Green Infrastructure Practices

Nuts and bolts
Tools
lubrication

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Presented for:

FOX WATERWAY AGENCY
Lake & McHenry Counties

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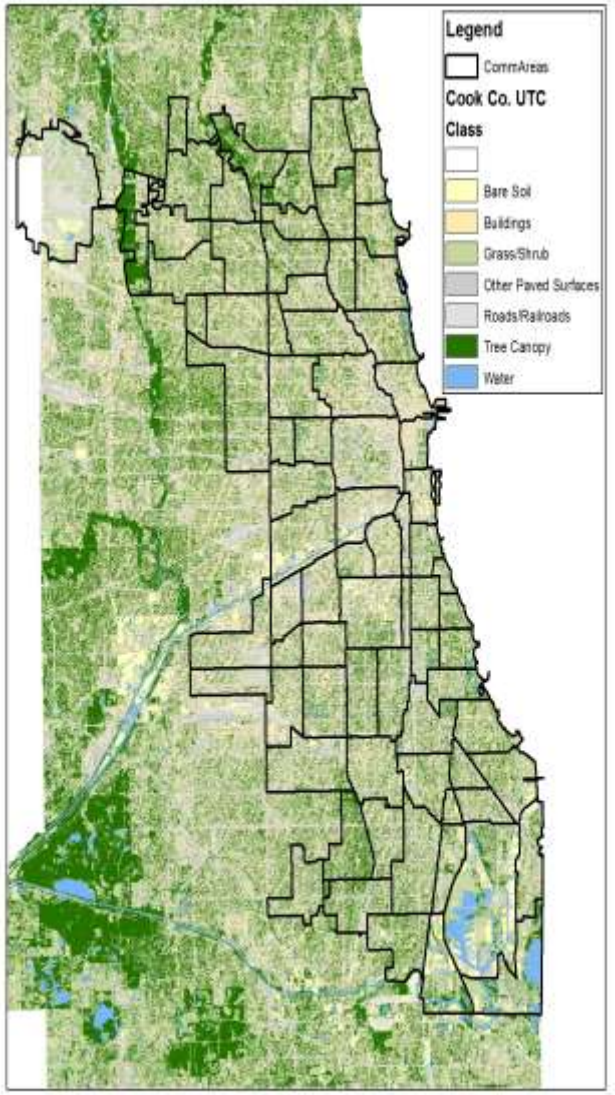
What is Green Infrastructure?

- Landscape features designed to ameliorate some of the negative impacts associated with stormwater runoff by limiting and treating surface outflow
- Scale – regional or on-site
- Part of the toolbox for BMPs

Chicago Wilderness

- **Chicago Wilderness Definition:**
  - **Green Infrastructure – interconnected network of natural areas and open space that conserves ecosystem values and functions that sustain our society.**
  - **Connects across all SCALES of green infrastructure from site – specific practices to our regional plan. The Urban Tree Canopy is a key part of Green Infrastructure.**



Be Aware of Scale with GI

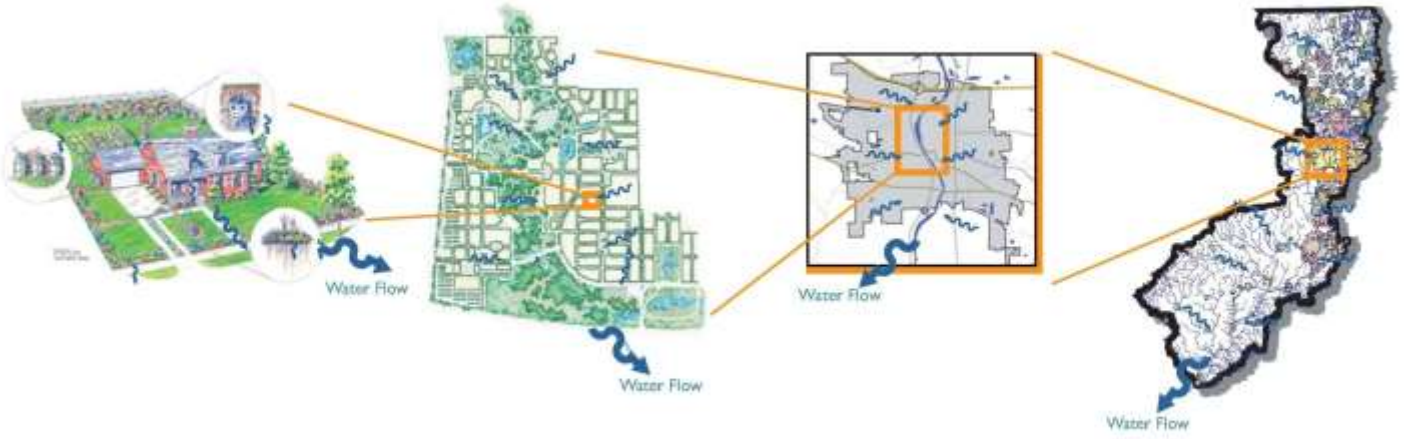
GREENING *Infrastructure*

An Initiative of ChicagoWilderness

Green Infrastructure at Four Scales

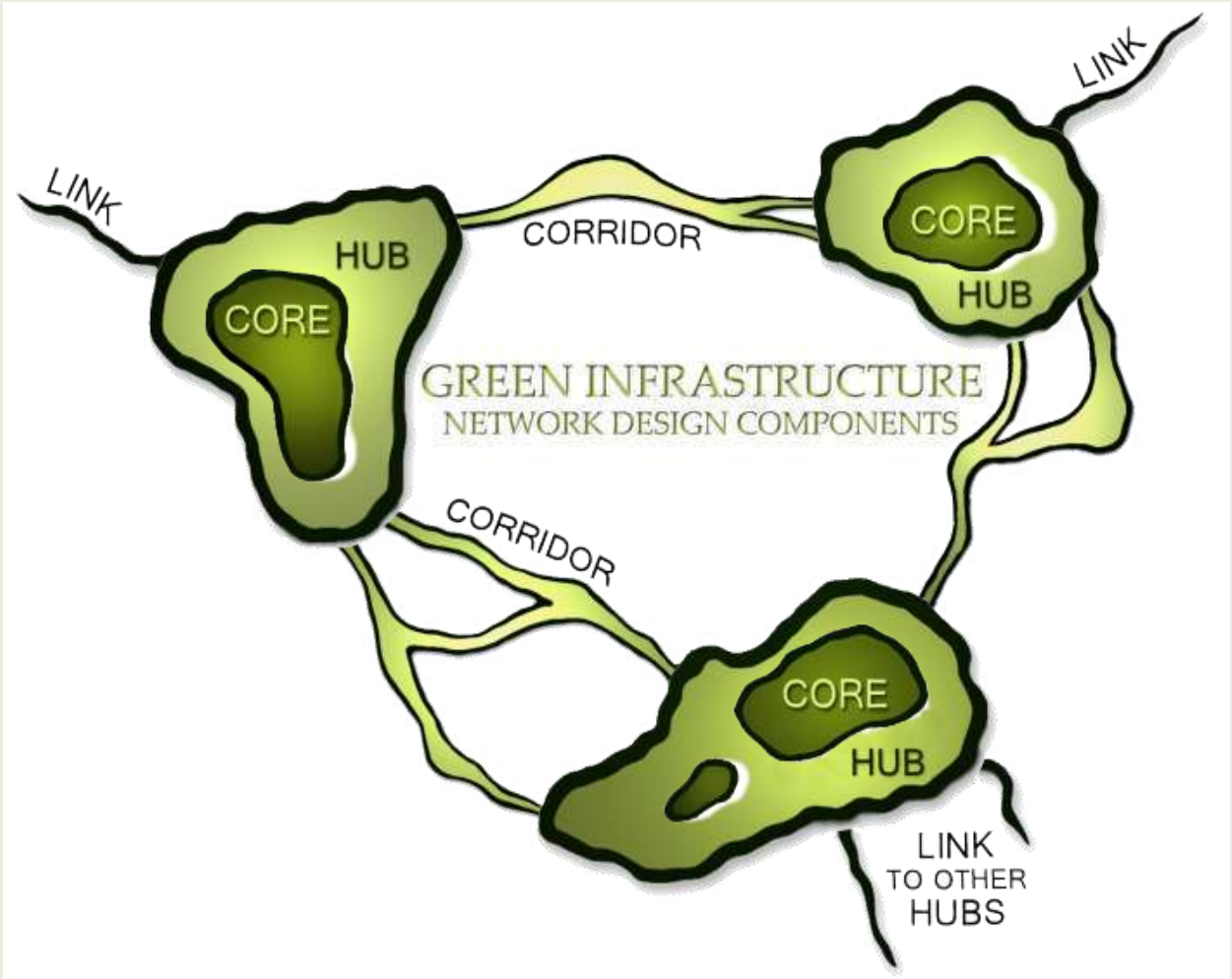
"The nation behaves well if it treats the natural resources as assets which it must turn over to the next generation increased, and not impaired in value."

-Theodore Roosevelt



Individual Building Lot Scale | **Neighborhood or Campus Scale** | **Municipal, Community, or County Scale** | **Watershed Scale**

Design and Connect Network Features



Core Areas:

- Contain fully functional natural ecosystems
- Provide high-quality habitat for native plants and animals

Hubs:

- Slightly fragmented aggregations of core areas, plus contiguous natural cover

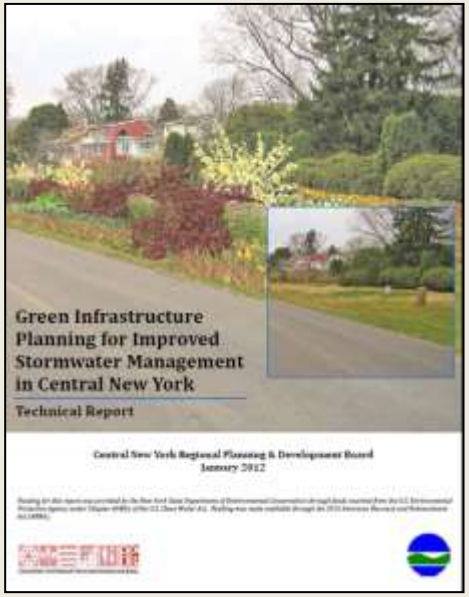
Corridors:

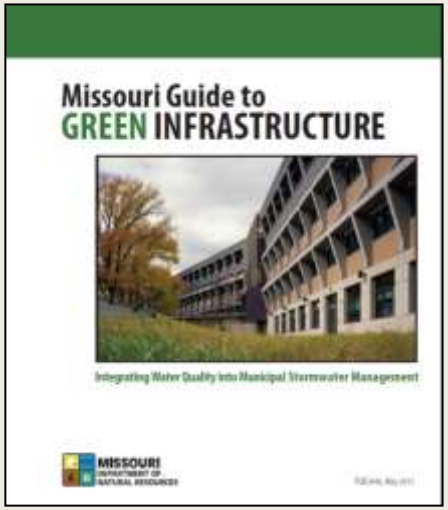
- Link core areas together
- Allow animal movement and seed and pollen transfer between core areas

Regional Green Infrastructure approaches

- East and Chesapeake Bay Area – wooded buffers, often associated with WQ objectives
- Out West – thermal objectives for salmon
- Midwest – regional corridors for humans and habitat, and on-site stormwater offsets

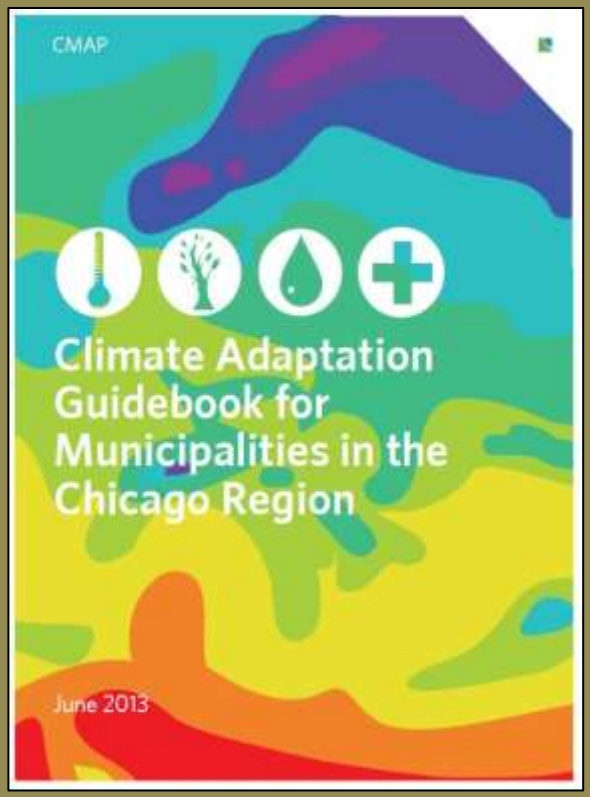
Municipal Green Infrastructure Plans





Adapting to Climate Change Impacts

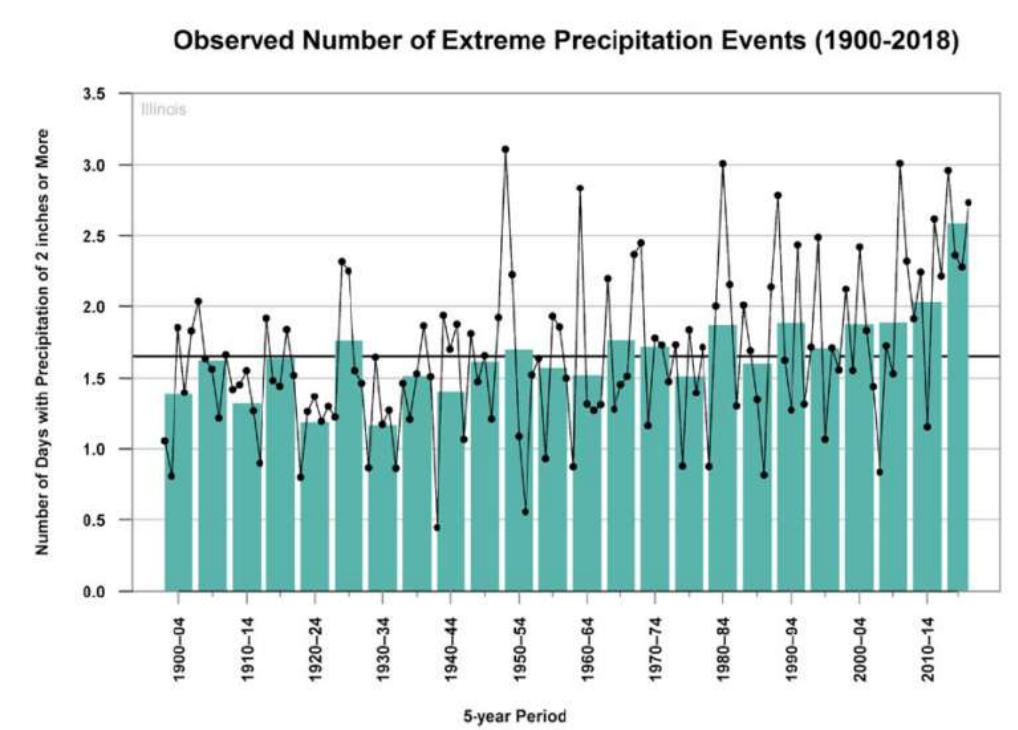
- Drainage and Flood Protection
- CSO's
- Standards for Building and Site Planning
- Managing Heat
- Air Quality
- Open Space and Urban Forestry
- Runoff Volume Reduction (RVR)



Annual Precipitation Increase

Illinois

On average, precipitation has gone up by around 15% in the last century



MWRDGC Service Area

- 893 sq. miles in Cook County
- 27,000 gallons in an acre-inch
- 15.5 billion gallons of potential runoff from each inch of rainfall!
- That’s a lot of rain gardens!

Municipal Climate Adaptation – Stormwater and drainage

- Increase regulatory controls
- Increase flood protection elevation
- Analyze drainage system - assess risk and test sensitivity
- Adopt long-term stormwater management goals
  - MS4 compliance
  - Green Infrastructure Plan
  - CSO separations

Capturing first 0.5" Runoff Volume

- Lake County Watershed Development Ordinance requirement for water quality protection

- The "first flush" tends to contain the most non-point source pollution

New Math

- 27,000 gallons per acre inch
- Lake County – around 38 inches of precipitation per year
- 1,026,000 gallons per acre to manage every year
- 1,368 square miles in LC
- 444 sq. miles is land
- 935 sq. miles is water (68%)
- Water is impervious…..

"RVR"

Local Regulations Moving Towards

Runoff Volume Reduction

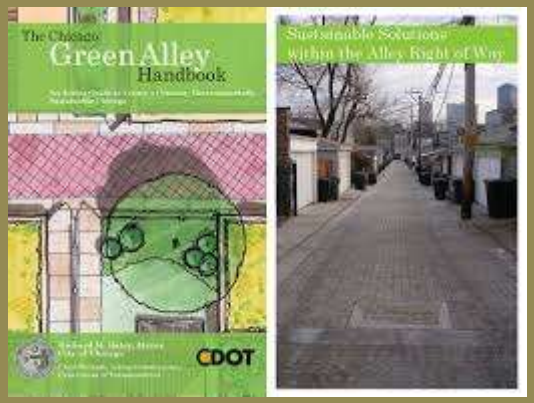
- Six County area ordinances going there
- IEPA ILR10
- Wisconsin
  - NR151
- Emerging National Requirements
- Part of Anti-degradation initiative at federal level

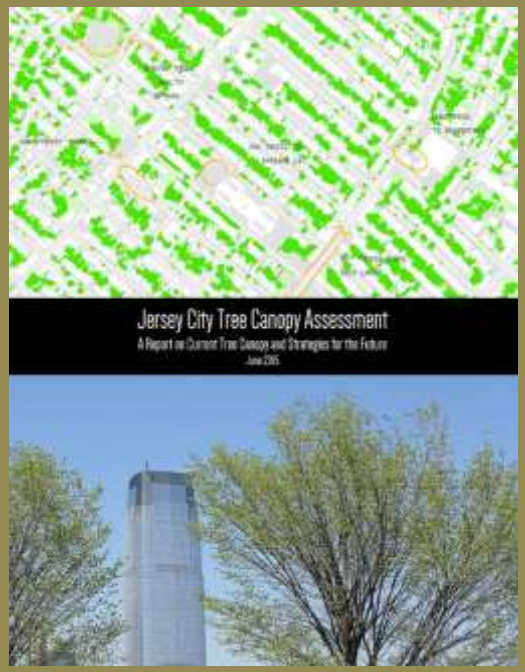
RVR Approaches

- Rain Barrels/ Cisterns
- Green roofs
- Permeable pavement
- Rain gardens
- Bioswales
- Infiltration facilities
- Retention
- Disconnected impervious ahead of detention

Design Considerations

- Regional networks of GI are often linear connected networks usually along riparian corridors
- Urban retrofits or new development designs are site specific
- Need to consider design and watershed objectives when picking appropriate BMPs – water quality, heat, habitat, etc.





Soil Considerations

- Amount of sand, silt and/or clay controls how much water will seep into the ground and how much will run off
- Often use amended soils – e.g. 1/3 sand, 1/3 compost, 1/3 topsoil
- Fertility is a blessing and a curse
- New data (Bannerman, WI) that compost may actually EXPORT nutrients out of the facility rather than sequester

Planting "Guidance"

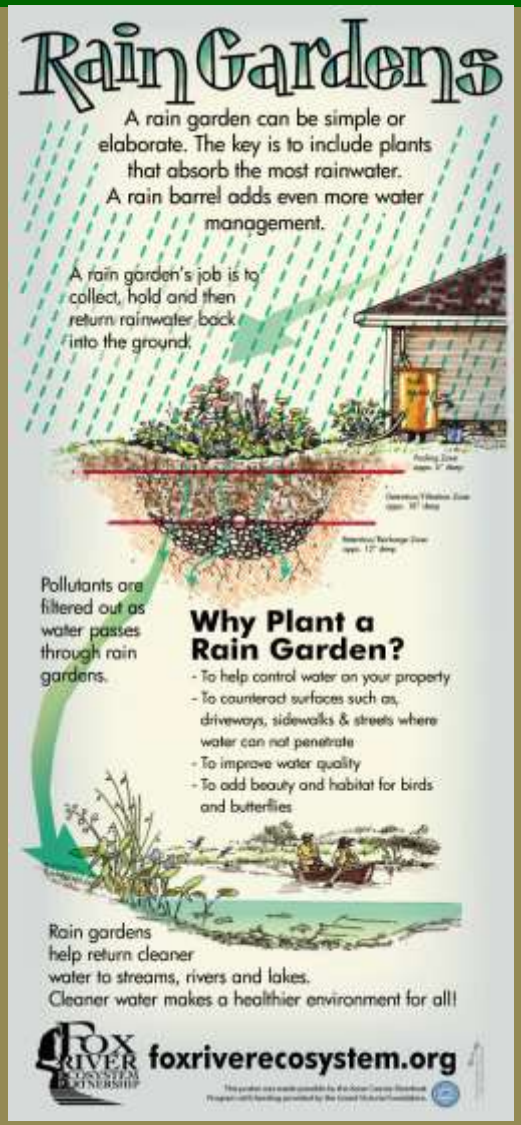
- "Obligate wetland species are not recommended if the soils in the root zone are sandy. Upland species are also not recommended, due to frequent periods of inundation. We suggest planting a variety of species at first, allowing conditions to "proof" the choice of plant selection. Plan to replace some species after the first growing season."
- "…..ask a local nursery."
- *From Design Guidelines for Stormwater Bioretention Facilities* – UW Madison, 2006

BMPs in Urban Areas

- Need to consider context
  - Public safety – not too tall!
  - Traffic sight lines if close to roadways
  - Appearance and public acceptance
  - Trash and debris accumulation
  - Impacts of road salt
  - How will it be maintained?

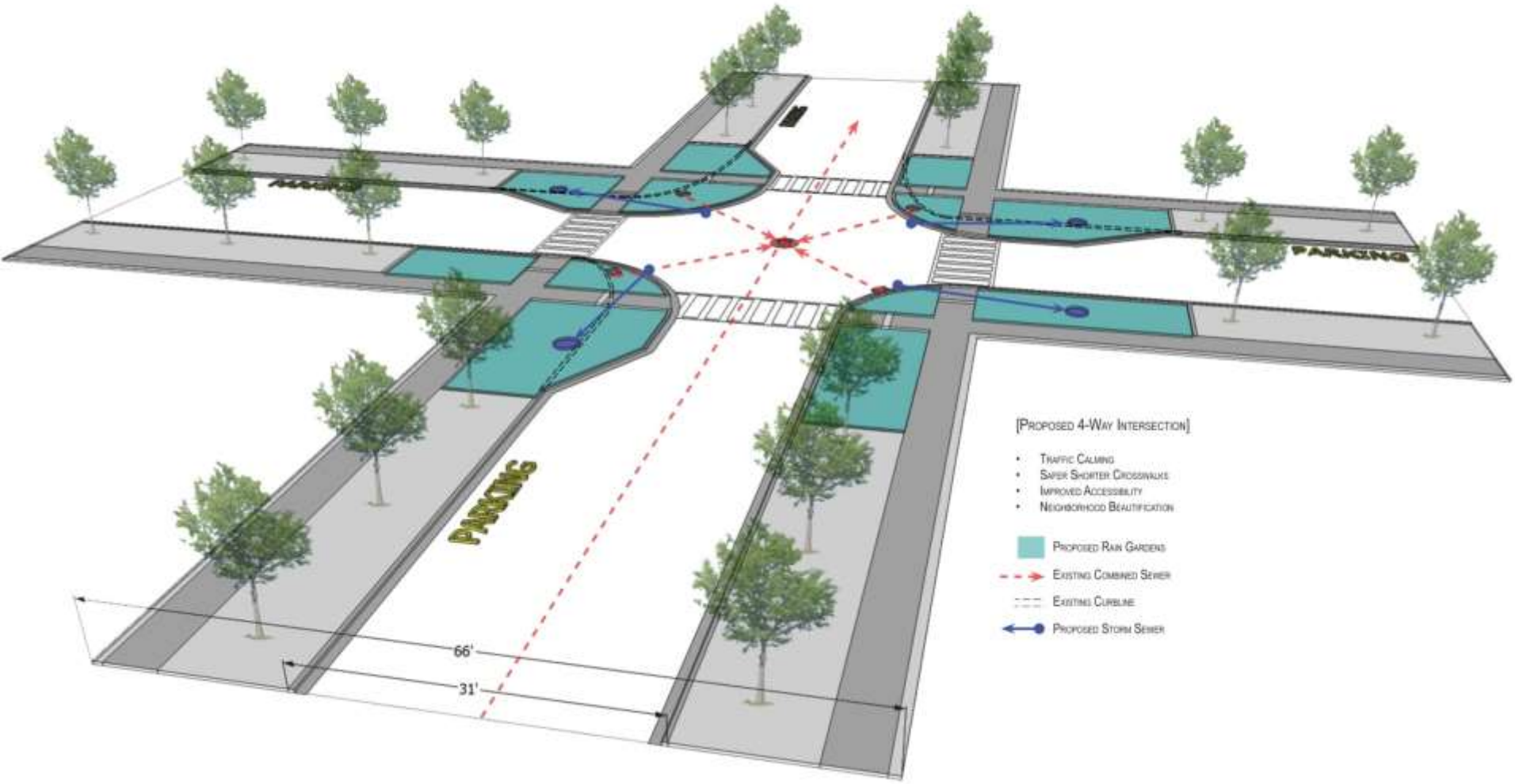
Rain Gardens

- Generally, a small depression fed by a roof gutter.
- Has to have some gravity to work properly and not cause problems.
- Will need to “garden” to keep it looking good for the neighbors
- Limited permitting
- “Disconnected impervious”

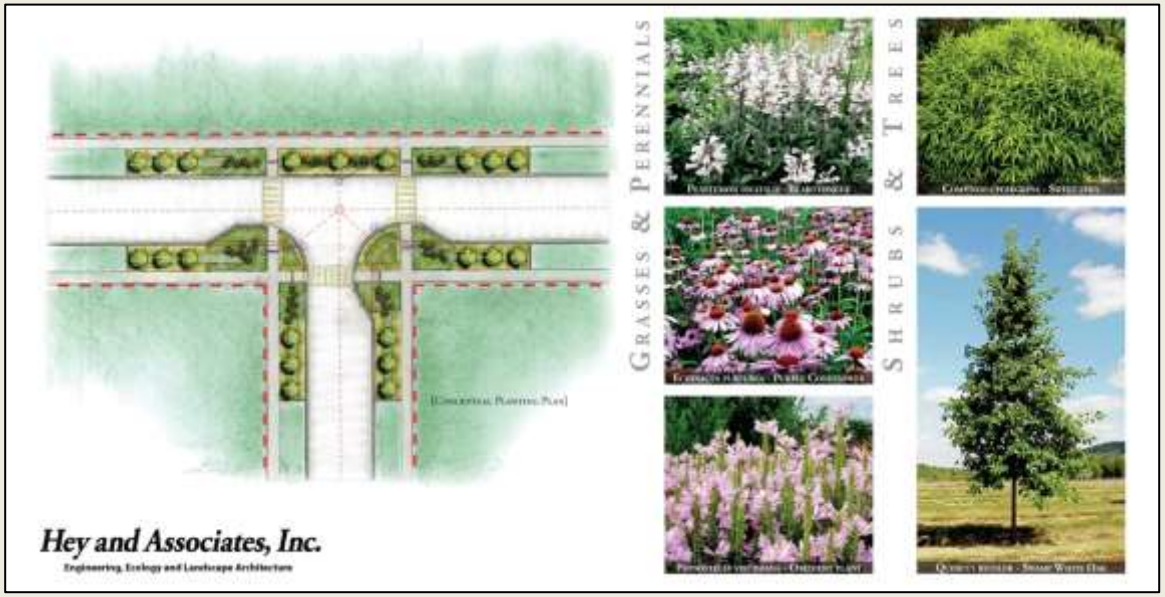


GI FOR CSO CONTROL

City of Aurora received a $1.7 million dollar grant to construct over 120 rain gardens in the public right-of-way to reduce stormwater runoff entering their combined sewer system.



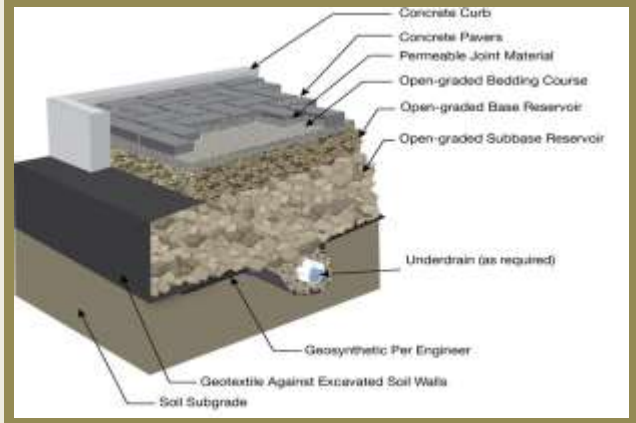
GI for CSO Control



- Extensive public information and consensus building process.
- Some proposed locations were dropped from the program due to lack of neighborhood support.
- Renderings and illustrations used to help residents and local aldermen understand what was being proposed in their neighborhoods.

Local Considerations

- Largely dependent on design considerations and practices
- Scattered BMPs will be more expensive to maintain than more concentrated ones
- Access for equipment could be an issue if not planned for
- Entity doing work will greatly affect prices – contractor versus staff versus owner



Local Considerations

- Quality of installation and initial establishment will define level of effort in maintenance activities
- Annual disturbance potential (e.g. snow piles/salt damage) would influence annual work
- Aesthetic expectation of owner could require more gardening

Routine maintenance

Weed Control

- A few acres of on-site BMPs with a contractor – budget something around $2-3,000 per year, not necessarily every year
- Backpack spraying and hand pulling
- Dormant season mowing an option if accessible by equipment
- Weed whipping/removal of biomass is a good option too for smaller practices

Routine maintenance

Prescribed Burning

- Big wildcard, due to complexity, infrastructure and risk
- Minimum cost for a burn – probably $2,000
- Bigger site, scattered practices, add $1,000's more
- Likely not needed or desirable annually

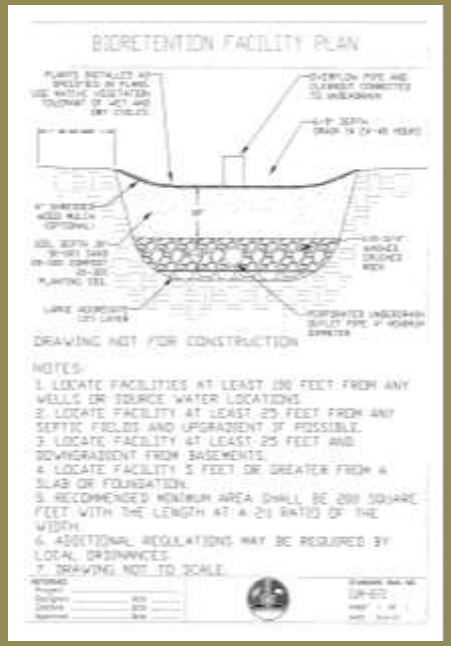
Routine maintenance – Rain "garden"

- Seen $1 to $3 per square yard per maintenance event
- For a 150 SY RG, once/month from May through September could range from $750 to $2250 per year per rain garden depending on level of maintenance and contract
- Some economies of scale but still subject to multiplier factor and standard of care

ROUTINE MAINTENANCE

Infrastructure

- Cleaning of pipes and catchments may need to be done periodically
- Cost per vacuum and disposal? Highly dependent on site - $350/hour for one catch basin
- Could be $250 for each catch basin if on a standard route.
- Culling and replacing soil matrix is sometimes called for in design guidance



Lincoln Ave. METRA Lot

Concerns about saturation destabilizing adjacent railroad embankment resulted in engineered liner and underdrain system.

Runoff from parking lot flows into basin, flows through plantings and seeps into engineered topsoil, is collected via tile system, and discharges into local sewer after being detained and cleansed.

Spring Street & McCarty park

Rain gardens constructed in parkway after combined sewer separation projects.

Downtown Aurora

Plant palette had to match existing downtown streetscape.

City's horticulturalist added annuals for more color.

Very popular!!!

GI FOR CSO CONTROL

Chicago Public Schools

View from the field – Various Practices

Rain Garden - Pingree Grove, IL

Bioswale - Madison, Wisconsin

Turf Grass Infiltration

Unmowed Turf Grass Sideslope and Native Bottom

Rain Garden – McHenry County, IL

Mowed Sideslopes and Unmowed Bottom

Roadside Swale with Switchgrass

Native vegetation in Infiltraton basin

Old Basin with Mowing and Drywells

Mowed Basin with Trenches

Maintenance Considerations

- Starts in the beginning
- Weed seeds apparently came in with imported topsoil.
- Reed canary grass nearly took over in less than two years; common reed and teasel also present.
- Cost of “remedial” work far greater than what it would have cost to maintain from the start.

Long-term Considerations

- Remember practitioners:

Design once, maintain forever.

- Don’t burden yourself or owner with high/expensive maintenance
- The goals should be realistic and situational – habitat versus loadings
- May be better ways to get similar results
- Size considerations versus benefits

Questions?

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