RAIN GARDENS:

Landscaping for clean water & healthy streams

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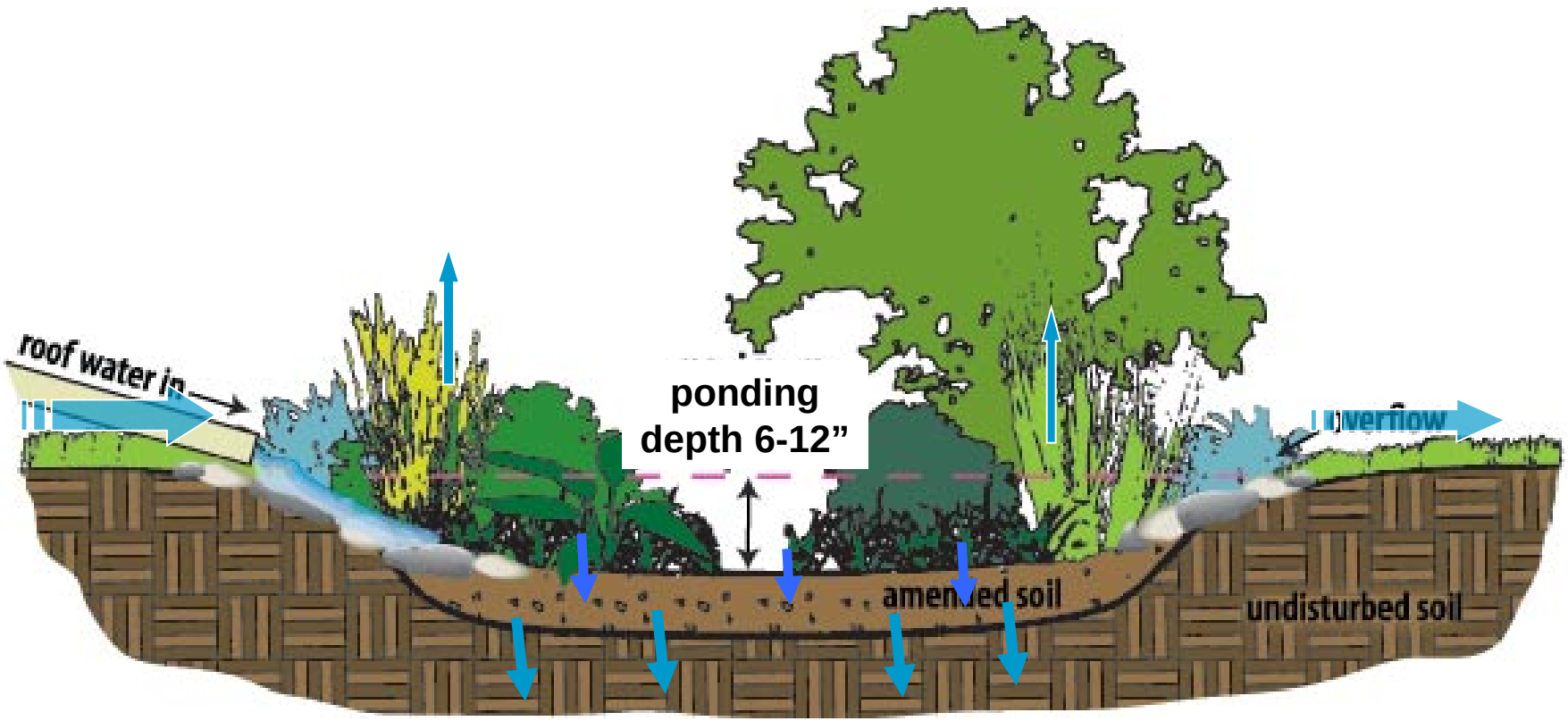
- Workshop Agenda
- 1st hr Introduction to Stormwater Issues
- 2nd hr Site Assessment Hands On Exercise
  Break
- 3rd hr Construction/Design
  Challenging Sites; Slopes
- 4th hr Rain Garden Tour

What is a rain garden?

What is a rain garden?

A rain garden is a “sunken garden bed” that collects and treats stormwater runoff from rooftops, driveways, sidewalks, parking lots and streets.

How a Rain Garden Works



A rain garden that absorbs stormwater from a parking lot

Do rain gardens breed mosquitoes?

NO!

Is this a rain garden?

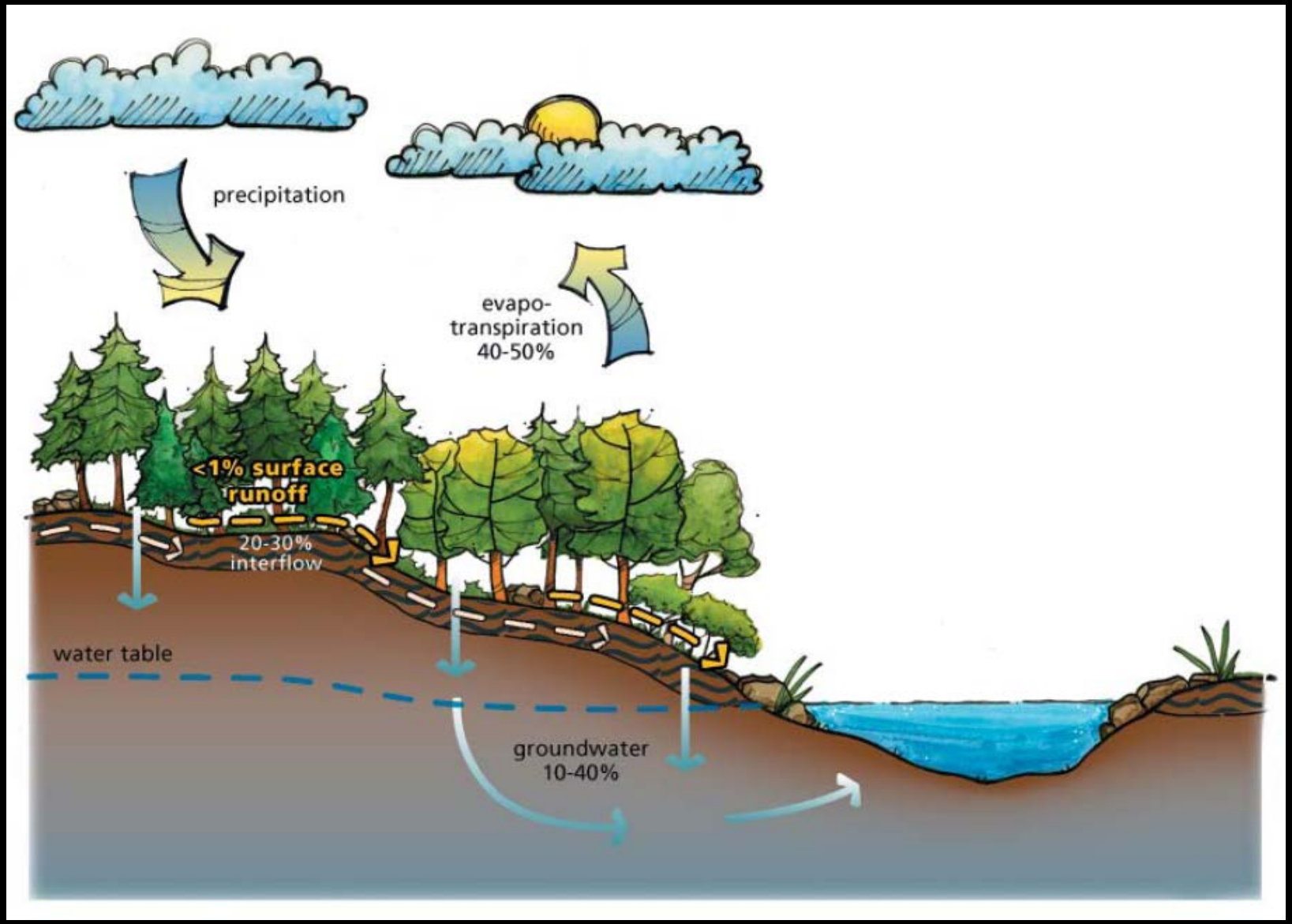
Is this a rain garden?

Rain gardens are designed to dry out in about a day!

Chesapeake Bay Watershed

Why a rain garden?

Forested Watershed



Impervious Surfaces

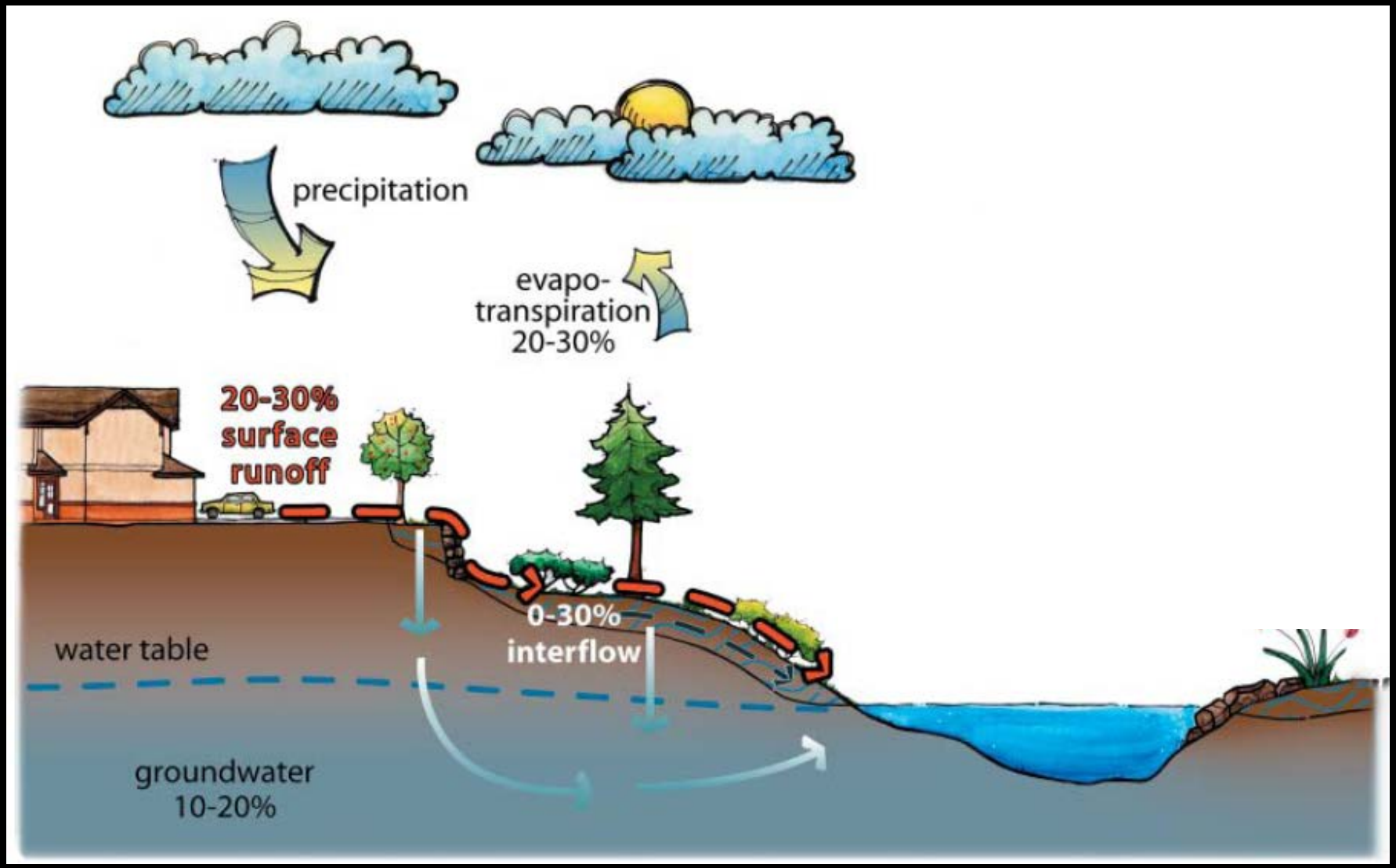
Surfaces that don't allow rain water to be naturally absorbed by the soil.


The Problem: Conventional Stormwater Management


Robert Emanuel, OSU Extension Service

Sent to stream or wastewater treatment plant

Developed Watershed



Stream Degradation

WSU Extension/Puget Sound Action Team

Water Quantity Impacts:

Flooding & Erosion

Water quality impacts

solid waste
hydrocarbons*
Fertilizers
pesticides*
Bacteria
cleaning chemicals*
detergents/soaps
copper* and other metals
temperature

- Recent studies show link between these chemicals and salmonid olfactory
- disorientation, mortality

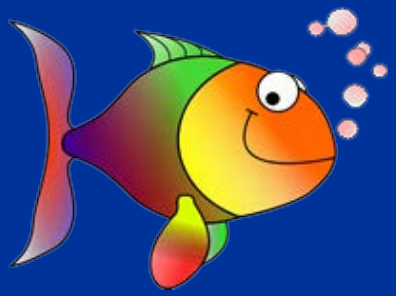
An Alternative Approach

Challenge –

Stormwater runoff from impervious surfaces affects water quantity, water quality, and stream health.

Solution –

- **Use rain gardens to capture stormwater**
- **Treat it naturally with vegetation, soils and microorganisms**
- **Release it safely to groundwater and streams.**



Building a Rain Garden

Steps

1. Assess your site
2. Decide on a location
3. Do a percolation test
4. Determine the size
   (generally 10% of impervious area)
5. Excavate
6. Plant with vegetation
7. Mulch
8. Disconnect downspouts

How big do I make my rain garden?

House:
40ft x 25 ft = 1000 sq ft

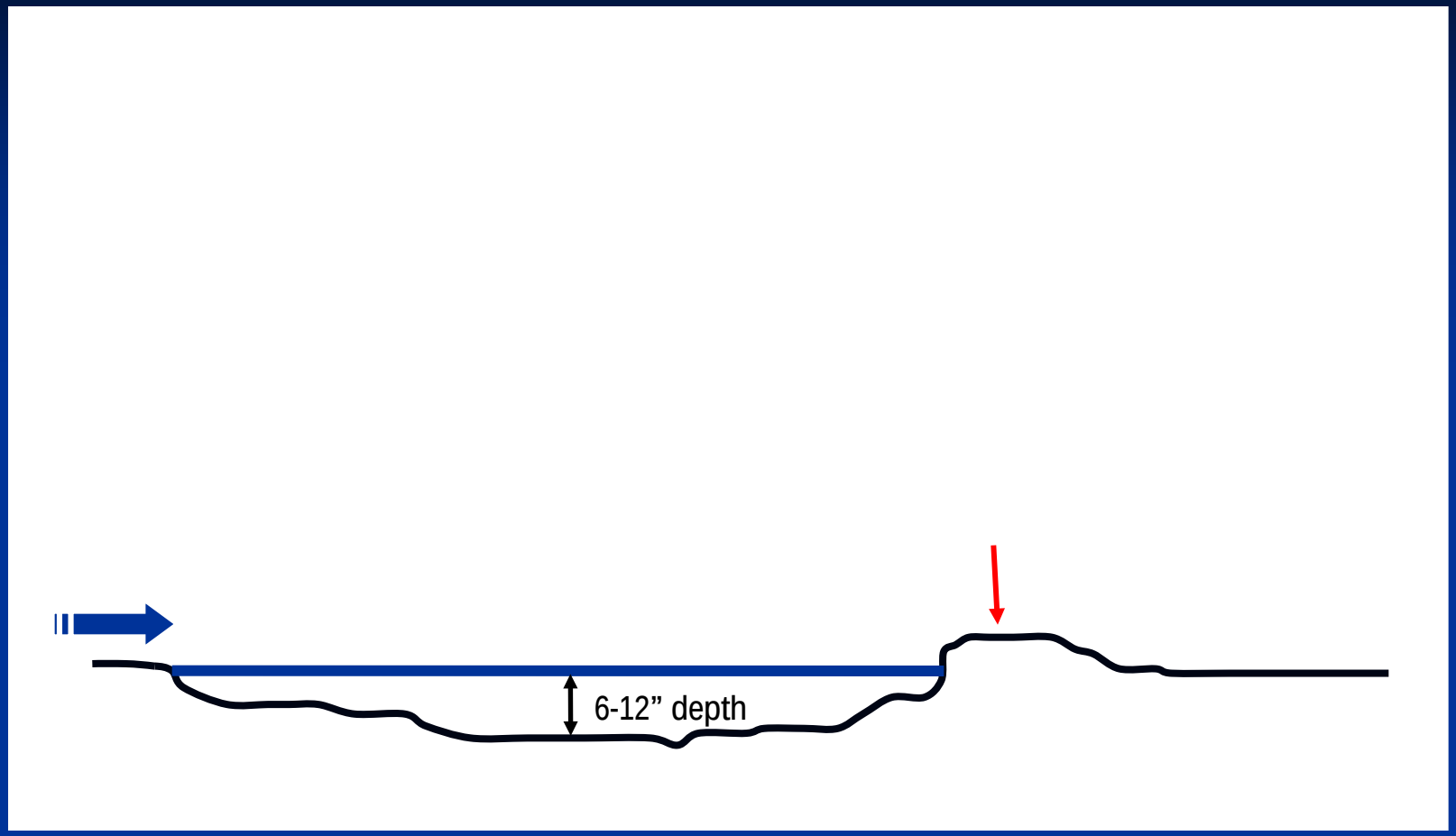
10%=100 sq ft

One big rain garden: 100 sq ft
or
Front rain garden: 50 sq ft
Back rain garden: 50 sq ft

Rule of Thumb: 10% of impervious surface area

Find a spot in your yard where you can easily direct the runoff from your downspout or other impervious surface.

Do a Percolation Test



- **Dig a shallow depression to create a rain garden (6-12 in deep)**

Rain garden construction

Disconnect Downspouts

Assessing Your Site

Things to Consider

- Slopes
- Soils
- Rain garden placement
- Amount of impervious surface area
- Rain garden sizing

Permits?

- Portland:
  - Where rain gardens are allowed, no permit needed for residential rain gardens
- Gresham
  - No permit, safety inspection by City req. before disconnecting downspouts
- Other jurisdictions:
  - Call the Building Dept
- "Do I need a permit to build a rain garden?"

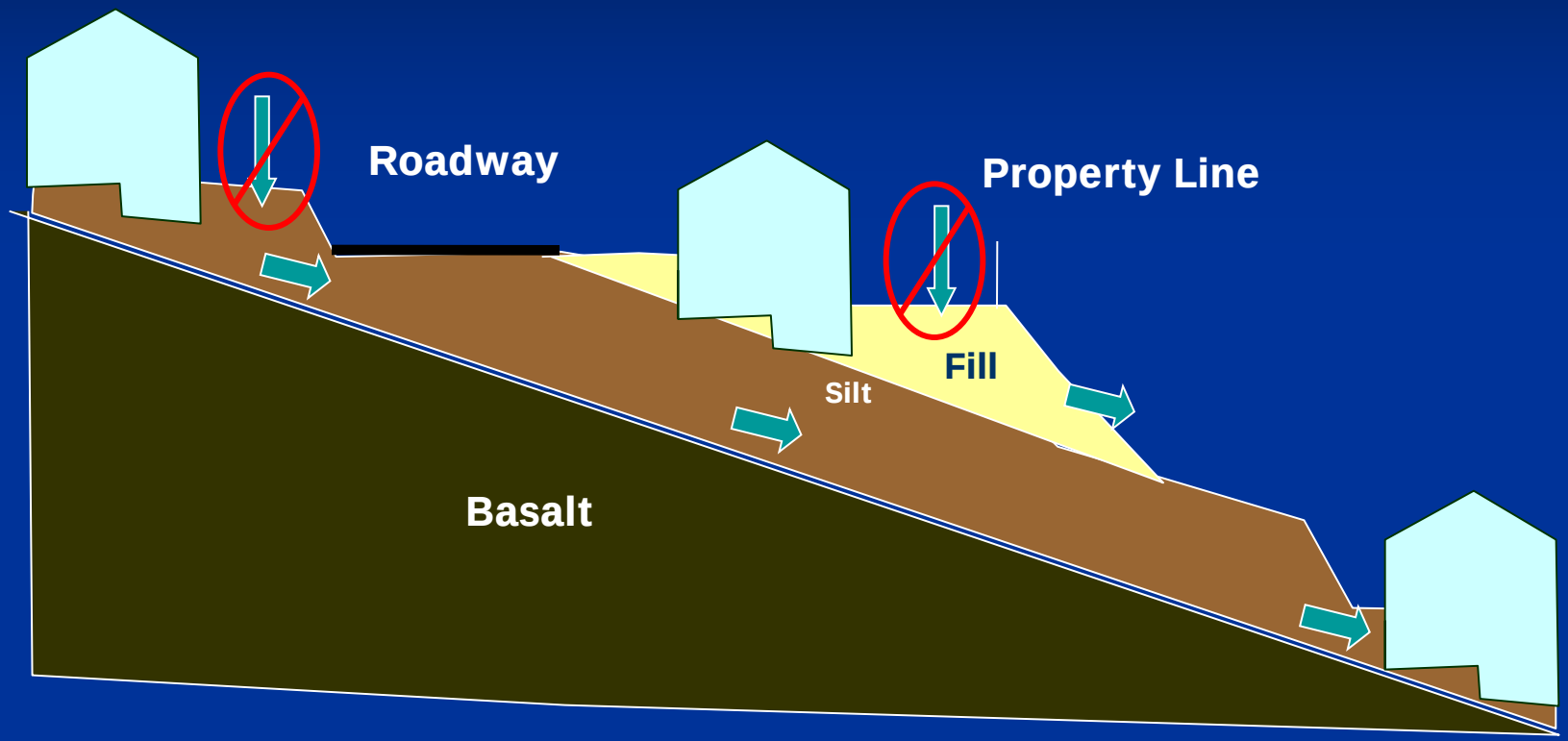
What's the trouble with slope?

- Increased chance for surface erosion
- Water-logged soils can "slide"
- Someone is almost always downhill…

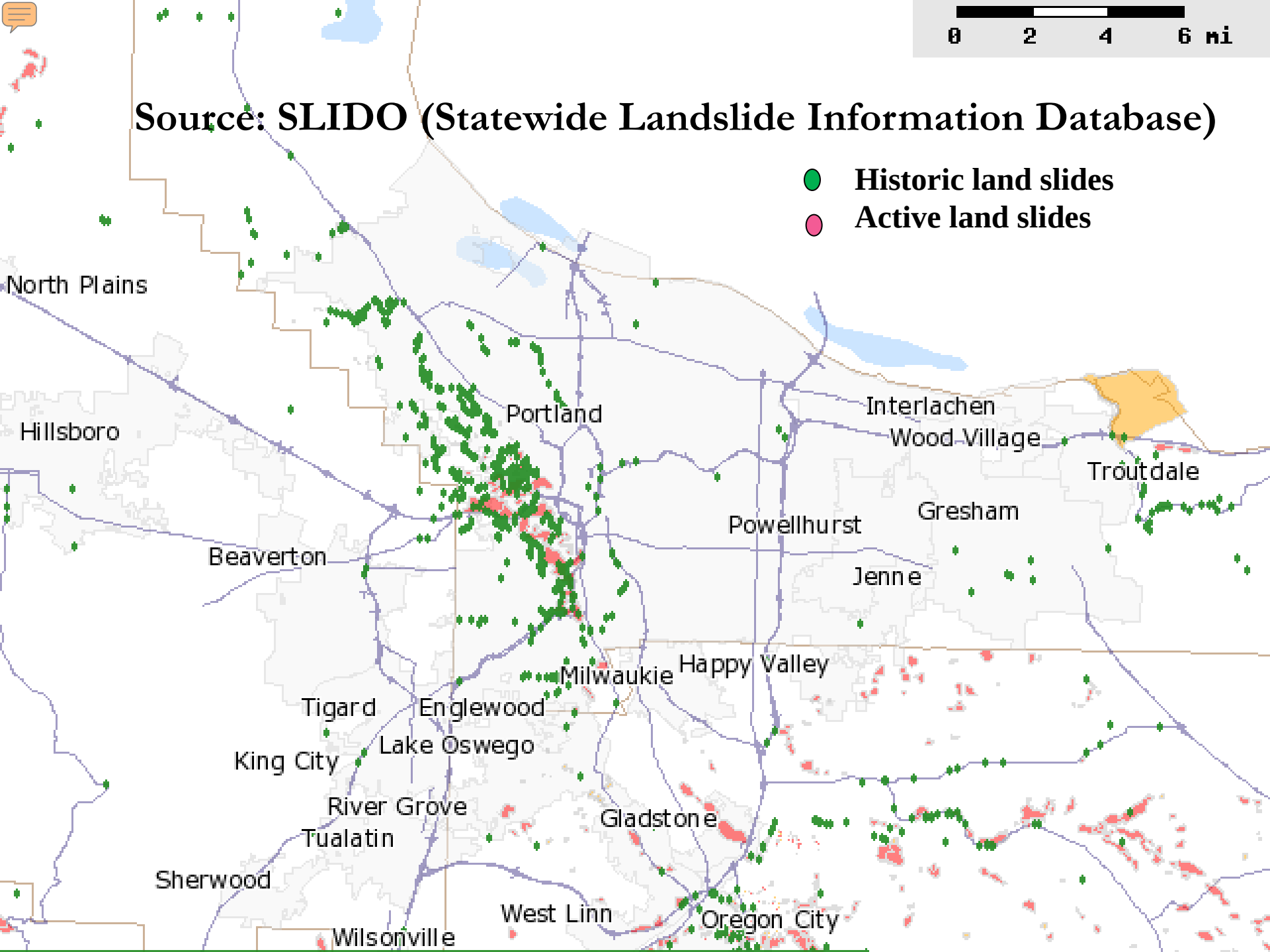
House slides onto Terwillager Ave, 2008

Source: KGW.com

Example Subsurface Profile
Portland West Hills

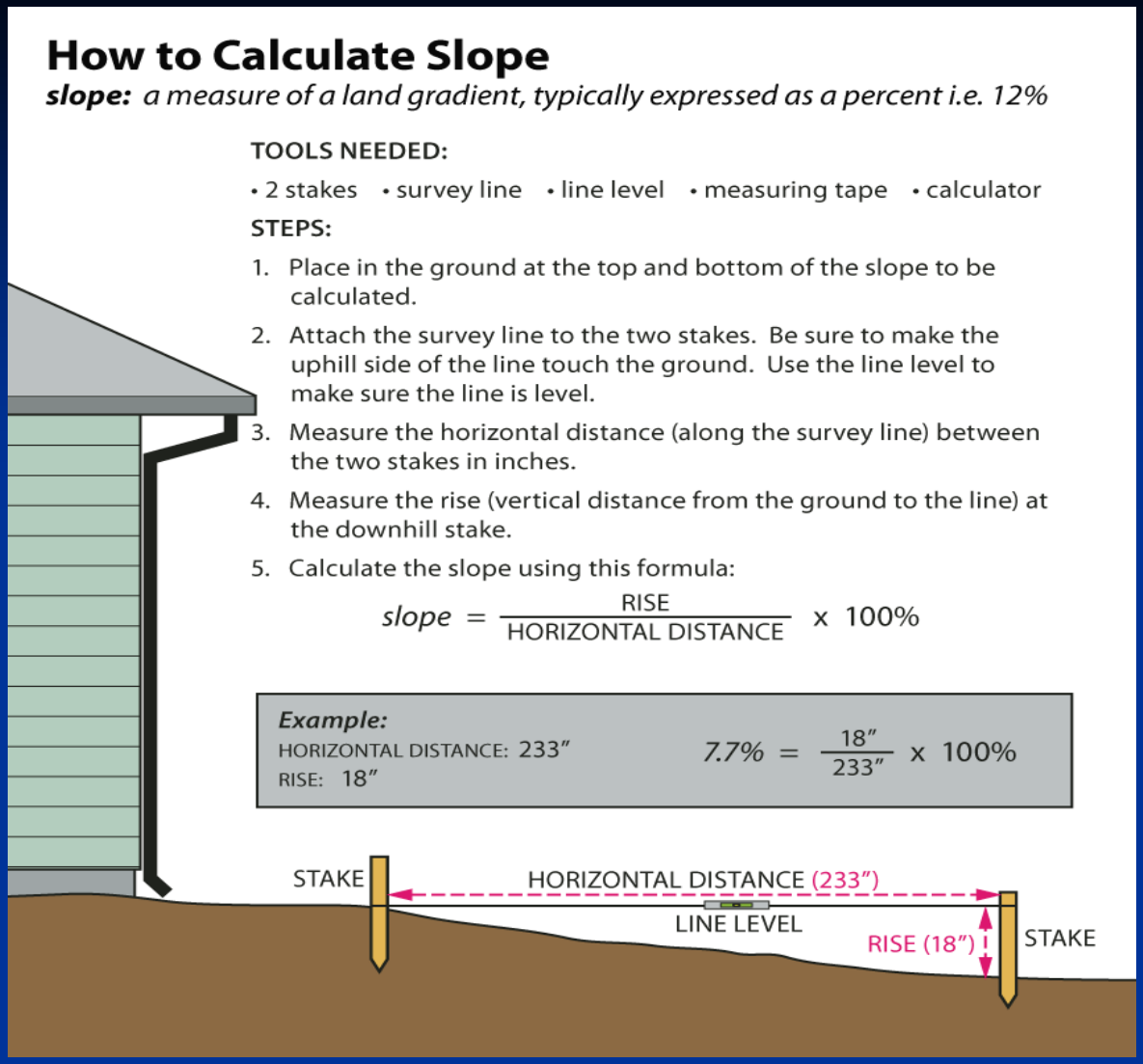


Portland, Bureau of Development Services


0 2 4 6 mi
Source: SLIDO (Statewide Landslide Information Database)
Historic land slides
Active land slides
North Plains
Hillsboro
Portland
Interlachen
Wood Village
Troutdale
Gresham
Powellhurst
Beaverton
Jenne
Happy Valley
Milwaukie
Tigard
Englewood
Lake Oswego
King City
River Grove
Tualatin
Gladstone
Sherwood
West Linn
Oregon City
Wilsonville

Slope Guidelines

- Overall slope of property greater than 10% (may trigger erosion concerns).
- Steeply sloped properties are not appropriate for rain gardens.
- If you have concerns, seek professional guidance.



- Use slope measurement to determine how to move water through the rain garden.

Rain Garden Placement

Placement Guidelines

- 10 ft from foundation (2 ft if no basement)
- 5 ft from property line
- 3 ft from sidewalks/driveways
- 10 ft from retaining walls

- Manage rain down slope from structures

Rain Garden Placement

- 3 ft from driveway
- 3 ft from sidewalk
- 10 ft from basement


?
Retaining Walls
5 ft
10 ft from retaining walls

Rain Garden Placement

- Don't direct overflow to neighboring private property
- Be aware of rights of way and utility lines
- Be kind to overhead trees
- Stay away from septic drain fields and oil tanks

Don't place rain garden:

- in a "wet spot" in yard
- in an area where the seasonal (winter) water table is less than three feet from the bottom of the rain garden

Site Assessment: slope and soil erosion, texture and permeability

Soil Texture - Feel Test

- Strong clumping?
- Slick, slimy?
- Strong or weak ribbon?

- Slimy, strong ribbon = high clay
- Gritty, weak ribbon = high sand

Percolation Test

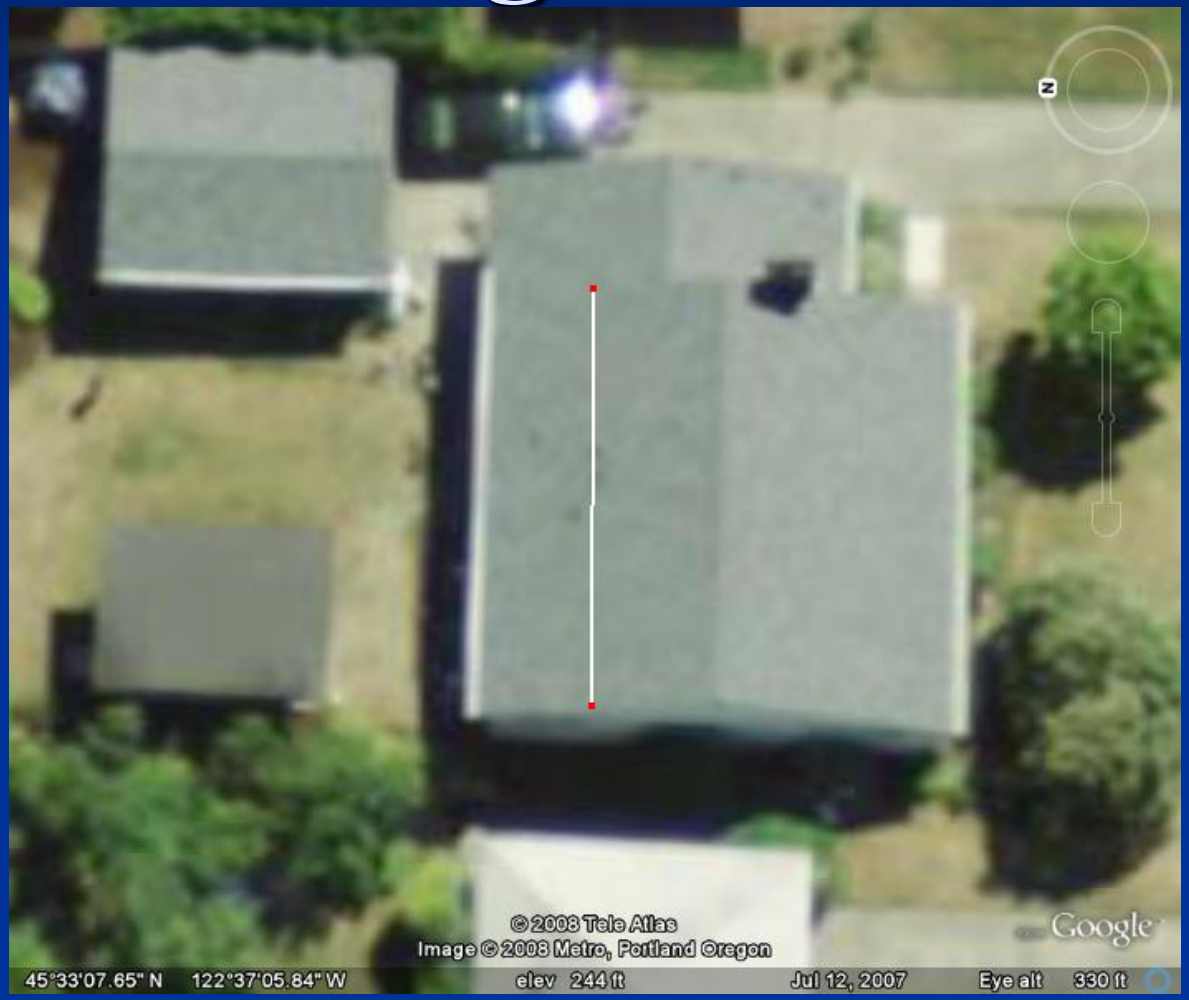
1. Dig a hole 12” deep
2. Fill with water and let it drain
3. Fill with water again, measure water depth, let drain for 1 hr
4. Measure water depth again
5. Calculate permeability = depth (inches) / time (hours)

Soil Percolation Test Interpretation

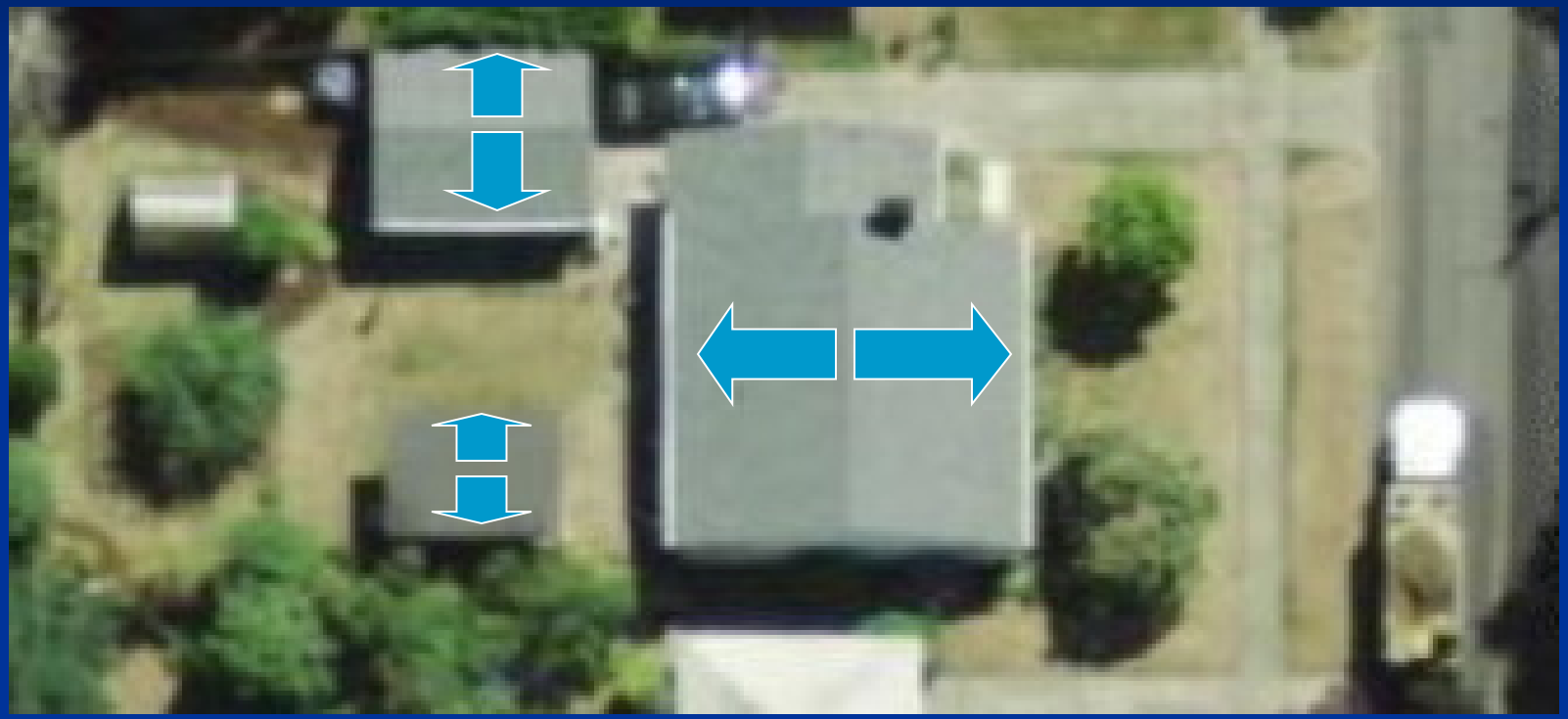
- 2”/hr. = excellent native soil for a rain garden (24” in < 12 hours)
- ½”/hr. = adequate, but expect some standing water and overflow in large storms (12” in < 24 hours)

How much impervious area do you have?

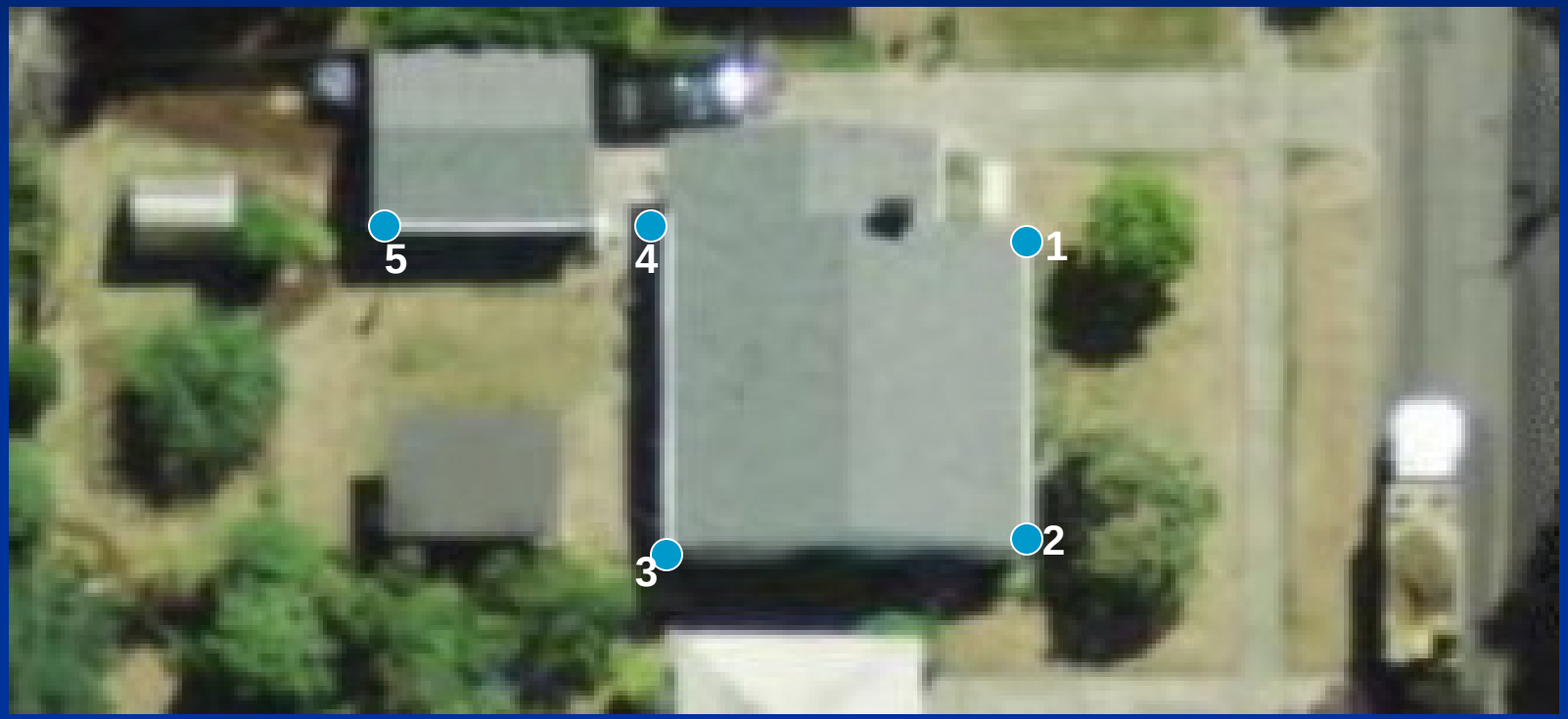
A “measuring tip” -Google Earth



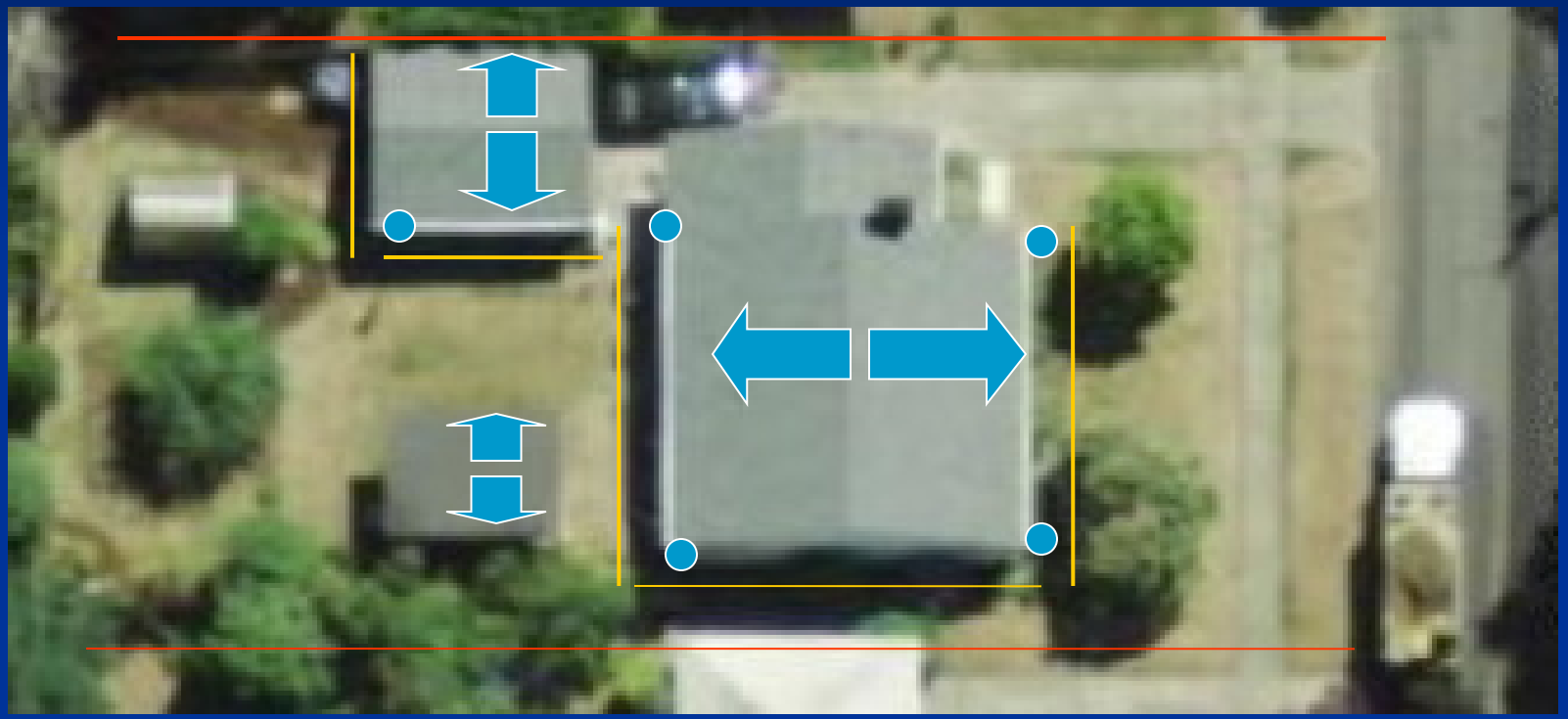
Where does the water flow?



Where are downspouts?

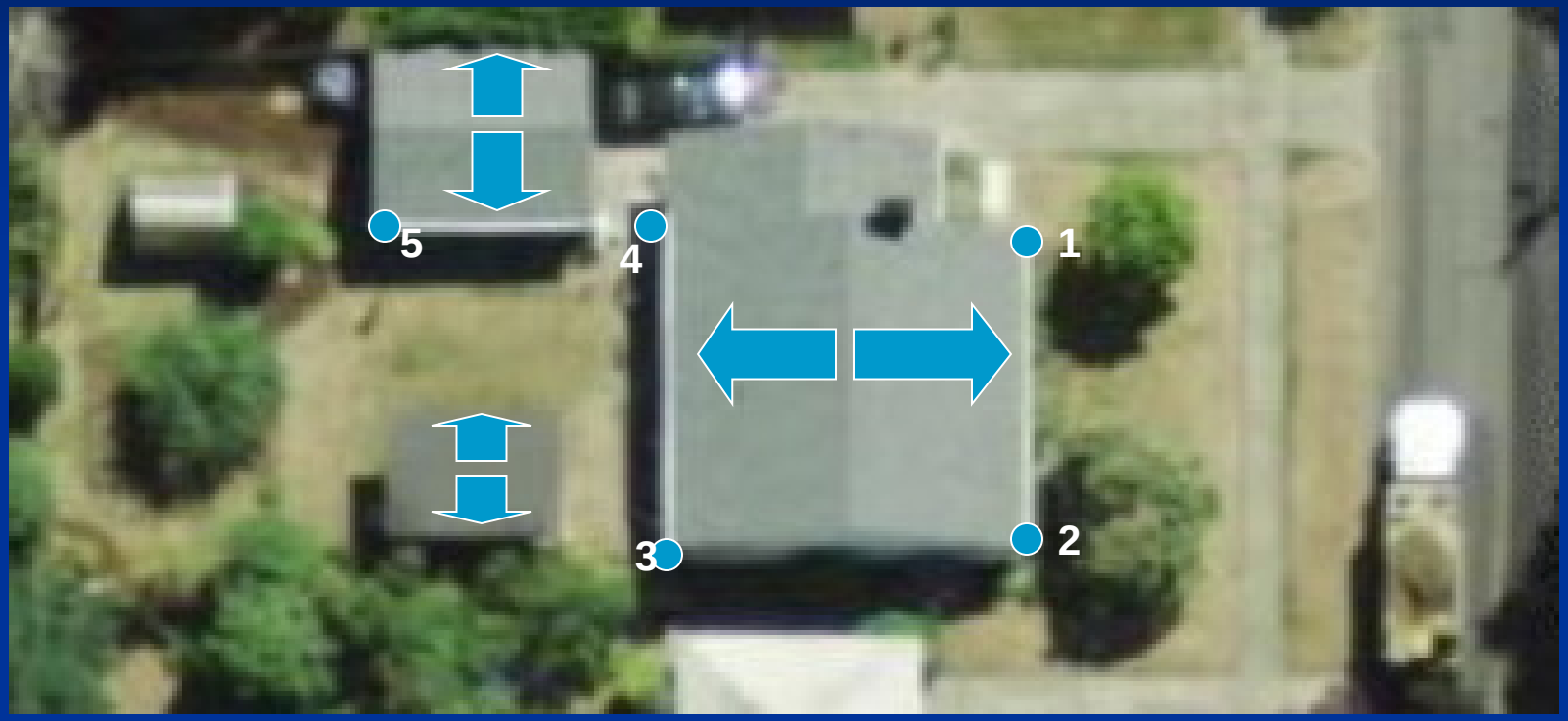


What are the "constraints" to keep in mind?



-property lines
-proximity to buildings
-tree roots

So, where are the obvious places to put rain gardens?



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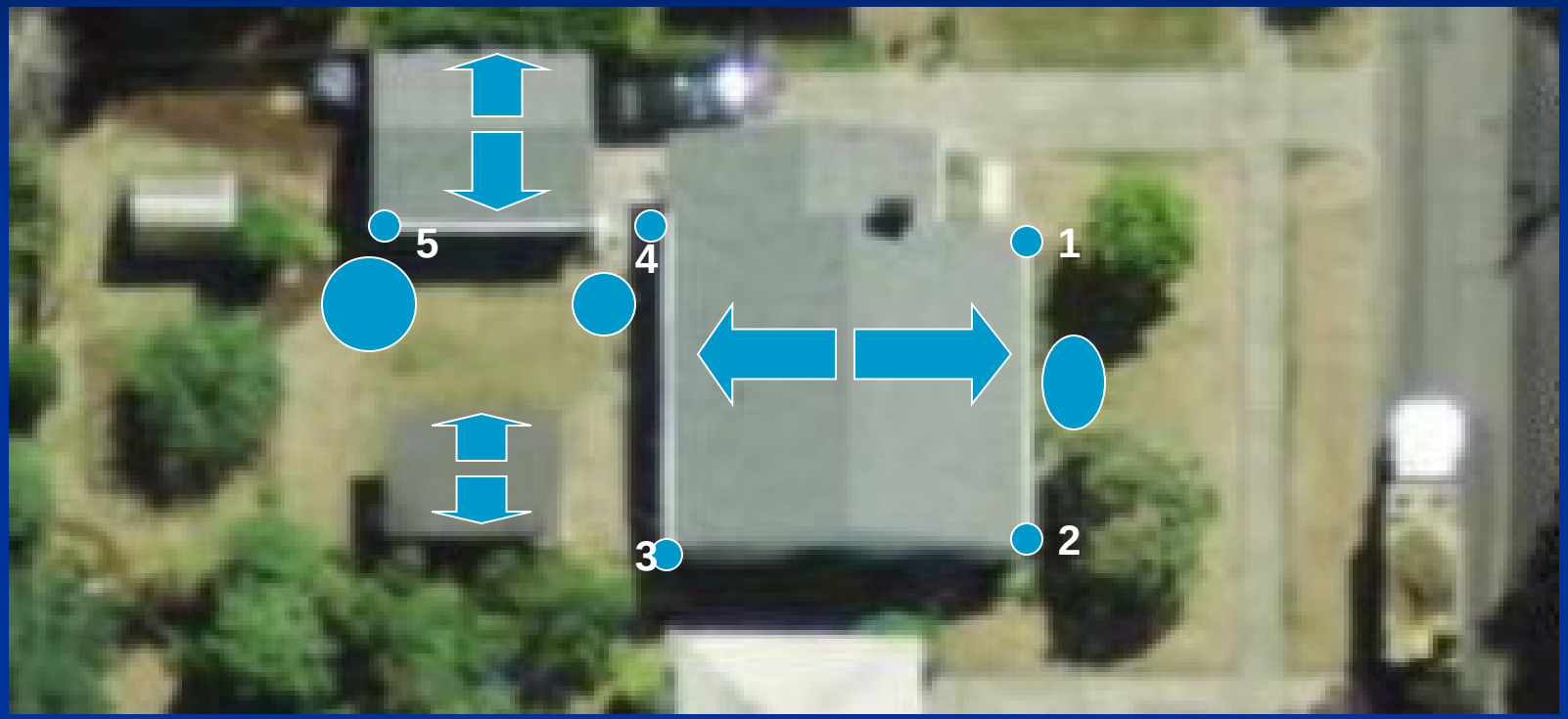
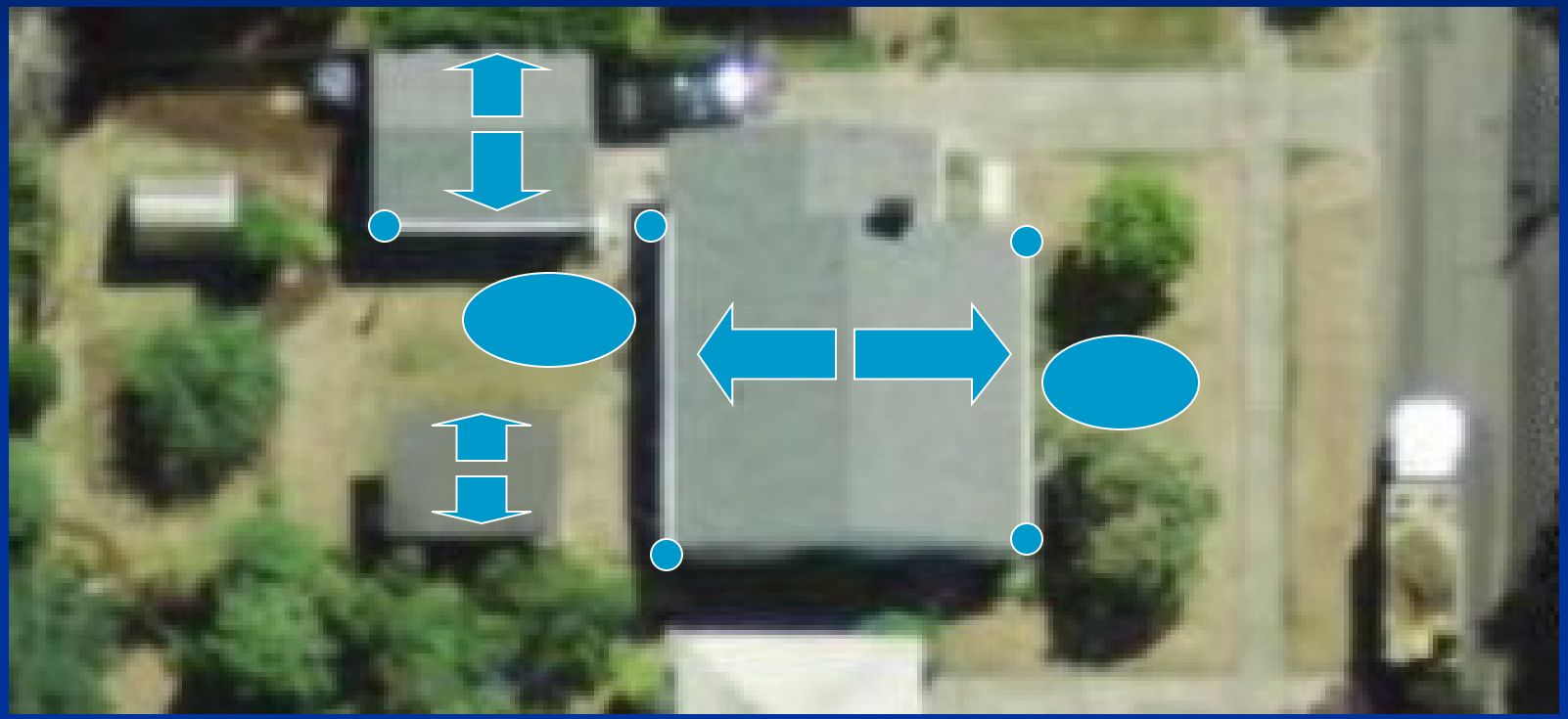
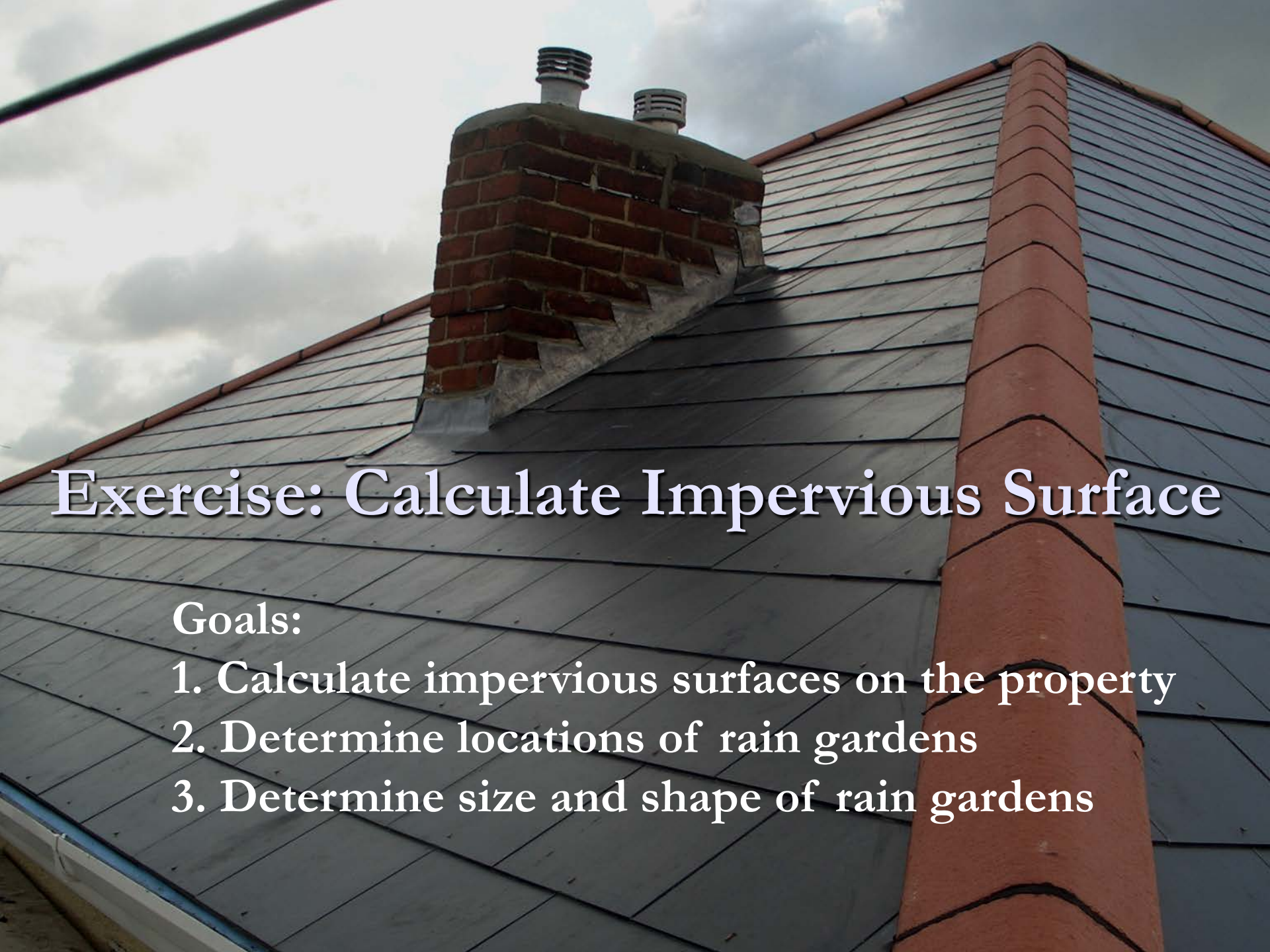


How big should they be? And what shape?





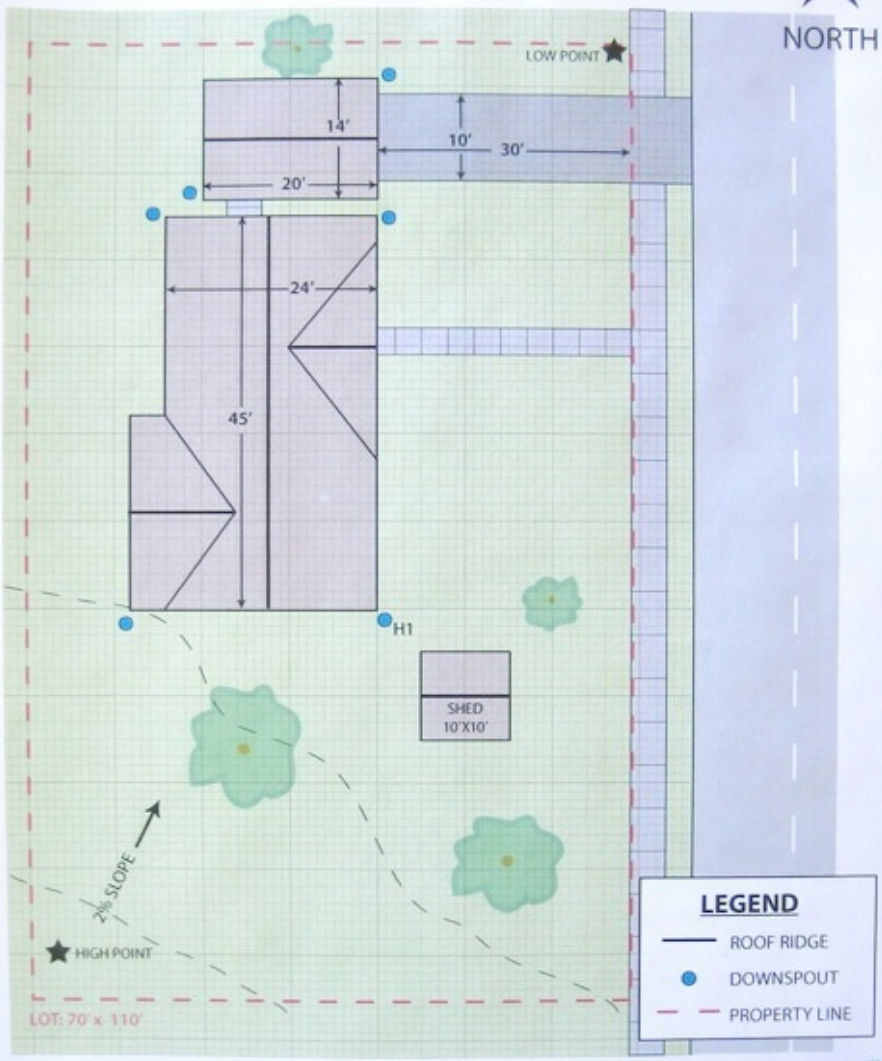
Exercise: Calculate Impervious Surface

Goals:

1. Calculate impervious surfaces on the property
2. Determine locations of rain gardens
3. Determine size and shape of rain gardens

Calculate Impervious Surface

See worksheet for instructions



Calculate Impervious Surface

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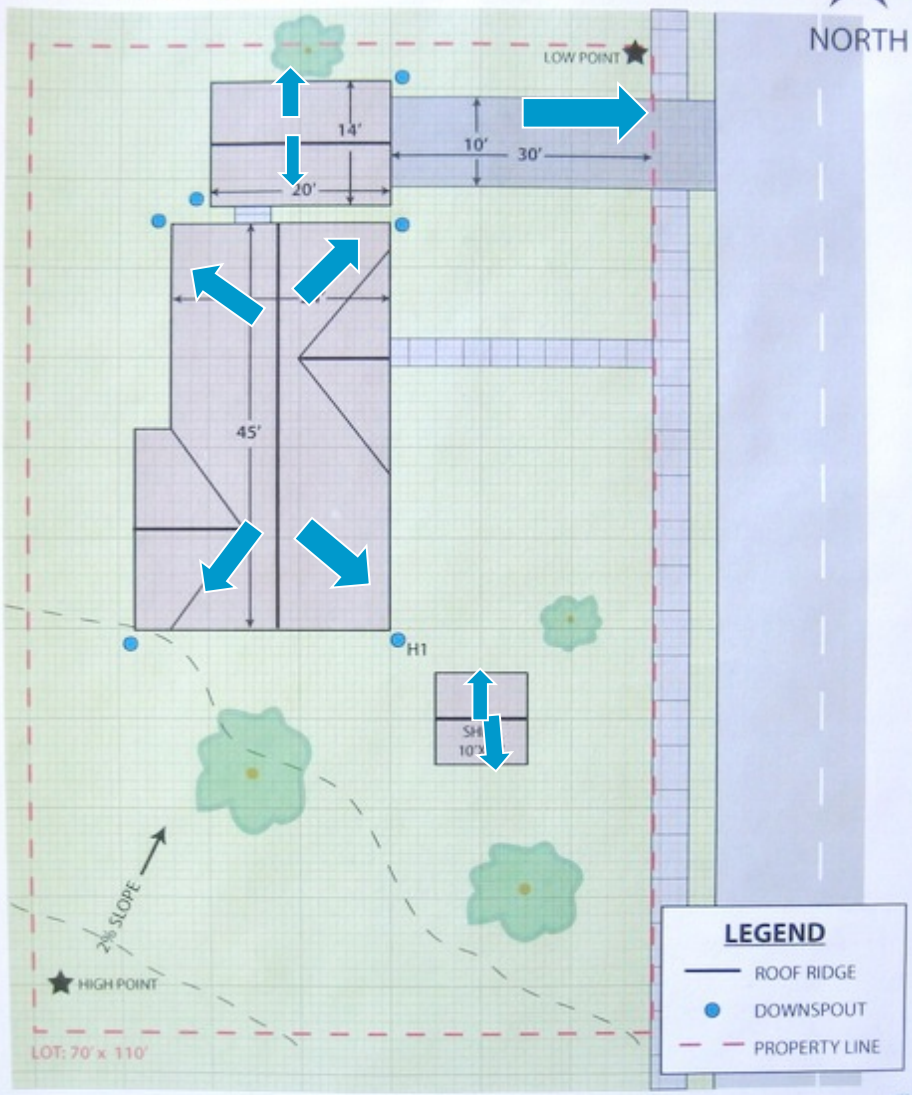
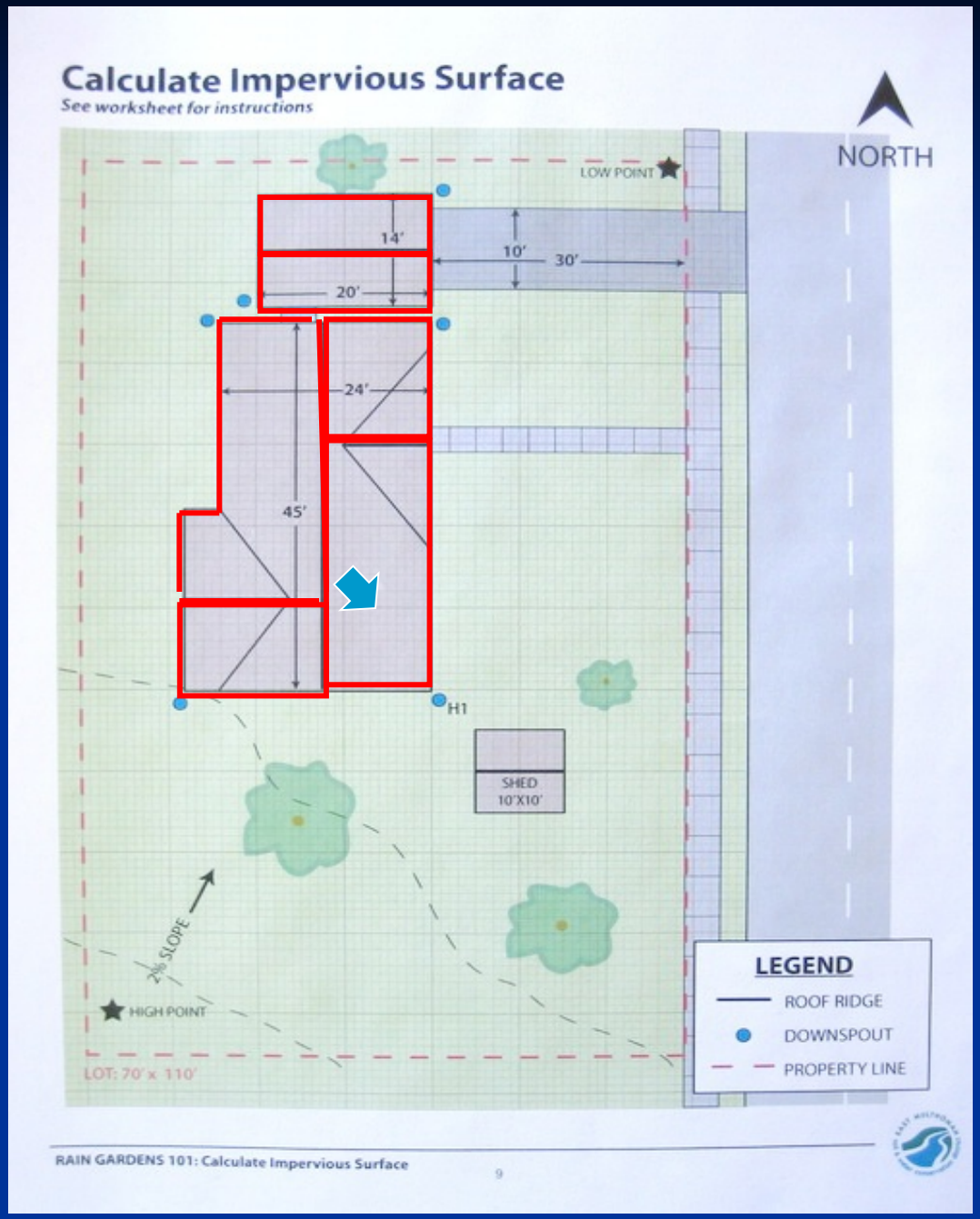
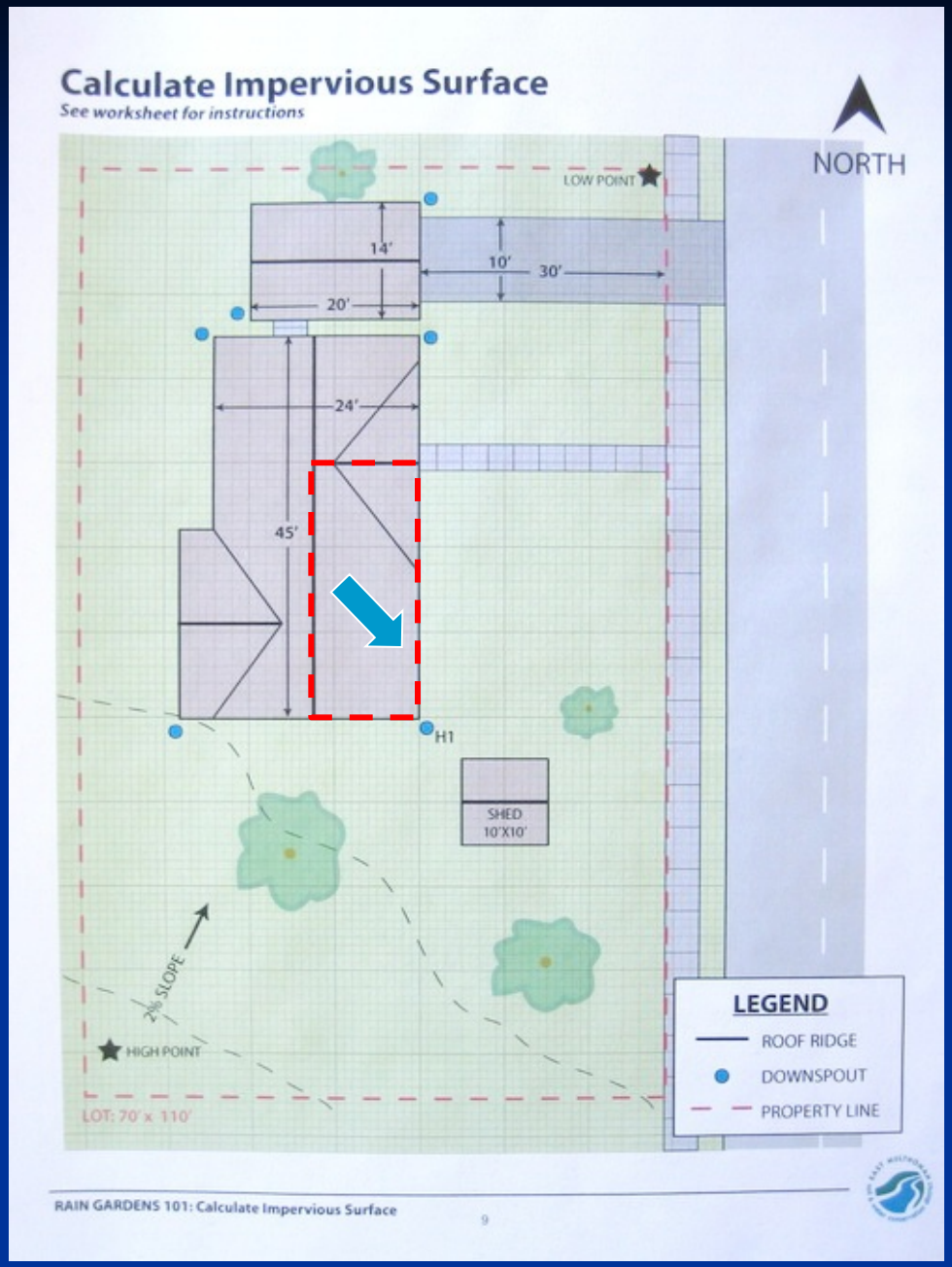



Calculate Impervious Surface
See worksheet for instructions
NORTH
LOW POINT
14'
10'
30'
20'
24'
45'
H1
SHED
10'X10'
2% SLOPE
HIGH POINT
LOT: 70' x 110'
LEGEND
ROOF RIDGE
DOWNSPOUT
PROPERTY LINE
RAIN GARDENS 101: Calculate Impervious Surface
9

1 square = 1 ft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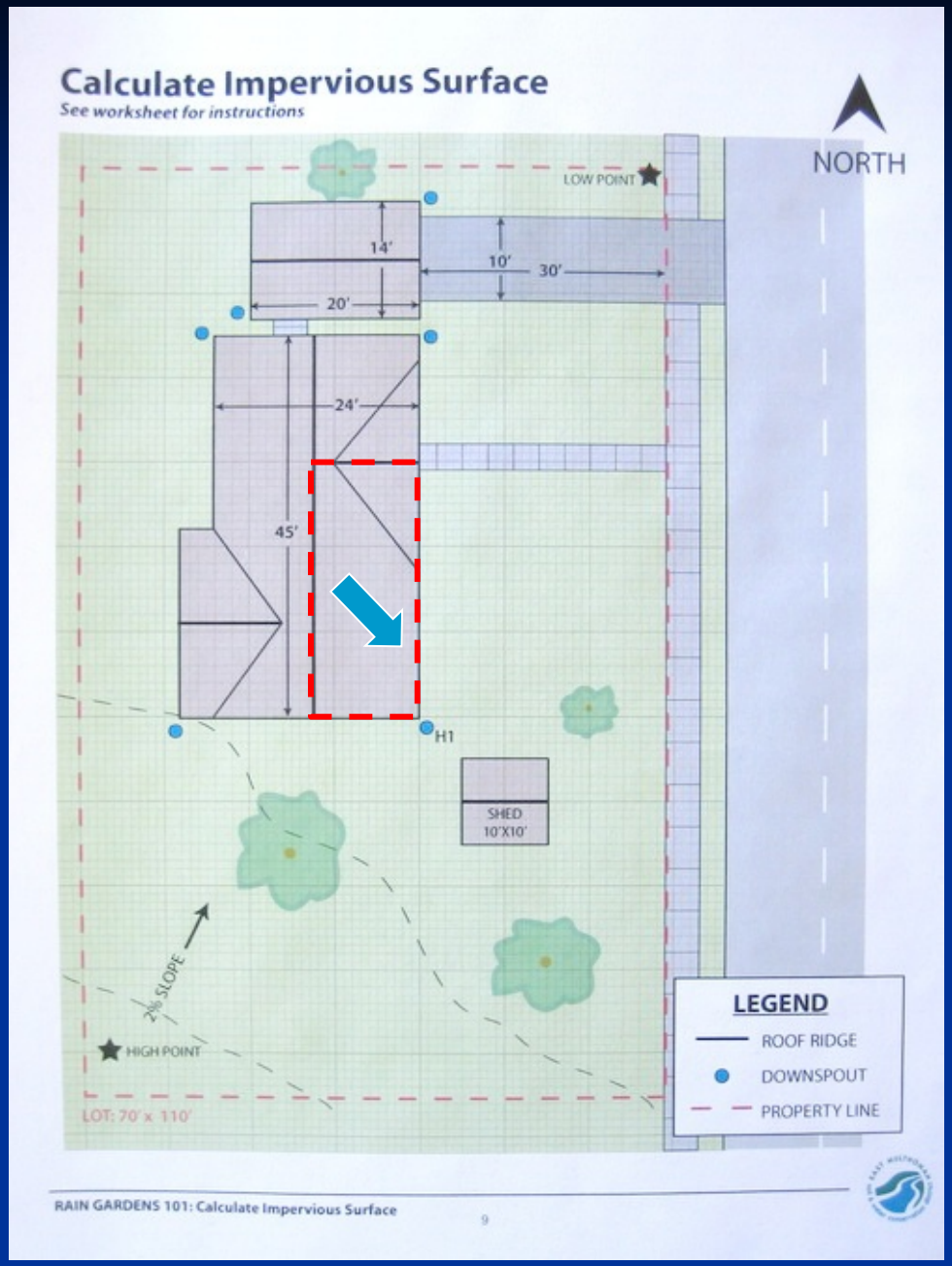
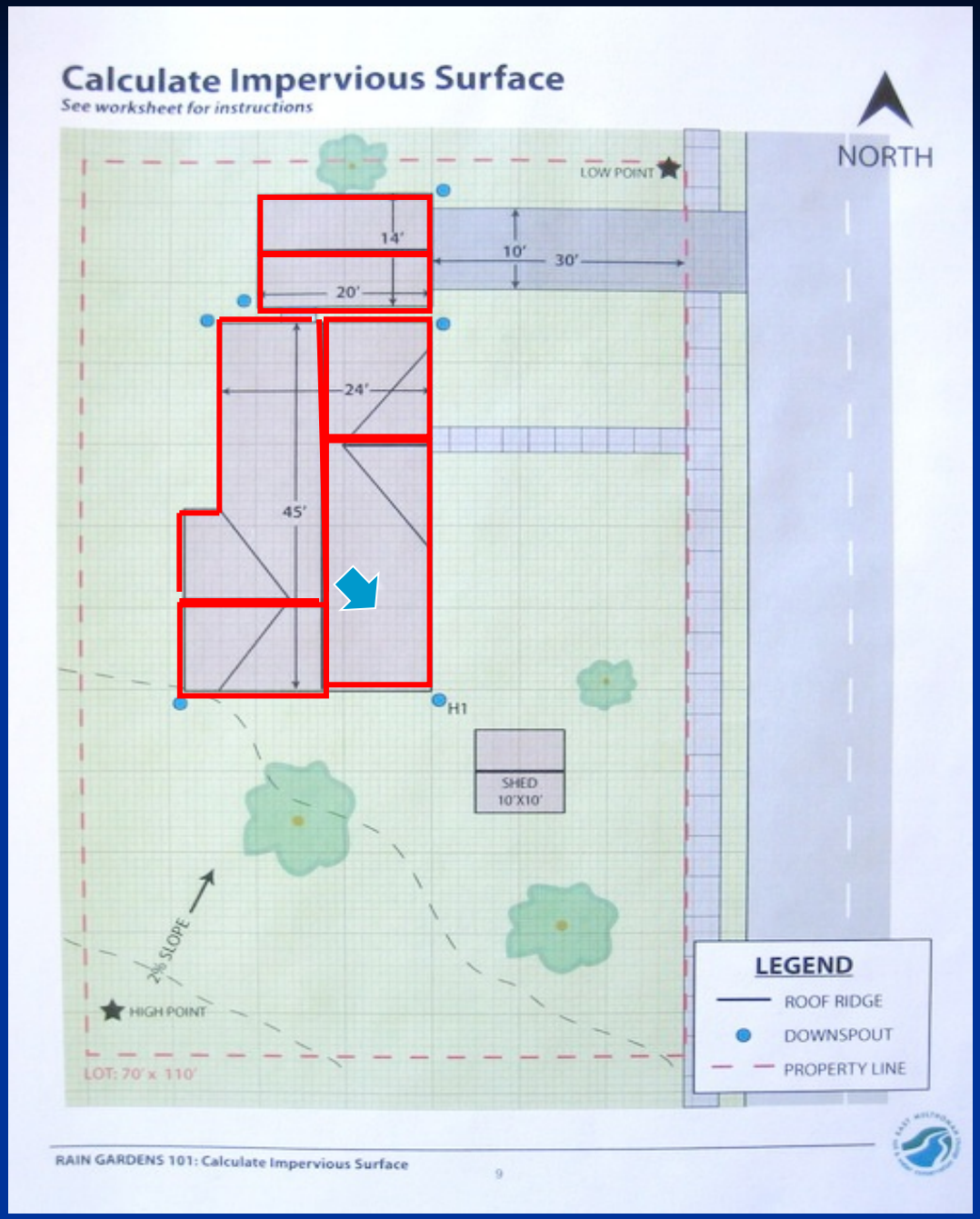


Highlighted area:

30 ft x 12 ft = 360 ft

Multiply by 10% rain garden sizing factor (0.10)

360 x 0.10 = 36 sq ft of rain garden area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LEGEND
ROOF RIDGE
DOWNSPOUT
PROPERTY LINE
RAIN GARDENS 101: Calculate Impervious Surface
9

1 square = 1 ft

The Down and Dirty: Construction, Plants & Maintenance

Rain Garden Construction

When to build it?

- Seasons to build & plant
  - Fall— best time of year
  - Spring—next best
  - Summer—more resource intensive
  - Winter-not recommended

Before you get started!

- Two business days prior call the Oregon Utility Notification Center:
  - 811
  - 1-800-332-2344
- Visit the OUNC website at www.digsafelyoregon.com

Delineate Area of Rain Garden

- Mark rain garden location with spray paint or a hose
- Remove the sod to make excavation easier

Excavation

- Small gardens best done by hand (with help)
- Excavated soils (use for the berm or for another project, or have it hauled away)

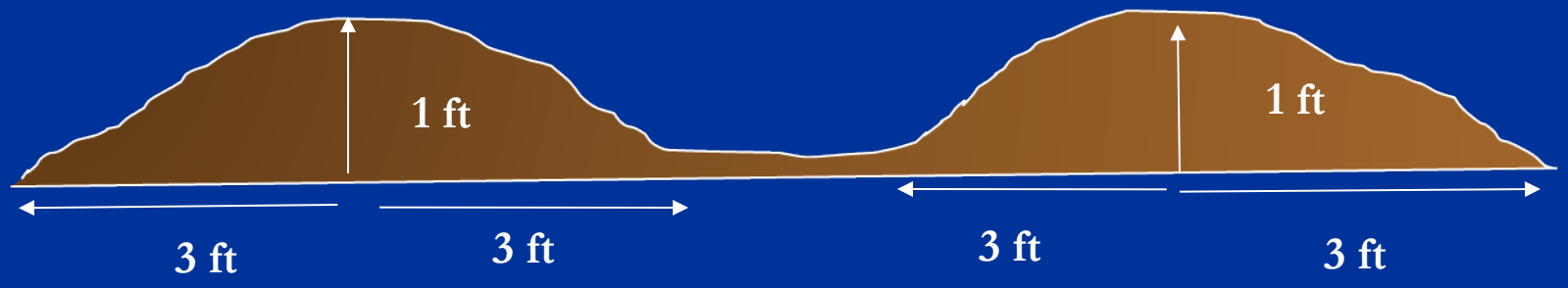
Excavation

- Small equipment in larger excavations is okay
- Prevent soil compaction—keep machinery out of hole

- Building the berm

Berms

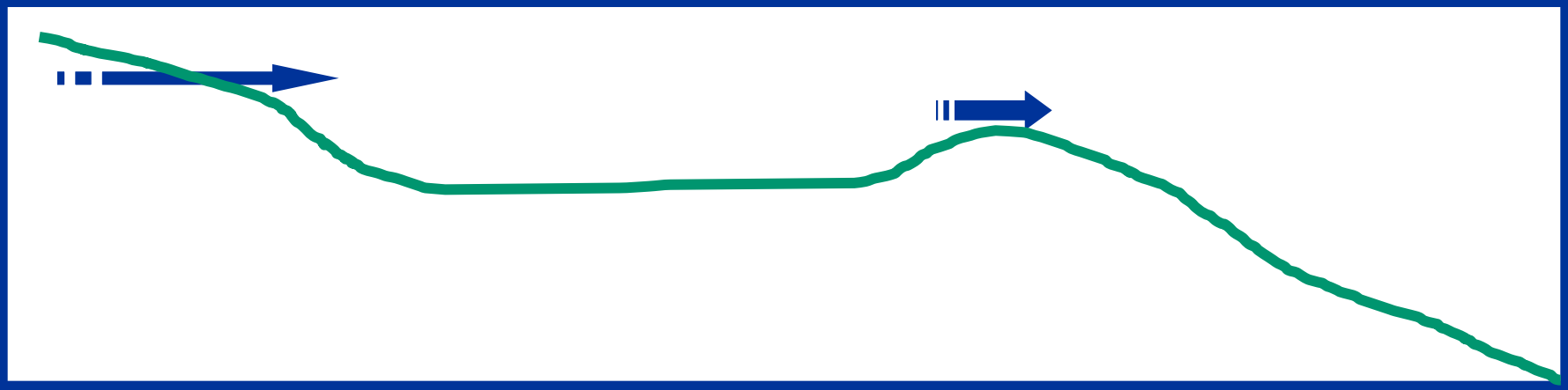
- Gentle slope on the berm (e.g. 3:1 ratio)
- Compact the berm
- Plant and mulch berm edges to prevent erosion



- Compacting the berm

Flat site (berm built on the "house" side of rain garden)

Sloped site (berm built on the "downslope" side of rain garden)

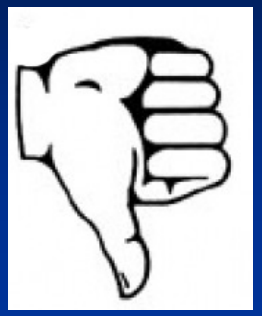


Inlet always higher than outlet (to protect house from flooding)

Grading

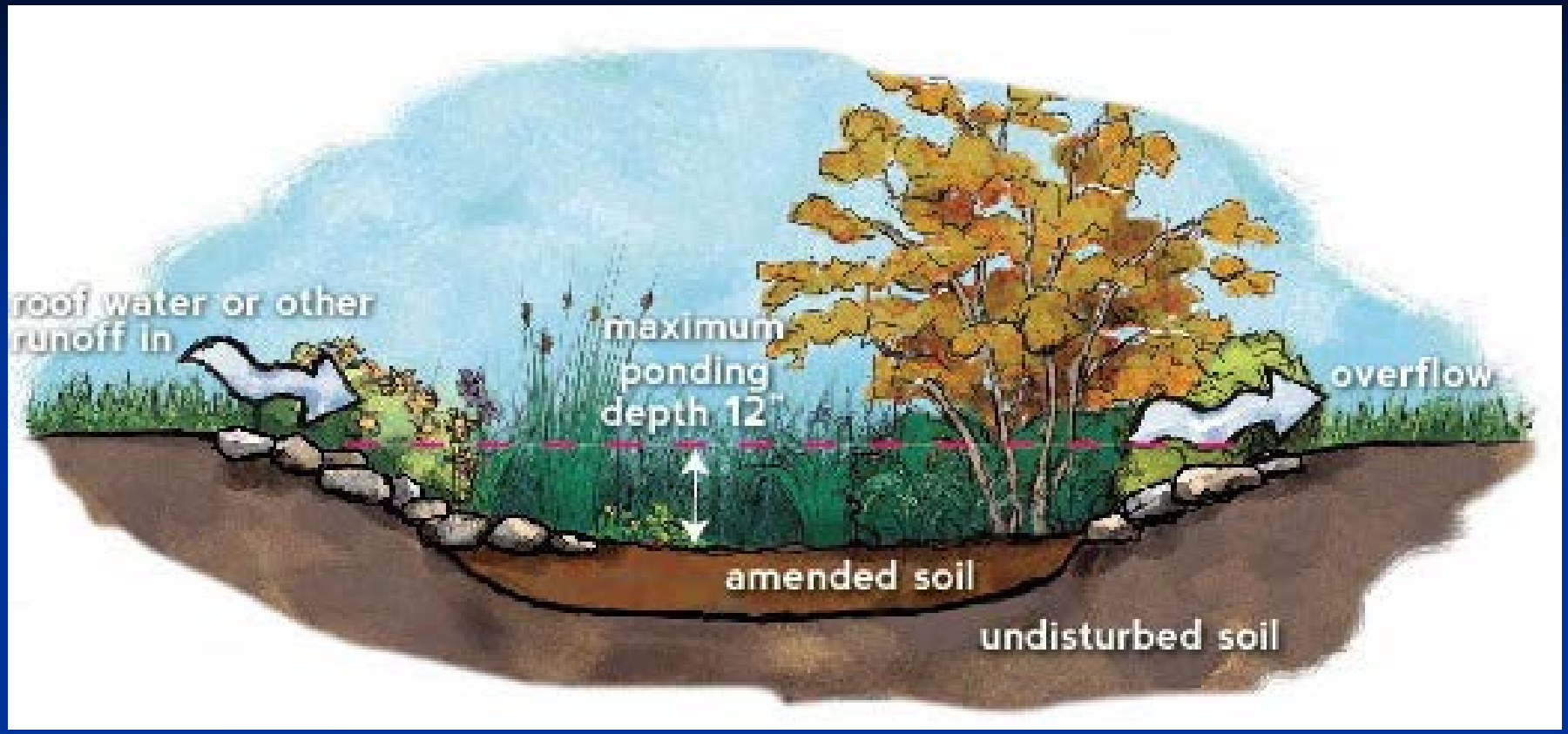
- Level the bottom of the rain garden

Bottom of rain garden is not level



Bottom of rain garden is level

- **Bottom of rain garden should be mostly flat to ensure water can really soak in**



- Should have 6-12” ponding depth below outlet (to ensure rain garden will absorb sufficient water).

- Add soil amendment (optional)
- Work it into the soil

To amend or not to amend?

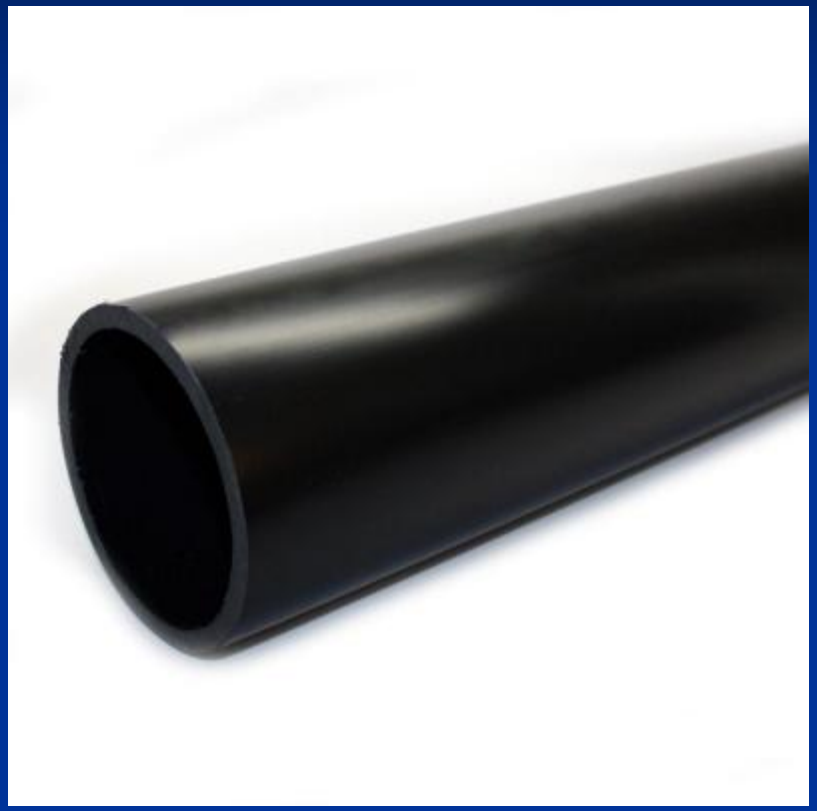
- Planting Mix (not potting soil)
- Compost (mixed with native soil)
- Sand (not recommended)
- We can't "amend" your way out of poorly draining soils!
- Amendments help support plants

Getting Water to the Rain Garden

Underground Pipe

Flexi pipe not recommended for piping!

Piping

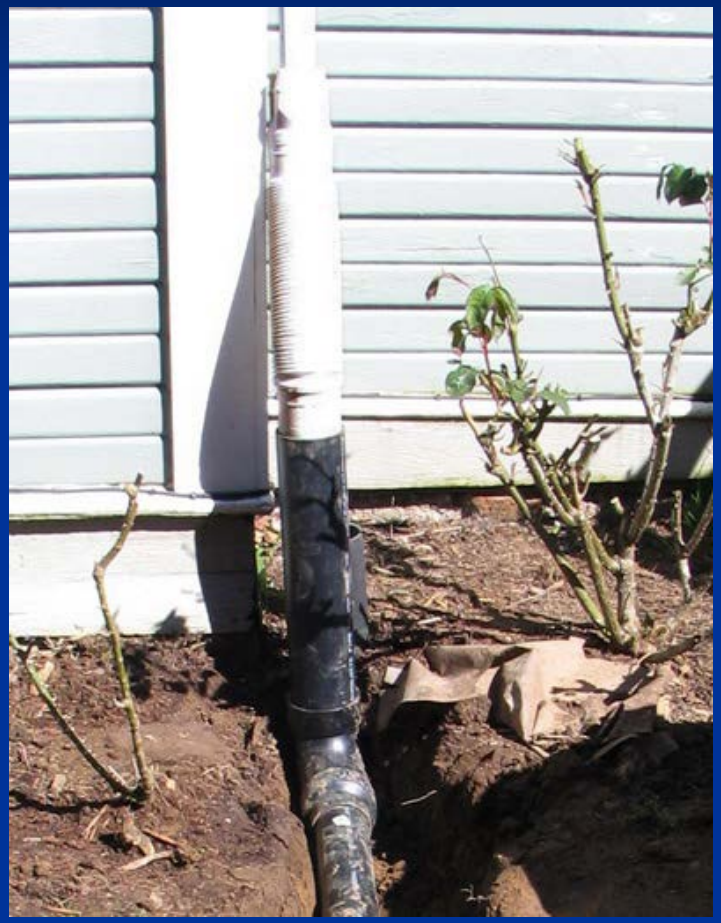


- Recommend 3” or 4” ABS pipe
- More durable over time

Connecting downspout to piping

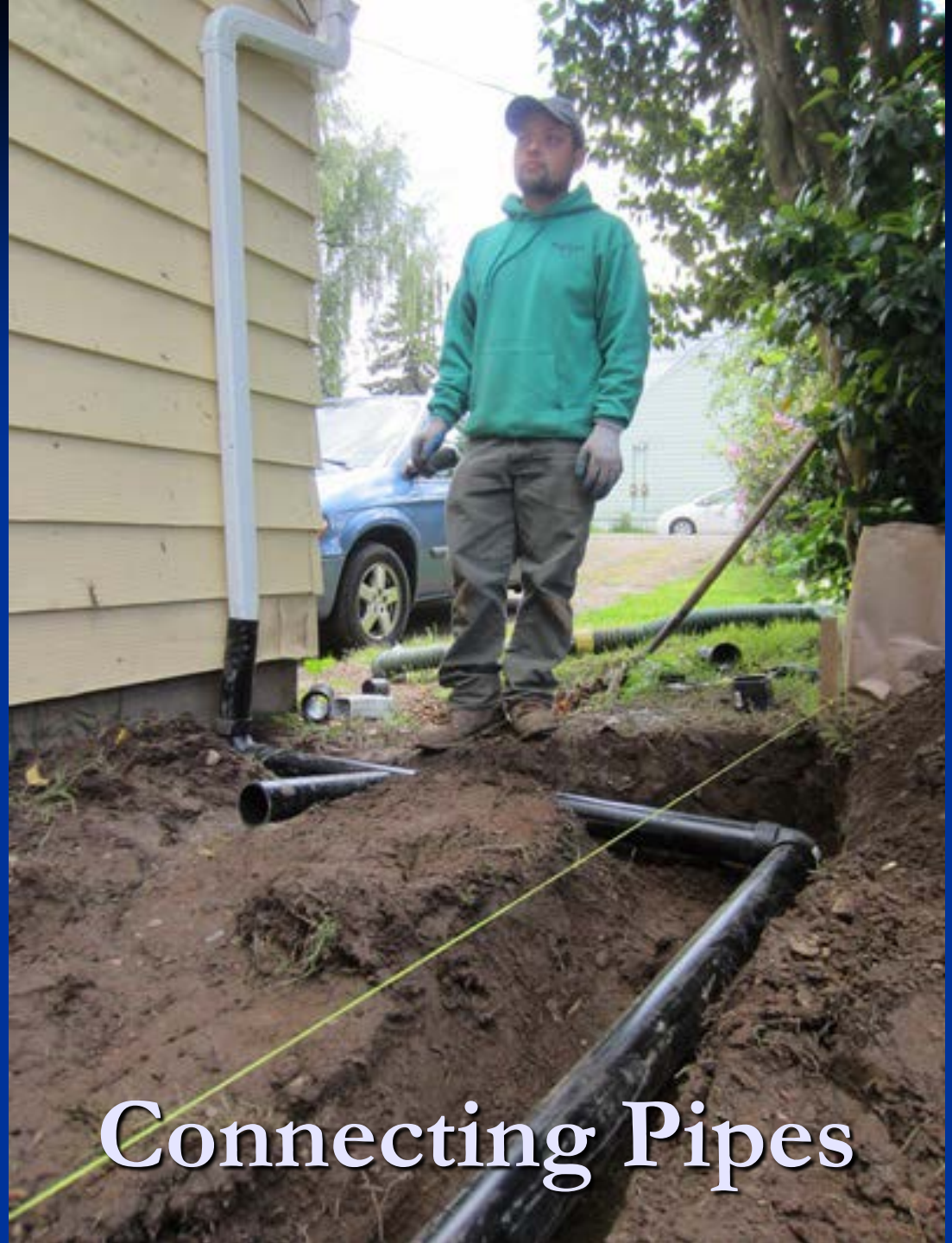
Connecting the downspout to the piping

Connections



- No flexi pipe connectors (May leak)

Connections



Connecting Pipes

Connecting the Pipes

- Use a level to ensure outflow is lower than inflow
- Pipe –min. of 1% slope (1 in. of ‘drop’ for every 10 ft)

- May use a tape measure for longer distances

- May use a tape measure for longer distances

One Percent Slope?

- Use the "marble test" to ensure a 1% slope

One Percent Slope?

Other End of Pipe

Marble

- Pipe is positioned correctly to direct flow to rain garden

Gluing the Pipes

Use glue designed for ABS pipe

A side note!

Moving water on flat areas

Farther = deeper rain garden

Dry Creek Bed

Another way to direct water to the rain garden

Underlayment

- Protects impermeable liner from punctures

Dry Creek Bed

Impermeable liner

Add rock

Dry Creek Bed

Will direct runoff to the rain garden

Leaf Guards

To keep vegetation and debris out of pipes

Clean Out

- Recommended for long pipe lengths
- If pipe gets clogged; easier to clean out


Clean out


Inflow
Outflow

- Position plants

Planting the plants

Much About Mulch

At least 2” of fine or shredded mulch


The Finished Rain Garden

The Finished Rain Garden

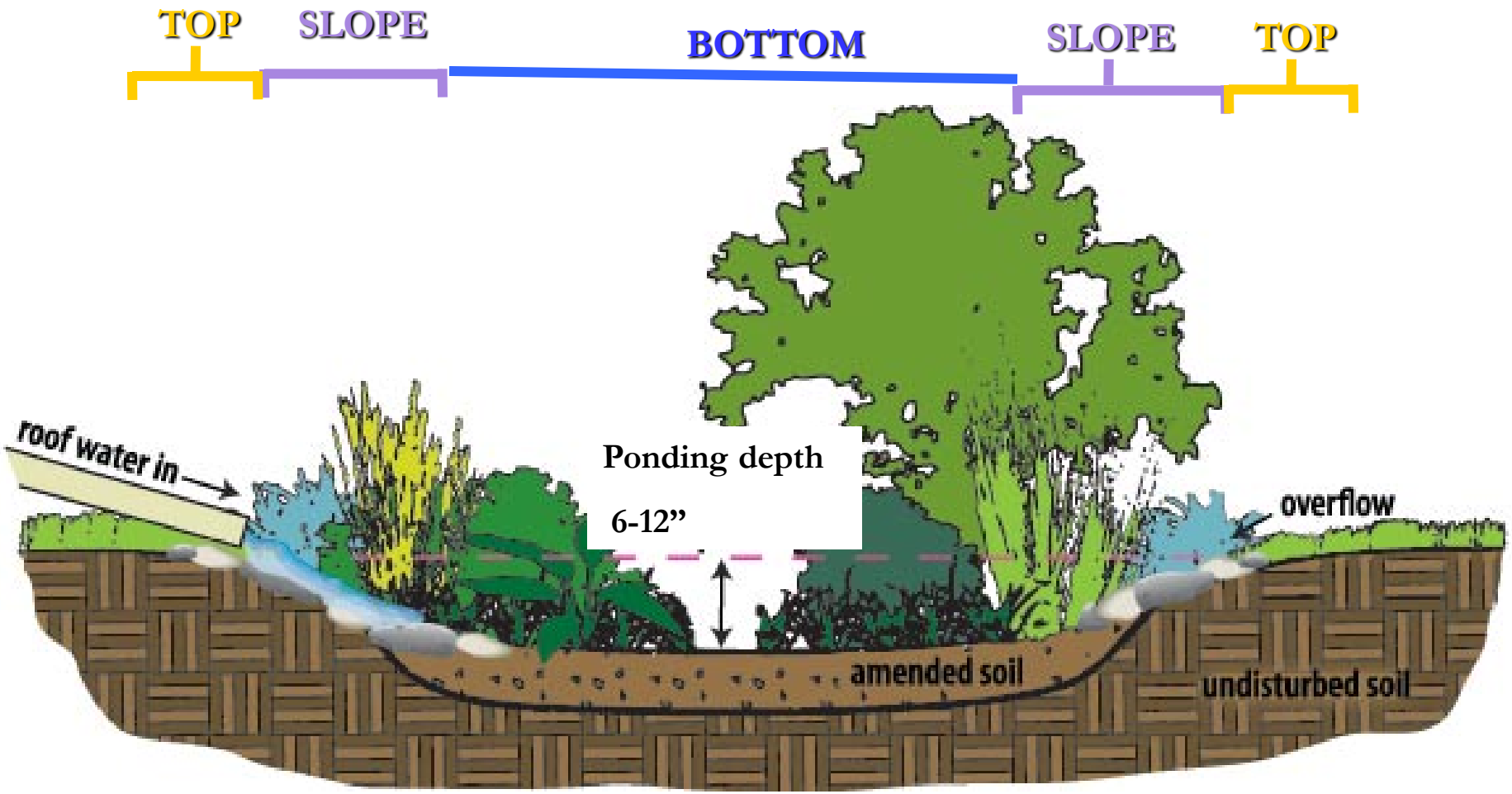

Three years later

Newly installed rain garden


Two years later

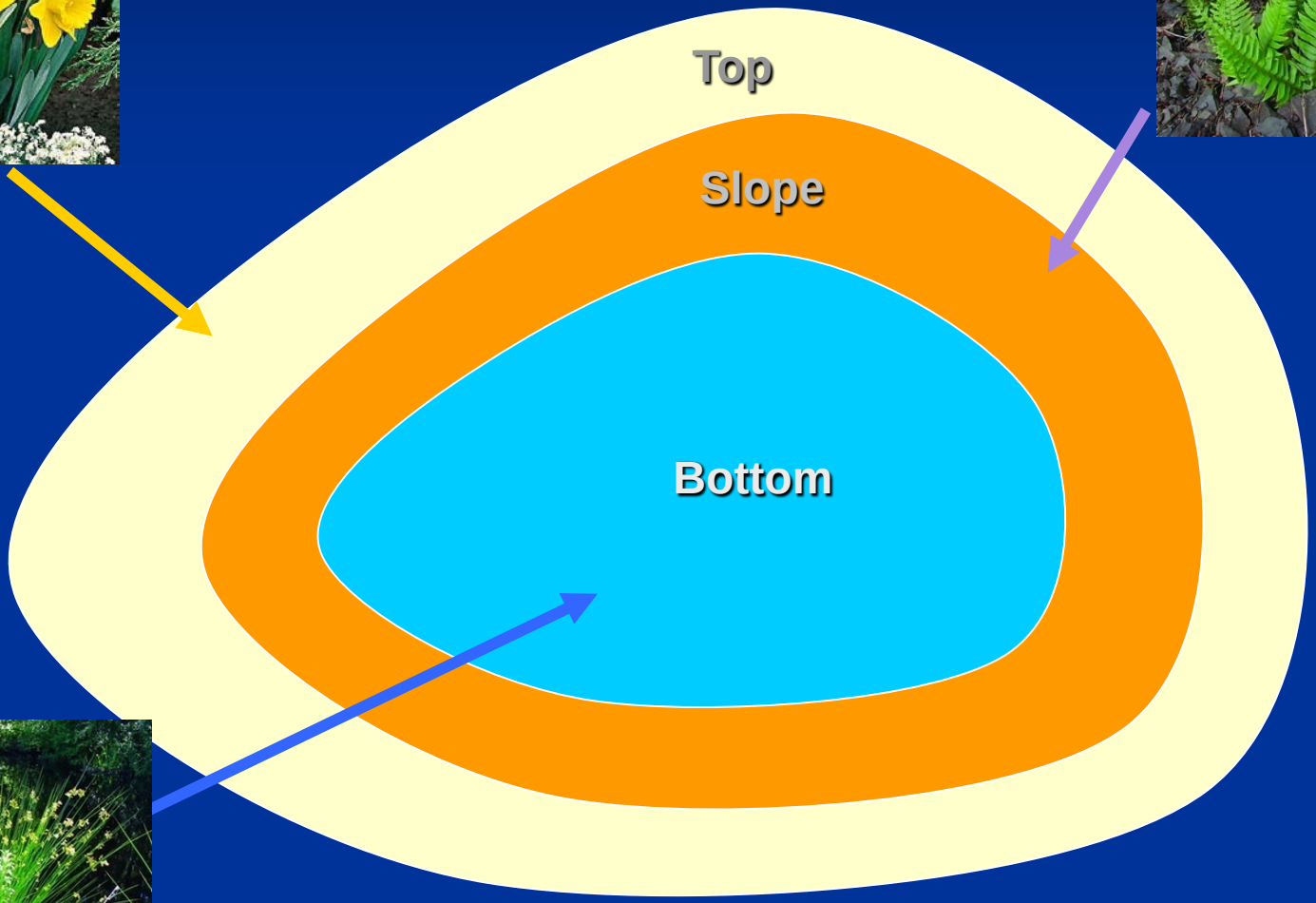
Rain Garden Planting Zones

- Does the plant tolerate wetter or drier soil—bottom, slope or top?
  - Bottom: plants have to "tolerate" wet feet regularly
  - Slope: plants can "tolerate" wet feet occasionally
  - Top: plants that don't see "wet feet"



Courtesy of East Multnomah Soil & Water Conservation District

Zones of a Rain Garden



Plant Functions in a Rain Garden

- Roots create channels for water to move into soil
- Plants absorb water through roots and then release it into the atmosphere
- Reduce soil erosion
- Help break down pollutants
- Provide habitat/food for insects, birds, and more

A Few Rain Garden Plants


Bottom
aquatechnobel
Dagger-leaved Rush (Juncus ensifolius)

Sunny

Bottom

Cammas

(*Cammassia quamash*)

Bottom/Slope/Top

Red Twig Dogwood (Cornus sericea)

Slope/Top

Sunny

Oregon Iris
(Iris tenax)

Western Columbine
(Aquilegia formosa)


Sunny
Slope/Top
Kinnickinnik (Arctostaphyllos uva-ursi)


Sunny
Slope/Top
Red-Flowering Currant (*Ribes sanguineum*)


Shade/Partial Shade
Slope/Top
Fringecup
(*Tellima grandiflora*)


Shade/Partial Shade
Slope/Top
Western Bleeding Heart (*Dicentra formosa*)


Shade/Partial Shade
Slope/Top
Photo:MSU.edu
Heuchera sp (*Heuchera micrantha*)

Shade/Partial Shade

Slope/Top

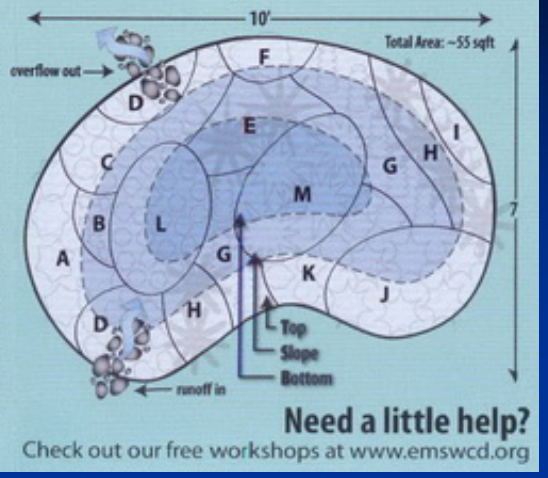
Design Ideas

Don’t forget rocks, wood, even sculpture

Shady rain garden design

Shady Garden

KEY	Common Name, *Scientific Name*	ZONES	Mature ht.
A.	Salal, *Gaultheria shallon*	TS	2-6'
B.	Fringecup, *Tellima grandiflora*	TS	32"
C.	Piggyback Plant, *Tolmiea menziesii*	S	24"
D.	Woodland Strawberry, *Fragaria vesca*	TSB	8-12"
E.	Deer Fern, *Blechnum spicant*	TSB	3'
F.	Creeping Oregon Grape, *Mahonia nervosa*	TS	2'
G.	False Solomon's Seal, *Smilacina racemosa*	TSB	3'
H.	Sword Fern, *Polystichum munitum*	TS	2-4'
I.	Evergreen Huckleberry, *Vaccinium ovatum*	TS	2-12'
J.	Western Bleeding Heart, *Dicentra formosa*	TS	15"
K.	Wood Sorrel, *Oxalis oregana*	TS	6"
L.	Pacific Rush, *Juncus effusus var pacificus*	B	10"
M.	Stream Violet, *Viola glabella*	B	6"

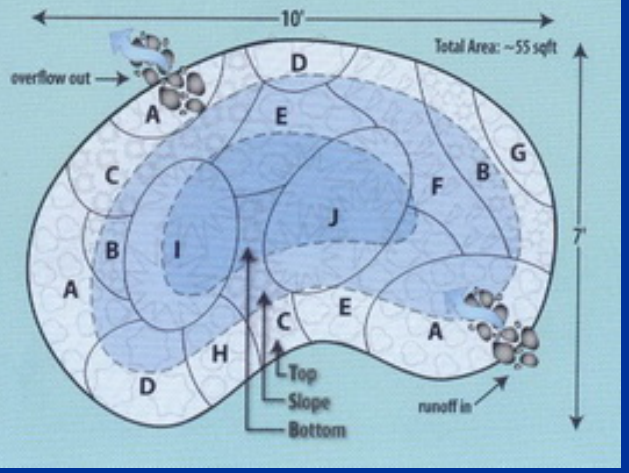


Need a little help?
Check out our free workshops at www.emswcd.org

Sunny rain garden design

Sunny Garden

KEY	Common Name, *Scientific Name*	ZONES	Mature ht.
A.	Creeping Oregon Grape, *Mahonia nervosa*	TSB	8-12"
B.	Western Columbine, *Aquilegia formosa*	TS	24"
C.	Tufted Hair-grass, *Deschampsia cespitosa*	TSB	36"
D.	Douglas Aster, *Aster subspicatus*	TS	8-40"
E.	Common Camas, *Camassia quamash*	TSB	24"
F.	Oregon Iris, *Iris tenax*	TS	12"
G.	Cardwell's Penstemon, *Penstemon carwellii*	TS	4-12"
H.	Northwest Cinquefoil, *Potentilla gracilis*	TSB	12"
I.	Red Osier Dogwood, *Cornus sericea*	TSB	6-18'
J.	Slough Sedge, *Carex obnupta*	B	4'



EMSWCD rain garden brochure

Edibles in a Rain Garden?

- There are edibles that could do well in a rain garden

- Water quality issues must be considered

-fecal coliform
-pH < 5.6 (acidic)
-lead, copper, cadmium, zinc (roof runoff)
-metals, petroleum products (driveway)

- Personal decision whether safe to eat plants from rain garden

Edibles in a Green Street?

- Metals, petroleum products, etc!

Rain Garden Maintenance

- Water in first year (during dry summer weather)
- No fertilizer or garden chemicals
- Maintain at least ½" of mulch, clear of trash, debris
- Prune, weed, and trim as needed

Invasive Species

A plant that thrives and spreads aggressively outside its natural range.

Invasive Species

- Rain gardens are designed to overflow
- So, possibility of spreading seeds/plant material!
- Unruly plants, tempting to use herbicides (h20 quality)

Butterfly Bush
(*Buddleia davidii/ B. variabilis*)
and cultivars

Butterfly bush illegal to purchase/sell in OR!
(except approved sterile cultivars-listed on ODA website).

Source: OR Dept. of Agriculture

Butterfly Bush

Yellow-flag Iris
(Iris pseudocorus)

Source: Portland's Nuisance Plant List

Vinca
(Vinca major and Vinca minor)

Source: Portland's Nuisance Plant List

Bishop's Weed, Goutweed
(*Aegopodium podagraria L.*)

Source: Portland's Nuisance Plant List


Chameleon Plant
Houttuynia cordata
Source: Portland's Nuisance Plant List

How much does it cost to build a rain garden?

Professionally Installed Rain Garden

(100 sq ft)

Design	500
Labor	475
Plants (30- 1 gallon; $8-12/ea)	300
Rock (.75 ton, delivered)	165
Mulch (2 cu yd delivered)	100
Piping (installed; includes pipes, leaf trap for downspout, etc.)	200
Irrigation	150
Total	$1890

Moderate Budget Rain Garden

100 sq ft

Disconnect downspout	10
Drain pipe and fittings (15 ft)	40
Rock (1/2 yd)	35
Plants (30- 1 gallon)	240
Sod cutter or rototiller (1 day rental)	110
Compost (2 yds, delivered)	100
Total	$535

Low Budget Rain Garden

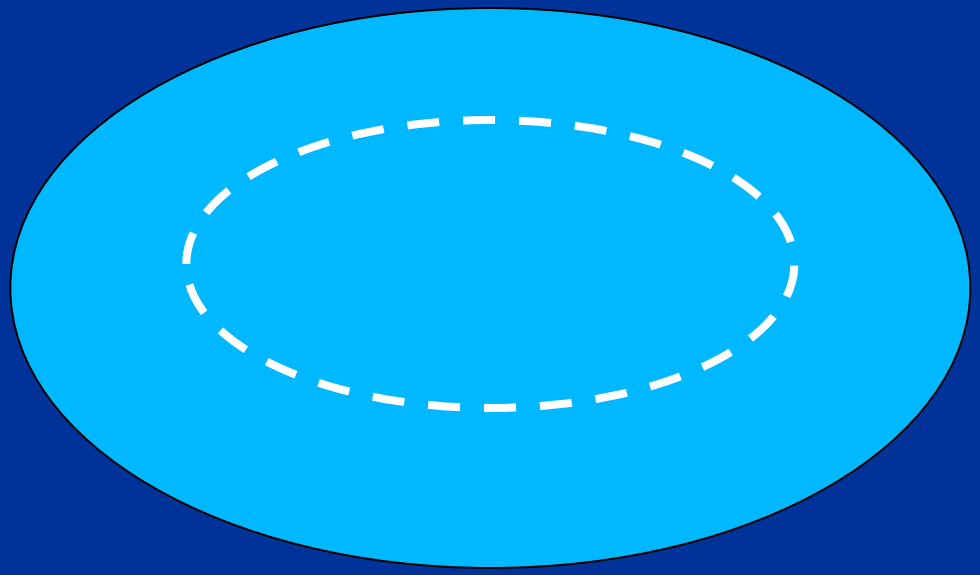
100 sq ft

Disconnect downspouts	10
Drain pipe and fittings (15 ft)	40
Plants (10- 4” pots)	40
Chipped mulch (tree service)	free
Total	$90

Challenging Sites! What to do?

Challenging Soils?

1. Make it bigger!
2. Be prepared for some standing water



Rain Garden Sizing
(Challenging Soils)

- Sizing based on results of infiltration test

- 2.00”/hr= 10 %
- 1.50”/hr= 12 %
- 1.00”/hr= 15 %
- 0.50”/hr= 21%

(info not in the handouts)

Pavement and other Obstacles


Moving water overhead!


Another creative overhead solution!
24th and SE Division, Portland

Where to build the rain garden?

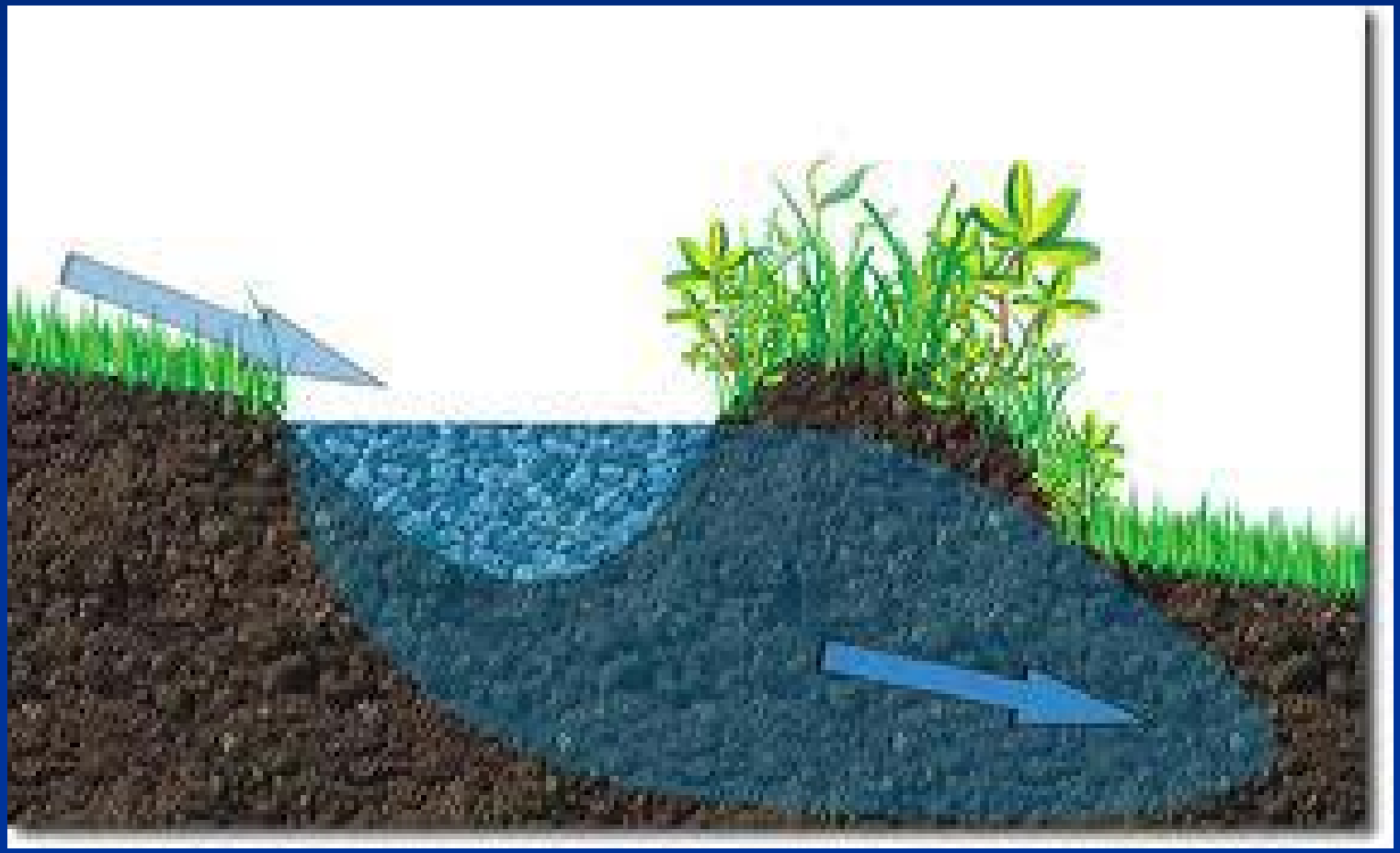
How to move water “across” the path?


Another option: Re hang the gutters!


Moving water across a walkway


Walkway right through a rain garden!

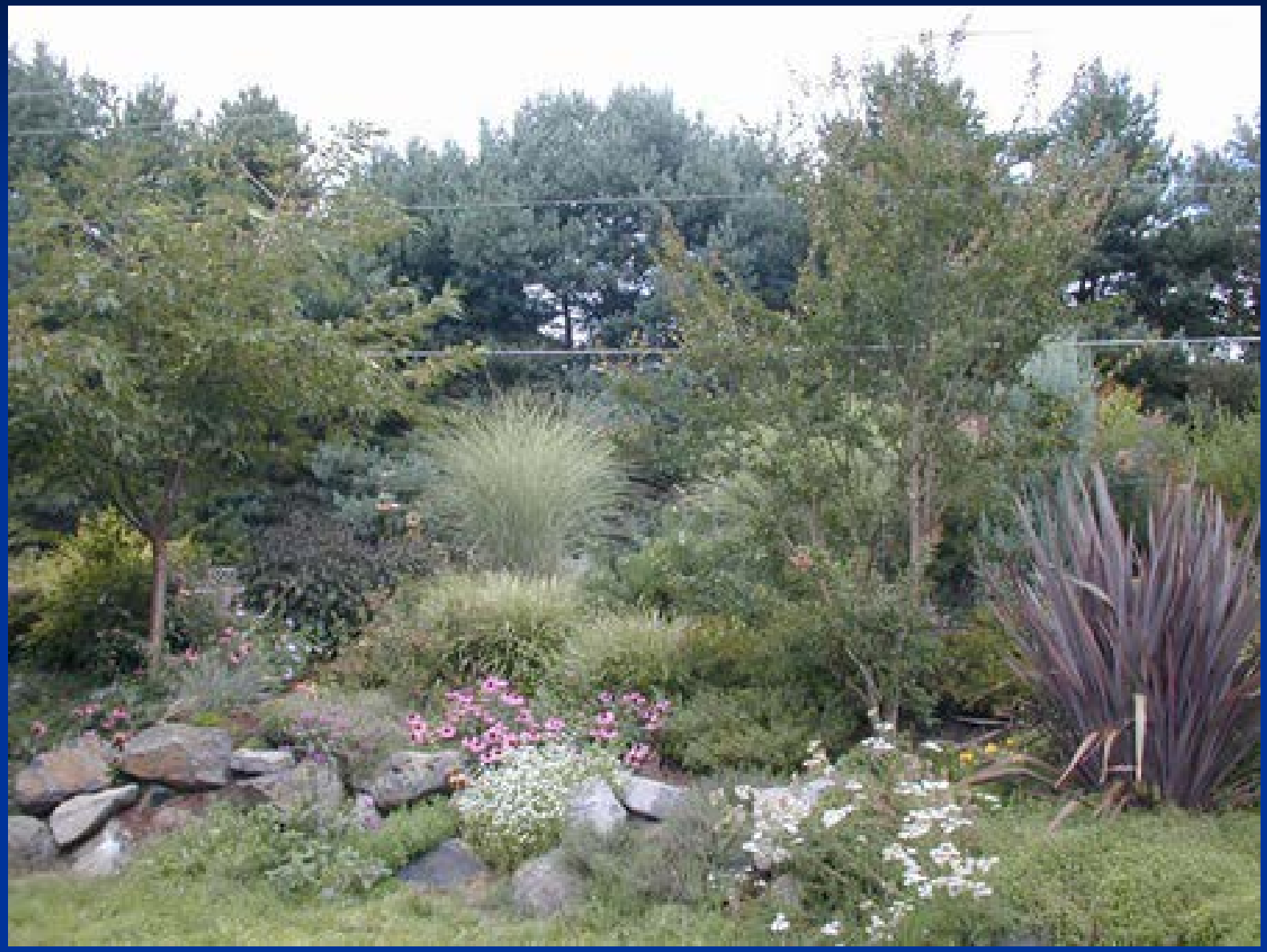
Managing runoff from a slope



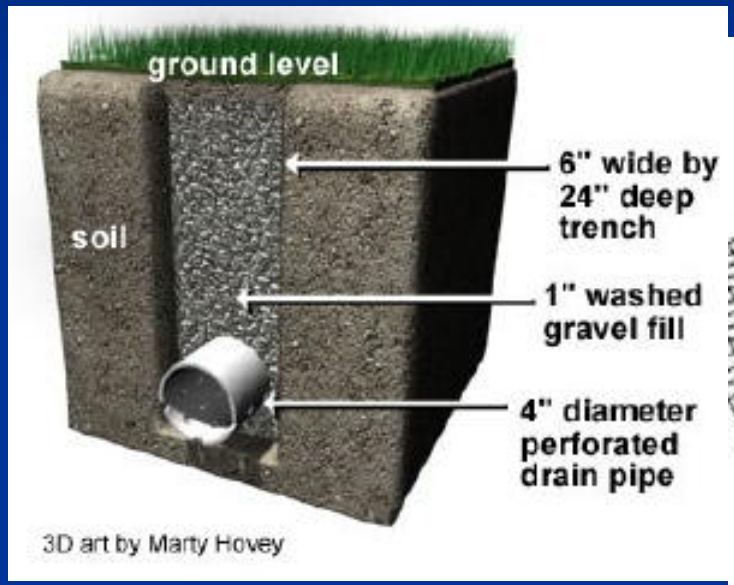
Not appropriate for steep slopes!

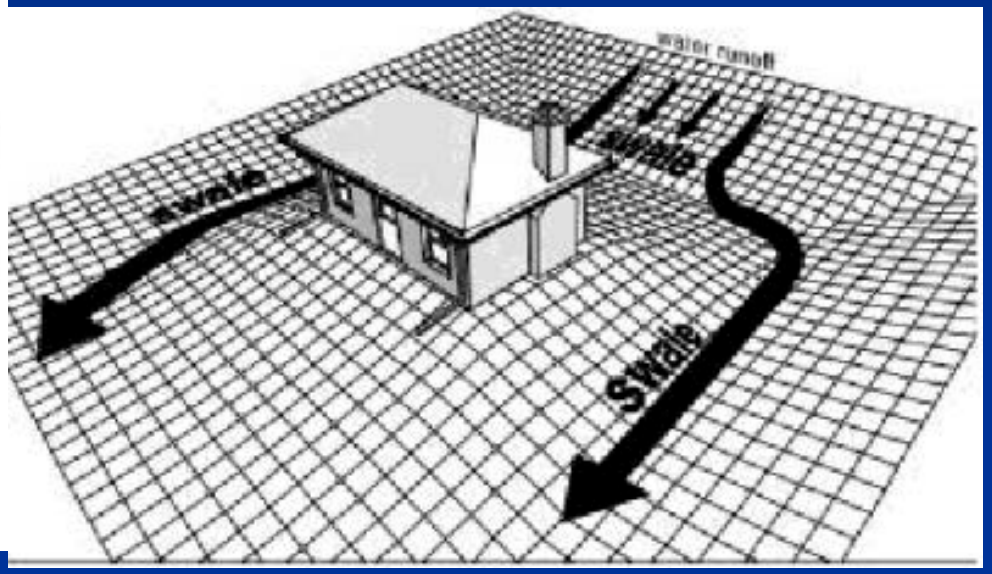

Managing runoff from a slope
Not appropriate for steep slopes!

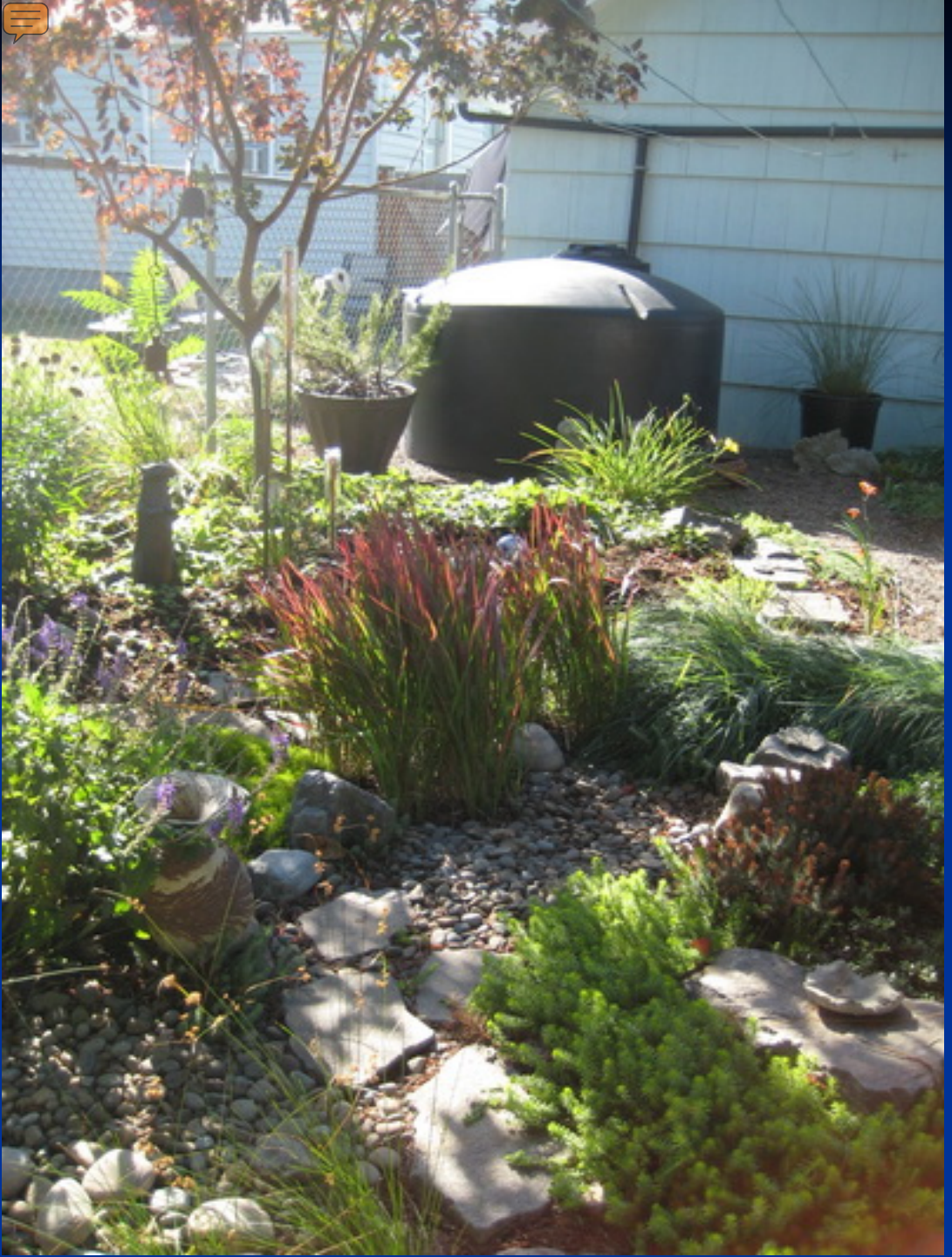
Dense planting to mange runoff from a slope



Draining water around the house







Rainwater Harvesting and Rain Gardens

Driveways

How to handle the runoff?

A trench drain!!


Rain Garden Needed?
Yes, No or Maybe?

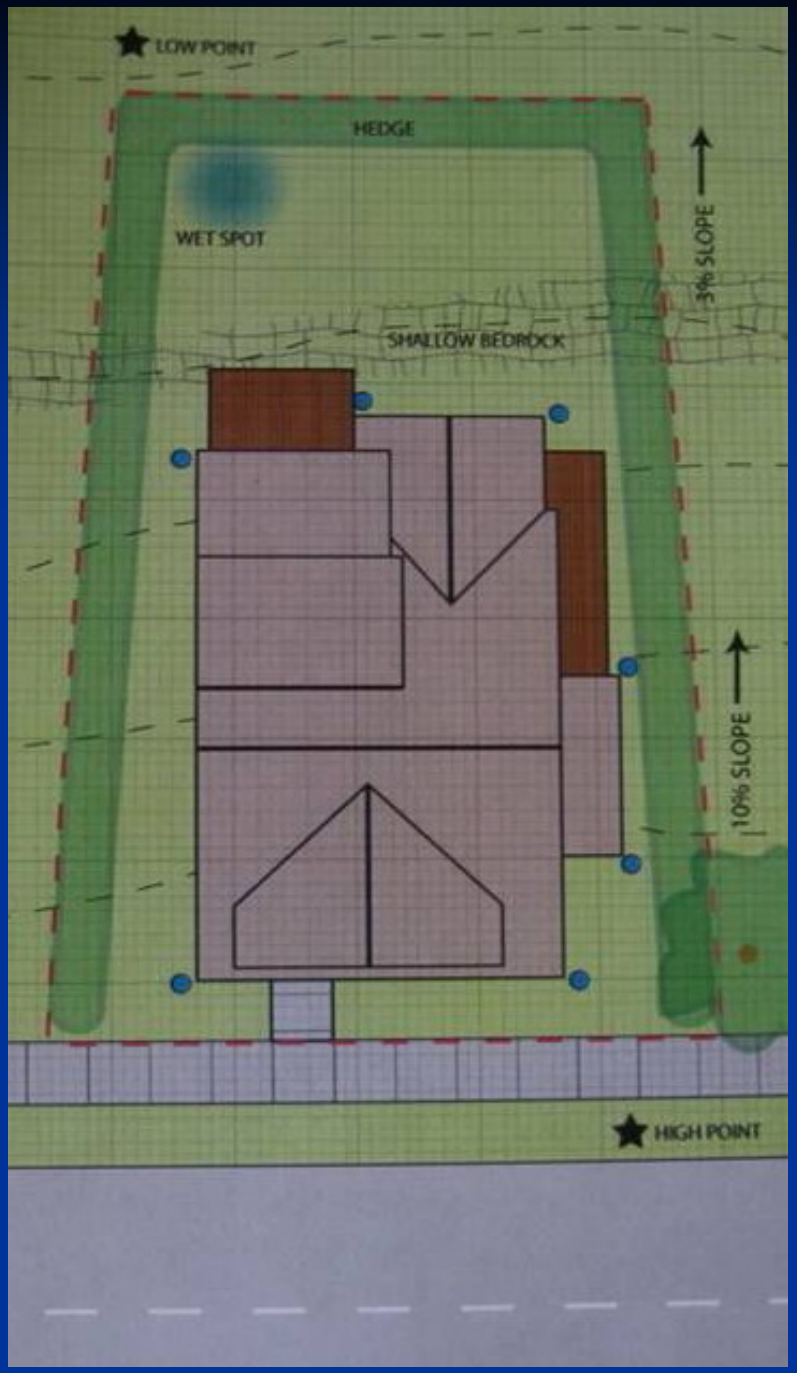

Rain Garden Needed?
Yes, No or Maybe?


Rain Garden Needed?
Yes, No or Maybe?

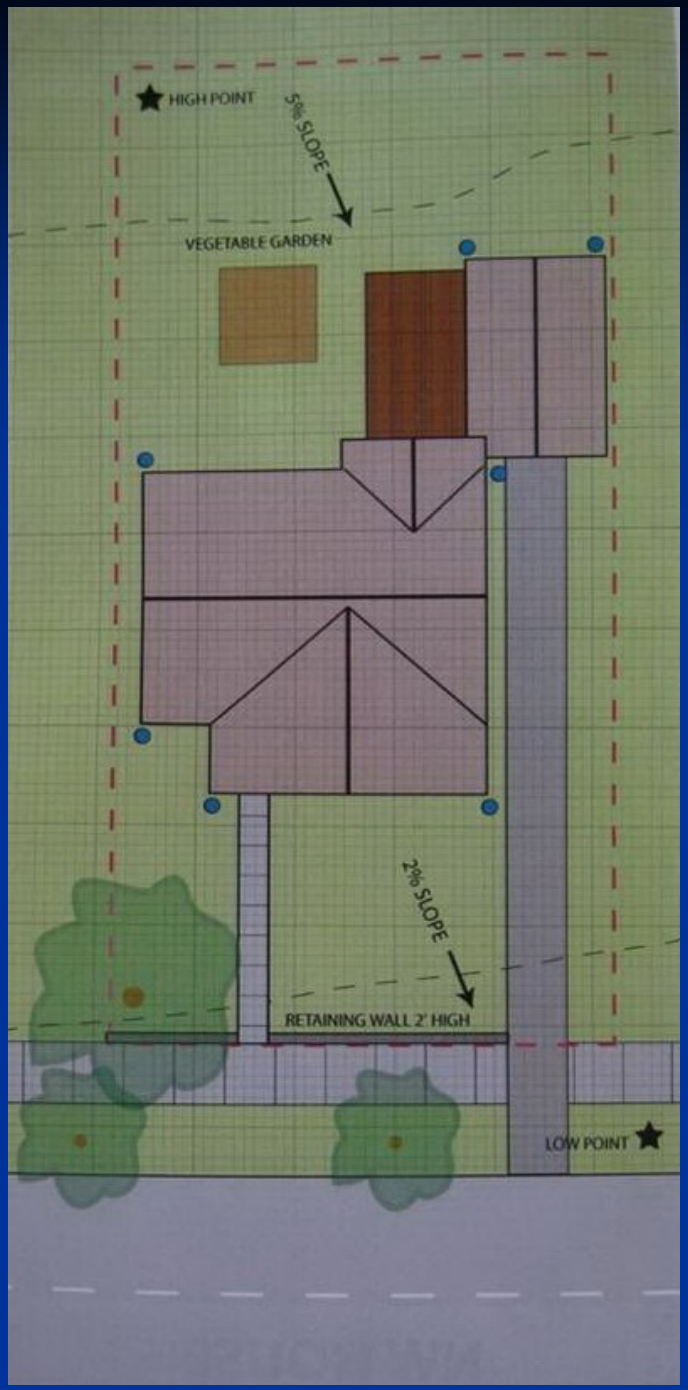
Exercise: Challenging Sites

Let's examine some together!

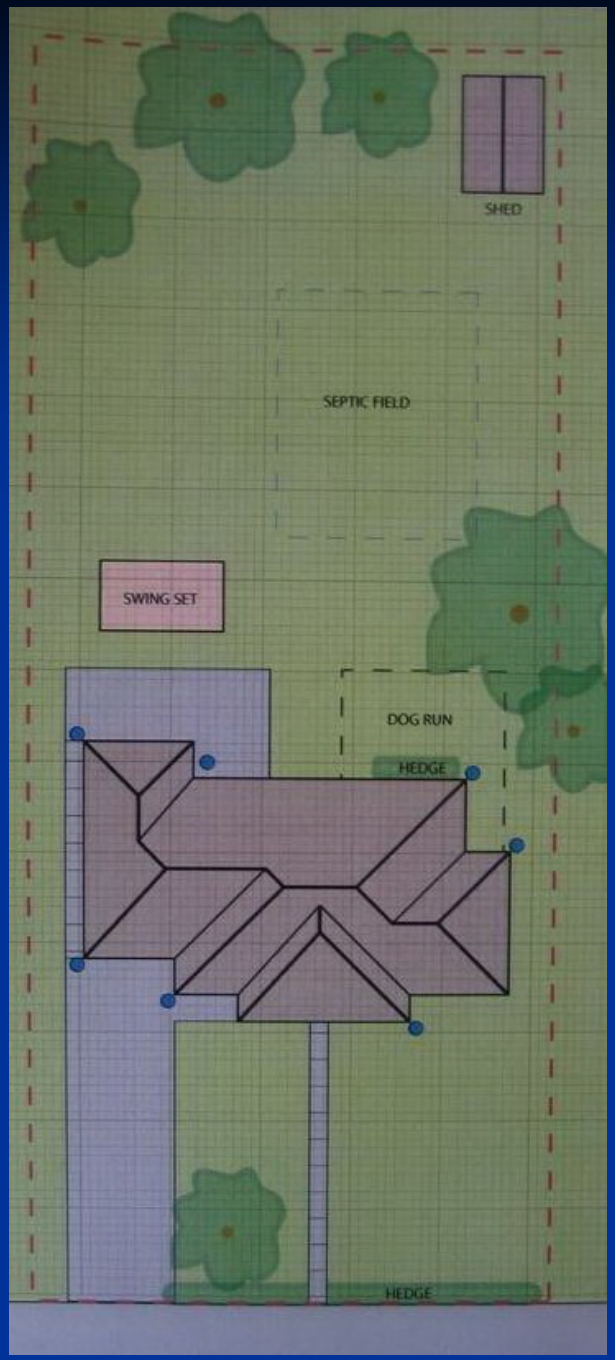
Site # 1 (p. 4)


LOW POINT
HEDGE
WET SPOT
3% SLOPE
SHALLOW BEDROCK
10% SLOPE
HIGH POINT

Site # 2 (p. 5)


HIGH POINT
5% SLOPE
VEGETABLE GARDEN
2% SLOPE
RETAINING WALL 2' HIGH
LOW POINT

Site # 3
(p. 6)



Can’t Build a Rain Garden?

Other great alternatives!

Portland-street trees and park trees

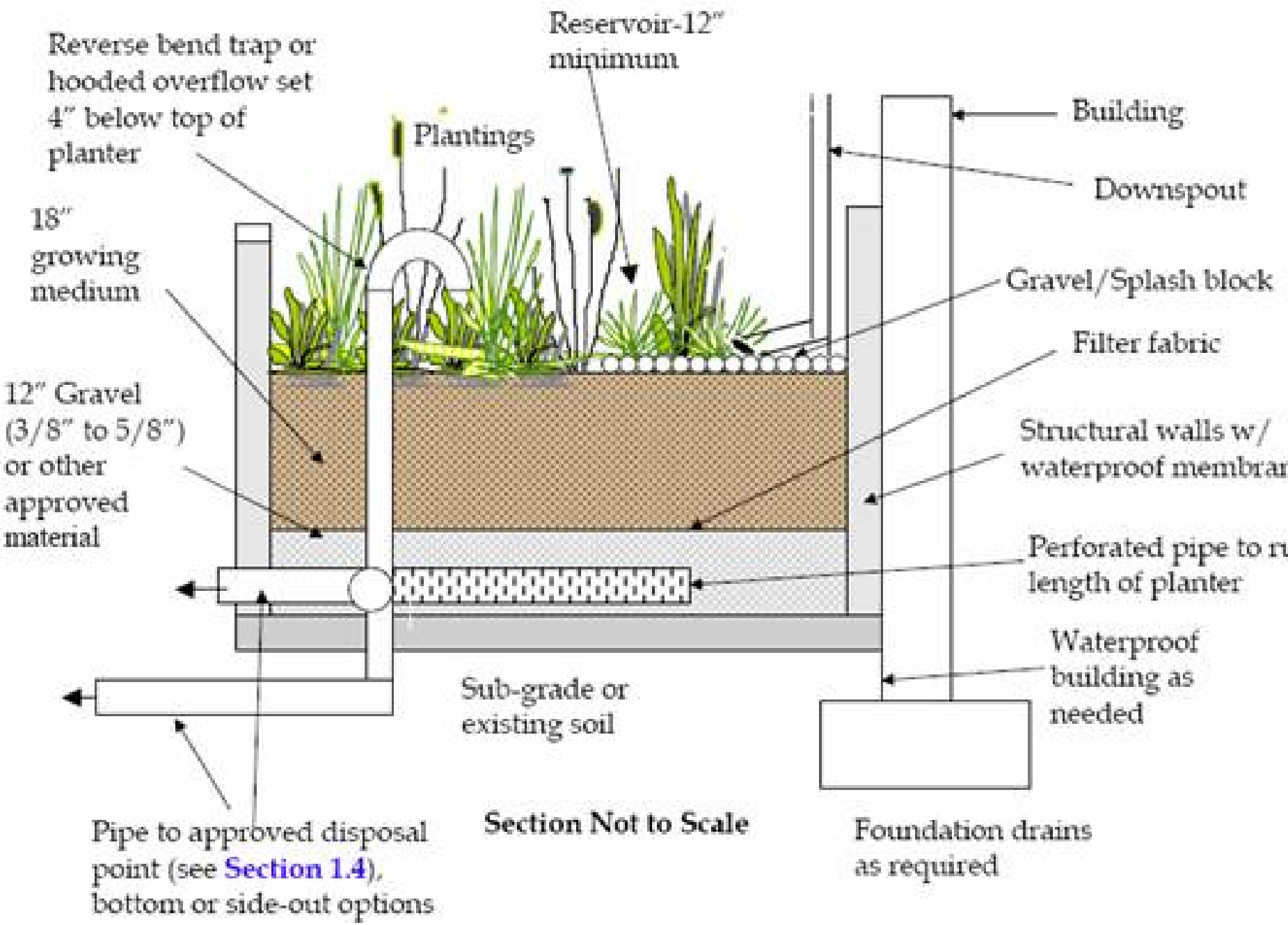
-reduce surface water runoff by 3 million gal. in a 1”rainstorm

-that equals 135 million gallons per year*

*Portland’s Urban Forest Canopy: Assessment and Public Tree Evaluation, Portland Parks and Recreation, (Oct 07)


"Hollywood"
Driveway
Pervious Pavement
(Pavers, Concrete, Asphalt)

Stormwater Planter


Reverse bend trap or hooded overflow set 4" below top of planter
Reservoir-12" minimum
Plantings
Building
Downspout
18" growing medium
Gravel/Splash block
Filter fabric
12" Gravel (3/8" to 5/8") or other approved material
Structural walls w/ waterproof membran
Perforated pipe to ru length of planter
Waterproof building as needed
Sub-grade or existing soil
Pipe to approved disposal point (see Section 1.4), bottom or side-out options
Section Not to Scale
Foundation drains as required

‘Bucket Brigade’ Downspout Planter, EMSWCD Office

Ecoroof/Green Roof

Green Street-to handle street runoff

Portland's Bureau of Environmental Services, Sustainable Stormwater Group

Rain Garden to manage Sidewalk Runoff

Incentives for Managing Stormwater

City of Portland

- Clean River Rewards program
  (up to 100% off onsite portion of stormwater water bill -applies to roof runoff only)

City of Gresham

Discount up to 27% off stormwater bill ($30/yr)

Other jurisdictions?

Call and ask

Register your rain garden!

(available in Multnomah county east of the Willamette River)

www.emswcd.org

Need a Rain Garden designer/contractor?

In Your Yard

Conservation Directory

In Your Yard | EMSWCD - Mozilla Firefox

File Edit View History Bookmarks Tools Help

Pandora Radio - Listen to Free Interne... | Doodle: Herbicide Roundtable 2014 | Inbox (2) - info@4countycwma.org - ... | In Your Yard | EMSWCD

emswcd.org/in-your-yard/

EAST MULTNOMAH soil & water conservation district

ABOUT EMSWCD | IN YOUR YARD | ON YOUR LAND | GRANTS AND COST SHARE | LAND CONSERVATION | FARM INCUBATOR | NATIVE PLANTS | WORKSHOPS AND EVENTS

EMSWCD » In Your Yard

Naturescaping
Low-maintenance, low-impact landscapes

Rain Gardens
an attractive way to utilize stormwater and help local waterways

Water Conservation
save money while protecting our drinking water

Check out our **Conservation Directory**

Get some help through Cost Share!

In Your Yard

We help you discover simple, cost-effective ways to create low-maintenance, sustainable landscapes that will conserve water, reduce stormwater runoff, and cut down on toxic substances in your yard!

We offer many ways for you to explore the benefits and how-to's of sustainable landscaping practices.

You can take a **free workshop**, attend our annual **Naturescaped Yard Tour**, or buy inexpensive native plants at our **Annual Plant sale**. You can even **bring workshops and presentations** to your community!

In this Section you can learn more about each of these exciting topics:

Naturescaping: Naturescaping is the practice of using native plants and simple techniques that mimic nature so you can have a garden that helps you reduce your water use, your use of harmful chemicals and your maintenance.

Rain Gardens: A rain garden is a sunken garden bed that captures storm water runoff from hard surfaces like rooftops, sidewalks and driveways, and allows it to soak back into the ground naturally.

11:26 AM
11/4/2013

Evaluations!!

Questions?

East Multnomah Soil and Water Conservation District
(503) 935-5366