

8. WATERSHED APPROACH TO WATER QUALITY MANAGEMENT PLANNING

Section 208 of the 1972 Amendments to the Federal Water Pollution Control Act (later known as the Clean Water Act, with Section 208 being codified at 33 USC §1288) required the Governor of each state to identify areas having water quality problems, delineate the boundaries of the areas and designate for each area a single representative organization that would develop plans for each area. In Arizona, the Governor delineated areas along political (i.e., county) boundaries. One of the areas delineated was Pima County, and the Governor designated PAG as the planning organization for that area. PAG subsequently developed its original 1978 Section 208 Areawide Water Quality Management Plan for Pima County.

Parts of PAG's original 208 Plan, particularly the non-point source elements, were developed on a watershed basis to a limited extent. For example, the 1978 document included figures showing watersheds delineated at varying scales for areas inside and outside the urban window. The plan also included soil losses and certain pollutant loads that were calculated on a watershed basis. However, 208 Planning in Pima County and throughout Arizona has mostly been done on a political-boundary basis.

EPA has increasingly emphasized a watershed-based approach to address water quality problems. In 2002, EPA expressed a renewed commitment to advancing the watershed approach, stating that "such an approach, which focuses multi-stakeholder efforts within hydrologically defined boundaries to protect and restore our aquatic resources and ecosystems, offers the most cost-effective opportunity to tackle today's challenges" (EPA, 2002). Also, as noted in the introduction of this report, EPA has placed increasing emphasis on Total Maximum Daily Loads (TMDL) and nonpoint source pollution control.

In 1997, ADEQ prepared a draft Statewide Watershed Framework document (ADEQ, 1997a), which "describes how water protection efforts can be organized along watershed boundaries. A watershed framework supports partnering, using sound science, taking well-planned actions and achieving results. ADEQ's multi-disciplinary watershed management approach is evolving and being used to solve tough problems." (ADEQ, 2005h). ADEQ's Nonpoint Source State Management Plan (ADEQ, 2003) notes that ADEQ continues to work with the Designated Planning Agencies on incorporating a watershed-based approach into the 208 process. ADEQ (2003) further notes that "this is a slow process because the DPAs were established on political jurisdictional lines and pollution knows no boundaries."

In order to be consistent with EPA's and ADEQ's emphasis on watershed planning, PAG intends to transition its 208 Planning process to a watershed-based approach. This will involve a number of challenges, some of which can be partially addressed by this update. Others will take more time.

Two key challenges that must be addressed when attempting to incorporate a watershed-based approach to 208 planning, and which can be discussed in this 208 plan update, are:

- choosing a watershed scale
- avoiding or resolving difficulties with planning (and implementing plans) across jurisdictional boundaries

8.1. WATERSHED SCALE

The scale of a watershed can range anywhere from an unnamed tributary near the headwaters of a mountain stream (perhaps a few square miles within a single county) to the entire watershed for a large river, such as the Colorado, encompassing many states and crossing an international border. Choosing a very small scale for a watershed would have the advantage that most watersheds would be under a single jurisdiction and possibly even under a single land owner. This would minimize the need for coordination among different jurisdictions and land owners, and it would simplify the development of the management plan for that watershed. The obvious disadvantage is that planning on a very small scale would result in an extremely large number of watersheds for which individual plans would be needed and coordinated with. It would also defeat the purpose of planning for water quality management on a regional basis.

At the other end of the spectrum, watershed planning on the scale of the Colorado River would have the advantage that most of Arizona would fall within a single watershed planning area, thus minimizing the number of plans. However, development and implementation of the plan would be enormously complex and involve an unreasonably large number of cities, towns, counties, tribes, states and nations. It is clearly the intent of the Clean Water Act that states take individual responsibility for water quality management, and that water quality management planning be conducting on a sub-state scale. Therefore, planning on the scale of the Colorado River watershed would not be an appropriate choice for incorporating a watershed-based approach into the 208 process.

One way to differentiate scales or resolutions of watersheds is by using the U.S. Geological Survey's Hydrologic Unit Codes (HUC). EPA's "Surf Your Watershed" Web site (<http://www.epa.gov/surf/>) provides maps and lists of watersheds, according to their HUC, by state and by county. The USGS Web site (<http://water.usgs.gov/GIS/huc.html>) has an excellent explanation of HUCs:

The United States is divided and sub-divided into successively smaller hydrologic units which are classified into four levels: regions, sub-regions, accounting units, and cataloging units. The hydrologic units are arranged within each other, from the smallest (cataloging units) to the largest (regions). Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system.

The first level of classification divides the Nation into 21 major geographic areas, or regions. The second level of classification divides the 21 regions into 222 subregions. A subregion includes the area drained by a river system, a reach of a river and its tributaries in that reach, a closed basin(s), or a group of streams forming a coastal drainage area. The third level of classification subdivides many of the subregions into accounting units. These 352 hydrologic accounting units nest within, or are equivalent to, the subregions. The fourth level of classification is the cataloging unit, the smallest element in the hierarchy of hydrologic units. [Efforts are under way to add further levels of subdivisions.] A cataloging unit is a geographic area representing part or all of a surface drainage basin, a combination of drainage basins, or a distinct hydrologic feature. These units subdivide the subregions and accounting units into smaller areas. There are 2150 Cataloging Units in the nation. Cataloging Units sometimes are called "watersheds."

Under the USGS HUC system, PAG's Designated Planning Area lies entirely within the Lower Colorado Region (Region 15) and includes parts of Subregions 1505 (Middle Gila), 1507 (Lower Gila) and 1508 (Sonora). Within these subregions, there are five accounting units in PAG's area:

Middle Gila (1505)

- San Pedro-Willcox (150502)
- Santa Cruz (150503)

Lower Gila (1507)

- Lower Gila (150702)

Sonora (1508)

- Rio Sonoyta (150801)
- Rio De La Concepcion (150802)

PAG's area contains all or parts of 14 watersheds at the cataloging unit scale (EPA, 2005a):

San Pedro-Willcox (150502)

- 15050202 Upper San Pedro
- 15050203 Lower San Pedro

Santa Cruz (150503)

- 15050301 Upper Santa Cruz
- 15050302 Rillito
- 15050303 Lower Santa Cruz
- 15050304 Brawley Wash
- 15050305 Aguirre Valley
- 15050306 Santa Rosa Wash

Lower Gila (150702)

- 15070202 Tenmile Wash
- 15070203 San Cristobal Wash

Rio Sonoyta (150801)

- 15080101 San Simon Wash
- 15080102 Rio Sonoyta
- 15080103 Tule Desert

Rio De La Concepcion (150802)

- 15080200 Rio De La Concepcion

These watersheds range in size from 125 square miles (Rio De La Concepcion) to 2,210 square miles (Upper Santa Cruz) (USGS, 2005). The USGS HUC system does not extend beyond the nation's borders. Thus many watersheds in southern Arizona are delineated such that their southern boundary corresponds to the international border with Mexico.

At the cataloging unit scale, 84 watersheds lie partly or entirely within Arizona (EPA, 2005b). ADEQ has consolidated these 84 watersheds into 10 larger watersheds statewide that are distinct from the USGS HUC system (ADEQ, 1997a):

- Bill Williams
- Colorado - Grand Canyon
- Colorado - Lower Gila
- Little Colorado - San Juan
- Middle Gila
- Salt
- San Pedro - Willcox Playa - Rio Yaqui
- Santa Cruz - Rio Magdalena - Rio Sonoyta
- Upper Gila
- Verde

At the state level, division of the state into 10 watersheds, by consolidating individual cataloging unit watersheds into larger watersheds, is a practical choice for coordinating a variety of programs statewide. Coincidentally, it is somewhat comparable in scale to the division of the state into eight Designated Planning Areas and Planning Agencies under Section 208.

However, at the regional (i.e., Designated Planning Agency) level, it is more useful in many ways to conduct watershed planning at the scale of the cataloging units. For example, in PAG's Designated Planning Area, ADEQ has consolidated most of Pima County into the "Santa Cruz / Rio Magdalena / Rio Sonoyta" watershed. The individual cataloging units within this larger watershed include the Upper Santa Cruz, the Lower Santa Cruz, Brawley Wash, Rillito, San Simon Wash, and others. These individual watersheds are distinct from one another. The Upper Santa Cruz and Rillito watersheds encompass much of the Tucson metropolitan area and include a Unique Water, several perennial streams flowing down the slopes of high mountains, and an effluent dependent water, whereas the Brawley Wash watershed is predominantly rural in nature, consisting of low-elevation desert rangeland. The Sam Simon Wash watershed is within the low-elevation desert of the Tohono O'odham Nation. Given the diversity of the individual watersheds within ADEQ's larger watersheds, it is more appropriate for PAG to conduct watershed planning in its Designated Planning Area at a cataloging-unit resolution or finer.

Planning at a resolution finer than that of the cataloging unit will be necessary in many cases, including management of Unique Waters and development of TMDLs for impaired waters. For example, plans for managing Cienega Creek, a Unique Water in a rural area southeast of Tucson, would need to be made at a resolution finer than the scale of the entire Rillito watershed, which encompasses much of the eastern half of the Tucson metropolitan area (downstream of Cienega Creek) and which therefore has numerous issues not pertinent to the management of Cienega Creek. Likewise, the draft TMDL for Lakeside Lake, an artificial urban lake fed by reclaimed water and stormwater runoff on Tucson's east side, does not (and should not) address all pollutant sources in the entire Rillito watershed.

8.2. PLANNING ACROSS JURISDICTIONAL BOUNDARIES

Traditionally, land use planning has been conducted by local town, city and county governments, Metropolitan Planning Organizations and regional Councils of Governments. The plans developed by these entities typically only encompass the areas within their jurisdictions.

With watershed-based planning, however, plans are based on hydrologic boundaries, rather than political boundaries.

Transitioning from planning on a political boundary basis to a watershed basis is a challenge, because government entities with the legal authority to develop and implement plans and enforce environmental regulations do not have any authority to carry out these activities beyond their jurisdictional limits (i.e., outside the city, town, or county boundaries). In very few cases do jurisdictional boundaries correspond to watershed boundaries, thus precluding local governments from planning for entire watersheds (particularly if the watersheds are large). If such plans were made, they would be difficult to implement because most entities would lack the authority to implement the plans.

If Arizona were to transition completely to watershed-based planning under Section 208 of the Clean Water Act, the Governor would presumably rescind the designations of the current planning agencies and planning areas statewide, and designate new planning area boundaries across the state, corresponding to the boundaries of Arizona's watersheds, "after consultation with appropriate elected and other officials of local governments having jurisdiction in such areas." {Clean Water Act §208(a)(2) 33 USC §1288 (a) (2)}. For each watershed, the Governor would then designate a new planning agency consisting of "a single representative organization, including elected officials from local governments or their designees, capable of developing effective area wide waste treatment management plans for such area" {Clean Water Act §208(a)(2)}.

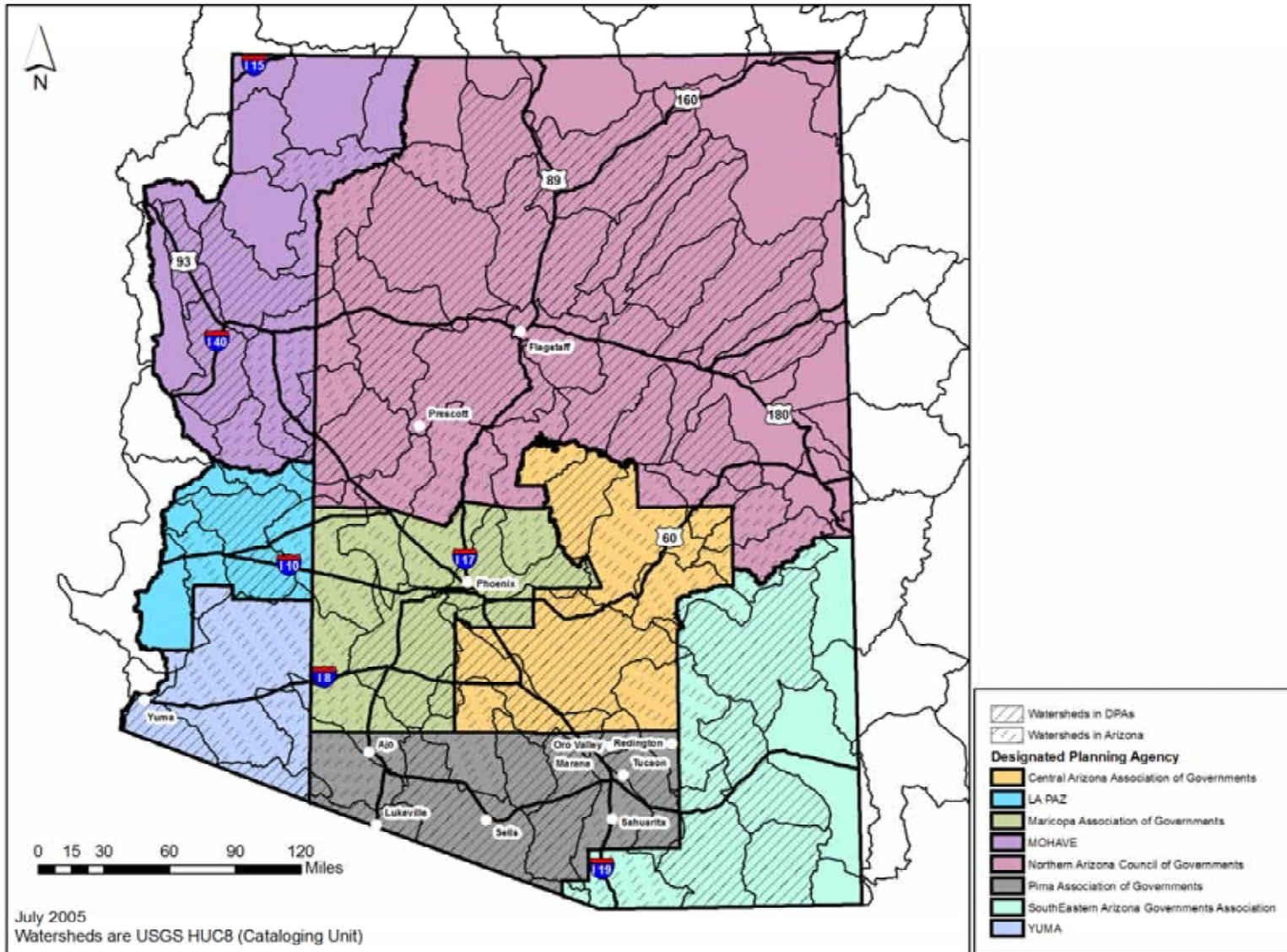
The scenario described above would be exceedingly difficult to implement, considering that for most watersheds, no such organizations currently exist, and considering that the jurisdictions of local governments do not usually correspond to watershed boundaries. Furthermore, the Clean Water Act requires that these newly created organizations would have a waste treatment planning process in place within a year of being designated; within two years a plan would have to be certified by the Governor and submitted to EPA.

Such a transition is clearly outside the scope of this update to PAG's 208 Plan. Instead, PAG is attempting with this update to take initial steps toward incorporating the principles of watershed-based planning into the existing planning structure that is founded upon political jurisdiction boundaries.

The principal advantage of PAG's approach is that it does not necessitate the creation of new organizations and preparation of new plans from scratch, and instead relies on existing organizations (Designated Planning Agencies and Designated Management Agencies) with the experience and authorities to carry out the planning and management activities needed to protect water quality in the region. The existing Designated Planning Agencies represent multiple local governments and thus increase the extent to which local governments can cooperatively conduct watershed planning outside their individual jurisdictional boundaries.

The large geographic extent of the existing Designated Planning Areas (encompassing at least an entire county and in several cases multiple counties) results in many watersheds falling entirely (or almost entirely) within an existing DPA, thus helping to minimize the problems associated with planning across jurisdictional boundaries. Of Arizona's 84 watersheds, 59 lie completely within Arizona. The other 25 watersheds extend into adjoining states. Of the 59 watersheds completely within Arizona, 38 lie completely within single Designated Planning Areas. The other 21 watersheds cross boundaries between the DPAs (Figure 8-1).

Figure 8-1. Watersheds in Arizona and Designated Planning Area Boundaries



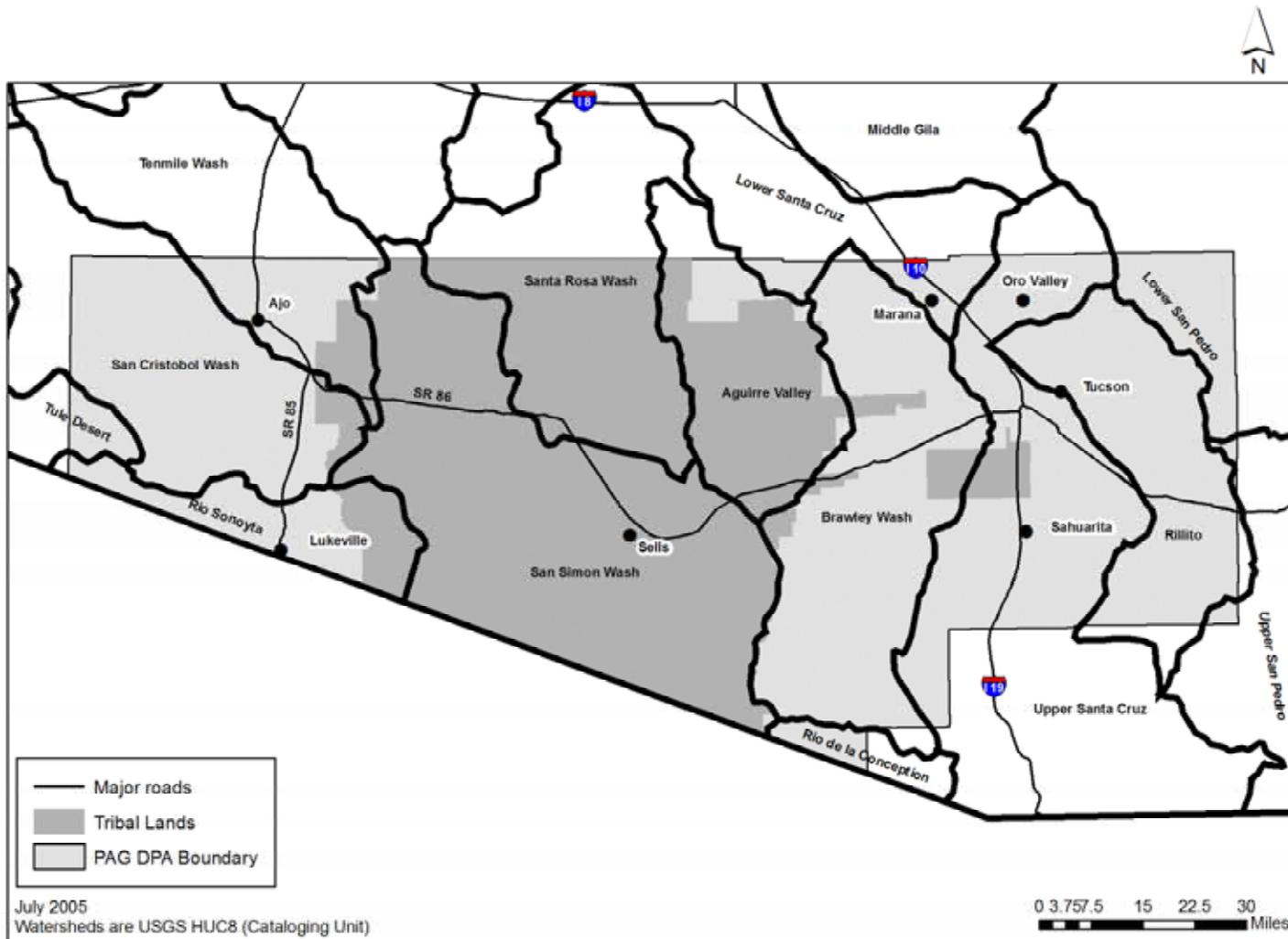
In PAG's area, five of the 14 watersheds lie almost completely within Pima County (Figure 8-2): San Simon Wash, Brawley Wash, Rio Sonoyta, Rillito and Aguirre Valley. One of the most significant watersheds (in terms of population, land use and water resources) in the PAG area is the Upper Santa Cruz. Most of this watershed is within PAG's area, but a large portion of the headwaters are within the SouthEastern Arizona Governments Association (SEAGO) area (in Santa Cruz county), and the downstream end of the watershed is in Central Arizona Association of Governments' (CAAG) area (in Pinal County). A small part of the Lower Santa Cruz watershed is within PAG's area. The bulk of this watershed is within CAAG, although a small part at the northwest end is within MAG's area. PAG's area also includes a small part of the San Pedro watershed. The rest of the San Pedro watershed is divided roughly evenly between SEAGO and CAAG. The remaining watersheds in PAG's area (Santa Rosa Wash, Tenmile Wash, San Cristobal Wash and Rio Sonoyta) are located in the very arid, sparsely populated reaches of western Pima County. Much of these watersheds are comprised of tribal lands and federal lands.

The small, unincorporated community of Ajo is in the southern, upstream reaches of the Tenmile watershed, in the northwest corner of Pima County. This watershed extends into the Maricopa Association of Governments (MAG) and Yuma County planning areas. However, most of the watershed downstream from Ajo, outside Pima County, is very arid land with minimal water resources and population. Much of it is within the Barry Goldwater Air Force Range. For these reasons, the likelihood of any water quality issues in this watershed spanning multiple planning areas is minimal.

The far northeast corner of Pima County is in the Lower San Pedro watershed. This is a sparsely populated area on the opposite side of the Santa Catalina Mountains from Tucson, and it only represents a small part of the Lower San Pedro watershed, most of which is located in the SEAGO and CAAG areas. However, the part of the watershed in Pima County includes a number of very important natural aquatic habitat resources, including perennial waterbodies like Bingham Cienega (a rare wetland), Buehman Canyon (a Unique Water), and a perennial reach of the San Pedro River itself. Planning in this area should occur at the scale of the watersheds for the individual tributaries to the San Pedro River, rather than at the scale of the entire Lower San Pedro River watershed. This would take into account the specific challenges and needs associated with the individual waterbodies in this area, and it would minimize the need for planning across jurisdictional boundaries.

The vast majority of the population, economic development and water resources in Pima County are in eastern Pima County, in the Upper Santa Cruz, Rillito and Brawley Wash watersheds. Since the Brawley Wash and Rillito watersheds lie entirely or almost entirely within PAG's planning area, PAG can plan for these areas without much need to cross jurisdictional boundaries. Much of the Upper Santa Cruz watershed is within PAG's area, and PAG can plan for the Pima County portion of this watershed. Planning for the Upper Santa Cruz watershed as a whole, however, including the southern and northern limits, will require coordination with CAAG and SEAGO. This can be accomplished through the statewide Water Quality Management Working Group, which meets regularly to discuss water quality plans and issues, particularly updates and amendments to 208 Plans. As a formal advisory body to ADEQ, the Water Quality Management Working Group has the ability to play a strong role in ensuring that coordination of planning across DPA boundaries will occur.

Figure 8-2. Watersheds within PAG's Designated Planning Area



8.3. NINE KEY ELEMENTS OF A WATERSHED PLAN

EPA recommends that whenever feasible, watershed-based plans be developed and implemented for all watershed projects, whether they are designed to protect unimpaired waters, restore impaired waters, or both. Accordingly, EPA has issued guidelines to promote the use of Section 319 funding for developing and implementing watershed-based plans [Federal Register: October 23, 2003 (Volume 68, Number 205)]. These guidelines include nine key elements that must be included in watershed-based plans to restore waters impaired by nonpoint source pollution using incremental Section 319 funds. The nine key elements are:

- 1) identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the pollution load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan);
- 2) an estimate of the load reductions expected for the management measures described under paragraph (c) below;
- 3) A description of the non-point source (NPS) management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan);
- 4) an estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan;
- 5) an information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing and implementing the NPS management measures that will be implemented;
- 6) a schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious;
- 7) a description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented;
- 8) a set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised; and
- 9) a monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

Incorporation of all nine elements into PAG's plan update is outside the scope and focus of this project. The nine elements are geared primarily toward waterbodies impaired by nonpoint

source pollution. In the future, if a waterbody in PAG's area becomes impaired due to nonpoint source pollution in the watershed, a watershed-based water quality improvement plan (TMDL) incorporating these nine elements would likely be developed if Section 319 funds are sought.

EPA also states in its guidance [Federal Register: October 23, 2003 (Volume 68, Number 205)] that "watershed-based plans should address not only the sources of water quality impairment, but also any pollutants and sources of pollution that need to be addressed to assure the long-term health of the watershed, including both surface and ground water that serve as sources of drinking water."

8.4. INITIAL ELEMENTS OF A WATERSHED-BASED WATER QUALITY MANAGEMENT PLAN FOR THE PAG PLANNING AREA

As a first step toward implementing the areawide water quality management plan on a watershed basis, PAG has inventoried wastewater treatment facilities and other potential sources of pollutant discharges for selected watersheds in the region (those encompassing most of the population, point source discharges, perennial streams and developed water resources). This is consistent with EPA's guidance noted above (that watershed-based plans should address any sources that need to be addressed to assure the long-term health of the watershed). The WWTF inventory is also consistent with key element "1" of the nine key elements, which is an inventory of sources. In addition, a discussion of education/public information and monitoring components of the plan is provided, consistent with elements "5" and "9" above. Key features in the watersheds, such as impaired waters, Unique Waters⁵ and perennial streams are also included in the discussion. Table 8-1 provides a summary of the features in each watershed.

8.4.1 Lower San Pedro

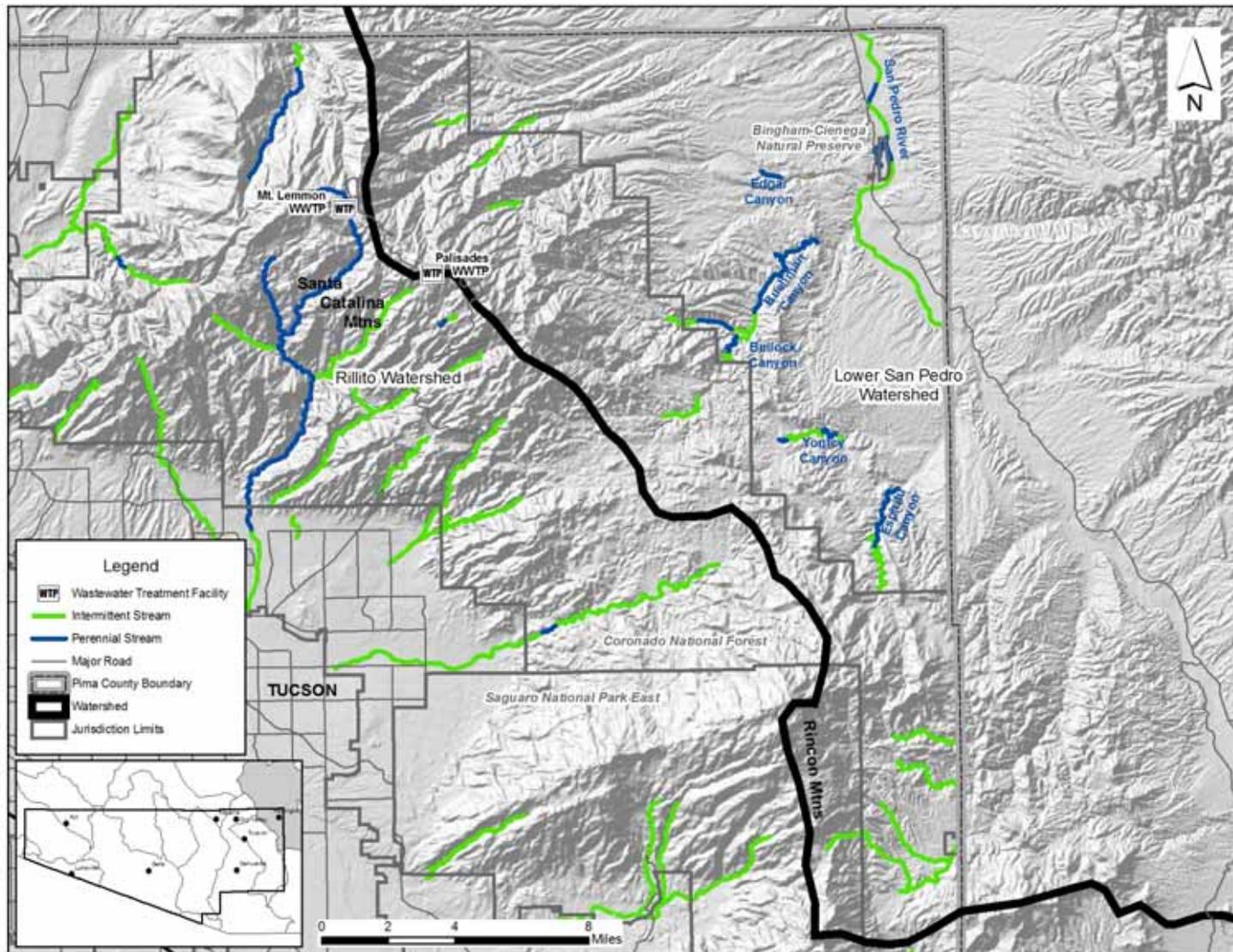
Several sub-watersheds within the PAG portion of the Lower San Pedro watershed (Figure 8-3) include important perennial streams that provide aquatic and riparian habitat for native species. These streams, which drain the northeast slopes of the Santa Catalina Mountains and Rincon Mountains, include Buehman Canyon (a Unique Water), Edgar Canyon, Bullock Canyon (which flows into Buehman), Espiritu Canyon and Youtcy Canyon. This area also includes Bingham Cienega, a rare low-elevation perennial wetland. The San Pedro River itself is also perennial in this area. There are no impaired waterbodies in the PAG portion of the San Pedro watershed.

There are no wastewater treatment facilities in this area. However, the Mount Lemmon WWTF discharges effluent via spray irrigation in the Corona National Forest within the boundaries of the Lower San Pedro watershed. There are no other permitted point sources of pollutants.

The PAG portion of the Lower San Pedro watershed area is sparsely populated, and wastewater is treated with individual on-site septic systems. There are no incorporated cities or towns; the small community of Redington, along the San Pedro River, is unincorporated. Potential non-point sources of pollutants include cattle grazing, mining, septic tanks and irrigated cropland along the river. Sediment transport enhanced by recent forest fires is an additional nonpoint source concern.

⁵ Under Arizona's Water Quality Standards Rules, a Unique Water is "a surface water that is classified as an outstanding state resource water by the Director under R18-11-112."

Figure 8-3. Lower San Pedro Watershed in Pima County



8.4.1.1 Monitoring

ADEQ's 2004 305(b) report indicates that Buehman Canyon and the San Pedro River were monitored in 1999, 2000, 2001 and 2002. Buehman was found to be attaining all uses, while the San Pedro was found to be inconclusive for the Aquatic and Wildlife and Full Body Contact uses due to E. coli exceedances and former turbidity standard exceedances. PAG sampled surface water quality in Edgar Canyon, the San Pedro River and Bingham Cienega seven times between 1998 and 2000 for an investigation to determine the source of water at Bingham Cienega.

8.4.1.2 Education and Public Information

PAG does not conduct regular public education or outreach in, or about, the San Pedro watershed. However, we hosted a large public forum on riparian area restoration and management in December 2003. One of the projects featured at this forum was located at Bingham Cienega.

8.4.2 Upper Santa Cruz

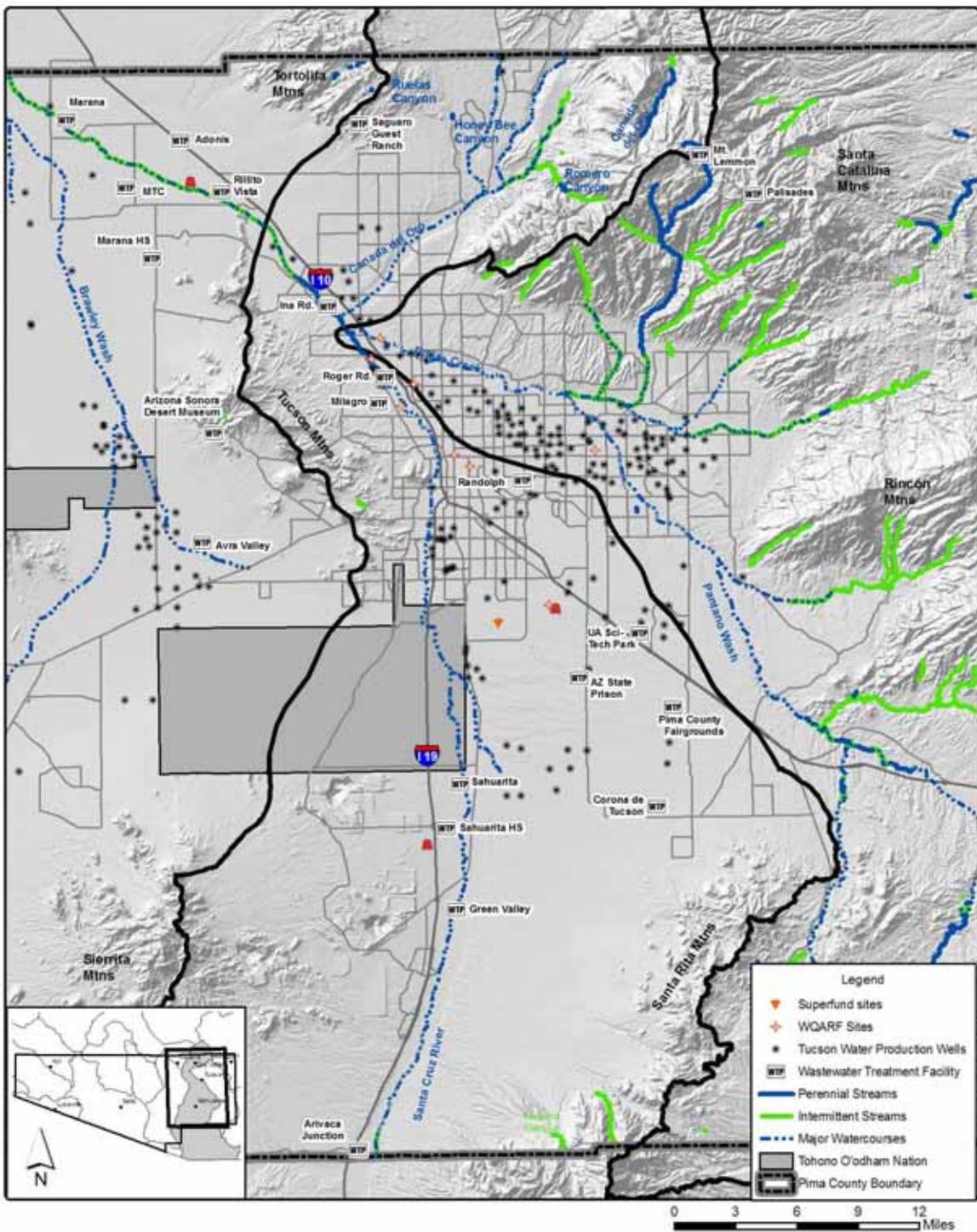
Along with the Rillito watershed, the Upper Santa Cruz watershed (Figure 8-4) is one of the two most heavily populated watersheds in PAG's planning area. It encompasses the western part of the Tucson metropolitan area, including downtown Tucson and Oro Valley. A large number of production wells supplying the Tucson area's municipal water needs are within this watershed, making it a very important water resource for the region.

Most of the wastewater treatment facilities in PAG's area are located in the Upper Santa Cruz watershed:

- Arivaca Junction
- AZ State Prison
- Corona de Tucson
- Green Valley
- Ina Rd.
- Milagro
- Mt. Lemmon
- Pima County Fairgrounds
- Randolph
- Roger Rd.
- Sahuarita
- Sahuarita High School
- UA Science/Tech Park

Two facilities in the Upper Santa Cruz watershed that are outside PAG's planning area but worthy of mention here are the Nogales International WWTF in SEAGO's area and the Saddlebrooke WWTF in CAAG's area. Because of its large size (14.5 MGD average daily inflow in 2004), upstream location, and history of large floods along the Santa Cruz River, the Nogales facility could be relevant to watershed-based plans for the reach of the Santa Cruz River in southern Pima County. The Saddlebrooke facility discharges to a tributary of the Canada del Oro Wash. Because the Canada del Oro is a significant source of groundwater recharge for the Oro Valley area, facilities in the upstream reaches of this watershed are of interest to Oro Valley.

Figure 8-4. Upper Santa Cruz Watershed in Pima County



Within PAG's planning area, the Upper Santa Cruz contains six Water Quality Assurance Revolving Fund (WQARF) sites, the Tucson International Airport Area Federal Superfund Site, and the Davis-Monthan Air Force Base Department of Defense site. Nonpoint source issues include urban runoff (which is managed under several municipal stormwater AZPDES permits), irrigated agriculture, grazing, mining and wildcat dumping. In addition, recent wildfires in the Santa Catalina Mountains have increased sediment loads in some drainages. Twenty closed landfills are within the watershed, as are the active Los Reales landfill and active Sahuarita No. 2 landfill. Mining is a significant land use in the Green Valley area, south of Tucson. The closed landfills are:

- Catalina #1
- Catalina #2
- Cortaro
- Camino del Cerro
- Silverbell/Jail Annex
- State Pit
- Dragoon
- St. Mary's
- Rio Nuevo North
- Rio Nuevo South
- A Mountain
- Tumamoc
- Mission
- 29th Street
- Ryland
- Cottonwood
- Old Nogales
- Rita Road
- Sahuarita #1
- Ina Rd (open for inert materials only)

PAG's portion of the Upper Santa Cruz watershed includes several perennial stream reaches: Upper Canada del Oro, Romero Canyon, Honey Bee Canyon and Ruelas Canyon. The Upper Canada del Oro and Romero Canyon are in the Santa Catalina Mountains, while Honey Bee Canyon and Ruelas Canyon are in the Tortolita Mountains. The Santa Cruz River is perennial downstream of Tucson because of constant effluent discharges from the Roger Road and Ina Road wastewater treatment facilities. Madera Canyon, a national renowned birding area in the Santa Rita Mountains, is one of many intermittent streams of note.

No Unique Waters or impaired waters are within PAG's part of the Upper Santa Cruz watershed.

8.4.2.1 Monitoring

PAG, ADEQ, the USGS, and numerous local entities monitor this watershed extensively. ADEQ, the USGS, and Pima County Wastewater Management Department monitor the effluent dependent reach of the Santa Cruz River near Tucson regularly at several locations. PAG has conducted many studies in this watershed, including a recent well inventory along the Santa Cruz River, and recent studies at Arivaca Creek and Sopori Wash. Various water providers conduct water quality and water level monitoring at numerous wells in the Santa Cruz watershed. Local municipalities with stormwater AZPDES permits monitor urban runoff.

Groundwater quality at the Federal Superfund and state WQARF sites is monitored intensively. Surface water and groundwater quality monitoring at wastewater treatment facilities occurs in accordance with the facilities' permits.

8.4.2.2 Education and Public Information

PAG actively educates the public and disseminates public information in and about this watershed, along with the Rillito, Lower Santa Cruz and Brawley Wash watersheds (see below). PAG maintains extensive mailing lists for its Environmental Planning Advisory Committee and Watershed Planning Subcommittee, and information is regularly disseminated to parties on these lists. The committees meet regularly, and PAG also hosts large public forums on a variety of watershed topics at least once a year. PAG and many other local entities maintain Web sites and publicly accessible libraries with information about the watershed.

PAG and its member jurisdictions have recently focused on educating the public about preventing stormwater pollution. The education campaign has included targeted outreach to specific industries and also the general public, in the form of bus ads, bus shelter posters and radio spots.

8.4.3 Rillito

As noted above, the Rillito watershed (Figure 8-5) is one of the two most heavily populated watersheds in PAG's planning area. It includes much of central and eastern Tucson as well as the northern Tucson suburbs in the foothills of the Santa Catalina Mountains. Part of the rapidly growing Vail area on the Tucson metropolitan area's far southeast side is also in this watershed. Very little of the watershed extends beyond PAG's planning area boundaries, minimizing cross-jurisdictional planning issues.

Two wastewater treatment facilities are located within this watershed: the Mount Lemmon WWTF and the Palisades Ranger Station WWTF. Both are in the Santa Catalina Mountains near the edge of the watershed. The Mount Lemmon facility actually discharges into the Lower San Pedro watershed, even though the treatment facility itself is located within the Rillito watershed. Three WQARF sites are in this watershed: Camino del Cerro, Shannon Road – Rillito Creek, and Broadway North. Nonpoint source issues include urban runoff, irrigated agriculture and grazing. In addition, recent wildfires in the Santa Catalina Mountains have led to increased sediment loads in some drainages. Eleven closed landfills are within the watershed. The active, privately owned Speedway Landfill is also in this watershed. The closed landfills are:

- La Cholla #1 and #2
- Cactus
- Columbus
- Walnut
- Vincent Mullins
- Broadway North
- Broadway South
- Prudence
- Harrison
- Irvington

The Rillito watershed is very important to water resource planning in the Tucson area. The watershed drains the Santa Catalina Mountains, Rincon Mountains, Santa Rita Mountains and Whetstone Mountains, and it provides a significant part of the natural groundwater recharge for

the Tucson basin. It is a significant tributary watershed for the Upper and Lower Santa Cruz watersheds. The Rillito includes a large number of municipal supply wells serving the Tucson metropolitan area, and it has the largest number of perennial streams of any watershed in the PAG planning area, including: Cienega Creek (a Unique Water), Davidson Canyon (nominated for Unique Water status), Empire Gulch, Cinco Canyon, Mattie Canyon, Wakefield Canyon, Posta Quemada Wash, Upper Tanque Verde Creek, Sabino Creek, Lemmon Creek and others. Cienega Creek is a particularly prominent feature in the watershed. The upper perennial reach is the focal point of the Las Cienegas National Conservation Area. The lower perennial reach is in Pima County's Cienega Creek Natural Preserve. Sabino Canyon is a very popular recreation area in the Coronado National Forest.

Lakeside Lake is the only impaired waterbody in this watershed. It is an artificial urban lake on Tucson's east side. A popular fishing spot, the lake is sustained by reclaimed water and stormwater runoff. Several fish kills have occurred at the lake, and ADEQ has prepared a draft TMDL addressing dissolved oxygen, pH and nutrients. The February 2005 draft of the TMDL document (ADEQ with PBS&J, 2005) calls for addition of alum to the lake to correct the problems. The City of Tucson also has installed an aeration system.

8.4.3.1 Monitoring

ADEQ, PAG and other entities monitor the Rillito watershed extensively. ADEQ's 2004 305(b) report includes surface water quality monitoring results for Chiminea Creek, Cienega Creek, Loma Verde Wash, Madrona Creek, Sabino Canyon, Lakeside Lake and Rose Canyon Lake. PAG has conducted additional surface water quality monitoring in Davidson Canyon, Cienega Creek and Posta Quemada Wash. Tucson Water and other water providers monitor wells throughout the watershed. The City of Tucson and Pima County monitor stormwater quality for their municipal stormwater discharge permits. Groundwater at WQARF sites and other landfills is monitored regularly, as is Lakeside Lake. Surface water quality and groundwater quality monitoring at wastewater treatment facilities occurs in accordance with the facilities' permits.

8.4.3.2 Education and Public Information

Outreach in the Rillito watershed occurs together with the outreach for the Upper Santa Cruz watershed. PAG's and local agencies' committees, libraries and Web sites address education and information needs for both watersheds. The stormwater pollution prevention educational campaigns target both watersheds too. In addition to these activities, PAG is very active in the Cienega Corridor Conservation Council and somewhat active in the Sonoita Valley Planning Partnership. These organizations help disseminate information on the Lower and Upper Cienega Creek watersheds, respectively.

8.4.4 Lower Santa Cruz

Only a relatively small part of the Lower Santa Cruz watershed (Figure 8-6) is within PAG's planning area. However, PAG's part of the watershed includes three wastewater treatment facilities:

- Marana
- Rillito Vista
- Adonis

One perennial stream – Wild Burro Canyon in the Tortolita Mountains – is also within PAG's portion of the Lower Santa Cruz watershed. No Unique Waters or impaired waters are in the area. Two closed landfills (Marana #1 and Marana #2) and the active Tangerine Road landfill are in the area.

Figure 8-5. Rillito Watershed in Pima County

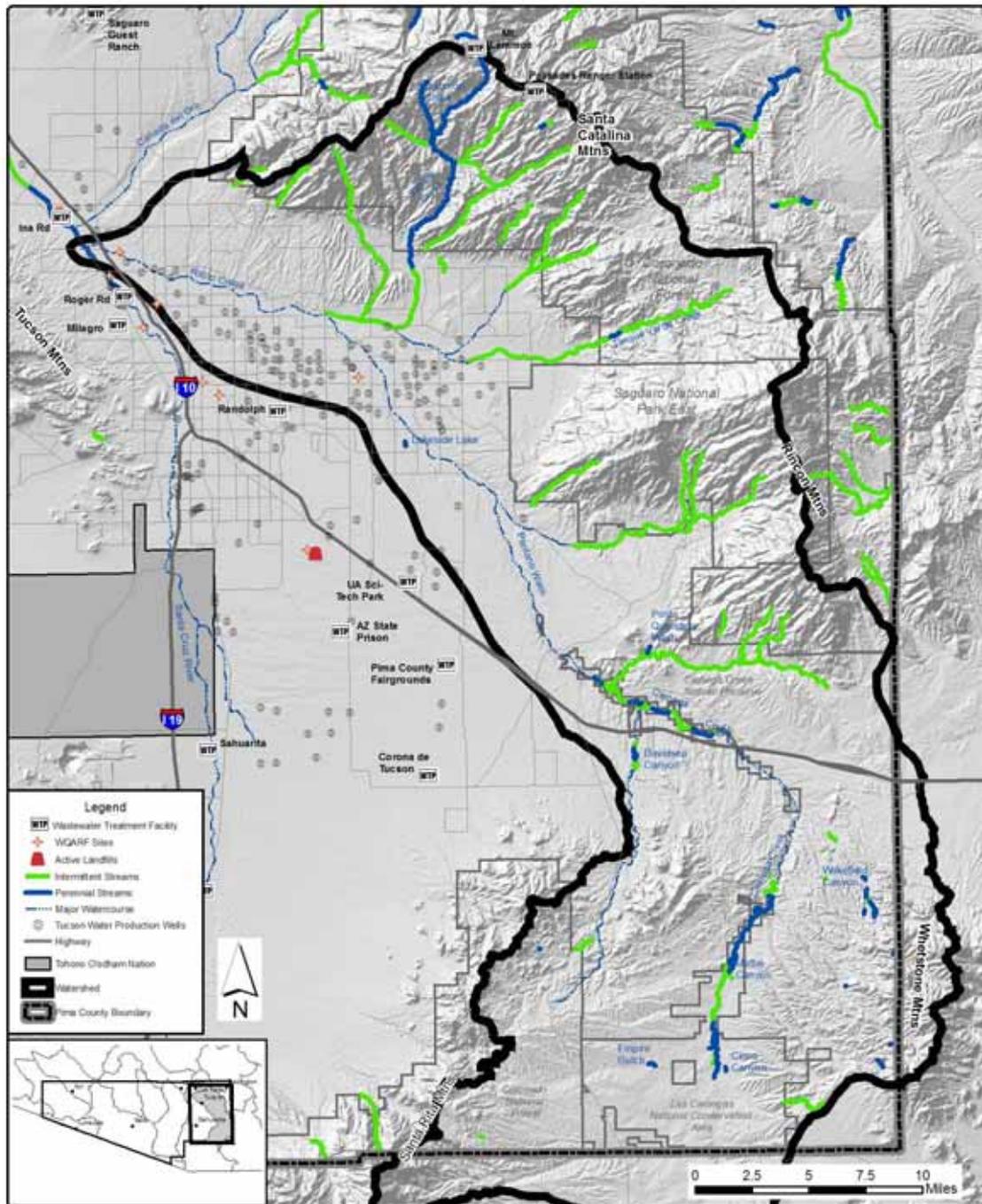
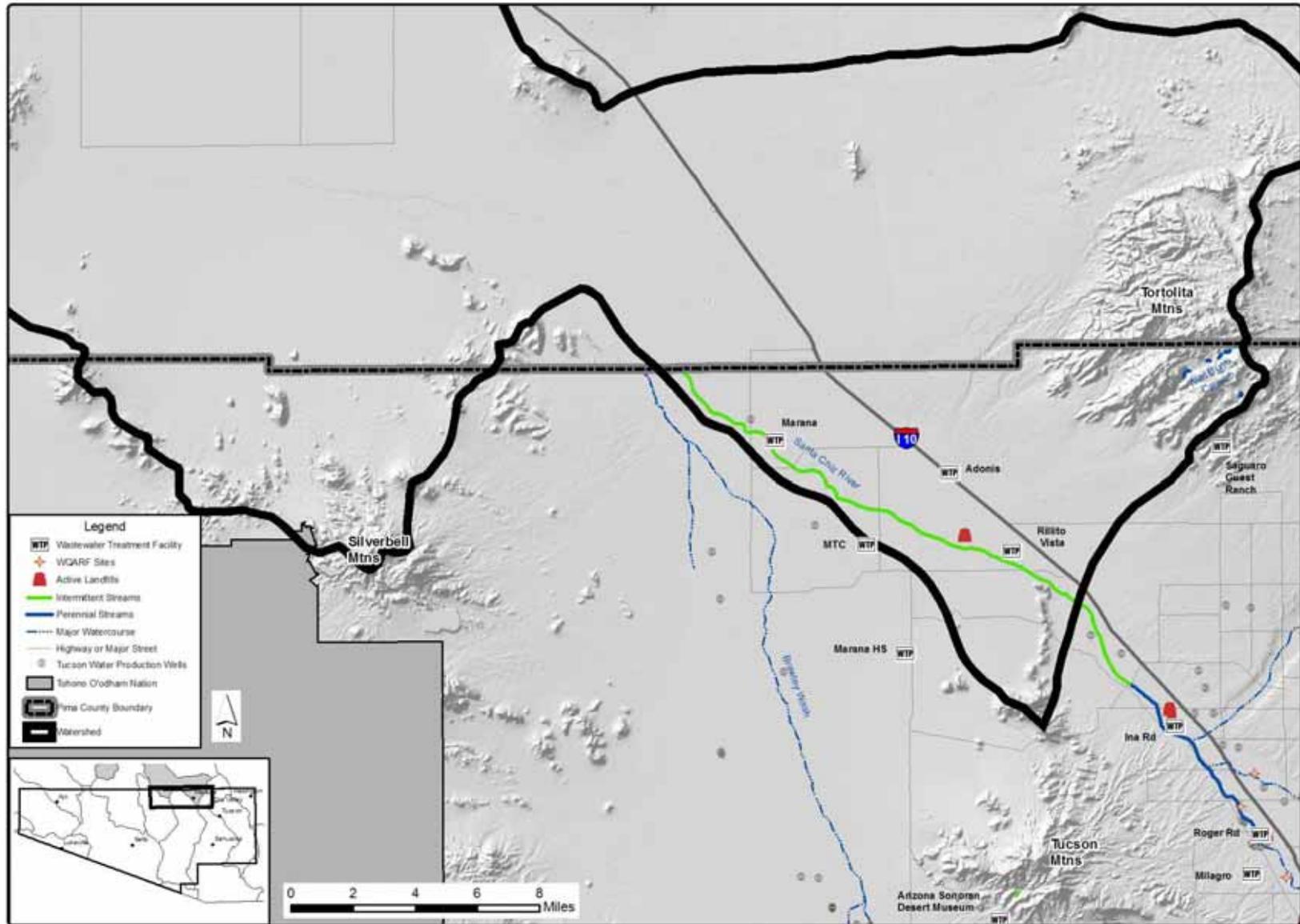


Figure 8-6. Lower Santa Cruz Watershed in Pima County



8.4.4.1 Monitoring

In PAG's part of the Lower Santa Cruz watershed, the effluent dependent reach of the Lower Santa Cruz is monitored regularly. Local water providers monitor groundwater quality from their wells in accordance with the Safe Drinking Water Act. Water quality monitoring at wastewater treatment facilities occurs in accordance with the facilities' permits.

8.4.4.2 Education and Public Information

Education and dissemination of public information for this area occurs in conjunction with activities in the Upper Santa Cruz and Rillito watersheds (see above for more details).

8.4.5 Brawley Wash

The Brawley Wash watershed (Figure 8-7) is almost entirely within Pima County, encompassing the Altar and Avra Valleys west of Tucson. It is a rural watershed, separated from Tucson by the Tucson Mountains. However, parts of metropolitan Tucson are beginning to extend into it.

Brawley Wash is a very important watershed from a water resource standpoint. It includes Tucson Water's Avra Valley well fields, which contribute significantly to the Tucson area's water supply. It is also the location of the Central Avra Valley Storage and Recovery Project (CAVSARP), which is the largest CAP water recharge and recovery facility in the region. Artificial groundwater recharge and recovery in Avra Valley is expected to be a major component of Tucson's water resource plans for many years into the future.

Four wastewater treatment facilities are in the Brawley Wash watershed. Pima County operates the Avra Valley WWTF in southern Avra Valley. The Arizona-Sonora Desert Museum has its own wastewater treatment facility in the Tucson Mountains. The Marana High School and the MTC correctional facility are served by small package plants.

Potential nonpoint sources of pollutants include grazing, mines and irrigated agriculture. Two closed landfills (Ryan and County Parks #2) are also present in the watershed.

Arivaca Lake, at the southeast periphery of the watershed, is an impaired water. ADEQ has completed a TMDL for the lake, which was listed due to the presence of mercury in fish tissue at concentrations in excess of guidelines. There are no permitted point source discharges of mercury in the Arivaca Lake watershed, nor were any other significant terrestrial sources identified despite an intense search conducted for the TMDL study. The TMDL study concluded that background watershed loading is the major source of mercury to the lake. Implementation plans focus on livestock and range best management practices to reduce erosion rates (ADEQ et al., 1999).

Brawley Wash, the principal drainage feature in the watershed, is ephemeral. However, Arivaca Lake and Arivaca Creek are perennial. There are no Unique Waters in the watershed.

8.4.5.1 Monitoring

Surface water monitoring in this watershed is limited, due to the paucity of surface water sources. ADEQ's 2004 305(b) report contains monitoring results for Arivaca Lake but no other waterbodies in this watershed. A recent inventory of available water quality data for priority streams in Pima County (PAG, 2002b) contained ADEQ sampling data from 1993 for Arivaca Creek.

Groundwater monitoring is more extensive. Tucson Water and other water providers have wells that are monitored in accordance with the Safe Drinking Water Act.

8.4.5.2 Education and Public Information

Education and dissemination of public information for this area occurs in conjunction with activities in the Upper Santa Cruz and Rillito watersheds (see above for more details). PAG has also coordinated with the Arivaca Water Education Task Force (AWET).

8.4.6 Tenmile Wash

A portion of the Tenmile Wash watershed (Figure 8-8) is in arid northwest Pima County. It includes the unincorporated communities of Ajo and Childs. The Ajo Improvement Company WWTF is in this watershed. No perennial streams, Unique Waters or impaired waters are present. Potential nonpoint sources of pollutants include mining and grazing. The active Ajo Landfill is also within this watershed.

8.4.6.1 Monitoring

Surface water monitoring in PAG's part of the Tenmile Wash watershed is extremely limited, due to the lack of perennial water. Water quality monitoring at the WWTF and mines presumably occurs in accordance with applicable permits and regulations. Water providers conduct groundwater quality monitoring under the Safe Drinking Water Act.

8.4.6.2 Education and Public Information

Education and public information in and about PAG's portion of this watershed are limited. PAG's activities have been limited to conducting a public hearing for a 208 Plan Amendment regarding the Ajo Improvement Company WWTF and maintaining a document library that contains some information pertinent to the watershed.

8.4.7 Rio Sonoyta

The Rio Sonoyta watershed (Figure 8-9) is in extreme southwestern Pima County along the Mexico border. It includes one of the few natural, perennial waterbodies in western Pima County – Quitobaquito Springs (along with the pond that the springs support). This watershed also includes wastewater treatment facilities at the Lukeville border station and Organ Pipe Cactus National Monument. On the U. S. side of the border, the watershed consists almost entirely of federal lands: Organ Pipe Cactus National Monument, Cabeza Prieta National Wildlife Refuge and the Barry M. Goldwater Air Force Range.

8.4.9.1 Monitoring

Surface water monitoring occurs at Quitobaquito Springs and Quitobaquito Pond. Otherwise, water quality monitoring is very limited due to the arid nature of the watershed and the limited development of water resources.

8.4.9.2 Education and Public Information

PAG does not conduct any educational or public information activities in this watershed.

Table 8-1. Features of the Watersheds in PAG's Designated Planning Area

<i>Watershed</i>	<i>Perennial Waterbodies</i>	<i>Impaired Waters</i>	<i>TMDLs</i>	<i>WWTFs in watershed</i>	<i>Regional WWTFs serving watershed</i>	<i>Active Public Landfills in Watershed</i>	<i>Population** 2005 / 2030</i>
Aguirre Valley 15050305	None	None	None	None	None	None	(a)
Brawley Wash 15050304	Arivaca Lake, Arivaca Creek (approx. 2.7 miles plus lake area)	Arivaca Lake	Arivaca Lake	Arizona-Sonora Desert Museum, Avra Valley, Marana High School, MTC	Avra Valley	None	7,191 / 84,112
Lower San Pedro 15050203	Bingham Cienega, Buehman Canyon*, Bullock Canyon, Edgar Canyon, Espiritu Canyon, San Pedro River, Youtcy Canyon (approx. 13.1 miles)	None	None	Mt. Lemmon spray field	None	None	152 / 245
Lower Santa Cruz 15050303	Wild Burro Canyon (approx. 0.4 miles)	None	None	Adonis, Marana, Rillito Vista	Marana	Tangerine	14,042 / 60,772

<i>Watershed</i>	<i>Perennial Waterbodies</i>	<i>Impaired Waters</i>	<i>TMDLs</i>	<i>WWTFs in watershed</i>	<i>Regional WWTFs serving watershed</i>	<i>Active Public Landfills in Watershed</i>	<i>Population** 2005 / 2030</i>
Rillito 15050302	Apache Spring, Cienega Creek*, Cinco Canyon, Davidson Canyon, Empire Gulch, Lakeside Lake, Lemmon Creek, Little Nogales Spring, Mattie Canyon, Montosa Canyon, Nogales Spring, Posta Quemada, Rose Canyon Lake, Sabino Creek, Scholefield Spring, Simpson Spring, Tanque Verde (upper), Wakefield Canyon, Wild Cow Spring (approx. 35 miles plus lake area)	Lakeside Lake	Lakeside Lake (draft)	Mount Lemmon, Palisades Ranger Station	Ina Road, Mount Lemmon, Roger Road	None	408,851 / 566,563
Rio De La Concepcion 15080200	None	None	None	None	None	None	(a)
Rio Sonoyta 15080102	Quitobaquito Springs, Quitobaquito Pond (approx. 0.1 miles plus pond area)	None	None	Lukeville, Organ Pipe Cactus National Monument	None	None	(a)
San Cristobal Wash 15070203	None	None	None	None	None	None	(a)
San Simon Wash 15080101	None	None	None	None	None	None	(a)
Santa Rosa Wash 15050306	None	None	None	None	None	None	(a)

<i>Watershed</i>	<i>Perennial Waterbodies</i>	<i>Impaired Waters</i>	<i>TMDLs</i>	<i>WWTFs in watershed</i>	<i>Regional WWTFs serving watershed</i>	<i>Active Public Landfills in Watershed</i>	<i>Population** 2005 / 2030</i>
Tenmile Wash 15070202	None	None	None	Ajo	Ajo	Ajo	(a)
Tule Desert 15080103	None	None	None	None	None	None	(a)
Upper San Pedro 15050202	None	None	None	None	None	None	40 / 57
Upper Santa Cruz 15050301	Upper Canada del Oro, Honey Bee Canyon, Romero Canyon, Ruelas Canyon, Santa Cruz River (edw) (approx. 11.7 miles)	None	None	Arivaca Junction, AZ State Prison, Corona de Tucson, Green Valley, Ina Rd., Milagro, Mt. Lemmon, Pima County Fairgrounds, Randolph, Roger Rd., Sahuarita, Sahuarita High School, UA Science/Tech Park	Corona de Tucson, Green Valley, Ina Road, Roger Road, Sahuarita	Los Reales, Sahuarita #2	443,656 / 783,825

* = Unique Water

**Population calculated using TAZ data and area weighting method (assumes equal distribution of population across TAZ.); TAZ data set does not completely cover Brawley watershed. Population was only estimated for the portion of the watershed within Pima County.

(a) Data not available for watersheds in western Pima County. Estimated population for total of all watersheds west of Brawley: 11, 655 (2005) / 19,497 (2030).

Figure 8-7. Brawley Wash Watershed in Pima County

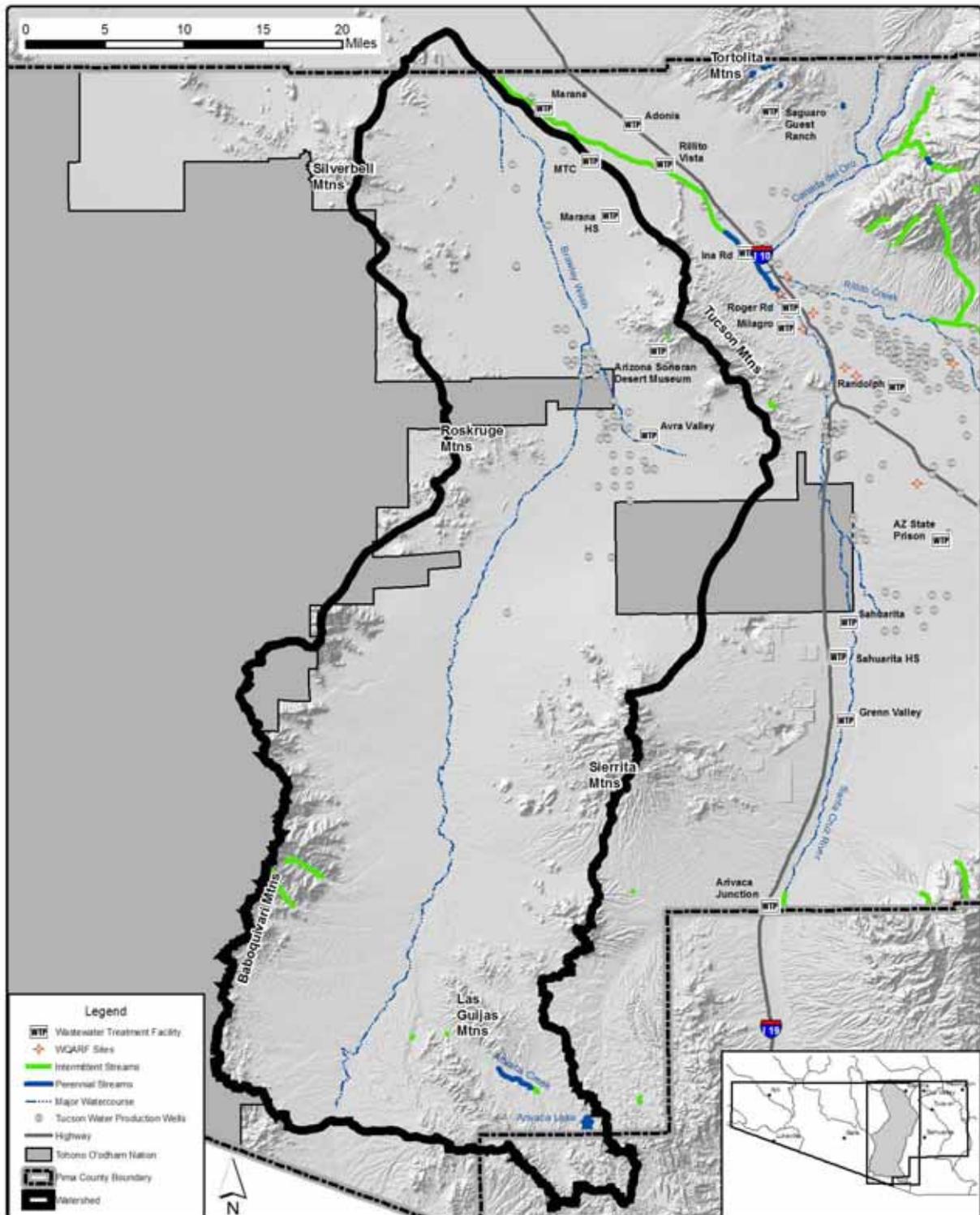


Figure 8-8. Tenmile Wash Watershed in Pima County

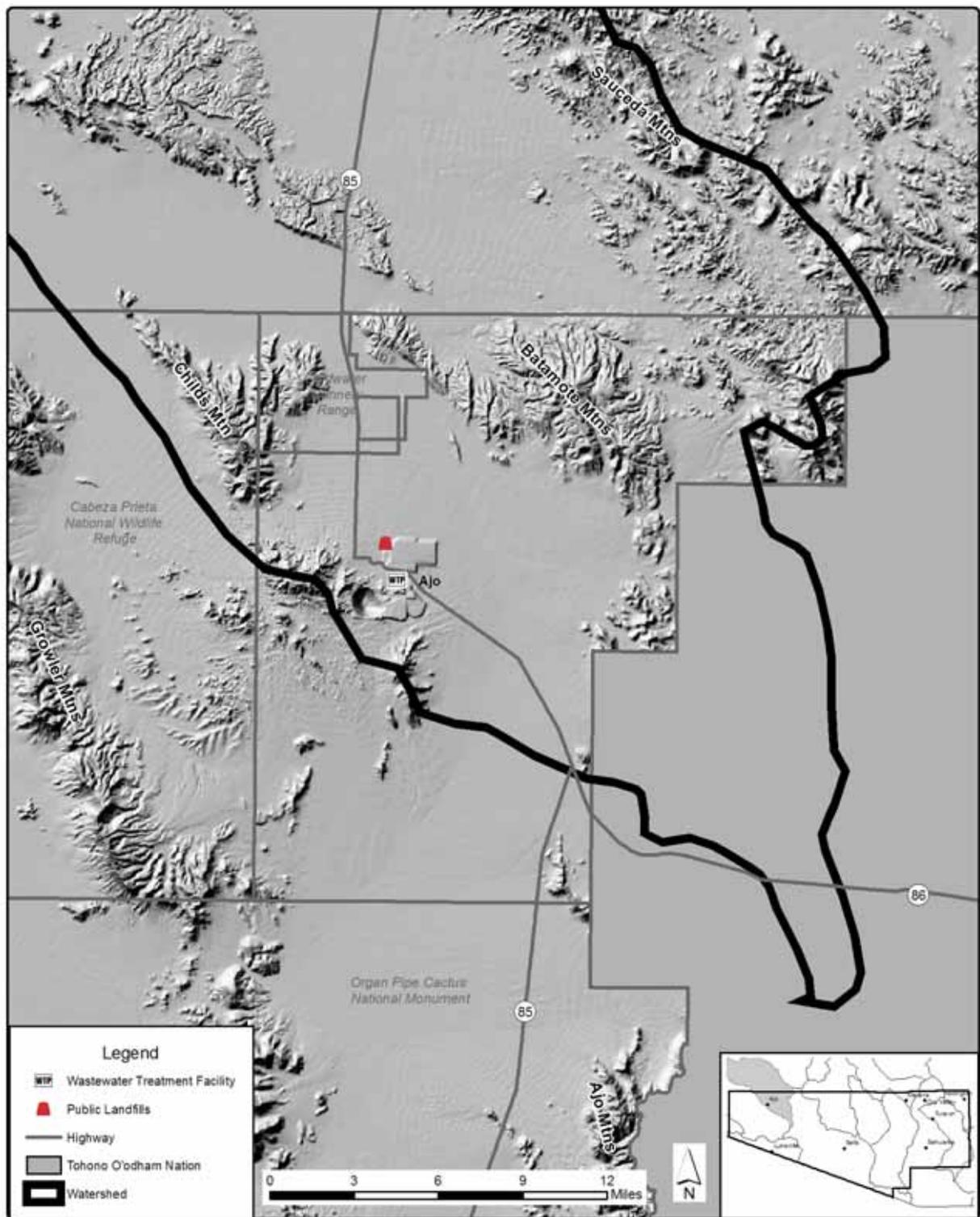


Figure 8-9. Rio Sonoyta Watershed in Pima County

