



9 - Low Impact Development

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Module Content

- LID Definition and Objectives
- Importance of applying LID early in the site design process
- LID Design Principles



Green Infrastructure

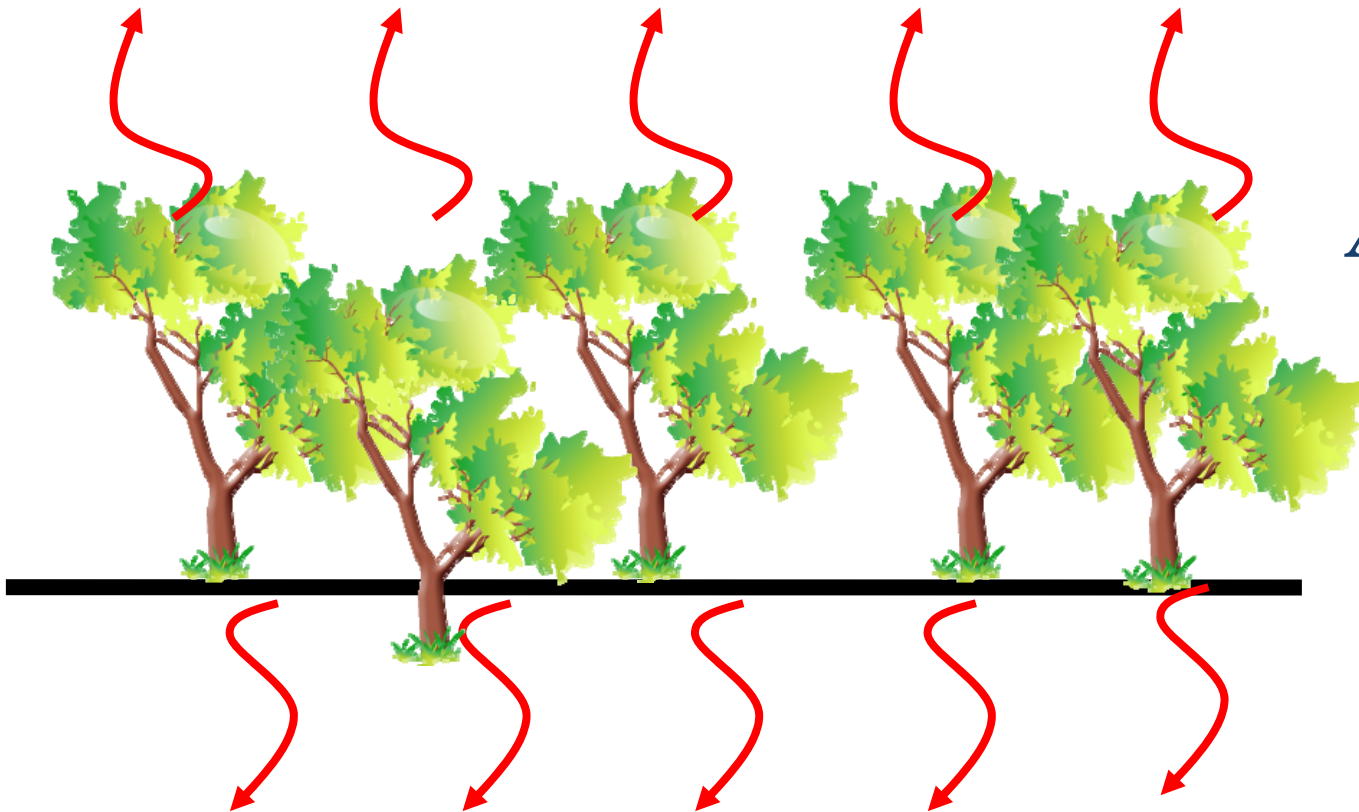


- Use soil and vegetation
- Reduce stormwater volume
- EPA's GI message:
 - Maintains healthy waters
 - Can mimic "natural" hydrology
 - Provides other environmental benefits
 - Supports sustainable communities



Runoff Reduction Pathways

Evapotranspiration (“up”)



*Alternate Use
 (“out”)*



Infiltration (“down”)



Green Infrastructure includes...

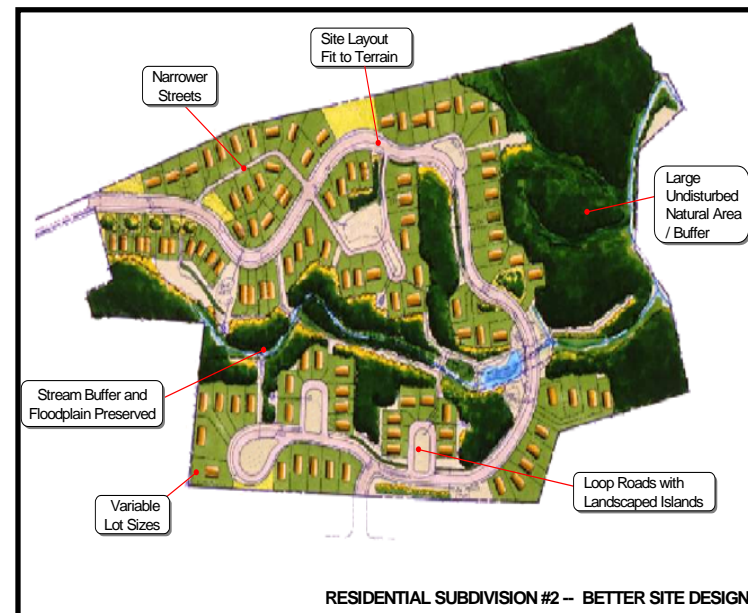
Low Impact Development

- Pocket Parks
- Parks/Greenways
- Cluster development
- Walking trails
- Open space plans
- Urban Forest areas
- Water features
- Stream buffers
- Recharge zones
- Pavement reductions



What is Low Impact Development

- The use of fundamental site layout, hydrologic, and stormwater management concepts applied early in site planning
 - Integrates the development with the natural topography
 - Reinforces the site's natural hydrologic characteristics
 - Makes use of the natural soils & vegetation for stormwater control



The Early Bird Gets the Worm!

➤ Apply LID early

- Ideally, as early as development tract speculation
- Start applying LID practices during site layout activities

➤ Why?

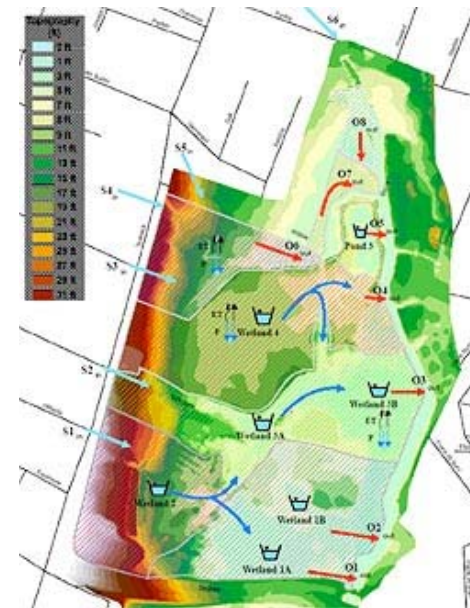
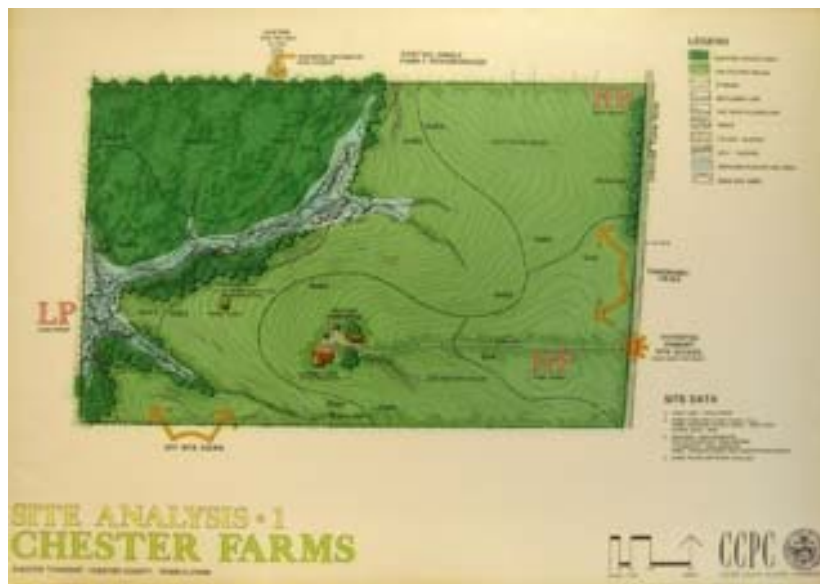
- LID designs will have a lower *weighted Rv* than traditional designs
- Once a site layout is set, variations are more difficult
- Can result in lower infrastructure cost
 - Less runoff = Less infrastructure need
- Preservation costs less than Restoration
 - Re-establishing vegetation and soils cost \$\$



LID Design Principle 1

1. Identify and Map Natural Feature and Resources

- Areas of undisturbed soils and vegetation
- Floodplains and riparian areas
- Natural drainage pathways
- Ridgetops and steep slopes
- Streams, wetlands, ponds, springs, seeps
- Aquifers and recharge areas
- Wetlands
- Hydrologic soil groups
- Other critical areas
- Adjacent land cover, existing infrastructure



LID Design Principle 2

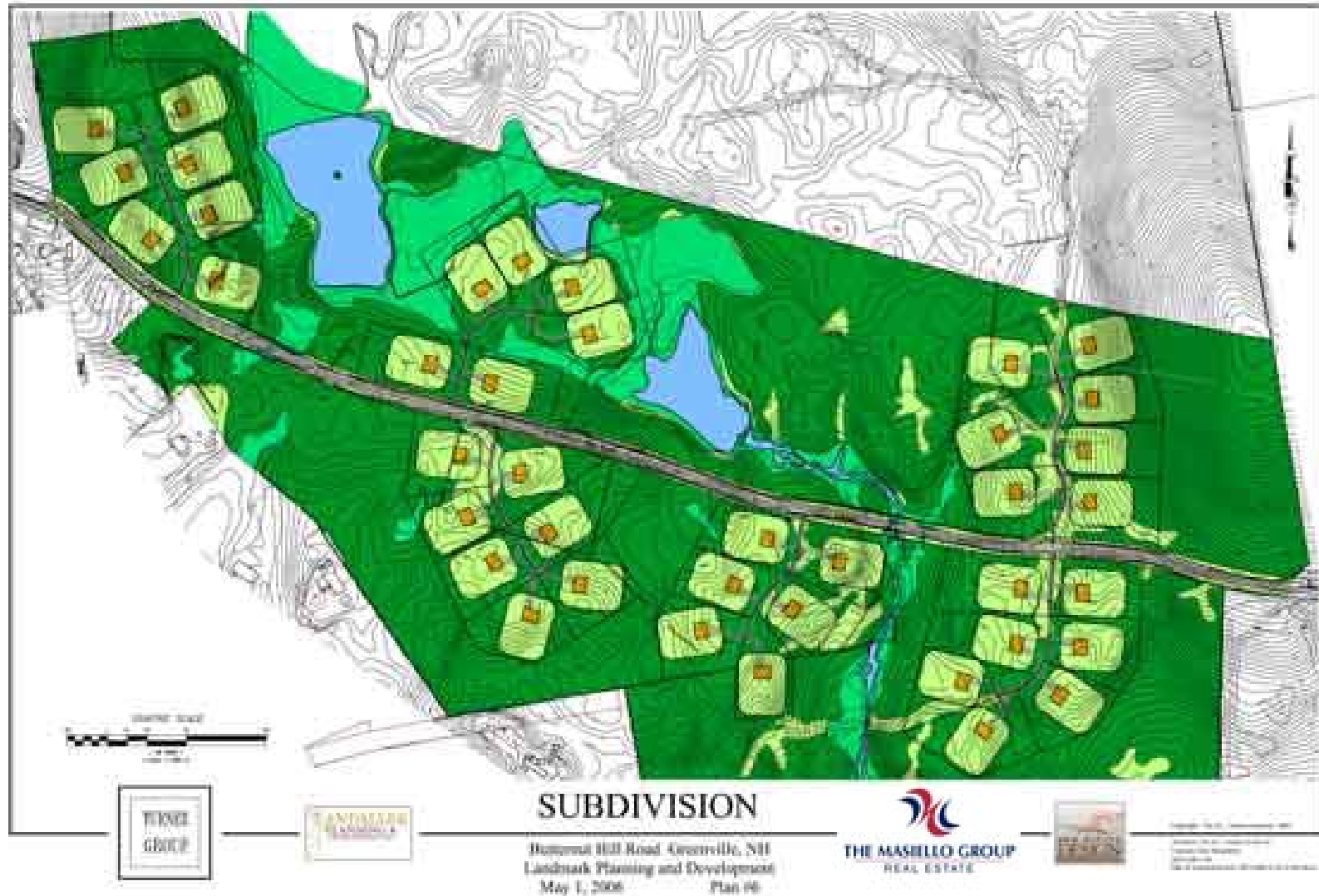
2. Conserve Natural Features and Resources

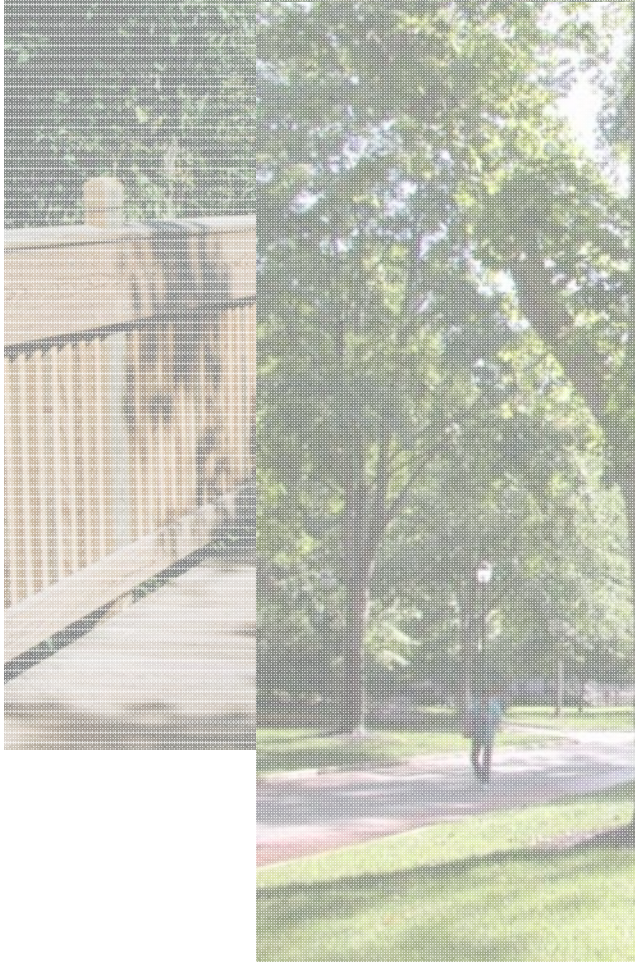
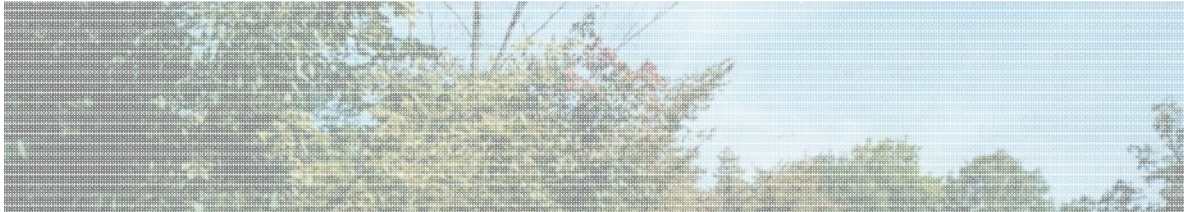
- Purpose: Retain pre-development hydrologic function
 - Avoid mass grading, limit grading and construction to minimum necessary
 - Locate buildings HSG C and D soils
 - Limit construction activities to least porous soils and un-compacted soils
 - Preserve riparian buffers, floodplains and steep slopes
 - Include natural open spaces in site plan
 - Link to natural landscape connections (e.g., greenways, blueways, forests, etc.)



Natural Feature Conservation Example

Source: Landmark Planning & Development LLC





LID Design Principle 3

3. Manage Stormwater Close to the Source

- Purpose: Mimic pre-development hydrologic function and reduce stormwater infrastructure needs (and costs)
 - Infiltrate stormwater using Green Infrastructure Practices
 - Disconnect impervious surfaces



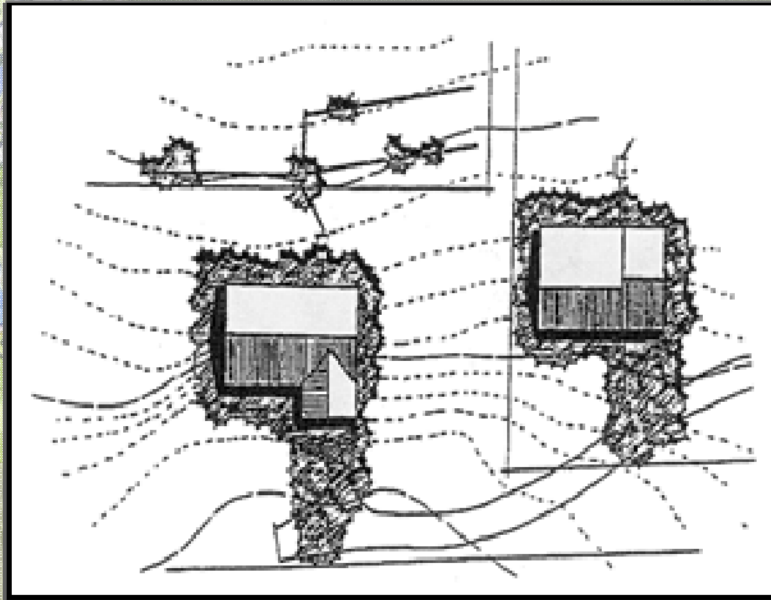
LID Design Principle 4

4. Design to Reduce Runoff Impacts

- Purpose: Mimic pre-development hydrologic function and reduce stormwater runoff
 - Fit the design to the natural terrain and use natural drainage paths
 - Reduce the limits of clearing, grading and construction activities
 - Locate the development in less sensitive areas
 - Cluster the development
 - Use open spaces and intrinsic GIPs
 - Use vegetated swales, grass channels and water quality channels
 - Disconnect impervious areas



Example of Limits of Clearing (Source: DDNREC, 1997)



Example of Site Footprinting



Source: N



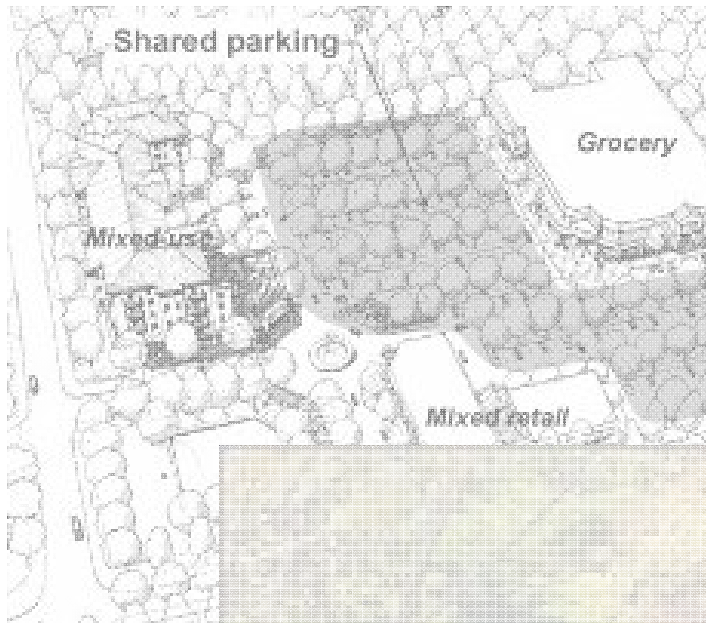
LID Design Principle 5

5. Reduce and Disconnect Impervious Cover

- Purpose: Reduce stormwater runoff
 - Install green roofs
 - Disconnect downspouts to infiltration GIPs
 - Disconnect parking areas to intrinsic GIPS or infiltration CIPs
 - Use permeable pavement
 - Reduce impervious surface
 - Increase number of floors to decrease building footprint
 - Use multi-floor parking
 - Use shared driveways or parking areas
 - Decrease street widths or parking stall areas



Examples



*Cayuga Medical Laboratory
Source: Tompkins County NY*



LID Design Principle 6

6. Minimize Soil Compaction

- Purpose: Promote natural infiltration

- Avoid mass clearing and grading
- Limit grading and construction areas
- Cordon-off protected areas
- Avoid extensive stockpiling of topsoil
- Amend soils where disturbance has occurred



Bobcat with Soil Conditioner Attachment
Source: Bobcat.com

Tree Protection Zone



Source: City of Calgary



Module Topic Summary

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Questions?

