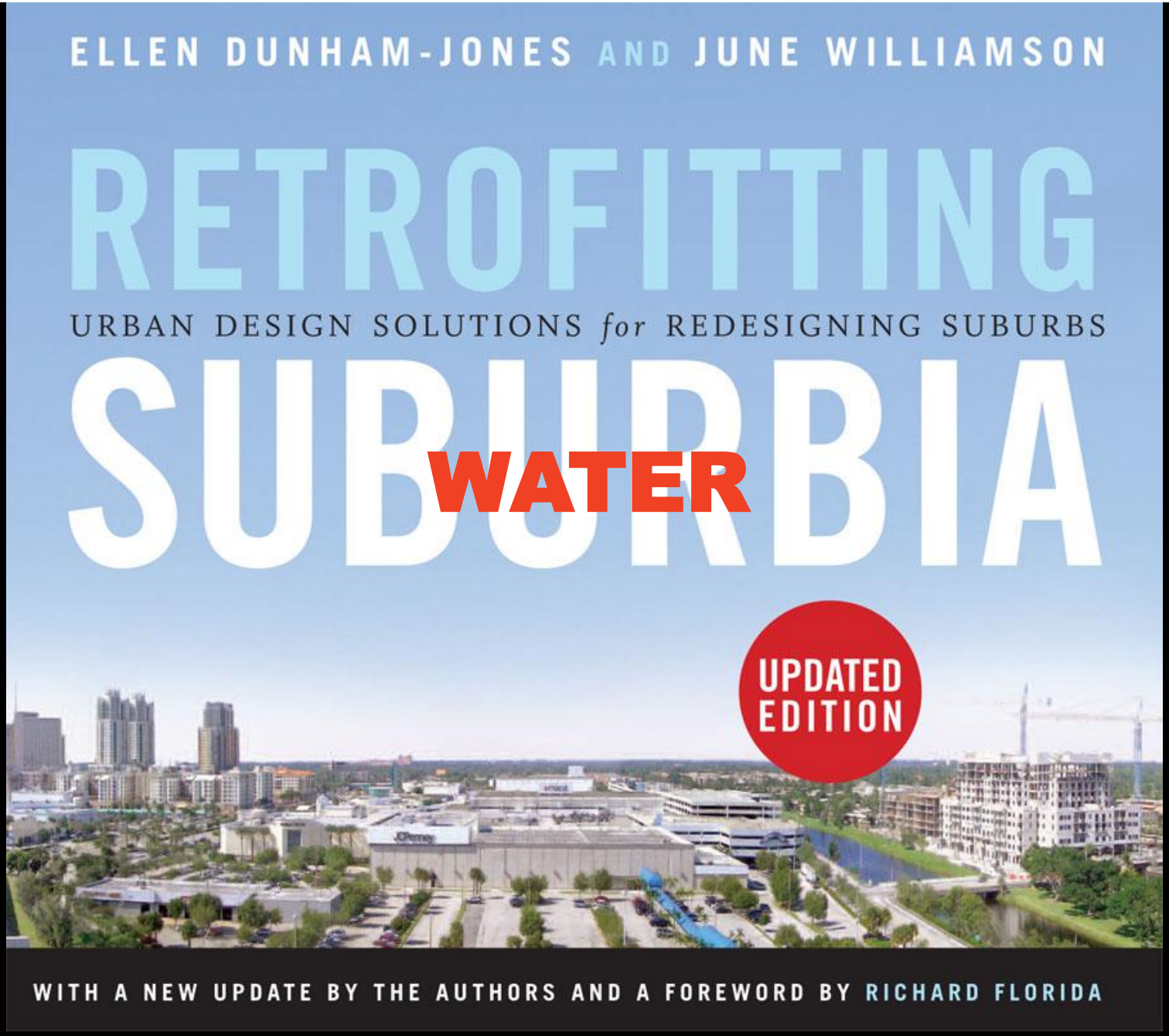


Ellen Dunham-Jones, AIA
Professor, MSUD Coordinator, Georgia Institute of Technology

retrofitting suburbia challenge:

Water

Some Problems

The Water-Energy Nexus

Groundwater depletion

- Saltwater intrusion threatens water supply
- Subsidence threatens use of land

Stormwater runoff

- Erosion and contaminated creeks
- Combined Stormwater Overflows
- EPA's new stormwater standards require onsite retention for new development but don't fix the old

Suburban Design

- Reliance on yesterday's flood maps, culverts, and rapid conveyance systems
- Upstream development has increased downstream flooding
- Limited water-Sewer hook-up capacity for redevelopment

Some Solutions

Water Quality

Too Little Water

Too Much Water

Storing water, recharging groundwater, and revitalizing the neighborhood

Lafitte Blueway, New Orleans, LA: Waggoner & Ball

Videos give overhead view of devastating flooding on Florida Blvd., O'Neal Lane

From the Baton Rouge area floodings | COMPLETE COVERAGE series

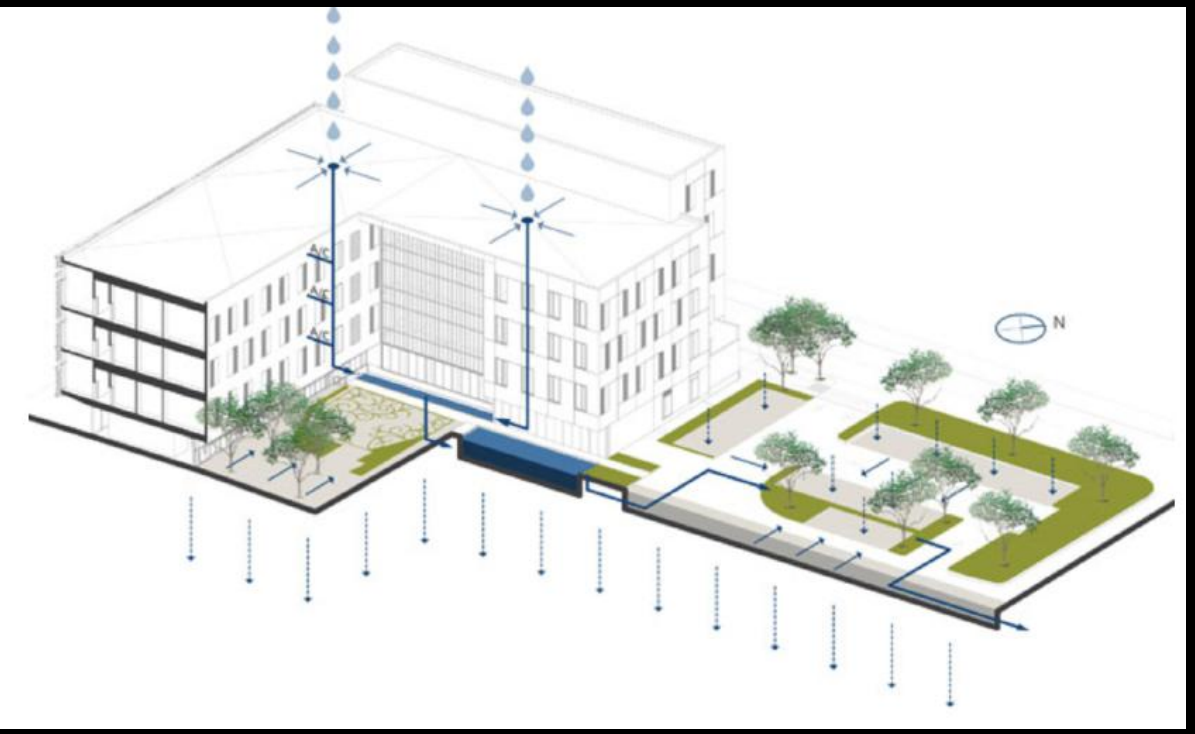
Advocate staff report **AUG 14, 2016 - 4:54 PM** (1)

What if suburban strips like Florida Blvd were retrofitted into something like the Lafitte Blueway?

Integrating stormwater collection and filtration into the design of the building

Bioinnovation Center, New Orleans, LA: Eskew + Dumas + Ripple

- Stormwater collected from the roof feeds a fountain in the courtyard. Overflow is directed into a bioswale in the parking lot and through pervious concrete for underground retention and groundwater recharge.



retrofitting challenge:

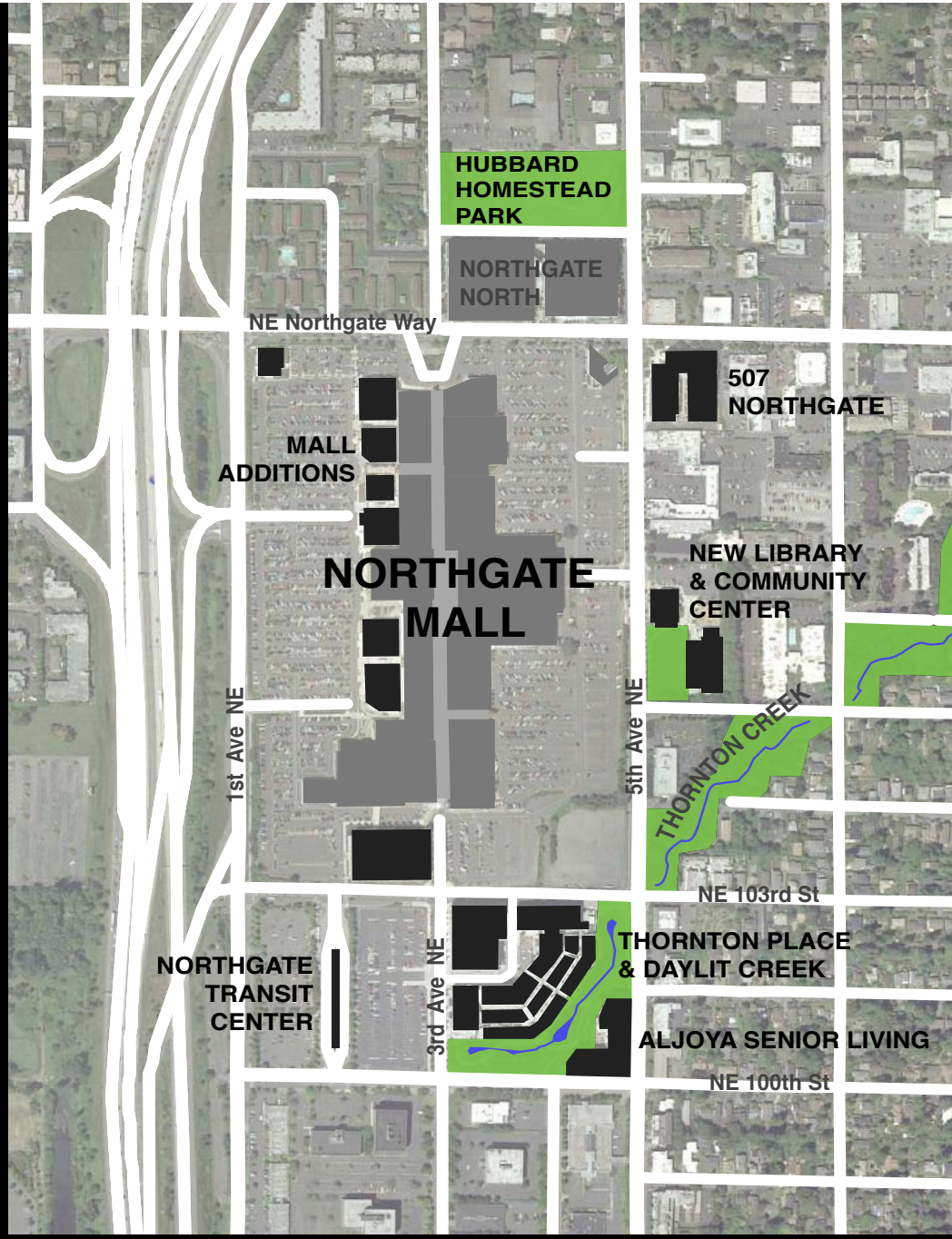
Water

Water Quality:

- Daylight culverted creeks
- Reconstruct wetlands
- Infiltrate runoff close to the source

WATER POLLUTION:

Poo-sniffing pups streamline detection



from parking lot to mixed-use TOD with condos, senior housing, daylit creek and wetlands

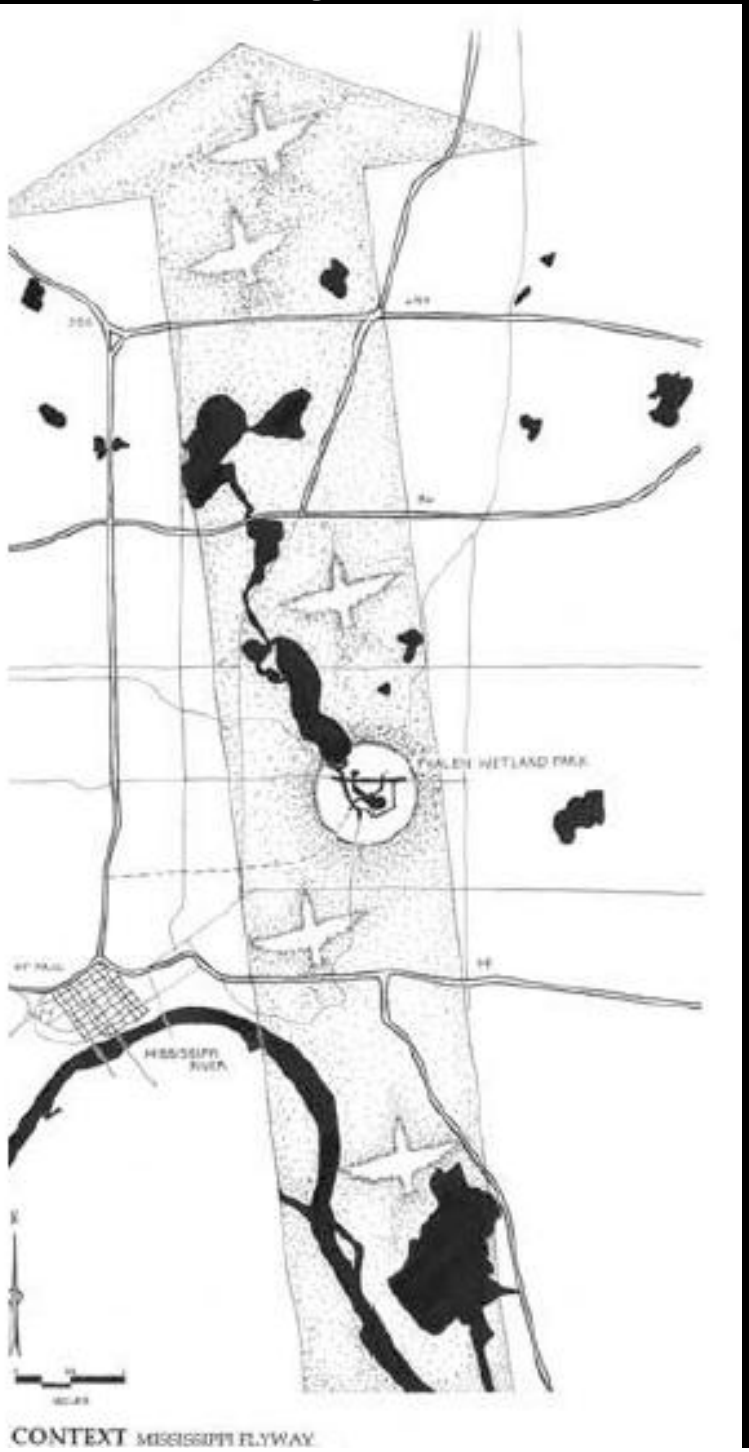
Thornton Place, Northgate Mall, North Seattle, WA: LEED-ND pilot program

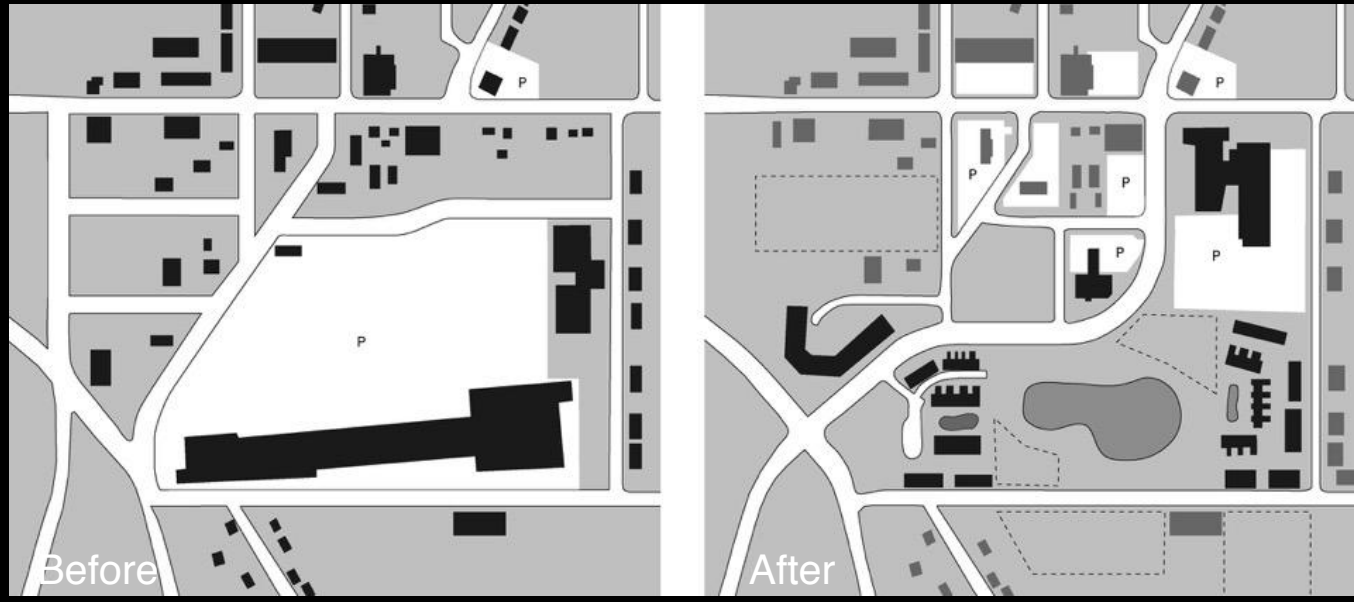
Mithun Architects for Stellar Holdings & Lorig Associates

source: Dunham-Jones, Williamson, 2011

from shopping center to wetland w/ new lakefront property investment

Phalen Village, Phalen MN,U.Minnesota CALA (Dowdell, Fraker, Nassauer) and City of St. Paul





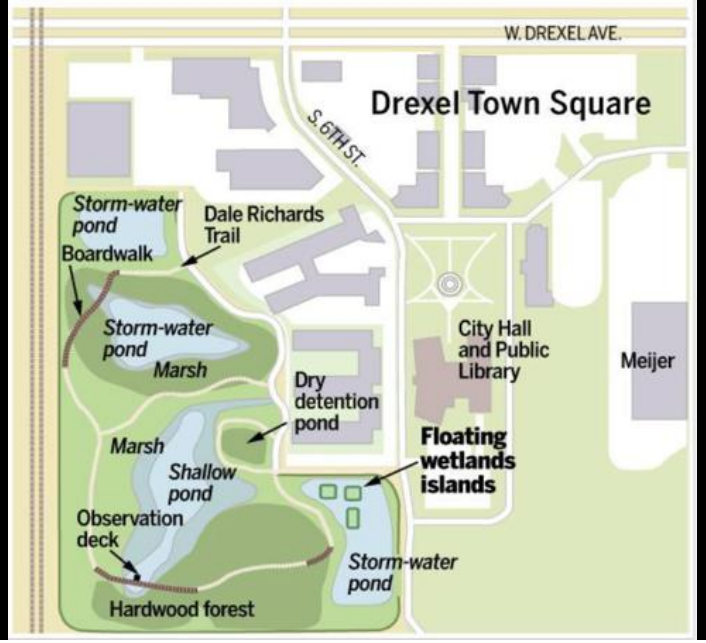
From manufacturing plant to town center and reconstructed wetland

Drexel Town Center, Oak Creek WI: WISPARK, Rinka Chung Arch., TRC Env'l Corp.

- Man-made islands remove pollutants from wetland park like an "aquatic roomba"

Artificial islands cleanse water

Three artificial islands covered with wetland plants were pulled onto a pond in Oak Creek's Emerald Preserve to help remove pollutants from storm water draining off the Drexel Town Square development. Water from the ponds flows into a wetland.



Reducing phosphorus runoff to the lake by increasing infiltration at the mall

Maplewood Mall, Maplewood, MN**:** Ramsey-Washington Metro Watershed District

2009-12: rainwater gardens, 1” infiltration through tree trenches, cistern, porous pavement, and interpretive elements. Infiltrates 20M gallons/year reducing phosphorous 60%, sediment 90%. $5M.

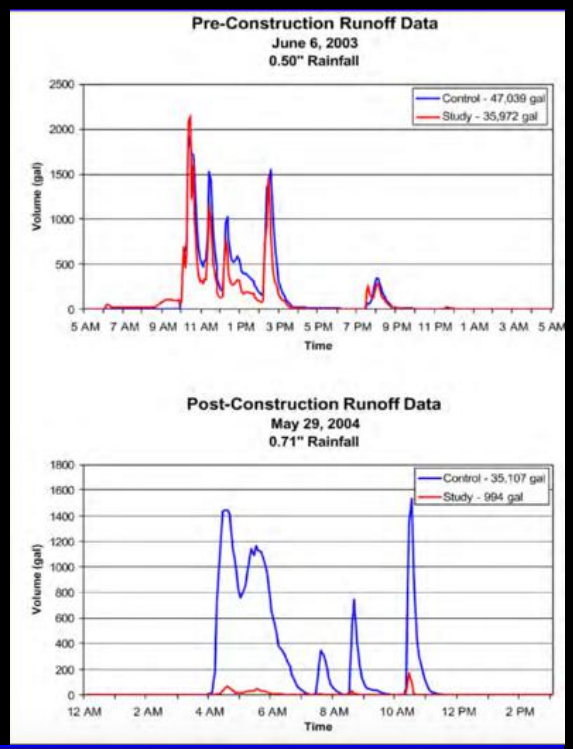
Phase I before

Phase I after

Reducing runoff from residential streets with rain gardens

Burnsville, MN: City of Burnsville, Met Council, Barr Engineering

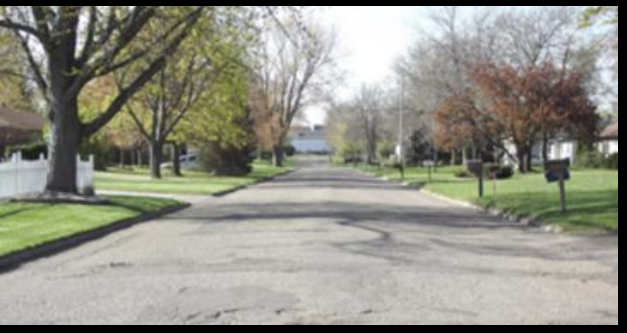
- 17 gardens at $7500/per. Reduced discharge to Crystal Lake 80% in 49 events (2004)

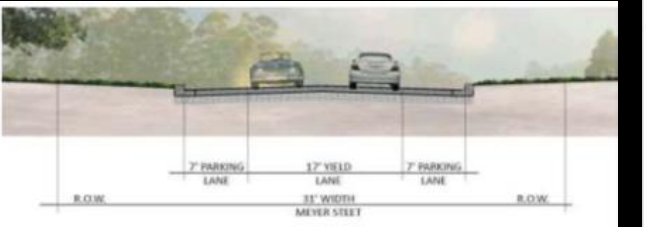


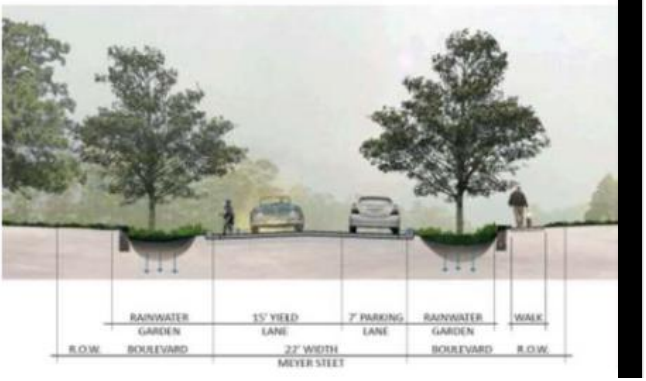
Upgrading suburban streets to "Living Streets"

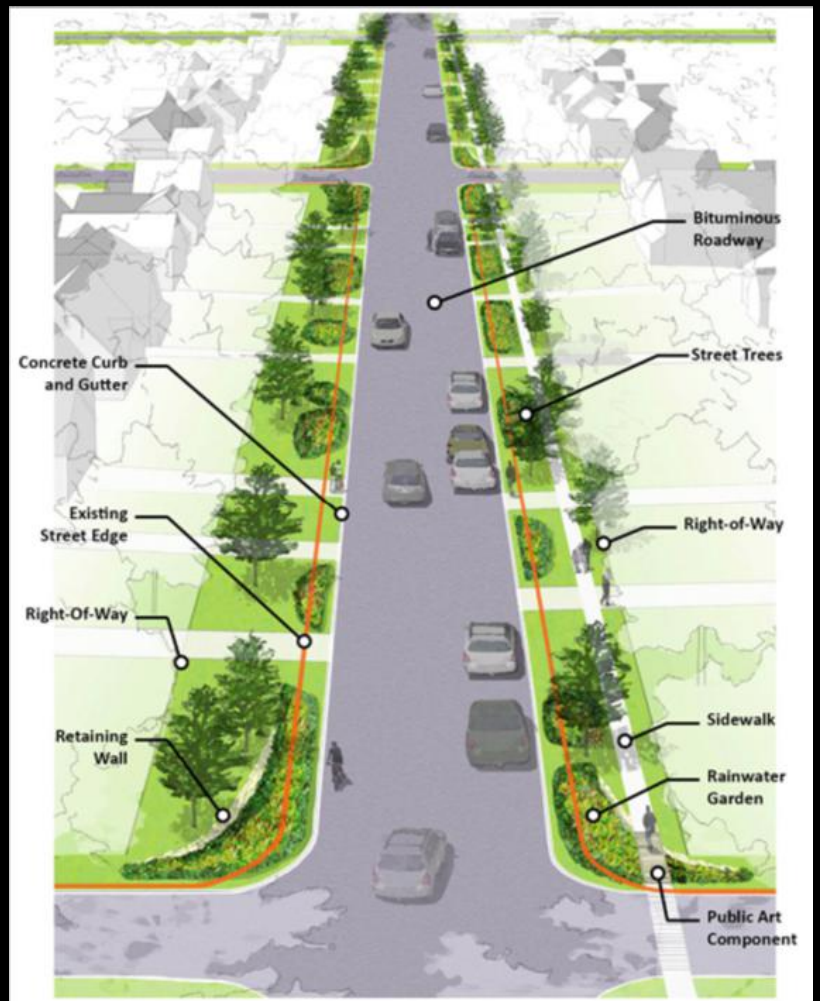
Maplewood Living Street Demonstration Project, Maplewood, MN: Ramsey-Washington Metro Watershed District, City of Maplewood, Barr Eng'g, Kimley-Horn & Assoc.

- Street replacement project enabled reconstruction of 2 miles of residential streets, narrowing the pavement from 31' to 24', adding 32 rain gardens and one larger basin, 200 trees and 1.5 miles of sidewalk. Led to adoption of Living Streets Policy for all new street projects
- Resulted in 50% of rainwater runoff is filtered or infiltrated, 40% evaporates and only 10% of the water runs directly into storm sewers. 95% of homeowners maintain their gardens.
- Cost: $4.3 million in 2012. In 2016, city of 30k pop. has 700 rain gardens, national recognition and has inspired rain garden movements in Kansas City, Lexington KY, Toledo OH.









Maplewood Raingardens 3

For street reconstruction projects, residents can select a garden design: Easy Shrub, Easy Daylily, Sunny Garden, Sunny Border Garden, Butterflies and Friends, Minnesota Prairie Garden, or Shady Garden, Perennial Rainbow Garden, Cool Whites, or Jazz Brights.

retrofitting challenge:

Water

Too little water:

- **Capture for reuse**
- **Conserve**
- **Replenish groundwater**

Using purified wastewater for groundwater replenishment (and drinking)

Groundwater Replenishment System, Orange County, CA: OC Water District, OC Sanitation District

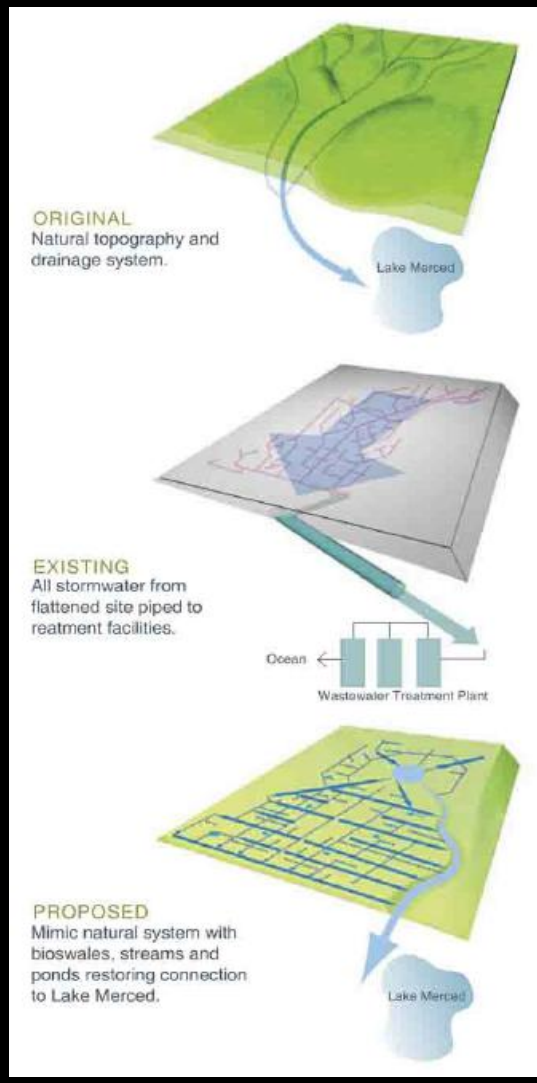
- The world's largest water purification system for indirect potable reuse. It takes highly treated wastewater that would have been discharged into the Ocean and puts it through a 3-part purification process before it is piped to several recharge basins.
- The partnership saved OCSD from building a new ocean outfall and resolved OCWD's problem with seawater intrusion.
- It creates 100 million gallons of new water/day – meeting 2/3 of the groundwater pumping withdrawals as of Sept 2016.

Ultra-pure Groundwater Replenishment System Water Being Recharged in Miller Basin

Upgrading 1940-s-50's environmental, social, and transportation systems

Parkmerced, a 3,221-unit rental apt community, San Francisco, CA: SOM

5,665 net new residences with net zero increase in greenhouse gases, zero landfill waste, 100% aquifer recharge, 68-acres open space including an organic farm, 56% reduction in reliance on "the grid," 100% replacement of 1,538 rent-controlled apts, 15% below market units in each construction phase, and re-routing of Muni streetcar through the site.



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Using treated wastewater for wetlands recharge (and carbon sequestration)

Luling Oxidation Pond Wetlands, St Charles Parish, LA*:* Entergy Corp, Comite Resources, The Climate Trust, Tierra Resources

- 2012: American Carbon Registry approved wetlands methodology developed by Tierra and LSU
- 950 acre pilot wetlands restoration protects it from saltwater intrusion and captures 1-7k metric tonnes of CO2, producing commercially viable carbon credits to offset emissions
- 2016: still waiting to see if California will adopt Blue Carbon Credits in its cap & trade system?

Carbon credits could generate $1.6 billion for Louisiana coastal restoration, study says

retrofitting challenge:

Water

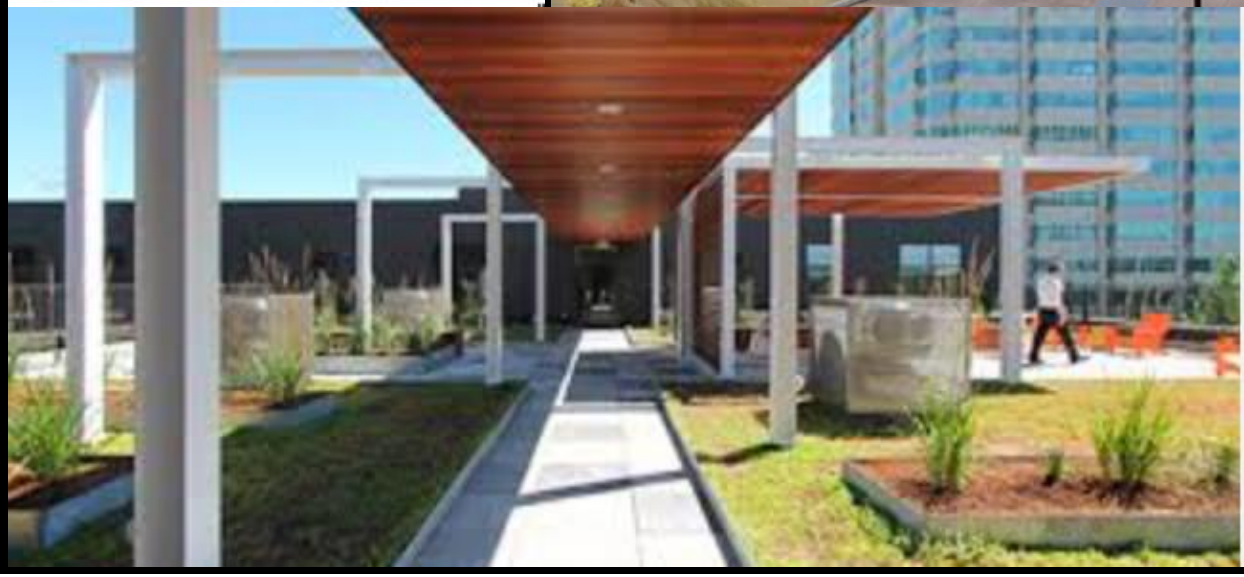
Too much water:

- **Green roofs, cisterns, water recycling, and increased infiltration to reduce sewer overflows**
- **Shift from gray to blue/green infrastructure**
- **Treat water as a resource**
  - **Demolish buildings in flood plains, build stormwater parks (and lakefront property)**
- ***Buildings and infrastructure that can take a bath***
- ***Planned retreat***

From office superblock to LEED Platinum complex in new eco-district

Hassalo on 8th, Lloyd District, Portland, OR: American Assets Trust, GBD Architects

- NORM, Natural Organic Recycling Machine/Green Roof treat 100% gray/blackwater treatment to flush toilets and irrigate the public plaza and green street. Diverts 45k gallons/day from the CSO-strained sewer system earning a $1.48M, approx 50% refund, on city's Systems Development Charges.
- 100% solar hot water; rainwater storage and reservoir; street level stormwater networks
- 657 apts, parking for 1,000 bikes and 1200 underground cars



Analysis of impact of proposed stormwater tax on typical big box retail site

Louis Johnston, Georgia Institute of Technology

An existing big-box super center in anywhere USA with a parcel GA of 15.01 acres and as it stands a total IA of 12.36 acres. The stormwater tax on this site as it stands would be; GA - $690 and IA - $4,491.

GA **MULTIPLIER**

GA Tax = (435,600s.f. / 500 s.f.) * $0.528

The GA Tax = $459 monthly

IA Impervious Acreage **MULTIPLIER**

IA Tax = (392,040 s.f. / 500 s.f.) * $4.169

The IA Tax = $3,268 monthly

Transfer of Development Rights to regreen and urbanize flooded 50's biz park

Fort Washington Office Center, Upper Dublin, PA: Urban Ptnrs, URS, Smith & Porter, McMahon

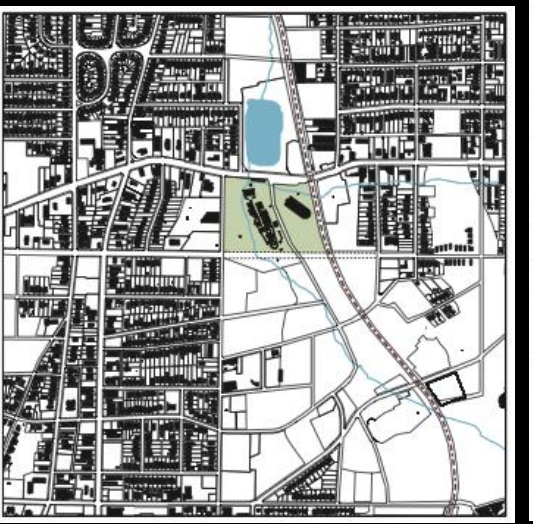
From urban mall to multi-modal TOD and flood control park

Meriden Green, Meriden, CT: Parsons Brinckerhoff, Milone & MacBroom

BEFORE

Stormwater park catalyzes BeltLine, Ponce City Market, and new development

Historic 4th Ward Park, Atlanta, GA: TPL, Smith Dalia Arch'ts, HDR, WPi, Jacobs Eng'g

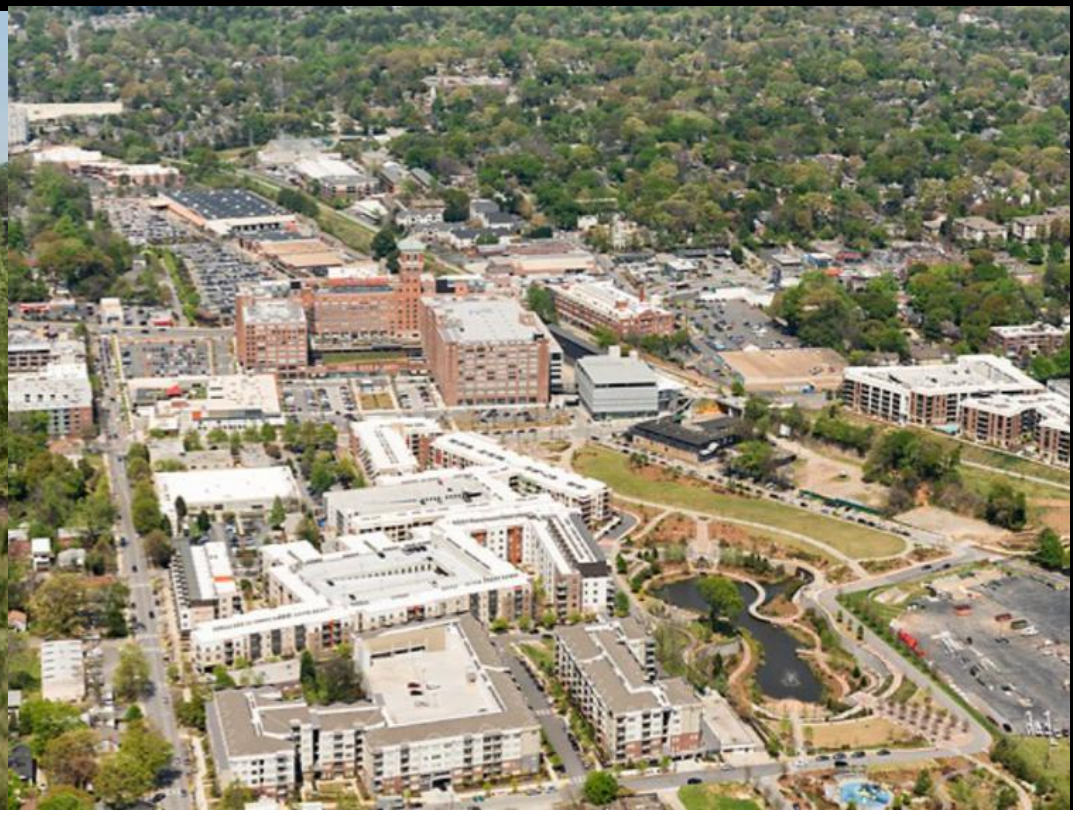


1907

1960

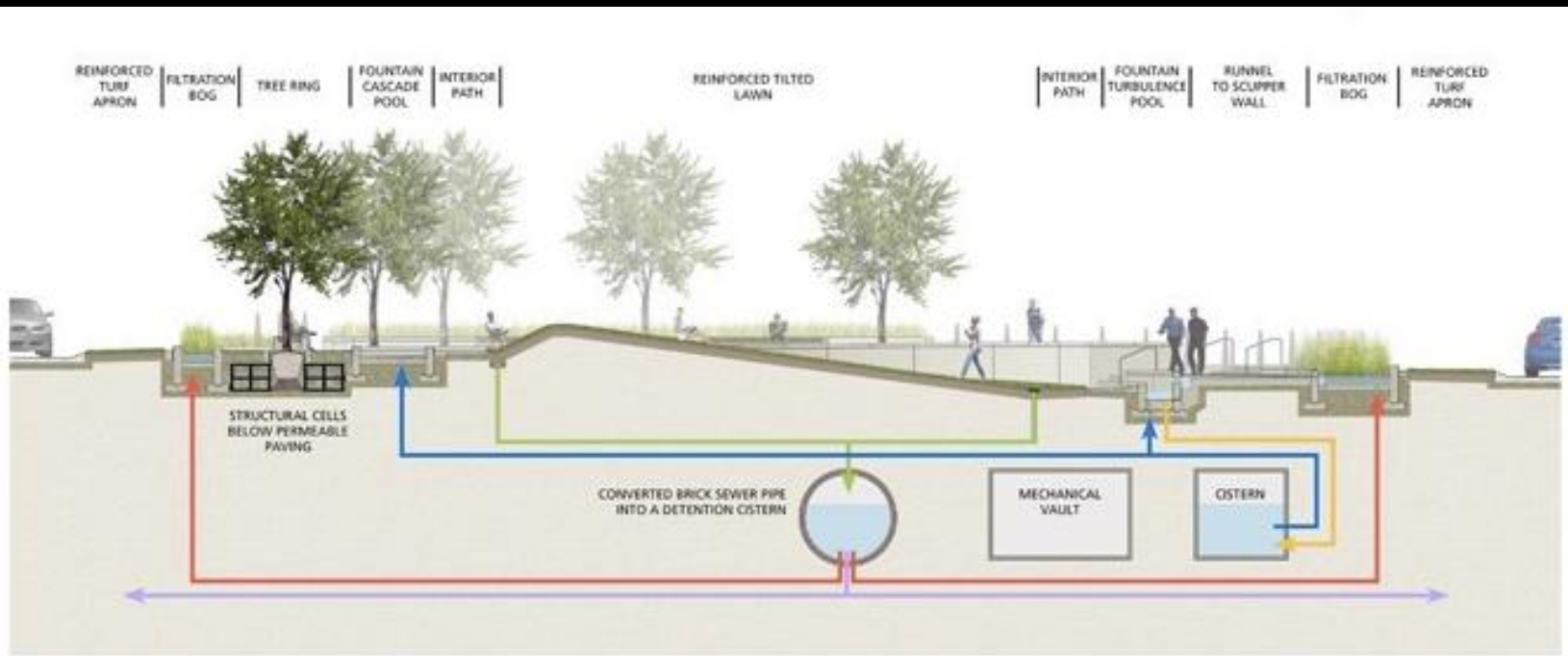
2016

Future



Intersection retrofit with water-cleansing occupiable fountain

Normal Illinois Roundabout, Normal Illinois: Doug Farr Associates, Hoerr Schauer Landscape



retrofitting suburbia challenge:

Water

Shifts in Practice

Keep, store, reuse, and infiltrate rainwater on-site or locally

Treat wastewater as a resource

- Capture waste heat and nutrients
- Replenish aquifers and wetlands
- Bio-swales, rain gardens instead of retention ponds

Shifts in Policy

Resilience tax credits? Rebates?

Stormwater Utility fees?

Insurance policies that encourage more resilient reconstruction?

Transfer of Development Rights from flood prone areas?

Focus on BIG infrastructure or SMALL incremental changes?