SECTION III ARIZONA'S MISSING LINKAGES WORKSHOP

The Arizona Wildlife Linkages Workgroup (AWLW) first convened to determine ways to identify areas important to wildlife and habitat connectivity. Upon examination, the AWLW found that the available information only covered a fraction of Arizona's species, varied in quality and was out of date in some cases. The team decided that the best approach to addressing habitat connectivity would be to collect the current biological knowledge that exists throughout the state from those individuals that conduct wildlife research or management.

At the Arizona's Missing Linkages Workshop: Biodiversity at the Crossroads, biologists, land managers, planners and engineers mapped important wildlife habitats and potential linkage zones throughout Arizona. The workshop was hosted by the Phoenix Zoo and was held April 13th and 14th, 2004. Follow-up workshops were held in November 2004 in Tucson, Flagstaff and Phoenix to refine and prioritize the linkages. An additional workshop was arranged for the Sky Island Ecoregion and was held at the National Audubon Society's Appleton-Whittell Research Ranch south of Elgin in the Canelo Hills.

The April workshop focused on identifying potential linkage zones needed to maintain wildlife movement, species in need of connectivity in each linkage and threats to wildlife movement. The November follow-up workshops were conducted to refine the linkage areas and prioritize the linkages based on a ranking of the habitat guality and threats to wildlife movement. The statewide wildlife linkage map that resulted and the background information compiled on important species and habitat will provide a framework for land managers and planners to assess opportunities for mitigation activities including wildlife crossings, land protection measures and community planning.

About 100 individuals attended the April workshop. The two day workshop was opened by Victor Mendez, Arizona Department of Transportation (ADOT) Director and Duane Shroufe, Arizona Game and Fish Department (AGFD) Director. Prominent speakers demonstrated the urgency and need to cooperatively address wildlife habitat connectivity on a statewide level. During breakout sessions, participants were divided into groups to tackle specific geographic



regions. Using transparency maps and tailored questionaires, the participants assisted in the identification of habitats, wildlife, behavior and needs, existing and potential linkage zones as well as present and future threats or opportunites for conservation. The workshop wrapped up with presentations that provided examples of wildlife overpasses, underpasses, and other functioning highway wildlife crossing structures that exist in Europe, Canada and elsewhere in the United States. The closing remarks were given by Robert E. Hollis, Federal Highway Administration (FHWA) Division Administrator.

These workshops were the first statewide effort to consider needs for wildlife connectivity in Arizona that embodied a multi-agency collaboration. The level of commitment and partnership has been monumental. Two members of the AWLW, Evelyn Erlandsen, AGFD and Siobhan Nordhaugen, ADOT, were presented the FHWA Partnership in Excellence Award by Robert E. Hollis, FHWA Division Administrator, to recognize their substantial contributions in coordinating this successful workshop. The following sections describe the activities of the workshops and are the basis of this report and mapping tool.

Breakout Sessions

Between two sets of presentations, the hard work of the workshop began. Ecoregional teams were assembled from the attendees based on The Nature Conservancy's ecoregion designations as follows: Mohave Desert, Colorado Plateau, Sonoran Desert, Arizona/New Mexico Mountains and the Apache Highlands. The large and diverse Apache Highlands Ecoregion was further divided into the Apache Highlands and Sky Island ecoregions (Figure 3-1). Ecoregions are large areas of land and water – on the scale of tens of millions of acres - that are characterized by distinct plant communities, species, and environmental conditions such as climate and landforms (Turner 2004). Individuals with knowledge in specific regions were encouraged to work together and attend one or more of the six ecoregional breakout groups to define wildlife habitat areas, which species were present, important linkages to maintain for those species, and the current or potential threats (obstacles) to those

linkages. Experts working on adjacent ecoregions collaborated to identify cross-boundary potential linkage zones and habitat blocks.

In each ecoregion group, a facilitator moderated the discussion, coordinated the completion of linkage data sheets (Appendix A) and ensured that each potential linkage zone as well as the associated habitat blocks were sketched on a base map. To aid in the assessment of the linkages, large-scale transparency maps were provided that depicted various features within Arizona including land ownership, topography, watersheds, land use, impediments, species richness, traffic volumes, perennial waters, statewide road kill, vegetation and the Nature Conservancy's identified core regions (Figure 3-2).



Figure 3-2. Resource Maps Provided at the Workshops

ARIZONA ECOREGIONS

COLORADO

PLATEAU

NEXICO NOLINI



APACHE HIGHLANDS

17/2/7///×

DESERT



Figure 3-1. Arizona Ecoregions (Based on the Nature Conservancy Ecoregion Designations)

Siobhan Nordhaugen 2006

On the first day of the workshop, the more than 80 linkage zones identified were digitized and mapped by Siobhan Nordhaugen (ADOT Natural Resources Management Group), Mark Endries (Florida Fish and Wildlife Conservation Commission), Norris Dodd and Jeff Gagnon (both of the AGFD). The draft map was presented on the second morning of the workshop. This allowed participants to see the preliminary results for all ecoregions, which prompted further discussions, review, clarification, and refinement of the mapped polygons. The potential linkage zones and habitat block mapping process is described in more detail in Section IV Arizona's Wildlife Linkages Mapping.

Follow-up Workshops (November 2004)

In November 2004, follow-up workshops were conducted to solicit participation by experts who could not attend the April workshop and to refine as well as prioritize the proposed potential linkage zones in each ecoregion in accordance with a set of criteria established by the AWLW. Section V Arizona's Wildlife Linkages Prioritization gives a complete account of the prioritization methodology. The follow-up workshops also significantly expanded the number of proposed potential linkage zones and supplied more detailed information. Figure 3-3 outlines the overall project development.





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ARIZONA'S WILDLIFE LINKAGES ASSESSMENT 9 Section III Arizona's Missing Linkages Workshop

Figure 3-3. Flowchart of Project Development

ARIZONA'S MISSING LINKAGES WORKSHOP AGENDA

April 13th and 14th, 2004

The Phoenix Zoo

Agenda: Day 1

Registration/Continental Breakfast......8:00 a.m. - 9:00 a.m.

Acting Workshop Coordinator: Evelyn Allegretto (Erlandsen), Habitat Branch, Arizona Game and Fish Department Moderator: Terry Brennan, Forest Engineer, USDA Forest Service, **Tonto National Forest**

Victor Mendez, Director, Arizona Department of Transportation Duane Shroufe, Director, Arizona Game and Fish Department

Presenters:

Paul Beier, Professor of Wildlife Ecology......9:30 a.m.-10:00 a.m. School of Forestrv Northern Arizona University

"Scientific Studies Demonstrate that Corridors Work"

Skeptics have questioned the empirical evidence that corridors provide landscape connectivity. Some also have suggested dangers of corridors. We reviewed published studies that empirically addressed whether corridors affect species in habitat patches connected by corridors. There are no empirical studies demonstrating any negative effect of corridors. Both experimental and observation studies have demonstrated positive effects of corridors on natural populations of conservation concern. The successful experiments measured demographic traits before and after treatment in both the treated area (corridor created or destroyed) and an untreated area (habitat patches apparently isolated from each other). This experimental approach avoids problems arising from the fact that corridor presence is often correlated with other variables, such as patch size, that can confound the analysis. Second,

observations of movements by naturally dispersing animals in fragmented landscapes have convincingly demonstrated conservation value of corridors. The best observational studies focused on dispersing juveniles of area-sensitive species, took place in landscapes of conservation concern, and documented that animals did not move through matrix habitat. Although over half of the 32 studies we reviewed were inconclusive due to design flaws, the well-designed studies clearly demonstrated that corridors are valuable conservation tools. Those who would destroy the last remnants of natural connectivity should bear the burden of proving that corridor destruction will not harm target populations.

"Arizona Can Improve California's Collaborative Approach to Linkage Conservation"

In Fall 2001, the groundbreaking Missing Linkages Report identified 232 wildlife linkages throughout California. South Coast Wildlands immediately spearheaded an effort to prioritize, protect, and restore linkages in the South Coast Ecoregion of that state. We first forged a partnership with 15 federal and state agencies, conservation NGOs, universities, county planners, and transportation agencies. By partnering from the start (rather than developing a plan on our own and asking others to "unite under us"), we garnered spectacular support and are making rapid progress.

With our partners, we (1) selected 15 priority linkages (out of 69 linkages in the ecoregion) on the basis of biological importance (size & quality of core areas served) and vulnerability; (2) held workshops to identify 12 to 20 focal species per linkage; (3) researched the needs of focal species, obtained high-resolution spatial data, and collected field data to develop a linkage design based on GIS analysis of movement of focal species; (4) made detailed recommendations for protecting key habitat parcels, creating highway crossing structures in specific locations, and landuse guidelines in and adjacent to the proposed linkages, and (5) presented the design to partners who are now procuring easements and land, changing zoning, restoring habitat, and mitigating transportation projects.

Arizona has an advantage over southern California because the transportation agencies are involved as committed players from the start. The ultimate key to success is to streamline the linkage designs into transportation projects, land-use plans, and conservation plans (such as the state

conditions.

The Wildlands Project

Since 1994, the Wildlands Project and its partner organizations have worked together to design a conservation plan and a map that demonstrates how healthy species populations in the Sky Islands can be ensured into the distant future. One of the key elements of that plan--the Sky Islands Wildlands Network--is the conservation biology principle of connecting wild "core areas" together via wildlife linkages (or corridors) to promote healthy movement of focal species, particularly the larger carnivores, across their ranges.

How did the elements of the Sky Islands plan come together? First, expert workshops gave us a basic concept of where cores and linkages were located in the Sky Islands. Perhaps the most important element in determining the design of the Sky Islands Plan was the identification of Focal Species - animals whose survival requirements represent factors important to maintaining ecological health. The habitat needs of these species helped refine the configuration of the network design. Some of these Sky Islands focal species include Mexican gray wolf, mountain lion, and jaguar. Finally, clear indications of where wildlife linkages should occur were determined by on-the-ground tracking.

Some of the most prominent threats to habitat connectivity within the Sky Islands Wildlands Network include ex-urban subdivisions and highways, such as Interstate-10, that block critical wildlife linkage connections across the entire breadth of the conservation area. One of the best means for protecting wildlife linkages from highway fragmentation are wildlife overpasses and underpasses. Numerous examples of successful wildlife crossing structures occur in Canada, many locations in the U.S., and in Europe.

The success of these existing wildlife crossing structures in reducing wildlife-vehicle collisions is proof that we can and

Comprehensive Wildlife Conservation Strategy). This collaborative, science-based, core-to-core approach promises not merely to slow the rate at which things get worse, but to actually improve connectivity over today's

"Wildlands Network Design in the Sky Islands"

should incorporate more strategically located wildlife crossing structures into our highway planning processes in Arizona and across the United States.

Janice	Przybyl,	Wildlife	Monitoring	Program	Coordinator
				10:15 a.m.	-10:30 a.m.
Sky Isla	nd Alliance				

"Using Track Counts to Evaluate Wildlife Linkages"

Sky Island Alliance is a membership-driven conservation organization based in Tucson, Arizona with the overall goal to protect and restore the native biological diversity within the Sky Island region. The Wildlife Monitoring is one of five distinct programs within Sky Island Alliance. The mission of the Wildlife Monitoring Program is to identify at-risk landscape-level wildlife corridors within the Sky Island region and conduct within those corridors long-term wildlife monitoring and data collection that will be used to guide local and international management decisions related to the preservation and restoration of bio-regional connectivity.

The Wildlife Monitoring Program is particularly concerned with the movement of four large, wide-ranging mammals: bear (Ursus black americanus), mountain lion (Puma concolor), jaguar (Pantera onca), and Mexican gray wolf (Canis lupus baileyi) and two smaller species, bobcat (Lynx rufus) and coati



(Nasua narica). Sky Island Alliance chose to monitor top predators primarily based on their large spatial requirements and reliance on wildlife corridors linking the mountain ranges of the Sky Island ecoregion. To date four possible wildlife corridors with potential threat from urban development have been identified for monitoring. These study areas include: the Tumacacori-Santa Rita corridor, the Cienega Creek Watershed, the Dragoon-Whetstone Corridor, and the north/south spine of the Peloncillo Mountain range.

The Wildlife Monitoring Program relies on volunteers to collect data on wildlife presence. These "grassroots

naturalists" conduct track surveys along pre-established transects. Types of data collected include tracks and other sign left by wildlife. Volunteers must follow strict guidelines and adhere to a six-week survey interval to ensure viability of data. In addition to the track surveys, Sky Island Alliance has collaborated with Arizona Department of Transportation to install remote wildlife cameras under the bridges and in the culverts along the main highways that bisect project areas.

Sky Island Alliance's long-term vision is to use collected data to advocate for protection of these wildlife corridors threatened by human development of open spaces.

Dale Turner. Conservation Planner with Rob Marshall. Science The Nature Conservancy

"Biodiversity at the Crossroads: Using Ecoregional Data to Identify Linkages and Areas Sensitive to Fragmentation"

In 1996, The Nature Conservancy began developing ecoregion-based conservation assessments for the entire United States and portions of the 27 countries in which the Conservancy works. Assessments are science-based attempts to determine how much and what parts of the landscape are needed to maintain biological diversity over the long term. They require large amounts of data and a wide array of agency, academic, institutional, Tribal, and private-sector expertise.

Ecoregions are large areas of land and water – on the scale of tens of millions of acres - that are characterized by distinct plant communities, species, and environmental conditions such as climate and landforms. The Nature Conservancy used the U.S. Forest Service ECOMAP framework as the basis for delineating North American ecoregions, making minor modifications where regional data sets or expertise resulted in enhanced boundaries for conservation-based analyses.

There are several advantages to analyzing the conservation needs of biological diversity at an ecoregional scale. First, ecoregions typically capture large proportions, if not entire distributions, of major plant communities and individual

species. By capturing a large proportion of a species' distribution in a single unit of analysis, conservation goals may be developed that better integrate two important components of biological diversity - ecological and genetic variation. Second, maintenance or recovery of declining species may be more effectively planned for and accomplished at ecoregional scales, particularly if the target organism requires large expanses of unfragmented habitat (e.g., pronghorn), relies on disturbance regimes or other ecological processes that occur across multiple agency/jurisdictional boundaries, or the organism's population structure is maintained by immigration and emigration over a large area. Finally, accommodating potential changes in the distribution of plant communities and species that result from changes in climate may require conservation efforts carried out at ecoregional scales.

analysis include: conservation goals.

The Nature Conservancy has completed analyses for all five ecoregions within Arizona, incorporating 15,000 data points on more than 1,300 species. We also developed new data for the distribution and status of grasslands and aquatic habitats statewide.

organizations.

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The foundation of ecoregional assessments is a comprehensive scientific analysis of existing and, in some cases, newly developed data. Integral components to the

1) identification of conservation targets, or a group of organisms and ecological systems that comprehensively represent an ecoregions biological diversity;

2) identification of conservation goals for each target that serve as a hypothesis about the number and distribution needed to maintain long-term viability;

3) identification of conservation areas sufficient in size and distribution to capture ecological gradients and meet

The result is a network of 147 conservation areas, comprising about 40% of the state (Figure 3-1). The boundaries of these areas provide a very refined starting point for identifying opportunities and conflicts at a finer scale. They also highlight the priority areas for maintaining connectivity for wildlife. The vast majority of these areas remain unprotected, so there is much work to be done and it will require collaboration between wide varieties of



Figure 3-4. Priority Conservation Areas Identified by The Nature Conservancy through **Ecoregional Assessments.**

Objectives & Goals for Breakout Session: Norris Dodd, Research Biologist, Arizona Game and Fish Department

Overview of Available Maps: Siobhan Nordhaugen, Natural Resources Management Group, Arizona Department of Transportation

Introduction of the Facilitators: Ray Schweinsburg, Research Biologist, Arizona Game and Fish Department

Break with Refreshments2:00 p.m 2:15 p.m.				
Closing of 1 st Day/Discussion of Next Day Activities 				
Evening Mixer: Ruby's House, Phoenix				

Agenda: Day 2

Continental Breakfast8:00 a.m. – 8:30 a.m.

Acting Workshop Coordinator: Evelyn Allegretto (Erlandsen), Habitat Branch, Arizona Game and Fish Department Moderator: Bruce Eilerts, Statewide Section Manager, Statewide Natural Resources Management Group, Arizona Department of Transportation

Ecoregion Presentations:

Introductio	on and o	Quest	tion/Ans	wers8:	45 a	.m. – 9	0:00 a.m .
Prepare Highlights.	for	a 	Brief	Presentatio	on :00 a	on .m. – 9	Linkage D:45 a.m.
<i>3 Ecoregion Presentations</i>							
Break with	Refres	hmen	ts	10:3	0 a.r.	n 10	:45 a.m.
<i>3 Ecoregion Presentations10:45 a.m. – 11:30 a.m.</i> (10 minutes each with a 5 minute question period)							

Presenters:

Mark Endries. Division of Wildlife GIS Program Florida Fish and Wildlife Conservation Commission

Agencies in the State of Florida have recently taken a number of steps to modernize the environmental review process. The Florida Fish and Wildlife Conservation Commission (FWC) is responsible for performing environmental reviews of major land developments in Florida that impact fish and wildlife resources and their habitat. In an effort to improve the efficiency and accuracy of these assessments, and to improve coordination between agencies, the FWC developed a GIS (Geographic Information System)-based habitat model that incorporates a wide variety of land cover and wildlife species data.

The Integrated Wildlife Habitat Ranking System (IWHRS) ranks the Florida landscape based upon the needs of wildlife as a way of identifying ecologically significant lands in the state, and to assess the potential impacts of land development projects. The IWHRS is provided as an ArcView (ESRI, Redlands CA) project on a compact disc, which includes the results of the model, all of the data layers that went into the model, a wide variety of wildlife species location data, and a Florida land cover image. By using the capabilities of GIS, users can perform specific queries and investigations of the model results, the data layers that comprise the model and the additional data provided on the CD. The IWHRS is used as a component of the Florida Department of Transportation's Environmental Screening Tool (EST). The EST is an internet-accessible interactive database and mapping application that allows stakeholders to view project plans, perform analyses to assess potential project effects on resources, and provide comments on the project plan.

"Florida's Integrated Wildlife Habitat Ranking System: Mapping Wildlife Needs for Efficient Transportation Decision Making"

"Wildlife Linkages and the Federal-Aid Program"

The federally funded highway program consists of two major programs. These are the Federal-Aid Program, which is a grants program to the State Departments of Transportation, and the Federal Lands Highway Program, which designs and constructs highways on National Forests, Parks, Federal Wildlife Refuges, and other federally owned or managed lands. Highways are also built by states and other government agencies. The Federal-Aid Program is responsible for a large part of the highways in the United States, including the interstate system.

There are three important components of the Federal-Aid Program: the National Highway System, the Surface Transportation Program, and the Transportation Enhancements Program. These programs interact in many ways and have important authorities that support efforts to enhance habitat linkage and wildlife movement corridors.

Important aspects of the current transportation legislation include a preference for mitigation banking to compensate for impacts to wetlands and natural habitats, funding eligibility of costs for overpasses, fencing, and underpasses for wildlife to improve safety and habitat connectivity, and funding support for the development of statewide and regional natural habitat and wetland conservation and mitigation plans.

Important federal laws which apply to the development of federally funded highway projects include NEPA, the Endangered Species Act, the Clean Water Act, the Fish and Wildlife Coordination Act, Migratory Bird Treaty Act, and various state and local laws and regulations. The FHWA Strategic Plan and Vital Few Program objectives include environmental stewardship. As a measure of environmental stewardship, FWHA has established the Exemplary Ecosystem Initiative program showcasing projects that exemplify outstanding efforts for ecosystem conservation. More information about this program can be found at http://www.fhwa.dot.gov/environment/ecosystems/index.htm.

Alex Levy, Ecologist	1:20 p.m1:45 p.m.
Federal Highways Administration	
Southern Resource Center	

"Linking Wildlife Habitats in Europe: The Scan Tour"

With growth and development in many areas of the world, habitat and wildlife resources have diminished to the point that transportation agencies are being asked to address impacts to these resources when implementing planned improvements to the world's transportation systems. The issues involved in addressing these impacts are international in nature. Therefore, the Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO) sponsored an international technology scan to learn what actions are being taken in Europe to address habitat and wildlife issues. An interdisciplinary delegation of federal, state, and conservation-group representatives visited five countries to observe and document efforts in Europe. The group visited Slovenia, Switzerland, Germany, France, and the Netherlands.

As a result of the trip, the team formed conclusions and recommendations for U.S. applications in the areas of policy, communications, guidance manuals, and research. In particular, the group recommends (1) including wildlife/transportation issues in the FHWA and AASHTO strategic plans; (2) creating a central source of contact for international exchange of information; (3) developing a number of guidance manuals pertaining to assessment methodologies, interagency coordination, terminology, and structures design; and (4) using pooled funds to study connectivity needs for all types of wildlife; and (5) funding a national connectivity study.

Short Break.....1:45 p.m. - 1:55 p.m.

Patricia White, *Director**1:55 p.m.- 2:20 p.m.* Habitat and Highways Campaign Defenders of Wildlife Washington, D.C.

"BUILT-IN CONNECTIVITY: Streamlining for the 21st Century"

Defenders of Wildlife is a national non-profit wildlife conservation organization with 425,000 members and supporters, dedicated to the protection of all native wild animals and plants in their natural communities. Defenders has recently launched the **Habitat & Highways Campaign** to prevent or reduce conflicts between transportation and wildlife. The Habitat & Highways Campaign has two main objectives. First, the campaign seeks ways to reduce the impact of roads and highways on wildlife and habitat. Second, the campaign supports incorporating wildlife conservation into transportation planning at the earliest stages.

A very promising tool for incorporating conservation into transportation planning is on the horizon. As part of the U.S. Department of Interior's State Wildlife Grants Program (SWG), states receive SWG funds to support cost-effective conservation aimed at preventing wildlife from becoming endangered. In order to make the best use of the SWG, Congress charged each state with developing a statewide Comprehensive Wildlife Conservation Strategy, to be completed by October 2005. These strategies will provide an essential foundation for the future of wildlife conservation and a stimulus to engage the states, federal agencies and other conservation partners.

The resulting state resource maps will act as a blueprint for each state's conservation priorities. Transportation agencies can use these maps to inform their own planning process. By avoiding building new roads in natural areas, transportation agencies streamline their NEPA and permit process while becoming partners in their state's environmental stewardship. Florida has already employed their own streamlining process; the Efficient Transportation Decision Making (ETDM) process. ETDM utilizes hundreds of data layers, including wildlife conservation data to inform early planning and project development.

Arizona faces a variety of pressures on her land and resources. Home to unique ecosystems, Arizona is home to

many rare and endangered species. Arizona's natural beauty and warm climate draw people from other states, across the border and around the world. Because of these pressures, Arizona is a prime candidate for incorporating conservation considerations early in the transportation and development planning.

Bill Ruediger, Ecology Program Leader for Highways......2:20 p.m. - 2:45 p.m. USDA Forest Service Washington, D.C.

"Arizona Habitat Connectivity: Where Do We Go From Here?"

The analysis for habitat connectivity should include an approach that encompasses the Broadscale, Mid-scale, and Fine-scale analyses. Arizona should look at the Broadscale by including connectivity with California, Utah, New Mexico and Mexico. Further refinement of the analysis should then include identifying important wildlife habitat and the locations of large animal collisions. Use of the best wildlife coordination technology should be utilized, including the use of current mapping technologies. Partnerships are integral to the success of wildlife connectivity analysis and planning by forming a foundation for integrating conservation planning with transportation planning. Timing is also critical, as early planning will provide more opportunities to recommend locations and designs in roadway projects that will have the greatest benefit to wildlife. Our success in ensuring connectivity also lies with integrating designs that work, incorporating adaptive management and employing effective monitoring.

Questions for Presenters......2:45 p.m. - 3:00 p.m.

Robert E. Hollis, Division Administrator, Federal Highway Administration, Arizona Division

SR 260 Site Visit: Payson, Arizona, Thursday, April 15th, approximately 8:30 a.m.





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