

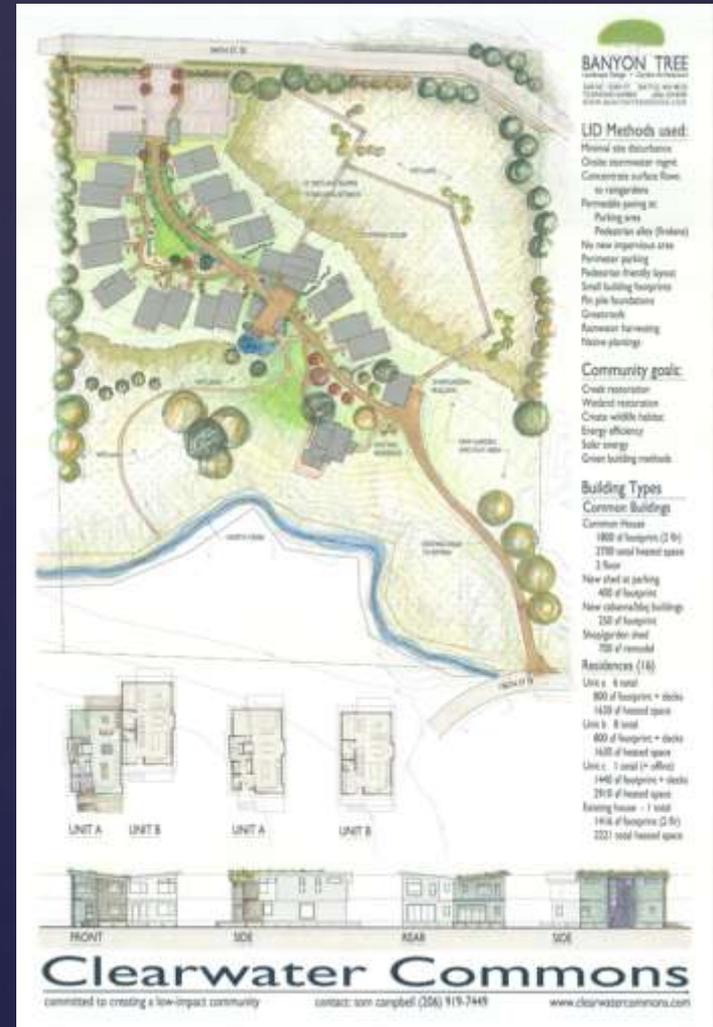


# Low Impact Development

Lisa Port APLD, Banyon Tree Design Studio  
WALP –King and Snohomish Counties Chapter Meeting  
An education initiative funded by the Department of Ecology

# Low Impact Development

- What is LID?
- Stormwater
- Regulations and Changes
- LID features / BMPs
- Opportunities



# Low Impact Development

- A stormwater and land use management strategy
  - Strives to mimic pre-disturbance hydrology
  - Utilizes infiltration, filtration, storage, evaporation and transpiration processes
  - Emphasizes conservation, use of on-site natural features, site planning and distributed stormwater management practices
  - Integrated project design

# LID Principles

- Conservation
  - Trees and existing plants
  - Existing healthy topsoil
- Minimize
  - Impervious surfaces
  - Site disturbance
  - Native vegetation loss
  - Stormwater runoff



# LID Best Management Practices

- Distributed stormwater management practices include elements such as:
  - Rain gardens and bioretention facilities
  - Permeable pavements
  - Roof downspout controls and dispersion
  - Soil quality and depth
  - Minimal site and excavation disturbance
  - Vegetated roofs and walls
  - Use of native plants





1

Rainwater soaks through two types of porous concrete installed at the fairgrounds entrance.



2

Three rain gardens infiltrate parking lot runoff and filter pollutants.



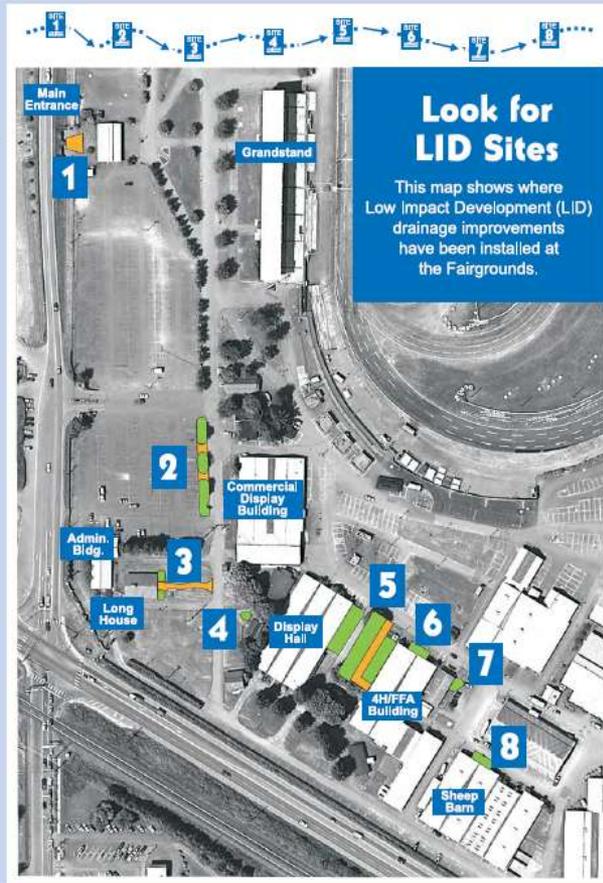
3

Porous walkway includes porous concrete and colored pavers to create Native American art mosaics.



4

Rain garden near historic Shannahan Cabin infiltrates local runoff.



Compost amended soils, porous asphalt, and porous pavers infiltrate rainwater in stage area.

5



Biofiltration planter box infiltrates roof runoff.

6



Rain garden infiltrates runoff from roof and adjacent paved areas.

7



Biofiltration planter box infiltrates roof runoff.

8



# LID at the Evergreen State Fairgrounds, Snohomish County

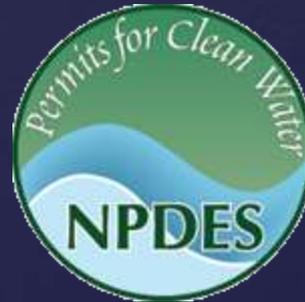
# Stormwater

- Impervious Surfaces
  - Roads, driveways, parking lots
  - Roof area
  - Lawns
- Pollutants
  - Oil
  - Heavy metals
  - Phosphorous
  - Silts
- Affected Natural Areas
  - Wetlands
  - Streams
  - Water bodies



# Stormwater is Regulated

- Federal Clean Water Act
- National Pollution Discharge Elimination System (NPDES)
- Washington State Department of Ecology
- Municipal permits



& The Department of Ecology is making regulatory changes to stormwater management and the use of low impact development (LID) to address the negative impacts of stormwater runoff in our urban and natural landscape.



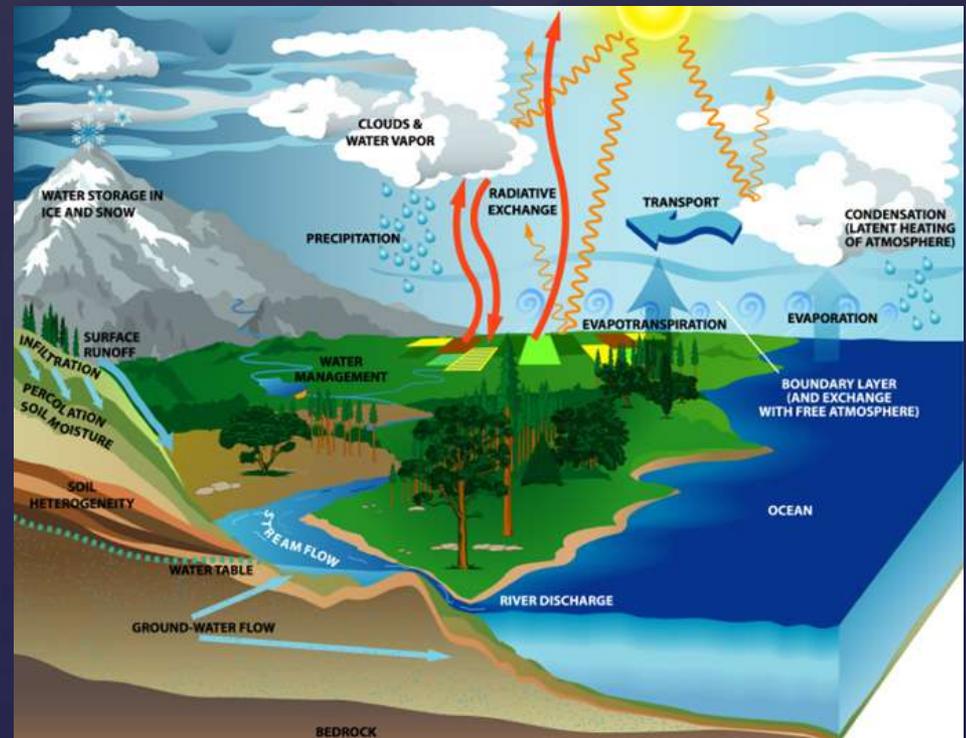
# Regulatory Changes are Coming

- Western Washington - LID will be required in new development and re-development
- Eastern Washington - LID allowed
- Deadline to adopt regulation depends on population size
  - Earliest: June 2015
  - Most will adopt by: December 2016
  - Latest: June 2018

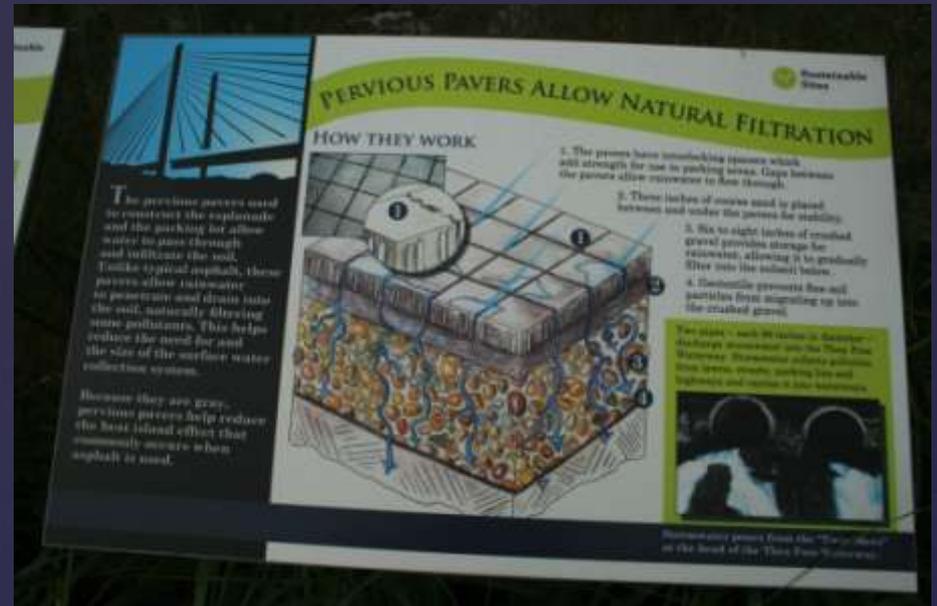


# LID Benefits

- Reduces and slows stormwater runoff
- Protects water quality
- Restores ecosystem services including:
  - Water infiltration
  - Groundwater recharge
  - Pollution interception and filtration
  - CO2 sequestration
  - Protection of habitat



Hydrologic (water) cycle



LID BMPs -  
Permeable pavement



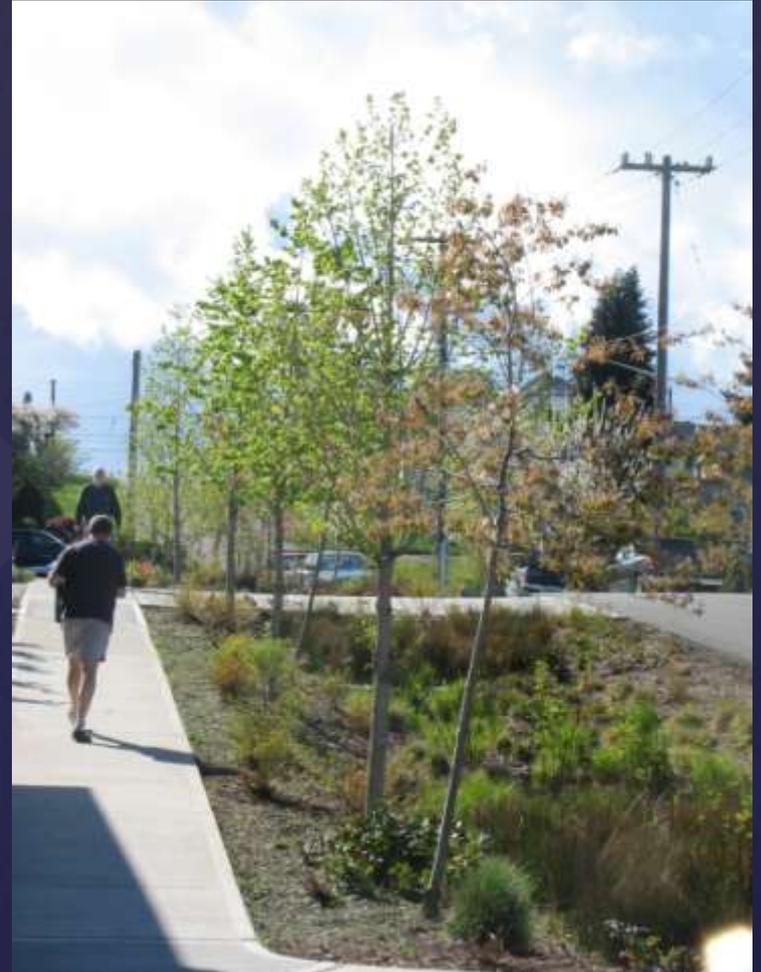
Center for Urban Waters, Tacoma



Cisterns, native plant use, swales, rain gardens, electric car charging sites, signage

- Planted depressions designed to capture, infiltrate and filter stormwater
- Amended soils or designed soil mix with high organic matter content (35-40%) to increase water infiltration
- Utilizes native plantings, and regionally adapted species suited to their environmental conditions

# Rain Gardens



Private residence, Portland



Tanner Springs, Portland



# Rain Gardens

Spring St. Friday Harbor, WA



Private Residence, Seattle



# Rain Gardens

Clearwater Commons, Bothell

Native plant installation



# Rain Garden/Bio-Swale

Bio-swales convey stormwater from run-off area to another LID feature; rain garden, bio-retention, etc.



Compacted soils



Negative drainage,  
too narrow?

# Bio-Swales done poorly?

# Bio-retention

Engineered facility with specific design, sizing and modeling to store and treat stormwater by passing it through a designed soil mix often with under drains and control structures.





Lake City Fire Station, Seattle



Broadview Library, Seattle

# Bio-Retention



Overgrown or pleasantly filled in?



Is this a design or maintenance flaw?

# Bio-retention, 2 years old



**Private development with public access, Friday Harbor, WA**



**Private residence, Seattle WA**

# Bio-retention

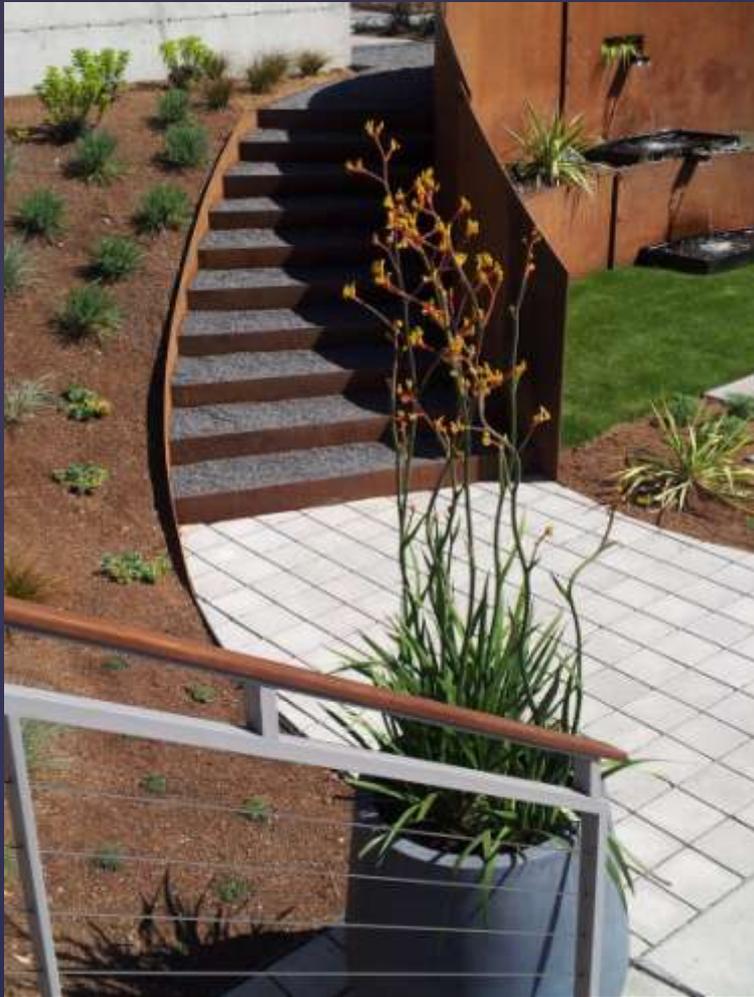
# Permeable Pavement

Pervious concrete, porous asphalt and permeable pavers allow passage of water through the pavement and into the ground reducing and filtering stormwater. Stormwater is filtered when passed through the pavement into a subgrade of appropriate native soils or an engineered treatment layer.





# Pervious Pavers



# Pervious Pavers

Roofs layered with waterproofing materials, growing medium and vegetation designed to slow stormwater.



Vegetated Roofs



# Vegetated Roofs

The accumulation of rain water for re-use, stored in cisterns or barrels above or below ground.



Rain Water Harvesting



Creative and aesthetic  
applications

- As new development and redevelopment occur an increasing amount of LID will be required.
- Opportunities for participation in design, installation and maintenance will exist on:
  - Commercial property
  - Public land
  - Right of ways
  - Private property

# Opportunities





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Thank you!

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