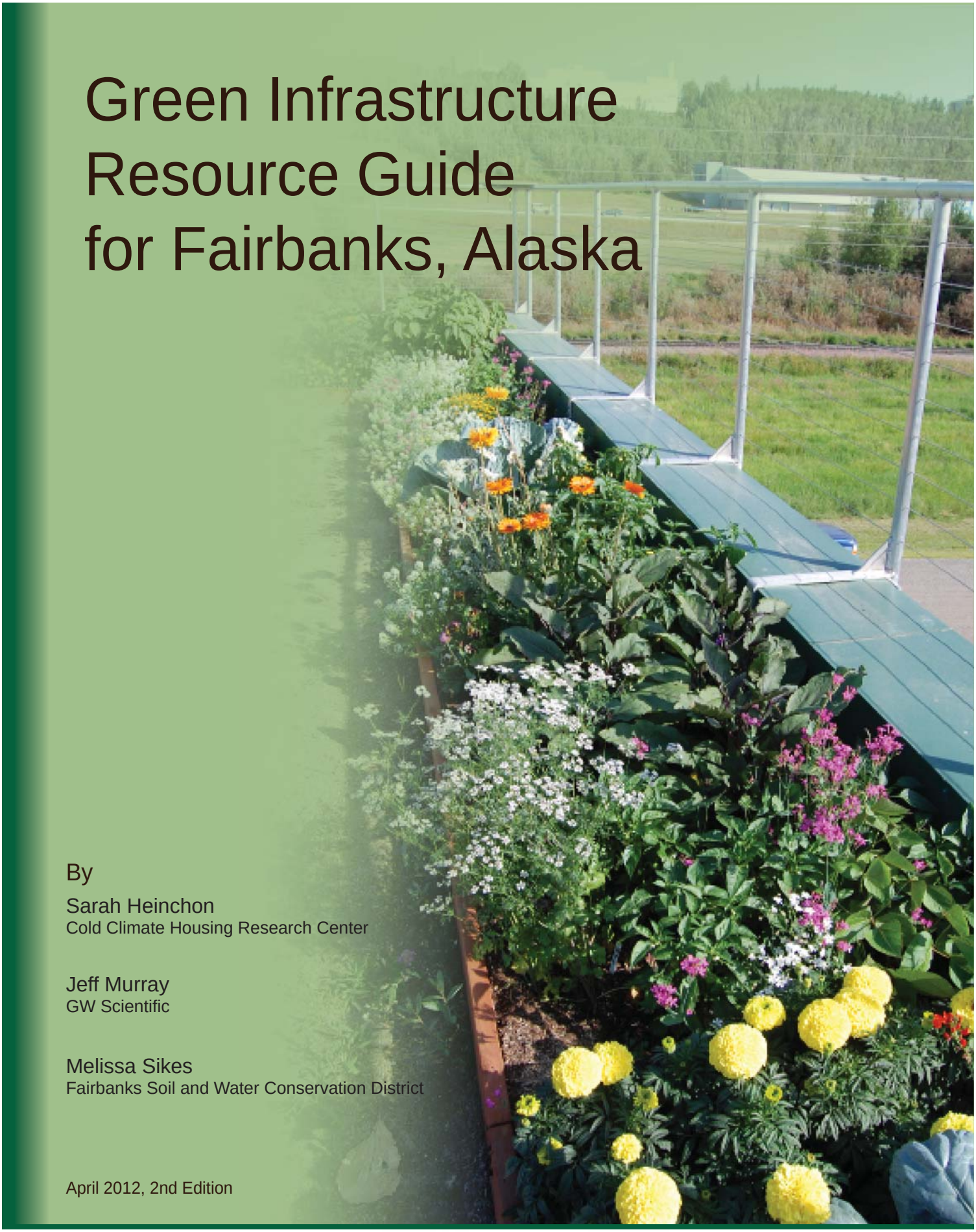
Green Infrastructure Resource Guide for Fairbanks, Alaska



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April 2012, 2nd Edition

COLD CLIMATE HOUSING RESEARCH CENTER
CCHRC

CITY OF FAIRBANKS ALASKA

FAIRBANKS SOIL & WATER CONSERVATION DISTRICT

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Introduction

"Green Infrastructure" best management practices (BMPs) can be used to manage wet weather through infiltration, evapotranspiration, capture, and reuse of water from rain and melting snow that is cost-effective, sustainable, and environmentally friendly. On a residential scale, examples of green infrastructure include rain barrels, rain gardens, green roofs, permeable pavers, and an array of rainwater harvesting systems for non-potable uses such as gardening, lawn irrigation, and even toilet flushing. This Green Infrastructure Resource Guide is intended to be a resource for homeowners in the Fairbanks area for constructing these types of BMPs on their properties. The guide provides background on the purpose and need for green infrastructure in the Fairbanks area, discussion of how this guide was developed, design considerations for the Fairbanks area, and detailed installation instructions for BMPs suitable for the Fairbanks environment.

Purpose and Need for Guide

The City of Fairbanks (City), incorporated in 1903, lies along the banks of the Chena River and Noyes Slough and has grown to a population of more than 35,000 within city limits. While residential areas have necessarily expanded away from the river, the square footage of impervious surfaces, increase in monoculture planting such as lawns, and other urban development factors have contributed to a substantial amount of runoff and pollutants therein that empties into the river and slough. The BMPs presented in this guide aim to assist the City in mitigating these runoff concerns.

Guide Development Process

In December 2009 the Alaska Department of Natural Resources invited local governments across Alaska to apply for planning grants that would help prevent water pollution and improve water quality in their communities. The City partnered with the Cold Climate Housing Research Center (CCHRC), GW Scientific (GWS), and Fairbanks Soil & Water Conservation District (FSWCD), and successfully applied for a grant to develop this guide for homeowners in the Fairbanks area. Development of the guide utilized an intern position at the CCHRC to work with a team of design, hydrology, and education experts from the project team to evaluate and design cold-climate BMPs for residential properties, engage the community in small-scale demonstration projects, and ultimately provide a planning resource for future residential development, redevelopment, and retrofit projects, as follows.

Update

Between July, 2011 and April 2012, project pages were updated by the Fairbanks Soil and Water Conservation District. Pictures from Green Infrastructure projects in Fairbanks that were funded through the intitial grant and the continuation grant were substituted wherever possible.

Research & Preliminary Design

Development of the guide began by compiling each partner's personal collections of research data and publications related to BMPs in Alaska and other cold-climate regions. The project intern then completed a literature review of the data and publications to assist the project partners with selection of 10 BMPs appropriate for residential use in the Fairbanks area based on the feasibility, cost-effectiveness, ease of installation, and level of maintenance. The 10 BMPs selected included the rain barrel, rain garden, tree pit, infiltration and flow-through planter, dry well, swales and berms, green roof, permeable pavers, grass reinforcement mesh, and riparian zone revegetation – each of which are shown in the guide with specific cold-climate design adaptations.

Demonstration Projects

Once the preliminary design work was complete, a series of small-scale demonstration projects of the selected BMPs were completed under three venues to educated the public about BMPs and inform them about development of the guide. All of these demonstration projects occurred in 2010, as follows.

1. The first venue was homeowner participation in demonstration projects (i.e. building a rain garden), through reimbursement of materials and/or contractual labor costs up to $500 per residence. A total of six residences were selected through an application process based on location and project type. For each demonstration project, the construction process was well-documented by taking "before and after" and "step-by-step" photographs, as well as tracking all materials, costs, and labor hours involved for use in the guide. Information regarding the performance of these BMPs will be collected at a later date.

2. The second venue was three in-store workshops at the FSWCD Annual Tree Sale on May 22, Lowe's on July 10, and Tanana Valley Farmers Market on July 14 which demonstrated how to construct some of the simpler green infrastructure applications (i.e. installing a rain barrel for water reuse).

3. The third venue was booths at the Interior Alaska Building Association's Home Show on March 26-28, Tanana Valley State Fair on August 7, and Chena Hot Springs Resort "Pollution Solutions" 2010 Renewable Energy Fair on August 15. The functions of these booths were to engage homeowners who may not know about runoff concerns, and provide them with simple, effective solutions to these problems.

Guide Compilation

Once the demonstration projects were complete, the resource guide was assembled using the final design drawings, construction photographs, material lists, and refined estimates of the material costs and labor hours associated with each green infrastructure BMP, as well as a thorough bibliography of additional print and online resources. For the BMPs that demonstration projects were not completed, stock photographs and representative cost/labor information were used until such time local documentation can be obtained for replacement.

Lowe's July 10, 2010

Tanana Valley Farmer's Market July 14, 2010

Green Infrastructure Design Considerations for Fairbanks

Geology

Fairbanks is located in the Tanana River Valley between the White Mountains and the Alaska Range. The valley bottom consists of permeable flood-plain alluvium, but the hills are covered in loess and perennially frozen silt. Discontinuous permafrost is also found on the north facing slopes of hills and in the poorly drained lowlands (Geologic Map of Central (Interior) Alaska Northeastern Region, 1998). Permafrost affects BMP effectiveness by greatly reducing the porosity of the soil. Infiltration BMPs should not be considered in areas with shallow permafrost. Loess also creates very poorly draining soils, but these soils can be amended for infiltration BMP use. The groundwater level in the valley bottom is usually between 5 to 20 feet below the surface, and is seasonally affected. The lowest levels are just before the spring snowmelt, and the highest levels occur after spring snowmelt (United States Geological Survey, n.d.).

Climate

Located centrally in Alaska's Interior, which is classified as a sub-arctic climate, Fairbanks experiences some of the largest, and most extreme, climatic variations in North America. From bitter cold in the winter to warm in the summer, the temperature variations alone can cause headaches when trying to create successful Green Infrastructure projects.

The Fairbanks area is dominated by solar radiation received throughout the year. In the summer months, the sun is above the horizon for as much as 18-21 hours per day. During this time, temperatures commonly reach into the 70s, and while not as frequently, they can also reach into the 80s and 90s. On average, temperatures reach 80 degrees or higher about 10 times each summer. In the winter, when the sun is only above the horizon for a few hours, the average temperature dips well below zero degrees. Temperatures during the winter months vary drastically, from as warm as 45 degrees above to 65 degrees below zero (ACRC, 2010). As a result of the extremely long, cold winters, the ground begins to freeze in October and does not begin to thaw until May (Shannon & Wilson, 2006).

Precipitation

The average annual precipitation in Fairbanks is around 10 inches, with an average of only one inch per month in June, July, August, and September(Shannon & Wilson, 2006).

Snow covers Fairbanks from October through April, and snow cover is persistent throughout the winter. While fall is considerably drier than summer, it contributes the most snowfall. Winter and spring are even drier because the atmosphere is so cold, which prevents much water vapor from accumulating.

Summertime rainfall peaks in July and August, but consistent averages should never be expected as shown on the graph on the following page.

The BMPs selected for Fairbanks are designed to process the rainwater runoff in the summer and snow melt in the spring. Fairbanks experiences its peak water runoff event in the spring when the snow melts when most BMPs effectiveness is reduced by the inability of the soil to absorb water while it is frozen. However, infiltration BMPs do gradually thaw the frozen ground. This is accomplished by standing water being warmed by the sun that results in the ground being able to thaw and the standing water to percolate down into the soil.

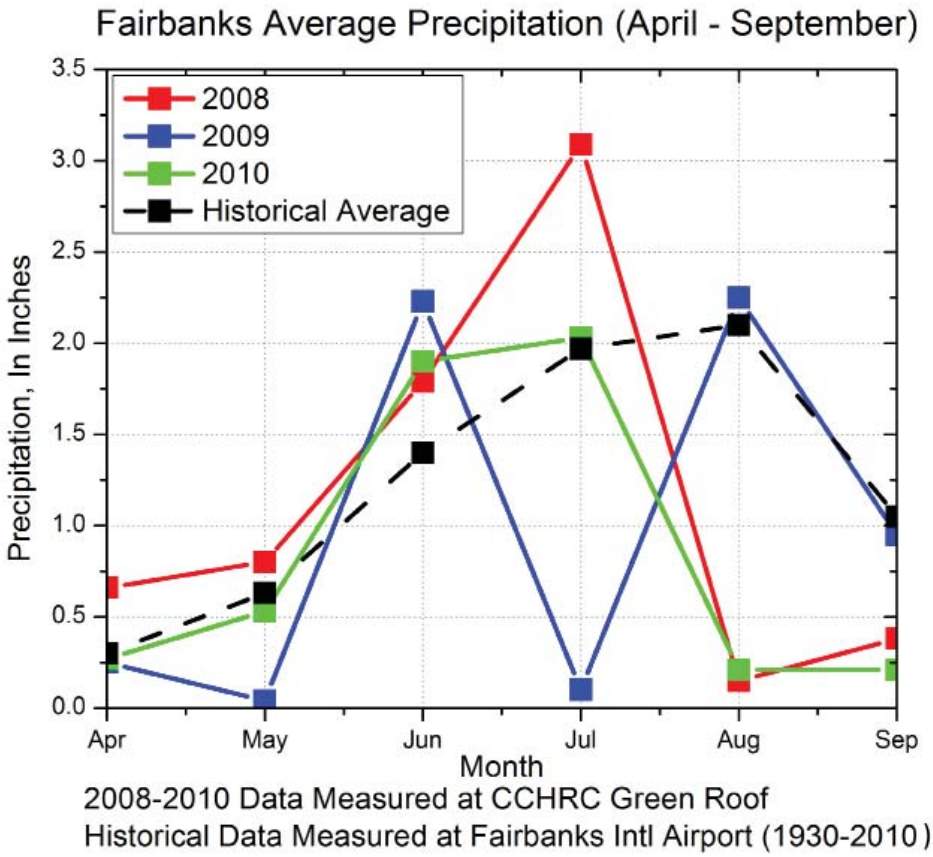


Figure 1 shows the 2008 and 2009 summer rainfall data collected at the CCHRC's Green Roof, located about two miles from the northwest boundary of the City of Fairbanks. These amounts are compared to the historical rainfall average. June and July present good examples of the uncertainty of rainfall amounts from year to year. In both 2008 and 2009, CCHRC received slightly higher than average rainfall amounts in June. In July 2008, CCHRC received above normal amounts of rain, while, as previously stated, Fairbanks received almost no rain in July 2009.

Water Quality

As Fairbanks has become more urbanized, the quantity of runoff has increased while the quality has degraded. This is due to increased development and amounts of impermeable surfaces. As more area is developed, there are fewer opportunities for rain water and snowmelt to infiltrate into the ground. This not only increases the amount of runoff, but it also increases the amount of sediment, nutrients, bacteria, and contaminants being introduced into the nearby water bodies. Increased runoff also increases the temperature of the water bodies, harming cold water species (Alaska Storm Water Guide, 2009).

According to the Fairbanks & North Pole Storm Water Management Program Guide "the main pollutants of concern from residential land use are sediments, oil and grease, solvents and detergents, litter and debris, pesticides and fertilizers, nutrients, and pathogens." The best way to reduce the impacts of these pollutants is the use of BMPs.

Selection and Adaptation of Green Infrastructure Applications for Fairbanks

The primary focus of this guide was to develop do-it-yourself green infrastructure projects for homeowners of Fairbanks. Selection of the projects, or BMPs, was based on several factors: including feasibility, cost-effectiveness, ease of installation, and level of maintenance.

Feasibility

The first aspect consideration was whether or not the BMP could perform in Fairbanks' climate. The climate here presents unique challenges in collecting and using runoff, including infrequent, heavy rains; a brief growing season; and permafrost and other frozen ground conditions. Many of the BMPs used in other states are simply not suitable for Fairbanks based on these climate conditions.

Cost-Effectiveness

The cost of shipping was also a key consideration in selecting BMPs for Fairbanks. Some solutions, while practical and inexpensive at the outset (i.e. permeable concrete pavers), were cost-prohibitive when shipping costs were factored in. Lighter-weight materials, like the grass mesh, proved to be more appropriate for Fairbanks. In addition, few of the materials required for many BMPs are available locally.

Ease of Installation

In focus with the intent of the guide, the most practical approach was to select and develop BMPs that local homeowners could accomplish themselves, or with a minimal amount of contracted help. There is one exception to that rule in our group of BMPs - green roofs, which have been built atop log cabins for many generations in Fairbanks.

Level of Maintenance

The level of maintenance for each BMP was also a key factor. Usually there is more maintenance required for BMPs in Fairbanks than would be required for less extreme environments. The higher the maintenance level, the more likely that the BMP will fail due to it not being properly maintained. Homeowners are also more likely to install a BMP that is easy to maintain.

Residential BMP Comparison Tables

After considering all of these factors, the following 10 BMPs were selected. The cost estimates were calculated based on materials needed, equipment rentals, and shipping costs; and the runoff volume reduction percentages were derived from the "Technical Memorandum: The Runoff Reduction Method" (Hirschman & Collins, 2008)

BMPs Feasible for Fairbanks					
BMP Project	**Cost Estimate**	**Time Estimate (days)**	**Ease of Installation**	**Runoff Volume Reduction (%)**	**Maintenance Level**
Rain Barrel	$70 - $200	1	Easy	40	Moderate
Rain Garden	$10 - $15 per sq ft	1 - 3	Moderate	40 - 80	Moderate
Tree Pit	$10 - $100	1	Easy	50 - 90	Low
Infiltration and Flow-Through Planter	$60 - $250	1 - 2	Moderate	50 - 90	Moderate
Dry Well	$10 - $20	1 - 2	Moderate	50 - 90	Moderate
Swales and Berms	$3 - $7 per sq ft	1 - 3	Moderate	40 - 60	Moderate
Green Roof	$20 per sq ft	5 - 10	Difficult	45 - 60	Low
Permeable Paver	$10 per sq ft	1 - 2	Moderate	45 - 75	Low
Grass Protection Mesh	$1.25 per sq ft	1	Easy	10 - 20	Low
Riparian Zone Revegetation	$300 - $1000	1 - 4	Moderate	10 - 20	Low

BMPs Not Feasible for Fairbanks					
BMP Project	**Cost Estimate**	**Time Estimate (days)**	**Ease of Installation**	**Runoff Volume Reduction (%)**	**Maintenance Level**
Porous Asphalt	$8 - $10 per sq ft	1 - 3	Difficult	45 - 75	High
Xeriscaping	$10 - $15 per sq ft	2 - 4	Difficult	10 - 20	Moderate
Retention grading	$1 per sq ft	3 - 4	Difficult	0 - 15	Low

Selected Green Infrastructure Applications

The following handouts were produced for homeowners to help them choose BMPs that are appropriate for their property and lifestyle.

List of Handouts

Rain Barrel

Rain Garden

Tree Pit

Infiltration and Flow-Through Planters

Dry Well

Swales and Berms

Green Roof

Permeable Pavers

Grass Reinforcement Mesh

Riparian Zone Revegetation

Sections of Each Handout

An explanation of the BMP

Installation difficulty

Cold climate considerations for the BMP

Materials list

Tools required

Installation steps

A diagram of the BMP

Expected maintenance

Cost estimate

Time estimate

Pros and cons of the BMP

A list of sources for more information

Easy Difficult

Rain Barrel

For Your Home

Need free water?

A rain barrel is used to collect rain water for non-potable uses. A simple rain barrel can be constructed for minimal costs using materials found at most hardware stores. A rain barrel is an easy way to help the environment and save you money.

Caution: Water collected in rain barrels is safe for grey water uses, i.e., watering plants and gardens (not including vegetables). IT IS NOT SAFE TO DRINK.

Cold Climate Considerations:
The rain barrel must be disconnected from the downspout in the fall to prevent ice dams from forming in the gutters. We also recommend that homeowners cover the top of the barrel or use mosquito pellets made with Bt-israelensis (Bt-i) to control the mosquito population.

Constructing Your Own Rain Barrel

Materials:
- ☐ 55-gallon barrel
- ☐ Garden hose valve or spigot
- ☐ Garden hose washer
- ☐ Plastic hose/tubing
- ☐ Plastic cement/silicon caulking
- ☐ Teflon tape
- ☐ ¾" polypropylene compression bulkhead fitting
- ☐ Small sheet metal screws
- ☐ Cinder blocks
- ☐ Wire screen
- ☐ Universal downspout adapter or flexible down spout extension

Tools:
- ☐ Drill
- ☐ 1" drill bit
- ☐ Small drill bit
- ☐ Keyhole saw
- ☐ Heavy-duty scissors
- ☐ Hacksaw

Garden Hose Valve

www.malcleanse.co.uk/

Bulkhead Fitting

aquabarrel.com

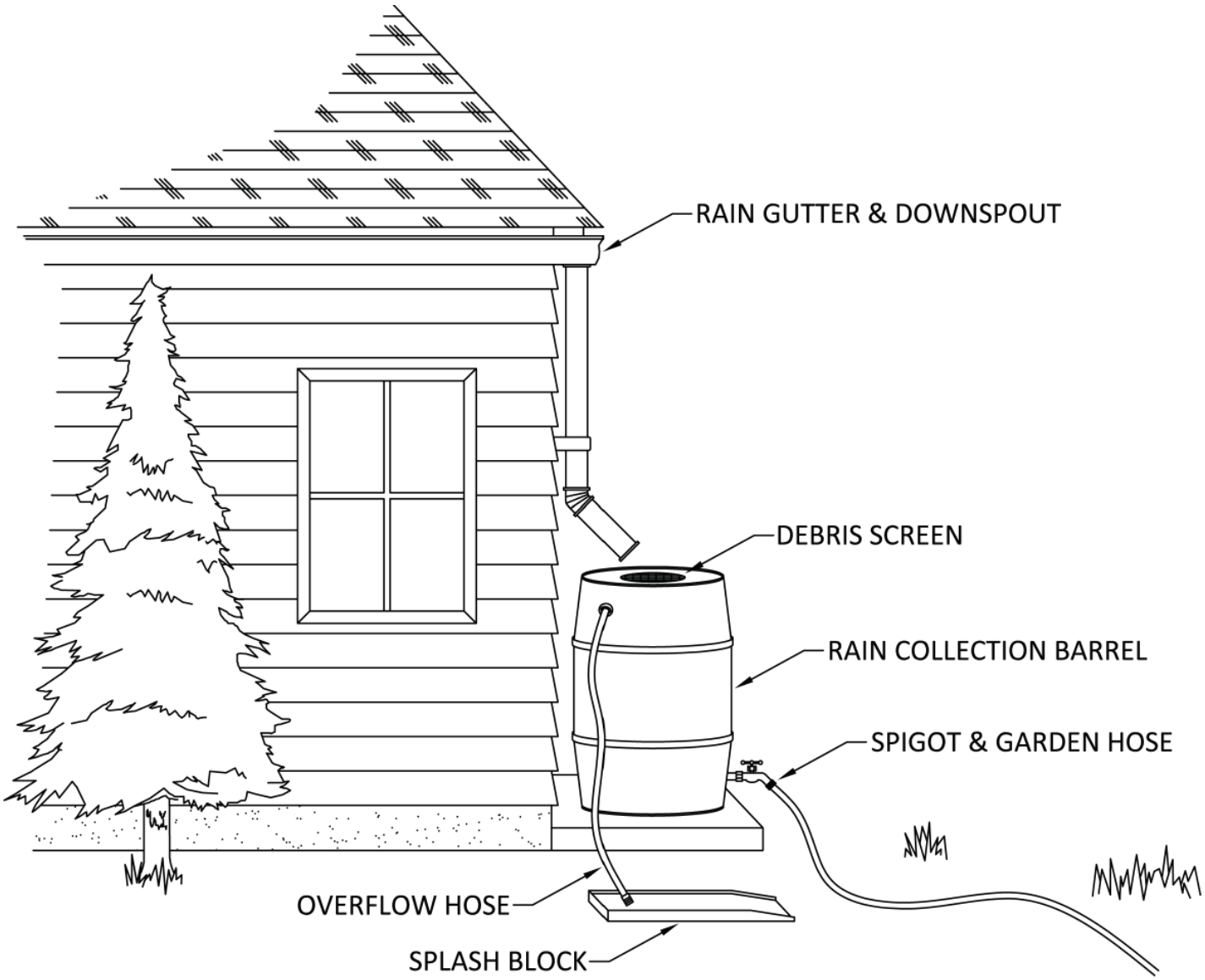
Garden Hose Washers

http://www.generich.com

Keyhole Saw

Steps:

1. You can calculate the amount of water you can expect to collect using the size of your roof and the average rainfall for Fairbanks. Fairbanks averages about 1.3 inches of rain each month from May to September. This will help you determine how many barrels you will want to install. A rain barrel calculator is available at: http://cchrc.org/green-infrastructure.
2. Level the soil at your site and use the cinder blocks to create a stable platform for the rain barrel.
3. Saw an opening about twice the size of your downspout in the top of the barrel for the incoming water.
4. Drill a one-inch hole within four inches of the bottom of the barrel.



5. Attach the bulkhead fitting:
   a. Remove the locknut from the fitting, leaving the gasket on the body.
   b. Wrap Teflon tape around the threads of the bulkhead fitting.
   c. Insert the body through the hole in the tank from the inside, trapping the washer between the tank wall and the bulkhead fitting.
   d. Screw the locknut back onto the body over the Teflon tape.
6. Attach the wire screen to the hole on top of the barrel to keep debris out.
7. Modify the downspout so that it directs water into the barrel:
   a. Measure how tall your rain barrel is going to be including the height of the platform and up to five extra inches
   b. Use a hacksaw to cut the downspout at the appropriate height.
   c. Attach the universal downspout adapter or flexible down spout extension.
   d. Place the rain barrel under the downspout so the water will flow into it.
8. Install waterproof heat tape in downspout and barrel (recommended).
9. Set up the overflow system:
   a. Drill a hole within three inches of the top of the barrel.
   b. Insert the plastic hose/tubing into the hole and glue into place.
   c. Direct the hose to a suitable runoff area or another barrel

Maintenance:

- Wash out and check washers for integrity every spring.
- Clean off the wire screen periodically throughout the growing season.
- Clean gutters once a year to keep them clear.
- Empty the barrel and divert the downspout after the first freeze in the fall.
- Clean algae buildup yearly.

Cost Estimate:

- Pre-made: $80 - $200
- Homemade: $70 - $200

Time Estimate:

- The project should take about one to two days.

Pros:

- Reduces water runoff
- Increases groundwater infiltration
- Minimal maintenance required
- Requires limited space
- Collects rainwater for gray water uses

Cons:

Freezing water can cause pipe blockage and deformation of the barrel.

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

Aquabarrel Kits
www.aquabarrel.com

City of Portland, Oregon, Rain Barrel Plans
www.portlandonline.com/bes/index.cfm?a=182095&c=50367

Drought Buster, Downspout rainwater redistributor
www.cleanairgardening.com/drbudorare.html

Plant Kingdom has 40-gallon barrels with a spigot already installed.
620 Fideler Rd, Fairbanks, AK 99712
(907)457-5268

Rain Barrel Guide is a website with many articles on rainwater harvesting.
www.rainbarrelguide.com

Sourdough Fuel sells new 55-gallon barrels.
(907)456-7798x2

Whatcom County, Bellingham, Washington, Rain Barrel Factsheet
http://whatcom.wsu.edu/ag/compost/rainbarrel.htm

Easy Difficult

Rain Garden

For Your Home

Want to mow less?

A rain garden is generally a low section of land that is planted with water-tolerant plants that absorb rainwater and filter out harmful chemicals. It is a very effective and attractive way of diverting runoff from your home's rain gutters.

A rain garden is usually a low section of land that is assembled with water-tolerant plants that absorb rainwater and also filter out harmful chemicals. It is a very effective and attractive way of diverting runoff from your home's gutters.

Cold Climate Considerations:

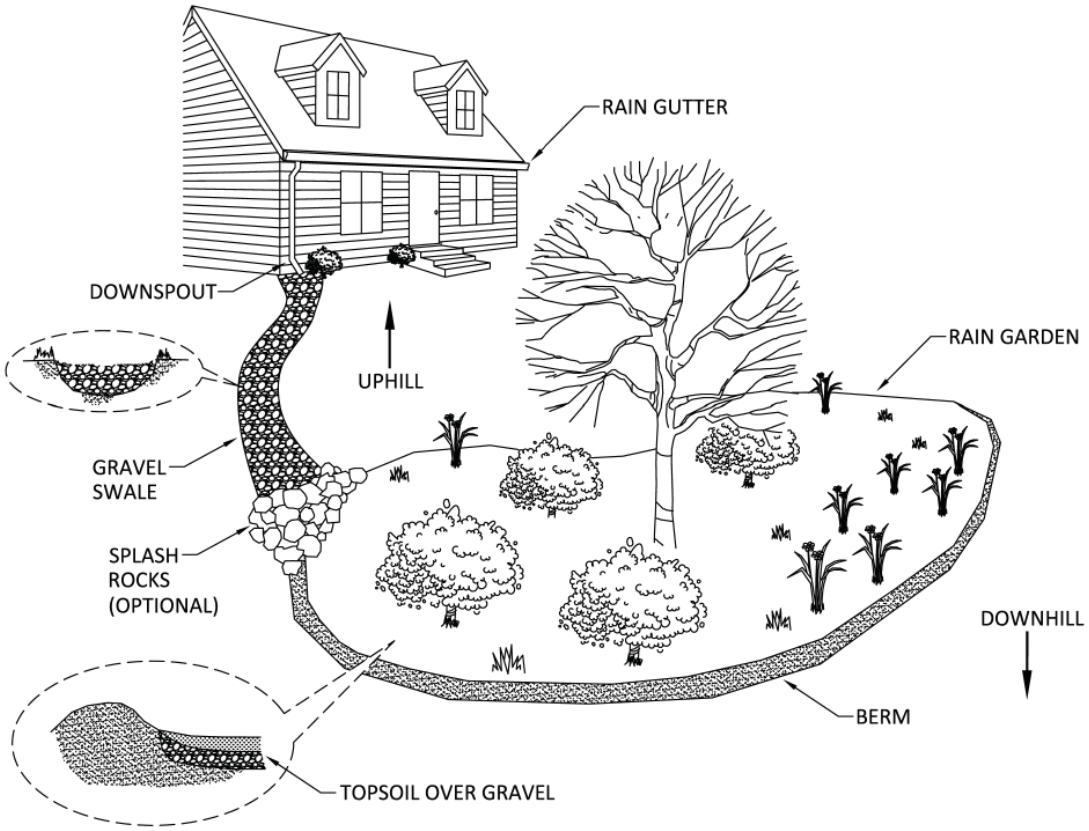
See list on back for specific plants that will survive in a Fairbanks rain garden.

Materials:

- ☐ Rain Garden soil mix (if replacing existing soil) 50-60% sand, 20-30% topsoil, 20-30% compost
- ☐ Fertilizer mix (10-20-10 in the spring)
- ☐ Appropriate plants - see list
- ☐ Mulch (best to use mulched grass clippings or aged compost)

Tools:

- ☐ Shovel
- ☐ Tarp
- ☐ Digging fork
- ☐ Spade
- ☐ Camera
- ☐ Bow rake
- ☐ Rototiller



Steps:

1. Choose an appropriate size for your rain garden. The more runoff you can redirect to your rain garden, the larger it can be. If you make the garden larger than can be supported by runoff, you will have to water it more during dry periods. See http://anchorageraingardens.com/RGmanualWEB.pdf for examples of how to calculate the appropriate size.
2. Choose the right location for your rain garden:
   a. Do not build a rain garden in permafrost.
   b. Note the direction of runoff and low spots where water collects.
   c. Make sure that the chosen location is downhill and at least 10 feet away from buildings with basements.
   d. Location should not be on or near septic tanks or wellheads.
   e. Before you dig, be aware of underground service lines or utilities on your property. Call 1-800-478-3121 or go online at www.akonecall.com to have the underground lines marked for you.
3. Once you have chosen a location, define the borders using non-toxic paint, stakes and string, etc.

4. Test the infiltration rate of your soil:
    a. Dig an eight by eight inch hole within the designated area after the ground has had enough time to thaw in the spring.
    b. Fill the hole with water and check the depth of the water every hour for at least three hours.
    c. If the water level in the hole goes down on average at least one inch an hour your soil will be able to drain effectively for a rain garden.
    d. If it takes longer than eight hours for the hole to completely drain, then you will want to put a gravel layer under your rain garden.
    e. Most locations in Fairbanks have well draining soils. If you live in the hills surrounding Fairbanks, you may have poorly draining soils.
5. Remove sod, if needed, and dig a three to four foot deep hole, piling the soil off to the side onto a tarp. Making the rain garden hole this deep and amending the soil will help ensure proper drainage.
6. Loosen the soil in the hole with a digging fork or a rototiller.
7. You can place a layer of gravel before replacing the soil. The gravel should be no more than twelve inches deep.
8. Loosely pile the soil back in or replace the soil with rain garden soil mix: 50 - 60% sand, 20 – 30% topsoil, and 20 – 30% compost.
9. The height of the finished garden bed should be lower than the height of the soil surrounding the bed, of six to eight inches in the rain garden. This may mean that not all of the soil will fit back in the rain garden.
10. Redirect downspouts to flow into designated area by constructing channels, swales, or pipes:

— To create berms along the downhill side of the rain garden:

    a. Pile up an appropriate amount of soil using left over soil from the rain garden hole. Usually five inches tall is sufficient to retain water but not drown plants.
    b. Compact the soil by walking on it and tamping it down well.
    c. To help minimize erosion of the berms, either put a two inch layer of mulch on the berm or plant drought resistant plants for ground cover. Rock Cress (Arabis arendsii), Gold Creeping Jenny (Lysimachia mummularia 'Aurea'), and Field Pussytoes (Antennaria neglecta 'Greene') are some good choices.

— To create a swale from the downspout to the rain garden:

    a. The swale can be as wide or narrow as you want it, and does not need to be very deep.
    b. The slope of the swale should be not more than 3:1, horizontal to vertical.
    c. Remove the sod and dig a trench with the dimensions you wish your swale to be.
    d. Once you have finished your trench, either replace the sod or reseed the swale. You will need to water the sod or seeds well until they are established.
    e. Attach a universal downspout adapter to the downspout and redirect it into the swale.
11. Grade the area so that water entering the garden will spread out over the whole bermed area.
12. Plant selected plants.
13. Feed plants using fertilizer mix according to the package directions.
14. Put a three to four inch layer of mulch down to help retain moisture and deter weeds.
15. Water young plants until well established.

Maintenance:

- Weeding
- Fertilizing
- Watering, frequently until the garden is established, then occasionally

Cost Estimate:

- Self installed $3 - $7 per sq ft
- Professionally installed $10 - $15 per sq ft

Time Estimate:

- This project could take one to three days to complete.

Pros:

- Aesthetically pleasing
- Reduces water runoff
- Increases groundwater infiltration
- Increase property value
- Creates habitat for birds and butterflies

Cons:

- Surface freezing in the fall reduces the water retention potential
- A restricted list of suitable plants
- Possible breeding ground for mosquitoes

Plants Suited to an Alaskan Rain Garden		**Key:** Shade - ✸ | Partial Shade - ☀ |Full Sun - ☼	
Plant Type	**Plant Name**	**Latin Name**	**Growing Conditions**
Evergreen Shrubs	Creeping Juniper	*Juniperus horizontalis*	☼
Deciduous shrubs	Saskatoon Serviceberry	*Amelanchier alnifolia*	☀ ☼
	Nanking Cherry	*Prunus tomentosa*	☀ ☼
	Flowering Almond	*Prunus triloba*	☀ ☼
	Rugosa Rose	*Rosa rugosa*	☀ ☼
	Royalty Lilac	*Syringa x prestoniae 'Royalty'*	☼
	Highbush Cranberry	*Viburnum edule*	☀ ☼
Evergreen Trees	White Spruce	*Picea glauca*	☀ ☼
	Scotch Pine	*Pinus sylvestris*	☼
Deciduous Trees	Alaska Paper Birch	*Betula neoalaskana*	☼
	Siberian Crabapple	*Malus baccata*	☼
	Quaking Aspen	*Populus tremuloides*	☀ ☼
	Amur Chokecherry	*Prunus maackii*	☼
Perennials	Columbine	*Aquilegia*	✸ ☀ ☼
	Alaska Wild Iris	*Iris setosa*	☀ ☼
	Ostrich Fern	*Matteuccia struthiopteris*	✸ ☀
	Native Bluebells	*Mertensia paniculata*	☀ ☼
	Globeflower	*Trollius*	☀ ☼
	Common Yarrow	*Achillea millefolium*	☼
	Larkspur / Delphinium	*Delphinium glaucum*	☼
	Siberian Aster	*Aster sibiricus*	☼
	Asiatic Lily	*Lilium spp.*	☼
	Daylily	*Hemerocallis spp.*	☼
	Cranesbill Geranium	*Geranium erianthum*	☼

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

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www.wildlife.alaska.gov/index.cfm?adfg=birds.plants

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www.lid-stormwater.net/bio_benefits.htm

Low Impact Development, Rain Garden Design Templates
www.lowimpactdevelopment.org/raingarden_design/index.htm

Cuyahoga Soil and Water Conservation District, Rainwater Garden Plans
www.cuyahogaswcd.org/grantfunded-raingardens.htm

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www.raingardens.org

University of Alaska Fairbanks Cooperative Extension Service, A Key to Flower Growing in Alaska
www.uaf.edu/ces/publications-db/catalog/anr/HGA-00139.pdf

Easy Difficult

Tree Pit

For Your Home

Need more shade?

Tree pits are gravel lined pits used to plant trees and shrubs in. A shallow depression is left around the base of the tree to collect diverted rainwater runoff and allows it to be absorbed and maximized by the plant. A tree pit will increase the health of your tree and your lawn.

A tree pit is most often a depression around a tree or shrub that allows diverted water to be absorbed by the plant, and filters out harmful chemicals. The pit can also be a hole that is lined with gravel around the tree to help retain water.

Cold Climate Considerations:

See list for specific trees that will survive in a Fairbanks tree pit.

Materials:

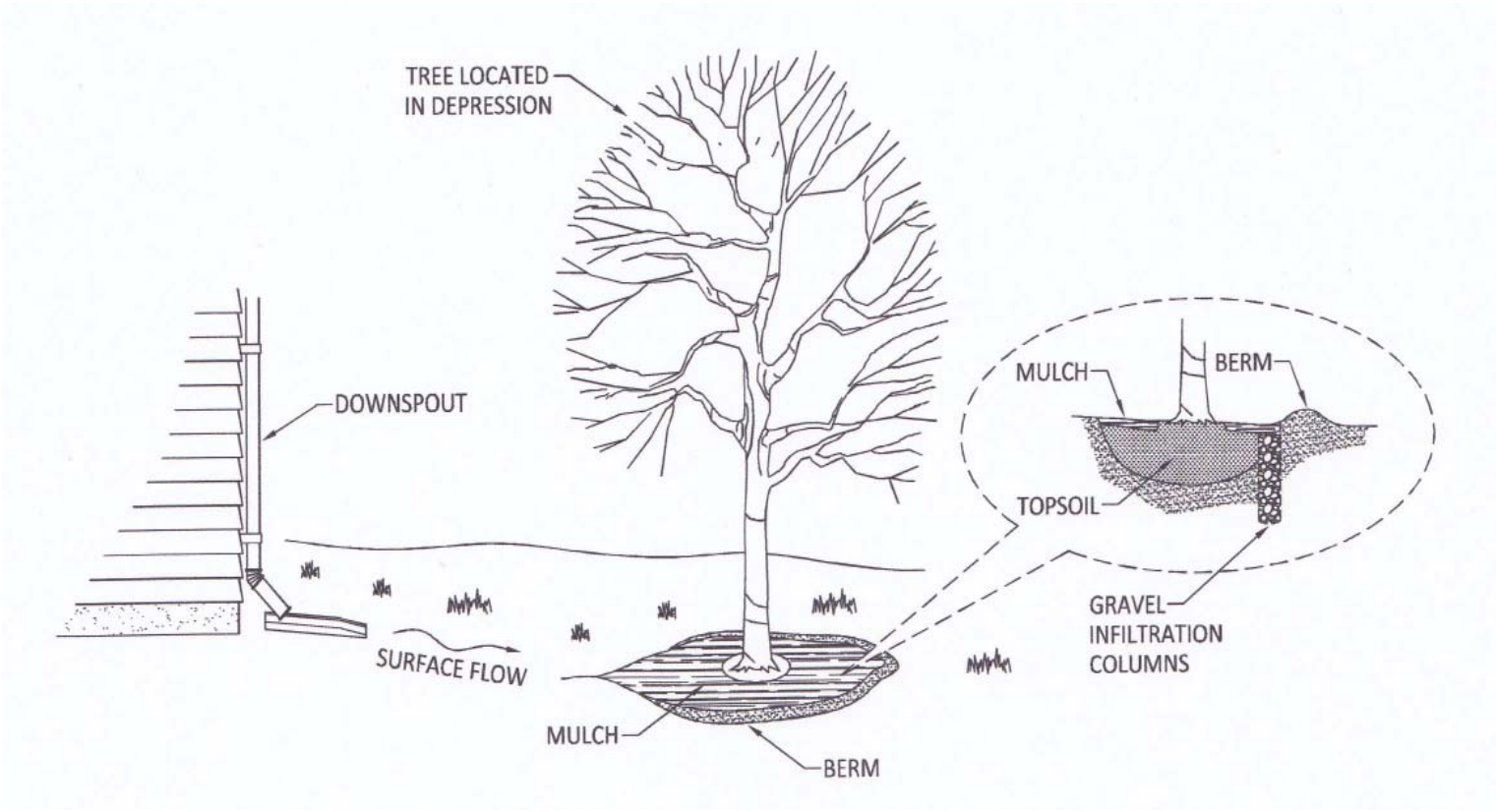
- ☐ Gravel
- ☐ PVC pipe

Tools:

- ☐ Post hole digger or drain spade
- ☐ Drill
- ☐ Shovel
- ☐ Camera
- ☐ Tape measure

Steps:

1. Find a suitable location on your property to plant a new tree using these guidelines:
   a. Tree should be planted at least 10 feet away from buildings with basements.
   b. Tree can be in a small depression, but not where water stands for more than a day.
   c. Location should not be on or near septic tanks or wellheads.
   d. Before you dig, be aware of underground service lines or utilities on your property. Call 1-800-478-3121 or go online at www.akonecall.com to have the underground lines marked for you.
2. Test the infiltration rate of your soil:
   a. Dig an eight by eight inch hole within the designated area after the ground has had enough time to thaw in the spring.
   b. Fill the hole with water and check the depth of the water every hour for at least three hours.
   c. If the water level in the hole goes down on average at least one inch an hour your soil will be able to drain effectively for a tree pit.



d. If it takes longer than eight hours for the hole to completely drain, then you will want to put in a gravel layer.
e. Most locations in Fairbanks have well draining soils. If you live in the hills surrounding Fairbanks, you may have poorly draining soils.

For an existing tree:

1. Choose a tree using the above guidlines for location.
2. Use a post hole digger or a drain spade to make a few narrow holes around the tree. The holes should be between three to four feet deep and six inches to one foot in diameter.
3. Fill the hole with gravel or place a perforated PVC pipe in the hole. Fill with gravel.
4. Redirect downspouts to flow into designated area by constructing channels, swales, or pipes. Or use berms to retain water if needed by piling up an appropriate amount of soil along the downhill side of the tree.

Additional ways of directing water to the tree pit:

— To create berms along the downhill side of the tree pit:

a. Pile up an appropriate amount of soil using left over soil from the tree pit hole. Usually five inches tall is sufficient to retain water but not drown plants.
b. Compact the soil by walking on it and tamping it down well.
c. To help minimize erosion of the berms, either put a two inch layer of mulch on the berm or plant drought resistant plants for ground cover. Rock Cress (Arabis arendsii), Gold Creeping Jenny (Lysimachia mummularia 'Aurea'), and Field Pussytoes (Antennaria neglecta 'Greene') are some good choices.

— To create a swale from the downspout to the tree pit:

a. The swale can be as wide or narrow as you want it, and does not need to be very deep.
b. The slope of the swale should be not more than 3:1, horizontal to vertical.
c. Remove the sod and dig a trench with the dimensions you wish your swale to be.
d. Once you have finished your trench, either replace the sod or reseed the swale. You will need to water the sod or seeds well until they are established.
e. Attach a universal downspout adapter to the downspout and redirect it into the swale.

Plants Suited to an Alaskan Tree Pit		**SUN:** Shade - ✸ | Partial Shade - ◐ | Full ☼	
Plant Type	**Plant Name**	**Latin Name**	**Growing Conditions**
Evergreen Shrubs	Creeping Juniper	*Juniperus horizontalis*	☼
Deciduous shrubs	Saskatoon Serviceberry	*Amelanchier alnifolia*	◐ ☼
	Nanking Cherry	*Prunus tomentosa*	◐ ☼
	Flowering Almond	*Prunus triloba*	◐ ☼
	Rugosa Rose	*Rosa rugosa*	◐ ☼
	Royalty Lilac	*Syringa x prestoniae 'Royalty'*	☼
	Highbush Cranberry	*Viburnum edule*	◐ ☼
Evergreen Trees	White Spruce	*Picea glauca*	◐ ☼
	Scotch Pine	*Pinus sylvestris*	☼
Deciduous Trees	Alaska Paper Birch	*Betula papyrifera var. neoalaskana*	☼
	Siberian Crabapple	*Malus baccata*	☼
	Quaking Aspen	*Populus tremuloides*	◐ ☼
	Amur Chokecherry	*Prunus maackii*	☼

Maintenance:

Clearing debris from the area to keep rainwater flowing into the pit and to maintain absorption.

Cost Estimate:

- $10 - $100 per tree.

Time Estimate:

- This project could take one half to one day to complete.

Pros:

- Improves tree health
- Reduces water runoff
- Increases groundwater infiltration
- Requires limited space
- Easy to install
- Inexpensive

Cons:

- Can't process large volumes of water
- Surface freezing reduces the water retention potential

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

TLC for Trees
http://www.tlcfortrees.info/transplanting_landscape_trees.htm

University of Alaska Fairbanks, Cooperative Extension Service, Transplanting Trees Successfully
http://www.uaf.edu/ces/publications-db/catalog/anr/HGA-00335.pdf

University of Alaska Fairbanks, Cooperative Extension Service, Managing Your Trees and Shrubs in Alaska Part Two: Planting Guide for Trees in Urban and Rural Alaska
http://www.uaf.edu/ces/pubs/catalog/detail/index.xml?id=132

Easy Difficult

Infiltration and Flow-Through Planters

For Your Home

Want to water less?

A flow-through planter has an impervious bottom with a porous pipe that drains the water after it has been filtered by the plants and soil. Infiltration planters have a pervious bottom to allow water to infiltrate the ground below.

These types of planters require less watering, provide filtration of pollutants, and are suitable in areas with limited space. Planters or raised beds can be constructed during the winter months and installed after the ground thaws in the spring.

Cold Climate Considerations:

The infiltration and flow-through planters must be disconnected from the downspout in the fall to prevent ice dams from forming in the gutters.

Materials:

- ☐ Planter or raised bed
- ☐ Gravel
- ☐ Universal downspout adapter or flexible down spout extension
- ☐ Potting soil
- ☐ Mulch
- ☐ Plants
- ☐ Geotextile fabric
- ☐ Silicon caulking
- ☐ PVC pipe to correspond to the length of the planter or raised bed

Tools:

- ☐ Drill
- ☐ One-inch drill bit
- ☐ Small drill bit
- ☐ Keyhole saw

Installing a Flow-Through Planter:

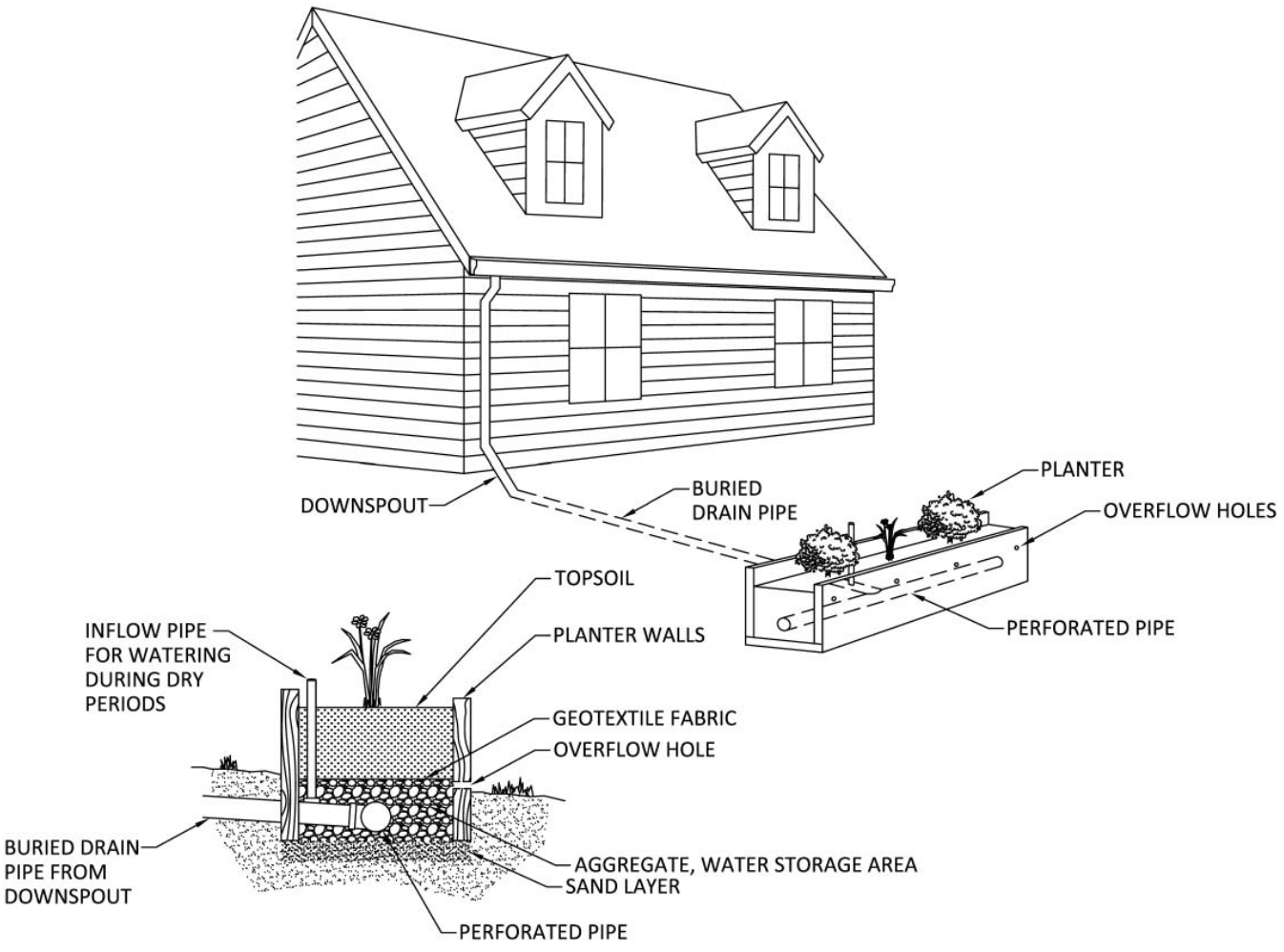
1. Find a suitable area on your property:
   a. Note the direction of runoff and low spots where water collects. These would be good locations for a dry well as long as they follow the location constraints below.
   b. Only roof runoff should be redirected into a dry well.
   c. Make sure that the chosen location is downhill and at least ten feet away from buildings with basements.
   d. Location should not be on or near septic tanks or wellheads. It is not advisable to plant a garden on top of the dry well.
   e. Before you dig, be aware of underground service lines or utilities on your property. Call 1-800-478-3121 or go online at www.akonecall.com to have the underground lines marked for you.
2. Using a one-inch drill bit, drill a hole about two inches from the bottom in the middle of one of the long sides of the planter. This is for the inflow from the downspout to enter. Use the keyhole saw to make the hole large enough for the downspout adapter or flexible down spout extension.
3. Drill another hole about six inches from the bottom in the front of the planter close to the other end of the planter without the inflow with the one-inch drill bit and use the keyhole saw to make the hole large enough for the smaller PVC pipe.
4. Fill the bottom of the planter with about three inches of gravel.
5. With the small drill bit, drill holes about one-half to one inch apart in the larger PVC pipe. Leave about three inches of one end un-perforated.
6. With the one inch drill bit, in the middle of the perforated PVC pipe drill a hole that will be large enough for the downspout adapter or extension.
7. Set up overflow system:
   a. Drill a series of holes (about six inches apart) on the long side of the planter opposite of the inflow pipe.
   b. Place the holes at the top of where the gravel layer will be.
8. Seal the gap around the PVC pipe that extends from the planter with silicon caulking.

9. Modify the downspout so that it directs water into the planter:
    a. Use a hacksaw to cut the downspout at the appropriate height.
    b. Attach the universal downspout adapter or flexible downspout extension, mmaking sure the adapter/extension is long enough to reach the planter.
    c. Bury the adapter/extension, or lay it on the ground.
    d. Insert the adapter/extension into the drilled hole on long side of the planter.
    e. Attach the adapter/extension to the perforated PVC pipe with silicon caulking, then seal the gap between the adapter/extension and the planter hole.
10. Put another two-inch layer of gravel all along the planter.
11. Lay down a geotextile fabric to separate the gravel and soil.
12. Fill the planter with soil. The soil should contain a high level of organic matter. Try to not use soil with clay or silt in it. This will ensure that the soil is able to support the wicking function.
13. Plant. Many plants will do well in the moist-to-slightly-moist soil conditions which these planters will provide. Ask your local nursery for advice on plants that will be happy in this kind of setting.
14. Mulch.

Installing an Infiltration Planter:

Follow the same directions above with a few exceptions:

a. There should not be a bottom on the planter or foam along the bottom of the planter. This means that you may have to cut off the bottom of a planter or drill large holes in the bottom if you buy it pre-made.
b. Do not want to build an infiltration planter in permafrost.
c. You will also need to test the infiltration rate of your soil.



To test the infiltration rate of your soil:

a. Dig an eight by eight inch hole within the designated area after the ground has thawed in the spring.
b. Fill the hole with water and check the depth of the water every hour for at least three hours.
c. If the water level in the hole goes down on average at least one inch an hour your soil will be able to drain effectively.
d. If it takes longer than eight hours for the hole to completely drain, then you will want to put a gravel layer under your planter.
e. Most locations in Fairbanks have well draining soils. If you live in the hills surrounding Fairbanks, you may have poorly draining soils.

Maintenance:

- Disconnect the downspout from the planter after the first freeze in the fall.
- Weed when and if necessary.
- Clean gutters once a year to help keep debris out of the inflow pipe of the planter.

Cost Estimate:

- between $60 and $250 depending on size and materials.

Time Estimate:

- This project could take one to two days to complete.

Pros:

- Can be placed right next to a building
- Reduces water runoff
- Increases groundwater infiltration
- Requires limited space
- Minimal maintenance required
- Easy to install
- Inexpensive
- Aesthetically pleasing

Cons:

- Surface freezing in the fall reduces the water retention potential
- A restricted list of suitable plants. Only use plants that like moist to slightly moist soils.
- The perforated pipe can become blocked by ice or soil
- Needs good soil for proper wicking

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

Charles River Watershed Association, Low Impact Best Management Practice (BMP) Information Sheet
www.crwa.org/projects/bmpfactsheets/crwa_stormwater_planter.pdf

City of Portland Environmental Services, Flow-Through Planters
www.portlandonline.com/BES/index.cfm?a=127475&c=31870

Hébert, Michele. Building the Ultimate Alaska Raised Box Garden by
www.uaf.edu/ces/michele/articles/general_gardening/raisedBoxGardening.pdf

University of Alaska Fairbanks Cooperative Extension Service, Raised Bed Gardening in Alaska
www.uaf.edu/ces/publications-db/catalog/anr/HGA-00132.pdf

Easy Difficult

Dry Wells

For Your Home

Does Your Yard Flood Frequently?

A dry well is an underground structure that dissipates runoff rainwater. A dry well is composed of a perforated pipe that directs roof runoff into a small pit lined with gravel. This pit helps filter harmful chemicals.

http://www.canalelandscaping.com

A dry well is a perforated pipe that drains into a small pit filled with gravel. Only roof runoff should be redirected into a dry well. The following instructions are for a very simple dry well. If your yard frequently floods you may want to install more than one dry well.

Cold Climate Considerations:

The dry well must be disconnected from the downspout in the fall to prevent ice dams from forming in the gutters.

Materials:

- ☐ Gravel
- ☐ Geotextile fabric
- ☐ Universal downspout adapter or flexible down spout extension

Tools:

- ☐ Post hole digger
- ☐ Shovel
- ☐ Tape measure

Steps:

1. Find a suitable area on your property:
   a. Do not build a dry well in permafrost.
   b. Note the direction of runoff and low spots where water collects. These would be good locations for a dry well as long as they follow the location constraints below.
   c. Only roof runoff should be redirected into a dry well.
   d. Make sure that the chosen location is downhill and at least ten feet away from buildings with basements.
   e. Location should not be on or near septic tanks or wellheads. It is not advisable to plant a garden on top of the dry well.
   f. Before you dig, be aware of underground service lines or utilities on your property. Call 1-800-478-3121 or go online at www.akonecall.com to have the underground lines marked for you.
   g. Test the infiltration rate of your soil:
   h. Dig an eight by eight inch hole within the designated area after the ground has had enough time to thaw in the spring.
   i. Fill the hole with water and check the depth of the water every hour for at least three hours.
   j. If the water level in the hole goes down on average at least one inch an hour your soil will be able to drain effectively for a rain garden.
   k. If it takes longer than eight hours for the hole to completely drain, then you will want to put a gravel layer under your rain garden.
   l. Most locations in Fairbanks have well draining soils. If you live in the hills surrounding Fairbanks, you may have poorly draining soils.
2. Use a post hole digger to make a narrow hole. The hole should be three to six feet deep and one to three feet wide.
3. The dry well will last much longer if you line the hole with geotextile fabric to keep the soil separate from the gravel fill.
4. Redirect downspouts to flow into the designated area by constructing channels, swales, or pipes.

— To create berms along the downhill side of the dry well:
   a. Pile up an appropriate amount of soil using left over soil from the dry well hole. Usually five inches tall is sufficient to retain water but not drown plants.
   b. Compact the soil by walking on it and tamping it down well.
   c. To help minimize erosion of the berms, either put a two inch layer of mulch on the berm or plant drought resistant plants for ground cover. Rock Cress (Arabis arendsii), Gold Creeping Jenny (Lysimachia mummularia 'Aurea'), and Field Pussytoes (Antennaria neglecta 'Greene') are some good choices.

— To create a swale from the downspout to the dry well:
   a. The swale can be as wide or narrow as you want it, and does not need to be very deep.

b. The slope of the swale should be not more than 3:1, horizontal to vertical.
c. Remove the sod and dig a trench with the dimensions you wish your swale to be.
d. Once you have finished your trench, either replace the sod or reseed the swale. You will need to water the sod or seeds well until they are established.
e. Attach a universal downspout adapter to the downspout and redirect it into the swale.

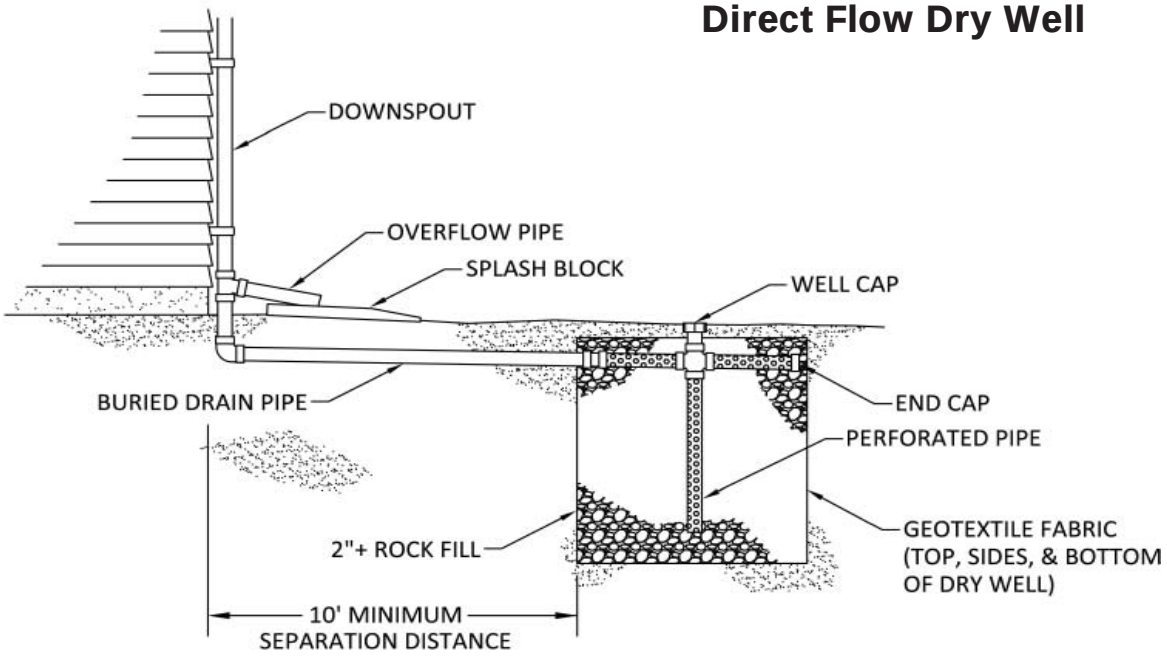
5. Fill the dry well hole with gravel or place a perforated PVC pipe in the hole then fill with gravel.
6. Line the top of the well with more geotextile fabric to keep the soil separate from the gravel fill. This will keep the top soil and grass in place. It is not advisable to plant a garden on top of the dry well.

Variations:

Direct flow dry well: You can attach a PVC pipe to your downspout and burry it in a shallow trench that leads to the dry well. If you use this option you need to make sure that you can disconnect the PVC pipe from your downspout in the fall to prevent ice dams from forming in your gutters. This type is demonstrated (in the diagram below) (in diagram A) (in the direct flow dry well diagram).

Prefabricated dry well: There are multiple dry well kits available for home installation. If you purchase a kit, follow the manufacturer's directions when installing it.

Intermediate sump box dry well: Instead of directly connecting your downspout to the PVC pipe, you can have the downspout directed to a sump box. This box will collect the water and it will pass through a wire screen to keep debris out before it flows through the PVC pipe that is attached to the bottom of the box.



Maintenance:

- Disconnecting the downspout from the PVC pipe in the fall and reconnecting it in the spring.

Cost Estimate:

- $10 to $20 per well

Time Estimate:

- This project should take one to two days to complete.

Pros:

- Reduces water runoff
- Increases groundwater infiltration
- Requires limited space
- Minimal maintenance required
- Homeowner can install without assistance

Cons:

- Can't process large volumes of water
- Surface freezing reduces the water retention potential
- The perforated pipe can become blocked by ice or soil

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

Pennsylvania Stormwater Management Manual, French Drains
www.bfenvironmental.com/pdfs/Frenchdrains.pdf

Poribesh, Drywell for Stormwater Drainage
www.poribesh.org/Documents/drywell.pdf

Tree People, Install a Drywell
www.treepeople.org/install-drywell

Easy Difficult

Swales and Berms

For Your Home

Want to water less?

A vegetated swale is a grass-lined depression that slows down runoff water velocity and infiltrates the water into the soil.

Berms are low earthen walls adjacent to ditches that can be used to help retain runoff in a designated area along the downhill side of the location.

www.uvm.edu

www.lincoln.ne.gov

A vegetated swale is usually a grass-lined depression. Plants slow down runoff water velocity and infiltrate the water into the soil. Swales can be used to redirect rainwater runoff to rain gardens, tree pits, and dry wells.

Berms can be used to help retain runoff in a designated area by piling up an appropriate amount of soil along the downhill side of the location. The berms do not need to be very big, usually five inches tall is sufficient for this purpose.

Cold Climate Considerations:

See "Steps to create a berm" for examples of plants that will survive on a Fairbanks berm.

Materials:

- ☐ Appropriate plants
- ☐ Extra soil if needed
- ☐ Non-toxic paint, stakes or string
- ☐ Native plant seeds or grass seeds

Tools:

- ☐ Shovel
- ☐ Spade
- ☐ Measuring tape

Steps to create a vegetated swale:

Steps to create a vegetated swale:

1. Choose the right location for your swale:
   a. Note the direction of runoff and low spots where water collects.
   b. Swales can be used to convey roof runoff to rain gardens, dry wells, or other areas of your lawn. Swales should not be used to direct runoff into the street or other nonporous surfaces.
   c. Make sure that the chosen location runs downhill and ends at least ten feet away from buildings with basements.
   d. Location should not be on or near septic tanks or wellheads.
   e. Before you dig, be aware of underground service lines or utilities on your property. Call 1-800-478-3121 or go online at www.akonecall.com to have the underground lines marked for you.
2. Once you have chosen a location, define the borders using non-toxic paint, stakes and string, etc.
   a. The swale can be as wide or narrow as you want it.
   b. The depth of the swale can be as deep as you like. For residential purposes six inches or less is adequate.
   c. The slope of the swale should be not more than 3:1, horizontal to vertical.
3. Remove the sod and dig a trench with the dimensions you wish your swale to be.
4. Once you have finished your trench, either replace the sod or reseed the swale. You will need to water the sod or seeds well until they are established.
5. Attach a universal downspout adapter to the downspout and redirect it into the swale.

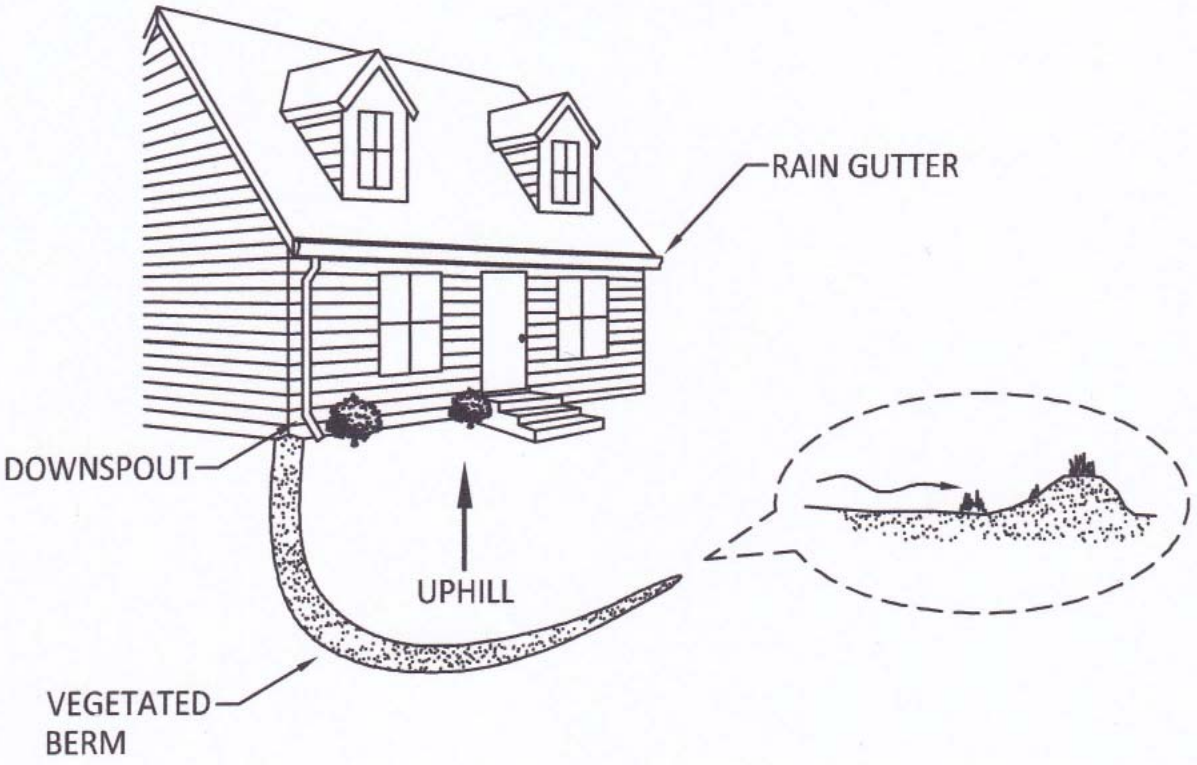
Steps to create a berm:

1. Pile up an appropriate amount of soil. Usually five inches tall is sufficient to retain water but not drown plants.
2. Compact the soil by walking on it and tamping it down well.
3. To help minimize erosion of the berms, either put a two-inch layer of mulch on the berm or plant drought resistant plants for ground cover. Rock Cress (Arabis arendsii), Gold Creeping Jenny (Lysimachia mummularia 'Aurea'), and Field Pussytoes (Antennaria neglecta 'Greene') are some good choices.

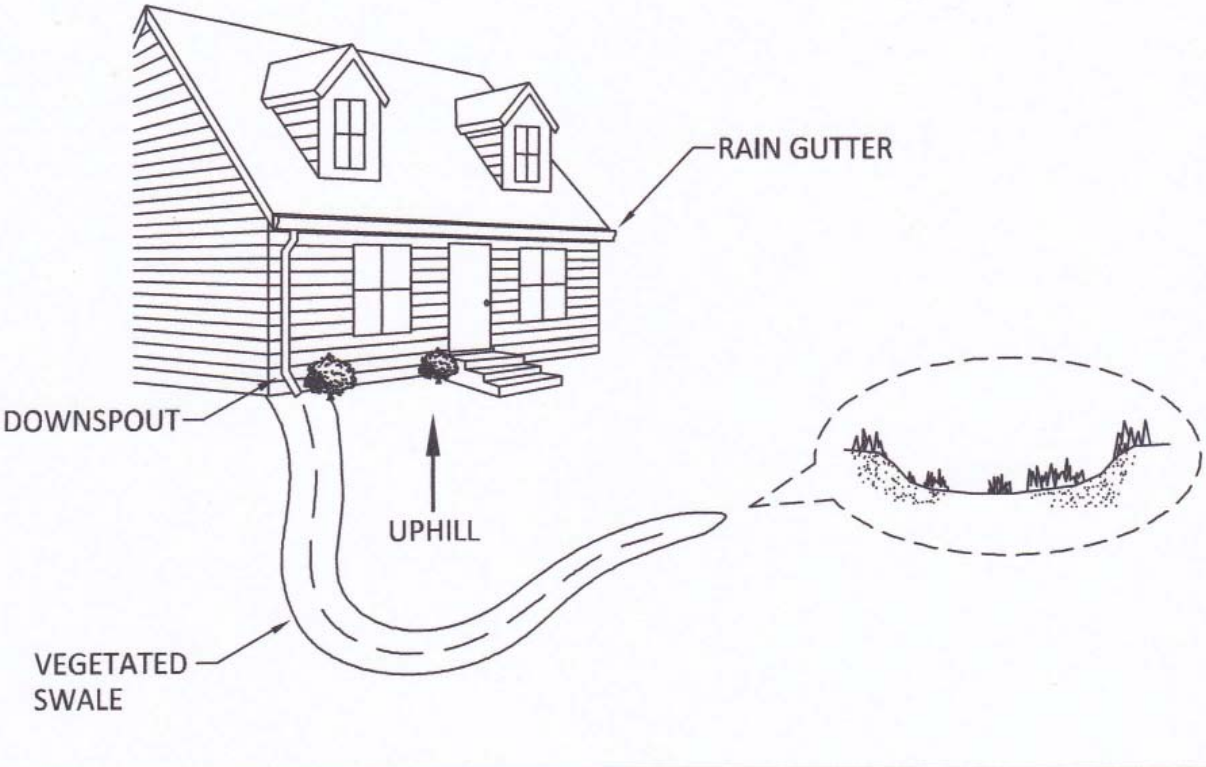
Maintenance:

- Weeding
- Fertilizing
- Watering, frequently until the vegetation is established, then occasionally

Vegetated Swale



Berm



Cost Estimate:

- Self installed
  $3 - $7 per sq ft
- Professionally installed
  $10 - $15 per sq ft

Time Estimate:

- This project could take one to three days to complete.

Pros:

- Aesthetically pleasing.
- Reduces water runoff.
- Increases groundwater infiltration.
- Increases property value.
- Creates habitat for birds and butterflies.

Cons:

- Surface freezing in the fall reduces the water retention potential during that season.
- A restricted list of suitable plants.

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

Alaska Department of Fish and Game, Native Alaskan and Exotic Plants Used by Wildlife
www.wildlife.alaska.gov/index.cfm?adfg=birds.plants

Tree People website, Build Berms
www.treepeople.org/build-berms

United States Environmental Protection Agency website, National Pollutant Discharge Elimination System, Grassed Swales
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=75

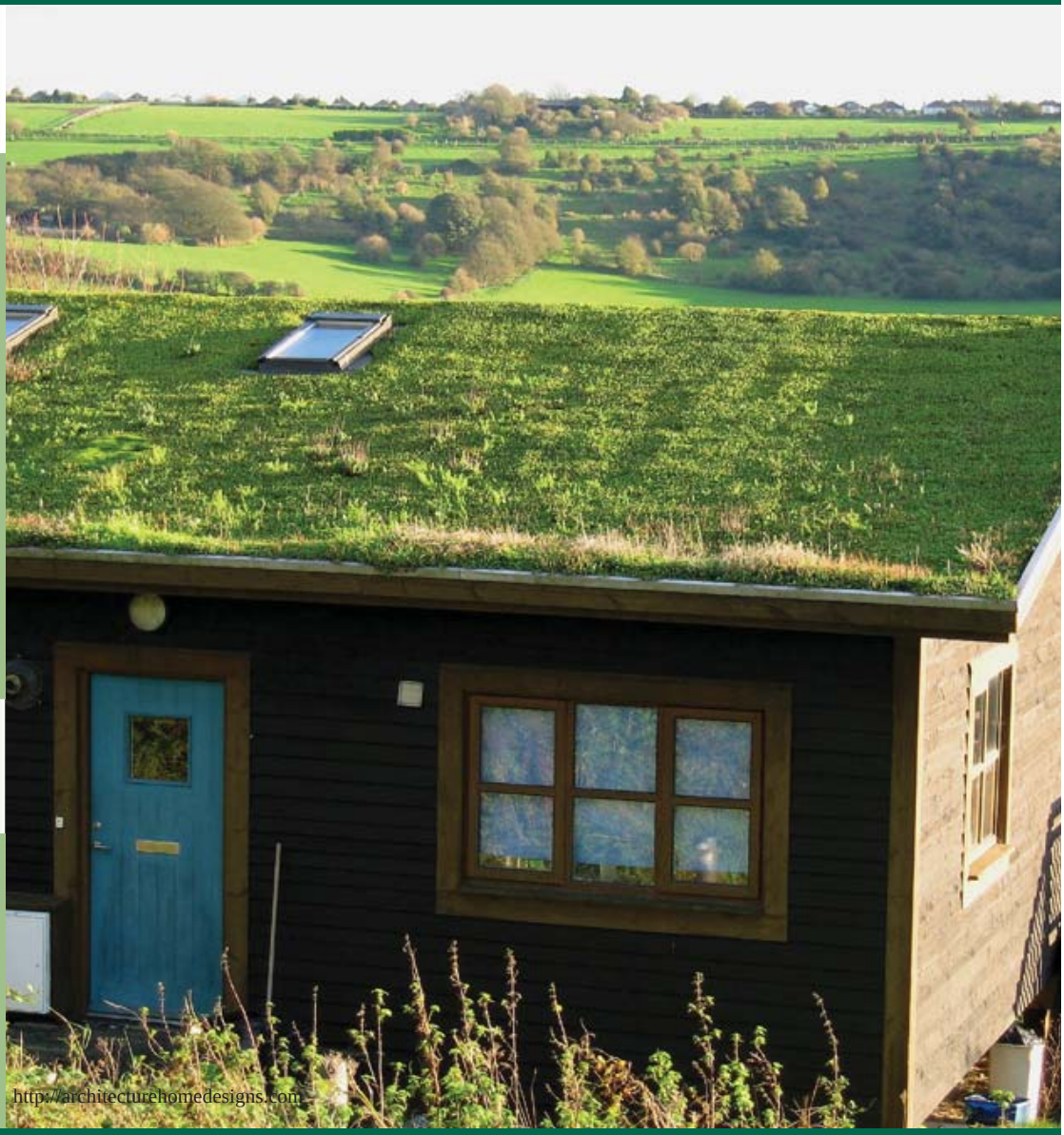
Easy Difficult

Green Roofs

For Your Home

Want lower heating bills?

A green roof is completely or partially covered with vegetation in a growing medium planted over several layers of waterproof membrane, root barrier, and a drainage board. A green roof can absorb up to half of the rainwater and greatly increase the insulation value of your roof.



http://architecturehomedesigns.com

A green roof is completely or partially covered with vegetation in a growing medium planted over a waterproof membrane, root barrier, and a drainage board. There are two basic types of green roofs, extensive and intensive. An extensive roof has a layer of growing medium that is six inches or less. Extensive roofs can support the growth of grasses and some small shrubs. An intensive roof has a six to twenty four inch layer of growing medium. Intensive roofs can support larger shrubs and even trees. A green roof can absorb up to half of the rainwater that falls on it and greatly increase the insulation value of your roof.

Cold Climate Considerations:

See following page for list of specific plants that will survive on a Fairbanks green roof.

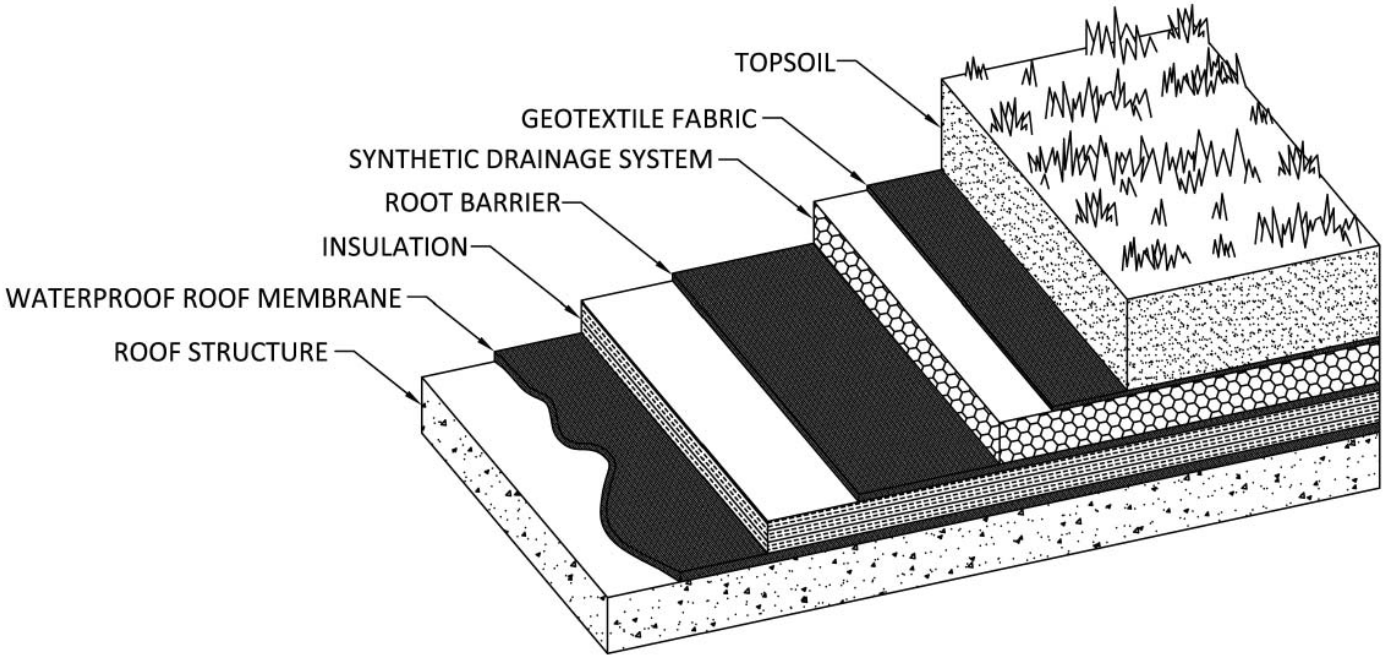
Steps:

The following steps outline the basic elements of a modern green roof. Every green roof installation is unique depending on the building on which it is to be used. It is essential that you consult a professional for more detailed and site specific information before building or adding a green roof.

1. Consult an engineer to determine the proper structural adjustments needed for the building to safely support the substantial extra weight of a green roof. Only after your structure has been determined to support the extra weight should you begin any installation of the green roof. To ensure the green roof is installed properly, hire a roofing company that is familiar with installing these systems. Attempting to install a green roof your self my negatively impact your homeowners insurance policy.

Here are the Steps the installer will take to install a green roof:

2. Install a vapor control barrier on top of your roof structure.
3. Then install the insulation.
4. Install a waterproof membrane such as 60 mil EPDM rubber membrane. This can also act as the root barrier.
5. Install a drainage layer such as a drain board.
6. Install a moisture retention mat on top of the drain board. This helps plant growth by retaining water and making it easily available for plant use.
7. Lay down the growing medium. There are several options of growing medium: inorganic and organic, as well as engineered soils.
8. Plant selected plants.



Below is the list of plants that were planted on the south green roof of the Cold Climate Housing Research Center in 2007. They have since naturalized, so not all species are currently represented in the bed. Take into account the amount of sun your roof gets when selecting plants for your green roof.

Plant Name	Latin Name
Nortran Tufted Hairgrass	*Deschampsia cespitosa*
Alyeska Polargrass	*Arctagrostis latifolia*
Tilesius' Wormwood	*Artemisia tilesii*
Tundra Bluegrass	*Poa glauca cv. Tundra*
Arctared Fescue	*Festuca rubra*
Mayweed	*Tripleurospermum*
Tall Jacob's Ladder	*Polemonium acutiflorum*
Arctic Goldenrod	*Solidago multiradiata var. arctica*
Nootka Lupine	*Lupinus nootkatensis*
Alpine Sweetvetch	*Hedysarum alpinum*
Wainwright Wheatgrass	*Elymus trachycaulus*
Sourdough Bluejoint Reedgrass	*Calamagrostis canadensis*

Cost Estimate:

- According to Green Roofs for Healthy Cities (see below for reference) green roofs cost $15 to $25 per sq ft. The green roof on the CCHRC building cost about $19 per square foot in 2006. These cost estimates are for professional installation.

Time Estimate:

- This project could take five days to over a week to complete.

Pros:

- Reduces water runoff
- Filters water runoff
- Sound insulation
- Heat insulation
- Aesthetically pleasing
- Increases property value
- Creates habitat for birds and butterflies
- Can have a much longer lifespan than a traditional roofs
- Gardening without having to worry about moose etc.

Cons:

- High initial cost
- Possible insurance issues if installed incorrectly.
- Extensive green roofs can weigh ten to fifteen pounds per square foot when fully saturated
- Some buildings can't be retrofitted because they can't support the extra weight.
- Homeowner would need assistance to construct.

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

Cold Climate Housing Research Center, Green Roof website
http://cchrc.org/green-roof
Green Roofs for Healthy Cities website
http://greenroofs.org
Green Roof Plants: A Resource and Planting Guide, by Edmund C. Snodgrass and Lucie L. Snodgrass, 2006 from Timber Press, Portland, OR.
Living Roofs website
http://livingroofs.org
Low Impact Development Center, Inc., Green Roof
www.lid-stormwater.net/greenroofs_home.htm

Easy Difficult

Permeable Pavers

For Your Home

Driveway Causing Runoff Pools?

Asphalt driveways often cause problems with runoff.These porous concrete blocks allow water to pass through them and into the soil. Permeable pavers can be used instead of concrete or asphalt for driveways, patios, and walkways.


www.stonewoodproducts.com


www.enhancecompanies.com


www.mylaborsolutions.com

These porous blocks allow water to pass through them and into the soil. Permeable pavers can be used instead of concrete or asphalt for driveways, patios, and walkways, or in place of some concrete/asphalt.

Cold Climate Considerations:
We only recommend composite pavers. Permeable concrete pavers will not last very long in our environment due to the effects of freeze thaw cycles. Call your local nursery or hardware store for availability of pavers.

Materials:
- ☐ Coarse gravel
- ☐ Geotextile fabric
- ☐ Bedding sand and / -or pea gravel
- ☐ Permeable pavers
- ☐ Edge restraints
- ☐ Water

Tools:
- ☐ Hand tamp or mechanical compactor
- ☐ Shovel
- ☐ Excavator (optional)
- ☐ Hose
- ☐ Push broom

Steps:
1. Evaluate your chosen area of installation with the followin guidelines:
   a. Do not place permeable pavers on permafrost.
   b. Only roof runoff should be redirected onto permeable pavers.
   c. Location should not be on or near septic tanks or wellheads.
   d. Before you dig, be aware of underground service lines or utilities on your property. Call 1-800-478-3121 or go online at www.akonecall.com to have the underground lines marked for you.
2. Prepare area. If there is an existing surface already remove old pavers. If in a new area remove sod, if needed, and excavate down one foot deep.
3. Compact the soil with either a hand tamp or a mechanical compactor. Using a hand tamp is not recommended for large areas.
4. Deposit a six inch (minimum) layer of compacted aggregate base.
5. Lay down a layer of geotextile fabric to keep the sand in place and to prevent weeds from growing.
6. Deposit a one inch layer of bedding sand.
7. Install the edge restraints. Place the restraints along the perimeter of the project. These can be plastic, aluminum, or steel and are available at most hardware stores. Install the permeable pavers following the manufacturer instructions.
8. Fill the joints by sweeping coarse sand or pea gravel over the pavers. Or plant moss or grass between the pavers.
9. Compact the pavers with a hand tamp for small areas and a mechanical compactor for large areas.
10. Spray the paved area with water to help compact the sand.

Maintenance:
- Over several years some of the joint sand may erode away. If it does, just spread more joint sand over the pavers and sweep it in.
- Weeding may be necessary throughout the summer to prevent weeds from colonizing the cracks between the pavers.
- If the pavers become uneven you can remove the pavers in the affected area, re-level the aggregate base (you may need to add more sand) and reinstall the pavers.
- Sweep the pavers at least every spring to remove dirt and sand, which will prevent the loss of porosity of the pavers.

Cost Estimate:

- about $10 per square foot

Time Estimate:

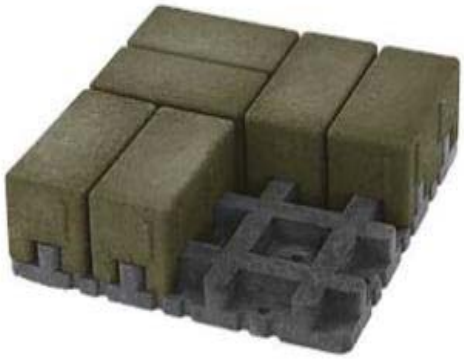
- one to four days depending on the size of the area

Pros:

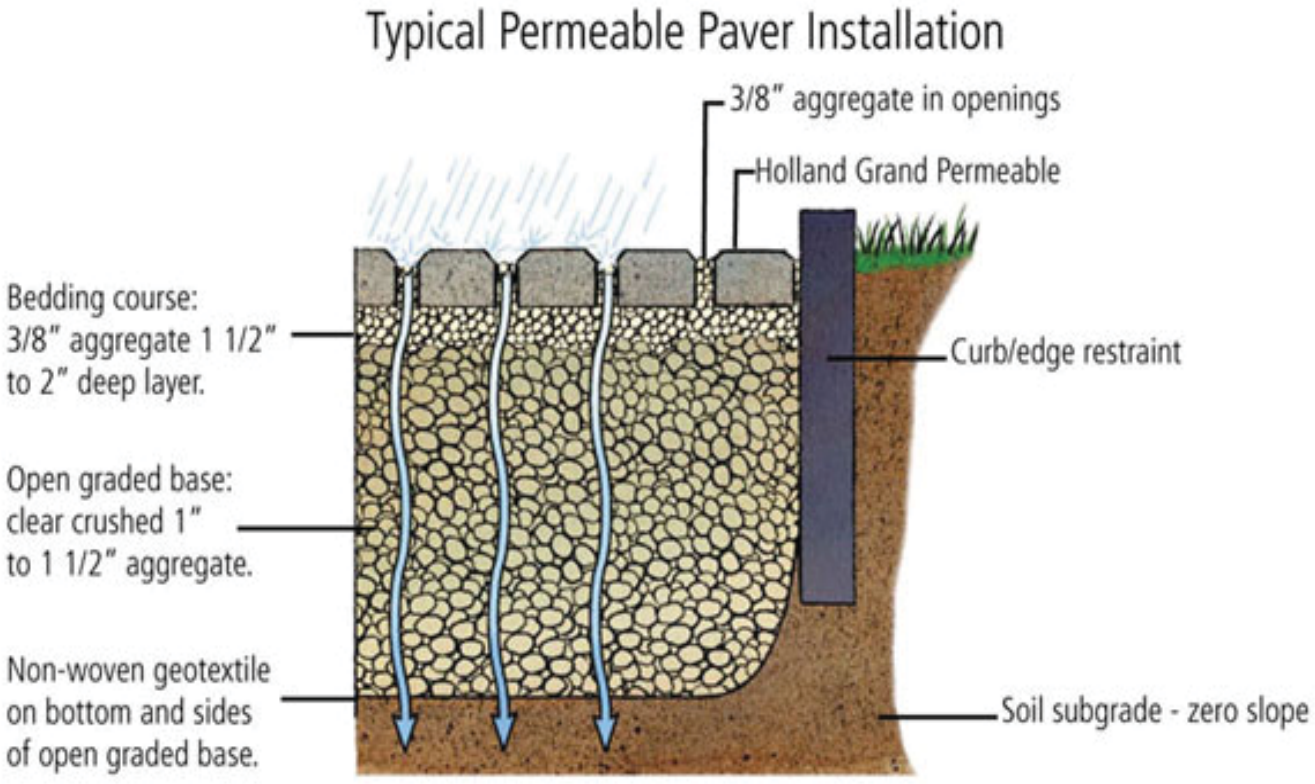
- Reduces water runoff.
- Increases groundwater infiltration.

Cons:

- Using sand for traction on or near the pavers can reduce the porosity of the pavers.



These are porous pavers produced by VAST Enterprises. They have permeability that is comparable to traditional porous pavers, but they are made from recycled rubber and plastic so they are much more resistant to cracking. For more information please visit the VAST website at www.vastpavers.com



http://www.mypaverdriveway.com

For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

Interlocking Concrete Pavement Institute
http://www.icpi.org/
Low Impact Development Center, Inc., Permeable Pavers
http://www.lid-stormwater.net/permpavers_benefits.htm
VAST Enterprises
http://vastpavers.com

http://www.masoncontractors.org

http://vastpavers.com

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CITY OF FAIRBANKS ALASKA

U.S. Fish and Wildlife Service
Partners for Fish & Wildlife

FAIRBANKS SOIL & WATER CONSERVATION DISTRICT

GW Scientific

Easy Difficult

Grass Reinforcement Mesh

For Your Home

Can't stand mud?

A polyethylene grid placed directly on grass and secured with metal U-Pins or plastic pegs. It helps stabilize the grass so that it can handle much more traffic without damage.

A polyethylene grid placed directly on grass and secured with metal U-Pins or plastic pegs, the mesh helps stabilize the grass so that it can handle much more traffic than a unprotected lawn, without damage. There are several grades of mesh, some of which are suitable for driving/parking vehicles and some of which is designed for foot traffic. The mesh can be used for everything from additional parking for a special event to a permanent patio.

Cold Climate Considerations:

Most varieties of this grass mesh can withstand temperatures below -50 F. They should not be plowed during the winter, but they can be shoveled.

Materials:

- ☐ Grass reinforcement mesh
- ☐ Metal U-Pins
- ☐ Grass seed (if starting a new lawn)

Tools:

- ☐ Lawn mower

Steps:

1. Mow the grass on an established lawn. For a newly sown area the only preparation is to make sure the soil is well consolidated. The area can be sown before or after the mesh is in place.
2. Unroll the mesh over the selected area and let it stand for at least one hour to help it flatten out.
3. Secure the mesh to the ground with metal U –Pins:
   a. Secure U-Pins along the middle of the mesh every three to six feet.
   b. Make sure to secure the perimeter of the mesh every twelve to twenty inches with the metal U –Pins.
   c. To join two sections of mesh, secure the two ends together with the metal U –Pins every twenty inches along the seam.
4. Do not use the area until the grass has grown through the mesh. This can take up to four weeks.
5. Once the grass is long enough to mow, set the mower blades at a relatively high setting to prevent the blade from cutting the mesh. Once the grass has completely grown around the mesh, the grass can be cut normally.

Maintenance:

- Mowing the grass as it grows up around the mesh.
- Monitor integrity of plastic after winter, replace sections if necessary.

Cost Estimate:

- About $1.25 per square foot.

Time Estimate:

- The project should take about six hours depending on the size of the area.

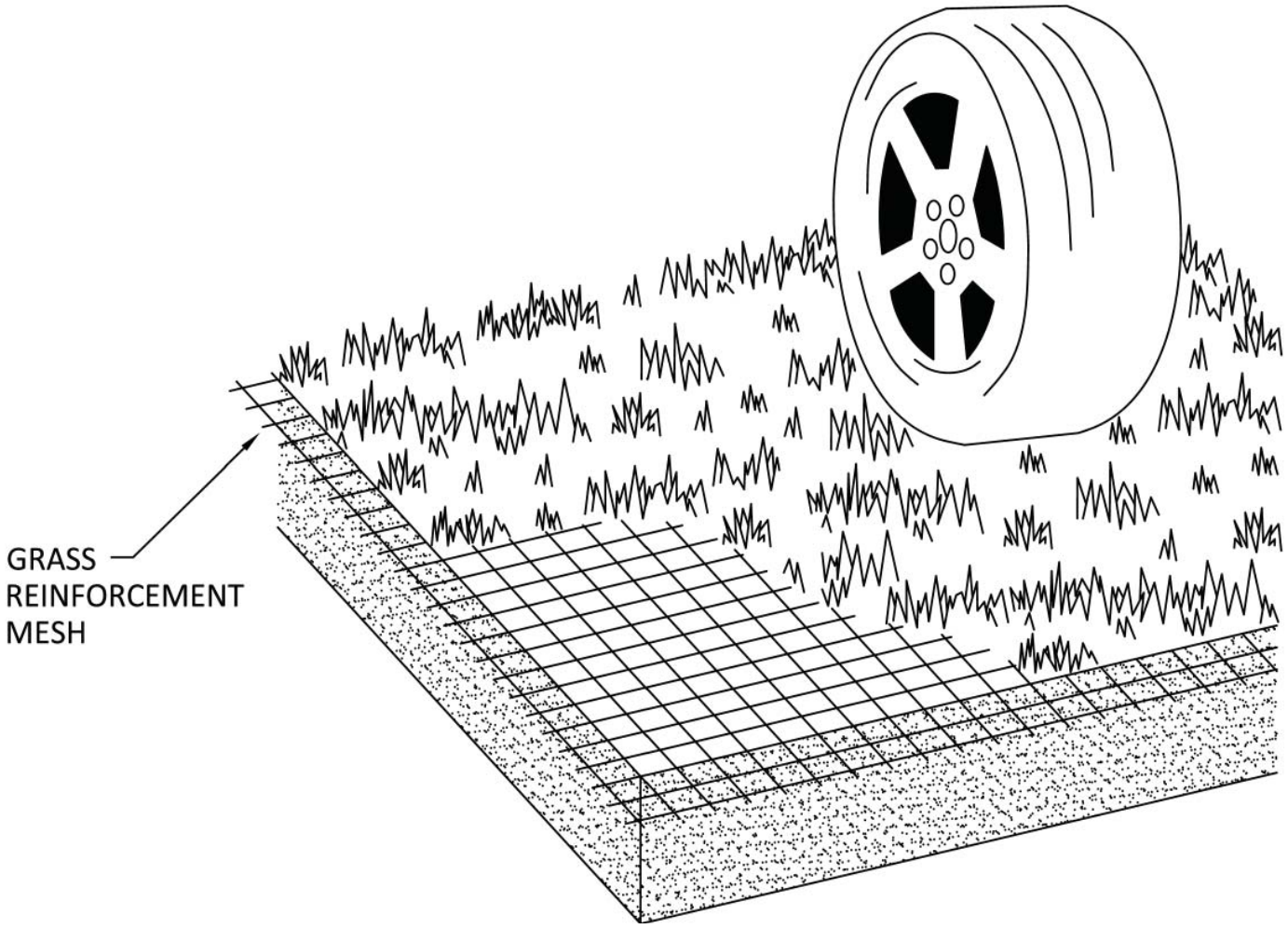
Pros:

- Reduces water runoff.
- Increases groundwater infiltration.
- Can be used to control mud problems.
- Aesthetically pleasing.
- Increases property value.
- Homeowner can install without assistance.
- No excavation or soil removal is required.

Cons:

- May not be able to use snow plows over the mesh.
- Have to buy a minimum amount.

Ground leveled, with mesh layed out prior to pinning.



For more information about the Green Infrastructure Project please visit: **www.cchrc.org/green-infrastructure**

Sources:

Boddingtons Ltd, GrassProtecta® Grass Reinforcement Protection Mesh
http://www.grass-reinforcement.com/
Polar Supply 2134 Texaco Street, Unit A Fairbanks, Alaska 99701
907-452-4743 http://www.polarsupply.com

Easy Difficult

Riparian Zone Revegetation

For Your Home

Live on a Waterway? Have Erosion Issues?

Land adjacent to waterways has many important functions. Healthy vegetated riparian areas keep your land from eroding, improve water quality and quantity, provide important fish and wildlife habitat, and help sustain aquatic life.

photos: US Fish and Wildlife Service

A healthy riparian zone is a naturally vegetated area adjacent to a waterway. These areas help reduce erosion, improve water quality and quantity, provide wildlife habitat, and help sustain aquatic life. Native plant species are preferred. Roots of riparian vegetation stabilize the stream bank and reduce stream bank erosion and sedimentation. Reducing excess sedimentation helps prevent silt from covering the stream bed which serves as spawning gravel for juvenile salmon and many aquatic macroinvertebrates. Undercut banks and overhanging vegetation large woody debris, also serve as important habitat for fish and other aquatic wildlife.

Cold Climate Considerations:

See list on back for specific plants that will survive in a Fairbanks riparian zone.

Special Considerations:

Streambank revegetation projects may require prior approval from state, federal, and/or municipal agencies. We recommend that you contact the permitting agencies early in your planning process (one year before project in spring or summer) to allow ample time to secure necessary permits, aquire grant funding if applicable, and aquire assistance. Permit processing can take 30 days after filing application, much longer depending on project and permitting stipulations. Technical assistance can be obtained by contacting the Fish and Wildlife Service Partners program at 456-0209 or the Alaska Department of Fish and Game Habitat Division at 459-7289.

Maintenance:

- Water new plants daily and intensely through the hot dry part of summer to help them establish.
- Remove unnecessary debris regularly.

Materials:

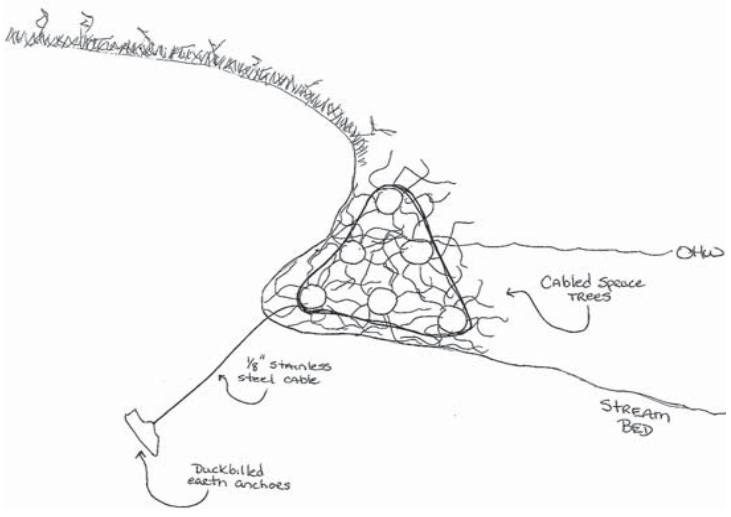
- ☐ Native Plants
- ☐ Veg Mat (removed with permission)
- ☐ Coir Logs (12”diameter)
- ☐ Wooden stakes
- ☐ Biodegradeable Fabric C125 BM (ENC2 eqv.)
- ☐ Biodegradeable Fabric Coir Mat 700 (CF7 eqv.)
- ☐ Fill soil, topsoil if possible
- ☐ Gravel
- ☐ Galvanized or stainless steel cable (1/8 inch)
- ☐ Duckbill earth anchor (size 66) and Ferrules

Tools:

- ☐ Shovels, pickaxes, loppers
- ☐ Sledgehammer
- ☐ Pruners
- ☐ Small Earthmover (optional)
- ☐ Cable Cutter

Cabled Spruce Tree Revetment

- The spruce trees are cabled along the river bank with the butt end of the tree facing upstream.
- The trees will overlap by 1/2 to 1/3 the length of the tree in shingle fashion.
- The trees are held in place with a duck bill anchor (size 66) driven into the river bank.
- The cabled spruce trees will be drawn tightly against the bank at and below ordinary high water (OHW)
- No limbs will be removed from the trees prior to installation.
- If the cabled spruce trees are not maintained an deteriorate, all visible cables and anchors that remain below OHW must be removed.



Cost Estimates:

- Brush Layers - $105/ft
- Trenched Willow - $50/ft
- Veg Mat - $8/ft
- Cabled Spruce - $45/ft
- Root Wads - $225/ft

Time Estimate:

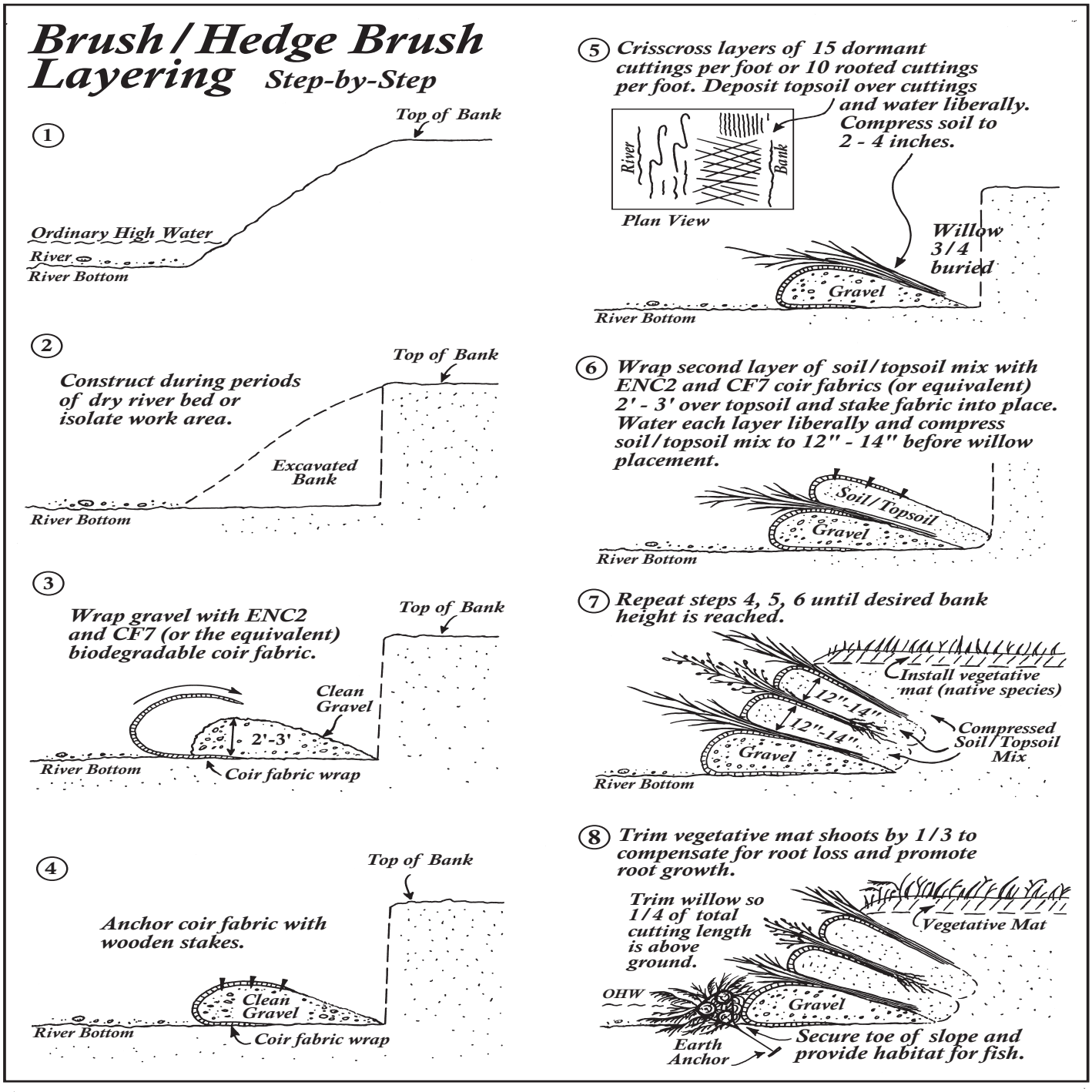
This project could take one day to many weeks to complete depending on level of contractor involvement, type and size of project.

Pros:

- Reduces water runoff and increases groundwater infiltration.
- Reduces property erosion.
- Minimal maintenance required.
- Helps keep water bodies cool.
- Improves habitat for fish, birds and other aquatic life.
- Helps maintain aquatic habitats.

Cons:

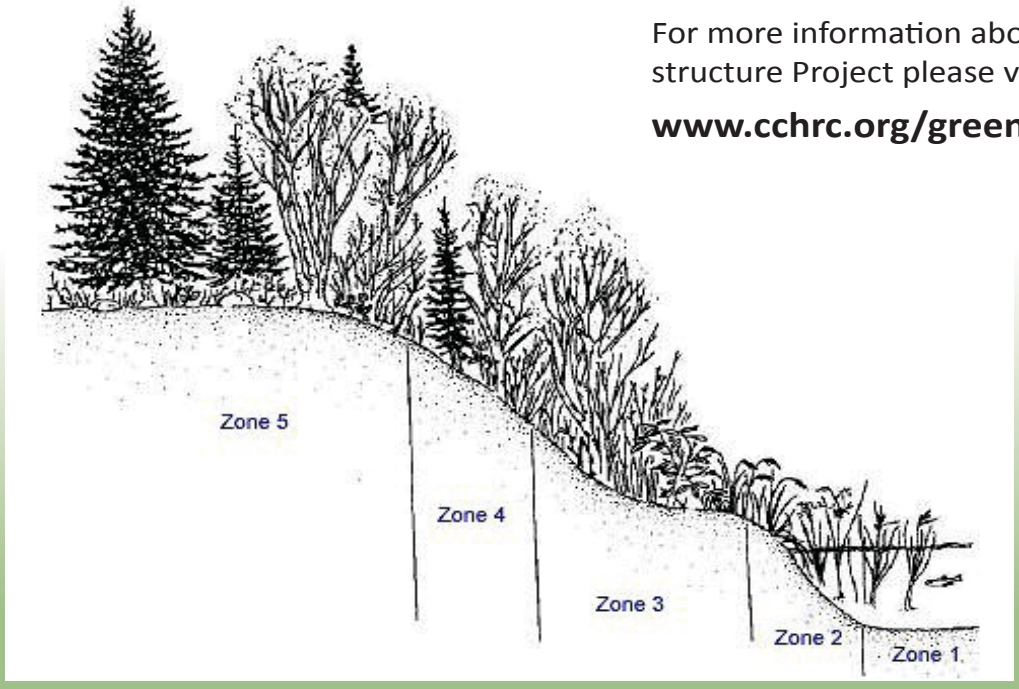
- Permits may be necessary and can delay project.
- Should be installed during low water periods.



Tree and Shrubs	Plant Common Name	Latin Name	Zone	Revegetation Uses*
Deciduous Shrubs	Feltleaf Willow	*Salix alaxensis*	3-4	DC, LS, B, BL, L, H, RC, T, S
	Red Osier Dogwood	*Cornus stolonifera*	3	DC, LS, B, BL, H, RC, T, S
	Lingonberry	*Vaccinium vitus-idea*	3	RC, T, S
	Rugosa Rose	*Rosa rugosa*	3	RC, R, T, S
	Diamond Leaf Willow	*Salix planifolia spp. Pulchra*	3-4	DC, LS, B, BL, H, RC, T, S
	Highbush Cranberry	*Viburnum edule*	3	LS, BL, L, H, RC, T, S
	Bebb's Willow	*Salix bebbiana*	3-4	DC, LS, B, BL, L, H, RC, T, S
	Thin Leaf Alder	*Alnus tenuifolia*	4	DC, LS, B, BL, H, RC, T, S
Coniferous Trees	Whites Spruce	*Picea glauca*	4-5	RC, T, S
	Larch/Tamarack	*Larix laricina*	5	RC, T, S
Deciduous Trees	Alaska Paper Birch	*Betula neoalaxensis*	5	DC, LS, B, BL, H, RC, T, S
	Balsam Poplar	*Populus balsamifera*	5	DC, LS, B, BL, H, RC, T, S
	Quaking Aspen	*Populus tremuloides*	5	DC, LS, B, BL, H, RC, T, S
Grasses and Sedges	Plant Common Name	Latin Name	Zone	Availability
Grasses	Bluejoint Reedgrass	*Calamagrostis canadensis*	2-3	Limited Seed Supply, Transplants from wild
	Bering Hairgrass "Norcoast"	*Deschampsia caespitosa*	2-3	Seed Available High Demand
	Red Fescue "Arctared" "Boreal" "Pennlawn"	*Festuca rubra*	2	Seed Available
	Polargrass "Alyeska" "Kenai"	*Arctagrostis latifolia*	2	Alyeska seed available
	Sloughgrass "Egan"	*Beckmannia syigachne*	2	Seed available
Sedges	Water Sedge	*Caryx aquatilis*	1-2	Contract seed collections
	Lyngby Sedge	*Caryx lyngbyaei*	1-2	Contract seed collections

*Key to Revegetation Uses:

DC : dormant cutting B: bundles L: live siltation RC: rooted cutting R: root cutting
LS: Live Stakes BL: brush layer H: hedge layering T- transplants S: seed



For more information about the Green Infrastructure Project please visit:

www.cchrc.org/green-infrastructure

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