



# Integrating LID into Municipal Stormwater Programs

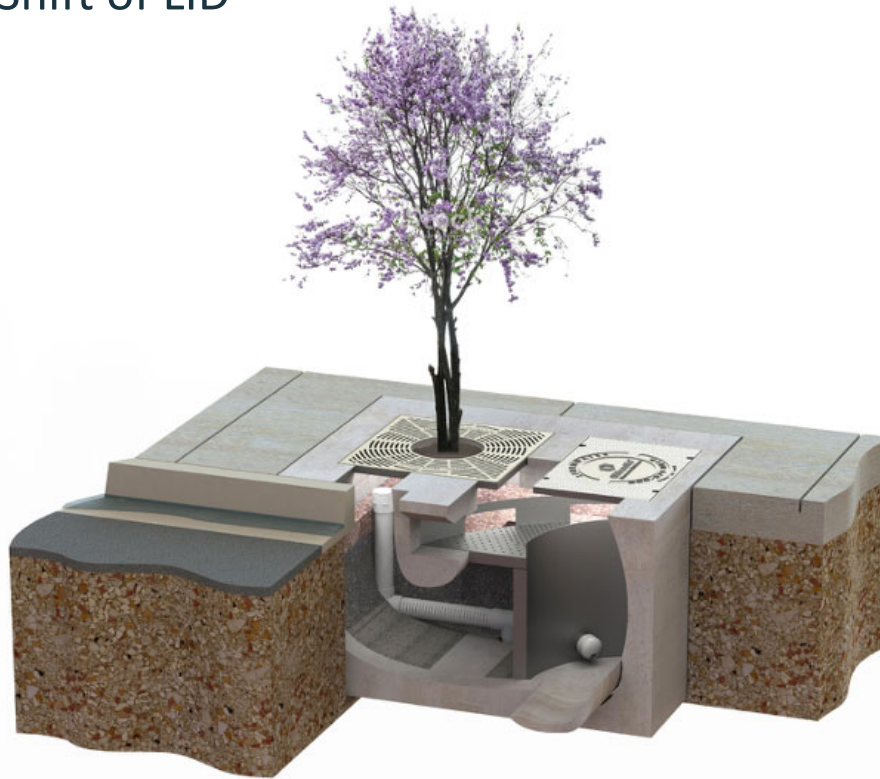
**Mary Halley PE**

OFMA Stormwater Quality Workshop  
July 19, 2023

## Agenda

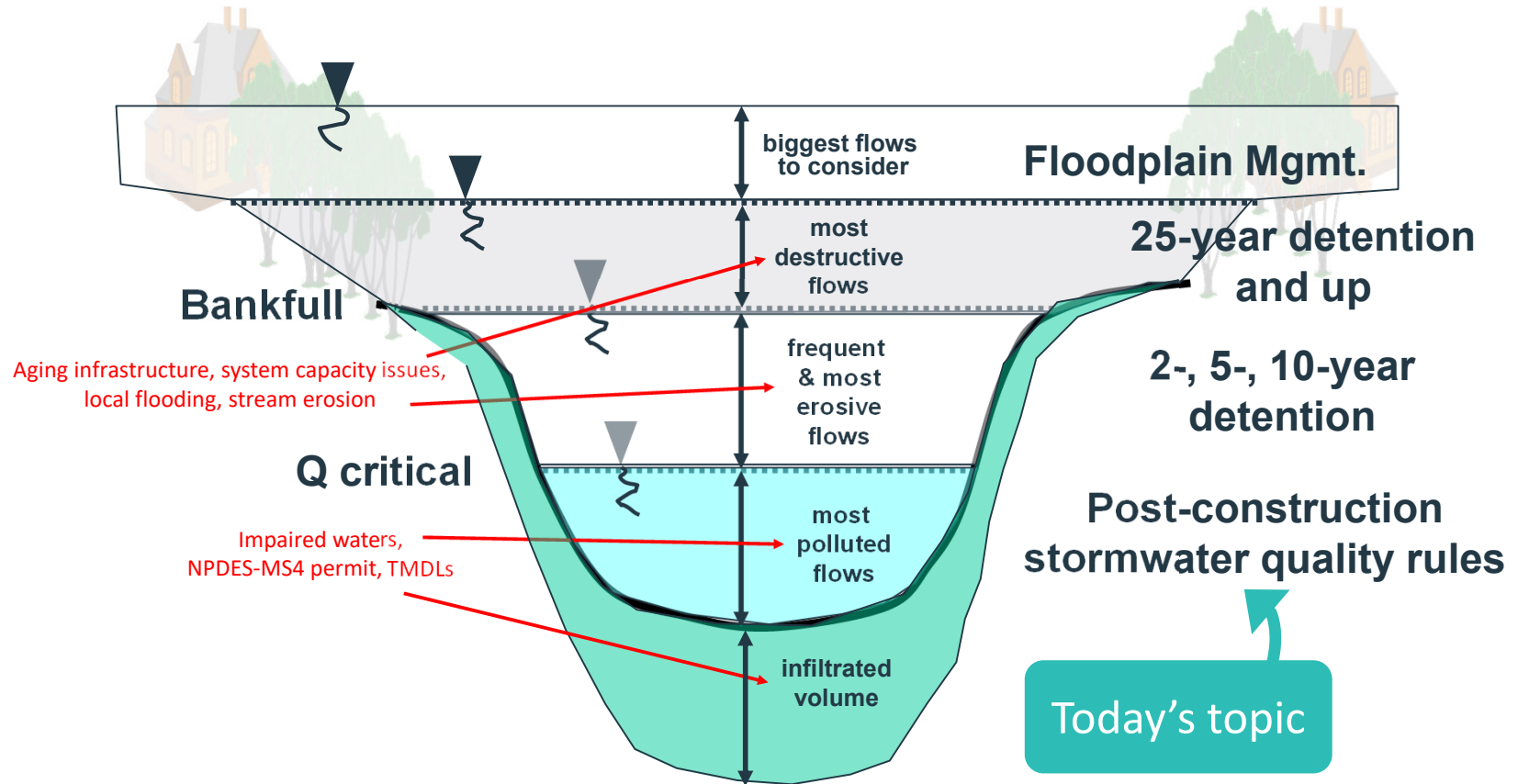
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1. History and Paradigm Shift of LID
2. The LID Roadmap
3. Creating LID Policy

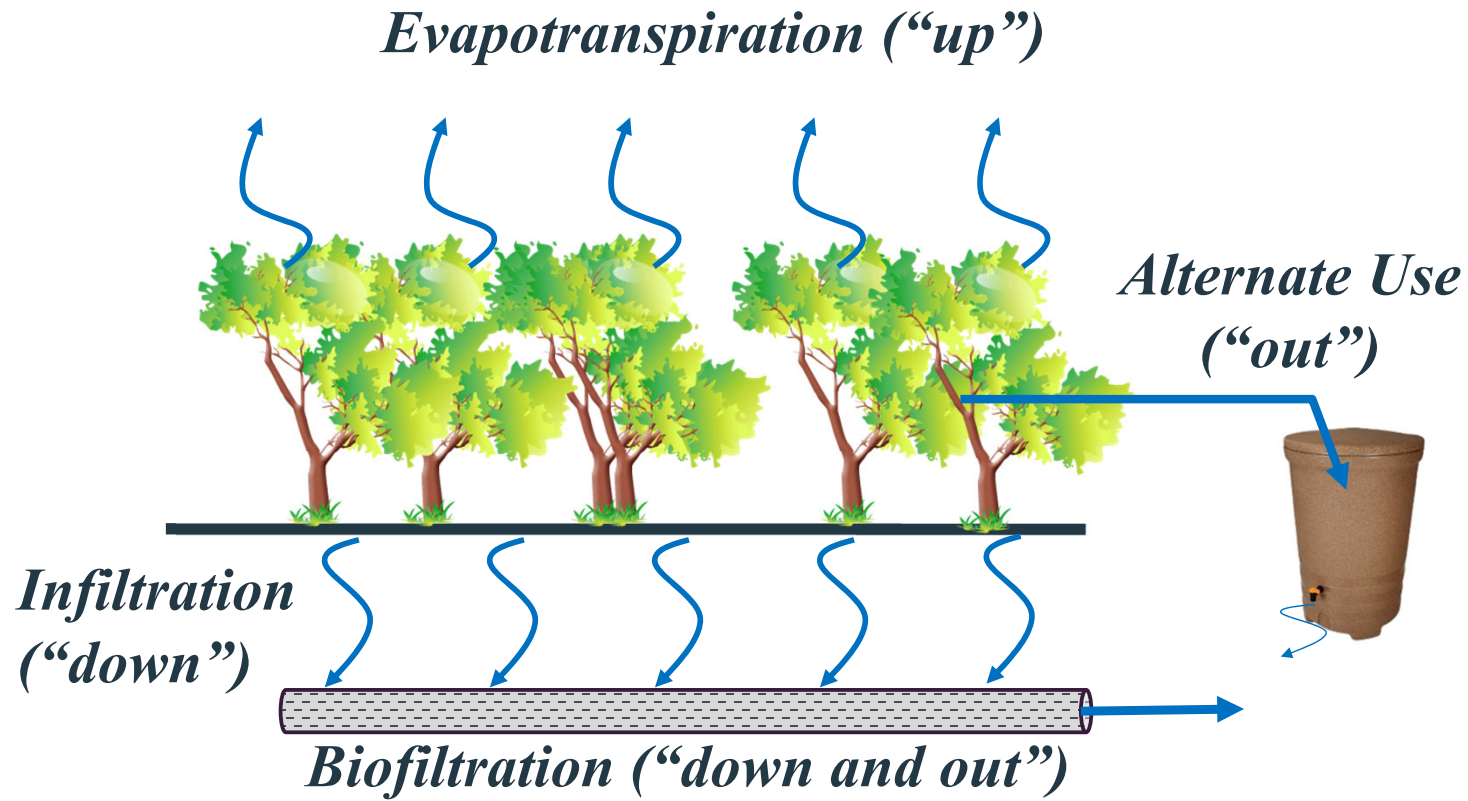


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# Typical Municipal Stormwater Regulations



# LID explained



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## Why are we thinking about LID?

- LID is required by Oklahoma's OKR04 permit (*affects 53 cities and counties*)
  - LID must be a preferred option for stormwater control on applicable developments
  - Structural practices require long-term maintenance (*permittees must ensure this*)
  - Applies to both private and public land developments

### Things to keep in mind:

- LID can work in Oklahoma
- “Preferred” gives permittees a lot of flexibility
- LID is not always feasible
- LID must be designed, constructed, & maintained correctly in order to work

# Why is LID in our permit?



*LID concept for The Paseo in Oklahoma City  
Source: Perkins & Will*



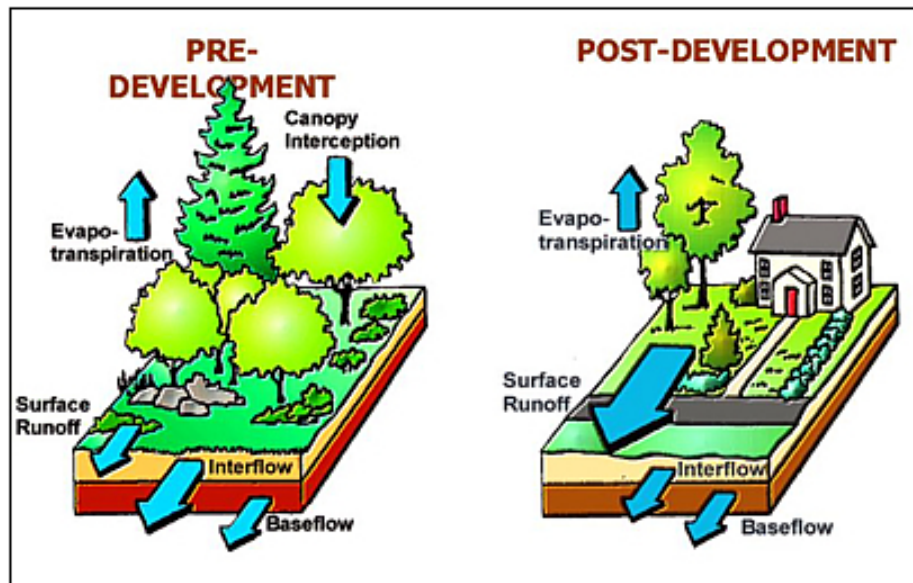
*LID at the Crash Pad in Chattanooga TN*



*LID on Bagby Street in Houston TX*



## Stormwater Pollution 101



### On developed land:

- More development = more runoff
- Developed land has pollutants
  - Litter, trash, debris
  - Sediment
  - Nutrients (Nitrogen, Phosphorus)
  - Pet waste
  - Metals, Oils, Greases, Etc.
- Runoff carries pollutants to local waterways thru the municipal storm drainage system

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## Typical Municipal Stormwater Permits (2003 to 2012-ish)

### Permitted cities & counties required “Pollutant Removal”

- Remove pollutants from runoff before it discharges to the public stormwater system
- Traditional pollutant removal BMPs became the norm
- Work via gravitational settling, filtering, and hydrodynamic separation





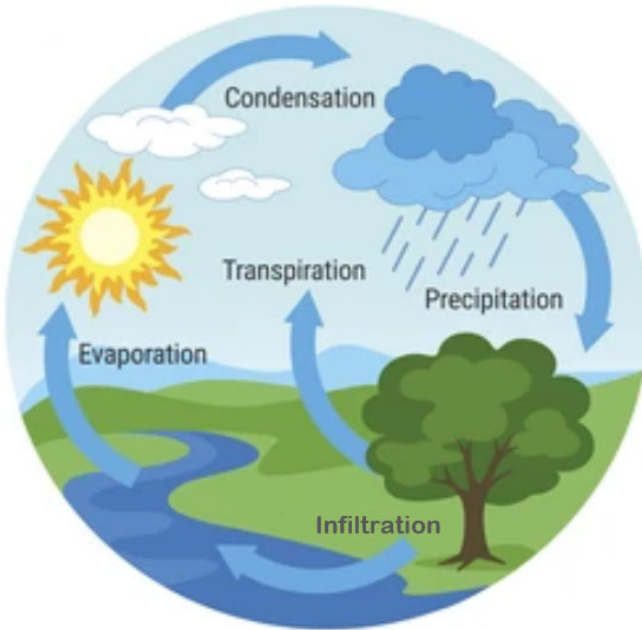
## But EPA sees this approach as missing the mark

- The nation waters are still seeing substantial:
  - Water quality degradation
  - Habitat alteration
  - Eroding streambanks
- Land development designs that mimic natural hydrology can help
  - Pollutant Removal – **GOOD**
  - **Maintain predevelopment hydrologic conditions – BETTER!**



## What are “Predevelopment Conditions”?

The Water Cycle



Traditional Residential Subdivision Design



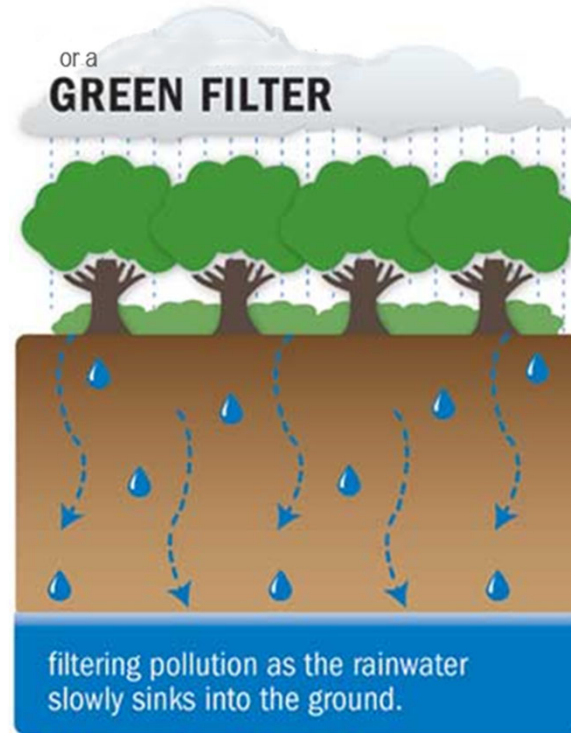
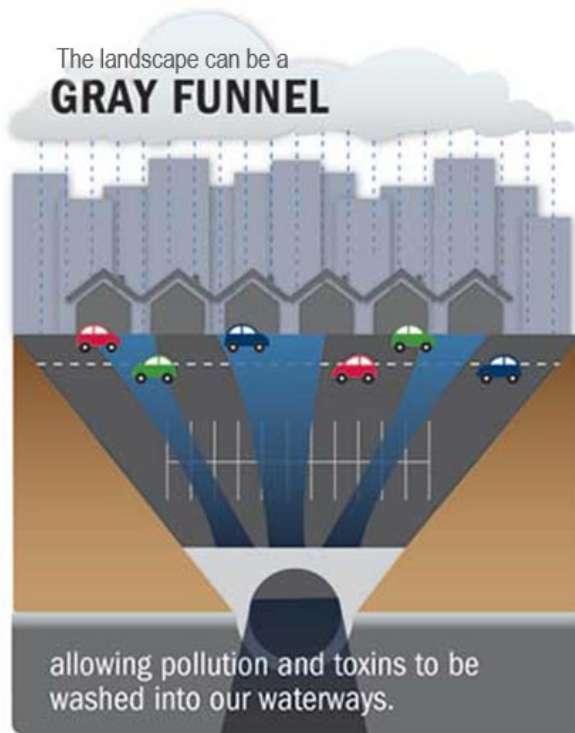
- Mass clear-cutting
- Mass grading
- Maximize lot # and sizes

LID Residential Subdivision Design



- Less clearing & grading
- Site is fit to the land
- Same lot #, smaller sizes
- Preserved open space & vegetation

## Why maintain predevelopment conditions?



Mimicking natural hydrology reduces stormwater runoff and thus, pollution

## So, EPA really loves LID



- Reduces stormwater pollution
- LID requirements are now in permits across the US, including Oklahoma

### Added Benefits

- Healthier natural waters
- Lower drinking water costs
- Lower infrastructure maintenance costs
- Better air quality
- Lower utility costs
- Improved quality of life

# Green is the New Gray!

## Traditional (Grey) Infrastructure

- Needs basins, pipes & ditches to **reduce pollutants** in stormwater



7/20/2023 Source: hydro-int.com

## Low Impact Development

- Needs uncompacted soil & healthy plants to **reduce stormwater volume**

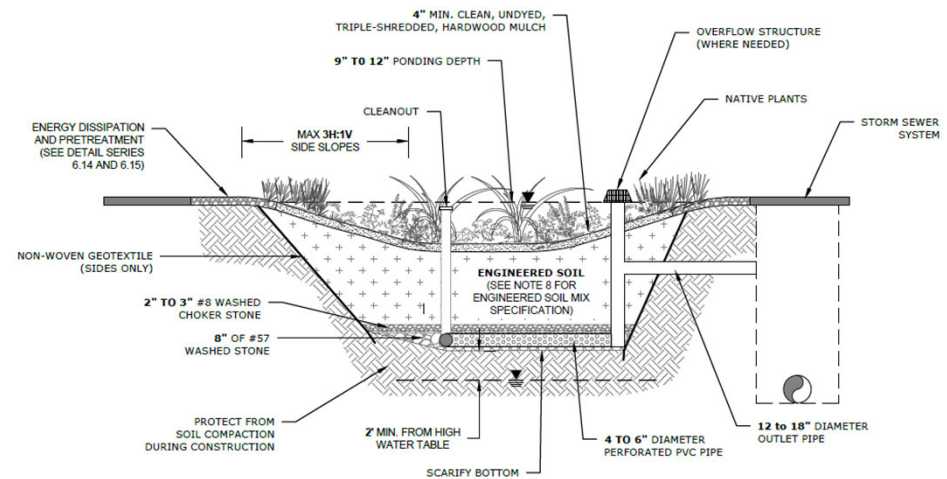
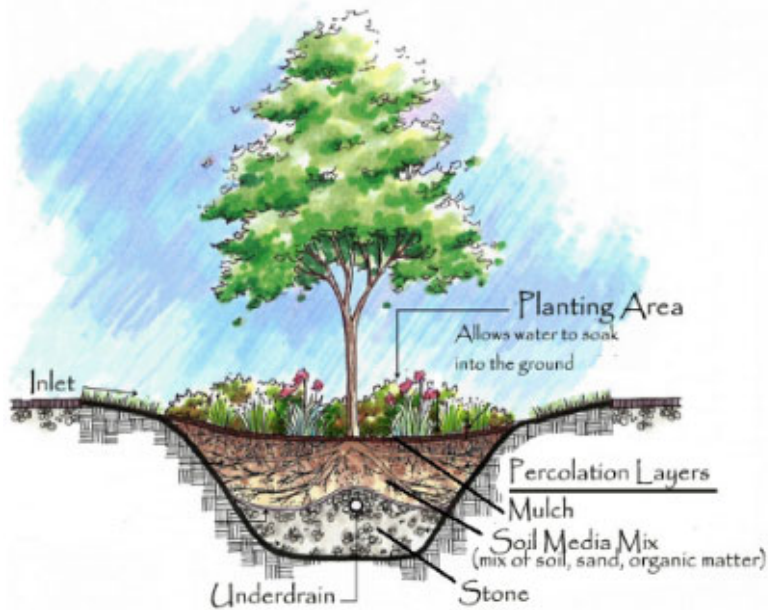


Source: Tompkins County NY (Bioswale)

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# LID's paradigm shift for site designers & municipal staff

Plants & soil are engineered infrastructure that must be properly designed, constructed, and maintained



## Wide range of LID Practices

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### Non-structural LID

- Parks
- Walking trails
- Open space plans
- Conservation areas
- Urban forests
- Water features
- Stream preservation
- Recharge zones
- Disconnection areas
- Etc.

### Structural LID

- Disconnection areas
- Pervious pavers
- Permeable pavements
- Green roofs
- Cisterns
- Filter paths
- Bioretention
- Infiltration basins
- Bioswales
- Etc.



## Municipal decisions for LID

- Which LID practices are right for our community?
- Will we incentivize LID?
- When/where is LID feasible?
- What's allowed on residential lots?
- What's allowed in public ROW?
- Require or encourage native species?
- When will we inspect construction?
- How specific will plant specs be?
- Do these policies change for maintenance?
- Etc.



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## LID Roadmap

### MCM 5 in the OKR04 Permit

- iii. Review local ordinances, regulations, and engineering plans or specifications to identify any legal/regulatory barriers to LID as well as opportunities to promote LID. Develop a schedule to remove those barriers and implement identified opportunities. If a barrier is not removed or an opportunity is not implemented, provide a justification. You may use the EPA Water Quality Scorecard as a guide. You can download the document from the following EPA website:



Decide what your city wants to change to include LID as a preferred tool for sw management:

- ✓ Set priorities
- ✓ Develop strategies and a schedule



## Example: LID Opportunities and Barriers



# LID Evaluation Tools: EPA Water Quality Scorecard

5 Main Categories, 200 Questions

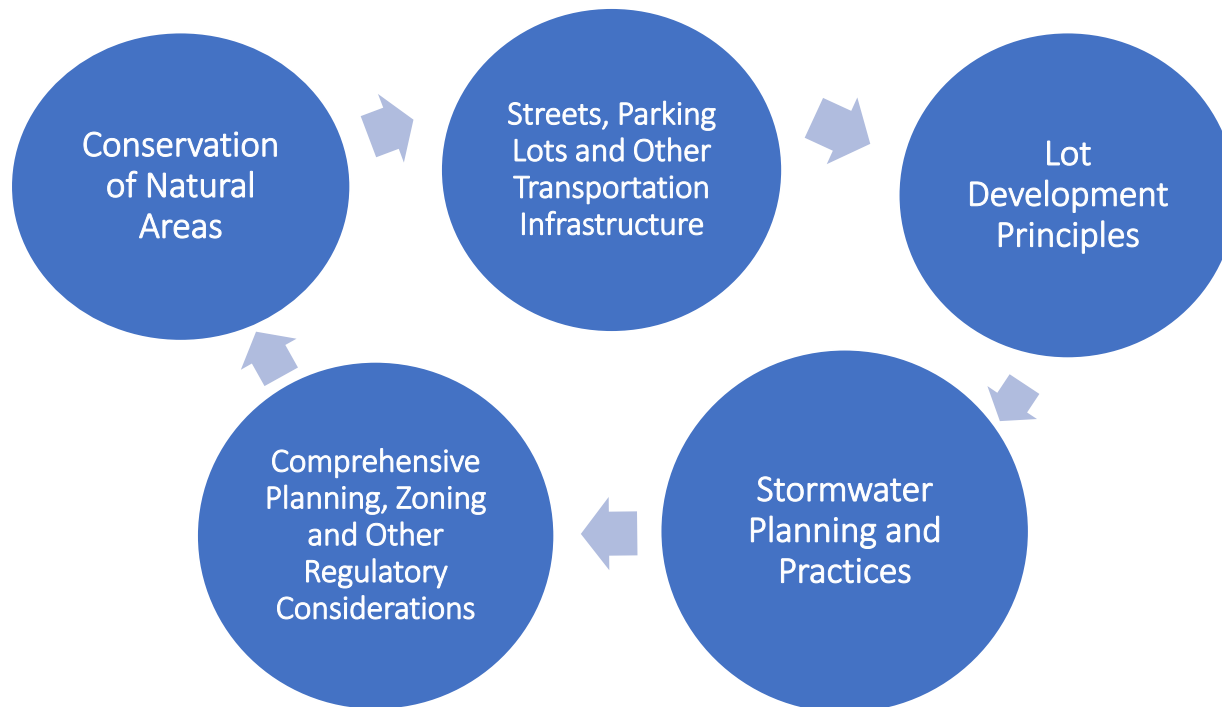
## INCLUDE ALL CITY STAFF STAKEHOLDERS!

- LID opportunities/barriers
- Non-negotiables or hard no's
- Land development rules on paper vs. what's practiced
- Clarify and resolve conflicts identified
- Assess change difficulty
- Set priorities



## Areas of Evaluation

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# Examples of Roadmap Strategies

**Table 4. Summary of LID Strategies**

LID Strategy	Priority	Timeframe	Estimated Cost*
1. Reference the LID Design Manual in the Unified Development Code (UDC)	High	Implement as soon as possible as predicated by UDC adoption and post-adoption review timeframes	\$10,000 to \$15,000
2. Develop Plant & Tree Guidance (as a supplement to the Stormwater Management Manual)	Medium	Implement during the second phase of development of a comprehensive City Stormwater Manual.	\$30,000 to \$50,000
3. Develop a City Tree Inventory	High	Implement as soon as resources can be allocated for this effort.	\$200,000 to \$300,00
4. Implement a Vacant Lot Adoption Program, with intention of using LID where feasible	Low	Implement after other priorities have been accomplished if resources and capabilities are available to City staff	\$75,000 to \$100,000
5. Develop City policies, standards, utility replacement details & processes to support LID in the public ROW	Low	Implement after higher priorities have been accomplished if resources and capabilities are available to City staff, especially for ROW maintenance	\$100,000 to \$150,000
6. Develop inter-departmental processes to consider LID on City property & Capital Improvement Projects	Medium	Implement after the LID Design Manual and guidance on LID practice maintenance is developed and published.	\$30,000 to \$50,00
7. Provide incentives for the use of LID on private land developments	Varies by incentive (see strategy 7)	Timeframes vary by incentive. The highest priority incentives will be implemented with the writing of the LID Design Manual, anticipated in 2022	Varies, based on incentive and administrative detail of incentive

\*Cost estimate ranges are broadly defined assuming the use of consultants to define policies or processes, or to collect data (for the tree inventory) or develop a pilot project (such as for the Vacant Lot Adoption program). Estimates will vary depending on City staff involvement,

## 18.235.090 Stormwater best management practice credits.

Credits may be authorized up to 20 percent when stormwater best management practices are incorporated into the landscape plan, subject to the approval of the [Utilities Director, Water Pollution Control Division, City of Topeka](#). Such practices shall adhere to recognized principles of stormwater drainage engineering. [The list of Best Management Practices \(BMPs\) available for credits and their potential credit is set forth in the City of Topeka Stormwater BMP Design Handbook, and consist of but are not limited to:](#)

- ~~(a) Bioretention systems.~~
- ~~(b) Open vegetated channels.~~
- ~~(c) Filter strip.~~
- ~~(d) Dry and wet swales.~~
- ~~(e) Detention systems.~~
- ~~(f) Retention/wetland systems.~~
- ~~(g) Stream buffers.~~

~~A point value of credit for stormwater best management practices shall be established by separate resolution of the City of Topeka.~~ (Ord. 18255 § 7, 6-1-04; Ord. 17846 § 9, 6-11-02. Code 1995 § 48-38.08.)



## Crafting LID Policy

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### Who is required to do post-construction BMPs?

- New/Re-developments of 1 acre or greater?
- In watersheds with stream impairments?
- In watersheds with clean streams?

### Do we want to require or encourage LID?

### What LID practices make sense for our city?



## Crafting the foundational LID requirement

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### Common ordinance text:

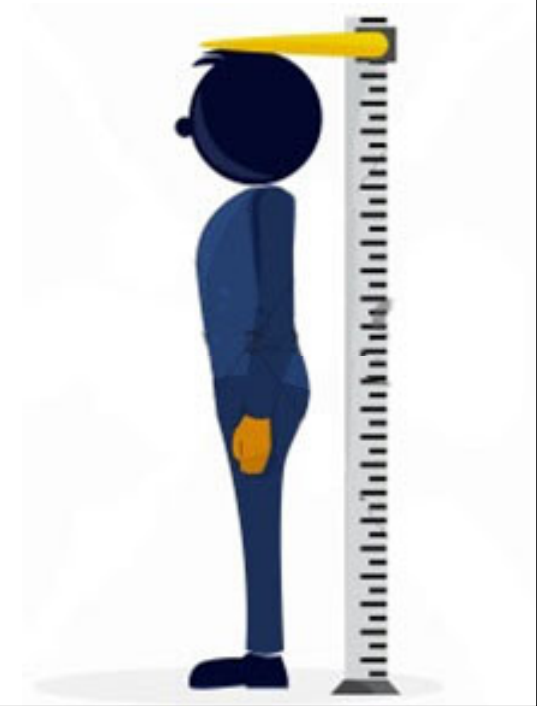
“The applicant must mimic pre-development hydrology to the maximum extent practicable.”

### No measurable goal or measuring stick

- How do I know when I am done

### No measuring stick

- How do I show that I have complied



## What does MEP mean??

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**Developers** → **Its not practicable for my projects.**

**Site Designers** → **What he said.** 

**State Regulators** → **It means Maximum Extent Practicable.**

**Municipal Plan Reviewers** → **I feel a headache coming on.**

**Construction Contractors** → **Wait. Whut?**

**Municipal Stormwater Managers** → **Its time to find a new job.**

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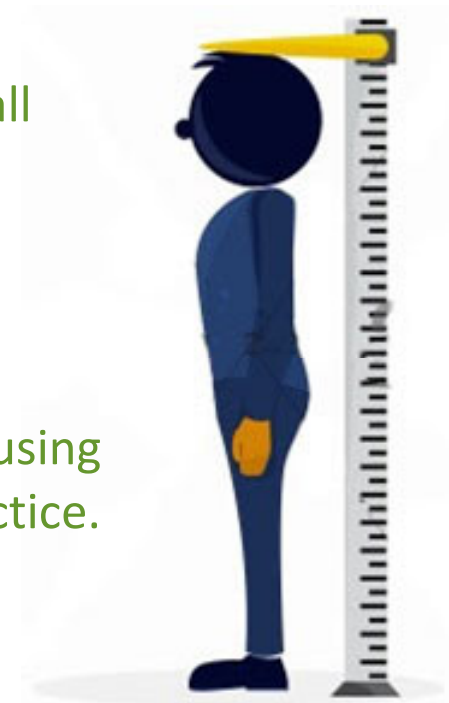
## Be CLEAR and MEASUREABLE

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~~“The applicant must mimic pre-development hydrology to the maximum extent practicable.”~~

Manage the runoff volume from the first 1-inch of rainfall using one or more LID practices specified in the *City of Smallville LID Design Manual*.

If LID practices are determined to be infeasible for the project, the first 1.5 inches of rainfall shall be managed using extended detention or other stormwater treatment practice.



## Do you need your own DESIGN MANUAL?

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Not necessarily!

### DO:

- Work with other permittees to create a manual; or
- select ONE manual that:
  - is hydrologically appropriate for your area
  - has clear BMP design specifications
  - write your own policies to direct & manage its use
  - engage stakeholders in selection

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### DON'T:

- reference another city's ENTIRE manual
- be afraid to write your own policy to fit it to your needs
- hesitate to talk with the manual "owners" about what works and what doesn't



# Keep BMP maintenance in mind in your DESIGN policies

• Don't

LID-BMP Name	Land Use										Characteristic of Drainage Area or BMP Location					
	Comm., Industrial, & Institutional			Residential			Private Roads <sup>1</sup>		Other							
	Landscaped Areas	Parking Spaces	Driveways and Parking Lots	Single Family Home Lots	Multi-Family Residential Lots	Areas Owned in Common	Roadway Shoulders/Medians	Travel Ways	Private Parks & Open Spaces	SFHAs & 100-year Floodplains	Areas with a History of Flooding	Areas with Contaminated <sup>2</sup> Soil	Chemical/Waste Storage, Loading & Transfer Areas	Near Site Utilities	Wellhead Protection Areas	Groundwater Recharge Areas
Bioretention	●	●	●	○	⊙	●	●	●	●	×	⊙	×	×	×	×	×
Urban Bioretention	●	●	●	○	⊙	●	●	●	●	×	⊙	×	×	×	×	×
Wet Bioswale	●	●	●	○	⊙	●	●	●	●	×	⊙	×	×	×	×	×
Dry Bioswale	●	●	●	○	⊙	●	●	●	●	×	⊙	×	×	×	×	×
Infiltration Basin	●	●	●	○	⊙	●	●	●	●	×	⊙	×	×	×	×	×
Pervious Surfaces	●	●	⊙	○	⊙	●	⊙	×	●	×	⊙	×	×	⊙	⊙	⊙
Engineered Wetlands	●	●	●	○	⊙	●	●	●	●	×	●	×	×	×	×	×
LID-MTDs	●	●	●	○	⊙	⊙	⊙	●	●	×	×	×	×	⊙	×	×

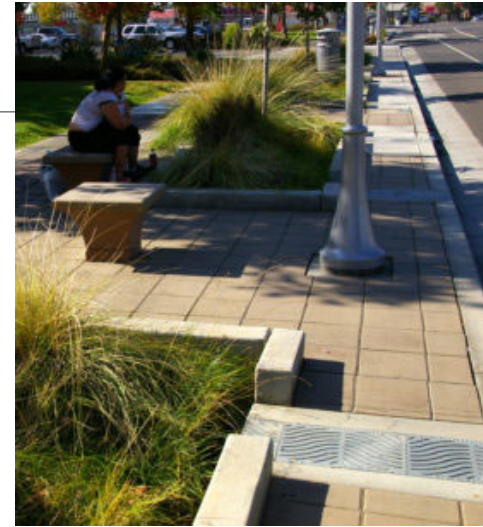
- - BMP is usually suitable for this land use or BMP location. Check BMP design specifications to confirm suitability.
- ⊙ - BMP is sometimes unsuitable for this land use or BMP location. Check BMP design specifications to determine suitability.
- - BMP is usually suitable for this land use or BMP location but may not be approved due to concerns about future owner maintenance.
- ×



# Consider requiring (or providing) signs



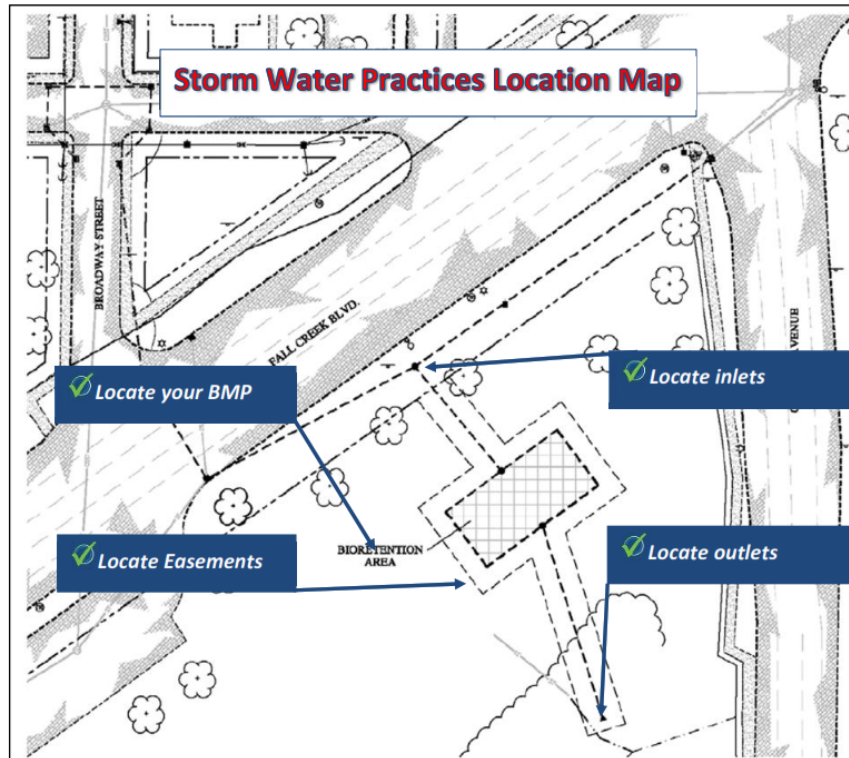
# Consider requiring BMP protection



## Require As-Built Plans and Maintenance Plans

- One as-built for each post-construction BMP
- BMP Maintenance Report
  - Location Map
  - Maintenance requirements
  - Inspection checklist

**Better option!**  
Provide these to site  
designers and BMP Owners



## Summary

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- Develop a LID Roadmap using the EPA Water Quality Scorecard
- Determine:
  - Who must do LID
  - the performance standard
  - design specifications
  - LID feasibility criteria
  - “fallback” stormwater quality treatment requirement
- Keep maintenance in mind when crafting DESIGN policies



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