STATEWIDE CONDITION OF ARIZONA'S TERRESTRIAL AND RIPARIAN/AQUATIC HABITAT TYPES (ELEMENT 2)

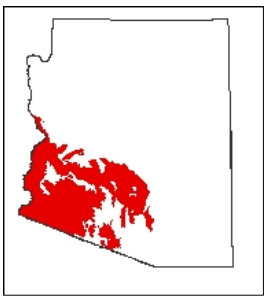
Traditionally, the Department has managed wildlife and evaluated resources at the landscape level (habitat type) and below. Brown and Lowe (1974) vegetation communities were used to represent habitat types in the CWCS since this classification is imbedded in most of the commonly used ecoregion and province classifications for Arizona (Table 14).

Table 14. Percentages of habitat types owned by different Arizona land owners.

Community Type	Community Description	AZ Game & Fish	Federal	Other	Private	State Trust	Tribal	Sum*
Desertscrub	Upland Sonoran	0.03	43.95	3.84	11.94	16.61	23.62	100%
	Chihuahuan	0	30.58	0.18	25.85	43.39	0	100%
	Great Basin	0.01	20.67	0	5.88	3.49	69.93	100%
	Lwr Colorado R Sonoran	0.06	45.02	10.10	22.54	10.17	12.12	100%
	Mohave	0.03	72.52	0.11	17.41	5.03	4.90	100%
Desertscrub Total		0.04	42.86	4.88	15.84	11.81	24.57	100%
Grasslands	Plains and Great Basin	0.06	11.82	0.02	28.51	15.82	43.77	100%
	Semidesert	0.05	26.31	1.60	33.67	32.68	5.70	100%
	Subalpine	0	85.50	0	0.47	0	14.03	100%
Grasslands Total		0.05	18.11	0.68	30.55	22.77	27.84	100%
Woodlands	Alpine Tundra	0	100.00	0	0	0	0	100%
	Great Basin Conifer	0.07	38.12	0	13.00	7.71	41.10	100%
	Interior Chaparral	0	66.67	0	10.13	15.36	7.84	100%
	Madrean Evergreen	0.06	71.92	0.06	10.36	8.10	9.49	100%
	Montane Conifer	0.07	64.80	0	3.82	1.30	30.01	100%
	Subalpine Conifer	0	70.70	0	0.16	0	29.14	100%
Woodlands Total		0.06	50.51	0.01	10.39	7.39	31.65	100%

* Each row represents 100% of that habitat type; columns are not additive. Percentages based on ASLD GIS data.

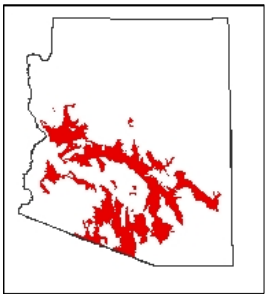
DESERTSCRUB



Lowland Sonoran: elevation 100-3000 ft

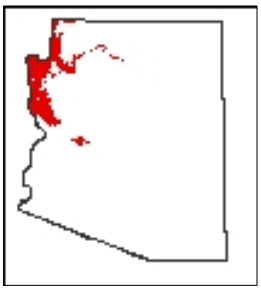
Vegetation is dominated by low, open stands of creosotebush and bursage. Smaller areas that have low, undrained and salt-affected soils commonly are dominated by saltbush, acacia, and mesquites. Has annual species, sometimes referred to as "ephemerals," since they grow only after brief moist periods and are short-lived. Other conspicuous species include: desert broom, chuparosa, ocotillo, cholla, ironwood, palo verde, desert willow, and canyon ragweed.

More than 21% of the area formerly occupied by lowland Sonoran desertscrub has been replaced by development or agriculture, the highest proportion of any vegetation community in the state. The remainder is rapidly shrinking and being fragmented by urban expansion, especially on private and former State Trust lands in the vicinity of Yuma and Phoenix. Habitat values on much of the undeveloped land are somewhat degraded due to livestock grazing (Hall and others 2005, Nabhan and Holdsworth 1999). However, 45% of this community is within federal lands, including National Wildlife Refuges and military lands which are ungrazed and have limited other human disturbances.



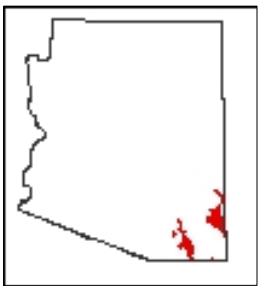
Upland Sonoran: elevation 500-3500 ft
Leguminous trees and succulents are abundant. Tree species include: foothill and blue palo verde, ironwood, mesquites, and cat-claw acacia. The giant saguaro cactus is found in this community, as are numerous other succulent species including: chollas, pincushions, barrel cacti, organpipe, ocotillo, hedgehog, and prickly-pear. Other conspicuous species include: creosotebush, jojoba, brittlebush, desert hackberry, triangle-leaf bursage, ratany, desert broom, desert willow, and chuparosa.

The area occupied by upland Sonoran desertscrub has lost about 8% due to development or agriculture. The remainder is rapidly shrinking and being fragmented by urban expansion, especially on private and former State Trust lands in the vicinity of Tucson and Phoenix. Habitat values on much of the undeveloped land are somewhat degraded due to livestock grazing (Hall and others 2005, Nabhan and Holdsworth 1999). However, 44% of this community is within federal lands, including National Park Service lands and BLM National Monuments.



Mohave: elevation 1000-5500 ft
Landscapes are typically quite barren and desolate in appearance with low, scattered shrubs; predominately creosotebush, brittlebush, bursage, desert holly, shadscale, and blackbrush. Annuals cover the ground in wet years. Although this landscape is shrub-dominated and lacks giant cacti and many tree species, several large plants such as the Joshua tree and Mohave yucca are common, and mesquites and cat-claw acacia are present (Turner 1994a).

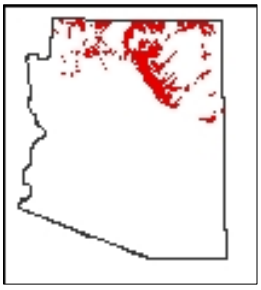
Mohave desertscrub has lost about 5% of its historic distribution in Arizona due to agriculture and low-density development. More than 75% of its distribution is federally managed, including National Park Service and BLM national monument lands, and thus probably secure from those threats.



Chihuahuan: elevation 2000-5500 ft
Vegetative community consists of many species of shrubs, leaf succulents, and small cacti. Indicator species include: creosotebush, tarbush, and whitethorn acacia. Trees are rare, but numerous species of small cacti such as prickly pear, cholla, barrel, and hedgehog are present. Other

conspicuous species present include: ocotillo, mesquites, desert zinnias, agaves, century plant, sandpaperbush, and a number of yuccas.

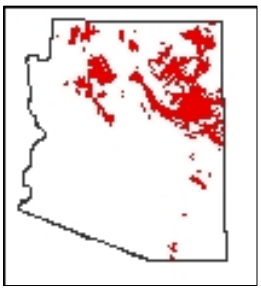
The area occupied by upland Chihuahuan desertscrub has lost about 9% due to development or agriculture. Additional losses are expected due to low-density housing development, especially along the San Pedro River valley. Livestock grazing impacts, especially in the late 1800s, caused significant changes in the soils and vegetation which may be slow to recover (Bahre and Shelton 1996, Sayre 1999).



Great Basin: elevation 3000-6500 ft
Vegetation consists mostly of scattered low, small-leafed shrubs and almost no trees or succulents. Indicator species are big sagebrush and shadscale. Other conspicuous species present include: blackbrush, Mormon-tea, four-wing saltbush, greasewood, rabbitbrush, horsebrush, and winterfat (Turner 1994b).

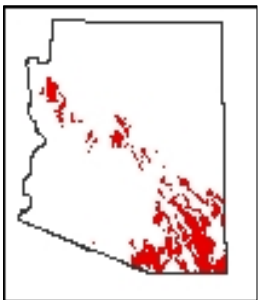
The area occupied by Great Basin desertscrub has remained largely unchanged within historic times. Improper grazing management has caused widespread habitat degradation, especially from the late 1800s through middle 1900s (Tuhy and others 2002).

GRASSLANDS



Plains and Great Basin: elevation 5000-7000 ft
Perennial grass dominated landscape usually composed of mixed or short-grass communities. Blue, black, and sideoats gramas are important. Other important grasses include: buffalo-grass, Indian rice grass, Galleta grass, prairie Junegrass, Plains lovegrass, vine mesquite grass, Texas Timothy, and alkali sacaton. Shrubs such as four-wing saltbush, sagebrush, winterfat, cholla, and rabbitbrush may be scattered throughout. Junipers have invaded large areas of all types of grasslands in the Southwest. Forbs are abundant.

The area occupied by Plains and Great Basin grasslands has remained largely unchanged within historic times. These grasslands are in good condition across about 38% of their distribution. Moderate levels of shrub invasion (10-35% cover) affect about 45%, and the remaining 16% is dominated by shrubs or nonnative grasses, or suffers from severe erosion (TNC data; Schussman and Gori 2004). Lack of regular fires and high grazing pressure, including historic periods of overgrazing combined with drought, may have led to conversion of areas from grassland to Great Basin desertscrub or Great Basin conifer woodland (Finch 2004, ACERP 1995). Due to the attractiveness of low-lying valley bottoms for housing development, losses from this source are expected to grow with increasing population pressures in Arizona.



Semidesert: elevation 3500-4500 ft

Originally, the grasses were perennial bunch grasses, the bases of the clumps separated by intervening bare ground. Currently, three-awn and tobosa species together with grama grasses dominate. Some areas are essentially pure stands of grass. In other places, an open savanna with grasses beneath oaks or mesquites is common. Most areas are characterized by short-grasses interspersed with a variety of low-growing trees, shrubs, and cacti. Grass species include: black, blue, sideoats and hairy gramas, buffalo grass, Plains lovegrass, little bluestem, Plains bristlegrass, fluffgrass, burrograss, Lehmann lovegrass, and hairy tridens. Forbs and weeds are abundant. Other conspicuous species present include: acacias, prickly-pear cactus, century plant, cholla, and yuccas.

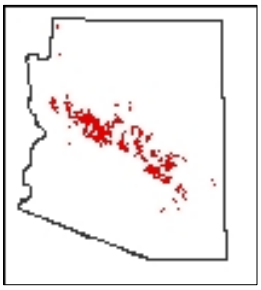
The condition of semidesert grasslands is good across about 9% of its range. Moderate levels of shrub invasion (10-35% cover) affect about 39%, and the remaining 52% is dominated by shrubs or nonnative grasses, or suffers from severe erosion (TNC data; Schussman and Gori 2004). Lack of regular fires and high grazing pressure, including historic periods of overgrazing combined with drought, may have led to conversion of large areas from grassland to Chihuahuan desertscrub. This community has also lost about 10% of its historic extent to development and agriculture. Due to the attractiveness of low-lying valley bottoms for housing development, losses are expected to continue as population pressures increase in Arizona.

There are several separate issues involved in restoration of this habitat type, and the scientific community has different opinions on potential for restoration. Some scientists believe that native grasses cannot be restored because of changes in soil characteristics and lowering of the water table. Some places have been restored with long periods of decreased grazing pressure. Grazing rest or reduction of grazing pressure is generally not occurring on most State Trust and private lands. Drought and climate change impact the ability of this vegetative community to recover. Natural fire, which historically maintained this community, no longer occurs in much of the habitat due to lack of grasses to carry the fire. A natural fire regime is not likely to be restored on most of the Semidesert Grassland because of continued grazing pressure and development of human communities within the vegetation type. There have been some successes at restoring Semidesert Grassland with herbicides to reduce shrubs and thereby promote grasses, but these efforts have been on a small scale and expensive. High human use, both because of the increasing human population and because of heavy border activity, is degrading the habitat and decreasing the value of the habitat for wildlife. In some places, introduced nonnative plants (for example, Lehmann lovegrass) have invaded the natural vegetation and caused ecosystem changes that may not be reversible. In places where nonnative grasses have become established, an unnaturally frequent and intense fire regime is established, which furthers the spread and dominance of the nonnatives.

Subalpine: elevation 8500+ft
Typically a high elevation, lush grassland habitat dominated by perennial bunchgrasses and forbs. Unlike plains and desert grasslands, subalpine grasslands receive relatively high average annual precipitation.

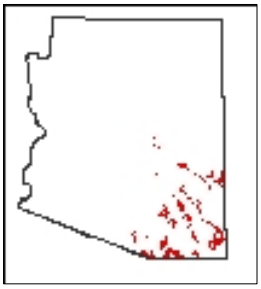
The area covered by subalpine grasslands has remained somewhat stable through historic times, although there are areas, such as the North Kaibab plateau, which have seen conifer and aspen incursion at the expense of grasslands. The vegetation communities of subalpine grasslands have been affected by grazing or, less commonly, fire, leading to reductions in native bunchgrasses and increases in shrubs and herbaceous plants (Brown 1994).

WOODLANDS / FORESTS



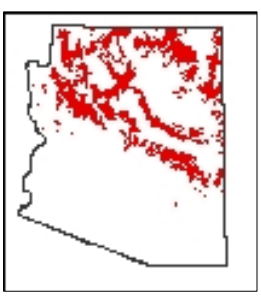
Chaparral: elevation 4000-6000 ft
Often comprised almost entirely of 2 species of manzanita and shrub live oak, which form a dense, nearly impenetrable thicket. Receives substantial summer rainfall. Because of the high percentage of crown cover, forbs and grasses are not abundant except in the scattered interscrub openings or after a fire event. Other conspicuous species present include: birchleaf mountain-mahogany, skunkbush sumac, silktassels, and desert ceanothus. Succulents such as prickly-pear cactus, agaves, and yuccas commonly grow alongside shrubs.

The area occupied by chaparral has remained largely unchanged within historic times. Chaparral ecosystems were subjected to treatments such as mechanical manipulation, and herbicides in the 1950's and 1960's to increase water yield and grazing potential. Because of their high accessibility and relatively gentle terrain, these ecosystems were heavily grazed by goats, especially between 1880 and 1920, and until 1940 (Pase and Brown 1994). Many of the important range grasses were eliminated from most of the sites and, as a result, have been confined to rocky protected areas (ACERP 1995).



Madrean: elevation 5000-7000 ft
Predominantly found in southeastern Arizona. Evergreen oaks dominate with junipers and sometimes pines also growing in the mix. Open savannas are common in some areas with numerous grasses growing beneath the oaks. Common tree species include: Emory oak, Mexican blue oak, Arizona oak, silverleaf oak, alligator bark juniper, one-seed juniper, and Mexican pinyon pine.

The area occupied by Madrean woodlands has remained largely unchanged within historic times. Fire suppression, both deliberate and incidentally from livestock grazing, has altered the community composition to favor trees and shrubs over grasses (McPherson 1992). Only about 6% of the Madrean woodlands have fire regimes which are severely altered from their historical range, but another 77% are moderately altered, creating a moderate risk of losing key ecosystem components (USFS data; Schmidt and others 2002). About 20% of Madrean woodland area is within areas managed with permanent protection for a primarily natural state (TNC 2004a).

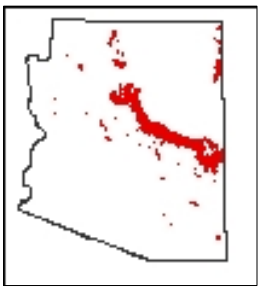


Great Basin Conifer: elevation 3400-8800 ft
Evergreen woodland dominated by juniper and pinyon-pine species. North of the Mogollon Rim, Utah and one-seed juniper are intermixed with

pinyon and to the south, alligator juniper grows. Colorado Pinyon-pine is the characteristic species throughout nearly the entire zone. Singleleaf pinyon grows locally intermixed with Utah juniper, mostly in northwestern Arizona. Grassland, desertscrub, or chaparral woodland may form an understory beneath and between woodland trees, depending on the area.

Great Basin conifer woodlands have been significantly affected by changes in fire regime, livestock grazing, and mechanical or chemical treatments (Monsen and Stevens 1999, Stevens and Monson 2004). Due to increased density of tree canopies and of invasive grass species, widespread crown fires are predicted and the area of these woodlands may decline, to be replaced by shrublands or grasslands (Gruell 1999, Tausch 1999). Only about 11% of the Great Basin conifer woodlands have fire regimes which are severely altered from their historical range, but another 70% are moderately altered, creating a moderate risk of losing key ecosystem components (USFS data; Schmidt and others 2002). Pinyon pines have recently experienced widespread mortality due to drought and insects, affecting 1.2 million acres (9% of total distribution in Arizona) during 2002-2004 (Breshears and others 2005; USFS 2003, 2004b, 2005). The area occupied by Great Basin conifer woodland has remained largely unchanged within historic times. About 69% of this community is within areas managed with permanent protection for a primarily natural state (TNC 2004a).

Montane Conifer: elevation 6000-9000 ft

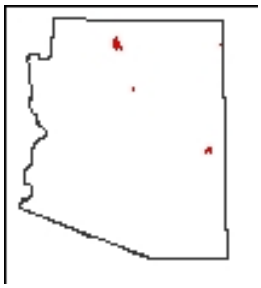


Ponderosa pine dominates, with Douglas fir and white fir growing in varying proportions. Other tree species include limber pine, southwestern white pine, Gambel oak, silverleaf oak, bigtooth maple, and quaking aspen. Many stands of ponderosa pine are relatively open or park-like, which permits the growth of grasses, forbs, shrubs, and broadleaf trees as understory. Mainly located along the southern rim of the Colorado Plateau in central Arizona as an unbroken ponderosa pine forest. In southern Arizona, the Montane Conifer Forest grows primarily on the larger mountains as "islands."

The area of forested lands in Arizona, primarily conifer forests, has been reduced by about 10% since 1630, based on historic estimates. More detailed estimates of timberland suggest a reduction of about 2.6% for the period 1953-2002 (USFS 2003). Only about 7.6% of montane conifer area is within areas managed with permanent protection for a primarily natural state (TNC 2004a).

Changes in fire regime and forest management have changed many conifer forest stands from well-spaced groups of large trees to closed thickets of small trees, resulting in decreased diversity of grasses, forbs and shrubs. Mortality of large trees by disease, insects, or high-intensity crown fires has replaced the understory thinning action of low-intensity ground fires (Dahms and Geils 1997). Approximately 58% of the montane conifer forests have fire regimes which are severely altered from their historical range, creating a high risk of losing key ecosystem components (USFS data; Schmidt and others 2002). Recent insect outbreaks,

amplified by drought and high winter temperatures, caused widespread die-off in ponderosa pines affecting 1.3 million acres (27% of total distribution in Arizona) during 2002-2004 (USFS 2003, 2004b, 2005). These dead trees will likely support additional large fires in the future.



Alpine Conifer: elevation 8000-9000 ft
A mix of many coniferous and one deciduous species characterize these spruce-alpine fir woodlands. The principal boreal conifers are: Engelmann spruce, blue spruce, corkbark fir, white fir, Douglas fir, bristlecone pine and limber pine. Quaking aspen is the dominant deciduous species; both intermixed with various coniferous species and in pure stands. Dense overstories common to these forests severely limit or prevent growth of herbaceous vegetation.

Due to their limited distribution in Arizona, the alpine conifer forests have been disproportionately affected by a small number of development projects such as ski runs, communication towers, and observatories (Patten and Stromberg 1995, Dahms and Geils 1997). They also experienced significant tree mortality due to drought and insects, affecting 77,000 acres (32% of total distribution in Arizona) during 2002-2004 (USFS 2003, 2004b, 2005). Historically, subalpine conifer forest was insulated from fire by the surrounding lower-elevation fire-resistant mixed conifer, which historically burned regularly but not catastrophically; the mixed conifer was thinned naturally by fire, and fire did not usually invade into the wetter subalpine spruce fir forest. With the current unnaturally high tree density in mixed conifer, and the resulting high fuel loads, the subalpine conifer forest is now being lost to fire and disease. Approximately 79% of the alpine conifer forests have fire regimes which are severely altered from their historical range, creating a high risk of losing key ecosystem components due to destructive crown fires (USFS data; Schmidt and others 2002).

Tundra: elevation 11,000-12,600 ft
Located on the peaks of the San Francisco Mountains in northern Arizona. Extreme cold temperatures exclude trees and succulents. Dominant plants are ground-hugging woody shrubs and perennial herbs.

This community has very limited distribution in Arizona, occurring on just two mountain peaks (Brown 1994). The only significant stressor is trampling and other disturbance by hikers, but climate change could lead to reductions in this community due to an upward shift in treeline (Bowman and others 2002, Tuhy and others 2002).

Human-dominated landscapes:
The current status of many species in Arizona, especially birds, depends on the quality of non-traditional habitat. Some native wildlife species are attracted to pastures and irrigated agricultural lands. In particular during migration and winter, many species of birds including raptors, egrets, herons, ibis, shorebirds, waterfowl, blackbirds, and sparrows often congregate locally in exceptional numbers in these human-altered landscapes. Urban sprawl is rapidly converting adjacent agricultural lands into residential and commercial developments, much to the detriment of many species. Conversely, residential and urban ponds, lakes, and canals often attract

thousands of wintering waterfowl and other waterbirds such as coots, grebes and cormorants. These permanent urban water impoundments and subsequent fish populations have also encouraged the local establishment of heron and cormorant nesting colonies.

RIPARIAN / AQUATIC SYSTEMS

Maintaining aquatic and riparian habitats is critical to maintaining the biological diversity of the ecoregion. Water resources throughout the state are currently over-allocated such that conflicts are increasing between human uses and maintenance of biological diversity. Active land and water management planning will be critical to accommodating the anticipated human population growth while maintaining biological diversity.

Riparian and aquatic systems throughout Arizona have been uniformly impacted in dramatic fashion from the pre-settlement condition. Three major sources of impact are worthy of discussion: Prevailing drought; impacts from livestock management to riparian areas and watersheds; and introduction of nonnative organisms. Other factors causing significant local impact include pollution; off-road vehicular use; changes to watercourses from diversion, impoundments and beaver removal; and fire on watersheds resulting in high siltation.

Prevailing drought conditions in Arizona are at their most extreme within recorded history. This directly results in lower input to both surface and subsurface water resources. Many springs and seeps have dried up within the last few years for the first time in living memory. This has direct severe impact on the wildlife and plant communities dependent on them. Rivers and streams have lower flow regimes and reduced seasonal peaks. This affects the life histories of riparian and aquatic organisms in multiple ways.

Emphasis on preservation of livestock grazing as a viable use of public lands has conflicted with efforts to preserve watershed condition in many areas. Many rangeland watersheds have been damaged over the years such that soils have been lost and plant communities altered. This impacts the nature of runoff events into streams, rivers and lakes, and also impacts groundwater recharge. Stream flow patterns have become more "flashy," that is, more prone to high runoff events characterized by high velocities and silt loading, followed by dramatic reduction in flow. Previously, watersheds with better plant cover allowed vegetation to slow the impact of falling precipitation, reducing erosion, and organic material at the soil surface slowed runoff, allowing more recharge of soil moisture and subsurface aquifers. Degradation of this system by excessive removal of plant biomass and reduction in vigor is a positive feedback loop; deteriorating conditions further restrict plant vigor and moisture retention, leading to further degradation of the plant community. Currently many watercourses have been reduced from perennial meandering small streams and wetlands to gullies with ephemeral flows of high velocity and short duration. Gullies lower the effective wet zone below the reach of many riparian plant types, limiting banks to upland vegetation only. These processes are essentially irreversible at the landscape scale within human lifetimes.

Grazing by livestock and by elk (in some areas) has resulted in loss of recruitment of new individuals to the plant communities, especially among riparian trees. In many areas there is a

near total lack of riparian tree recruitment during most of the last 100 years. Trends are generally positive regarding this issue, with most land managers moving toward reduction or elimination of grazing in riparian areas. Areas that have received the most extensive relief have generally shown positive, sometimes remarkable improvement.

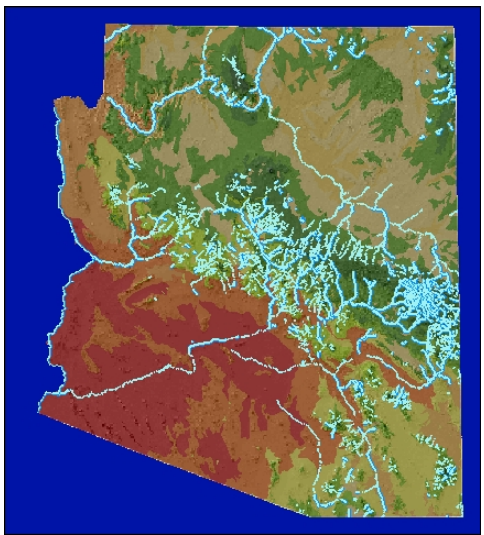
Nonnative organisms introduced deliberately and inadvertently have greatly modified the biota of riparian and aquatic systems throughout Arizona. In the aquatic environment, nonnative fishes, crayfish, and mollusks have essentially converted many aquatic communities to a different biota. Crayfish are an emerging threat of large magnitude in these aquatic systems. Native fish in Arizona are considered the most threatened taxa among Arizona native species, largely as a result of predation and competition with these nonnative organisms.

Off-road vehicle use has similarly affected localized riparian and aquatic areas throughout the state. In many areas, access by motorized vehicle is only possible by following the streamcourses. This has resulted in extensive damage by trampling banks and vegetation. This travel, and cross-channel fording adds to sediment loading of aquatic systems, reducing productivity and the integrity of systems downstream, and creating erosive actions that can lead to head-cutting upstream, with all of the associated adverse effects.

Artificial impoundments and diversion of watercourses occur throughout the state to varying degrees, dramatically changing many watercourses from the pre-settlement condition. Especially in smaller watercourses, loss of once-widespread beaver impoundments has altered aquatic habitats. Early explorers found many beaver in streams and wetlands throughout Arizona. These were profoundly reduced in the mid-1800s. Many watercourses apparently have changed as a result, with loss of more continuously connected wetland areas, increases in flow rate peaks, decreases in flow duration, and increases in both seasonal and area extent of periods of no flow. This has had profound effects on riparian and aquatic plant communities and their associated wildlife.

High intensity fires and those burning larger areas have profound affects on riparian and aquatic systems. Although direct consumption by fire can be locally destructive, the largest impacts result from impacts to the watershed, where ash and silt runoff results in erosive damage to the physical structure of watercourses. Silt and ash smother organisms, change water chemistry, destroy spawning habitat, and create turbidity that disrupts essential behaviors. Erosion resulting from fire impacts to watersheds can cause dramatic downcutting of watercourses, with all the resulting damage to both aquatic and riparian communities as discussed regarding gullies above.

Wetlands/Springs/Seeps – Scattered throughout the state, these landscapes provide critical habitat for a number of species. Wetlands, whether perennial or intermittent, provide important habitat for migrating waterfowl. All free-flowing seeps and springs provide water for wildlife consumption, while some are host to a number of rare and endemic species. This category also includes natural cienegas (marshes), tinajas (ephemeral pools), and stock



tanks. In addition, these features often support riparian vegetation which varies across the state but is often more diverse and lush than surrounding vegetation.

The statewide status of wetlands, springs, and seeps is not well documented, but most are thought to be greatly reduced from their prehistoric conditions. The distribution of cienegas has shrunk from formerly widespread to small, scattered remnants due to grazing and streambed modifications (Hendrickson and Minckley 1984). The remaining riparian areas are often subject to intensive utilization. Arizona has more than 6,400 mapped springs, but most have been diverted for human or livestock uses (Arizona State Land Department data; Stevens and Meretsky, in press). Construction of concrete "spring boxes" has resulted in many springs becoming unavailable to support riparian communities at the margins. Some of those have remnant outflow which still provides wildlife habitat (Pima County 2000). A survey of more than 220 springs in northern Arizona found 93% of springs on federal, non-National Park Service lands to be ecologically devastated or functioning at risk (Stevens and Springer 2004). Springs and cienegas are supported by locally high groundwater levels which can be drawn down by groundwater withdrawals, especially during times of drought (ADWR 1994). The current extended period of drought, combined with poor initial watershed condition, is causing many of these areas to go dry for the first time in recorded history. Approximately 11,800 acres of marsh habitat occurs within the Colorado River floodplain below Hoover Dam, including California (LCRMSCP 2004). Most researchers believe that this acreage is much higher now than historically because river dynamics prior to the construction of dams did not favor the establishment of marshes (Ohmart and others 1991). Most of this habitat is protected within federal and state wildlife refuges, but threats to the habitat and resident wildlife exist from selenium accumulation, wildfire, and vegetation accumulation and succession.

Streams/Rivers – Includes perennial and intermittent running waters and the associated riparian area. According to one data set, now somewhat outdated, Arizona has lost 35% of historically perennial river and stream flow (Brown and others 1981). Loss of natural perennial flow includes formerly perennial reaches that are now dry, mostly due to groundwater pumping and surface water diversions, and formerly perennial reaches that are now regulated, chiefly due to dam construction (ADWR 1994, Tellman and others 1997). According to a TNC analysis of Brown and others dataset, the loss of naturally flowing perennial reaches has been most profound on Arizona's big rivers - the Colorado, Gila, Salt, and Verde rivers - where 91% of free-flowing perennial miles have been lost. On moderate-sized rivers – the San Pedro, Santa Cruz, Little Colorado, White, Black, Blue, San Francisco, and Babocomari rivers - 37% of naturally flowing perennial reaches have been lost. In the remaining creeks and streams, which consist chiefly of streams draining the White Mountains and small discontinuous perennial flow reaches in other locations, at least 9% of free flowing perennial reaches have been lost.

As of 1993, Arizona had about 267,000 acres of riparian vegetation associated with perennial waters, covering approximately 0.4% of the state (Valencia 1993). Increasing human population in the state is expected to put added demands on water (ADWR 1994) and thus reduce the water available for wildlife or degrade its value as habitat. This would likely also reduce the area of riparian vegetation available as wildlife habitat (Valencia 1993). Many streams and rivers have become highly eroded, impacted by nonnative organisms, and converted to ephemeral flows as a

result of erosion and general watershed degradation. Riparian tree communities have been greatly reduced in extent due to overgrazing of seedlings necessary for recruitment and by altered flow regimes that reduce or eliminate conditions necessary for seed germination and seedling establishment. Many land managers are moving toward active acceptance of responsibility to manage these impacts from livestock on riparian areas, so the trends for condition of riparian habitat may begin to see improvement. Nonnative aquatic organisms are also having profound effects, however, and have eliminated or reduced native fish and aquatic invertebrates in many areas. Many waterways are under threat or have already been converted by crayfish to simple monocultures of crayfish and algae.

Lakes/Reservoirs – Includes small man-made lakes, backwater lakes, and large reservoirs, associated marshes and riparian vegetation throughout the state. Lakes and reservoirs were not a common or important part of the historic landscape of Arizona. Creation of reservoirs in Arizona has affected flows and introduced nonnative fish, crayfish, and mollusks in all major river systems except along the San Pedro. Currently, smaller human-created impoundments are of value to native wildlife. These smaller impoundments range from stock tanks of less than ½ acre in size up to local community/ranch ponds and small lakes. Most of these are dominated by nonnative fishes and have limited or no riparian areas associated with them. They provide locally important sources of drinking water for many wildlife species, and indeed are frequently the only sources of standing water over significant areas.

Arizona currently has about 492 square miles covered with water, mostly in artificial lakes (Tellman and others 1997). Since most of those lakes also have value for water storage and flood control, that area is not likely to decline. At least ten of Arizona's lakes have serious contamination by mercury or other toxins which affect fish, the result of mining or farming operations in their watersheds (ADEQ 2004).

ECOREGION-SPECIFIC HABITAT CONDITIONS (ELEMENT 2)

Ecoregions are defined as areas–on the scale of tens of millions of acres–that are characterized by phenomena that influence the character of specific habitat types. These large-scale phenomena include environmental conditions such as climate and landforms, as well as regional human activities and population centers. Terrestrial habitat types are summarized by ecoregion in Table 15. Terrestrial and aquatic/riparian habitat types are depicted by ecoregion in Figs. 3 and 4, respectively.

Table 15. Percentage of ecoregion occupied by each landscape.

		Percentage in each Ecoregion*					
Community Type	Landscape	AHN	AHS	AZNM	CP	MD	SD
Desertscrub	Upland Sonoran Desertscrub	0.39	0	0	0	1.33	46.68
	Chihuahuan Desertscrub	0.01	15.32	0	0	0	0
	Great Basin Desertscrub	0.34	0	0.61	27.49	0.85	0
	Lower Colorado River Sonoran Desertscrub	0	0	0	0	4.80	52.37
	Mohave Desertscrub	0.36	0	0	3.71	82.18	0.63

Desertscrub Total		1.10	15.32	0.61	31.20	89.16	99.68
Grasslands	Plains and Great Basin Grassland	13.91	1.96	13.04	34.96	0	0
	Semidesert Grassland	14.32	60.96	0	0	2.88	0.20
	Subalpine Grassland	0	0	0.88	0.04	0	0
Grassland Total		28.23	62.92	13.92	35.00	2.88	0.20
Woodlands	Alpine Tundra	0	0	0.02	0	0	0
	Great Basin Conifer Woodland	37.70	0.23	31.72	30.72	5.45	0.03
	Interior Chaparral	21.82	2.06	0.86	0.05	2.41	0.10
	Madrean Evergreen Woodland	2.93	18.13	0.18	0	0	0
	Petran Montane Conifer Forest	8.22	1.29	50.73	2.44	0.10	0
	Petran Subalpine Conifer Forest	0	0.05	1.96	0.58	0	0
Woodlands Total		70.67	21.76	85.47	33.79	7.96	0.13
*Percentages based on ASLD GIS data.							

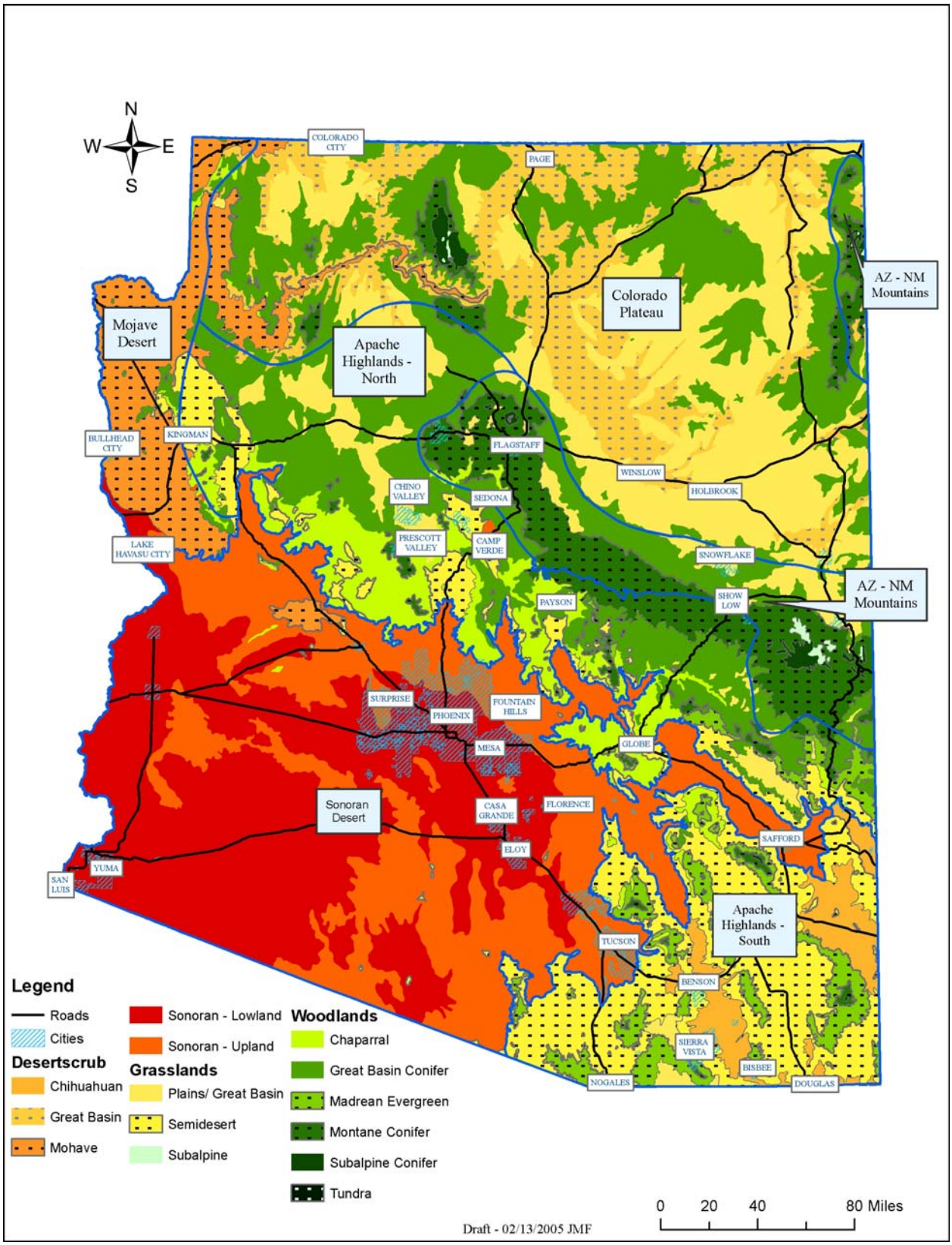


Figure 3. Habitat types and ecoregions identified in Arizona's CWCS.

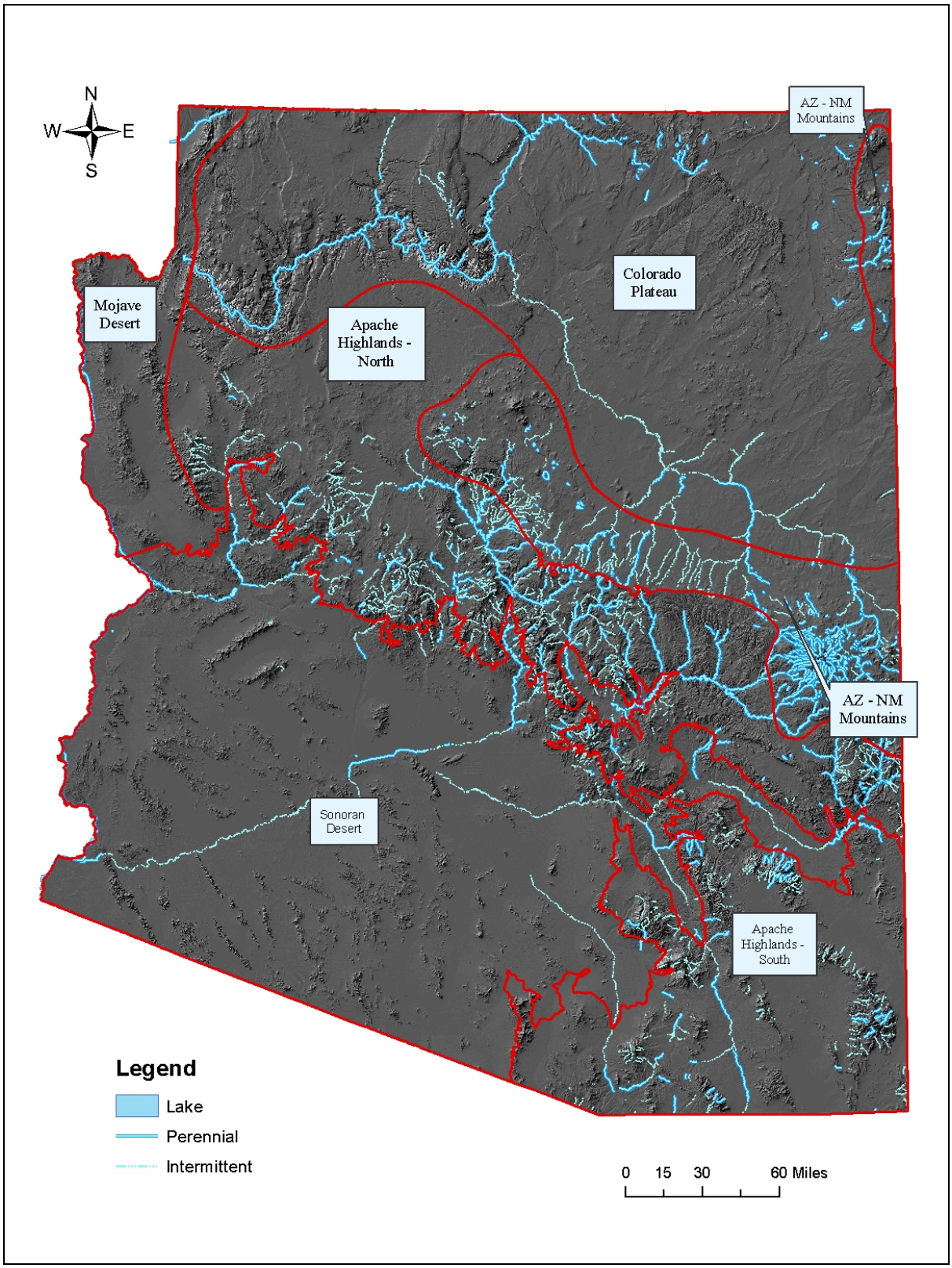


Figure 4. Riparian/aquatic habitat types and ecoregions identified in Arizona's CWCS.