Inter Tight
Small-Scale Green Infrastructure Best Management Practices

Roboto Slab

Nature-Based Solutions for Stormwater Management & Regulatory Compliance

BASED ON NJDEP STORMWATER MANAGEMENT RULES (N.J.A.C. 7:8) & BMP MANUAL

The Paradigm Shift: From ‘Gray’ Disposal to ‘Green” Retention

Key Concept 1: Nature-Based Solutions (NBS)

Definition: Actions using natural processes to address societal challenges—such as climate change, flood risk, and urban heat—while improving biodiversity.

Key Concept 2: Low Impact Development (LID)

Definition: A design strategy that seeks to preserve or closely mimic the site's natural or pre-developed hydrologic response.

The Shift:

- **Traditional**: Centralized structural facilities responding to runoff.
- **LID/NBS**: Decentralized measures interacting with the process close to the source.

Defining Green Infrastructure: A Multi-Benefit Network

Regulatory Definition (US EPA): Measures that use natural systems (permeable surfaces, soil systems, harvesting) to reduce flows to sewer systems.

Holistic Definition: A ‘Blue-Green’ network providing ingredients for solving urban challenges including Climate Adaptation, Food Production, and Heat Stress Reduction.

The New Jersey Regulatory Mandate

New Jersey Administrative Code (N.J.A.C. 7:8) defines Green Infrastructure as a measure that manages stormwater close to its source by:

1. Treating runoff through infiltration into subsoil.

2. Treating runoff through filtration by vegetation or soil.

3. Storing runoff for reuse.

Compliance Check

✓	**1. Is the stormwater managed close to its source?**	
✓	**2. Are the BMPs distributed throughout the site?**	
✓	**3. Are the contributory drainage area limitations met?**	e.g., 1 acre for Dry Wells, 2.5 acres for Bioretention.

Selecting the Right Tool for the Job (Table 5-1)

Table 5-1
Green Infrastructure BMPs for Groundwater Recharge, Stormwater Runoff Quality, and/or Stormwater Runoff Quantity

Best Management Practice	TSS Removal Rate (%)	Runoff Quantity	Groundwater Recharge	Min. Separation from Water Table
Cistern	0	Yes	No	-
Dry Well[a]	0	No	Yes	2
Grass Swale	50 or less	No	No	2[e] 1[f]
Green Roof	0	Yes	No	-
Manufactured Treatment Device[a] (g)	50 or 80	No	No	Dependent upon the device
Pervious Paving System[a]	80	Yes	Yes[b] No[c]	2[b] 1[c]
Small-Scale Bioretention Basin[a]	80 or 90	Yes	Yes[b] No[c]	2[b] 1[c]
Small-Scale Infiltration Basin[a]	80	Yes	Yes	2
Small-Scale Sand Filter[a] [b]	80	Yes	Yes	2
Vegetative Filter Strip	60-80	No	No	-

← Quantity Only (No Recharge).

← Recharge depends on subsoil design.

The "All-Star" BMP: Satisfies Quality, Quantity, and Recharge. Roboto Slab

Toolkit 01: Rainwater Harvesting

Residential Scale: Rain Barrel (~55 gal)

Commercial Scale: Cistern

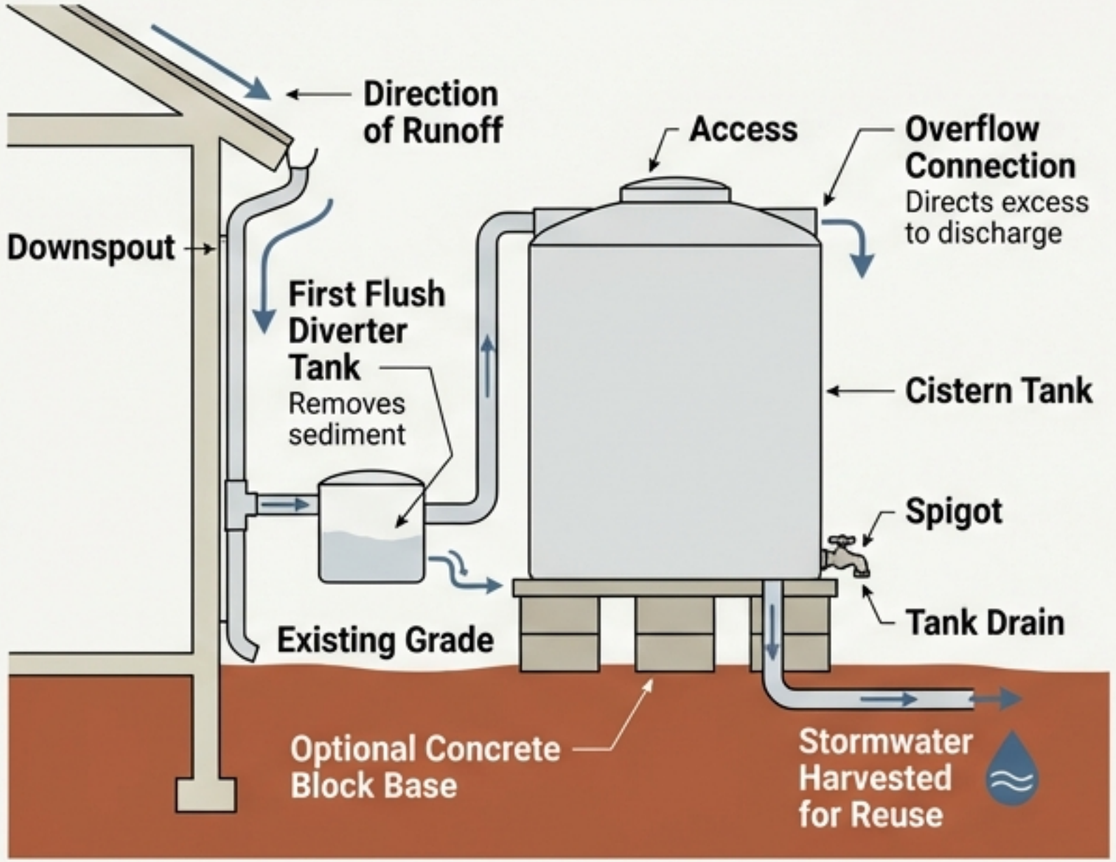
Performance Metrics

The Math of Potential: 1 inch of rain on a 1,000 sq. ft. roof ≈ 600 gallons harvested.

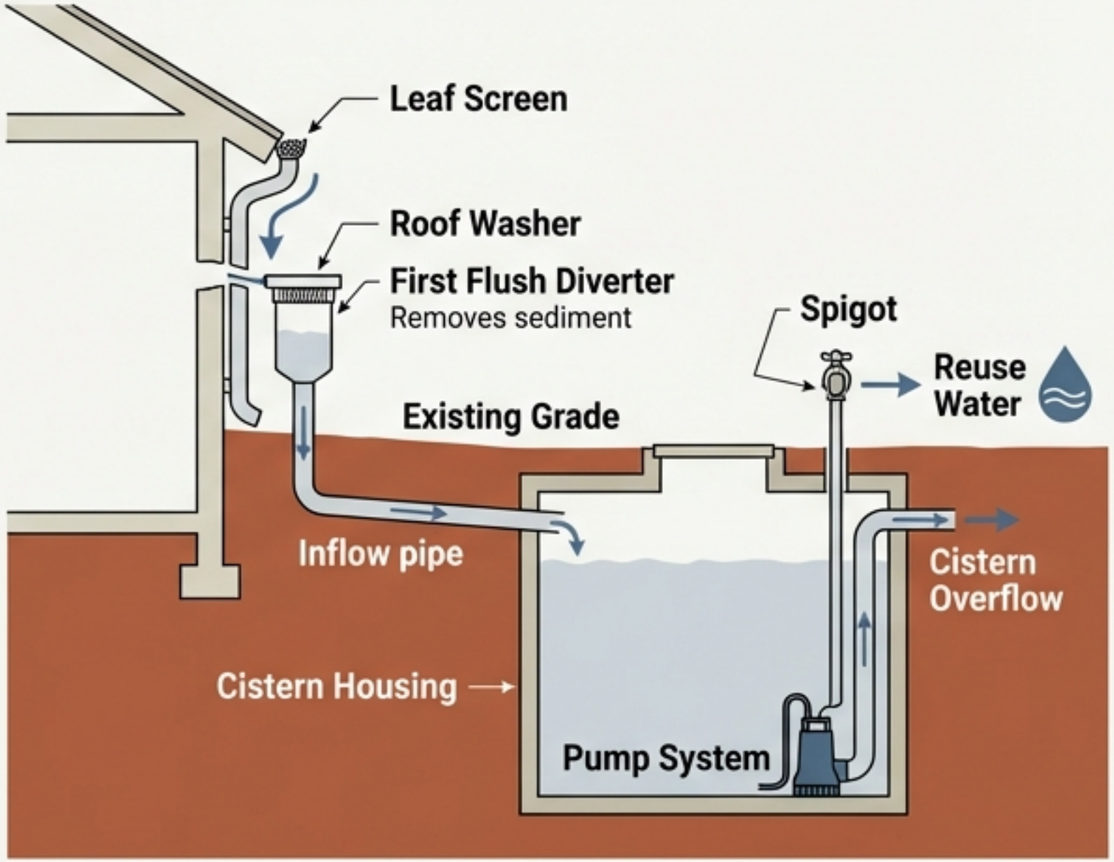
Impact: Domestic harvesting can reduce a household's drinking water consumption by 50%.

Harvesting System Mechanics

Surface Cistern



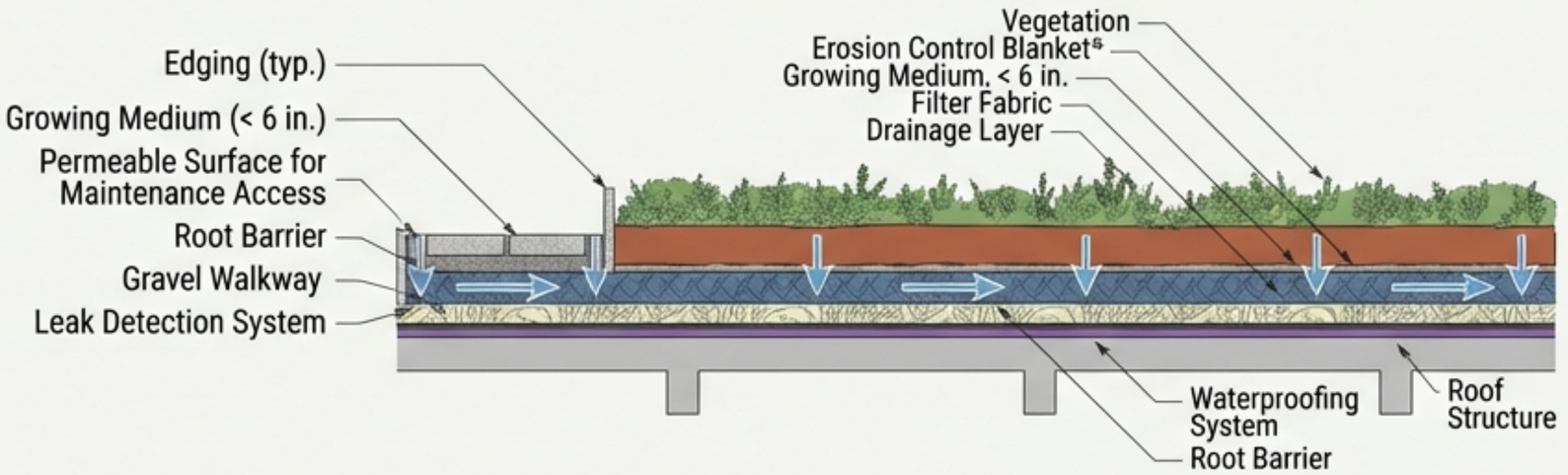
Subsurface Cistern



Constraint: Systems require active management and are often underutilized due to perception or siting.

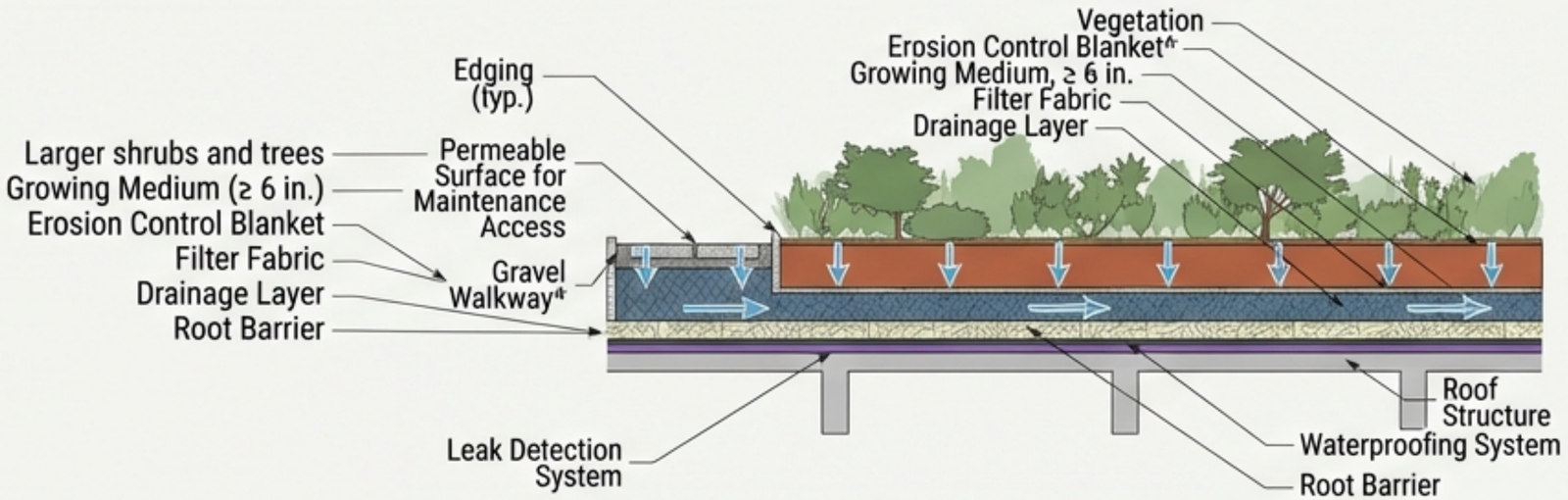
Toolkit 02: Green Roof Systems

Extensive Green Roof



Note: Low maintenance, drought resistant, lighter weight.

Intensive Green Roof



Note: Supports shrubs/trees, higher load, requires irrigation/maintenance.

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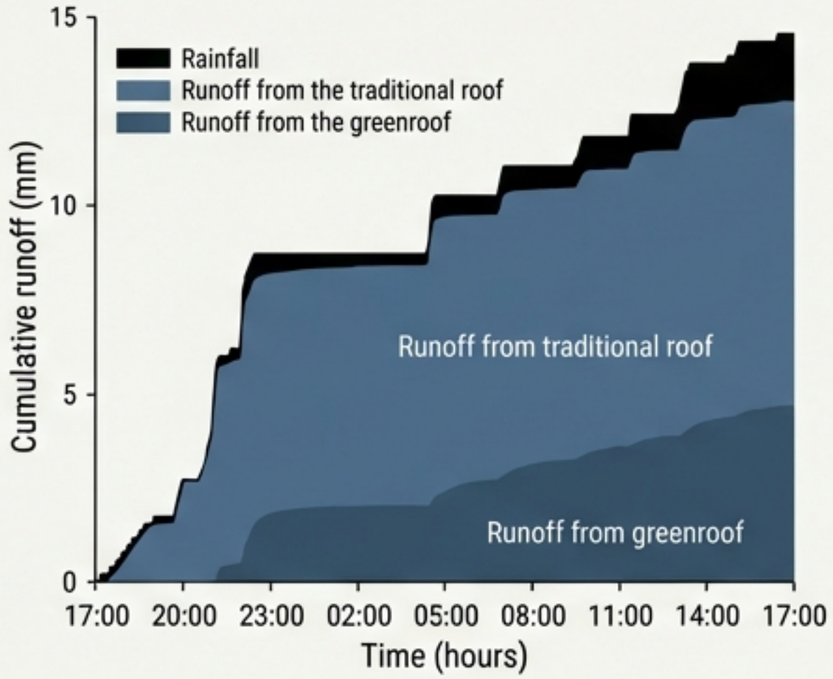
Green Roof Performance: Water & Energy

Runoff Mitigation



Energy Impact

Summer heat gain reduced by 70-90%.

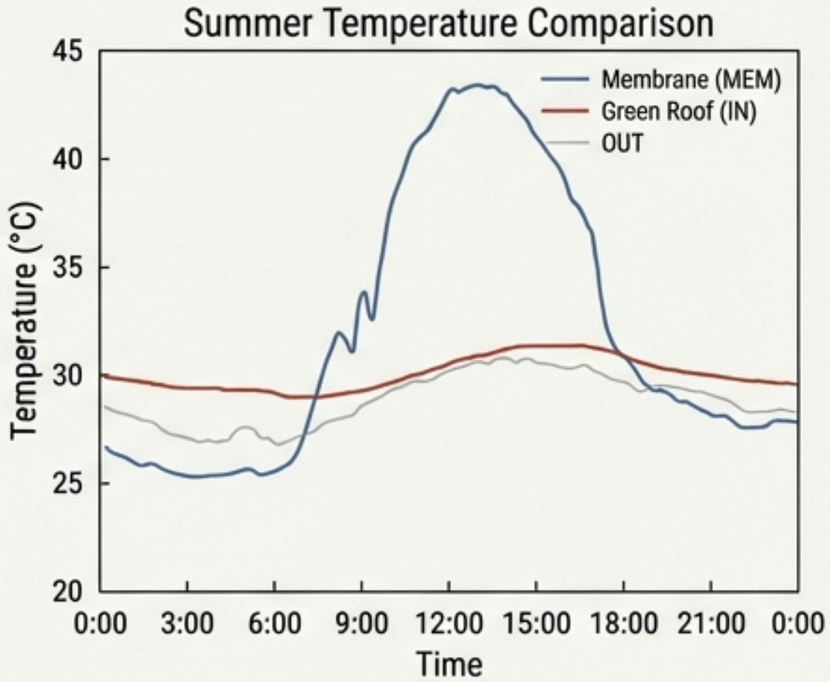
Winter heat loss reduced by 10-30%.

Runoff Impact

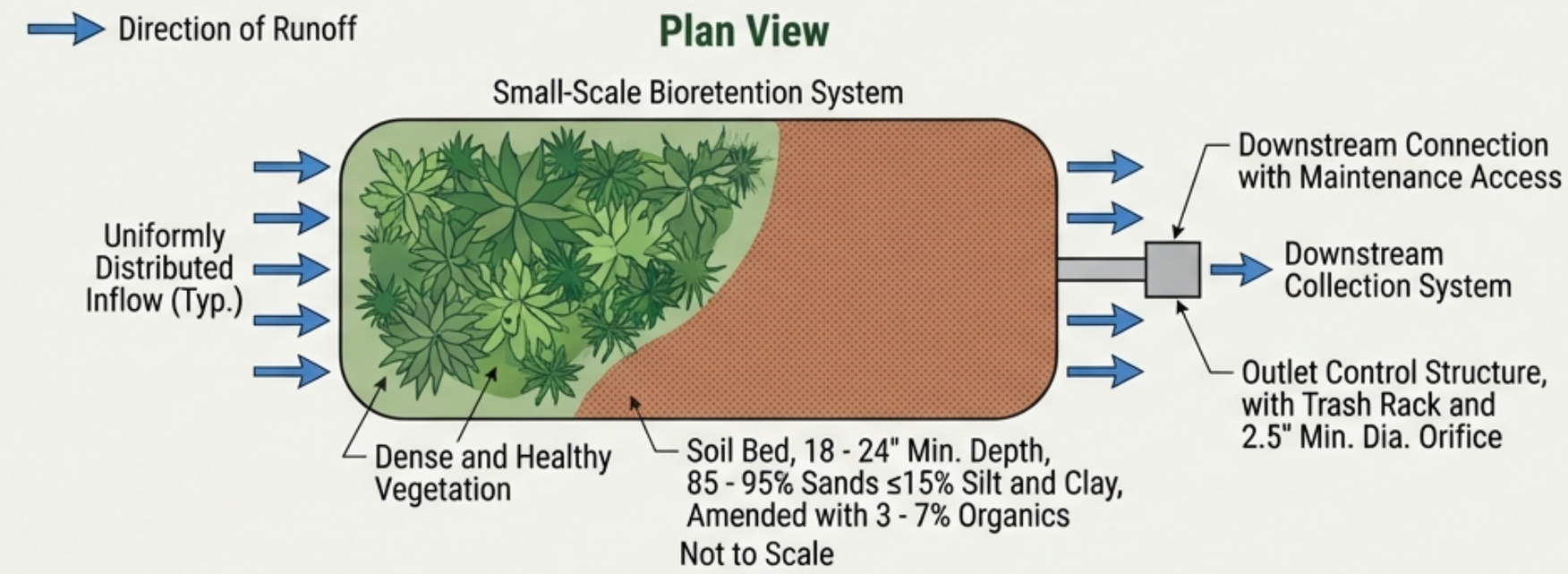
Significant delay and reduction in peak flow.

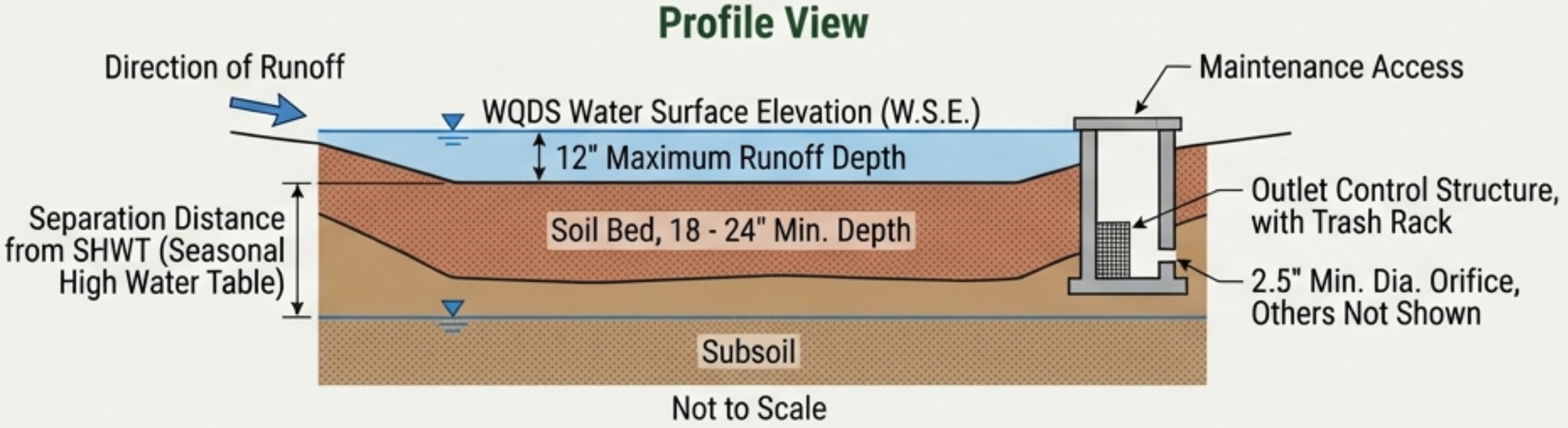
Retention is best (85%) at the lowest slope.

Energy Efficiency



Toolkit 03: Small-Scale Bioretention (Rain Gardens)





Soil Bed Composition: 85-95% Sands, <15% Silt/Clay, amended with 3-7% organics.

Design Rule: Must feature a flat bottom for uniform infiltration.

Bioretention Efficacy & Application

Pathogen Removal

Can remove up to **97%** of E. Coli.

Metal Removal

Shown to remove the majority of Zinc in urban runoff.

Groundwater Recharge

Provides **30%** more groundwater recharge than a conventional lawn.

Toolkit 04: Pervious Paving Systems

System Types:

- Pervious concrete
- Porous asphalt
- Permeable interlocking concrete pavers (PICP)
- Porous turf

Performance Metrics:

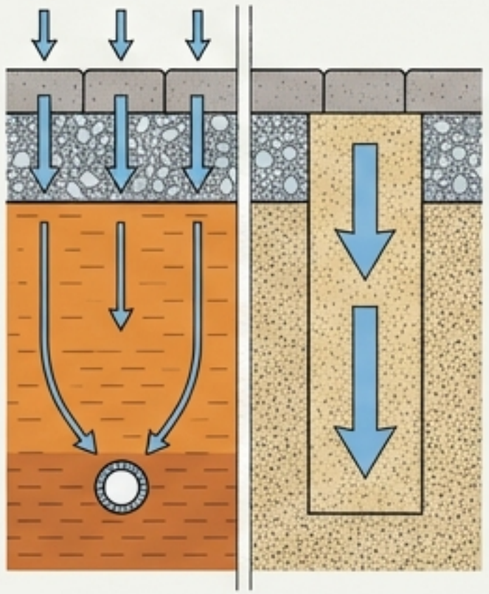
Flow Rate: Pervious concrete can handle up to **480 inches/hour**.

Runoff Reduction: **93%** less runoff compared to impermeable asphalt.

Quality: Significantly lower metal pollutants (copper/zinc).

Paving Limitations & Maintenance

The Limiting Factor: Subsoil Exfiltration

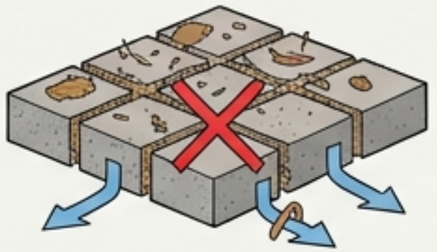


The underlying soil determines the system's speed.

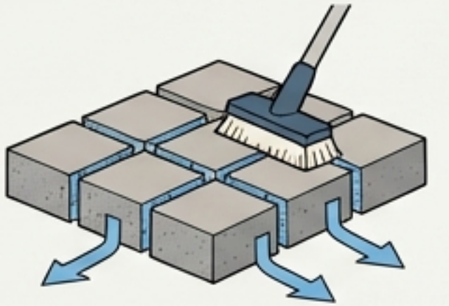
- Clay: Slow (0.8 cm/d) – May require underdrains.
- Sand/Trenching: Fast (25.8 cm/d).

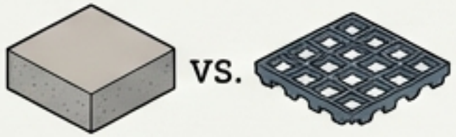
Maintenance Requirement: Clogging

Air voids can get clogged with debris. These are not "install and ignore" systems.



- Requirement: Regular vacuum sweeping.
- Durability: Concrete pavers show high durability; plastic matrix systems may shift over time.





The First Line of Defense: Nonstructural Strategies

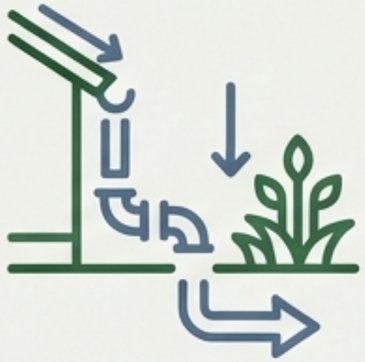
Before building BMPs, the NJ BMP Manual requires these strategic considerations.

PROTECT

Areas susceptible to erosion and natural drainage features.

MINIMIZE

Impervious surfaces, land disturbance, and soil compaction.



DISCONNECT

Break up flow over impervious surfaces (don’t pipe it immediately).

VEGETATE

Use low-maintenance native landscaping to encourage retention.

Life-Cycle Goal: Minimize energy consumption, carbon emissions, and secondary pollution.

Designing with Nature, Not Against It

Summary:

1. Shift from centralized "disposal" to distributed "treatment".
2. Compliance with NJAC 7:8 requires a "Concept-to-Application" approach.
3. Assess the site → Minimize disturbance → Select the right Small-Scale BMP.

Conclusion:

Small-scale, distributed Green Infrastructure is not just a regulatory requirement—it is the foundation of a resilient, cooler, and cleaner community.