COMMUNITY ADAPTATION FOR RESILIENCE

Dana Nunez Brown, FASLA, PLA, AICP, LEED AP

Lafitte Greenway, New Orleans, LA. Completed 2015.
Natural vs Urban Water Cycles

The natural water cycle:
- Condensation
- Evapotranspiration
- Evaporation
- Lots of infiltration
- High groundwater flow
- Constantly flowing stream
- Soil
- Bedrock

The urban water cycle:
- Condensation
- Evaporation
- Much less infiltration
- Roofs, roads, & paths stop infiltration
- More runoff
- No rain: streams dry up
- Rain: streams flood
- Bedrock
- Soil
WHY WORRY ABOUT URBAN STORMWATER?

• Hydrologic processes disturbed
• Excessive rainfall overwhelms the drainage system
• Runoff backs up causing localized flooding
TRADITIONAL APPROACH

• Engineer structures to CONTROL stormwater
• Move water as quickly as possible from where it falls
• Shorten the time of concentration
• Costly to construct, operate, & maintain
• Drainage only – single benefit
• Reduces neighborhood livability and quality
WATER QUALITY

- Runoff picks up pollutants
- Pollutants are pumped into the lakes and rivers
- Water quality in the lakes/rivers/coastal wetlands degrades

Source: http://www.fromthesouthblog.com/2016/08/my-hometown-is-flooded-heres-what-i-know.html
Source: CBS News
REDUCED GROUNDWATER RECHARGE & SUBSIDENCE
DETRIMENTAL DISCONNECTION: LACK OF PUBLIC AWARENESS
WHY WORRY ABOUT URBAN STORMWATER FOR RESILIENCE?

• Localized Flooding
• Subsidence
• Groundwater
• Water pollution
• Ecoregion shifts
• Sea level rise
• Increasingly stronger storms
• Receding coastline
DEVELOPMENT

• Increase in impervious surfaces
• Increase in temperatures
  • Higher energy consumption
  • Bigger, stronger storms
URBAN HEAT ISLAND EFFECT

- Increase in impervious surfaces
- Increase in temperatures
  - Higher energy consumption
  - Bigger, stronger storms
STORMWATER MANAGEMENT APPROACH

- Mimic nature
- Detain
- Infiltrate
- Filter
STORMWATER MANAGEMENT APPROACH

- Develop to be resilient
- Manage each drop of rainwater as close to where it falls as possible
- Extend time of concentration to reduce peak
- Treat runoff to improve water quality
- Make places for water to exist
- Live *with* water
STORMWATER MANAGEMENT STRATEGY

- **DETENTION** temporarily store each drop of rain as close as possible to where it falls
- **INFILTRATION** Store runoff to increase recharge of groundwater
- **FILTRATION** Store and convey runoff to facilitate pollutant removal by plants and soil

- All are involved in extending the time of concentration
- All are involved in increasing residence time in stormwater green infrastructure
GREEN INFRASTRUCTURE

• Mimics natural hydrology
• Detains water
• Filtering stormwater runoff through a plant/soil/microbe complex to remove pollutants.
• Provides multiple benefits
  • Reduces flood risk
  • Reduces burden on drainage system
  • Retains or uptakes pollutants such as N, P, bacteria, & heavy metals
  • Recharges groundwater
  • Reduces soil subsidence
  • Increases urban habitat
  • Improves Air Quality
  • Reduces urban heat island effect
  • Increases value of neighborhoods
• Applicable at any scale
GREEN INFRASTRUCTURE FACILITIES
GREEN INFRASTRUCTURE
STORMWATER LOT
DETENTION
GREEN INFRASTRUCTURE

STORMWATER LOT

FILTRATION
GREEN INFRASTRUCTURE
CORNER STREET BASIN

- Curb cut for sheet flow
- Bioretention soil mix
- Gravel
- Street basins
- Infiltration into soil recharges groundwater

Details:
- To drainage system
- Native vegetation cleans stormwater
- ADA accessibility
- Crosswalk
- Intersection identification
GREEN INFRASTRUCTURE
BIORETENTION CELL
NEW ORLEANS CITY PARK

GREEN INFRASTRUCTURE
STORMWATERWETLAND

1: INFLOW
2: SEMI WET ZONE
3: MARSH ZONE
4: POOL ZONE
CURRENT RESILIENCE PROJECTS IN NEW ORLEANS
RECONNECTING ECOHYDROLOGIC PROCESSES
LOCALIZED FLOODING MITIGATION
PEAK FLOOD STAGE BEFORE AND AFTER MORE STORMWATER MANAGEMENT MEASURES

BEFORE

AFTER
A. Stormwater Park
B. Urban Bioswale
C. Stormwater Lot
D. Street Basin
E. Urban Bioswale and Pervious Paving
1 collection from nearby streets
2 temporary retention & infiltration
3 excess water overflows to canal
4 Dwyer canal drains remaining
DRAINAGE PUMPING STATION #01
WATERSHED MANAGEMENT
Hazard Mitigation Grant Program
DRAINAGE PUMPING STATION #01
WATERSHED MANAGEMENT
Hazard Mitigation Grant Program

Stormwater becomes floodwater – modeling the storm event

EXISTING 5 YEAR FLOOD

REDUCED 5 YEAR FLOOD
DRAINAGE PUMPING STATION #01
WATERSHED MANAGEMENT
Hazard Mitigation Grant Program
GREEN INFRASTRUCTURE
TREATMENT TRAIN

WOMANS’ HOSPITAL

1. 11 ACRES OF PARKING RUNOFF COLLECTED
2. NATIVE PLANTS & GRASSES
3. WETLAND FOREBAY FILTERING
4. BIORETENTION POND
5. BIORETENTION POND
BIOSWALE IN PARKING LOT
MICHOUD
REVERSE ENGINEERING

MICHOUD FRONT DOOR
NEW ORLEANS

1. EXPANDED & ADDED RETENTION AREAS
2. MAGNIFYING PATHS SLOW WATER DOWN

- BACKFLOW SWAMP
- DRAINAGE AREA
- ENHANCED DETENTION PONDS
- INCREASED T.O.C.

* THIS DESIGN PRECLUDED THE NEED TO EXPAND PUMP CAPACITY.
MICHOUD
REVERSE ENGINEERING
Restore Hydrologic Systems
With Green Infrastructure

Reconnect urban and coastal ecologies
Reconnect people to water
Strengthen Resilience
Community & Site Scale

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