NORTH URBAN WATERSHEDS

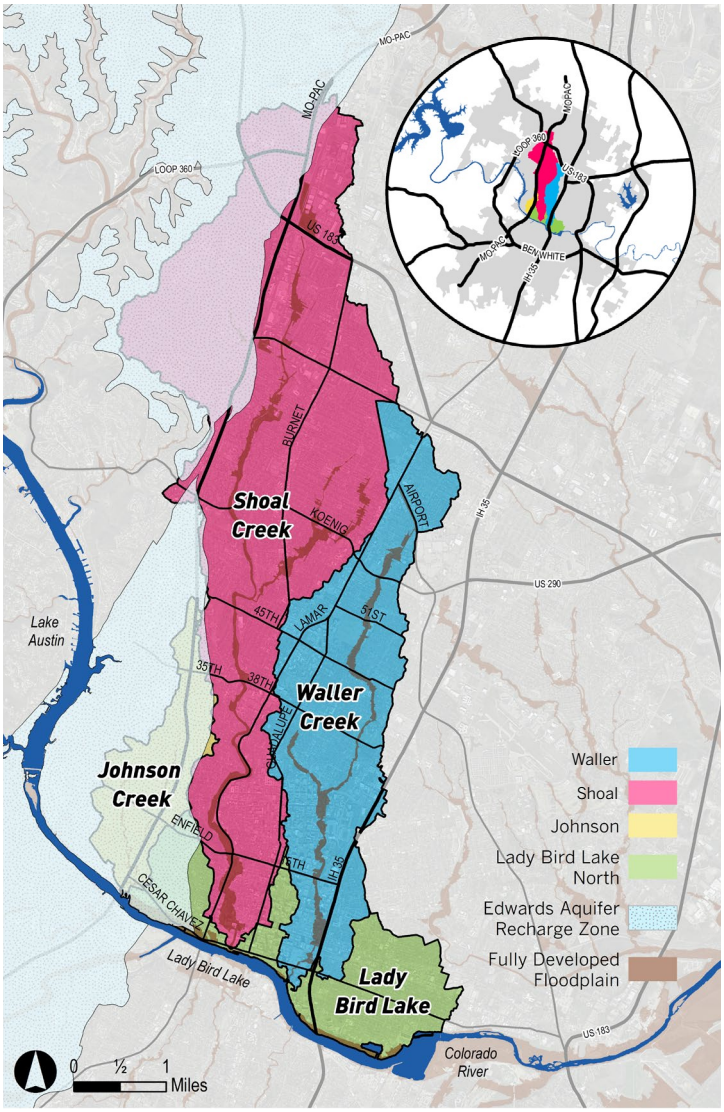
Shoal Creek | Waller Creek | Johnson Creek | Lady Bird Lake

City of Austin
WATERSHED PROTECTION

Watershed Profile - December 27, 2016

Austin circa 1887 (Source: Amon Carter Museum)

Austin 2016 (Source: Google Earth, Landsat)



This profile is part of a series of publications that characterize Austin's watersheds. Using the **Watershed Protection Department's** three missions as a framework, the profile looks at creek and localized flooding, erosion, and water quality problems in four central Austin watersheds. The profile also discusses past, current, and upcoming watershed solutions. This edition of the series examines Shoal, Waller, and Johnson creeks, as well as the areas that drain directly to Lady Bird Lake.

As the land between Waller and Shoal Creek has been inhabited by permanent settlers since the early 1800s, these watersheds are among the most heavily impacted in the Austin area. The figure above (left) shows a bird's-eye view of Austin in 1887. Shoal Creek and its largely undisturbed floodplain are clearly visible on the left-hand edge of the illustration, whereas the floodplain of Waller Creek has already been crisscrossed by streets and lots. Both creeks empty into the Colorado River, which would eventually become Lady Bird Lake. The image on the right shows current-day Austin, which has seen intense development in the areas surrounding the north urban watersheds.

What's Inside:

Environmental History 2-3
Creek Flood Hazard Mitigation 4-5
Localized Flood Hazard Mitigation 6-7
Erosion Control 8-9
Water Quality Protection 10-11
Additional Resources 12

Environmental History

1974

Waterways Ordinance restricts development in the 25-year floodplain and reduces post-development peak flows.

1977

Adoption of Austin's first **Drainage Criteria Manual.**

1983

100-year floodplain established.

1991

Urban Waterways Ordinance establishes setbacks for streams and critical environmental features; mandates use of water quality controls.

2013

Watershed Protection Ordinance expands stream setbacks to eastern watersheds, restricts development in the Erosion Hazard Zone, and strengthens floodplain modification criteria.

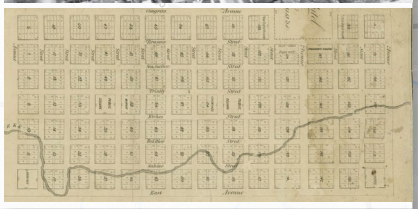
Over **66%** of the land area of the north urban watersheds was developed prior to the **Urban Watersheds Ordinance** of 1991, meaning that development in these areas lacks water quality controls.

The MoPac Expressway, photographed here undergoing construction in 1974, transects the entire **Johnson Creek** watershed.

Source: TexasFreeway.com

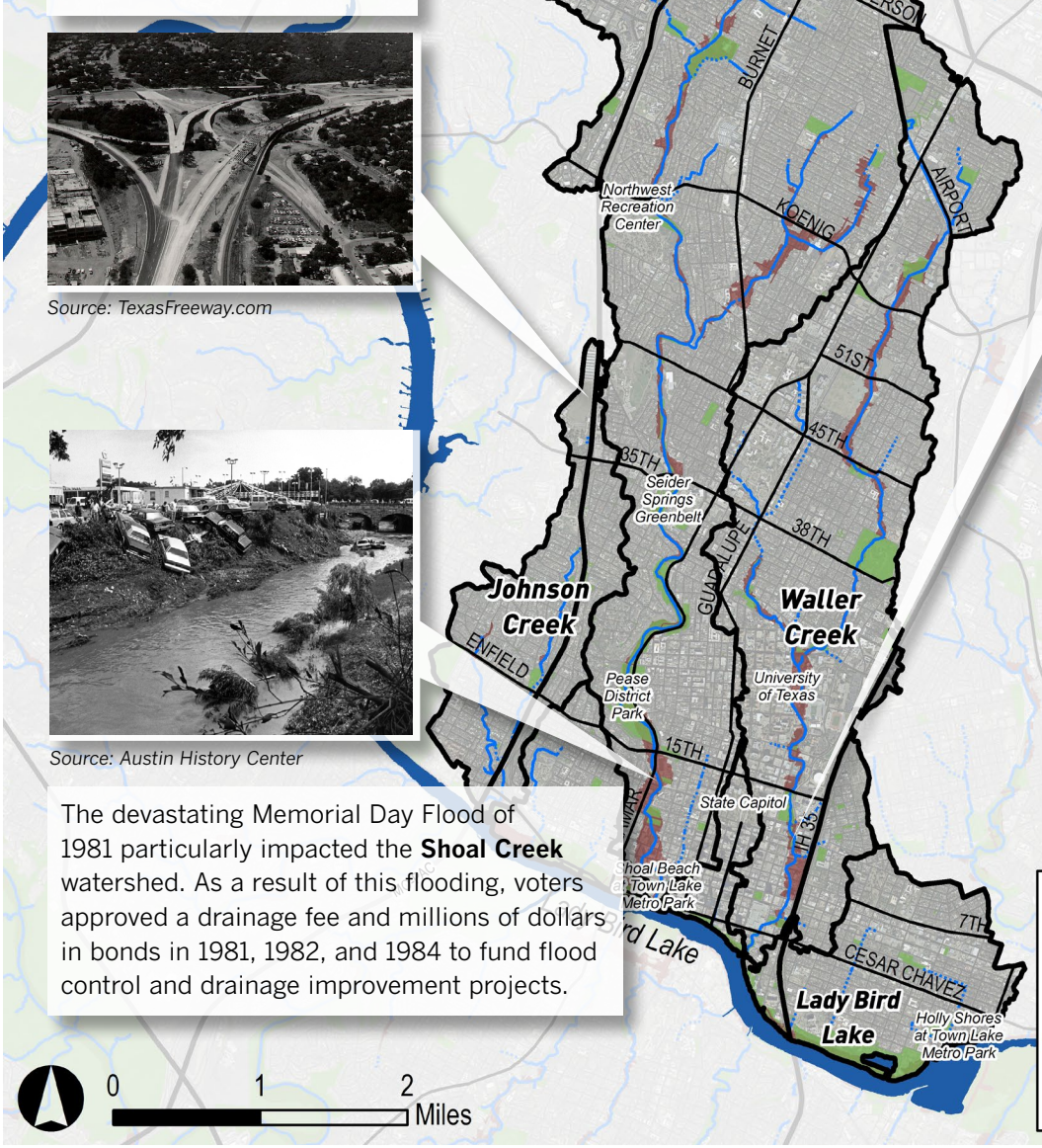
Source: Austin History Center

The devastating Memorial Day Flood of 1981 particularly impacted the **Shoal Creek** watershed. As a result of this flooding, voters approved a drainage fee and millions of dollars in bonds in 1981, 1982, and 1984 to fund flood control and drainage improvement projects.



Channel erosion has long affected **Waller Creek.** It is visible in the top image of the creek at East 1st St., now Cesar Chavez St. The photo was taken prior to the construction of I-35 in the 1950s. Below this image, Edwin Waller's 1839 plan shows how the city grid was planned without considering the creek, promoting encroachment.

Source: Austin History Center



General

- Creeks
- Culvert
- Parks and Open Space
- Fully Developed Floodplain

Shoal Creek is the largest of the north urban watersheds, encompassing approximately 8,000 acres (12.9 square miles) and stretching from downtown to The Domain. It served as the original western boundary of the city. The area to the west of the creek remained largely undeveloped into the 1920s. It is best known for the 1981 Memorial Day Flood that devastated lower Shoal Creek and claimed 13 lives, but it has experienced significant flooding events throughout Austin's history. The 1915 flood killed 23 people along Shoal Creek, and another 12 along Waller Creek. A second large Memorial Day Flood struck in 2015. Shoal Creek is also home to the oldest trail in Austin, which was built by volunteers in the 1960s (Shoal Creek Conservancy, 2013).

Spanning approximately 3,500 acres (5.6 square miles), **Waller Creek** is the second largest of the north urban watersheds. After Austin was designated the capital in 1839, Texas President Mirabeau Lamar chose Judge Edwin Waller to supervise the surveying and sale of town lots. Somewhat ironically, Waller's plan did not take into account the creek that would later become his namesake. As the map on the previous page shows, the creek cuts through several parcels on the gridiron layout that Waller designed. Building this close to the creek has resulted in severe water quality, erosion, and flooding problems.

At 1,100 acres (1.8 square miles), **Johnson Creek** is the smallest of the north urban watersheds. Almost the entire watershed is situated over the Edwards Aquifer Recharge Zone. Its headwaters are located near Camp Mabry, while the main stem roughly follows the path of the MoPac Expressway. The watershed is home to the historic Tarrytown neighborhood and the Johnson Creek Greenbelt Trail, which connects West Enfield Park to the Ann and Roy Butler Hike and Bike Trail. The trail's southern trailhead, known as "The Rock," is a popular gathering area for community groups and trail users.

Lady Bird Lake is a reservoir on the Colorado River that was formed by the construction of the Longhorn Dam in 1960. The area that drains directly to **Lady Bird Lake** covers approximately 1,818 acres (2.98 square miles) of downtown Austin. Most of Austin's central core drains to the reservoir via various creeks, including Shoal, Johnson, and Waller. The western end is bounded by the Tom Miller Dam, built in 1939. Originally named Town Lake, it was renamed in 2007 in honor of Lady Bird Johnson, a dedicated advocate for beautifying the lake and creating the iconic hike-and-bike trail. The lake is primarily used for non-motorized recreation and provides refuge for a wide variety of urban wildlife.

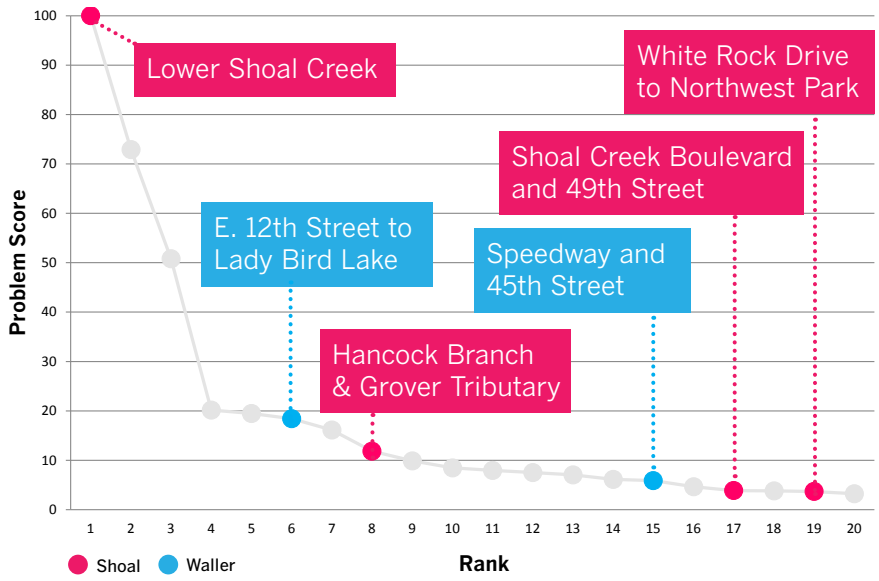
Creek Flood Hazard Mitigation

Because the north urban watersheds were among the first areas to be developed in Austin, large portions of these watersheds were built before modern floodplain regulations. Over 50% of their land area was developed prior to the Waterways Ordinance of 1974, meaning that floodplains in this area are frequently encroached upon due to existing structures. The Memorial Day floods of 1981 and 2015 are reminders of the public safety and property hazards associated with such encroachment.

The Watershed Protection Department's (WPD) creek flood mission identifies and prioritizes creek flooding problems for both structures and roadway crossings. To quantify the risk to flooded structures, WPD uses hydrologic and hydraulic models to predict how high the creeks will rise and how fast they will flow under various design storms. When combined with data on the location of structures in Austin, these models can identify where the worst flooding is likely to occur. In order to prioritize potential solutions by problem severity, WPD develops problem scores to identify and rank areas where watershed protection goals are not being achieved.

Flooding on lower Shoal Creek, Memorial Day 2015

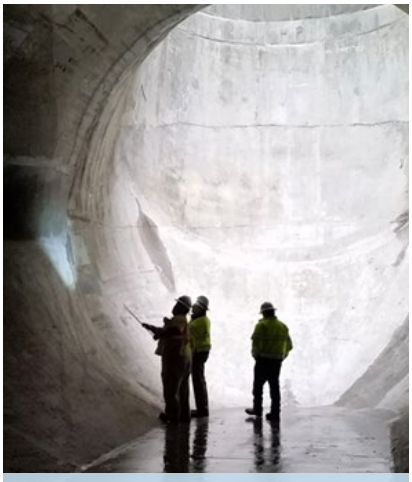
Creek Flood Structures: Top 20 Problem Scores



Problem scores are a function of three elements:

1) Problem severity,
2) The number of resources impacted, and
3) The type of community resources impacted by the problem.

The graph to the left plots the citywide top 20 ranked groups of structures by their problem scores. Shoal (magenta) and Waller (blue) creeks feature six of the top 20 flood problems. With a problem score of 100, Lower Shoal Creek between 15th Street and Lady Bird Lake is the worst flooding problem in the city. This also makes it the highest-ranked structure cluster. For fiscal year 2017, WPD will undertake a study to identify and evaluate potential flood mitigation solutions for this area.



WPD engineers inspect the 8th Street inlet during construction.

Highlighted Project: Waller Creek Tunnel

The Waller Creek Tunnel project addresses flooding (#6 rank) and erosion (#1 rank) along lower Waller Creek. The floodplain is 800 feet wide at points, potentially flooding significant areas of downtown. When complete, the tunnel will remove 28 acres of property from the 100-year floodplain, providing flood protection to 42 buildings and 12 roadway crossings. The tunnel system will also replace water within the tunnel with fresh water from Lady Bird Lake to prevent the water from becoming septic. As an added benefit, this recirculation system will supplement creek baseflow, enhance water quality, and improve the ability to support aquatic life. Furthermore, the tunnel will facilitate redevelopment in the Waller Creek District. While the tunnel itself allows development in an area that was previously within the floodplain, the larger park, stream, and trail improvements will also create an amenity to anchor the value of nearby redevelopment—all of which contribute to the economic structure created to pay back the bonds for the tunnel construction through a tax increment financing (TIF) zone.

Creek Flood Hazard Mitigation

The map below shows "high" and "very high" scoring structure clusters and roadway crossings. The red number indicates the citywide rank of the problem. The map also includes completed, ongoing, and planned creek flood solutions as filled, half-filled, or open points.

Since the **1981 Memorial Day Flood**, WPD has spent over $65 million dollars to construct detention ponds, channel modifications, and other flood mitigation solutions in the Shoal Creek watershed. The light blue areas represent the drainage areas to detention ponds. Detention is critical in the upper third of the watershed, as it allows the flows to be released into the creek more slowly.

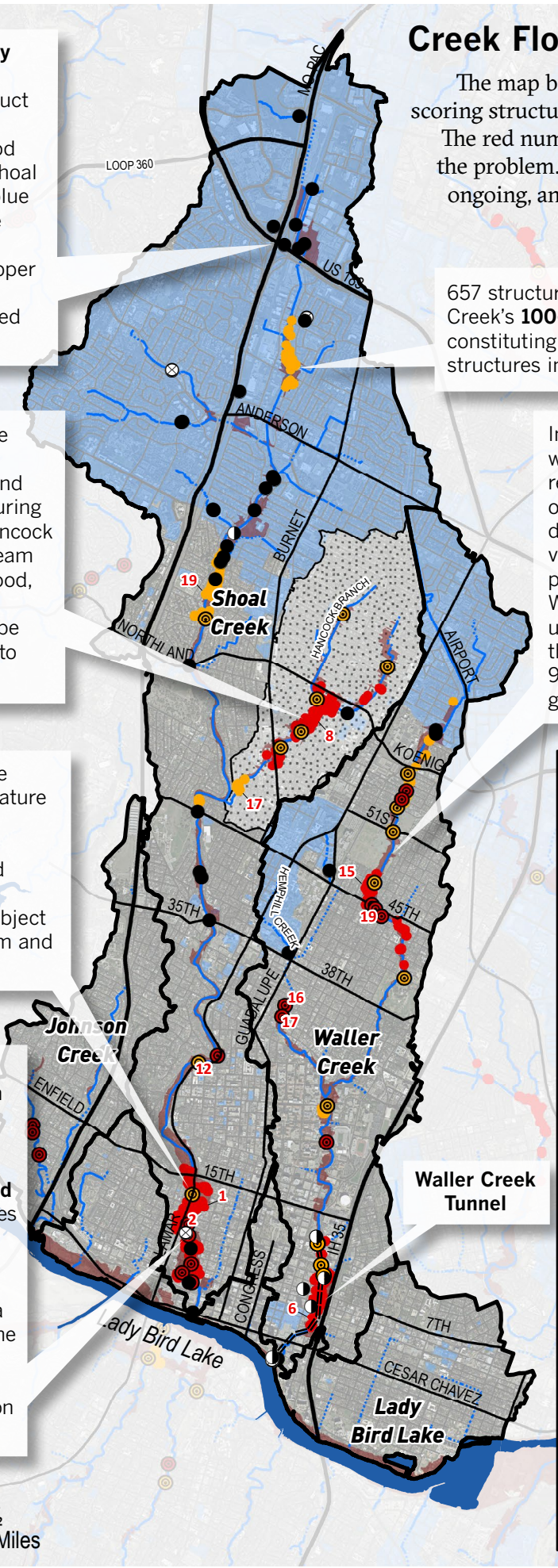
657 structures are within Shoal Creek's **100-year floodplain**, constituting 15% of citywide structures in the floodplain.

Ninety-six structures near the **Hancock Branch** and **Grover Tributary** along Joe Sayers and Grover avenues are at risk during an 100-year flood. As the Hancock Tributary is directly downstream of the Brentwood neighborhood, any solution to the localized flooding in Brentwood must be carefully designed so as not to worsen flooding in this area.

In many neighborhoods that were established prior to current regulations, the development occurred in such a way that drainage channels require periodic vegetation management to ensure proper storm flow conveyance. WPD's **Vegetation Control Program** uses multiple contractors to manage the vegetation within approximately 91 miles of channels during the growing season (spring fall).

Due to the topography of the floodplain and undersized nature of the channel, floodwaters routinely flow along **Lamar Boulevard** between 15th and 9th streets. Businesses and roadways in this area are subject to inundation during medium and large storm events.

Two **low-water** crossings on 9th and 10th streets between Lamar Blvd. and West Ave. have been closed nine times between 2010 and 2016. Real-time data from the **Flood Early Warning System** enables WPD to close crossings in advance of flooding. Early warning is crucial at this location, as flooding during a 100-year storm can reach nine feet. These crossings will be assessed in the Lower Shoal Creek Flood Hazard Mitigation Project.



Capital Improvement Program Solutions

- Completed
- Underway
- Planned
- Brentwood Drainage Improvements (Planned)

Roadway Crossing Problem Score

- Very High
- High

Structure Problem Score

- Very High
- High
- # Citywide Rank

General

- Creeks
- Culverts
- Fully Developed Floodplain
- Drainage Areas to Detention Ponds

0 ½ 1 1½ Miles

Localized Flood Hazard Mitigation

"Localized flooding" is a term used when flooding occurs away from creeks due to problems with the secondary drainage system. The secondary drainage system is composed of pipes, curb inlets, manholes, minor channels, roadside ditches, and culverts. This system is intended to convey stormwater runoff to the primary drainage system, the creeks.

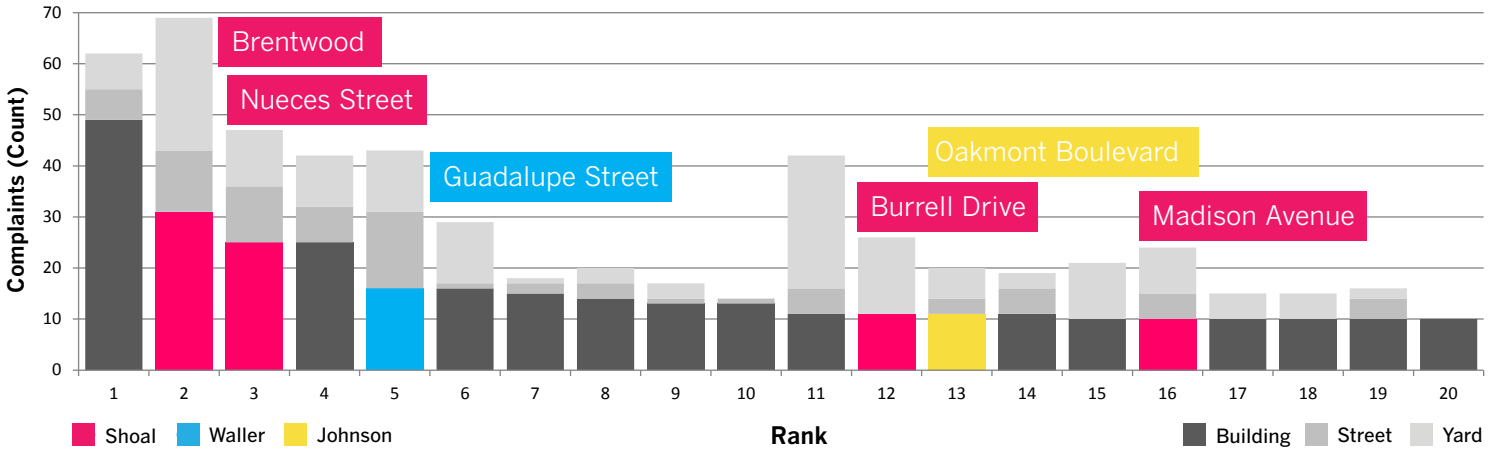
Because much of the development in the north urban watersheds predates the implementation of modern drainage criteria in 1977, a large percentage of the storm drains in these watersheds are considered outdated. Storm drains constructed before drainage criteria were adopted are often undersized, which can cause ponding of runoff in roadways and yards. While roughly 19% of Austin's entire drainage system was built before 1977, more than 77% of north urban storm drains are outdated. The Waller Creek watershed has the highest percent of outdated infrastructure of the north urban watersheds, with 82% of its storm drains constructed prior to modern criteria.

Localized flood problems are currently prioritized using citizen complaint data, largely gathered via non-emergency 3-1-1 calls. For each complaint, WPD staff meet with the citizen and investigate the property to determine the source and severity of the flooding. Verified complaints are entered into a database. Shoal Creek watershed has the second-highest number of total complaints in the city; it is only surpassed in complaints by Williamson Creek watershed.

The complaint database is used to create and prioritize Localized Flood Problem Areas, which delineate the approximate drainage area around clusters of complaints. Problem areas with the highest number of building complaints are prioritized for solution implementation.

The graph below plots the citywide top 20 ranked problem areas by the total number and type of complaints. Shoal (magenta), Waller (blue), and Johnson (yellow) creeks feature six of the top 20 ranked problem areas. The Brentwood neighborhood in Shoal Creek is the second ranked problem area. As this area is also a high priority for the erosion mission and directly upstream of the Hancock Tributary of Shoal Creek, a comprehensive multi-mission solution is needed to address the problem. WPD is initiating a feasibility study that evaluates all possible solutions.

Localized Flood Problem Areas: Top 20 Ranked Problem Areas



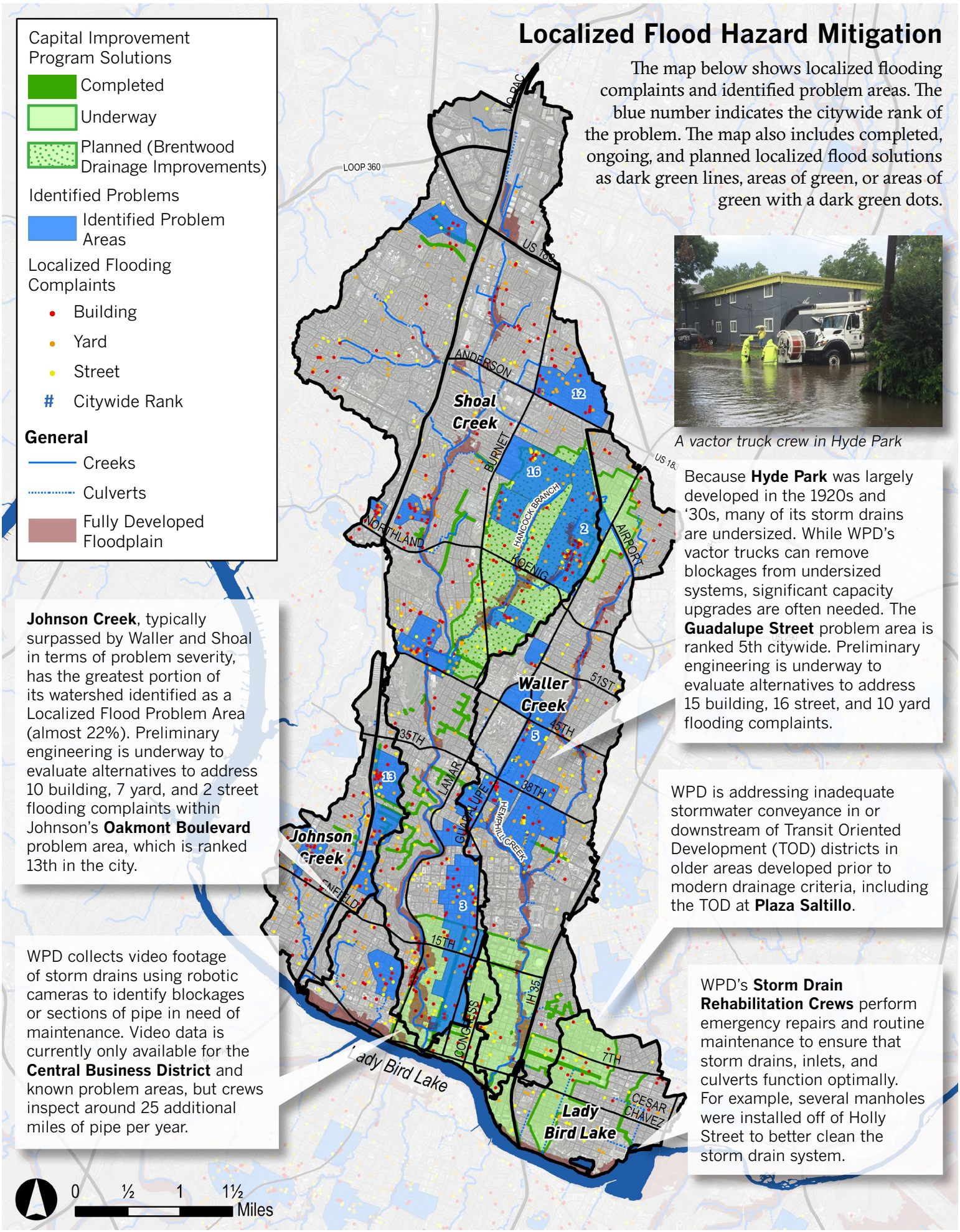
Highlighted Project: Brentwood Drainage Improvements

The Brentwood neighborhood was developed throughout the 1940s and 1950s with drainage infrastructure that was designed prior to modern drainage criteria. Undersized channels, culverts, and storm drains result in street and structure flooding on a frequent basis. Development of the neighborhood also altered the natural drainage patterns of the two main channels, Hancock Branch and Grover Tributary, both of which are severely eroding. A preliminary engineering study for a multi-mission project in the area is planned to begin in fiscal year 2017. The purpose of this study is to recommend feasible, cost-effective solutions to flooding and stream erosion in the area, while also incorporating improvements to stormwater quality.

Grover Tributary

Localized Flood Hazard Mitigation

The map below shows localized flooding complaints and identified problem areas. The blue number indicates the citywide rank of the problem. The map also includes completed, ongoing, and planned localized flood solutions as dark green lines, areas of green, or areas of green with a dark green dots.



A vactor truck crew in Hyde Park

Because **Hyde Park** was largely developed in the 1920s and '30s, many of its storm drains are undersized. While WPD's vactor trucks can remove blockages from undersized systems, significant capacity upgrades are often needed. The **Guadalupe Street** problem area is ranked 5th citywide. Preliminary engineering is underway to evaluate alternatives to address 15 building, 16 street, and 10 yard flooding complaints.

Johnson Creek, typically surpassed by Waller and Shoal in terms of problem severity, has the greatest portion of its watershed identified as a Localized Flood Problem Area (almost 22%). Preliminary engineering is underway to evaluate alternatives to address 10 building, 7 yard, and 2 street flooding complaints within Johnson's **Oakmont Boulevard** problem area, which is ranked 13th in the city.

WPD is addressing inadequate stormwater conveyance in or downstream of Transit Oriented Development (TOD) districts in older areas developed prior to modern drainage criteria, including the TOD at **Plaza Saltillo**.

WPD collects video footage of storm drains using robotic cameras to identify blockages or sections of pipe in need of maintenance. Video data is currently only available for the **Central Business District** and known problem areas, but crews inspect around 25 additional miles of pipe per year.

WPD's **Storm Drain Rehabilitation Crews** perform emergency repairs and routine maintenance to ensure that storm drains, inlets, and culverts function optimally. For example, several manholes were installed off of Holly Street to better clean the storm drain system.

Erosion Control

Erosion is a natural response by a creek to the stresses of urbanization. Problems occur due to improper placement of man-made resources near stream banks. The north urban watersheds were largely developed before the relationship between urbanization and erosion was well-understood —development was often placed too close to creek banks, putting those resources at risk when north urban creeks experienced erosion. As a result, the north urban watersheds have been significantly impacted by erosion.

Like the other WPD missions, the erosion mission uses technical studies to identify and characterize problem areas. Staff conduct assessments of creek reaches and erosion sites in response to citizen complaints. The result is a citywide inventory of erosion sites identifying locations along the creeks where erosion poses a current or future threat to property, stream stability, water quality, utilities, and drainage infrastructure.

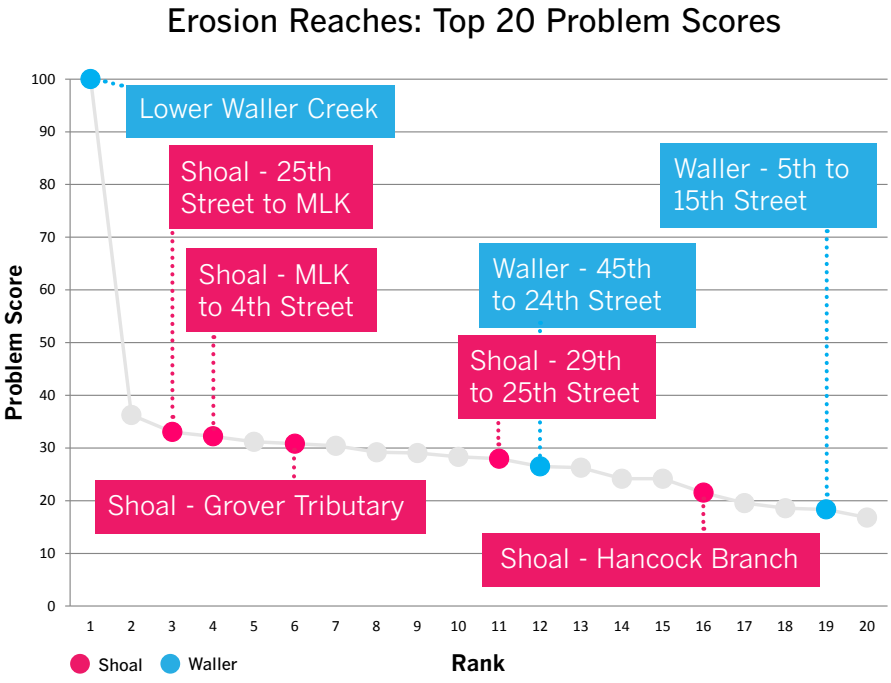
Erosion problem scores are calculated for individual sites and reaches. The resulting scores are used to quantify the relative priority of erosion concerns along Austin's drainage system. Accounting for approximately 14% of site problem scores, the Shoal Creek watershed makes up the largest portion of total citywide problem scores. The north urban watersheds as a whole account for approximately 27% of cumulative site problem scores, even though they comprise only 4% of Austin's creeks by length.

The graph below plots the top 20 ranked reaches by problem score. Shoal (magenta) and Waller (blue) creeks feature eight of the citywide top 20 ranked reaches. With a score of 100, lower Waller Creek is by far the most severely impacted reach in the city. The Waller Creek District Creek and Trail Improvements Project will address this reach by providing a stable, ecologically sustainable creek system from Waterloo Park to Lady Bird Lake in collaboration with the Waller Creek Conservancy. WPD is also initiating a feasibility study to address the Grover Tributary and Hancock Branch of Shoal Creek (ranked #6 and #16, respectively).

Restoration along Shoal Creek in Pease Park between 15th and 28th streets.

Highlighted Project: Shoal Creek Restoration

The Shoal Creek Restoration project aims to provide erosion protection to Shoal Creek, improve the quality of stormwater runoff, and restore native vegetation along the creek corridor. In addition to stabilizing approximately 3,000 feet of the creek bank, the project will also retain or restore the natural character of the greenbelt and integrate with existing uses in Pease Park.



Severe erosion threatens resources along lower Waller Creek.

Erosion Control

The map below shows "high" and "very high" scoring erosion geomorphic reaches. The black number indicates the citywide rank of the problem. The map also includes completed, ongoing, and planned erosion control solutions as dark green lines, areas of green, or areas of green with a dark green dots

Half of the **top 20 erosion problem score sites** citywide are located in the north urban watersheds. All top 20 sites will be addressed in ongoing or planned projects.

WPD's **Open Waterways Program** crews perform regular maintenance and installation of small-scale erosion control projects. This program allows for efficient and cost-effective implementation of channel maintenance projects throughout the city. For example, the crew stabilized 320 linear feet of an eroding gully downstream of the Great Northern Dam near Shoal Creek Boulevard with boulder grade controls and soil lifts.

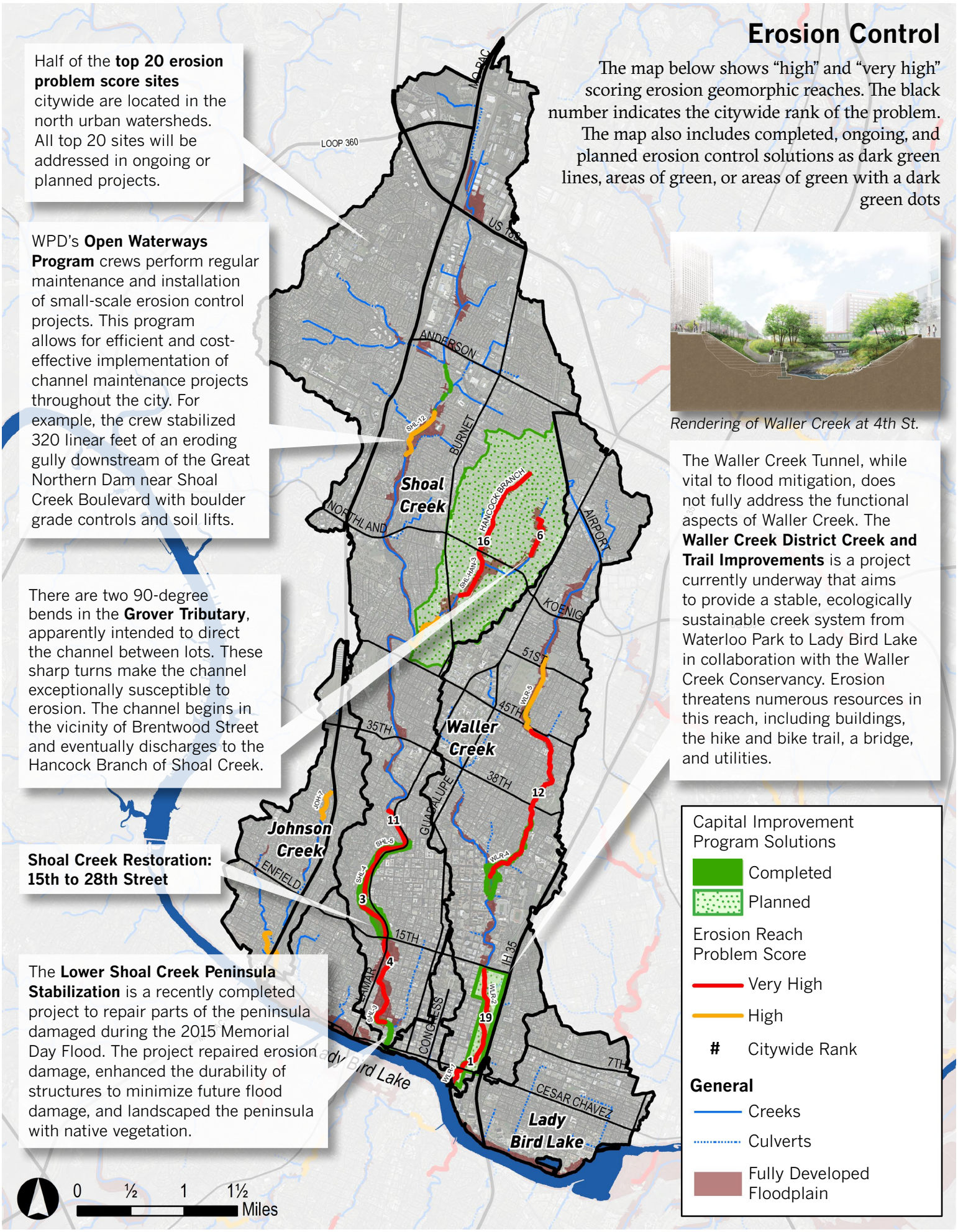
There are two 90-degree bends in the **Grover Tributary**, apparently intended to direct the channel between lots. These sharp turns make the channel exceptionally susceptible to erosion. The channel begins in the vicinity of Brentwood Street and eventually discharges to the Hancock Branch of Shoal Creek.

Shoal Creek Restoration: 15th to 28th Street

The **Lower Shoal Creek Peninsula Stabilization** is a recently completed project to repair parts of the peninsula damaged during the 2015 Memorial Day Flood. The project repaired erosion damage, enhanced the durability of structures to minimize future flood damage, and landscaped the peninsula with native vegetation.

Rendering of Waller Creek at 4th St.

The Waller Creek Tunnel, while vital to flood mitigation, does not fully address the functional aspects of Waller Creek. The **Waller Creek District Creek and Trail Improvements** is a project currently underway that aims to provide a stable, ecologically sustainable creek system from Waterloo Park to Lady Bird Lake in collaboration with the Waller Creek Conservancy. Erosion threatens numerous resources in this reach, including buildings, the hike and bike trail, a bridge, and utilities.



Water Quality Protection

Sources of water quality problems are complex to study and control. Key concerns include increases in runoff, sediment, nutrients, metals, litter, fecal indicator bacteria, and degradation of aquatic and riparian habitat. To assess this complexity, WPD developed its **Environmental Integrity Index** (EII) monitoring and scoring system to compare conditions across the city.

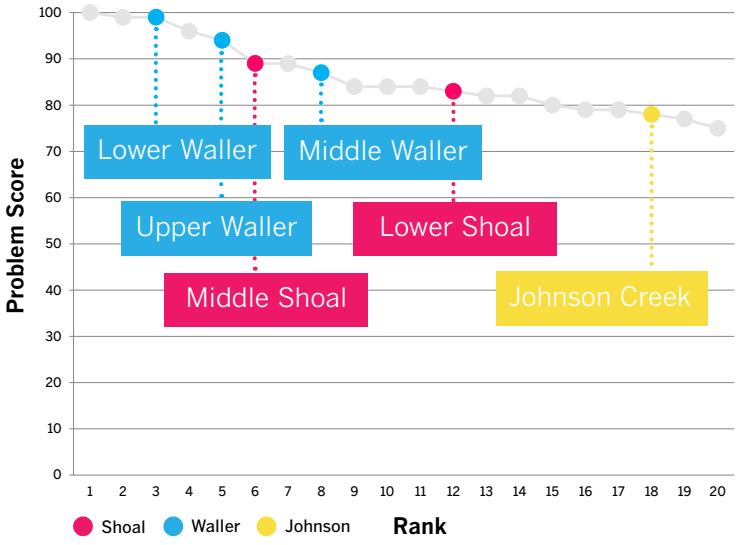
While the EII remains the overall indicator of watershed ecological integrity, WPD uses a subset of this data to identify and prioritize solutions used to address water quality problems in Austin. The eight problem categories are: toxins in sediment, litter, bacteria from animals, sewage, nutrients (e.g. fertilizer), construction runoff, poor riparian vegetation, and unstable channels.

North urban watersheds are among the worst scoring watersheds for riparian vegetation. Because these watersheds have been urbanized for over 100 years, the riparian zones of these creeks have been encroached upon and largely lack vegetation. Human activities such as mowing and development remove the original mature vegetation, degrade soil carbon content, and compact the soil. When repeated over decades, this makes passive restoration techniques more difficult to implement to achieve a healthy riparian vegetative community. Waller Creek and the Spicewood Tributary of Shoal Creek have specifically been identified as not supporting contact recreation uses by the Texas Commission on Environmental Quality (TCEQ) due to elevated levels of fecal indicator bacteria. Improvement of riparian area vegetation is an important management measure in the approved plan to implement a Total Maximum Daily Load, which is a determination made by TCEQ of the amount that a pollutant (in this case fecal bacteria) must be reduced for a watershed to no longer be impaired.

Out of the eight individual problem scores, four problem scores that can be feasibly addressed by capital projects are combined into a Capital Improvement Program (CIP) water quality score. These four components are: poor riparian vegetation; unstable channels; nutrients; and toxins in sediment. While this score is used to prioritize problems that are considered "fixable" by CIP structural solutions, those problems that cannot feasibly be improved by structural solutions are instead tackled through regulatory and programmatic solutions.

The graph below plots the citywide top 20 ranked reaches by CIP problem score. Shoal (magenta), Waller (blue), and Johnson (yellow) creeks feature six of the top 20 ranked reaches, with all three of Waller Creek's reaches in the top 20.

Water Quality Reaches: Top 20 Problem Scores



Highlighted Program: Grow Zones

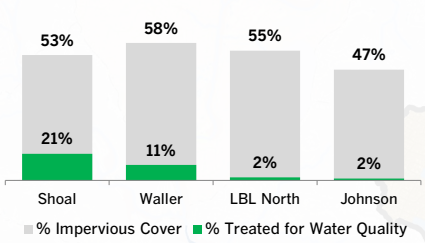
The north urban watersheds are among the worst scoring watersheds for riparian vegetation. Grow Zones are an effort to promote healthy riparian vegetation along creeks in over 50 sites in several city parks. WPD staff work with the Parks and Recreation Department to decrease mowing along the creek, which allows a more biologically diverse plant community to grow in place of the existing, degraded turf. WPD then monitors these sites to document the transition, ensure that vegetation does not impede the flow of water, and make sure that restoration goals are being reached. They also meet with neighborhood associations, conduct educational creek walks, and post signs to explain the process. Over time, native grasses and, eventually, trees become established and transform the areas into more ecologically functional, beautiful landscapes. In addition to the wide variety of ecological services that these buffers provide, they are also integral to the effort to reduce fecal bacteria loads in Waller and Shoal creeks.

Dottie Jordan Recreation Center before (top) and after (bottom) a Grow Zone was established along Little Walnut Creek.

Water Quality Protection

The map below shows "high" and "very high" scoring water quality reaches. The green number indicates the citywide rank of the problem. The map also includes completed, ongoing, and planned water quality solutions as filled, half-filled, or open points.

The Jollyville Plateau Salamander is listed as a threatened species under the Endangered Species Act. The salamanders are found in springs, spring-fed streams, and caves with flowing water, including the **Spicewood Springs** tributary of Shoal Creek. WPD monitors salamanders as another means to understand non-point source pollution and impacts to Austin's water resources.



Only 15% of the impervious cover in the north urban watersheds is treated by water quality ponds.

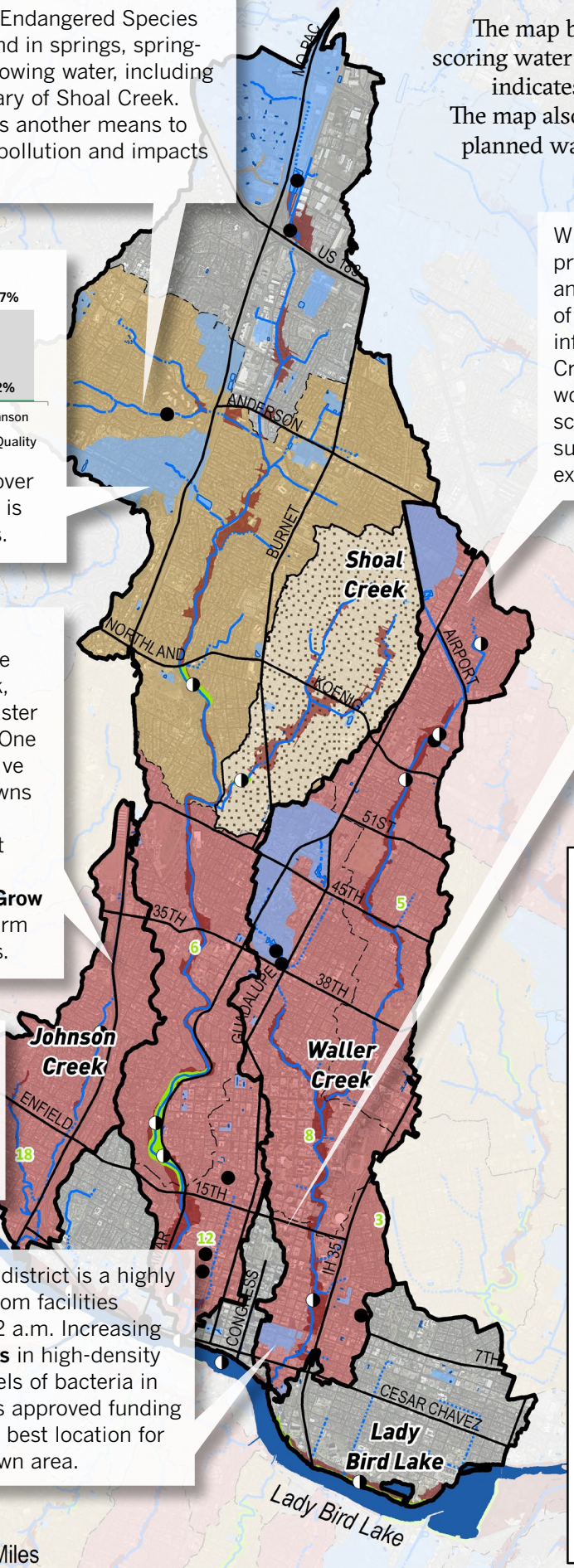
Nutrients such as nitrate, ammonia, and orthophosphate are elevated in Johnson Creek, which causes algae to grow faster than ecosystems can handle. One potential source is the excessive application of fertilizers on lawns and gardens. Because single-family homes make up almost half of the watershed, public education programs such as **Grow Green** are critical tools to inform residents about best practices.

WPD inspects and maintains multiple trash booms around Lady Bird Lake to catch and contain floating trash and debris before it enters the reservoir.

The downtown entertainment district is a highly trafficked area with few restroom facilities available for public use after 2 a.m. Increasing the availability of **public toilets** in high-density areas will reduce elevated levels of bacteria in Waller Creek. City Council has approved funding for a pilot program to find the best location for portable toilets in the downtown area.

WPD is launching a five-year pilot project to improve water quality and quantity via implementation of small-scale green stormwater infrastructure projects within Waller Creek's headwaters, which has the worst Environmental Integrity Index score of Waller's three reaches. If successful, this program could be expanded to all Urban watersheds.

Austin was one of the first U.S. cities to monitor the environmental impact of food service operations. The **Food Service Environmental Assessment** program ensures that the handling of grease, cleaning of equipment, and maintenance of dumpsters does not pollute our watersheds.



Capital Improvement Program Solutions

- Completed
- Planned
- Brentwood Drainage Improvements (Planned)

Water Quality Reach Narrative Score

- Very High
- High
- # Citywide Rank

General

- Creeks
- Culvert
- Grow Zones
- Water Quality Control
- Drainage Area to Water Quality Control
- Fully Developed Floodplain

0 ½ 1 1½ Miles

Additional Resources

Watershed Protection Department Master Plan

austintexas.gov/department/watershed-protection-master-plan

Creek Flooding

austintexas.gov/department/creek-flooding

Localized Flooding

austintexas.gov/stormdrains

Flood Information and Road Closures

www.atxfloods.com

Stream Erosion

austintexas.gov/department/erosion-control-stream-restoration

Water Quality Protection

austintexas.gov/department/environmental-resource-management

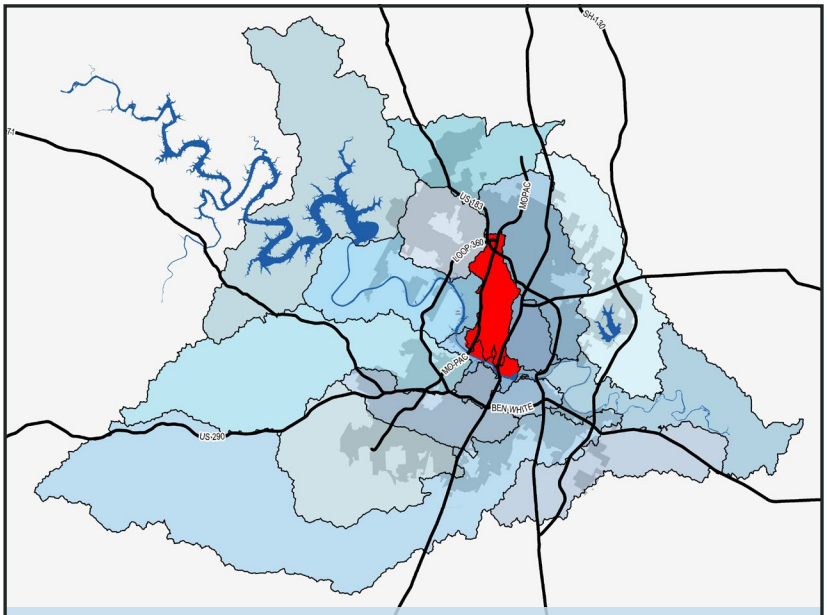
Field Operations

austintexas.gov/department/field-operations

For More Information

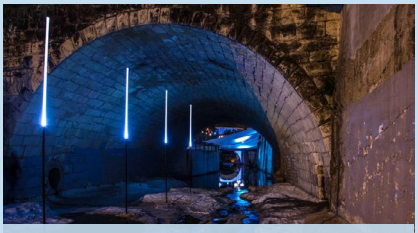
WPDPIO@austintexas.gov

(512) 974 - 2550



This profile is part of a series of publications that characterize Austin's watersheds. Using the **Watershed Protection Master Plan** as a framework, the profiles overview watershed problems and solutions in 17 groups of watersheds.

Shoal Creek Conservancy Restoration Event



Waller Creek Conservancy Creek Show 2014

Keep Austin Beautiful Cleanup

Whenever possible, the Watershed Protection Department identifies **public-private partnerships** to share costs and increase benefits to an area. These partnerships address challenges across jurisdictional boundaries and help realize economies of scale. This combination of resources minimizes costs to the public while maximizing public benefit. Some WPD partners include:

• The **Shoal Creek Conservancy** (SCC) is a non-profit partner dedicated to improving Shoal Creek and its associated trails. The SCC organizes volunteers, hosts educational programs, fundraises, hosts events, and collaborates with the City of Austin to address flood, water quality, and erosion challenges.

• The **Waller Creek Conservancy** (WCC) is a non-profit community partner to the City of Austin, primarily interacting with WPD, Parks and Recreation, Planning and Zoning, Development Services, and Public Works. In partnership with these departments, the WCC helps coordinate and deliver projects for the Waller Creek District. A Joint Development Agreement between the City of Austin and the Waller Creek Conservancy defines the roles and responsibilities of each party to achieve the common goals of preserving, restoring, managing, and operating the District.

• **Keep Austin Beautiful** (KAB) engages the Austin community to remove litter from neighborhoods, creeks, and public spaces while raising awareness about the impact of litter. Cleanup efforts primarily stem from one-time events where KAB identifies areas in need, coordinates trash collection, recruits volunteers, and leads trainings. Because the north urban watersheds are highly impacted by humans, KAB has many events in north urban watersheds. For example, KAB's Clean Lady Bird Lake initiative organizes large-scale cleanups every other month, picking up trash in and along Lady Bird Lake.