

# Sustainable Wildlife Corridors in the Flagstaff Region

## 2009 Flagstaff Zoning Code Update 2009 Flagstaff Regional Transportation Plan 2012 Flagstaff Regional Land Use Plan

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### **Introduction**

As the human population grows in the Flagstaff region, we increase the impact of transportation corridors (such as roads and rails) and land use changes (such as urban and rural development) on wildlife populations. The frequent result of these activities is habitat fragmentation, which creates barriers to animal movement within previously unfragmented blocks of habitat. Promoting wildlife habitat connectivity will help:

- improve human safety by reducing vehicular collisions with wildlife;
- maintain the ability of animals to access necessary resources for survival and reproduction;
- allow for wildlife movement between populations;
- allow for seasonal migration;
- enable population movements in response to climate change;
- and prevent genetic isolation of wildlife populations.

Loss of habitat connectivity is not inevitable, as long as the needs of wildlife are cooperatively addressed early in the transportation and development planning process.

To that end, the City of Flagstaff and Coconino County requested wildlife corridor information from the Arizona Game and Fish Department to be evaluated as part of the Flagstaff Regional Land Use and Transportation Plan Updates, as well as the Zoning Code Update. The information provided includes a map and brief description of sustainable wildlife corridors as well as travel mitigation areas. Corridors and travel mitigation areas are described in terms of the habitats they connect or fragment (respectively), the species that need them, and the barriers that threaten them. Corridors are based on known or assumed wildlife movement patterns. Travel mitigation areas are based on a 500-meter “road effect zone” (Forman and Deblinger 2000). Data used to develop the map are derived from expert-based input collected during the 2001 Flagstaff Regional Land Use and Transportation Plan – Urban Open Spaces Plan, the 2004 Coconino County Comprehensive Plan Wildlife Working Group, and the 2009 Coconino County Wildlife Linkages Project (in progress).



## Definitions

A **sustainable wildlife corridor** is a swath of land that facilitates wildlife survival and reproduction by allowing movement between habitat blocks even when the surrounding landscape is converted to other uses. This means that barriers within the corridor are avoided or mitigated, management activities are compatible with wildlife movement, and landowners in and around the corridor act as stewards. For some highly mobile species, like birds and bats, habitat “**stepping stones**” separated by large geographic barriers can serve as a corridor. However, for most species, a sustainable wildlife corridor must be a “**continuous corridor**”: free of barriers and connecting large blocks of habitat. Barriers can include, but are not limited to, roads, railways, residential and commercial development, fences, and areas where the vegetation has been significantly altered or lost.

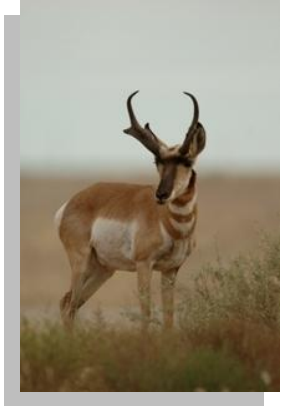


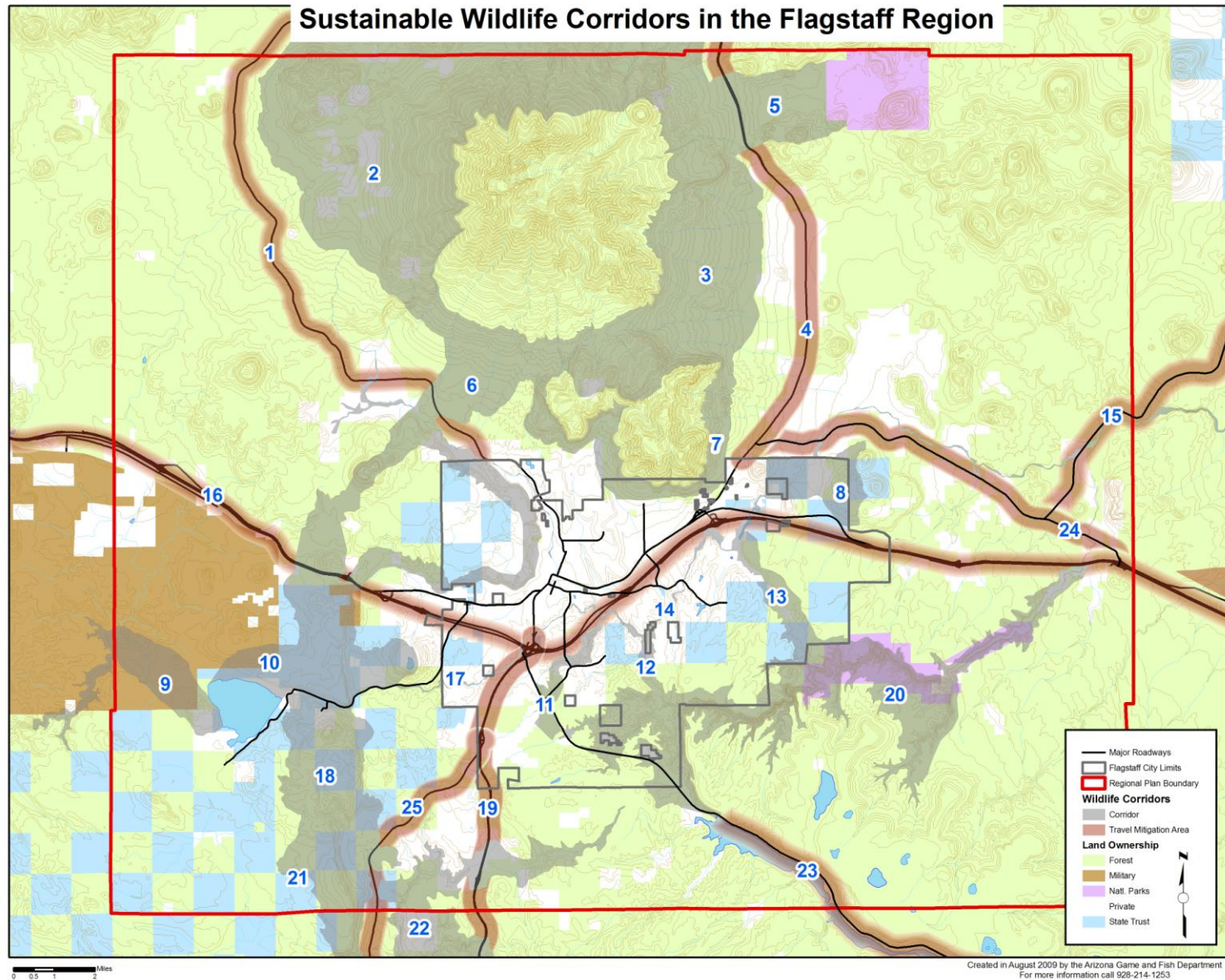
Photo by G. Andrejko, AGFD



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A **travel mitigation area** is an existing roadway and/or railway where wildlife habitat connectivity is threatened and/or public safety is threatened by vehicular collisions with wildlife. In travel mitigation areas, consultation with the Arizona Game and Fish Department will aid in siting and design of wildlife crossings. Attention should be paid to zoning and land uses in and around travel mitigation areas to ensure that wildlife crossings do not lead wildlife into urbanizing areas.





## **Sustainable Wildlife Corridor Descriptions**

### **1. Highway 180**

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Forest, woodlands, and grasslands on Coconino and Kaibab National Forests
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison's prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, Mexican vole, bats
Current Threats/Barriers: highway, rural and suburban development, recreation

### **2. San Francisco Peaks, Northwest**

Type: Continuous Corridor
Habitat Blocks Connected: San Francisco Peaks to grasslands north of the peaks, also elevation gradient up and down San Francisco Peaks
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison's prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, Mexican vole, bats
Current Threats/Barriers: OHV use of illegal trails, traffic on FR 151, recreation

### **3. San Francisco Peaks, East**

Type: Continuous Corridor
Habitat Blocks Connected: San Francisco Peaks to Mt Elden and Timberline, also elevation gradient up and down San Francisco Peaks
Focal Species: mountain lion, elk, mule deer, black bear, northern goshawk, Gunnison's prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, bats
Current Threats/Barriers: OHV use of illegal trails, traffic on Schultz Pass Rd, recreation

### **4. State Highway 89**

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Peaks/Elden Foothills, cinder hills, and grasslands on Coconino National Forest
Focal Species: pronghorn, mountain lion, elk, mule deer, Gunnison's prairie dog, neotropical migratory birds, porcupine, bats
Current Threats/Barriers: highway, urban and suburban and commercial development

### **5. Peaks to Sunset Crater**

Type: Continuous Corridor
Habitat Blocks Connected: San Francisco Peaks to Sunset Crater NM, and Bonito Park to grasslands to the north
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison's prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, bats
Current Threats/Barriers: highway, traffic on FR 545, OHV use of illegal trails, recreation



## 6. Schultz Pass to Woody Ridge

Type: Continuous Corridor
Habitat Blocks Connected: San Francisco Peaks to the Mogollon Rim
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison's prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, Mexican vole, bats
Current Threats/Barriers: Highway 180, Interstate 40, urban and suburban development, recreation

## 7. Elden Foothills

Type: Continuous Corridor
Habitat Blocks Connected: Elevation gradient up and down Mt Elden
Focal Species: mountain lion, mule deer, bats
Current Threats/Barriers: urban and suburban development, recreation, illegal mountain bike trail use

## 8. Turkey Hills

Type: Continuous Corridor
Habitat Blocks Connected: Turkey Hills to Picture Canyon
Focal Species: elk, mule deer, turkey, bald eagle, peregrine falcon, neotropical migratory birds, porcupine, bats, Gunnison's prairie dog, bats
Current Threats/Barriers: rural development, OHV recreation

## 9. Rogers Lake – Volunteer Canyon

Type: Continuous Corridor
Habitat Blocks Connected: Rogers Lake to Camp Navajo to Volunteer Canyon
Focal Species: pronghorn, elk, mule deer, black bear, turkey, bald eagle, mountain lion, Mexican spotted owl, northern goshawk, northern leopard frog, Gunnison's prairie dog, Mexican vole, neotropical migratory birds, bats
Current Threats/Barriers: recreation, military training

## 10. Dry Lake - Rogers Lake

Type: Continuous Corridor
Habitat Blocks Connected: Dry Lake to Rogers Lake
Focal Species: pronghorn, elk, mule deer, black bear, turkey, bald eagle, mountain lion, Mexican spotted owl, northern goshawk, northern leopard frog, Gunnison's prairie dog, Mexican vole, neotropical migratory birds, bats
Current Threats/Barriers: suburban development, recreation, traffic on Woody Mountain Road

## 11. Bow and Arrow

Type: Stepping Stone
Habitat Blocks Connected: Patches of habitat in Bow and Arrow Wash
Focal Species: neotropical migratory birds, bats
Current Threats/Barriers: urban and suburban development, Lake Mary Road, Lone Tree, invasive plants



## 12. Hoffman Tank Area

Type: Continuous Corridor
Habitat Blocks Connected: Rio de Flag to Walnut Canyon
Focal Species: neotropical migratory birds, Gunnison's prairie dog, bats
Current Threats/Barriers: suburban and rural development, invasive plants

## 13. Peaceful Valley – Campbell Mesa

Type: Continuous Corridor
Habitat Blocks Connected: Rio de Flag to Walnut Canyon
Focal Species: bald eagle, neotropical migratory birds, Gunnison's prairie dog, elk, mule deer, porcupine, bats
Current Threats/Barriers: suburban development, recreation

## 14. Rio de Flag

Type: Stepping Stone
Habitat Patches Linked: Patchy riparian habitats in the Rio de Flag throughout Flagstaff (Museum of Northern Arizona, Francis Short Pond, I-40 Wetlands, Picture Canyon)
Focal Species: neotropical migratory birds, waterfowl, bald eagle, bats
Current Threats/Barriers: urban/suburban/rural/commercial development, Interstate 40, recreation, invasive plants, trash, stormwater

## 15. Leupp Road

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Pinyon-juniper woodlands on Coconino National Forest
Focal Species: elk, pronghorn, mule deer, bats
Current Threats/Barriers: Leupp Road

## 16. Interstate Highway 40

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Forest, woodland, and grassland on Kaibab and Coconino National Forests
Focal Species: pronghorn, elk, mule deer, black bear, turkey, bald eagle, mountain lion, Mexican spotted owl, northern goshawk, northern leopard frog, Gunnison's prairie dog, Mexican vole, neotropical migratory birds, porcupine, bats
Current Threats/Barriers: Interstate 40, urban/suburban/rural/commercial development, railroad

## 17. Sinclair Wash

Type: Stepping Stone
Habitat Patches Linked: Riparian patches linked in Sinclair Wash (Sawmill, NAU, along Beulah, toward Woody Ridge)
Focal Species: neotropical migratory birds, bats
Current Threats/Barriers: urban/suburban/commercial development, Milton, Beulah, Interstate 40, invasive plants, trash, stormwater



### 18. Woody Ridge

Type: Continuous Corridor
Habitat Blocks Connected: Schultz Pass – Woody Ridge Corridor to Rogers Lake to Mogollon Rim
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison’s prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, Mexican vole, bats
Current Threats/Barriers: Traffic and recreation along Woody Mountain Rd (FR 231), some fuels reduction treatments

### 19. Interstate Highway 17

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Coconino National Forest rim country
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison’s prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, Mexican vole, bats
Current Threats/Barriers: Interstate 17, suburban and rural development

### 20. Walnut Canyon

Type: Continuous Corridor
Habitat Blocks Connected: Walnut Canyon and surrounding uplands, Rio de Flag, San Francisco Wash
Focal Species: mountain lion, elk, mule deer, black bear, northern goshawk, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, bats
Current Threats/Barriers: Lake Mary Road, recreation

### 21. Black Pass

Type: Continuous Corridor
Habitat Blocks Connected: Woody Ridge to Mogollon Rim
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison’s prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, Mexican vole, bats
Current Threats/Barriers: State Route 89A, recreation, some fuels reduction treatments

### 22. Schoolhouse - Pumphouse

Type: Continuous Corridor
Habitat Blocks Connected: Coconino National Forest lands north of Mountaineer to Pumphouse Wash
Focal Species: elk, mule deer, black bear, northern goshawk, Gunnison’s prairie dog, Mexican spotted owl, waterfowl, bald eagle, neotropical migratory birds, turkey, leopard frog, bats
Current Threats/Barriers: Interstate 17, suburban and rural development, OHV use of illegal trails, recreation and traffic along FR 237



### 23. Lake Mary Road (Forest Road 3)

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Forests, woodlands, grasslands, and riparian areas on Coconino National Forest lands through Anderson Mesa, Lakes Mary, and Mormon Lake
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison's prairie dog, Mexican spotted owl, neotropical migratory birds, turkey, leopard frog, bats
Current Threats/Barriers: Lake Mary Road, suburban and rural development, OHV use of illegal trails, recreation

### 24. Townsend-Winona Road

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Forests, woodlands, riparian areas (Rio de Flag), and grasslands on Coconino National Forest lands
Focal Species: pronghorn, mountain lion, elk, mule deer, black bear, badger, northern goshawk, Gunnison's prairie dog, neotropical migratory birds, turkey, bats, leopard frog, Mexican vole
Current Threats/Barriers: Townsend-Winona Road, suburban and rural development, OHV use of illegal trails, recreation

### 25. State Highway 89A

Type: Travel Mitigation Area
Habitat Blocks Fragmented: Forests, woodlands, riparian areas (Oak Creek) on Coconino National Forest and State Trust lands
Focal Species: elk, mule deer, black bear, northern goshawk, Gunnison's prairie dog, Mexican spotted owl, waterfowl, bald eagle, neotropical migratory birds, turkey, leopard frog, bats
Current Threats/Barriers: Highway 89A, rural development, recreation

### Citation

Forman, R. T. T. and R. D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (USA) suburban highway. *Conservation Biology* 14: 36-46.





For more information on how to incorporate wildlife habitat connectivity into land use planning, visit the Arizona Game and Fish Department's Wildlife Friendly Planning Guidelines at [http://www.azgfd.gov/w\\_c/WildlifePlanning.shtml](http://www.azgfd.gov/w_c/WildlifePlanning.shtml)

