

# Glossary:

## Talking About Resilience

### 10-year storm (10% storm)

An event that has a 10% chance of occurring or being exceeded any given year. Also known as a **T10 storm**, where the “T10” refers to the return period.

### 100-year storm (1% storm)

An event that has a 1% chance of occurring or being exceeded any given year. Also known as a **T100 storm**, where the “T100” refers to the return period.

### adaptation

Adjustments to a changing climatic characteristics such as rising sea levels. These may include structural changes such as the lifting of levees or the raising of homes, as well as changes in policy and management practices that reduce vulnerability and risk to communities. See also **climate change**.

### base flood

A flood with a 1% chance of being equaled or exceeded in any given year. This regulatory standard is used by the National Flood Insurance Program (NFIP) and other federal agencies for determining flood insurance rates and regulating new development.

### base flood elevation (BFE)

An elevation (height) set by the Federal Emergency Management Agency (FEMA) that measures the elevation to which floodwater is anticipated to rise during a base flood. To receive FEMA funds in the case of storm damage, FEMA requires the lowest floor of the building to be at or above BFE.

### berm

A raised barrier dividing space, which may be used to prevent flooding or erosion. Berms can be incorporated into landscape designs to create detention and retention basins.

### best management practice (BMP)

A method or technique that consistently yields outcomes superior to those achieved by other means and generally agreed upon by a community of experts to be the most effective means of delivering a particular outcome.

### biofiltration

The process of vegetation slowing down and filtering pollutants out of stormwater, improving the water quality.

### bioswale

A linear depression in the landscape constructed to slow and filter stormwater with vegetation and soil media. Bioswales can remove silts, pollutants, and pathogens, and reduce the quantity of runoff from a site.

### brackish water

A mix of freshwater and seawater found in places like estuaries and deltas.

### canal

A man-made channel for water, often built as connections to larger bodies of water.

### catch basin

Also known as a **storm drain** or **curb inlet**, a catch basin is a receptacle that captures stormwater runoff, as well as solids and large sediment, typically at the point where water passes from a gutter into a piped drainage system.

### catchment area

An area where all runoff is conveyed to the same outlet, with boundaries typically defined by ridges or other topography. See also **watershed**.

### climate change

Changes in temperatures, precipitation patterns, and the frequency of extreme weather events commonly linked to human activity.

### culvert

A closed drain, pipe, or channel used to convey water (eg. from beneath a roadway from one side to another).

### detention

The holding of stormwater temporarily in a **swale**, **detention basin**, or other features. Water detention reduces **peak discharge** by allowing the slower and more controlled release of runoff, but does not allow for the permanent pooling or storage of water.

**discharge**

The emptying of stormwater runoff or sewage from the drainage system into a waterway.

**drainage canal**

An artificial channel built to drain an area with no natural outlet for runoff.

**ecological services, ecosystem services**

The beneficial products and processes provided to humanity by the natural systems of the biosphere. These services include, but are not limited to, the production of clean water, crop pollination, waste decomposition, climate regulation, and recreational benefits. In stormwater management, for example, wetlands and urban forests provide these services in the form of pollutant bioremediation, evapotranspiration, and groundwater recharge.

**egress**

An established safe route to higher ground that is designed to stay dry and passable in the event of an emergency such as flooding. An egress route could be a roadway that is above the base flood elevation, connecting a low lying area to a higher elevation so that people can evacuate.

**elevation**

The altitude of a given location relative to sea level.

**estuary**

A partially-enclosed body of water where freshwater from rivers and streams flows into the ocean, mixing with seawater and forming brackish water. Estuaries are rich habitats influenced by tides but protected from the direct impact of ocean waves and winds by surrounding land, wetlands, and barrier islands.

**first flush**

The initial stormwater runoff from a rain event. This typically has higher concentrations of pollutants such as organic debris, sediments, oil, and other surface pollutants that accumulate on rooftops and roadways in the period before the storm.

**flood**

The temporary condition of inundation of what is usually dry land. Floods can be caused by an overflow of inland or tidal waters, or the rapid accumulation of stormwater runoff in drainage ditches or inland waterways. **Flash floods** are floods that subside in fewer than six hours.

**floodplain**

An area of typically flat land that is susceptible to inundation by water from any source. Floodplains are typically fertile agricultural areas as a result of nutrient-rich sediments deposited by floodwaters.

**floodwall**

A vertical barrier, usually made of concrete, constructed to contain floodwaters from a river, lake, or sea in order to prevent flooding in urbanized areas. Floodwalls are used in densely developed areas where building **levees** is not feasible, or atop levees in order to increase the level of safety provided by the levee.

**floodgate**

A movable structure that can be opened or closed in order to adjust the flow of water through a canal, or to prevent the flow of water as part of a levee and floodwall system.

**fluvial**

Of or relating to rivers and streams, and the flooding, erosion, and soil deposition associated with these waterways.

**freeboard**

The distance between an established water level, such as a **base flood elevation**, and maximum water levels. This could apply to drainage infrastructure, such as in a drainage canal or a retention basin, or to a structure. The freeboard is used to calculate the capacity of a given water feature. Freeboard can also be considered the additional elevation of safety. For example, if the lowest level of an elevated building was built to be two feet above the base flood elevation, it would have two feet of freeboard.

**geohydrology, hydrogeology**

The study of **groundwater**, including its flow and its physical and chemical interactions with soils and surface water.

**gray infrastructure**

Traditional mechanisms for stormwater management and wastewater treatment, such as pipes and sewers.

**graywater**

Wastewater generated from domestic activities such as dishwashing, laundry, or bathing. Properly treated, it can be recycled for other uses like irrigation.

**green infrastructure**

An approach to stormwater management that utilizes natural processes to filter and reduce runoff. In contrast to gray infrastructure, green infrastructure can provide additional benefits such as improved air quality and more verdant streetscapes.

**groundwater**

Water held in underground permeable rock or soil layers. When these layers hold enough water to be usefully extracted for human use, it is called an aquifer.

**groundwater monitoring network**

A system of wells, gauges, and data collection for tracking groundwater levels and quality. Such a network allows for a more comprehensive understanding existing groundwater issues such as **subsidence** and **saltwater intrusion**, and the management of soils and groundwater.

**harden**

To make structures and utilities resistant to storms and natural hazards.

**hazard mitigation**

Sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects. Hazard mitigation can include the building of levees, elevating of structures, or the relocation of assets. Improving urban water management is also a form of hazard mitigation.

**hydraulics**

An applied science that studies the properties of water and other fluids, especially in relation to the application of mechanical forces. The term **hydraulic** indicates a system or activity involving fluid under pressure.

**hydric soil**

A soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil layer. Hydric soils are commonly found in wetlands, and support unique landscapes, including vegetation that adapts to absorb oxygen from the atmosphere rather than the soil.

**hydrograph**

A chart that graphically describes the rate of flow — of water, for example — relative to a specific point over a period of time. A hydrograph can help in describing the contours of a rain event, and in the planning and design of waterways and water control structures.

**hydrology**

The study of the distribution, flow, and quality of water. This includes the water cycle, water resources, and watershed sustainability. The term **hydrologic** refers to the movement of water between land areas, waterways, water bodies, and the atmosphere.

**impervious surface**

A material or area that cannot be penetrated by water. This includes most rooftops and structures like roads, sidewalks, and parking lots that are paved with concrete, asphalt, or stone. Impervious surfaces prevent rainfall from infiltrating into the ground and recharging groundwater, and accelerate runoff.

**infiltration**

The passage of water into below-ground soil layers. The velocity at which this occurs is called the infiltration rate, which is dependent on the composition of surface soil layers. Infiltration replenishes groundwater and raises the water table.

### **infrastructure**

Foundational systems and installations necessary to maintain and enhance basic social, economic, governmental, economic, and military functions. These include drinking water systems, drainage systems, sewers, hurricane defenses, schools, transportation networks, electrical grids, and telecommunications networks.

### **inundation**

Flooding, the overwhelming of an area by floodwaters.

### **levee**

A linear earthen ridge that divides areas hydrologically, and can be used to protect inhabited areas from flooding. Many natural levees have been reinforced with additional soil, rock, concrete, and/or grass. Levees are also known as **dikes**.

### **LIDAR**

Light Detection and Ranging (LIDAR) is a remote sensing method that uses a pulsed laser to measure variable distances to the earth. LIDAR systems help scientists and mapping professionals examine both natural and manmade environments with greater accuracy. LIDAR is one of many tools used to create more accurate shoreline maps and digital elevation models.

### **marsh**

A wetland that is frequently inundated with water and characterized by soft-stemmed vegetation adapted to saturated soil conditions. Nutrients are typically abundant, allowing plant and animal life to thrive in these areas. Marshes help reduce flood damage by slowing and storing flood water. As water moves slowly through a marsh, sediments and other pollutants settle to the marsh floor. Some municipalities are now building urban wetlands to harness these natural processes in cleaning stormwater and wastewater.

### **Multiple Lines of Defense**

A core concept of the importance of naturally-occurring and manmade features in protecting inhabited areas from the direct impact of storms. Manmade features include levees, flood gates, pump stations, elevated structures,

highways that serve as ridges, and hurricane evacuation routes. Natural features include offshore shelves, barrier islands, sounds, marsh land bridges, and natural ridges.

### **National Flood Insurance Program (NFIP)**

A national program providing flood insurance to property owners. The NFIP also works to mitigate the impacts of flooding by encouraging floodplain management regulations and promoting the purchase of risk and flood insurance. The NFIP is run through the Federal Emergency Management Agency (FEMA).

### **outfall**

The pipe, channel, or opening through which water is emptied into another body of water, such as a river or bay, or the location where such discharge occurs.

### **oxidation**

The decomposition and compaction of organic matter that occurs in the presence of oxygen. Oxidation is a primary cause of subsidence in areas where highly organic soils with lowered water tables are exposed to oxygen.

### **peak rainfall**

The duration or point in a rain event when rain is falling at its highest intensity.

### **peak discharge**

The highest volume of stormwater runoff or sewage exiting the drainage system and flowing into a waterway.

### **periodic inundation/permanent inundation**

When water is present in a landscape, such as when designed for stormwater storage, occasionally and for a short amount of time, compared to always being wet, such as in wetlands.

### **pervious paving**

Materials for walkways, roadways, and parking lots that allow stormwater to be absorbed by the ground where it falls, reducing runoff into the drainage system.

**pluvial**

Of or relating to rainfall.

**pump, pumping**

The mechanical removal of water from an area. When pumps remove groundwater in addition to stormwater, it can cause subsidence.

**pumping capacity**

The volume of water that a pump station can move over a given period of time, typically measured in cubic feet per second (cfs).

**rain garden**

A shallow excavated basin that collects and cleans stormwater runoff on a small scale. Soil layers and plantings are designed for **infiltration** and the removal of pollutants.

**resilience**

The capacity to anticipate potential threats, reduce a community's vulnerability to hazard events, respond to and recover from specific hazard events when they occur, and adapt to changing risks and hazards.

**repetitive loss**

A repetitive loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the **National Flood Insurance Program (NFIP)** within any rolling ten-year period, since 1978. A RL may or may not be currently insured by the NFIP. Currently, there are over 122,000 repetitive loss properties nationwide.

**retention**

The holding of stormwater permanently in basins, ponds, or cisterns. **Retention basins** allow stormwater to infiltrate the ground, and for the collected stormwater to be repurposed for other uses such as irrigation.

**retrofit**

A measure taken to adapt existing infrastructure or buildings to operate more efficiently and effectively, without having to completely rebuild existing systems.

**risk**

A predictive measure of harm or loss due to the likelihood of a hazard occurring, and the consequences of such an event.

**runoff (surface runoff)**

Stormwater flowing from rooftops, streets, and other surfaces that neither infiltrates into the ground nor evaporates, but instead collects and must be drained away in order to prevent flooding.

**saltwater intrusion**

When the flow of freshwater, such as from a river or groundwater in the soil, is not sufficient to balance the flow of saltwater from encroaching into aquifers. Normally, freshwater flows towards the sea, and prevents saltwater from dispersing farther inland.

**sea level rise**

An increase in the mean sea level, caused by changes in air temperatures that are linked to global climate change. Sea level rise poses a growing risk to low-lying coastal communities.

**slow, store, discharge**

A new approach to stormwater management: slow water as it hits the ground, create spaces in the city to store water and use it as a resource, and discharge into larger water bodies when tides allow.

**stormwater**

Commonly called rainfall, the water from precipitation (and snow or ice melt). Stormwater can infiltrate into the soil, remain on a surface and evaporate, or become **runoff**.

**stormwater management**

Techniques, methods or policies that control planning, maintenance, and regulation of stormwater (rainfall).

**subsidence**

The sinking or compaction of land relative to sea level. Subsidence can be caused when stormwater is unable to penetrate the ground due to impervious surfaces, or by the excessive pumping of groundwater. As groundwater is removed, the soil from which it is drawn compresses and highly organic soil layers are able to oxidize. Subsidence damages buildings, streets, and other infrastructure, and its effects are irreversible.

**surge**

The rise in seawater caused by a storm. Surge is generated by the force of winds pushing water towards the shore. This is commonly referred to as **storm surge**.

**sustainability**

The ability to manage human and natural resources in a productive and holistic way in order to support future generations. Generally, sustainability often refers to resource consumption, such as water or energy, and global climate change.

**swale**

A linear depression in the landscape constructed to slow or convey stormwater. Some swales feature vegetation and soil media meant to slow and filter water; see **bioswale**.

**tidal action**

The process of fluctuating water levels between low and high tides.

**topography**

The position and **elevation** of natural and artificial features in an area, and also the study of the surface shape and features of an area. Topographic maps and models provide graphic representations of features that appear on the earth's surface, including infrastructure and development, waterways and water bodies, relief (mountains, valleys, slopes, depressions), and vegetation.

**water assignment**

The volume of stormwater for a given rain event that exceeds the total storage and pumping capacity of a **catchment area**. The water assignment provides a rough measure of flooding that may occur if such an event were

to occur, without taking into account finer variations in rainfall intensity and distribution that determine the actual impact of each rain event.

**water balance**

The calculation of the various inputs and outputs of water in an area, including rainfall, groundwater withdrawals, drinking water withdrawals, and both stormwater and sewage discharges.

**water literacy**

An understanding of how water impacts and functions in a given landscape—where water is coming from, how it is used, how it is stored, and risks and opportunities associated with water.

**water quality**

A measure of how suitable water is for a particular type of use (such as drinking or bathing) based on physical, chemical, and biological characteristics such as temperature, turbidity, mineral content, and the presence of bacteria.

**water table**

The boundary between water-saturated soils and unsaturated soils. Typically, deeper soil layers are saturated with water while those closer to the surface are drier. The water table is the depth between ground surface, or “grade,” and groundwater.

**watershed**

A land area, and distinct hydrological entity, where all water drains to the same point. See also **catchment area**.

**weir**

Barriers that alter the flow of waterways to prevent flooding, to store water, or for navigation purposes, while allowing the steady flow of water over the top of the structure.

**wetlands**

Ecosystems that are saturated with water, including bottomland hardwood forests, swamps, marshes, and bayous. The presence of water drives the nature of soil development, as well as characteristic plant and animal communities living in and above the soil. Wetlands are natural storm buffers that store and filter runoff.