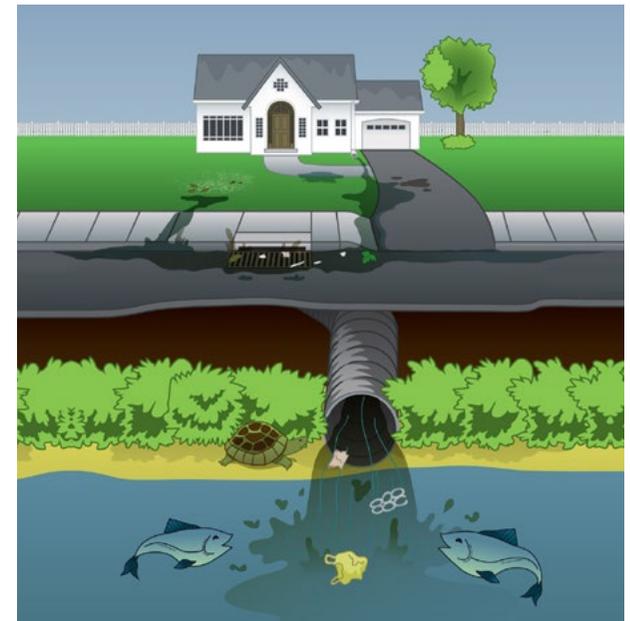


# Stormwater Runoff in the West Fork Watershed



In southwest Montana, the West Fork of the Gallatin River drains Big Sky, Moonlight Basin, the Yellowstone Club, and the Spanish Peaks resort areas into the mainstem Gallatin. High rates of development in recent years make water quality a major point of concern.

Vegetated soil that easily drains deeper into the ground is often covered during development, creating what are called “impervious surfaces.” Roads, sidewalks, and parking lots prevent water from infiltrating into groundwater storage. This water that is not stored may be quickly transported to nearby stream habitat, carrying sediment and other pollutants with it.



Consider summer thunderstorms over the town center in the Big Sky Meadow Village: 30 years ago, most of the rain would have infiltrated through grass and soil into groundwater; presently, rain is far more likely to land on streets or parking lots, flow into storm drains, and quickly end up in the river.

A study using satellite imagery at a resolution of 30 meters classified nearly 26% more land as impervious surface in 2005 compared to 1990.

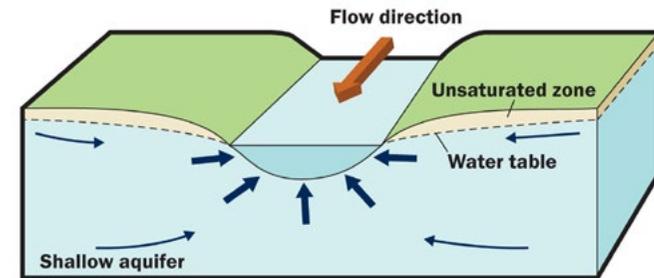
*For a longer-term perspective, the images below showcase how land surface has changed in Big Sky from 1984 to 2016. Lone Peak is visible on the left. To view a fluid timelapse, see the link below.*



[goo.gl/JXgfHF](https://goo.gl/JXgfHF)

Impervious surface area has undoubtedly increased since 2005. Further development is likely to cause lower summer stream flows and more pollutants in stream water, unless it is accompanied by storm water management practices that mitigate the effects of impervious surfaces.

Rainstorms and snowmelt can add a lot of water to rivers, but streams that naturally flow all year usually come from groundwater reservoirs. During late summer in Big Sky, the majority of the water in rivers and streams ultimately comes from water stored in the ground.



When impervious surfaces increase, less precipitation replenishes the storage in groundwater- the source of summer surface water. Consequently, “base flows,” or low flows, are reduced because this storage has been depleted (much like a bank account with debits that consistently exceed credits). Less water in rivers and streams can significantly harm fish and other aquatic life.

Water that used to end up in groundwater now flows rapidly down streets and into streams, carrying oil, sediment, and harmful chemicals bonded to sediment with it. The Middle and South Forks of the West Fork and the West Fork of the Gallatin itself are currently designated ‘impaired’ by the Montana DEQ standards in terms of sediment load.



Research suggests that aquatic ecosystems could be the first amenity to suffer in the West Fork watershed and beyond in the Upper Gallatin, because they are sensitive to low levels of imperviousness.

Lower flows can harm aquatic life because:

- Less cold groundwater addition to streams can lead to warmer stream temperatures, reducing habitat for cutthroat trout and other cold-water fishes
- Warmer streams cannot hold as much dissolved oxygen to support fish and the aquatic insects that feed them

Increased sediment:

- Harms the food chain that supports fish by scouring organisms off of surfaces, scraping and damaging important body structures, and introducing harmful chemicals
- Hurts important fish species by clogging their gills and covering up their eggs (not allowing them to “breathe”)

## What is the Solution?

To mitigate the negative impacts of impervious surfaces, “green” stormwater infrastructure and Best Management Practices (BMPs) should be implemented. Structures, like detention ponds and infiltration basins, and vegetative implementations, like rain gardens and bioswales, reduce and treat stormwater while delivering social, environmental, and economic benefits.

For example, vegetative BMPs include a variety of landscaping practices. Grassed swales (ditches) and filter strips can be strategically placed in residential areas to help reduce stormwater runoff through infiltration and storage.



BMPs and green stormwater infrastructure would be most useful in the Mountain Village and Meadow Village areas because of their dense impervious surface compositions.

For more information on stormwater and how to deal with it, click here: [goo.gl/10kKxi](http://goo.gl/10kKxi)