

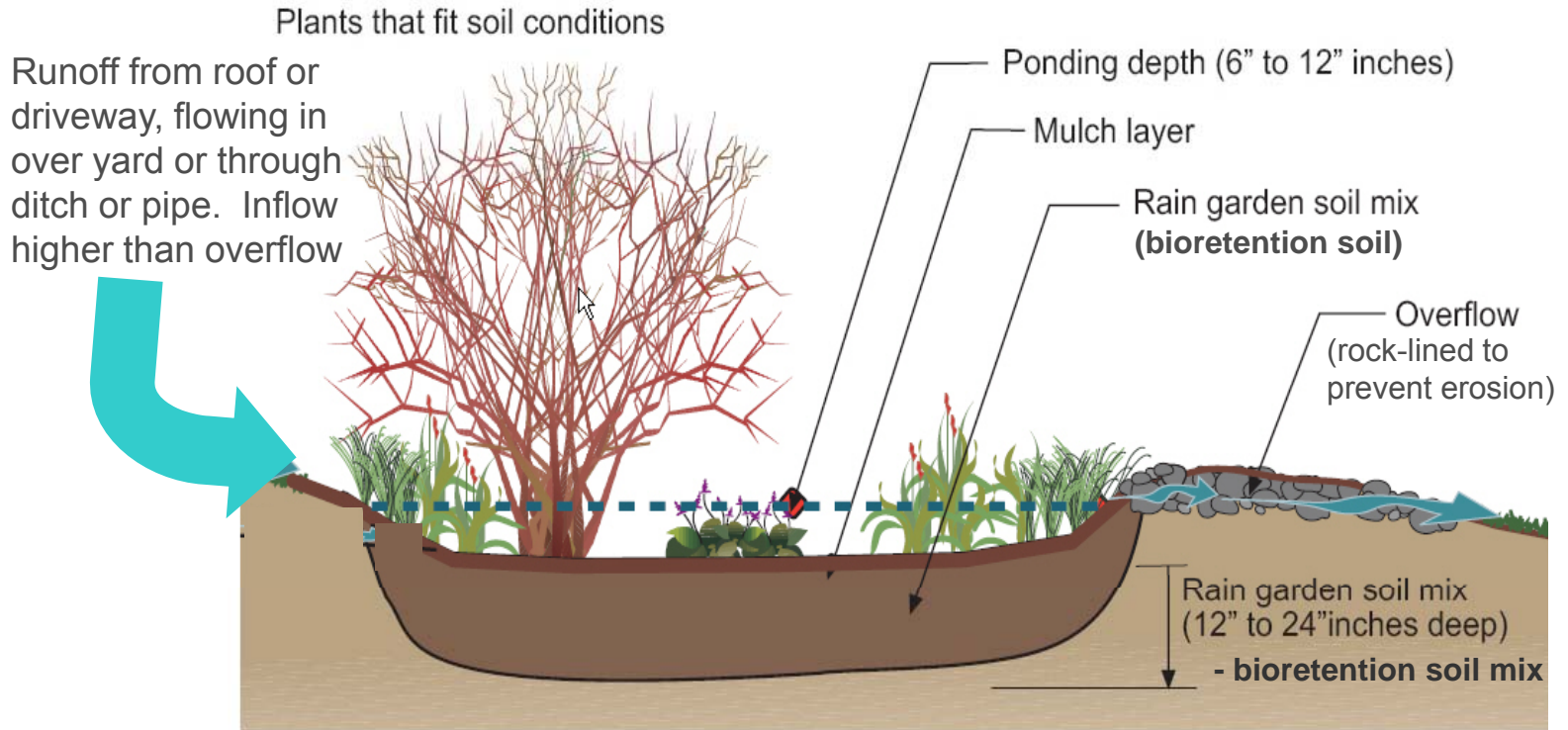


Before you build: Locating and Planning a Rain Garden



David McDonald, Seattle Public Utilities

Installing Rain Gardens & Cisterns *Trainings for contractors 11/3/2011* www.seattle.gov/util/rainwise





Refer to Rain Garden Handbook & Seattle Flow Control Manual

- *Rain Garden Handbook for Western Washington Homeowners* has complete “how to” except sizing chart not appropriate for Seattle.
- Seattle RainWise sizing: see next slide
- Code-required bioretention project sizing: refer to *Seattle Stormwater Code*:

*Volume 3 – Flow Control and Water Quality
Treatment Technical Requirements Manual,
Chapter 4 – Flow Control Design*

*Table 4.5 “Flow Control Sizing Factors for Pre-Sized
Approach”*

*Look under “Bioretention Cell” for rain gardens with
2-inch, 6-inch, or 12-inch ponding depths on soils
with infiltration rates of ¼, ½, or 1 inch per hour.*

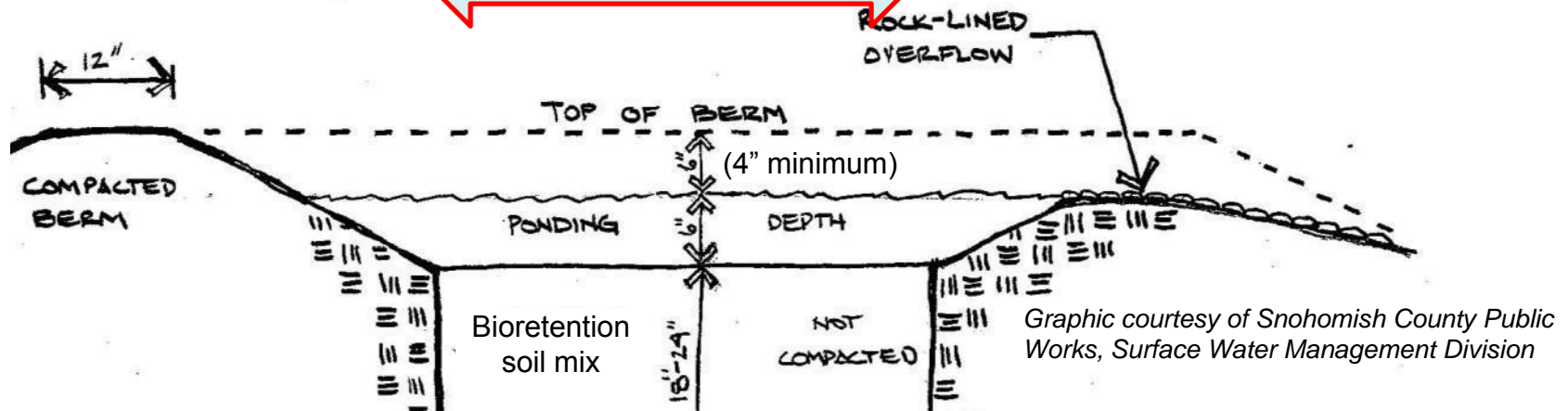
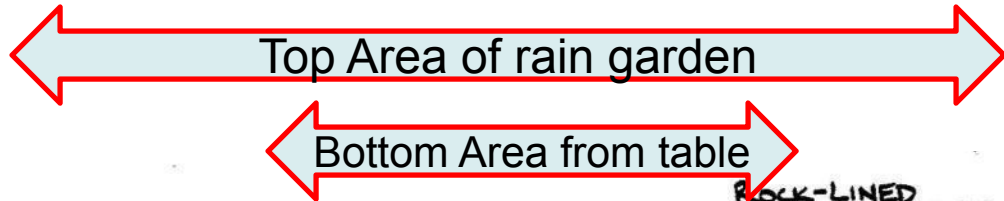
- Both linked from www.seattle.gov/util/rainwise





Sizing Factor from tables gives the bottom area of rain garden

– add side-slope width to get top area



Example: Site with 0.25"/hr infiltration rate.

Sizing Factor from table (for 6" ponding depth) is 7.4% (.074)

500 SF roof area X .074 = **37 sf bottom rain garden area** (or about 6'x6')

To convert to top rain garden area, add slope grading for 10" minimum depth (the 6-inch ponding depth plus 4" inch minimum freeboard). At 2.5H:1V side slope, add 10"x2.5 = 25" (~2 feet) around RG bottom area, = **100 sf top rain garden area**



Infiltration (“perc”) on-site test

- 1) Dig hole 24 inches deep, add stake with ruler
- 2) Fill with hose to depth of 12”, let drain completely
- 3) Repeat fill-&-drain (may take overnight)
- 4) On third fill to 12-inch depth:
 - Measure water height every hour
 - Continue until rate of fall stabilizes (same amount of fall for 2-3 hours)
 - Use that as the infiltration rate (inches/hour)

Results:

- < 0.25 in/hr: don’t install rain garden
- ≥ 0.25 in/hr: use 0.25 (or 0.5, 1.0) RG size in table
- > 1.0 in/hr: use 1.0 in/hr RG size in table (can’t make RG size smaller)








If you hit hardpan within 24” don’t build there!





Rain Garden Location

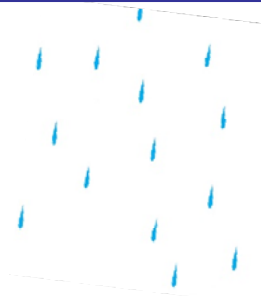
– Don't locate 

-  Over underground utilities – call 1-800-424-5555 for free utility location service or www.callbeforeyoudig.com
-  Over major tree roots
-  In soggy areas (water table at surface in winter)
-  Within 300 feet of steep slopes or landslide-prone areas (500 ft. setback for code-required bioretention projects)
 - Enter your site on RainWise Tools website to see critical areas, or see DPD map showing steep slope & landslide areas at <http://web1.seattle.gov/dpd/dpdgisv2/mapviewer.aspx>
 - Consult a geotechnical engineer if in doubt
-  Within setback limits from buildings:
 - 5 ft. minimum from all buildings
 - 10 ft. min. from buildings with basements. Add 2 ft. more setback for each foot that basement extends below 5 feet.

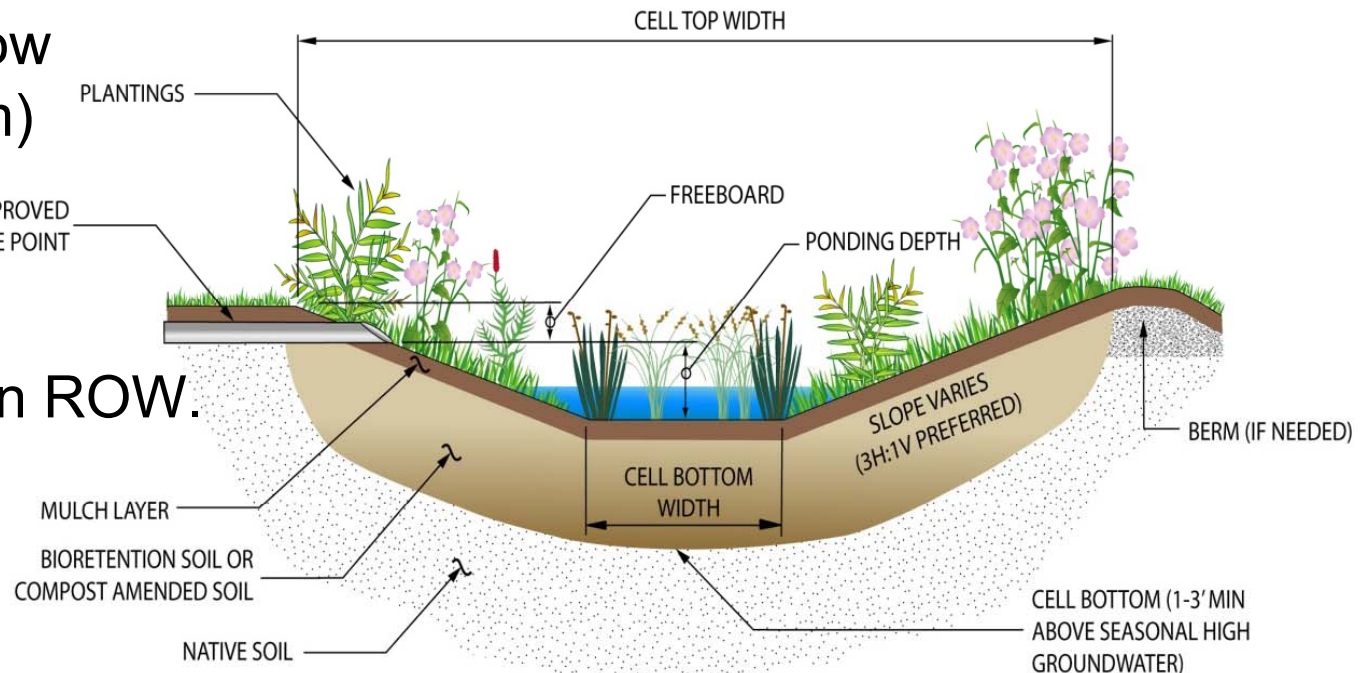


Rain Garden Location

– Do locate



- ✓ On a fairly level site – up to 5% slope (1ft. drop in 20 feet)
- ✓ On site big enough for required bottom area (from sizing table) plus width of side slopes (depending on depth & freeboard)
- ✓ Where roof (or driveway) runoff will flow downhill to the rain garden through a pipe, swale (shallow ditch) or overland
- ✓ Where overflow (in a big storm) will flow downhill to street drains in ROW.
- ✓ Where it will look good.

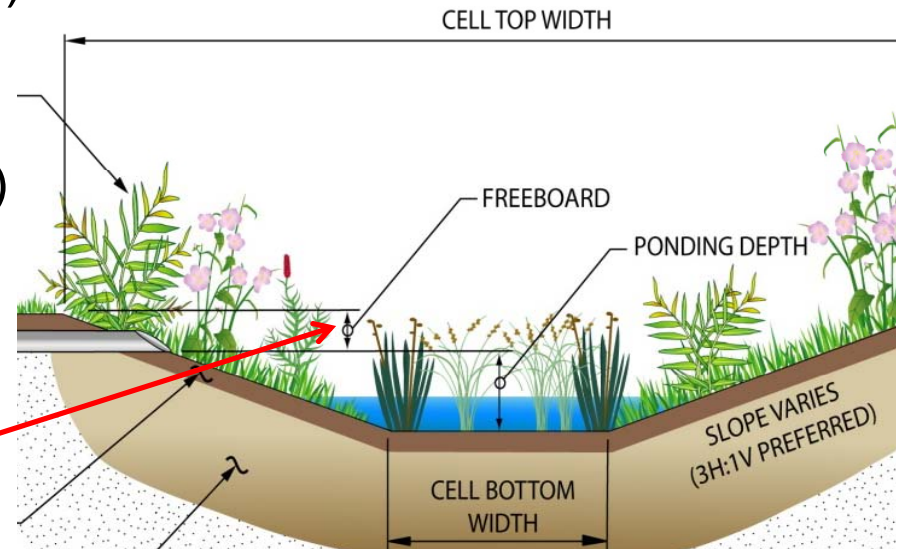




Sizing to allow for side slope width (depending on ponding depth and freeboard)

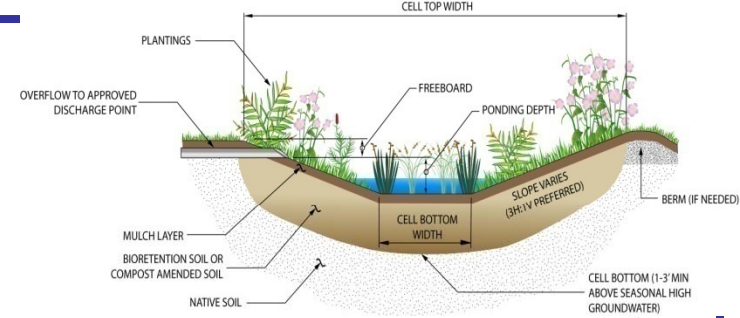
- Side slopes must be max. slope of 2.5H:1V (2½ inches horizontal run per 1 inch vertical rise), and
- Require minimum 4 inches of vertical freeboard from overflow height (which determines ponding depth) to top of slope,
- So to compute top size for:
 - 6-inch ponding depth + 4 inches of freeboard = 10 in. vertical rise, so add 10" x 2.5 = 25 inches (~2 ft.) to bottom width all around
 - 12-inch ponding depth + 4 in. freeboard = 16 in. rise, so add 3½ ft. (16" x 2.5 = 40 inches) to bottom width all around

Ponding depth is determined by height of overflow. Must have 4 inches minimum freeboard above overflow height to top of berm

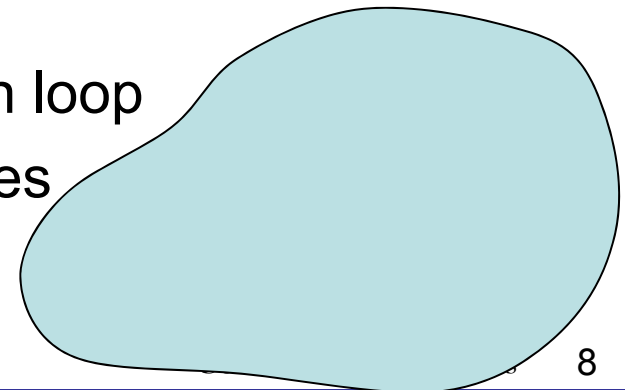
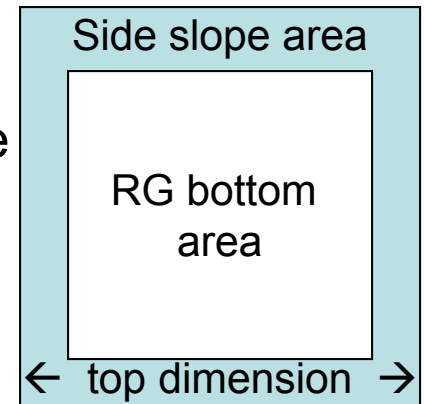




Simple layout method, to see where RG will fit in existing landscape



- Start with required bottom size (square feet) from sizing table
- Make that size into a square (take square root of bottom size)
 - Example: 100 sf bottom area as a square is 10 ft x10 ft
- Add side slopes to get top dimensions as square
 - 6 in. ponding depth + 4 in. freeboard at 2.5:1 slope = 25 in. (~2 ft.) side slope width all around, so
 - 10'x10' bottom needs 14 ft x 14 ft top width
- Calculate perimeter of square (side length x 4)
 - 14 ft side length x 4 = 56 ft. perimeter
- Mark a rope or hose to that length, tie it in loop
- Use that loop to try RG layouts and shapes in different locations in yard
(works for oval or bean shapes).

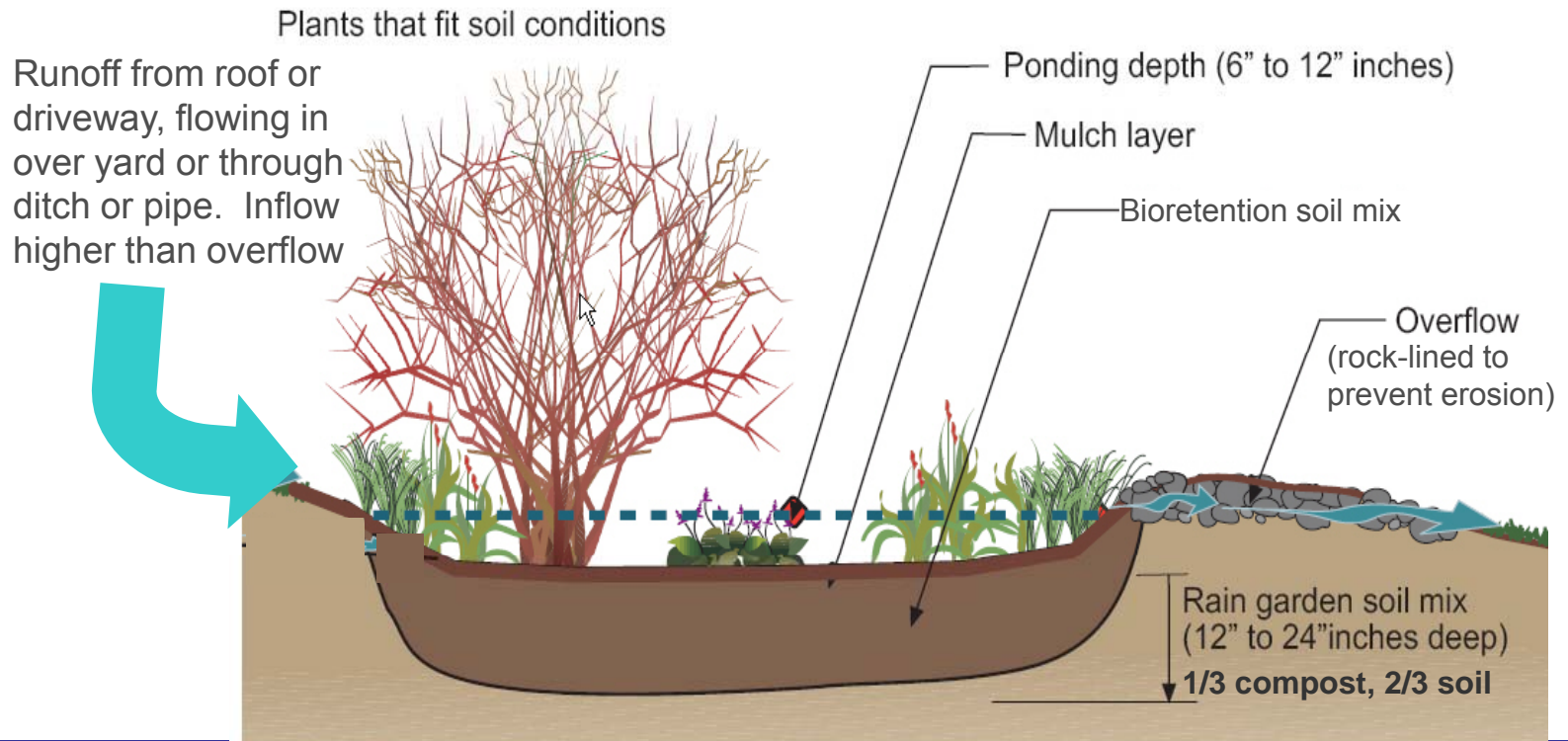




Planning the inflow



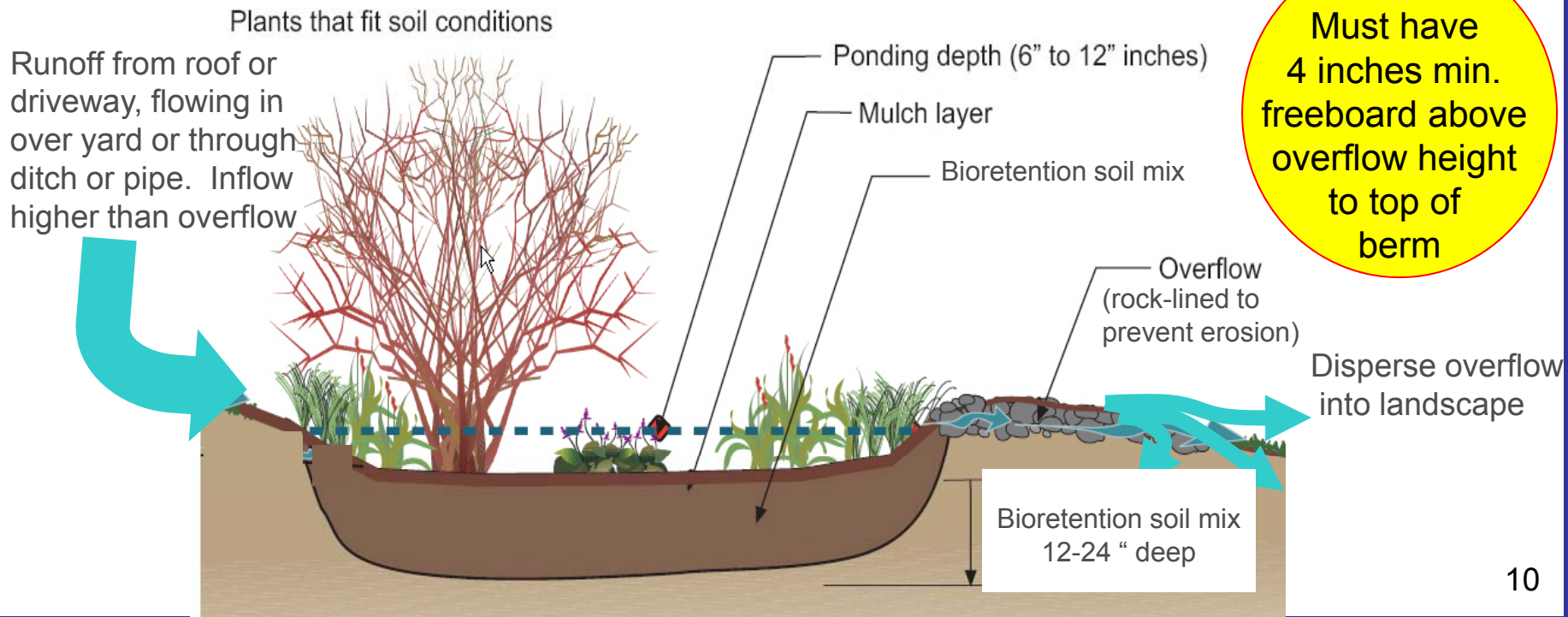
- Downhill ($\geq 2\%$ slope) from downspout or driveway contributing area
- Convey inflow by:
 - Underground pipe (connected above-ground to downspout),
 - Shallow swale (with grass or vegetation), or ditch filled with drain rock





Planning the overflow

- In big storms, rain garden may overflow – plan for it!
- Rock line overflow area to prevent erosion
- Should disperse onto landscape minimum of 3 ft. away from sidewalks or alleys – disperse with rock or gravel level spreader (see Detail sheet #8 on website)





Pre-construction site inspection (for projects seeking reimbursement by SPU)

SPU inspector must verify on-site, prior to construction:

- Appropriate location: slope, trees, etc.
- Size:
 - ☑ measured infiltration rate
 - ☑ chosen ponding depth
 - ☑ verify contributing area, x sizing factor from tables
 - = required minimum RG bottom area
 - + side slope width
 - = required top area of rain garden
- Inflow conveyance (PVC Schedule 40 pipe, swale, or ditch) and slope
- Overflow location and dispersion
 - ☑ min. 3 ft. from rock/gravel overflow spreader to sidewalk
 - ☑ not flooding neighboring properties