BMP Suitability Matrix

A User's Guide to Green Infrastructure Best Management Practices

Oregon State University

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Contributors

Green Girl Land Development Solutions, LLC

Oregon Department of Forestry

Oregon State University

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Prepared by

Christine Johnson, Oregon Department of Forestry

Jenna Tilt, Oregon State University

Maria Cahill, Green Girl Land Development Solutions, LLC

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BMP SUITABILITY MATRIX

	Site Factors																							Designed to Provide Factors										Maintenance Factors	
	Site Conditions						Drainage Area				Land Use						Land Owner-ship		Development Type			Location			Water Quality		Water Quantity			Added Value Benefits						
	Steep Slopes	High Groundwater Tables	Shallow Bedrock	Slow Draining Soils	Expansive Clay Soils	Contaminated Soils	Rooftops	Roadways	Sidewalks	Landscapes	Single-family Residential Lot	Subdivisions & Campuses	Commercial	Institutional	Roads and Public Right-of-Way	Industrial	Private	Public	Retrofit	Redevelopment	New Development	Urban	Suburban	Rural	On-site	Downstream	Flood Control	Evaporation	Aquifer Recharge	Aesthetics	Air Quality	Community Identity	Habitat	Public Health	Establishment	Post -Establishment
Prevent Runoff: Minimize Impervious Area BMPs																																			
Share Parking Spaces BMP	3	3	3	3	3	3		3				2	3	2		1	2	2	2	2	3	3	2	2	M	H	L	M	L	M	L	M		H		
Minimize Pavement Widths BMP	3	3	3	3	3	3		3	3		3	3	2	3	3	1	3	3	2	2	3	2	2	3	M	H	L	M	L	M	L		L	H		
Minimize Front Setbacks BMP	3	3	3	3	3	3		3	3		3	2		2			3	2		1	3	3	3	1	M	H	L	M	L	L	L			H		
Share a Driveway BMP	3	3	3	3	3	3		3	3		3	3	2	3		1	3	2	1	2	3	3	2	2	M	H	L	M	L	M	L	M		H		
Minimize Building Footprint(s) BMP	3	3	3	3	3	3	3				2	3	3	3		2	3	2		1	3	3	3	3	M	H	L	M	L	L	L	L		H		
Minimize New Pavement BMP	3	3	3	3	3	3		3	3		3	3	3	3	2	3	3	3	2	3	3	2	2	3	M	H	L	M	L	M	L		L	H		
Prevent Runoff: Limit Disturbance BMPs																																			
Construction Sequencing BMP	3	3	3	3	3	3					3	3	3	3	3	3	3	3	3	3	3	3	3	3	H	H	L	L	L		M		M	M		
Conserve Fast(er) Draining Soils BMP	3	3	3	3	3	3				3	3	3	3	3	1	3	3	3	3	3	3	3	3	3	M	H	L	M	L				L			
Cluster Development BMP	3	3	3	3	3	3	3	3	3	3		3	2	2		2	3	3		1	2	2	3	3	H	H	L	H	L	L	H	M	H	M		
Riparian Buffer(s) BMP	3	3	3	3	3	3		3	3	3	3	3	2	2	3	2	3	3		1	3	2	3	3	H	H	M	L	L	H	H	H	H	H	M	L
Tree Protection BMP	3	3	3	3	3	3	2	3	3	3	3	3	2	2	3	2	3	3	3	2	2	3	3	3	H	H	L	M	L	H	H	H	H	H		
Minimal Foundation BMP	3	3	3	3	3	3	3				3	2	3	3		3	3	3		1	3	3	3	3	L	M	H		L	L			L	L		
Prevent Runoff from Landscape and Hardscape Areas																																			
Restored Soils BMP	3	3	3	3	3					3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	H	H	L	M	M	H	H		M	H	M	L
Tree Planting BMP	3	3	3	3	3	3	1	2	2	3	2	3	1	2	2	2	3	3	3	3	3	3	3	3	M	H	M	M	M	H	H	H	H	H	M	L
Depave Existing Pavement BMP	3	3	3	3	3	3		2	2		2	3	2	3	2	2	3	3	3	3	2	2	3	3	M	H	M	M	M	M	H	M	L	H	M	L
Contained Planter(s) BMP	3	3	3	3	3	3	2	3	3		3	3	3	3	2	2	3	3	3	3	2	3	3	3	M	M	L	H		H	L	M	L	L	H	M
Vegetated Roofs (Green Roofs) BMP	3	3	3	3	3	3	3				2	2	3	2		3	2	3	1	2	3	3	3	2	M	M	M	H		H	H	M	H	M	M	L
Porous Pavement BMP		1	1	3			3	2	2		2	3	3	3	3	3	2	3	1	1	3	3	2	2	H	H	H	L	H	L	L		L	H	L	L
Reduce Runoff from Landscape and Hardscape Areas																																			
Stormwater Planter BMP				2	3		3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	H	H	H	M	H	H	H	M	L	M	H	M
Infiltration Rain Garden BMP				2	3		3	3	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3	H	H	H	M	H	H	H	M	L	M	H	M
Soakage Trench BMP		1	1	2			3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	H	H	H		H	L		L	L	L	M	M
Drywell BMP		1	3		2		3	2	2	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	H	H	H		H			L	L	L	M	M
Rain Barrels or Cisterns BMP	3	3	3	3	3	3	3				3	3	2	3		2	3	1	3	3	3	2	3	3	M	L	L	L	L	L		L		M	M	M
WQ Conveyance Swale BMP	3	3	3	3	3		3	3	3	3	1	3	3	3	3	3	3	3	3	3	3	3	3	3	M	L	L	L	L	H	M	L	L	L	H	M
Dispersion: Downspout Disconnection BMP		1	1	3	3		3				3	3	2	3		2	3	3	3	3	3	2	3	3	M	L	L	L	L	L	L	L	L	L	M	M
Dispersion: Vegetated Filter Strips BMP		1	1	3	3		1	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3	3	M	L	L	L	L	L	M	L	L	L	M	M

Suitability Level	
3	Well Suited to Condition
2	Moderately Suited to Condition
1	Less Suited to Condition
	Not Applicable
Effectiveness Level	
H	High Effectiveness
M	Medium Effectiveness
L	Low Effectiveness (Supports Function)
	Not Applicable
Added Value Benefits	
H	High Benefits
M	Medium Benefits
L	Low Benefits
	Not Applicable
Maintenance Level	
H	Seasonal Maintenance
M	Fall-Spring Maintenance
L	Yearly Maintenance
	Not Applicable

This matrix was adapted from Low Impact Development in Western Oregon: A Practical Guide for Watershed Health (2017). Green Girl Land Development Solution LLC first developed this matrix to guide green infrastructure professionals in identifying suitable BMPs for Western Oregon. Oregon State University adapted and expanded the BMP Suitability Matrix for this course to include location, social and ecological benefits and general maintenance considerations.

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INTRODUCTION

This matrix was adapted from the *Low Impact Development in Western Oregon: A Practical Guide for Watershed Health* (2017). Green Girl Land Development Solutions LLC first developed this matrix to guide green infrastructure professionals in identifying suitable BMPs for Western Oregon. Oregon State University adapted and expanded the BMP Suitability Matrix for the entire state of Oregon to include location, social and ecological benefits and general maintenance considerations.

This matrix is a guide and may need to be adapted further for a variety of conditions.

BMP Suitability Matrix Organization

The BMP Suitability Matrix is organized with the three site-based categories listed across the top – *Site Factors, Designed to Provide Factors, and Maintenance Factors* – and the four best management practices (BMPs) categories listed on the side – *Minimize Impervious Area BMPs, Prevent Runoff: Limit Disturbance BMPs, Prevent Runoff from Landscape and Hardscape Areas, and Reduce Runoff from Landscape and Hardscape Areas.* The user's guide will first define and describe the site-based categories. The remaining pages define and describe 26 BMPs listed in the BMP Suitability Matrix.

SITE-BASED CATEGORIES

When considering a green infrastructure project, there are numerous factors that influence which BMPs are most suitable. The site-based categories displayed across the top row in the BMP Suitability Matrix aim to guide users toward the practices that are suitable for a site based on the project goals and the resources available. These factors, 36 in all, are diverse and include site constraints, such as steep slopes, as well as site opportunities, such as public health. One factor not listed in the matrix is cost. The cost of certain BMPs vary drastically from project to project and are difficult to quantify given the wide range of site conditions, permitting costs, potential consultant fees and other site specific factors.

Site Factors																								Designed to Provide Factors										Maintenance Factors	
Site Conditions						Drainage Area				Land Use						Land Owner-ship		Development Type			Location			Water Quality		Water Quantity			Added Value Benefits						
Steep Slopes	High Groundwater Tables	Shallow Bedrock	Slow Draining Soils	Expansive Clay Soils	Contaminated Soils	Rooftops	Roadways	Sidewalks	Landscapes	Single-family Residential Lot	Subdivisions & Campuses	Commercial	Institutional	Roads and Public Right-of-Way	Industrial	Private	Public	Retrofit	Redevelopment	New Development	Urban	Suburban	Rural	On-site	Downstream	Flood Control	Evaporation	Aquifer Recharge	Aesthetics	Air Quality	Community Identity	Habitat	Public Health	Establishment	Post -Establishment

Site Factors

There are six site-specific factors in the first columns of the matrix. These factors conceptualize the suitability of BMPs based on the condition, type, ownership, etc. Certain BMPs are more compatible with specific site conditions depending on how the BMPs function.

Suitability Level	
3	Well Suited to Condition
2	Moderately Suited to Condition
1	Less Suited to Condition
	Not Applicable

Site Conditions

Lists those BMPs that may be appropriate for challenging site conditions such as steep slopes, seasonal or permanent high groundwater tables, shallow bedrock, inadequate setbacks, and/or contaminated soils.

Drainage Area

Lists those BMPs that may be applied to certain runoff surfaces such as rooftops, roadways, sidewalks, and landscapes.

Land Use

Lists those BMPs that may be appropriate for certain land uses or zoning classifications. Always check local codes for guidance.

Land Ownership

Lists those BMPs that may be used in private development or public development.

Development Type

Lists those BMPs that may be compatible with a retrofit, redevelopment or new development.

Location

Lists those BMPs that are suitable across the urban-to-rural continuum.

Designed to Provide Factors

There are seven factors included within the Designed to Provide columns. The first two, water quality and water quantity, are environmental benefits tied to the annual water balance on-site and downstream. The effectiveness level assumes that the BMP is acting as a stand alone BMP under average conditions. As BMPs are used together, their effectiveness tends to increase.

Effectiveness Level	
H	High Effectiveness
M	Medium Effectiveness
L	Low Effectiveness (Supports Function)
	Not Applicable

Water Quality

Lists those BMPs that address water quality on-site and which substantially reduce runoff volume to protect against erosion and subsequent re-pollution of downstream waterways.

Water Quantity

Lists those BMPs that are appropriate to address water quantity concerns like flood control, as well as BMPs that aid evaporation and aquifer storage.

The additional five factors are secondary benefits often accompanying green infrastructure BMPs. These benefits, while difficult to evaluate, are closely associated with visible improvements to the site and invisible improvements to the environment as a whole. For example, minimizing pavement increases the site aesthetics by maintaining greenspace or leaving room for additional landscaping.

Added Value Benefits	
H	High Benefits
M	Medium Benefits
L	Low Benefits
	Not Applicable

When weighing the added value benefits of each BMP, consider how impervious surfaces, air, vegetation and water are impacted. These added value benefits are subjective and should be applied to local site context, circumstance, and users. Certain practices may be more or less culturally relevant or identifiable with a community.

Aesthetics

Lists those BMPs that are effective at beautifying the landscape.

Air Quality

Lists those BMPs that are likely to improve local air quality. This is closely related to how the BMP promotes or hinders air pollution such as high temperature, CO_2, and airborne particles.

Community Identity

Lists those BMPs that can contribute to the community's identity, pride, sense of place and/or local culture.

Habitat

Lists those BMPs that can improve or provide habitat for soil microbes and/or wildlife.

Public Health

Lists those BMPs that may aid in improving public health and includes concepts like traffic slowing, reduced violence, increased physical activity, and reduced levels of stress. During extreme events, such as historic rains, these BMPs may contribute to flood mitigation and reducing the impact on built infrastructure, such as combined sewers.

Maintenance Factors

Green infrastructure facilities *do* require maintenance, and some BMPs require more than others. These are approximations of how often, on average, BMP facilities would need to be attended to.

Maintenance Level	
H	Seasonal Maintenance
M	Fall-Spring Maintenance
L	Yearly Maintenance
	Not Applicable

Establishment

An approximation beginning at the time of installation until about 3 years.

Post Establishment

The time period after initial establishment.

BEST MANAGEMENT PRACTICES

Best management practices are practices and facilities that remove, reduce, hinder, or prevent stormwater runoff constituents, pollutants, and contaminants from reaching receiving waters. The BMPs displayed in the first column in the BMP Suitability Matrix are listed in order of the stormwater management hierarchy. At the top are practices that aim to closely resemble the pre-development site hydrology or limit the disturbance to the pre-development site hydrology.

Runoff prevention BMPs – *Minimize Impervious Area BMPs, Prevent Runoff: Limit Disturbance BMPs, Prevent Runoff from Landscape and Hardscape Areas* – manage rain where it falls and prevent new runoff from impacting the landscape. When runoff is generated, then resort to using runoff reduction BMPs – *Reduce Runoff from Landscape and Hardscape Areas* – which manage the runoff they receive. Practices listed at the bottom of the matrix do still offer water quality and quantity benefits, just not as much as the practices at the top of the list.

For many green infrastructure projects, stormwater is treated using a combination of BMPs that are suitable for the site and achieve project goals. In other words, to achieve the maximum impact and benefit, use multiple BMPs that are suitable to the site.

Stormwater Management Hierarchy

Prevent Runoff: Minimize Impervious Area BMPs
Share Parking Spaces BMP
Minimize Pavement Widths BMP
Minimize Front Setbacks BMP
Share a Driveway BMP
Minimize Building Footprint(s) BMP
Minimize New Pavement BMP
Prevent Runoff: Limit Disturbance BMPs
Construction Sequencing BMP
Conserve Fast(er) Draining Soils BMP
Cluster Development BMP
Riparian Buffer(s) BMP
Tree Protection BMP
Minimal Foundation BMP
Prevent Runoff from Landscape and Hardscape Areas
Restored Soils BMP
Tree Planting BMP
Depave Existing Pavement BMP
Contained Planter(s) BMP
Vegetated Roofs (Green Roofs) BMP
Porous Pavement BMP
Reduce Runoff from Landscape and Hardscape Areas
Stormwater Planter BMP
Infiltration Rain Garden BMP
Soakage Trench BMP
Drywell BMP
Rain Barrels or Cisterns BMP
WQ Conveyance Swale BMP
Dispersion: Downspout Disconnection BMP
Dispersion: Vegetated Filter Strips BMP

PREVENT RUNOFF: LIMIT IMPERVIOUS AREA BMPS

The first six BMPs listed is this category prevent runoff by minimizing the amount of impervious surfaces. These practices are typically done with new development but can also be applied during retrofit and redevelopment projects.

Share Parking Spaces BMP

What it is

Share parking spaces, or flex-time parking, prevents construction of new impervious surfaces by using existing parking facilities for dual purposes.

How it works

Less impervious surface means less runoff and more landscape to receive rainfall. This practice also offers cost savings, as you reduce the cost of materials, labor, and equipment by not installing new pavement.

How to do it

When new parking facilities are being proposed, especially in commercial districts, consider limiting the parking area by sharing spaces. This BMP also works with the Depave Existing Pavement BMP when redeveloping existing parking lots.

Minimize Pavement Widths BMP

What it is

Minimizing pavement widths for roadways, parking lots, and sidewalks is an efficient way to minimize impervious surfaces.

How it works

By lessening the amount of pavement or impervious surface, more stormwater is able to infiltrate into the ground, decreasing runoff.

How to do it

Dependent upon use, many road widths can be reduced to meet the guidance provided by the Federal Highway Administration and American Disabilities Act requirements.

SOURCE: Maria Cahill

Small unused pavement areas add up to a lot of unnecessary runoff for a watershed.

Minimize Front Setbacks BMP

What it is

Decreases the distance between buildings and the road thereby minimizing impervious surfaces associated with driveways and sidewalks.

How it works

By lessening the amount of pavement or impervious surface, more stormwater is able to infiltrate into the ground, decreasing runoff.

How to do it

When new residences and building centers are being proposed, consider decreasing the front setback codes thereby setting homes closer to the road and increasing the yard in the back.

Share a Driveway BMP

What it is

Driveways that are shared with a neighbor can prevent the construction of new impervious surfaces to some extent. (see illustration A on page 6).

How it works

Less impervious surface means less runoff and more open ground. This practice also offers cost savings, as you reduce the cost of materials, labor, and equipment by not installing new pavement.

How to do it

When laying out a new housing development, orient houses on either side of a driveway lane and extend pavement from a shared driveway to individual residences.

Minimize Building Footprint(s) BMP

What it is

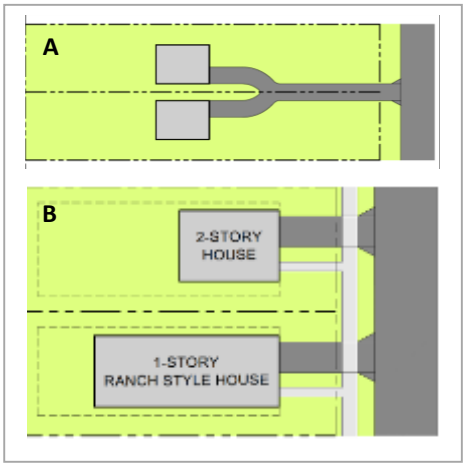
A building "footprint" is the amount of land are the build takes up. By minimizing this area, less impervious surface is created. (see illustration B)

How it works

By minimizing the impervious surface, stormwater runoff and site disturbance is reduced.

How to do it

One easy way to minimize building footprints is to allow increased height allowances on buildings. This way the building footprint is reduced without sacrificing building space.



A. Share a Driveway BMP. **B.** Go up, not out, with your floor plan.

SOURCE: Maria Cahill

Minimize New Pavement BMP

What it is

A practical BMP that recommends minimizing any new pavement, asphalt, concrete, or impervious surface that is unnecessary.

How it works

Less impervious surface means less runoff and more open ground. This practice also offers cost savings, as you reduce the cost of materials, labor, and equipment by not installing new pavement.

How to do it

Using a combination of the above BMPs, plan new sites with the goal of minimizing new pavement surfaces and use alternative paving materials when feasible.

PREVENT RUNOFF: LIMIT DISTURBANCE BMPS

The next six BMPs listed prevent runoff by laying out the site to minimize impacts to natural resources. Again, these practices are typically implemented before any development has occurred, but can also be applied to redevelopment and retrofit projects.

Construction Sequencing BMP

What it is

Construction sequencing represents a specified work schedule that coordinates the timing of land-disturbing activities and the installation of erosion prevention and sediment control (EPSC) measures.

How it works

The goal is to prevent erosion and control sediment by minimizing the extent of cleared land at one time and EPSC measures before land clearing begins.

How to do it

Disturb only a portion of the site at a time to prevent erosion form areas where no work will take place in the near future.

Conserve Fast(er) Draining Soils BMP

What it is

Minimizes the impact of site disturbance by placing impervious surfaces on slower draining areas of a site.

How it works

Conserving soils that drain quickly enable the site to maintain some natural site hydrology while placing impervious surfaces on areas of the site that were less pervious to begin with.

SOURCE: Maria Cahill

Conduct an infiltration test in multiple locations on a site to determine which areas drain quickly.

How to do it

After conducting a series of infiltration tests around the site, the results will reveal where healthy, fast draining soil exist. This leaves fast draining soils open to receive rainfall and also guides developers on where to direct runoff from other areas of the site for optimal infiltration. Existing soil and geologic maps may also be helpful.

Cluster Development BMP

What it is

An approach to development that clusters buildings and facilities close together to limit disturbance, reduce impervious surfaces, and preserve natural and open spaces.

How it works

Buildings and facilities that are clustered together will have fewer impervious surfaces than if they were spaced apart. By designing a site that groups buildings together, more permeable surfaces are left functional.

How to do it

Work with the developer and local planners to create a feasible site design that allows for higher density of building on a portion of the site.

Riparian Buffer BMP

What it is

A zone of vegetation (existing or planted) immediately adjacent to a stream or other body of water. Riparian buffers are ideally composed of mixed native vegetation.

How it works

The vegetation adjacent to the stream or waterbody intercepts water, sediment, pollutants and debris from nearby landscapes, giving the receiving body of water a "buffer" against direct impairment.

How to do it

Riparian areas can be protected from development by applying buffer zone overlays to plans. Similarly, codes can be written to offer protection.

Tree Protection BMP

What it is

Protecting healthy established trees can help maintain existing hydrology and water quality functions of the site.

How it works

Individual and groves of trees offer shade, shelter, soil stability, and added stormwater benefits via interception and transpiration.

How to do it

A stand, or grove of trees will offer more benefits than a single tree and will also be less prone to disease or windfall. To protect trees, place fencing and signage beyond the outermost branches of the tree(s). Consult with an arborist when preparing a tree protection plan.

This grove of trees was saved from a recent parking lot protection to provide slope stability and wind buffering.

SOURCE: Oregon Department of Forestry

Minimal Foundation BMP

What it is

Leaves soil within the footprint of a building exposed by using pier, post, block foundations, or walls that create a shallow crawl space.

How it works

This practice will allow for stormwater to pass through shallow subsurface soil and more closely mimic natural site hydrology on certain sites. This practice eliminates disturbance of the groundwater flow, which directly impacts watershed health.

How to do it

Minimal excavation foundations can be installed anywhere, but are especially beneficial on steeply sloping sites and areas prone to flooding. As with any foundation, hire a qualified licensed geotechnical engineer to design and implement this BMP.

PREVENT RUNOFF FROM LANDSCAPE AND HARDSCAPE AREAS BMPS

The following six BMPs prevent runoff by intercepting, evaporating, and/or infiltrating rainfall.

Restored Soils BMP

What it is

Restored Soil BMP amends existing disturbed soil (soil that has been modified by development, agriculture or other current or previous land uses on the property) to increase permeability.

How it works

Amending the soil allows for more spaces, or voids, in the soil increasing the amount of water that can fill those voids rather than running off the soil surface with pollutants in tow. In addition, amending soil increases plant health due to greater access to air and water in the soil voids.

How to do it

Soil is amended with organic matter compost. The top few inches of the soil is lightly tilled to loosen the soil, then organic matter compost is mixed in with the existing soil. Once the soil has been amended, add plants to the area to avoid soil erosion and improve water quality. Be careful to avoid digging in areas with underground utilities or other material less than 12 inches down from the soil surface.

Tree Planting BMP

What it is

Planting new trees on a site. Application of the Right Tree, Right Place arboriculture principle.

How it works

Carefully planting trees in the right location on a site will allow trees to grow healthy and to maturity offering many benefits to the site including shading of buildings (lower energy demand) and decreased water runoff due to trees' extensive root system.

How to do it

To get the maximum benefit from trees, be sure to plant trees where they have plenty of room to grow to maturity. A certified arborist can help you select a tree that matches your site constraints such as overhead utilities or narrow setbacks. Trees also need adequate soil volume; combining tree planting with restored soils is a great way to increase soil volume, permeability, and reduce water runoff.

Depave Existing Pavement BMP

What it is

Taking out existing pavement and replacing it with landscape. This BMP works best in combination with another BMP such as Restored Soil BMP or Rain Garden BMP.

How it works

Depaving an area reduces the amount of impervious surface and allows for increased water infiltration on a site.

How to do it

Removing small areas of pavement can be done without the need of heavy equipment (done by hand). Be sure you understand where underground utilities are located before you dig and properly dispose of the pavement. Local public works office or contractors can help advise on how to best remove pavement on your site and where and how to properly dispose of the pavement.

Contained Planters BMP

What it is

The practice of placing planters over existing impervious areas on the ground or roof. As a cost savings alternative to depaving, place a potted plant anywhere there is unused pavement.

How it works

Contained planters intercept rainfall and then evaporate it back into the air, even in the winter. Acting much like vegetated roofs, contained planters can reduce annual runoff by 40% to 60% from the area on which they are placed while also improving the aesthetics of paved areas.

SOURCE: Maria Cahill

Contained planters are a common beautification project that benefit the watershed when placed over impervious surfaces.

How to do it

The container must drain from the bottom. Since these will be outside year-round, consider durability. Suitable materials include untreated wood, fabric sacks, ceramics without metal glazes and concrete or cement. Avoid containers made out of plastic or treated wood as these can leach harmful chemicals into the water. Containers are excellent "street furniture" for business districts and front porches/driveways.

Vegetated Roofs (Green Roofs) BMP

What it is

Roofs that have a layer of soil and plants growing on the top of the roof structure.

How it works

By providing a growing medium by adding soils and plants to the roof, a high volume of rainwater is intercepted and then absorbed into the soil where it later evaporates thus reducing runoff.

How to do it

Vegetated roofs have an impermeable layer to protect the roof from water, then a drainage layer, filter fabric, and finally the soil and plants. All the material adds a lot of weight to the roof; the roof must be structurally strong enough to bear this extra weight.

SOURCE: Maria Cahill

Residence with a vegetated roof. Consult with a structural engineer to be sure that installing a vegetated roof is feasible.

Porous Pavement BMP

What it is

A type of pavement that can absorb water rather than create sheet flow. Types of porous pavement including permeable pavers, porous asphalt and concrete, and porous gravel

How it works

Porous pavement can be used to manage direct rainfall and stormwater runoff from other areas. The small voids in the pavement allows water to move through void spaces within the pavement surface and rock below to infiltrate into underlying soils.

How to do it

Porous pavement is made of special materials that creates voids but also allows for hard surface that—depending upon the type of porous pavement—can bear the weight of cars. Site selection for porous pavement must be done carefully. There needs to be adequate space under the pavement to allow for water storage while the water filtrates down into the soil. In other words, the soil underneath a porous pavement site must be well-draining and the ground water table must be low. Maintenance costs can be higher for porous pavement relative to some other BMPs. The pavement must be kept clean of debris or the voids in the pavement will clog and will no longer be able to infiltrate water.

SOURCE: Maria Cahill

SOURCE: Oregon Department of Forestry

A. Porous Concrete and Share a Driveway BMP. **B.** Permeable Pavers and Permeable Gravel paired with an Infiltration Rain Garden.

REDUCE RUNOFF FROM LANDSCAPE AND HARDSCAPE AREAS BMPS

Runoff reduction is the primary focus of the next eight BMPs. These facilities are designed to reduce runoff through temporary surface storage, evaporation, infiltration, and conveyance. Some of these BMPs redirect runoff below ground for infiltration. Although these BMPs are low on the stormwater management hierarchy they still provide some water quality and water quantity benefit.

Stormwater Planter BMP

What it is

A depression in the ground with vertical sides that collects and ponds runoff. A stormwater planter can be one ponding area or several areas connected together. When the shape is linear, it is commonly referred to as a Low Impact Development (LID) Swale, and check dams are added to pond the water.

How it works

Stormwater runoff is first collected in a depression to settle and filter out sediment and pollutants. The water ponds. As stormwater comes into contact with soil and plants, pollutants are reduced further through chemical and biological means. Stormwater quantity is reduced through evaporation, infiltration, and evapotranspiration.

How to do it

The practices work through ponding the water into depressions so the water can infiltrate or evaporate rather than running off the property untreated. A stormwater container does not have a bottom, allowing water to infiltrate into the ground.

SOURCE: Maria Cahill

A. Roadside Stormwater Planter. Vegetation tapers down to a depressed area where the rainfall and runoff collects as it slowly infiltrates into the ground. **B.** Rain Garden . ***The difference is that a stormwater planter has vertical sides instead of a gentle sides.***

SOURCE: Maria Cahill

Infiltration Rain Garden BMP

What it is

A "sunken garden bed" with gentle side slopes that collect and treat stormwater runoff by ponding runoff and passing it through soils and plants. A rain garden can take any shape.

How it works

Stormwater runoff is first collected in a depression to settle and filter out sediment and pollutants. The water ponds. As stormwater comes into contact with soil and plants, pollutants are reduced further through chemical and biological means. Stormwater quantity is reduced through evaporation, infiltration, and evapotranspiration. When they are planted with a variety of vegetation they become more robust facilities.

How to do it

The practices work through ponding the water into depressions so the water can infiltrate or evaporate rather than running off the property untreated.

Soakage Trench BMP

What it is

Soakage trenches (also called infiltration trenches, recharge beds) are excavated trenches filled with coarse stone wrapped in geotextile that receive runoff via a pipe and store it in the rock voids until it is able to infiltrate into surrounding soils.

How it works

Water is able to slowly infiltrate into the groundwater storage. Runoff from any surface may be directed to a soakage trench, as long as hazardous materials, toxic substances, or petroleum products are not used, stored, or handled in the area drained by the soakage trench.

How to do it

Water is injected underground via a pipe, rather than infiltrating through the soil surface. Soakage trenches should be located in well-draining soils.

Drywell BMP

What it is

A well composed of perforated pipes or series of drain tiles that receives and infiltrates runoff.

How it works

Runoff received from impervious surfaces is routed to the drywell where it temporarily stores the water before it infiltrates into the surrounding soils. This reduces the volume and rate of runoff.

How to do it

Drywells classify as an Underground Injection Well (UIC) and require authorization by Oregon Department of Environmental Quality (DEQ) if implemented on public property. Refer to a certified contractor to properly size, design, construct and implement a drywell facility.

SOURCE: Wendy Edde, City of Bend

A drywell under construction.

Rain Barrel or Cisterns BMP

What it is *A container that receives stormwater from a downspout.*

How it works *Rain barrels reduce stormwater runoff by collecting and storing water for later use, typically for irrigation.*

How to do it *Purchase a sturdy container to place below the downspout and route roof runoff to the barrel. Connect with a hose to water plants or another rain barrel. .*

Water Quality Conveyance Swale BMP

What it is *A swale that treats stormwater by moving it – not ponding it – through a facility overtop of plants or sometimes an engineered soil.*

How it works *Because water does not pond, runoff reduction via infiltration and evaporation is less than in an LID swale, so this BMP provides less protection of downstream watersheds.*

How to do it *Water is conveyed through a linear depression or ditch that is heavily planted to improve water quality. Since the water is continuously moving, fewer pollutants are being removed and overall water quality is lower than with other BMPs such as a raingarden or LID swale. Plant selection, such as those with fibrous rooting systems, is key in WQ conveyance swale to maximize water quality improvements.*

SOURCE: Oregon Department of Forestry

Water Quality Conveyance Swale

Dispersion: Downspout Disconnection BMP

What it is *Disperses concentrated flows of stormwater such as those coming from gutters to an area of vegetation*

How it works *Disconnecting the downspout to a gutter allows for the stormwater to disperse into an area where it can absorb into the ground. The area needs to have well-draining soils and be located away from buildings.*

How to do it *Disconnect the downspout from the gutter and redirect the water to a vegetated facility away from buildings.*

Dispersion: Vegetated Filter Strips BMP

What it is *Stormwater runoff from roadways and other linear surfaces are directed into landscaped strips.*

How it works *Stormwater overland flow or "sheet flow" is dispersed over landscaped areas specifically designed to reduce pollution and runoff. To use dispersion on parking lots and driveways, avoid using curbs and gutters.*

How to do it *The area needs to have well-draining soils which can be enhanced when applying the restored soils BMP. Filter strips should not be used within 10 feet of building with a basement or within 2 feet with a building with a basement.*