

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 principles and practices.
- | Trends in LID/GSI application.
- | Soil compaction and ESC.
- | Site planning tools to protect native soils and vegetation and create desirable communities.

low impact development technical workshop series

WASHINGTON STATE UNIVERSITY
EXTENSION

 HERRERA

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

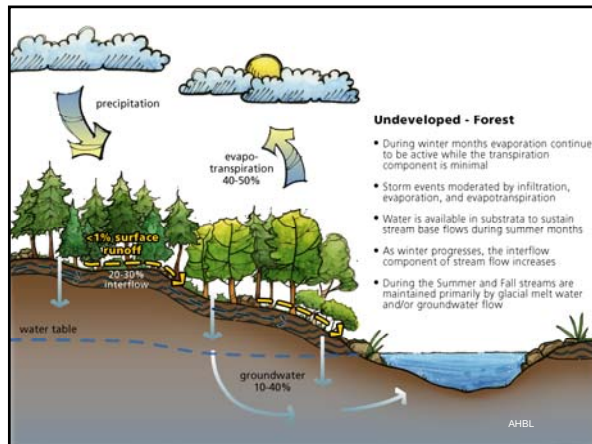


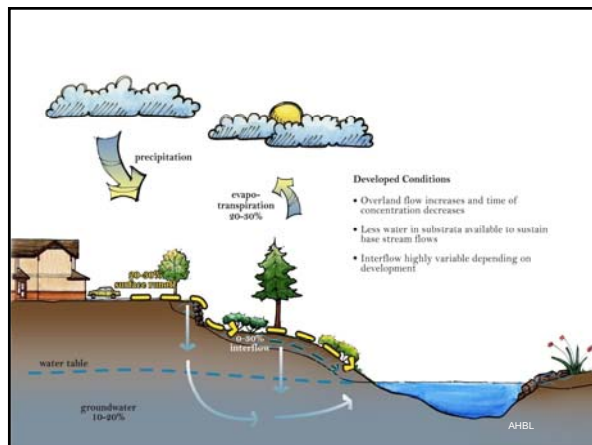
Used at the parcel and subdivision scale: site scale necessary but not sufficient...regional land use planning critical for effective stormwater management.



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

Comprehensive Stormwater Management Program

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

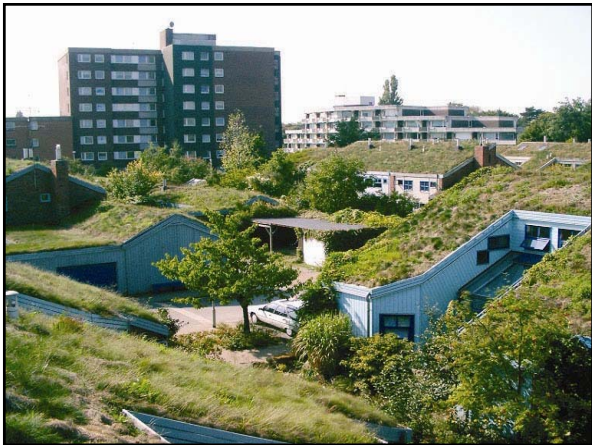
From Puget Sound Water Quality Management Plan

introduction















Integrating Nature Back into the Built Environment



City of Portland...
what happens when
you turn a bunch of
LA's loose.

Integrating Nature Back into the Built Environment



Headwaters
Apartments SW
Portland.



Integrating Nature Back into the Built Environment



Europe's lead driven
by regulation?



Hydrology redefining the urban landscape



GSI to protect receiving
water will significantly
change the built
environment aesthetic
and influence other
social and
environmental issues.



Whole Systems Design



Kroon Hall, Yale School of Forestry and Environmental Studies.



Solar array in Europe.



Re-tooling our education programs



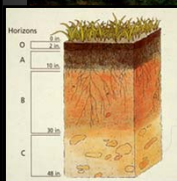
Innovation will require engineering programs that deliver interdisciplinary civil/hydrology/ecology degrees.

and us

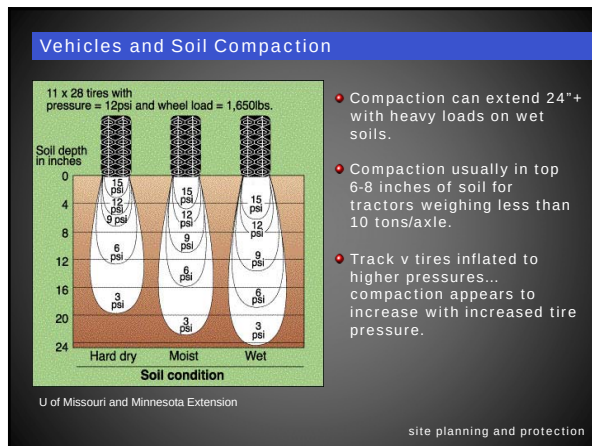


Soil Compaction and TESC

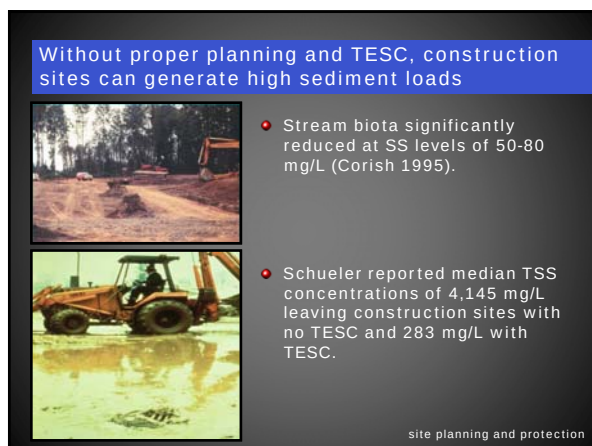
The typical construction approach is to strip, cut, fill and pound.



site planning and protection







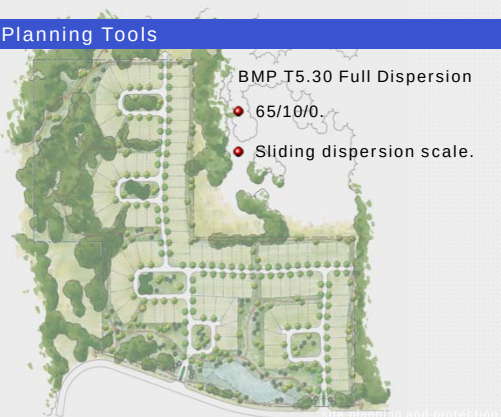
Minimizing site disturbance, as well as good TESC, necessary to protect aquatic resources



- Site design.
- Construction planning.
- Training.
- Equipment.

site planning and protection

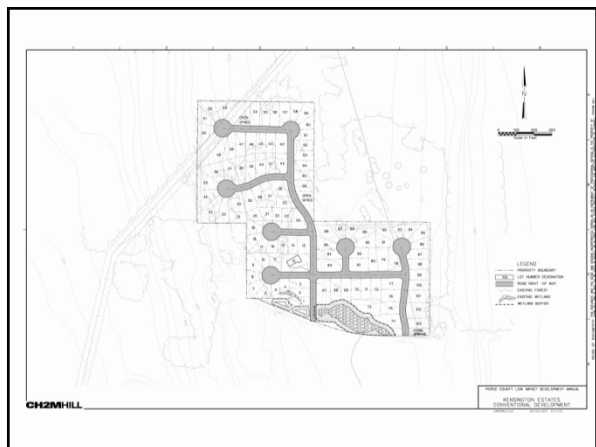
Site Planning Tools

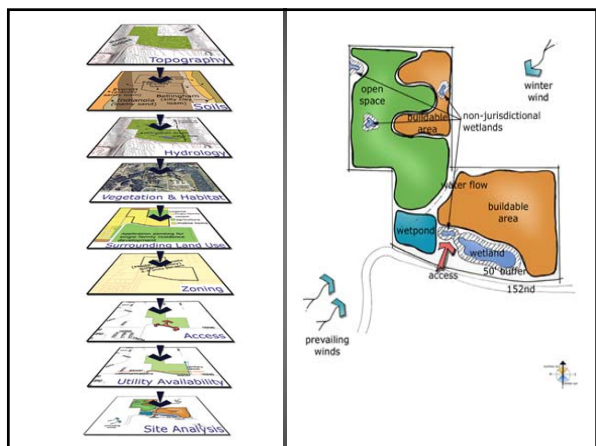


site planning and protection



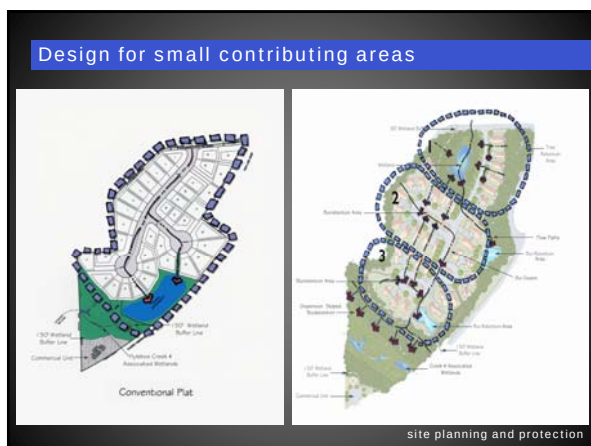








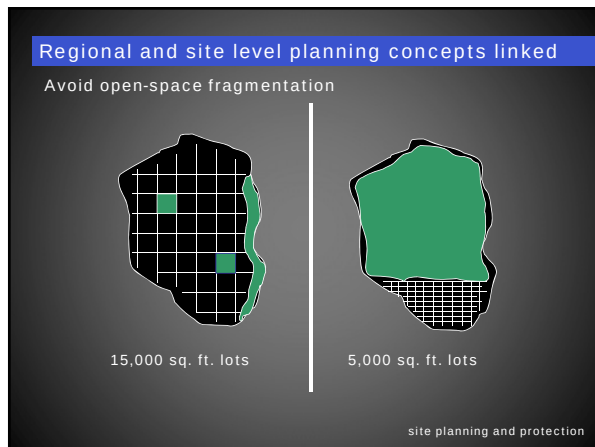


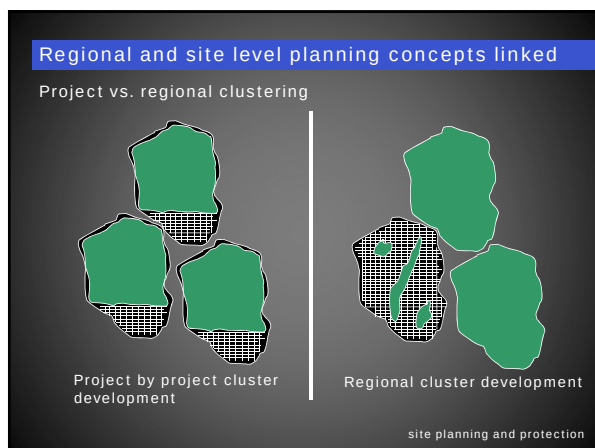


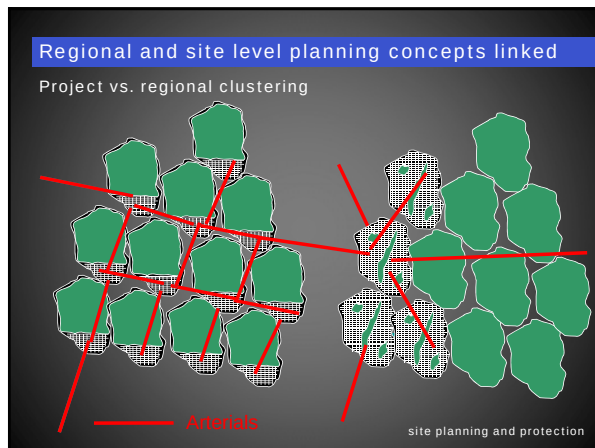
	Detention storage reduced (ft ³)	Detention storage required (ft ³)
Conventional development		270,000
Low impact development		
• reduce development envelope	-149,019	
• and use bioretention	-40,061	
• and use minimal excavation foundation	-7,432	
• and use 20' wide permeable road	-29,988	
Total	-226,500	43,500

Hydrologic modeling comparing a conventional development and the flow reduction benefits from individual practices for a low impact development design. The 24-acre till-mantled site in southern Puget Sound has 103 lots and was modeled with Western Washington Hydrologic Model (adopted from AHB, 2000).

site planning and protection

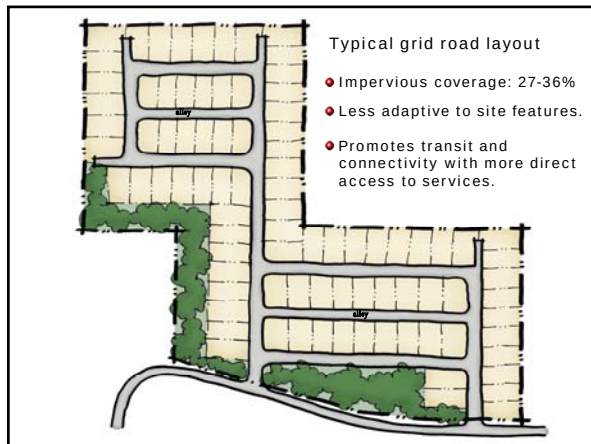


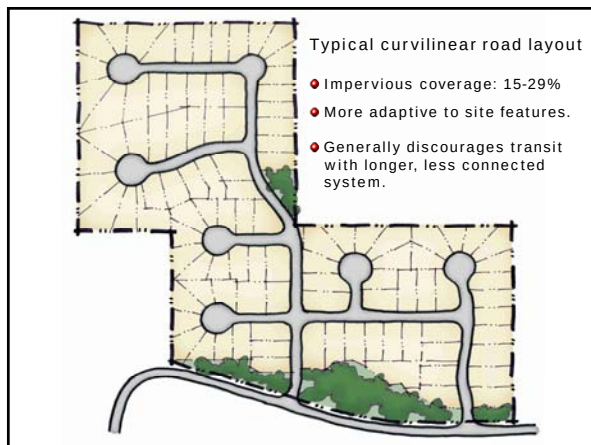














Streams and streets are linked

Street layout with 23 stream crossings
No local street crossings of stream corridors

Street layout with 63 stream crossings
Local stream street crossing standard across stream corridors (maximum of 125 ft.)

site planning and protection

DIVEWAY/STAGGERING

NISCONOMY/THEOTYLE

ROUNDABOUT/CIRCLE

NISCONOMY/TURN

residence

green street/ rain garden (bioretention area)

residence

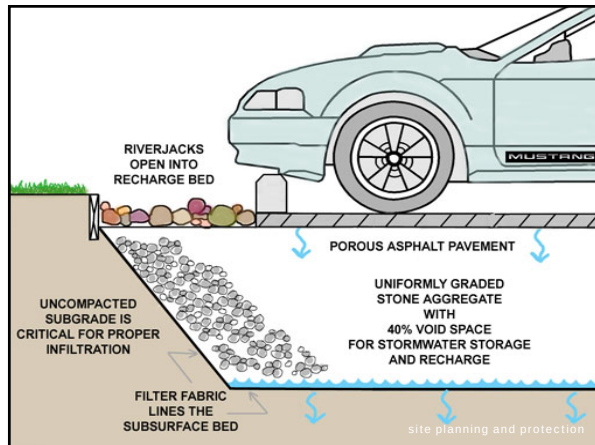
Concepts for parking lots



3.25 mi² of parking in City of Portland.

- Use landscaping areas for aesthetics and stormwater.
- Consider median or maximum parking instead of minimum standards.
- Parking layout.

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Working with small lots









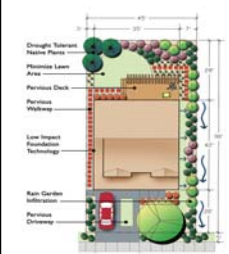
Working with small lots



Zero lot lines.

Small lots often require:

- Flexible code.
- Narrow side and front yard setbacks...consider fire and safety (sprinklers, fireproof siding).
- Effective use of open space and lot layout.







Rural cluster

30% reduction in impervious surface when lot size reduced from 1.4 to 0.25 acres (MD Office of Planning).



Increase in road network and driveways primary driver for impervious increase.

site planning and protection

Protecting Native Vegetation and Soils



It takes a village...and fines to protect trees and soil.

- Contractor training.
- Bonding/fines.
- Signage.

site planning and protection
