The goal of these workshops is to give designers, builders and managers the technical details necessary to properly design, construct and maintain LID facilities.

- LID research, data, guidelines, specifications, and regulations are evolving rapidly.
- New and evolving bioretention guidelines.
- New resources, including: SWMMWW, 2012 LID Manual, Rain Garden Handbook.

low impact development technical workshop series

Washington State University Extension | Herrera

Fundamental questions to consider during the workshops

- LID or a distributed approach involves the public in stormwater management. Increased public education and engagement necessary.

- LID or distributed approach manages stormwater in smaller contributing areas...this is a fundamental shift in design approach and likely system performance.
- Effective application of LID on difficult sites is possible, but site assessment, design and construction precision necessary for success increases significantly.

introduction

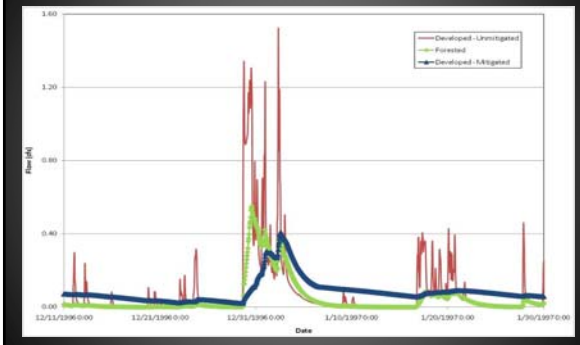
Puget Sound Conditions

Stormwater outfalls:

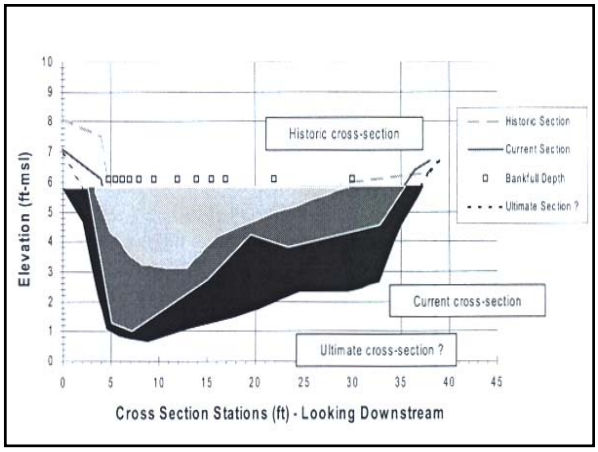
- 4,529 manmade.
- 2,123 natural drainages.
- 93 CSO.
- 297 WSDOT.

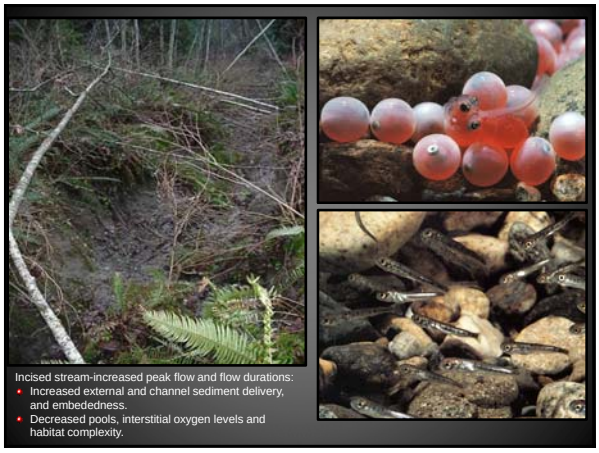
introduction

Peak Flow Control



introduction





Incised stream-increased peak flow and flow durations:

- Increased external and channel sediment delivery, and embededness.
- Decreased pools, interstitial oxygen levels and habitat complexity.

Comprehensive Stormwater Management Program

- Land use planning
- Standards equal to Ecology's
- Site plan review
- Construction site inspections
- Maintenance
- Source control
- Illicit discharges & problem response
- Existing problems
- Public education & involvement
- Watershed or basin planning
- Monitoring
- Stable funding
- Low impact development

From Puget Sound Water Quality Management Plan

introduction

Low Impact Development Principles and Practices

A land use development strategy that emphasizes protection and use of on-site natural features to manage stormwater.

Integrated engineered, small scale stormwater controls.

introduction

Low Impact Development Principles and Practices

Used at the parcel and subdivision scale: site scale necessary but not sufficient...regional land use planning critical for effective stormwater management.

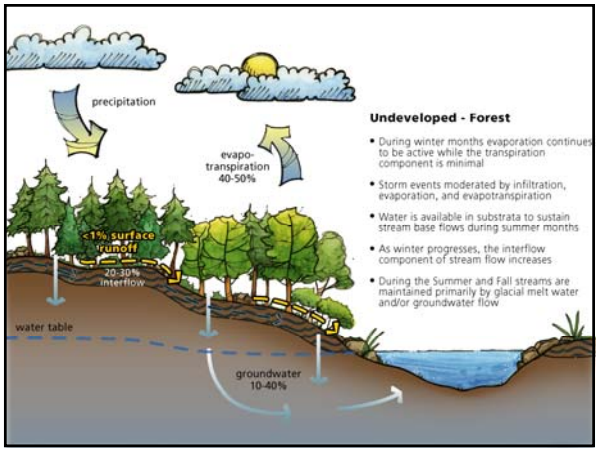
Primary goals: 1) no measurable impacts to receiving waters; and 2) maintain or more closely approximate pre-development surface flow volumes and durations.

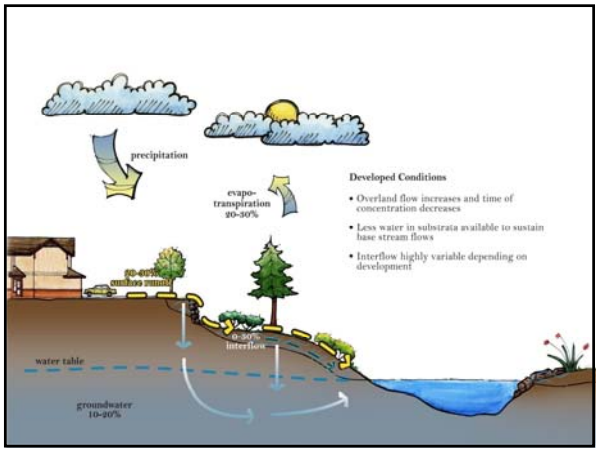
introduction

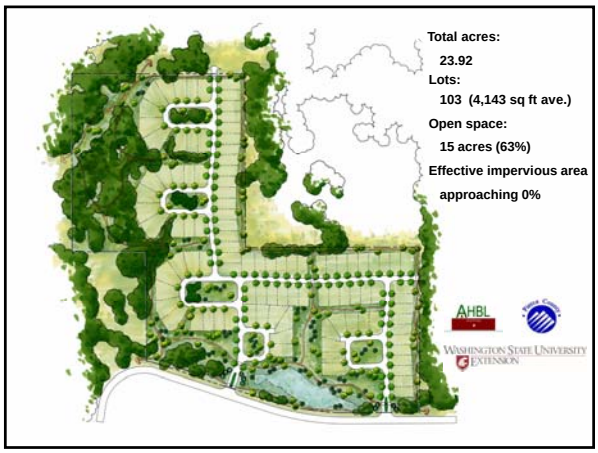
LID Objectives

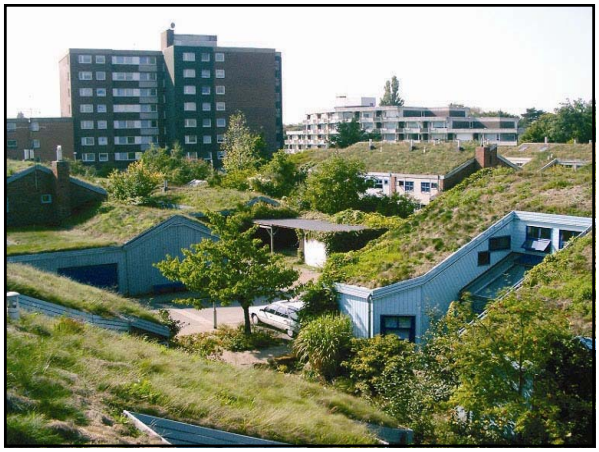
- Protect and restore native soils/vegetation.
- Reduce the development envelope.
- Reduce impervious surfaces and eliminate effective impervious area.
- Manage stormwater as close to its origin as possible.
- Integrate stormwater controls into the design—create a multifunctional landscape.
- Reduce concentrated surface flow, minimize stormwater contact with impervious surfaces, and increase stormwater contact with soils and vegetation.

introduction






Total acres:
23.92
Lots:
103 (4,143 sq ft ave.)
Open space:
15 acres (63%)
Effective impervious area
approaching 0%
AHBL
Washington State University
Extension




MAY 8 2002

Compost Amended Soils

Basic Bioretention Application

Shallow landscaped depressions that receive stormwater from small contributing areas.

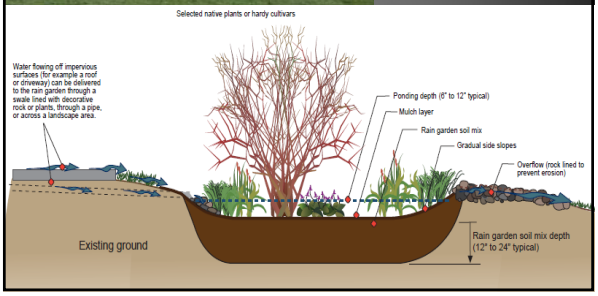
Soil mixes and plants selected to mimic native conditions.

Small scale, dispersed facilities integrated into the design as a landscape amenity.

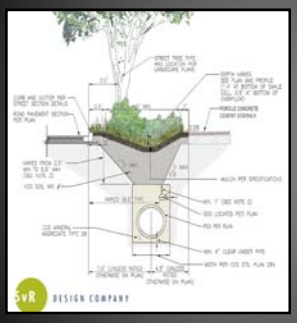
bioretention basics

Benefits of Bioretention

Anatomy of a Rain Garden



Anatomy of Bioretention



Often fitted with various under-drain configurations to manage larger flows in poorer-draining soils or for specific water quality treatment objectives.

bioretention basics


Photo by City of Maplewood MN


Photo by Filterra

Five Critical Design and Construction Factors

- Site assessment.
- Correct design specifications.
- Qualified installers.
- Erosion and sediment control.
- Maintenance.

bioretention basics

Application Trends

Photo by City of Maplewood MN

- Bioretention swales adjacent to roads and within right of way.
- Application of bioretention cells on single family lots increasing...in this region and nationally.
- Construction in dense settings requires careful sequencing and TESC.
- Most challenging design elements likely soil media and under-drains.

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Application Trends

SEA Street project, 2nd Ave NW, from NW 117th to NW 120th

- Hydrologic performance tending to exceed design expectations.

- **Approximately 98% stormwater volume reduction compared to pre-existing street design.**

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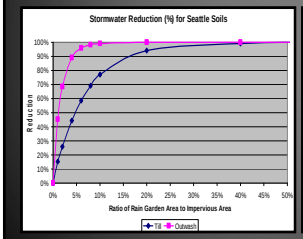
Myths

- Bioretention is not and effective flow control practice on till.
- Bioretention can not be used for water quality treatment in pollutant hot spots.
- Geotextiles necessary at the soil mix and native soil interface.



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