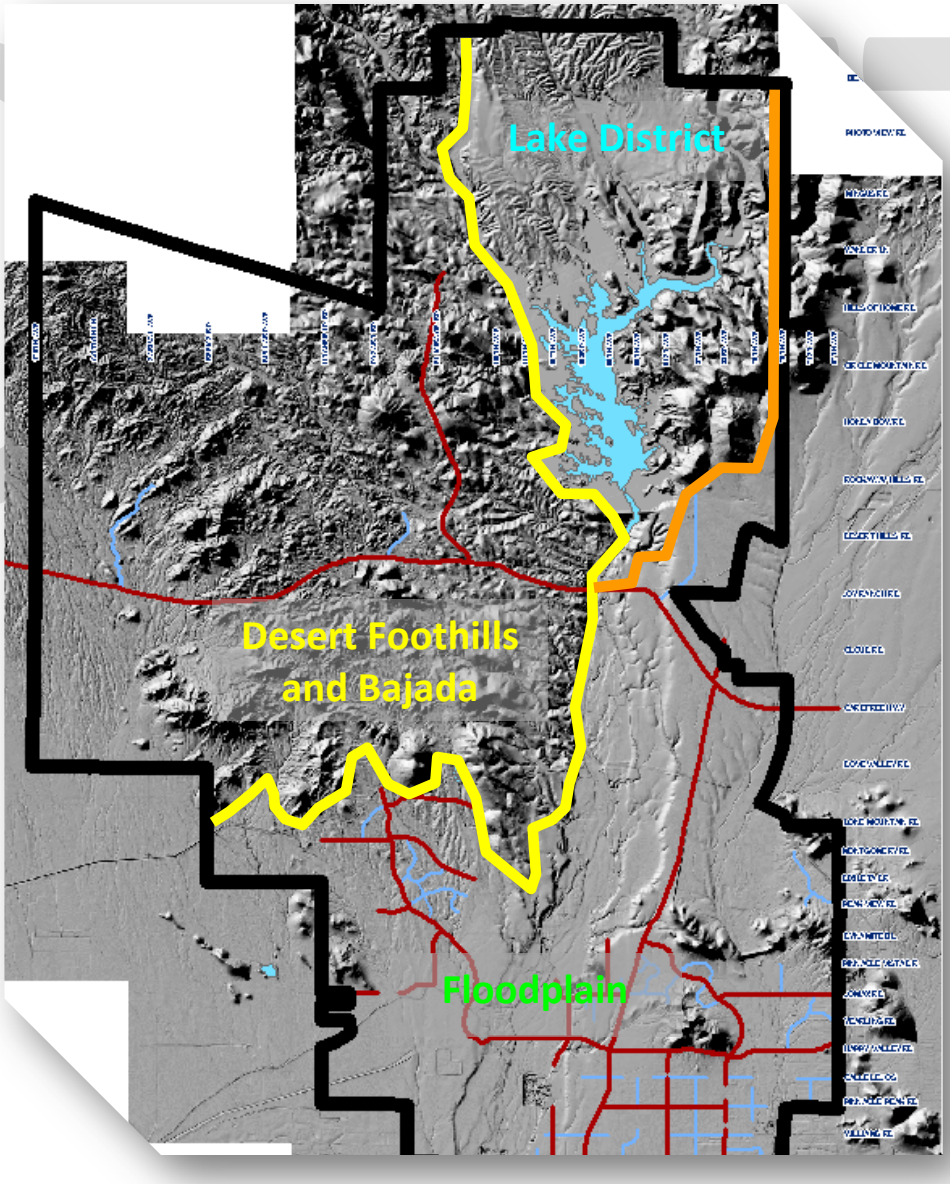
Geomorphology and Geography

There are three distinct geographic areas within the master plan area: the floodplain between the river corridors, the Sonoran Desert foothills of the North /Northwest; and the Lake District. Most of the master plan area is situated within the floodplain between the Agua Fria and New Rivers. The floodplain is generally flat and slopes southward toward the Salt River. The soils are generally sandy loams - typical for floodplains and alluvial fans. Slopes are slight at between 0 and 5%.

The desert foothills of the north and northwest are located between Loop 303 and Carefree Highway (SR 74), largely to the west of the Agua Fria River. This area is characterized as hillside and foothill landforms. Within this area, there are a few large-scale master planned communities that have either been built or are still in planning stages.



North of SR74, the topography changes to low foothills, increasing in height and area further north toward Yavapai County. The Lake District is located within this area and is the gateway to the Bradshaw Mountains. The Bradshaw Mountains are composed of granite, gneiss, and schist. In the mid-1860's gold was discovered in the Bradshaw Mountains along with copper and silver.

The master plan area consists of a little more than 200 square miles between Pinnacle Peak Road and north of Table Mesa Road in Yavapai County; and between 67th Avenue east and 179th Avenue west. The area includes the watersheds of the Agua Fria River, the New River, and Morgan City Wash. Other significant drainages within the project area include Caterpillar Tank Wash, Twin Buttes Wash, and three unnamed washes west of the Agua Fria River. The Hieroglyphic Mountains dominate the northwestern portion of the master plan area. Southern portions of the master plan area consist of small isolated mountains (e.g., Calderwood Butte, Westwing Mountain and Sunrise Mountain) and low-relief terrain such as fan terraces and alluvial valleys.

DRAFT

Sonoran Desert Regional Context

The Sonoran Desert lies in the western US basin and range geologic province. This province consists of broad, low-elevation valleys rimmed by long, thin, parallel mountain ranges, which extend from northern Mexico across much of Arizona, California, Utah, and Nevada. Dry streams in each valley either connect to a major through-flowing river, such as the Gila or Salt rivers, or drain into a valley's internal low spot where a salt-encrusted playa forms.

The soils throughout the area generally correlate with the topography. The Hieroglyphic Mountains and adjacent high relief locales in the north are dominated by numerous rock outcrops and shallow to very shallow soils. Unweathered bedrock typically occurs less than 2-feet below the surface. Toward the south the terrain grades into more gentle and moderate slopes on the fan terraces and in the alluvial valleys, and the soils become much deeper. Elevation within the area ranges from about 1200-feet to 3275-feet. The surface sediments of the master plan area include silty-gravelly sands and sandy gravels. Cobble to boulder size debris also can be observed along the surface of the floodplain in the form of gravel bars, which may rise as much as one meter above the basal floodplain ground surface. Although such bars are most common along the river channels and among the larger washes, they are also observed in virtually all areas of the river floodplains. Basal soils are generally pervious and dense, with a maximum estimated depth to bedrock of approximately 90-feet in some areas.

Study Area Context

In Arizona, the Sonoran Desert is bounded on the northeast by a mile-high escarpment known as the Mogollon Rim that forms the distinctive southern edge of the Colorado Plateau province. The eastern edge of the Sonoran Desert is located in the vicinity of Tucson in southern Arizona. Topography is an important influence upon the unique climate of the Sonoran Desert, since

topographic barriers direct, confine, or block moist air masses. Since rising air cools, annual precipitation and wintertime cold extremes intensify to the east, causing the desert, with its frost-sensitive plants, to gradually give way to grassland.

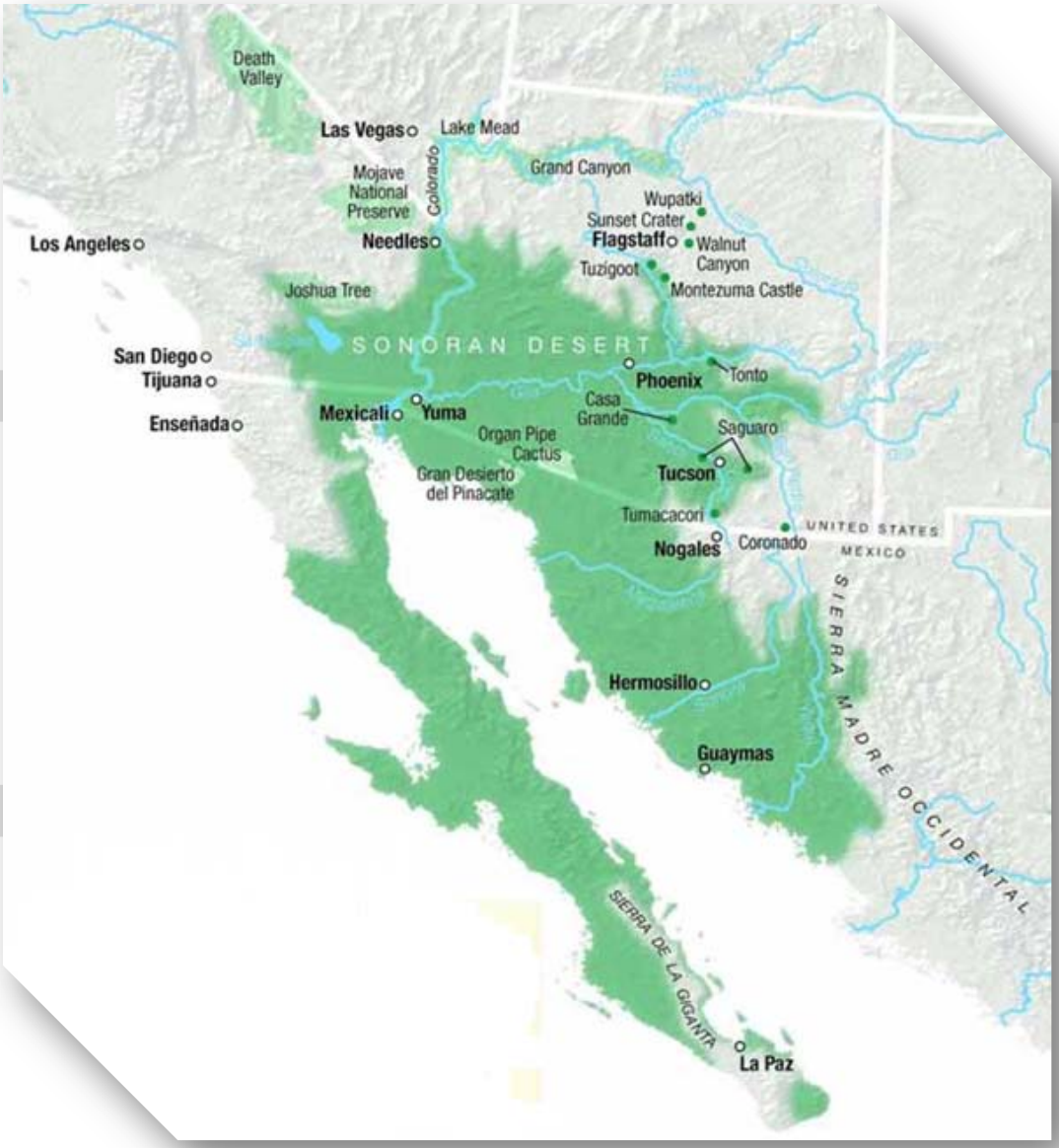


Illustration from Sonoran Desert: An American Deserts Handbook, www.wnpa.org

Mountains and Bajada. The Sonoran Desert contains a characteristic series of landforms. Sparse regional rainfalls tend to lack the force to move sediments very far from the mountains however, infrequent heavy rains produce torrents of mud, rocks, and vegetation that cascade rapidly down steep narrow canyons in the mountains. This debris flow spreads out at the fronts

of the mountains into cone-shaped masses called alluvial fans. When neighboring alluvial fans coalesce along a mountain front, the resulting landform is a bajada. The term bajada is generally reserved for those areas where obvious alluvial fans line the mountain front, while piedmont is used in situations where alluvial fan shapes are not obvious.

Alluvial fans have the shape of a fan, either partially or fully extended, with a radial pattern of topographic contours. Alluvial fans are located near a topographic break, which may be expressed either laterally or vertically. The alluvial fan landform typically occurs within the piedmont area landform. Watercourses on alluvial fans consist of poorly defined, distribution channels with broad sheet flow areas. Streams on alluvial fans tend to have high lateral erosion potential due to avulsions, stream piracy, low channel capacity, high velocities, and non-resistant unconsolidated boundary materials (sand and gravel). Sheet and unconfined flow occurs where there is no defined drainage network to convey the majority of flood water.

Beneath the bajada lies an important hidden feature of desert geology: the pediment. Pediments are buried shoulders of mountain rocks that extend from the edge of the exposed mountain some miles toward the valley center, where they contact the buried Basin and Range fault, beyond which lies thick valley alluvium (gravel, sand, silt, and clay). Pediments form as the mountain front is worn back with time by all the streams exiting the mountain front; then the shoulder is buried by a thin layer of gravel as the valley fills with alluvium. Their presence, though invisible, is very important for human development, since the main valley aquifer - often a mile thick - is confined to the centers of the valleys. Water wells drilled into the pediment often do not yield sufficient water for even a single residence. Isolated small hills near mountains, called inselbergs, are exposed rock masses that have not worn away; they are a sure sign of the pediment's presence.

DRAFT

Major valleys contain one or more main stream channels that are normally dry. Floodplains are strips of flat land adjacent to the channel that in former times were subject to flooding. But since the 1890s, river floods have tended to incise and widen the channels, so that the floodwaters do not flow out onto the floodplains, except locally. This post-1890s channel enlargement is part of a regional trend throughout the West called "arroyo cutting," likely caused by a combination of factors, including increased cattle grazing following development of regional railroads in 1882, devegetation of hillsides by the mining industry for mine timbers and

coke, and a possible unrecognized, subtle climate shift. Stabilizing channel embankments with soil cementation is not without some risk. Haphazard bank stabilization increases channel erosion (bank caving) and floodplain inundation downstream of the protected reaches. This is because cement-lined channel walls prevent infiltration and force more water down the channel.

Lake Pleasant. Peoria is the "Gateway to Lake Pleasant," one of the finest water recreation areas in Arizona. The Lake Pleasant Regional Park is managed by the Maricopa County Parks and Recreation Department. Lake Pleasant is the largest lake in the Phoenix metropolitan area. The lake features over 50 miles of shoreline with 10,000 acres of crystal clear water fed primarily from the Agua Fria River.

The lake was originally created in the 1920s with the building of the "Carl" Pleasant Dam which was later renamed as Waddell Dam. Prior to construction dam, water flowed in the Agua Fria most of the year. W.H. Beardsley began the survey and construction of the dam which harnessed the river for irrigation uses. At its completion the original dam was the highest multiple arch dam in the United States. The old dam was breached when New Waddell Dam was completed downstream. The new larger dam was constructed in 1992 which tripled the size of the lake. The original dam now lies under 100 feet of water.

Lake Pleasant is formed behind New Waddell Dam and is a storage reservoir for Colorado River water from the CAP Canal and surface water from the Agua Fria. The storage capacity for the Lake is between 812,000 and 1.1 million acre-feet. An additional 36,700 acre-feet of inactive conservation storage capacity was created in order to maintain a minimum pool for fish and wildlife purposes. The new dam is a multipurpose structure owned by the U.S. Bureau of Reclamation. Colorado River water is transported by the Central Arizona Project to Lake Pleasant via the Waddell Canal during the winter months.
The County Park at Lake Pleasant provides camping, boating, house boating, sailing, water skiing, jet skiing and fishing. Anglers have experienced trophy-size catches at the lake with a wide variety of native and sport fish.

Floodplains. In the mountainous edge areas rock outcrop is common; rock fragments typify soil constituents; and channels consist of well defined, low sinuosity tributary streams located in bedrock or mountain canyons. These streams have low lateral erosion potential and have narrow or non-existent floodplains. The piedmont landform consists of mildly sloping alluvial

DRAFT

surfaces with dendritic tributary drainage networks. The piedmont areas typically occur as a buffer between the mountain slopes, the floodplain and sheet flow areas. The watercourses in the piedmont areas consist of moderately steep, well-defined channels with narrow floodplains. These streams generally have low lateral erosion potential due to low peak discharges, relatively resistant boundary materials (cobbles, clay, and/or caliche), and bank vegetation.

Agua Fria River. The Agua Fria River and the New River flow through Peoria from northeast to southwest toward a confluence with the Salt River. The Agua Fria river basin occupies about 1,200 square miles in central Arizona. The northern half of the basin is in the Central highlands physiographic province, and the southern half is in the Basin and Range province. The basin's main drainage is the Agua Fria River (Spanish for cold water), which flows north to south through the basin and empties into Lake Pleasant. Major tributaries to the Agua Fria are Big Bug, Silver, Sycamore, Yellow Jacket, and Skunk Creeks, and the New River. The Agua Fria and its tributaries are generally intermittent streams except for some perennial stretches where impermeable bedrock forces groundwater into the streambed. The Agua Fria River flows as an intermittent stream over its 120 mile length. The source is approximately 20 miles east northeast of Prescott, Arizona. The river flows through a small canyon called "Black Canyon" into Lake Pleasant.

The Central Arizona Water Conservation District of the Central Arizona Project operates the Agua Fria Recharge Project, located about four miles south of the New Waddell Dam. Below Lake Pleasant the Agua Fria River flows only when water is released from the dam during major flood events.

New River. Below New River Dam (located approximately at 75th Avenue and Jomax), the New River is both undefined floodplain and channelized corridor. Above the dam, in the area known as the Upper New River watershed, the area is largely undeveloped and relatively pristine, undisturbed Sonoran Desert. The New River is controlled by New River Dam, an earthen dam built for flood control purposes, located north of Jomax Road. The Dam has nearly 44,000 acre-feet of storage capacity. One of the earliest flood control projects along the New River was authorized by the Flood Control Act of 1965. This plan recommended construction of a channel from New River Dam to the Agua Fria River and several small levees along New River from Skunk Creek to the confluence with the Agua Fria River. Channelization of the New River, between Grand Avenue and Olive Avenue, was completed by the USACE in 1989. New River Dam was included in the plan and involved the construction of an earthfill embankment, an ungated outlet, a saddle dike, and a detached spillway located on the left abutment of the dam. The dam was completed by the US Army Corps of Engineers in 1985, and is maintained by the Flood Control District of Maricopa County.

DRAFT

New River at Carefree Highway, 1965

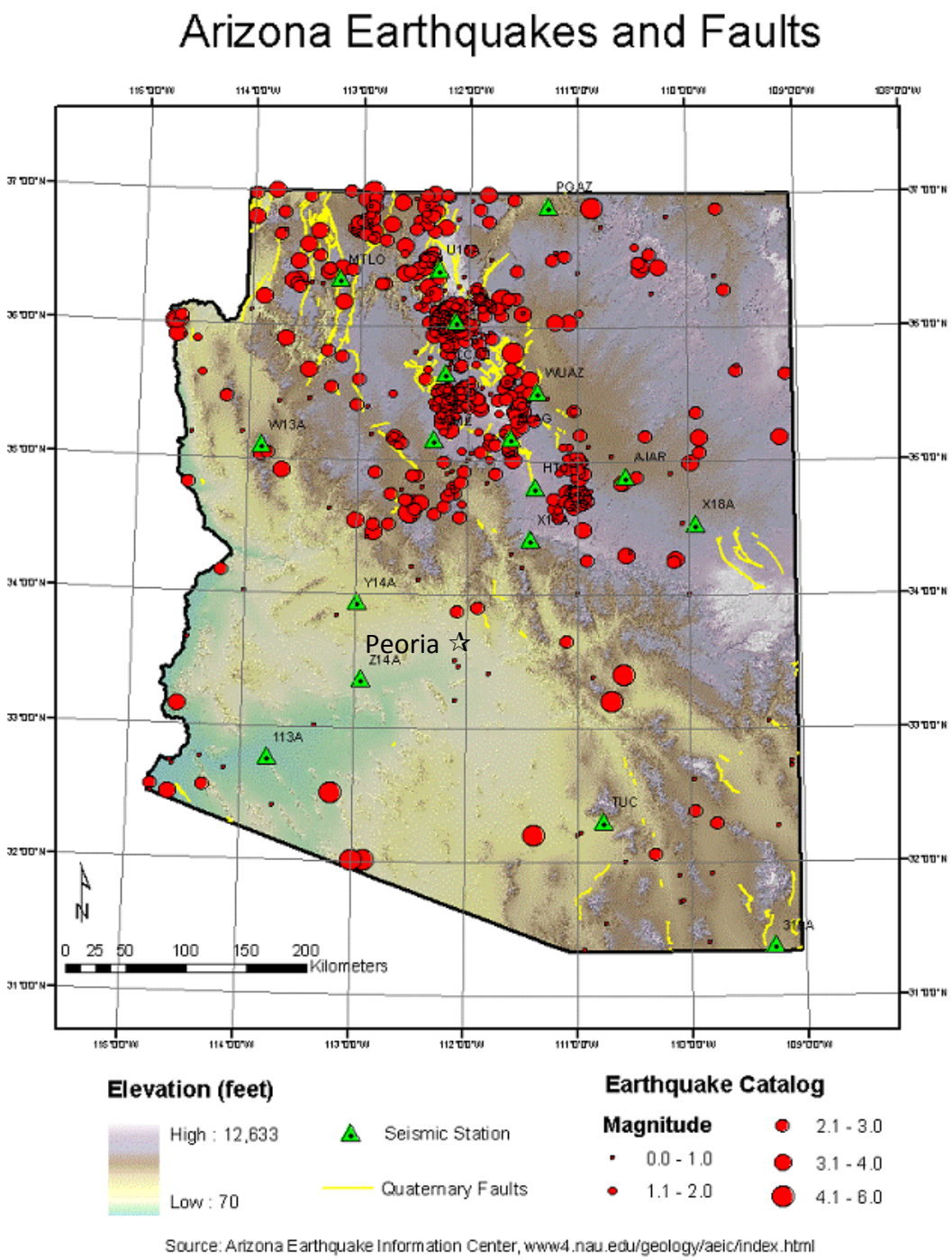
DRAFT

Morgan City Wash. A major wash that flows from the northwest southeasterly to a confluence with the Agua Fria, Morgan City Wash is an unspoiled natural wash. It is an important focus of open space preservation and wildlife linkages in this master plan.

Seismicity. Except for the major influence of San Andreas Fault activity, the Sonoran Desert is seismically quiet, with noticeable earthquakes felt less than once per few decades. There are no known seismically active faults or record of earthquakes within the master plan area. The earliest Arizona earthquakes were those recorded in Yuma in the 1800's. Probably the most notable earthquake in this region occurred in 1887 near Bavispe, Sonora Mexico, about 350 miles southeast of Peoria. The estimated magnitude was 7.2 on the Richter scale. The quake was responsible for fifty-one deaths in Mexico, cracked walls in Tucson and El Paso, and stopped pendulum clocks in Phoenix. Geysers of water reportedly shot up from the flood plain of the San Pedro River in Tucson. A tremor on August 18, 1912, caused a 50-mile-long crack in the earth north of the San Francisco Range (approximately 100 miles north of Peoria). Houses were damaged at Williams, and the shock was strong in Coconino County, north of Flagstaff. Rockslides roared down the mountainsides, and the earth seemed to roll “like waves on the Colorado River.”

In 1935, a strong earthquake awakened sleepers at the Grand Canyon, 180 miles north of Peoria. Many were frightened by the distinct subterranean rumble and the movement of their houses. Walls were cracked in some cases, and rockslides occurred in the mountains. Three slight foreshocks were felt by Grand Canyon residents during the first week of January, and one very minor aftershock was noted on January 15.

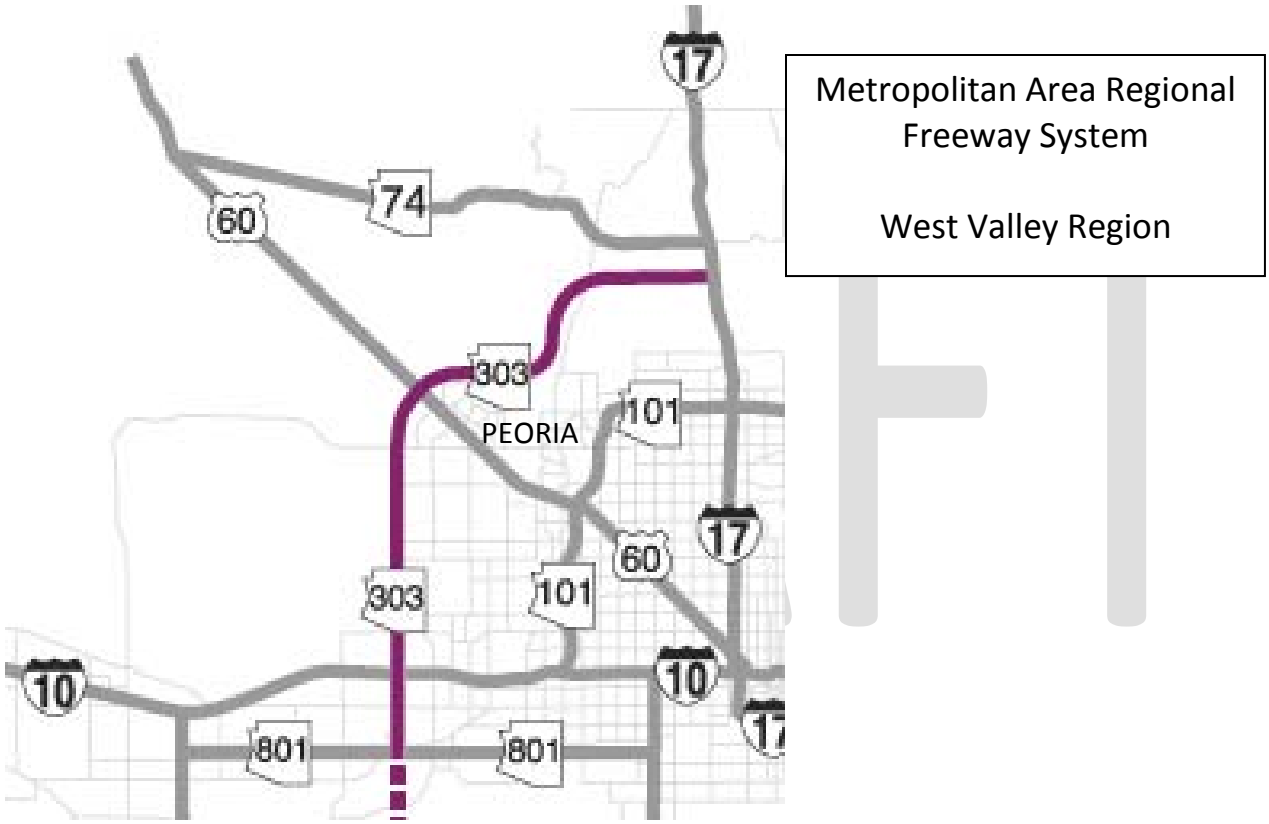
On January 16, 1950, a strong earthquake in Apache County left several cracks in the ground as it rumbled through the small town of Ganado 380 miles northeast of Peoria. The cracks, one-half inch wide and up to 12 feet long, extended in a north-south direction near the Ganado trading post.



BUILT ENVIRONMENT

Major Transportation Routes. Pinnacle Peak Road is the default southern boundary of the open space master plan primarily because it was previously defined as a southern limit in the City's Desert Lands Conservation Ordinance. This master plan piggy-backs on the Conservation Ordinance. Pinnacle Peak is located approximately 2 miles north of Loop 101, a major limited access highway that is part of the metropolitan area's transportation beltway system.

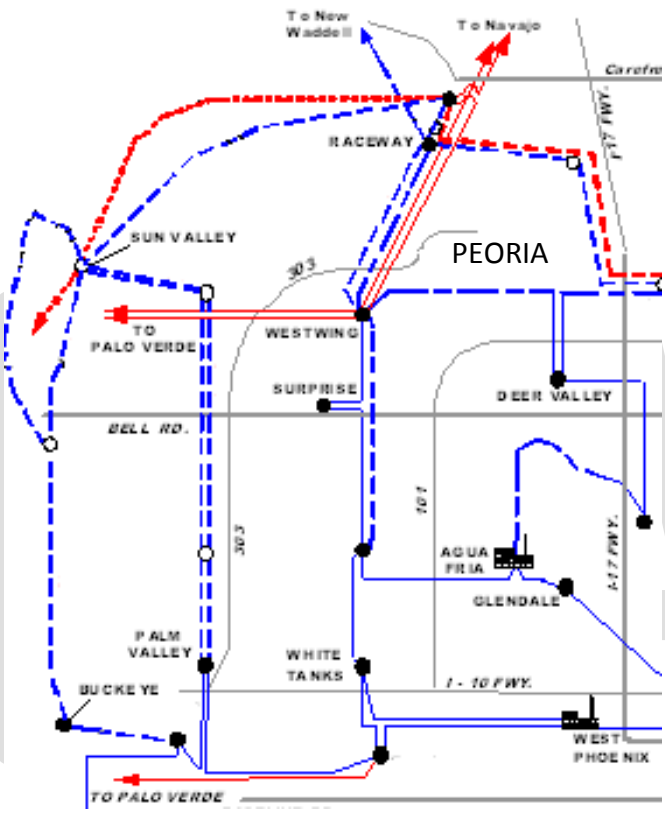
Located along Pinnacle Peak is a major 4-mile long multi-use trail corridor connecting the Agua Fria River with New River.



Further north, work on the extension of outer Loop 303 limited access highway between 117th Avenue and Interstate 17 is nearing completion. Planning studies for a distant-future Loop 505 incorporating the existing State Route 74 (Carefree Highway) have been conducted. Both these limited access routes impact the open space master plan area. Trail crossing penetrations have been planned for but wildlife may experience difficulty transitioning from more remote northern areas southward through the major river corridors. Lake Pleasant Parkway extension is under design between WestWing Boulevard and the CAP. The Parkway will eventually extend northward to State Route 74.

Power Corridors. There are four major power substations in the Planning Area (Waddell – at the Lake Pleasant dam, Humbug – south of the dam, Raceway – just north or State Route 74/south of the dam, and Westwing – west of the Agua Fria River/north of Loop 303). There is

a 500/230kV transmission line along the Dove Valley Road alignment in North Peoria extending from just west of Interstate 17 to the Agua Fria. The transmission line turns at the river toward the northeast along the river corridor to the Raceway substation south of Lake Pleasant. The line then heads west along the southern edge of State Route 74 to a point west of the Loop 303 alignment, then heads south to the Westwing substation.



Metropolitan Area Regional Power Transmission System

West Valley Region

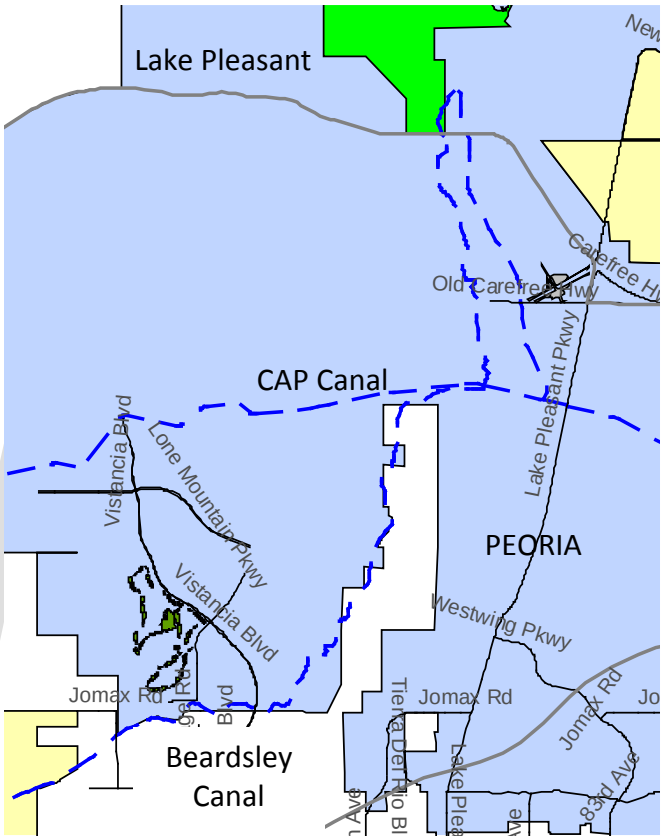
DRAFT

Water Resources

Canals. Water has been a defining element in the Planning area since the era of the Hohokam. The Native Americans dug a system of canals to provide water for crops and to sustain life. These prehistoric canals are not as defined in the planning area as they are in other parts of the metropolitan area, but canals in general have been a part of Peoria's history.

South of the Planning area, William Murphy built the 42-mile Arizona Canal from Greenway and 75th Avenue to the salt River east of Scottsdale in 1885. The Marinette Heading Canal dates to around 1910, and was located adjacent to the Agua Fria north of Calderwood Butte. The canal transported water to the community of Marinette, located east of the Agua Fria River around 107th and Thunderbird. The Marinette Heading Canal is no longer in existence although there are a few places where the old canal alignment can be observed or has been memorialized.

The Beardsley Canal originally served the townsite of Beardsley which began as a sheep station on the Santa Fe, Prescott & Phoenix Railroad to McMicken. The town began developing the irrigation canal in the 1880's and stretched from Lake Pleasant to ranches as far as 30 miles away. The Maricopa Water District was organized in 1925, as an irrigation and water conservation district. The District provides water and power to a service area of approximately 60 square miles which has agricultural lands in cotton, vegetables, fruits, citrus, grapes, and grain. The District also serves hobby farms and golf courses.



The District has a 157,600 acre feet storage capacity in Lake Pleasant, now created by New Waddell Dam. Camp Dyer Diversion Dam creates Hank Raymond Lake as MWD's regulatory storage. Water is diverted from Camp Dyer Dam south of Lake Pleasant into the Beardsley Canal. The District owns, operates, and is developing Pleasant Harbor at Lake Pleasant which includes a marina and an RV Resort.

The Central Arizona Project (CAP) is a 336 mi diversion canal extending from the Colorado River near Parker into central and southern Arizona. The CAP is the largest and most expensive aqueduct system ever constructed in the United States. CAP is managed and operated by the Central Arizona Water Conservation District (CAWCD).

During the early 1900's, the seven states of the Colorado River Basin: Arizona, California, Nevada, New Mexico, Wyoming, Colorado, and Utah negotiated for shares of Colorado River water. In 1922, representatives from the seven states and the United States government

created the Colorado River Compact, which divided the states into lower and upper basins and gave each basin 7.5 million acre-feet of water to apportion.

Before CAP was constructed, many archaeological and biological studies were conducted by a number of local and federal organizations to determine how the environment would be affected by CAP and what could be done to minimize those affects. It was realized that many desert animals would be attracted to the canal for water, so an effort to reduce animal drownings identified ways of protecting wildlife along the canal route.

Specially designed bridges were placed at important animal movement and migration paths so animals and desert tortoises can safely cross the canal. Eight-foot high fences line the canal on both sides to keep large animals safely out. The top five feet of the concrete lining has a rough finish to let small animals that get through the fence climb down for a drink and safely back out.

DRAFT

The project was envisioned to provide water to nearly one million acres of irrigated agricultural land and including the metropolitan areas of Phoenix and Tucson. In addition to its water supply benefits, the project also provides substantial benefits from flood control, outdoor recreation, fish and wildlife conservation, and sediment control.

Construction of the project began in 1973 with the award of a contract for the Havasu Intake Channel Dike and excavation for the Havasu Pumping Plant. The new and modified dams constructed as part of the project were declared substantially complete in 1994. All of the non-Indian agricultural water distribution systems were completed in the late 1980s, as were most of the municipal water delivery systems.

The CAP bisects the Planning Area from east to west and currently (2010) serves as the northern limit of suburban expansion of the City. Lands to the north are generally undeveloped though many areas have been master planned for future development.

The CAP is also home to a National Recreation Trail extending the full 336 miles from California to Tucson. Enabling legislation for the construction of the CAP also set aside land to be combined with adjoining private lands for a multi-use recreational trail along the south and west sides of the canal alignment. The US Bureau of Reclamation acquired sufficient along the edge of the right of way and land and inset the fence 10 ft. to 20 ft from the property boundary to allow for the trail to be developed. The CAP requests that each municipality and/or

developer provide an additional twenty feet of trail width or setback along those adjacent developments to allow for proper grading, drainage and landscaping enhancements to occur on the developers property.

EXISTING LAND USE

Agricultural Lands

Much of Peoria's heritage is in farming. There are parcels south of Pinnacle Peak Road that are still tilled and planted. However, there is no large scale farming with in the master plan study area north of Pinnacle Peak Road. Portions of State Lands and BLM lands around Lake Pleasant have been or are currently being grazed by cattle as evidenced by numerous stock tanks, extensive fencing, and cattle-loading areas. Feral burros can be found in the area surrounding Lake Pleasant.

DRAFT

Residential Development

Existing master planned communities include, Cibola Vista, Pleasant Valley, Quintero, Rock Springs, Sonoran Mountain Ranch, Terramar, Tierra del Rio, Vistancia, and Westwing. Future planned developments include the Boulders at White Peak, the Enclave at White Peak, the Estates at Lakeside, Florenza, Vista at White Peak, Lake Pleasant Heights, Querencia, Saddleback Heights and Sunrise Canyon.

Commercial and Public Facilities Development

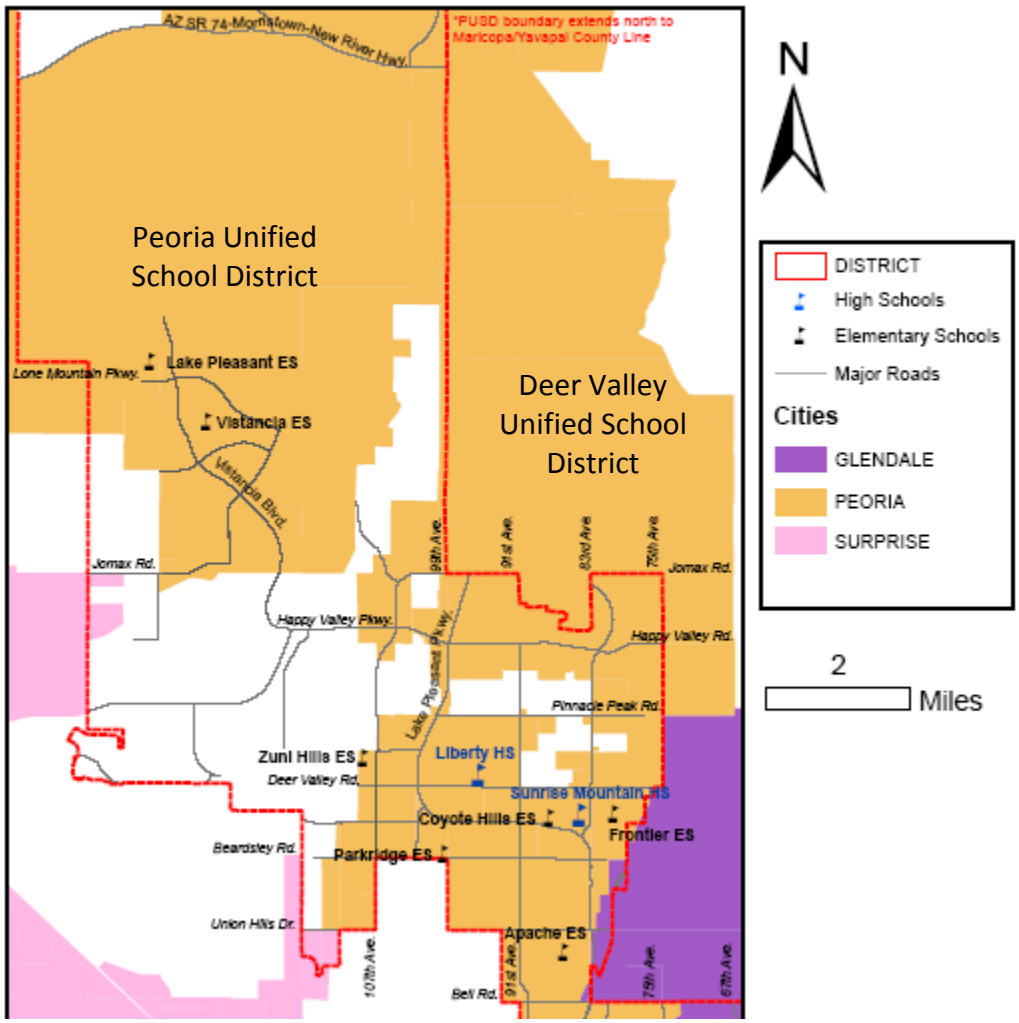
The intersection of Happy Valley Road and Lake Pleasant Parkway is a developing major commercial node. Future commercial development is planned along the Loop 303 Corridor and is described in more detail in the *Loop 303 Specific Plan*.

The Agua Fria River corridor south of Happy Valley Road is an existing rock products (sand and gravel) material resource area. There are currently a few active source pits and settling ponds in the channel.

PUBLIC SERVICES

Police/Park Rangers and Fire. The master plan area is serviced by the City of Peoria Police and Fire Departments. The Maricopa County Sheriffs Department patrols Lake Pleasant County Regional Park. City of Peoria Park Rangers respond to calls regarding public open space, parks and trails.

Schools. The Deer Valley Unified School District and the Peoria Unified School Districts operate within the master plan area. There are currently five existing elementary schools and no existing high schools in the open space master plan area north of Pinnacle Peak Road.



Library. The City of Peoria operates a branch library just south of the open space master plan area at Lake Pleasant Parkway and 95th Avenue.