5.4.14 Santa Cruz River – Upper
This watershed extends from the Santa Rita Mountain ridge in the southeast across the Santa Cruz River basin to the Sierrita Mountains in the southwest. Its northern terminus is south of Martinez Hill and Black Mountain and the northern boundary of the San Xavier District of the Tohono O’odham Nation. It is comprised of 232,084 acres (362.6 square miles), 19,754 of which are in the Town of Sahuarita.

Figure 147 - Upper Santa Cruz River Watershed
5.4.14.1 Flood Characteristics

In addition to mountain front drainage across large alluvial fans, the Santa Cruz River enters from the south across Santa Cruz County and the international border to Mexico. Of geographic and political interest is the fact that its headwaters are also within the United States.

In total, including incorporated areas and federal lands there are 11,194 acres of SFHA and 264 acres of Special Study floodplains and 1,630 acres of locally mapped sheet flood area. The FEMA Flood Insurance Study (FIS) indicates a peak discharge of 60,000 cubic feet per second (cfs) at Drexel Road over three miles downstream of the watersheds terminus with a drainage area of 2,101 square miles. On the upstream side of the watershed, but over 9 miles downstream of the County line, the FIS indicates a peak discharge of 45,000 cfs at Continental Road with a drainage area of 1,162 square miles. This is by far the largest flow entering the County.

**Figure 148 - Upper Santa Cruz River SFHA in Acres**

In sum both unconstrained riverine flooding and cross drainage are all significant concerns.

The FEMA Flood Insurance Study (FIS) indicates a peak discharge of 60,000 cubic feet per second (cfs) at Drexel Road over three miles downstream of the watersheds terminus with a drainage area of 2,101 square miles. On the upstream side of the watershed, but over 9 miles downstream of the County line, the FIS indicates a peak discharge of 45,000 cfs at Continental Road with a drainage area of 1,162 square miles. This is by far the largest flow entering the County.

The table below summarizes historic USGS gaging station records.
<table>
<thead>
<tr>
<th>USGS Gaging Station</th>
<th>Demetrie Wash near Continental, AZ 09481800</th>
<th>Santa Cruz River at Continental, AZ 09482000</th>
<th>Ocotillo Wash near Continental, AZ 09481900</th>
<th>Santa Cruz River near Amado, AZ 09481770</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Watershed Area (sq. m)</strong></td>
<td>.15</td>
<td>1682</td>
<td>3.60</td>
<td>1460</td>
</tr>
<tr>
<td><strong>Flood Peak of Record (cfs)</strong></td>
<td>110</td>
<td>45000</td>
<td>1840</td>
<td>7770</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>09-07-1975</td>
<td>10-02-1983</td>
<td>07-00-1964</td>
<td>07-19-2007</td>
</tr>
<tr>
<td><strong>Table of Regulatory Discharge (cfs)</strong></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

The table below summarizes Pima County’s Alert Gages. The locations are from the District’s Alert map.

<table>
<thead>
<tr>
<th>Pima County ALERT Gages</th>
<th>Santa Cruz River below Continental Road ID: 6054</th>
<th>Santa Cruz River at Continental Road ID: 6053</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location (Latitude, Longitude)</strong></td>
<td>(31.8567, -110.98)</td>
<td>(31.8542, -110.9792)</td>
</tr>
<tr>
<td><strong>Period of Record</strong></td>
<td>2014-06-25 to Present</td>
<td>2007-07-10 to Present</td>
</tr>
<tr>
<td><strong>Watershed Area (sq. m)</strong></td>
<td>1643.87</td>
<td></td>
</tr>
<tr>
<td><strong>Flood Peak of Record (cfs)</strong></td>
<td>7250</td>
<td>4200</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>09-18-2014</td>
<td>09-19-2014</td>
</tr>
</tbody>
</table>
The table below summarizes regulatory discharge locations within the watershed. The locations are from the District’s Tables of Regulatory Discharges.

**Table 49 - Upper Santa Cruz River Watershed Regulatory Discharges**

<table>
<thead>
<tr>
<th>Watercourse</th>
<th>Regulatory Discharge, cfs</th>
<th>Drainage Area, sq. miles</th>
<th>Source of Discharge Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Cruz River @Continental Road</td>
<td>45000</td>
<td>1682</td>
<td>FEMA, Flood Insurance Study</td>
</tr>
</tbody>
</table>
5.4.14.2 Existing Development & Infrastructure Trends

The chart below shows the distribution of residents within known floodplains, and distribution between incorporated and unincorporated areas. Over 16 percent of the residents live within regulatory floodplains and 70 individuals live behind a levee.

Figure 149 - Upper Santa Cruz River Watershed

After passing into Pima County from Santa Cruz County, the river passes through the Town of Sahuarita, Sahuarita Farms (Farmers Investment Company/Green Valley Pecan Company, and the San Xavier District of the Tohono O’odham Nation.

East of the River, the uplands including mountain escarpment and alluvial fan are largely protected natural open spaces due to inclusion within National Forest and the University of Arizona Experimental Range. While the County has purchased the historic Canoa Ranch at the upstream area of this watershed along the Pima and Santa Cruz County border most of the land along the main channel remains in private hands within Green Valley and the Town of Sahuarita.

Green Valley is not an incorporated town, but the community has a local identity for residents and reviews activity within a Green Valley Council. The Council works regularly with Pima County staff to request construction and maintenance of drainage infrastructure. A network of constructed drainageways conveys flows through Green Valley to the Santa Cruz River floodplain.

Within the formally incorporated Town of Sahuarita, the Town has floodplain management jurisdiction. The Pima County Regional Flood Control District cooperates with incorporated jurisdictions to deliver floodplain mapping and capital improvement projects following guidance from the Flood Control District Advisory Committee.
Along the river and only partly within unincorporated County, but mostly within the Town of Sahuarita are the Farmers Investment Company (FICO) pecan orchards. At over 7000 acres, these are amongst the largest in the world.

In 2015, both jurisdictions approved a long-term mixed-use residential and commercial development specific plan for the FICO property, the Sahuarita Farms Specific Plan. Under this plan, channelization will narrow much of the floodplain to facilitate the conversion from agriculture to urban use. The plan is a broad-ranging planning document including a river master plan as well as land use planning, community facilities, transportation and utilities. The plan will guide decision-making over the next 50 years. Development pressure now does not motivate major implementation of plan elements in the near future. The District has recommended the use of compound channel design to protect the natural and beneficial functions of floodplains and to address future conditions.

Most of these uplands are private or State lands. As shown on the figure below, there are 106,753 acres of private lands and 46,916 acres of State Trust lands, which is 66% of the watershed.
Market factors have stalled several substantial developments in these areas. While large areas are vacant, current land uses are predominately recreational, residential, some ranching and large mining operations. The
large amount of HOA common area is notable as they are private maintained and protected. In many cases, these include drainageways and watercourses.

**Figure 152 - Upper Santa Cruz River Watershed Floodplain Land Use**

Within the floodplain land use is predominately agricultural however as noted above Pima County and the Town of Sahuarita accepted FICO’s Sahuarita Farms Specific Plan. This plan includes a River Management Plan. This plan features riparian restoration and recreational features in low flow overbanks and a bank protected main channel. The owners expect this development to use less groundwater than the agricultural operations.
The portion of the River extending from the Santa Cruz County line to Pima Mine Road is the least impacted by channel drainage infrastructure. In general, the floodplain is a half-mile or more wide and encroachment is minimal. South of Green Valley there is very little development along the channel or in the tributaries. From Green Valley north through Sahuarita, there is development along the west bank, but minimal bank protection. Along the east bank, there are pecan fields and some residential development. Recent hydraulic analysis has indicated that flow along the eastern edge of the floodplain through the pecan fields may be a prominent secondary flow path in a significant flood. Within the San Xavier Reservation, the reach downstream of Martinez Hill and Interstate 19 is partially bank protected, although not by soil cement, as this was not a County project. South of Interstate 19 the channel is natural however has experienced head cutting and other erosive forces. The O’odham began a restoration project over a decade ago for the now absent massive bosques that existed prior to arrival of European enterprise. Vegetation and surface water has begun to rebound and a major farm expansion and recharge project is planned which will have additional natural floodplain function benefit.
The map below shows the land use patterns in this watershed.

*Figure 153 - Upper Santa Cruz River Land Use Map*
5.4.14.3 Riparian Habitat and Natural Areas
There is 20,267 acres of Pima County Regulated Riparian Habitat within this watershed and 11,054 acres designated as IRA. There are also 61,414 preserved acres in this watershed, including 1,694 in regulatory floodplain. It also includes the County owned Raul M. Grijalva Canoa Ranch Conservation Park situated along both sides of the Santa Cruz River for almost 5 miles. As noted above the southeastern uplands are within the Santa Rita Experimental Range and the Coronado National Forest. While tribal lands are sovereign, with the exceptions of current mining and gaming enterprises, the population is small (2,053 per the 2000 Census) and the land use predominately ranching or vacant.

![Figure 154 - Upper Santa Cruz River Watershed Riparian Habitat in Acres](image)

Pima County acquired the Historic Canoa Ranch in 2001 (now designated as “Raul M Grijalva Conservation Park”) with the goal of preserving cultural and historic features. The ranch lands encompass 4800 acres along the SCR extending north of the Pima-Santa Cruz county line. The District, as Program Sponsor of an Army Corps of Engineers’ (USACE) In-Lieu Fee (ILF) Program within southern Arizona, is proposing to restore natural riverine and aquatic resource functions within Canoa Ranch. As part of this effort, restoration of the historic lake completed in 2018 provides 2.5 acres of open water habitat and passive recreation for visitors. This location is quickly becoming a premiere birding location in AZ. Continuing the habitat restoration efforts a cienega will be created adjacent to the lake, 10 acres of pollinator garden and grassland plus 30 acres of open mesquite woodland and riparian shrub habitat restoring natural floodplain function to abandoned agricultural fields on the floodplain terrace is planned through 2021. Stewardship of the Canoa Ranch includes protecting the rich natural resources by prohibiting human activity detrimental to the ecosystem.
5.4.14.4 Historic Floodplain Management Approach

The figure below shows the split between natural and improved drainageways, and how many acres the District is responsible for in each jurisdiction.

*Figure 155 - Upper Santa Cruz River Improved vs. Open Space Drainageways in Acres*

This 1983 flood photograph was taken looking south along the Upper Santa Cruz River watershed with Martinez Hill on the left, shows bank collapse caused by the natural processes of aggredation, degradation, flow splits and lateral migration. As development has encorached upon this floodplain increased bank protection has been required as has been done more completely downstream of this point through the middle reach of the Santa Cruz River until it is partially released again onto the farmland flooplains of Marana.

*1983 Flood Photo by Peter Kresan looking south from Martinez Hill*
The District has classified the Santa Cruz River has been classified as a major watercourse for regulatory and planning purposes.

Please see the Lower Santa Cruz River watershed chapter for a complete discussion of ALERT gauges and notification levels for this watershed.

Franco Wash is a significant tributary, which may affect the Summit area near South Nogales Highway and Old Vail Connection road. There is one stream gauge at Swan Road (6213). The channels in this area cannot convey large amounts of flow and may affect residential structures and at-grade crossings in the Summit area. Stream gauges may not reflect sheet flow. The District has not studied travel time. However, assuming an average channel velocity of 10 fps, travel time from 6213 to Country Club Road is 20 minutes. Streamflow of 200 cfs at Franco Wash at Swan Road (6213) may affect at-grade crossings including Country Club Road, Summit Street and Old Vail Connection Road. At this rate, ALERT staff notifies PCDOT. Streamflow of 500 cfs at Franco Wash at Swan Road (6213) may affect the Summit residential area. During flood events, senior staff makes the decision as to whether District should pass the information to OEM.

5.4.14.5 Needs – Capital Improvement
For each watershed; monitoring, frequently flooded structures and properties subject to damage, exposed infrastructure, and safety concerns have been described in full detail in the District’s Flood Response Field Manual (April 2019). Each of the areas so identified have addresses and geodetic coordinates associated with them and District personnel have them mapped in the Geographic Information System used. For planning purposes, specific items of concern follow; the complete report is in Appendix D.

Data Gathering Needs
- No site-specific issues identified.

Frequently Flooded Structures and Properties Subject to Damage
- The Lee Moore Wash and tributaries to the Lee Moore have created head cuts and other erosional features that are a potential threat to structures near Camino San Matias and Calle San Julian. (T16S R14E Sec. 18) <GIS Point ID: SCU-FSP-001>
- The design of Madera Highlands subdivision may not have been adequate to deal with flooding from the Santa Cruz River and Sawmill Canyon Wash. (T18S R13E Sec. 13) <GIS Point ID: SCU-FSP-002>

8.15.2 Infrastructure
- Kolb Basin - Damage has occurred to both the riprap splash pads at the bottom of the east side inlets. (T15S R15E Sec. 20) <GIS Point ID SCU-INF-001>
- Kolb Basin - Some bank rill erosion has been getting deep along the north bank and some small riprap drainage spillways at these locations may be warranted. (T15S R15E Sec. 20) <GIS Point ID SCU-INF-002>
- Arroyo Chico basin complex - The outlet splash pad into Basin # 3 has a sizeable scour hole,
four to five foot deep across the length of the concrete splash pad. This is slated to be repaired in 2016/17 by adding more very large rip rap boulders.. (T14S R14E Sec. 18) <GIS Point ID SCU-INF-003>

- Arroyo Chico basin complex - The arch culvert outlet off of basin #1 collects sediment on the outlet splash pad which needs to be monitored and possibly removed to keep low flow events from stacking material in the arch culvert. (T14S R14E Sec. 18) <GIS Point ID SCU-INF-004>

Safety Concern

- Green Valley drainageway # 6, does not have enough capacity to convey the base flood. (T18S R13E Secs. 10, 11) <GIS Point ID: SCU-SAF-001>
- Green Valley drainageway # 9 does not have enough capacity to convey the base flood. (T18S R13E Secs. 14, 15)<GIS Point ID: SCU-SAF-002>
- Green Valley drainageway # 13 does not have enough capacity to convey the base flood. (T18S R13E Secs. 14, 15, 22, 23) <GIS Point ID: SCU-SAF-003>
- Green Valley drainageway # 17 does not have enough capacity to convey the base flood. (T18S R13E Secs. 22, 23) <GIS Point ID: SCU-SAF-004>
- Green Valley drainageway # 6 has vertical embankments. (T18S R13E Secs. 10 11) <GIS Point ID: SCU-SAF-005>
- Green Valley drainageway # 9 has vertical embankments. (T18S R13E Secs. 14, 15) <GIS Point ID: SCU-SAF-006>
- Santa Cruz River: The channel of the Santa Cruz River will contain the 10 year event (about 16,000 cfs) at the Green Valley Sewage Treatment facility. The channel upstream will not contain the 50-year event (about 32,000 cfs). Once it gets out in the right overbank, access along the Nogales highway could be compromised. In a 50-yr event someone in Sahuarita should monitor the highway and railroad adjacent to Madera Highlands. (T17S R14E Sec. 31) <GIS Point ID: SCU-SAF-007>

- Santa Cruz River: The channel capacity of the Santa Cruz River at Pima Mine Road is 16,000 cfs according to the Flood Insurance Study. Head cutting has increased the channel capacity, so the threshold of concern is approximately 20,000 cfs. If flows break out the intersection of Pima Mine and Old Nogales will start to flood. (T16S R14E Sec. 31) <GIS Point ID: SCU-SAF-008>
5.4.14.6 Floodplain Management
Future needs identified by District staff include:

- Non permitted structures
- Gravel pits
- Head cut Lee Moore and tributaries
- Potential future development/Sonoran corridor
- Updated mapping
- Management Plan for Santa Cruz County Line to Pima Mine Road

Head Cut West of Old Nogales Highway near Placita Del Caballito