
CHAPTER 5

ANALYSIS BASED ON STEWARDSHIP AND MANAGEMENT STATUS

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INTRODUCTION

This chapter describes the methods and results of the gap analysis as conducted by the Gap Analysis Program. As described in the general introduction to this report, the primary objective of GAP is to provide information on the distribution and status of several elements of biological diversity. Here, we present gap analysis results for land cover and terrestrial vertebrate species for the southwestern region. Other components of biodiversity, such as aquatic organisms or selected groups of invertebrates may be incorporated into GAP distributional data sets, however they were not the focus of SWReGAP's mapping effort.

Although GAP "seeks to identify habitat types and species not adequately represented in the current network of biodiversity management areas" (GAP 2000), it is unrealistic to create a standard definition of "adequate representation" for either land cover types or individual species (Noss et al. 1995). A practical solution to this problem is to report both percentages and absolute area of each element in biodiversity management areas and allow the user to determine which types are adequately represented in natural areas. There are many other factors that should be considered in such determinations including:

- historic loss or gain in distribution;
- nature of the spatial distribution;
- immediate versus long term risk; and
- degree of local adaptation among populations of the biotic elements that are worthy of individual conservation consideration.

Such analyses are beyond the scope of this project, but we encourage their application coupled with field confirmation of the mapped distributions.

Where appropriate, GAP data may also be analyzed to identify the location of a set of areas in which most or all land cover types or animal species are predicted to be represented. The use of "complementarity" analysis, that is, an approach that additively identifies a selection of locations that may represent biodiversity rather than "hot spots of species richness" may prove most effective for guiding biodiversity maintenance efforts. Several quantitative techniques have been developed that facilitate this process (see Pressey et al. 1993, Williams et al. 1996, Csuti et al. 1997, for details). These areas become candidates for field validation and may be incorporated into a system of areas managed for the long-term maintenance of biological diversity.

State wildlife agencies maintain records on vertebrate species inventories. The network of Conservation Data Centers (CDCs) and Natural Heritage Programs (NHPs) established cooperatively by The Nature Conservancy and various state agencies maintain detailed databases on the locations of rare elements of biodiversity. GAP cooperatively uses these data to develop predicted distributions of potentially suitable habitat for these elements. These data may also be valuable for identifying additional research needs and preliminary considerations for restoration or reintroduction. Conservation of rare elements, however, is best accomplished through the fine-filter approach of the above organizations as

described in the general introduction. It is not the role of GAP to duplicate or disseminate state wildlife agency data or Natural Heritage Program or CDC Element Occurrence Records. Users interested in more specific information about the location, status, and ecology of populations of rare species are directed to their state wildlife agencies and state Heritage Program or CDC.

METHODS

We conducted the gap analysis using ESRI® ArcGIS Desktop 9 software and the Spatial Analyst extension. Gap analysis is accomplished by first producing maps of land cover ([Chapter 2](#)), predicted animal-habitat distributions ([Chapter 3](#)), land stewardship ([Chapter 4](#)), and GAP management status ([Chapter 5](#)). To facilitate the analysis, each data set was converted to grid format for use within ArcGIS' Model Builder. In Model Builder, a graphical model was designed to run a series of cross-tabulations employing the "Tabulate Area" tool. By intersecting the land stewardship and management status maps with the land cover and animal-habitat species distribution maps, estimates were produced of the total area and percent of the mapped distributions for every land cover class and animal species within each land stewardship and management status category. Calculations were generated for the entire 5-state region as well as for each state individually. We highlight the results of these analyses in the sections below and present detailed summaries in a series of appendices at the end of this chapter. Management implications of the results are provided in [Chapter 6](#).

RESULTS

Results from the gap analysis are provided in a series of appendices, tables, and figures that allow users to carry out inquiries about the representation of each element in different land stewardship and management status categories as appropriate to their own management objectives. This forms the basis of Gap's mission to provide land owners and managers with the information necessary to conduct informed policy development, planning, and management for biodiversity maintenance.

Recall from [Chapter 4 \(Land Stewardship\)](#), that each biodiversity management category recognized by GAP provides increasing levels of conservation based on the management objectives of the land steward. Lands managed according to GAP Status 1 and 2 criteria are assumed to have the highest amount of protection. As a coarse indicator of the conservation status of the elements, we identify for every land cover type and animal species, the proportion of its distribution that falls within Status 1 and 2 lands according to five levels of representation: 0-<1%, 1-<10%, 10-<20%, 20-<50%, and >=50%. The <1% level indicates elements with essentially none of their distribution in a protected status while levels of 10%, 20%, and 50% have been recommended in the literature as necessary amounts of conservation (Noss and Cooperrider 1994, Odum and Odum 1972, Specht et al. 1974, Ride 1975, Miller 1984).

Land Cover - Regional Analysis

A total of 125 land cover types are mapped within the SWReGAP area; of which 109 are natural or semi-natural ecological systems. The five most abundant land cover types in the region are: *Western Great Plains Shortgrass Prairie* (S088) (comprising 8.2% of the region), *Inter-Mountain Basins Big Sagebrush Shrubland* (S054) (7.8% of the region), *Colorado Plateau Pinyon-Juniper Woodland* (S039) (7.1%), *Inter-Mountain Basins Mixed Salt Desert Scrub* (S065) (5.7%), and *Agriculture* (N80) (5.5%). *Great Basin Pinyon-Juniper Woodland* (S040) and *Southern Rocky Mountain Ponderosa Pine Woodland* (S036) are also quite extensive as well as several varieties of desert scrub, grassland, and shrub-steppe systems.

The proportional distribution (as a percent) for each land cover type by land steward in the 5-state region is provided in [Appendix 5-1](#). The distribution of each land cover type by GAP Management Status is presented in [Appendix 5-2](#). For example, from these appendices we note that *Inter-Mountain Basins Mixed Salt Desert Scrub* (S065), a land cover type that occurs in all 5 states, is managed predominantly by the U.S. Bureau of Land Management (65.1%) ([Appendix 5-1](#)) and for the most part, falls within GAP Management Status 3 ([Appendix 5-2](#)).

[Figure 5-2](#) presents a summary of ecological systems within GAP Management Status 1 and 2 for each of the five threshold categories of conservation. Ecological systems have been aggregated into National Land Cover Database (NLCD) classes to aid in presenting these data. For instance, from [Figure 5-1](#) we note there are six ecological systems with less than 1% (0-<1% threshold category) of their distribution within Status 1 or 2 lands for the 5-state region. These include: one barren type, one shrub/scrub type, one emergent herbaceous wetland system, and three grassland/herbaceous systems. [Table 5-1](#) presents similar, but more detailed information about the distribution of land cover types in Status 1 and 2 lands for the 5-state region.

Approximately 11.5% (160,183 km²) of the 5-state region falls within GAP Status 1 or 2 ([Appendix 5-2](#)). In general, land cover classes at higher elevations are more likely to have a larger proportion of their total distribution within GAP Management Status 1 and 2 than lower elevation land cover classes, because much of the higher elevation land is under government stewardship with a mandate to protect biodiversity (e.g. Wilderness Areas). On the other hand, examining land cover types that exhibit low proportions (e.g. thresholds of 0-<1%, and 1%-<10%) of their distribution in GAP Management Status 1 and 2 is useful as it provides a measure of potentially threatened biodiversity (e.g. using a coarse filter approach), and may help prioritize land cover types in need of conservation action.

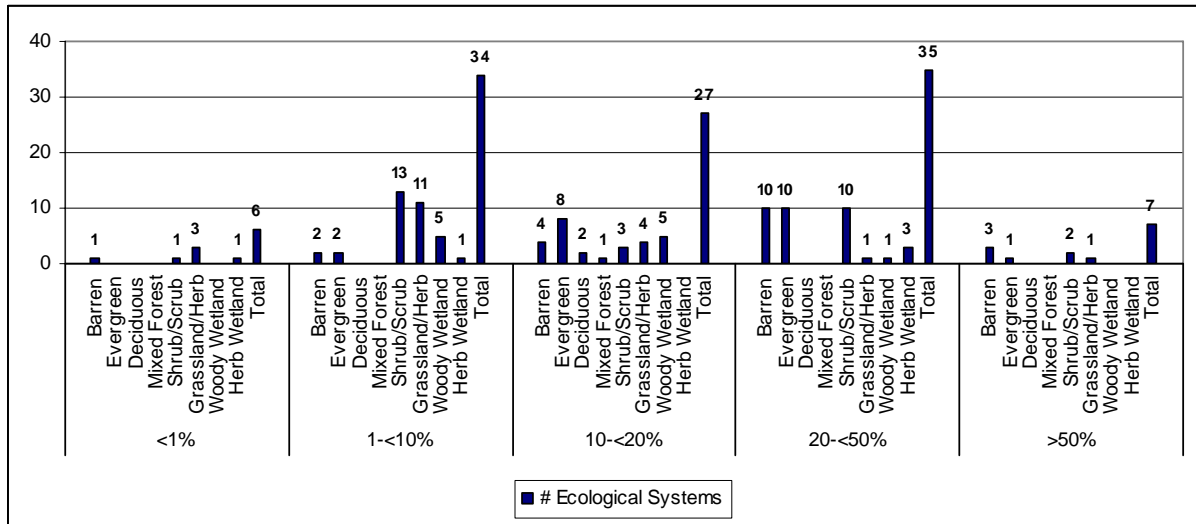


Figure 5-1. Total number of ecological systems (Y-axis) aggregated into NLCD classes (X-axis) and summarized by conservation thresholds (<1%, 1-<10%, 10-<20%, 20-<50%, and >50%) of Status 1 and 2 lands in the SWReGAP project area.

Table 5-1. Representation of each land cover type in the SWReGAP project area within Status 1 & 2 Lands, summarized by conservation thresholds of 0-<1%, 1-<10%, 10-<20%, and 20-<50%; >=50%.

Code	Land Cover Type	Area in region		Area in Status 1&2				
		km ²	km ²	<1 %	1-<10 %	10-<20 %	20-<50 %	>=50 %
S109	Chihuahuan-Sonoran Desert Bottomland and Swale Grassland	<1	n/a	0.0				
S008	Western Great Plains Cliff and Outcrop	315	3	0.9				
S138	Western Great Plains Mesquite Woodland and Shrubland	1,898	3	0.2				
S108	Western Great Plains Saline Depression Wetland	41	<1	0.5				
S089	Western Great Plains Sand Prairie	18	n/a	0.0				
S088	Western Great Plains Shortgrass Prairie	114,340	774	0.7				
S058	Apacherian-Chihuahuan Mesquite Upland Scrub	32,060	1,671		5.2			
S077	Apacherian-Chihuahuan Semi-Desert Grassland and Steppe	46,038	3,289		7.1			
S087	Central Mixedgrass Prairie	123	3		2.7			
S062	Chihuahuan Mixed Desert and Thorn Scrub	27,891	1,359		4.9			
S116	Chihuahuan Mixed Salt Desert Scrub	4,448	306		6.9			
S113	Chihuahuan Sandy Plains Semi-Desert Grassland	1,050	44		4.2			
S068	Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub	5,891	138		2.3			
S061	Chihuahuan Succulent Desert Scrub	189	13		6.8			
S056	Colorado Plateau Mixed Low Sagebrush Shrubland	2,401	158		6.6			
S118	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	1,387	99		7.1			
S054	Inter-Mountain Basins Big Sagebrush Shrubland	109,699	7,553		6.9			
S078	Inter-Mountain Basins Big Sagebrush Steppe	1,851	45		2.4			
S096	Inter-Mountain Basins Greasewood Flat	23,842	1,728		7.2			
S075	Inter-Mountain Basins Juniper Savanna	5,615	147		2.6			
S045	Inter-Mountain Basins Mat Saltbush Shrubland	4,155	271		6.5			
S065	Inter-Mountain Basins Mixed Salt Desert Scrub	79,498	4,589		5.8			
S071	Inter-Mountain Basins Montane Sagebrush Steppe	41,190	3,831		9.3			
S090	Inter-Mountain Basins Semi-Desert Grassland	33,693	1,519		4.5			
S079	Inter-Mountain Basins Semi-Desert Shrub-Steppe	47,668	3,453		7.2			
S014	Inter-Mountain Basins Wash	46	2		4.4			
S115	Madrean Juniper Savanna	995	54		5.5			
S098	North American Warm Desert Riparian Mesquite Bosque	847	79		9.3			
S125	Rocky Mountain Foothill Limber Pine-Juniper Woodland	6	<1		3.1			
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	18,960	1,402		7.4			
S047	Rocky Mountain Lower Montane-Foothill Shrubland	2,872	199		6.9			
S007	Sierra Nevada Cliff and Canyon	134	6		4.5			
S136	Southern Colorado Plateau Sand Shrubland	7,021	244		3.5			
S074	Southern Rocky Mountain Juniper Woodland and Savanna	11,968	179		1.5			
S038	Southern Rocky Mountain Pinyon-Juniper Woodland	15,311	1,040		6.8			
S103	Temperate Pacific Subalpine-Montane Wet Meadow	3	<1		1.7			
S120	Western Great Plains Floodplain	842	31		3.7			
S086	Western Great Plains Foothill and Piedmont Grassland	5,096	121		2.4			
S095	Western Great Plains Riparian Woodland and Shrubland	1,720	140		8.1			
S048	Western Great Plains Sandhill Shrubland	14,088	368		2.6			
S080	Chihuahuan Gypsophilous Grassland and Steppe	805	154			19.1		
S039	Colorado Plateau Pinyon-Juniper Woodland	97,894	13,618			13.9		
S055	Great Basin Xeric Mixed Sagebrush Shrubland	35,631	4,030			11.3		
S012	Inter-Mountain Basins Active and Stabilized Dune	3,103	383			12.3		
S042	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	3,445	390			11.3		
S015	Inter-Mountain Basins Playa	17,586	1,891			10.8		
S011	Inter-Mountain Basins Shale Badland	3,301	390			11.8		
S051	Madrean Encinal	4,406	695			15.8		
S035	Madrean Pine-Oak Forest and Woodland	5,737	959			16.7		
S112	Madrean Pinyon-Juniper Woodland	21,930	2,547			11.6		
S123	Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland	236	24			10.1		
S057	Mogollon Chaparral	11,518	2,153			18.7		

Code	Land Cover Type	Area in	Area	<1	1-<10	10- <20	20- <50	>50
		region	in Status 1&2					
		km ²	km ²	%	%	%	%	%
S018	North American Warm Desert Active and Stabilized Dune	2,845	526			18.5		
S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland	427	75			17.7		
S097	North American Warm Desert Riparian Woodland and Shrubland	461	84			18.2		
S020	North American Warm Desert Wash	657	95			14.4		
S134	North Pacific Montane Grassland	32	4			11.4		
S023	Rocky Mountain Aspen Forest and Woodland	21,050	2,675			12.7		
S024	Rocky Mountain Bigtooth Maple Ravine Woodland	898	103			11.4		
S031	Rocky Mountain Lodgepole Pine Forest	8,876	1,649			18.6		
S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	2,236	223			10.0		
S083	Rocky Mountain Subalpine Mesic Meadow	2,178	392			18.0		
S092	Rocky Mountain Subalpine-Montane Riparian Woodland	294	51			17.5		
S122	Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland	21	4			19.1		
S070	Sonora-Mojave Mixed Salt Desert Scrub	2,571	499			19.4		
S085	Southern Rocky Mountain Montane-Subalpine Grassland	10,346	1,181			11.4		
S036	Southern Rocky Mountain Ponderosa Pine Woodland	50,241	5,683			11.3		
S117	Coahuilan Chaparral	96	39				40.7	
S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland	13,310	2,669				20.1	
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland	24,321	7,416				30.5	
S052	Colorado Plateau Pinyon-Juniper Shrubland	11,536	4,179				36.2	
S040	Great Basin Pinyon-Juniper Woodland	51,234	10,351				20.2	
S053	Great Basin Semi-Desert Chaparral	169	57				33.7	
S009	Inter-Mountain Basins Cliff and Canyon	2,889	759				26.3	
S050	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	2,569	726				28.3	
S013	Inter-Mountain Basins Volcanic Rock and Cinder Land	1,360	519				38.2	
S111	Madrean Upper Montane Conifer-Oak Forest and Woodland	811	163				20.1	
S003	Mediterranean California Alpine Bedrock and Scree	39	17				42.3	
S033	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	2	1				32.0	
S121	Mediterranean California Red Fir Forest and Woodland	114	24				20.6	
S105	Mediterranean California Subalpine-Montane Fen	2	1				45.8	
S060	Mojave Mid-Elevation Mixed Desert Scrub	16,864	7,220				42.8	
S100	North American Arid West Emergent Marsh	1,074	248				23.1	
S017	North American Warm Desert Badland	113	53				46.7	
S016	North American Warm Desert Bedrock Cliff and Outcrop	3,635	1,645				45.3	
S021	North American Warm Desert Pavement	399	99				24.8	
S022	North American Warm Desert Playa	1,146	352				30.7	
S019	North American Warm Desert Volcanic Rockland	995	347				34.9	
S029	Northern Pacific Mesic Subalpine Parkland	53	25				47.0	
S102	Rocky Mountain Alpine-Montane Wet Meadow	1,962	622				31.7	
S006	Rocky Mountain Cliff, Canyon and Massive Bedrock	2,971	774				26.1	
S032	Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	8,970	2,073				23.1	
S034	Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	7,297	1,462				20.0	
S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	14,846	4,941				33.3	
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	10,365	3,375				32.6	
S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	802	207				25.8	
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland	3,240	1,124				34.7	
S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub	59,616	16,190				27.2	
S129	Sonoran Mid-Elevation Desert Scrub	5,395	1,240				23.0	
S063	Sonoran Paloverde-Mixed Cacti Desert Scrub	40,079	8,778				21.9	

Code	Land Cover Type	Area in	Area	<1	1-<10	10-<20	20-<50	>50
		region	in					
		km ²	Status	%	%	%	%	%
			1&2					
		km ²	km ²	%	%	%	%	%
S132	Western Great Plains Tallgrass Prairie	1	<1				25.8	
S128	Wyoming Basins Low Sagebrush Shrubland	54	13				23.7	
S026	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	670	430					64.2
S001	North American Alpine Ice Field	23	22					92.8
S002	Rocky Mountain Alpine Bedrock and Scree	3,863	2,392					61.9
S043	Rocky Mountain Alpine Dwarf-Shrubland	109	88					80.2
S004	Rocky Mountain Alpine Fell-Field	761	474					62.3
S081	Rocky Mountain Dry Tundra	2,779	1,447					52.1
S114	Sonora-Mojave Semi-Desert Chaparral	89	85					95.6
N80	Agriculture	77,813	639	0.8				
N22	Developed, Medium - High Intensity	7,600	38	0.5				
N21	Developed, Open Space - Low Intensity	7,463	19	0.3				
D03	Recently Mined or Quarried	1,240	7	0.5				
N31	Barren Lands, Non-specific	1,437	65		4.5			
D01	Disturbed, Non-specific	93	6		6.4			
D14	Disturbed, Oil Well	52	1		1.7			
D09	Invasive Annual and Biennial Forbland	2,649	86		3.2			
D08	Invasive Annual Grassland	8,347	274		3.3			
D06	Invasive Perennial Grassland	2,869	49		1.7			
N11	Open Water	11,220	322		2.9			
D11	Recently Chained Pinyon-Juniper Areas	689	68		9.9			
D10	Recently Logged Areas	855	55		6.4			
D04	Invasive Southwest Riparian Woodland and Shrubland	1,666	267			16.0		
D02	Recently Burned	2,033	305			15.0		
D07	Invasive Perennial Forbland	1	<1				31.0	

Land cover classes with <1% of mapped distribution in Status 1 or 2:

Six ecological systems in the 5-state region have between 0 and <1% of their distribution in Gap Management Status 1 or 2 (Table 5-1). With one exception (*Western Great Plains Shortgrass Prairie* (S088)) they are mostly rare, small patch types or peripheral types that occur on the edge of their range within the SWReGAP project area. More research is needed to focus on conservation of biodiversity in these small patch types, and because the peripheral types mostly occur in adjacent regions, analysis needs to be expanded by mapping a fuller extent of the range-wide occurrence of the ecological system (i.e. beyond the SWReGAP study area).

Land cover classes with 1-<10% of mapped distribution in Status 1 or 2:

Thirty-four ecological systems have between 1 and <10% of their distribution within Status 1 or 2 (Table 5-1). Twenty-one ecological systems are relatively uncommon (<10,000 km² mapped in the region) and all but one (*Inter-Mountain Basins Wash* (S014)) of the 6 rarest types (<200 km² mapped), are peripheral to the region. The widespread *Inter-Mountain Basins Wash* (S014) often occurs as narrow, linear bands below the minimum mapping unit and with only 46 km² having been mapped. However, this system as well as all the other lower elevation riparian and wetland types have between 1 and <10% for their distributions within Status 1 or 2 lands. This is a concern because of the importance of riparian and wetland cover types for many upland wildlife species, and further supports their need to be targeted for biodiversity conservation and restoration.

There are several widespread ecological systems that are characteristic of the region, and some endemic or near-endemic types that are largely restricted to the 5-state study area. Protection is likely warranted for some of these widespread land cover types to conserve biodiversity within the southwestern U.S., and additional research might be needed to assess conservation status of these cover types in Mexico and neighboring U.S. states. These systems are: *Apacherian-Chihuahuan Semi-Desert Grassland and Steppe* (S077), *Chihuahuan Mixed Desert Scrub* (S116), *Inter-Mountain Basins Montane Sagebrush Steppe* (S071), *Inter-Mountain Basins Big Sagebrush Shrubland* (S054), and *Inter-Mountain Basins Semi-Desert Grassland* (S090).

Endemic or near-endemic ecological systems with between 1 and <10% of their distribution in Status 1 or 2 are: *Colorado Plateau Mixed Low Sagebrush Shrubland* (S056), *Southern Colorado Plateau Sand Shrubland* (S136), *Southern Rocky Mountain Juniper Woodland and Savanna* (S074), *Western Great Plains Sandhill Shrubland* (S048), *Southern Rocky Mountain Pinyon-Juniper Woodland* (S038), and *Rocky Mountain Gambel Oak-Mixed Montane Shrubland* (S046).

The remaining land cover types with between 1 and <10% of their distribution in Status 1 or 2 include several peripheral types that would require information from outside the SWReGAP project area to evaluate their range-wide protection status.

Land cover classes with 10-<20% of mapped distribution in Status 1 or 2:

Twenty-seven ecological systems have between 10 and <20% of their distribution in Status 1 or 2 lands (Table 5-1). These ecological systems occur in a wide variety of environmental settings, from areas of high elevation with subalpine forests and wetlands to playas and salt desert scrub. Types of ecological systems include: 4 riparian systems, 1 aspen and 1 aspen-mixed conifer system, 2 montane grassland systems, 2 dune systems, and 1 badland system. Four systems in this distribution category occur only marginally within the 5-state region.

Land cover classes with 20-<50% of mapped distribution in Status 1 or 2:

There are 35 ecological systems with between 20 and <50% of their distribution in Status 1 and 2 lands (Table 5-1). Many of these ecological systems include lower- to mid-elevation forests and rock outcrops (e.g. barren lands).

Land cover classes with >50% of mapped distribution in Status 1 or 2:

Seven ecological systems have greater than 50% of their distribution in Status 1 and 2 lands. With the exception of one somewhat rare system (*Sonora-Mojave Semi-Desert Chaparral* (S114)), all occur in higher elevation (alpine and subalpine) zones.

In addition to the data provided in Appendices 5-1 and 5-2, Appendix 5-3 presents for each land cover type, a cross-tabulation of land stewardship by GAP Management Status. This effectively allows users of this report to assess relative biodiversity protection using thresholds other than those used by the Gap Analysis Program (i.e. 0-<1%, 1-<10%, 10-<20%, 20-<50%, and >50%).

Land Cover - State-based AnalysesArizona

Seventy-seven land cover types are mapped in Arizona; 70 of these are natural or semi-natural ecological systems and constitute 95.4% of all land cover in the state (Appendix 5-4). Over half (54%) of the state consists of six ecological systems. Three of these ecological systems (*Sonoran Paloverde-Mixed Cacti Desert Scrub* (S063), *Sonora-Mojave Creosotebush-White Bursage Desert Scrub* (S069), and *Colorado Plateau Pinyon-Juniper Woodland* (S039)) cover more than 10% of the state and together comprise 37.7% of the state. Three other ecological systems *Apacherian-Chihuahuan Mesquite Upland Scrub* (S058); *Southern Rocky Mountain Ponderosa Pine Woodland* (S036); and *Inter-Mountain Basins Semi-Desert Shrub-Steppe* (S079) occur with greater than 5% cover (and < 10% cover) and make up an additional 16.3% of the state land cover. Sixteen ecological systems have greater than 1% cover (and < 5%) and make up 36% of the total state land cover. Forty-eight ecological systems are limited in their distribution with less than 1% cover and form 5.3% of the state cover.

A summary of the percent distribution of each land cover type by land steward for Arizona is provided in Appendix 5-4. For example, in Arizona, tribal lands are responsible for approximately 27% of the land stewardship within the state (Appendix 5-4). Several ecological systems have greater than 80% of their total distribution within these areas, including 3 barren land types, 1 shrubland, 1 grassland, 2 woody wetlands, and 1 emergent herbaceous wetland. Appendix 5-5 summarizes the percent distribution of each land cover type represented within the four GAP Management Status categories. Ecological systems such as *Southern Colorado Plateau Sand Shrubland* (S136) where 89% of its distribution occurs on tribal lands has nearly the same proportion of its distribution within Status 3 lands (Appendix 5-5).

Approximately 13.5% (39,659 km²) of Arizona lands are currently managed according to GAP Management Status 1 or 2 criteria. We summarize below the representation of ecological systems within these lands. Representation is categorized by the percent of the

aerial coverage of the ecological system occurring in Status 1 and 2 lands: <1%, 1 to < 10%, 10 to < 20%, 20 to < 50% and greater than 50%. [Figure 5-2](#) presents an overview of the number of ecological systems by NLCD class with representation in Status 1 and 2 lands broken down by conservation threshold for the state of Arizona. [Table 5-2](#) presents a more detailed version of this information by identifying the representation of individual land cover types in Status 1 and 2 lands.

Land cover classes with <1% of mapped distribution in Status 1 or 2:

Seven ecological systems ([Table 5-2](#)) receive the least amount of protection, with less than 1% of their respective distributions within Status 1 or 2 lands. These ecological systems are: *Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub* (S068), *Inter-Mountain Basins Mat Saltbush Shrubland* (S045), *Inter-Mountain Basins Playa* (S015), *North American Warm Desert Playa* (S022), *Rocky Mountain Alpine-Montane Wet Meadow* (S102), *Rocky Mountain Subalpine Mesic Meadow* (S083), and *Rocky Mountain Subalpine-Montane Riparian Shrubland* (S091). Each of these has limited distribution within Arizona (4% or less of the regional distribution) and collectively the seven contribute 0.2% to the state's total land cover.

Land cover classes with 1-<10% of mapped distribution in Status 1 or 2:

Twenty-five ecological systems ([Table 5-2](#)) have between 1 and <10% of their respective areas within Status 1 and 2 lands in Arizona. Four of the most extensive ecological systems, *Southern Rocky Mountain Ponderosa Pine Woodland* (S036), *Colorado Plateau Pinyon-Juniper Woodland* (S039), *Apacherian-Chihuahuan Mesquite Upland Scrub* (S058) and *Inter-Mountain Basins Semi-Desert Shrub-Steppe* (S079) are included in this group of 25. Collectively the 25 ecological systems contribute 46% to the state's total land cover.

Land cover classes with 10-<20% of mapped distribution in Status 1 or 2:

There are 14 ecological systems with distributions between 10 and <20% within Status 1 and 2 lands in Arizona ([Table 5-2](#)). These types collectively comprise 14.2% of the land cover in Arizona.

Land cover classes with 20-<50% of mapped distribution in Status 1 or 2:

Fifteen ecological systems have 20 to <50% of their distribution in conservation lands; they collectively contribute 33.7% to the state's total land cover.

Land cover classes with >50% of mapped distribution in Status 1 or 2:

Five ecological systems have distributions greater than 50% within Status 1 and 2 lands in Arizona: *Great Basin Semi-Desert Chaparral* (S053), *Great Basin Pinyon-Juniper Woodland* (S040), *Madrean Upper Montane Conifer-Oak Forest and Woodland* (S111), *Rocky Mountain Alpine Bedrock and Scree* (S002), and *Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland* (S025). The *Great Basin Pinyon-Juniper Woodland* covers 1.15% of Arizona land cover, while the other four ecological systems .04% or less land cover. The *Rocky Mountain Alpine Bedrock and Scree* and *Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland* occur at the highest elevations in Arizona.

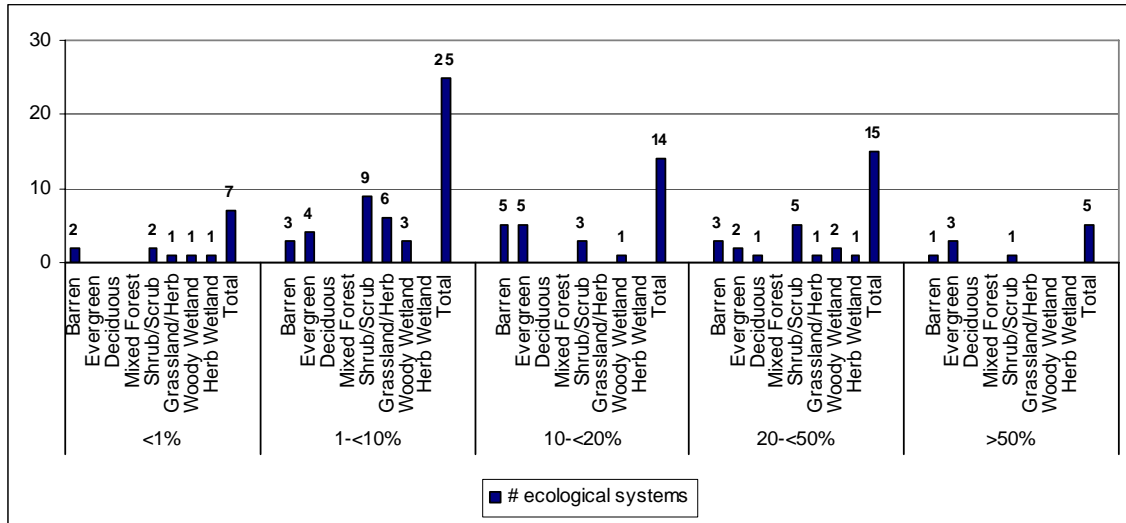


Figure 5-2. Total number of ecological systems (Y-axis) aggregated into NLCD classes (X-axis) summarized by conservation thresholds (<1%, 1-<10%, 10-<20%, 20-<50%, and >50%) of Status 1 and 2 lands in the state of Arizona.

Table 5-2. Percent distribution of each land cover type represented within Status 1 & 2 lands, summarized by conservation thresholds of 0-<1%, 1-<10%, 10-<20%, 20-<50%, and >=50% in the state of Arizona.

Code	Land Cover Type	Area	Area	<1	1-	10-	20-	>50
		in AZ	in		<10	<20	<50	
		km ²	km ²	%	%	%	%	%
S068	Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub	187	2	0.9				
S045	Inter-Mountain Basins Mat Saltbush Shrubland	75	<1	0.1				
S015	Inter-Mountain Basins Playa	7	n/a	0.0				
S022	North American Warm Desert Playa	48	<1	0.3				
S102	Rocky Mountain Alpine-Montane Wet Meadow	<1	n/a	0.0				
S083	Rocky Mountain Subalpine Mesic Meadow	<1	n/a	0.0				
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland	<1	n/a	0.0				
S058	Apacherian-Chihuahuan Mesquite Upland Scrub	16,539	1,369		8.3			
S077	Apacherian-Chihuahuan Semi-Desert Grassland and Steppe	11,346	596		5.3			
S062	Chihuahuan Mixed Desert and Thorn Scrub	6,318	215		3.4			
S116	Chihuahuan Mixed Salt Desert Scrub	2,814	153		5.4			
S113	Chihuahuan Sandy Plains Semi-Desert Grassland	16	<1		2.7			
S061	Chihuahuan Succulent Desert Scrub	109	6		5.7			
S056	Colorado Plateau Mixed Low Sagebrush Shrubland	489	5		1.1			
S052	Colorado Plateau Pinyon-Juniper Shrubland	353	23		6.4			
S039	Colorado Plateau Pinyon-Juniper Woodland	32,482	2,724		8.4			
S012	Inter-Mountain Basins Active and Stabilized Dune	350	19		5.6			
S096	Inter-Mountain Basins Greasewood Flat	1,235	13		1.0			
S075	Inter-Mountain Basins Juniper Savanna	3,998	57		1.4			
S065	Inter-Mountain Basins Mixed Salt Desert Scrub	6,995	169		2.4			
S090	Inter-Mountain Basins Semi-Desert Grassland	11,245	298		2.7			
S079	Inter-Mountain Basins Semi-Desert Shrub-Steppe	15,465	560		3.6			
S011	Inter-Mountain Basins Shale Badland	729	42		5.7			
S115	Madrean Juniper Savanna	336	23		6.8			
S098	North American Warm Desert Riparian Mesquite Bosque	795	69		8.6			
S006	Rocky Mountain Cliff, Canyon and Massive Bedrock	91	5		5.1			
S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	24	<1		2.0			
S070	Sonora-Mojave Mixed Salt Desert Scrub	1,011	31		3.1			
S136	Southern Colorado Plateau Sand Shrubland	6,073	188		3.1			
S085	Southern Rocky Mountain Montane-Subalpine Grassland	563	22		3.9			
S038	Southern Rocky Mountain Pinyon-Juniper Woodland	1	<1		4.3			
S036	Southern Rocky Mountain Ponderosa Pine Woodland	16,233	1,328		8.2			
S059	Colorado Plateau Blackbrush-Mormon Tea Shrubland	4,033	583			14.4		
S054	Inter-Mountain Basins Big Sagebrush Shrubland	5,199	568			10.9		
S013	Inter-Mountain Basins Volcanic Rock and Cinder Land	573	98			17.2		

Code	Land Cover Type	Area	Area	<1	1- <10	10- <20	20- <50	>50
		in AZ	in Status 1&2					
		km ²	km ²	%	%	%	%	%
S014	Inter-Mountain Basins Wash	4	1			14.9		
S051	Madrean Encinal	3,008	357			11.9		
S035	Madrean Pine-Oak Forest and Woodland	4,008	796			19.9		
S112	Madrean Pinyon-Juniper Woodland	13,161	1,842			14.0		
S057	Mogollon Chaparral	9,636	1,683			17.5		
S017	North American Warm Desert Badland	34	4			12.5		
S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland	180	33			18.3		
S021	North American Warm Desert Pavement	45	5			12.1		
S019	North American Warm Desert Volcanic Rockland	205	32			15.5		
S034	Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	439	74			16.8		
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	120	23			19.2		
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland	6,965	1,459				20.9	
S071	Inter-Mountain Basins Montane Sagebrush Steppe	1	<1				26.9	
S060	Mojave Mid-Elevation Mixed Desert Scrub	5,416	2,179				40.2	
S100	North American Arid West Emergent Marsh	24	8				31.6	
S018	North American Warm Desert Active and Stabilized Dune	1,017	406				40.0	
S016	North American Warm Desert Bedrock Cliff and Outcrop	760	301				39.6	
S097	North American Warm Desert Riparian Woodland and Shrubland	269	62				23.1	
S020	North American Warm Desert Wash	152	31				20.5	
S023	Rocky Mountain Aspen Forest and Woodland	442	93				21.1	
S032	Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1,029	225				21.8	
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	128	30				23.6	
S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	223	56				24.9	
S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub	38,909	7,935				20.4	
S129	Sonoran Mid-Elevation Desert Scrub	5,390	1,239				23.0	
S063	Sonoran Paloverde-Mixed Cacti Desert Scrub	39,773	8,778				22.1	
S040	Great Basin Pinyon-Juniper Woodland	3,414	2,414					70.7
S053	Great Basin Semi-Desert Chaparral	<1	<1					100.0
S111	Madrean Upper Montane Conifer-Oak Forest and Woodland	123	96					78.3
S002	Rocky Mountain Alpine Bedrock and Scree	5	5					95.9
S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	2	2					76.2
N80	Agriculture	5,629	21	0.4				

Code	Land Cover Type	Area in AZ	Area in Status 1&2	<1	1- <10	10- <20	20- <50	>50
		km ²	km ²	%	%	%	%	%
N22	Developed, Medium - High Intensity	4,046	12	0.3				
N21	Developed, Open Space - Low Intensity	1,710	3	0.2				
D06	Invasive Perennial Grassland	13	<1	0.0				
D03	Recently Mined or Quarried	467	<1	0.1				
N31	Barren Lands, Non-specific	1,118	49		4.4			
D09	Invasive Annual and Biennial Forbland	127	10		7.5			
D08	Invasive Annual Grassland	72	1		1.7			
D04	Invasive Southwest Riparian Woodland and Shrubland	473	80			16.9		
N11	Open Water	220	54				24.7	
D02	Recently Burned	168	91					54.5

Colorado

A total of 82 land cover types are mapped in the state of Colorado, 66 of which are ecological systems ([Appendix 5-6](#)) and comprise 77% of the state's total area. With the exception of agricultural lands (N80), *Western Great Plains Shortgrass Prairie* (S088) is the most abundant land cover type, making up 16.9% of the state's area. *Colorado Plateau Pinyon-Juniper Woodland* (S039) (5.6%), *Inter-Mountain Basins Big Sagebrush Shrubland* (S054) (5.0%), *Rocky Mountain Aspen Forest and Woodland* (S023) (4.2%), and *Southern Rocky Mountain Ponderosa Pine Woodland* (S036) (4.0%) are the next most abundant land cover types.

A summary of the percent distribution of each land cover type by land steward for Colorado is provided in [Appendix 5-6](#), and the percent distribution of each land cover type by GAP Management Status is reported in [Appendix 5-7](#). For example, the U.S. Forest Service is responsible for managing a substantial portion of two forest types, *Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland* (S028) (88.4%) and *Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland* (S030) (86.4%) ([Appendix 5-6](#)). Due to multiple resource management objectives of the Forest Service, representation of these land cover types is well distributed across each GAP Management Status, including: ~12% in Status 1, ~22% in Status 2, ~60% in Status 3, and ~6% in Status 4 ([Appendix 5-7](#)).

[Figure 5-3](#) presents an overview of the number of ecological systems by NLCD class with representation in Status 1 and 2 lands broken down by conservation threshold for the state of Colorado. [Table 5-3](#) presents a more detailed version of this information by identifying the representation of individual land cover types in Status 1 and 2 lands.

A total area of 27,529 km² (10.2%) of Colorado's land cover is managed according to Status 1 and 2 criteria ([Table 5-3](#)); representing 6,837 km² Status 1 and 20,692 km² Status 2 lands, respectively. [Figure 5-3](#) provides a condensed version of the information in [Table 5-3](#) by aggregating the land cover types by NLCD class and showing the total number of ecological systems with representation in Status 1 and 2 lands according to the conservation thresholds.

Land cover classes with <1% of mapped distribution in Status 1 or 2:

Colorado has 14 land cover types that occur less than 1% in GAP Status 1 and 2 lands. Ten of these systems (*Western Great Plains Cliff and Outcrop* (S008), *North American Warm Desert Bedrock Cliff and Outcrop* (S016), *North American Warm Desert Active and Stabilized Dune* (S018), *North American Warm Desert Wash* (S020), *North American Warm Desert Playa* (S022), *Madrean Pine-Oak Forest and Woodland* (S035), *Chihuahuan Mixed Desert and Thorn Scrub* (S062), *Chihuahuan Gypsophilous Grassland and Steppe* (S080), *Madrean Pinyon-Juniper Woodland* (S112), and *Madrean Juniper Savanna* (S115)) occur minimally within the state, and four of which are 'Chihuahuan' and 'Madrean' in nature, and are unlikely to occur in Colorado. One type, *Western Great Plains Sand Prairie* (S089), is not abundant, but was mapped, where modeled in northeastern Colorado. One type, *Southern Rocky Mountain Juniper*

Woodland and Savanna (S074), is mapped fairly abundantly in southeastern Colorado (2149 km²), where little protected lands exist (only 6 km² of it is attributed to Status 1 and 2 lands in Colorado). The last three of the land cover types occurring less than 1% in GAP Status 1 and 2 lands (N21, N22 and N80) are not natural communities, but human dominated landscapes of low intensity developed areas, medium to high intensity developed areas, and agricultural areas.

Land cover classes with 1-<10% of mapped distribution in Status 1 or 2:

There are 29 land cover types that occur with 1-<10% of their distribution on GAP Status 1 and 2 lands. Of these, 22 are considered representative of natural communities, and 7 of 'disturbed' land cover classes. Of the 22 considered natural communities, 6 of those systems (27%) (*Inter-Mountain Basins Cliff and Canyon* (S009), *Inter-Mountain Basins Wash* (S014), *Western Great Plains Shortgrass Prairie* (S088), *Rocky Mountain Foothill Limber Pine-Juniper Woodland* (S125), *Southern Colorado Plateau Sand Shrubland* (S136), and *Western Great Plains Mesquite Woodland and Shrubland* (S138)) provided less than 150 square kilometers of habitat base across the 5-state region. Another 12 (55%) of these woodland, grassland and riparian communities (*Southern Rocky Mountain Pinyon-Juniper Woodland* (S038), *Inter-Mountain Basins Mat Saltbush Shrubland* (S045), *Rocky Mountain Lower Montane-Foothill Shrubland* (S047), *Western Great Plains Sandhill Shrubland* (S048), *Inter-Mountain Basins Montane Sagebrush Steppe* (S071), *Inter-Mountain Basins Juniper Savanna* (S075), *Southern Rocky Mountain Montane-Subalpine Grassland* (S085), *Western Great Plains Foothill and Piedmont Grassland* (S086), *Inter-Mountain Basins Semi-Desert Grassland* (S090), *Rocky Mountain Lower Montane Riparian Woodland and Shrubland* (S093), *Western Great Plains Riparian Woodland and Shrubland* (S095), and *Western Great Plains Floodplain* (S120)), provided more than 150 square kilometers, but less than 10,000 square kilometers of habitat base per type, across the 5-state region. There were 4 (18%) natural communities with greater than 10,000 square kilometers of habitat base per type (*Southern Rocky Mountain Ponderosa Pine Woodland* (S036), *Rocky Mountain Gambel Oak-Mixed Montane Shrubland* (S046), *Inter-Mountain Basins Big Sagebrush Shrubland* (S054), and *Western Great Plains Shortgrass Prairie* (S088)) with 1-<10% of their distribution on GAP Status 1 and 2 lands. The majority of these types are desert montane shrublands, pinyon-juniper woodlands, and shortgrass prairies of the eastern plains. These systems with greater areal extents for management consideration were ponderosa pine woodlands, gambel oak shrublands, big sagebrush shrublands, and shortgrass prairies. The 7 non-natural community cover types (*Recently Mined or Quarried* (D03), *Invasive Southwest Riparian Woodland and Shrubland* (D04), *Invasive Perennial Grassland* (D06), *Invasive Annual Grassland* (D08), *Invasive Annual and Biennial Forbland* (D09), *Recently Logged Areas* (D10), *Recently Chained Pinyon-Juniper Areas* (D11)) present more than 4,400 square kilometers of habitats with 'restoration potential,' with almost half of this amount being 'invasive annual grasslands. The next five most available (based on areal extent) for restoration possibilities, in descending order of square kilometers of habitat modified, were cover types currently labeled as invasive annual and biennial forblands, recently logged areas, invasive southwest riparian woodlands and shrublands, invasive annual grasslands, and recently chained pinyon-

juniper areas. The logged and chained areas, may in fact represent already prescribed habitat manipulation treatments.

Land cover classes with 10-<20% of mapped distribution in Status 1 or 2:

There are 16 land cover types with distributions of between 10-<20% on GAP Status 1 and 2 lands in Colorado; 15 of which are natural communities, and one ‘disturbed’ land cover class representing the ‘disturbed, oil well’ class, with less than 1 km² of this type mapped in Colorado. (This class was the focus of more mapping effort in the other four states). Of the 15 natural land cover types, *Rocky Mountain Aspen Forest and Woodland* (S023) and *Colorado Plateau Pinyon-Juniper Woodland* (S039) provide the most land base (11,432 km² and 15,134 km², respectively, with potential for increasing the extent of protected habitat). Seven of the 15 natural land cover types (47%) represent a per type habitat base of between 1,504 km² and 6,938 km² to work with, from a management potential standpoint. The remaining 5 cover types (33%) (*Inter-Mountain Basins Shale Badland* (S011), *Inter-Mountain Basins Playa* (S015), *Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland* (S025), *Colorado Plateau Mixed Low Sagebrush Shrubland* (S056), and *Rocky Mountain Subalpine-Montane Riparian Woodland* (S092)) each afforded less than 500 km² of total base per type to work with, across the 5-stage region. These types represented mixed bedrock canyonlands, intermountain basin playas, limber/bristlecone pine woodlands, low sagebrush woodland, and sub-alpine/montane riparian woodlands.

Land cover classes with 20-<50% of mapped distribution in Status 1 or 2:

There are 16 land cover types with distributions of between 20-<50% on GAP Status 1 and 2 lands in Colorado. Two of these (12%) (*Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland* (S028) and *Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland* (S030)) represent high elevation conifer forest types, with >10,000 km² and >8,000 km², respectively, of habitat base in our SWReGAP project area. Three of these 16 land cover types (*Colorado Plateau Pinyon-Juniper Shrubland* (S052), *Rocky Mountain Subalpine-Montane Riparian Shrubland* (S091), *Rocky Mountain Alpine-Montane Wet Meadow* (S102)) (19%) provide per class habitat bases of >1,700, >2,800 and >1,300 km² respectively, representing pinyon-juniper woodlands, subalpine-montane riparian shrublands, and alpine-montane wet meadows. Seven of the 16 land cover types (44%) (*Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland* (S050), *North American Arid West Emergent Marsh* (S100), *Wyoming Basins Low Sagebrush Shrubland* (S128), *Western Great Plains Tallgrass Prairie* (S132), *Barren Lands, Non-specific* (N31), *Disturbed, Non-specific* (D01), and *Recently Burned* (D02)), with distributions between 20-<50% in Status 1 and 2 lands (44%) each afford less than 500 km² of habitat base across the 5-state project area. Three of these types represent either barren lands, or disturbed/burned land cover types, for which their minimal representation might be interpreted as a good thing, *Rocky Mountain Cliff, Canyon and Massive Bedrock* (S006) and *Colorado Plateau Mixed Bedrock Canyon and Tableland* (S010) represented 981 km² and 674 km² of habitat base, for which 20-<50% was found in GAP Status 1 and 2 lands.

Land cover classes with >50% of mapped distribution in Status 1 or 2:

There are 5 land cover types with distributions of greater than 50% on GAP Status 1 and 2 lands in Colorado. Four of these are ‘alpine’ systems (*North American Alpine Ice Field* (S001), *Rocky Mountain Alpine Bedrock and Scree* (S002), *Rocky Mountain Alpine Fell-Field* (S004), and *Rocky Mountain Dry Tundra* (S081)), and fall within the greater than 50% GAP Status 1 and 2 lands, by virtue of the amount of these types falling within wilderness areas. The fifth type, *Inter-Mountain Basins Active and Stabilized Dune* (S012), falls into this category given the substantial amount of its cover that occurs within the Great Sand Dunes National Monument.

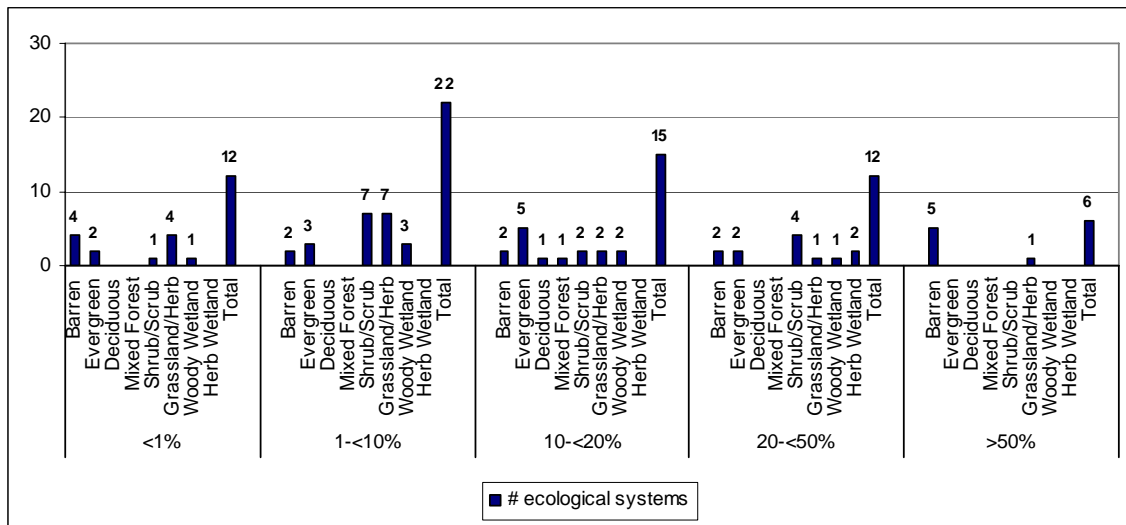


Figure 5-3. Total number of ecological systems (Y-axis) aggregated into NLCD classes (X-axis) summarized by conservation thresholds (<1%, 1-<10%, 10-<20%, 20-<50%, and >50%) of Status 1 and 2 lands in the state of Colorado.

Table 5-3. Percent distribution of each land cover type represented within Status 1 & 2 lands, summarized by conservation thresholds of 0-<1%, 1-<10%, 10-<20%, 20-<50%, and >50% in the state of Colorado.

Code	Land Cover Type	Area in	Area in	<1	1-	10-	20-<50	>50
		CO	Status	<1	<10	<20	20-<50	>50
		km ²	1&2	%	%	%	%	%
S080	Chihuahuan Gypsophilous Grassland and Steppe	<1	n/a	0.0				
S062	Chihuahuan Mixed Desert and Thorn Scrub	9	<1	0.1				
S115	Madrean Juniper Savanna	1	n/a	0.0				
S035	Madrean Pine-Oak Forest and Woodland	<1	n/a	0.0				
S112	Madrean Pinyon-Juniper Woodland	<1	n/a	0.0				
S018	North American Warm Desert Active and Stabilized Dune	<1	n/a	0.0				
S016	North American Warm Desert Bedrock Cliff and Outcrop	<1	n/a	0.0				
S022	North American Warm Desert Playa	<1	n/a	0.0				
S020	North American Warm Desert Wash	1	<1	0.7				
S074	Southern Rocky Mountain Juniper Woodland and Savanna	2,149	6	0.3				
S008	Western Great Plains Cliff and Outcrop	88	1	0.7				
S089	Western Great Plains Sand Prairie	18	n/a	0.0				
S087	Central Mixedgrass Prairie	120	3		2.7			
S054	Inter-Mountain Basins Big Sagebrush Shrubland	13,378	1,024		7.7			
S009	Inter-Mountain Basins Cliff and Canyon	4	<1		8.5			
S075	Inter-Mountain Basins Juniper Savanna	281	7		2.3			
S045	Inter-Mountain Basins Mat Saltbush Shrubland	1,019	72		7.1			
S071	Inter-Mountain Basins Montane Sagebrush Steppe	8,498	673		7.9			
S090	Inter-Mountain Basins Semi-Desert Grassland	862	69		8.0			
S014	Inter-Mountain Basins Wash	20	1		3.9			
S125	Rocky Mountain Foothill Limber Pine-Juniper Woodland	6	<1		3.4			
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	10,226	618		6.0			
S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	566	54		9.5			
S047	Rocky Mountain Lower Montane-Foothill Shrubland	2,303	176		7.6			
S136	Southern Colorado Plateau Sand Shrubland	13	<1		2.3			
S085	Southern Rocky Mountain Montane-Subalpine Grassland	7,245	687		9.5			
S038	Southern Rocky Mountain Pinyon-Juniper Woodland	4,834	386		8.0			
S036	Southern Rocky Mountain Ponderosa Pine Woodland	10,790	829		7.7			
S120	Western Great Plains Floodplain	828	31		3.8			
S086	Western Great Plains Foothill and Piedmont Grassland	4,362	102		2.3			
S138	Western Great Plains Mesquite Woodland and Shrubland	10	<1		2.8			
S095	Western Great Plains Riparian Woodland and Shrubland	849	61		7.2			
S048	Western Great Plains Sandhill Shrubland	8,679	259		3.0			
S088	Western Great Plains Shortgrass Prairie	45,615	634		1.4			
S056	Colorado Plateau Mixed Low Sagebrush Shrubland	66	8			11.5		
S039	Colorado Plateau Pinyon-Juniper Woodland	15,134	3,014			19.9		
S042	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	1,951	224			11.5		
S096	Inter-Mountain Basins Greasewood Flat	2,276	337			14.8		
S065	Inter-Mountain Basins Mixed Salt Desert Scrub	2,324	269			11.6		
S015	Inter-Mountain Basins Playa	44	7			16.3		

Code	Land Cover Type	Area in	Area in	<1	1-	10-	20-<50	>50
		CO	Status	<1	<10	<20	20-<50	>50
		km ²	1&2	%	%	%	%	%
S079	Inter-Mountain Basins Semi-Desert Shrub-Steppe	3,350	540			16.1		
S011	Inter-Mountain Basins Shale Badland	258	33			12.9		
S023	Rocky Mountain Aspen Forest and Woodland	11,432	1,337			11.7		
S032	Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	3,150	425			13.5		
S031	Rocky Mountain Lodgepole Pine Forest	6,939	1,302			18.8		
S034	Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	3,603	475			13.2		
S083	Rocky Mountain Subalpine Mesic Meadow	1,504	251			16.7		
S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	369	56			15.2		
S092	Rocky Mountain Subalpine-Montane Riparian Woodland	215	24			11.4		
S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland	97	36				37.0	
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland	674	253				37.6	
S052	Colorado Plateau Pinyon-Juniper Shrubland	1,764	549				31.1	
S050	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	1	<1				24.4	
S100	North American Arid West Emergent Marsh	44	19				44.5	
S102	Rocky Mountain Alpine-Montane Wet Meadow	1,327	488				36.8	
S006	Rocky Mountain Cliff, Canyon and Massive Bedrock	981	298				30.3	
S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	10,179	3,563				35.0	
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	8,150	2,789				34.2	
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland	2,812	1,073				38.1	
S132	Western Great Plains Tallgrass Prairie	1	<1				27.7	
S128	Wyoming Basins Low Sagebrush Shrubland	43	11				26.4	
S012	Inter-Mountain Basins Active and Stabilized Dune	129	111					85.5
S001	North American Alpine Ice Field	2	2					78.8
S002	Rocky Mountain Alpine Bedrock and Scree	2,878	1,734					60.3
S004	Rocky Mountain Alpine Fell-Field	584	354					60.7
S081	Rocky Mountain Dry Tundra	2,446	1,328					54.3
N21	Developed, Open Space - Low Intensity	2,010	3	0.1				
N22	Developed, Medium - High Intensity	1,068	8	0.8				
N80	Agriculture	52,820	518		1.0			
D09	Invasive Annual and Biennial Forbland	633	20		3.2			
D08	Invasive Annual Grassland	372	21		5.7			
D06	Invasive Perennial Grassland	2,079	25		1.2			
D04	Invasive Southwest Riparian Woodland and Shrubland	486	27		5.5			
D11	Recently Chained Pinyon-Juniper Areas	231	19		8.4			
D10	Recently Logged Areas	540	52		9.6			
D03	Recently Mined or Quarried	87	4		4.7			
D14	Disturbed, Oil Well	<1	<1			14.8		
N11	Open Water	607	82			13.5		
N31	Barren Lands, Non-specific	10	2				21.5	
D07	Invasive Perennial Forbland	1	<1				31.0	
D02	Recently Burned	313	139				44.5	
D01	Disturbed, Non-specific	2	1					50.4

New Mexico

There are 89 land cover types mapped in New Mexico, 79 of which are natural or semi-natural ecological systems ([Appendix 5-8](#)). Of the 89 land cover types, there are eight (9%) that were mapped most abundantly. These are: *Western Great Plains Shortgrass Prairie* (S088), *Apacherian-Chihuahuan Semi-Desert Grassland and Steppe* (S077), *Colorado Plateau Pinyon-Juniper Woodland* (S039), *Southern Rocky Mountain Ponderosa Pine Woodland* (S036), *Chihuahuan Mixed Desert and Thorn Scrub* (S062), *Inter-Mountain Basins Semi-Desert Grassland* (S090), *Apacherian-Chihuahuan Mesquite Upland Scrub* (S058), and *Inter-Mountain Basins Semi-Desert Shrub-Steppe* (S079). These eight land cover types account for 228,258 square kilometers (73%) of New Mexico and each represent 5% or greater of the state. An additional six land cover types account for 1-4% each of the state's total area including: *Southern Rocky Mountain Pinyon-Juniper Woodland* (S038), *Southern Rocky Mountain Juniper Woodland and Savanna* (S074), *Madrean Pinyon-Juniper Woodland* (S112), *Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub* (S068), *Western Great Plains Sandhill Shrubland* (S048), *Inter-Mountain Basins Big Sagebrush Shrubland* (S054), and *Inter-Mountain Basins Mixed Salt Desert Scrub* (S065).

A summary of the percent distribution of each land cover type by land steward for New Mexico is provided in [Appendix 5-8](#), and the percent distribution of each land cover type by GAP Management Status is reported in [Appendix 5-9](#). For instance, the distribution of a relatively sparse but localized (<1 km²) ecological system, *Chihuahuan-Sonoran Desert Bottomland and Swale Grassland* (S109), falls almost entirely within private lands (98%) with the other 2% in State School Trust lands ([Appendix 5-8](#)), where 100% of its total distribution is managed according to Status 4 criteria ([Appendix 5-9](#)).

[Figure 5-4](#) presents an overview of the number of ecological systems by NLCD class with representation in Status 1 and 2 lands broken down by conservation threshold for the state of New Mexico. [Table 5-4](#) presents a more detailed version of this information by identifying the representation of individual land cover types in Status 1 and 2 lands.

Approximately 6.3% (19,908 km²) of New Mexico lands are currently managed according to GAP Management Status 1 or 2 criteria ([Appendix 5-9](#)). There are 36 land cover types (40%) that do not occur on Status 1 lands (10 of which are altered or disturbed). Fourteen (16%) of these land cover types do not occur on Status 2 lands either (four of which are altered or disturbed).

Land cover classes with <1% of mapped distribution in Status 1 or 2:

Of the 89 land cover types, eight (9%) occur with less than 1% of their distribution on GAP Status 1 and 2 lands. Two types (*Western Great Plains Shortgrass Prairie* (S088), *Western Great Plains Mesquite Woodland and Shrubland* (S138)) were mapped on the eastern part of New Mexico, an area primarily under private ownership. *Western Great Plains Shortgrass Prairie* was the dominant mapped system within New Mexico and accounts for greater than 20% of the mapped land cover type within the state. The other type (*Western Great Plains Mesquite Woodland and Shrubland*) was mapped in the

northeastern part of the state, but still largely occurring on private lands. There are four systems (*Rocky Mountain Alpine Bedrock and Scree* (S002), *Rocky Mountain Alpine Fell-Field* (S004), *Rocky Mountain Dry Tundra* (S081), *Chihuahuan-Sonoran Desert Bottomland and Swale Grassland* (S109)) that occur sparsely within the state and Inter-Mountain Basins Playa (S015) that was mapped only slightly more extensively in the state. One type (*Sonora-Mojave Creosotebush-White Bursage Desert Scrub* (S069)) was mapped very sparsely and would not likely occur within the state as it is a type associated with the Sonoran and Mojave deserts.

Land cover classes with 1-<10% of mapped distribution in Status 1 or 2:

There are 39 land cover types that occur with 1-<10% of their distribution on GAP Status 1 and 2 lands. The majority of these types are desert scrub, pinyon-juniper woodlands, and riparian types. The areas in which these land cover types occur are where the majority of private lands or multiple use lands (Status 3) occur. Historically, areas near to and surrounding riparian zones were settled first, and thus, are likely to be privately owned. Consequently, there are several riparian land cover types each with minimal protection of their distribution within Status 1 and 2 lands, including: *North American Arid West Emergent Marsh* (S100), *North American Warm Desert Wash* (S020), *Inter-Mountain Basins Greasewood Flat* (S096), *Inter-Mountain Basins Wash* (S014), *Rocky Mountain Alpine-Montane Wet Meadow* (S102), *Rocky Mountain Lower Montane Riparian Woodland and Shrubland* (S093), *Western Great Plains Riparian Woodland and Shrubland* (S095), and *Western Great Plains Saline Depression Wetland* (S108).

Land cover classes with 10-<20% of mapped distribution in Status 1 or 2:

There are 15 land cover types with distributions of between 10-<20% on GAP Status 1 and 2 lands in New Mexico. Many of the land cover types within this category are riparian areas and thus subject to management discussed above. These include: *North American Warm Desert Lower Montane Riparian Woodland and Shrubland* (S094), *North American Warm Desert Riparian Woodland and Shrubland* (S097), *Rocky Mountain Subalpine Mesic Meadow* (S083), *Rocky Mountain Subalpine-Montane Riparian Shrubland* (S091), and *Rocky Mountain Subalpine-Montane Riparian Woodland* (S092). Also included within this category is *Southern Rocky Mountain Ponderosa Pine Woodland* (S036) which is a dominant land cover type on forested Status 3 lands. One grassland type, *Chihuahuan Gypsophilous Grassland and Steppe* (S080), one forest type, *Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland* (S042), and one shrubland type, *Mogollon Chaparral* (S057) are also included within this threshold. There are two shrublands which include: *Colorado Plateau Mixed Low Sagebrush Shrubland* (S056) and *Sonoran Mid-Elevation Desert Scrub* (S129). Four barren or sparse land cover types include: *Inter-Mountain Basins Active and Stabilized Dune* (S012), *Inter-Mountain Basins Shale Badland*, (S011) *North American Warm Desert Pavement* (S021), and *Rocky Mountain Cliff, Canyon and Massive Bedrock* (S006).

Land cover classes with 20-<50% of mapped distribution in Status 1 or 2:

There are 12 land cover types with distributions of between 20-<50% on GAP Status 1 and 2 lands in New Mexico. Many of the land cover types within this category are high

elevation conifer and aspen forest types that occur within wildernesses in New Mexico. The high elevation land cover types include: *Rocky Mountain Aspen Forest and Woodland* (S023), *Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland* (S032), *Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland* (S034), *Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland* (S028), *Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland* (S030), *Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland* (S025), and *Southern Rocky Mountain Montane-Subalpine Grassland* (S085). Lower elevation land cover types include *Coahuilan Chaparral* (S117), *Madrean Encinal* (S051), *North American Warm Desert Playa* (S022), *North American Warm Desert Riparian Mesquite Bosque* (S098), and *North American Warm Desert Volcanic Rockland* (S019).

Land cover classes with >50% of mapped distribution in Status 1 or 2:

There are 3 land cover types with distributions of greater than 50% on GAP Status 1 and 2 lands in New Mexico. These include: *Inter-Mountain Basins Volcanic Rock and Cinder Land* (S013), *Rocky Mountain Bigtooth Maple Ravine Woodland* (S024), and *Sonoran Paloverde-Mixed Cacti Desert Scrub* (S063). The volcanic lands are largely within El Malpais National Park in central New Mexico. *Rocky Mountain Bigtooth Maple Ravine Woodland* (S024) was mapped sparsely within the southeastern part of the state within the Lincoln National Forest. *Sonoran Paloverde-Mixed Cacti Desert Scrub* (S063) was mapped very sparsely in southwestern New Mexico. Although it is considered a Sonoran Desert land cover type, where it occurs in New Mexico, the actual vegetation is probably more closely associated with the Chihuahuan Desert.

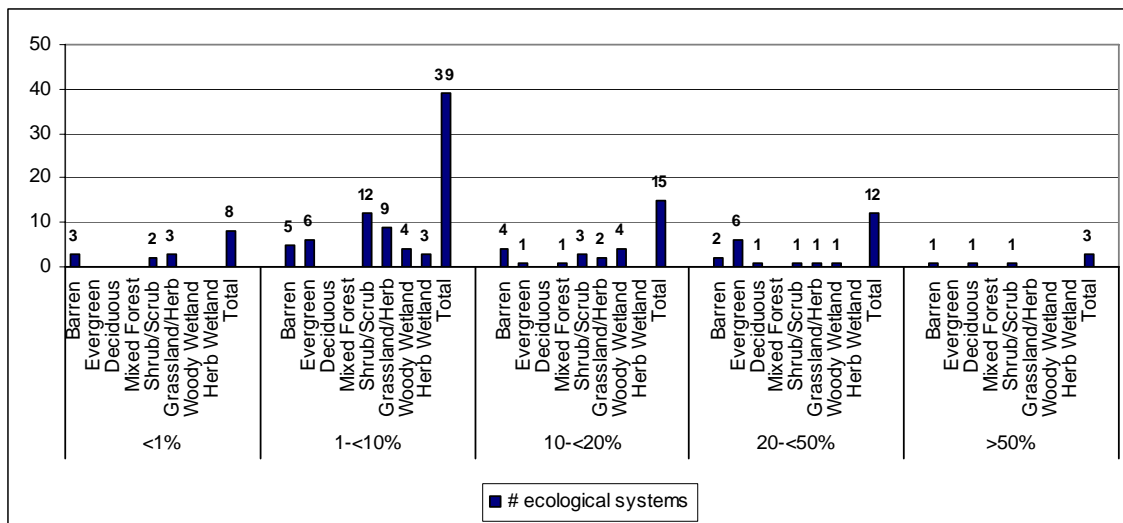


Figure 5-4. Total number of ecological systems (Y-axis) aggregated into NLCD classes (X-axis) summarized by conservation thresholds (<1%, 1-<10%, 10-<20%, 20-<50%, and >50%) of Status 1 and 2 lands in the state of New Mexico.

Table 5-4. Percent distribution of each land cover type represented within Status 1 & 2 lands, summarized by conservation thresholds of 0-<1%, 1-<10%, 10-<20%, 20-<50%, and >50% in the state of New Mexico.

Code	Land Cover Type	Area	Area	<1	1-<10	10-<20	20-<50	>50
		in NM km ²	in Status 1&2 km ²	%	%	%	%	%
S109	Chihuahuan-Sonoran Desert Bottomland and Swale Grassland	<1	n/a	0.0				
S015	Inter-Mountain Basins Playa	2	n/a	0.0				
S002	Rocky Mountain Alpine Bedrock and Scree	7	n/a	0.0				
S004	Rocky Mountain Alpine Fell-Field	<1	n/a	0.0				
S081	Rocky Mountain Dry Tundra	19	n/a	0.0				
S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub	<1	n/a	0.0				
S138	Western Great Plains Mesquite Woodland and Shrubland	1,787	3	0.2				
S088	Western Great Plains Shortgrass Prairie	67,399	140	0.2				
S058	Apacherian-Chihuahuan Mesquite Upland Scrub	15,120	302		2.0			
S077	Apacherian-Chihuahuan Semi-Desert Grassland and Steppe	34,343	2,694		7.8			
S062	Chihuahuan Mixed Desert and Thorn Scrub	21,066	1,144		5.4			
S116	Chihuahuan Mixed Salt Desert Scrub	1,590	153		9.6			
S113	Chihuahuan Sandy Plains Semi-Desert Grassland	969	44		4.5			
S068	Chihuahuan Stabilized Coppice Dune and Sand Flat Scrub	5,537	136		2.5			
S061	Chihuahuan Succulent Desert Scrub	78	7		8.5			
S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland	141	5		3.8			
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland	2,465	225		9.1			
S039	Colorado Plateau Pinyon-Juniper Woodland	27,849	2,351		8.4			
S054	Inter-Mountain Basins Big Sagebrush Shrubland	3,929	118		3.0			
S096	Inter-Mountain Basins Greasewood Flat	2,264	97		4.3			
S075	Inter-Mountain Basins Juniper Savanna	1,297	82		6.3			
S065	Inter-Mountain Basins Mixed Salt Desert Scrub	3,777	161		4.3			
S071	Inter-Mountain Basins Montane Sagebrush Steppe	282	24		8.6			
S090	Inter-Mountain Basins Semi-Desert Grassland	16,390	663		4.0			
S079	Inter-Mountain Basins Semi-Desert Shrub-Steppe	14,466	574		4.0			
S014	Inter-Mountain Basins Wash	3	<1		1.1			
S115	Madrean Juniper Savanna	657	32		4.8			
S035	Madrean Pine-Oak Forest and Woodland	1,725	163		9.5			
S112	Madrean Pinyon-Juniper Woodland	8,754	705		8.1			
S111	Madrean Upper Montane Conifer-Oak Forest and Woodland	672	66		9.9			
S100	North American Arid West Emergent Marsh	85	3		3.8			
S018	North American Warm Desert Active and Stabilized Dune	1,695	113		6.7			
S016	North American Warm Desert Bedrock Cliff and Outcrop	838	61		7.3			
S020	North American Warm Desert Wash	197	10		5.1			
S102	Rocky Mountain Alpine-Montane Wet Meadow	136	11		7.8			
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	1,888	147		7.8			
S031	Rocky Mountain Lodgepole Pine Forest	7	1		8.2			
S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	783	43		5.5			
S047	Rocky Mountain Lower Montane-Foothill Shrubland	266	4		1.7			
S136	Southern Colorado Plateau Sand Shrubland	79	1		1.2			

Code	Land Cover Type	Area	Area	<1	1-<10	10-<20	20-<50	>50
		in NM	in Status 1&2					
		km ²	km ²	%	%	%	%	%
S074	Southern Rocky Mountain Juniper Woodland and Savanna	9,803	173		1.8			
S038	Southern Rocky Mountain Pinyon-Juniper Woodland	10,465	654		6.2			
S008	Western Great Plains Cliff and Outcrop	221	2		1.0			
S086	Western Great Plains Foothill and Piedmont Grassland	701	18		2.6			
S095	Western Great Plains Riparian Woodland and Shrubland	851	78		9.2			
S108	Western Great Plains Saline Depression Wetland	20	<1		1.0			
S048	Western Great Plains Sandhill Shrubland	5,208	109		2.1			
S080	Chihuahuan Gypsophilous Grassland and Steppe	803	154			19.1		
S056	Colorado Plateau Mixed Low Sagebrush Shrubland	329	42			12.8		
S012	Inter-Mountain Basins Active and Stabilized Dune	735	89			12.1		
S042	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	182	33			18.1		
S011	Inter-Mountain Basins Shale Badland	481	79			16.5		
S057	Mogollon Chaparral	870	150			17.2		
S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland	191	31			16.1		
S021	North American Warm Desert Pavement	173	32			18.2		
S097	North American Warm Desert Riparian Woodland and Shrubland	122	21			16.8		
S006	Rocky Mountain Cliff, Canyon and Massive Bedrock	417	77			18.4		
S083	Rocky Mountain Subalpine Mesic Meadow	147	27			18.3		
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland	103	15			14.9		
S092	Rocky Mountain Subalpine-Montane Riparian Woodland	5	1			10.0		
S129	Sonoran Mid-Elevation Desert Scrub	2	<1			10.7		
S036	Southern Rocky Mountain Ponderosa Pine Woodland	21,160	3,297			15.6		
S117	Coahuilan Chaparral	93	39				41.7	
S051	Madrean Encinal	1,350	339				25.1	
S022	North American Warm Desert Playa	515	171				33.2	
S098	North American Warm Desert Riparian Mesquite Bosque	3	1				20.9	
S019	North American Warm Desert Volcanic Rockland	700	264				37.6	
S023	Rocky Mountain Aspen Forest and Woodland	1,483	522				35.2	
S032	Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	2,864	967				33.8	
S034	Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,610	514				31.9	
S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	982	359				36.6	
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	640	275				43.0	
S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	376	129				34.4	
S085	Southern Rocky Mountain Montane-Subalpine Grassland	1,855	430				23.2	
S013	Inter-Mountain Basins Volcanic Rock and Cinder Land	470	414					88.1
S024	Rocky Mountain Bigtooth Maple Ravine Woodland	<1	<1					62.6
S063	Sonoran Paloverde-Mixed Cacti Desert Scrub	<1	<1					66.3
N80	Agriculture	6,026	25	0.4				
N22	Developed, Medium - High Intensity	1,107	3	0.3				
N21	Developed, Open Space - Low Intensity	975	3	0.3				

Code	Land Cover Type	Area	Area	<1	1-<10	10-<20	20-<50	>50
		in NM	in Status 1&2					
		km ²	km ²	%	%	%	%	%
D06	Invasive Perennial Grassland	29	<1	0.1				
D11	Recently Chained Pinyon-Juniper Areas	<1	n/a	0.0				
D03	Recently Mined or Quarried	177	n/a	0.0				
N31	Barren Lands, Non-specific	54	1		1.5			
D09	Invasive Annual and Biennial Forbland	48	3		6.5			
D04	Invasive Southwest Riparian Woodland and Shrubland	27	1		3.4			
N11	Open Water	438	36		8.3			
D02	Recently Burned	806	45		5.6			
D10	Recently Logged Areas	8	<1		2.6			

Nevada

Seventy-four of the 125 land cover classes mapped within the 5-state region occur in Nevada. Of this total, nine cover classes are either altered and disturbed (e.g., invasive species, mineral extraction, or recently burned) or developed and agriculture, where the remainder are naturally occurring ecological systems ([Appendix 5-10](#)). Nearly 78% of the state is dominated by six land cover types: *Inter-mountain Basins Big Sagebrush Shrubland* (S054), *Inter-mountain Basins Mixed Salt Desert Scrub* (S065), *Great Basin Pinyon-Juniper Woodland* (S040), *Great Basin Xeric Mixed Sagebrush Shrubland* (S055), *Sonora-Mojave Creosotebush-White Bursage Desert Scrub* (S069), and *Inter-mountain Basins Montane Sagebrush Steppe* (S071).

Remarkably, 62 mapped cover types in Nevada are limited in their distribution with less than 1% cover each and form less than 8% of the total state cover. Invasive species, such as *Invasive Annual and Biennial Forbland* (D09), *Invasive Annual Grassland* (D08), *Invasive Perennial Grassland* (D06), and *Invasive Southwest Riparian Woodland and Shrubland* (D04) represent slightly more than 2% of the total land cover for Nevada. Collectively, developed and agricultural land cover types in Nevada represent 2,914 km² or approximately only 1% of the areal extent of the state.

A summary of the percent distribution of each land cover type by land steward for Nevada is provided in [Appendix 5-10](#). As an example, the U.S. Bureau of Land Management is responsible for 67% of the surface land management for the state of Nevada ([Appendix 5-10](#)). Consequently, it manages the majority of pinyon-juniper woodlands (~64%), basin big sagebrush and black sagebrush shrublands (76% and 78%, respectively) that occur throughout the state. [Appendix 5-11](#) summarizes the percent distribution of each land cover type represented within the four levels of GAP Management Status, where it can be seen that these three land cover types fall mostly within Status 3 lands (75%, 78.1%, and 79.5%, respectively).

[Figure 5-5](#) presents an overview of the number of ecological systems by NLCD class with representation in Status 1 and 2 lands broken down by conservation threshold for the state of Nevada. [Table 5-5](#) presents a more detailed version of this information by identifying the representation of individual land cover types in Status 1 and 2 lands.

Approximately 14.8% (42,218 km²) of Nevada lands are currently managed according to GAP Management Status 1 or 2 criteria ([Appendix 5-11](#)); they represent 8,876 km² Status 1 and 33,342 km² Status 2 lands, respectively. The ecological systems receiving the least amount of protection in Nevada, i.e., where less than 10 % of their respective distributions occur within Status 1 or 2 lands, include the following: *Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland* (S118), *Inter-mountain Basins Active and Stabilized Dune* (S012), *Inter-mountain Basins Big Sagebrush Shrubland* (S054), *Inter-mountain Basins Big Sagebrush Steppe* (S078), *Inter-mountain Basins Greasewood Flat* (S096), *Inter-mountain Basins Mixed Salt Desert Scrub* (S065), *Inter-mountain Basins Semi-Desert Grassland* (S090), *Inter-Mountain Basins Wash* (S014), *Rocky Mountain Bigtooth Maple Ravine Woodland* (S024), *Sierra Nevada Cliff and*

Canyon (S007), *Southern Rocky Mountain Montane-Subalpine Grassland* (S085), and *Temperate Pacific Subalpine-Montane Wet Meadow* (S103). Some of these ecological types, however, present the most opportunity to provide conservation measures. Many of the rarest Status 1 and 2 ecological systems predominantly occur in Status 3 areas such as U.S. Bureau of Land Management and U.S. Forest Service lands where the land is under permanent federal control and where public laws apply to conservation management. Status 3 lands in Nevada represent 71.8% of the aerial extent of the state or 204,049 km² ([Appendix 5-11](#)). Forty-one of the 74 land cover types in Nevada have greater than 50% of their areal extents classified as within the GAP Management Status 3 category ([Appendix 5-11](#)). Among the 12 ecological systems identified with low protection (less than 10% aerial extent in Status 1 or 2), all but three have >50 % of their areal extent in Nevada in Status 3 (*Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland* -S118, *Inter-mountain Basins Semi-Desert Grassland* -S090, and *Rocky Mountain Bigtooth Maple Ravine Woodland* -S024), and thus represent the greatest opportunity for future protective actions.

Lastly, under the Status 4 GAP management category there are no known public or private institutional mandates or legally recognized easements or deed restrictions to prevent conversion of natural habitat types to anthropogenic cover types, thus these are the least protected lands for biodiversity conservation in Nevada. Land cover types in this category are typically developed as high- or low-density urban or converted to agriculture and are held in private ownership. The total Status 4 lands in Nevada represent 13.4% of the areal extent of the state or 38,120 km² ([Appendix 5-11](#)). Nevertheless, eight natural ecological systems are well represented within Status 4 category lands in that they represent 35 - 89% of the areal extent for the ecological system as it is represented in Nevada. They include 1 deciduous forest type, 2 grassland /herbaceous types, 3 woody wetland types, and 2 emergent herbaceous wetland types. Specifically they include: *Rocky Mountain Bigtooth Maple Ravine Woodland* (S024), *Inter-mountain Basins Big Sagebrush Steppe* (S078), *Inter-mountain Basins Semi-Desert Grassland* (S090), *Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland* (S118), *North American Warm Desert Lower Montane Riparian Woodland and Shrubland* (S094), *North American Warm Desert Riparian Woodland and Shrubland* (S097), *North American Arid West Emergent Marsh* (S100), and *Temperate Pacific Subalpine-Montane Wet Meadow* (S103). These may represent management opportunities such as conservation easements for future consideration.

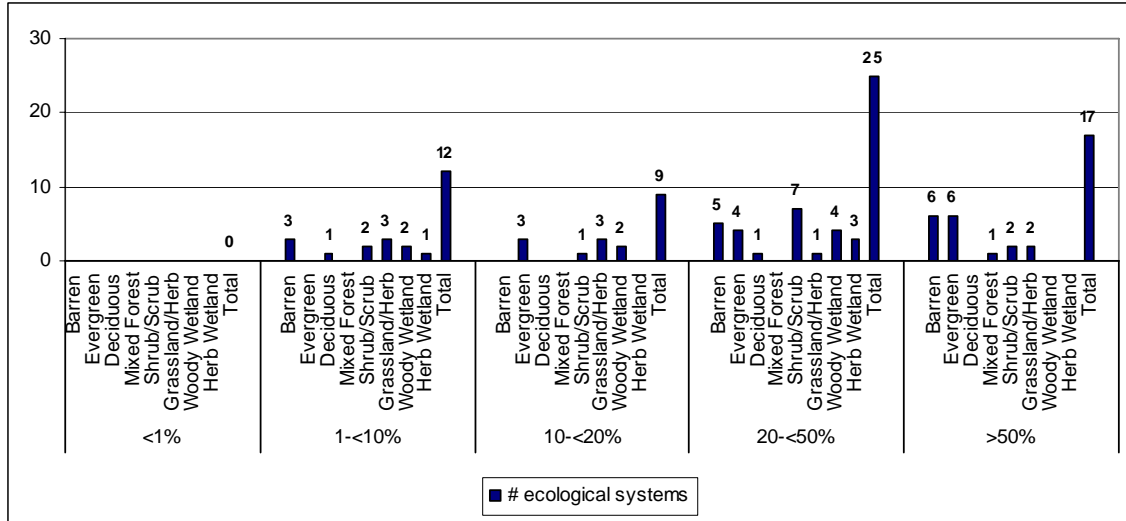


Figure 5-5. Total number of ecological systems (Y-axis) aggregated into NLCD classes (X-axis) summarized by conservation thresholds (<1%, 1-<10%, 10-<20%, 20-<50%, and >50%) of Status 1 and 2 lands in the state of Nevada.

Table 5-5. Percent distribution of each land cover type represented within Status 1 & 2 lands, summarized by conservation thresholds of 0-<1%, 1-<10%, 10-<20%, 20-<50%, and >50% in the state of Nevada.

Code	Land Cover Type	Area	Area	<1	1-<10	10-<20	20-<50	>50
		in NV	in Status 1&2					
		km ²	km ²	%	%	%	%	%
S118	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	1,059	72		6.8			
S012	Inter-Mountain Basins Active and Stabilized Dune	79	3		4.1			
S054	Inter-Mountain Basins Big Sagebrush Shrubland	65,988	4,165		6.3			
S078	Inter-Mountain Basins Big Sagebrush Steppe	1,274	37		2.9			
S096	Inter-Mountain Basins Greasewood Flat	10,550	1,011		9.6			
S065	Inter-Mountain Basins Mixed Salt Desert Scrub	50,604	3,090		6.1			
S090	Inter-Mountain Basins Semi-Desert Grassland	3,101	195		6.3			
S014	Inter-Mountain Basins Wash	18	1		3.4			
S024	Rocky Mountain Bigtooth Maple Ravine Woodland	1	<1		1.0			
S007	Sierra Nevada Cliff and Canyon	123	6		4.9			
S085	Southern Rocky Mountain Montane-Subalpine Grassland	2	<1		6.7			
S103	Temperate Pacific Subalpine-Montane Wet Meadow	2	<1		2.4			
S040	Great Basin Pinyon-Juniper Woodland	36,374	6,489			17.8		
S055	Great Basin Xeric Mixed Sagebrush Shrubland	31,792	3,724			11.7		
S071	Inter-Mountain Basins Montane Sagebrush Steppe	17,813	2,344			13.2		
S079	Inter-Mountain Basins Semi-Desert Shrub-Steppe	5,973	1,030			17.2		
S123	Mediterranean California Ponderosa-Jeffrey Pine Forest and Woodland	209	24			11.4		
S097	North American Warm Desert Riparian Woodland and Shrubland	5	1			18.1		
S020	North American Warm Desert Wash	288	53			18.3		
S134	North Pacific Montane Grassland	27	4			13.3		
S122	Sierra Nevada Subalpine Lodgepole Pine Forest and Woodland	20	4			19.5		
S053	Great Basin Semi-Desert Chaparral	162	57				34.8	
S009	Inter-Mountain Basins Cliff and Canyon	2,486	642				25.8	
S075	Inter-Mountain Basins Juniper Savanna	1	<1				35.4	
S050	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	1,924	626				32.5	
S015	Inter-Mountain Basins Playa	6,082	1,475				24.3	
S033	Mediterranean California Dry-Mesic Mixed Conifer Forest and Woodland	2	1				32.7	
S121	Mediterranean California Red Fir Forest and Woodland	106	24				22.4	
S105	Mediterranean California Subalpine-Montane Fen	2	1				47.4	
S057	Mogollon Chaparral	425	133				31.3	
S060	Mojave Mid-Elevation Mixed Desert Scrub	10,521	4,952				47.1	
S100	North American Arid West Emergent Marsh	311	72				23.2	
S018	North American Warm Desert Active and Stabilized Dune	16	7				45.4	
S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland	30	8				26.9	
S021	North American Warm Desert Pavement	168	62				36.9	

Code	Land Cover Type	Area	Area	<1	1-<10	10-<20	20-<50	>50
		in NV	in Status 1&2					
		km ²	km ²	%	%	%	%	%
S022	North American Warm Desert Playa	526	180				34.3	
S098	North American Warm Desert Riparian Mesquite Bosque	25	9				37.6	
S102	Rocky Mountain Alpine-Montane Wet Meadow	10	5				47.9	
S023	Rocky Mountain Aspen Forest and Woodland	1,289	364				28.3	
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	108	39				35.8	
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	175	71				40.7	
S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	14	6				43.3	
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland	3	1				30.2	
S092	Rocky Mountain Subalpine-Montane Riparian Woodland	67	25				37.3	
S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub	19,013	8,036				42.3	
S070	Sonora-Mojave Mixed Salt Desert Scrub	1,528	467				30.6	
S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland	4	3					89.6
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland	2	2					96.1
S042	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	84	44					52.5
S026	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	635	409					64.5
S003	Mediterranean California Alpine Bedrock and Scree	23	17					71.3
S017	North American Warm Desert Badland	78	48					62.1
S016	North American Warm Desert Bedrock Cliff and Outcrop	1,842	1,233					67.0
S019	North American Warm Desert Volcanic Rockland	78	52					65.9
S029	Northern Pacific Mesic Subalpine Parkland	42	25					59.0
S002	Rocky Mountain Alpine Bedrock and Scree	148	97					65.8
S081	Rocky Mountain Dry Tundra	20	14					70.1
S032	Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	196	140					71.7
S034	Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	216	127					58.8
S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	190	97					51.0
S083	Rocky Mountain Subalpine Mesic Meadow	24	14					59.2
S114	Sonora-Mojave Semi-Desert Chaparral	86	85					98.8
S036	Southern Rocky Mountain Ponderosa Pine Woodland	7	7					96.9
N21	Developed, Open Space - Low Intensity	724	<1	0.0				
D03	Recently Mined or Quarried	319	<1	0.0				
N80	Agriculture	2,222	33		1.5			
N31	Barren Lands, Non-specific	186	13		7.0			
N22	Developed, Medium - High Intensity	210	5		2.5			
D09	Invasive Annual and Biennial Forbland	1,131	27		2.4			
D08	Invasive Annual Grassland	4,610	118		2.6			

Code	Land Cover Type	Area	Area	<1	1-<10	10-<20	20-<50	>50
		in NV	in Status 1&2					
		km ²	km ²	%	%	%	%	%
D06	Invasive Perennial Grassland	187	3		1.5			
D02	Recently Burned	574	28		4.9			
N11	Open Water	129	24			18.7		
D04	Invasive Southwest Riparian Woodland and Shrubland	126	37				29.6	

Utah

Within the state of Utah a total of 80 land cover types are mapped, 65 of which are natural or semi-natural ecological systems ([Appendix 5-12](#)). The most abundant ecological systems mapped within the state of Utah are: *Colorado Plateau Pinyon-Juniper Woodland* (S039), *Inter-Mountain Basins Big Sagebrush Shrubland* (S054), *Inter-Mountain Basins Mixed Salt Desert Scrub* (S065), *Colorado Plateau Mixed Bedrock Canyon and Tableland* (S010), *Inter-Mountain Basins Montane Sagebrush Steppe* (S071), *Inter-Mountain Basins Playa* (S015), and *Great Basin Pinyon-Juniper Woodland* (S040). Of these more abundant land cover types, each represents 5% or more of the state's total area, and when combined represent nearly half (~49%) of the state's area. There are nine ecological systems that represent between 1% and 5% of the state's area: *Colorado Plateau Pinyon-Juniper Shrubland* (S052), *Colorado Plateau Blackbrush-Mormon-tea Shrubland* (S059), *Inter-Mountain Basins Semi-Desert Shrub-Steppe* (S079), *Inter-Mountain Basins Greasewood Flat* (S096), *Rocky Mountain Gambel Oak-Mixed Montane Shrubland* (S046), *Rocky Mountain Aspen Forest and Woodland* (S023), *Great Basin Xeric Mixed Sagebrush Shrubland* (S055), *Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland* (S028), and *Inter-Mountain Basins Mat Saltbush Shrubland* (S045). Collectively these ecological systems comprise another quarter of the state's total area (~26%). There are forty-nine ecological systems that are only sparsely distributed throughout the state, each contributing proportions smaller than 1% to the state's total area. Several ecological systems occur near the periphery of the state's borders and are sparsely distributed within the state (e.g. *Sonora-Mojave Mixed Salt Desert Scrub* (S070), *Wyoming Basins Low Sagebrush Shrubland* (S128), *North American Warm Desert Riparian Mesquite Bosque* (S098), and *Sonora-Mojave Semi-Desert Chaparral* (S114)), or are naturally rare with very limited extents in Utah. Examples include: *Rocky Mountain Dry Tundra* (S081), *Rocky Mountain Alpine Dwarf-Shrubland* (S043), *Southern Rocky Mountain Ponderosa Pine Woodland* (S036), *Inter-Mountain Basins Juniper Savanna* (S075), and *Inter-Mountain Basins Semi-Desert Grassland* (S090).

A summary of the percent distribution of each land cover type by land steward for Utah is provided in [Appendix 5-12](#), and the percent distribution of each land cover type by GAP Management Status is reported in [Appendix 5-13](#). As an example, the U.S. Bureau of Land Management is responsible for 74% of the management of *Inter-Mountain Basins Shale Badland* (S011) ([Appendix 5-12](#)), and the majority of this land cover type falls within Status 3 lands (72.2%) ([Appendix 5-13](#)).

[Figure 5-6](#) presents an overview of the number of ecological systems by NLCD class with representation in Status 1 and 2 broken down by conservation threshold. [Table 5-6](#) presents a more detailed version of this information by identifying the representation of individual land cover types in Status 1 and 2 lands.

Land cover classes with <1% of mapped distribution in Status 1 or 2:

Approximately 14.5% (30,874 km²) of Utah lands are currently managed according to GAP Management Status 1 or 2 criteria ([Table 5-6](#)). Of those ecological systems

receiving the least amount of protection (0-<1% of distribution in Status 1 or 2) are the following: *Great Basin Semi-Desert Chaparral* (S053), *Inter-Mountain Basins Wash* (S014), *Inter-Mountain Basins Juniper Savanna* (S075), *North American Warm Desert Volcanic Rockland* (S019), *North American Warm Desert Riparian Mesquite Bosque* (S098), and *Sonora-Mojave Semi-Desert Chaparral* (S114). It should be noted however, that each of their distributions are also quite limited within the state of Utah.

Land cover classes with 1%-<10% of mapped distribution in Status 1 or 2:

Twenty-three ecological systems have between 1 and <10% of their distribution in Status 1 or 2. This ranking comprises the most diverse set of ecological systems, including at the lower elevations a variety of desert scrub types, dunes, washes, playas, lower elevation riparian, and sagebrush-dominated systems. At higher elevations, pure aspen forests and woodlands, aspen-mixed coniferous forests, several shrubland types of the lower montane and foothill regions, and montane-subalpine grasslands are within this threshold category of biodiversity projection.

Land cover classes with 10%-<20% of mapped distribution in Status 1 or 2:

There are 14 ecological systems with between 10 and <20% of their distribution within Status 1 or 2. Of those ecological systems, many are evergreen forest or woodland types occurring within montane and subalpine zones (e.g. *Southern Rocky Mountain Ponderosa Pine Woodland* (S036), *Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland* (S030), *Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland* (S032), *Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland* (S034), and *Rocky Mountain Lodgepole Pine Forest* (S031). In a slightly lower elevation range are the extensive *Great Basin Pinyon-Juniper Woodland* (S040), *IMB Mountain Mahogany Woodland & Shrubland* (S050), and *IMB Semi-desert Grassland* (S090). Additionally, there are three riparian types *Rocky Mountain Subalpine-Montane Riparian Shrubland* (S091), *Rocky Mountain Lower Montane Riparian Woodland and Shrubland* (S093), and *North American Warm Desert Lower Montane Riparian Woodland and Shrubland* (S094), plus *IMB Shale Badlands* (S011) and one mixed desert scrub type *Mojave Mid-Elevation Mixed Desert Scrub* (S060) within this ranking.

Land cover classes with 20%-<50% of mapped distribution in Status 1 or 2:

Seventeen ecological systems have between 20 and <50% of their total distribution within Status 1 and 2 lands in Utah. This ranking includes systems that generally occur at higher elevations such as *Rocky Mountain Alpine-Montane Wet Meadow* (S102), *Rocky Mountain Subalpine Mesic Meadow* (S083), *Rocky Mountain Dry Tundra* (S081), *Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland* (S025), and *Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland* (S028). Several of these systems are characterized by having rugged terrain such as the cliff and canyon, massive bedrock types, making them less conducive for development or agricultural endeavors. Many of these systems also tend to occur within the southern part of the state where a greater proportion of the lands have a GAP Management Status of 2 due to their inclusion within National Parks and/or National Monuments (e.g. *Colorado Plateau Pinyon-Juniper Woodland* (S039), *Colorado Plateau Pinyon-Juniper Shrubland* (S052), *Colorado Plateau Blackbrush-Mormon-tea Shrubland* (S059), *Sonora-Mojave*

Creosotebush-White Bursage Desert Scrub (S069), North American Arid West Emergent Marsh (S100), Colorado Plateau Mixed Bedrock Canyon and Tableland (S010).

Land cover classes with >50% of mapped distribution in Status 1 or 2:

There are 5 ecological systems with greater than 50% of their distribution in Status 1 and 2, all of which occur at only the highest elevations within the state: *Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland (S026), Rocky Mountain Alpine Fell-Field (S004), Rocky Mountain Alpine Bedrock and Scree (S002), Rocky Mountain Alpine Dwarf-Shrubland (S043), and North American Alpine Ice Field (S001).*

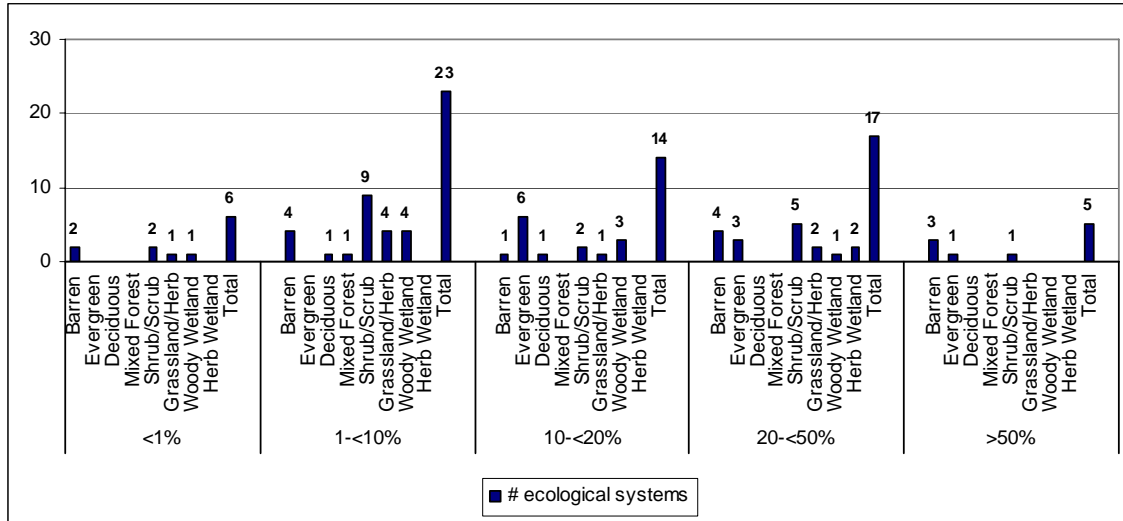


Figure 5-6. Total number of ecological systems (Y-axis) aggregated into NLCD classes (X-axis) summarized by conservation thresholds (<1%, 1-<10%, 10-<20%, 20-<50%, and >50%) of Status 1 and 2 lands in the state of Utah.

Table 5-6: Percent distribution of each Land Cover type represented within Status 1 & 2 Lands, summarized by conservation thresholds of 0-<1%, 1-<10%, 10-<20%, 20-<50%, and >=50% in the state of Utah.

Code	Land Cover Type	Area in UT		Area in Status 1&2				
		km ²	km ²	<1 %	1-<10 %	10-<20 %	20-<50 %	>50 %
S053	Great Basin Semi-Desert Chaparral	<1	n/a	0.0				
S075	Inter-Mountain Basins Juniper Savanna	9	<1	0.9				
S014	Inter-Mountain Basins Wash	1	n/a	0.0				
S098	North American Warm Desert Riparian Mesquite Bosque	3	<1	0.7				
S019	North American Warm Desert Volcanic Rockland	8	n/a	0.0				
S114	Sonora-Mojave Semi-Desert Chaparral	3	n/a	0.0				
S056	Colorado Plateau Mixed Low Sagebrush Shrubland	1,517	103		6.8			
S118	Great Basin Foothill and Lower Montane Riparian Woodland and Shrubland	283	27		9.5			
S055	Great Basin Xeric Mixed Sagebrush Shrubland	3,635	305		8.4			
S012	Inter-Mountain Basins Active and Stabilized Dune	1,804	160		8.9			
S042	Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland	1,222	90		7.3			
S054	Inter-Mountain Basins Big Sagebrush Shrubland	19,935	1,678		8.4			
S078	Inter-Mountain Basins Big Sagebrush Steppe	522	8		1.6			
S096	Inter-Mountain Basins Greasewood Flat	7,280	270		3.7			
S045	Inter-Mountain Basins Mat Saltbush Shrubland	3,036	199		6.6			
S065	Inter-Mountain Basins Mixed Salt Desert Scrub	15,499	901		5.8			
S071	Inter-Mountain Basins Montane Sagebrush Steppe	14,046	790		5.6			
S015	Inter-Mountain Basins Playa	10,998	408		3.7			
S079	Inter-Mountain Basins Semi-Desert Shrub-Steppe	8,329	748		9.0			
S013	Inter-Mountain Basins Volcanic Rock and Cinder Land	316	7		2.1			
S022	North American Warm Desert Playa	6	<1		6.3			
S097	North American Warm Desert Riparian Woodland and Shrubland	8	<1		5.9			
S020	North American Warm Desert Wash	10	1		8.1			
S023	Rocky Mountain Aspen Forest and Woodland	6,334	359		5.7			
S046	Rocky Mountain Gambel Oak-Mixed Montane Shrubland	6,596	568		8.6			
S047	Rocky Mountain Lower Montane-Foothill Shrubland	252	18		7.3			
S070	Sonora-Mojave Mixed Salt Desert Scrub	10	<1		2.7			
S136	Southern Colorado Plateau Sand Shrubland	855	55		6.4			
S085	Southern Rocky Mountain Montane-Subalpine Grassland	593	42		7.1			
S040	Great Basin Pinyon-Juniper Woodland	10,986	1,449			13.2		
S050	Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	626	100			15.9		
S090	Inter-Mountain Basins Semi-Desert Grassland	2,011	294			14.6		
S011	Inter-Mountain Basins Shale Badland	1,827	235			12.9		
S060	Mojave Mid-Elevation Mixed Desert Scrub	826	88			10.6		
S094	North American Warm Desert Lower Montane Riparian Woodland and Shrubland	20	4			19.3		
S024	Rocky Mountain Bigtooth Maple Ravine Woodland	887	103			11.6		

Code	Land Cover Type	Area	Area	<1	1-<10	10-<20	20-<50	>50
		in UT	in Status 1&2					
		km ²	km ²	%	%	%	%	%
S032	Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland	1,710	316			18.5		
S031	Rocky Mountain Lodgepole Pine Forest	1,815	346			19.1		
S093	Rocky Mountain Lower Montane Riparian Woodland and Shrubland	837	125			14.9		
S034	Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland	1,427	272			19.1		
S030	Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	1,273	216			17.0		
S091	Rocky Mountain Subalpine-Montane Riparian Shrubland	298	35			11.7		
S036	Southern Rocky Mountain Ponderosa Pine Woodland	2,019	221			10.9		
S059	Colorado Plateau Blackbrush-Mormon-tea Shrubland	9,021	2,042				22.6	
S010	Colorado Plateau Mixed Bedrock Canyon and Tableland	14,164	5,476				38.7	
S052	Colorado Plateau Pinyon-Juniper Shrubland	9,414	3,607				38.3	
S039	Colorado Plateau Pinyon-Juniper Woodland	22,356	5,530				24.7	
S009	Inter-Mountain Basins Cliff and Canyon	382	117				30.6	
S057	Mogollon Chaparral	583	187				32.1	
S100	North American Arid West Emergent Marsh	409	146				35.7	
S016	North American Warm Desert Bedrock Cliff and Outcrop	127	51				39.9	
S102	Rocky Mountain Alpine-Montane Wet Meadow	472	118				25.1	
S006	Rocky Mountain Cliff, Canyon and Massive Bedrock	1,466	395				27.0	
S081	Rocky Mountain Dry Tundra	293	105				35.8	
S028	Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	3,224	867				26.9	
S083	Rocky Mountain Subalpine Mesic Meadow	499	101				20.2	
S025	Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland	39	14				35.1	
S092	Rocky Mountain Subalpine-Montane Riparian Woodland	4	1				28.6	
S069	Sonora-Mojave Creosotebush-White Bursage Desert Scrub	808	222				27.4	
S128	Wyoming Basins Low Sagebrush Shrubland	4	1				34.0	
S026	Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland	32	21					65.4
S001	North American Alpine Ice Field	21	20					94.2
S002	Rocky Mountain Alpine Bedrock and Scree	813	556					68.4
S043	Rocky Mountain Alpine Dwarf-Shrubland	109	88					80.3
S004	Rocky Mountain Alpine Fell-Field	177	120					67.8
N80	Agriculture	9,183	42	0.5				
N31	Barren Lands, Non-specific	42	<1	0.1				
N22	Developed, Medium - High Intensity	1,098	9	0.9				
N21	Developed, Open Space - Low Intensity	1,978	9	0.5				
D02	Recently Burned	172	<1	0.2				
D10	Recently Logged Areas	287	2	0.8				
D01	Disturbed, Non-specific	90	5		5.3			
D14	Disturbed, Oil Well	46	1		1.8			

Code	Land Cover Type	Area in UT		Area in Status 1&2				
		km ²	km ²	<1 %	1-<10 %	10-<20 %	20-<50 %	>50 %
D09	Invasive Annual and Biennial Forbland	695	25		3.7			
D08	Invasive Annual Grassland	3,231	134		4.1			
D06	Invasive Perennial Grassland	526	22		4.1			
D03	Recently Mined or Quarried	171	2		1.1			
D11	Recently Chained Pinyon-Juniper Areas	458	49			10.7		
D04	Invasive Southwest Riparian Woodland and Shrubland	450	122				27.2	

Predicted Animal Habitat Distributions - Regional Analysis

A summary table is not provided due to the large number of species analyzed, but some generalizations and examples of species results by the various thresholds are provided below. The complete Predicted Animal Habitat Distribution Analyses Table, found in [Appendix 5-14](#), provides the area in square kilometers (km²) of the species' mapped habitat distribution by management status and land steward, and the percent of the species' habitat total distribution in each management category. For example, Gunnison sage-grouse (*Centrocercus minimus*) has 12,526.1 km² of predicted habitat within the region and 1,212.5 km² (10%) of that area is within Status 1 and 2 lands.

There are 25 species within the region with less than 1% of their habitat on Status 1 and 2 lands. Of these 25 species, 1 is an amphibian, 18 are birds, 2 are mammals and 4 are reptiles. The amphibian, lowland burrowing treefrog (*Pterohyla fodiens*), did not have any predicted habitat on Status 1 or 2 lands. Only 2.1 km² of habitat was mapped and 1.8 km² was on status 3 lands.

Of the 19 birds, the Neotropic cormorant (*Phalacrocorax brasilianus*) and lesser prairie-chicken (*Tympanuchus pallidicinctus*) had no mapped habitat on Status 1 lands and no mapped habitat for Neotropic cormorant on Status 2 lands. Only 7 km² of habitat were mapped for the bronzed cowbird (*Molothrus aeneus*) within Status 1 and 2 lands and 49 km² for the inca dove (*Columbina inca*). Two species of mammals included the Plains pocket gopher (*Geomys bursarius*) and the swift fox (*Vulpes velox*). Only 55 km² of habitat were identified on Status 1 lands for Plains pocket gopher. Of the 4 reptiles, smooth softshell turtle (*Apalone mutica*) and Colorado Desert fringe-toed lizard (*Uma notata*) had no habitat mapped on status 1 and 2 lands. The Sand dune lizard (*Sceloporus arenicolus*) had less than 1 km² of habitat mapped on Status 1 and 2 lands. Only 1,104 km² of habitat for Plains garter snake (*Thamnophis radix*) was mapped on status 1 and 2 lands.

The majority of all taxonomic groups occur with less than 20% of the predicted habitat on Status 1 and 2 lands. There are 288 species with predicted habitat 1-<10% on Status 1 and 2 lands and 385 species that have habitat between 10 and <20% on Status 1 and 2 lands. For amphibians 33 of 37 species fall within this threshold. Of the four species that have 20-<50% of their habitat within Status 1 and 2 lands, three are endemics with little predicted habitat including the Green Frog (*Rana clamitans*), Mountain yellow-legged frog (*Rana muscosa*), and Relict leopard frog (*Rana onca*). For the fourth species, Sonoran green toad (*Bufo retiformis*), habitat is found throughout southern Arizona. For birds, 54 of the 433 species modeled occur with 20% or greater predicted habitat on Status 1 and 2 lands. These figures include habitats for the entire life history of the species and are not limited to breeding habitat. There are 144 bird species with predicted habitat 1-<10% on Status 1 and 2 lands and 219 birds species with 10-<20%. There are 28 mammals that have 20% or greater of their predicted habitat on Status 1 and 2 lands. There are 78 mammal species with predicted habitat 1-<10% on Status 1 and 2 lands and 107 mammals species with 10-<20%. For reptiles, there are 33 that have 20% or greater

of their predicted habitat on Status 1 and 2 lands. There are 52 reptile species with predicted habitat 1-<10% on Status 1 and 2 lands and 41 reptile species with 10-<20%.

Table 5-7. Number of species by Gap Status thresholds for each taxa group within region/state as mapped by the Southwestern Regional Gap Analysis Project.

State	Taxon	<1%	1-<10 %	10-<20 %	20-<50 %	>50 %
Region	Amphibian	1	14	18	4	0
	Birds	18	144	219	47	7
	Mammals	2	78	107	26	2
	Reptiles	4	52	41	31	2
	Total	25	288	385	108	11
Arizona	Amphibian	2	5	14	6	0
	Birds	15	91	181	76	7
	Mammals	8	45	80	20	1
	Reptiles	1	31	48	23	2
	Total	26	172	323	125	10
Colorado	Amphibian	3	10	4	1	0
	Birds	27	167	127	23	3
	Mammals	3	60	45	23	2
	Reptiles	13	31	9	7	0
	Total	46	268	185	54	5
Nevada	Amphibian	0	4	4	7	2
	Birds	12	45	138	102	22
	Mammals	2	17	69	27	16
	Reptiles	0	5	15	25	12
	Total	14	71	226	161	52
New Mexico	Amphibian	1	15	6	4	0
	Birds	28	227	103	26	1
	Mammals	8	98	43	13	0
	Reptiles	6	67	13	13	2
	Total	43	407	165	56	3
Utah	Amphibian	0	1	10	5	0
	Birds	11	85	135	92	3
	Mammals	1	26	74	28	4
	Reptiles	1	4	19	29	3
	Total	13	116	238	154	10

Analysis of relative percentage (Figure 5-7) reveals trends regarding both the status of species within each state and the region. This figure provides the relative percent of taxon by region and by state within the five threshold categories. Colorado and New Mexico have a higher percentage of species within the 1-<10% threshold than do Arizona, Nevada, and Utah. Regionally <40% of species occur within Status 1 and 2 lands. Few species in each state and the region occur with >50% of the habitat in Status 1 and Status 2 lands. However, Nevada has a higher percentage within this category than the other four states.

Cumulative numbers by taxon by state or region (Figure 5-8) provide between and within state comparisons. As expected, protection levels vary by state and taxon. Though New Mexico and Arizona have similar total species counts, more species are in Status 1 and 2 lands in Arizona. New Mexico has more species within the thresholds of <1% and 1-<10% than Arizona. Differences manifest themselves in the 1-<10% threshold in New Mexico (407 species) and the 10-<20% threshold in Arizona. A similar pattern is observed between Colorado and Nevada. Twice as many species are in 1-<10% threshold in Colorado and Nevada has more species in the 10-<20% threshold. These differences may be more pronounced because of the discrete thresholds used for analysis.

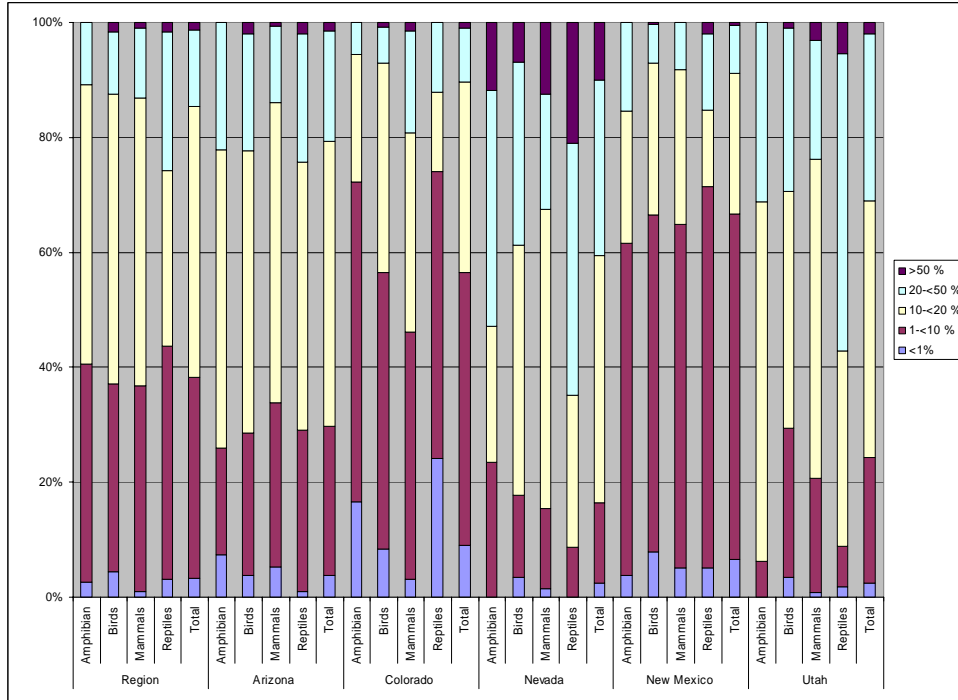


Figure 5-7. Percentage of species by taxon (amphibian, bird, mammal, reptile) occurring on GAP Status 1 and 2 lands within the 5 threshold categories (<1, 1-10, 10-20, 20-50, >50) for animals modeled within the Southwest Regional Gap Analysis Project.

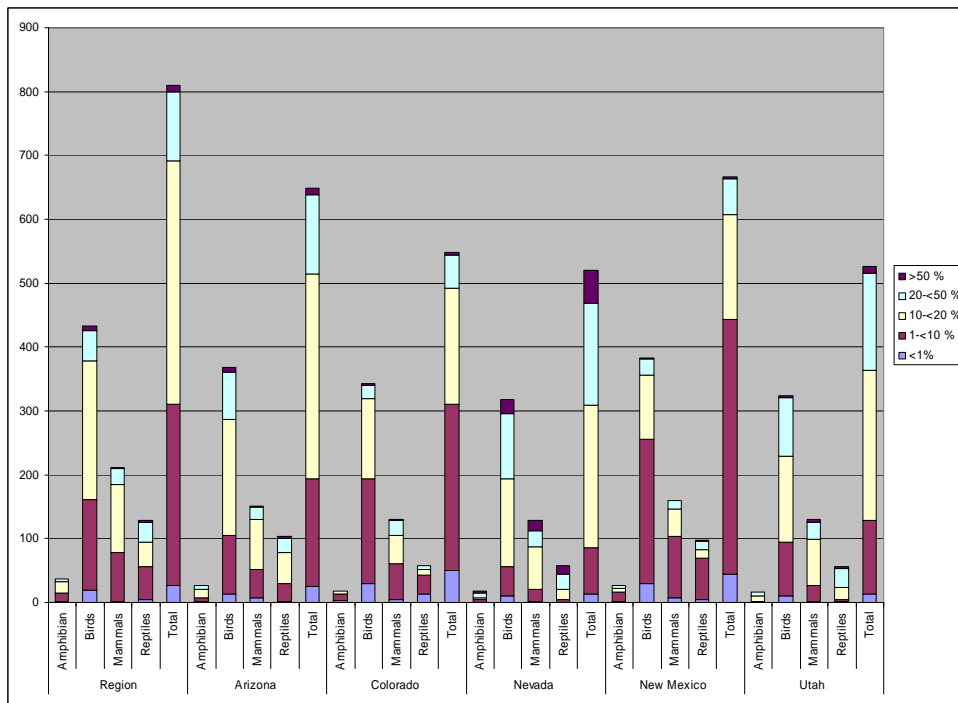


Figure 5-8. Total number of species by taxon by state or region on GAP Status 1 and 2 lands for the 5 threshold categories (<1, 1-10, 10-20, 20-50, >50) for animal habitats modeled within the Southwest Regional Gap Analysis Project.

Table 5-8. Animal species with 0-<1% of predicted habitat distribution in GAP Management Status 1 or 2 for Region as mapped by the Southwest Regional Gap Analysis Project.

Taxon	SWReGAP Common Name	SWReGAP Scientific Name
Amphibian	LOWLAND BURROWING TREEFROG	<i>Pternohyla fodiens</i>
Bird	UPLAND SANDPIPER	<i>Bartramia longicauda</i>
	CHIMNEY SWIFT	<i>Chaetura pelagica</i>
	INCA DOVE	<i>Columbina inca</i>
	BLUE JAY	<i>Cyanocitta cristata</i>
	GYRFALCON	<i>Falco rusticolus</i>
	WHOOPIING CRANE	<i>Grus americana</i>
	RED-BELLIED WOODPECKER	<i>Melanerpes carolinus</i>
	RED-HEADED WOODPECKER	<i>Melanerpes erythrocephalus</i>
	BRONZED COWBIRD	<i>Molothrus aeneus</i>
	GREAT CRESTED FLYCATCHER	<i>Myiarchus crinitus</i>
	EASTERN SCREECH-OWL	<i>Otus asio</i>
	HOUSE SPARROW	<i>Passer domesticus</i>
	NEOTROPIC CORMORANT	<i>Phalacrocorax brasilianus</i>
	DICKCISSEL	<i>Spiza americana</i>
	BROWN THRASHER	<i>Toxostoma rufum</i>
	LESSER PRAIRIE-CHICKEN	<i>Tympanuchus pallidicinctus</i>
	SCISSOR-TAILED FLYCATCHER	<i>Tyrannus forficatus</i>
	TENNESSEE WARBLER	<i>Vermivora peregrina</i>
Mammal	PLAINS POCKET GOPHER	<i>Geomys bursarius</i>
	SWIFT FOX	<i>Vulpes velox</i>
Reptile	SMOOTH SOFTSHELL TURTLE	<i>Apalone mutica</i>
	SAND DUNE LIZARD	<i>Sceloporus arenicolus</i>
	PLAINS GARTER SNAKE	<i>Thamnophis radix</i>
	COLORADO DESERT FRINGE-TOED LIZARD	<i>Uma notata</i>

Species with <1% of predicted distribution in Status 1 or 2:

There are 25 species (3% of those modeled) that have less than 1% of their habitat on Status 1 and 2 lands (Table 5-8). There are 18 birds species (41%), 4 reptiles (3%), 2 mammals (1%) and 1 amphibian (3%). Several of these species, such as the lesser prairie-chicken, are already the subject of conservation planning.

Species with 1-<10% of predicted distribution in Status 1 or 2:

There are 288 species (35% of modeled species) with predicted habitat of between 1 and less than 10% on status 1 and 2 lands within the entire region. This includes 14 amphibian species (38%), 144 bird species (33%), 78 mammal species (35%), and 52 reptile species (40%).

Species with 10-<20% of predicted distribution in Status 1 or 2:

385 species (47% of modeled species) have 10-<20% of their predicted habitat on status 1 and 2 lands within the entire region. This includes 18 amphibian species (49%), 219 bird species (50%), 107 mammals (49%), and 41 reptiles (30%).

Species with 20 -<50% of predicted distribution in Status 1 or 2:

Within the SWReGAP region, there are 108 species (13 % of those modeled) with predicted habitat occurring on status 1 and 2 lands 20-<50% of the entire distribution of habitat. These 108 species include 4 amphibian species (11%), 47 bird species (11%), 26 mammal species (12%), and 31 reptile species (24%).

Species with at least 50% representation in GAP Status 1 and 2:

There are 11 species (1% of those modeled) with predicted habitat occurring on status 1 and 2 lands greater than 50%. These species include 7 birds (2%), 2 mammals (1%), and 2 reptiles (1%). Birds include Clapper rail, dunlin, black tern, sedge wren, tricolored blackbird, brown-capped rosy-finch, and Mexican chickadee. Mammals include Palmer's chipmunk and mountain goat. Reptiles include Sonoran shovel-nosed snake and ridge-nosed rattlesnake.

Comparison of protection by region compared to state, using threshold numbers to define the five representative groups, is another useful way to examine differences between species protection (Table 5-9). The thresholds were defined as:

<u>Threshold</u>	<u>Description</u>
1	Species with <1% of predicted distribution in Status 1 or 2
2	Species with 1-<10% of predicted distribution in Status 1 or 2
3	Species with 10-<20% of predicted distribution in Status 1 or 2
4	Species with 20 -<50% of predicted distribution in Status 1 or 2
5	Species with at least 50% representation in GAP Status 1 and 2

In many cases the majority of species are equally well protected on the state level compared to the regional. There are differences, however, best illustrated where there is a difference of 10 or more species between state and regional protection numbers.

In Arizona, there are 4 differences (greater than 10 species) between regional protection and state protection. There are 53 species within Threshold 3 for Arizona, but within Threshold 2 for the region. There are also 52 species in Threshold 4 for Arizona, but within Threshold 3 for the region. These two groups have more predicted habitat by percentage on Status 1 and 2 lands within Arizona than the region. There are two groups with more predicted habitat by percentage on Status 1 and 2 lands within the entire region than in Arizona. This includes 36 species within Threshold 2 for Arizona, but within threshold 3 for the region. There are 14 species within Threshold 4 for the region, but within Threshold 3 for Arizona.

In Colorado, there are 4 differences. There are 27 species in Threshold 4 within Colorado, but regionally within Threshold 3. This group has more predicted habitat by percentage on Status 1 and 2 lands within Colorado than the region. There are 3 groups that have more predicted habitat by percentage on Status 1 and 2 lands in the region than in Colorado. There are 30 species in Threshold 1 in Colorado, but in Threshold 2 in the region; there are 89 species in Threshold 2 in Colorado but in Threshold 3 in the region. There are 13 species in Threshold 3 within Colorado and in Threshold 4 in the region.

In New Mexico, five groups comprise the major differences. There are 2 groups with more predicted habitat by percentage on Status 1 and 2 lands within the state than within the region. There are 17 species in Threshold 3 for the state and Threshold 2 for the region and 24 species in Threshold 4 for the state and Threshold 3 for the region. There are 3 groups with more predicted habitat by percentage on Status 1 and 2 lands within the region than the state. These include 179 species within Threshold 3 in the region and within Threshold 2 in New Mexico. There are 18 species within Threshold 1 in New Mexico and in Threshold 2 within the region and 19 species within Threshold 3 in New Mexico and Threshold 4 in the region. There are an additional 17 species within Threshold 2 in New Mexico, but within the region they are in Threshold 4.

In Nevada, there are 6 groups of species with a difference between the state and the region. Five of these groups have more predicted habitat by percentage on Status 1 and 2 lands within the state than within the region. There are 104 species within Threshold 4 of Nevada, but in Threshold 3 for the region. There are 51 species in Threshold 3 in Nevada, but in Threshold 2 in the region. 25 species are in Threshold 5 within Nevada, but Threshold 3 within the region. There are 12 species within Threshold 4 within Nevada, but in Threshold 2 for the region. There are 19 species within Threshold 5 in Nevada and within Threshold 4 in the region. There is one group with more predicted habitat by percentage on Status 1 and 2 lands within the region than the state. This group has 13 species in Threshold 2 in Nevada and Threshold 3 regionwide.

In Utah there are five differences between the state and the region. There are three groups with more predicted habitat by percentage on Status 1 and 2 lands within the state than within the region. There are 88 species within Threshold 4 in Utah, but in threshold 3 for the region. There are 16 species in Threshold 4 and 36 species in Threshold 3, but are in Threshold 2 for the region. There are two groups with more predicted habitat by percentage on Status 1 and 2 lands within the region than the state. There are 21 species in Threshold 2 for the state, but in Threshold 3 for the region. There are 15 species that are in Threshold 3 for the state, but Threshold 4 for the region.

Some of the identified differences within this comparison are likely due to using an absolute threshold value that may create more of a distinction in management than actually exists (for example, 9% vs. 12%). Each species should be reviewed individually where management decisions are to be made. Many species more protected in states than the region may be on the edges of the species range. This is particularly true for species in Nevada that are considered Sierra Nevada or California species or Great Plains species in Colorado or New Mexico.

Table 5-9. Number of Terrestrial Vertebrate Species by threshold category for each state by threshold category for the region.

State	Threshold Categories	Region					Total Species
		1	2	3	4	5	
AZ	1	6	9	8	2		25
AZ	2	1	125	36	5		167
AZ	3		53	255	14		322
AZ	4		6	52	67		125
AZ	5		3	1	1	5	10
CO	1	12	30	3		1	46
CO	2	6	164	89	3		262
CO	3		9	162	13		184
CO	4		5	27	20		52
CO	5				2	3	5
NM	1	17	18	4	2	1	42
NM	2	4	201	179	17		401
NM	3		17	127	19	1	164
NM	4		1	24	31		56
NM	5		1			2	3
NV	1	2	9	2			13
NV	2	1	53	13	3		70
NV	3		51	164	8		223
NV	4		12	104	44	2	162
NV	5		5	25	19	3	52
UT	1	2	5	5	1		13
UT	2	2	89	21	1		113
UT	3		36	186	15		237
UT	4	2	16	88	47		153
UT	5		1	2	4	3	10

Analysis of State Endemics

Only two endemic species were modeled for New Mexico (Jemez Mountain Salamander and Sacramento Mountain Salamander) and one endemic species was modeled in Utah (Utah Prairie dog).

Predicted Animal Habitat Distributions – State-based Analyses

Arizona

We mapped 649 species within Arizona. This includes 27 amphibians (73% of amphibians modeled for region), 368 birds (84% of birds modeled for region), 151 mammals (70% of mammals modeled for region), and 103 reptiles (79% of reptiles modeled for region).

The Arizona Game and Fish Department (AGFD) identified species of conservation priority in the Arizona Comprehensive Wildlife Conservation Strategy (CWCS) (AGFD 2005a). Four categories defined in Companion Document B (AGFD 2005b) were used to evaluate a species' status: Vulnerable Species, Responsibility Species, Focal Species and/or Economic Species. Five hundred sixty nine vertebrate species are considered to be "priority," that is, classified by one or more of the four evaluation categories under the AGFD CWCS evaluation. Of these, 113 species (19.9%) have less than 10% habitat in Status 1 and 2 lands. Two hundred eighty four vertebrate species are identified as vulnerable and 62 species (21.8%) have less than 10% habitat in Status 1 and 2 lands.

Species with <1% of predicted distribution in Status 1 or 2:

Twenty-six species (4% of all mapped species) have less than 1% of their habitat on Status 1 and 2 lands within the state of Arizona ([Table 5-10](#)). This includes 2 amphibians, 15 birds, 8 mammals, and 1 reptile. Fifteen species have less than 100 km² of habitat mapped within Arizona and 4 other species have less than 1000 km² within the state. Seven of these species were considered conservation priorities by the ADGF. Red-Eyed Vireo, American Pipit, and Thirteen-lined Ground Squirrel were identified as Vulnerable and Focal. The Pine Grosbeak was identified as Vulnerable and Economic. Calliope Hummingbird and Bronzed Cowbird were identified as Focal and Economic. The Eastern Phoebe was identified as Focal. The Bronzed Cowbird is a brood parasite and is expanding its range; this species provides an example where low representation on Status 1 and 2 lands is not necessarily a problem.

Species with 1-<10% of predicted distribution in Status 1 or 2:

There are 172 species with 1-<10% predicted habitat within status 1 and 2 lands within the state of Arizona ([Appendix 5-15](#)). These species include 5 amphibians, 91 birds, 45 mammals, and 31 reptiles. Eight species have less than 100 km² of habitat within the state and 14 with between 100 to 1000 km² of habitat. Sixty (35%) of these species are identified as vulnerable in the Arizona CWCS.

Species with 10-<20% of predicted distribution in Status 1 or 2:

There are 323 species with 10-<20% of their predicted habitat within Status 1 and 2 lands within Arizona ([Appendix 5-15](#)). This includes 14 amphibians, 181 birds, 80 mammals, and 48 reptiles. Seven species have less than 100 km² of habitat within the state and 16 have between 100 and 1000 km² of habitat.

Table 5-10. Animal species with 0-<1% of predicted habitat distribution in GAP Management Status 1 or 2 for Arizona as mapped by the Southwest Regional Gap Analysis Project.

Taxon	SWReGAP Common Name	SWReGAP Scientific Name
Amphibian	BOREAL CHORUS FROG	<i>Pseudacris maculata</i>
	LOWLAND BURROWING TREEFROG	<i>Pternohyla fodiens</i>
Birds	AMERICAN PIPIT	<i>Anthus rubescens</i>
	BOHEMIAN WAXWING	<i>Bombycilla garrulus</i>
	CALIFORNIA QUAIL	<i>Callipepla californica</i>
	GRAY-CHEEKED THRUSH	<i>Catharus minimus</i>
	INCA DOVE	<i>Columbina inca</i>
	PALM WARBLER	<i>Dendroica palmarum</i>
	BRONZED COWBIRD	<i>Molothrus aeneus</i>
	HOUSE SPARROW	<i>Passer domesticus</i>
	RING-NECKED PHEASANT	<i>Phasianus colchicus</i>
	PINE GROSBEAK	<i>Pinicola enucleator</i>
	BLACK-CAPPED CHICKADEE	<i>Poecile atricapilla</i>
	EASTERN PHOEBE	<i>Sayornis phoebe</i>
	DICKCISSEL	<i>Spiza americana</i>
	CALLIOPE HUMMINGBIRD	<i>Stellula calliope</i>
RED-EYED VIREO	<i>Vireo olivaceus</i>	
Mammals	BARBARY SHEEP	<i>Ammotragus lervia</i>
	NORTHERN FLYING SQUIRREL	<i>Glaucomys sabrinus</i>
	MEADOW VOLE	<i>Microtus pennsylvanicus</i>
	MINK	<i>Mustela vison</i>
	AMERICAN PIKA	<i>Ochotona princeps</i>
	HEATHER VOLE	<i>Phenacomys intermedius</i>
	THIRTEEN-LINED GROUND SQUIRREL	<i>Spermophilus tridecemlineatus</i>
WESTERN JUMPING MOUSE	<i>Zapus princeps</i>	
Reptiles	COLORADO DESERT FRINGE-TOED LIZARD	<i>Uma notata</i>

Species with 20 -<50% of predicted distribution in Status 1 or 2:

Within Arizona, there are 125 species with 20-<50% of their predicted habitat occurring within Status 1 and 2 lands ([Appendix 5-15](#)). This includes 6 amphibians, 76 birds, 20 mammals, and 23 reptiles. Twenty-one species have less than 100 km² of habitat within the state and 42 between 100 and 1000 km² of habitat.

Species with at least 50% representation in GAP Status 1 and 2:

There are 10 species with predicted habitat occurring within Status 1 and 2 lands greater than 50% ([Appendix 5-15](#)). These species include 7 birds, 1 mammal, and 2 reptiles. Eight species have less than 100 km² of habitat within the state and one has between 100 and 1000 km² of habitat. Only the Sonoran Shovel-nosed Snake is mapped with greater than 1000 km² of habitat in Arizona.

Colorado

We mapped 549 species within Colorado. This includes 18 amphibians (49% of amphibians modeled for region), 343 birds (78% of birds modeled for region), 130 mammals (60% of mammals modeled for region), and 58 reptiles (45% of reptiles modeled for region).

Species with <1% of predicted distribution in Status 1 or 2:

There are 46 species that have less than 1% of their habitat on Status 1 and 2 lands within the state of Colorado ([Table 5-11](#)). This includes 2 amphibians, 27 birds, 3 mammals, and 13 reptiles. Of the 46, 9 have been identified as Species of Greatest Conservation Need in Colorado (CDOW 2005).

Species with 1-<10% of predicted distribution in Status 1 or 2:

There are 268 species with 1-<10% predicted habitat within Status 1 and 2 lands within the state of Colorado. This includes 10 amphibians, 167 birds, 60 mammals, and 31 reptiles. Of the 268, 63 have been identified as Species of Greatest Conservation Need in Colorado (CDOW 2005). Representative species include northern cricket frog, plains leopard frog, sandhill crane, scaled quail, greater sage-grouse, northern bobwhite, greater prairie-chicken, lesser prairie-chicken, Columbian sharp-tailed grouse, Plains sharp-tailed grouse, sage sparrow, loggerhead shrike, golden eagle, ferruginous hawk, bald eagle, snowy plover, mountain plover, least tern, Forster's tern, northern pintail, red-headed woodpecker, Lewis's woodpecker, fringed Myotis, black-footed ferret, white-tailed prairie dog, black-tailed prairie dog, Botta's pocket gopher, northern pocket gopher, triploid checkered whiptail, and Texas horned lizard

Species with 10-<20% of predicted distribution in Status 1 or 2:

There are 185 species with 10-<20% of their predicted habitat within Status 1 and 2 lands in Colorado. This includes 4 amphibians, 127 birds, 45 mammals, and 9 reptiles. Of the 183, 49 have been identified as Species of Greatest Conservation Need in Colorado (CDOW 2005). Representative species include northern leopard frog, wood frog, northern goshawk, western grebe, black-chinned hummingbird, Gunnison sage-grouse, yellow-billed cuckoo, band-tailed pigeon, olive-sided flycatcher, black swift, Grace's warbler, willow flycatcher, peregrine falcon, black rosy-finch, flammulated owl, osprey, purple martin, broad-tailed hummingbird, rufous hummingbird, pygmy nuthatch, red-naped sapsucker, spotted owl, Townsend's big-eared bat, Gunnison's prairie dog, spotted bat, Arizona Myotis, olive-backed pocket mouse, and dwarf shrew.

Table 5-11. Animal species with 0-<1% of predicted habitat distribution in GAP Status 1 or 2 for Colorado as mapped by the Southwest Regional Gap Analysis Project.

Taxon	SWReGAP Common Name	SWReGAP Scientific Name
Amphibian	GREEN TOAD	<i>Bufo debilis</i>
	COUCH'S SPADEFOOT	<i>Scaphiopus couchii</i>
Bird	PLAINS SPADEFOOT	<i>Spea bombifrons</i>
	WOOD DUCK	<i>Aix sponsa</i>
	SPRAGUE'S PIPIT	<i>Anthus spragueii</i>
	UPLAND SANDPIPER	<i>Bartramia longicauda</i>
	CHIMNEY SWIFT	<i>Chaetura pelagica</i>
	ROSS'S GOOSE	<i>Chen rossii</i>
	SEDGE WREN	<i>Cistothorus platensis</i>
	BLUE JAY	<i>Cyanocitta cristata</i>
	GYRFALCON	<i>Falco rusticolus</i>
	WHOOPING CRANE	<i>Grus americana</i>
	BLUE GROSBEAK	<i>Guiraca caerulea</i>
	FRANKLIN'S GULL	<i>Larus pipixcan</i>
	THAYER'S GULL	<i>Larus thayeri</i>
	RED-BELLIED WOODPECKER	<i>Melanerpes carolinus</i>
	GREAT CRESTED FLYCATCHER	<i>Myiarchus crinitus</i>
	WHIMBREL	<i>Numenius phaeopus</i>
	EASTERN SCREECH-OWL	<i>Otus asio</i>
	HOUSE SPARROW	<i>Passer domesticus</i>
	RING-NECKED PHEASANT	<i>Phasianus colchicus</i>
	GREAT-TAILED GRACKLE	<i>Quiscalus mexicanus</i>
	COMMON GRACKLE	<i>Quiscalus quiscula</i>
	EASTERN BLUEBIRD	<i>Sialia sialis</i>
	FIELD SPARROW	<i>Spizella pusilla</i>
	EASTERN MEADOWLARK	<i>Sturnella magna</i>
	CURVE-BILLED THRASHER	<i>Toxostoma curvirostre</i>
	BROWN THRASHER	<i>Toxostoma rufum</i>
	SCISSOR-TAILED FLYCATCHER	<i>Tyrannus forficatus</i>
TENNESSEE WARBLER	<i>Vermivora peregrina</i>	
Mammal	SOUTHERN PLAINS WOODRAT	<i>Neotoma micropus</i>
	HISPID COTTON RAT	<i>Sigmodon hispidus</i>
	PREBLE'S SHREW	<i>Sorex preblei</i>
Reptile	CHECKERED WHIPTAIL	<i>Cnemidophorus tesselatus</i>
	WESTERN DIAMONDBACK RATTLESNAKE	<i>Crotalus atrox</i>
	RING-NECKED SNAKE	<i>Diadophis punctatus</i>
	GREAT PLAINS SKINK	<i>Eumeces obsoletus</i>
	WESTERN HOOK-NOSED SNAKE	<i>Gyalopion canum</i>
	YELLOW MUD TURTLE	<i>Kinosternon flavescens</i>
	TEXAS BLIND SNAKE	<i>Leptotyphlops dulcis</i>
	PLAIN-BELLIED WATER SNAKE	<i>Nerodia erythrogaster</i>
	MASSASAUGA	<i>Sistrurus catenatus</i>
	GROUND SNAKE	<i>Sonora semiannulata</i>
	CHECKERED GARTER SNAKE	<i>Thamnophis marcianus</i>
	COMMON SLIDER	<i>Trachemys scripta</i>
	LINED SNAKE	<i>Tropidoclonion lineatum</i>

Species with 20 -<50% of predicted distribution in Status 1 or 2:

Within Colorado, there are 52 species with 20-<50% of their predicted habitat occurring within Status 1 and 2 lands. This includes 1 amphibian, 21 birds, 23 mammals, and 7 reptiles. Of the 52, 12 have been identified as Species of Greatest Conservation Need in Colorado (CDOW 2005). These include: western toad, boreal owl, white-throated swift, evening grosbeak, white-tailed ptarmigan, red crossbill, wolverine, river otter, lynx, kit fox, long-nosed leopard lizard, and Southwestern black-headed snake.

Species with at least 50% representation in GAP Status 1 and 2:

There are 5 species with predicted habitat occurring within Status 1 and 2 lands greater than 50%. These species include 3 birds and 2 mammals. Of the 5, 2 have been identified as Species of Greatest Conservation Need in Colorado (CDOW 2005). These are black tern and brown-capped rosy-finch.

New Mexico

We mapped 667 species within New Mexico. We mapped 26 species of amphibians (70% of amphibians modeled for region), 383 birds species (88% of birds modeled for region), 159 mammal species (74% of mammals modeled for region), and 98 species of reptiles (75% of reptiles modeled for region).

Species with <1% of predicted distribution in Status 1 or 2:

There are 43 species (6%) that have less than 1% of their habitat on Status 1 and 2 lands within the state of New Mexico ([Table 5-12](#)). Of the 43, 6 have been identified as Species of Greatest Conservation Need in New Mexico (NMDGF 2005). This includes 1 amphibian (4% of mapped amphibians within the state), 28 birds (7% of mapped birds within the state), 8 mammals (5% of mapped mammals within the state), and 6 reptiles (5% of mapped reptiles within the state). Three of these species (bison, California condor, and whooping crane) are considered either extirpated or accidental within the state. Twelve of these species have a total amount of habitat mapped within the state of <100 km² and an additional 10 of these species have <1000 km² of mapped habitat within the state. A list of animal species whose predicted habitat distributions are <1% within Status 1 and 2 lands in the state of New Mexico is provided below in [Table 5-12](#).

Species with 1-<10% of predicted distribution in Status 1 or 2:

There are 407 species with predicted habitat within Status 1 and 2 lands within New Mexico. Of the 407, 64 have been identified as Species of Greatest Conservation Need in New Mexico (NMDGF 2005). This includes 15 amphibians (58%), 227 birds (59%), 98 mammals (60%), and 67 reptiles (66%). There was 1 species that had little habitat mapped within the state (<100 km²) and 9 species with between 100-1000 km² of mapped habitat. Species include barking frog, Gila monster, Preble's shrew, ferruginous hawk, Gunnison's prairie dog, and sage thrasher.

Table 5-12. Animal species with 0-<1% of predicted habitat distribution in GAP Status 1 or 2 for New Mexico as mapped by the Southwest Regional Gap Analysis Project.

Taxon	SWReGAP Common Name	SWReGAP Scientific Name
Amphibian	BOREAL CHORUS FROG	<i>Pseudacris maculata</i>
Bird	CHUKAR	<i>Alectoris chukar</i>
	AMERICAN PIPIT	<i>Anthus rubescens</i>
	GREATER SCAUP	<i>Aythya marila</i>
	UPLAND SANDPIPER	<i>Bartramia longicauda</i>
	WHITE-RUMPED SANDPIPER	<i>Calidris fuscicollis</i>
	CALIFORNIA QUAIL	<i>Callipepla californica</i>
	COMMON REDPOLL	<i>Carduelis flamma</i>
	CHIMNEY SWIFT	<i>Chaetura pelagica</i>
	SEMIPALMATED PLOVER	<i>Charadrius semipalmatus</i>
	NORTHERN BOBWHITE	<i>Colinus virginianus</i>
	INCA DOVE	<i>Columbina inca</i>
	BOBOLINK	<i>Dolichonyx oryzivorus</i>
	WHOOPING CRANE	<i>Grus americana</i>
	CALIFORNIA CONDOR	<i>Gymnogyps californianus</i>
	ORCHARD ORIOLE	<i>Icterus spurius</i>
	BLACK RAIL	<i>Laterallus jamaicensis</i>
	BROWN-CAPPED ROSY-FINCH	<i>Leucosticte australis</i>
	RED-HEADED WOODPECKER	<i>Melanerpes erythrocephalus</i>
	BRONZED COWBIRD	<i>Molothrus aeneus</i>
	GREAT CRESTED FLYCATCHER	<i>Myiarchus crinitus</i>
	SNOWY OWL	<i>Nyctea scandiaca</i>
	HOUSE SPARROW	<i>Passer domesticus</i>
	NEOTROPIC CORMORANT	<i>Phalacrocorax brasilianus</i>
	RING-NECKED PHEASANT	<i>Phasianus colchicus</i>
	EASTERN PHOEBE	<i>Sayornis phoebe</i>
	DICKCISSEL	<i>Spiza americana</i>
	LESSER PRAIRIE-CHICKEN	<i>Tympanuchus pallidicinctus</i>
	SCISSOR-TAILED FLYCATCHER	<i>Tyrannus forficatus</i>
Mammal	BISON	<i>Bos bison</i>
	LEAST SHREW	<i>Cryptotis parva</i>
	NINE-BANDED ARMADILLO	<i>Dasypus novemcinctus</i>
	PLAINS POCKET GOPHER	<i>Geomys bursarius</i>
	WYOMING GROUND SQUIRREL	<i>Spermophilus elegans</i>
	ROUND-TAILED GROUND SQUIRREL	<i>Spermophilus tereticaudus</i>
	COLORADO CHIPMUNK	<i>Tamias quadrivittatus</i>
	SWIFT FOX	<i>Vulpes velox</i>
Reptile	SMOOTH SOFTSHELL TURTLE	<i>Apalone mutica</i>
	TRIPLOID CHECKERED WHIPTAIL	<i>Cnemidophorus neotesselatus</i>
	SIX-LINED RACERUNNER	<i>Cnemidophorus sexlineatus</i>
	SAND DUNE LIZARD	<i>Sceloporus arenicolus</i>
	PLAINS GARTER SNAKE	<i>Thamnophis radix</i>

Species with 10- <20% of predicted distribution in Status 1 or 2:

There are 165 species (24%) with 10- <20% of their predicted habitat within Status 1 and 2 lands within New Mexico. Of these 165, 43 have been identified as Species of Greatest Conservation Need in New Mexico (NMDGF 2005). This includes 6 amphibians (23%), 103 birds (26%), 43 mammals (27%), and 13 reptiles (13%). There are 12 species that have little habitat mapped within the state (<100 km²) and 24 species with between 100-1000 km² of mapped habitat. Included among the species that fall within this gap status list are the Jemez Mountains Salamander, Sacramento Mountain salamander, elf owl, Baird's sparrow, and white-nosed coati.

Species with 20 -<50% of predicted distribution in Status 1 or 2:

Within New Mexico, there are 56 species (8%) with 20- <50% of their predicted habitat occurring within Status 1 and 2 lands. Of the 56, 26 have been identified as Species of Greatest Conservation Need in New Mexico (NMDGF 2005). This includes 4 amphibians (15%), 26 birds (7%), 13 mammals (8%), and 13 reptiles (13%). There were 4 species that had little habitat mapped within the state (<100 km²) and 8 species with between 100-1000 km² of mapped habitat. Species include Chiricahua leopard frog, Madrean alligator lizard, marten, blue grouse, and northern goshawk.

Species with at least 50% representation in GAP Status 1 and 2:

There are 3 species (<1%) with predicted habitat occurring within Status 1 and 2 lands greater than 50%. Of the 3, 2 have been identified as Species of Greatest Conservation Need in New Mexico (NMDGF 2005). These species include sedge wren, and 2 reptiles (canyon spotted whiptail, and ridge-nosed rattlesnake). All three species have little habitat mapped within the state (<30 km²).

Nevada

We mapped 520 species within Nevada including 17 amphibians (46% of amphibians modeled for region), 317 birds (73% of birds modeled for region), 129 mammals (60% of mammals modeled for region), and 57 reptiles (44% of reptiles modeled for region).

Species with <1% of predicted distribution in Status 1 or 2:

There are 14 species that have less than 1% of their habitat on Status 1 and 2 lands within the state of Nevada (Table 5-13). These include 12 birds and 2 mammals. Many of these species are on the periphery of their range in Nevada.

Species with 1- <10% of predicted distribution in Status 1 or 2:

There are 71 species with 1- <10% predicted habitat within Status 1 and 2 lands within the state of Nevada. These include 4 amphibians, 45 birds, 17 mammals, and 5 reptiles. There are 20 species identified as Species of Greatest Conservation Need (SGCN) including sage sparrow, ferruginous hawk, greater sage-grouse, Columbian sharp-tailed grouse, mountain beaver, pygmy rabbit, river otter, dark kangaroo mouse, pale kangaroo mouse, pygmy short-horned lizard, and greater short-horned lizard (NDOW 2005).

Table 5-13. Animal species with 0-<1% of predicted habitat distribution in GAP Status 1 or 2 for Nevada as mapped by the Southwest Regional Gap Analysis Project.

Taxon	SWReGAP Common Name	SWReGAP Scientific Name
Bird	BOHEMIAN WAXWING	<i>Bombycilla garrulus</i>
	BROAD-WINGED HAWK	<i>Buteo platypterus</i>
	COMMON REDPOLL	<i>Carduelis flammea</i>
	LAWRENCE'S GOLDFINCH	<i>Carduelis lawrencei</i>
	VEERY	<i>Catharus fuscescens</i>
	INCA DOVE	<i>Columbina inca</i>
	PALM WARBLER	<i>Dendroica palmarum</i>
	BRONZED COWBIRD	<i>Molothrus aeneus</i>
	BLACK-BELLIED PLOVER	<i>Pluvialis squatarola</i>
	EASTERN KINGBIRD	<i>Tyrannus tyrannus</i>
	WHITE-THROATED SPARROW	<i>Zonotrichia albicollis</i>
	HARRIS'S SPARROW	<i>Zonotrichia querula</i>
	Mammal	UTAH PRAIRIE DOG
UINTA GROUND SQUIRREL		<i>Spermophilus armatus</i>

Species with 10-<20% of predicted distribution in Status 1 or 2:

There are 226 species with 10-<20% of their predicted habitat within Status 1 and 2 lands within Nevada. These include 4 amphibians, 138 birds, 69 mammals, and 15 reptiles. There are 42 species that are identified as SGCNs including: desert horned lizard, American white pelican, white-faced ibis, canvasback, northern goshawk, snowy plover, rufous hummingbird, willow flycatcher, Virginia's warbler, Merriam's shrew, Inyo shrew, spotted bat, Allen's chipmunk, western jumping mouse, kit fox, Townsend's big-eared bat, and Columbia spotted frog (NDOW 2005).

Species with 20 -<50% of predicted distribution in Status 1 or 2:

Within Nevada, there are 161 species with 20-<50% of their predicted habitat occurring within Status 1 and 2 lands. These include 7 amphibians, 102 birds, 27 mammals, and 25 reptiles. Of these 159, 54 have been identified as Species of Greatest Conservation Need in Nevada (NDOW 2005). These include southwestern toad, desert tortoise, desert night lizard, Gila monster, common loon, eared grebe, bald eagle, peregrine falcon, black tern, yellow-billed cuckoo, Costa's hummingbird, white-headed woodpecker, black phoebe, Bendire's thrasher, grace's warbler, bell's vireo, montane shrew, hoary bat, California leaf-nosed bat, northern flying squirrel, pocket gopher, and Mojave black-collared lizard (NDOW 2005).

Species with at least 50% representation in GAP Status 1 and 2:

There are 52 species with predicted habitat occurring within Status 1 and 2 lands greater than 50%. These species include 2 amphibians, 22 birds, 16 mammals, and 12 reptiles. Of these 52, 14 have been identified as Species of Greatest Conservation Need in Nevada (NDOW 2005). These include: relict leopard frog, western banded gecko, western lyre snake, least bittern, spotted owl, tricolored blackbird, gray-crowned rosy-finch, cave

Myotis, big free-tailed bat, American pika, Palmer's chipmunk, marten, desert pocket mouse, and common chuckwalla (NDOW 2005).

Utah

We mapped 526 species within Utah including 16 amphibians (43% of amphibians modeled for region), 324 birds (74% of birds modeled for region), 130 mammals (60% of mammals modeled for region), and 56 reptiles (43% of reptiles modeled for region).

Species with <1% of predicted distribution in Status 1 or 2:

There are 13 species that have less than 1% of their habitat on Status 1 and 2 lands within the state of Utah (Table 5-14). These species include 11 birds (3% of the birds mapped within the state), 1 mammal (<1% of the mammals mapped within the state), and 1 reptile (2% of the reptiles mapped within the state). Of the total habitat mapped within Utah, seven of these species have <100 km². Two of the species have between 100-1000 km² of habitat mapped within the state. A list of animal species whose predicted habitat distributions are <1% within Status 1 and 2 lands in the state of Utah is provided below in Table 5-14.

Table 5-14. Animal species with 0-<1% of predicted habitat distribution in GAP Status 1 or 2 for Utah as mapped by the Southwest Regional Gap Analysis Project.

Taxon	SWReGAP Common Name	SWReGAP Scientific Name
Bird	RUDDY TURNSTONE	<i>Arenaria interpres</i>
	CHESTNUT-COLLARED LONGSPUR	<i>Calcarius ornatus</i>
	LONG-TAILED DUCK	<i>Clangula hyemalis</i>
	PALM WARBLER	<i>Dendroica palmarum</i>
	WOOD THRUSH	<i>Hylocichla mustelina</i>
	ACORN WOODPECKER	<i>Melanerpes formicivorus</i>
	WHITE-WINGED SCOTER	<i>Melanitta fusca</i>
	HOUSE SPARROW	<i>Passer domesticus</i>
	RED-NECKED GREBE	<i>Podiceps grisegena</i>
	LEAST TERN	<i>Sterna antillarum</i>
	TENNESSEE WARBLER	<i>Vermivora peregrina</i>
Mammal	BELDING'S GROUND SQUIRREL	<i>Spermophilus beldingi</i>
Reptile	PYGMY SHORT-HORNED LIZARD	<i>Phrynosoma douglasii</i>

Species with 1-<10% of predicted distribution in Status 1 or 2:

There are 116 species with 1-<10% predicted habitat within Status 1 and 2 lands within the state of Utah. These include 1 amphibian (6% of those mapped in UT), 85 birds (26% of those mapped in UT), 26 mammals (19% of those mapped in UT), and 4 reptiles (7% of those mapped in UT). Of their total mapped distributions within Utah, three of these species have <100 km². Twelve of the species have between 100-1000 km² of habitat mapped within the state.

Twenty-five of these species are recognized as being Species of Greatest Conservation Need within the state of Utah (UDWR 2005). Included among the species within this GAP status threshold are the bobolink, Columbian sharp-tailed grouse, Gunnison sage-grouse, greater sage-grouse, relict leopard frog, olive-backed pocket mouse, pygmy rabbit, Utah prairie dog, white-tailed prairie dog, and the smooth green snake.

Species with 10-<20% of predicted distribution in Status 1 or 2:

There are 238 species with 10-<20% of their predicted habitat within Status 1 and 2 lands within Utah. These include 10 amphibians (63% of those mapped in UT), 135 birds (42% of those mapped in UT), 74 mammals (56% of those mapped in UT), and 19 reptiles (34% of those mapped in UT). Of their total mapped distributions within Utah, eight of these species have <100 km². Sixteen of the species have between 100-1000 km² of habitat mapped within the state.

Fifty-five of these species are recognized as being species of greatest conservation need within the state of Utah (UDWR 2005). Included among the species within this GAP status threshold are bighorn sheep, lynx, kit fox, spotted bat, Townsend's big-eared bat, silver-haired bat, river otter, sage sparrow, willow flycatcher, yellow-billed cuckoo, northern goshawk, burrowing owl, desert tortoise, northern leopard frog, and western toad,

Species with 20 -<50% of predicted distribution in Status 1 or 2:

Within Utah, there are 154 species with 20-<50% of their predicted habitat occurring within Status 1 and 2 lands. These include 5 amphibians (31% of those mapped in UT), 92 birds (28% of those mapped in UT), 28 mammals (21% of those mapped in UT), and 29 reptiles (52% of those mapped in UT). Of their total mapped distributions within Utah, six of these species have <100 km². Thirty-one of the species have between 100-1000 km² of habitat mapped within the state.

Forty-one of these species are recognized as being species of greatest conservation need within the state of Utah (UDWR 2005). Included among the species within this GAP status threshold are the black-throated gray warbler, California condor, gray vireo, spotted owl, plateau striped whiptail, big free-tailed bat, desert shrew and silky pocket mouse.

Species with at least 50% representation in GAP Status 1 and 2:

There are 10 species with predicted habitat occurring within Status 1 and 2 lands greater than 50%. These species include 3 birds (<1% of those mapped in UT), 4 mammals (3% of those mapped in UT), and 3 reptiles (5% of those mapped in UT). Of their total mapped distributions within Utah, one of these species has <100 km². Six of the species have between 100-1000 km² of habitat mapped within the state.

Four of these species are recognized as being species of greatest conservation need within the state of Utah (UDWR 2005). Included among the species within this GAP status threshold are the Mogollon vole, Stephen's woodrat, desert night lizard and long-tailed brush lizard.

DISCUSSION

Limitations and Discussion

When applying the results of our analyses, it is critical that the following limitations are considered: 1) the limitations described for each of the component parts (land cover mapping, animal habitat mapping, stewardship mapping) of the gap analysis, 2) the spatial and thematic map accuracy of each component, and 3) the suitability of the results for the intended application (see [Appropriate and Inappropriate Use of these data in Chapter 7](#)).

Assessing the conservation status of natural land cover is limited by certain confounding factors. One challenge is to produce a land cover map that is ecologically and spatially accurate while adequately representing the habitat requirements for terrestrial animal species. Previous GAP efforts have found the accuracy of the mapped distributions of natural land cover to be substantially lower and more variable than that of predicted animal habitat distributions. Mapping at the ecological systems level provided an appropriate scale for a project of this size, which by reducing the variability in the land cover units, improved the accuracy of the land cover map and the delineation of wildlife habitat. An important assumption behind any aggregation of biotic units (e.g. above species) is that the aggregated unit serves as a surrogate for species or lower levels of biotic organization, which may under-represent actual conservation needs (Pressey and Logan 1995). Another challenge is that we cannot distinguish the degree of natural condition or value of the mapped units due to management manipulation, exotic invasion, or spatial configuration.

In addition to the general limitations of accuracy given a project of this scale, there are several considerations that must be acknowledged in regard to the land cover data set in particular. For example, the encroachment of invasive plants such as cheatgrass or tamarisk was not captured in the land cover data set, unless it occurred as a dominant presence, in relatively homogenous, well established sites. “Disturbed” land cover types represent what was present at the time of image acquisition and ground reconnaissance. Several of these cover types incorporate to some degree human management of the vegetation. However, recently burned areas, for instance, may not be represented in the land cover map if the fire took place since the time the imagery was acquired land cover types with restricted, highly specialized niches were either under the minimum map unit for mappability (1 acre) or had low numbers of training sites, and were not mapped. Ultimately, thematic mapping involves placing a *continuum* of land cover into *discrete* land cover classes. Distinctions between certain land cover types such as grassland, shrub-steppe, and shrubland, tend to be gradual and can be difficult to detect. Therefore, some land cover types are more similar than others. For more information on land cover map validation and fuzzy accuracy assessment of individual land cover types, see Chapter 2.

With regard to the relative distribution of land cover types in Status 1 and 2 lands, we found that ecological systems that occur at higher elevations such as in the alpine and sub-alpine zones, are typically afforded greater levels of protection. This is not unexpected as much of the region's federally protected lands are at higher elevations. On the other hand, ecological systems occurring at lower elevations such as the valley bottoms and footslopes, tend to have less protection. These lower slopes and valleys tend to be more accessible, and are often considered "managed" landscapes, supporting multiple human uses.

Similar to limitations provided for land cover there are limitations to the species habitat analysis. There are no established area criteria for adequate representation for each species. This is particularly true for conservation efforts on species because of life history differences. Even within genera, there can be a wide variance of needed habitat for species survival. We focused our attention within this chapter on species and GAP Management status analysis, but stewardship data are available for further analyses ([Appendix 5-14](#)). We also focused on total habitat for the species and not on seasonal aspects of species ecology (e.g. breeding), which is also available ([Appendix 5-15](#)). As mentioned in Chapter 3, all habitat modeled within this project does not constitute occupied habitat as factors such as fragmentation, condition, and microhabitat factors play a significant role in species occurrence.

Representation between states and within the region varied by species. Some differences may be the result of species on the periphery of their range. It is important to consider that some species with little identified habitat in Status 1 and 2 lands may have their biological needs met in existing Status 3 and 4 lands. Additionally, Status 3 and 4 lands may provide better habitat because of microhabitat or other non-modelable reasons.

We compared our analysis to the recent Comprehensive Wildlife Conservation Strategy (CWCS) effort by each state. We found both similarity and dissimilarity between GAP and each state's CWCS. Species not identified by CWCS but that are identified as a "gap species" should minimally be reviewed by natural resource agencies. Species like bronzed cowbird should be excluded from conservation efforts but other, previously unidentified species may warrant review and possible inclusion into Species of Greatest Conservation Need. Providing this information to resource agencies engaged in conservation planning is one objective of GAP.

The analysis supports the need for regional projects such as SWReGAP. Species and land cover can be state protected (Status 1 and 2 lands >10%) and regionally unprotected (Status 1 and 2 lands <10%). The converse is also true. For both land cover types and animal-habitat conservation, the entirety of the range needs to be addressed. Regional efforts also allow ecoregion analyses to be completed. A separate gap analysis was recently completed for the Colorado Plateau ecoregion. A series of reports including analyses of land stewardship, land cover, and predicted animal habitat distributions are to be published in the upcoming Colorado Plateau III book.

Finally, as we stated in the introduction to this chapter, it is unrealistic to identify a standard measure constituting “adequate representation” of land cover or species distribution for biodiversity conservation. What gap analysis provides is a quantitative and systematic approach to assessing representation within a geographic framework. This framework provides data that can be used to focus attention on biota of concern within specific geographic regions. Determining which biota is of concern ultimately must be carried out by individual practitioners, agencies, and organizations with concerns about biodiversity in the region. The results in this chapter and the data provided by the SWReGAP project offer a starting point for further analysis, summary, and biological assessment.



Cactus Wren (*Camphlorhynchus brunneicapillus*)

Photographer: John J. Mosesso, NBII Digital Image Library