



Run Off!

Why storm water is an issue when you go to build your dream house.

By V. Donath and Charlie Bancroft

So you're at the zoning office or talking to your contractor and storm water is mentioned. You start to hear about impermeable surfaces, erosion, bio retention, LID, hydrology, permeable paving — and suddenly you're in over your head. You went to talk about the cute cape with breezeway and two car garage and now they want you to think about rain and water and where it goes when it drains away.

This may surprise you, but in towns across the United States, how you plan and build is really as important as what you build. So let's start with storm water and why it is such an important consideration when you build anything.

Storm water is the accumulation of water that results from a rain storm or shower. In urban areas, as soon as storm water hits paved areas, it is quickly channeled into storm sewers or streams. In rural areas, it may slowly seep through the ground into nearby streams or rivers or into the ground water, filtered by the soils, trees and grasses. When the soil cannot absorb all the rain water, culverts may carry some of it away, but, in most cases, excess water (sheet flow) travels across the land toward

the nearest water body, slowed only by the land's natural contours and vegetation. That's the natural process.

When you build your home, that natural process is altered. Storm water hits impermeable surfaces like the roof of your house and outbuildings, driveways and parking areas. You think of a driveway as the way to get to your house. In the storm water world, the driveway is one huge impermeable surface. Even excavation for a driveway typically disturbs the natural slope of the land and alters the flow of water across the land. The heavy construction equipment used for construction compacts the ground it drives over, making the land itself impermeable too.

Now your property no longer has the same amount of permeable land for filtering storm water. And, most likely, the contours of the land have been changed too, so the natural flow and absorption of storm water is changed. As

a result, more erosion may occur, damaging your property or your neighbor's. (Remember when your friend roughed in his driveway and it rained and most of the soil ended up in a heap at the bottom of his drive?) More sediment and pollutants reach the ground water, rivers and streams, adversely affecting water quality. (Own a dog or horse? Runoff collects barn yard and pet waste, too, not to mention the oil, gasoline and other toxics that accumulate on drives and parking areas.)

A little planning could have avoided this mess.



So your new home, added to all the other homes in the area, has an accumulated effect on erosion and water quality. Now consider commercial developments, where buildings and parking lots are much bigger. When the storm water hits those impermeable surfaces, the rest of the undisturbed land may no longer be able to slow the water or filter it before it goes into the stream, rivers or ground water. Commercial development also adds an extraordinary amount of automotive pollutants, salt and sand from winter de-icing, and litter.

When storm water enters streams and rivers at greater speeds and in greater amounts, often carrying pollutants, flooding, erosion and degradation of the water can occur. Your town's stream and rivers suffer from siltation. Erosion may damage the stream banks. Like to fish in that stream? Aquatic life has a harder time surviving. Rivers become muddied and unattractive and are less able to support fish. If you have a tourist based economy, that may affect business.

By the way, is drilling a well part of your project? You will be tapping into ground water for your water supply. Less erosion and good storm water controls will make your drinking water much cleaner and safer. Getting water from your municipality? They probably pump their water from the same ground water.

So, thinking a little differently about your dream home? It sounds like

you're going to have another expenditure to budget for. But don't worry. Engineers have designed low cost, efficient ways you can build your dream house AND protect your town's streams and rivers.

When you build a house, barn, garage, driveway and parking area, one goal is to try to keep the original filtering system as intact as possible, and to keep the water flow and direction as close to the natural state that existed BEFORE you built. This is called "replicating the original hydrology."

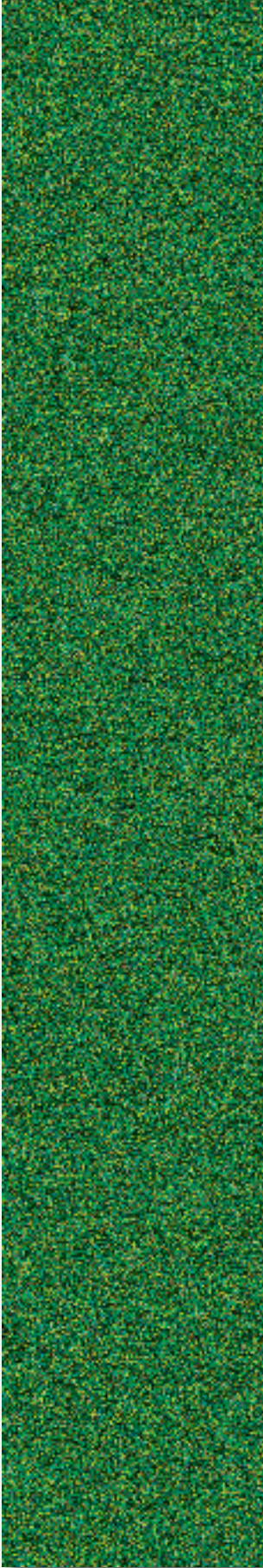
Using low impact strategies and building this way is called low impact development or design (LID). Ok, another of those geek terms. Most times the LID techniques are extremely effective and much less expensive than elaborate engineered solutions. Not surprising, the benefits of LID are many: increased greenery, improved wildlife habitat, enhanced wetlands, pollution control, greater curb appeal, cleaner ground water and decreased flooding. All of this adds value to your land and to your enjoyment of it.

Thinking ahead can save you money and help you end up with a home that's better situated on your land. Let's start with some ideas to consider BEFORE you start building:

- 1. Talk to your contractor** or architect and tell him/her that storm water control is a concern of yours. They can suggest new techniques you may not be familiar with.
- 2. Build two-story buildings** rather than long extended one story structures. This reduces the size of your roof (an impermeable surface).
- 3. Ask about using permeable concrete and asphalt.** On flat parking areas near your home they might be perfect. They're strong, but you can actually pour water right through them!
- 4. Before constructing buildings,** explain to the contractors that you want to keep the construction vehicles from compacting large expanses of land. Limit heavy equipment to certain areas you have marked off with surveyor's tape.
- 5. Design the driveway to travel gently along the contours of hills and valleys,** avoid deep cuts into slopes and the need to use large amounts of stone (rip rap) to decrease the chances for erosion.
- 6. Don't build on the highest elevation of the property.** You will avoid long stretches of extremely steep driveways which speeds the flow of rain water and prevents slower, natural absorption. Keep the driveway as narrow as possible and, when conditions allow, keep it as short as possible. Remember your driveway is one long impermeable surface. (Added benefits to keeping it short: it's less expensive to maintain in the winter and easier to get to your home after a snow storm.)
- 7. Plan the driveway entrance and culvert placement** in coordination with your city or town officials to avoid unacceptable erosion or siltation.



Bad driveway runoff can turn roads into rivers



8. Plan the location of your driveway with your neighbors in mind. In some town and cities there is no restriction as to where you may place your drive. It can be right on your boundary. A poorly designed drive could flood your neighbor's land or basement.

9. Consider carefully the fact that trees, shrubs and grassy areas slow the flow of storm water, which allows the land to absorb it. This not only prevents erosion but also helps prevent pollutants from reaching rivers, lakes and ground water. So think carefully before removing trees, bushes, shrubs and grassy areas. (Studies show a direct relationship between increased size of wooded areas and lower costs of treating drinking water!)

10. Build as far away as possible from existing streams and rivers. Pay attention here, as towns and villages are getting tough about protecting those streams from your storm water run off - and with good reason.

“The aim is to catch and treat stormwater close to its source”

Now we're ready to talk about those LID techniques (low impact development or design) This is just so you don't have that vacant look when your contractor says we need a "bioretention area" here. We'll start with the cheapest and easiest. But remember, several of these techniques can and should be used together to reduce the volume of run off and spread the run off over multiple sites. The aim is to catch and treat the stormwater close to its source to avoid erosion caused by multiple channels of fast running storm water.

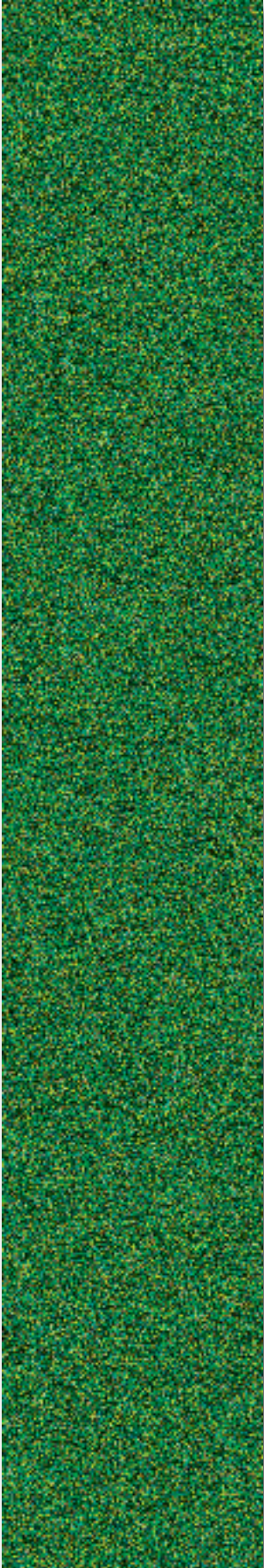
Grassed areas catch, slow and promote evaporation of the rain water. (These are called bioretention cells or biologically enhanced practices). They can be buffers, beds or pond like areas. Ponds can drain or hold water over a period of time. Here are some helpful ways to use natural buffers:

A. Construct a grassed or garden area (rain gardens) near structures to catch the rain water that comes off roofs. If gutters or your roof direct the rain water to one place, this is the perfect location to dig a depression and choose plants that will tolerate extreme moisture. Most states now have online resources to help you plan and construct this simple but effective storm water control.

B. Construct multiple vegetated ditches or depressions (swales) along a driveway or downhill from larger structures to slow the storm water and filter sediment. This prevents water from reaching great speeds and volumes and helps the water's slow absorption into the soil.

C. Construct strips of heavily planted grassed areas (filter strips) to catch, slow and absorb rain water from large parking areas. These can be built in conjunction with the vegetated swales which direct remaining water to different locations.

D. Construct cisterns to collect the rain water for your irrigation and watering. If you have municipal water, your water bill will probably go down. If you have a gutter system, a cheap and easy alternative is to buy and install a rain barrel to catch the rain water that comes off the roof.



E. Build underground dry wells. The water enters a stone lined gravel filled depression which allows it to be slowly absorbed into the ground.

F. When building your driveway, consider a center strip of grass rather than a solid gravel or paved driveway. The grass absorbs some of the rain fall and it is pretty easy to maintain. In colder places, if the grassed strip sits a little lower than the gravel or pavement, plowing is not a problem.

If you have purchased an exceptionally steep piece of property you may need elaborate engineered (translation: more expensive) solutions to your storm water problems. These might include infiltration trenches or basins, blind ditches, dry ponds, wet ponds, wet vaults, pocket ponds, detention ponds, micro ponds. (we can go on and on). If you have purchased a lot in an established village or town, you may have to plan even more carefully in order to avoid affecting your neighbors. Talk to a licensed professional about your options.

When you plan ahead and build smartly, considering your neighbor and the health of the streams and rivers and ground water in your town, everyone benefits.
