Prepared by:
The Arizona Wildlife Linkages Workgroup

ARIZONA'S WILDLIFE LINKAGES ASSESSMENT

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Siobhan E. Nordhaugen, *Arizona Department of Transportation, Natural Resources Management Group*
Evelyn Erlandsen, *Arizona Game and Fish Department, Habitat Branch*
Paul Beier, *Northern Arizona University, School of Forestry*
Bruce D. Eilerts, *Arizona Department of Transportation, Natural Resources Management Group*
Ray Schweinsburg, *Arizona Game and Fish Department, Research Branch*
Terry Brennan, *USDA Forest Service, Tonto National Forest*
Ted Cordery, *Bureau of Land Management*
Norris Dodd, *Arizona Game and Fish Department, Research Branch*
Melissa Maiefski, *Arizona Department of Transportation, Environmental Planning Group*
Janice Przybyl, *The Sky Island Alliance*
Steve Thomas, *Federal Highway Administration*
Kim Vacariu, *The Wildlands Project*
Stuart Wells, *US Fish and Wildlife Service*

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The Arizona Wildlife Linkages Workgroup
E-mail:
arizonalinkages@azdot.gov

The Arizona Wildlife Linkages Workgroup Mission Statement

"To identify and promote wildlife habitat connectivity using a collaborative, science based effort to provide safe passage for people and wildlife"

Primary Contacts:

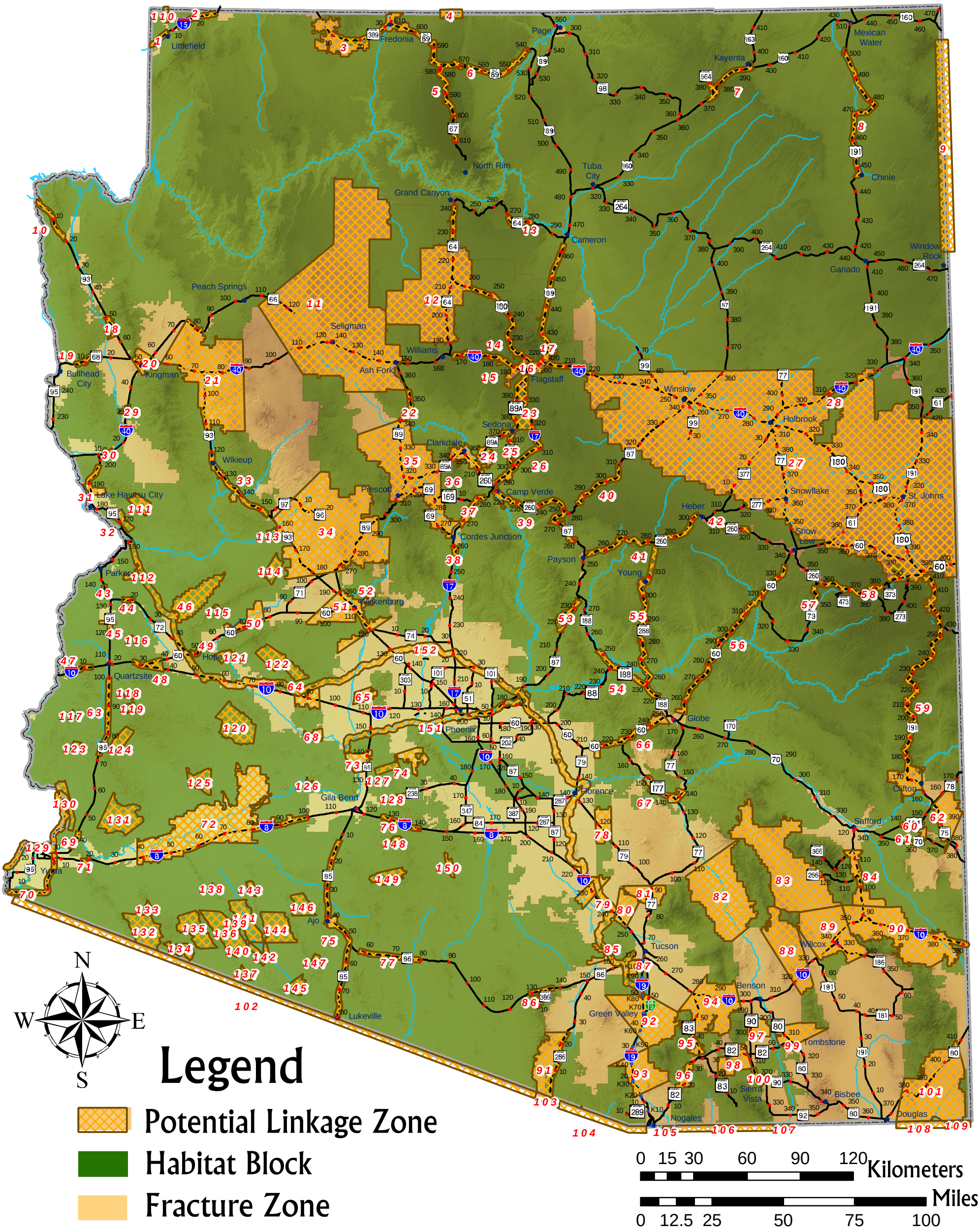
Bruce D. Eilerts
Siobhan E. Nordhaugen
Arizona Department of Transportation
Office of Environmental Services
Statewide Natural Resources Management Group

Ray Schweinsburg
Arizona Game and Fish Department
Research Branch

E-mail:
arizonalinkages@azdot.gov

Photo by Kelly Roberts

ARIZONA'S WILDLIFE LINKAGES



Note: Linkage numbers are for identification purposes only. These numbers do not imply priority status.

Each proposed Potential Linkage Zone polygon depicts a planning area of which only a small fraction of this polygon could be included in a wildlife linkage, if deemed appropriate through future studies. Private landowners within identified wildlife linkages are encouraged to participate in voluntary federal and state programs that pay land owners for conservation of their lands, voluntary sale or donations of conservation easements, voluntary changes in management to protect ecological property values, or voluntary sale or donation of lands to conservation buyers. State and Federal agencies are encouraged to coordinate with private landowners during the planning process of linkage projects and to inform them of voluntary habitat protection opportunities.

This map is part of a dynamic process and should not be considered the definitive revision. To suggest additional Potential Linkage Zones or to provide comments for future editions of this map, please contact arizonalinkages@azdot.gov.

Siobhan Nordhaugen

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EXECUTIVE SUMMARY

The phenomenal growth of Arizona's human population, economy, and infrastructure present challenges to maintaining natural ecosystems and wildlife populations that constitute an important part of Arizona's wealth. In particular, roads, urbanization, canals, railways, energy corridors and activities of illegal migrants and border security operations not only destroy habitat, but create barriers that isolate wildlife populations and disrupt ecological functions such as gene flow, predator-prey interactions, and migration. Addressing each of these potential barriers one-at-a-time is expensive and inefficient. In each landscape, we must address all these factors concurrently to successfully maintain or restore linkages between habitats and conserve the wildlife and natural ecosystems that Arizona's residents and visitors rely on and benefit from.

Conspicuous evidence of habitat fragmentation is wildlife road kill - a far too common sight along many Arizona roadways. These often fatal encounters have far-reaching effects. Wildlife-vehicle collisions can result in human deaths and injuries, millions of dollars in property damage, loss of game and non-game animals, and sometimes expose the State to liability. Working together, federal, state, county and private stakeholders can minimize these social costs while enhancing opportunities for movement of wildlife between Arizona's habitat areas.

The Arizona Wildlife Linkages Workgroup (AWLW) has taken the first step in that process. The AWLW is a collaborative effort between public and private sector organizations formed to address habitat fragmentation through a comprehensive, systematic approach. Through this partnership and commitment, a statewide assessment was conducted to identify large blocks of protected habitat, the potential wildlife movement corridors between as well as through them, and the factors threatening to disrupt these linkage zones. After four successful workshops and many hours spent coordinating, meeting, mapping and writing, we present our initial findings, methodology and recommendations – a product that is intended to evolve and ultimately be used as a planning instrument.

The *Arizona's Missing Linkages Workshop* held in April 2004 and the follow-up workshops that ensued are the basis for this report and mapping tool. Attendance at the workshops was well represented with biologists, engineers, planners and land managers from state and federal agencies, universities, consulting firms and private sector conservation organizations. Individuals were divided into groups to address specific geographic regions. They used map transparencies and tailored questionnaires to assist in the identification of habitats, wildlife species, wildlife behavior and needs, *potential linkage zones* (see *Table 4-1*) as well as present and future threats or opportunities for conservation. One of the many products resulting from this process was a computerized geographic information system (GIS) projection graphically displaying the compiled information. There are over 150 potential linkage zones included in the Arizona's Wildlife Linkages Map.

The potential linkage zones represent areas that are important to Arizona's wildlife and natural ecosystems. If integrated into regional planning frameworks, these areas have the potential to be maintained or preserved during this time of prosperity, growth and development. As such, for each potential linkage zone, the AWLW built on information collected from the workshops to further define existing conditions, recording biotic communities, listing species that depend on particular linkages, identifying land ownership within those linkages, and detailing known and anticipated threats.

For further refinement, potential linkage zones were prioritized based on biological importance threats - existing and anticipated - and opportunities for preservation and/or restoration purposes. Biological importance scores depended on the size and habitat quality of the *habitat blocks* (see *Table 4-1*) and on the ability of the potential linkage zones to support special status species, aquatic ecosystems, or seasonal migrations. Threat scores reflect the barrier effect of canals, roads, urbanization and railroads. Opportunity scores indicate ongoing and proposed conservation efforts in the areas, and whether impending major road projects provide an opportunity to increase the permeability of roads. As road construction programs are updated and development in the State progresses, this evaluation and resulting prioritization will need revision.

Our intention in this report is to provide a starting point for detailed consultation and coordination among the organizations and agencies that have a major role to play in maintaining habitat connectivity. To offer flexibility in the use of this report, all the maps within this document have been created at the same scale so that the transparency of the Arizona's Wildlife Linkages Map included in the front of this document may be used as an overlay. Furthermore, the report was drafted in a manner to allow each individual chapter to be used as a stand-alone tool. For that reason, terminology common throughout the entire document is defined in each section. All technical terms are also collectively defined in the glossary.

Important to taking the next step in preserving or restoring habitat connectivity is the physical design and construction of linkages. To help facilitate these applications, this report outlines the methodology used to create specific linkage designs within potential linkage zones. In the coming years, the AWLW intends to develop linkage designs for each potential linkage zone through a combination of GIS analysis and fieldwork. This analysis coupled with a feasibility study on linkage protection will further define the present potential linkage zones into smaller, more site-specific delineations and is intended to aid in conservation and planning efforts. Linkages ranking highest in our prioritization will be addressed first. Future assessments will identify additional potential linkage zones.

This report represents the results of the first statewide wildlife linkages assessment. We hope to elevate the current level of awareness of wildlife connectivity areas and issues in Arizona. The tools in this report will allow land managers to incorporate the identified wildlife linkage zones into their management planning processes to address habitat fragmentation due to highways and other human development. We expect to facilitate the integration of the potential linkage zones presented in this report and those identified in the future into early project planning efforts. We acknowledge that this is only the first step in a continuing process of defining critical habitat connectivity areas.

Now more than ever, decision makers have a responsibility to protect and maintain wildlife linkages to sustain Arizona's diverse wildlife species and wild landscapes. We firmly believe that government agencies and citizens working together with a comprehensive, landscape-scale approach can achieve these conservation goals while accommodating the growth of Arizona's population, an expanding economy, and associated infrastructure.

- The Arizona Wildlife Linkages Workgroup

DISCLAIMER

Nothing in this report obligates the Arizona Department of Transportation, Arizona Game and Fish Department, Bureau of Land Management, Federal Highway Administration, Northern Arizona University, Sky Island Alliance, USDA Forest Service, US Fish and Wildlife Service or the Wildlands Project to commit or transfer any funds. Specific work projects or activities that involve the transfer of funds, services, or property among the various agencies and organizations referred to in this report will require separate agreements and be contingent upon the availability of appropriated funds. Appropriate statutory authority must independently authorize such activities. This report does not provide such authority. Negotiation, execution, and administration of each such agreement must comply with all applicable statutes and regulations.

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This assessment should not be construed as a compliance document. Information provided in this assessment should be used as a guide only and should not be relied upon as the sole source of information relating to its content. While the information contained herein is believed to be accurate, it is supplied for informative purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance thereon. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding any matter with respect to this product. Because the AWLW is continually improving and upgrading its product design, the information contained herein is subject to change.

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AASHTO	American Association of State Highway and Transportation Officials
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AG	Attorney General
AGFD	Arizona Game and Fish Department
AHR	Americans for Our Heritage and Recreation
AHS	Arizona Highway System
ALRIS	Arizona Land Resource Information System
AORCC	Arizona Outdoor Recreation Coordinating Commission
A.R.S.	Arizona Revised Statutes
ASH	Arizona Service Highway
ASLD	Arizona State Land Department
ASP	Arizona State Parks
ATIS	Arizona Transportation Information System
AWLW	Arizona Wildlife Linkages Workgroup
AZ	Arizona
BBN	Bring Back the Natives
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
CAB	Conservation Acquisition Board
CACOG	Central Arizona Council of Governments
CAP	Central Arizona Project
CCAA	Candidate Conservation Agreements with Assurances
CCC	Commodity Cooperation Corporation
CERI	Craighead Environmental Research Institute
CFR	Code of Federal Regulations
CIG	Conservation Innovation Grants
Corps	U.S. Army Corps of Engineers
CRP	Conservation Reserve Program
CSP	Conservation Security Program
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
CYMPO	Central Yavapai Metropolitan Planning Organization
DDT	Dichlorodiphenyltrichloroethane
DOD	Department of Defense
DPS	Department of Public Safety
EDTM	Efficient Transportation Decision Making
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FMPO	Flagstaff Metropolitan Planning Organization
FRPP	Farm and Ranch Land Protection Program
FSA	USDA Farm Service Agency
FWCA	Fish and Wildlife Coordination Act
GIS	Geographic Information System
GPS	Global Positioning System
GRP	Grassland Reserve Program
HCP	Habitat Conservation Plan
HFRP	Healthy Forests Reserve Program
I	Interstate
km	Kilometer
LCCA	Least Cost Corridor Analysis
LIP	Landowner Incentive Program
LRSP	Local, Regional and State Parks
LWCF	Land and Water Conservation Fund
MAG	Maricopa Association of Governments
MBTA	Migratory Bird Treaty Act
MFP	Management Framework Plan
MOU	Memo of Understanding
MP	Milepost
MSCGP	Multistate Conservation Grant Program
NACOG	Northern Arizona Council of Governments
NAU	Northern Arizona University
NAWCA	North American Wetlands Conservation Act
NEPA	National Environmental Policy Act
NFWF	National Fish and Wildlife Foundation
NMBCA	Neotropical Migratory Bird Conservation Act
NMFS	National Marine Fisheries Service
NPS	National Park Service
NRCS	Natural Resources Conservation Service
PAG	Pima Association of Governments
PARC	Partners in Amphibian and Reptile Conservation
PCA	Patch Configuration Analysis
PTI	Pulling Together Initiative
RMP	Resource Management Plan
SEAGO	South Eastern Arizona Governments Organization
SEPM	Spatially Explicit Population Model
SCWCs	State Comprehensive Wildlife Conservation Strategy
SLIF	State Lake Improvement Fund
SR	State Route
SWG	State Wildlife Grant
TDML	Total Maximum Daily Load
TNC	The Nature Conservancy
TU	Trout Unlimited
U.S.	United States
USAF	U.S. Air Force
USC	United States Code
USDA	U.S. Department of Agriculture
USDOI	U.S. Department of Interior
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
WACOG	Western Arizona Council of Governments
WCS	Wildlife Conservation Society
WHIP	Wildlife Habitat Incentives Program
WHPRP	Wildlife Habitat Policy Research Program
WMA	Weed Management Area
YMPO	Yuma Metropolitan Planning Organization

GLOSSARY

HABITAT BLOCK: an area of land that consists of important wildlife habitat and can reasonably be expected to remain wild for at least 50 years. Habitat blocks are primarily comprised of lands within National Forests, National Parks, National Wildlife Refuges, large military reservations, tribal lands and lands managed by Bureau of Land Management or Bureau of Reclamation. Although some of these lands contain bombing ranges, barracks, reservoirs, and other non-natural elements, they still have a long-term prospect of serving as wildlife habitat. We recognize that tribal sovereignty retains the right to develop those lands. Habitat blocks also include private lands that are managed for conservation, such as Nature Conservancy preserves and some large ranches whose owners are committed to long-term conservation. All other private lands and land owned by Arizona State Land Department (which has no conservation mandate under current law) have for the most part been excluded. (Note: To keep maps readable, some habitat block polygons include small private and state inholdings that may not be conserved).

FRACTURE ZONE: areas of reduced permeability between habitat blocks. These regions are largely State Land, private holdings and transportation corridors. Roads, canals, urban areas, railroads, or border security operations limit or prevent animal movement, or threaten to do so in the foreseeable future in these zones. Most fracture zones need significant restoration to function as reliable linkages. Portions of the fracture zone are designated as potential linkage zones (see definition below). Resource agencies and conservation groups should continue to protect and enhance washes, streams, and rivers as major corridors in all areas of the fracture zone, including improvements to culverts and bridges to promote wildlife permeability.

POTENTIAL LINKAGE ZONE: a portion or subset of the fracture zone or habitat block identified as an area critical to wildlife movement. Threats must be managed if connectivity is to be maintained or restored. We emphasize that these polygons depict planning areas within which a functional linkage(s) must be designed and conserved. In most cases, only a small fraction of the proposed potential linkage zone will be included in the linkage design (*Section X)*, which will be developed in future detailed analyses.

RIPARIAN HABITAT/LINKAGE ZONE: streams that historically supported riparian communities and perennial water flow (in some cases pools linked by subsurface flow for much of the year). Each potentially provides essential habitat for aquatic species, and critical landscape connectivity for both aquatic and terrestrial animals (*Section VIII)*.

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