

one
green
city

Portland, Oregon

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History

The Change of the Hydrologic Cycle, or How the Car Ruined Everything

Way back, before the European settlers came to North America the native people were small in number, lived with the land, managed it to live on and most importantly, didn't know what asphalt was. The early city settlements were based on horse and pedestrian transportation. Technology improved, we got smarter and invented better modes of transportation: railroads and streetcars even though we still walked on our own feet quite a bit. There still was no such thing as asphalt, instead they paved in cobbles and bricks. Because they were individual rocks or bricks, when they were laid side by side they had a small amount of space between them for rain to get between. Storm drains weren't needed yet because there was no runoff or flooding. That natural hydrologic cycle still hadn't been altered to a great degree due to the still small populations and the current mode of transportation.

Then came the automobile, the vehicle that created asphalt, extensive



Storm Drain (Source: Portland Online)

paving, storm drains, storm sewers, giant pipes underground and flooding, all with one invention.

Currently, we pave around half a million acres of land over every year. (Ferguson, 1998) The car

changed the urban structure, roads changed to accommodate the car and streets became 50

percent wider for this reason. (Ferguson, 1998) The most important feature of this change in urban structure was the sheer amount of impervious surface introduced in the urban setting seriously altering the natural hydrologic cycle. The more the urban population grew the more streets that

were created. The more streets we created the more impervious surface we laid down and the more impervious surface we laid down the more rain water had nowhere to go.

The traditional solution to deal with all of that rain water was to send it underground, down pipes and into the closest water way. Storm sewers were created, storm drains placed on every street to capture all the rain water that ran down the streets. Soon the storm system would handle not only water from the roads but water from all parking lots, houses and patios. The typical motto was to get it down and get it out as fast as possible.

Portland Water History

Portland was no exception to this problem. They also had a combined sewer and stormwater system that was sent directly into the Willamette River and the Columbia Slough.

In the early 20th century, public concerns about water pollution and public health increased. Tests in 1927 showed that the Willamette flowing through Portland was severely polluted. By the mid-1930s, salmon fingerlings placed in the river died within 15 minutes. Pollution had robbed the river water of nearly all its oxygen. The untreated sewage also carried disease-causing bacteria and other contaminants into the river. Swimming was banned.

Citizens took action. More than 4,000 Portland schoolchildren held a rally outside City Hall in November 1938 to demand cleanup of the river. Later that year, Oregon voters initiated and passed the Water Purification and Prevention of Pollution Bill. A newly established State

Sanitary Authority began to enact wastewater treatment requirements for both cities and industries. (Portland Online)

Stormwater and sewage is still combined in most of Portland. There have been several large projects to manage all of the overflow including a solids

lagoon in 1970, compost facility in 1984, chlorine contaminant building in 1992, sludge cake handling facility in 1993 and the Columbia Slough big pipe in 2000, all at a staggering cost. In 1977 Portland initiated a stormwater utility fee to help pay for all of this management.



Stormwater Cycle (Source: City of Oxford)

The Natural Hydrologic Cycle vs. The Urban Hydrologic Cycle

In a natural setting, a forest, there is almost no rain water runoff. Trees intercept the rain and much of it evaporates back into the atmosphere. The soil is so pristine that the water is soaked up quickly where it is taken up by roots or it enters the groundwater which either feeds into a waterway or into aquifers underground. The natural cycle is very slow. It takes a long time for water that enters the ground to move. It's a complete cycle that begins

or ends with precipitation or snowfall. In a low density setting there is a

seventy percent permeable surface while in high density it's fifty percent and in complete urbanization it's only ten percent permeable. (Metro, 2002) That means in an urban setting ninety percent of all the rainfall that hits the ground goes through the storm drains. This water that in a forest setting would take days to years to reach a creek or river is now being done in a matter of minutes to hours in an urban setting. This is one of the major causes of urban flooding.

Aside from the slow movement of water, there are few pollutants in a natural setting. In an urban setting however, there are many pollutants that are picked up on the impervious surface and carried along down the storm drains. Some of those pollutants include oil and grease, heavy metals, toxics such as pesticides and bacteria. Unfortunately because the runoff went underground much of this was not realized for some time. The sewer system was combined with the storm sewers and as a result of rain runoff they often overflowed.

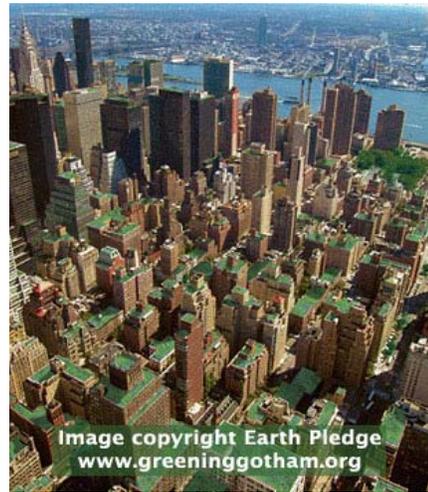


The Green Movement

Today there is a movement in the United States to 'green' up our urban centers and make them a more desirable place to live, work and visit. Many European cities have been experimenting with green efforts for many years and they're starting to catch on here and particularly in Portland. Many of the green efforts address the issue of storm water management and Portland is one of a

Eco-roof (Source: WERF)

couple cities leading the way in the states. Sustainability, green and eco-friendly are buzz words that have been gaining a huge movement in urban centers. There are many organizations that are capitalizing on this movement and publishing documents, offering incentives and educating the public. Metro in Portland has published a series of books all focused on greening the region. The City of Portland has written a Stormwater Management Manual that is used as a foundation for other manuals throughout the country. Seattle, Portland, Vancouver, Chicago and many other large cities are not only greening their cities, but bragging about their projects. It's becoming a feather in the cap for cities and they're featured in magazines, newspapers, online blogs and at conferences. It is the new city, the structure is changing and it's catching on very quickly.



Portland

The City of Portland has been developing a large stormwater program. As part of that overall program they currently have a green streets program, downspout disconnect, eco-roofs, roof gardens, vegetated swales, pervious pavers and many other methods to deal with the rainwater that falls in Portland.

Stormwater Management Manual

Portland's stormwater program began in the early 1990s in response to the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit issued by the

state to address water quality regulations. Portland began developing a stormwater management plan. (WERF)

Portland's Bureau of Environmental Services started to analyze what the city was already doing and what already complied with the new regulations. They then brainstormed new ideas of what they could start doing and worked with other departments closely. This was only the start and advisory councils were formed, policies reviewed city wide and many current systems were analyzed. Eventually they came up with a manual which is used as a template for many other cities as well as being referenced in many other documents.

Residential

Starting at a residential scale, they offer a downspout disconnect program that offers incentives to homeowners to disconnect their downspouts to prevent roof runoff moving straight into the storm drains. This has started to change the look of residential neighborhoods in a very interesting way. People are creative and given a problem they often find some very interesting solutions. Many houses have placed rain chains at house corners, scuppers that



Artistic scupper (Source: WERF)

shoot water away from the house, and also decorative gargoyles that concentrate runoff. Many of these creative ways to deal with runoff have come directly from Europe and they're spreading from houses to city buildings and schools and back again. It's really an easy sell to remove ugly, metal downspouts and replace with original, creative art. People like to be individualistic and these ideas are quite popular. The tradition of gutters may just be a thing of that past and these new, creative solutions are the future.

Green Roofs

Green roofs are definitely a European influence with Germany as the leader with 800 installed green roofs in the country. This is a piece that has been picked up very quickly and is spreading rapidly. There is already an entire conference devoted to nothing but green roofs going on its sixth year, as well as organizations all over the country.



The Multnomah County building has a green roof as does Metro's

Peoples Food Coop (Source: NPR)

Regional Headquarters. The City of Portland has even published a green roof tour map on their website which encompasses sixteen different sites, nine of which are in the center of Portland, and six more on the close-in east side.

Green roofs are one of the more dramatic and literal ways of greening the city. Installed on tall buildings they can be viewed by surrounding tall buildings and when they're installed on smaller buildings such as People's Food Coop they are visible to all the shoppers who enter the store. They are one of the most easily seen and visible components. Imagine flying into a city and seeing green instead of gray. That is the goal many people are aiming for.

Aside from the stormwater value there are many others benefits, including reducing heating and cooling costs and adding wildlife habitat in the urban center. This has become a much sought after feature in recent time as people are much more enthralled with urban wildlife. Consider Pale Male in

New York City, the Peregrine Falcons under the bridges in Portland and the swifts that spiral down the chimney at Chapman High School, also in Portland. The school loves the swifts so much that they go without heating for the duration of the swifts stay in their chimney. Urban wildlife is a shifting paradigm and the public is looking to bring more of it into the city.

Green Streets

Another large project Portland has taken on is its Green Streets program. Green streets consist of retrofitting a street or sidewalk to include a swale that street runoff is directed to in order to slow and clean it. They have installed several in urban neighborhoods on the east side of the Willamette but perhaps the most interesting are the green streets in downtown Portland.

One in particular is on the Portland State University campus and fits right into the sidewalk. This model adds green in the form of grasses, flowers and trees right into the urban fabric while providing an ecological benefit at the same time. To the casual onlooker the planters are nothing more than green space, but to someone looking a little closer they would see the curb inlets and the metal catchment basins. Nothing is lost as far as parking or sidewalk

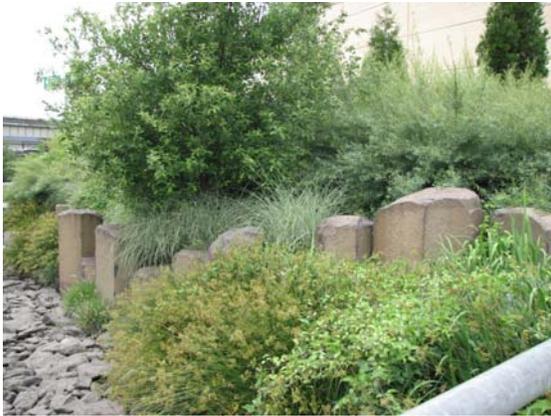


Portland State Green Street (Photo: Kelly Brenner)

space, but a lot is gained, aesthetically to the casual onlooker and a huge

ecological and hydrologic benefit. This same style has been installed at People Food Coop on the east side as well. Green streets may very well become regulation in the not-too-distant future.

Artistic Approach



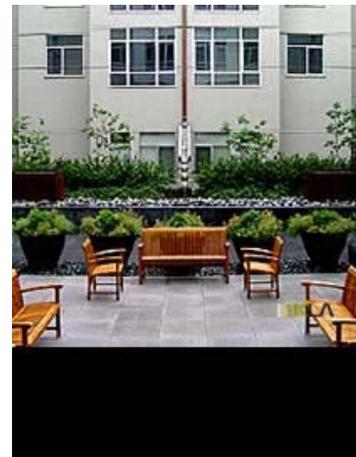
Oregon Convention Center Rain Garden
(Photo: Kelly Brenner)

Many landscape architects have embraced this new way of designing for rain and taken a very artistic, creative approach. The Oregon Convention Center has a rain garden designed by Mayer-Reed, a Portland firm. The rain garden circles a quarter of the perimeter of the building and is filled with lush, green vegetation, night

lights, rocks and water. Even when no water is in the garden it is still attractive.

Steve Koch, another Portland landscape architect has created a number of very attractive designs that manage the rain water. One specific design is at 10th and Hoyt in Portland and is described on his website.

Water channels, cascades and fountains naturally activate the courtyard during, and for 30 hours after rainfall. This project is an innovative addition to the growing



10th & Hoyt (Source: KLA)

awareness and interest in sustainable technologies in the designed urban environment.

Tanner Springs is one more example of creating an artistic way to manage rain water. It was a joint project between Greenworks of Portland and a



Tanner Springs (Photo: Kelly Brenner)

European landscape architect named Atelier Dreiseitl. Tanner Springs is located in the middle of the Pearl District as part of a new series of park blocks running from Jamison Square up to the river. All the water that lands on the ground within the block is directed into a faux wetland. Along the south side are recycled railroad ties from the Pearl District with blue glass imprinted with insects. The park is very different from typical urban parks with very little seating and no recreation area.

Instead it's a quiet, contemplative park that people either love or hate. The condos looking over it sold out in a matter of hours if that's any indication as to who loves it.

Change of the Urban Fabric

Many of these features alone would not be enough to change the urban fabric, but together they have the power to change the entire appearance

and function of urban centers. Suddenly the downtown can be a nice place to live and it can be clean and cool.

Public perception is changing and designers are changing. The public has to be open-minded and they are showing they really are. Designers have to be open minded to try new things and listen to the public. Today there is so much opportunity to improve our urban centers much like Europe has.

Bibliography

City of Oxford <http://cleanwateroxford.org/stormwater.htm>

EPA <http://www.epa.gov/ORD/NRMRL/news/news042006.html>

KLA <http://www.kochla.com/default.asp>

NPR <http://www.npr.org/templates/story/story.php?storyId=1970286>

Portland Online History

<http://www.portlandonline.com/bes/index.cfm?a=ebjgc&c=dbadb>

WERF http://www.werf.org/livablecommunities/studies_port_or.htm