

Small scale best management practices (BMPs) to protect lake water quality by John Cobourn, University of Nevada Cooperative Extension

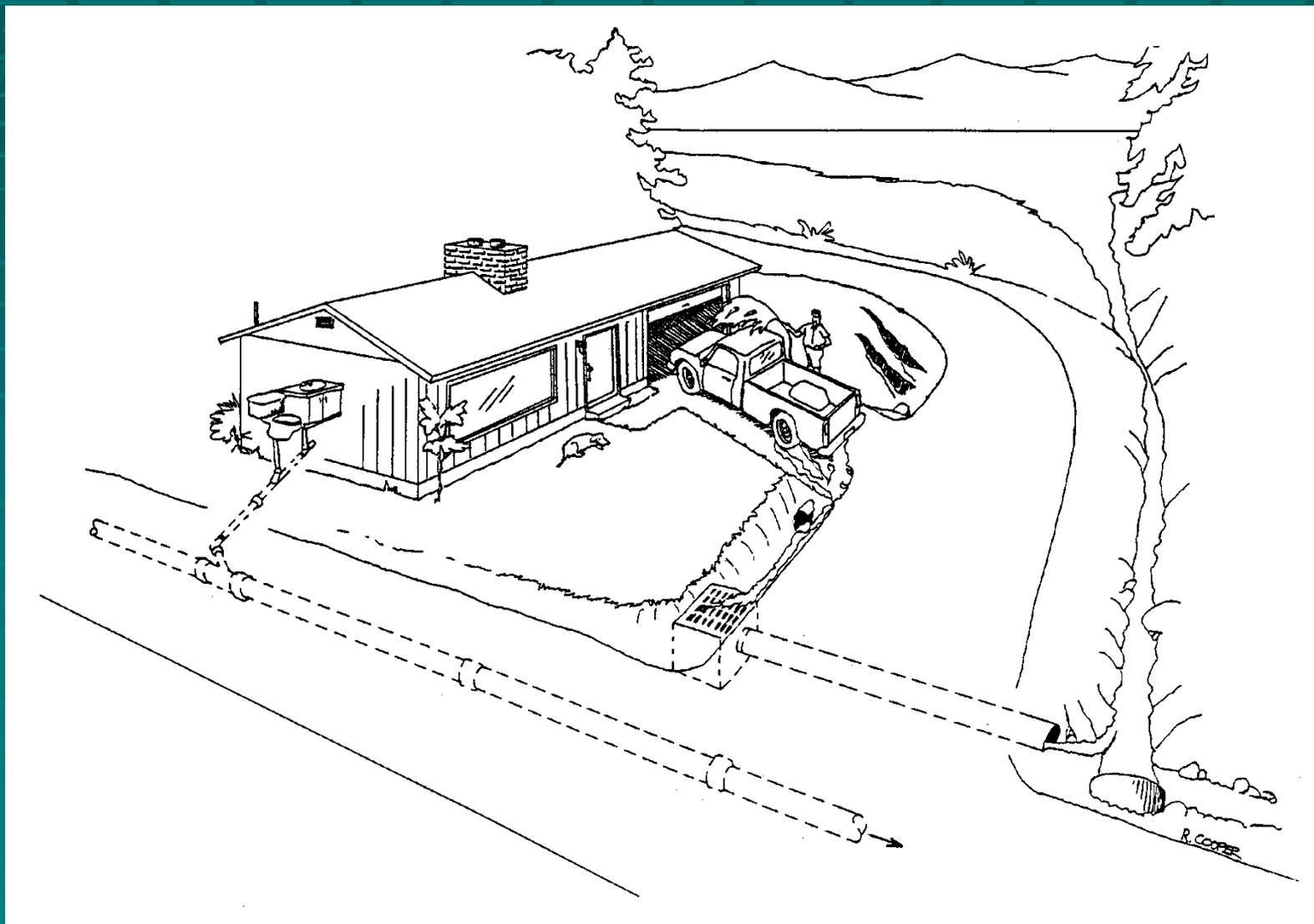


Greatest Threats to Water Quality

- **NUTRIENTS** feed algae suspended in water
- **FINE SEDIMENTS** also remain suspended in the water
- Worst sediments are .5-10 microns
- 72% of fine sediment comes from urban runoff

■ We have two kinds of “sewer” systems

Runoff from streets, parking lots and rooftops is the enemy.
It is not “treated.”



BMPs are Required at Tahoe

- **All we have is Nonpoint Source Pollution at Tahoe**
- TRPA Code of Ordinances defines “BMP Retrofit”
- These BMPs are for single family homes and small businesses

The Steps of BMP Retrofit

1. Free BMP Site evaluation from TRPA or Conservation Districts
2. Install the required BMPs
3. A Conservation District or TRPA does an inspection, and TRPA issues a Certificate of BMP Completion

How BMPs work

1. **“Source Control”**: Vegetate and mulch bare soil to prevent erosion
2. **“Infiltration”**: Concentrated runoff from rooftops and pavement needs extra help to infiltrate (storage in a system)

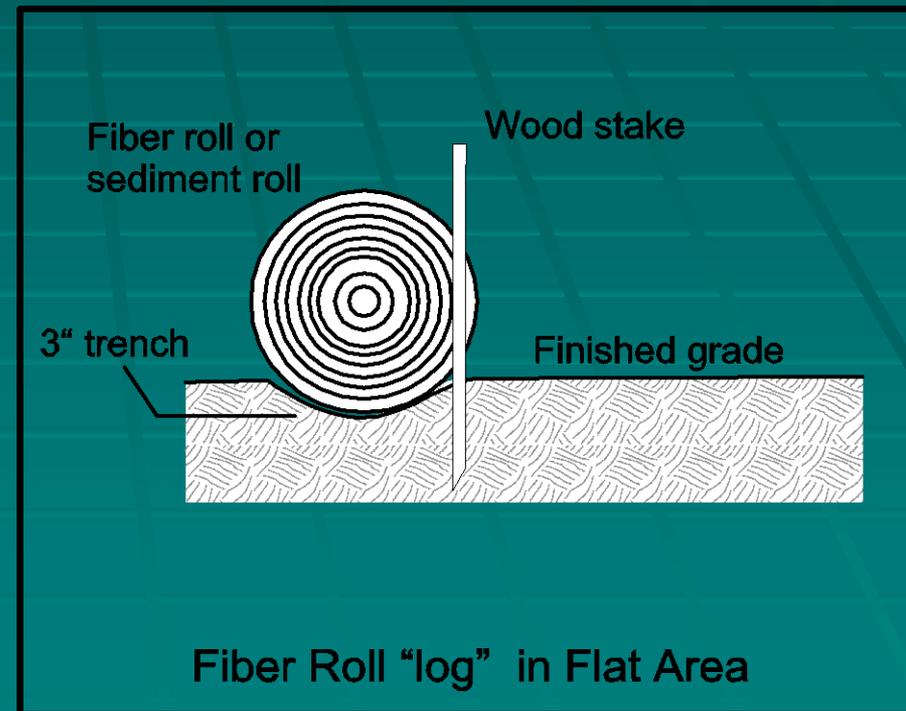
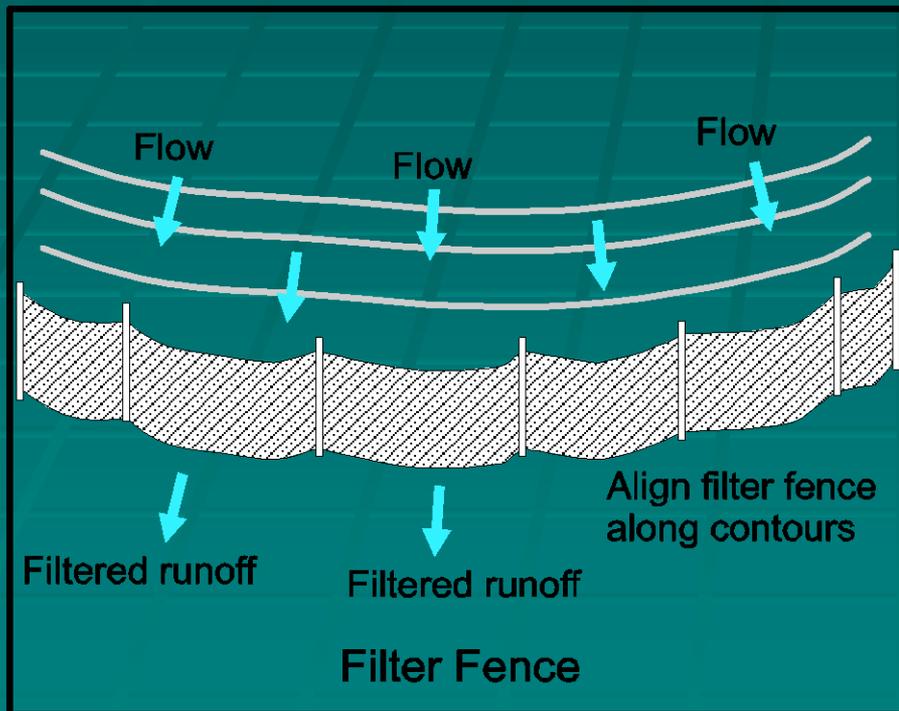
Five Main Categories of Small Scale BMPs

1. Temporary (construction) BMPs
2. Paving and properly Draining Driveways
3. Infiltrating runoff into the soil
4. Vegetating and mulching bare soil
5. Stabilizing steep slopes

*Each type of BMP has its own Chapter in
the Contractors BMP Manual (3 ring binder)*

1. Temporary BMPs

- Use during construction or any soil disturbance



2. Paving Driveways

Driveways must convey runoff to an infiltration system or flat, vegetated area



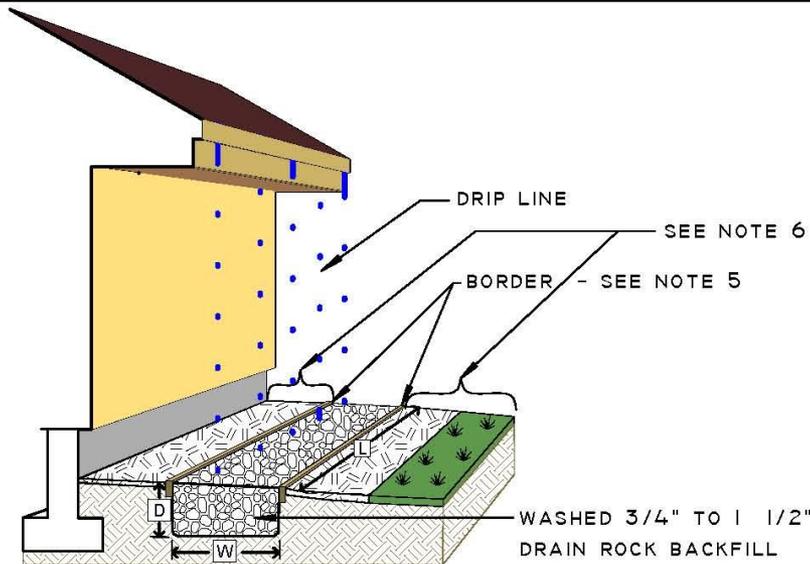
Prevent concentrated runoff from reaching the street by installing a swale or channel drain across the foot of the driveway.



3. Infiltration Systems

- Keep the water from leaving the property.
- Install a sediment trap for ease of maintenance
- Unless soil has rapid permeability, runoff water usually needs to be stored
- Water infiltrates after the rain event has ended
- Examples—Next 12 slides!

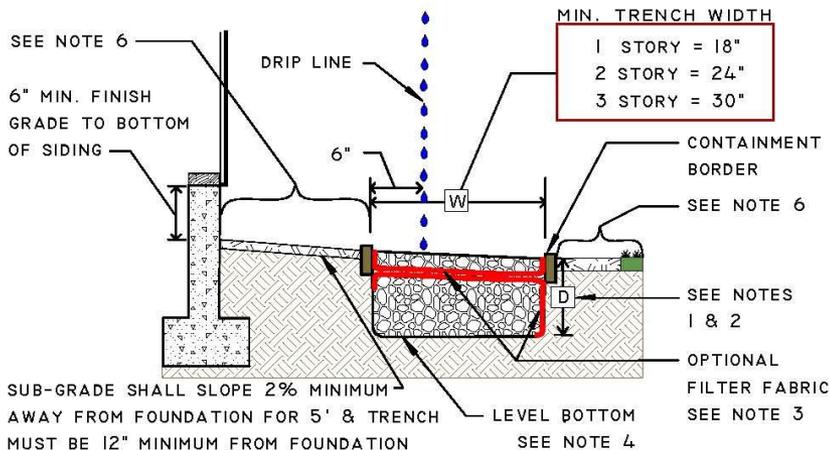
(RESIDENTIAL USE ONLY)
BEST MANAGEMENT PRACTICE
DRIP LINE INFILTRATION TRENCH



CONSTRUCTION NOTES

1. FOR SITE SPECIFIC TRENCH DIMENSIONS AND BACKFILL REQUIREMENTS REFER TO THE BMP "SITE EVALUATION RECOMMENDED TREATMENTS" FORM OR OTHER APPROVED BMP SIZING CALCULATIONS. SEE BMP-002, "ROOF VALLEY DRIP LINE TREATMENT," FOR DETAILS OF TRENCHES LOCATED UNDER ROOF VALLEYS.
2. MAXIMUM TRENCH DEPTH RECOMMENDED IS 10".
3. FILTER FABRIC IS OPTIONAL. SEE BMP-060, "FILTER FABRIC FOR INFILTRATION SYSTEMS," FOR DETAILS.
4. BOTTOM OF TRENCH MUST BE LEVEL. IF THIS IS NOT FEASIBLE, ALTERNATIVES INCLUDE CONSTRUCTING A SWALE OR SUBSURFACE DRAIN TO COLLECT AND CONVEY THE RUNOFF TO AN INFILTRATION SYSTEM. SEE BMP-004, "DRIP LINE CONVEYANCE SWALE," AND BMP-005, "SUBSURFACE CONVEYANCE SYSTEM."
5. CONTAINMENT BORDERS ARE REQUIRED. OPTIONS FOR MATERIALS INCLUDE PRESSURE TREATED LUMBER, RECYCLED COMPOSITES, BRICK, STONE, COBBLE, OR OTHER LANDSCAPE EDGING MATERIAL. FIRE DEFENSIBLE SPACE GUIDELINES FOR LAKE TAHOE RECOMMEND A NON-COMBUSTIBLE AREA WITHIN 5 FEET OF A STRUCTURE. COMBUSTIBLE MATERIAL SHALL NOT CONNECT FROM THE BORDER TO THE STRUCTURE.
6. CONSULT WITH YOUR LOCAL FIRE PROTECTION DISTRICT WHEN LANDSCAPING NEAR STRUCTURES. VISIT WWW.LIVINGWITHFIRE.INFO/TAHOE FOR GUIDELINES ON THE DEFENSIBLE SPACE ZONE.
7. REGULARLY SCHEDULED MAINTENANCE IS NECESSARY TO MAINTAIN FULL FUNCTION. MAINTENANCE INCLUDES INSPECTION, REMOVAL, AND PROPER DISPOSAL OF DEBRIS, PINE NEEDLES AND ACCUMULATED SEDIMENT.

INSTALLATION GUIDELINES



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NATURAL RESOURCES CONSERVATION SERVICE		
IN COOPERATION WITH		
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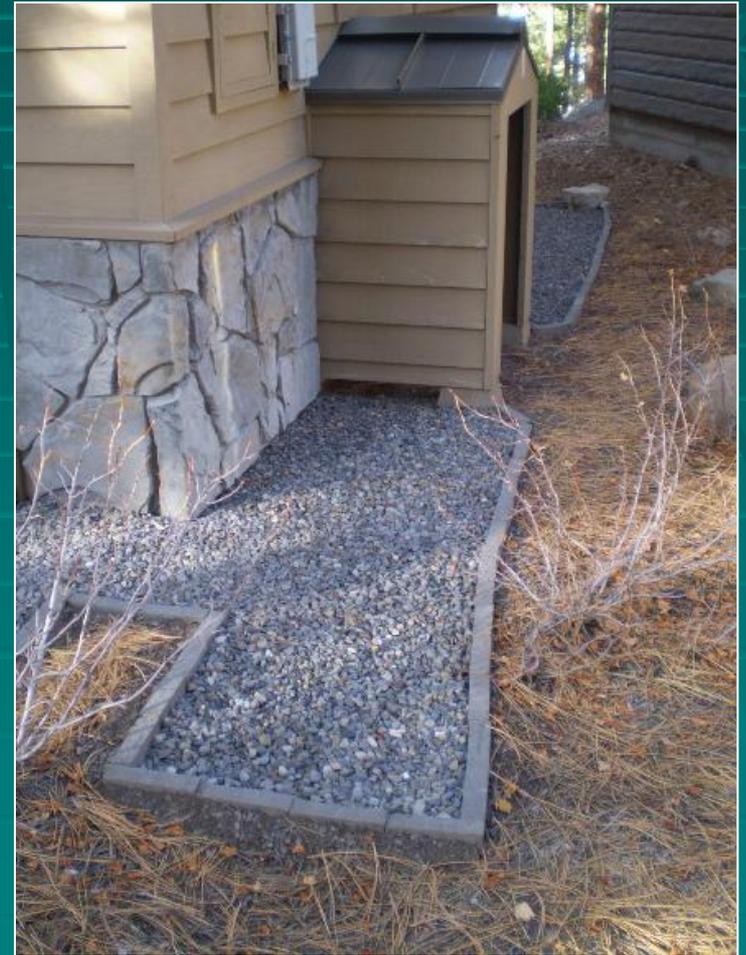
Dripline trench with containment border



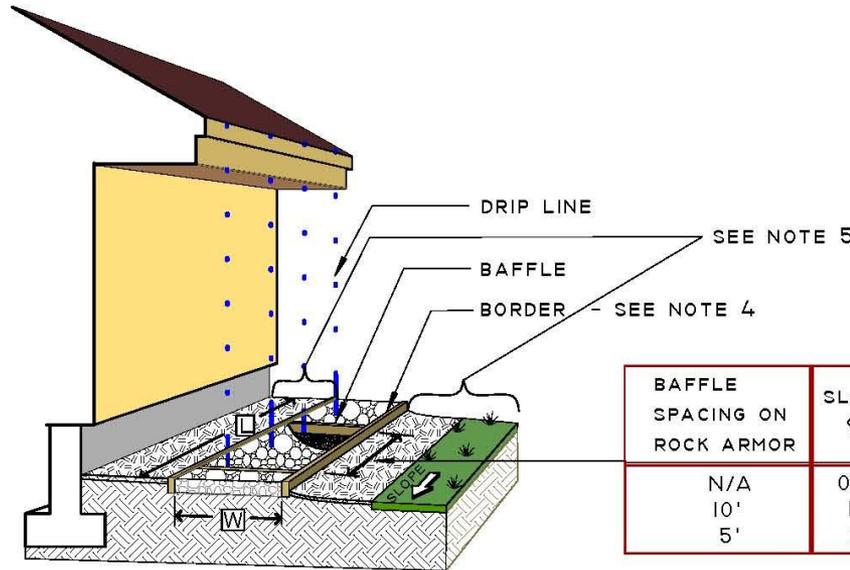
Dripline trench with cobble border



Armored Drip Line Treatments



Drain Rock with Containment Borders

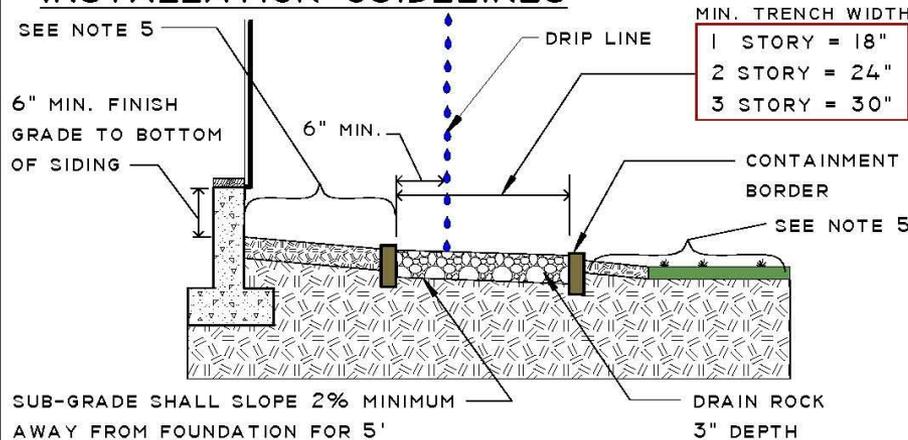


BAFFLE SPACING ON ROCK ARMOR	SLOPE %
N/A	0-10
10'	10
5'	15

CONSTRUCTION NOTES

- UNLESS SPECIFIED OTHERWISE, THE MINIMUM TRENCH WIDTHS SHOWN IN THE INSTALLATION GUIDELINES REFLECT THE MINIMUM REQUIREMENTS FOR THE BMP RETROFIT ORDINANCE. SEE BMP-002 FOR DETAILS OF TRENCHES LOCATED UNDER ROOF VALLEYS.
- ARMOR SOIL WITH A 3" MINIMUM CONTINUOUS LAYER OF ROCK. WASHED 3/4" TO 1 1/2" DRAIN ROCK OR COBBLE IS RECOMMENDED. NATIVE ROCK CAN BE SUBSTITUTED IF AVAILABLE.
- ON SLOPED DRIP LINES OVER 10%, CONTAIN THE DRAIN ROCK WITH BAFFLES AS SHOWN OR SUBSTITUTE LARGER RIPRAP FOR DRAIN ROCK. AN ALTERNATIVE PRACTICE IS TO CONSTRUCT A SWALE OR SUBSURFACE DRAIN TO COLLECT AND CONVEY RUNOFF TO AN INFILTRATION SYSTEM LOCATED A MINIMUM OF 10' AWAY FROM THE FOUNDATION. SEE BMP-004 AND BMP-005 FOR DETAILS.
- CONTAINMENT BORDERS ARE REQUIRED. OPTIONS FOR MATERIALS INCLUDE PRESSURE TREATED LUMBER, RECYCLED COMPOSITES, BRICK, STONE, COBBLE, OR OTHER LANDSCAPE EDGING MATERIAL. FIRE DEFENSIBLE SPACE GUIDELINES FOR LAKE TAHOE RECOMMEND A NON-COMBUSTIBLE AREA WITHIN 5 FEET OF A STRUCTURE. COMBUSTIBLE MATERIAL SHALL NOT CONNECT FROM THE BORDER TO THE STRUCTURE.
- CONSULT WITH YOUR LOCAL FIRE PROTECTION DISTRICT WHEN LANDSCAPING NEAR STRUCTURES. VISIT WWW.LIVINGWITHFIRE.INFO/TAHOE FOR GUIDELINES ON THE DEFENSIBLE SPACE ZONE.
- REGULARLY SCHEDULED MAINTENANCE IS NECESSARY TO MAINTAIN FULL FUNCTION. MAINTENANCE INCLUDES INSPECTION, REMOVAL, AND PROPER DISPOSAL OF PINE NEEDLES AND ACCUMULATED SEDIMENT.

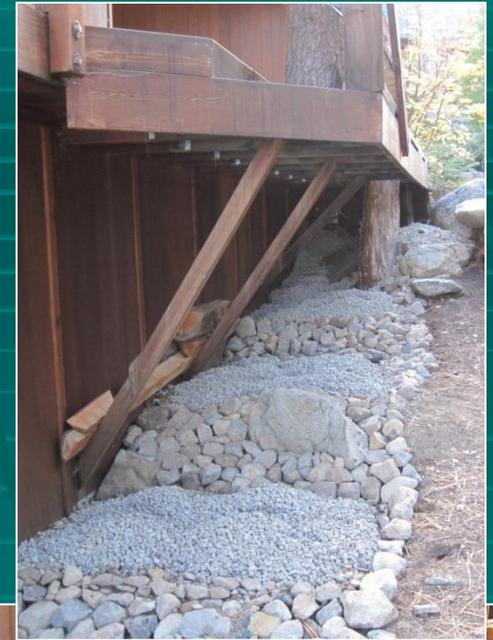
INSTALLATION GUIDELINES



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Armor under Elevated Structures



Prefabricated Infiltration Systems (Rainstore)

94% void space!



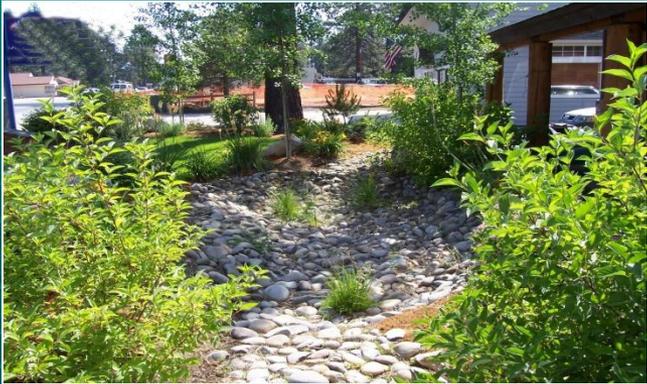
Rock Lined Basins

✓ **Maximum 2:1 side slope**

✓ **Level bottom**

✓ **Match contour of slope**

✓ **Incorporate armored spillway for potential basin overflow**



Vegetated Basins



✓ **Maximum 2:1 side slope**

✓ **Level bottom**

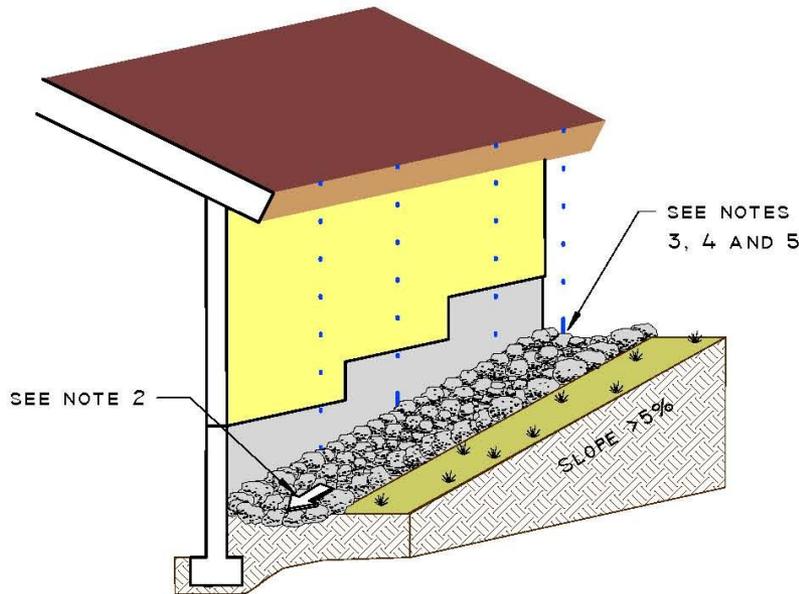
✓ **Match contour of slope**

✓ **Incorporate armored spillway
for potential basin overflow**

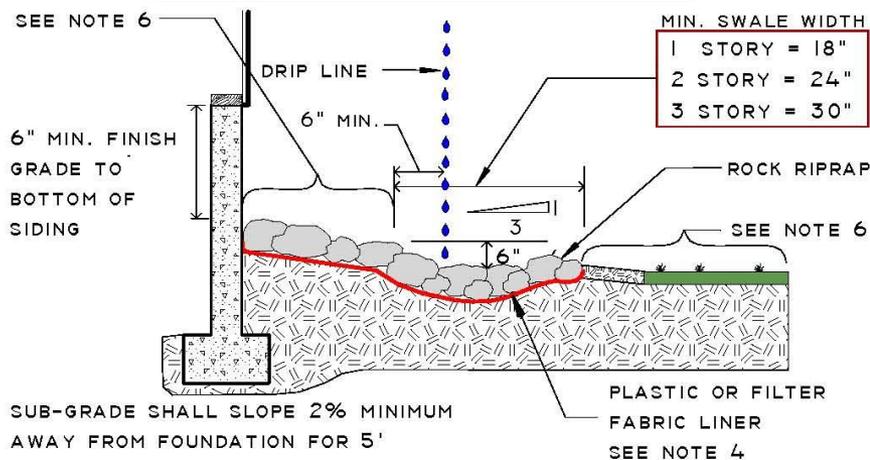
(RESIDENTIAL USE ONLY)
BEST MANAGEMENT PRACTICE
DRIP LINE CONVEYANCE SWALE

CONSTRUCTION NOTES

1. DIMENSIONS AND SIZING REFLECT MINIMUMS FOR THE BMP RETROFIT ORDINANCE. REFER TO THE "SITE EVALUATION RECOMMENDED TREATMENTS" FORM AND SITE PLAN FOR SITE SPECIFIC BMPs.
2. USE THIS TREATMENT ON SLOPES 5% AND STEEPER WHERE LEVEL BOTTOM INFILTRATION TRENCHES ARE IMPRACTICAL, AND TO CONVEY WATER AWAY FROM FOUNDATIONS. TREAT RUNOFF WATER IN AN INFILTRATION SYSTEM AT THE END OF THE SWALE.
3. EXCAVATE TO ACCOMMODATE KEYING IN THE LARGEST ROCKS PLUS A 6" DEEP CONCAVE SWALE WITH APPROXIMATELY 3:1 SIDE SLOPES.
4. LINE THE SWALE WITH 8 MIL PLASTIC BEFORE PLACING THE ROCK. FILTER FABRIC MAY REPLACE PLASTIC LINER WHERE INFILTRATED WATER WILL NOT AFFECT THE FOUNDATION.
5. ARMOR SOIL WITH 3" TO 10" ROCK RIPRAP. NATIVE ROCK CAN BE SUBSTITUTED IF AVAILABLE, BUT SHOULD BE ANGULAR TO SUB ANGULAR.
6. PLACE ROCK IN A MANNER THAT IS UNIFORMLY DISTRIBUTED AND FIRMLY IN CONTACT ONE TO ANOTHER WITH SMALLER ROCKS FILLING THE VOIDS BETWEEN THE LARGER ROCKS. HAND PLACE PLACEMENT OF SOME ROCK MAY BE REQUIRED ADJACENT TO EXISTING STRUCTURES TO PREVENT DAMAGE AND TO ACHIEVE THE FINAL FINISHED SURFACE.
7. CONSULT WITH YOUR LOCAL FIRE PROTECTION DISTRICT WHEN LANDSCAPING NEAR STRUCTURES. VISIT WWW.LIVINGWITHFIRE.INFO/TAHOE FOR GUIDELINES ON THE DEFENSIBLE SPACE ZONE.
8. REGULARLY SCHEDULED MAINTENANCE IS NECESSARY TO MAINTAIN FULL FUNCTION. MAINTENANCE INCLUDES INSPECTION, REMOVAL, AND PROPER DISPOSAL OF PINE NEEDLES AND ACCUMULATED SEDIMENT.



INSTALLATION GUIDELINES

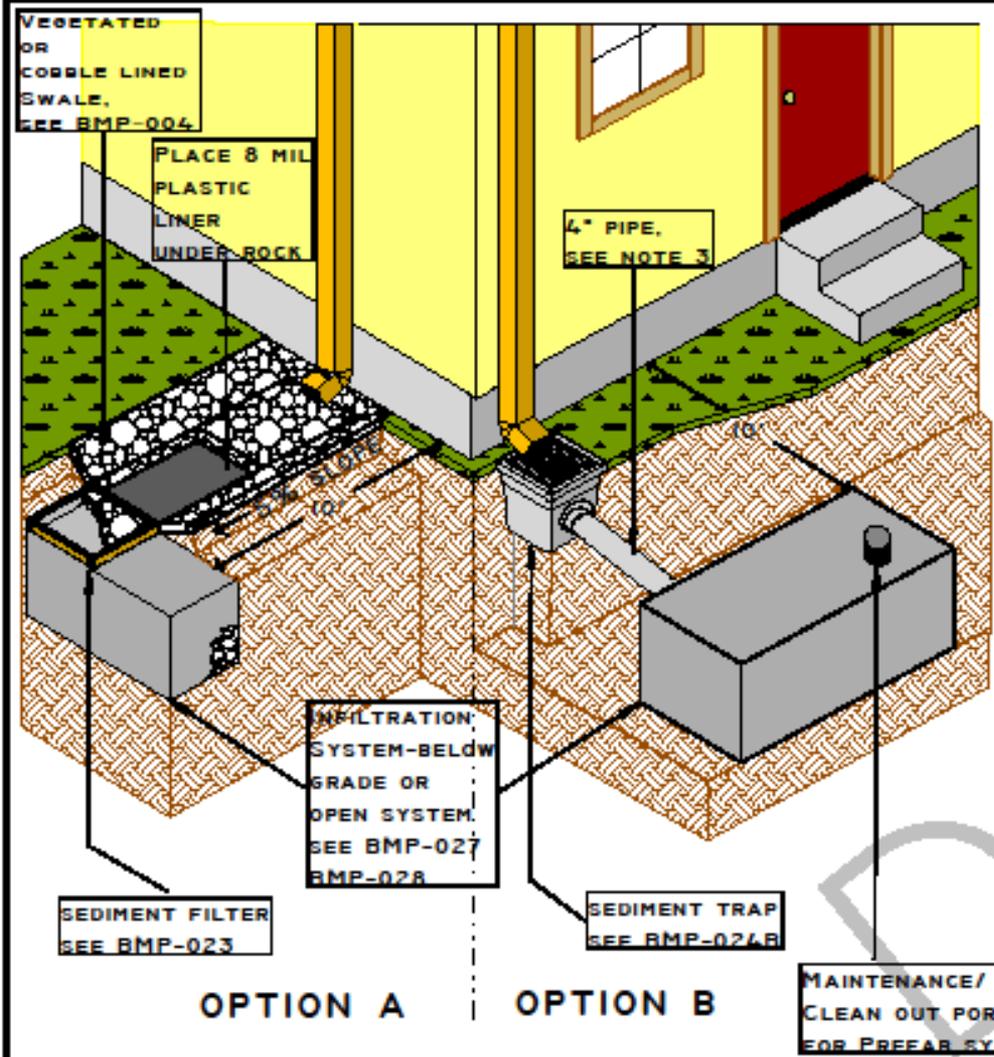


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THIS STANDARD DRAWING IS BASED ON A REFERENCE TO THE NRCS STANDARD PRACTICE 570 - STORMWATER RUNOFF CONTROL. THIS DRAWING IS INTENDED TO ASSIST THE DESIGNER IN PREPARATION OF A COMPLETE SITE SPECIFIC DESIGN, AND IT IS NOT TO REPLACE THE INDEPENDENT JUDGMENT AND ANALYSIS BY A QUALIFIED DESIGNER.

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BEST MANAGEMENT PRACTICE
GUTTER DOWNSPOUT INFILTRATION SYSTEM



CONSTRUCTION NOTES

1. INFILTRATION SYSTEM IS SHOWN SCHEMATICALLY. REFER TO SITE EVALUATION TREATMENT FORM AND SITE PLAN FOR SITE SPECIFIC BMPs.
2. OPTIONS FOR SEDIMENT CAPTURE AND CONVEYANCE ARE SHOWN.
3. PIPE CONNECTING TRAP AND INFILTRATION SYSTEM SHOULD SLOPE A MINIMUM OF 1/8 IN. DROP PER FOOT. 4" DIAMETER NON-PERFORATED POLYETHYLENE SMOOTH WALL SEWER AND DRAIN PIPE IS RECOMMENDED FOR EASE OF CLEANING. CORRUGATED PIPE MAY BE USED AS AN OPTION, BUT IS MORE PRONE TO CLOGGING.
4. 10' SEPARATION FROM BUILDING FOUNDATION TO THE INFILTRATION SYSTEM IS RECOMMENDED. OVERFLOW FROM THE SYSTEM SHOULD DISCHARGE AT A LOCATION WHERE THE PROPERTY SLOPES AWAY FROM THE BUILDING AND IS 5 FT. FROM A PROPERTY LINE.
5. REGULARLY SCHEDULED MAINTENANCE IS NECESSARY TO MAINTAIN FULL FUNCTION. MAINTENANCE INCLUDES INSPECTION, REMOVAL AND PROPER DISPOSAL OF DEBRIS, PINE NEEDLES AND ACCUMULATED SEDIMENT. REWORK TRENCH AND REPLACE GEO-TEXTILE FABRIC AS REQUIRED.

MAINTENANCE/
CLEAN OUT PORT
FOR PREAB SYSTEMS

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Conveyance Swales

Rock lined



Vegetated



Natural Infiltration or Water Spreading can work when there is a flat lawn or well vegetated area



4. Vegetate and Mulch Bare Soil

- Landscape should absorb water like a sponge
- Use both Native AND Adapted plants
- Recommended plant list

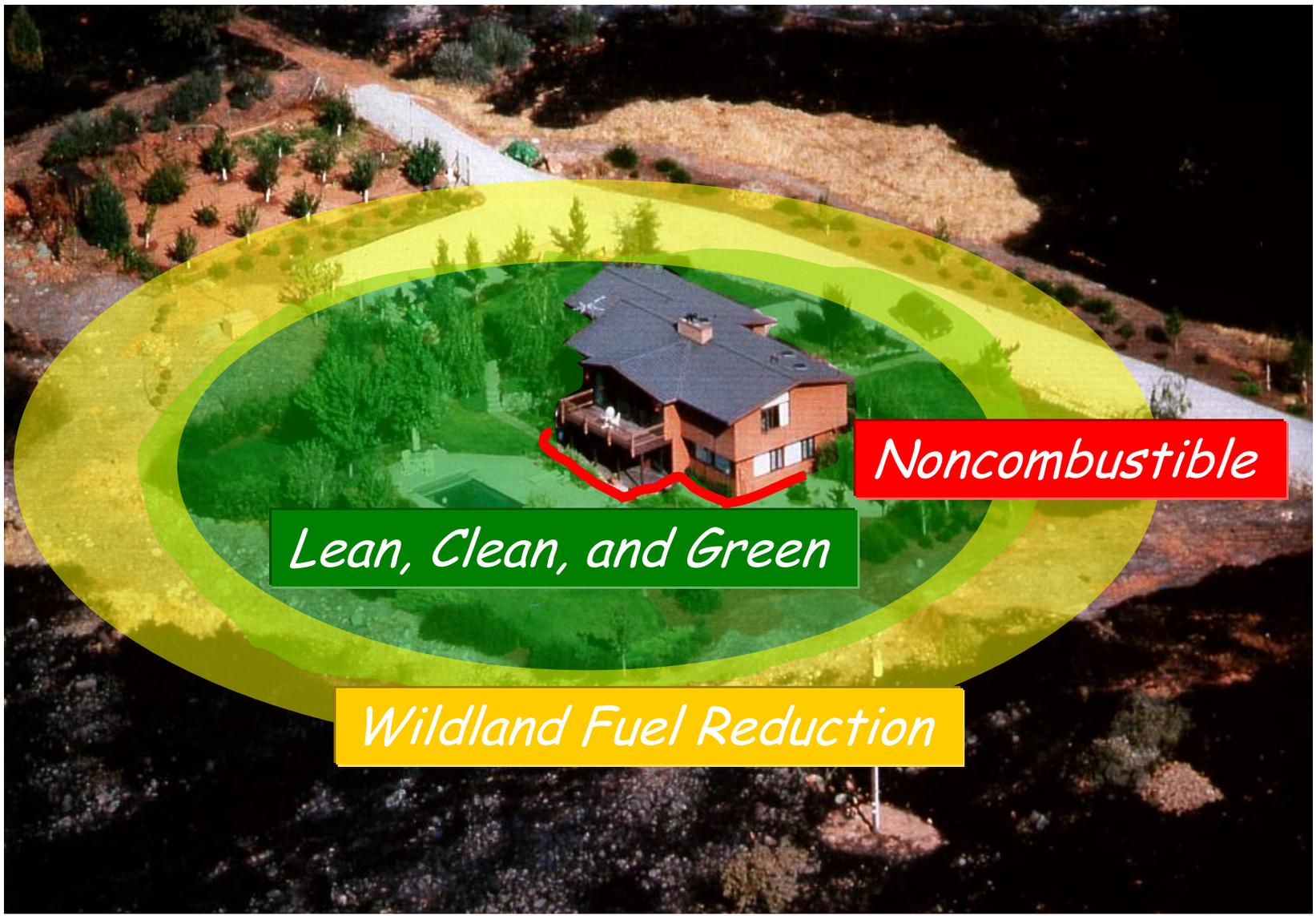
Heavy rain will wash unprotected soil into the street.



Cover bare soil with vegetation and/or mulch



(Appropriate turf)



Noncombustible

Lean, Clean, and Green

Wildland Fuel Reduction

5. Slope Stabilization

Structures needed for all slopes over 50%.
Combine with vegetation for best results.

Slope: Divide the Rise by the Run.
If you have 1/2, divide 1 by 2 and
you get .5 or 50%.
(also known as a “2 to 1 slope”).

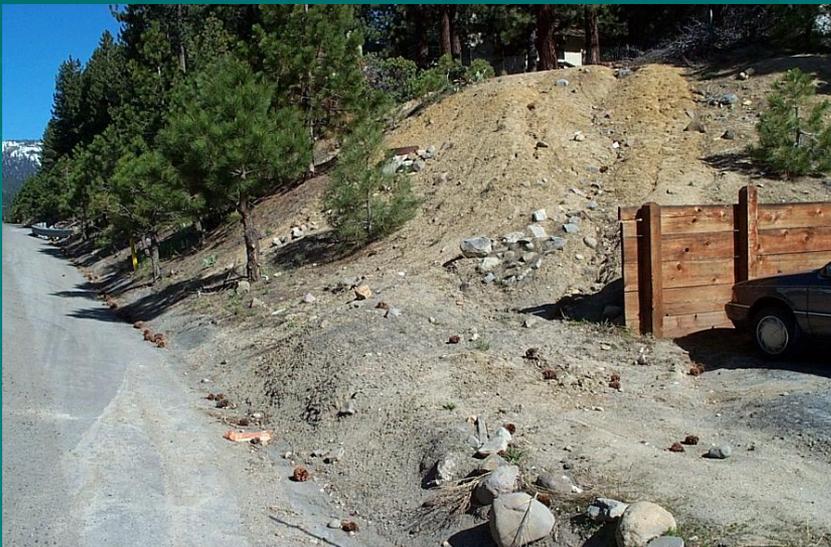


Slope Stabilization structures



BMPs Need to be Maintained

- Even newer homes need BMP Retrofit if BMPs have not been maintained.



Teach BMP Installation in Spanish

