Watershed Events

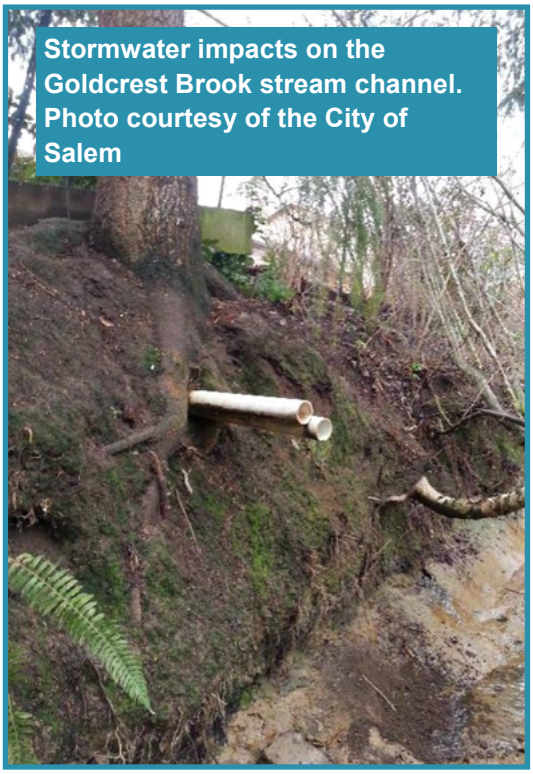
Glenn and Gibson Creeks Watershed Council
Summer 2024

Challenges of Urban Streams: balancing stream health and habitat values with stormwater conveyance.

Urban streams are challenged in many ways and Salem's streams are no exception. Complex ecosystems supporting a web of aquatic and terrestrial life, they are also stormwater conveyances. Impervious surfaces that come with development - roofs, streets, sidewalks, parking lots, landscaping - carry stormwater directly to our streams. In order to legally do this, the City must obtain a permit from the Oregon Department of Environmental Quality. The City's web page explains:

*The City of Salem operates under a National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit that addresses water pollution by regulating discharges that come from point sources. The City of Salem's stormwater outfalls discharge directly into local creeks and the Willamette River and are thus considered point sources. Regulations are in place to help meet water quality standards for the designated beneficial use of the waterway. Examples of beneficial uses are for fish and aquatic life, water recreation, fishing, and domestic water supply.** **https://www.cityofsalem.net/government/shaping-salem-s-future/reports-studies/stormwater-permits-and-annual-reports**

Salem's stormwater system is complex and has evolved over time to comply with changing needs and federal and state laws. Stormwater system design standards began with systems designed to provide drainage to natural waterways as quickly as possible. Current system standards require stormwater discharges to better match pre-development flow discharges to address forces that contribute to hydromodification. In many parts of the Glenn and Gibson Creeks Watershed, we live with the early parts of the stormwater system and the resulting environmental impacts.



Stormwater impacts on the Goldcrest Brook stream channel. Photo courtesy of the City of Salem

When development occurs, the watershed is hardened. Forests and fields change to roofs, driveways, streets, lawns and sidewalks. Rather than infiltrate, precipitation runs off, carrying accumulated deposits and debris. To prevent flooding, the City's Stormwater System, a complex system of pipes and retention basins, captures stormwater and conveys it to natural waterways.

This newsletter is the first of a series of three issues designed to provide information about the impacts of the storm-water system to our natural stream ecosystems; how the City attempts to mitigate or moderate these impacts; and finally, what landowners and residents of the watershed can do to assist and to amplify those efforts.

In this issue, the focus is on hydromodification and how it impacts stream ecology.

Hydromodification

Hydromodification is the alteration of natural stream and river channels, or the hydrology of a watershed away from their natural state. One of the causes of hydromodification is development that increases runoff volume, timing, or velocity.

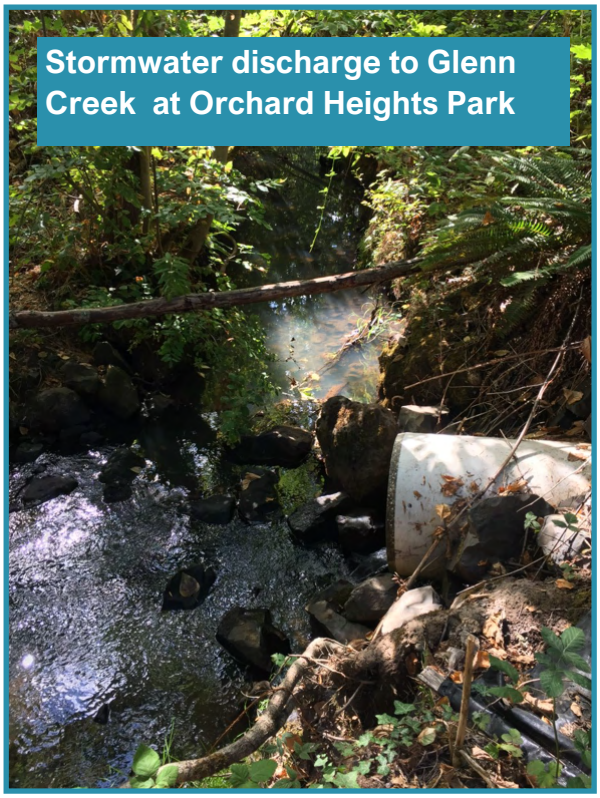
Hydromodification can have negative impacts on surface waters, groundwater levels, and aquatic and riparian habitats. For example, it can reduce the suitability of streamside habitats for fish and wildlife, and alter water temperature and sediment type patterns.

According to the epa.gov website,

*Perhaps the **most defining characteristic of urban streams** is the **increased amount and rapidity of stormwater or surface runoff** to those systems.*

How Does Stormwater Runoff Affect Streams?

- It alters natural hydrology, generally leading to **more frequent, larger magnitude and shorter duration peak flows**.
- It **alters channel morphology**, generally leading to changes such as increased channel width, increased downcutting and reduced bank stability.
- It **alters in-stream hydraulics**, affecting biologically important parameters such as water velocity and shear stress.
- It disrupts the balance between sediment supply and transport, generally leading to **increased sediment transport capacity and channel erosion**.
- It **increases stream temperatures**, due to the transfer of heat from impervious surfaces to stormwater runoff.
- It **increases delivery of pollutants** from the landscape to the stream. Pollutants commonly found in stormwater runoff include:
  - Sediment
  - Nutrients
  - Pesticides
  - Organic pollutants
  - Oil and grease



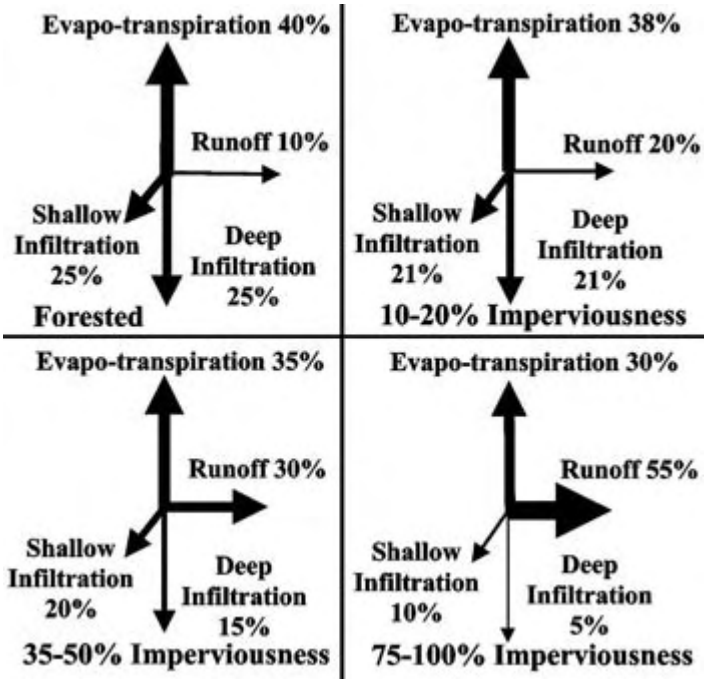


Figure above: The shift in relative hydrologic flow in increasingly impervious watersheds. Note the large increase in stormwater runoff as imperviousness increases at the expense of infiltration.
From *Paul MJ & Meyer JL. 2001. The ecology of urban streams. Annual Review of Ecology & Systematics 32:333-365.* © 2001 by Annual Reviews. Reprinted with permission.

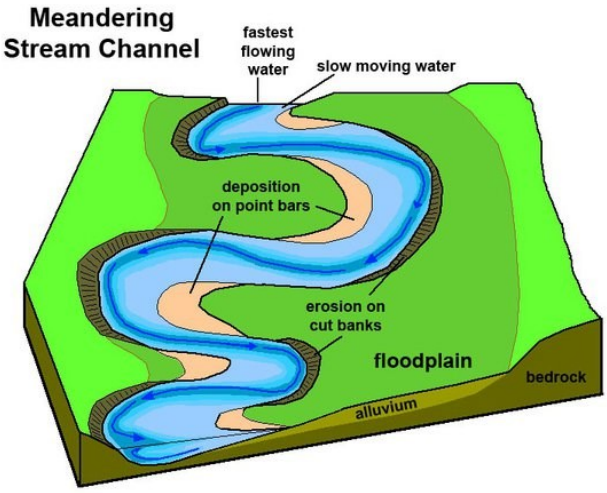
What is a Healthy Stream?

Because the Glenn and Gibson Creeks Watershed has been so altered by agriculture and suburban and urban development, residents have become accustomed to degraded streams. It is important to understand the difference between a healthy, functional stream that supports a varied and diverse ecosystem and a stream that is channelized, isolated from its floodplain, has a lowered water table and supports a diminished and degraded ecosystem.

The following is taken from The Shape of Healthy Streams; Characteristics of Natural Watercourses, a publication of the Minnesota Department of Natural Resources.

Channel stability is an important factor determining a stream's overall health. A stable stream is defined as one that can transport water and sediment while maintaining the channel's width, depth, pattern, and longitudinal profile. Stable streams have predictable shapes based on their watersheds. These shapes are dynamic but their proportions stay relatively unchanged. A stable stream is much less likely to have erosion or sedimentation problems than a disturbed stream.

Rivers and streams of all sizes naturally tend to meander, and the way a channel meanders from side to side is referred to as the stream's pattern. Meandering is a fundamental characteristic of flowing water and is critical to the physical stability of the channel and the health of the stream. By increasing the distance that water travels, meandering lowers the slope of the channel. This reduces the water's velocities and tendency to erode the river's banks and bed.



The following is taken from the
Ohio Watershed Network,
"How Do I recognize a Healthy Stream?"

Intact Riparian Corridors and Floodplain Connection:

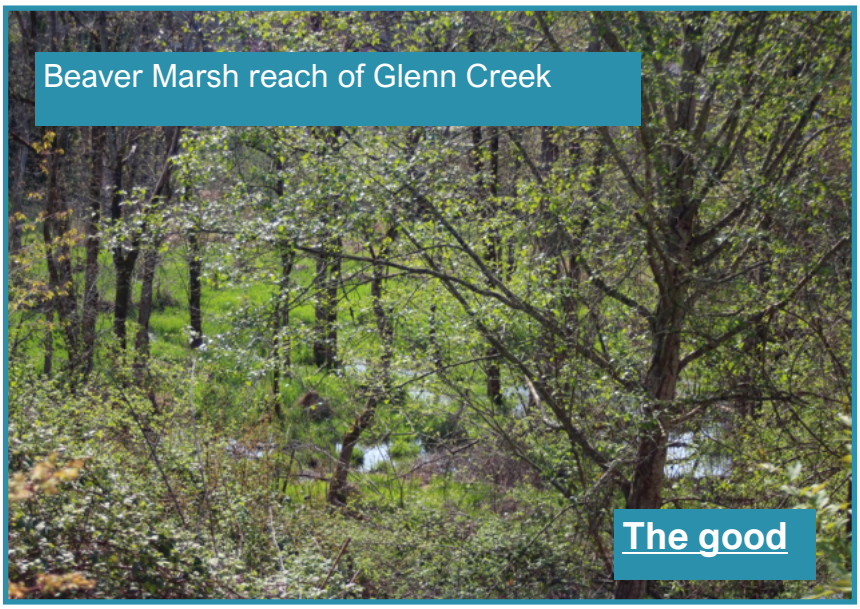
A healthy stream has a vegetated floodplain that is connected to the stream. The land next the stream that is often called the stream bank, riparian area, or floodplain. We often say that a floodplain is connected to a stream and they work together to maintain stability and water quality. A healthy floodplain is important because it protects the stream from activities that occur on the land; it helps the stream move sediments and breakdown nutrients; it slows down and absorbs excess water on the land, which helps protect property owners from floods; and it provides habitat for a variety of life such as birds, salamanders, and frogs.

In order to prevent erosion, increase property value, and improve water quality, think of and manage the floodplain as the area where the stream rules. This area should be the place on your property where the stream can flood and move around as much as it needs to in response to changing landscape or weather conditions (e.g., the building of a new subdivision or a large storm event). Managing the floodplain in this way will protect the rest of your property and your neighbors properties from flood damage and will improve the overall health of the stream. A floodplain that becomes disconnected from the stream does not protect the stream and can cause problems for landowners. Floodplains can become disconnected from streams when too much water gets into the stream too quickly for it to adjust itself.

The Balancing Act between Healthy Streams and Stormwater Management

We care about this balance because of the high habitat value of healthy, well-functioning streams and riparian areas. Currently, parts of our stormwater system allow unchecked and unfiltered stormwater to enter directly into our streams and we live with the consequences of a degraded stream system and habitat loss. How to store, filter, and slowly release stormwater without compromising stream structure, water quality, and habitat value is the challenge.

Our stormwater system simplifies watershed hydrology to an engineered system of pipes. It is expensive in many ways. Over time, it has evolved, but continues to impact our stream systems. Can the balance shift toward stream health? How can the shift happen?



The "bad" and the "ugly" parts of this page are examples of how the stormwater system has impacted our streams over time. The "good" is what happens when we leave it to the beavers. Our hope is to look toward restoration and toward a stormwater system that mimics the beavers; slows and filters stormwater, allowing room for streams to meander and to connect with floodplain, allowing habitat that supports biodiverse ecosystems.