

Pinal County Riparian Area Guidelines



2019

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1. Introduction

Purpose

The purpose of these guidelines is to provide planners and other project proponents the necessary tools to identify opportunities to protect riparian areas, open spaces, and other natural resources throughout Pinal County (the County). These guidelines offer background information, justification, and other strategies to guide and inform decisions in order to avoid, minimize, and/or mitigate impacts to these wildlife and plant resources, while fostering economic growth and environmentally-friendly development throughout the county.

These guidelines offer practical steps and access to tools that will inform planning and development decisions both at a local and regional level. These are non-regulatory guidelines and are intended to aid the planning and development community, along with the general public, to identify, protect, and reduce impacts to riparian areas throughout the County and beyond. The Arizona Game and Fish Department (Department) will work directly with project proponents to identify resources and incorporate conservation concepts into planning documents and maps. By using these guidelines and utilizing various tools, project proponents will be able to:

- Identify the various types of riparian areas and understand the important role these habitats play in any landscape for wildlife and people.
- Utilize a comprehensive on-line tool to identify riparian areas and other important resources in your project area during the planning and development process.
- Identify how their project fits into the greater natural landscape as well as the long-term objectives of the County.
- Receive guidance to incorporate conservation concepts into planning documents and maps.

Planning for the Future of Pinal County

The County has witnessed immense changes in the last decade. The population of the County has risen sharply, from 116,000 residents in 1990 to 430,237 residents in 2017. Some estimates suggest the County population will surpass 800,000 by the year 2040 (ADOA 2015). All of these changes can have immense impacts on the open spaces and wildlife habitats that make Pinal County so unique. These guidelines are intended to inform decisions avoid, reduce and/or mitigate for impacts to riparian areas, while fostering the economic growth and development coming to the County.

Riparian areas across Arizona are at risk. These habitats play a unique and vital role, especially in arid regions of the state, such as Pinal County, where riparian areas have a disproportionate role in the landscape. Although riparian areas make up less than 0.4% of the total land area in Arizona (Ffolliott, et al 2004), these delicate areas provide critical habitats for wildlife, areas for

groundwater recharge, the filtration of pollutants, and natural flood and erosion control, among others. The Environmental Protection Agency (EPA) defines riparian as:

“Riparian areas are vegetated ecosystems along a water body through which energy, materials and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent waterbody. These systems encompass wetlands, uplands, or some combinations of these two land forms. They will not in all cases have all the characteristics necessary for them to be classified as wetlands.” (EPA, 1993)

The Arizona Riparian Council (ARC) further defines riparian areas, specifically within in the arid systems found throughout central and southern Arizona:

“Riparian is defined as vegetation, habitats, or ecosystems that are associated with bodies of water (streams or lakes) or are dependent on the existence of perennial, intermittent, or ephemeral surface or subsurface water drainage.” (ARC, 1994)

Therefore, riparian areas can be considered the natural areas including and adjacent to rivers, streams, washes, and other bodies of water. These areas possess surface water year-round, part of the year, or only following rain events. Riparian areas include the stream channel itself, as well as the immediately-adjacent area of vegetation that acts as a transition zone between the channel and the upland area.

2. The Benefits of Riparian Areas

Riparian areas provide a multitude of benefits, many of which have direct and quantifiable impacts to our lives and communities (Levick et al, 2008). Human populations gain various benefits from the natural functions of healthy ecosystems and riparian areas play a crucial role in these ecosystem services. The benefits of healthy and functioning riparian areas include, but are not limited to:

- **Water supply:** Riparian areas help retain surface water which results in underground aquifer recharge that Arizona relies on for its water supply.
- **Flood control and mitigation:** Natural drainage systems of riparian areas can lessen the impact of severe weather events that sometimes result in property damage.
- **Storm water management:** Maintaining these natural drainage features ensures that storm water reduces its impacts to surrounding communities.
- **Improved water quality:** These waterways act as natural biofilters that help remove pollutants and harmful nutrients found in surface runoff.
- **Erosion control:** With banks fortified with vegetation, riparian areas act as a natural bulwark that can reduce the destructive impacts of erosion.

- **Recreation and quality of life:** Natural riparian areas offer a multitude of recreational opportunities like hiking or wildlife watching. These green spaces also provide the region with open landscapes and rural character unique to Pinal County.

Riparian Areas and Wildlife

Riparian areas provide critical habitats for wildlife. Because of the high moisture content of riparian areas, vegetation and wildlife abundance and diversity is exceedingly high within and directly adjacent to these habitats (Levick et al, 2008). Up to 80% percent of Arizona wildlife species are dependent on riparian areas for breeding, migration, shelter, and seasonal forage during some part of their life cycle (Chaney et al., 1990). Wildlife also depend on these riparian areas for a dependable water source. Many species unique to the southwest rely solely on riparian areas for breeding, including the endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and the threatened western yellow-billed cuckoo (*Coccyzus americanus*) and northern Mexican gartersnake (*Thamnophis eques magalops*). Game species such as Gambel’s quail (*Callipepla gambelii*), mule deer (*Odocoileus hemionus*), and javelina (*Pecari tajacu*) rely on these water sources to maintain healthy populations in Pinal County and beyond.



Arizona’s wildlife species oftentimes rely on riparian areas to safely move between habitats in search of resources.

Whether endangered or common, game species or not, nearly all of Arizona’s wildlife rely on riparian areas to facilitate movement from habitat to habitat. From dry washes to flowing rivers, these riparian areas act as wildlife corridors—the landscape linkages which provide habitats and allow for species to safely move from habitat to habitat throughout the year as conditions change. These riparian areas act as important linkages in the landscape to facilitate daily, seasonal, and annual movements of individuals and populations of species. Keeping these connections intact ensure the long-term viability of all wildlife species, as well as plants, by promoting genetic exchange between individuals and populations. Protecting riparian areas is critical to the long-term viability of all of Arizona’s plant and animal species.

3. The Need for Riparian Area Protections

With all of the changes coming to Pinal County, reducing adverse impacts to riparian areas is more important than ever. It is estimated that less than 5% of Arizona’s riparian areas remain in their original form, mostly due to anthropogenic (man-made) forces including cattle grazing, river channelization, agricultural clearing, and urbanization (Krueper 1995, ARC 2004). Most land preservation efforts in the Southwest have focused on upland areas that possess perennial rivers

and streams (year-round surface water). Meanwhile, bottomlands, where intermittent or ephemeral riparian areas (i.e. dry washes) are located, continue to be developed and degraded. This can have major residual effects for the greater landscape. Disruption of natural flow regimes have the potential to greatly increase downstream flooding while damaging wildlife habitat and depleting groundwater recharge, among many other adverse effects. Maintaining the integrity of the entire watershed both at a local and landscape level has benefits for all of Pinal County.

Most of the major rivers and waterways that possess perennial waters are currently protected under federal regulations, including Section 404 of the Clean Water Act. Many other riparian areas in Pinal County, such as the Lower San Pedro River, are also “Critical Habitats” designated by the United States Fish and Wildlife Service (USFWS) because these areas offer habitats essential to the survival of a threatened or endangered species, such as the Southwestern willow flycatcher. Other regulations restrict development within FEMA-designated 100-year floodplains as defined by the U.S. Corps of Engineers (USACE). In addition to these federal regulations, the Department’s policy clearly states the importance of riparian areas and their role in providing habitat for fish and wildlife populations in Arizona:

- *It is the policy of the Arizona Game and Fish Commission that the Department shall recognize riparian habitats as areas of critical environmental importance to wildlife and fisheries. The Department shall actively encourage management practices that will result in maintenance of current riparian habitat, and restoration of past or deteriorated riparian habitat in accordance with the Department’s Wildlife Habitat Compensation procedures. (Department policy A1.22 Riparian Habitat)*

Current Riparian Habitat Protections in Pinal County

Pinal County currently has a variety of existing policies, codes, and regulations that stress the importance of riparian areas, while also providing guidance towards protecting these areas. Some of these guiding documents include:

Pinal County Comprehensive Plan

The Comprehensive Plan highlights the importance of riparian areas, noting that "riparian areas occupy less than 1% of the total land area in Arizona, but the ecological value is disproportionate to their size" (Pinal County 2012, p. 252). Specifically, the Comprehensive Plan encourages the protection of riparian areas in three different sections:

- *Encourage the protection of ridgelines, foothills, significant mountainous areas, wildlife habitat and riparian areas. (Policy 3.1.4.1)*
- *Encourage compatible development in environmentally-sensitive areas and minimize impact to the native desert, grasslands and riparian areas. (Policy 3.9.1.4)*
- *Promote planning and decision-making that minimize disturbance to riparian areas and wetlands. (Policy 7.1.2.4)*

Pinal County Open Space and Trails Master Plan

The Open Space and Trails Master Plan was adopted into the County's Comprehensive Plan in 2009. Much of the proposed open space, parks, and trails identified in the Plan are integral to preserving the integrity of watersheds and waterways throughout the County. Some of the policies encouraged by the Open Space and Trails Master Plan include:

- *Develop open space and trail standards and criteria to provide sufficient buffer zones relative to roadways, river and wash corridors, critical habitat, sensitive lands and development areas. (Policy 6.1.1.9)*
- *Identify the significant natural washes and develop a countywide storm water management plan that preserves the significant natural washes and adopt development regulations to implement the storm water management plan.(Policy 6.1.2.1)*
- *Develop a watershed management plan that protects the county's key contributing areas to promote water quality and conservation for future generations. (Policy 6.1.2.2)*
- *Encourage landowners to work through regional and federally recognized solutions to remove property from floodplains to allow safe development and protection for future homeowners. (Policy 6.1.2.3)*

Pinal County Development Services Code

The Pinal County Development Services Code is designed for the general welfare for the citizens of the County through an efficient use of the land. The Development Services Codes clearly lay out rules, regulations and plans for the future growth and development of the county. Specifically, the Development Services Code call for the preservation and minimization of impact to these areas, including:

- *All significant natural features including, but not limited to, steep slopes, rock outcrops, and major washes shall be preserved and, where necessary, protected by setbacks. (Policy 2.176.090 C)*
- *Development shall be designed and sited to preserve and protect natural washes and floodplains.(Policy 2.176.100 D)*

With these long-term planning documents, Pinal County has taken a forward-looking approach to the future land use within the county. These and other various policies are designed to help maintain the open spaces and natural landscapes that make Pinal County unique.

4. Riparian Areas in Pinal County

Riparian areas possess one or more critical ecological functions and can take several forms, from perennial rivers or wetlands with year-round water supplies, to dry washes and arroyos that possess water only for short periods following rain events. Whether offering surface water year-round or

only part of the year, all riparian areas play critical roles in the landscapes and have direct effects to surrounding communities and wildlife.

Riparian areas are classified in three general categories. Each category possesses specific characteristics in water availability, soil moisture, vegetation, and others. In addition, each category of riparian area plays an important role in the landscape, such as acting as a water source, providing wildlife habitat and movement corridors, or acting as natural areas that reduce flood dangers and facilitate the safe movement of water across the landscape during any part of the year. The categories of riparian areas are defined below:

Hydro-riparian Areas

Hydro-riparian areas are perennial (year-round) or intermittent (seasonal) water sources that possess surface water year-round or at least part of the year. They possess hydric soils or substrates that are never dry or only dry for a short period of time. Arizona has lost more than 90% of these habitats due to flow management, development, over-grazing, and other human uses (Krueper 1993). Hydro-riparian areas are of the highest habitat quality for their ability to support a diversity of plant and wildlife species. Hydro-riparian areas also act as critical linkages in the landscape by providing movement corridors and habitats for various species, mostly characterized by healthy forests with canopy.



The San Pedro River (left) in eastern Pinal County has several stretches that maintain surface water year-round. These hydro-riparian areas are characterized by dense ribbons of green habitats running through the arid desert (right).

Indicator species in hydro-riparian areas include Goodding's willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), Arizona sycamore (*Plananus wrightii*), seep willow (*Baccharis salicifolia*), and coyote willow (*Salix exigua*). Hydro-riparian areas in Pinal County include the Lower San Pedro River and the Gila River.

Meso-riparian Areas

Meso-riparian areas are associated with intermittent water, ephemeral wetlands, and/or shallow groundwater. Much like hydro-riparian habitats, meso-riparian habitats have suffered adverse effects from similar manipulation of the landscape such as grazing and depleting ground water (Krueper 1995). In addition, however, Arizona has lost considerable meso-riparian habitats due to the arrival of salt cedar (*Tamarix* spp.) that outcompetes native riparian trees such as cottonwoods and willows (Poff et al, 2011).

Meso-riparian areas act as seasonal water resource. These habitats possess non-hydric soils and a substrate that is dry seasonally. Hydro-riparian trees such as Goodding's willow and Fremont cottonwood may also be present. Meso-riparian areas are of medium to high habitat quality for their ability to sustain a diversity of plant and wildlife species. Meso-riparian areas often act as critical linkages in the landscape by providing movement corridors for various species. These areas are also characterized by forested areas, although the canopy may not be as robust as that found in hydro-riparian areas.



Located near Red Rock, AZ, Greene's Wash (left) is a meso-riparian area that retains surface water for parts of the year. Seen from above (right) meso-riparian areas can possess characteristics of both hydro- and xero-riparian areas.

Indicator species in meso-riparian areas include Goodding's willow, Fremont cottonwood, Arizona sycamore, Arizona walnut, net-leaf hackberry, seep willow (*Baccharis salicifolia*), coyote willow (*Salix exigua*), arrow-weed (*Pluchea sericea*), velvet mesquite (*Prosopis velutinia*), honey mesquite (*P. glandulosa*), screwbean mesquite (*P. pubescens*). Examples of meso-riparian areas in Pinal County include portions of the Lower San Pedro and Gila rivers, Greene's Wash, Picacho Reservoir, and the Lower Santa Cruz River.

Xero-riparian Areas

Xero-riparian areas are associated with ephemeral surface water and they act as a water source only following infrequent events such as seasonal rainfall. These habitats possess non-hydric soils and a substrate that is dry most of the year

Xero-riparian areas are of medium habitat quality for their ability to sustain seasonal plants and animals compared with upland habitats. Xero-riparian areas can act as critical linkages in the landscape by providing movement corridors for various species.



Xero-riparian channels are dry for most of the year, except following rain events. An aerial photo (right) demonstrates how xero-riparian habitats are often braided, creating many different smaller channels for water to move across the landscape.

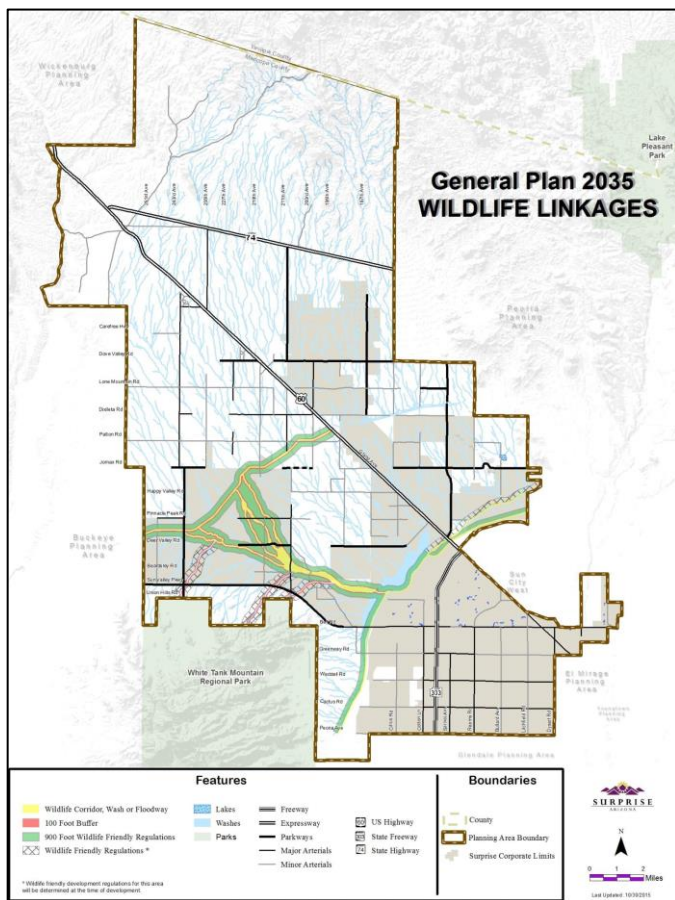
Indicator species of xero-riparian areas include blue palo verde (*Parkinsonia florida*), desert willow (*Chilopsis linearis*), desert broom (*Baccharis sarothroides*), four-wing saltbush (*Atriplex canescens*), brittlebush (*Encelia farinosa*), acacia species (*Acacia* spp.), tamarisk species, and mesquite. Many other trees and shrubs common in desert habitats can also be found in xero-riparian areas, including creosote (*Larrea tridentata*), ironwood (*Olneya tesota*), giant saguaro (*Carnegiea gigantea*), and other cactus species.

Riparian areas in a landscape context

Although each category of riparian area has distinct characteristics, all three area types working together creates a network that ensures the proper function of any living landscape. However, meso- and xero-riparian areas make up more than 81% of all riparian areas in the desert southwest (Krueper, 1995). Unfortunately, these types of riparian habitats are greatly underappreciated for their ecological and hydrological values and are oftentimes destroyed or altered during construction projects (National Research Council, 2002). In a watershed that delivers water from high elevation streams all the way down to lakes and wetlands, removing or compromising any parts of the riparian network can seriously damage the watershed's proper function while also creating potential hazards in the landscape.

5. Planning at Different Scales

Riparian habitat plays a critical role both at a regional (community) and local (project) level. At the local scale, in-tact riparian areas may facilitate the movement of water safely through neighborhoods that have retained the natural function of these habitats. At a regional scale, riparian areas may connect large habitat blocks, allowing for the long-distance movements of plants and animals through a landscape. In order to effectively reduce impacts to riparian areas, the identification and mapping of riparian areas in your project area—either at the project or community level—should be completed as early as possible in the planning process. For a comprehensive guide to project- and community-level designs for wildlife, see the Department’s *Wildlife Friendly Guidelines: Community and Project Planning* (2009), which can be accessed at: <https://www.azgfd.com/wildlife/planning/wildlifeguidelines/>.



The General Plan for Surprise, Arizona is large-scale community level project that incorporates both riparian areas and wildlife corridors. This design maintains functionality of riparian areas, while also using corridors to maintain connectivity between wildland blocks located beyond the project footprint.

Community Planning

Community planning, meanwhile, occurs at the regional landscape scale. It is long-term planning mostly completed by planning professional working for counties, cities, or associations of governments. Community planning often results in comprehensive or regional plans that assist community leaders with decisions regarding industrial, commercials, residential, recreation, and municipal land uses, such as the Pinal County Comprehensive Plan or Open Space and Trails Master Plan (Pinal County 2007 and 2009). The goal of community-scale planning is to balance the growth and mobility of Arizona residents with the biodiversity and mobility of wildlife.

These planners oftentimes work with state agencies to plan large-scale transportation projects or infrastructure projects. Community planners also sometimes collaborate between agencies and local governments to ensure compatible plans are developed and implemented. Community planners are encouraged to work with the Department to identify the riparian areas and other natural resources located in their project area, and to collaboratively develop plans to help reduce impacts to these resources.

One strategy commonly used at the community scale level is to incorporate “clustering” into the project design. Cluster development groups homes into a smaller proportion of the land and provides for the conservation of common open space and limits habitat fragmentation. The purpose of clustering is to:

- Preserve natural open space areas without increasing overall residential densities.
- Encourage and provide incentives for innovative site planning that is harmonious with natural features of the property.
- Support open spaces that are interconnected, continuous, and integrated.
- Provide additional usable open space.

Project Planning

Project scale planning occurs at the level of the individual development. These project proponents are typically comprised of a team of planners, engineers, and consultants hired by the developer to implement the design concept of a residential, commercial, or industrial development project. Project planning includes smaller, local projects, such as a solar facility, a shopping center, or planned area development (PAD).

Although smaller and localized, each of these project types has tremendous potential to adversely affect the surrounding environment, especially riparian areas. At the same time, these smaller projects have great potential to help maintain landscape integrity by protecting riparian areas and other open spaces that might be located within the project footprint. These projects can help maintain the overlooked connections in the landscape by preserving the smaller, xero-riparian areas that are common throughout Pinal County.



Project planning incorporates existing riparian areas (green) into its design. This maintains the functionality of riparian areas while also preserving linkages outside the project footprint.

By identifying these sensitive areas early in the design phase, project planners can incorporate changes to ensure impacts to riparian areas have been minimized. The role of the community planner at the project scale should be to help developers understand the impacts their project may have at the landscape level and avoid, minimize, or mitigate those impacts. Project planners should also work with the Department to avoid impacts to riparian areas.

6. Tools for Planners and Project Proponents

Whether a large PAD or a small-scale solar facility, all development projects have the potential to impact and alter riparian areas and, therefore, have adverse effects on the greater landscape. Planners and other project proponents should use all the available tools to first identify riparian areas and wildlife corridors, then make every attempt to avoid, minimize, and/or mitigate adverse impacts to these habitats. These guidelines provide simple steps to meet your project goals as well as those of the Department.

Steps to protect riparian areas in Pinal County:

1. Utilize the Department's On-Line Environmental Review Tool (ERT) to evaluate your project and identify potential impacts to natural resources.
2. Submit the ERT report to the Department for review that identify natural resources that may be affected by your project.
3. Coordinate with a Department biologists to identify strategies to avoid, minimize, and mitigate adverse impacts while simultaneously helping you meet you project goals.

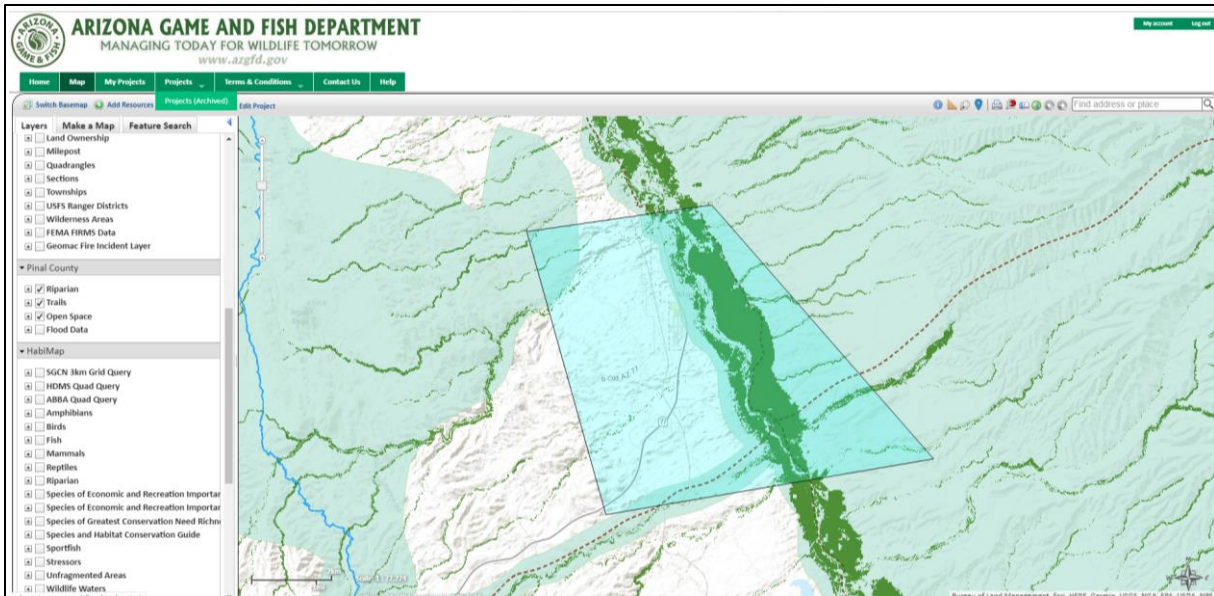
Arizona's Online Environmental Review Tool (ERT)

The first and most critical step to minimizing impacts to riparian areas is to identify the riparian areas in your project area. As previously noted, there are a variety of riparian habitat types but most fit into three main categories: **hydro-riparian** (perennial surface water), **meso-riparian** (intermittent surface water), and **xero-riparian** (ephemeral surface water; aka "dry wash").

Pinal County currently relies on the AGFD's Environmental Review Tool (ERT), a powerful on-line mapping tool helps planners and private and public entities identify various environmental concerns that may be impacted by a project. The ERT can be accessed here:

<https://azhgis2.esri.com/>

The Department's Heritage Data Management System (HDMS) and Project Evaluation Program (PEP) work together to provide current, reliable, and objective data on Arizona's plant and wildlife species, unique habitats, and other natural resources that might aid in the environmental decision making process. The following link provides a simple tutorial on using the ERT: <http://help.natureserve.org/ert/az/>.



The Arizona Online Environmental Review Tool (ERT) is a user-friendly on-line tool for project proponents that can help identify riparian areas, wildlife corridors, and other important natural resources within a project area.

In 2019, the Department updated the ERT to create county-specific layers within the on-line tool. These data layers rely on more accurate riparian habitat maps, creating a more effective tool for users to help avoid, minimize, and mitigate for riparian areas in Pinal County. The County-specific layers also incorporate the County’s Open Space and Trails Master Plan. This comprehensive data set illustrates the County’s long-term commitment to open space and recreation planning.

The County-specific tool also incorporates other important datasets that, together, help planners and other project managers, identify how their project fits into a larger landscape context. These other layers include AGFD wildlife connectivity layers that highlight the important wildlife corridors throughout the County, as well as areas of “critical habitat.” These are areas identified by the United States Fish and Wildlife Service (USFWS) as areas that are critical to the long-term survival of a certain threatened or endangered species (i.e. southwestern willow flycatcher or western yellow-billed cuckoo).

Layers in the ERT

The ERT now provides additional types of data layers to help planners and project leaders in Pinal County. By toggling on/off these layers, project proponents can gain a better understanding as to how their project fits into the larger landscape. Is my project adversely affecting fragile riparian areas? Is my project offer a wildlife corridor? Does my project contribute to the County’s long term plans? These are just a few of the questions that can be answered by utilizing the ERT. This tool has been modified to address sensitive areas and long-term plans in Pinal County. Specifically, the ERT offers three types of data layers to help project proponents in the design of

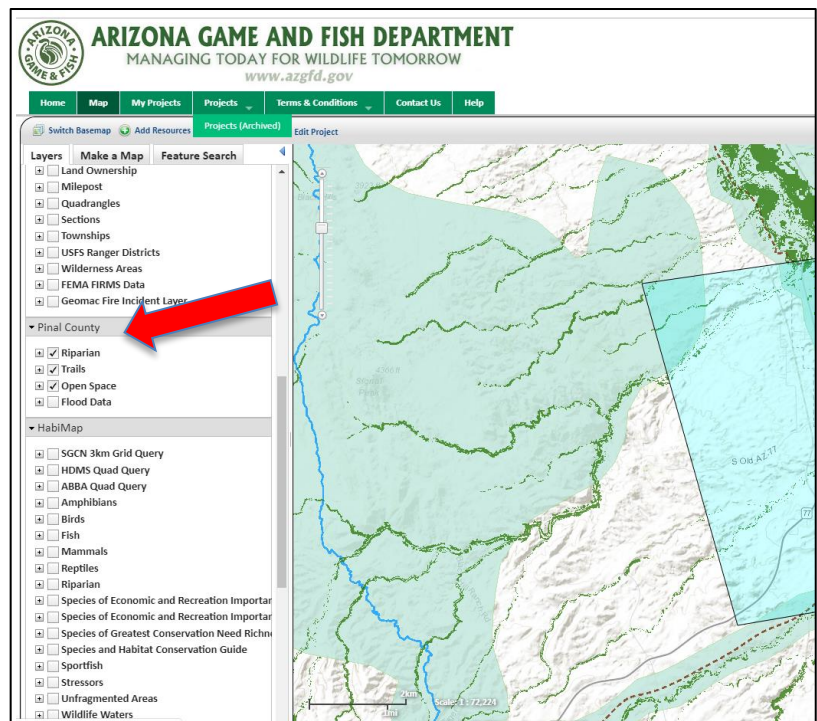
their project, the Pinal County Riparian layer, the Open Space and Trails Master Plan layer, and a few layers for wildlife connectivity:

Pinal County Riparian

The first layer added to the ERT is the Pinal County riparian layer, which illustrates all the vital riparian areas throughout the County, from the largest washes with perennial surface water, to smaller dry washes that possess water only following rain events. The purpose of this layer is to help identify riparian areas that might be adversely affected by a project. This layer is found in the Pinal County section along the table of contents along the left-hand side of the ERT window (see below).

While these guidelines describe three categories of riparian areas (hydro-, meso-, and xero-riparian) based on water availability and vegetation types, the ERT only identifies a generic “riparian area.” Eventually this tool will be able to identify the three unique classes of riparian area.

Through coordination with AGFD (see Section 8), project proponents will be able to consult with Department biologists. The purpose of this consultation process is: 1) Identify what riparian areas are in your project footprint, and 2) Offer solutions to help avoid, minimize, or mitigate impacts to riparian areas. The goal is to both protect these sensitive habitats while help provide solutions that meet the goals of your project.

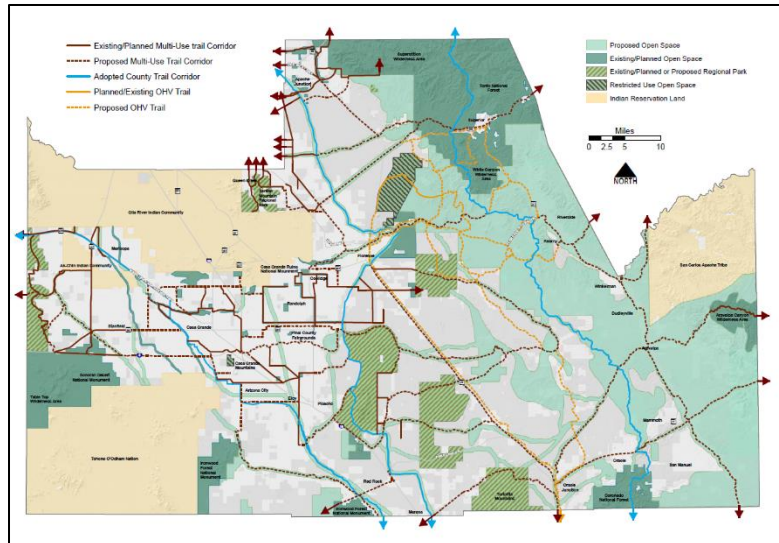


Some layers in the ERT are specific to Pinal County (red arrow). These data include riparian areas, the Open Space & Trails Master Plan, and multiple wildlife connectivity layers.

Open Spaces/Trails

The Pinal County Open Space and Trail Master Plan (the Plan) is represented in the ERT as the two layers, “Open Space” and “Trails.” The Plan is the long-term vision for preserving the

County’s open spaces and providing recreational opportunities for its residents and visitors. The Plan was based on extensive analysis of various resources that affect current and future County plans, including biological resources, cultural resources, land ownership, community connections, and existing and planned parks and trails. The result is a comprehensive strategy to maintain and protect open spaces and recreational opportunities that make Pinal County unique. One layer of the ERT tool allows project managers to view their project within the context of the Plan.



The Pinal County Open Space and Trails Master Plan illustrates long-term goals for the County. This layer in the ERT lets project proponents see how their project aligns with the County’s goals of preserving open space and providing more recreational opportunities.

Wildlife Connectivity Layers

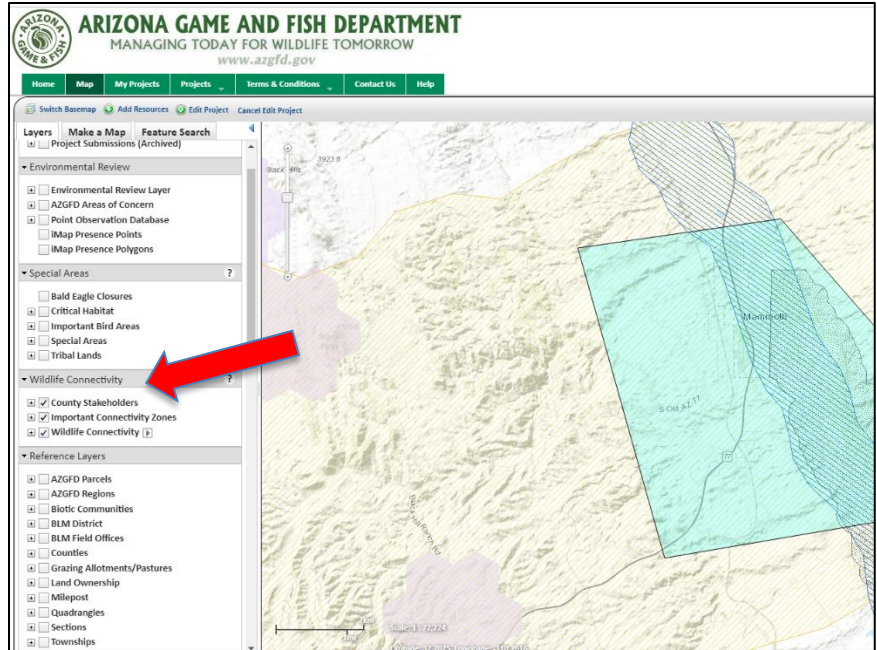
The other County-specific layers in the ERT provide information on wildlife corridors and areas of habitat connectivity. In the ERT’s table of contents, these layers are found in the section “Wildlife Connectivity.” Whether birds or mammals or fish, wildlife constantly need to move based on the availability of shelter, food, and other resources. Wildlife corridors are habitats that facilitate these daily, seasonal, or annual movements. In addition, wildlife corridors connect wildland blocks, which are the open areas that provide resources needed for individual survival and the long-term sustainability of populations.

Responsible planning incorporates both the needs of Arizona residents as well as the sustainability, diversity, and mobility of the state’s wildlife. An important first step in preserving this balance is the identification of wildlife resources within any project area. The wildlife connectivity layers used in the ERT highlight both wildlife corridors and wildland blocks, essentially demonstrating the areas that wildlife need to survive as well as the linkages that connect these habitats and allow for free movements.

While wildlife corridors can take many different forms, such as canyons or ridgelines, riparian areas are the most important and most frequently used type of corridor that facilitates the movements of wildlife. Riparian areas are home to the highest wildlife and plant diversity, yet they are some of the most fragile and rare habitats in Arizona. These riparian wildlife corridors can also

occur at several different scales, from large washes that facilitate movements of larger species like bighorn sheep and mountain lions, to smaller dry washes that might act as important habitats for smaller species such as the roadrunner, box turtle, or coati.

Sometimes, wildlife corridors run right through areas that are developed or may be developed in the future. Corridors are critical for wildlife with large-area requirements, those species that migrate seasonally, and for all wildlife to maintain genetic diversity. The size of an effective wildlife corridors vary by the species that use them. For example, a small lizard may not require a corridor as wide or as long as what might be needed for a black bear to pass safely from one habitat block to another. By planning corridors for those wildlife species with the largest width requirements, you can assume that you have provided the appropriate corridor width for most if not all of the wildlife species that might be found in your project area.



Three layers in the ERT illustrate how your project might affect connectivity for wildlife (red arrow).

So what makes a wildlife corridor? Streams, washes, canyons, and mountain ridges are some of the most frequently used landscape features for wildlife movement. Among these, riparian areas are crucial because they house the highest wildlife diversity and yet are among the rarest landscape features in Arizona. When possible, planners should consult with the Department to identify crucial wildlife movement corridors in their planning area.

Within the ERT, three wildlife connectivity datasets are available to project proponents. Each of the datasets can be used independently to inform conservation planning. However, when used in conjunction with other datasets provided in the ERT (i.e. riparian areas, Open Space and Trails Master Plan), the value of these planning tools can be further increased. Connectivity datasets available in the ERT include:

County Stakeholders Layer

This county-wide analysis was created in 2010 by a team of local stakeholders to identify important wildlife movement areas throughout the County. These data identify *landscape movement areas*, where wildlife can move long distances between large unfragmented areas of habitat, known as

wildland blocks. It also shows *diffuse movement areas*, a more local type of linkage in which animals can move within habitat blocks. More information on the County Stakeholder layer is detailed in the “Pinal County Wildlife Connectivity Assessment” which can be found here: <https://www.azgfd.com/wildlife/planning/habitatconnectivity/identifying-corridors>

Important Connectivity Zones Layer

Important Connectivity Zones (ICZs) represent general areas which contribute the most to connectivity of the whole landscape. These data represent areas of opportunities to preserve or enhance connectivity at a landscape or regional scale. While other wildlife connectivity data layers included in the ERT might identify specific areas of connectivity at a local level, the ICZs data highlights areas that contribute to connectivity at a landscape or regional scale. Project planning and implementation efforts should focus on maintaining and improving ICZs within a project footprint to help maintain wildlife connectivity at a larger scale. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer to:

https://s3.amazonaws.com/azgfd-portal-wordpress/azgfd.wp/wp-content/uploads/0001/01/23120719/ALIWCA_Final_Report_Perkl_2013_lowres.pdf

Wildlife Connectivity Layer

The Wildlife Connectivity layer is data that represents high-priority areas with current or anticipated threats to wildlife movements. These areas identify multi-species corridors that would best maintain wildlife movement and maintain connectivity between wildland blocks. These linkages do not necessarily represent current connectivity or wildlife movement, but are ideal connections based on species’ habitat needs; therefore, they provide a tool for planning, and represent connections that should be examined for preservation and permeability improvements. AGFD staff can identify potential landscape impacts, and make recommendations to a project proponent on how to avoid, minimize, and/or mitigate impacts to these linkages. Above all, it must be remembered that a lack of data in this dataset does not indicate a lack important connectivity features or issues. More information on the Arizona Missing Linkages can be found here: <http://corridordesign.org/linkages/arizona>

7. Avoid, Minimize, Mitigate: Protecting Resources in Your Project Area

Once you have identified riparian areas, wildlife corridors, and other natural resources in your project area, it is important to develop a plan that seeks to avoid, minimize, and/or mitigate any adverse impacts to these resources. This section describes guidelines to help guide project proponents to meet these objectives. Some of these guidelines are rigorous while others are guidance that would help preserve these riparian areas and other natural resources in Pinal County.

Avoid

The first and most cost-effective way to protect riparian areas, wildlife corridors, and other resources is to design or amend your project to avoid these areas altogether. Some general guidelines to avoid adverse impacts to riparian areas include:

- To the extent possible, avoid altering all existing riparian areas in your project area so they remain in their natural state.
- Avoid removing vegetation (small trees, shrubs, perennials, annuals, and grasses) within and immediately adjacent to the riparian area.
- Avoid removing soils, woody debris, leaves, branches, and other organic material.
- Do not construct any human encroachments within the riparian area, such as fencing or impervious surfaces (i.e. pavement or sidewalks).
- Avoid channelizing with impervious surfaces (i.e. concrete berms or channels).
- Avoid disturbance in riparian areas during breeding season for birds (generally May through late August), depending on species in the local area. Raptors breed in early February through May.
- Avoid using pesticides, fertilizers, or any other chemical within the riparian area.
- Aquatic species breed at different times throughout the year. Coordinate with a Department biologist to determine a timeframe and actions (e.g. limiting sediment input into water courses during construction) that would avoid impact to these species.
- Avoid fragmenting habitats by encouraging the connectivity of riparian areas past the boundary of your project area. This will increase connectivity between wildlife corridors at a landscape scale and help reduce fragmentation of wildlife habitats.

Minimize

Sometimes unavoidable impacts to riparian areas will occur in order to meet the goals of your project. The Department encourages project proponents to try various practices that will help minimize adverse impacts to these habitats. These include:

- Limit removal of vegetation or debris to those species considered noxious or invasive.
- To reduce fire hazards, limit removal or trimming of vegetation to an area that provides a sufficient buffer zone around structures to create a defensible space.
- Limit livestock and pet use of the riparian areas as these animals can degrade sensitive habitats, leave unwanted waste, and disrupt behavior of local wildlife that rely on these areas.

- Minimize the use of fencing, lighting, and non-native vegetation within 500 feet of any riparian area. These structures can influence animal movements and alter behavior.
- Incorporate setbacks and buffers into your project design to help protect riparian areas.

Setbacks and buffers

Installing setbacks, or buffers, are an easy way to minimize adverse effects to riparian areas and wildlife corridors. The Pinal County Floodplain Management Ordinance (2019) defines a setback as “The minimum horizontal distance between a structure and the top edge of the highest channel bank of a watercourse.” These buffers and setbacks can act as a transition zone between the stream channel and the upland areas and maintaining native vegetation in the buffer/setback zone helps protect the sensitive stream channel.

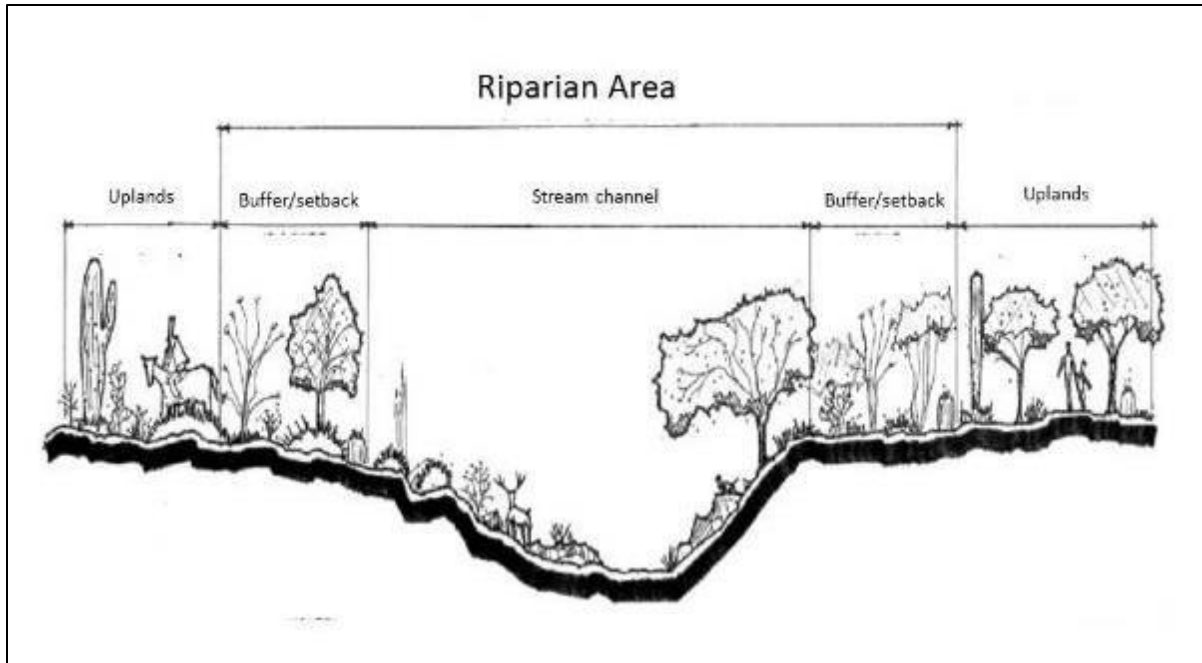


This project design for a solar facility adequately incorporates riparian areas in the project’s footprint (orange areas). Coordination with the Department early in the planning stage helped minimize impacts to riparian areas.

Once riparian areas have been identified in your project area, it is important to identify the size of the setback/buffer that would best help maintain the functionality of the riparian area. Minimum distances for setbacks and buffers are based on the type of riparian area identified in your project area (i.e. hydro-, meso-, or xero-riparian). Coordination with Department biologists will help identify which type of riparian habitat occurs in your project footprint.

The proper size of the setback/buffer are measured from the top edge of the stream channel. Setbacks and buffers should use the following general setback/buffer distances:

- **Hydro-riparian and meso-riparian areas = Minimum of 250 feet**
- **Xero-riparian areas = Minimum of 150 feet**



With proper planning, buffers and setbacks can be incorporated into the design of your project. Buffers and setbacks act as a transition zone and help protect the delicate stream channel.

Please note: Oftentimes, xero-riparian areas are “braided” channels, meaning there may be two or more active river channels that convey water during and after rain events. For these braided systems, the edge of the stream channel should be considered those edges on the outside of the braided system.

Mitigate

Sometimes, adverse impacts to habitats are unavoidable during the course of your project. The Department will work with project proponents to design and implement conservation measures that will help mitigate, or offset, unavoidable losses to wildlife habitat. While avoiding and minimizing impacts to habitats are considered part of mitigation (AZGFD 2016), the Department further defines mitigation as:

- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

No Net Loss

The Department recognizes riparian habitats as areas of critical environmental importance to wildlife and fisheries. Therefore, the Department actively encourages management practices that will maintain current riparian areas so that there is no “net loss” of habitat. No Net Loss is the

policy of habitat preservation through balancing economic development with mitigation and restoration efforts. Adhering to No Net Loss of riparian areas ensures that the total acreage of riparian habitat remains the same or increases within the project footprint

It is the policy of the Arizona Game and Fish Commission that the Department shall seek compensation at the 100% level, when feasible, for actual or potential habitat losses resulting from land and water projects (Department Policy I2.3, Wildlife and Wildlife Habitat Compensation). Through the policy of No Net Loss, the Department seeks to preserve riparian areas and maintain the functionality of these habitats.

Project proponents should work with the Department to design a mitigation plan with the goal of achieving No Net Loss of riparian area. Coordinating with the Department to design an effective mitigation plan can help design for the recovery of the riparian area for wildlife while still achieving the goals of your project. Some of these practices include:

- Re-contouring and/or replacing stream channel to their original natural state following construction.
- Reseeding, replanting, and/or transporting native plants to reconstitute the riparian area to regain its functionality.
- Re-establish connection in the landscape both within and outside the boundaries of your project footprint.

8. Coordination with AGFD

Whenever possible, the Department will work directly with the project proponents to help develop plans that will avoid, minimize, and/or mitigate for any adverse impacts or losses to riparian areas and other natural resources within your project footprint. These plans would include specifics on site analysis, revegetation (i.e. plant species, densities, planting locations), control of weedy species, implementing setbacks/buffers, and other strategies that would help maintain the functionality of riparian areas and wildlife corridors within your project footprint.

The Department is interested in the conservation of all riparian areas and other wildlife habitats. Although the ERT is a powerful tool to help project proponents identify potential adverse effects to riparian areas and wildlife connectivity, coordination with a qualified Department biologist can further this experience to ensure your project both meets its goals while also preserving the character and functionality of nearby natural resources. The Department will work directly with project proponents to identify resources and incorporate conservation concepts into planning documents and maps.

Once you have completed an ERT report for your project, closely review the project type recommendations to better understand the basic methods, advice, and other tips to avoid, minimize, and/or mitigate adverse effects to riparian areas and other natural resources that may occur with your project. Afterwards, submit the ERT report with the following supplemental information:

- A cover letter and project plans or documentation that includes a project narrative
- Acreage to be impacted
- How construction or project activities are to be accomplished
- Project locality information (including a site map).

Once the Department has received this information, please allow 30 days for completion of project reviews. All requests and inquiries can be sent to:

Project Evaluation Program (PEP), Habitat Branch
Arizona Game and Fish Department
5000 W. Carefree Highway
Phoenix, AZ 85086-5000
(623) 236-7600
PEP@azgfd.gov

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