

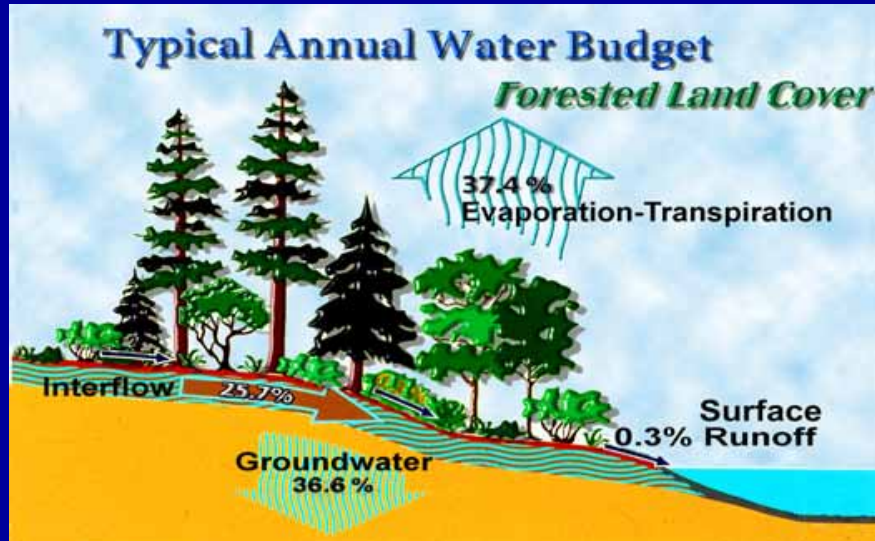
Low Impact Development

An innovative, ecosystem-based approach to land development and stormwater management

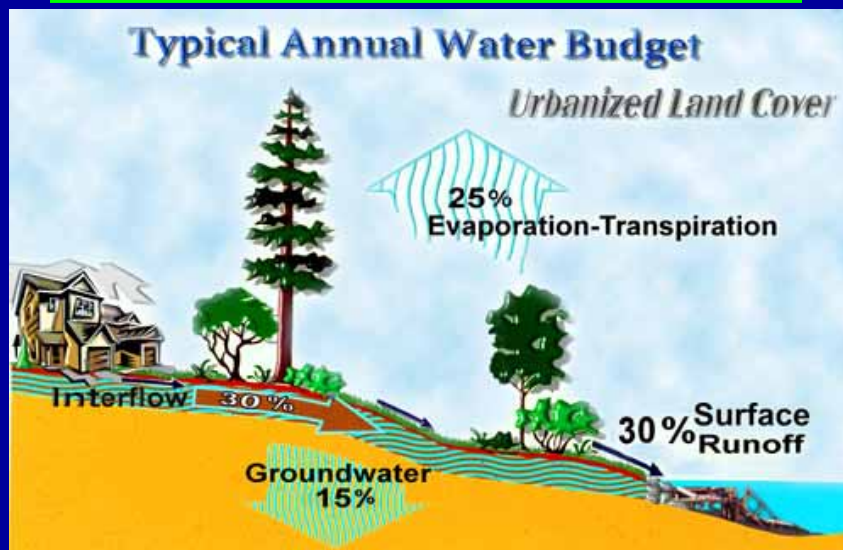
Presentation Highlights

- **Why We Need Low Impact Development**
- **Goals and Basic Principles**
- **Common Practices**
- **Projects and Studies**

Natural Conditions



Developed Conditions



Construction Impacts on Soils



How can we make residential developments function hydrologically like natural systems?



Remember this !!!

Roof runoff connected to
Driveways, draining to
Streets, draining to pipe systems
= dead fish, contaminated
shellfish, and thirsty people.

Primary Goal of LID

Design each development site to
protect, or restore, the natural
hydrology of the site so that the
overall integrity of the watershed is
protected.



Basic LID Principles

- 1. Conserve natural areas**
- 2. Minimize development impacts**
- 3. Maintain site runoff rate**
- 4. Use integrated management practices**

1. Conserve Natural Areas



- Conservation of drainages, trees & vegetation
- Land use planning
- Watershed planning
- Habitat conservation plans
- Stream & wetland buffers

2. Minimize Development Impacts

- Reduce storm pipes, curbs and gutters
- Preserve sensitive soils
- Cluster buildings and reduce building footprints
- Reduce road widths
- Minimize grading
- Limit lot disturbance
- Reduce impervious surfaces

3. Maintain Site Runoff Rate

- Maintain natural flow paths
- Use open drainage
- Flatten slopes
- Disperse drainage
- Lengthen flow paths
- Maximize sheet flow



4. Integrated Management Practices

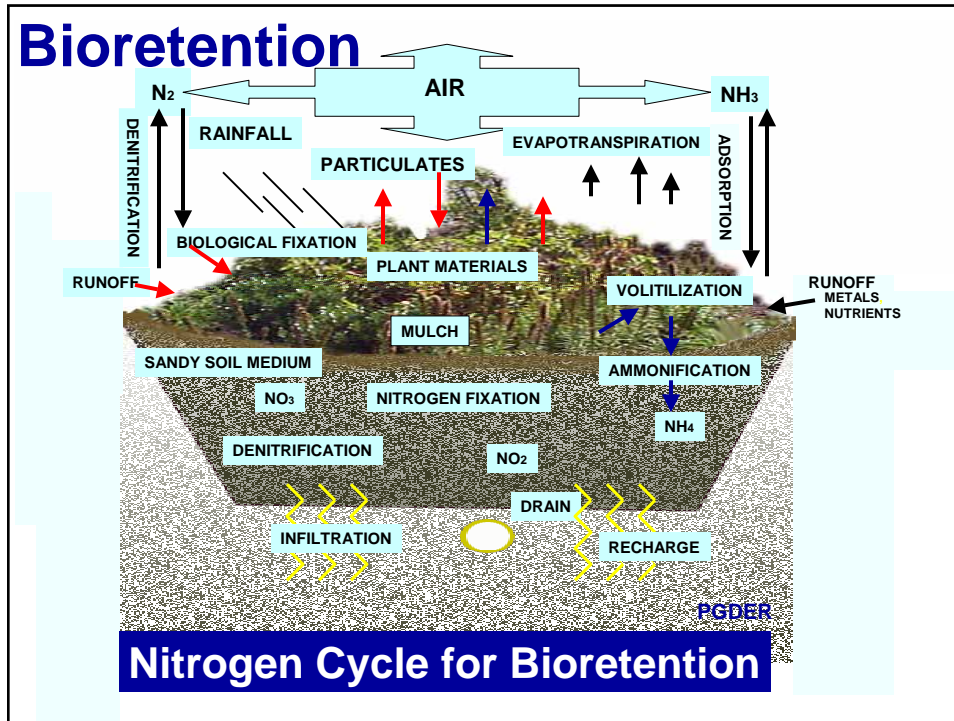
- **Small-scale stormwater controls**
- **Distributed throughout site**
- **Maintain flow patterns, filter pollutants and re-create or maintain hydrology**

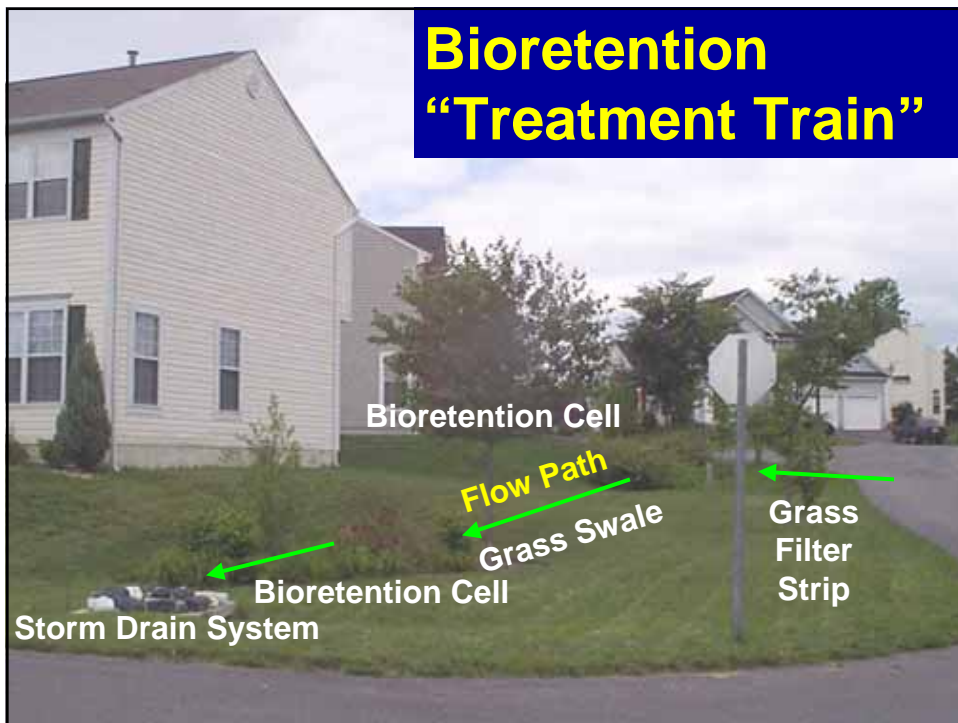
Common Integrated Management Practices

- Disconnectivity
- Bioretention
- Open Swales
- Green Roofs
- Soil Amendment
- Inlet Retrofits

Disconnectivity







Seattle's Street Edge Alternatives Program



Green Roofs



Soil Amendment

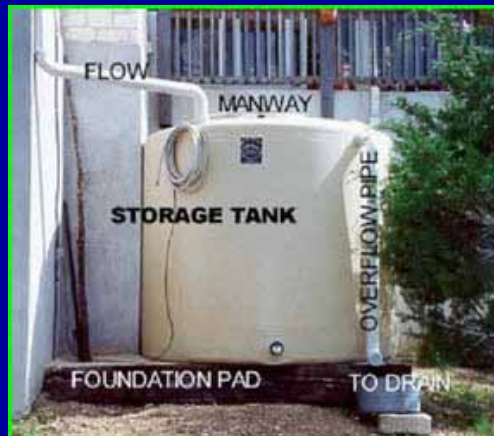


Soil aeration machine



Development at Redmond Ridge, where soils were amended to a depth of 12 inches.

Rain Barrels, Cisterns and Storage Tanks



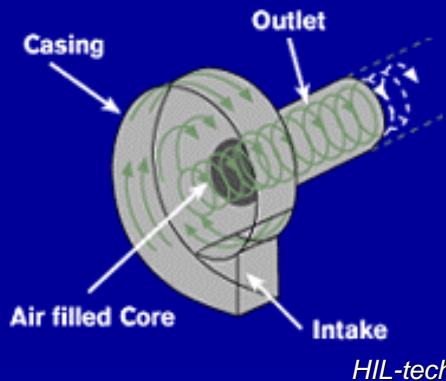
Inlet Control Devices



Snout

Floatables Removal

This prevents oils, grease, and trash from entering the storm drain system.



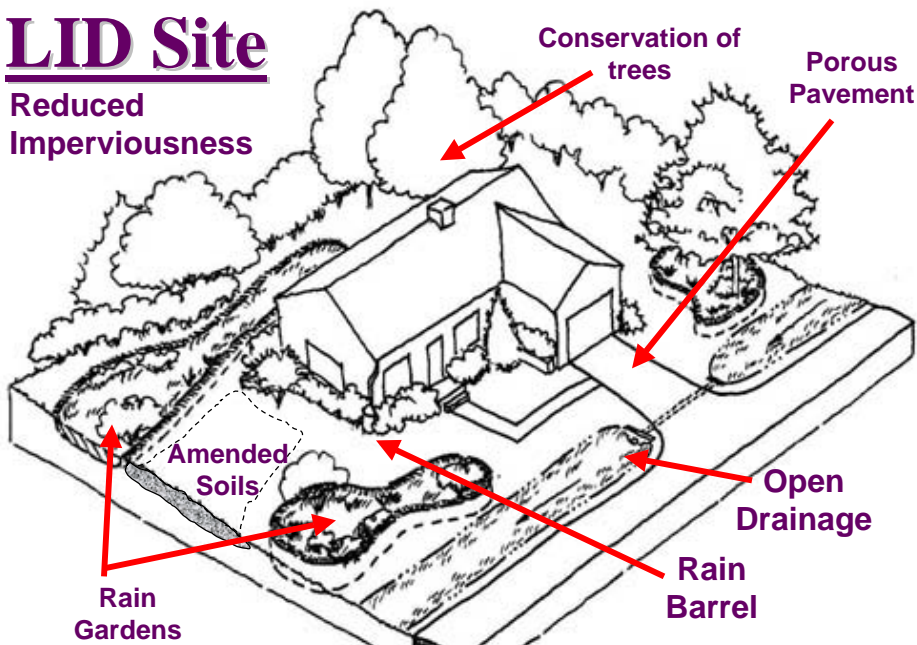
HIL-tech

Vortex Flow Control

The restricted opening reduces the peak flow rate, and eliminates debris from entering the system.

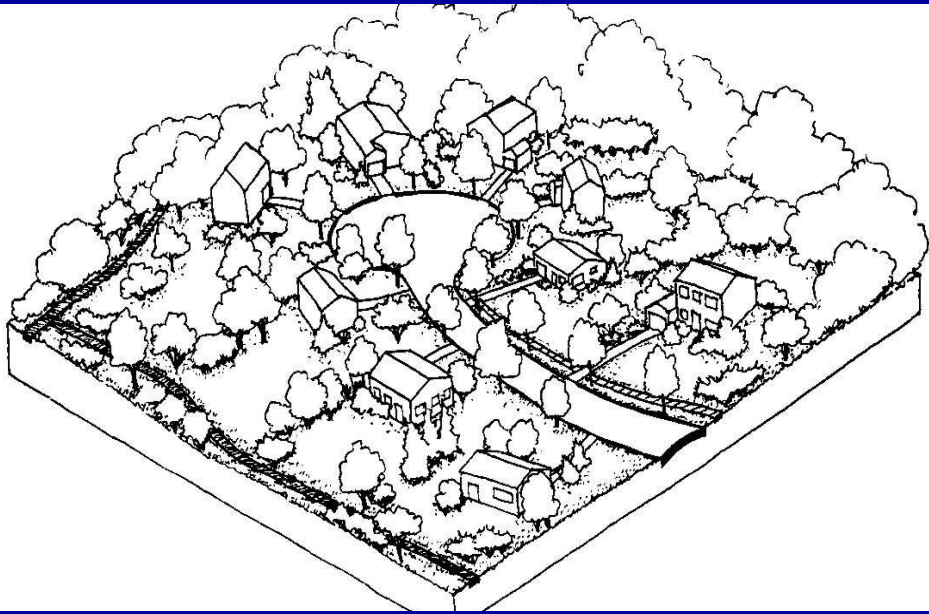
LID Site

Reduced Imperviousness



Create a Hydrologically Functional Lot

LID rebuilds ecological functions piece by piece.



Cumulative Beneficial Impacts of LID Techniques



**Tree conservation • Rain gardens
Narrower streets • Open drainage
On-lot detention storage and infiltration**

Comparing LID and Conventional Development

Conventional Development

LID Subdivision

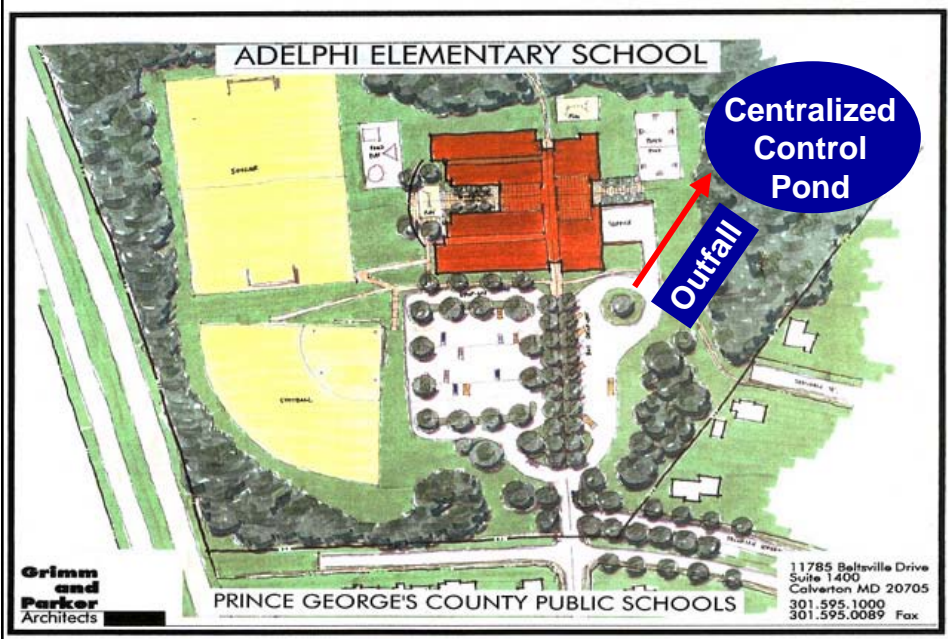


Two large stormwater ponds

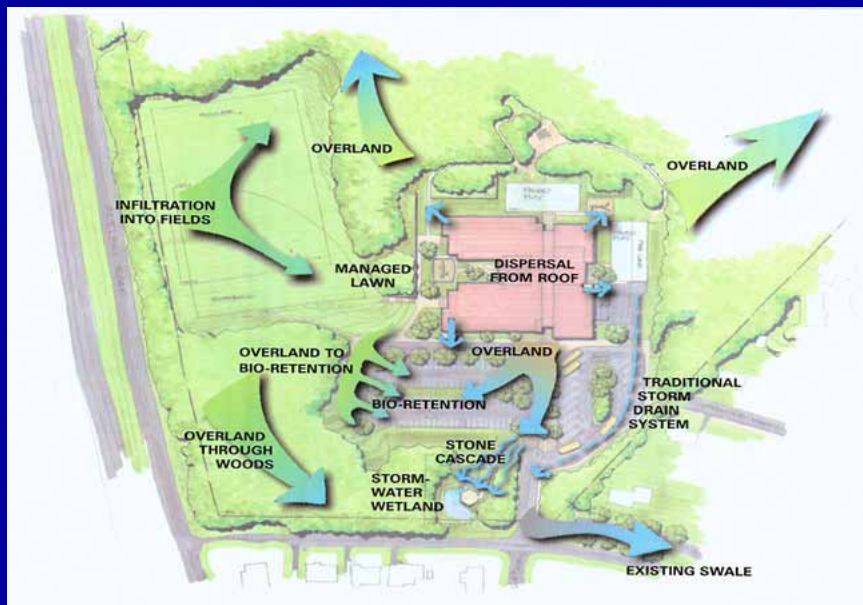


Topography, open swales, rain barrels, bioretention

Conventional Approach



LID Design



LID Implementation

- Identify and develop applicable regulations and requirements
- Use drainage/hydrology as a design foundation
- Reduce site imperviousness and minimize directly connected impervious areas
- Use sustainable integrated management practices
- Develop pollution prevention, maintenance, public outreach and education programs

Summary

- Development and stormwater runoff increases inland flooding, and degrades streams, fish habitat, shellfish beds and water quality in Buzzards Bay.
- LID is a new approach to land development and stormwater management that helps protect water resources and watershed hydrology.

For More Information

- Buzzards Bay Project
 - <http://www.buzzardsbay.org>
- The Low Impact Development Center
 - <http://www.lowimpactdevelopment.org>
- Stormwater Research Center
 - <http://www.stormwatercenter.net>
- U.S. Environmental Protection Agency
 - <http://www.epa.gov/owow/nps/bestnpdocs.html#urban>
- Bioretention homepage
 - <http://www.ence.umd/~apdavis/Bioret.htm>

Review- Primary Goal of LID

Design each development site to protect, or restore, the natural hydrology of the site so that the overall integrity of the watershed is protected. This is done by creating a “hydrologically” functional landscape.

Tihonet Site Characteristics

- Uneven topography
- Sandy, type “A” soils
- Good vegetative cover
- Uncompacted soil

Possible LID Practices at the Tihonet Project

- 1. Narrow streets**
- 2. No curb and gutter**
- 3. No pipes**
- 4. 50' to 75' road buffer**
- 5. 300' pond buffer**
- 6. Limited building envelope**

Narrow Streets

Narrow streets reduce the amount of impervious surfaces, thereby reducing flooding and pollution from storm water runoff.

No Curb and Gutter

Avoiding the standard curb and gutter road design allows water to flow off the road and not accumulate in any one spot.

No Pipes

Piping drainage:

- Decreases the opportunity for infiltration
- Increases runoff velocities
- Limit LID opportunities

50' to 75' Road Buffer

- The road buffer is natural area for the road runoff to be discharged
- The buffer disconnects road, driveway, and house.
- “Disconnecting” the impervious surfaces on this project reduces the impact of development by 50%

300' Pond Buffer

- Allows for natural treatment of pollutants
- Allows opportunity for soak-in.

Limited Building Envelope

Limiting lot disturbance decreases runoff and reserves areas for natural infiltration.

LID Helpful Hints

- Crown road
- Limit all work to designated areas
- On site inspection to ensure compliance

Summary

- **Development and stormwater runoff have degraded streams, fish habitat, shellfish habitat and water quality.**
- **Sites with large lots, sandy soils, and uneven topography provide opportunities to limit the impacts associated with storm water runoff.**
- **LID techniques can also be used on smaller, more densely developed sites, with tighter soils**

Credits

- **Much of this Power Point presentation was taken from “Low Impact Development in Puget Sound – Innovative Stormwater Practices” prepared by the Puget Sound Water Quality Action Team.**