Hydromodification: A Regulatory Perspective

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US EPA Region 9
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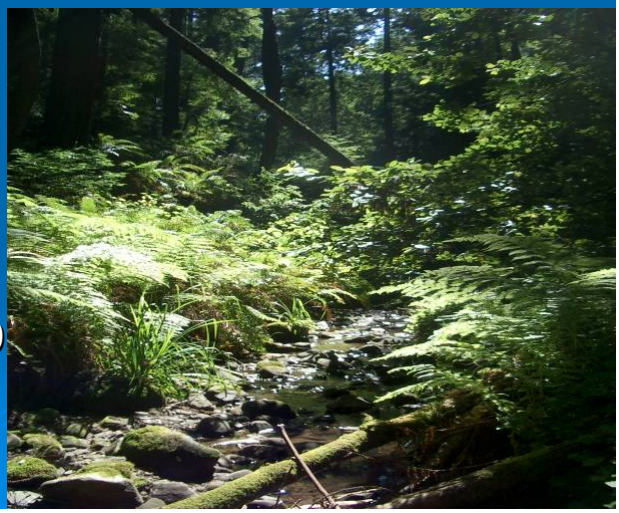
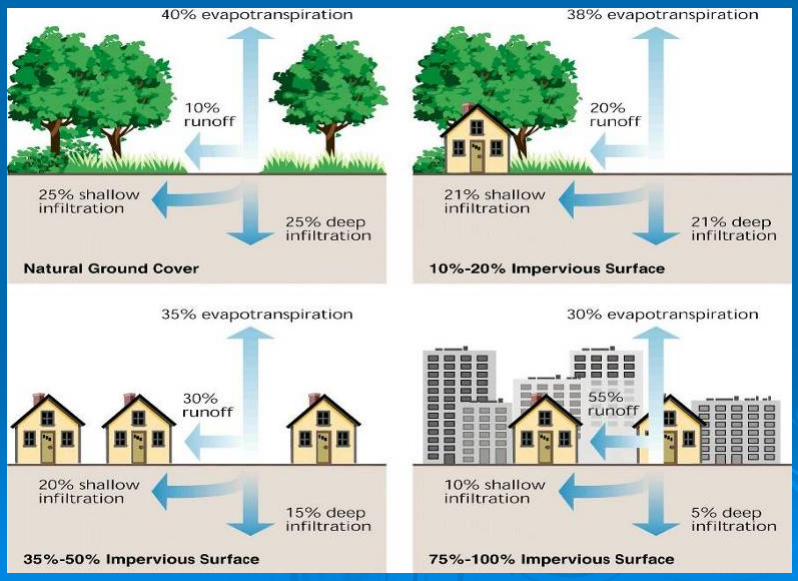


Impacts of Development on Water Resources

1) Increase Impervious Area
2) Increase Pollutant Runoff
3) Habitat/Resource Destruction

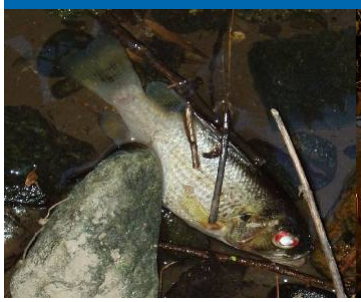
Increase in Impervious Area



Habitat/Resource Destruction

Pollutants in Storm Water Runoff

- oil, grease
- heavy metals
- sediment, trash
- temperature
- pesticides, herbicides



Impacts

- Changes to the natural hydrology, drainage
- Land cover changes, increased overland flow
- Physical impacts on receiving streams
- Transports pollutants that have collected on impervious surfaces
- Diminished Infiltration, interception and evapotranspiration rates

Increase in Impervious Area

- Erosion
- Loss of pool & riffles
- Loss of vegetation & riparian canopy
- Decrease in dry weather flow regime

Storm Water Management

- Management of storm water has primarily relied on BMP implementation for limiting pollutant levels in MS4 effluent.
- No specificity in permits on the compliance requirements.
- Appropriate in the past because lack of knowledge on tools and technology.
- But, storm water control efforts have not been successful; water quality goals not achieved

Objectives

- Achieve **water quality** improvements
- **Reduce** pollutant discharges
- Improve management of storm water (**LID** tools)
- **Minimize alteration** of hydrologic characteristics of waters (storm water discharge, velocities, or duration are maintained or reduced)
- **Minimize flow**
- **Prevent** increased erosion, protect habitat in natural drainage systems
-

EPA Recommendations

- Use Low Impact Development to minimize storm water generation, thus reducing storm water pollution, mimic natural hydrology
- Advocate green infrastructure as an approach to wet weather management that is cost-effective, sustainable, and environmentally sound

Low Impact Development (Green Infrastructure)

- New approach to stormwater management

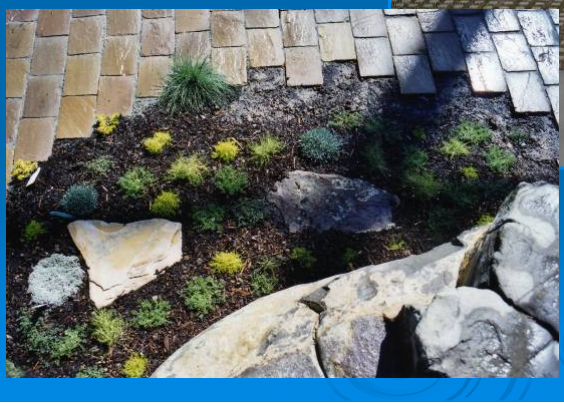
- Cost-effective
- Sustainable
- Environmentally friendly

Low Impact Development Concepts

- Preserve environmentally sensitive areas
- Reduce sources of pollution
- Minimize impervious areas
- Remove direct connections
- Utilize Natural systems

LID: Minimize impervious areas

- Permeable and porous pavement



Porous pavement & raingarden

LID: Parking Lots Infiltration, Retention

Parking lot treatment- vegetative buffer strip

Green Infrastructure

- Utilize natural systems & engineered systems to:
  - mimic natural landscapes,
  - capture, cleanse and reduce stormwater runoff using plants, soils and microbes
- Maximize Stormwater
  - Infiltration
  - Evapotranspiration
  - Storage for re-use

Tools to Minimize Hydromodification

- Implement LID strategies to increase infiltration (limits on effective impervious area)
- Hydromodification BMPs (e.g., post construction BMPs)
- In-stream restoration
- Develop, implement watershed-specific hydromodification control strategies

Metrics to Minimize Hydromodification

- New developments include buffer zones a certain distance from riparian zones or water.
- New development, redevelopment projects mush establish a post-development water balance which replicates pre-project runoff (e.g., porous pavements, tree planting)

Examples

- No change Pre- and Post- Development (RB 8)
- 5% EIA (Ventura County MS4 Permit)
- Hydromodification Management Plan (SD County MS4 Permit)
- 12% impervious cover cap (Barberry Creek TMDL, Maine)
- New Jersey, Portland, Seattle, Washington D.C., Maryland

Barberry Creek TMDL, Maine

- Impairment due to pollutant (metals) and non-pollutant (stream habitat, baseflow) stressors related to storm water runoff from developed areas.
- Sources of storm water from City of South Portland & overland runoff from a highly urbanized drainage area
- Existing Load = 23% IC
- **TMDL: Total extent of impervious cover (%IC) in watershed capped at 12%**

EPA Region 9

- **Advocates LID strategies**:
- Infiltrate, evapotranspire, capture and reuse storm water to maintain or restore natural hydrologies and improve water quality

- **Encourage permitting agencies to incorporate LID provisions into MS4 permits as clear, enforceable, measurable requirements which result in water quality improvements**

LID Resources

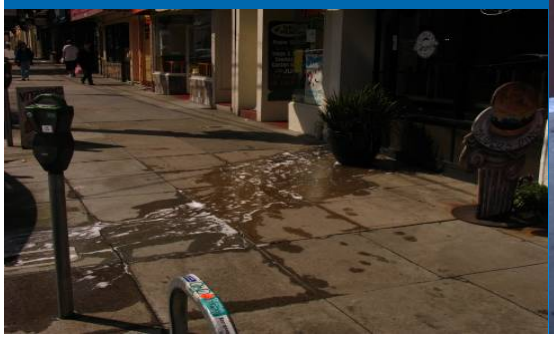
- www.epa.gov/NPDES/GreenInfrastructure
- California Stormwater Quality Association BMP Handbooks. www.CASQA.org
- www.lowimpactdevelopment.org
- "Start at the Source" - Bay Area Stormwater Management Agencies
- Alameda Countywide Clean Water Program Site Design Guidebook
  - www.BASMAA.org

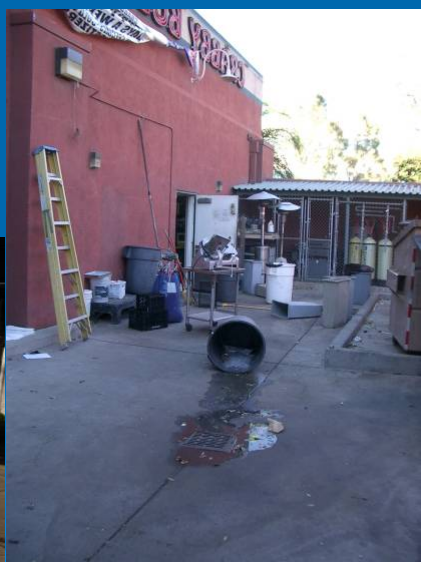
Thank You

LID: Reduce sources of pollution

Site design to contain or treat/recycle washwater

- Restaurant Areas –
- Vehicle washing area –

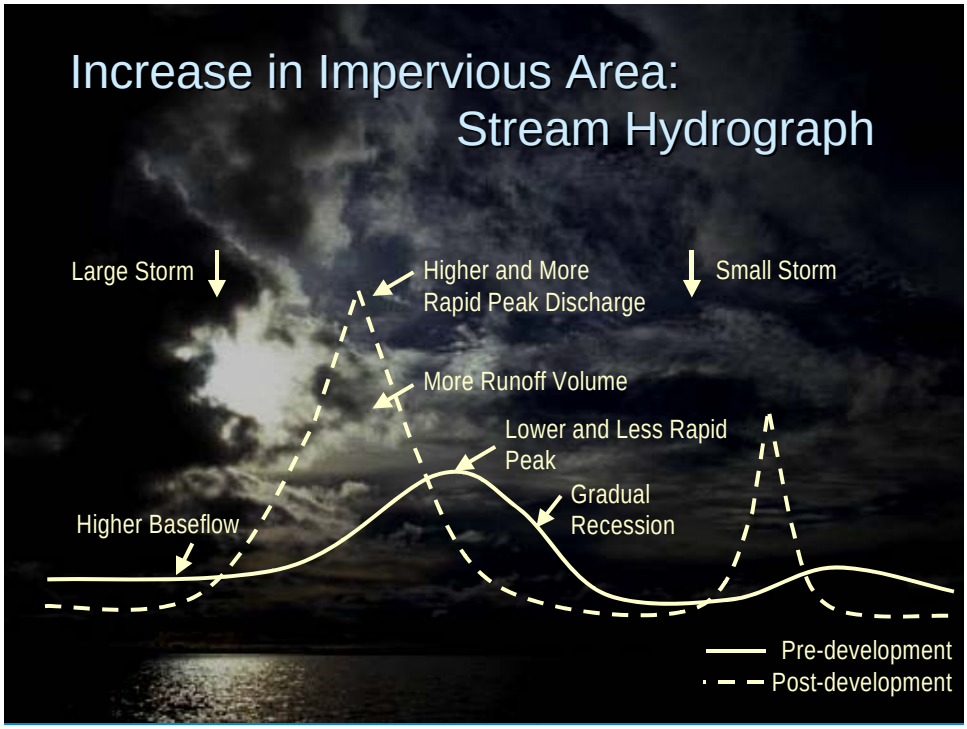




LID: Reduce sources of pollution

Site Design to prevent exposure (shed/cover) or contain and treat washwater

- Material Storage -
- Trash dumpsters -
- Fueling area -


Increase in Impervious Area:
Stream Hydrograph
Large Storm
Higher and More
Rapid Peak Discharge
Small Storm
More Runoff Volume
Lower and Less Rapid
Peak
Gradual
Recession
Higher Baseflow
Pre-development
Post-development


Porous
Asphalt
Standard
Asphalt
CAHILL ASSOCIATES
Environmental Engineers,
Scientists, & Planners
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LID: Preserve environmentally sensitive areas

- Wetlands
- Stream Buffers
- Springs
- Habitat areas/native vegetation
- Maintain natural drainage paths
- Mature trees

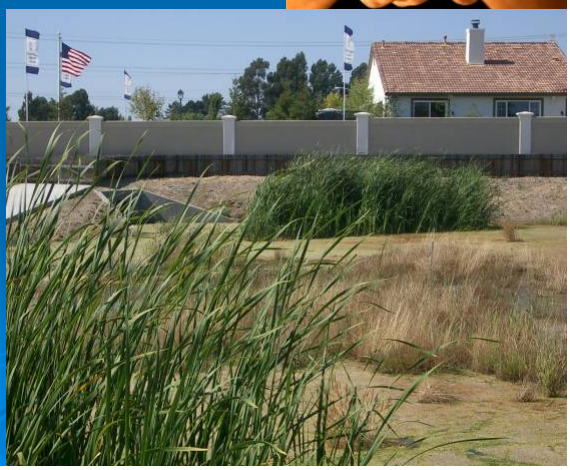
Pollutants Generated from:

- Construction
- Parking lots
- Maintenance areas
- Material storage areas
- Restaurant washing
- Trash storage

- Photo: California Nevada Cement Council

Multiple Benefits

- Reduce pollutants
- Maintain natural hydrograph
- Cost Effective
- Increase property values
- Climate change
- Maintain habitat



LID: Remove Direct Connections

Parking lot drains to swale

Disconnect
Roof Drains

Photo from Alameda Countywide
Clean Water Program

LID: Parking Lots
Infiltration, Retention

Grassy Swale

LID: Bioretention, Raingardens

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