

AGUA FRIA

WATERCOURSE MASTER PLAN

EXECUTIVE SUMMARY

Prepared for



November 2001



Table of Contents



<u>Contents</u>	<u>Section</u>
Executive Summary	I
Community Pages.....	II
▪ Maricopa County	
▪ City of Avondale	
▪ Town of El Mirage	
▪ City of Glendale	
▪ City of Goodyear	
▪ City of Peoria	
▪ City of Phoenix	
▪ City of Surprise	
▪ Town of Youngtown	
Information on Key Disciplines.....	III
▪ Public Involvement	
▪ Floodplain Management	
▪ No Adverse Impacts	
▪ Lateral Migration and River Erosion	
▪ Recreation	
▪ Vegetation and Wildlife	
▪ Groundwater Recharge	



Executive Summary

Overview

The Agua Fria River is a landmark of the West Valley's cultural diversity and history. This river corridor was once a lifeline for early civilizations that relied on the river and its adjacent lands for farming, homesteading, and transportation. Today, the Agua Fria is still an important element of the landscape and livelihood in the West Valley, and the varied land uses along the river include residential and commercial developments, sand and gravel mining, farms and orchards, and recreational areas.

West Valley leaders and communities understand the potential of the Agua Fria and its significance to the area's economic vitality and quality of life. They also understand that there are flood safety, recreational, and preservation opportunities that will enhance the communities along its banks.

From this understanding came the Agua Fria Watercourse Master Plan.

The Flood Control District of Maricopa County recognizes that traditional flood control projects are costly – for construction as well as long-term maintenance. The District has made it a matter of practice to look beyond “traditional” flood control solutions, and identify alternatives, where feasible, to single-purpose flood control structures that will still provided the needed levels of flood protection for citizens and property. The primary goal of the Agua Fria Watercourse Master Plan was to identify flood safety issues and address them in a way that is cost-effective, visually attractive, and that provides opportunities for recreation and other uses in the corridor.

In conjunction with the Flood Control District, West Valley leaders, agencies, and communities have been working together to

develop the Agua Fria Watercourse Master Plan. This Plan balances the need for flood safety and multi-use opportunities, and utilizes the major rivers of the West Valley for community-based recreation and for links to neighborhoods, communities and commerce.

This summary is divided into three sections. Following this project overview in Section II is a look at the Watercourse Master Plan on a community-by-community basis. Section III contains information on the key disciplines and considerations that went into the development of the Plan.

Study Purpose and Benefits

The Agua Fria River Watercourse Master Plan was funded by the Flood Control District of Maricopa County. The District's goal is to be able to provide a flood protection strategy that preserves the cultural and archaeological history of the river and also is consistent with the long-term, multi-use vision for the corridor. To accomplish this, it was important for the District to understand the opportunities within the corridor as well as the potential for flood hazards for the communities along its banks.

The Watercourse Master Plan outlines specific recommendations relative to floodplain management strategies, recreation opportunities, and habitat preservation for the corridor. Once the Master Plan is adopted by the County and each community, these agencies can adapt their current floodplain management programs, and use the Master Plan to help prioritize projects for implementation. Agencies also can use the Plan to identify partnering opportunities – for flood control recommendations or for recreational elements of the Plan.



Current Conditions

The Agua Fria River offers a diverse combination of open space, vegetation, desert habitat, industrial uses, and recreation spaces. There are limited areas where flash flood conditions exist in the central and lower reaches of the Agua Fria, but the southern portion of the corridor is a valuable source of water, shade, and food for a variety of wildlife. Over a century ago, the Agua Fria was only dry occasionally. With the damming of the river for water supply and flood control, and because of groundwater pumping, the Agua Fria is now considered to be an ephemeral watercourse – one that flows when it rains and is dry for many months of the year.

The corridor contains dramatic, canyon-like vistas in the north. There are thriving zones of native vegetation below Lake Pleasant, at the confluence with the Gila River, and intermittently throughout the corridor. These residual islands promote diversity of vegetation, wildlife, and recreation opportunities.

Development in the corridor has been concentrated in the areas from Beardsley

Road in the north to Olive Avenue in the south. Much of this development occurs outside of the historic floodplain, but some of this development has intruded into areas where the riverbanks could erode. Currently there are only limited areas of

flood risk, but as the West Valley grows and with current development standards, proactively addressing these areas of

potential risk becomes increasingly important.

Industrial activities in and around the river include sand and gravel mining and one closed landfill immediately south of Grand Avenue within the town of El Mirage. Sand and gravel mining is a vital part of the West Valley's economy, yet there are hidden costs associated with this activity. Sand and gravel mining in the riverbed has the potential to significantly lower the channel bottom during floods, which could lead to damaged bridges, utilities, and channel banks. Under the current floodplain management authorities, simple solutions have been identified that will allow continued mining while significantly reducing the likelihood that damages will occur.

Flood Hazards

There are few potential flood areas in the watercourse, with the exception of some areas of concern for infrastructure. Levees dominate the reach roughly from lower Buckeye Road in the south to Northern Avenue. The riverbed has been lowering over time, and is approaching a more stable slope. The current floodplain boundary maps

were developed based on the New Waddell dam providing a relative level of flood protection. Until the Agua Fria Watercourse Master Plan was developed, there was little information available that

allowed for a prediction of how the river might move from left to right (lateral migration). As part of the Master Plan, these





erosion zones (lateral migration erosion hazard zones) have been identified and mapped so that developers will be aware of areas where there could be damage potential.

Current floodplain management regulations were developed by the United States' Congress as a guideline to protect sites from floods. These same regulations do not fully consider the impacts that this development might have on other properties in the floodplain. Some of the functions that are adversely impacted by current standards include:

- *Peak flow rates* — Major floodplains can store significant amounts of water, which helps to naturally control downstream flood peaks. Current encroachment standards lead to a loss of this storage and an increase in downstream flood peaks.
- *Floodplain depth and width* — Current standards allow the encroachment of the floodplain to a line called the floodway. The net impact is that floodwaters are pushed across the watercourse, which expands the floodplain on the opposite side and could potentially flood land or buildings that were not previously considered to be in the floodplain.
- *Erosion* — Using hardbank materials can lead to increased erosion on adjacent or cross system banks. Current standards do not consider this potential.

There are various means and approaches to address these flooding-related hazards. Alternatives range from traditional solutions, such as the construction of levees or flood control channels, to techniques termed “non-structural.” The right solution for the Agua Fria River is a combination of these techniques. By establishing some guiding principles, the right solution, in the right place, for the right cost and that is consistent with the objectives for the corridor can be

established. Guiding principles for the flood protection recommendations developed for the Agua Fria Watercourse Master Plan included:

- Structural solutions should be used to fix existing problems;
- Priority should be given to strategies that have the lowest immediate and long-term public costs;
- Solutions should not transfer the flooding problem from one property to another; and
- Solutions should be consistent with the multiple use vision for the corridor.

Watercourse Master Plan Major Elements



Recreation and Open Space Opportunities:

Each community along the Agua Fria River has plans for parks and other recreational features that will serve community needs. In addition to these planned recreational elements, several opportunities were identified in the Master Plan:

- A potential park site along the west bank of the river north of Olive Avenue – a potential site is in the vicinity of the El Mirage treatment facility;



- A potential park site along the west bank of the river, north of Bell road at the McMicken Dam outfall channel;
- Construction of trails and trailheads in conjunction with existing Flood Control District levees or combined with a maintenance road for the river;
- Open space preservation areas north of CAP;
- Open space preservation at the confluence of the Agua Fria and Gila Rivers; and
- Open space restoration at the I-10 crossing of Agua Fria River.

Groundwater Recharge:

The West Valley communities, along with utility companies and private interest groups, have explored the potential for recharging the aquifer with excess waters. Groundwater recharge presents some opportunities to enhance the visual attractiveness and the landscape in and around these facilities. Existing recharge facilities include the Sun City West effluent recharge project on the east bank of the Agua Fria River and the Avondale Recharge facility, located on the east bank of the river near McDowell Road. Proposed facilities include:

- CAWCD recharge facility from the CAP Canal south to Jomax Road (under construction)
- SROG Linear recharge Project in Agua Fria from Bell Road south (planning phase)
- NAUSRP constructed recharge facility near Camelback Road vicinity (planning phase).

Flood Control Structures:

There are flood control levees on both sides of the Agua Fria River from approximately lower Buckeye Road to Indian School Road. From Indian School Road to Northern Avenue, levees exist primarily on the east side of the river. There are other bank protection structures associated with private developments or bridge crossings. Proposed flood control structures recommended in the Watercourse Master Plan include:

- Bank stabilization on both sides of the river south of Grand Avenue;
- Bank stabilization on the west side of the river south of Bell Road; and
- Structures to control channel lowering (grade control) as needed.

Regulations:

Each community currently has a floodplain management regulation and a drainage regulation. Findings and recommendations include:

- Current stormwater retention standards should be maintained;
- Floodplain standards should be modified so that development does not cause adverse flooding and erosion-related impacts on other properties; and
- Floodplain management standards should be expanded to manage the hazards associated with lateral bank erosion.



Sand and Gravel Mining:

The Agua Fria River provides quality affordable rock products to the Valley. This resource has a significant impact on the local and regional economy by keeping material costs down for construction and public infrastructure while providing jobs. In the context of a flood control project, the impacts of aggregate mining in the floodplain can be mixed. On the positive side, it was found that large pits located adjacent to the main channel helped to store floodwaters, reducing downstream flood peaks. At the same time, pits located within the floodplain often times lead to accelerated erosion (channel headcutting and degradation) during flood events, with impacts that might extend to adjacent properties or public infrastructure such as bridges. The challenge for flood control functions of the watercourse is to find a way for sand and gravel to operate within the Agua Fria River, while controlling adverse erosion impacts to the mined site. This Watercourse Master Plan evaluated several alternatives; including the recommended approach where the mine would either be isolated from the river via a low levee; or the site engineer would demonstrate that adverse impacts are contained within the property limits of the mine. Another alternative was the creation of a channeled section that would allow continued mining outside the boundaries of the newly channeled section. Due to the significant public expense of the channel option, it was not the recommended alternative. However, in the event that a public-private partnership with the sand and gravel industry could be crafted, the channel alternative would be worthy of additional examination.

For the immediate future, it is recommended that the District pursue a management approach that confines the erosion impacts of mining to the site via methods that isolate the site from the floodway.



Maricopa County



Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management
- Implement maintenance road
- Restore the Avondale mitigation site into a trailhead
- Coordinate with Corps of Engineers and Avondale on Restoration Project
- Discuss interest in bank stabilization projects with project sponsors
- Support Regional Trails Commission efforts to implement trails
- Begin maintenance road alignment and feasibility study
- Work with SROG and SRP for habitat and recreation opportunities in recharge sites
- Require development in Gila River confluence to elevate two feet above the flood elevation

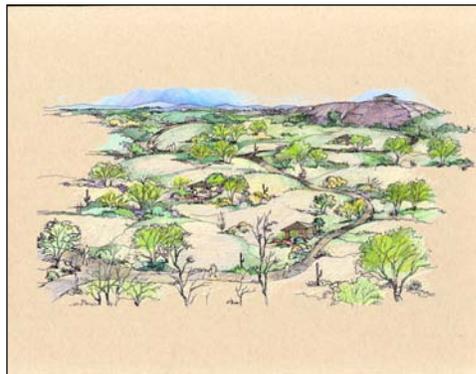
Project Recommendations:

- Stream restoration at I-10 and McDowell Road
- Stabilization south of Grand Avenue
- Stabilization south of Bell Road
- Grade control structures
- Develop trail system
- Lateral erosion management zone

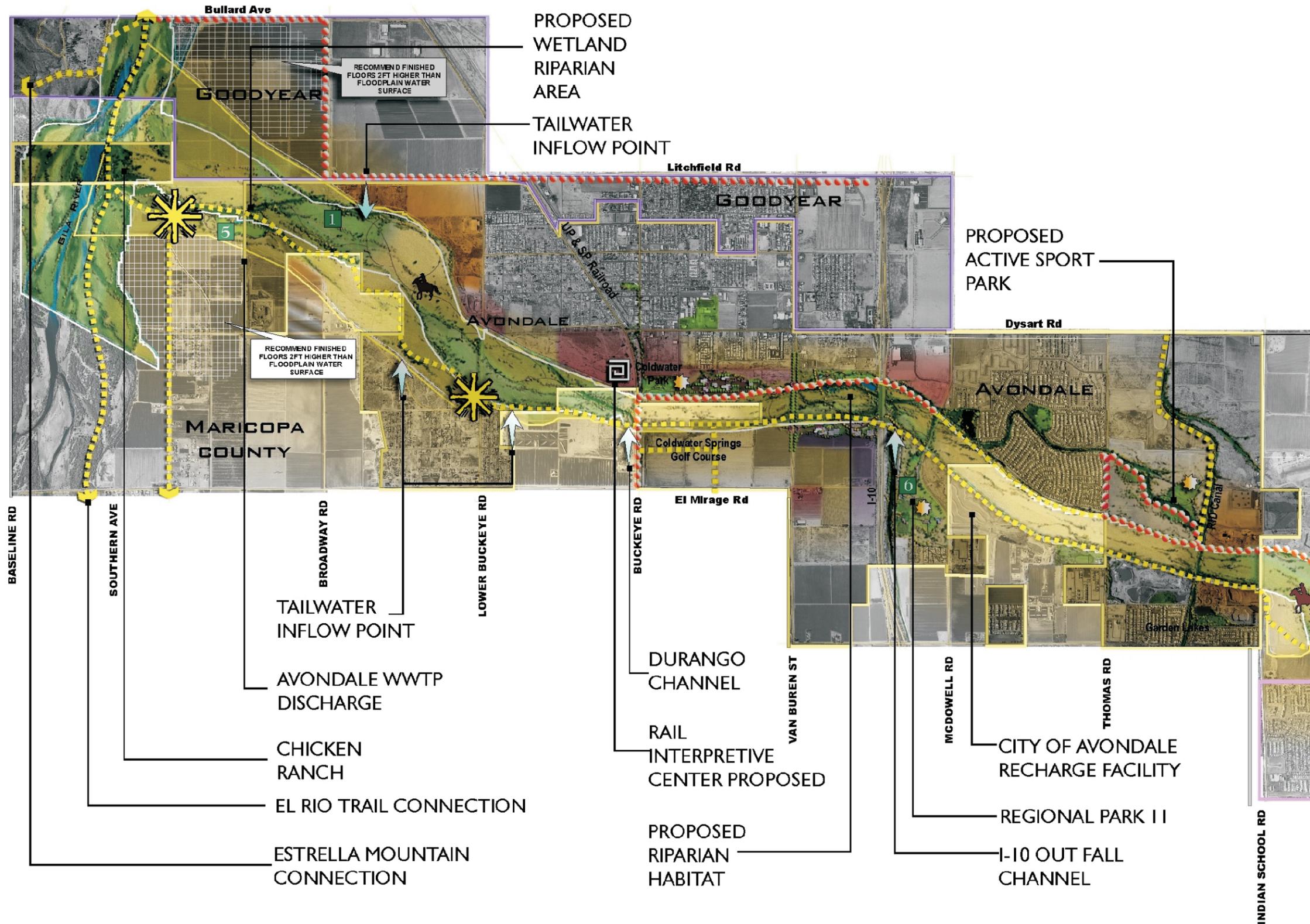
The Flood Control District has been the primary entity influencing floodplain management and flood control on the Agua Fria River for Maricopa County. Over time, annexations have decreased the land area that is directly under the regulatory responsibility of the County; however, the District continues to be a project sponsor for flood control. While there are “County Islands” throughout the watercourse, the largest blocked County areas are the reaches from Indian School Road to Peoria Avenue, and from Bell Road to Dynamite Boulevard.

The District has ongoing maintenance responsibilities associated with levees in the southern reach, and for the McMicken Dam outfall channel, Coulter channel, and other facilities.

The Flood Control District will participate in implementing flood safety project elements, as well as continue to implement regulatory programs. The Parks and Transportation departments also might assist with carrying out recommendations in the Watercourse Master Plan.



Significant recommendations for the District are to implementing strategies that manage lateral migration, and standards that manage the impact one development can have on another property.



LEGEND

- ECOZONE**
- MEDITERRANEAN ZONE
 - HYDRIC ZONE
 - MESIC ZONE
 - XERIC ZONE
- LANDUSE**
- INDUSTRIAL USE
 - RESORT
 - COMMERCIAL USE
 - RESIDENTIAL USE
 - MIXED USE
 - RURAL & AGRICULTURAL USE
 - RECREATIONAL USE
- SYMBOLS**
- LATERAL MIGRATION EROSION HAZARD ZONE
 - FLOODWAY
 - PROPOSED & EXISTING PARKS
 - WATER INFLOW POINTS
 - STAGING AREA
 - EQUESTRIAN FACILITY
 - INTERPRETIVE AREA
 - PLANNED & EXISTING MULTI USE TRAILS
 - PLANNED & EXISTING BIKE TRAILS
 - GREENWAYS

BASELINE RD
SOUTHERN AVE
BROADWAY RD
LOWER BUCKEYE RD
BUCKEYE RD
VAN BUREN ST
MCDOWELL RD
THOMAS RD
INDIAN SCHOOL RD

Bullard Ave
Litchfield Rd
Dysart Rd
El Mirage Rd

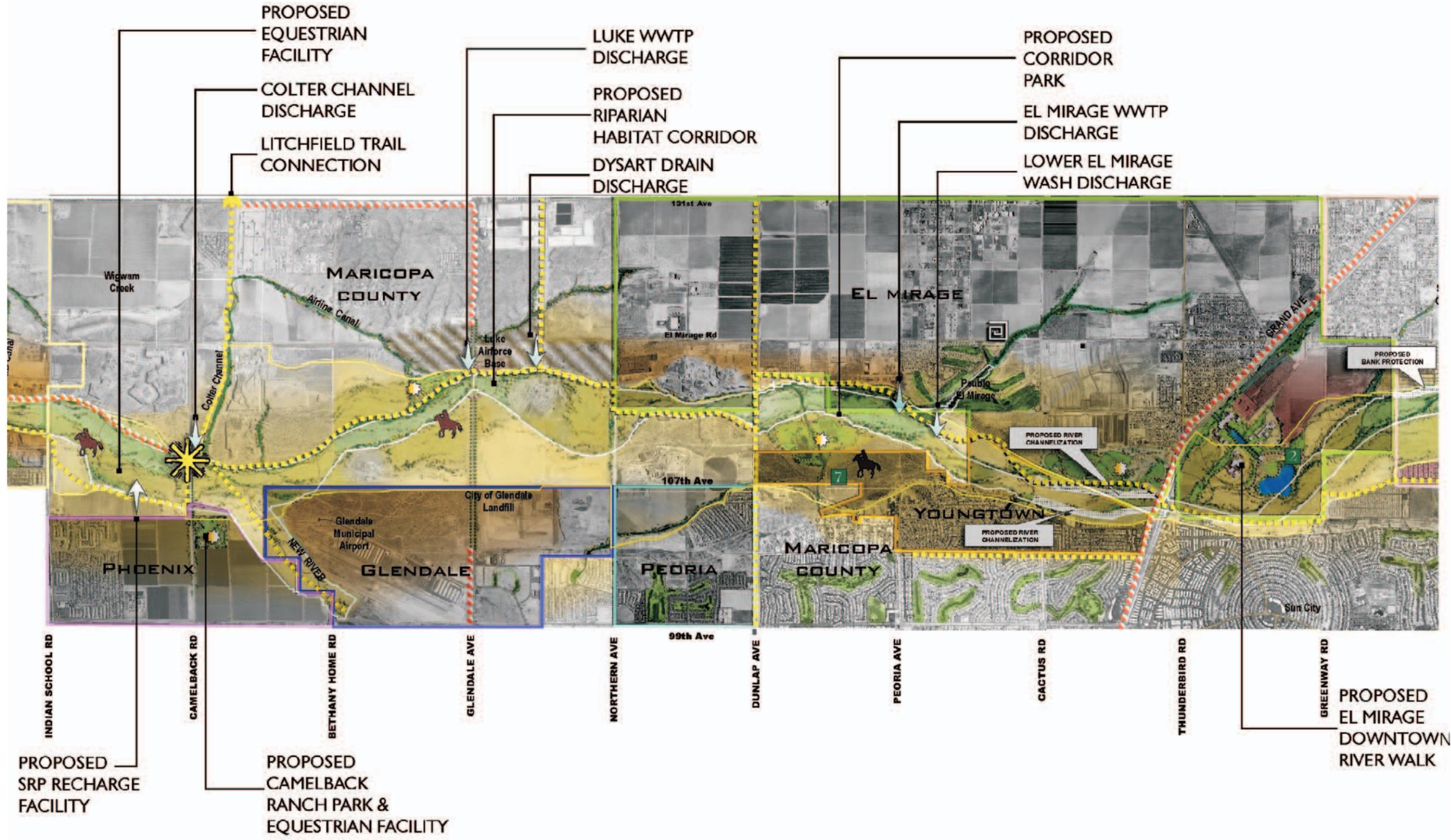
PROPOSED WETLAND RIPARIAN AREA
TAILWATER INFLOW POINT
RECOMMEND FINISHED FLOORS 2FT HIGHER THAN FLOODPLAIN WATER SURFACE
PROPOSED ACTIVE SPORT PARK
RECOMMEND FINISHED FLOORS 2FT HIGHER THAN FLOODPLAIN WATER SURFACE
DURANGO CHANNEL
RAIL INTERPRETIVE CENTER PROPOSED
PROPOSED RIPARIAN HABITAT
I-10 OUT FALL CHANNEL

AVONDALE WWTP DISCHARGE
CHICKEN RANCH
EL RIO TRAIL CONNECTION
ESTRELLA MOUNTAIN CONNECTION

Coldwater Springs Golf Course
Coldwater Park
Garden Lakes
CITY OF AVONDALE RECHARGE FACILITY
REGIONAL PARK II

GOODYEAR
GOODYEAR
AVONDALE
AVONDALE

5
6



LEGEND

ECOZONE

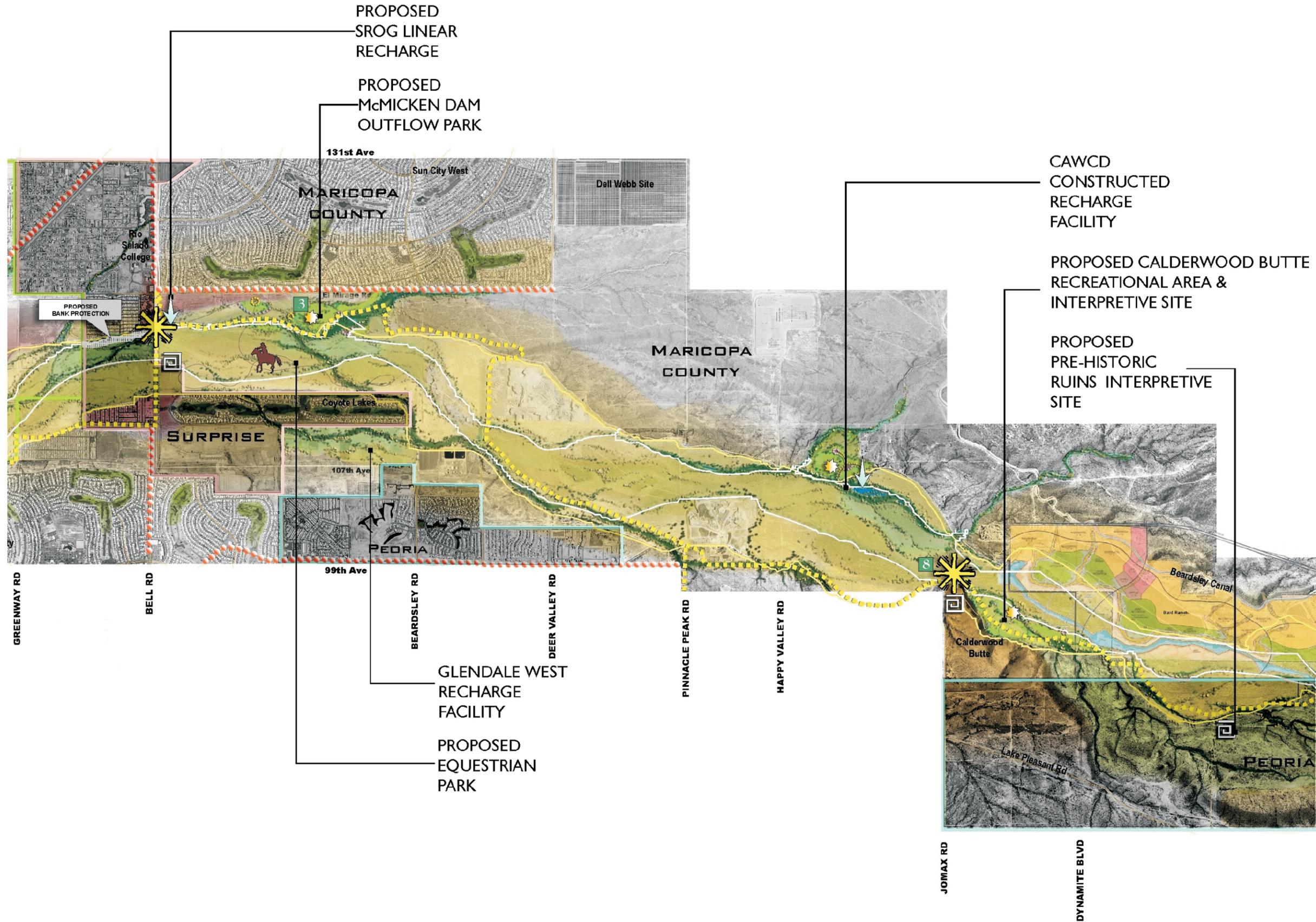
	MEDITERRANEAN ZONE
	HYDRIC ZONE
	MESIC ZONE
	XERIC ZONE

LANDUSE

	INDUSTRIAL USE
	RESORT
	COMMERCIAL USE
	RESIDENTIAL USE
	MIXED USE
	RURAL & AGRICULTURAL USE
	RECREATIONAL USE

SYMBOLS

	LATERAL MIGRATION EROSION HAZARD ZONE
	FLOODWAY
	PROPOSED & EXISTING PARKS
	WATER INFLOW POINTS
	STAGING AREA
	EQUESTRIAN FACILITY
	INTERPRETIVE AREA
	PLANNED & EXISTING MULTI USE TRAILS
	PLANNED & EXISTING BIKE TRAILS
	GREENWAYS

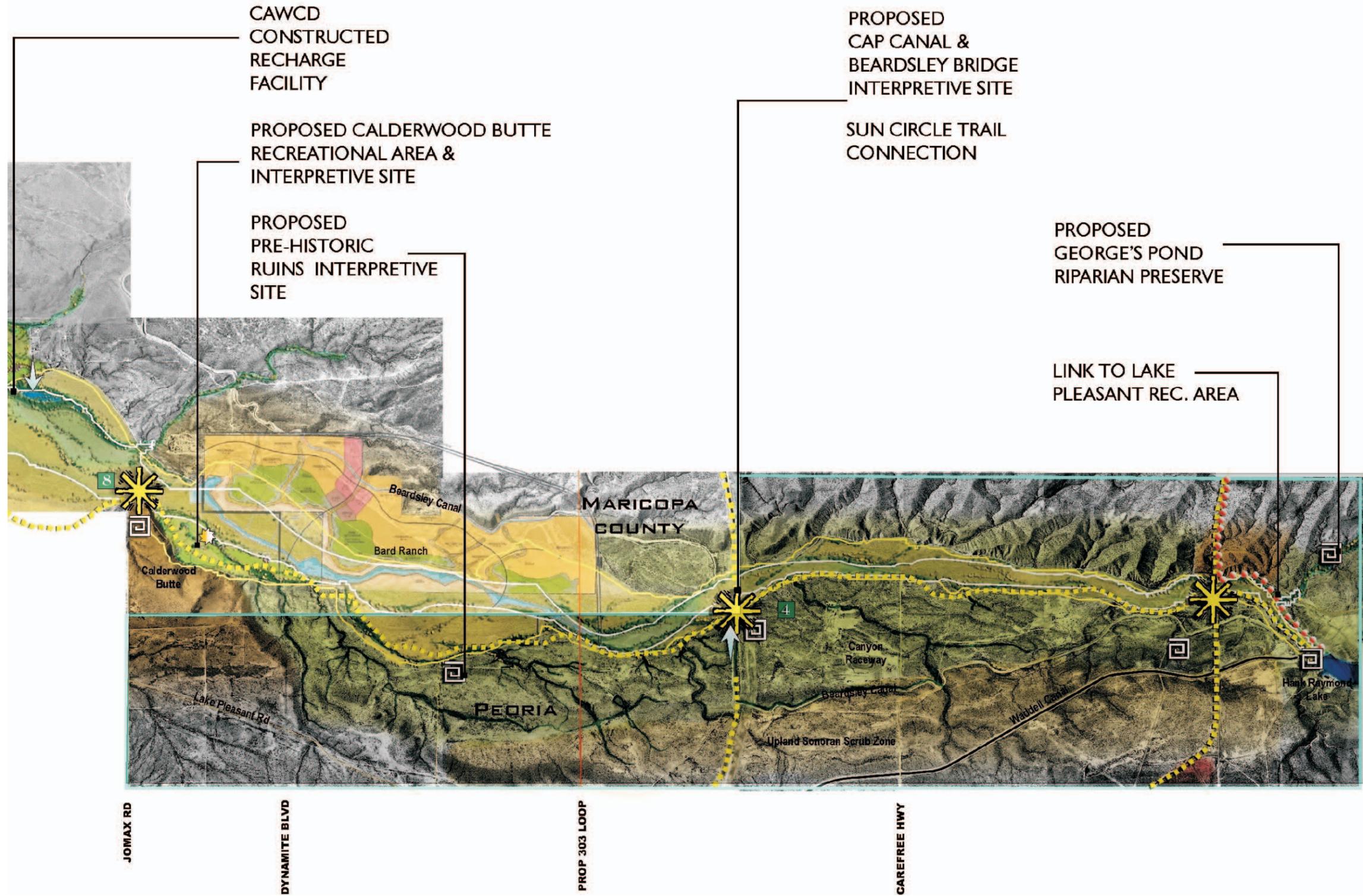


LEGEND

ECOZONE	
	MEDITERRANEAN ZONE
	HYDRIC ZONE
	MESIC ZONE
	XERIC ZONE

LANDUSE	
	INDUSTRIAL USE
	RESORT
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SYMBOLS	
	LATERAL MIGRATION EROSION HAZARD ZONE
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	EQUESTRIAN FACILITY
	INTERPRETIVE AREA
	PLANNED & EXISTING MULTI USE TRAILS
	PLANNED & EXISTING BIKE TRAILS
	GREENWAYS



LEGEND

ECOZONE	
	MEDITERRANEAN ZONE
	HYDRIC ZONE
	MESIC ZONE
	XERIC ZONE

LANDUSE	
	INDUSTRIAL USE
	RESORT
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	RECREATIONAL USE

SYMBOLS	
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	WATER INFLOW POINTS
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	INTERPRETIVE AREA
	PLANNED & EXISTING MULTI USE TRAILS
	PLANNED & EXISTING BIKE TRAILS
	GREENWAYS



City of Avondale



Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management
- Continue coordination with Corps of Engineers and District for the restoration project
- Continue development of Regional Park II
- Support Regional Trails Commission for trail implementation
- Adopt base flood elevation plus two feet of elevation standard
- Adopt floodplain and lateral migration hazard zone

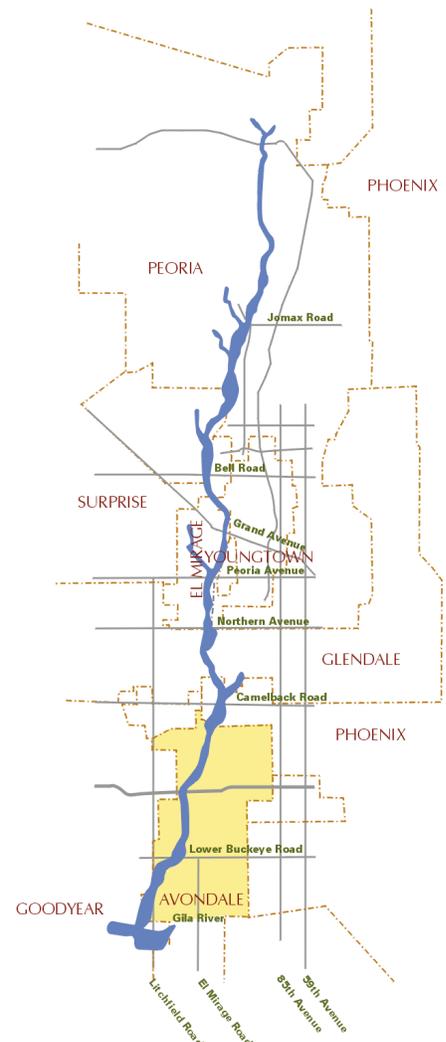
Project Recommendations:

- Stream restoration at I-10 and McDowell Road
- Develop trails along levees
- Restore the Avondale mitigation site into a trailhead
- Incorporate equestrian trailhead at lower Buckeye Road
- Mixed-use river development on west bank on City-owned land
- Trailhead linked with the proposed railroad interpretive park
- Incorporate recreation uses with in-city ground water recharge sites

The City of Avondale straddles both sides of the Agua Fria River from near the confluence with the Gila River to Indian School Road. The river transitions into the Gila River Floodplain south of lower Buckeye Road where flooding can occur from both the Agua Fria and Gila Rivers. Within these residual floodplain areas, the Watercourse Master Plan recommends that new construction be elevated two feet above the 100-year flood level, largely because of the dual hazard of being at a river confluence. North of lower Buckeye Road, the Agua Fria River has levees providing flood control on both sides of the watercourse.

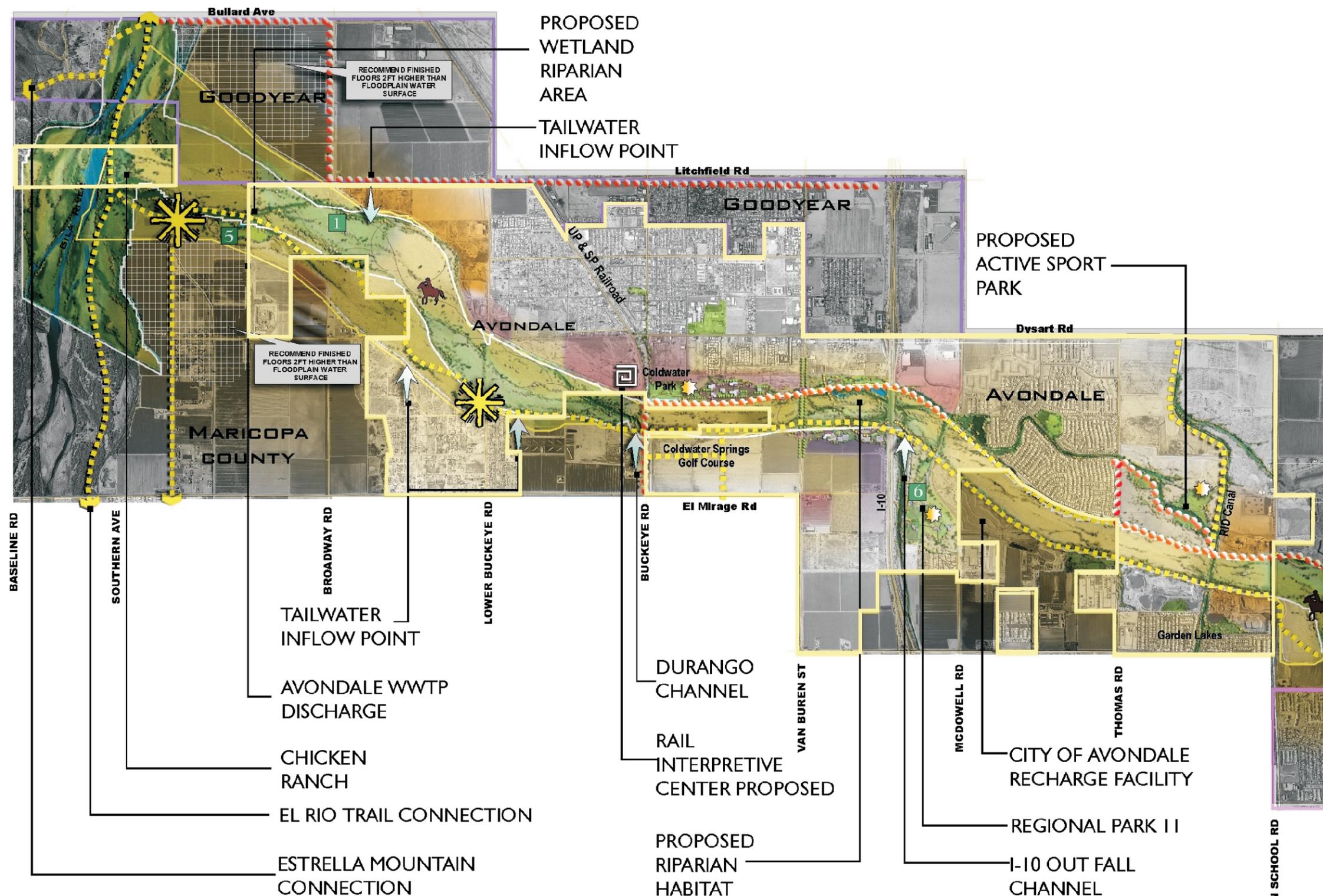
Several years ago, Avondale, in cooperation with the Flood Control District, constructed Cold Water Park and has aggressively pursued other recreation and development opportunities along the corridor. One of these is Regional Park II located near I-10 and the Agua Fria.

The City also has been cooperating with the Corps of Engineers and the Flood Control District to develop a stream restoration project near I-10. In-channel recharge is not considered feasible in the



southern areas of the City; however, there are active recharge sites in the vicinity of McDowell Road.

The recharge sites, existing and proposed park sites, trails, and the availability of prime commercial lands adjacent to the Agua Fria river provide Avondale with many opportunities to turn the river into an amenity for its citizens, and to be a destination for other users of the recreation corridor.



LEGEND

ECOZONE	
	MEDITERRANEAN ZONE
	HYDRIC ZONE
	MESIC ZONE
	XERIC ZONE

LANDUSE	
	INDUSTRIAL USE
	RESORT
	COMMERCIAL USE
	RESIDENTIAL USE
	MIXED USE
	RURAL & AGRICULTURAL USE
	RECREATIONAL USE

SYMBOLS	
	LATERAL MIGRATION EROSION HAZARD ZONE
	FLOODWAY
	PROPOSED & EXISTING PARKS
	WATER INFLOW POINTS
	STAGING AREA
	EQUESTRIAN FACILITY
	INTERPRETIVE AREA
	PLANNED & EXISTING MULTI USE TRAILS
	PLANNED & EXISTING BIKE TRAILS
	GREENWAYS



City of El Mirage



Community Action Items:

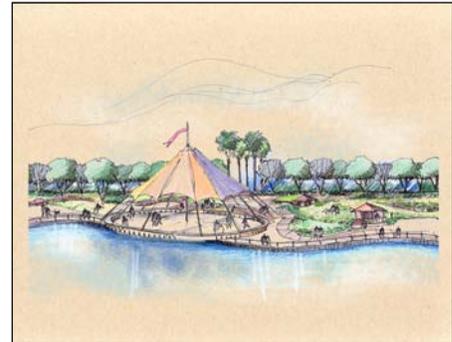
- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management
- Consider development of area north of Grand Avenue as a community gateway and commercial area tied to the plan
- Resolve issues, if any, associated with landfill closure and stabilization
- Participate in bank protection project
- Participate in grade control structure project
- Include proposed park site in community recreation master plan, and seek funding for implementation

Project Recommendations:

- Bank protection of river through landfill reach
- Create river park
- Develop trails along west bank of Agua Fria from Olive Avenue North, providing community linkages for commercial and recreational facilities
- Potential grade control structures
- Lateral erosion management zone

El Mirage primarily follows the west bank of the Agua Fria River from Northern Avenue to just north of Grand Avenue.

El Mirage, once a camp for Mexican migrant laborers during World War I, has grown into a community of over 5,000 people (1995 statistics). The rich Hispanic heritage of El Mirage is reflected in community festivals such as Founders Day, Cinco de Mayo, and Fiesta Patrias. This growing area is facing increased demand for residential development, and leaders are



seeking opportunities to blend the rich heritage with the anticipated community growth.

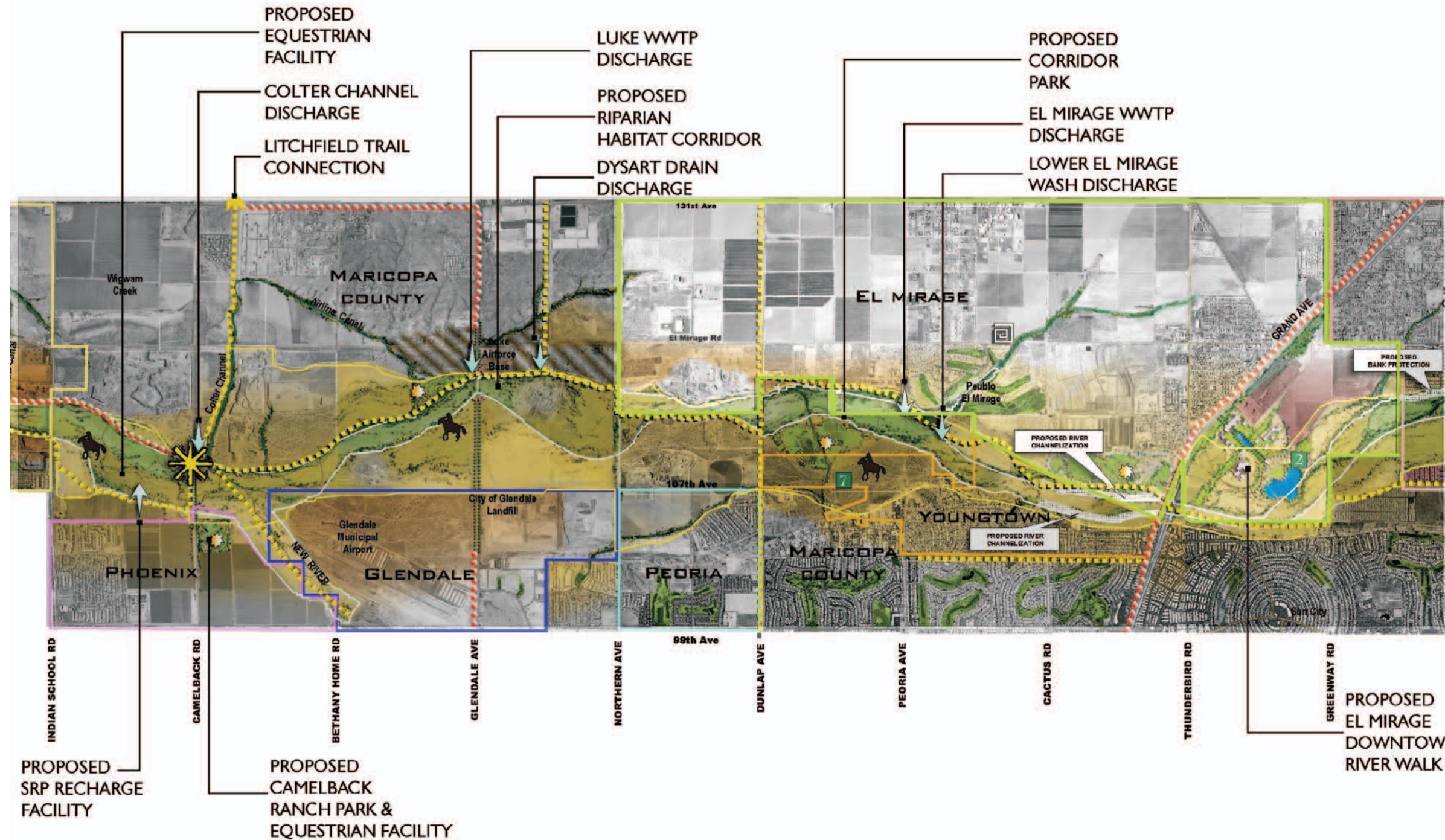
In the area adjacent to the treatment plant is a vibrant Mesquite and Palo Verde riparian area. North of Grand Avenue, there are opportunities for development that would make Grand Avenue a gateway for El Mirage. There are currently no significant flooding problems along the Agua Fria River, although recent development practices have promoted development within or adjacent to the floodplain.

The greatest challenge faced within this reach is the closed landfill just south of Grand Avenue. Construction debris has been used for stabilization to protect the landfill from flooding, but this might be inadequate flood protection for this site. Because of unsubstantiated but potential environmental concerns associated with the landfill, it will be necessary for agencies and entities responsible for this landfill to resolve issues, if any, associated with its closure and management.



EL MIRAGE

1 OF 1



LEGEND

- ECOZONE**
- MEDITERRANEAN ZONE
 - HYDRIC ZONE
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 - PLANNED & EXISTING MULTI USE TRAILS
 - PLANNED & EXISTING BIKE TRAILS
 - GREENWAYS

PROPOSED
EL MIRAGE
DOWNTOWN
RIVER WALK



City of Glendale



Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management once the river is annexed
- Continue active floodplain management
- Participate in trail planning and implementation
- Review MAG recommendations for multi-modal facilities along the New River

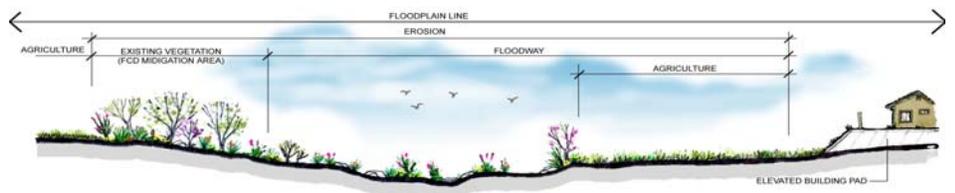
Project Recommendations:

- Develop trail system along the New River (see MAG Multi-Modal Planning study)
- Lateral erosion management zone

The City of Glendale is adjacent to or within the Agua Fria floodplain from Missouri Avenue to Northern Avenue. Within the reach from Glendale Avenue to Northern Avenue, the City operates a landfill and a solid waste transfer station which is protected by a levee. Based on existing strip annexations, the Agua Fria River in this reach will potentially be within the City.

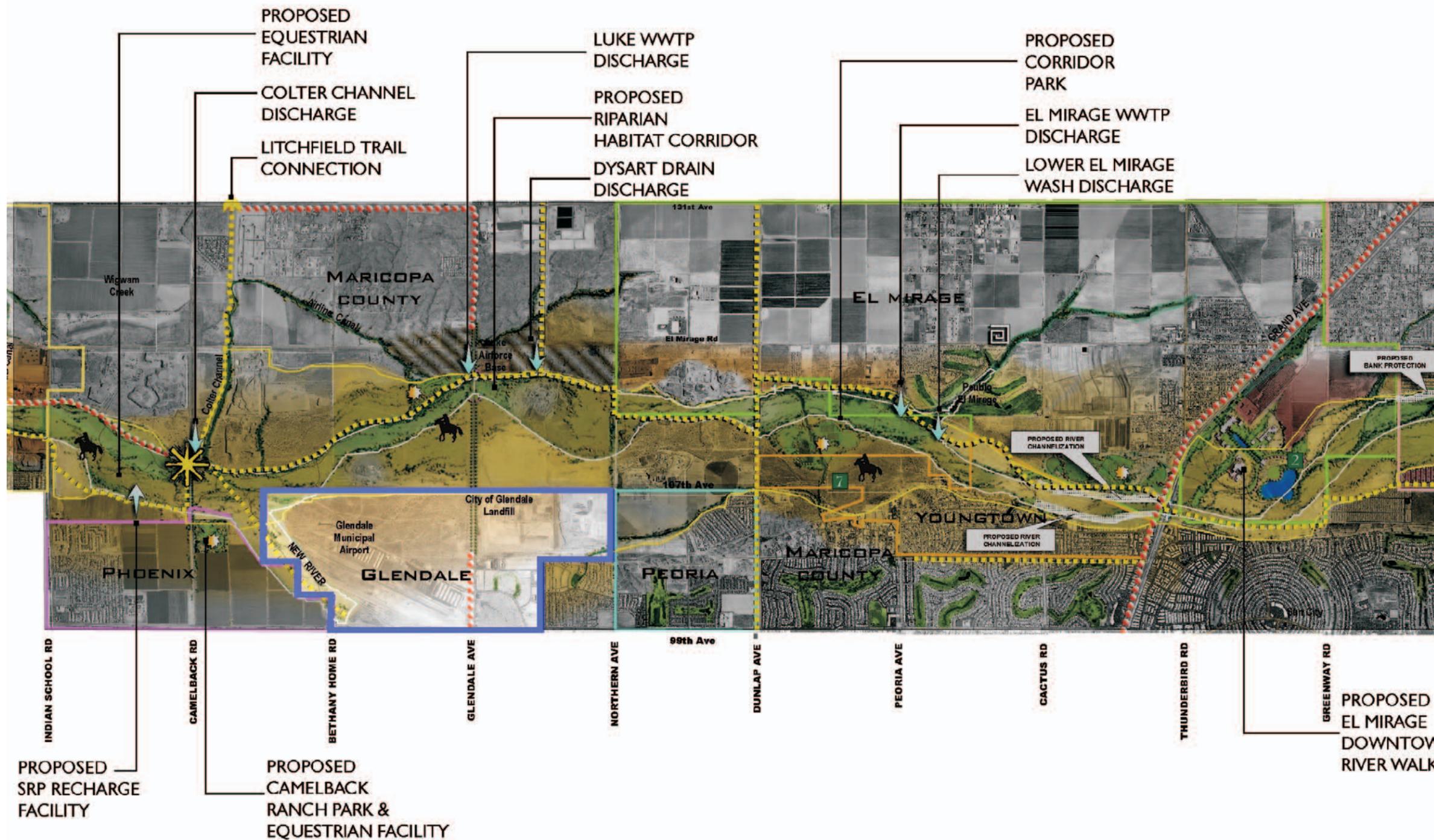
A multiple use maintenance road could be achievable, but currently there are no trails proposed in this reach due to the heavy industrial nature of the reach and the potential for serious conflict between operators and users. To provide a continuous north-south corridor, it is recommended that the proposed trail systems along the New River up to Olive Avenue include a loop back to the Agua Fria River.

Because of significant facilities within the reach, including the airport and other municipal sites, the City has a heightened interest in managing this floodplain. As proposed in the plan, sand and gravel operations in this reach should be isolated from the floodwaters of the Agua Fria River. This will limit the potential for the river to meander and perhaps undermine the protective works in this reach.



GLENDALE

1 OF 1



LEGEND

- ECOZONE**
- MEDITERRANEAN ZONE
 - HYDRIC ZONE
 - MESIC ZONE
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- LANDUSE**
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 - INTERPRETIVE AREA
 - PLANNED & EXISTING MULTI USE TRAILS
 - PLANNED & EXISTING BIKE TRAILS
 - GREENWAYS



City of Goodyear



Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management
- Adopt base flood elevation plus two feet of elevation standard

Project Recommendations:

- Develop trails
- Use of higher freeboard in confluence floodplain
- Lateral erosion management zone

Goodyear is adjacent to west bank of the Agua Fria at the confluence with the Gila River. Due to outflow from the Buckeye Irrigation Company and effluent flow from upstream treatment plants, this area is rich with vegetation and habitat value.

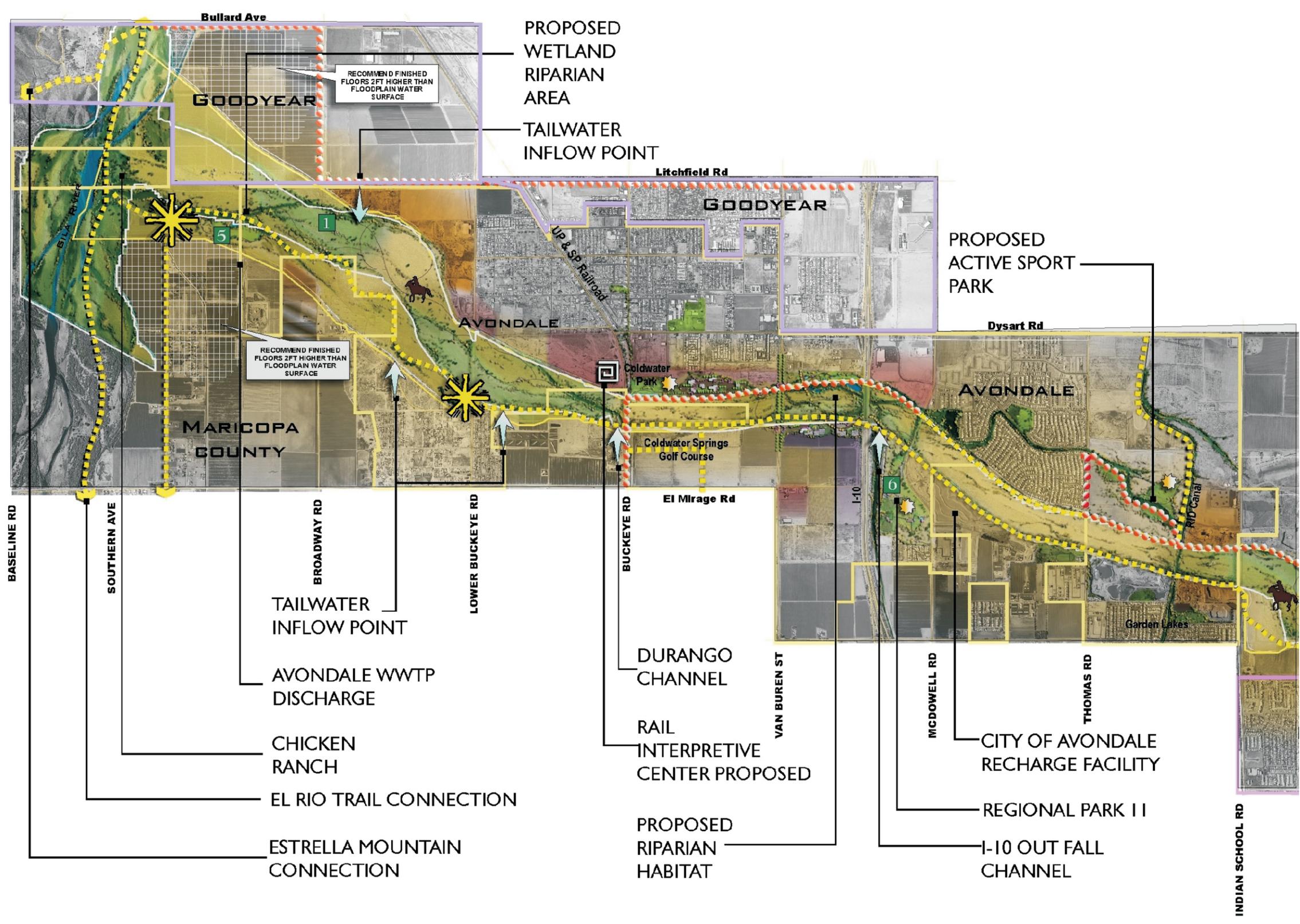
The area along the river is primarily agricultural, most of which is within the floodplains of the Agua Fria and Gila Rivers. If new development is proposed within the Agua Fria/Gila confluence, it is recommended that Goodyear adopt a standard of elevating the finished floors of new buildings two feet above the flood elevation.

With anticipated recreational activities in the Gila River and the proposed trail systems of the Agua Fria, Goodyear is in an advantageous position – residents of Goodyear will have convenient access to these amenities, and the area likely will serve as a desirable destination for other users of the system.



Located at the outlet to the Agua Fria, Goodyear will benefit from the recommended floodplain management strategies implemented upstream. Just as the other communities are taking action to not move flooding problems downstream, it is recommended that Goodyear take steps to neither restrict waters nor push waters across the floodplain.





LEGEND

ECOZONE

	MEDITERRANEAN ZONE
	HYDRIC ZONE
	MESIC ZONE
	XERIC ZONE

LANDUSE

	INDUSTRIAL USE
	RESORT
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SYMBOLS

	LATERAL MIGRATION EROSION HAZARD ZONE
	FLOODWAY
	PROPOSED & EXISTING PARKS
	WATER INFLOW POINTS
	STAGING AREA
	EQUESTRIAN FACILITY
	INTERPRETIVE AREA
	PLANNED & EXISTING MULTI USE TRAILS
	PLANNED & EXISTING BIKE TRAILS
	GREENWAYS



City of Peoria



Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management
- Preserve vegetation and natural features in watercourse
- Coordinate with CAP on multiple use opportunities for recharge project
- Participate in trail implementation

Project Recommendations:

- Develop trail system
- Develop interpretive sites at CAP, Casa De Piedras, Calderwood Butte
- Incorporate recreation uses with CAP sponsored recharge project
- Lateral erosion management zone

The City of Peoria is in close proximity to the east bank of the Agua Fria River from Dynamite Boulevard to an area just north of the Central Arizona Project (CAP), and from there the Agua Fria is entirely within the City all the way to the New

Waddell dam. Most of the land in this reach is owned by the State or the Federal government.

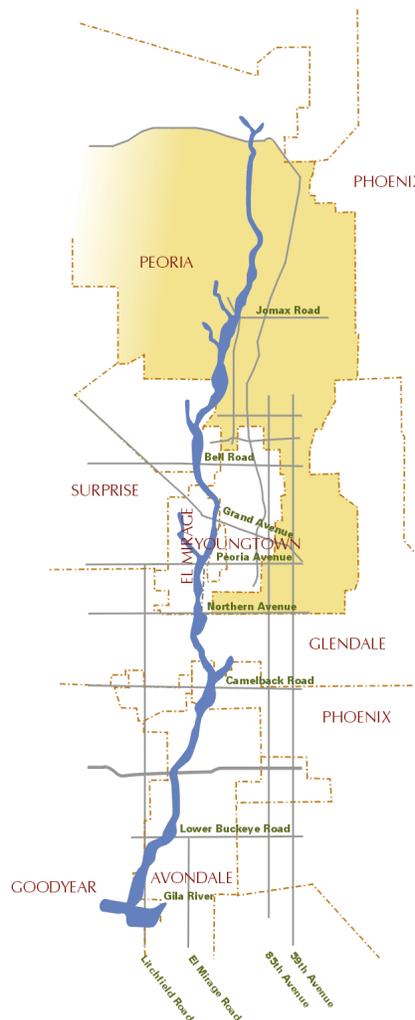
This reach of the river is characterized by somewhat steep

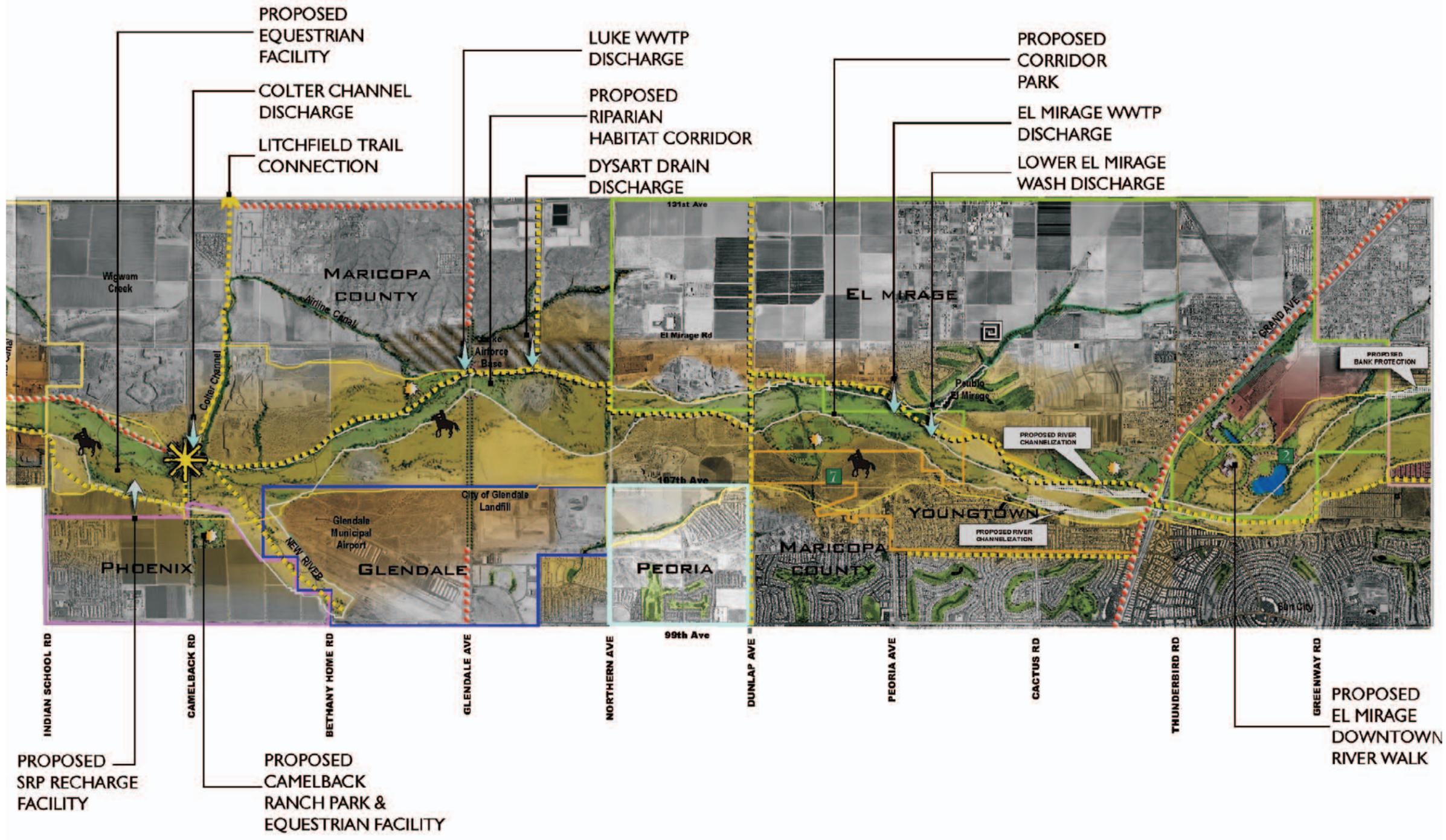


banks, and in places, a canyon-like backdrop. There are historically significant cultural sites in this reach of the Agua Fria. The scenic and habitat resources, particularly south of the New Waddell dam, offer outstanding recreation potential.

CAP is constructing a linear recharge facility south of the CAP canal. The primary purpose of this project is to recharge groundwater, but there are opportunities to enhance the visual character and habitat in this reach by integrating recreational and preservation areas near the recharge site.

The maintenance road/trail alignment through this reach is predominantly on or along the east bank, which provides beneficial access to many points along the river corridor for Peoria. Due to the relatively undisturbed character of this reach, there are no known significant flood hazards; however, if downstream areas are left unmanaged, the potential for channel lowering could lead to damages to either the CAP or the Beardsley Canal flume.



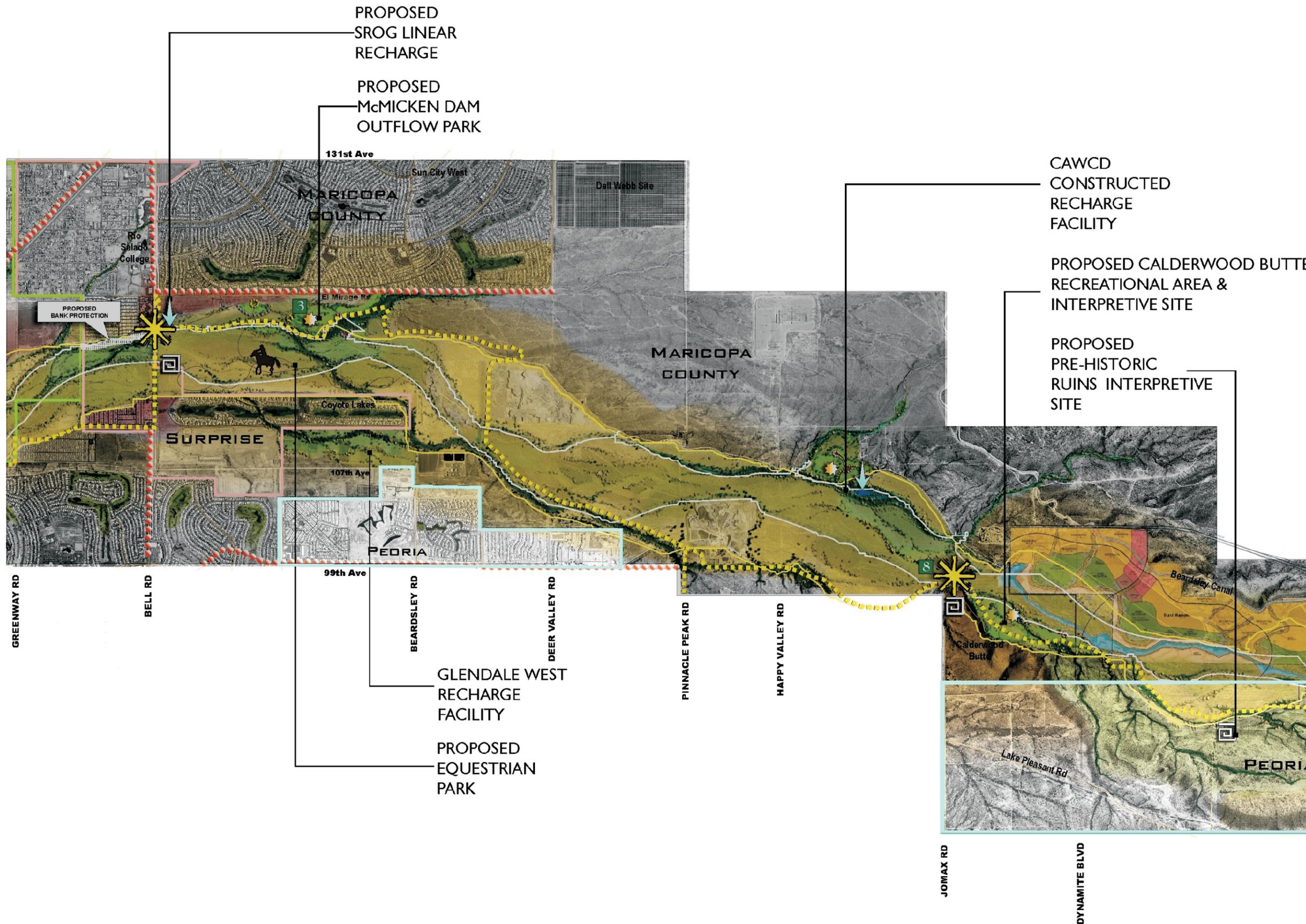


LEGEND

- ECOZONE**
- MEDITERRANEAN ZONE
 - HYDRIC ZONE
 - MESIC ZONE
 - XERIC ZONE

- LANDUSE**
- INDUSTRIAL USE
 - RESORT
 - COMMERCIAL USE
 - RESIDENTIAL USE
 - MIXED USE
 - RURAL & AGRICULTURAL USE
 - RECREATIONAL USE

- SYMBOLS**
- LATERAL MIGRATION EROSION HAZARD ZONE
 - FLOODWAY
 - PROPOSED & EXISTING PARKS
 - WATER INFLOW POINTS
 - STAGING AREA
 - EQUESTRIAN FACILITY
 - INTERPRETIVE AREA
 - PLANNED & EXISTING MULTI USE TRAILS
 - PLANNED & EXISTING BIKE TRAILS
 - GREENWAYS

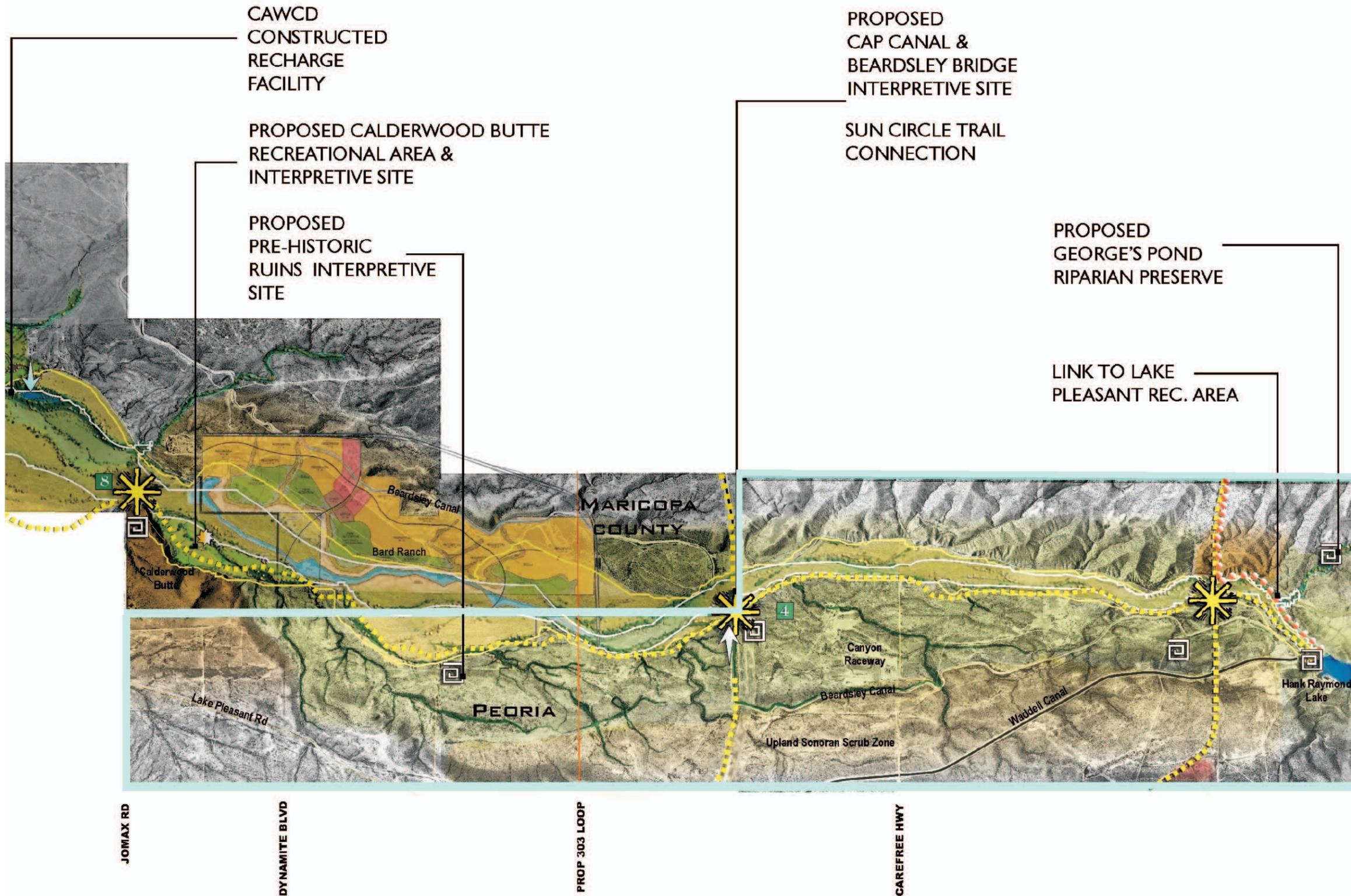


LEGEND

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City of Phoenix



Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management
- Participate in trail planning and implementation
- Continue active programs of managing watershed flows through the use of retention and detention standards

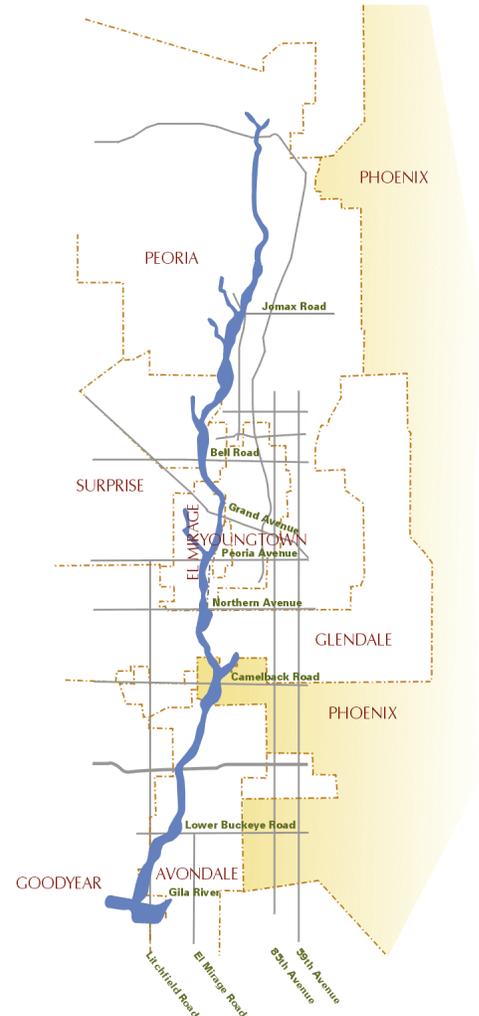
Project Recommendations:

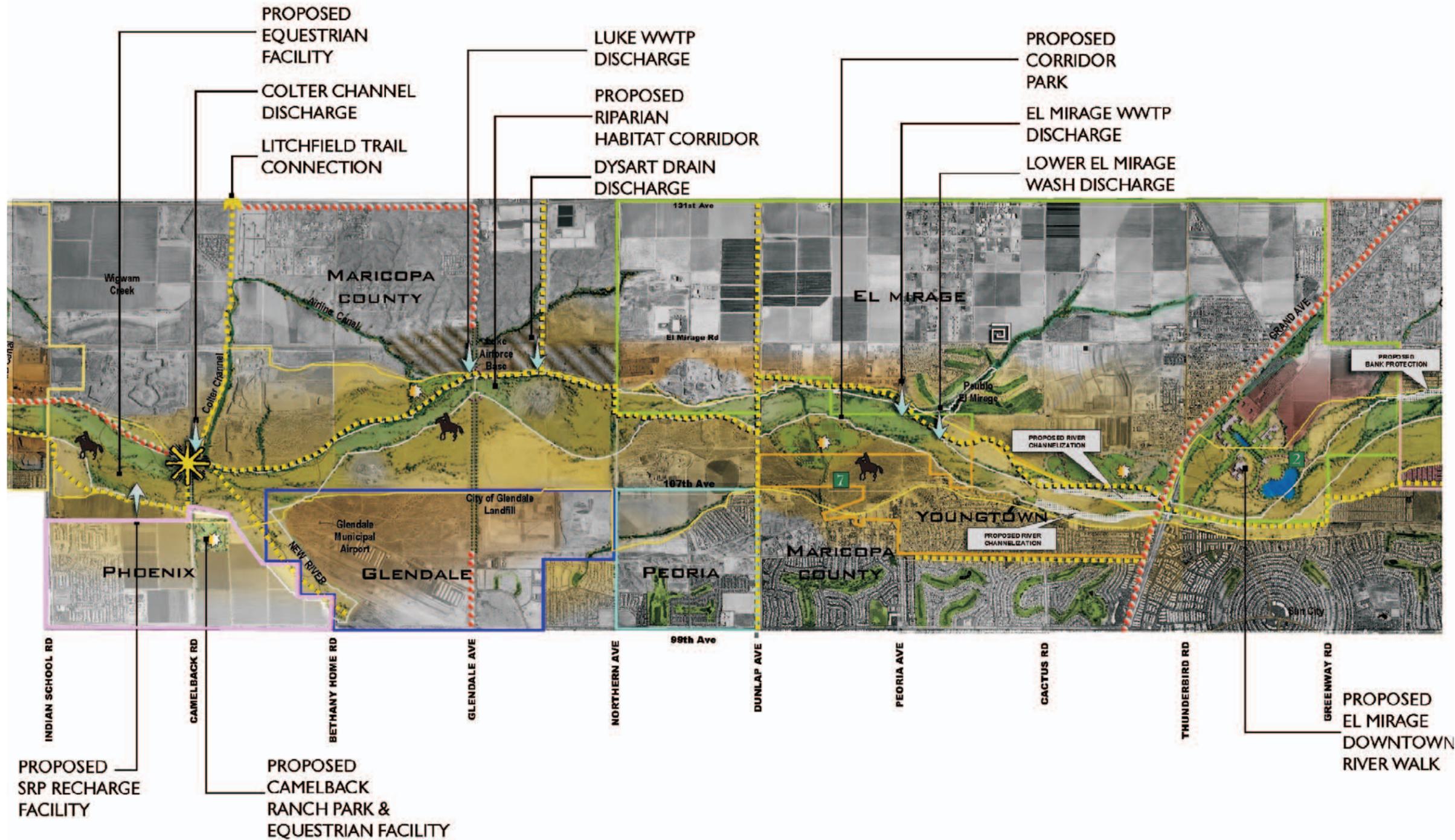
- Develop trail system along the Agua Fria
- Linkage with Camelback Ranch Park
- Lateral erosion management zone

The City of Phoenix is adjacent to or within the Agua Fria floodplain from Indian School Road to Bethany Home Road. The City has strip annexations in place stopping at El Mirage Road. Sand and gravel mining is active on the west bank of this reach, and the east bank is predominantly agricultural or pending development.

Due to the extensive levee systems on the east bank, the 100-year flood and erosion risk is contained within the Agua Fria River channel; however, on the west bank, the floodplain and erosion hazard boundary extends to El Mirage Road.

The City’s proposed Camelback Ranch Park will be a significant recreational feature in the corridor. The park will be linked to the river’s trail systems, which are proposed to follow the existing levees along the east bank. Camelback Ranch Park will be an important corridor link and a destination for watercourse users within the City of Phoenix. Because of the improved levees along Camelback Ranch and the improvements at the park, the City has a keen interest in floodplain management activities to ensure that its investments are protected from future flooding and stream instabilities.





LEGEND

ECOZONE	
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City of Surprise



Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management
- Participate in trail planning and implementation
- Work with Flood Control District on bank stabilization and grade control structures
- Participate in securing park site at McMicken Dam outfall
- Continue active programs of managing watershed flows through the use of retention and detention standards

Project Recommendations:

- Bank stabilization south of Bell Road
- New park at McMicken Dam Outfall
- Develop trail system along the New River (see MAG Multi-Modal Planning study)
- Lateral erosion management zone

The City of Surprise is on both sides of the Agua Fria River in a half-mile area south of Bell Road. North of Bell Road, the City includes the Coyote Lakes subdivision and follows the Agua Fria River’s east bank to Beardsley Road. The area south of Bell Road and along the west bank contains some potential development that could be impacted by lateral migration of the channel bank. Bank stabilization is proposed within this area. The Coyote

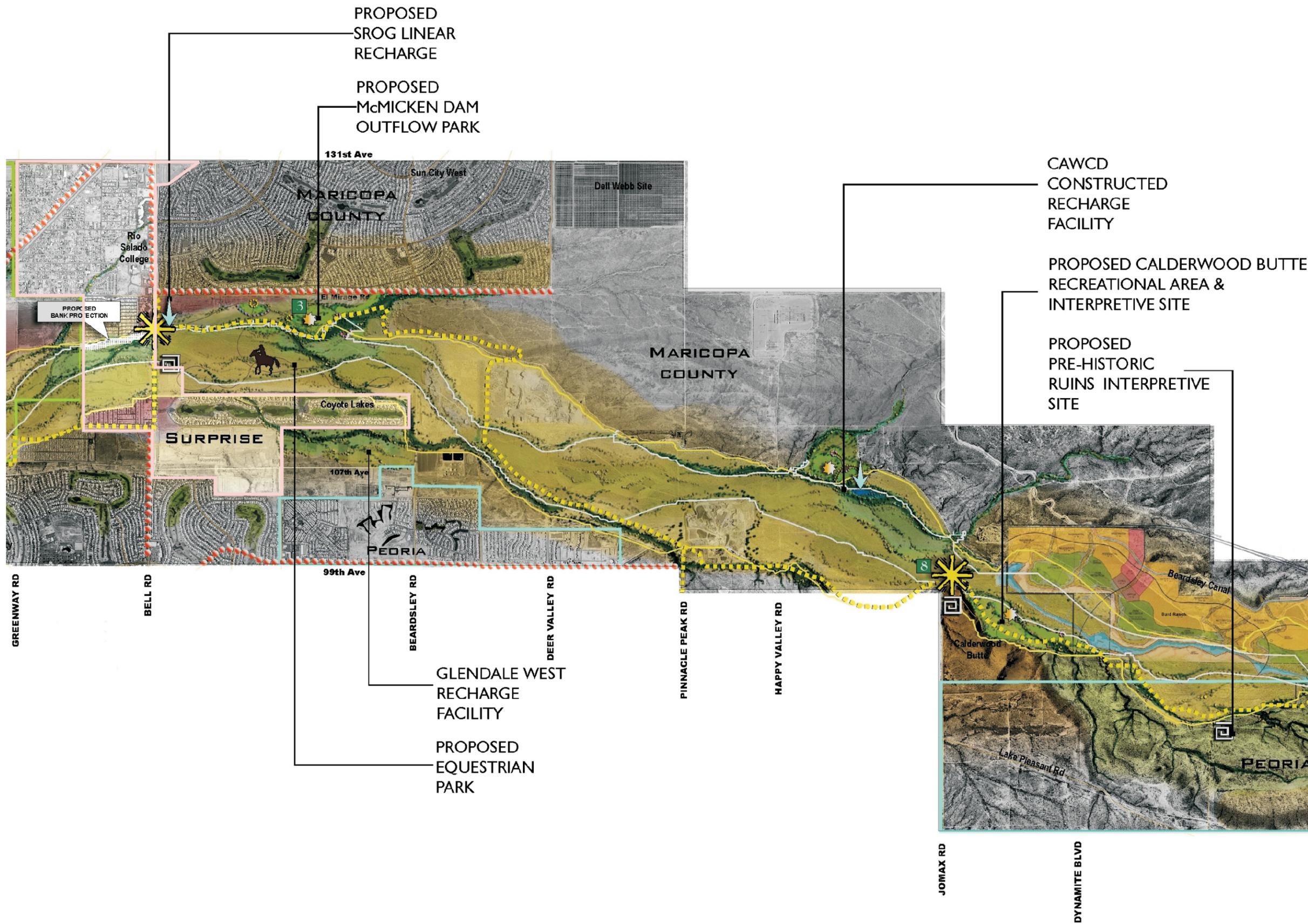


Lakes subdivision appears to be sufficiently protected, with the lateral migration line being contained by the existing structure.

North of Bell Road by approximately 1.5 miles, the McMicken Dam outfall channel enters the Agua Fria River on the west bank. A regional park is proposed to include with a trail system that follows the west bank of the river.

The City of Surprise currently fronts the Agua Fria at a few key locations with only limited access to the river. Implementing recommendations in the Watercourse Master Plan will provide east-west linkages for citizens to access the river and its amenities. This access will be a benefit to all residents, especially the active adult communities that are clustered within this reach of the Agua Fria River.





LEGEND

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Town of Youngtown

Community Action Items:

- Adopt Watercourse Master Plan
- Initiate management of erosion hazard zone
- Initiate use of “no adverse impact” strategy in floodplain management program
- Separate sand and gravel operations from flood flows
- Evaluate whether town drainage is also causing bank erosion
- Participate in river stabilization project
- Connect Maricopa Lake Park to trail system

Project Recommendations:

- Stabilize river in reach south of Grand Avenue
- Develop trail system along the New River
- Potential grade control structure at Olive Avenue
- Lateral erosion management zone

Youngtown borders the east bank of the Agua Fria River from Olive Avenue to Grand Avenue. Youngtown is a mostly developed community that overlooks the Agua Fria River floodplain. Proposed parks along the west bank, creation of riparian zones in the vicinity of the El Mirage treatment plant, and trails will enhance the vistas from Youngtown.

There is significant bank erosion along the east bank of the Agua Fria in the vicinity of Youngtown. While the river has had some influence on the erosion, there is the potential that street drainage also is accelerating the erosion of the bank. It is recommended that Youngtown evaluate whether uncontrolled drainage from the Town is leading to erosion of the river bank.

Youngtown can gain access to a trail system by promoting linkages with Maricopa Lake Park. This will provide enhanced opportunities for citizens of Youngtown to more fully benefit from the recreational components of the plan.

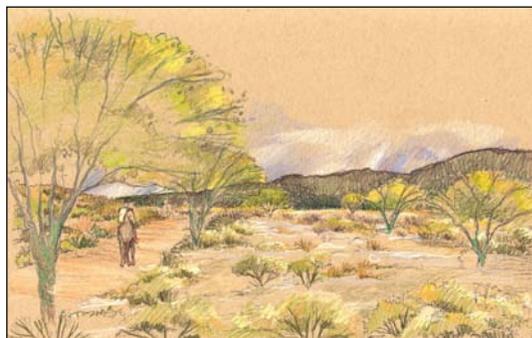
A significant factor that will influence the river stabilization



project will be how the closed landfill just south of Grand Avenue will be stabilized.

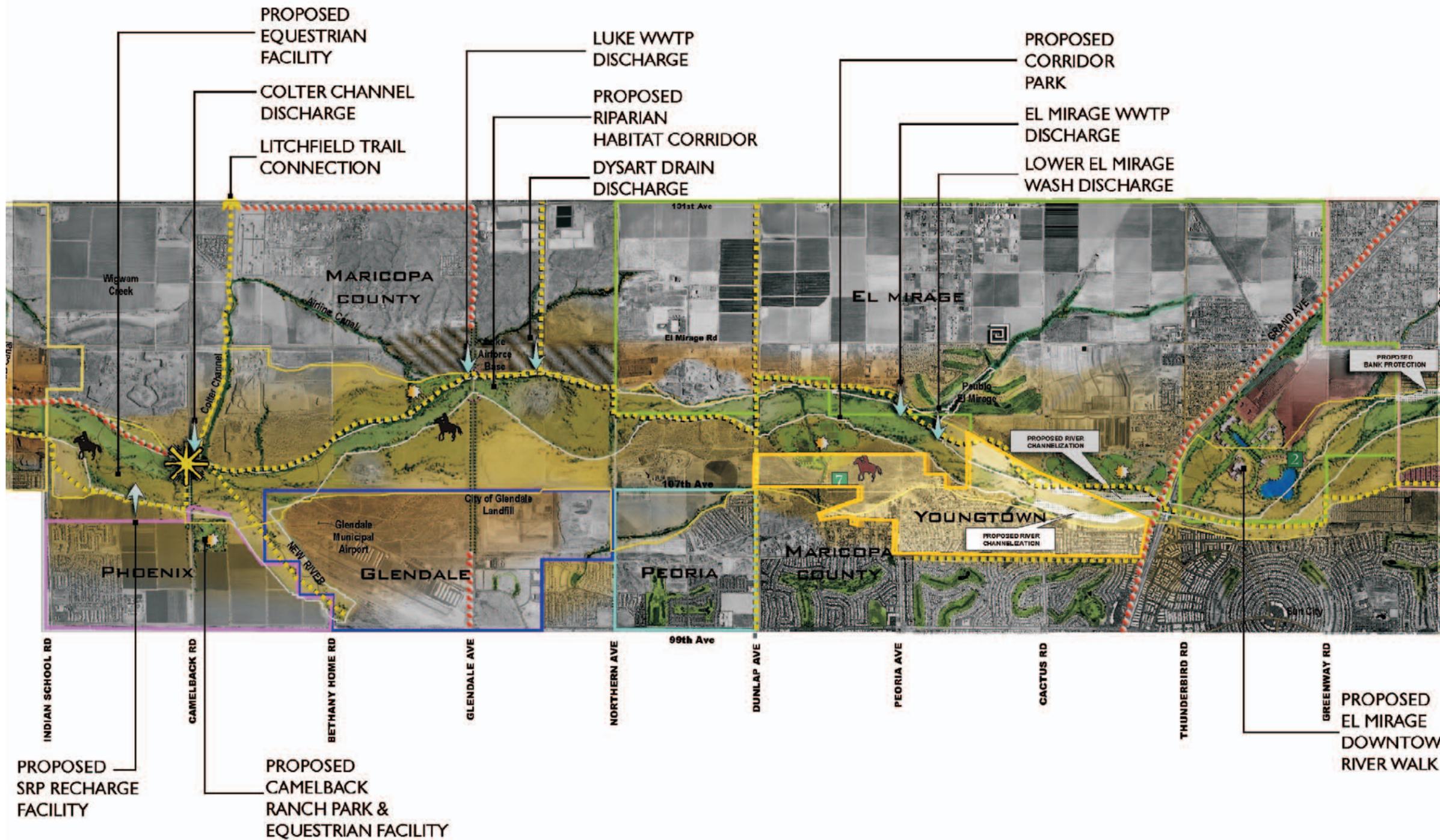
Dealing with bank erosion near

Youngtown without considering how the river might respond on the landfill side could lead to damaging the landfill and washing trash downstream.



YOUNGTOWN

1 OF 1



LEGEND

- ECOZONE**
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PROPOSED
EL MIRAGE
DOWNTOWN
RIVER WALK



Public Involvement Program

The Agua Fria Watercourse Master Plan was supported by a strong public involvement and media relations program throughout the two-year planning process. The Flood Control District of Maricopa County and the consultant team created a project identity, which, together with the New River, has become known as the *West Valley Recreation Corridor*. Over the past two years, the project has been highlighted in supportive articles in all West Valley publications and the *Arizona Republic*. The following summary provides details of the successful public involvement program that was carried out between November 1999 and October 2001.

Key Stakeholders

Before the public involvement program began, the team researched elected officials, community leaders, special interest groups, landowners, residents, and other stakeholders to ensure that the appropriate people were receiving information about the project. The Flood Control District wanted to engage in a dialogue of issues and opportunities with stakeholders in the communities along the Agua Fria and New Rivers, and to obtain input throughout the process.

Public Meetings

Four sets of public meetings were held in communities in the north, central, and southern reaches of the Agua Fria River. These meetings were held at distinct milestones in the planning process. More than 500 people attended the meetings throughout the development of the Watercourse Master Plan.

Web Site

A web site dedicated to the Agua Fria Watercourse Master Plan (www.agua-fria.org) provides a virtual river tour with a map and photos, project updates, information about the public meetings, links to local,

regional and national agencies, and contact information.

Newsletters

Newsletters were distributed to key stakeholders, media, and residents who had expressed interest in receiving information about the Agua Fria River corridor. These newsletters included project updates, important project issues and considerations, and provided information about how people could get involved and learn more about the Corridor.

Special Events

Special events helped to promote the Agua Fria Watercourse Master Plan, involve local communities, and educate citizens about the project and opportunities for the Corridor.

The project was featured at Arbor Day celebrations where school children and elected officials planted trees near the Agua Fria.



A day-long Trails Tour was held for elected officials, media, and city staff members to identify existing conditions, flood control alternatives, and recreation opportunities along the Corridor.





Floodplain Management

Each of the communities along the Agua Fria River enforces a floodplain management ordinance. The Flood Control District implements Maricopa County's floodplain regulation and the regulation for El Mirage and Youngtown. All other jurisdictions implement and enforce their own regulations. Floodplain management regulations guide development within floodplains so that new construction will not be prone to flooding from a 100-year flood. They also reserve an area within the channel for future flood flows. The 100-year flood represents a flood that has on average a 1% chance of occurring in any year.

The basis for these floodplain regulations is primarily found in the standards of the National Flood Insurance Program (NFIP). While the NFIP is not mandatory, failure to participate can lead to the federal government withholding certain forms of disaster assistance, and also could eliminate the availability of flood insurance to the community.

As part of the Watercourse Master Plan, the adoption of a "no adverse impact" floodplain management strategy is recommended. These criteria include:

Watershed Impacts — Taking steps to manage the increased runoff resulting from watershed development.

- *Level 1* - Current retention standards are meeting the goal of not increasing future flow rates to the river. Communities should resist granting variances to the retention policy. Allowing the use of pre- versus post-detention for large developments only should be allowed following a watershed analysis that demonstrates no adverse (cumulative) impact to the river system.
- *Level 2* - The District should move toward updating the watershed models being developed as part of the ADMS/ADMP program to better monitor local watershed flows and trends.

Floodplain Storage — Current standards allow for new developments to encroach and displace storage in the floodplain, which can lead to higher flow rates downstream. Management measures include:

- *Level 1* - Prohibit new encroachment within the floodway fringe.
- *Level 2* - Require that storage be provided within one mile of the site to offset the loss of storage due to proposed encroachment. The storage area is to be located outside of the floodway but within the floodplain.
- *Level 3* - Creation of a regional storage facility funded by private development.

Expanding Floodplains — Current standards allow developments to displace conveyance in the floodplain, pushing the waters cross-stream or upstream.

- *Level 1* - Allow encroachment to the floodway to the extent that the floodplain's top width, as depicted on flood maps, is not significantly expanded by a single-sided encroachment. The expansion needs to be defined in terms of cross-river impacts or upstream impacts generated by backwater. By FEMA practice, the top width has significantly expanded when the line would be moved out a distance of more than 1/20th of the map scale. (E.G. 1:2000 map, significant increase is 100 feet total, or 50 feet each side). In addition, a non-significant expansion could not impact an existing building.
- *Level 2* - If Level 1 is exceeded, then require the developer to obtain a permission to impact from the owners of new properties brought into the floodplain.
- *Level 3* - Structures or fill should be placed within impacted areas (cross stream or within area of backwater) until impacts are mitigated.



No Adverse Impact Floodplain Management

For many years, communities have been implementing floodplain management practices and policies. These policies dictated the elevation of a building to prevent flooding during the 100-year flood and took steps to reserve an area for flood flows in the future.

These standards and practices worked well to ensure that new construction was protected from the 100-year flood. Despite the fact that most communities are enforcing these standards, flood damages per capita more than doubled in the United States between the early to late 1900s. In the past decade alone, average yearly damages as a result of flooding have increased by approximately \$2 billion.

One factor that could be causing these escalating flood damages is that current floodplain management practices do not consider the flooding impacts on other properties. This increased flooding can be caused by a property owner placing fill in the floodplain, which then pushes the floodwaters onto adjacent or cross-river properties. Flooding increases when people fill and don't replace the natural storage in the floodplain, which causes downstream flood levels to increase – similar to how a freeway will become overloaded with cars if the side streets are closed to traffic.

No adverse impact floodplain management is a “good neighbor” policy that attempts to isolate or mitigate for development impacts that can cause increased flooding on other properties.

Because a substantial portion of the Agua Fria River corridor is still relatively undeveloped, a no adverse impact approach would significantly reduce the potential for creating new flood damages as a result of future development activity.

The following guidelines are recommended in order to meet the objectives of a no adverse impact policy for the 100-year flood.

- Communities should continue to enforce retention standards for all new development in the community;
- New development should either provide replacement storage or take some action to mitigate for downstream impacts;
- Developers of new property should measure the impact of this development and take steps to mitigate for the impact; and
- Developers should demonstrate that their actions would not cause more erosion to other properties.



Lateral Migration and River Erosion

As part of their nature, rivers want to move sediment. When a change in the river occurs, whether caused by humans or by some natural event, a river can adjust dramatically by eroding its banks or by lowering or raising the channel bottom. Severe bank erosion is also called “lateral migration.” When a river floods, it is constantly trying to adjust the amount of available sediment with the demand the river has for moving it. When the sediment supply is high, sedimentation of the river can occur; but when the sediment supply is low, the river will begin to take the sediment from the river banks and channel bottom.

In some areas of the Agua Fria River, the river has less sediment entering the river system than it wants to move. As a result, the river responds initially by lowering the channel bottom, and ultimately by eroding the channel banks. The photos to the right demonstrate the changes in the Agua Fria floodplain over the past 50 years as a result of the effects of lateral migration.

The Agua Fria Watercourse Master Plan has identified and mapped areas of potential erosion. These zones, called the “lateral migration erosion hazard zones,” are areas that are expected to erode over a period of 60 years of occasional flows plus a 100-year flood event. Mapping this existing hazard will assist communities and builders in identifying the risk and taking steps to reduce the likelihood of damages from constructing in these areas.

Managing the Lateral Migration Zone

- **Level 1** - Hard banking not allowed within the lateral migration erosion hazard management zone. Sand and gravel mining to be allowed outside of floodway, providing that pits are

designed with a controlled drown-out feature. Mining plans should consider potential redirection of channel flow through the pit, provide mitigation plans, and comply with other District criteria.

- **Level 2** - Hard banking allowed, provided that it is set back a minimum of 100 feet or 10% of the width of the distance between the floodway and the lateral migration erosion hazard zone. The property owner must also provide a sustainable mechanism to assure that the natural bank is restored to the floodway boundary following erosive events. Sand

and gravel excavation in the floodway is allowed to the extent



Pre-1980



Post-1980

that it is removing materials no lower than the historic channel low point.

- **Level 3** - Hard banking allowed to the extent that sediment continuity can be demonstrated for low flow and high flow events for the channel bed and channel bank. The proposed hard bank would not lead to the redirection of the channel flow path or meander to the detriment of other properties.



Recreation

Identifying opportunities for recreational uses along the Agua Fria was one of the key objectives of the Watercourse Master Plan. While other uses are vitally important, it was envisioned that recreational uses, such as parks and trails, would provide a valuable amenity to the residents of the West Valley, connect communities to the river, and provide opportunities for preserving the Corridor's cultural history and habitat.

The Watercourse Master Plan identified 30 existing and planned recreational facilities that are in close proximity to the watercourse. These facilities ranged from community parks and golf courses, to trails and equestrian stables. Several additional recreational amenities were included in the Recreation Plan. Some of the goals for this Plan are to:

- Complement the flood control and other functions with multiple-use recreational features;
- Connect open space and recreational resources in and around the river;
- Create opportunities for activity while minimizing impacts to the Corridor's unique landscape and habitat;
- Provide access to the river for residents, hikers, bikers, and equestrians; and
- Identify ways that recreation could be used as a bridge to the cultural history of the West Valley.

Highlights of the Recreation Plan

The Agua Fria Corridor provides many opportunities to showcase the river and adjacent landscape, allow for multiple recreation activities, and at the same time integrate these with valuable flood control management strategies. Recommendations for the recreational element of the Watercourse Master Plan include:

- Aggressively implement the recreation plans of the communities along the river.

- Develop park sites in the general vicinity of the El Mirage treatment facility and the McMicken Dam outfall (located north of Bell Road).
- Implement a network of multi-use trails along the Corridor. Primary trails would be outside the floodway, and would be an improved surface for bicycles, walkers, joggers, and skaters. Secondary trails would be in-channel, for use by equestrians or hikers. Major and minor trailheads are proposed at several locations to link trails along the network and serve as access points to the trails.



- In addition to the existing stables along the corridor and a planned equestrian access at Camelback Ranch Park, equestrian access also is proposed at Lower Buckeye Road.
- Recharge facilities could serve as anchor points from which to align trails, and could perhaps serve a dual purpose as a park or an interpretive site.
- Interpretive areas are recommended near the archaeological sites at Calderwood Butte and Casa De Piedras, as well as more modern interpretive opportunities associated with the Calderwood Stage, Central Arizona Project, Beardsley Canal, and other features.



Vegetation and Wildlife

Over the nearly 32-mile corridor, there are significant variations in both vegetation and wildlife. Five vegetation communities were identified along the Agua Fria River Corridor:

- Early Level Successional
- Sonoran Upland
- Agricultural
- Commercial/Residential
- Mesic/Hydric Riparian

Ecologists identified a substantial amount of the vegetation in and near the Agua Fria River as being in the early level successional community. This community includes Mesquite, Cottonwood, Rubber Rabbitbrush, and Bursage. Evidence suggests that these communities have been in place for 75-100 years, with their extent interrupted by development and other activities. Beyond direct disturbance of these land areas, the primary factor influencing the vegetation is soil moisture, or more specifically, the lack thereof. In addition to the lack of water, flooding has scoured parts of the riverbed, causing a setback to these early level communities.

There is also a distinct vegetative divide within the corridor: the Arizona Upland Subdivision (typical species include Palo Verde, cacti, and mixed shrubs), and the Lower Colorado River Valley Subdivision (typical species include Creosote bush, White Bursage, and Saltbush).

Wildlife is primarily concentrated in the northern and southern portions of the corridor, largely due to more moisture and less disturbance in these areas. Higher moisture levels in the northern portion (south of the New Waddel Dam) and in the southern portion of the Corridor, near the confluence with the Gila River, promotes increased vegetation, as well as

increased wildlife habitat looking for sources of food, water, and shelter.

Ecologists observed 6 species of reptile, including a rattlesnake and frogs, 17 species of bird, and 11 species of mammal, including coyotes, a bobcat, and evidence of kitfox.

There were sightings of birds throughout the corridor, but the prime habitats appeared to be away from the most disturbed areas. Because of specific areas of abundant habitat and water, and significant disturbance to the watercourse in other portions, it is envisioned that with the exceptions of birds, most wildlife sightings will be limited to the northern and southern reaches of the watercourse. Birds are more widely spread due to their ability to travel further distances and take advantage of nesting sites in and around the general corridor.

Adopting the Agua Fria Watercourse Master Plan will assist in conserving these habitats, but in reality, it will not promote significant wildlife movement. Perhaps more relevant to the movement of wildlife at this time will be their ability to move into upland areas in the northern and southern reaches that are currently natural desert areas.





Groundwater Recharge

Groundwater plays a significant role in West Valley water supplies. It remains an important resource for domestic drinking water, irrigation for agricultural fields, and for industrial uses. Statewide depletion of groundwater resources has led to the creation of the Groundwater Management Act and the formation of Active Management Areas. The West Valley is within an Active Management Area, and is under stringent guidelines to manage the amount of groundwater pumped from the aquifer.

With West Valley populations in the vicinity of the Agua Fria River slated to increase 104% by the year 2020, West Valley communities are reevaluating their water sources and distribution. The recharge of excess waters to the aquifer can benefit these communities by allowing them to pump the recharged water for future use.



The Agua Fria River corridor from Lake Pleasant south to approximately Indian School Road is being considered for recharge projects by several entities. Currently, there are recharge facilities associated with Sun City West and Avondale. The Central Arizona Project (CAP) Agua Fria Recharge Facility near Jomax Road is currently under construction. Proposed facilities include the Sub-Regional Operating Group's (SRCOG) recharge project from Bell Road south, and Salt River Project's New River-Agua Fria

Underground Storage and Recovery Project (NAUSR) at the New River.

Traditionally, and for sound technical and management reasons, recharge facilities have been designed to optimize the amount of recharge to the aquifer, which means they are typically industrial in appearance. The Watercourse Master Plan looked at ways that recharge projects could actually enhance the visual character of the Agua Fria watercourse. The increased water levels provided by water recharge activities often leads to dense riparian vegetation and habitat. Integrating these recharge sites with preservation and nature study areas, parks, or interpretive sites will provide for multiple uses while accomplishing the necessary recharge activities.

Recommendations

- Recharge facilities in the floodplain should be constructed in a manner that is consistent with the floodplain management recommendations and strategies outlined in the Agua Fria Watercourse Master Plan.
- If a community is a sponsor of a recharge project, it should consider allocating a fraction of the water to be available for landscaping or establishing vegetation.
- The Flood Control District and other jurisdictions should continue to negotiate with the State to identify and modify requirements that inhibit or restrict landscaping or the creation of vegetation.
- The sponsors of proposed recharge projects should be approached in an attempt to ensure that the facilities are designed in a manner that is aesthetically appealing.