	32.84879001	-104.9087143	3634527	508542	13
Pituophis	catenifer	35.50146438	-106.8240162	3930185	334568	13
Pituophis	catenifer	34.05715032	-107.0623725	3770411	309656	13
Pituophis	catenifer	34.41673195	-106.8279056	3809878	332015	13
Pituophis	catenifer	32.54649541	-107.4794738	3603724	267169	13
Pituophis	catenifer	31.52661385	-108.9757003	3489742	692200	12
Pituophis	catenifer	31.54088538	-108.8856592	3491486	700720	12
Pituophis	catenifer	32.42918112	-104.2872032	3588232	567012	13
Pituophis	catenifer	35.78792632	-103.9673617	3960918	593319	13
Pituophis	catenifer	35.18868939	-105.4068339	3894044	462961	13
Pituophis	catenifer	34.00526231	-106.9846488	3764515	316719	13
Pituophis	catenifer	34.10435812	-107.283656	3776081	289346	13
Pituophis	catenifer	36.91425939	-103.8212824	4086009	604997	13
Pituophis	catenifer	35.11553985	-106.7947079	3887329	336451	13
Pituophis	catenifer	33.14796377	-107.0814137	3669619	305870	13
Pituophis	catenifer	34.75098272	-107.3284231	3847898	286865	13
Pituophis	catenifer	34.11369321	-107.2537082	3777055	292132	13
Pituophis	catenifer	33.8753895	-107.7053683	3751633	249765	13
Pituophis	catenifer	33.68694579	-107.5730932	3730417	261481	13
Pituophis	catenifer	34.0342492	-107.0473202	3767843	310995	13
Pituophis	catenifer	34.02324929	-107.0409874	3766612	311555	13

Pituophis	catenifer	36.26607693	-106.4227473	4014399	372199	13
Pituophis	catenifer	36.23957855	-106.4195564	4011456	372442	13
Pituophis	catenifer	31.91442196	-109.1433834	3532454	675543	12
Pituophis	catenifer	31.90849101	-109.1114356	3531848	678576	12
Pituophis	catenifer	31.88157546	-109.0669137	3528938	682840	12
Pituophis	catenifer	31.90213024	-109.1001513	3531162	679655	12
Pituophis	catenifer	31.90303992	-109.1015106	3531260	679525	12
Pituophis	catenifer	34.78881771	-107.9328198	3853544	231648	13
Pituophis	catenifer	33.9318552	-107.0124301	3756424	313993	13
Pituophis	catenifer	34.00742769	-106.9453899	3764685	320350	13
Pituophis	catenifer	34.10922951	-107.1211935	3776298	304346	13
Pituophis	catenifer	33.9110027	-106.9279331	3753961	321761	13
Pituophis	catenifer	34.46359945	-107.1582622	3815674	301761	13
Pituophis	catenifer	34.86334456	-106.0786635	3858419	401404	13
Pituophis	catenifer	35.61432721	-106.1291143	3941759	397740	13
Plethodon	neomexicanus	35.96426077	-106.4361873	3980937	370497	13
Plethodon	neomexicanus	35.96468414	-106.4362163	3980984	370495	13
Plethodon	neomexicanus	35.96493644	-106.4366682	3981013	370454	13
Plethodon	neomexicanus	35.96492437	-106.4373334	3981012	370394	13
Plethodon	neomexicanus	35.96455825	-106.4375445	3980972	370375	13
Plethodon	neomexicanus	35.96489168	-106.4375244	3981009	370377	13
Plethodon	neomexicanus	35.96529753	-106.4382046	3981055	370317	13
Plethodon	neomexicanus	35.96555779	-106.437989	3981084	370336	13
Plethodon	neomexicanus	35.96527456	-106.4375564	3981052	370375	13
Plethodon	neomexicanus	35.96557958	-106.4378935	3981086	370345	13
Pseudacris	triseriata	35.96048799	-106.724464	3980940	344493	13
Pseudacris	triseriata	36.04154033	-106.846466	3990133	333660	13
Rana	blairi	33.08536369	-107.1769619	3662858	296813	13
Rana	blairi	36.06718853	-104.3719092	3991583	556560	13
Rana	pipiens	36.60703523	-106.3821288	4052170	376390	13
Rana	pipiens	36.6079357	-106.3813104	4052269	376464	13
Rhinocheilus	lecontei	34.392656	-106.899701	3807330	325366	13
Rhinocheilus	lecontei	34.351031	-106.879667	3802679	327122	13
Rhinocheilus	lecontei	34.389004	-106.905131	3806934	324859	13
Rhinocheilus	lecontei	34.381703	-106.919722	3806149	323502	13
Rhinocheilus	lecontei	34.335055	-106.696256	3800610	343963	13
Rhinocheilus	lecontei	31.96724522	-108.3377586	3539901	751592	12
Rhinocheilus	lecontei	31.95989639	-108.6848479	3538331	718799	12
Rhinocheilus	lecontei	31.9573446	-108.70896	3537999	716526	12
Rhinocheilus	lecontei	31.9747316	-108.579207	3540194	728749	12

Rhinocheilus	lecontei	32.42872682	-104.2724722	3588191	568397	13
Rhinocheilus	lecontei	32.31306645	-107.8158476	3578621	234889	13
Rhinocheilus	lecontei	34.50723924	-106.7678536	3819818	337710	13
Rhinocheilus	lecontei	32.40129059	-108.7258592	3587192	713888	12
Rhinocheilus	lecontei	31.88411518	-109.0713214	3529213	682418	12
Rhinocheilus	lecontei	31.46762151	-109.4526297	3482464	647003	12
Rhinocheilus	lecontei	31.87074185	-109.0469681	3527771	684748	12
Rhinocheilus	lecontei	31.88737281	-109.0766544	3529565	681907	12
Rhinocheilus	lecontei	31.89149394	-109.0832548	3530011	681274	12
Rhinocheilus	lecontei	32.05718338	-109.00724	3548510	688126	12
Rhinocheilus	lecontei	32.03583651	-109.0277633	3546108	686232	12
Rhinocheilus	lecontei	32.04979171	-109.0144411	3547678	687461	12
Salvadora	deserticola	32.94890623	-107.2463824	3647862	290009	13
Salvadora	grahamiae	32.52867096	-107.1974126	3601166	293620	13
Salvadora	grahamiae	35.61346689	-106.1732599	3941711	393740	13
Salvadora	grahamiae	35.61332876	-106.1736313	3941696	393707	13
Salvadora	grahamiae	35.57674854	-106.1807673	3937646	393012	13
Scaphiopus	couchi	34.95385629	-104.6133711	3867994	535300	13
Scaphiopus	couchi	34.95457856	-104.5818707	3868085	538176	13
Scaphiopus	couchi	33.20258427	-106.8070459	3675200	331568	13
Scaphiopus	couchi	33.13154672	-107.1002814	3667833	304074	13
Scaphiopus	couchi	33.57948015	-107.1860725	3717672	297112	13
Scaphiopus	couchi	33.93316051	-106.8323076	3756257	330646	13
Scaphiopus	couchi	32.40538255	-108.7257448	3587646	713889	12
Sceloporus	clarkii	32.09448804	-108.9752734	3552703	691067	12
Sceloporus	clarkii	32.09674923	-108.9747512	3552954	691111	12
Sceloporus	clarkii	32.09502834	-108.9704172	3552771	691524	12
Sceloporus	jarrovi	31.51948605	-109.0039257	3488902	689534	12
Sceloporus	jarrovi	31.91785796	-109.2744943	3532630	663139	12
Sceloporus	magister	34.10454118	-106.8216045	3775245	331974	13
Sceloporus	magister	34.2042984	-106.8175349	3786301	332547	13
Sceloporus	magister	34.20444894	-106.8176245	3786318	332539	13
Sceloporus	magister	34.16228411	-106.8036242	3781619	333746	13
Sceloporus	magister	34.15662959	-106.7154793	3780852	341861	13
Sceloporus	magister	33.96024252	-106.7597726	3759142	337403	13
Sceloporus	magister	33.97629303	-106.7621484	3760926	337214	13
Sceloporus	magister	34.14427316	-106.9678317	3779902	318569	13
Sceloporus	magister	34.14427316	-106.9678317	3779902	318569	13
Sceloporus	magister	34.14449427	-106.9679952	3779926	318554	13
Sceloporus	magister	34.14599438	-106.9924854	3780137	316299	13
Sceloporus	magister	34.44237554	-106.9104108	3812862	324485	13
Sceloporus	magister	34.00301177	-106.9912146	3764277	316108	13
Sceloporus	magister	34.00251573	-106.9913039	3764222	316098	13
Sceloporus	magister	34.14551703	-106.817158	3779782	332465	13
Sceloporus	magister	33.83493718	-106.6813045	3745125	344426	13
Sceloporus	magister	33.82361859	-106.7026699	3743902	342428	13
Sceloporus	magister	33.85256113	-106.6965431	3747103	343048	13
Sceloporus	magister	33.95653353	-106.925136	3759006	322114	13
Sceloporus	magister	33.90964248	-106.9542931	3753856	319321	13
Sceloporus	magister	33.90983569	-106.9540221	3753877	319346	13

Sceloporus	magister	33.91156856	-106.9647646	3754088	318356	13
Sceloporus	magister	34.14429797	-106.9673573	3779904	318613	13
Sceloporus	magister	34.2402488	-107.0060796	3790615	315252	13
Sceloporus	magister	34.24022407	-107.00638	3790612	315224	13
Sceloporus	magister	34.23845666	-107.0071454	3790418	315150	13
Sceloporus	magister	34.23902471	-107.0068468	3790480	315178	13
Sceloporus	magister	33.91274563	-106.9286293	3754156	321700	13
Sceloporus	magister	33.91105483	-106.9308288	3753972	321493	13
Sceloporus	magister	33.90823759	-106.9384212	3753673	320785	13
Sceloporus	magister	33.91070371	-106.9411046	3753951	320542	13
Sceloporus	magister	33.90982085	-106.9532057	3753874	319421	13
Sceloporus	magister	33.90907436	-106.9555948	3753796	319199	13
Sceloporus	magister	33.90111364	-106.9819646	3752960	316744	13
Sceloporus	magister	34.10795328	-106.8216597	3775623	331976	13
Sceloporus	poinsetti	33.86737757	-107.5330195	3750338	265689	13
Sceloporus	poinsetti	33.85303278	-107.5503159	3748787	264049	13
Sceloporus	poinsetti	33.84371881	-107.5619524	3747780	262946	13
Sceloporus	poinsetti	33.84308338	-107.5626582	3747712	262879	13
Sceloporus	poinsetti	33.7148442	-107.5247178	3733401	266042	13
Sceloporus	poinsetti	33.71489273	-107.5247014	3733406	266043	13
Sceloporus	poinsetti	33.71454857	-107.523858	3733366	266121	13
Sceloporus	poinsetti	33.81556517	-107.5780435	3744695	261379	13
Sceloporus	poinsetti	33.81066268	-107.5870281	3744172	260533	13
Sceloporus	poinsetti	33.81928171	-107.5741262	3745098	261752	13
Sceloporus	poinsetti	33.71743413	-107.5174153	3733672	266726	13
Sceloporus	poinsetti	33.7172022	-107.5190182	3733650	266576	13
Sceloporus	poinsetti	33.71481931	-107.5246316	3733398	266050	13
Sceloporus	poinsetti	33.80849504	-107.4244748	3743565	275578	13
Sceloporus	poinsetti	33.80876779	-107.4249123	3743596	275538	13
Sceloporus	poinsetti	33.80961277	-107.424115	3743688	275614	13
Sceloporus	poinsetti	33.71729147	-107.5189882	3733659	266580	13
Sceloporus	poinsetti	33.78603749	-107.4933188	3741227	269143	13
Sceloporus	poinsetti	33.79069397	-107.4882334	3741732	269627	13
Sceloporus	poinsetti	33.79069397	-107.4882334	3741732	269627	13
Sceloporus	poinsetti	33.57774829	-107.4074014	3717936	276561	13
Sceloporus	poinsetti	33.5775695	-107.4072992	3717916	276571	13
Sceloporus	poinsetti	33.57753698	-107.407155	3717912	276584	13
Sceloporus	poinsetti	33.49851256	-107.4178143	3709170	275390	13
Sceloporus	poinsetti	33.56266589	-108.1140781	3717399	767911	12
Sceloporus	poinsetti	33.56307015	-108.1164455	3717437	767689	12
Sceloporus	poinsetti	33.56296018	-108.1148381	3717429	767839	12
Sceloporus	poinsetti	33.56270294	-108.1129822	3717406	768012	12
Sceloporus	poinsetti	33.56388361	-108.112107	3717539	768090	12
Sceloporus	poinsetti	33.78571906	-107.492772	3741190	269193	13
Sceloporus	poinsetti	33.92963802	-107.3388966	3756818	283807	13
Sceloporus	poinsetti	33.88027221	-107.4058986	3751486	277484	13
Sceloporus	poinsetti	33.88014439	-107.4059873	3751472	277475	13
Sceloporus	poinsetti	33.88214657	-107.4056288	3751693	277514	13
Sceloporus	poinsetti	33.86777999	-107.4073672	3750103	277315	13
Sceloporus	poinsetti	33.86618659	-107.4065863	3749925	277384	13

Sceloporus	poinsetti	33.86668196	-107.4066345	3749980	277380	13
Sceloporus	poinsetti	33.8666434	-107.4066881	3749976	277375	13
Sceloporus	poinsetti	33.86944774	-107.4068284	3750287	277370	13
Sceloporus	poinsetti	33.91328459	-107.3917439	3755117	278879	13
Sceloporus	poinsetti	33.94366035	-107.4382095	3758587	274662	13
Sceloporus	poinsetti	33.82057638	-107.5733551	3745240	261827	13
Sceloporus	poinsetti	33.82337376	-107.571287	3745545	262026	13
Sceloporus	poinsetti	33.85818464	-107.5832072	3749434	261019	13
Sceloporus	poinsetti	33.95172508	-106.9689368	3758549	318056	13
Sceloporus	poinsetti	33.95180304	-106.9692408	3758559	318028	13
Sceloporus	poinsetti	33.95085546	-106.9685043	3758452	318094	13
Sceloporus	poinsetti	33.95085546	-106.9685043	3758452	318094	13
Sceloporus	poinsetti	33.90994859	-106.954729	3753891	319281	13
Sceloporus	poinsetti	33.90979612	-106.9546139	3753874	319291	13
Sceloporus	poinsetti	33.9098703	-106.9540598	3753881	319343	13
Sceloporus	poinsetti	34.23258036	-106.9849538	3789726	317181	13
Sceloporus	poinsetti	33.87854185	-107.4056424	3751293	277503	13
Sceloporus	poinsetti	33.67227235	-107.5881064	3728825	260048	13
Sceloporus	poinsetti	33.67227235	-107.5881064	3728825	260048	13
Sceloporus	poinsetti	33.66971838	-107.5918637	3728550	259692	13
Sceloporus	poinsetti	33.669537	-107.5919472	3728530	259684	13
Sceloporus	poinsetti	33.66941337	-107.5920496	3728517	259674	13
Sceloporus	poinsetti	33.91869192	-107.080907	3755090	307633	13
Sceloporus	poinsetti	33.92274977	-107.0835466	3755545	307398	13
Sceloporus	poinsetti	33.925349	-107.0856024	3755837	307214	13
Sceloporus	poinsetti	33.92533542	-107.085532	3755836	307221	13
Sceloporus	poinsetti	33.92554111	-107.0857091	3755859	307205	13
Sceloporus	poinsetti	33.92532938	-107.0855055	3755835	307223	13
Sceloporus	poinsetti	33.91753497	-107.0810631	3754962	307616	13
Sceloporus	poinsetti	34.07671326	-107.152547	3772753	301378	13
Sceloporus	poinsetti	34.07678643	-107.1527099	3772761	301363	13
Sceloporus	poinsetti	34.07643733	-107.1548459	3772726	301165	13
Sceloporus	poinsetti	34.07623993	-107.1554996	3772706	301104	13
Sceloporus	poinsetti	34.18837069	-107.2231035	3785276	295136	13
Sceloporus	poinsetti	34.18849901	-107.2246892	3785293	294990	13
Sceloporus	poinsetti	34.18826792	-107.2244816	3785267	295009	13
Sceloporus	poinsetti	34.18813096	-107.223725	3785251	295078	13
Sceloporus	poinsetti	34.28606009	-107.2738526	3796214	290700	13
Sceloporus	poinsetti	34.28606009	-107.2738526	3796214	290700	13
Sceloporus	poinsetti	34.28597393	-107.2762726	3796210	290477	13
Sceloporus	poinsetti	34.28597703	-107.2764544	3796211	290461	13
Sceloporus	poinsetti	34.28615715	-107.2787322	3796235	290251	13
Sceloporus	poinsetti	34.28606546	-107.2789656	3796226	290230	13
Sceloporus	poinsetti	34.28619948	-107.2792575	3796241	290203	13
Sceloporus	poinsetti	34.00191751	-107.144025	3764441	301990	13
Sceloporus	poinsetti	34.00190938	-107.1436904	3764439	302021	13
Sceloporus	poinsetti	34.00173269	-107.1437589	3764420	302015	13
Sceloporus	poinsetti	33.97751335	-107.2575077	3761959	291448	13
Sceloporus	undulatus	32.64168651	-104.2756631	3611797	567937	13
Sceloporus	undulatus	33.69288144	-105.92731	3728490	414056	13

Sceloporus	undulatus	35.264842	-105.3368406	3902465	469362	13
Sceloporus	undulatus	35.826427	-106.6399954	3965938	351861	13
Sceloporus	undulatus	35.86107275	-106.2162654	3969222	390186	13
Sceloporus	undulatus	35.86036624	-106.2222412	3969150	389645	13
Sceloporus	undulatus	35.76119215	-106.2597359	3958193	386118	13
Sceloporus	undulatus	33.58120901	-107.4111902	3718328	276219	13
Sceloporus	undulatus	33.57923297	-107.4105925	3718107	276269	13
Sceloporus	undulatus	35.82749954	-106.6400698	3966057	351856	13
Sceloporus	undulatus	35.82729444	-106.6407058	3966035	351798	13
Sceloporus	undulatus	35.82700283	-106.6404493	3966002	351821	13
Sceloporus	undulatus	35.82560289	-106.6392627	3965845	351926	13
Sceloporus	undulatus	35.82305647	-106.6372891	3965560	352099	13
Sceloporus	undulatus	35.82417034	-106.6373319	3965683	352097	13
Sceloporus	undulatus	35.82684433	-106.6438104	3965990	351517	13
Sceloporus	undulatus	36.04796279	-104.3769096	3989447	556123	13
Sceloporus	undulatus	35.54700879	-106.7827318	3935168	338404	13
Sceloporus	undulatus	32.81951127	-106.2753473	3631998	380616	13
Sceloporus	undulatus	35.08003981	-106.4796685	3882920	365104	13
Sceloporus	undulatus	36.7833546	-105.0704831	4070842	493710	13
Sceloporus	undulatus	33.85519951	-107.5460628	3749017	264448	13
Sceloporus	undulatus	34.0181349	-107.1339537	3766220	302958	13
Sceloporus	undulatus	34.0181349	-107.1339537	3766220	302958	13
Sceloporus	undulatus	34.0188757	-107.1337421	3766301	302979	13
Sceloporus	undulatus	34.73678981	-107.9730692	3847881	227793	13
Sceloporus	undulatus	34.94433864	-107.8388624	3870551	240737	13
Sceloporus	undulatus	35.49900522	-106.9238204	3930084	325509	13
Sceloporus	undulatus	35.50110354	-106.9234088	3930316	325551	13
Sceloporus	undulatus	35.83865644	-104.2940356	3966283	563756	13
Sceloporus	undulatus	33.79415452	-107.6040244	3742381	258913	13
Sceloporus	undulatus	35.88428048	-106.6637541	3972391	349824	13
Sceloporus	undulatus	35.88258918	-106.6642925	3972205	349772	13
Sceloporus	undulatus	33.81545286	-107.5808298	3744689	261120	13
Sceloporus	undulatus	33.79900714	-107.6014111	3742913	259169	13
Sceloporus	undulatus	33.9473825	-107.5026212	3759143	268718	13
Sceloporus	undulatus	36.07067733	-104.334677	3991992	559910	13
Sceloporus	undulatus	36.07083005	-104.3347654	3992009	559902	13
Sceloporus	undulatus	36.07084262	-104.354366	3991998	558137	13
Sceloporus	undulatus	36.04767756	-104.3706981	3989419	556683	13
Sceloporus	undulatus	36.07175943	-104.3532976	3992101	558233	13
Sceloporus	undulatus	36.07080599	-104.3525942	3991995	558297	13
Sceloporus	undulatus	33.79078341	-107.4880788	3741741	269641	13
Sceloporus	undulatus	33.79081517	-107.4879731	3741745	269651	13
Sceloporus	undulatus	33.5776078	-107.4071791	3717920	276582	13
Sceloporus	undulatus	34.75122496	-107.3282767	3847924	286879	13
Sceloporus	undulatus	34.13974877	-106.8205767	3779148	332138	13
Sceloporus	undulatus	33.60009503	-108.0583378	3721696	772969	12
Sceloporus	undulatus	34.22230524	-107.4406802	3789499	275172	13
Sceloporus	undulatus	34.23291036	-107.4615511	3790721	273277	13
Sceloporus	undulatus	34.23296174	-107.4614682	3790727	273285	13
Sceloporus	undulatus	34.2348812	-107.4672982	3790953	272753	13

Sceloporus	undulatus	34.23538486	-107.4800639	3791037	271578	13
Sceloporus	undulatus	34.23558335	-107.4794427	3791058	271636	13
Sceloporus	undulatus	33.82388882	-106.70339	3743934	342362	13
Sceloporus	undulatus	36.31395176	-106.5823145	4019933	357951	13
Sceloporus	undulatus	36.31384112	-106.5793145	4019916	358220	13
Sceloporus	undulatus	36.31167809	-106.5833031	4019682	357858	13
Sceloporus	undulatus	35.41682778	-106.2888341	3920032	382988	13
Sceloporus	undulatus	35.41369085	-106.3377805	3919743	378539	13
Sceloporus	undulatus	35.41366135	-106.3382214	3919740	378499	13
Sceloporus	undulatus	35.41371156	-106.3382823	3919746	378493	13
Sceloporus	undulatus	35.4141625	-106.3385158	3919796	378473	13
Sceloporus	undulatus	35.41453793	-106.3385816	3919838	378467	13
Sceloporus	undulatus	35.38993092	-106.2829012	3917041	383487	13
Sceloporus	undulatus	34.13874429	-108.4961063	3780372	730879	12
Sceloporus	undulatus	34.13820969	-108.4982374	3780308	730684	12
Sceloporus	undulatus	35.25341185	-107.1587679	3903282	303602	13
Sceloporus	undulatus	35.2573992	-107.1541574	3903715	304031	13
Sceloporus	undulatus	35.24969942	-107.1496794	3902852	304420	13
Sceloporus	undulatus	35.22139189	-106.4840561	3898604	364938	13
Sceloporus	undulatus	33.91357234	-106.9452033	3754276	320169	13
Sceloporus	undulatus	35.61277212	-106.1734689	3941634	393721	13
Sceloporus	undulatus	35.61346069	-106.1731927	3941710	393746	13
Sceloporus	undulatus	35.6138595	-106.1730844	3941754	393757	13
Sceloporus	undulatus	35.55745122	-106.1681703	3935492	394128	13
Sceloporus	undulatus	35.55772849	-106.1693707	3935524	394019	13
Sceloporus	undulatus	35.55770444	-106.1718214	3935524	393797	13
Sceloporus	undulatus	34.01809593	-107.1432787	3766233	302097	13
Sceloporus	undulatus	34.01800674	-107.1457313	3766228	301870	13
Sceloporus	undulatus	34.01693135	-107.1435452	3766105	302070	13
Sceloporus	undulatus	34.01687996	-107.1425811	3766097	302159	13
Sceloporus	undulatus	35.03600422	-106.3463807	3877864	377190	13
Sceloporus	undulatus	35.60864143	-106.1339187	3941134	397297	13
Sceloporus	undulatus	35.60789511	-106.1346128	3941052	397234	13
Sceloporus	undulatus	35.59171636	-106.1688101	3939294	394115	13
Sceloporus	undulatus	35.59156188	-106.1687465	3939276	394120	13
Sceloporus	undulatus	35.6142589	-106.1290258	3941752	397748	13
Sceloporus	undulatus	35.60863984	-106.1338729	3941134	397302	13
Sceloporus	undulatus	35.60497141	-106.1391666	3940732	396817	13
Sceloporus	undulatus	35.60494551	-106.1392846	3940730	396807	13
Sceloporus	undulatus	35.59377411	-106.1605752	3939513	394863	13
Sceloporus	undulatus	35.5937431	-106.1606027	3939510	394861	13
Sceloporus	undulatus	35.61856301	-106.16365	3942266	394617	13
Sceloporus	undulatus	35.61810452	-106.1642331	3942215	394564	13
Sceloporus	undulatus	35.57752403	-106.1790541	3937730	393168	13
Sceloporus	undulatus	35.5776304	-106.1789385	3937742	393178	13
Sceloporus	undulatus	35.56803161	-106.1849478	3936684	392621	13
Sceloporus	undulatus	35.61238873	-106.1806971	3941599	393065	13
Sceloporus	undulatus	35.60997063	-106.1816208	3941332	392978	13
Sceloporus	undulatus	35.59792517	-106.1705549	3939984	393965	13
Sceloporus	undulatus	35.60951357	-106.1744007	3941274	393632	13

Sceloporus	undulatus	35.61623552	-106.1904836	3942037	392184	13
Sceloporus	undulatus	33.8766089	-106.5756623	3749591	354273	13
Sceloporus	virgatus	31.87409059	-109.2327064	3527841	667169	12
Senticolis	triaspis	31.93270264	-109.1785684	3534424	672182	12
Sistrurus	catenatus	34.330802	-106.728928	3800189	340949	13
Sistrurus	catenatus	34.342318	-106.723422	3801457	341478	13
Sistrurus	catenatus	34.334671	-106.632823	3800472	349798	13
Sistrurus	catenatus	34.338826	-106.629074	3800927	350151	13
Sistrurus	catenatus	34.338702	-106.629181	3800913	350141	13
Sistrurus	catenatus	34.399421	-106.678368	3807721	345727	13
Sistrurus	catenatus	34.384243	-106.931581	3806452	322417	13
Sistrurus	catenatus	34.330603	-106.729867	3800168	340863	13
Sistrurus	catenatus	34.334552	-106.723932	3800597	341416	13
Sistrurus	catenatus	34.34515527	-106.6951315	3801728	344085	13
Sistrurus	catenatus	34.378228	-106.932407	3805786	322328	13
Sistrurus	catenatus	34.339087	-106.629415	3800956	350120	13
Sistrurus	catenatus	34.34207132	-106.6231142	3801278	350705	13
Sistrurus	catenatus	34.406934	-106.877296	3808875	327455	13
Sistrurus	catenatus	34.344401	-106.621226	3801534	350882	13
Sistrurus	catenatus	34.39266	-106.656422	3806938	347732	13
Sistrurus	catenatus	34.365151	-106.684535	3803930	345097	13
Sistrurus	catenatus	34.396797	-106.678294	3807430	345729	13
Sistrurus	catenatus	34.307497	-106.692043	3797547	344300	13
Spea	bombifrons	34.95468996	-104.58783	3868095	537632	13
Spea	multiplicata	34.9546519	-104.6064166	3868084	535935	13
Spea	multiplicata	35.1314301	-106.7856103	3889077	337312	13
Tantilla	nigriceps	34.40208	-106.605461	3807907	352434	13
Tantilla	nigriceps	36.92676963	-103.4688358	4087843	636372	13
Tantilla	nigriceps	35.10549121	-106.7977604	3886220	336153	13
Tantilla	nigriceps	32.09896574	-108.3225463	3554543	752668	12
Terrapene	ornata	34.4072113	-106.6890554	3808601	344759	13
Terrapene	ornata	34.3725853	-106.6806997	3804748	345463	13
Terrapene	ornata	34.3719233	-106.6811518	3804675	345421	13
Terrapene	ornata	34.392828	-106.6566169	3806957	347715	13
Terrapene	ornata	34.3695067	-106.6824447	3804409	345297	13
Terrapene	ornata	34.3915509	-106.6785176	3806848	345699	13
Terrapene	ornata	34.40663	-106.6783958	3808520	345738	13
Terrapene	ornata	34.4039733	-106.674282	3808219	346111	13
Terrapene	ornata	34.3934094	-106.6571403	3807022	347668	13
Terrapene	ornata	34.4045296	-106.6765379	3808285	345905	13
Terrapene	ornata	34.3823858	-106.6785311	3805832	345681	13
Terrapene	ornata	34.3651164	-106.6852589	3803927	345030	13
Terrapene	ornata	34.3649642	-106.6847849	3803909	345074	13
Terrapene	ornata	34.3937538	-106.6786252	3807093	345693	13
Terrapene	ornata	34.3760448	-106.6788991	3805129	345635	13
Terrapene	ornata	34.3822247	-106.6785136	3805814	345682	13
Terrapene	ornata	34.3944456	-106.6579331	3807138	347597	13
Terrapene	ornata	34.3976471	-106.6604451	3807497	347371	13
Terrapene	ornata	34.3551395	-106.6899184	3802827	344583	13

Terrapene	ornata	34.3868147	-106.6785221	3806323	345690	13
Terrapene	ornata	34.3711662	-106.681475	3804592	345389	13
Terrapene	ornata	34.3477536	-106.6937636	3802014	344216	13
Terrapene	ornata	34.3961813	-106.659285	3807333	347475	13
Terrapene	ornata	34.3370482	-106.699445	3800836	343674	13
Terrapene	ornata	34.3979064	-106.6784507	3807553	345717	13
Terrapene	ornata	34.37308101	-106.6801437	3804802	345515	13
Terrapene	ornata	34.35861787	-106.6880756	3803210	344759	13
Terrapene	ornata	34.34155131	-106.6970195	3801331	343905	13
Terrapene	ornata	34.34654516	-106.6944347	3801881	344152	13
Terrapene	ornata	34.3930571	-106.6784908	3807015	345704	13
Terrapene	ornata	34.39740378	-106.6784487	3807497	345716	13
Terrapene	ornata	34.40467819	-106.6772215	3808302	345842	13
Terrapene	ornata	34.40251448	-106.6684315	3808049	346646	13
Terrapene	ornata	34.38531708	-106.6784756	3806157	345691	13
Terrapene	ornata	34.34671951	-106.694308	3801900	344164	13
Terrapene	ornata	34.34671196	-106.6943122	3801900	344164	13
Terrapene	ornata	34.36441806	-106.6851411	3803849	345040	13
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Terrapene	ornata	34.3726428	-106.6809175	3804755	345443	13
Terrapene	ornata	34.37238908	-106.6789815	3804724	345621	13
Terrapene	ornata	34.33920622	-106.6982178	3801073	343790	13
Terrapene	ornata	34.06924272	-106.865976	3771404	327809	13
Terrapene	ornata	33.26098049	-106.8417861	3681732	328444	13
Terrapene	ornata	33.19907863	-106.9267435	3675011	320403	13
Terrapene	ornata	35.28256662	-104.2450479	3904640	568653	13
Terrapene	ornata	35.37934835	-103.4981378	3916148	636417	13
Thamnophis	cyrtopsis	33.90483261	-107.397761	3754192	278300	13
Thamnophis	cyrtopsis	31.9319336	-109.1850577	3534328	671570	12
Thamnophis	cyrtopsis	35.5775641	-106.1790531	3937735	393168	13
Thamnophis	elegans	36.52783161	-106.2369974	4043206	389257	13
Thamnophis	elegans	35.98501017	-106.4847046	3983305	366157	13
Thamnophis	elegans	36.03856266	-106.8478488	3989805	333529	13
Thamnophis	elegans	35.95097043	-106.7452164	3979918	342602	13
Thamnophis	elegans	36.03873692	-106.847231	3989823	333585	13
Thamnophis	elegans	35.99737977	-106.8071715	3985168	337110	13
Thamnophis	elegans	35.95097043	-106.7452164	3979918	342602	13
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Thamnophis	elegans	36.52815071	-106.3394817	4043365	380082	13
Thamnophis	elegans	34.13755766	-108.4984855	3780235	730663	12
Thamnophis	elegans	35.99262496	-106.8763466	3984758	330864	13
Thamnophis	elegans	36.02782887	-106.8466786	3988612	333612	13
Thamnophis	elegans	34.87104736	-106.1419679	3859337	395627	13
Thamnophis	marcianus	34.417408	-106.842015	3809977	330719	13
Thamnophis	marcianus	32.24364812	-104.6963917	3567483	528601	13
Thamnophis	sirtalis	36.54751752	-106.3447777	4045520	379638	13
Trimorphodon	biscutatus	33.13430336	-107.1769471	3668285	296927	13
Tropidoclonion	lineatum	34.95465953	-104.5289076	3868116	543011	13

Tropidoclonion	lineatum	35.50110949	-103.4992381	3929651	636111	13
Tropidoclonion	lineatum	35.04568666	-106.3837693	3878984	373794	13
Urosaurus	ornatus	35.66716027	-106.7310372	3948413	343325	13
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Urosaurus	ornatus	33.83065662	-107.5719746	3746355	261982	13
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Urosaurus	ornatus	33.91079885	-106.9649276	3754003	318340	13
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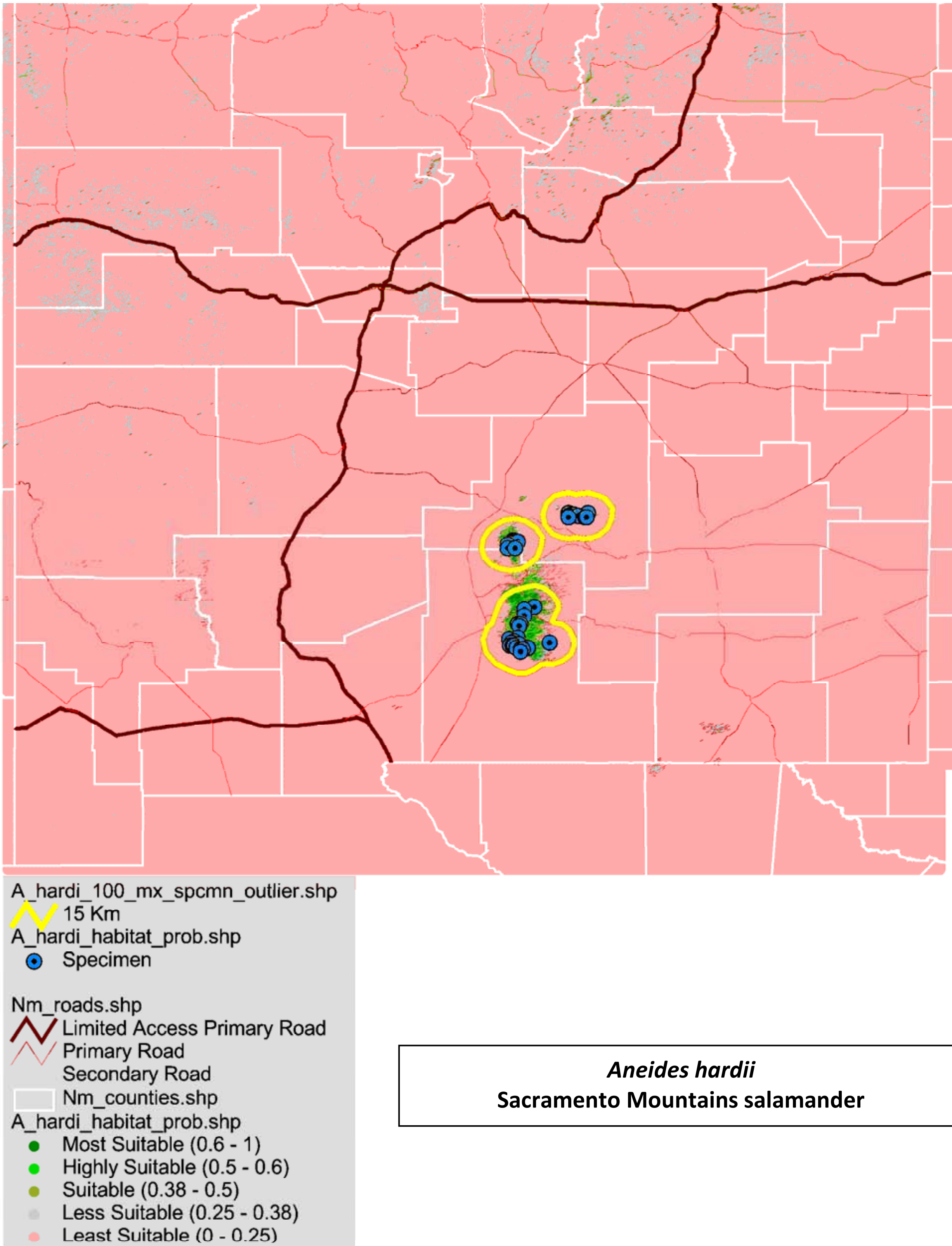
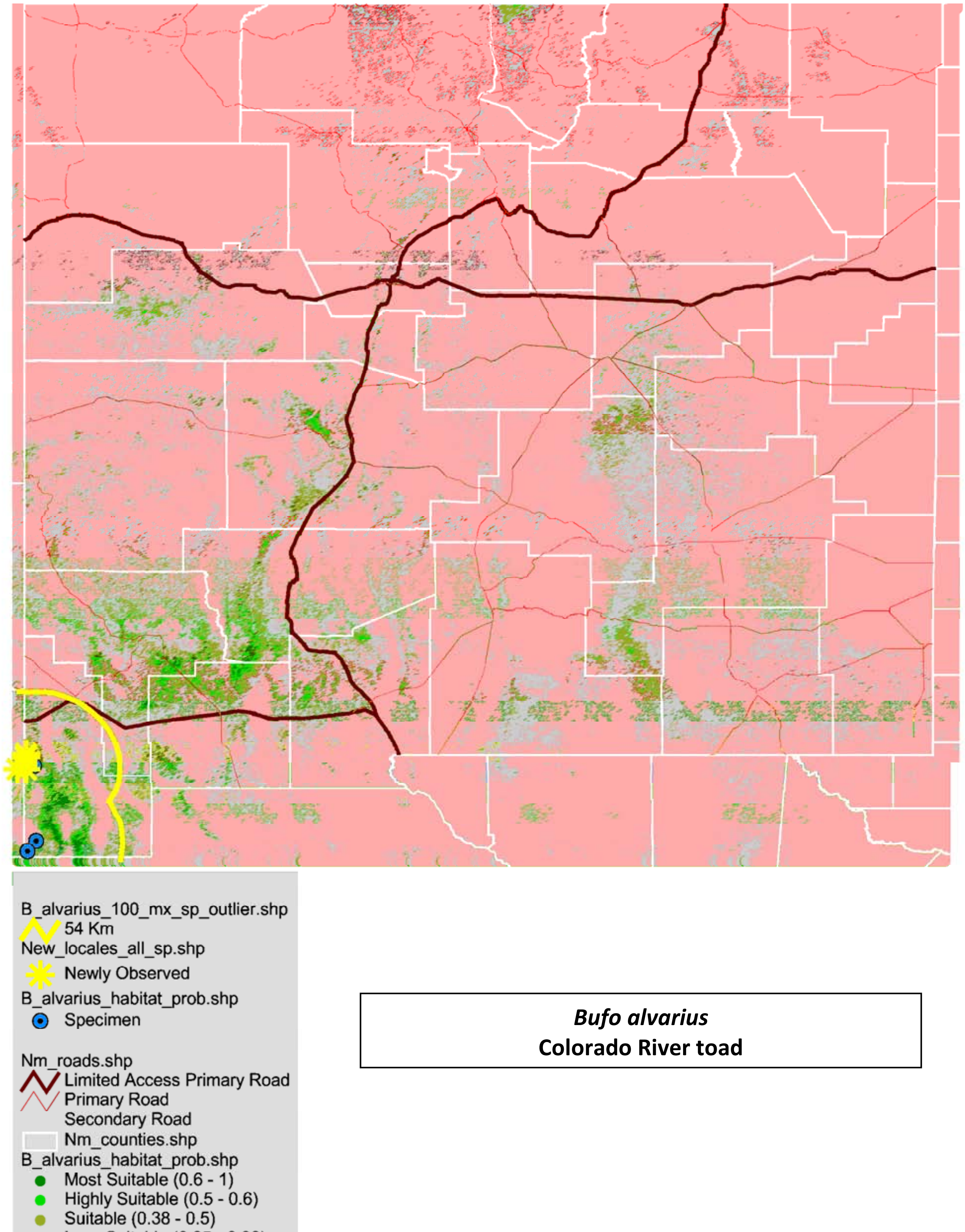
Uta	stansburiana	34.59159295	-106.6599966	3829006	347766	13

Uta	stansburiana	33.91207038	-106.9306387	3754084	321513	13
Uta	stansburiana	33.9095683	-106.9295986	3753805	321604	13
Uta	stansburiana	33.91205446	-106.9306549	3754083	321511	13
Uta	stansburiana	33.91356613	-106.945202	3754276	320169	13
Uta	stansburiana	33.91250842	-106.9493776	3754166	319781	13
Uta	stansburiana	35.5592949	-106.8047104	3936568	336436	13
Uta	stansburiana	34.24005417	-107.0040456	3790589	315439	13
Uta	stansburiana	32.53881533	-107.2098851	3602315	292472	13
Uta	stansburiana	32.53875707	-107.2111038	3602311	292357	13
Uta	stansburiana	34.09769811	-106.8281024	3774497	331361	13
Uta	stansburiana	34.09759937	-106.8279334	3774485	331376	13
Uta	stansburiana	34.10647094	-106.8220925	3775460	331933	13
Uta	stansburiana	34.10407288	-106.8220204	3775194	331935	13
Uta	stansburiana	33.96848487	-106.7682039	3760070	336640	13
Uta	stansburiana	33.96844966	-106.7678512	3760065	336672	13
Uta	stansburiana	33.96831689	-106.7673776	3760050	336716	13
Uta	stansburiana	33.9812386	-106.7668072	3761482	336793	13
Uta	stansburiana	33.98435935	-106.777789	3761846	335784	13
Uta	stansburiana	33.98369785	-106.7855803	3761785	335063	13
Uta	stansburiana	33.98364941	-106.7855114	3761779	335070	13
Uta	stansburiana	34.03984185	-106.9111981	3768221	323575	13
Uta	stansburiana	33.87287744	-106.5749072	3749177	354337	13
Uta	stansburiana	33.86715696	-106.5728102	3748539	354521	13
Uta	stansburiana	33.8761085	-106.5759201	3749536	354249	13

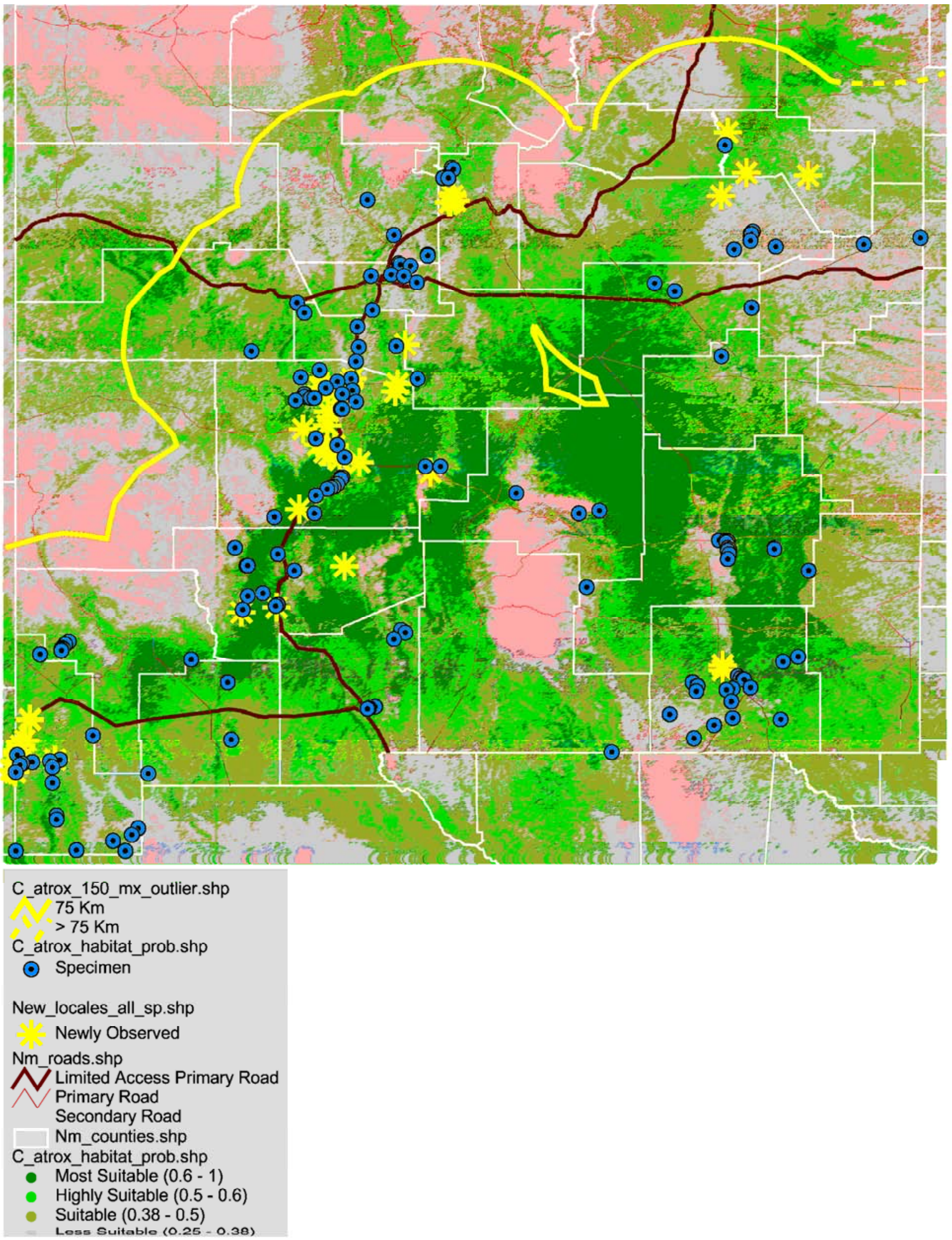
Appendix 6. Examples of individual maps of potential species distribution (Maps for all species of interest are available as electronic images and also in a common GIS format on the enclosed DVD)



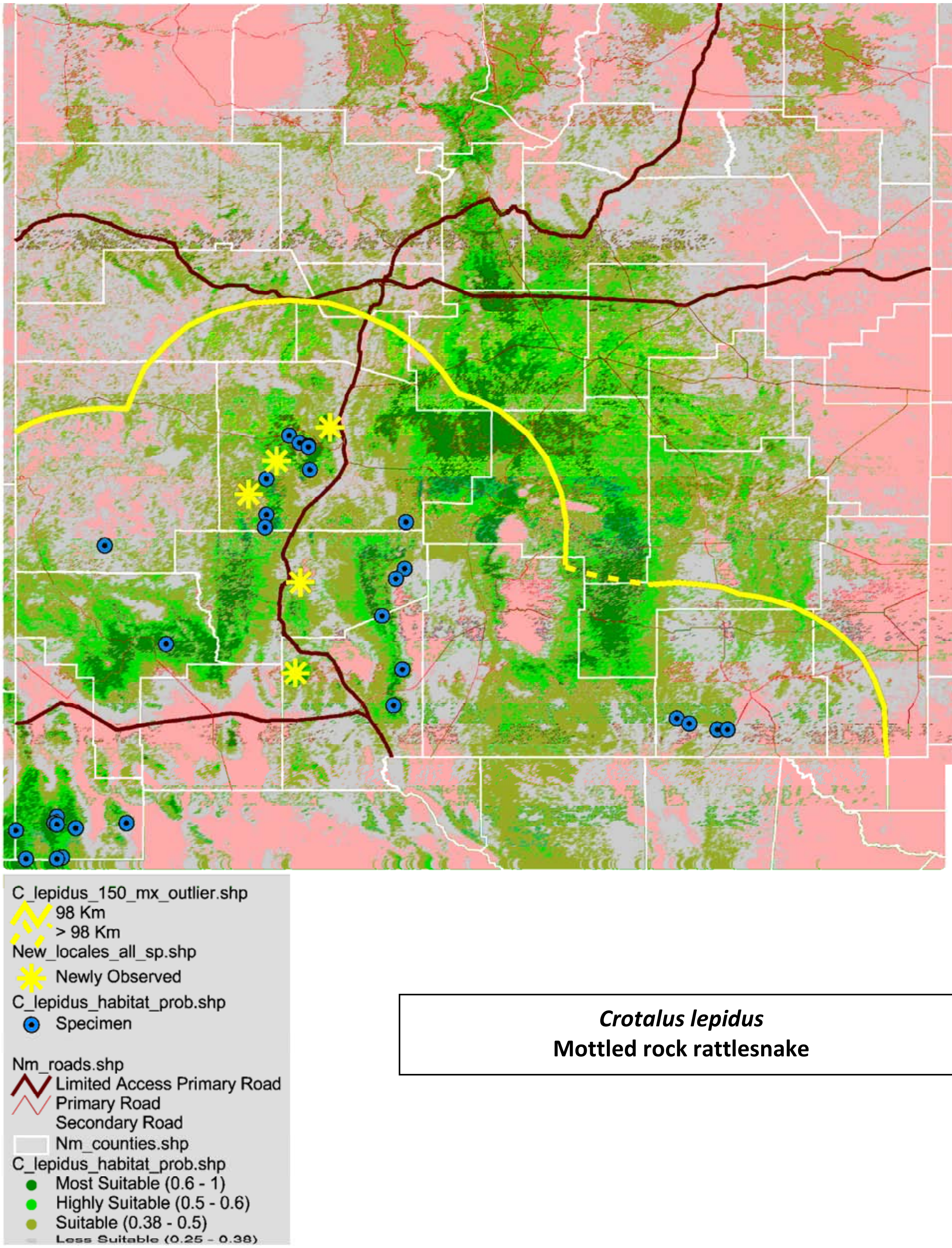
Aneides hardii
Sacramento Mountains salamander



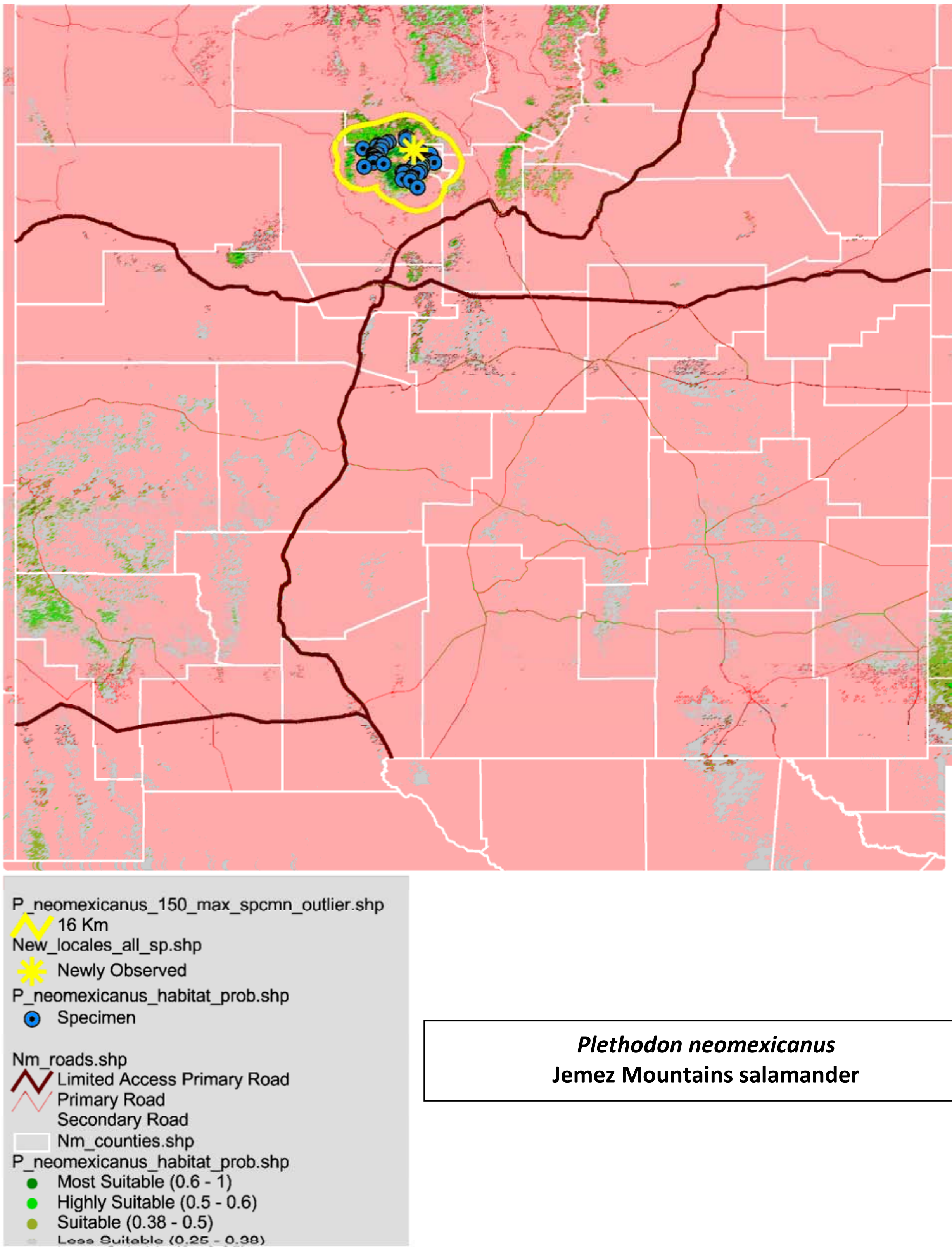
Bufo alvarius
Colorado River toad



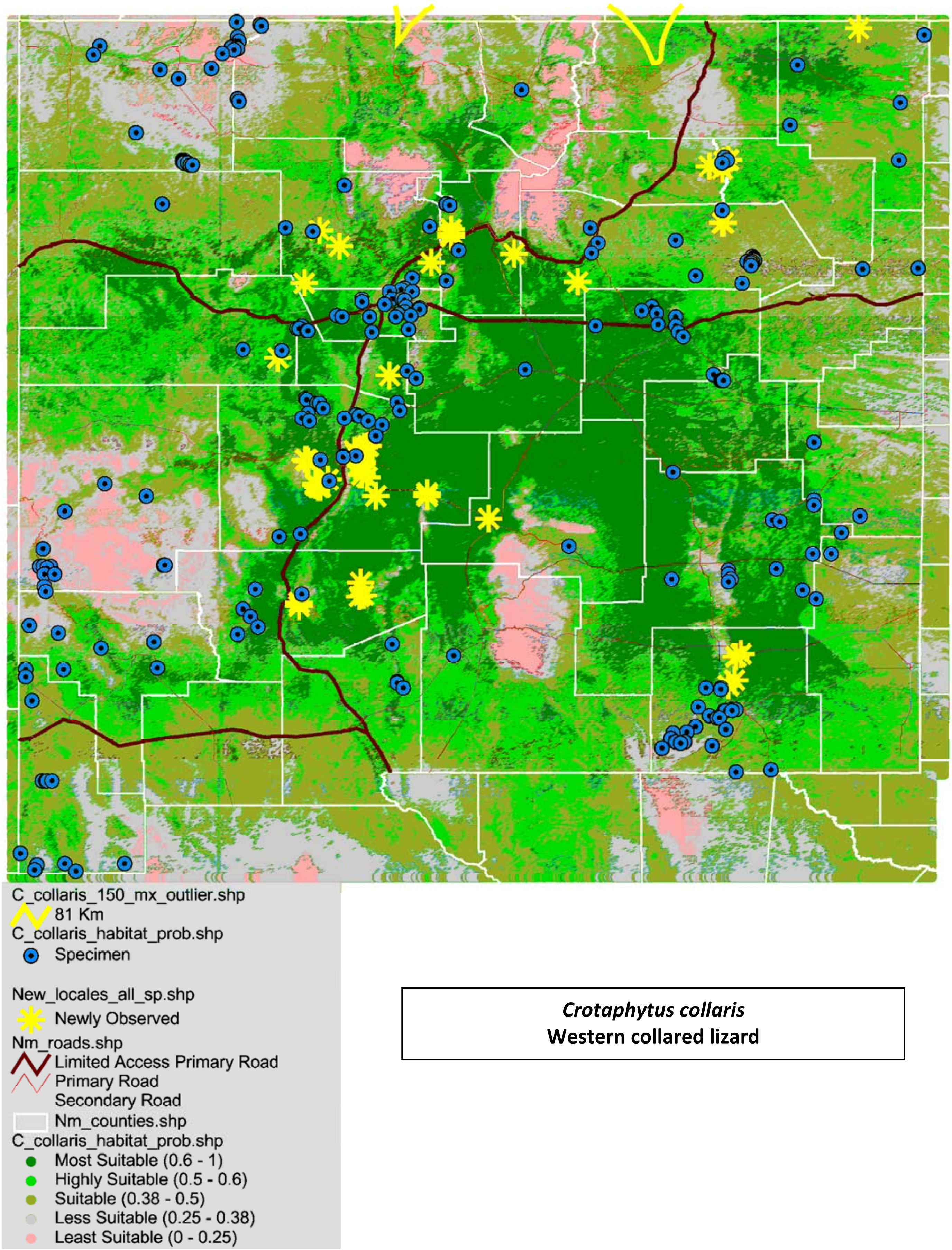
C_atrox_150_mx_outlier.shp
75 Km
> 75 Km
C_atrox_habitat_prob.shp
Specimen
New_locales_all_sp.shp
Newly Observed
Nm_roads.shp
Limited Access Primary Road
Primary Road
Secondary Road
Nm_counties.shp
C_atrox_habitat_prob.shp
Most Suitable (0.6 - 1)
Highly Suitable (0.5 - 0.6)
Suitable (0.38 - 0.5)
Less Suitable (0.25 - 0.38)



Crotalus lepidus
Mottled rock rattlesnake



Plethodon neomexicanus
Jemez Mountains salamander



Crotaphytus collaris
Western collared lizard