

Rain Events, Flooding and Flash Flooding

HOW FLOODS HAPPEN

Floods begin when soil and vegetation cannot absorb falling rain or melting snow, or when water runs off the land in such quantities that it cannot be carried in normal stream channels or retained in natural ponds and human-made reservoirs. Flash floods are the result of too much rain falling in too small an area, in too short a time. Flash floods frequently occur in seconds and minutes, while floods occur over hours and days.

FLASH FLOODS

Flash floods are rapid-onset hydrologic events that can be difficult to forecast and can occur within several seconds to several hours, with little warning. They can be deadly because they produce rapid rises in water levels and have devastating flow velocities. Several factors can contribute to flash flooding. Among these are rainfall intensity, rainfall duration, surface conditions, and topography and slope of the receiving basin. Urban areas are susceptible to flash floods because a high percentage of the surface area is composed of impervious streets, roofs, and parking lots where runoff occurs very rapidly, therefore, the nature of the rainfall and the anticipated runoff processes are key elements in the flash flood forecast process.

In general, the greater the precipitation intensity, the more likely it is that significant surface runoff will be generated. Higher precipitation intensity can result in more runoff because the ground cannot absorb the water quickly enough. Although prior ground saturation increases the flash flood risk, many flash floods occur when the ground is not saturated. Flash floods can and do occur with dry soils and drought conditions.

Surface alterations such as pavement, compaction, and fire can have an even greater influence result in very rapid runoff even in dry conditions. Land cover and land use are other essential influences on runoff. Urbanization and de-vegetation are special cases that need to be considered.

Urbanization has several major impacts, including:

- Greater runoff volumes due to increased percentage of impermeable surfaces and compacted soils.
- Faster runoff due to road grids, storm sewer networks, alterations to the natural vegetation, and sometimes channelization of streams.

All of this greatly enhances the movement of runoff to and within stream channels. As a result, when compared to rural conditions, urban streams will flood faster, more frequently, and with a greater peak flow given the same rainfall. In fact, in an urban environment flood conditions can occur with much less rainfall than that necessary for rural or “pre-urban” conditions.

Just because you haven't experienced a flood in the past, doesn't mean you won't in the future. Flood risk isn't just based on history; it's also based on a number of factors: rainfall, river-flow and tidal-surge data, topography, flood-control measures, and changes due to building and development.

CLIMATE CHANGE

Rising global average temperature is associated with widespread changes in weather patterns. Scientific studies indicate that extreme weather events such as heat waves and large storms are likely to become more frequent or more intense with human-induced climate change.

☒ **U.S. and Global Precipitation.** Total annual precipitation has increased in the United States and over land areas worldwide. Since 1901, precipitation has increased at an average rate of 0.5 percent per decade in the contiguous 48 states and 0.2 percent per decade over land areas worldwide.

☒ **Heavy Precipitation.** In recent years, a higher percentage of precipitation in the United States has come in the form of intense single-day events. Nationwide, nine of the top 10 years for extreme one-day precipitation events have occurred since 1990. The occurrence of abnormally high annual precipitation totals (as defined by the National Oceanic and Atmospheric Administration) has also increased.

STORM SEWER SYSTEM

Storm sewers within the City of O'Fallon, like many other communities, are designed to handle a typical 15 year, 20 minute storm event at maximum as identified in City Ordinance [405.230](#). These type of rainfall events are the "typical or norm", not a sudden more severe thunderstorm or flash flood event. In a normal rain event, the storm drains will drain without concern. A "river" through the yard to direct runoff to the storm sewer may still be visible. This river is normal and usually in the graded drainage swale/area in the back or side yard. These swales are typically graded areas 2-4 feet wide and several inches up to a few feet deep. This relates to structures in streets and yards as well as the connecting pipes.

On greater sized storm events, it is common to see "rivers" in backyards and on streets and ponding or pooling of runoff. There are cases where storm sewer inlets will not be able to handle the larger storm event. This may result in runoff ponding or surcharging (backing up) at the storm sewer inlet causing temporary flooding of a street or yard. When the pressure in the pipes and volume in the storm sewer pipes goes down, then the runoff will drain into the storm sewer. This can take 20-30 minutes after the rain event ceases in a larger or sudden event. This surcharging is due to the sizing of the storm sewer system.

In many developments, if storm sewers cannot handle the amount of runoff coming to it they are designed to have an overland flow swale to divert the water to surrounding areas. Many of the side and back yards are initially designed to provide these swales. When yards are improved such as patios, decks, pools, fences, playgrounds and/or landscape changes are made, many of the initial swales disappear and water can sit in these areas where the drainage is either slow or ground is too flat to drain any longer. Many of the issues reported to the City are a direct result of the owner making improvements to their lot and many times we ask residents to work together to improve their situation. Often times, there resolution is relatively simple.

Although the storm sewers structures pipes are maintained by City crews, there are hundreds that are located behind homes and are either not visible from the street or are in backyards surrounded by fences or other improvements that decreases ease of accessibility. There are many examples of inlets that have debris built up blocking flow into these inlets. The City residents are asked to periodically check these inlets for blockage and/or damage. Grass clippings, tree limbs and leaves frequently block these openings. If they wash into or are deposited into the pipe, then it can cause blockages in the actual pipe which causes the storm sewer not to drain as designed. Keeping these areas clear will greatly help the drainage in your yard. Residents also like to place objects on or around the storm sewers. We ask that you keep the openings including lids or grates free of obstacles that can prevent easy access should repairs need to be done. Storm sewers are not the most attractive item to have in a back yard, so camouflaging them with landscaping is often done. As long as the landscape does not block the opening of the storm sewers preventing it to operate as intended the storm sewer should operate fine. We often find that landscaping is installed too close to these structures which can cause runoff not to be allowed to enter the storm sewer as intended by design.

DETENTION (DRY) AND RETENTION (WET) BASINS:

Detention/Retention basins have higher requirements for flood protection and decrease stream channel degradation from urban development which increase the amount of stormwater runoff to local streams. By metering the discharge coming out of these basins, downstream properties have decreased potential for flooding and creek bank erosion which can cause major damage to properties. Detention/Retention basin maintenance is the responsibility of the subdivision board of trustees or homeowner's association. The City does provide periodic inspections to ensure that these basins are being maintained and functioning properly. If a deficiency is brought to our attention or found while conducting inspections, we work with the associations to remedy any deficiencies if found. The City recommends regular inspection of these basins to ensure they are free of debris, properly maintained and functioning properly.

Material References:

http://www.nws.noaa.gov/os/brochures/FloodsTheAwesomePower_NSC.pdf

https://www.floodsmart.gov/floodsmart/pages/flooding_flood_risks/ffr_overview.jsp

<http://www.weatherexplained.com/Vol-1/Floods-Flash-Floods.html#ixzz38KfICRug>

<http://www.epa.gov/climatechange/science/indicators/weather-climate/index.html>