What's Green About Green Infrastructure?

by Gerhard Epke and Sandy Guldman

Small, local flood management solutions, commonly described as Green Infrastructure, have received strong support during public meetings in the Ross Valley.

What Problems Does Green Infrastructure Address?

Stormwater runoff is a major cause of water pollution in urban areas. When rain falls on roofs, streets, and parking lots, the water cannot soak into the ground. Instead, it drains quickly through engineered collection systems (think gutters and storm drains) and is discharged into nearby creeks loaded with trash, bacteria, heavy metals, and other pollutants. High flows resulting from heavy rains also can cause erosion and flooding, damaging habitat, property, and infrastructure.

Green infrastructure can help clean runoff and slow it down. In addition, vegetation in Green Infrastructure projects sequesters carbon, can reduce temperatures in urban areas during hot summer weather, sometimes provides recreational benefits, and improves air quality. When rain falls in natural, undeveloped areas, the water is absorbed and filtered by soil and plants, and any stormwater runoff is cleaner. Even better, if floodplains can be restored, they accommodate water that would otherwise be flowing in low paved areas near creeks.

A Filterra storm drain inlet is located at the southeast corner of Rose Lane and Orchid Drive, in Larkspur. Photos by Sandy Guldman

What is Green Infrastructure?

Green Infrastructure uses vegetation, soils, and other methods to restore some of the natural processes required to manage water and create healthier developed environments. While single-purpose stormwater infrastructure—conventional piped drainage—is designed to move urban stormwater quickly away from the built environment and into creeks, Green Infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits. Here are some types of Green Infrastructure: downspout disconnection, rain gardens, bioswales, permeable pavements, green roofs, and trees. Open spaces incorporated in infrastructure can address water quality and flooding impacts while providing recreational opportunities.

Green Infrastructure and Flood Management

The relative sizes of floods can be described by how frequently a particular flow is expected to occur. A flood with a 1% chance of occurring in any particular year is traditionally referred to as the 100-year flood. These large floods occur when intense rain falls on ground that is already saturated from recent rains. The soil has no capacity for water to infiltrate and it runs off, overwhelming the stormwater infrastructure. In those situations, smallscale Green Infrastructure cannot stop the flooding because cisterns, swales, and small flood plains are also at capacity. However, in floods that occur more frequently, small-scale Green Infrastructure can make a big difference. These smaller floods are often quite damaging in local areas, so this is a major benefit of small-scale projects. (Friends is gathering quantitative information about ability of these facilities to accommodate storm flows. An article describing what we find will be in a future issue of Creek Chronicles.)

This close-up of the planted section of the Filterra unit shows accumulated trash, often discarded by students.

It is worth observing that many flood managers consider detention basins to be Green Infrastructure. However, in discussions of measures to reduce flood damage in the Ross Valley, the public has clearly demonstrated that it does not agree with that assessment. Some communities that have implemented Green Infrastructure describe some components as "floodable spaces" including detention basins, flood plains, and swales regardless of size.

Ross Valley Examples of Small Scale Green Infrastructure
Here are three examples of Green Infrastructure, two in Larkspur and one in San Anselmo:

Rose Lane Green Infrastructure

The Rose Lane neighborhood, located in the City of Larkspur and adjacent to Larkspur Creek includes a Filterra system. Stormwater runoff enters a drain and then flows through a filtering mixture in a landscaped container. Pollutants are removed from the stormwater, which then flows through underground drains into a swale about 550 feet long near Larkspur Creek, where the water slowly infiltrates. If the water in the swale gets very deep, it overflows into the creek.

The swale, about 550 feet long, is located at the east end of the Rose Lane development, parallel to Larkspur Creek. The swale filled after a big December storm, and is seen from Doherty Drive. Photo by Sandy Guldman

City of Larkspur Magnolia Avenue Green Infrastructure

The City of Larkspur has proposed a project to compensate for the increased impervious surface of the new Bon Air Bridge. This project would provide some relief from local flooding, would increase the number of trees and shrubs, and improve water quality. The project includes:

- Eliminating the second through travel lane in both directions on Magnolia Avenue for one block between Bon Air Road and Dartmouth Avenue and replacing the asphalt with landscaping,
- Providing curb cuts to direct street drainage into swales, and
- Installing an underground infiltration system.

Magnolia Avenue south of Bon Air Road and north of Dartmouth Avenue would have only one lane of through traffic in each direction, but the reconfigured intersections would retain two queuing lanes and left and right turn lanes at the Magnolia Avenue/Dartmouth Avenue intersection. Traffic experts do not expect significant worsening of traffic from the change. The City of Larkspur is studying alternatives to the Magnolia Avenue project, but some residents of Larkspur will almost certainly experience a loss of parking and/or travel lanes whatever alternative is selected.

San Anselmo Magnolia Avenue Green Infrastructure

The Town of San Anselmo is finishing designs for three municipal Green Infrastructure projects: bioretention at the Town corporation yard, bioretention in a street median at Greenfield Avenue and Lincoln Park, and reconstruction of the public parking lot at Magnolia Avenue. The parking lot is about 13,000 square feet, accommodates 30 cars, and the pavement has deteriorated. The original design for converting the lot to Green Infrastructure included a combination of permeable pavement and small rain gardens or tree wells wherein one parking stall would be lost. Local merchants have made it clear, however, that the loss of a single parking spot is unacceptable because of the associated losses in revenue. Constraining the final design to not lose any parking should be possible but will likely come at the cost of the rain gardens and trees.

Conclusions

The environmental benefits of Green Infrastructure are not greater than undeveloped areas, but compared to traditional engineering, this approach has several advantages, including reduced local flooding during small, high frequency events; better water quality in streams; and better air quality and more carbon sequestration from the trees and other vegetation that frequently replace pavement.

Right now, it appears that residents of the Ross Valley are all in favor of Green Infrastructure, unless it is located where it might inconvenience them. As advocates of Green Infrastructure, we need to do a better

job of demonstrating the benefits of individual projects so that the support for Green Infrastructure changes from an abstract concept to support for real projects