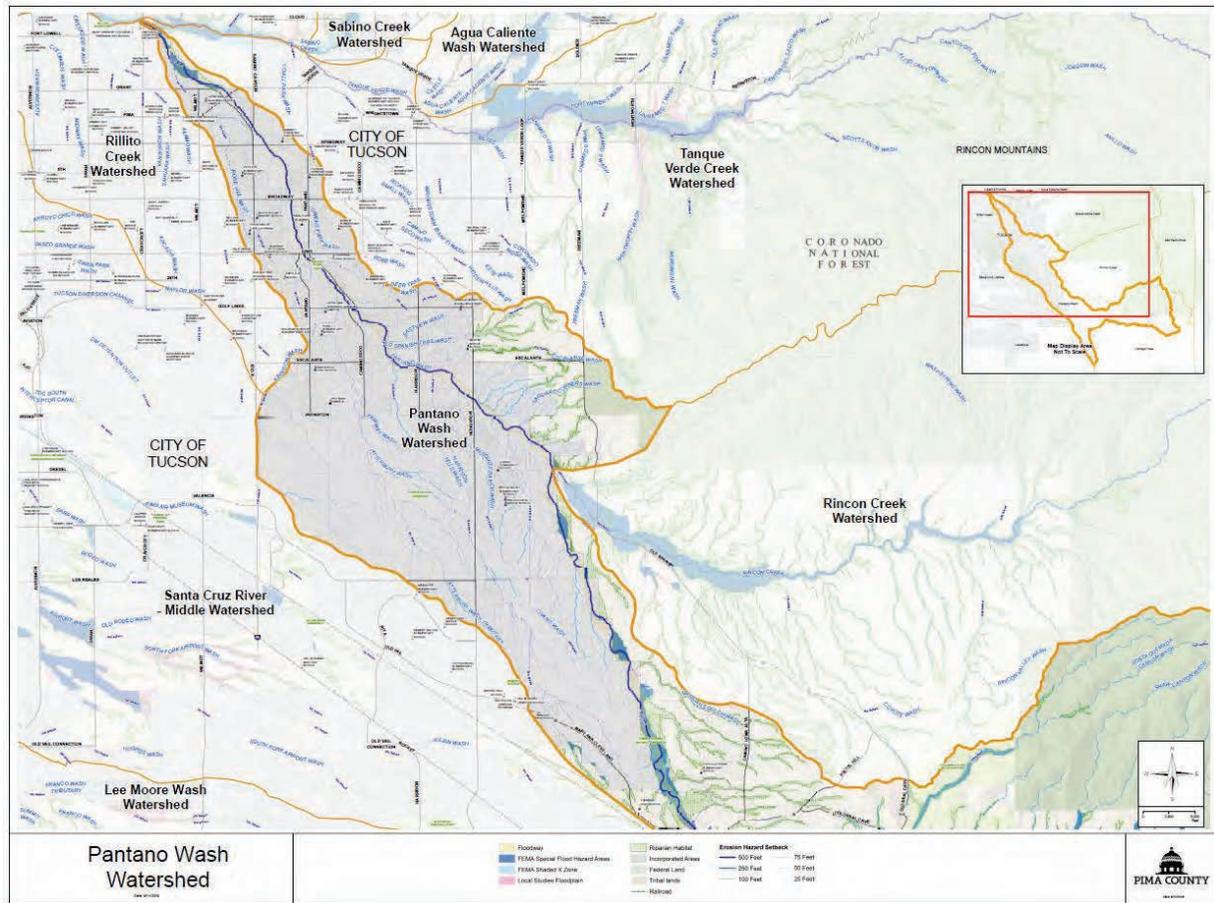


5.4.8 Pantano Wash

The Pantano Wash begins in the community of Vail at the confluence of Cienega and Agua Verde Creeks near Davidson Canyon. Below the confluence, the watershed is predominately the geologic floodplain and lower bajada associated with this major watercourse. The watershed originates high in the Rincon Mountains near Rincon Peak at over 8,000 above mean sea level and includes the sub basin flowing to the Agua Verde Creek. It is comprised of 64,649 acres (101 square miles), of which 24,815 acres are within the City of Tucson. In addition, Rincon Creek (87.3 square miles) and Cienega Creek (324.1 square mile) are tributaries to the Pantano Wash.

Figure 91 - Pantano Wash Watershed Map

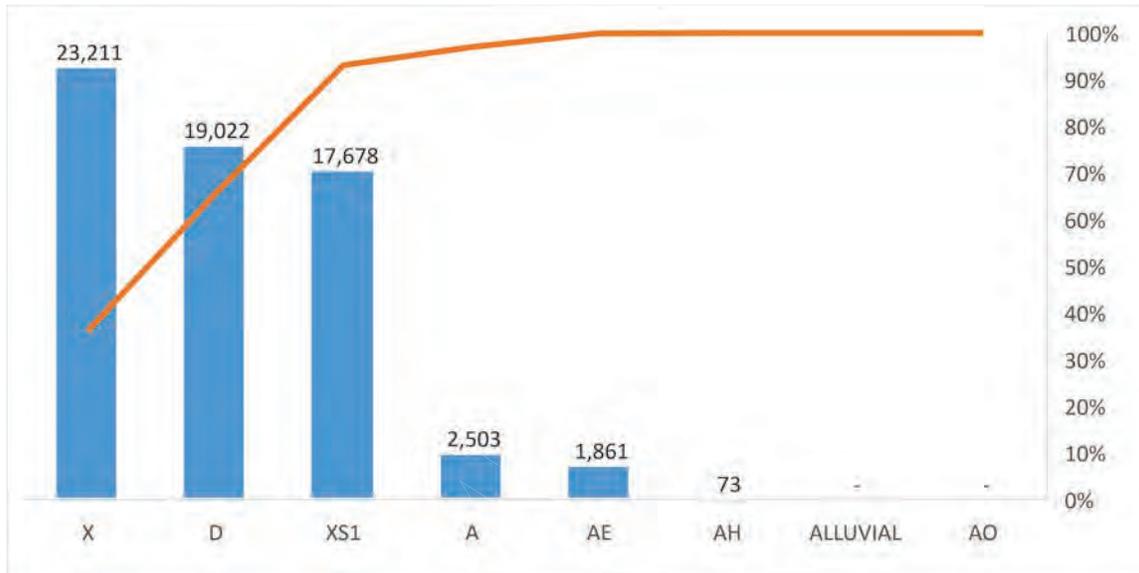


The main stem of the Pantano Wash is a continuation of the lower Cienega Creek. The Pantano Dam impounds perennial flow from the Cienega Creek about 3,500 feet downstream of Agua Verde Creek. Del Lago LLC owns the dam and diverts runoff to a golf course about a mile downstream of the dam. With flow diverted to urban recreation, vegetation associated with the Preserve becomes much less dense and more typical of a southern Arizona ephemeral stream.

5.4.8.1 Flood Characteristics

In addition to the 4,437 acres of SFHA included on the chart above, there are also 317 acres of District Special Studies Floodplains, and 228 acres of sheet flood area in this watershed. Together these mapped floodplain areas nearly 8 percent of the total watershed area!

Figure 92 - Pantano Wash SFHA in Acres



The Pantano originates in the Cienega watershed southeast of Pima County in Santa Cruz County draining portions of the Empire, Santa Rita and Rincon Mountains. Major tributaries include Rincon Creek and Atterbury Wash. Upstream of the Pantano Dam, the watershed is largely undeveloped and government owned with scattered private parcels attached to ranches. In addition, future development proposals are in the pipeline in the Houghton to Pantano Dam reach, such as the proposed Rocking K development on the northeast quadrant of the Rincon/Pantano confluence.

All floods of record on the gaged stations along the Pantano occurred during the Summer Monsoon, which suggests that higher intensity shorter duration storms, such as the 3hr Type II storm would produce flood peaks on this watercourse. Longer duration storms, such as the October 1983 tropical storm can also cause flooding. Given the size of the watercourse, a regional tropical storm generating several inches of rainfall over several days could produce flooding on the Pantano. However, because of the high capacity of the Pantano to infiltrate, these storms will likely need to be quite large. Because of the long travel from tributary watersheds, especially upstream of the Pantano Dam, to the confluence with the Rillito, considerable flood attenuation can occur from transmission losses. In general, tributaries tend to discharge sequentially into the Pantano, which may be because of the elongated form of the watershed, with Cienega/Pantano system form the longest flow path, and tributaries enter on either side. In addition, because of the relatively flat slopes and good infiltration capacity flood peaks on the Pantano tend to attenuate downstream of the Pantano Dam.

The table below provides a summary of the historic USGS gauging station streamflow records.

Table 26 - Pantano Wash Watershed USGS Gages

USGS Gaging Station	Pantano Wash NR Vail, AZ 09484600	Pantano Wash at Broadway Blvd. at Tucson, AZ 09485450	Pantano Wash Near Tucson, AZ 09485500	Atterbury Wash Tributary at Tucson, AZ 09485390	Saguaro Corners Wash near Tucson, AZ 09485100
Period of Record	1958-08-11 to 2015-09-02	1978-12-18 to 2015-09-03	1940-08-13 to 1983-10-01	1976-09-25 to 1983-09-22	1965-09-12 to 1974
Watershed Area (sq. m)	457	599	602	4.97	0.17
Flood Peak of Record (cfs)	38,000	15,900	20,000	390	49
Date	8-11-1958	07-31-2006	08-12-1958	08-11-1977	08-1968
FIS Discharge (cfs)	29,000	32,000	32,000	4200	NA

The table below summarizes Pima County's ALERT Gages. The locations are from the District's ALERT map.

Table 27 - Pantano Wash Watershed ALERT Streamflow Gages

Pima County ALERT Gages	Pantano Wash at Schist ID:4263	Pantano Wash near Vail ID: 4253	Davidson Canyon Wash Above I-10 ID: 4313
Location (Latitude, Longitude)	(32.0433, -110.69)	(32.0361,-110.6767)	(31.9936, -110.6451)
Period of Record	2013-07-05 to Present	2001-07-05 to Present	1987-01-19 to Present
Watershed Area (sq. m)	458.79	455.82	50.57
Flood Peak of Record (cfs)	4832	9715.3	2855
Date	07-23-2017	07-22-2008	07-30-2010
Table of Regulatory Discharge (cfs)	NA	NA	NA

Table 28 - Pantano Wash Watershed ALERT Precipitation Gages

Pima County Alert Gage	Irvington Road near Pantano road Pantano Basin ID: 4160	Pantano Wash at Houghton Road-Pontano Basin ID: 4180	Rancho Del Lago-Pantano Basin ID: 4220	Pantano Wash at Schist ID: 4260	Pontano Wash at Vail ID: 4250	Davidson Canyon Wash Above I-10 ID: 4310	Salcido Place-Cienega Basin ID: 4270
Location (Latitude, Longitude)	(32.1622, -110.8197)	(32.1672, -110.7722)	(32.0681, -110.7303)	(32.0433, -110.69)	(32.0361, -110.6767)	(31.9936, -110.6451)	(32.0397, -110.495)
Period of Record	1994-10-25 to Present	1993-02-04 to Present	1993-03-31 to Present	2013-07-05 to Present	1987-09-01 to Present	1987-01-09 to Present	1993-03-25 to present

The table below summarizes regulatory discharge locations within the watershed. The locations are from the District’s Table of Regulatory Discharges (Revised October 28, 2014).

Table 29 - Pantano Wash Watershed Regulatory Discharges

Watercourse	Regulatory Discharge, cfs 1% Return Frequency	Drainage Area, sq. miles	Source of Discharge Information
Pantano Wash @ Craycroft Rd.	32,000	604	FEMA Flood Insurance
@ Houghton Rd.	31,000	570	Study
Upstream of Rincon Creek Confluence	29,000	475	“
			“

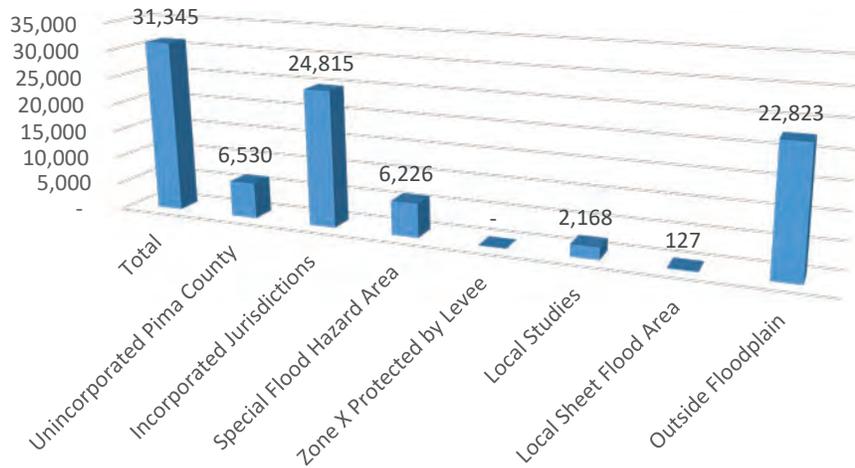
Downstream of the Pantano Dam to about Houghton Rd, there has been considerable down cutting, most of it associated with sand and gravel mining. Evaluation in 2014 showed active head cuts near the Valencia Road alignment. Downstream of Houghton Road, the channel is generally bank protected and grade controls stabilize the bed. The biggest risk of flood occurs downstream of Colossal Cave Rd and upstream of Houghton Road. Historically, floods from tributaries such as Rincon Creek occur from short-duration, high intensity storms, such as during the Monsoon. Furthermore, the flood of record on the Pantano occurred during the Monsoon, which originated in Rincon Creek. Because of the history of down cutting along the Pantano, grade control structures all up and down the channel are important. The Pantano Dam acts as a grade control with over a 20’ drop on the downstream side. Downstream of the Dam, sand and gravel mining has contributed to instability in the Pantano.

In this reach, a sewer crossing downstream of Rincon Creek plays an important role in maintaining the base grade of the Pantano upstream of Houghton Rd.

5.4.8.2 Existing Development & Infrastructure Trends

The chart below shows the distribution of residents within known floodplains, and distribution between incorporated and unincorporated areas.

Figure 93 - Pantano Wash Watershed Population Distribution



This watershed increasingly urbanized over the previous decade. Nearly 60% is private; furthermore, Department of Defense lands are also largely urban in nature and attract industrial and commercial uses as well as off base housing. Together, private, state and defense lands are 72% of the watershed within unincorporated Pima County.

Figure 94 - Pantano Wash Watershed Ownership in Acres

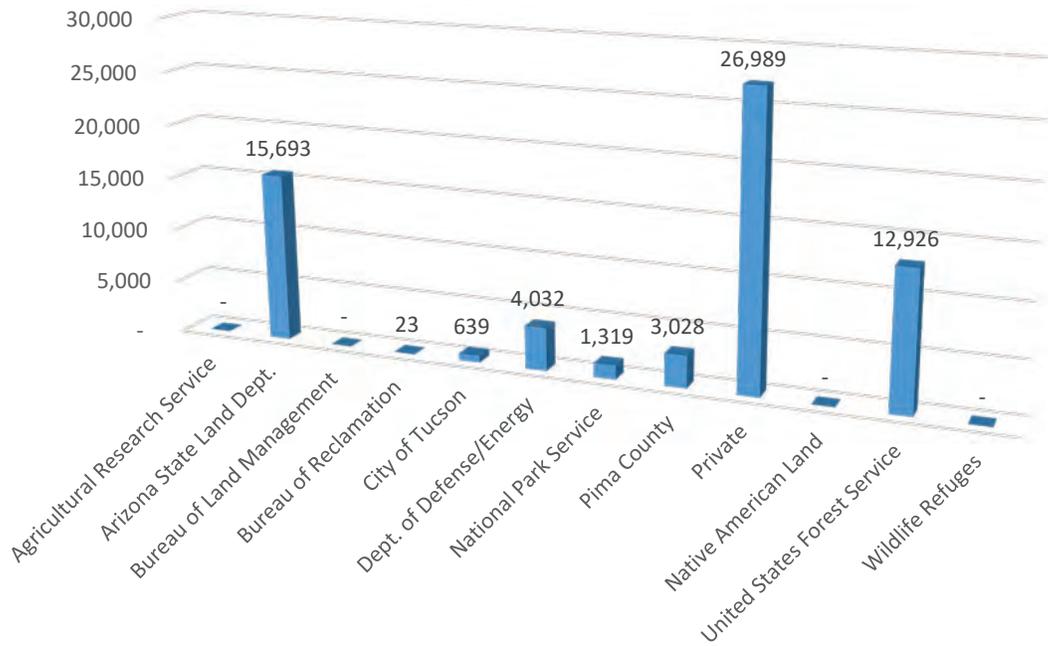
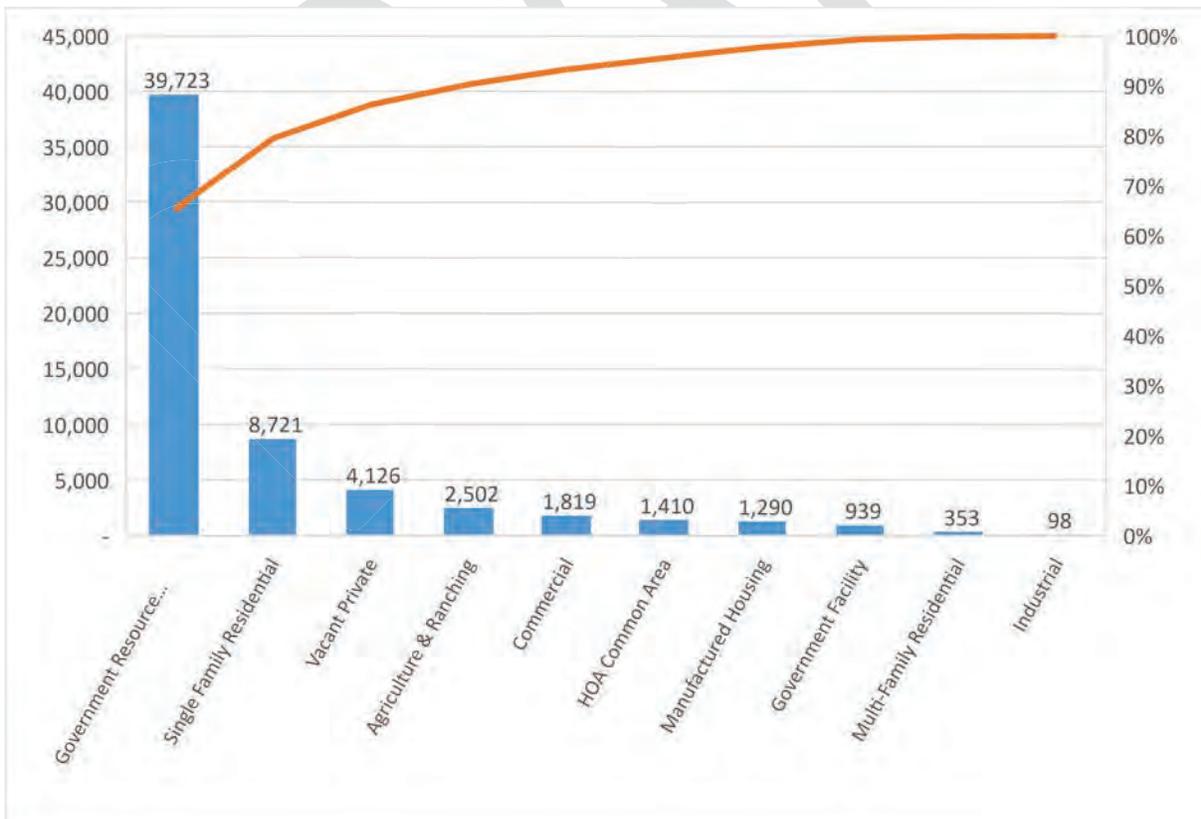
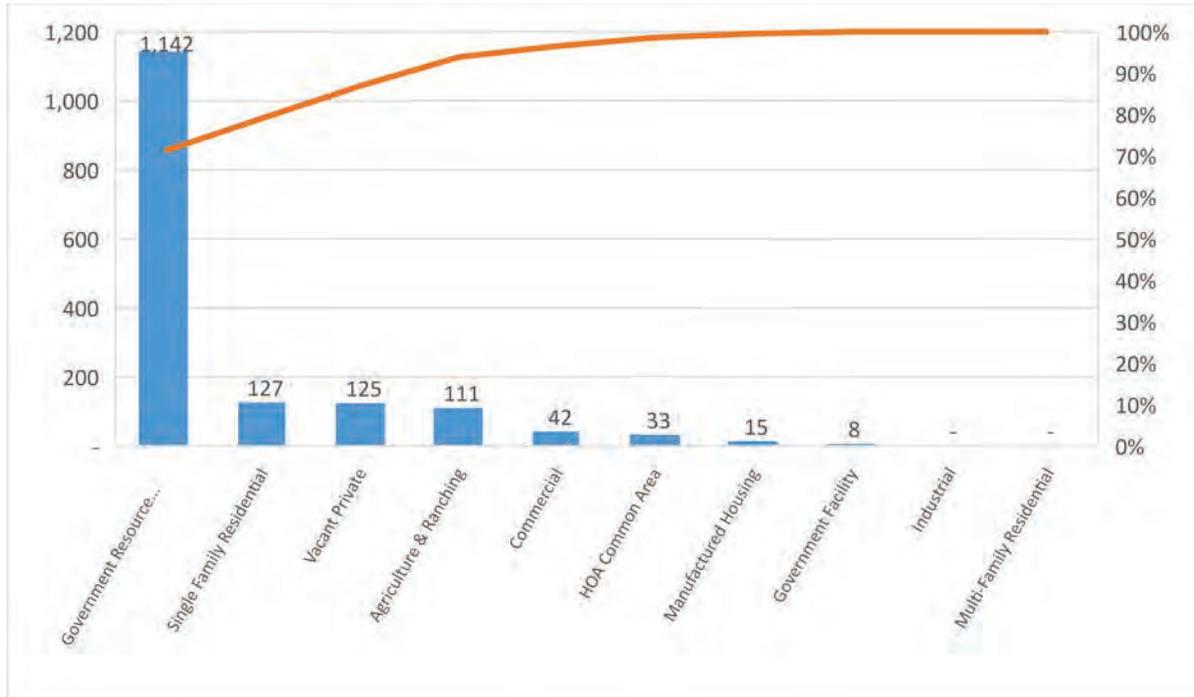


Figure 95 - Pantano Wash Watershed Land Use in Acres



While a large percentage is vacant, outside the federal lands development pressure is high.

Figure 96 - Pantano Wash Floodplain Land Use



Much of the private land area is located along the Pantano Wash corridor as shown on the map below.

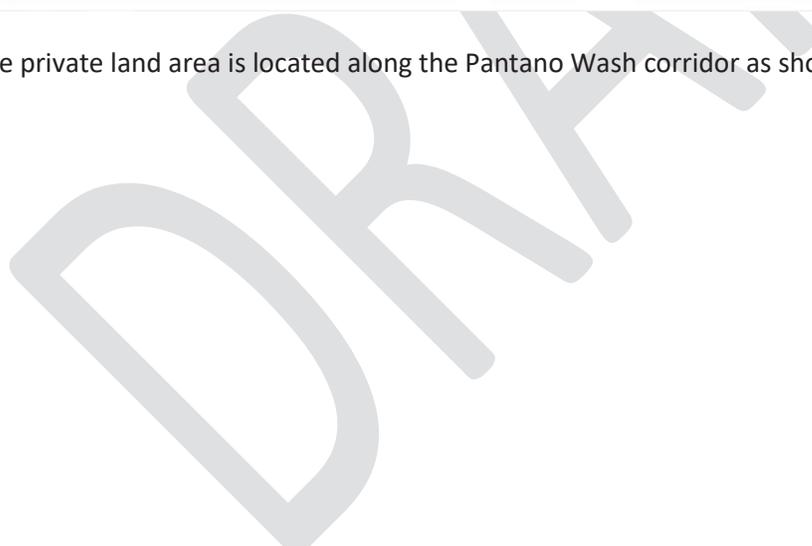
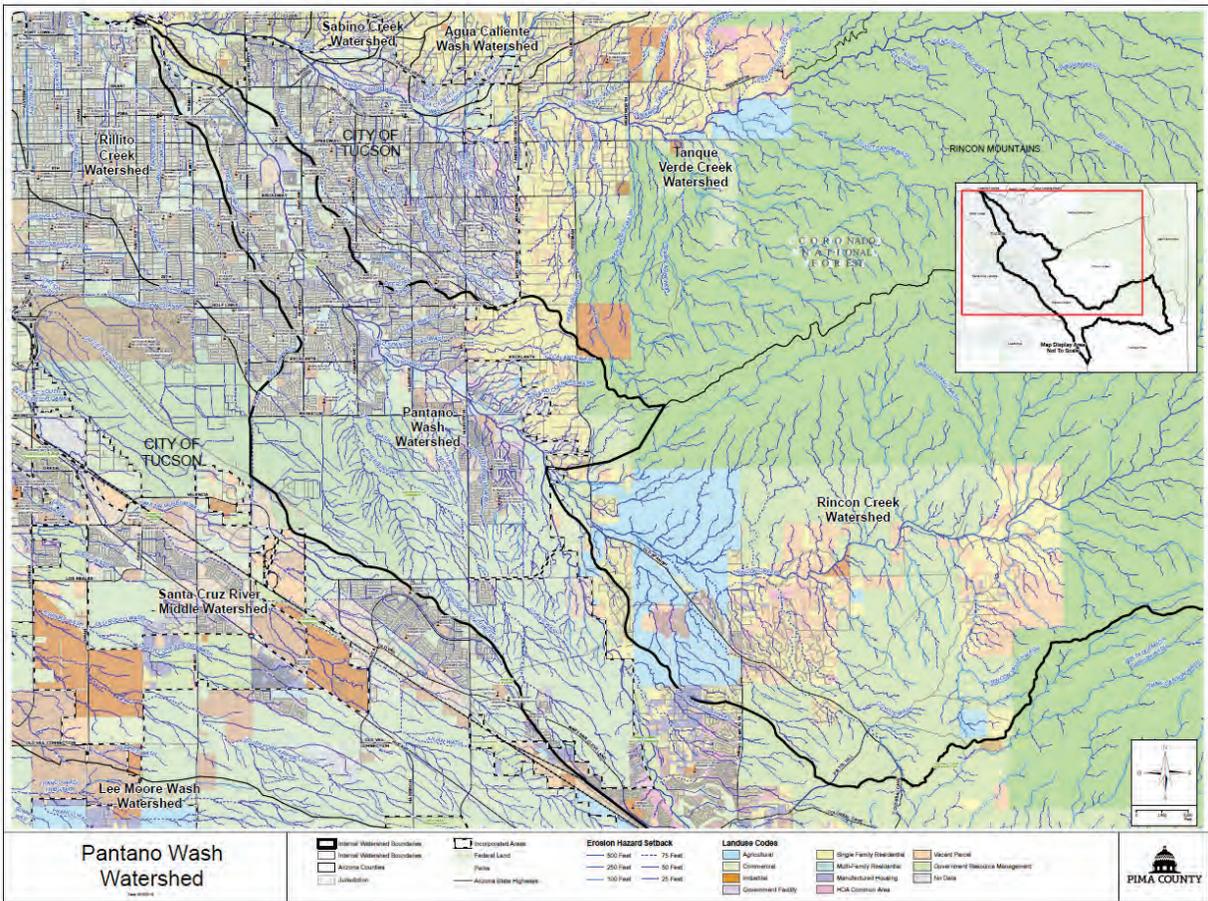


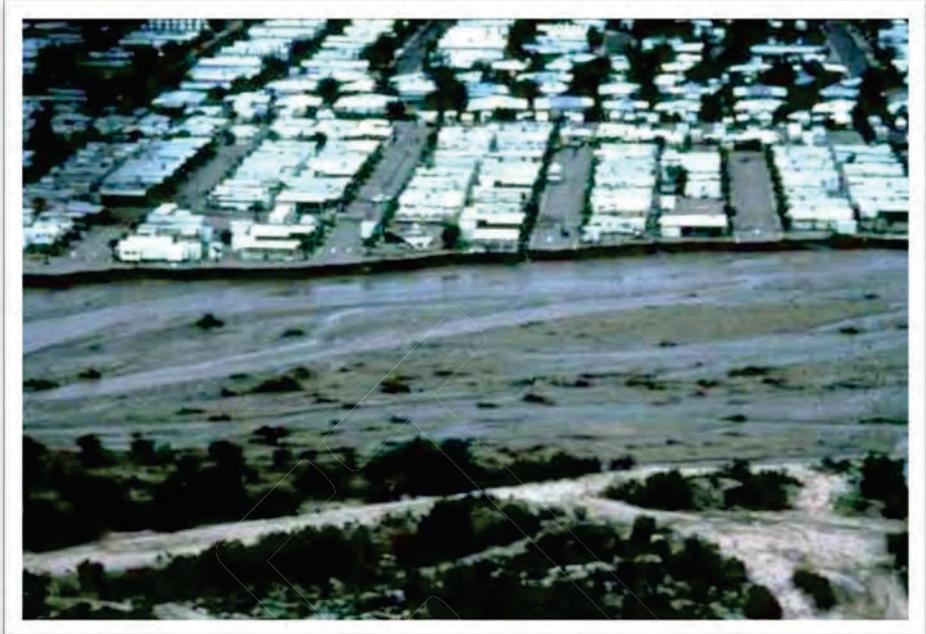
Figure 97 - Pantano Wash Land Use



Relatively high residential density characterizes the private property upstream of the City of Tucson jurisdiction. Subdivisions platted after the year 2000 typically include constructed drainage improvements to convey stormwater runoff and to reduce damage due to flooding. Subdivisions platted before that time and lots on unplanned land experience more problems from neighbor-to-neighbor flow diversion. Even relatively low flows can damage properties when infrastructure is minimal.

The District reviews drainage plans for new subdivisions for compliance with best practices to increase public safety and to protect property values.

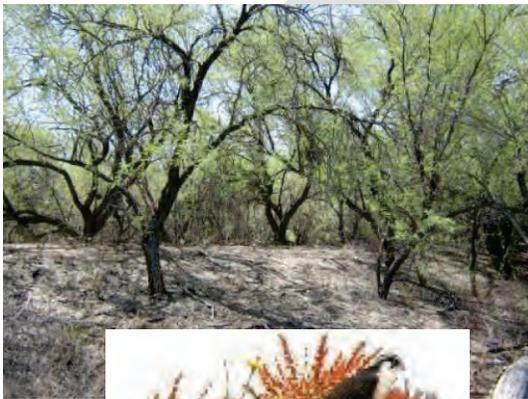
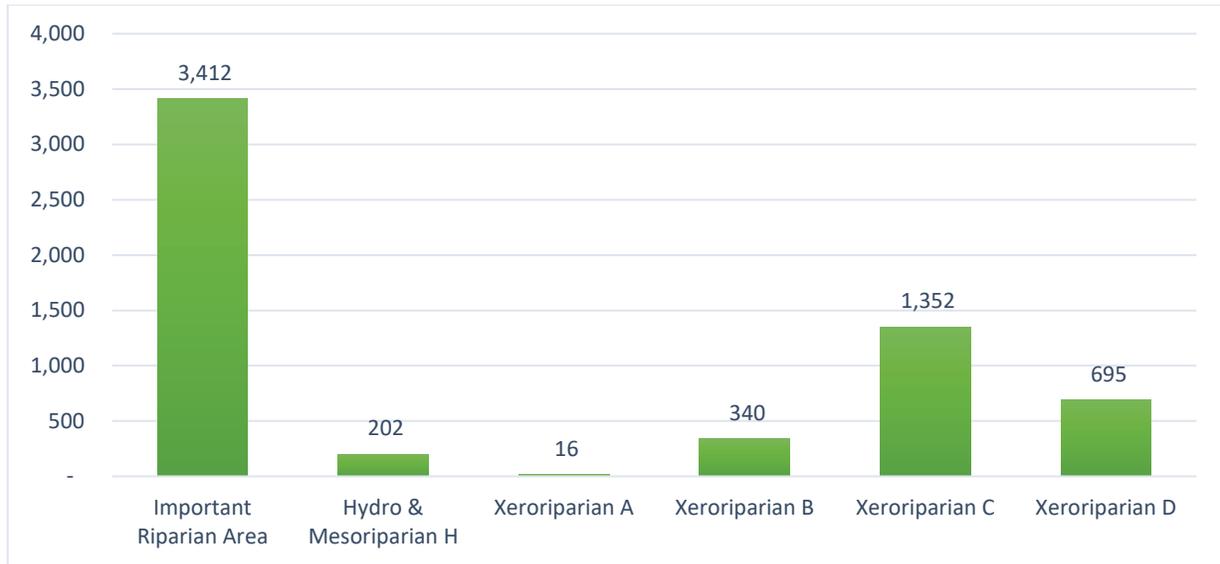
The District has completed major projects including bank protection, maintenance, restoration and acquisition in this area. The picture on the right shows erosion after the 1983 flood and the picture below bank protection and grade control adjacent to a capped landfill.



5.4.8.3 Riparian Habitat and Natural Areas

As shown on the figure below, there are 2,605 acres of Pima County Regulated Riparian Habitat in this watershed. In addition, 3,412 acres is IRA. There are also 20,640 preserved acres in this watershed, including 1,128 in regulatory floodplain.

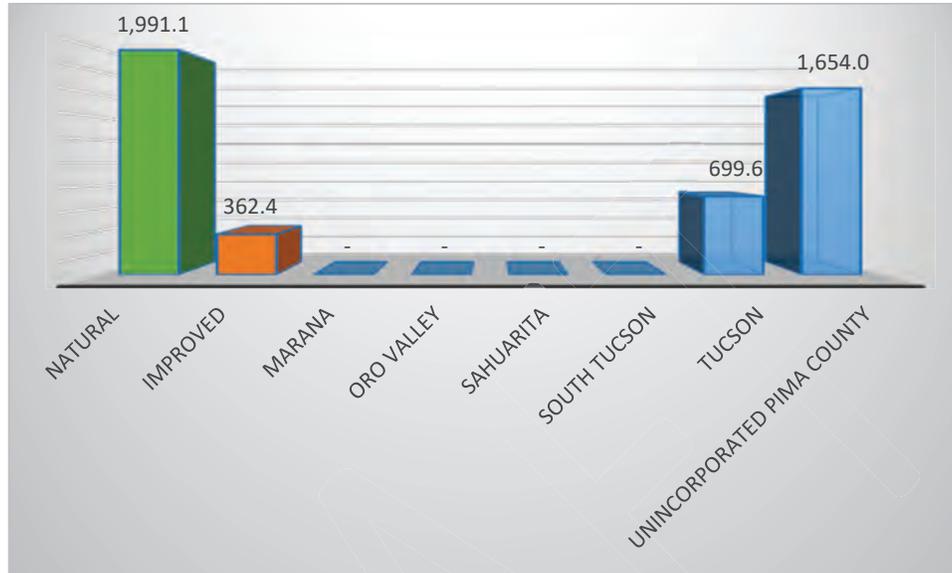
Figure 98 - Pantano Wash Watershed Riparian Habitat in Acres



5.4.8.4 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 99 - Pantano Wash Drainageway Acreage



Much of this watershed and the Pantano Wash are within the City of Tucson incorporated areas (City). The City is responsible for floodplain management for permitting within its jurisdiction. Pima County owns a significant number of parcels adjacent to and including the Pantano Wash floodplain within the City. Ownership of these floodplain properties facilitates access, maintenance and control over activities. The District works with City staff and officials for effective floodplain management and funds some maintenance and construction activities.

Pantano Wash can convey large flows. Most of the urban area is bank protected, but some bank failures have occurred in large flows. The only at-grade crossing is located at Harrison Road. The stream gauge at Vail (4253) is approximately 13 miles upstream of Harrison Road. Travel time to Harrison Road is approximately 2-3 hours. Travel times change through the rainy season as the channel becomes wetted.

One major tributary, Rincon Creek, may affect flow at Harrison road. The stream gauge at the X-9 Ranch (4113) is approximately 12 miles upstream of Harrison Road. Travel time information is not available. Assuming an average channel velocity of 10 fps, travel time from 4113 is approximately 1.5-2 hours. Streamflow of 750 cfs at Vail (4253) may affect the at-grade crossing at Harrison Road. At 700 cfs ALERT staff contacts the City of Tucson, Streets Maintenance Division. Recently the District installed an additional upstream gauge (4263 Schist) 1 mile downstream of 4253.

Rampant OHV use. The surrounding neighborhoods provide easy access to the wash. Many of the access points lie on private property or HOA common area, which makes restriction of OHV activity on District land difficult to control. The District has installed signage and large rocks to deter OHV use, but use is still a problem and the District regularly receives complaints from the public regarding the nuisance.

5.4.8.5 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

- Monitor Pantano Wash tributary repair area off of Nebraska Rd, next to the County Nebraska Gravel Pit near the confluence of this tributary wash and Pantano Wash. Grouted riprap was constructed in the tributary channel and cement bank stabilization was installed along the west side of the gravel pit in 2007. (T15S R15E Sec. 01) <GIS Point ID: PAN-DAT-001>

Frequently Flooded Structures and Properties Subject to Damage

- No site-specific issues identified.

Infrastructure

- The sewer line crossing Atterbury Wash just upstream of the confluence with Pantano Wash was exposed. RWRD is placing a concrete cap on top of it to hopefully prevent future damage. The design scour depth over a drop for the cap is several feet greater than the toe down of the existing bank protection. While the cap toe down will be anchored to the bank protection, there is some possibility of exposure of the bank protection toe down in a very large event. Therefore the bank protection should be inspected after large flow events. (T14S R15E Sec. 21) <GIS Point ID: PAN-INF-001>

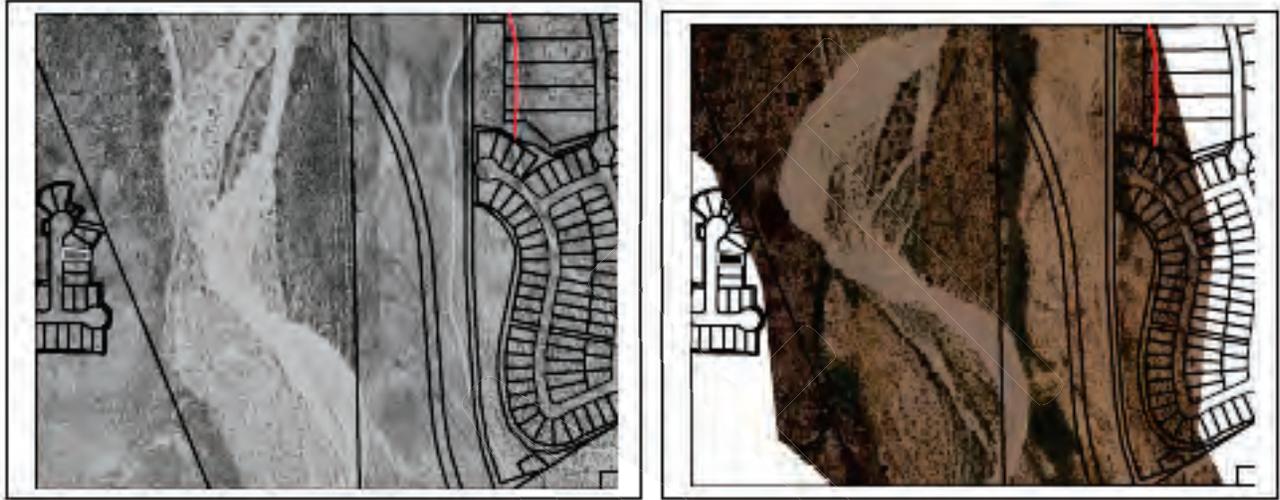
Safety Concerns

- Access to the Pantano Wash tributary repair area off of Nebraska Rd can get cut off during flood events. Do not enter this area during a flood event unless prepared to remain there until the flood waters subside. (T15S R15E Sec. 01) <GIS Point ID: PAN-SAF-001>
- Jeremy Wash (tributary to Rincon Creek) creates flood hazards, but it’s all on private property/roads. Alvord Road is a private road that has many problems during flood events. No Access to the road during flood events, but worth looking at after the flooding has occurred. (T15S R16E Sec. 08) <GIS Point ID: PAN-SAF-002>

5.4.8.6 Floodplain Management

Future needs identified by District staff include:

- Sand and gravel operators
- Unstable geomorphology
- Develop consistent property rights for effective management in and adjacent to Pantano Wash



1998 and 2008 photograph from the Pantano wash Management Study showing lateral migration