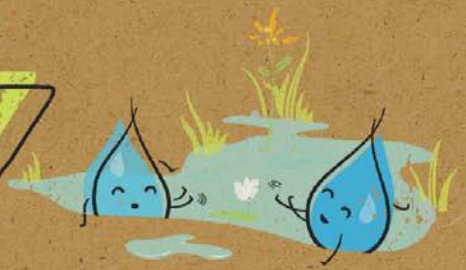
RAIN GARDEN IN A BOX



Edmonton

HOW TO USE THIS GUIDE

The City of Edmonton is excited to share the Rain Garden in a Box project. This guide is intended to help single-family homeowners to design and build simple rain gardens on their own property. The guide is intended to walk you through all the steps needed to install a rain garden on your own. While technical guidance is provided in this guide, the final decisions such as size and appearance are up to you. You can also hire a landscape professional to install your rain garden if you don't feel up to tackling the construction yourself.

Rain gardens are an easy way to help slow down and treat stormwater before it is discharged into the natural environment. Every drop of water infiltrated helps reduce flooding and improves water quality.

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SO YOU WANT TO BUILD A RAIN GARDEN?

Introduction

In this section you'll learn:

- The benefits of having a rain garden
- The typical water cycle
- The requirements to have a rain garden
- The components of a rain garden

As a city grows and more land is developed, the natural water cycle is altered. Urbanization creates more hard surfaces, which increases runoff, and decreases the water being soaked up by the ground. These changes can result in increased flooding and decreased water quality (among other problems). Pollutants picked up by urban runoff in Edmonton ultimately end up in the North Saskatchewan River or its tributaries.

BENEFITS OF A RAIN GARDEN

Rain gardens have a number of benefits to both you and the environment. Rain gardens:

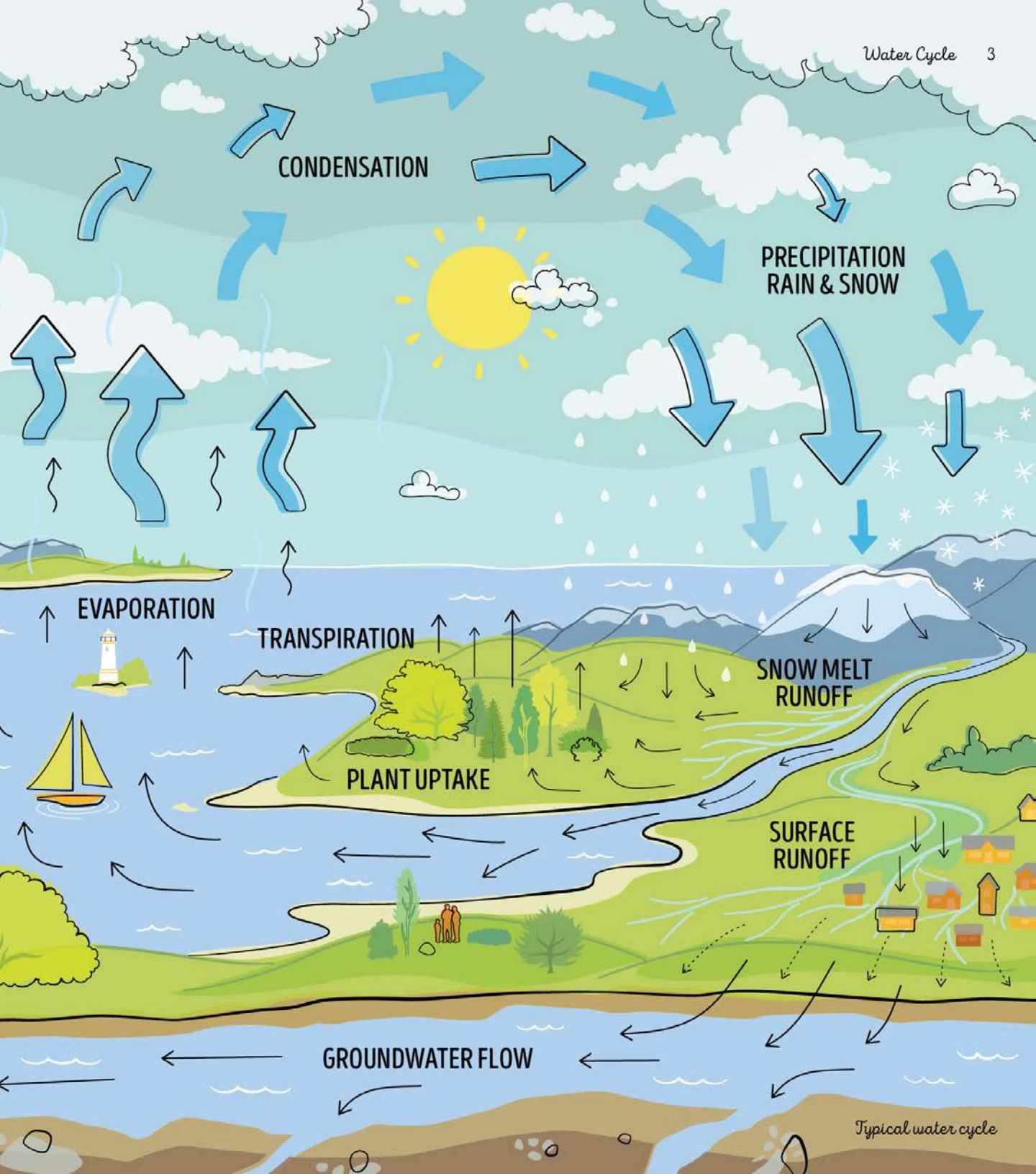
- help remove pollutants from stormwater
- slow down flows
- make your property more attractive
- provide habitats for beneficial insects & birds
- can help reduce flooding

Rain gardens can be shaped and sized to fit your yard and are constructed with a special soil mix that allows water to soak in rapidly, treats runoff, and supports plant growth. These attractive landscape features can be planted with a variety of plants.

The City encourages DIY rain gardens on single-family lots that were constructed after 1989 and have an approved grading plan. If your home was constructed prior to this date, a rain garden can still be constructed but additional steps may be needed to determine if the lot is graded properly, as the lot likely doesn't have a City-approved lot grading plan to ensure proper drainage.

You can help protect the environment

Reduce these issues by planting a rain garden! A rain garden is a landscaped area that collects, absorbs, and filters stormwater runoff from rooftops, driveways, patios, and other hard surfaces that don't allow water to soak in.



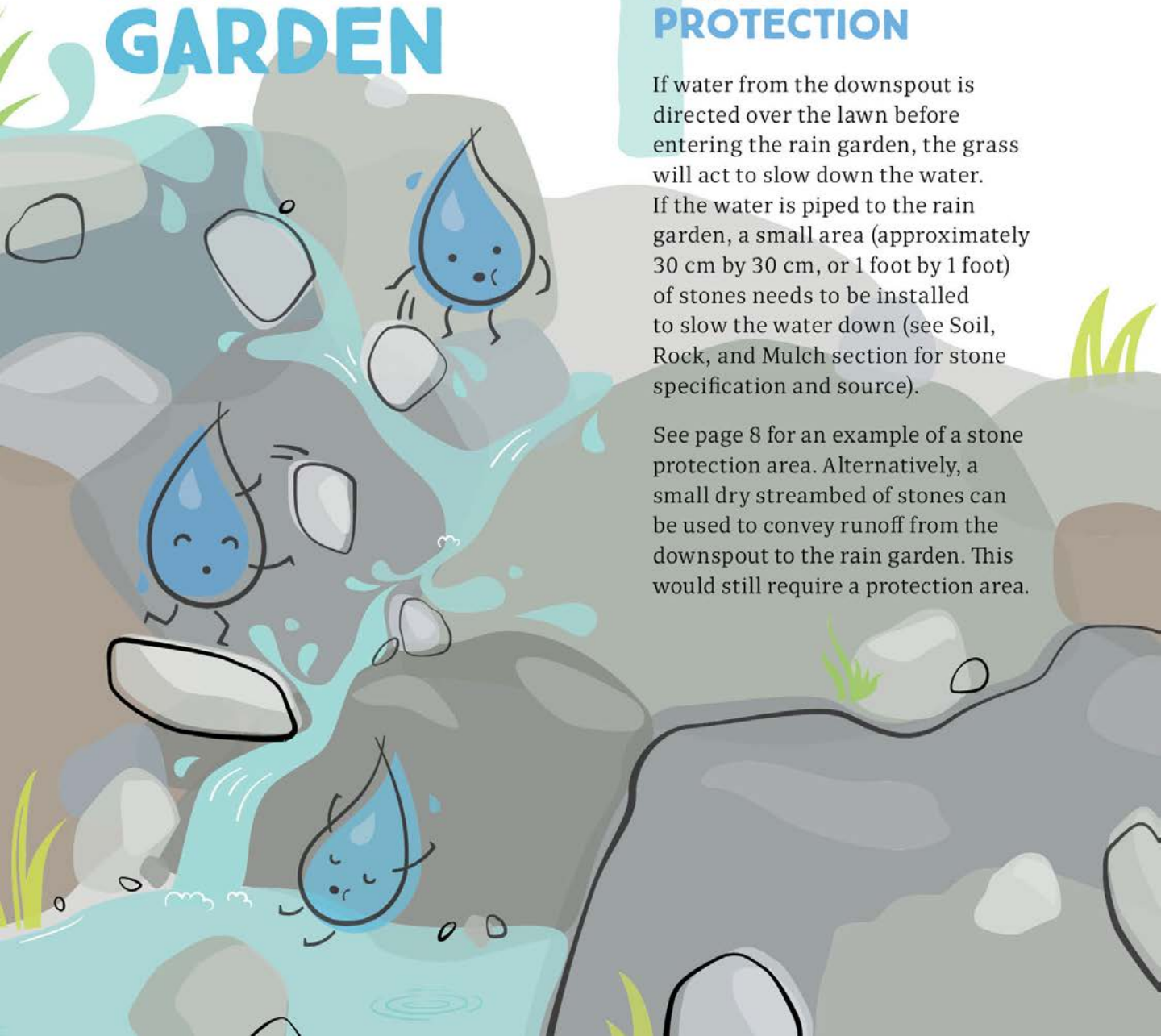
Typical water cycle

RAIN GARDEN CHECKLIST

- [ ] Do you currently live in a single-family home?
- [ ] Do you enjoy gardening and would like to build and maintain a rain garden that you can proudly show off to the community?
- [ ] Do you have an area where water can flow naturally to use for a rain garden?
- [ ] Is your potential rain garden 5 m away from any building foundations on your property?
- [ ] Is there a source of water to feed the rain garden, such as a downspout or rain barrel?
- [ ] Is the location of the rain garden at least 50 m away of any steep and/or hazardous slope or ravine?
- [ ] Is the ground on the lot dry in late August, with no frequent sump pump discharges during this time?
- [ ] Is your sump pump inactive (not discharging water) during the winter?

IF YOU ANSWERED YES TO ALL THE QUESTIONS, A RAIN GARDEN MAY BE THE RIGHT FIT FOR YOU!

PARTS OF A RAIN GARDEN



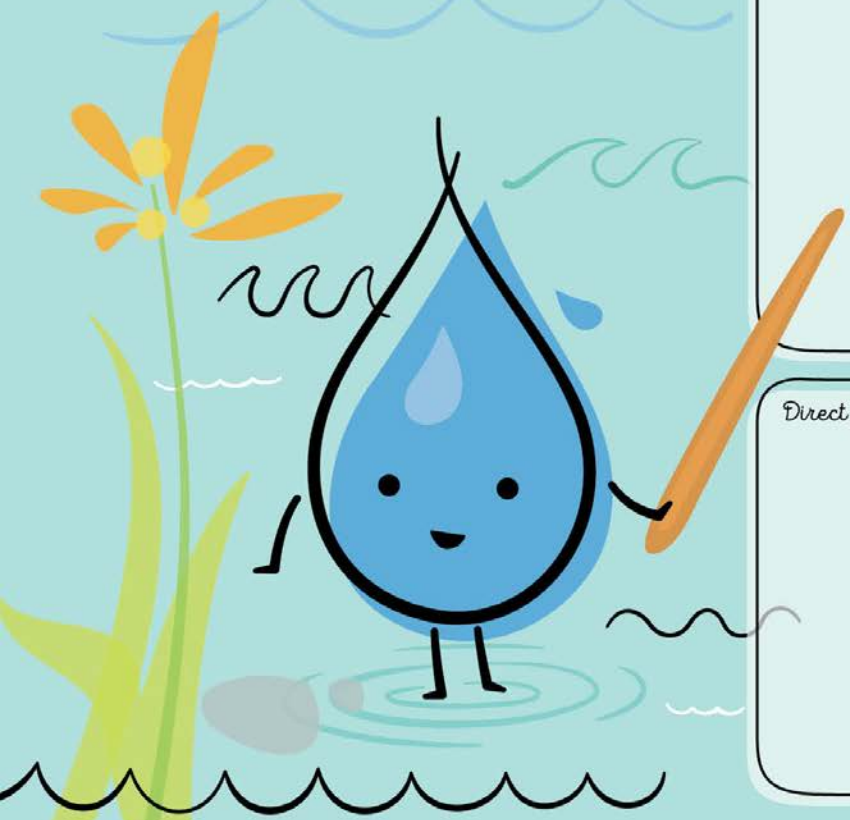
1 EROSION PROTECTION

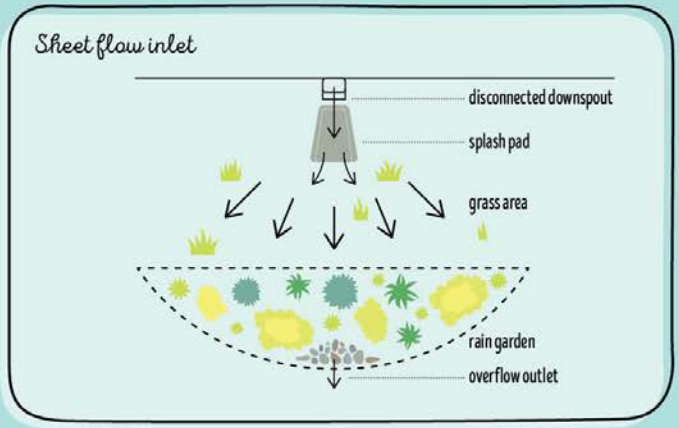
If water from the downspout is directed over the lawn before entering the rain garden, the grass will act to slow down the water. If the water is piped to the rain garden, a small area (approximately 30 cm by 30 cm, or 1 foot by 1 foot) of stones needs to be installed to slow the water down (see Soil, Rock, and Mulch section for stone specification and source).

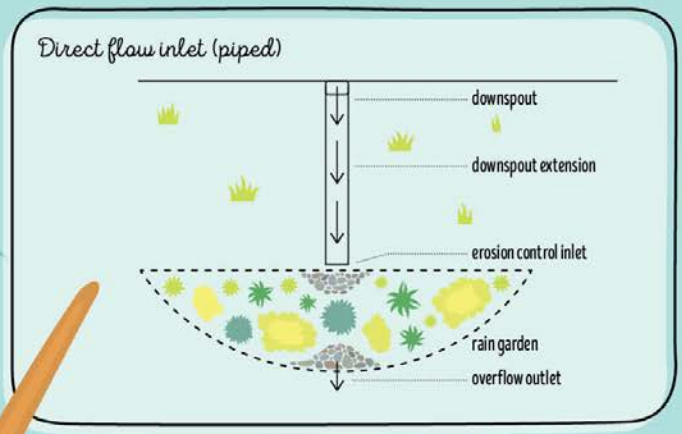
See page 8 for an example of a stone protection area. Alternatively, a small dry streambed of stones can be used to convey runoff from the downspout to the rain garden. This would still require a protection area.

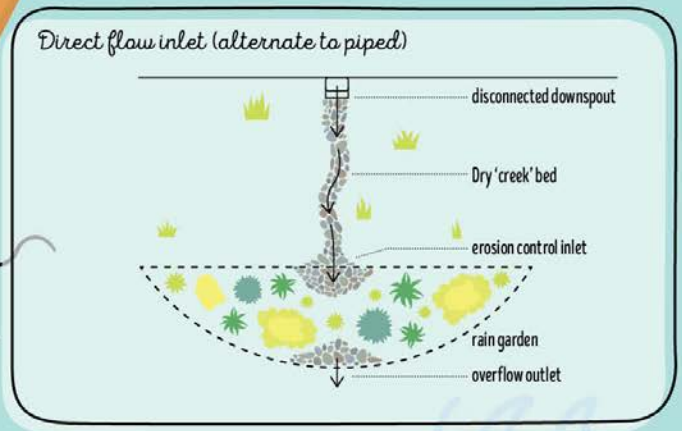
2 WATER INLET

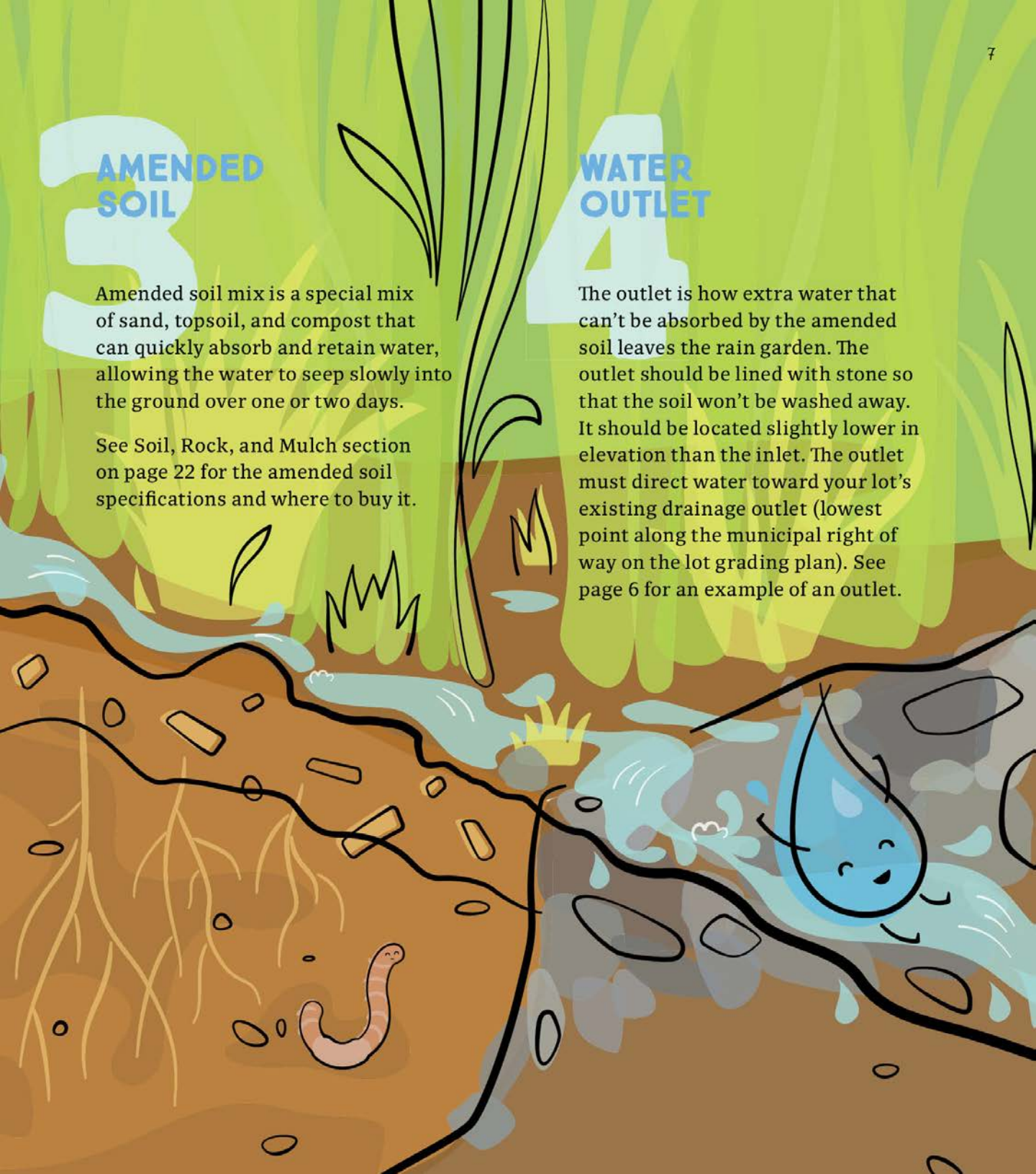
The inlet is where water enters the rain garden. There are two primary types of inlets allowed: (1) slow, spread-out flow across the lawn upstream of the rain garden (sheet flow), or (2) a piped flow entrance (direct flow). When direct flow is used, a stone pretreatment area must be used to slow the water down.











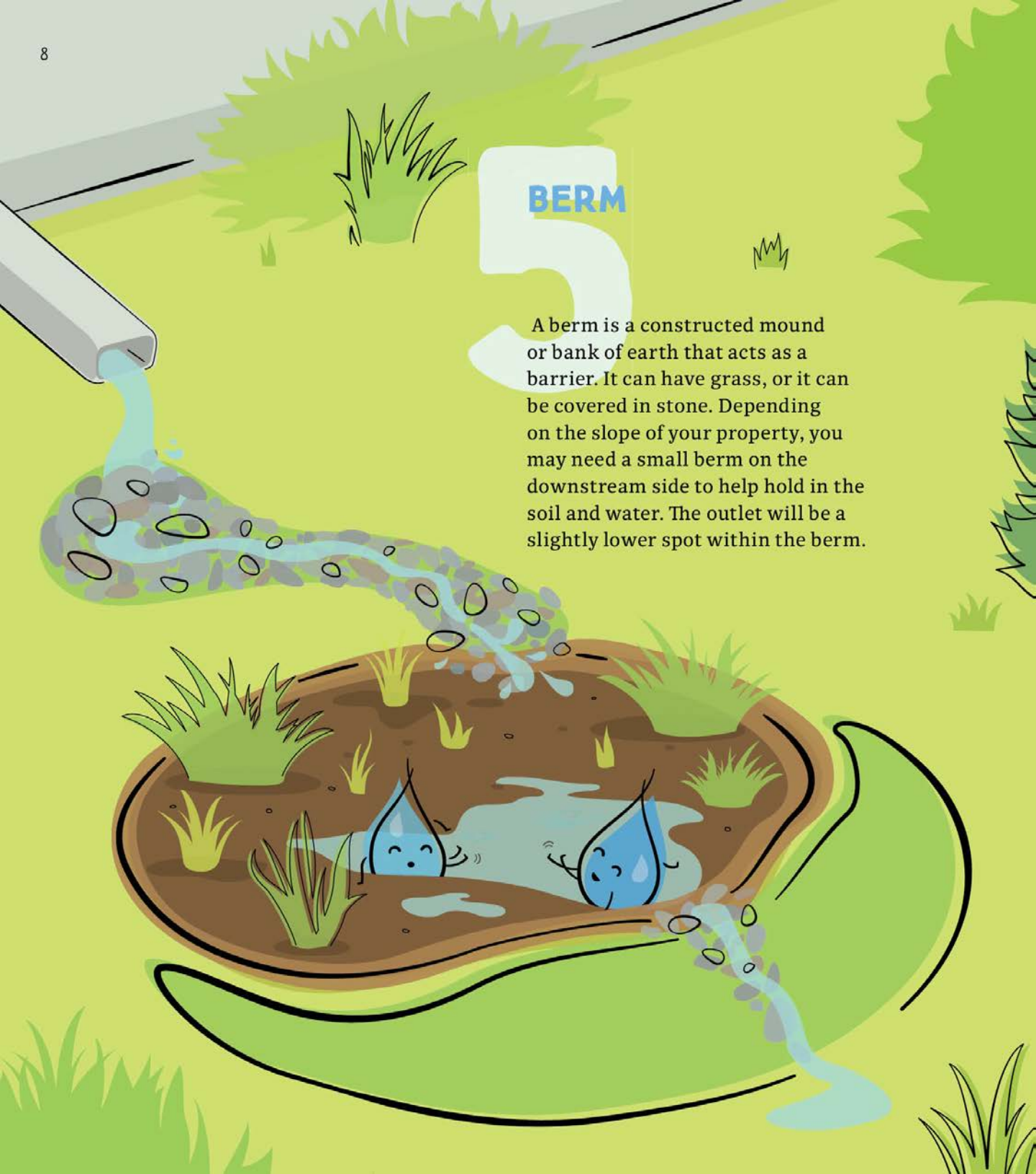
3 AMENDED SOIL

Amended soil mix is a special mix of sand, topsoil, and compost that can quickly absorb and retain water, allowing the water to seep slowly into the ground over one or two days.

See Soil, Rock, and Mulch section on page 22 for the amended soil specifications and where to buy it.

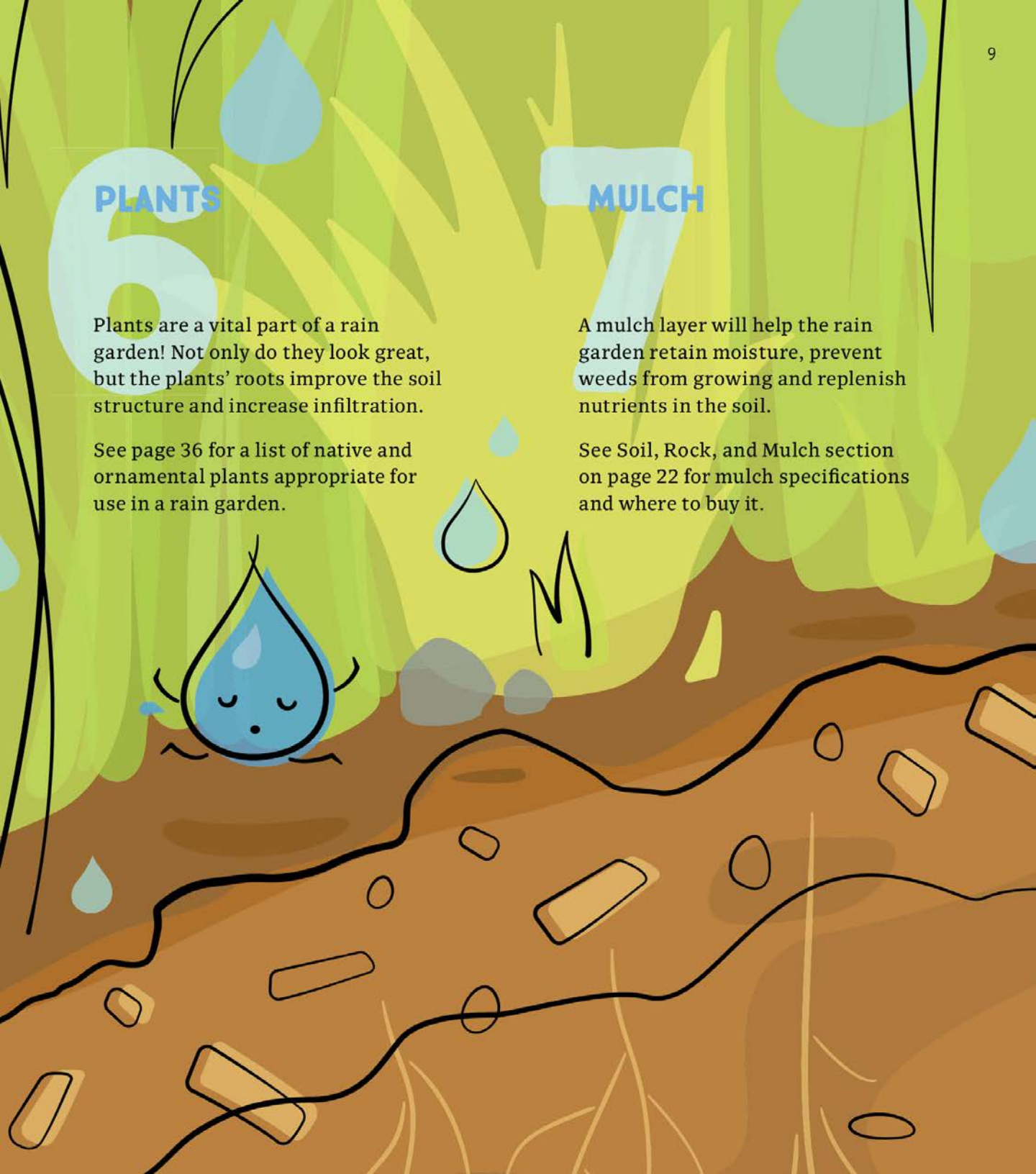
4 WATER OUTLET

The outlet is how extra water that can't be absorbed by the amended soil leaves the rain garden. The outlet should be lined with stone so that the soil won't be washed away. It should be located slightly lower in elevation than the inlet. The outlet must direct water toward your lot's existing drainage outlet (lowest point along the municipal right of way on the lot grading plan). See page 6 for an example of an outlet.



5 BERM

A berm is a constructed mound or bank of earth that acts as a barrier. It can have grass, or it can be covered in stone. Depending on the slope of your property, you may need a small berm on the downstream side to help hold in the soil and water. The outlet will be a slightly lower spot within the berm.



6 PLANTS

Plants are a vital part of a rain garden! Not only do they look great, but the plants' roots improve the soil structure and increase infiltration.

See page 36 for a list of native and ornamental plants appropriate for use in a rain garden.

7 MULCH

A mulch layer will help the rain garden retain moisture, prevent weeds from growing and replenish nutrients in the soil.

See Soil, Rock, and Mulch section on page 22 for mulch specifications and where to buy it.

Notes

PLANNING YOUR RAIN GARDEN

Plan

In this section you'll learn:

- What you need to do before digging
- The process to disconnect storm drains from storm services
- How to assess the site for the rain garden
- Which areas are prohibited to place a rain garden
- How to measure the slope
- What soil, rock and mulch to purchase

It is important to plan your project ahead of time to avoid unnecessary delays or issues.

Notify the City of Edmonton with your interest to construct a rain garden via online form on edmonton.ca/raingarden. If necessary, you will be assigned a mentor to assist you with the rain garden design and installation process.

PLANNING AHEAD

Buy your soil and mulch from local landscaping companies. If you are using a contractor, have them supply it.

Communicate with your neighbors in advance of your intent to construct a rain garden and its purpose. This will help to minimize the chance of future complaints.

Lots with separate storm services (i.e. not combined sewer area) will require an exemption/deferral letter from the City's Drainage Planning group in order to disconnect storm drain from storm service. Residents can contact Water & Sewer Servicing at 311 to find out what system they are serviced by. Please note this deferral will be seasonal (May to October) and reconnection to the storm system is required during off-season.

If you have general inquiries on lot grading on your property, please contact the City of Edmonton's Lot Grading group at 311 prior to proceeding with rain garden installation.

Call Before You Dig

It is important to locate and mark all underground utilities before digging to prevent any damage to shallow utilities. Homeowners can be held liable for damage if the proper dig permits are not obtained from:

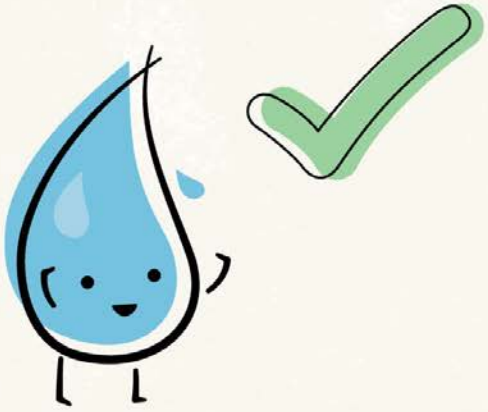
Alberta One Call
phone **1-800-242-3447**
or visit **albertaonecall.com/submit-a-locate-request/**

Dig Shaw
phone **1-866-344-7429**
or visit **digshaw.ca**

BEFORE YOU START

I have spoken with:

- ☐ my neighbours
- ☐ Alberta One Call
- ☐ Dig Shaw
- ☐ the City's Water & Sewer Servicing group
- ☐ the City's Lot Grading group (if required)



Notes

SITE ASSESSMENT

Using the worksheet provided in this document, sketch your property, including all buildings, downspout locations, grassed areas, impervious surfaces, and existing gardens, decks and pools.

If your property was developed after 1989 and you have a City-approved Lot Grading Plan, identify your property type from the City property sketches (A, B, C, D, or W), and note this on your sketch.

Note any areas where rain gardens are prohibited, as shown on the City property sketches.

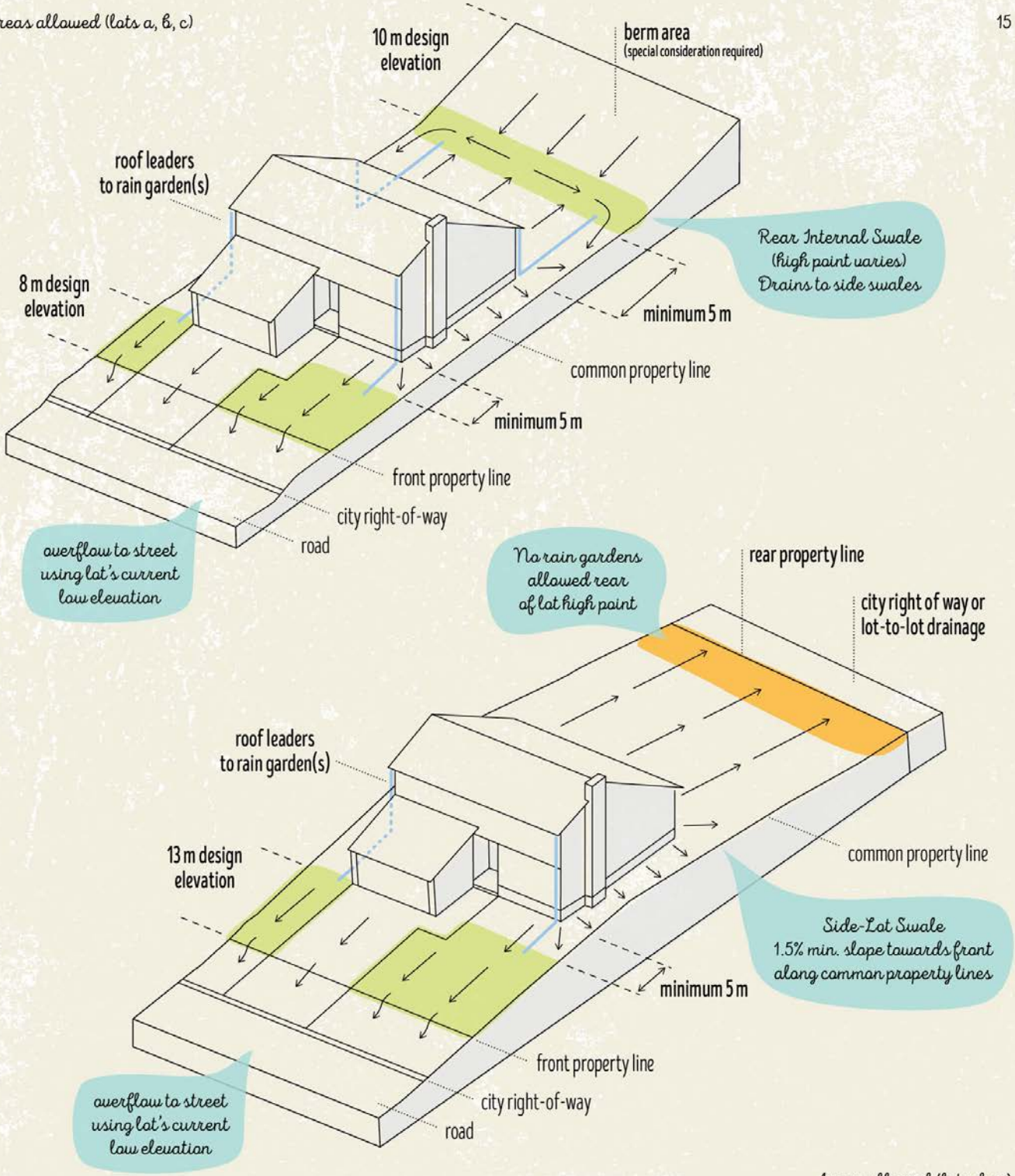
If your house was built prior to 1989 and does not have a City-approved Lot Grading plan, you will need to do the following additional steps:

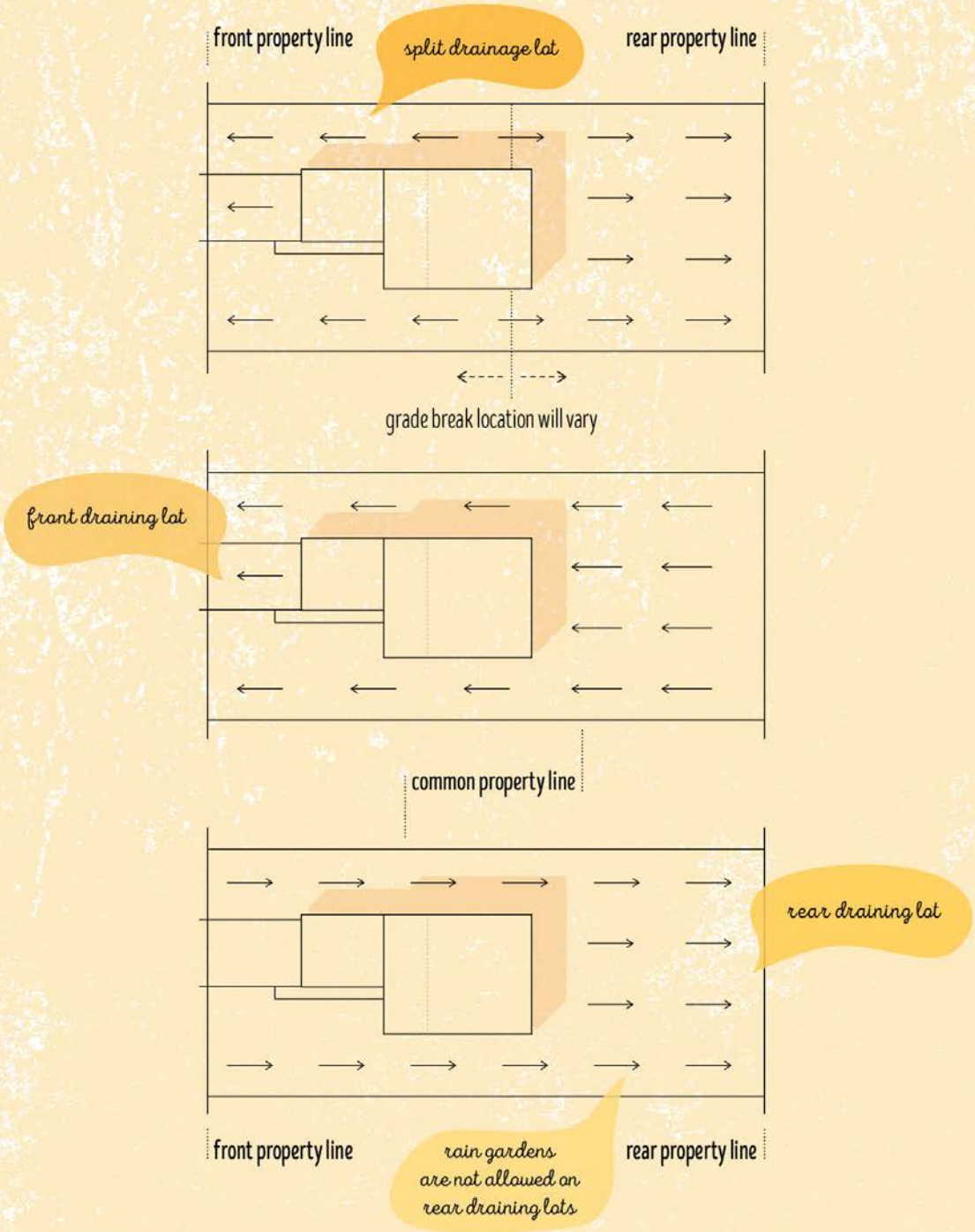
Locate where surface water flows off your property into the municipal storm system. The easiest way to do this is to observe where water leaves your lot during rain storm. If there is no rain, or you cannot see any surface flow, a bucket or hose can be used to observe where water leaves your property by pouring water out and watching where it goes. Mark these locations on your sketch. Check at least four to six locations *(for example both sides and the middle of the front and back yard).*

What's your lot type?

Examples of the 5 different lot types (A, B, C, D, or W) for single-family homes can be found at:

edmonton.ca/residential_neighbourhoods/lot_grading/lot-grading-drawings.aspx.


10 m design elevation
berm area
(special consideration required)
roof leaders to rain garden(s)
8 m design elevation
Rear Internal Swale
(high point varies)
Drains to side swales
minimum 5 m
common property line
minimum 5 m
front property line
city right-of-way
road
overflow to street using lot's current low elevation
No rain gardens allowed rear of lot high point
rear property line
city right of way or lot-to-lot drainage
roof leaders to rain garden(s)
13 m design elevation
common property line
Side-Lot Swale
1.5% min. slope towards front along common property lines
minimum 5 m
front property line
city right-of-way
road
overflow to street using lot's current low elevation



Areas allowed on pre-1989 lots

Identify if your lot is front draining, split draining or rear draining.

- Lots that are front draining have all surface flow leaving from only the front of the property.
- Lots that are split draining have surface flow leaving from both the front and rear of the property.
- Lots that are rear draining have surface flow leaving from only the rear of the property.

Rear yard rain gardens are only allowed on properties that are front draining. Rain gardens will NOT be allowed on properties that are rear draining.

Locate any low spots on your property that do not drain properly. These areas may have pooled water or will be soggy longer than the rest of your lot after a rain storm. These locations are NOT suitable for a rain garden.

Once you have completed these steps and marked all the information on your property sketch, continue to the rest of the site investigations.

Home Check-up

If you have existing lot drainage issues on your property, please call 311 to contact the City of Edmonton's Flood Prevention Home Check Up Program prior to proceeding with rain garden installation.

PLACES WHERE RAIN GARDENS ARE PROHIBITED

Rain gardens will not be allowed in the following locations:

- Within 5 m of any building foundations.
- Over utilities (contact Alberta One Call and Dig Shaw).
- In low-lying areas without a proper overland flow connection to the municipal storm system, these areas may occur on lots developed prior to 1989.
- On lots with high groundwater table. Is your lot wet in late August, with frequent sump pump discharges occurring during this time (or in the winter)? The groundwater table is high under your property and could hit the bottom of the rain garden, causing groundwater to rise to the surface.
- Within 50 m of a hazardous or steep slope. Infiltration from the rain garden may destabilize the slope, causing localized collapses. Most residential properties near a river valley and ravine system (top of bank) have a storm service requirement for downspouts (roof leaders) and have a right-of-way, easement, or restrictive covenant registered on the title regarding development restrictions to preserve the slope.
- In any location marked as prohibited on the lot type sketches (page 15). Rain gardens are only allowed in locations where the extra water will run to the street or municipal drainage system. Directing water to another lot (i.e. your neighbour's property) will not be allowed.

WHERE NOT TO LOCATE A RAIN GARDEN

MEASURING SLOPE

Slope is important because water will always flow downhill. Knowing where the water on your property will flow will help you determine the best location for you rain garden.

The easiest way to determine slope is to pour a full bucket of water at the base of each downspout and watch where is goes. This will tell you the general slope of the area (toward or away from house).

Mark the direction of flow on the property sketch with arrows from each downspout.

- Away from house: good. Water runs away from foundations.
- Toward house: bad. This increases the chance of water entering basements. Any areas that slope toward the house should be fixed immediately to prevent water from entering the foundation. Contact a landscaper if you find that you have a slope toward your house and don't know how to fix it.

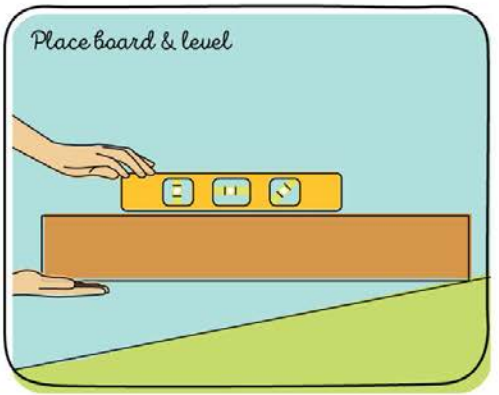
TOOLS:

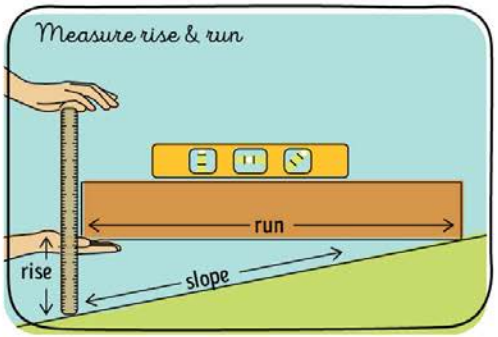
- carpenter's level
- metre stick
- straight wooden board (a piece of 2x4, 1.5 to 2 m long)

STEPS:

Place the wooden board along the slope to be measured.

Place the level on top of the board, and lift the lower end until the board is level.





Measure the distance from the ground to the bottom of the wooden board. This measurement is your 'rise'.

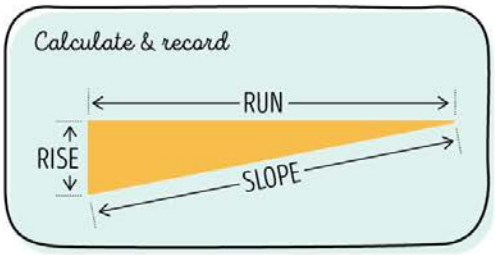
Measure the length of the wooden board that you used. This measurement is your 'run'.

Make sure you use the same unit of measurement for the 'rise' and 'run'. ***For example use centimetres or inches for both measurements.***

Divide the 'rise' by the 'run' to obtain the slope, then multiply the answer by 100 to get your percentage slope.

In general, a slope of 1% to 6% is considered good.

Once you have calculated the slopes under each downspout, make sure you mark them down on your property sketch.



Example Calculation

If your 'rise' is 0.04 m (4 cm) and your 'run' is 0.7 m (70 cm), then your slope is 0.04 divided by 0.7 times 100 = 5.7%. You can round your answer up or down to the nearest whole number (in this case, to 6%).

SOIL, ROCK & MULCH

In general, soils can be classified as clay, sand, or loam. Soils below the topsoil in the Edmonton area tend to be hard clay and are often poor in nutrients, so an amended soil mix is recommended for rain gardens. This soil mix is a loamy soil that will soak up and hold water to allow for slow uptake by plants and infiltration into the ground. Do not apply fertilizers to the rain garden. The amended soil mix provides plenty of nutrients.

You can use the mix specified in the table or the updated topsoil specification in the City of Edmonton Landscaping Design and Construction Standards (see the Additional Resources section at the back of this handbook for details).

Amended soil must conform to the specifications in the table on the following page.

If you are using a contractor, they can provide an appropriate soil mix. If you are constructing your own rain garden you can contact any local landscape supplier and ask for an equivalent soil blend that meets the specifications provided in the table. A few examples of suitable soil mix include:

- #1 Mix 1-1-1 sold by Canar Rock and Landscaping Supplies
- #1 Mix sold by Classic Landscape
- Number One Garden Mix sold by Park Topsoil

Use shredded cedar mulch or shredded park blend mulch, which is available at local landscape supply companies.

AMENDED SOIL SPECIFICATIONS

Use ¾ in to 1 ½ in washed rock mix for inlets and outlets. Mix examples include washed rock, river rock, creek stone, and New Alberta Rainbow. Any washed stone mix that is fractured or round and within the noted size range can be used. You can usually buy washed rock from the same company that supplied your soil mix.

Optional items include edging materials (stone, precast, or grass edging). While not necessary, this can give the rain garden a cleaner look. Contact your local landscape supply companies.

Texture

Particle size classes by Canadian System of Soil Classification	Percent Dry Weight Mineral Fraction (%)
Sand *(>2 mm & <75 mm)*	50 – 70
Silt *(>0.002 mm & <0.05 mm)*	Silt & Clay Combined <30
Clay *(<0.002 mm)*	
Acidity (pH)	5.5 – 7.5

Drainage

Minimum saturated hydraulic conductivity (cm/hour) in place	7

Organic Content

Percent of Dry Weight (%)	8 – 15

Notes

DESIGNING YOUR RAIN GARDEN

Design

In this section you'll learn:

- Where to locate your rain garden
- How to properly size your rain garden
- How to determine if your garden needs a berm
- How to fill out your worksheet
- Which plants are best to grow

It's important that you properly locate your rain garden to avoid any drainage problems on your lot.

This is where you get to decide exactly what your rain garden will look like. Do you want a formal garden or a more natural landscape with native plants; a straight edged rectangle or a curved freeform shape? Let your imagination guide you to your perfect rain garden!

LOCATION OF YOUR RAIN GARDEN

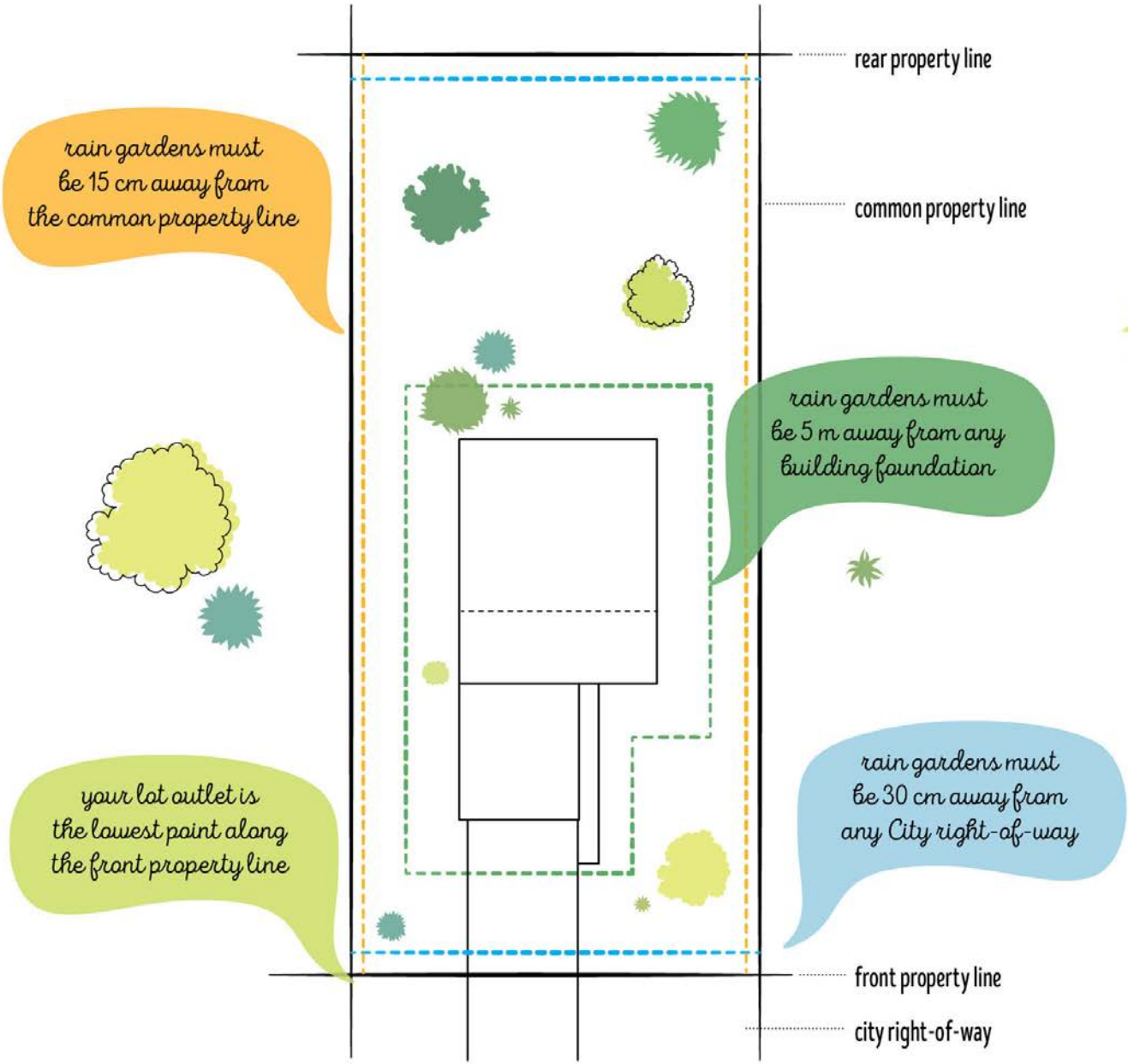
The rain garden should be 5 m away from any building foundations.

Ensure your rain garden is located in a location where the overflow from the garden outlet can flow to the existing lot outlet (lowest point of your property) by overland flow.

Controlled discharge points, which include rain garden outlets, must be at least 15 cm from property line adjoining neighboring properties, or 30 cm from property line adjoining the City right-of-way.

Mark the limitations on your sketch, and mark one or two areas where you wish to build a rain garden. The locations selected should be able to receive runoff from at least one of the downspouts marked on the drawing. Do not locate your rain garden in any area where rain gardens are prohibited (some rear yards, close to hazardous or steep slopes, etc.).

Decide on the final location for the rain garden and the desired size. Estimate the area of the rain garden.


rain gardens must be 15 cm away from the common property line
rear property line
common property line
rain gardens must be 5 m away from any building foundation
your lot outlet is the lowest point along the front property line
rain gardens must be 30 cm away from any City right-of-way
front property line
city right-of-way

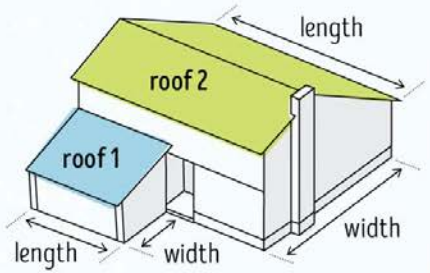
SIZING YOUR GARDEN

To size your rain garden, you will need to know the area of your roof. Measure the length and width of your house and multiply them together. ***For example, if the front of your house (width) is 10 m long and the side of your house (length) is 8 m long, multiplying 10 x 8 gives you 80 m² of roof area.*** Mark this number on your sketch.

Determine how much of your roof is going to each down spout. Count the number of downspouts on your roof and divide your total roof area by that number. ***For example, using the same house, if you count four downspouts, you would divide 80 m² by 4 to give you 20 m² of roof area per downspout.*** Mark this on your sketch.

A rain garden has deeper soils than a normal garden to provide more space to soak up water. The soil depth can range from 250 mm to 450 mm in depth. You can not exceed 450 mm of depth in the rain garden. A rain garden with 450 mm of soil will infiltrate more water than one with 250 mm of soil; or it can infiltrate the same amount of water in a smaller rain garden area.

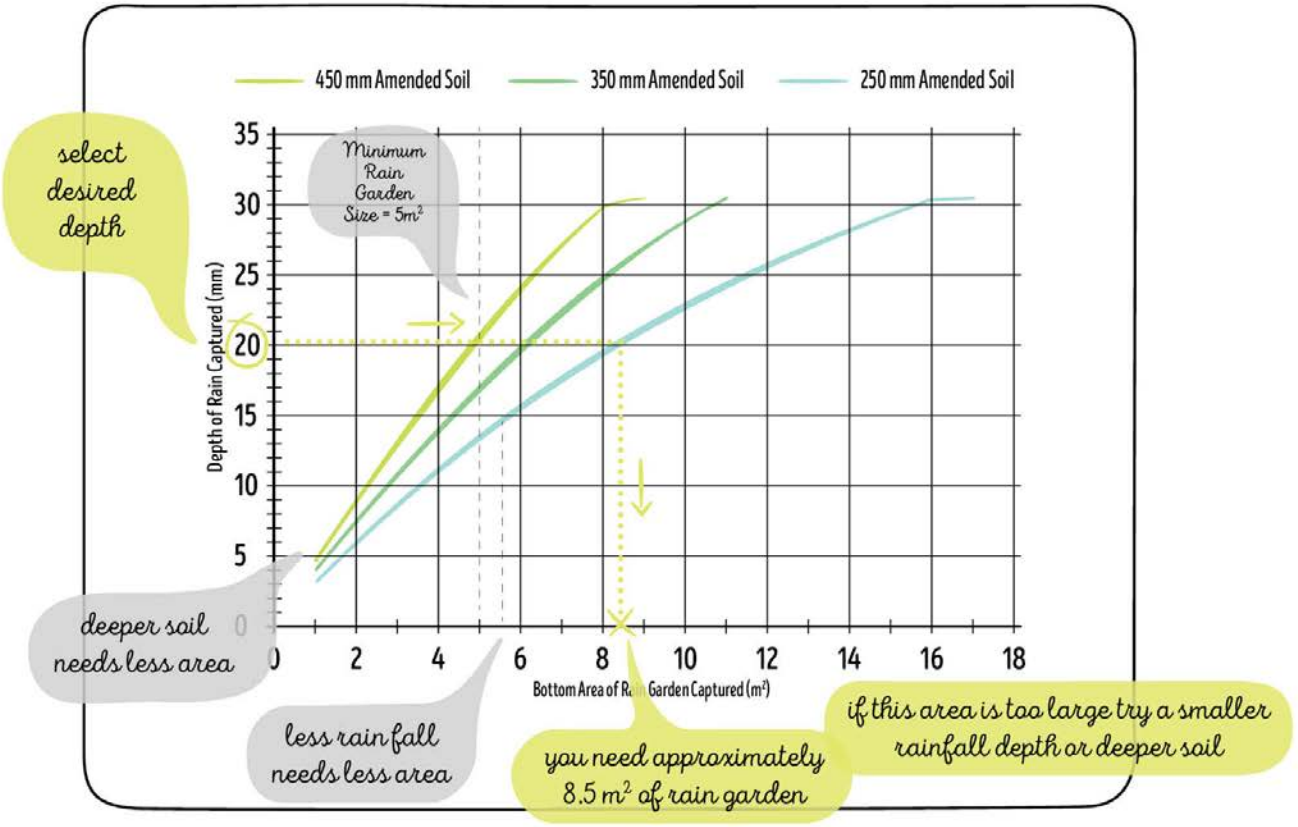
Calculating roof area



Start thinking about how deep you would like to make your rain garden, as you will need to know this to use the sizing graphs. Remember, you will have to dig that far down into the soil!

There is no target for the amount of rain your rain garden will infiltrate. Larger, deeper rain gardens will infiltrate more water. If you don't have the space for a large rain garden or don't want to dig deeper, don't worry! Even a small rain garden will provide some infiltration and slow down runoff!

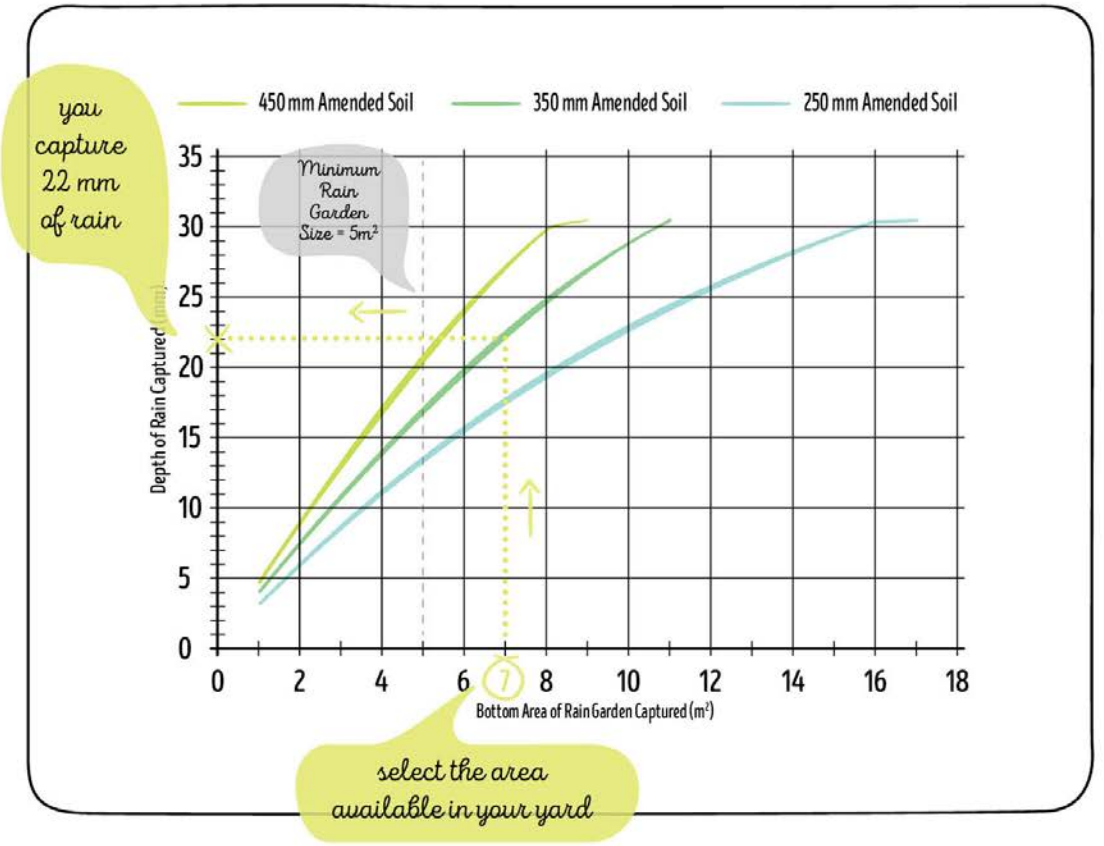
USING THE GRAPH



Based on the calculation of how much roof area per downspout, select the appropriate graph for rain garden sizing. Using the same example, for 20 m² of roof area per downspout, you would use the 'up to 25 m² of roof area' graph. You will see three lines that represent different soil depths in the graph.

Sizing is based on the area available for the rain garden.

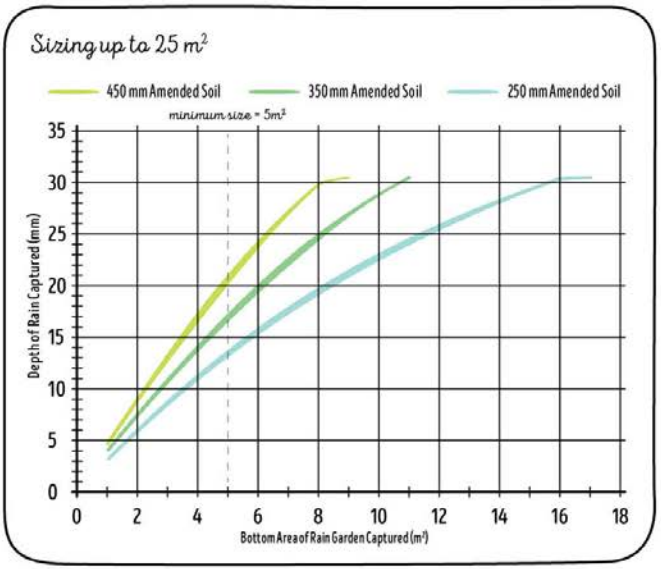
EXAMPLE OF SIZING UP TO 25 SQUARE METRES

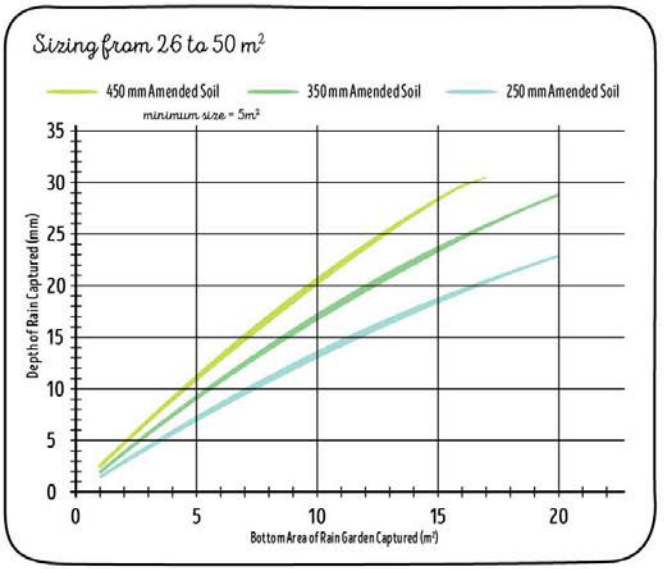


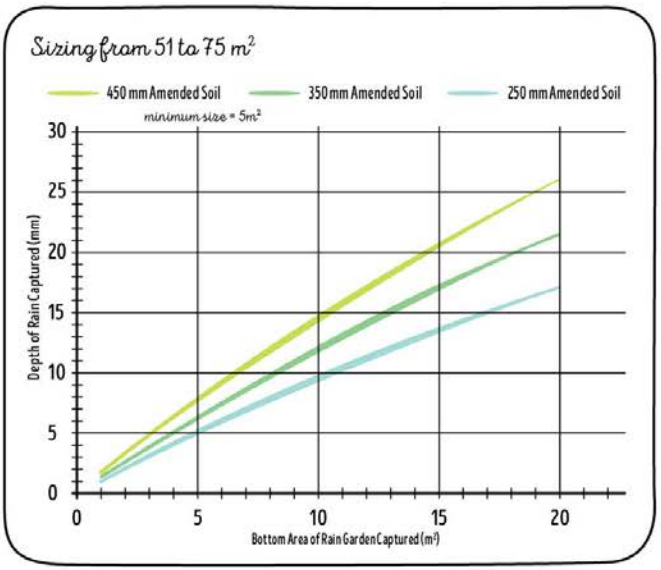
Select the area you have available or have chosen for a rain garden on the bottom of the graph. Draw a straight line up until you hit the coloured line for your desired soil depth.

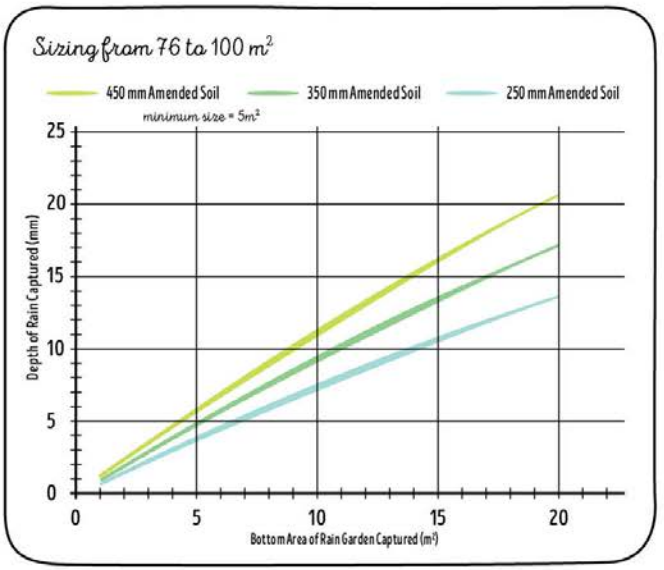
Draw a straight line from this point to the left side of the graph to see how much rainfall you can capture in your rain garden. if you wish to capture more, try increasing the soil depth.

SIZING GRAPHS









DO YOU NEED A BERM?

You can use any depth of soil between 250 mm and 450 mm by estimating between the two soil depth lines.

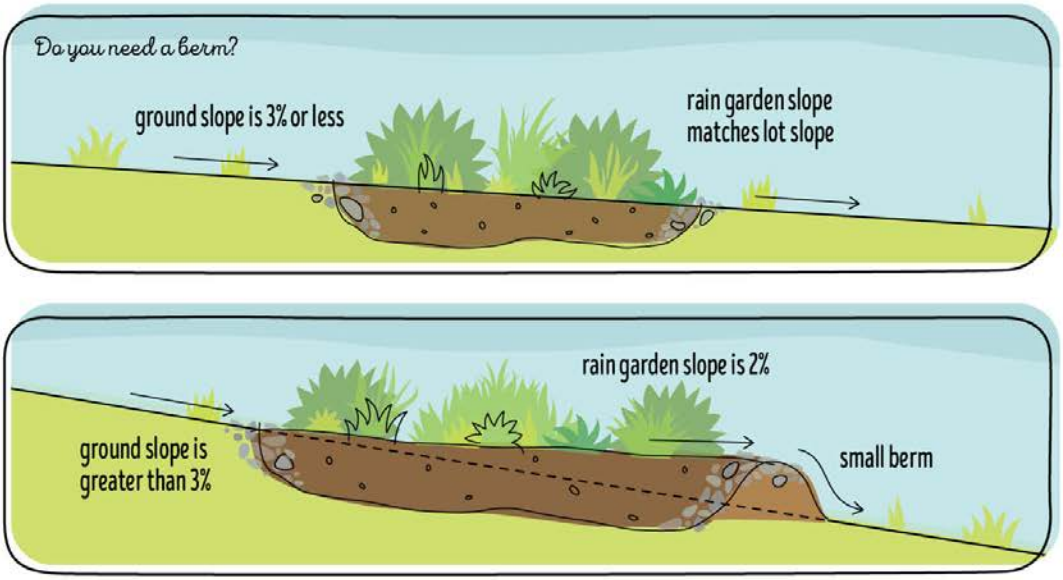
Remember, if you are directing more than one downspout to a rain garden, you will need to use the proper graph for the TOTAL roof area served by the included downspouts. Using the same example house, if two downspouts are being directed to the rain garden, the total roof area would be 20 m^2 multiplied by 2 for a total roof area of 40 m^2. You would then use the '26 to 50 m^2 of roof area' graph for rain garden sizing.

The smallest size for a rain garden is 5 m^2. It is difficult to build a rain garden smaller than this.

Refer back to your slope calculations. If the slope in the location of your rain garden is less than 3%, your rain garden must match your lot slope. If the slope is greater than 3%, the rain garden must have a 2% slope therefore your rain garden will require a berm (see figure on next page).

To determine how high a berm you will need:

- Using your lot slope, determine the difference in ground height over the length of your rain garden. Divide your slope by 100 and multiply by the length of your rain garden along the slope to get your lot difference. ***For example, if your lot is sloped at 6%, and your rain garden is 4 m long, divide 6 by 100 and multiply by 4 (6/100x4) for 0.24 m difference.***
- Using the rain garden slope of 2%, determine the difference in height for your rain garden over the length. Divide 2% by 100 and multiply by the length of the rain garden to get your rain garden difference. ***For example, divide 2 by 100, and multiply by 4 (2/100x4) for 0.08 m difference.***
- Subtract the rain garden difference from the lot difference to get your berm height. ***In this example, 0.24 - 0.08 for a berm height of 0.16 m.***



Berm height can't be higher than 0.2 m (200 mm). If you need a berm higher than this, shorten the length of your rain garden.

The berm may be constructed out of the clay subsoil removed when digging the rain garden. Do not use amended soil or topsoil to construct the berm.

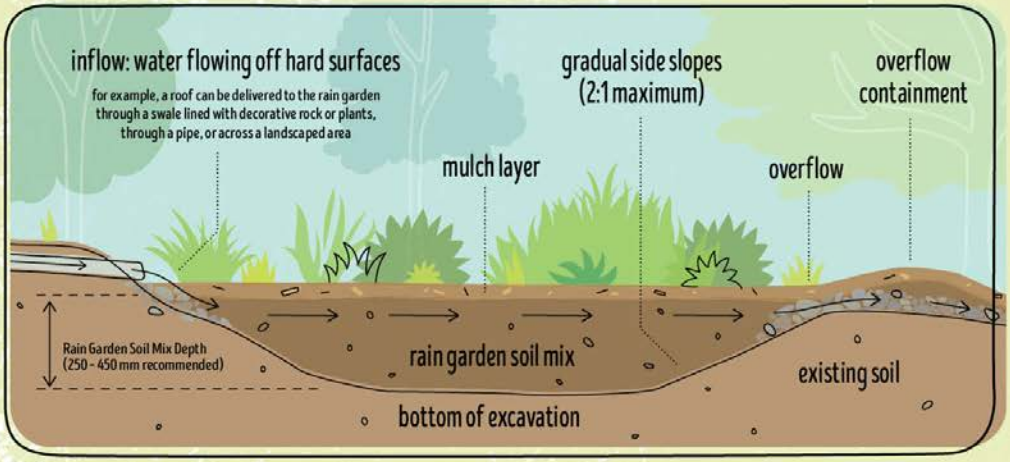
Mark where your downspout(s) will enter the garden. Remember that for the rain garden to work, the inlet and outlet should be as far apart as possible to allow water to flow across the soil.

Mark your rain garden outlet location. This will be determined by your existing site slope and drainage plan. Your rain garden outlet should be placed in a location that allows the rain garden to drain to the lowest point of your property.

Remember!

Your rain garden outlet must be at least 15 cm from the property line adjoining neighboring properties, or 30 cm from the property line adjoining the City right-of-way.

AREA OF YOUR RAIN GARDEN



Using the rain garden worksheet, sketch the size and shape of you would like for your rain garden, keeping the previous points in mind. Mark where your inlet and outlet locations will be.

Determine the amount of soil you require by multiplying the area of the rain garden by the soil depth.

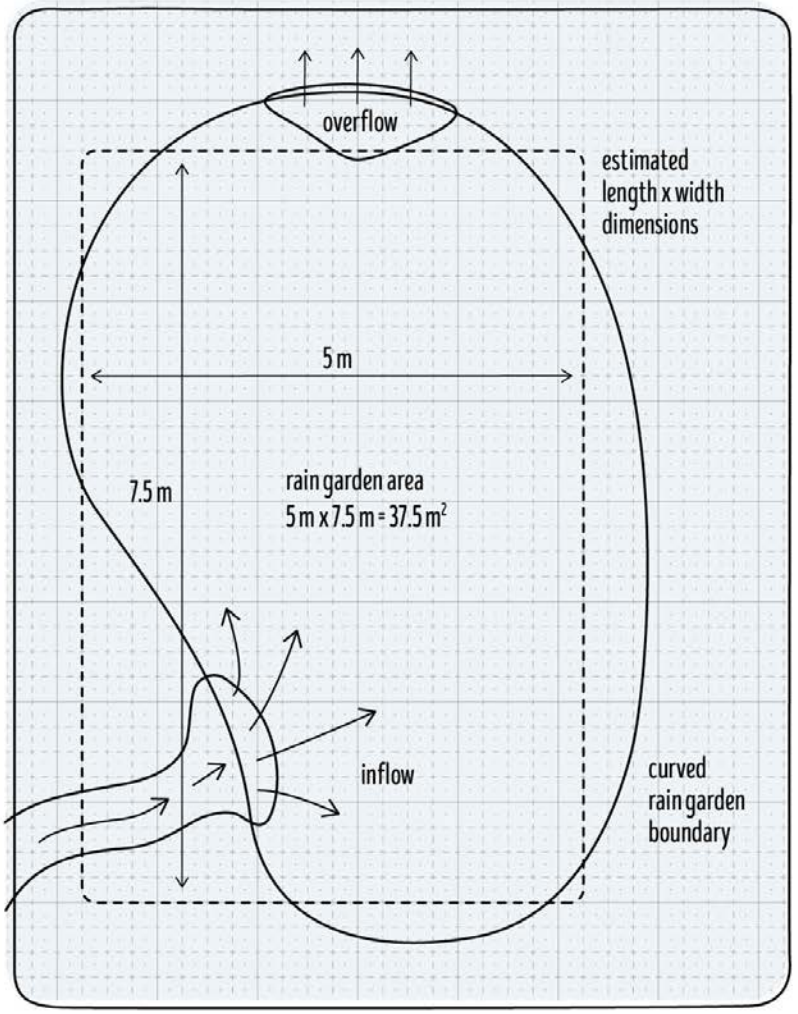
For example, a 12 m^2 rain garden with 350 mm of soil requires (12 x 0.35) 4.2 m^3 of soil. You often need to order soil in cubic yards, so multiply the cubic metres of soil by 1.3 to get cubic yards. 4.2 x 1.3 is 5.46 yd^3.

Determine the amount of mulch you require by multiplying the area of the rain garden by the mulch depth (0.1 m).

For example, a 12 m^2 rain garden requires (12 x 0.1) = 0.12 m^3 of mulch.

Add where you would like your plants in your rain garden plan to create a planting plan.

HOW TO CALCULATE THE AREA OF A CURVED RAIN GARDEN



CALCULATIONS CHECKLIST

- ☐ house length × house width = roof area
- ☐ roof area ÷ no. of downspouts = roof area per downspout
- ☐ number of downspouts directed to rain garden
- ☐ total roof area served by rain garden
- ☐ lot slope
- ☐ rain garden slope
- ☐ berm height
- ☐ rain garden length × rain garden width = rain garden area
- ☐ rain garden area × soil depth = soil volume required
- ☐ rain garden area × 0.1 m = mulch volume required

refer to sizing section for instructions (page 28)

PLANTS

Rain garden plants need to tolerate both wet and dry conditions because rain gardens experience alternating flooding and drought conditions. Any combination of flowers, shrubs, grasses, or ferns that tolerate these conditions can be used.

Native plants can be well suited to rain gardens, since they are used to local growing conditions.

Trees should be avoided in rain gardens, especially deciduous trees, since their leaf litter may hurt the soil's ability to absorb water and clog up the water's flow path through the rain garden.

PLANT LEGEND

- Native
- Ornamental
- Sun
- Partial Sun
- Shady
- May look messy
- Available as seed only

Some grasses can have a messy appearance and are marked in the plant list. Please note that a mixture of 'clean' grass species may also have a 'messy' look if they are sporadically spaced or if certain species are planted together.

Beware of Invasive Species

Do not plant any invasive species, and check the provincial prohibited/noxious weed list prior to planting your rain garden. The list can be found at:

edmonton.ca/bylaws_licences/PDF Weed_Identification_Book.pdf

wheatlandcounty.ca/weedguide

GRASSES

Awned Wheatgrass
AGROPYRON TACHYCULUM

Bulbous Oat Grass
ARRHENATHERUM ELATIUS SP.

Canada Anemone
ANEMONE CANADENSIS

June Grass
KOELERIA MANCRANTHA

Sheep Fescue
FESTUCA OVINA

Sweet Grass
HIEROCHLOE ODORATA

Western Wheatgrass
AGROPYRON SMITHII

Karl Foerster
CALAMAGROSTIS X ACUTIFLORA 'KARL FOERSTER'

Annual Rye Grass
LOLIUM MULTIFLORUM

Canada Wild Rye
ELYMUS CANADENSIS

Fowl Bluegrass
POA PALUSTRIS

June Grass
KOELERIAMACRANTHA

Little Bluestem
SCHIZACHYRIUM SCOPARIUM

Slough Grass
BECKMANIA SYZGACHNE

Tufted Hairgrass
DESCHAMPSIA CESPITOSA

Mooreflame Grass
MOLINA SP.

Use the plant list for inspiration. You can also choose other plants not on the list as long as they are tolerant of both drought and moist soil conditions, and are not on the provincial prohibited/noxious weed list. You do not need to plant water-loving plants, but they do need to tolerate lots of water for brief periods of time, as well as tolerate periods of drought. Usually native vegetation is used in a rain garden because those plants don't require fertilizer, have good root systems, and are adapted to the local climate. Remember to consider plant height, wildlife attraction, flowering, and sun & shade tolerance when choosing your plants. Ask your local nursery for assistance in selecting plants that best suit your vision for your rain garden.

PLANT LEGEND

- Native
- Ornamental
- Sun
- Partial Sun
- Shady

Carefully choose plants with their eventual mature size in mind. The rain garden soil mix provides an excellent growing medium, so plan on most plants reaching their mature width and height, perhaps more quickly than in other locations.

Space shrubs, and plants at installation according to their expected mature size. Plants that are too large can require more maintenance later, such as more pruning and thinning, so choose the right-sized plants from the start.

FLOWERING HERBACEOUS PLANTS

Black-eyed-susan *(RUDBECKIA HIRTA)*	Native, Ornamental, Sun, Partial Sun
New England Aster *(SYMPHYOTICHUM NOVAE-ANGLIAE)*	Native, Ornamental, Sun, Partial Sun
Oxeye Sunflower *(HELIOPSIS HELIANTHOIDES)*	Native, Ornamental, Sun
Showy Tick Trefoil *(DESMODIUM CANADENSE)*	Native, Ornamental, Sun, Partial Sun
Spotted Joe-pye Weed *(EUPATORIUM MACULATUM)*	Native, Ornamental, Sun, Partial Sun
Swamp Milkweed *(ASCLEPIAS INCARNATA)*	Native, Ornamental, Sun, Partial Sun
Wild Bergamot *(MONARDA FISTULOSA)*	Native, Ornamental, Sun, Partial Sun
Wild Columbine *(AQUILEGIA CNADENSIS)*	Native, Ornamental, Sun, Partial Sun
Alkali Buttercup *(RANUNCULUS CYMBALARIA)*	Ornamental
Globeflower *(TROLLIUS SPP.)*	Ornamental, Sun, Partial Sun
Purple Coneflower *(ECHINACEA PURPUREA)*	Ornamental, Sun, Partial Sun

SHRUBS

Red Osier Dogwood
CORNUS SERICEA

Alpine Currant
ALPINE ALPINUM

Chokecherry
PRUNUS VIRGINIANA

Common Juniper
JUNIPERNUS COMMUNIS

Coyote Willow
SALIX EXIGUA

Creeping Juniper
JUNIPERNUS HORIZONTALIS

Dwarf Arctic Willow
SALIX PURPUREA 'NANA'

Highbush Cranberry
VIBURNUM TRILOBUM

Nannyberry
VIBURNUM LENTAGO

Polar Bear Willow
SALIX SALICOLA 'POLAR BEAR'

Pussy Willow
SALIX DISCOLOR

Shining Willow
SALIX LUCIDA

Tri-color Willow
SALIX INTEGRA 'ALBOMACULATA'

Arctic Fire (native) Dogwood
CORNUS STOLONIFERA 'FARROW'

Common Elderberry
SAMBUCUS CANADENSIS

Gold Prairie Fire Dogwood
CORNUS ALBA 'AUREA'

Golden Variegated Dogwood
CORNUS ALBA 'GOUCHAULTII'

Ivory Halo Dogwood
CORNUS ALBA 'BAILHALO'

Kelsey Dwarf Dogwood
CORNUS SERICEA 'KELSEYI'

Nugget Ninebark
PHYSOCARPUS OPULIFOLUS NUGGET

Purple Twig Dogwood
CORNUS ALBA 'KESSELRINGII'

Siberian Coral Dogwood
CORNUS ALBA SIBIRICA 'CORAL'

Spirea
SPIREA SPP.

Notes

BUILDING YOUR RAIN GARDEN

Build

In this section you'll learn:

- How to build your rain garden
- How to dig on a slope
- How to disconnect and reconnect a downspout

Time to build your rain garden! It is important to follow the steps in this guide to ensure your rain garden is built properly.

Put out a call to your friends and family; the more hands helping, the quicker your rain garden will be finished.

If you don't want to do the work yourself, consider hiring a landscape professional.

BUILDING YOUR RAIN GARDEN

Use the included worksheet to draw a rough sketch of your ideal rain garden, including area, shape, plants, and inlet & outlet materials.

TOOLS:

- shovels
- ground paint or string
- a rototiller or cultivator
- weighted lawn roller (optional)

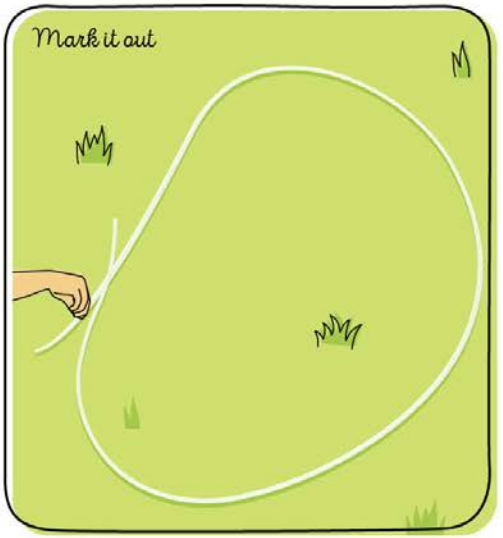
MATERIALS:

- mulch
- amended soil mix
- rock mix
- plants

STEPS:

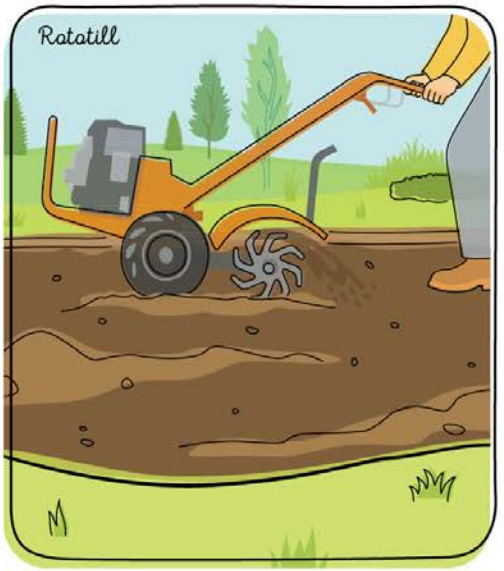
Make sure the rain garden area is blocked off from wet-weather flows (i.e flow from rain events) during construction, especially if the project will take place over a longer period of time.

Mark out the area of your rain garden using ground paint or string tied to wooden stakes. Mark any changes you would like to make. Also mark the inlet and outlet areas.



If you don't require a berm, start digging down to the depth you selected for your rain garden. Gently slope the sides of the garden down to the bottom to create a bowl shape.

If you do require a berm, see the section on how to dig on a slope. Follow the directions to dig down to the depth you selected for your rain garden. Gently slope the sides of the garden down to the bottom to create a bowl shape.



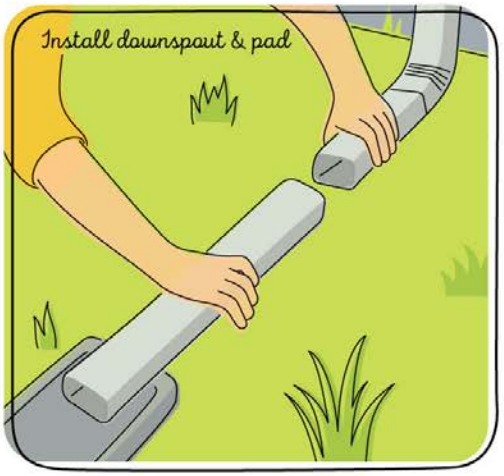
Loosen and break up the soil on the bottom of the rain garden to a depth of 300 mm below the base of the excavation to reduce soil compaction and encourage infiltration. You can break up the subsoil with a rototiller or cultivator.

Place amended soil into the rain garden 200 mm at a time, and lightly compact with a weighted lawn roller or by walking on it. The soil should be firm enough that deep footprints are not created when walked on.

Repeat placing 200 mm of amended soil at a time until the final layer of soil, which may be less than 200 mm. ***For example, if using 450 mm of soil, place the first 200 mm and compact, then place the second 200 mm and compact, and finally place the remaining 50 mm of soil and compact.***

Build an outlet on the downstream side of the rain garden to allow excess water to leave the rain garden. Your outlet must direct excess water to a safe location where it can flow to your lot drainage outlet. Do not direct the water toward adjacent properties or buildings. Line the outlet with drain rock to protect the soil from erosion by spreading out washed rock in a 15 cm (6 in) layer.

If your rain garden does not have a berm, your outlet will be located at the lowest point on the downstream side of the rain garden. If your rain garden does have a berm, your outlet will be cut through the berm in a depression that slopes out from the rain garden. The berm outlet should have rock protection all the way down the side of the berm until existing ground is reached.



Lay out and install the downspout and splash pad for overland flow, or the downspout extension alignment for piped flow to direct runoff into the rain garden. Overland flow paths must go downhill (water will not flow uphill)! If runoff is piped or directly connected to the rain garden, the bottom of the pipe should be at ground level so it does not back up. The pipe also must have erosion protection (see page 8) made out of rocks to slow down the flow. To create an erosion protection area, lay out washed rock in a 15 cm (6 in) layer that is approximately 30 cm by 30 cm or 1 ft by 1 ft.

Plant your rain garden. Refer back to your original design when planting. It's best to position all your plants before starting to ensure you like the layout. Make sure you do not plant too deep or too close. Carefully choose plants with their eventual mature size in mind. The rain garden soil mix provides an excellent growing medium, so plan on most plants reaching their mature width and height, perhaps more quickly than in other locations. Space shrubs, and plants at installation according to their expected mature size. Plants that are too large can require more maintenance later, such as more pruning and thinning, so choose the right-sized plants from the start.

Water plants well, and continue to water until established (Refer to maintenance section for more detail).

Lightly wet mulch to help with placement. Place mulch in a 10 cm layer to discourage weeds and help with water retention.

Lay out and install the overland flow path or downspout extension to direct runoff into the rain garden. If runoff is directed to the rain garden using a downspout extension, the bottom of the extension must be higher than the top of the rain garden to ensure that water does not back up in the pipe and flows freely. Place drain rock to prevent erosion by slowing down and spreading out the incoming water. Do not connect the rainwater flow path/downspout extension until the rain garden is completed to avoid the possibility of working in wet, messy soils.

DIGGING ON A SLOPE

TOOLS:

- measuring tape
- shovel

MATERIALS:

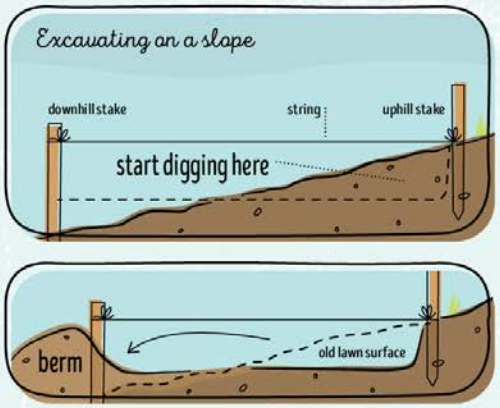
- stakes
- string
- soil

STEPS:

Place stakes on the uphill and downhill side of the rain garden about 1 or 2 m apart along the width of the rain garden.

Measure the berm height from the ground, and mark the downhill stakes with this height.

Tie a string from the berm height on the downhill stake to the ground level of the uphill stake. This string will be at 2% and represents the surface of your rain garden.



Work in 2 m sections (one at a time) to avoid getting tangled up in the strings.

Start digging on the uphill side, measuring down from the string to the desired depth.

If required, use soil excavated from the uphill side to fill the downhill area, maintaining the desired depth along the bottom of the rain garden.

Use excavated clay soils to build your berm on the downhill site, compacting the soil every after every 5 cm added. This will confine the water in the rain garden so no water seeps out.

To build your berm to the correct height, add soil up to the level of the string. The berm will be highest at the downhill end and will become shorter and taper off at the uphill ends. The berm should be sloped at a maximum ratio of 2:1 (horizontal to vertical) and be well compacted.

DISCONNECT A DOWNSPOUT

You may need to disconnect your downspout to direct water to your rain garden.

TOOLS:

- hacksaw
- screwdriver
- pliers or crimpers
- drill
- measuring tape

MATERIALS:

- caps
- splash pads
- screws
- brackets

PERMANENT DISCONNECTION

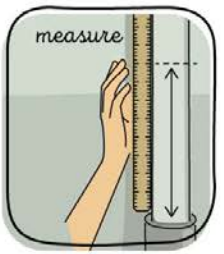
- elbows
- extensions

TEMPORARY DISCONNECTION

- flexible gutter downspout connection

STEPS:

Measure 23 cm (9 in) up the pipe from where the downspout enters the standpipe. Mark on the downspout.



Holding the short piece, cut the downspout using the hacksaw at the mark. Remove the short piece.

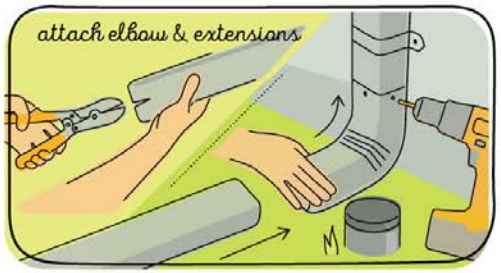
Place the cap on the top of the standpipe to prevent debris, water or small animals from getting into the pipe and causing a blockage.

PERMANENT DISCONNECTION:

Attach the elbow over the downspout to prevent leaking. You may need to crimp the downspout with pliers to make it fit inside the elbow.

Measure, cut and attach any needed extensions over the elbow to prevent leaking. You may need to crimp the opening of the elbow to make it fit inside the extension.

Drill holes, and secure the elbow and extension with sheet metal screws. One screw on each side is typically enough (two to four screws in total).



Seasonal Exemptions

Lots with separate storm services (i.e. not combined sewer area) that have a seasonal exemption/ deferral letter will need to install a temporary disconnection to allow the homeowner to reconnect the downspout in the winter.

TEMPORARY DISCONNECTION:

Attach the flexible gutter downspout extension over the downspout to prevent leaking. You may need to crimp the downspout with pliers to make it fit inside the extension.

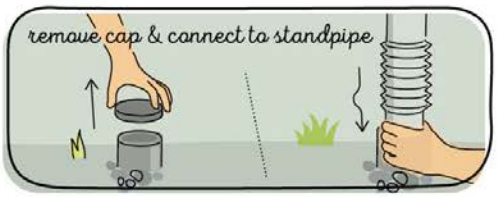
Stretch out the extension away from your house.

TEMPORARY RECONNECTION:

Remove the cap on the top of the standpipe and put it in a safe location to use again the following year.

Collapse the flexible extension down to the smallest length and make sure there are no bends in the pipe.

Insert the bottom of the flexible extension into the standpipe, making sure the extension stays straight and vertical.



Notes

MAINTAIN YOUR RAIN GARDEN

Maintain

In this section you'll learn:

- What to do while your rain garden is establishing
- When the garden will become established
- How to take care of your garden during the winter

Proper maintenance is critical to ensure your rain garden is healthy and working to infiltrate every drop of water it can. A new rain garden requires more maintenance, but once established only occasional maintenance is needed.

Your rain garden will even work in the winter. Don’t add any fertilizers or pesticides to your rain garden, as this can contribute to pollution going into the river.

WHILE THE RAIN GARDEN IS BEING ESTABLISHED

YEARS ONE & TWO

Water your rain garden regularly for the first one to two years until plants are well established.

Remove weeds as needed. Weeds should be easy to pull by hand, especially in the spring. Check your rain garden at least monthly for weeds.

Remove any debris, garbage, leaves, sticks and other items. Pay special attention to the inlet and outlet.

Correct any observed erosion problems. Check for areas of exposed soil, and put down more mulch as needed. Replace dead plants to fill in holes, and ensure drain rock at inlet and outlet is in place.

Feed the Birds

Stems and seed heads may be pruned before winter, but consider leaving them for visual interest and food for winter birds.

ONCE THE RAIN GARDEN IS ESTABLISHED

- Clean your gutters annually.
- Water your rain garden during drought conditions or as needed.
- Check your rain garden monthly for weeds and remove as needed.
- When new growth begins in the spring, cut back dead plant material 5 cm above the ground. Remove and replace dead or diseased plants as needed.
- Maintain mulch layer, and reapply annually as needed. Remove and reapply every three years.
- Remove any debris, garbage, leaves, sticks or other items. Pay special attention to the inlet and outlet.
- Check for signs of erosion. If you can see where the water has flowed through the garden, check that the inlet protection is intact.

Monitor your garden's performance to ensure it is functioning as designed (no ponding, drains within 48 hours). If rain garden is not functioning as designed:

Check that inlet and outlet are clear of debris and leaves.

Ensure garden is free of leaves.

Check under mulch layer to see if fine sediment is clogging the amended soil, and remove and replace as required.

Determine if water is coming into the rain garden from an unexpected source (i.e. the area directed to the rain garden has increased). Re-route flow from the extra area so it won't enter the rain garden to ensure the water remains on your property.

WINTER & RAIN GARDENS

Your rain garden still works throughout the winter months by managing rainwater (usually in the form of snow melt). The infiltration may slow down when the temperature is below freezing, but the rain garden still provides benefits.

Don't worry about the ice

A thin layer of ice may form in your rain garden, but this is normal and is no cause for worry. The ice will collapse after the water underneath it drains into the soil.

Water entering the rain garden during the winter is often warmer than the rain/snow that is falling due to contact with the roof. This slightly-warmer water has a thawing effect in the rain garden. Even a few degrees of difference will melt ice and thaw the soil.

Make sure the rain garden is properly mulched and that fallen leaves are removed prior to the first snowfall.

Clean up your garden in the spring by removing leaves and cutting back plants.

Clean your gutters annually.

Do not plow or shovel snow into the rain garden. Ensure inlet and outlet structures are not blocked. Snow that falls in the rain garden does not need to be removed—in fact, removal may damage the soil and plants.

Ice removal is not necessary in rain gardens. You should take care to prevent sand and de-icing agents from flowing into the rain garden, as they can be harmful to plants and contaminate the groundwater. Sand and other anti-slip agents can build up in your rain garden and affect its infiltration ability.

- Do confirm the location of existing utilities.
- Do talk to your neighbours to minimize potential for complaints.
- Do maintain your existing lot drainage pattern.
- Do provide an overflow for excess water.
- Do maintain a 2% slope on your rain garden if your lot grading exceeds 3% in slope.
- Do block water from entering the rain garden during construction.
- Do buy proper amended soil mix from a reputable landscaping contractor.
- Do use small stones to help prevent soil from washing away at the inlet and outlet of the rain garden.
- Do ask for help if required. Many community groups can provide advice.
- Do submit an online registration prior to commencing the planning phase of your rain garden.

- Don't build your rain garden over utilities.
- Don't use or modify on-site soil to make your own soil mix for the rain garden.
- Don't over-compact the amended soil.
- Don't use fertilizers, pesticides or herbicides.
- Don't direct any water to neighbouring properties.
- Don't exceed the maximum soil depth recommended in this guide – your rain garden may not drain properly.
- Don't allow your rain garden to pond.
- Don't construct a rain garden on a lot that is not fully landscaped.
- Don't use grass clippings or pure/beauty bark for mulch.

FREQUENTLY ASKED QUESTIONS

What is a rain garden?

A rain garden is a shallow garden with special soils designed to collect rainwater that runs off your roof. Rain gardens can be planted with any combination of shrubs, grasses and flowers.

What makes a rain garden different from any other garden?

The most important part of a rain garden is what you can't see, the loose, deep soil underneath that absorbs and filters rainwater.

What is stormwater?

Stormwater is water from rain or melting snow that does not soak into the ground. It runs over roads, roofs, bare soil and other impervious surfaces.

Why is stormwater a problem?

We tend to think that large industrial polluters cause the most harm to our water sources, but we are the real culprits! When stormwater flows, it picks up everything in its path and transports it to our local rivers and lakes, including pollutants such as sediment, pet waste, pesticides/fertilizer, de-icers, and automobile fluids (oil, grease, gas, antifreeze). In fact, close to 70% of the pollutants that enter rivers and lakes are transported there by stormwater, and about 50% of the pollution comes from individuals and homeowners due to yard care, yard waste and chemical pollution from household activities (data source: US Environmental Protection Agency).

Will rain gardens attract or breed mosquitos?

No. A properly-constructed rain garden is designed to hold and infiltrate water, not create standing water. Your rain garden is designed to drain rapidly and will have no surface ponding. Water will only be present for one to three days. Mosquitos have a four to 12 day lifecycle and take between four and seven days to become adults after eggs are deposited in standing water.

Will a rain garden attract bees?

Fragrant flowering plants will attract a wide variety of animals, such as birds, butterflies, and bees. 90% of insects are beneficial to gardening, and rain gardens are filled with pollinators of all sorts. You can also select plants to attract certain pollinators (such as butterflies) -- just make sure the plants can tolerate wetter soil conditions.

Do rain gardens have a wild and messy appearance?

No. While rain gardens are usually less manicured than regular gardens and have a more natural look, there is no reason they must appear messy. Keep your rain garden looking orderly and attractive by using well-defined edges, shorter plants and smaller shrubs.

Will my rain garden have standing water?

Not if installed properly. The rain gardens described in this document have no surface ponding and rely solely on the amended soil to soak up water.

Will a rain garden flood my basement?

No, not if it properly located, designed, and constructed. A rain garden should be at least 5 m away from any portion of your home. This will prevent water from draining to your foundation. The overflow should be located to flow away from your home rather than toward it.

Do rain gardens work in winter?

Yes, but they may have less effect because plants will be dormant. The rain garden soil will freeze. However, due to the looser soil structure, it will also thaw much more quickly. Water may stay in the soil longer, especially if the underlying soil is frozen, but that is not a problem in winter. Rain gardens do work best in the spring, summer, and fall, and that is when they are most needed. Over 50% of the yearly precipitation in Edmonton occurs in June, July, and August.

What is the cost of a rain garden?

The cost of a rain garden is dependent on the size of the rain garden, the depth of amended soil and the types of rocks and plants chosen. As rough cost estimate could be between $70 to $100 per m^2, depending on materials, depth, and plants. Ask your landscaping contractor or local landscape supplier for more details when you are selecting your materials.

Can a rain garden be too large or too small?

A rain garden should be at least 5 m^2. *For example, if you are directing 50 m^2 of roof to the rain garden, the garden should be no larger than 7.5 m^2. If the calculation gives you less than 5 m^2, use 5 m^2.*

Do I have to mulch my rain garden?

Yes, mulch will helps the stay garden moist, discourages weeds, and keeps the garden looking tidy. Using shredded hardwood mulch will also help enrich the soil, as no fertilizer should be applied to the rain garden.

Do I need to fertilize my rain garden?

No! Do not fertilize your rain garden. Stormwater carries many nutrients that are absorbed by the rain garden, so it is naturally fertilized regularly. Adding additional fertilizer would defeat the rain garden's purpose as a water treatment method. Fertilizing the rain garden may actually worsen water quality if excess nutrients are carried away by water overflowing from the rain garden.

Can I pile snow on my rain garden?

No. You can place a small amount of snow on your rain garden (providing it does not have sand or de-icing agent in it), but larger amounts may compact the soil or damage plants. Having a large snow pile in the rain garden in early spring may slow down the plant growth/greening. It is better to place large amounts of shoveled snow next to the rain garden so that meltwater will flow to the rain garden for infiltration.

What about salt?

It is better to locate the rain garden where it will not receive direct salt discharge. There are some salt-tolerant plants that you may use if the only place you can locate the rain garden will be subject to salt spray, but it is better to avoid infiltrating salt-laden waters. Salt cannot be easily removed from water; the only treatment currently available is reverse osmosis (desalination).

Can I order a sign for my rain garden?

Yes, register your rain garden with the City of Edmonton and you can receive a sign as our way to recognize your rain garden project. Fill out the web form on edmonton.ca/raingarden.

Who can I ask for help?

For Lot Grading inquiries, call 311 or email lot.grading@edmonton.ca

For Flood Prevention Home Checkup, call 311.

For Water & Sewer Servicing inquiries, call 311 or email wass.drainage@edmonton.ca

General rain garden inquiries or arrange volunteer mentor support, email raingarden@edmonton.ca.

GLOSSARY

Absorption: The physical uptake of water or dissolved chemicals by soils or organisms such as microbes or plant roots.

Amended soil: A soil that has sand or compost added to increase the infiltration capacity and/or water retention capabilities.

Berm: A small hill or wall of dirt/soil.

Common drainage swale: Shared drainage swales are located on common property lines. The grading of the drainage swale down a common property line must allow for 10% slope from the foundation walls of adjacent houses, and must provide drainage for both properties.

Compaction/soil compaction: When a soil gets denser after force is applied to it and the air in the soil grains gets displaced. Compaction is often achieved with a roller or mechanical tamper.

Destabilize: To cause the hillside to become unstable or unsafe.

Downspout: A pipe that carries rainwater from the roof of a building to the ground.

Drainage swale: A shallow, often-wet tract of land that is sloped to convey surface drainage toward a City right-of-way. The purpose of a swale is to collect and direct stormwater away from the building foundation and toward a suitable rain water outlet, such as the street or a catch basin.

Erosion: The mechanical process of wearing or grinding something down (as by particles washing over it).

Evaporation: When liquid water converts to water vapour due to energy from heat or air movement.

Groundwater: Water within the earth that often supplies wells and springs.

Groundwater recharge: Replenishment of existing natural groundwater aquifers from surface water or precipitation.

Groundwater table: The zone of soil and rock saturated with groundwater. High groundwater tables are close to the surface.

Hazardous or steep slopes: Any slope over 10% in grade or within a ravine setting.

Hydrologic cycle: The natural cycle of water from the atmosphere, to precipitation, to runoff, infiltration and groundwater recharge, to evaporation and transpiration back into the atmosphere.

Impervious surfaces: Surfaces such as roofs, roads, and parking lots. They do not soak up water and prevent water from passing through or penetrating into the subsoils.

Infiltration: The downward entry of water into the soil. Infiltration is often expressed as a rate (mm per hour), which is determined through an infiltration test.

Inlet: A way for entering; an opening or pipe to allow water into a rain garden.

Invert: The lowest point on the inside of a pipe, or the bottom elevation of a channel or rain garden.

Invasive species: Non-indigenous species, or non-native plants or animals, that adversely affect the areas they invade.

Lot drainage outlet/lot outlet: The place where all the water naturally drains out of your lot (the lowest elevation along the lot frontage). The drainage outlet is often the invert of the drainage swales at the street.

Lot grading: Shaping and sloping the land to direct surface drainage away from buildings and toward a City right-of-way.

Noxious weed: An invasive species of plant that has been designated by local or federal authorities as one that is harmful to crops (agricultural or horticultural), natural habitats/ecosystems, and humans or livestock.

Outlet: Place where something is let out. In a rain garden, this would be an opening or pipe to allow water to leave the garden.

Overland flow: Another term for surface drainage. Rainwater can be directed to rain gardens via overland flow on paved surfaces or grassed areas.

Retrofit: Installation of new technology or features (e.g. a rain garden) to existing developments.

Runoff: The portion of rainfall that flows over ground surface.

Sheet flow: Slow, shallow stormwater runoff over the land surface. More spread out than overland flow.

Stormwater: Precipitation during a storm that does not absorb into the soil and runs off into surface water bodies or stormwater management facilities (stormwater lakes, pump stations, sewers, etc.).

Subsoil: The layer of soil that is under the top layer (topsoil).

Topsoil: Surface soil, usually including the organic layer where the plants have most of their roots.

DESIGN & CONSTRUCTION STANDARDS

The City's standards for all projects help ensure that all infrastructure work in the city of Edmonton is constructed to a consistent standard. The standards contain a design section, specifications and drawings as required, plus any other guidelines or manuals appropriate. These standards can be found at edmonton.ca.

LOT GRADING GUIDELINES

Explanation of lot grading plan requirements and common elements can be found at edmonton.ca.

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