

SECTION I INTRODUCTION



Why do people come to Arizona? Hiking in the desert? Birding in the southeast riparian galleries? The majesty of the Grand Canyon? The modern wonder of Hoover Dam? Is it the skiing in the high mountains? Rafting the Colorado River? Sunshine in all of those places?



Scenic vistas and wide, open spaces are a part of Arizona's allure.

The varied landscapes and climates that draw people from all over the world to Arizona are also responsible for the tremendous abundance of plant and animal diversity in this state. Ranking third in the nation for overall biodiversity, Arizona has 4,759 plant, invertebrate and vertebrate species of which 135 are endemic to this state (NatureServe 2002). All species that reside in and migrate through the state have habitat needs that include the basics for survival; food, shelter and water. Arizona supports nearly 900 vertebrate wildlife species in habitats of low deserts to alpine biotic communities ranging in elevation from only 70 feet to more than 12,500-feet above sea level (Swartz 2005). These spectacular

wildlife resources help fuel our state's economy through tourism, hunting and fishing, as well as enhancing the quality of our own lives.

To protect the safe movement of people and plan for a future that includes wildlife, a blueprint is needed for Arizona's remaining wildlife habitats promoting the conservation or restoration of linkages in areas important for wildlife movement. This report is a preliminary statewide linkage assessment identifying important wildlife habitat connectivity areas, or linkage zones, as well as the associated threats. It is anticipated that this document will serve as a planning tool for all types and levels of planning including development, transportation, wildlife management and conservation.

To ensure the survival and persistence of Arizona's wildlife, minimization of further fragmentation is required. Maintaining landscape connectivity can lessen the detrimental consequences caused by the built environment. The effects of economic growth do not have to be mutually exclusive from the preservation of our state's ecological resources. A comprehensive approach is needed to efficiently, effectively protect and maintain Arizona's natural areas. Cooperation of all those involved (federal, state and county agencies, special interest groups and private landowners) must be facilitated with early involvement.

The Challenge

As Arizona seeks economic growth, there is a pressing need to protect and enhance the environment. The Arizona Department of Economic Security projects that the state's population will increase by 54% from 4.7 million in 1998 to 7.4 million in 2020. The sixth largest state in land area, Arizona is rapidly losing its status as a state of wide-open spaces and low human impact. The unique natural areas that attract these new residents as well as visitors are being impacted and diminished at an unprecedented pace.

The most significant threats to Arizona's wildlife populations are habitat alteration, fragmentation, and loss. Some of the leading causes of these threats are development, transportation corridors and land conversion. Worldwide, 85% of endangered species are imperiled by habitat fragmentation (Shaffer et al. 2000).

On a local level, remnant populations of pronghorn antelope, bighorn sheep, desert tortoise, badger, and other species will be lost if habitat fragmentation continues unchecked. As connectivity between key habitat elements is lost, isolation deprives species of their daily, seasonal and lifetime needs. Loss of connectivity deprives animals of resources, prevents some animals from finding mates, reduces gene flow, prevents animals from re-colonizing areas where extirpations have occurred, and ultimately prevents animals from contributing to ecosystem functions such as pollination, seed dispersal, control of prey numbers, and resistance to invasive species. Maintaining biodiversity and ecosystem functions requires habitat connectivity (CERI 2001).

As a leading threat to habitat connectivity, transportation corridors cut through many large tracts of wildlife habitat, destroying and fragmenting their integrity. Upgrading the state's rural highways to support rapid growth and increased traffic creates new challenges. As two-lane roads are expanded to four-lane divided highways, heavily used wildlife corridors are further fragmented and highways become a serious impediment to wildlife movement. In some cases, wildlife alter their behavior to use culverts and bridge underpasses to reach portions of their habitats. For those species that cover smaller home ranges, including reptiles, access to previously utilized habitat is destroyed or cut off in perpetuity. These corridors can become either impassable to wildlife, or passable only at great risk to the traveling public and the wildlife crossing the highway.

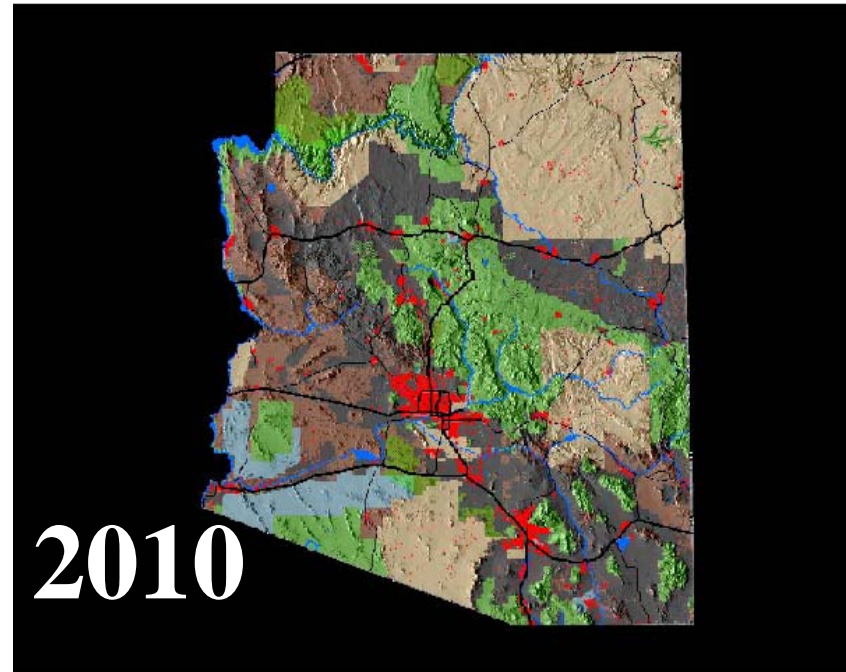
Arizona's expanding human population requires land and infrastructure. Sprawl consumes substantial amounts of acreage leading to further fragmentation and elimination of habitat. Roads can provide access to previously undisturbed areas making these regions more vulnerable to commercial and residential development



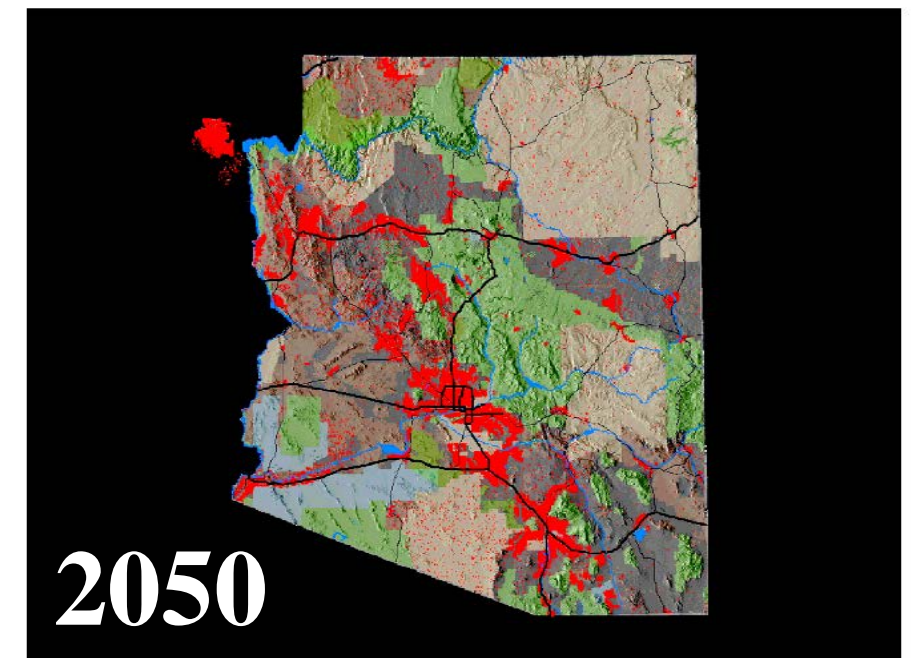
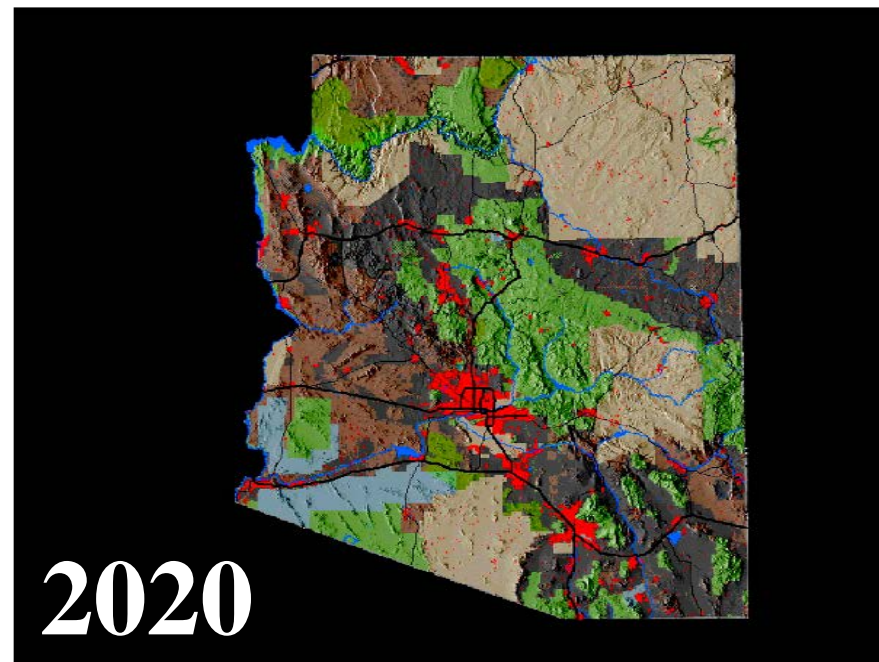
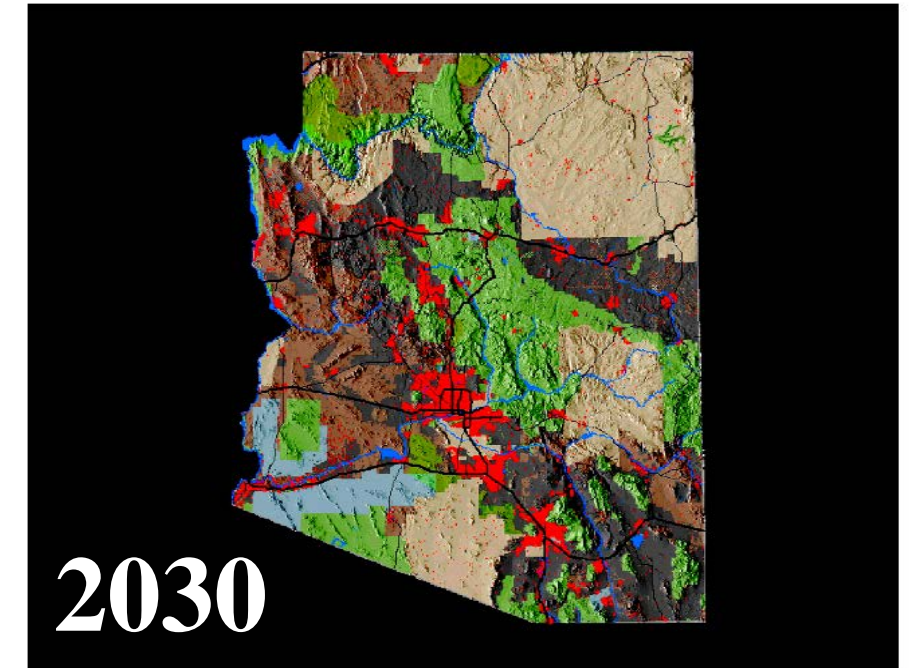
(Cerulean 2002). Likewise, urban expansion demands the ancillary structures of transmission lines, roads, canals and reservoirs. Along the international border, security measures pose additional barriers. Off road vehicle travel and the creation of wildcat roads also impact wildlife and habitat.

It is becoming increasingly obvious that manmade barriers such as highways and urban development are causing huge ecological problems with their concomitant costs. Increased pollution from roadsides into watersheds is an indirect result of proliferating roadways. The introduction and spread of non-native and invasive species is another associated concern. Disturbance and noise related to barriers including highways, border security and urbanization cause some species to abandon areas. And, of course, there is the direct mortality of wildlife on roadways, the size of which is unknown in aggregate, but estimated to be in the billions of vertebrates annually. Wildlife-vehicle collisions are a serious human safety concern. Nationally, it is estimated that over 200 human fatalities and nearly 30,000 injuries occur annually from these accidents with more than one billion dollars in related property damage (Meyer 2004).

Arizona's Urban Population Growth Projections 2010 - 2020
(Red Indicates Projected Urban Population Growth)



Arizona's Urban Population Growth Projections 2030 - 2050
(Red Indicates Projected Urban Population Growth)



Legal Environment

Arizona currently has very limited state protections for species, having no formal biodiversity policy or state law concerning endangered species. However, some protection is afforded to wildlife and habitat through existing state game and fish statutes,



various federal statutes and regulations (i.e. the Endangered Species Act), environmental planning tools like the National Environmental Policy Act (NEPA), county and city regulations, as well as land management and designations. It is in this legal environment that development, transportation, land management and wildlife conservation is conducted in Arizona and ultimately shapes the state of our natural environment. The following details briefly pertinent legal requirements as well as opportunities that exist to protect species and important habitat along with their associated linkage areas. The majority of state statutes pertaining to wildlife are for fish and game species. Exceptions are regulations for the protection of nesting birds, bird eggs, and jaguars.

There are several state statutes that are intended to support the conservation of wildlife and natural resources within the state. One of these is Arizona Revised Statutes Annotated §37-1001 which declares that it is “the policy of the legislature to provide for the restoration and conservation of lands and soil resources of the state...conserve natural resources, conserve wildlife...protect and restore this state’s rivers and streams and associated riparian habitats, including fish and wildlife resources that are dependent on those habitats...” Relative to wildlife habitat protection, state statutes offer some protection as they relate to game management, fishing, water quality and hazardous material regulations. Arizona also holds lands in trust for Arizona citizens, and there are regulations that allow for the conservation and protection of these lands for wildlife resources. There is a state regulation requiring that applications of power plant and transmission lines include the reporting of potential environmental and species impacts (Arizona Administrative Code R14-3-219). In addition, the Arizona Native Plant Law, Arizona Revised Statutes Title 3 Chapter 7, indirectly benefits wildlife habitats by offering some level of protection for

sensitive native plant species, but habitat protection is not mandated only encouraged.

Preserving habitat is key to protecting the State’s biodiversity – purchasing land for the purpose of habitat conservation is an end to that means. Habitat acquisition is possible by the Game and Fish Commission and the State Parks Board through a variety of funding sources including monies received from the state lottery. (Arizona Revised Statutes Title 17 § 296 – 299). These funds can be used for the acquisition of habitat related to threatened, endangered, and candidate species as well as for other natural areas. These funding possibilities and others are discussed in greater detail in *Section XII Funding Sources for Connectivity Resolution*. Relative to this exercise, land acquisition of key linkage areas should be considered in planning and is an important tool to protect species and habitat needs.

Several agencies are responsible for overseeing effects of project implementation to species and their associated habitats. Under Title 17 of the Arizona Revised Statutes, the Arizona Game and Fish Department (AGFD) is given the responsibility to “establish broad policies and long-range programs for the management, preservation and harvest of wildlife.” The Game and Fish Commission established the policy *Threatened Native Wildlife in Arizona* in 1988 that is intended to work in conjunction with the Endangered Species Act (ESA). This policy calls for the re-establishment of threatened indigenous wildlife. It does not, however, require the associated development of recovery plans or the designation of critical habitat, which is the responsibility of the U.S. Fish and Wildlife Service (USFWS). The 1996 version of the Game and Fish policy *Wildlife of Special Concern of Arizona* does address the recovery in addition to the re-establishment of threatened and endangered wildlife and their associated habitat requirements. This is administered through AGFD Nongame and Endangered Wildlife Program whose objective is to preserve the natural biological diversity of Arizona.

In an effort to protect unique settings, sensitive riparian habitats, rare animals, and sensitive plants, many local and county governments within Arizona offer certain zoning protections, have developed habitat conservation plans in coordination with USFWS, and established ordinances to conserve natural resources within their communities. Although too numerous to list, these local efforts are important in the overall effort to protect important habitats and linkages.

While state, county and city regulations offer some wildlife and habitat protections in Arizona, federal land-managers such as the Bureau of Land Management (BLM), the USDA Forest Service, the

National Park Service (NPS) and the USFWS (through the refuge system) play a pivotal role in the broad picture of habitat and species protection in Arizona. A key piece of this protection is provided in the form of management plans developed by these agencies that are tailored to specific units of land under their jurisdiction. When looking at habitat, wildlife management and connectivity on federal lands, the agency’s management plan combined with compliance with federal laws such as the ESA and the National Environmental Policy Act (NEPA), shape how that resource is managed. Since a major portion of land within the state of Arizona is held under the jurisdiction of various federal agencies, their role in habitat and wildlife protection statewide is vital. Again, relative to this exercise, federal agencies can use this tool to facilitate the integration of habitat connectivity into their plans.

Another important aspect of wildlife and habitat protection is the effort occurring on tribal lands. Many of the tribal nations within Arizona have their own wildlife management plans and regulations pertaining to habitat management. In addition to this, each tribe has their own set of policies regarding natural resources. When working on tribal lands, coordination with the appropriate personnel is crucial to ensure compliance with their wildlife and habitat protection requirements. A large percentage of land within Arizona is under tribal authority, and as such their input and policies are vital to the overall health of habitats and their associated linkages.

Although aforementioned factors provide some level of wildlife and habitat protection, the most far-reaching protections in Arizona come from compliance with NEPA, the ESA, the Migratory Bird Treaty Act (MBTA), and the Fish and Wildlife Coordination Act (FWCA). Environmental agencies establish standards for the regulation of agency activities and the protection of the environment. To ensure environmental compliance, there are procedures and permits available. The five principal regulatory agencies include the Arizona Department of Environmental Quality (ADEQ), the AGFD, the Army Corps of Engineers (Corps), the U.S. Environmental Protection Agency (EPA) and the USFWS.

NEPA requires that projects funded, permitted, or carried out by a federal agency that constitute a major federal action be assessed and the impacts to the environment from that action be disclosed. NEPA is a comprehensive environmental planning tool that provides a process by which to evaluate, document and disclose those effects. The evaluation generally includes an assessment of the human environment, including biological and cultural resources as well as human demographics – the analysis depends on the issues present within a given project area. Agencies through NEPA often consider ways to avoid or minimize impacts when possible, or to



offset impacts by repairing, rehabilitating, or restoring the affected environment; such actions are accomplished by reducing the impact over time by preservation and maintenance operations, or compensating for the impact (40 CFR Part 1508.20(a-e)). Private, state and local government actions that do not require federal funding or decisions are generally not subject to environmental review necessary under NEPA. These “non-federal” projects include the building of local roads, maintenance, residential and commercial developments as well as management plans for state or privately owned forest lands. It is important to remember that all of these may be subject to state, local and other federal regulations.

Congress passed the ESA in 1973. As written in Section 2(b) of the Act, the purpose is to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such species and to take such steps as may be appropriate to achieve the purposes of various treaties and conventions. Consultations with the USFWS are required when an action funded, permitted or carried out by that agency has the potential to impact a protected species, will likely result in the take of a protected species, or will modify designated critical habitat of a protected species. Private individuals and state entities through Section 10 of the ESA may develop and adopt Habitat Conservation Plans to reduce effects and ultimately mitigate taking of protected species. The ESA is responsible for protecting much of Arizona's threatened and endangered species and habitat.

Federal statutes protecting the movement of migrating avian species (MBTA) as well as fish and wildlife (FWCA) through coordination with the USFWS also provide species and habitat protections within Arizona. The MBTA prohibits harming, harassing or killing listed migratory birds. The FWCA allows the Secretaries of Agriculture and Commerce to assist state and federal agencies in protecting and enhancing game and fur-bearing animal populations. An amendment in 1946 requires federal agencies to consult with the USFWS when perennial waters are impounded, diverted or otherwise controlled or modified in order to prevent loss or damage to wildlife resources.

It is within this legal environment, the Arizona Department of Transportation (ADOT) is subject to 62 different federal, state, local and tribal environmental rules and regulations (ADOT 2004). Under its strategic issue of environmental stewardship, ADOT continues to integrate environmental management into its business practices. The Federal Highway Administration (FHWA) Environmental Guidebook has a complete list of environmental legislation applicable to all federally funded transportation projects. This can be

found on the Internet at <http://environment.fhwa.dot.gov/guidebook/T>.

Providing Solutions

Loss of connectivity is by no means inevitable, and the outcome of human population growth does not have to result in a proliferation of barriers. Although road-widening projects generally increase vehicle traffic, this need not result in more wildlife/vehicle collisions, or a decrease in animal movements. Road-widening projects present the greatest opportunity to provide crossing structures to accommodate wildlife movement. Because most of Arizona's roads were not originally designed to accommodate wildlife movement, current road improvement projects can dramatically restore permeability. Conversely, we can expect slower progress making canals and railroads more wildlife-friendly because these structures are not as regularly upgraded as our roads. Nonetheless, human structures are eventually upgraded, creating opportunities to facilitate connectivity - planners and engineers involved must be aware of the need for connectivity within the project area early in the planning process.

Although the issue is much broader than a “highway problem,” in many areas, design of new highways or modification of old highways will be an essential part of conserving connectivity. Fortunately, ADOT and FHWA have been in the forefront of our state's efforts on this issue. Working pro-actively to resolve conflicts that arise late in the process, the two agencies strive to coordinate activities with stakeholders and foster joint management early in the development process while project funding and plans are still flexible enough to incorporate measures to support connectivity. The partnership formed under the Arizona Wildlife Linkages Workgroup which includes both transportation agencies, AGFD, BLM, Northern Arizona University (NAU), the Sky Island Alliance, USDA Forest Service, USFWS, and the Wildlands Project has led this effort to put wildlife connectivity “on the map” by attempting the first comprehensive inventory of connectivity needs throughout the state.

Investing in wildlife connectivity is not only advantageous to wild populations, but also provides direct benefits to humans. Integrating wildlife crossing structures with roadside fencing have been found to minimize the ability of larger ungulates, such as elk, to gain access to highways. For transportation agencies, these structures are an investment in safety, aesthetics and education. There are 100 official wildlife-viewing areas along highways in Arizona that are a part of the national watchable wildlife program (Carr 1992). Taking advantage of opportunities to conserve and restore connectivity in

Arizona will require collaboration among city and county planners, state and federal agencies, non-governmental conservation organizations, academic researchers, wildland user groups, developers, and others to negotiate strategies for regional protection and conflict resolution of this collective concern.



Photo credit: National Geographic
Trans Canada Highway, Banff National Park, Alberta, Canada

