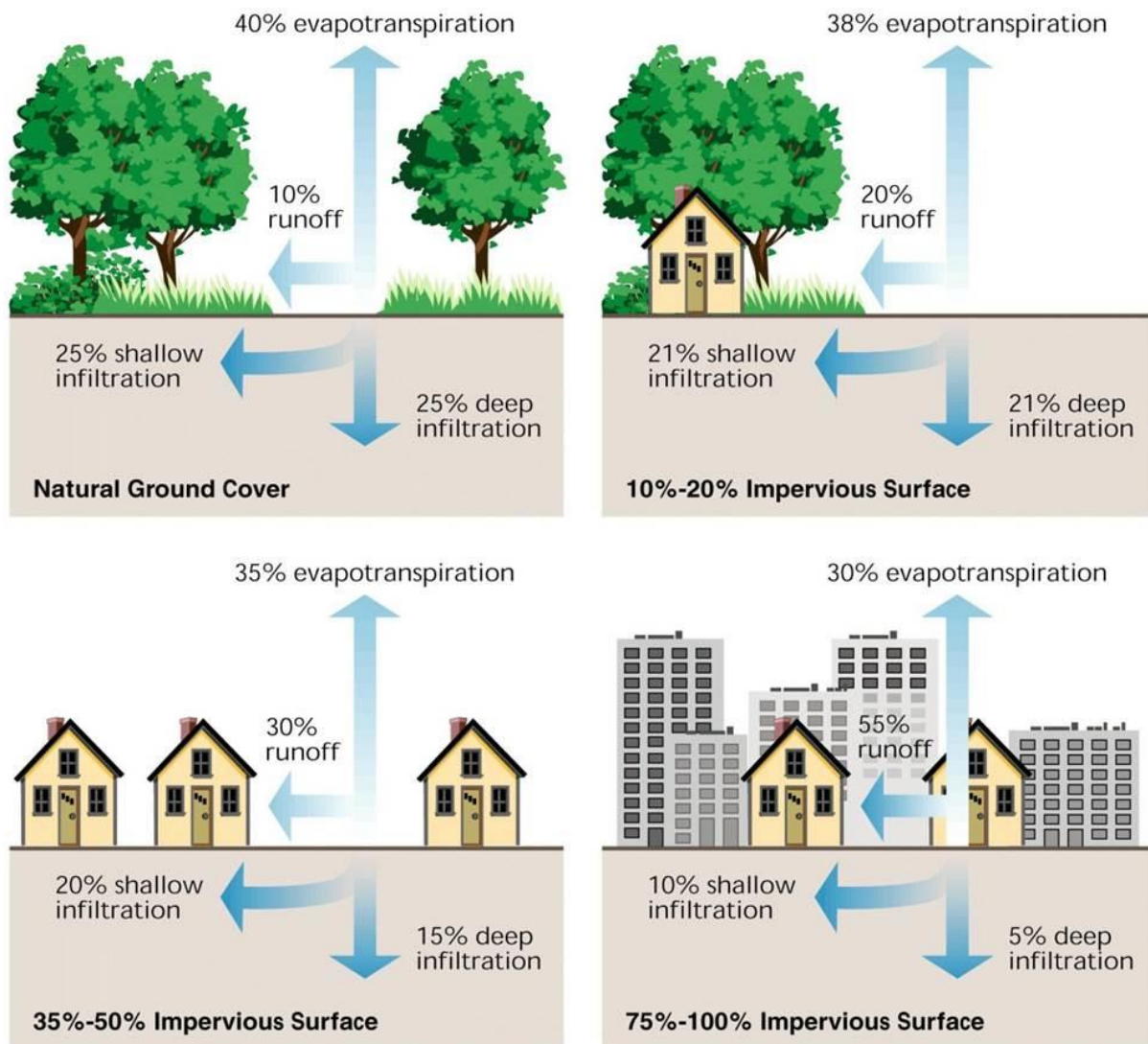


Influence of water on land

In this photo, silt conveyed by the river is forming new land – a delta.

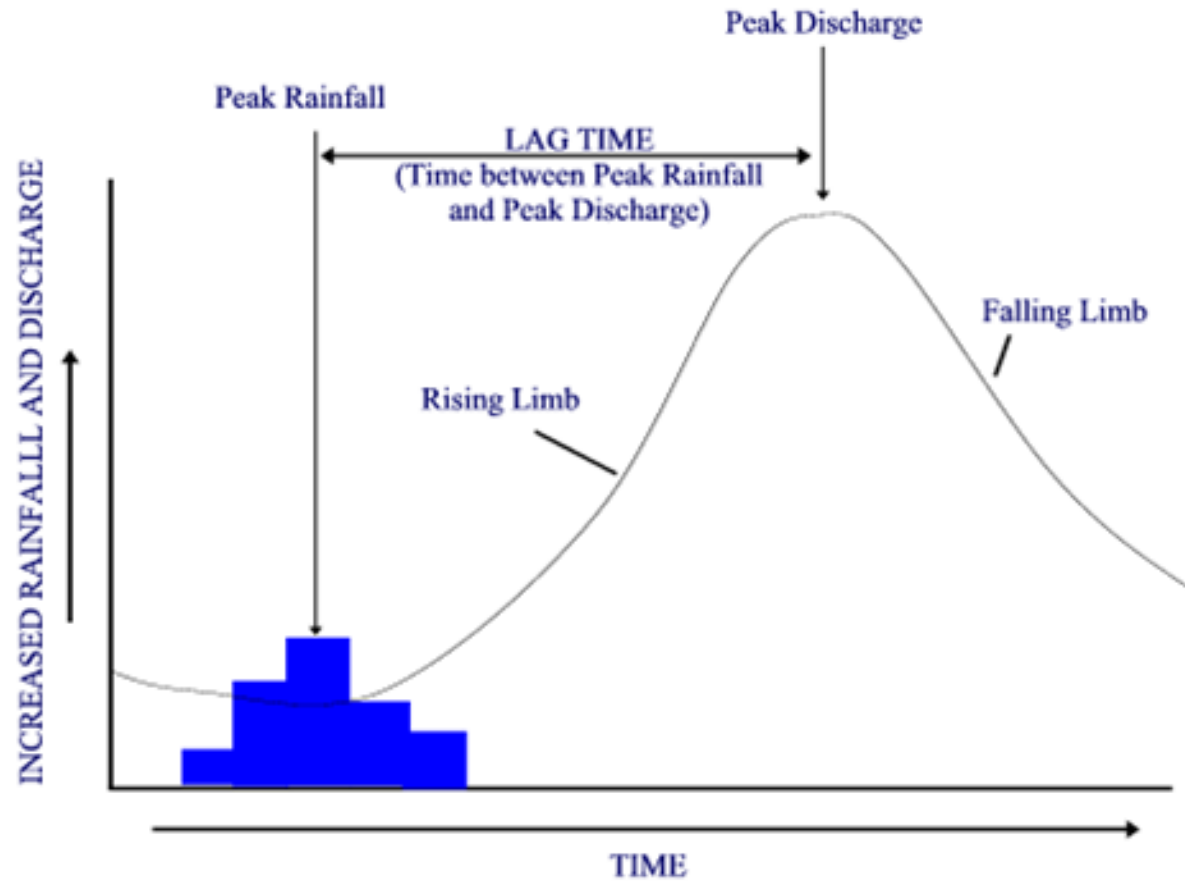


This graphic shows how converting native vegetation to development can change how water moves. As the amount of impervious surface grows, the amount of runoff increases, and the amount of infiltration and groundwater recharge decreases. Evapotranspiration doesn't decrease much, but changes from transpiration –dominated to evaporation-dominated.

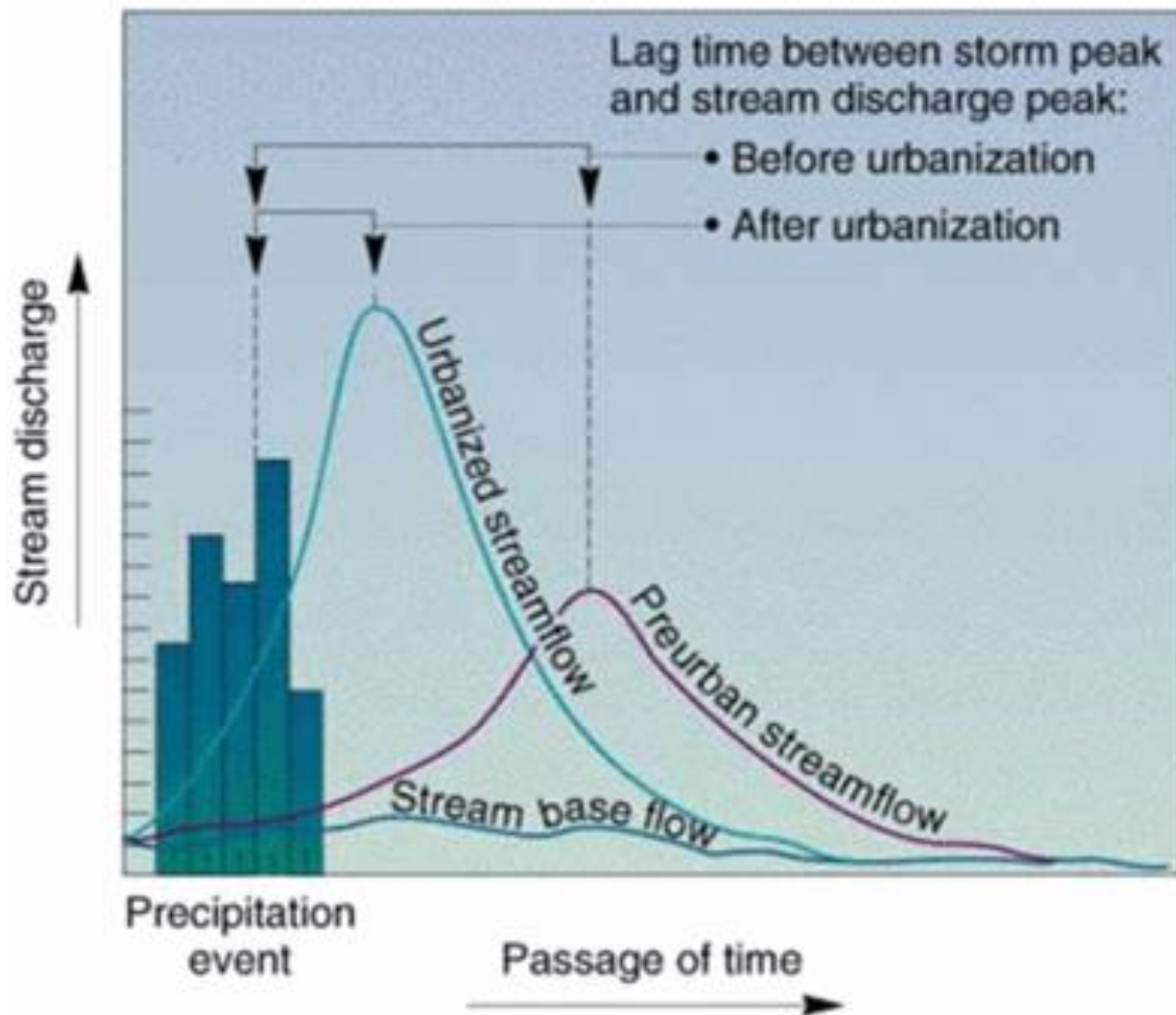


We use hydrographs to display the movement of water past a particular point. In this case, let's call it a monitoring station in Minnehaha Creek. There are several key concepts in this hydrograph. First, the hyetograph shows the rainfall event. Prior to and during the rainfall, flow in the Creek is low. As the rainfall is converted to runoff and moves through the drainage system to the Creek, it starts to rise. At some time in the event, flow reaches its peak, and then starts to fall again as no more stormwater gets

to the Creek. Eventually, it gets back down to where it was before the storm. Note that there is a Lag Time between when the storm reaches its peak and the Creek reaches its peak.



This hydrograph shows the stream response before development and after development. Prior to urbanization, much of the rainfall infiltrated or evapotranspired and the flow in the stream rose and fell gradually. In urban landscapes, not only is there much more impervious area generating more runoff, there are also storm sewers and channels conveying stormwater to the stream. The stream starts to rise almost immediately during a rain event, and reaches a higher peak flow much more quickly than under preurban conditions. Almost as important, it falls back to base flow very quickly. We call this being Flashy.



These next two photos are of the same stream, upstream and downstream of urban development. The flashy streamflows have destabilized and eroded the streambanks. Compare the bank heights. The flows have also caused the stream to scour and deepen.





Development and increased imperviousness increases runoff and flashiness.

The next photo is of Shingle Creek in Brooklyn Park following a 3-hour, 2-year event. Note the creek is almost as high as the bottom of the foot bridge.



Two hours later, a line of debris on the bank shows how high the creek rose. That's a flashy stream.



Increased imperviousness means less water infiltrates to the surficial groundwater that keeps our lakes, streams, and wetlands hydrated. The level of base flow, or the amount of water that is always in the creek, decreases.

The next photo is of Shingle Creek in another area of Brooklyn Park in late August during a dry spell. There is not enough groundwater to keep a steady flow in the creek.



The types of vegetation that wetlands can sustain may change from more hydrology-sensitive species to hardier monotypes such as cattails. Or, the wetlands may lose their wetland characteristics altogether. Streambanks can be destabilized and contribute more sediment to the stream, which in turn limits the fish population. And the impacts are not limited to urban development. Extensive tiling of farm fields acts like storm sewer, swiftly conveying runoff from rain events to agricultural ditches and streams where flashy flows have similar impacts as to urban streams.

- Urban runoff and flashiness
- Decrease in stream baseflow
- Changes to wetlands
- Streambank instability
- Agricultural stream degradation

Duck Creek in Davenport, IA. This streambank is downstream of an agricultural area with extensive tiling. It gets worse downstream, with city runoff added to streamflow. The orange dots are where stream pins were installed to monitor the rate of erosion.



Learning Activity

In the Discussion Forums, write a short paragraph suggesting one thing you and your neighbors could do to reduce the impact of development in your neighborhood on local water bodies. Take into consideration where you live, how much impervious surface there is, what your neighbors do with their property. Keep it simple.