



RICHARDSON STORMWATER DRAINAGE SYSTEM GUIDE

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Acknowledgments

The City of Richardson's Stormwater Drainage System Resource Guide was adapted from materials previously produced by the City of Richardson, including its Stormwater Management Plan, the Private Creek Maintenance page on the City's website, the Brush and Bulky Item Collection (BABIC) page on the City's website, and other portions of the City website. The guide is published by the City of Richardson, which thanks the following partners for their assistance and the use of their resources and/or for creating custom materials for this guide:

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Foreword

Richardson has an abundance of appealing amenities that attract businesses and residents to the community. A major contributor to Richardson's high quality of life is its natural environment, which includes a splendid system of parks and recreational facilities, mature neighborhoods with a beautiful tree canopy, and a robust network of creeks.

Richardson has invested heavily in its manmade infrastructure, too, as part of creating a safe, attractive home for residents and businesses. This infrastructure is absolutely essential, from Richardson's well-maintained streets and alleys to its well-designed stormwater drainage system.

The City's multi-faceted, stormwater drainage system, which includes creeks and so much more, has been carefully structured to operate efficiently and effectively in response to common rainfall events, as well as when nature creates more severe challenges.

To continue functioning as it was designed, the stormwater drainage system needs proper care, and the City has an annual maintenance program for addressing the system's routine needs. At the same time, local property owners - including residents and businesses - have a vital part themselves to play in protecting the system's proper functioning.

For homeowners and businesses located along creeks, this includes taking proper care of stream banks and vegetation on the banks in order to enhance their property, prevent or mitigate erosion problems, avoid flood losses, and add to their enjoyment of having a creekside location.

Even for Richardson residents and property owners who aren't alongside a creek, there is a critical role to play. The City's stormwater drainage system is designed to transport water in an orderly fashion across roadways and parcels of land, into gutters, ditches, culverts, and sewers that eventually drain stormwater into larger creeks and channels. Every upstream element of this system must be kept as free as possible from obstructions, in order to ensure that stormwater is conveyed away from homes and businesses - thus preventing potential property damage or loss of life.

We encourage you to study this guide, and we thank you for doing your part!



In short, what you need to understand is every single Richardson resident and business owner can help the stormwater drainage system work better.

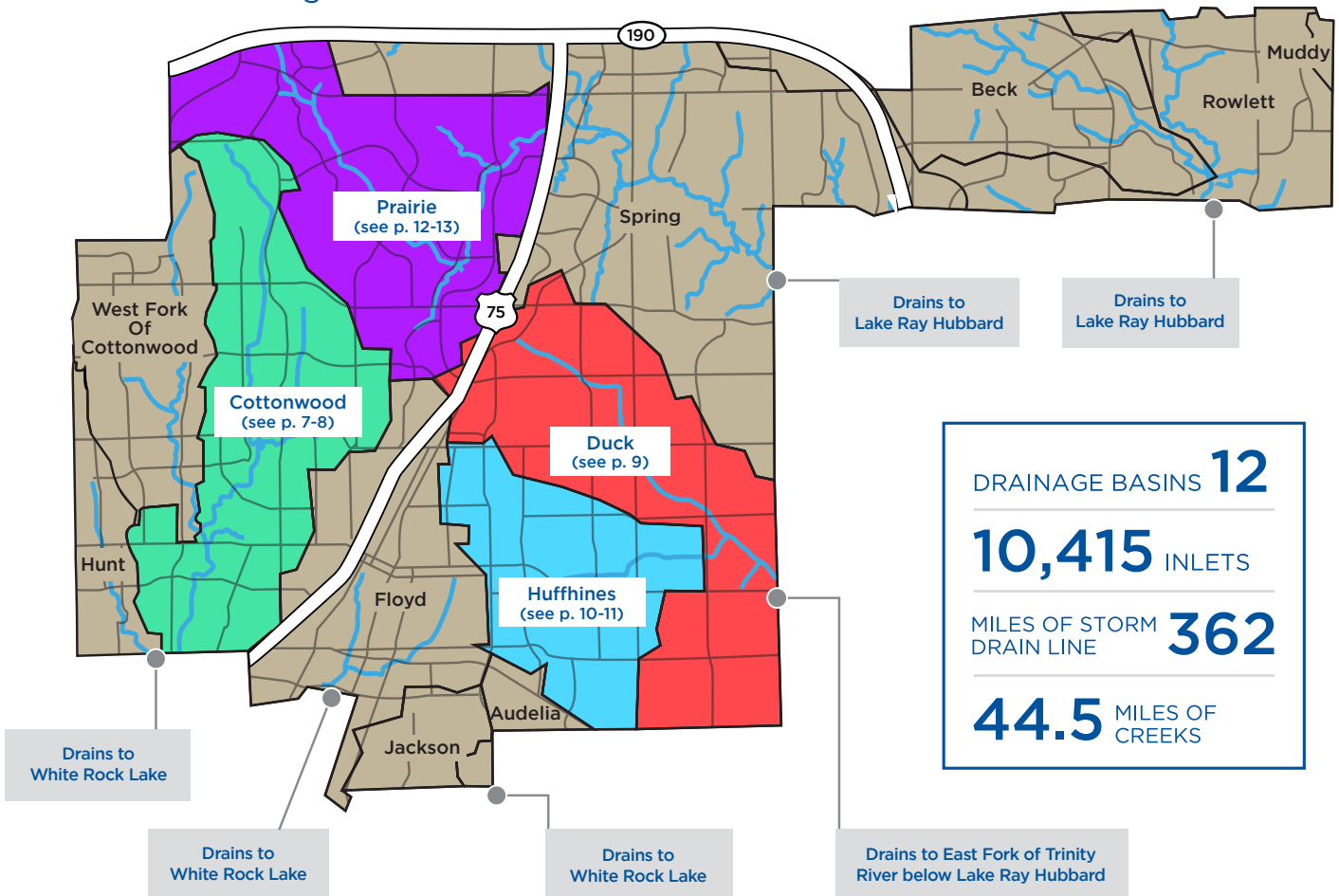


Richardson's Creek/Drainage System

A Multi-Part System To Drain Water Purposefully

- The City of Richardson encompasses **28 square miles** with 12 total drainage basins, as shown on the map below. To illustrate some of the citywide system's key features, **four of those basins** are featured in greater detail on pages 7-13 of this guide.
- Richardson's stormwater drainage system, primarily developed decades ago as subdivisions were constructed, is **designed to direct rainfall to drain lines and creek beds** in order to channel water purposefully to larger bodies of water downstream.
- The system includes several key components that work in harmony to accomplish the goal of funneling water away from homes and businesses, including **more than 10,000 inlets, over 350 miles of storm drain line and nearly 45 miles of creek beds.**

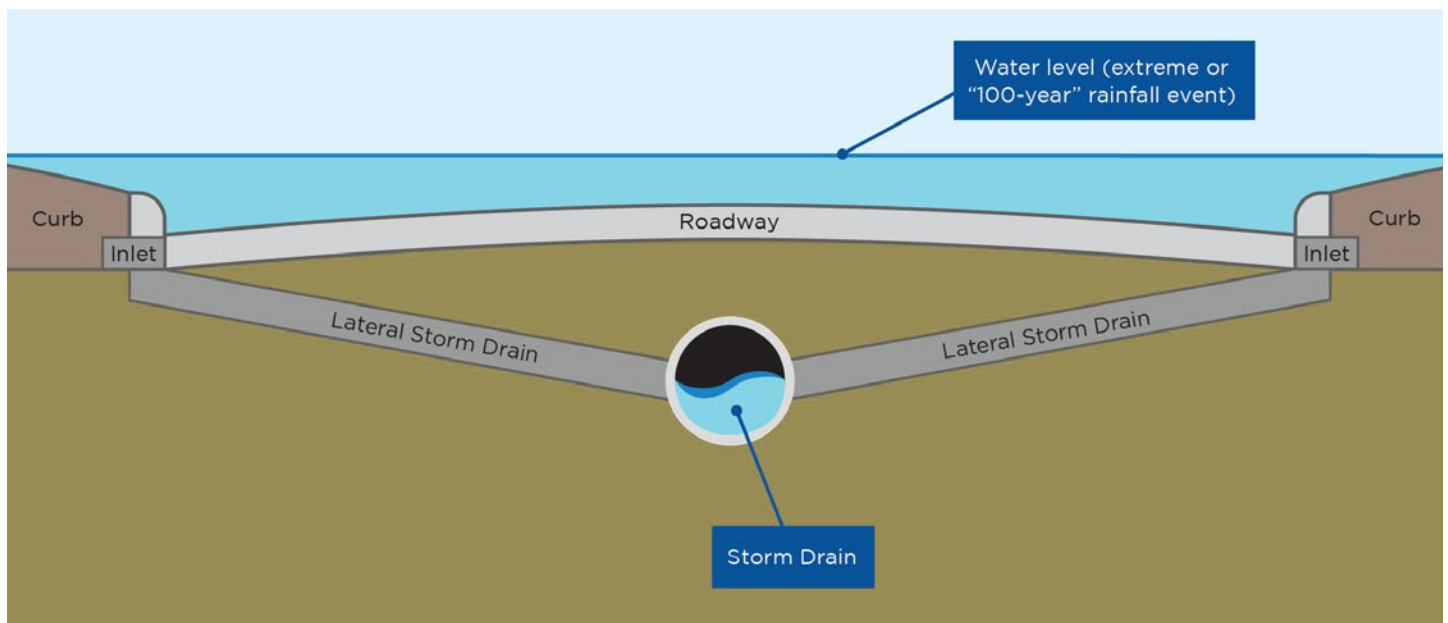
Richardson's Drainage Basins



Curbs to Creeks: The Stormwater Drainage Connection

Designed For Typical And Extreme Rainfall Events

Richardson's stormwater drainage system is intentionally designed to deal with a wide range of storm events, including the more **typical rainstorms** that occur fairly frequently, as well as more **extreme storms** that may occur only once per century, on average. The underground system can usually handle the water resulting from a 5-year or 10-year storm event, meaning events with a 20% or 10% probability of happening in a given year, respectively. Meanwhile, the right of way (public streets and alleys) is designed to handle the additional water produced by a more extreme, or 100-year, storm event — meaning one with a 1% chance of occurring in a given year.



Right-Of-Way Drainage For Extreme Events

- To help with stormwater drainage in extreme rainfall events, inlets are intentionally placed at low spots along the street.
- The depth of flow in residential neighborhood streets may be 6-10 inches deep. *This is an intentional design feature, to keep water away from homes and businesses.*



Factors Preventing Proper Drainage System Performance

- Clogged inlets
- Lack of positive drainage away from homes on lots
- Culvert debris blockages
- Lot to lot drainage



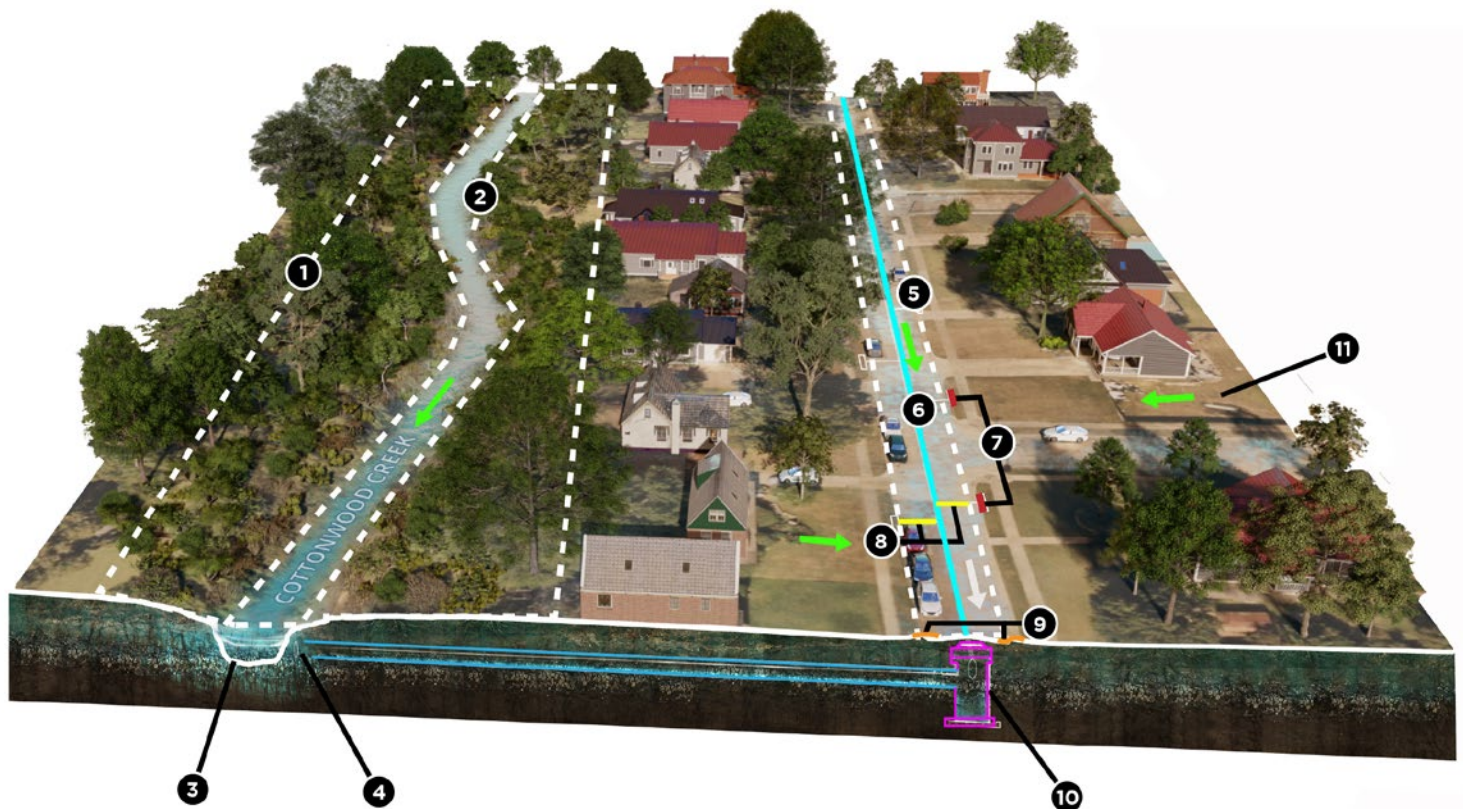
Cottonwood Creek Drainage System

The following pages show various aspects from four of the City's main drainage basins, and how they function in both typical and extreme storm events.

Cottonwood Creek is a natural channel that originates near the UT Dallas campus and drains south through residential areas before ultimately outfalling into White Rock Creek. Within the residential areas, stormwater runoff drains from yards to street gutters and is collected via curb inlets discharging into the creek. These inlets are connected to underground storm drain collector pipes that flow into larger storm drain mains, which ultimately outfall into natural waterbodies such as creeks, rivers or ponds.

Typical Storm Event

In a **typical event**, surface ponding will be minimal and stormwater will drain freely from the street to the underground storm drain system, then into the channel without being restricted by river-borne flood surges.

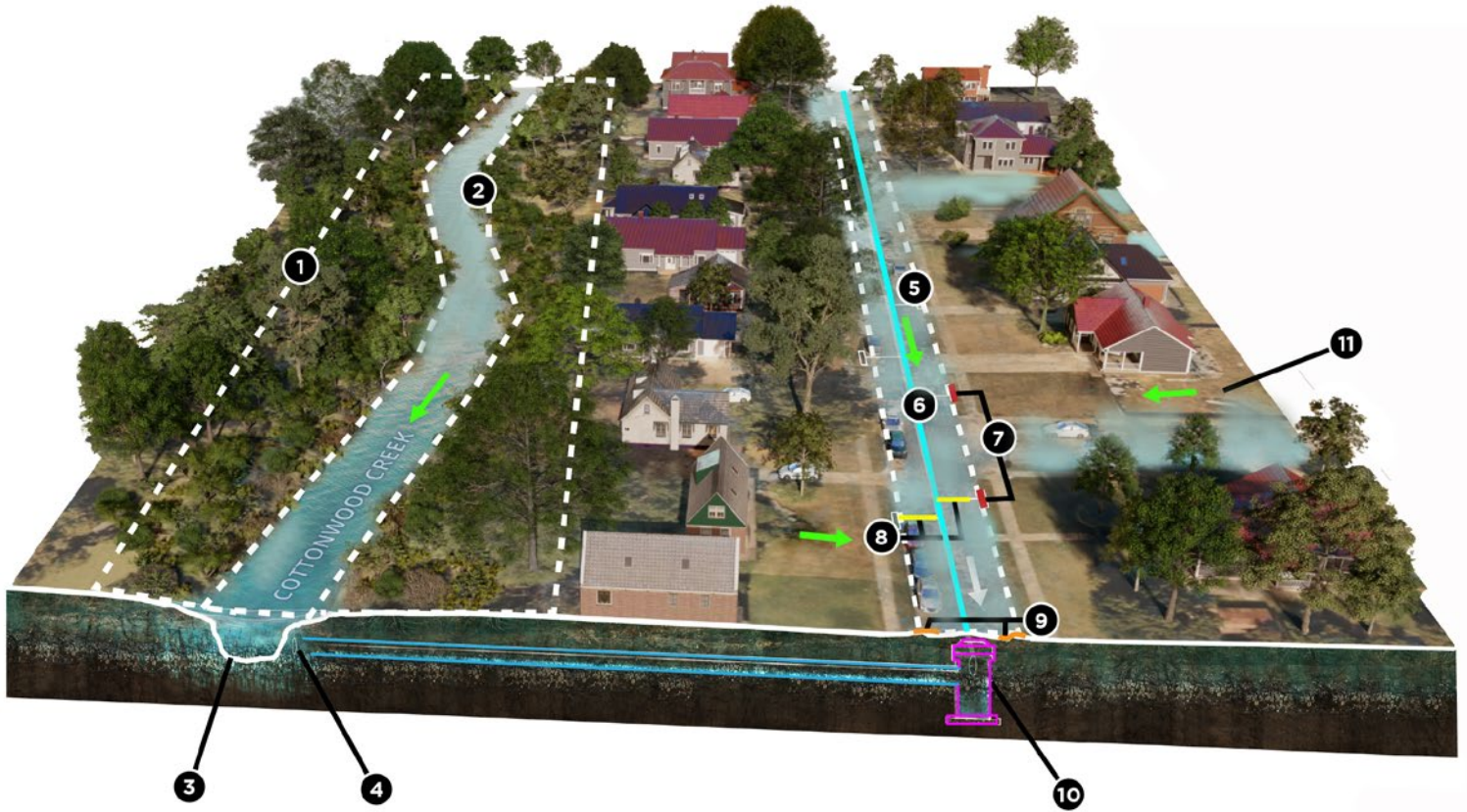


Key points

- | | | | | | |
|---|------------------------|---|-----------------------|----|-------------------------|
| 1 | Creek overbank | 5 | Street flow zone | 9 | Curbs and gutters |
| 2 | Creek normal flow zone | 6 | Storm drain main line | 10 | Manhole |
| 3 | Natural channel | 7 | Curb inlets | 11 | Minimal surface ponding |
| 4 | Storm drain outfall | 8 | Lateral storm drain | → | Water drainage path |

Extreme Storm Event

In this **extreme event**, stormwater may pond up to the top of the street curb and be stored in the underground storm drain system until the river-borne flood surge has been conveyed downstream and the water level in the channel has receded. There may also be significant, temporary surface ponding in yards.



Key points

- | | | |
|---|--------------------------|-------------------------------|
| ① Riparian zone | ⑤ Street conveyance zone | ⑨ Curbs and gutters |
| ② River-borne conveyance | ⑥ Storm drain main | ⑩ Manhole |
| ③ Natural channel with elevated water level | ⑦ Curb inlet | ⑪ Significant surface ponding |
| ④ Storm drain outfall | ⑧ Lateral storm drain | → Water drainage path |

STORMWATER DRAINAGE: QUADRANT TWO

Duck Creek Drainage System

Duck Creek is primarily a vegetated, engineered channel that collects stormwater runoff from business and residential areas east of US 75. Within the residential areas, stormwater runoff is collected by a storm drain system draining into this scenic creek, which contains a series of low-lying structures called weirs that maintain constant water levels in the creek during dry periods.

Typical Storm Event

During a **frequent rainfall event**, these weirs also help regulate flow to prevent fast-moving water from eroding the creek banks and potentially damaging City and private infrastructure.

Extreme Storm Event

During **extreme rainfall events**, this engineered creek is designed to fully contain floodwaters within its banks and provide protection to adjacent homeowners.



STORMWATER DRAINAGE: QUADRANT THREE

Huffhines Creek Drainage System

Huffhines Creek is a flowing, vegetated, engineered channel collecting runoff from residential areas to the eastern-most City boundary. At its upstream-most limit, stormwater runoff is collected by storm drain pipes into dry detention and wet retention ponds ultimately outfalling into Huffhines Creek. These ponds are permanent drainage structures designed to hold water for a short period of time thereby ensuring downstream drainage systems are not overburdened. A detention pond will remain dry until a storm occurs with its sole purpose being flood control; whereas a retention pond will have a constant pool of water and may serve multiple functions such as an amenity, water quality treatment and flood control.

Typical Storm Event

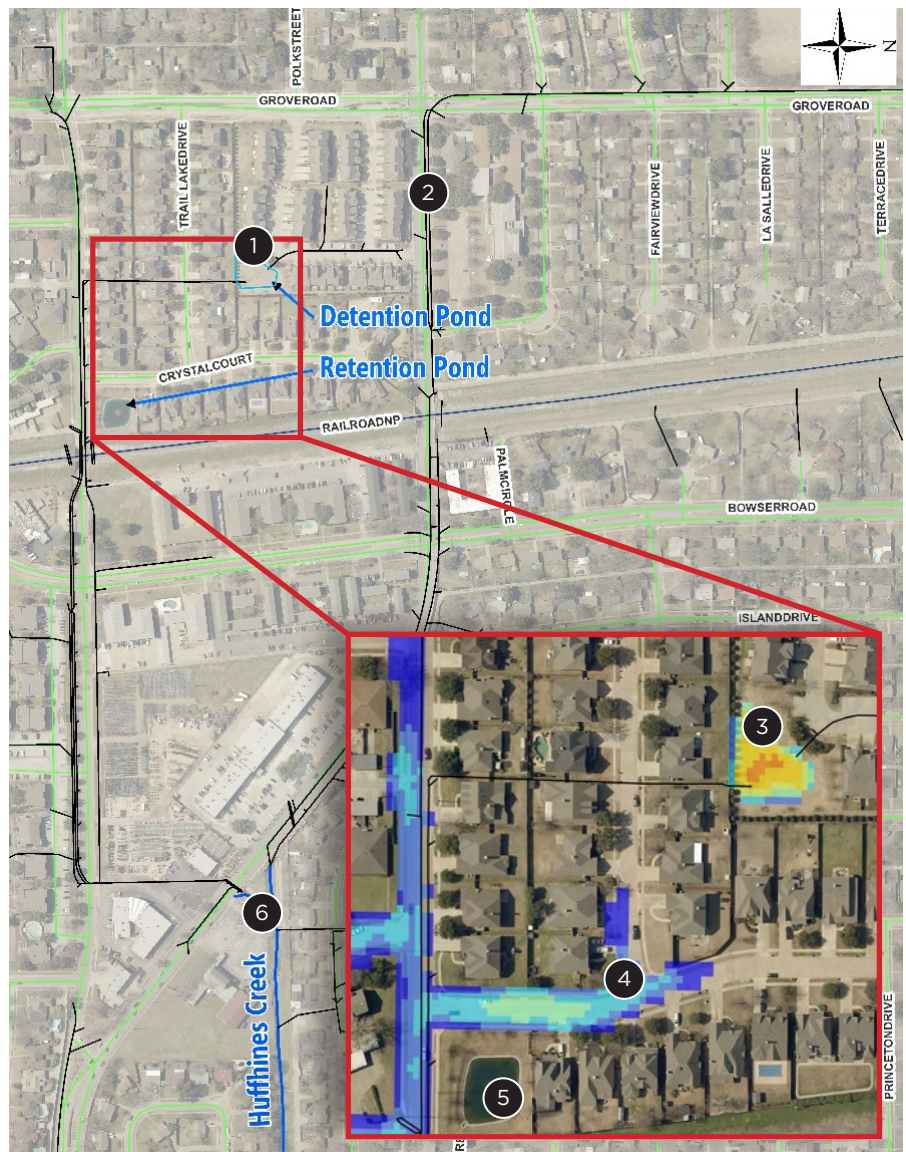
In response to a storm, detention and retention pond water levels fluctuate by collecting water and releasing it at a rate protecting downstream areas from flooding. During a **frequent storm event**, water up to several feet is expected to occur within the detention pond, while little to no change occurs in the retention pond water level. In this case, the retention pond serves as emergency storage for more severe storms only.

Rainfall

0" - 0.25"	1.5" - 2"
0.25" - 0.5"	2" - 3"
0.5" - 1"	3" - 4"
1" - 1.5"	> 5"

Key points

- 1 Dry until storm event
- 2 Storm drain network
- 3 Detention pond collects water
- 4 Street conveyance zone
- 5 No change in water level
- 6 Storm drain outfall



Extreme Storm Event

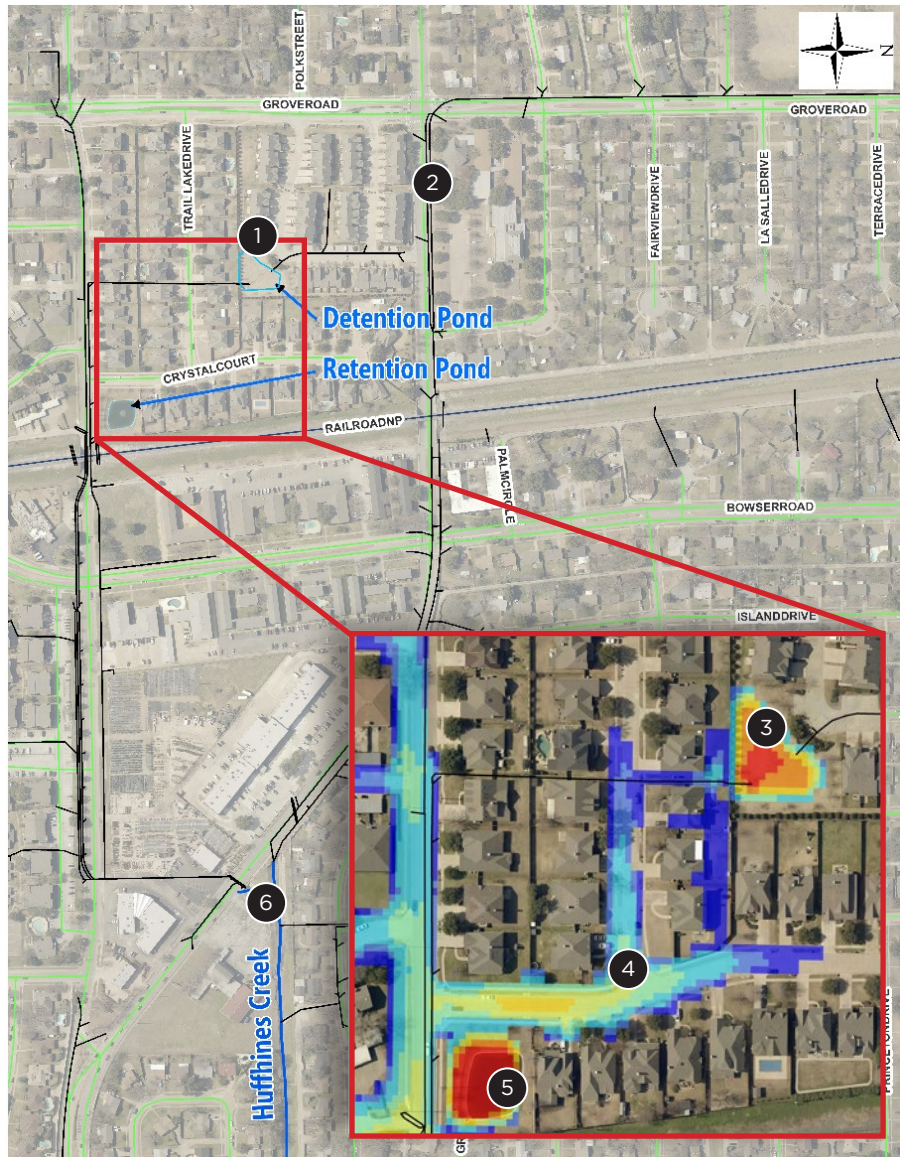
During an **extreme storm event**, the detention pond may be very near its capacity with some surface ponding along streets. The retention pond will also rise above its normal water level as backflow from the connecting storm drain system and overland flow to the pond occurs. Once floodwaters in Huffhines Creek and the connecting drainage systems recede, these ponds will slowly drain until normal water levels are reached.

Rainfall

0" - 0.25"	1.5" - 2"
0.25" - 0.5"	2" - 3"
0.5" - 1"	3" - 4"
1" - 1.5"	> 5"

Key points

- 1 Dry until storm event
- 2 Storm drain network
- 3 Detention pond collects water
- 4 Street conveyance zone
- 5 Retention pond sees no change in water level
- 6 Storm drain outfall



STORMWATER DRAINAGE: QUADRANT FOUR

Prairie Creek Drainage System

Prairie Creek is a natural channel collecting runoff from north Richardson and flowing towards the City of Garland. Within Richardson's city limits, Prairie Creek meanders through two golf courses providing a natural buffer to residents located near the creek. Areas developed and maintained for recreational uses along a creek, such as golf courses, preserve open space in this floodplain that is susceptible to being inundated by floodwaters. Open space preservation minimizes the exposure of buildings to flood or erosion hazards in areas that convey and store floodwaters. Commonly, golf courses utilize flood control structures such as retention ponds and spillways to maintain normal pool elevations.

Typical Storm Event

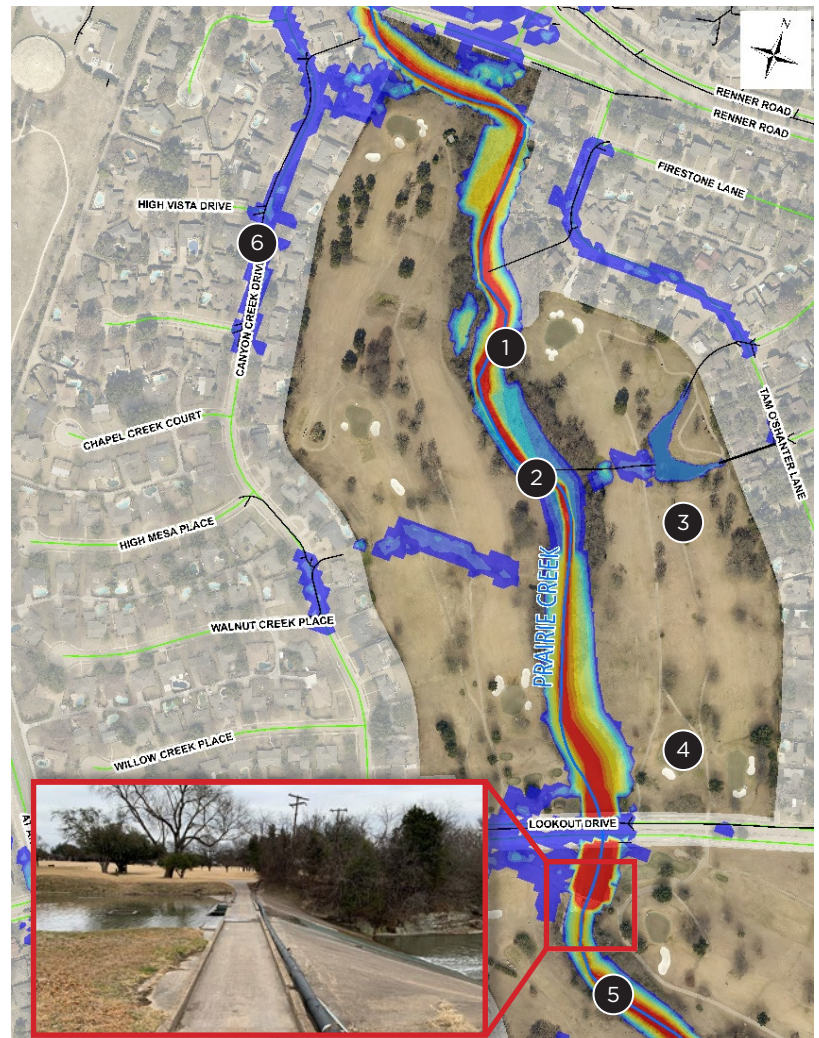
During a **frequent storm event**, runoff is effectively conveyed from residential areas to the creek where it is confined within undisturbed forested section of the creek, far from inundating residential areas. Water will be steadily flowing over the spillway at a depth of 3-4 feet.

Rainfall

0" - 0.25"	3" - 4"
0.25" - 0.5"	4" - 5"
0.5" - 1"	5" - 6"
1" - 1.5"	6" - 7"
1.5" - 2"	> 7"
2" - 3"	

Key points

- 1 Storm drain outfall
- 2 Undisturbed forested region
- 3 Retention pond
- 4 Open space buffer
- 5 Spillway with water depth at 3-4 feet
- 6 Minimal street conveyance



Extreme Storm Event

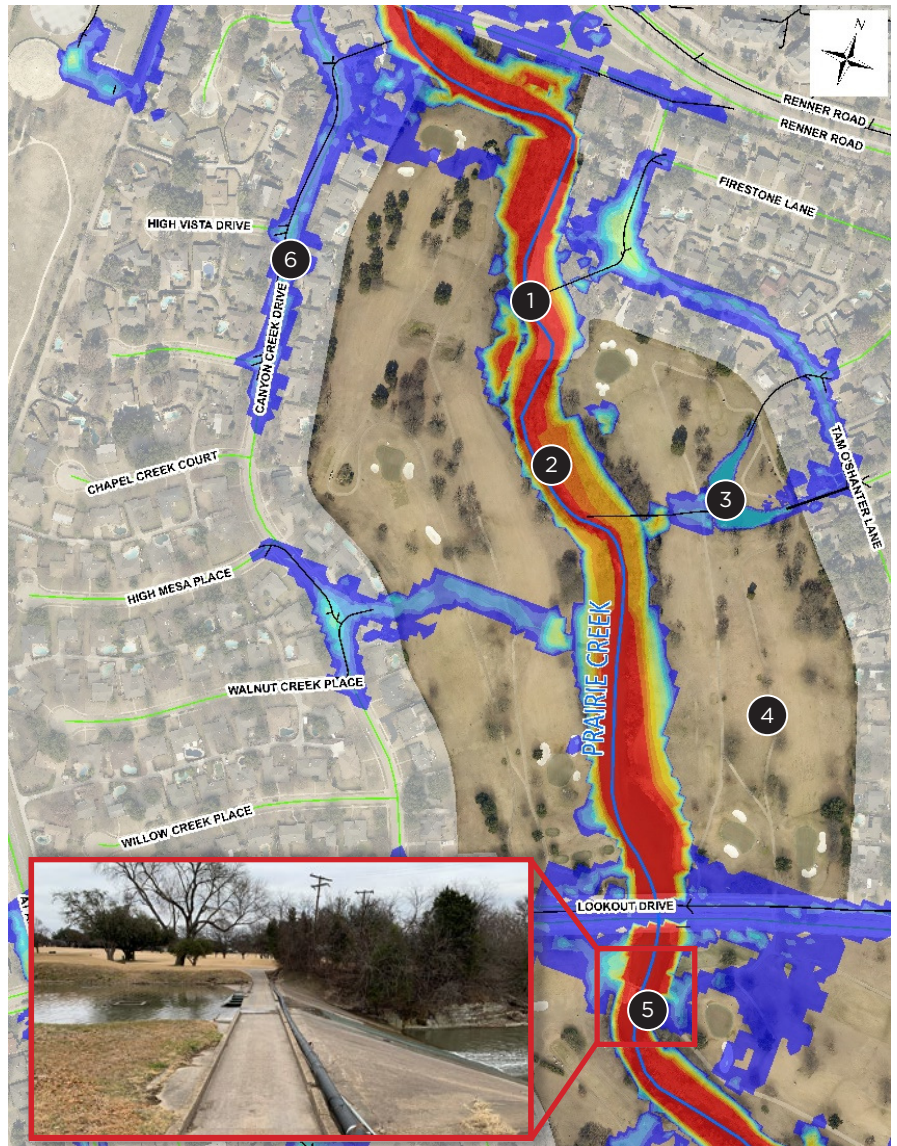
During an **extreme storm event**, residential street ponding may occur while storm drain systems convey runoff to the creek. Flow within the creek may extend beyond the forested area and manicured greens but does not encroach into the residential areas. Water will be flowing faster over the spillway at a depth of 6-7 feet.

Rainfall

0" - 0.25"	3" - 4"
0.25" - 0.5"	4" - 5"
0.5" - 1"	5" - 6"
1" - 1.5"	6" - 7"
1.5" - 2"	> 7"
2" - 3"	

Key points

- 1 Storm drain outfall
- 2 Undisturbed forested region
- 3 Retention pond
- 4 Open space buffer
- 5 Spillway with water depth at 6-7 feet
- 6 Significant street conveyance



Your Role: Promoting Positive Drainage

Ensuring the rain flows where it's supposed to — into swales and stormwater inlets — reduces the chances that water will end up where it's *not* supposed to, such as your home or garage!

You can help promote positive drainage on and around your property in a variety of ways:

- **Eliminate debris and blockages** on your property (old tires, garbage, yard clippings, litter, etc.). This includes keeping swales, storm inlets and streets free of leaves and other debris.
- **Avoid adding new fences or walls** that create barriers to positive drainage. If you must add a fence or wall, work with a professional to incorporate an appropriate drainage solution.



Debris and blockages



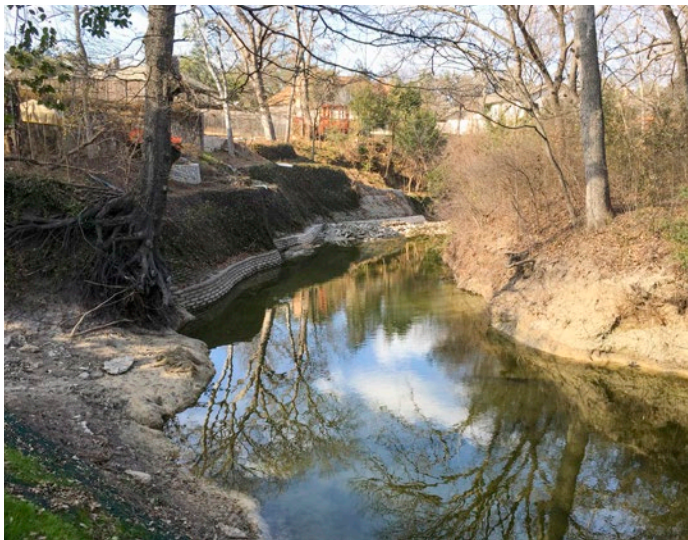
Eliminated debris and blockages



- **Minimize impervious surfaces** (driveways, parking areas, decks, paths, etc.) that may send water in the wrong direction, or too rapidly into the drainage system.
 - Instead of concrete, use wooden decks, gravel, brick or stone paths, paving stones, or concrete blocks set in sand so water can permeate more easily.
 - Employ landscaping to help with water drainage and absorption, or to slow its flow.

- **Ensure proper grading is preserved** – meaning a gentle slope away from your home.
 - Similarly, make sure gutters and pipes are directed away from your house – but first into vegetated or graveled areas for filtration before leaving your property.
 - Consider a rain barrel or other method to catch roof runoff for later irrigation use.

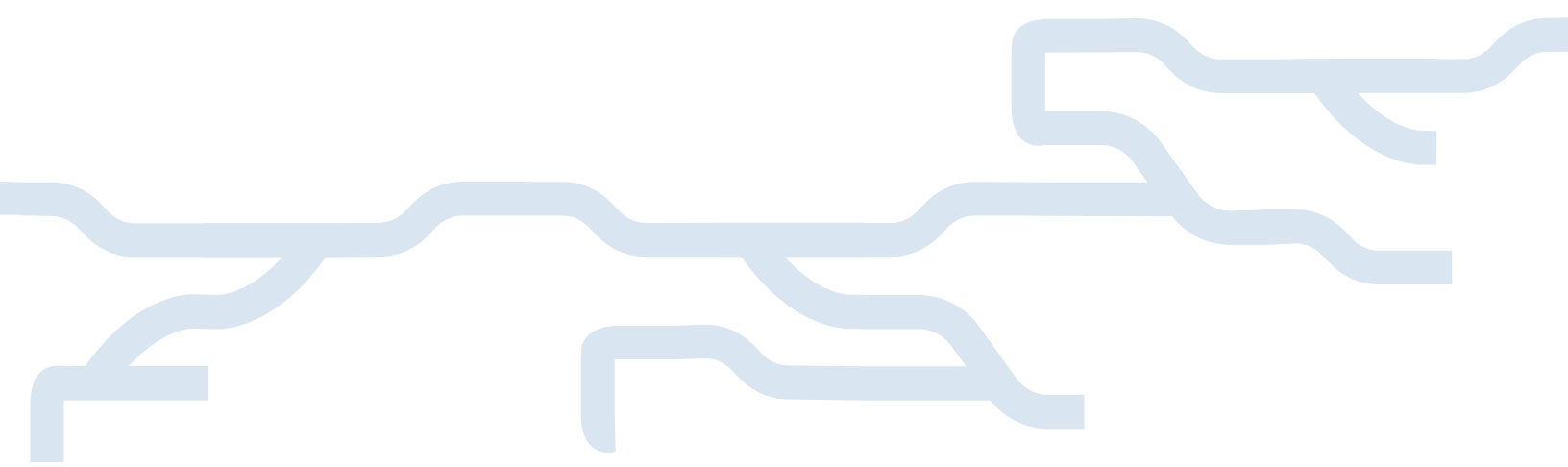
- **If you do not mulch**, ask your landscaping service to haul away lawn clippings, pruning debris and other materials. **Mulching your lawn clippings and other natural debris is the recommended options, wherever possible.**



- **Call the City of Richardson's Brush and Bulky Item Collection (BABIC)** service for yard debris pickup, or use the designated pickup days for bagged leaves and similar materials. For more information about BABIC services: www.cor.net/babic.

- **Keep an eye on your neighborhood's creek and storm drains.** Promptly call one of the resources listed on page 18 to report any blockages or other issues to the City of Richardson.

- **When rain is predicted, park in your garage or driveway** instead of the street, to ensure streets and gutters can drain water away smoothly.



Your Role: If You Live Along a Creek

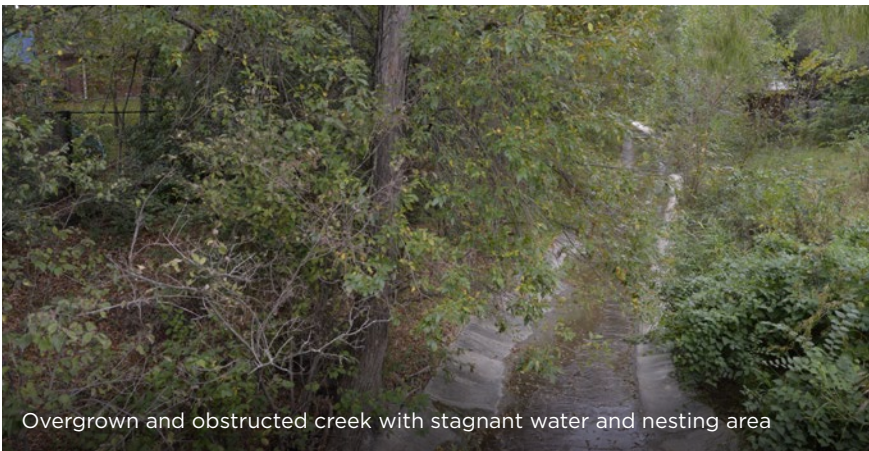
In most cases, property owners who live along creeks and waterways are responsible for regular maintenance of that area to preserve its drainage function and enhance neighborhood integrity.

Creeks that are not maintained regularly can become overgrown with weeds, collect brush and trash, and become obstructed and unattractive. Such waterways can't perform their vital role of conveying water further downstream, causing poor performance of the City's overall stormwater drainage system and potentially jeopardizing you, your neighbors and other nearby properties.

Overgrown and obstructed creeks also diminish the use and enjoyment of your property by leading to issues such as poison ivy, stagnant water and nesting areas for unwanted wildlife.



Creek that was not maintained regularly and became obstructed



Overgrown and obstructed creek with stagnant water and nesting area



If you live by a creek or waterway:

- **Carefully and regularly remove trash, litter and other dumped debris from the creek.**
- **Remove fallen trees, accumulated brush and other natural debris** from the creek.
 - Downed trees, brush and tree limbs in the creek can catch trash and cause stagnant water and sediment to build up. This can act as a breeding ground for mosquitoes and block the natural flow of the creek, which can lead to flooding.
 - Don't create a potential debris issue by dumping yard clippings down creek banks or within a flood zone.



- **Reduce streambank erosion** by slowing the flow of water to the creek or creek bed and by maintaining slope stabilization measures.
 - Instead of free-flowing or piped water, guide water to the creek in a protected way, such as via rock-lined channels and energy dissipaters as part of your landscape design.
 - Inspect retaining walls at least twice yearly and repair them promptly at the first sign of any damage or erosion.
 - Maintain planted ground cover in the creek bank area, because the root systems of such plants can help stabilize the soil and prevent slope erosion. But do trim this vegetation to prevent overgrowth and promote strong roots. Do not clear the creek slopes to bare ground, and replace any grasses or groundcover lost to high flows.



- **Contact one of the City resources listed on page 18** if you need assistance cleaning up the creek, or for help hauling away large debris that you have removed.
- **Avoid diverting water or damming a creek** since that can reduce water flow and cause water to flow into unintended areas rather than safely downstream.
 - Always seek the advice of the City before making any necessary modifications to resolve an existing creek bank issue.



Quick Reference Guide

Promoting positive drainage on and around your property, and keeping your nearby creek flowing smoothly, are relatively simple tasks. However, we understand that homeowners may need assistance and professional guidance when unexpected flooding or drainage issues arise. As always, the City of Richardson is here to help!

Where to Get Help

For general guidance:
www.cor.net/stormwater

Creek Maintenance Questions:

For more information on maintaining creeks, including information about erosion protection, permits required for improvements near a creek and a list of companies offering maintenance services, contact the Richardson Engineering and Capital Projects Department at 972-744-4280.

To request maintenance of a City-owned creek or natural area, report trash or debris accumulations on a property, or for help fixing similar issues that can adversely affect positive drainage:

- Use the MyRichardson App
- Call the 24-hour Response Center line, 972-744-4111
- Visit the **“I want to... Express a Concern”** page of the City website: www.cor.net/concern

Brush and Bulky Item Collection (BABIC):

Residents should “Think Big” by requesting free BABIC service only when there is a sufficient amount of materials to require a truck to haul the waste. Residents are asked to request BABIC service prior to placing an item between the sidewalk and the street curb for collection. Items weighing 50 or more pounds, large amounts of brush or oversized items, are appropriate for BABIC pick-up. Small piles of brush, lawn clippings and anything else weighing less than 50 lbs. should be disposed of through the regular, twice-per-week solid waste collection.

To learn more about BABIC requirements, please contact Public Services at 972-744-4220 or visit us online at www.cor.net/babic.

For BABIC Service Requests:

- 📱 Use the MyRichardson App
- ☎️ Call the 24-hour Response Center line, 972-744-4111
- 📄 Complete an online service request at www.cor.net/babic



Quick Reference Guide: Your Role in the Stormwater Drainage System

Do



Eliminate debris and blockages on your property, and in creeks alongside your property.



Incorporate surfaces on your property that allow water to permeate.



Design landscaping to help with appropriate water drainage and absorption.



Preserve proper grading - a gentle slope away from your home to nearby drain inlets, swales or creeks.



Keep a close eye on the overall functionality of creeks and storm drains in your neighborhood.



Properly maintain planted ground cover in the creek bank area adjoining your property.



Inspect retaining walls at least twice yearly and repair/replace them as needed.



Ask your landscaping service to haul away lawn clippings and debris if you do not mulch.



Call BABIC to schedule collection of large, bulky brush or heavy debris.



Contact the City for professional guidance and help, including the necessary permits that may be required for any creek bed or floodplain alterations!

Don't



Add unnecessary fences or walls that create artificial, unanticipated barriers to positive drainage.



Add impervious surfaces (driveways, parking areas, etc.) without considering drainage implications and alternative solutions.



Park in the street and block the stormwater drainage system when storms are predicted.



Inadvertently contribute to streambank erosion by clearing creek slopes to bare ground.



Alter the floodplain, a stream bank or the channel of a creek bed without first consulting with the City.



Hesitate to contact professionals for assistance with drainage solutions on and around your property!

Glossary

B

BABIC – The City of Richardson’s Brush and Bulky Item Collection service, provided by request to dispose of yard waste, unwanted furniture, and other large and bulky items (over 50 lbs.) that cannot fit into normal trash or be recycled into mulch.

Basin (or Drainage basin) – Another term for **watershed**.

Berm – Earthen structure used to control erosion and sedimentation by reducing the rate of surface runoff. Berms either reduce the velocity of water or direct water to areas that are not susceptible to erosion, thereby reducing the adverse effects of running water on exposed topsoil.

C

Catch basin – An underground concrete structure with a slotted grate or solid lid that collects stormwater runoff and routes it through underground pipes, allowing sediment and debris to settle.

Catchment – Any device or structure that captures water.

Conveyance – Curbs, gutters, man-made channels and ditches, drains, pipes and other constructed features designed or used for flood control or to otherwise transport stormwater runoff.

Culvert – A tunnel carrying a stream or open drain under a road or railroad.

D

Detention basin (or Detention pond) – An excavated area installed on, or adjacent to, waterways to protect against flooding and in some cases downstream erosion by storing water for a limited period of time. Detention ponds that are designed to permanently retain some volume of water at all times are called retention basins, or retention ponds.

E

Erosion – The process by which a material is worn away by flowing water, wave action or wind. Erosion is often intensified by human activities, such as land clearing and channelization.

F

Floodplain – A strip of relatively flat and normally dry land alongside a stream, river or lake that is covered by water during a flood. A 100-year-flood (or “extreme flood event” in the terms of this brochure) does not refer to a flood that occurs once every 100 years, but to a flood level with a 1% chance of being equaled or exceeded in any given year.

H

Hydrology – The science that encompasses the occurrence, distribution, movement and properties of the waters of the earth and their relationship with the environment within each phase of the hydrologic cycle.

I

Impervious cover – A material on the land surface that water cannot infiltrate. It is typically material like concrete, asphalt, metal or brick.

Inlet (also known as Storm sewer inlet or Stormwater inlet) – Manholes, catch basins, curb inlets and other drop-type structures constructed to direct stormwater into storm sewers or other underground drainage systems.

Intermittent stream – A stream that has flowing water during certain times of the year. During dry periods, these streams may not have flowing water. These streams are often called dry streams, creeks or washes.



Glossary

L

Lot-to-lot drainage – Also known as cross-lot drainage, meaning a system of drainage, approved by the City as part of the plan for a subdivision or parcel map, in which water from one lot drains across one or more lots prior to reaching a public street, storm drain or alley.

P

Perennial stream – A stream that has flowing water year-round during a typical year.

Positive drainage – A condition where the finished grade or clay surface of a property is sloped away from all structures, and directs water to a similarly sloped drainage swale or a storm sewer collection system.

R

Rain garden – A planted depression that is designed to collect and absorb rainwater runoff, reducing the amount of pollution and sediment reaching creeks and streams.

Retention pond - See **Detention pond**.

Right of way – The public right of way is any public thoroughfare such as a street, road or alley. It typically includes the median, utility poles, sidewalks and the area immediately adjacent to the street. The right of way is public property.

Riparian corridor – The zone of land adjacent to a stream, river or other water course.

Runoff – See **Stormwater runoff**.

S

Sanitary sewer – An underground system of pipes, manholes and tunnels that transports waste to a wastewater treatment plant for treatment and eventual re-use or release into creeks.

Spillway – A large physical barrier built across a river, often as part of a dam, to store water up to the spillway crest during dry conditions and control flood flows during a storm.

Storm drain – A drain built to carry away excess water in times of heavy rain.

Storm event (extreme) – For purposes of this guide, an extreme storm or rainfall event is defined as one with a 1% chance of occurring in a given year. Also known as a 100-year event.

Storm event (typical) – For purposes of this guide, a typical storm or rainfall event is defined as one with a 50% or higher chance of occurring in a given year.

Storm sewer – A system of storm drains, channels and pipes that rapidly transports stormwater runoff from streets, sidewalks and other impervious cover into streams with little or no treatment.

Stormwater runoff (or runoff) – Rainfall runoff, snow melt runoff, and surface runoff and drainage.

Swale – An open drainage channel or depression expressly designed to detain and promote the filtration of stormwater runoff.

V

Vegetative litter – Organic waste material that has been disposed of in areas not designated for solid waste disposal.

W

Watershed – All of the land areas that drain water to a common point, usually a lake, river or stream.

Weir – A small overflow-type barrier built across a stream or river to raise the water level slightly on the upstream side, allowing water to pool behind it while flowing steadily over the top.



