

COLORADO PLATEAU

The Colorado Plateau Ecoregion includes portions of Arizona, Utah, Colorado, and New Mexico. The Arizona portion covers 22.9 million acres, dominated by desertscrub and shrublands (CSE and others 2002; Tuhy and others 2002). Elevation ranges from about 1200 to 9200 feet, averaging about 5700 feet. It features extensive plains broken by sheer-walled canyons and buttes, and includes the Grand Canyon. Precipitation ranges from about 5 to 30 inches per year, with a high proportion falling in winter. Average temperatures vary seasonally and along elevation gradients, with all of the ecoregion receiving some snowfall.

Due to the high elevation of most of the ecoregion, the temperature extremes and their influence on vegetative communities can be significant. This, along with the low precipitation received in most seasons, causes very low vegetative diversity in most of the area. Many of the native grassland communities have also been converted to monotypic stands of desertscrub and woodlands. Soils are very thin and less than fertile due to lack of vegetative cover; leaching of nutrients by solar radiation, wind, and water action; and the generally low potential of sandstone substrates.

Vegetative communities at the higher elevations of the Kaibab Plateau and isolated higher elevations of the Arizona Strip consist of large conifer trees, predominantly ponderosa pine and spruce/fir forest, as well as aspen, which have been variably subjected to commercial timber harvest for the past century. Timber harvest directly removes wildlife habitat, and requires development of a significant transportation system to allow the removal of the harvest.

Historically, the Colorado Plateau Ecoregion was settled for domestic livestock ranching and small subsistence farming enterprises associated with Mormon settlement of the area. Most of the private lands were homesteaded, where water was available, by the Mormon church. Almost all of the public and state trust lands are leased for grazing.

Other enterprises in the area are centered on providing for the needs of travelers and visitors to the scenic and natural wonders that abound in the ecoregion. The ecoregion has the highest density of national parks, monuments and recreation areas of anywhere in the United States. This ecoregion contains NPS- and BLM-administered areas such as: the Grand Canyon, Lake Powell, Lake Mead, the Petrified Forest, the Wupatki ruins, Sunset Crater, Walnut Canyon, Grand Canyon-Parashant, Marble Canyon, Paria Canyon-Vermillion Cliffs. Many of these areas and additional parks, monuments, natural and wilderness areas cross state and tribal borders. Hence the NPS, BLM, and tribal governments are important partners in developing a comprehensive plan for preservation and enhancement of wildlife diversity in this ecoregion.

The Colorado Plateau Ecoregion in Arizona contains no major urban centers, but numerous rural communities. The largest population centers are Page, Fredonia, Kayenta, Window Rock, Tuba City, Winslow, and Holbrook. Neighboring communities of Kanab and St. George (Utah), Gallup (New Mexico), and Flagstaff are also exerting an influence on the ecoregion. Numerous smaller communities, mostly along the Arizona/Utah and Arizona/New Mexico state boundaries, complete the list of population centers. As human uses of the ecoregion increase, fragmentation due to roads and new urban and rural development continues to be a problem for maintaining

biodiversity. Most recent human development of the area has been restricted to the previously developed areas around existing population centers. Page, Arizona and St. George, Utah are the only examples of “urban” sprawl, with significant increases in developed area over the past 25–30 years.

As more people come to the area, there is an increased demand for recreational opportunity on public lands in the ecoregion. The increasing population leads to new demands on lands that were previously lightly impacted by man. Wildlands of the Colorado Plateau Ecoregion are used by the public for hiking, hunting, sightseeing, back-roading, birding, camping, fishing, and a whole assortment of other recreational and wildlife-oriented pursuits. Of particular concern is the increased use of off-road vehicles, which are associated with increased roads and increased vehicle use in all of the wildlands of the ecoregion.

While the impacts associated with human settlement are increasing in the ecoregion, most of the land in the Colorado Plateau Ecoregion is federally or tribally owned, and is expected to continue so into the foreseeable future. This factor will help ensure wildlife diversity in the ecoregion if planning and partnering with the federal and tribal landowners is maximized. Acquisition of lands for conservation of wildlife habitat values is less desirable or not a viable alternative in most of the ecoregion, although some limited opportunities do exist around communities in the Little Colorado River Valley.

The Colorado Plateau Ecoregion is entirely within the Colorado River watershed. Perennial tributaries to the Colorado River include the Paria and Little Colorado rivers, Tapeats, Kanab, and Havasu creeks. While the mainstem of the Colorado River is controlled by a series of dams, the tributaries are all relatively unencumbered by water control structures. Many smaller tributaries in the ecoregion are mainly intermittent. Most of the area within the ecoregion is very arid. Water for wildlife and livestock is supplemented by water developments such as guzzlers, catchments, and spring-fed tanks and troughs. Even the high elevation forests of the Kaibab Plateau, Mt Trumbull and Black Rock Mountain depend on human constructions to ensure adequate water for the needs of important wildlife species.

For an expanded description of each habitat type and characterization of statewide threats to each, see “Statewide Condition of Arizona’s Terrestrial and Riparian/Aquatic Habitat Types (Element 2).” See Appendix O for scoring of all stressors in each habitat type. The descriptions provided do not attempt to depict conditions on sovereign tribal lands. The nature of these stressors in Arizona is presented more fully under “Stressors that Impact Wildlife and Wildlife Habitats (Element 3).”

Species of Greatest Conservation Need (Element 1)

For more information on these species, see “Conservation Actions to Address Stressors to SGCN (Elements 3, 4).” A complete list of species, including those of lower conservation priority and of undetermined vulnerability status can be found in Appendix I. For some species in Table 19, this part of their distribution may not represent a key area for conservation actions.

Table 19. Tier 1a and 1b SGCN associated with each habitat type in the Colorado Plateau Ecoregion.

Scientific Name	Common Name	Desert- scrub	Grasslands		Woodlands/Forests				Human Dominated*	Aquatic & Riparian		
		Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petrans Montane Conifer Forest	Petrans Subalpine Conifer Forest		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
Amphibians												
<i>Bufo microscaphus</i>	Arizona Toad	X	X		X	X				X	X	
<i>Rana onca</i>	Relict Leopard Frog	X								X	X	
<i>Rana pipiens</i>	Northern Leopard Frog	X	X			X				X	X	X
Birds												
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk			X	X	X	X	X		X	X	X
<i>Aechmophorus clarkii</i>	Clark's Grebe								X	X	X	X
<i>Ammodramus savannarum perpallidus</i>	Western Grasshopper Sparrow		X						X			
<i>Anthus spragueii</i>	Sprague's Pipit		X									
<i>Ardea alba</i>	Great Egret								X	X	X	X
<i>Botaurus lentiginosus</i>	American Bittern								X	X	X	X
<i>Buteo regalis</i>	Ferruginous Hawk		X	X		X			X			
<i>Catharus ustulatus</i>	Swainson's Thrush	X		X		X	X	X	X	X	X	
<i>Ceryle alcyon</i>	Belted Kingfisher								X	X	X	X
<i>Charadrius alexandrinus nivosus</i>	Western Snowy Plover								X	X		X
<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo					X			X	X	X	X
<i>Contopus cooperi</i>	Olive-sided Flycatcher	X	X	X	X	X	X	X	X	X	X	X
<i>Dumetella carolinensis</i>	Gray Catbird								X	X	X	X
<i>Egretta thula</i>	Snowy Egret								X	X	X	X
<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher					X			X	X	X	X

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		Mohave Desertscrub	Plains & Great Basin Grassland	Subalpine Grassland	Interior Chaparral	Great Basin Conifer Woodland	Petrans Montane Conifer Forest	Petrans Subalpine Conifer Forest		Streams/ Rivers	Wetlands/ Springs	Lakes/ Reservoirs
<i>Microtus mexicanus hualpaiensis</i>	Hualapai Mexican Vole					X	X					
<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	X	X	X	X	X	X	X		X	X	X
<i>Perognathus flavus goodpasteri</i>	Springerville Pocket Mouse		X									
<i>Sorex nanus</i>	Dwarf Shrew			X				X	X			
Reptiles												
<i>Gopherus agassizii</i> (Mohave Population)	Mohave Desert Tortoise	X	X									
<i>Lampropeltis triangulum taylori</i>	Utah Milksnake		X			X						

*Human-dominated landscapes here refer to agricultural areas and urban lakes. These habitat types are discussed under "Statewide Condition of Arizona's Terrestrial and Aquatic/Riparian Habitat Types," and in "Stressors to Arizona's Wildlife and Wildlife Habitat" under the stressor "Urban/rural development."

Terrestrial habitat types below are arranged in order of prevalence in this ecoregion. Where patches of uncharacteristic habitat types (not described in this section) occur in this ecoregion, conservation should reflect stressors and species identified in neighboring ecoregions.

Plains and Great Basin Grasslands
(34.9% of acreage)

Habitat Condition (Element 2)

Prior to settlement of the region, much of this vegetative type was comprised of cool season, perennial grasses. Lightly populated by nomadic bands of the indigenous humans, the grasslands were not subject to heavy grazing by ungulates until the introduction of livestock (sheep, goats and horses) by Spanish explorers and missionaries. With the introduction of these influences, much of the native grasslands were heavily grazed to the point that conversion to shrubs and other woody species occurred (Johnson and Elson 1979, Gori and Enquist 2003, Finch 2004). There is a tendency for the Plains and Great Basin grassland type to convert to Desertscrub and/or Great Basin Conifer Woodlands when subjected to the combined effects of heavy livestock use, unnatural fire regimes and generalized warming of the region's climate (Wright

Neuenschwander and Britton 1979, White 2002, Stevens and Monson 2004). Most of the middle to lower elevation basins and benchlands along major canyon systems have been converted to these two habitat types and is public land managed by the BLM and NPS. A large percentage of the ecoregion's desertscrub/grassland habitat is located on tribal lands belonging to the sovereign nations of the Navajo and Hopi tribes.

Much of the grassland type is still being heavily used by livestock and continues to degrade in vegetative diversity and coverage, with bare soil predominating in many areas of formerly productive grasslands. Major human activities associated with this change include livestock grazing, off-highway vehicle travel, rural development and urbanization of nearby population centers.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate, rural development, human population growth in this ecoregion and in metropolitan Phoenix and Tucson.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Habitat fragmentation/barriers

Habitat degradation/shrub invasions

Loss of keystone species

Unnatural fire regimes

Management for game animals and sport fish

Soil erosion

Stressor Category: Climate Change

Shift to warmer climate

Drought

Stressor Category: Consumptive use of biological resources

Harvesting/collecting animals

Grazing by ungulates

Stressor Category: Habitat conversion

Rural development

Livestock management

Stressor Category: Invasive species

Nuisance plants

Disease/pathogens/parasites

Nuisance animals

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Right-of-way fencing along roadways

Unauthorized roads & trails
Power lines/wind-harnessing turbines

Great Basin Desertscrub
(27.5% of acreage)

Habitat Condition (Element 2)

Over 50% of the ecoregion is covered by this habitat type along with Plains and Great Basin grasslands. When the Ecoregion Workgroup evaluated stressors for the Colorado Plateau, the Plains and Great Basin Grassland and Great Basin Desertscrub habitat types were combined due to the interspersion of the two and the commonality of the threats to each. Most of the middle to lower elevation basins and benchlands along major canyon systems are covered by these habitat types. Most of it is public land managed by the BLM and NPS, with a large percentage of the ecoregion's desertscrub/grassland habitat on the sovereign nations of the Navajo and Hopi tribes (Turner 1994b).

Much of this habitat type is present due to degradation of former Desert and Great Basin Grassland communities by heavy livestock grazing pressure over the past 150 years. Further influences include: soil loss due to wind and water erosion, invasive species effects; groundwater depletion and invasion by nonnative grass and shrub species. Mining and road development for powerlines, wind turbine farms and general off-highway vehicle use are other effects from development of the ecoregion for energy production (Stevens and Monson 2004). The condition of this habitat type is degraded and not expected to improve due to soil loss, widespread invasive species influences and a shift to a warmer climate with longer periods of drought and continued desertification of a large expanse of the ecoregion.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate, human population growth in this ecoregion and in metropolitan Phoenix and Tucson.

Major Stressors Affecting Habitat (Element 3)

See stressors under "Plains and Great Basin Grassland."

Great Basin Conifer Woodland
(30.7% of acreage)

Habitat Condition (Element 2)

Historically found only at somewhat lower elevations than the Montane Conifer forest and on poorer soils at mid-elevations, this habitat type has expanded in distribution and density predominately on public lands managed by the Kaibab National Forest, Grand Canyon National Park, Arizona State Land Department and the BLM. Significant acreage of this habitat type is also now found on Hualapai, Navajo and Hopi tribal lands as well as on neighboring privately held lands. This habitat type is replacing plains and desert grasslands vegetation in many locales. Major human activities that may be associated with the changes observed include many, if not

all, of the commodity production activities in which human populations engage to ensure their continued existence. These activities include livestock grazing, timber harvest, fire suppression, introduction of nonnative species and other activities, many of which cause changes in vegetative composition through creation of conditions which favor woody species over perennial grasses and forbs (Aro 1971, Johnson and Elson 1979, Wright and others 1979, Everett 1987, Ffolliot and Gottfried 2002, Stevens and Monson 2004). All of these are exacerbated by the influence of a shift to a warmer climate and by the current pervasive drought. Much of the vegetative diversity provided by plains and desert grasslands habitats is lost when pinyon-juniper vegetation becomes established in nearly monotypic stands. Soil erosion results from creation of bare soil under these woody species, followed by the resulting unimpeded overland flows. The effect of soil losses is conversion of the soil profile to a near permanent barren state lacking any "A" horizon, in which the bulk of plant growth takes place. Management of these habitats requires balancing the needs of species dependent on the woodland type with the needs of grassland obligates in planning and prioritization of actions.

The current trend of this habitat type is expansion in distribution and density in the face of an apparent shift to a warmer climate. Concurrently, significant portions of typical pinyon – juniper vegetation have lost the pinyon pine component to bark beetle and other insect infestations induced by drought stress. The effect has been creation of a monotypic juniper stand of reduced value to wildlife due to the loss of significant mast production (pinyon nuts). This has made the habitat type more vulnerable to treatments, and may allow conversion of these landscapes back to a grassland or shrub dominated type.

Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in neighboring metropolitan areas.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Stressor Category: Changes in Ecological Processes

Management for game animals and sport fish

Soil erosion

Habitat degradation/shrub invasions

Habitat fragmentation/barriers

Unnatural fire regimes

Insect Infestation

Loss of keystone species

Soil erosion

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Harvesting/collecting animals

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Disease/pathogens/parasites

Nuisance plants

Nuisance animals

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Pollution

Illegal dumping/littering

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Unauthorized roads & trails

Right-of-way fencing along roadways

Mohave Desertscrub

(3.7% of acreage)

Habitat Condition (Element 2)

This habitat type is found at the lower elevations of the far western reaches of the ecoregion in the Grand Wash and at the very bottom of the Grand Canyon in a narrow band which reaches as far east as the confluence of the Little Colorado River. It provides a diversity of habitats in the canyons which results in corresponding diversity of wildlife in the public lands managed by the NPS and BLM (Turner 1994a).

It is likely that the distribution and vegetative composition of this habitat type in this ecoregion is nearly the same as during pre-settlement times. However, the invasion of the riparian zone along the Colorado River by saltcedar and other nonnatives may be reducing the diversity of this type as native species such as blackbrush are outcompeted for water and nutrients. This conversion is likely to increase with increased fluctuation in river flow regimes leading to mortality of native species during flood stage bank scouring and removal of soil. Increased grazing pressure by nonnative herbivores, including feral horses and burros, exacerbates this effect through removal of ground cover in upland areas (Turner 1994a, Stevens and Monson 2004).

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate and the effects incursions of nonnative plant and animal species.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use

Water diversion/water catchments

Stressor Category: Changes in Ecological Processes

Unnatural fire regimes

Habitat fragmentation/barriers

Soil erosion

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Nuisance plants

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Pollution

Noise pollution

Stressor Category: Transportation and infrastructure

Unauthorized roads & trails

Montane Conifer Forest **(2.4% of acreage)**

Habitat Condition (Element 2)

The commercial forests of the ecoregion are made up of almost pure stands of ponderosa pine with some interspersions of subalpine conifer forest at higher elevations. Most of this habitat type is found on the Kaibab Plateau north and south of the Grand Canyon. This forested land is managed by the USFS and NPS. Other significant amounts are situated on the Hualapai and Navajo tribal lands. A small amount of this vegetative type is found on the tops of isolated mountains such as Mt. Trumbull, Mt. Dellenbaugh and Black Rock Mountain, managed by the Arizona Strip District of the BLM. Most of the forest type off of the Kaibab National Forest is not commercially harvested to any extent except on Mt. Trumbull, which is being managed to demonstrate the influence of various levels of forest restoration treatments through removal of varying levels of ponderosa pine overstory. The results of this experiment will help determine the direction of forest restoration treatments as a standard management practice in the Southwest pine forests. While disagreement with estimates of pre-settlement conditions exists in the academic and scientific communities, it remains obvious that the structure and makeup of the montane conifer forests is different, in many respects, from historic condition. The large, mature, "old growth" forests of the ecoregion were replaced by over-populated stands of even-age ponderosa pine due to heavy commercial logging and associated fire suppression activities. Heavy fuel loads have caused stand replacement fires in large wildfire events over the past 25 – 30 years. Due to the large scale of the area involved, efforts to combat the effects of unnatural fire regimes have been largely confined to the urban interface to protect housing and other human development. Road building, dispersed recreation and use of the forest understory for livestock grazing also has had negative influence on the species composition and distribution of vegetative communities throughout this habitat type (Pase and Brown 1994b, Friederici 2004, Stevens and Monson 2004).

The condition of this habitat type is severely degraded but with active management in place to restore condition to an indeterminate "pre-settlement" condition. The major point of departure remains achieving consensus on what this condition was.

Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in metropolitan areas of the state.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

- Insect Infestation
- Soil erosion
- Habitat fragmentation/barriers
- Habitat degradation/shrub invasions
- Unnatural fire regimes
- Management for game animals and sport fish

Stressor Category: Climate Change

- Drought
- Shift to warmer climate

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates
- Forest and woodland management - consumptive use

Stressor Category: Habitat conversion

- Forest and woodland management - habitat conversion
- Livestock management
- Rural development
- Recreational sites/facilities

Stressor Category: Invasive species

- Nuisance plants
- Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

- Dispersed camping
- Motorized recreation off-trail

Stressor Category: Pollution

- Noise pollution
- Lead shot/fishing line

Stressor Category: Transportation and infrastructure

- Roads for motorized vehicles
- Unauthorized roads & trails
- Air traffic corridors/overflights
- Right-of-way fencing along roadways

Subalpine Conifer Forest
(0.6% of acreage)

Habitat Condition (Element 2)

The majority of this habitat type is found at the higher elevations of the North Kaibab Plateau and is interspersed with the Montane Conifer forest type at mid-elevations in canyons and on

north-facing slopes of some hills. Small pockets of this type also exist on isolated mountains such as Mt Trumbull, Mt. Dellenbaugh and Black Rock Mountain on the Arizona Strip. Most of this habitat is public land managed by the Kaibab National Forest, Grand Canyon National Park, and Arizona Strip District of the BLM. Much of this type, mostly on the North Kaibab plateau, has been heavily logged. The general condition of this habitat type is currently degraded. Much of it has failed to return to former vegetative composition and function due to loss of soil moisture and temperature increases wrought by overstory removal. Significant shifts in composition of many guilds and species have occurred (Pase and Brown 1994b, Stevens and Monson 2004).

The large, mature, "old growth" mixed conifer forests of the ecoregion were replaced, in many locations, by over-populated stands of even-age ponderosa pine due to heavy commercial logging, silvicultural treatments (eg. tree planting) and associated fire suppression activities. Heavy fuel loads have caused stand replacement fires in large wildfire events over the past 25 – 30 years. Road building, dispersed recreation and use of the forest understory for livestock grazing also has had negative influence on the species composition and distribution of vegetative communities throughout this habitat type. The overall general condition of this habitat type is degraded but with active management, expected to have some effect in the foreseeable future.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate and increased dependency of an increasing human population on the area for recreation as well as commodity needs.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

- Habitat fragmentation/barriers
- Insect Infestation
- Soil erosion
- Unnatural fire regimes
- Management for game animals and sport fish
- Soil erosion

Stressor Category: Climate Change

- Shift to warmer climate
- Drought

Stressor Category: Consumptive use of biological resources

- Forest and woodland management - consumptive use
- Grazing by ungulates

Stressor Category: Habitat conversion

- Forest and woodland management - habitat conversion
- Livestock management

Stressor Category: Invasive species

- Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

- Motorized recreation off-trail

Stressor Category: Transportation and infrastructure

Air traffic corridors/overflights
Unauthorized roads & trails
Roads for motorized vehicles

Interior Chaparral

(0.05% of total acreage)

Habitat Condition (Element 2)

This habitat type is found in neighboring parts of the Mohave Desert Ecoregion, with some representation in this ecoregion. The following major stressors were assessed for this habitat type in the Mohave Desert Ecoregion.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Mining

Stressor Category: Changes in Ecological Processes

Soil erosion
Habitat degradation/shrub invasions
Unnatural fire regimes

Stressor Category: Climate Change

Drought

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management
Rural development

Stressor Category: Invasive species

Nuisance plants

Stressor Category: Transportation and infrastructure

Telephone lines/cellphone towers
Power lines/wind-harnessing turbines

Subalpine Grassland

(0.04% of total acreage)

Habitat Condition (Element 2)

This vegetative community occurs in this ecoregion only on the Kaibab Plateau north of the Grand Canyon. Most of this is public land managed by the USFS and NPS. The condition of this habitat type may be considered degraded due to decreased plant species diversity, large amounts of bare soil, and continued loss of topsoil to wind and water action; however, the physical geography of the North Kaibab plateau may cause these grasslands to express a more alpine character since they are situated in valleys and natural bowls at high elevation (8200 to 8800

feet). Plant communities are not diverse and tend more toward forbs and low shrub-like species than to the "tussock grasslands" described by Walter (1973; cited in Brown 1994). There is very little difference in the character of these grasslands from the previously heavily grazed National Forest lands to the same vegetative type found on Grand Canyon National Park, an area supposedly lightly grazed in the past.

Historically very heavy livestock grazing has been the dominant land use. Continued heavy grazing by both livestock and wildlife (mule deer, elk) within areas of this habitat type may be impeding recovery. Encroachment on the Subalpine grassland by conifers, a result of heavy grazing, lowered water tables and increased average temperatures, serves to reduce the total amount of "meadow" habitat when over-story tree species proliferate (White 2002, Stevens and Monson 2002, Pase and Brown 1982).

Due to the open nature of the landscape, creation of unauthorized roads, along with the increasing demand for recreational opportunities, is also of concern due to the loss of vegetation and compaction of soil which results when the open "meadow" habitats are used for dispersed camping and off-highway vehicle "romping".

Stressors described below reflect resulting changes in ecological process as well as impacts related to a shift to a warmer climate and increased dependency of an increasing human population on the area for recreation as well as commodity needs.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Changes in Ecological Processes

- Unnatural fire regimes
- Soil erosion
- Management for game animals and sport fish
- Habitat fragmentation/barriers

Stressor Category: Climate Change

- Shift to warmer climate

Stressor Category: Consumptive use of biological resources

- Grazing by ungulates

Stressor Category: Habitat conversion

- Livestock management

Stressor Category: Transportation and infrastructure

- Roads for motorized vehicles

Riparian and aquatic systems in the Colorado Plateau include:

Wetlands/Springs/Seeps

Habitat Condition (Element 2)

Wetlands, springs, and seeps are rare features in the Colorado Plateau, and all are critical to maintain. Few major wetlands exist in the ecoregion. There are innumerable springs and seeps

associated with the major canyon systems. Many of these are habitat for distinct populations of invertebrates (for example: springsnails and ambersnails) and plants which are federally listed.

Prior to settlement of the ecoregion by contemporary civilizations the springs and wetlands of the Colorado Plateau were largely undeveloped except those that had been discovered and utilized by prehistoric indigenous peoples to support their agriculture. Most of these known waters were centers of their cultures and when they abandoned them the waters reverted largely to their original condition. Settlers found and used these waters for the same purposes as the native cultures. The water sources eventually became the centers of contemporary cultures. In this respect most were impacted by human "development" prior to European settlement of the area. Natural conditions likely included small wetlands and riparian areas in short reaches of the drainages in which the springs and seeps occurred. Many of these are centers of human development to this day. Most have been significantly degraded in species diversity and/or impacted by introduction of nonnative plant and animal species. Modern impacts to these areas are largely associated with burgeoning human development and recreation activities (White 2002, Stevens and Monson 2004).

Stressors described below reflect resulting changes in ecological process as well as impacts related to a trend toward a warmer climate, continued dependence on the waters of the ecoregion for supplying the needs of a growing human population in this ecoregion and in the metropolitan areas of Arizona.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Water diversion/water catchments
Mining

Stressor Category: Changes in Ecological Processes

Streambank alteration/channelization
Soil erosion
Habitat fragmentation/barriers
Habitat degradation/shrub invasions

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Habitat conversion

Livestock management

Stressor Category: Invasive species

Nuisance animals
Disease/pathogens/parasites
Nuisance plants
Bait-bucket dumping/illegal stocking

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail

Stressor Category: Pollution

Lead shot/fishing line

Stressor Category: Transportation and infrastructure

Canals/pipelines

Unauthorized roads & trails

Streams/Rivers

Habitat Condition (Element 2)

Rivers in the Colorado Plateau ecoregion include the Colorado River and its tributaries the Little Colorado River, Paria River and Kanab Creek. Other creeks and washes are mainly intermittent watercourses which run water only periodically. Prior to settlement of the ecoregion by contemporary civilizations the streams and rivers of the Colorado Plateau were largely undeveloped except those that had been discovered and utilized by the prehistoric indigenous peoples to support their agriculture. Most of these known waters were centers of their cultures and when they abandoned them the waters reverted largely to their original condition. European settlers found and used these waters for the same purposes as the native cultures. The water sources eventually became the centers of contemporary cultures. In this respect most were impacted by human "development" prior to European settlement of the area. Natural conditions likely included small riparian zones along short reaches of the drainages downstream from the sources and watersheds of higher elevations. Many of the accessible riparian zones are centers of human development to this day. Most have been significantly degraded in species diversity and/or impacted by introduction of nonnative plant and animal species. Modern impacts to these areas are largely associated with burgeoning human development and unrestricted recreation activities. The likelihood that the impacts will be mitigated in the near future is very low. However, the long range outlook for mitigation of impacts is fairly optimistic due to technological advances in hydro-electric generators, water column variable intakes, tempering valves, etc. The remainder of the streams will likely remain pretty much as they are or could possibly be improved by restoration of watershed condition of the surrounding uplands.

Stressors described below reflect resulting changes in ecological process as well as impacts related to a trend to a warmer climate and an increased dependence of the human population on resources supplied by this ecoregion.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Mining

Groundwater depletion and springhead use

Water diversion/water catchments

Stressor Category: Changes in Ecological Processes

Streambank alteration/channelization

Soil erosion

Habitat degradation/shrub invasions

Habitat fragmentation/barriers

Altered river flow regimes

Stressor Category: Climate Change

Drought

Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Habitat conversion

Livestock management

Dams/reservoirs/impoundments

Recreational sites/facilities

Stressor Category: Invasive species

Nuisance plants

Bait-bucket dumping/illegal stocking

Nuisance animals

Disease/pathogens/parasites

Stressor Category: Non-consumptive resource use

Scientific research and collection

Motorized recreation off-trail

Watercraft operation

Stressor Category: Pollution

Heavy metals/mine tailings

Pesticides/herbicides

Sediment/ash flows

Contaminants from waste water and runoff

Lead shot/fishing line

Nutrients/algal blooms

Stressor Category: Transportation and infrastructure

Canals/pipelines

Unauthorized roads & trails

Lakes/Reservoirs

Habitat Condition (Element 2)

Portions of large man-made lakes including Lake Powell and Lake Mead exist in the ecoregion. These lakes are important for sport fishing and other water-based recreation. Additionally, these flood-control impoundments significantly influence the flows, sediment transport, water quality, and wildlife habitat characteristics of the Colorado River. All lakes and reservoirs of the ecoregion were created by impoundment of major river systems. When the waters were impounded to form these large bodies of water significant changes were wrought in the river systems impounded. Complete loss of natural flow, temperature and nutrient cycling regimes occurred with associated influences on native wildlife species. This was compounded in most instances by the introduction of nonnative fish, crustacean, and amphibian species for sport fish production. Unnatural conditions were created on the streambanks with invasive nonnative plant species such as salt cedar prevailing. The likelihood that the impacts will be mitigated in the near future is very low. However, the long range outlook for mitigation of impacts is fairly optimistic

due to technological advances in hydro-electric generators, water column variable intakes, tempering valves, etc.

Stressors described below reflect resulting changes in ecological process as well as impacts related to human population growth in this ecoregion and in neighboring metropolitan Phoenix.

Major Stressors Affecting Habitat (Element 3)

Stressor Category: Abiotic resource use

Groundwater depletion and springhead use
Water diversion/water catchments
Mining

Stressor Category: Changes in Ecological Processes

Soil erosion
Habitat degradation/shrub invasions
Altered river flow regimes
Soil erosion

Stressor Category: Climate Change

Drought
Shift to warmer climate

Stressor Category: Consumptive use of biological resources

Grazing by ungulates

Stressor Category: Invasive species

Bait-bucket dumping/illegal stocking
Disease/pathogens/parasites
Nuisance animals
Nuisance plants

Stressor Category: Non-consumptive resource use

Motorized recreation off-trail
Watercraft operation

Stressor Category: Pollution

Lead shot/fishing line
Contaminants from waste water and runoff
Nutrients/algal blooms
Pesticides/herbicides
Heavy metals/mine tailings

Stressor Category: Transportation and infrastructure

Roads for motorized vehicles

Stressors that do not have habitat-level impacts in this ecoregion but may have large species-level impacts on specific SGCN in this ecoregion (Element 3)

In some cases, a stressor may have significant impacts to individual SGCN, but impacts are not felt throughout the habitat. Regardless of the extent of ecosystem-wide impacts, in any habitat type where these stressors act on SGCN, the appropriate conservation actions apply (see

“Conservation Actions to Address Stressors to SGCN (Elements 3, 4)”). The following stressors do not have significant ecosystem-level impacts any habitat type in this ecoregion, but where they act, they will negatively affect the associated SGCN in habitat types on the Colorado Plateau where these species occur. Note that for wide-ranging species, impacts from some stressors may be quite significant, but may not act on the species throughout its range.

Stressor Category	Stressor	Scientific Name	Common Name
Habitat conversion			
	Wetland filling for mosquito control		
		<i>Ardea alba</i>	Great Egret
		<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo
		<i>Egretta thula</i>	Snowy Egret
Transportation and infrastructure			
	Railroads		
		<i>Gopherus agassizii</i> (Mohave Population)	Mohave Desert Tortoise