

Green Infrastructure: P.A. 096-0026 Study

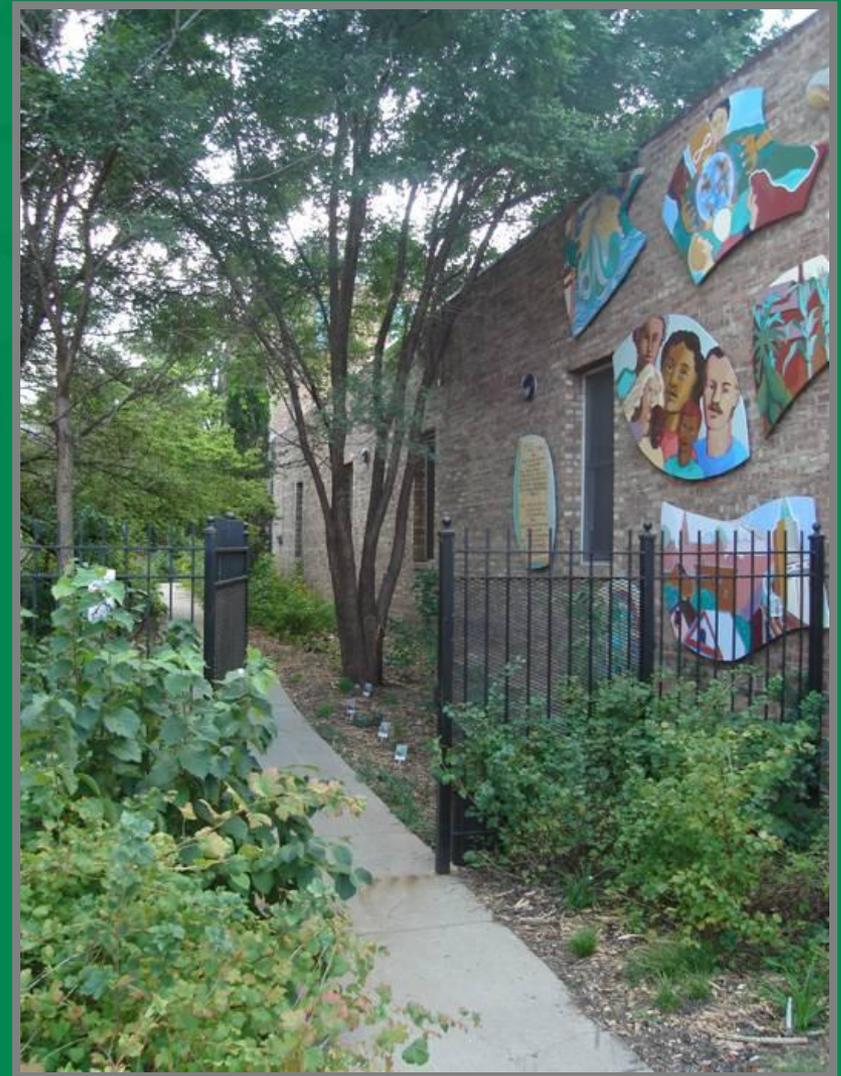
***Hal Sprague, Senior Policy
Associate, Natural
Resources Program, CNT***

***Illinois EPA Stakeholder
Meeting
Springfield, Illinois
January 12, 2010***



The Center for Neighborhood Technology

- ❑ 30 year old Chicago-based non-profit
- ❑ Sustainable energy, transportation, natural resource, climate strategies:
 - ❑ Research
 - ❑ Advocacy
 - ❑ Demonstration projects
 - ❑ Scaling up, replication
- ❑ Green Infrastructure agenda
 - ❑ Planning/Analysis Toolbox
 - ❑ Policy
 - ❑ Education
 - ❑ Practice



Topics

- Green Infrastructure
- History of P.A. 096-0026

Stormwater Management

- Early approaches focused on capturing and conveying precipitation away from developed areas and into local surface waters as quickly as possible.
- “Improved” stormwater management addressed flooding with the use of detention basins and stream armoring.

Stormwater Management

- To address water quality, many programs now address smaller, more frequent storms, utilizing natural systems to supplement and enhance existing strategies (“Green Infrastructure”).
- Our knowledge of effective stormwater management techniques has evolved more rapidly than their deployment, for a variety of reasons.

National Research Council Report

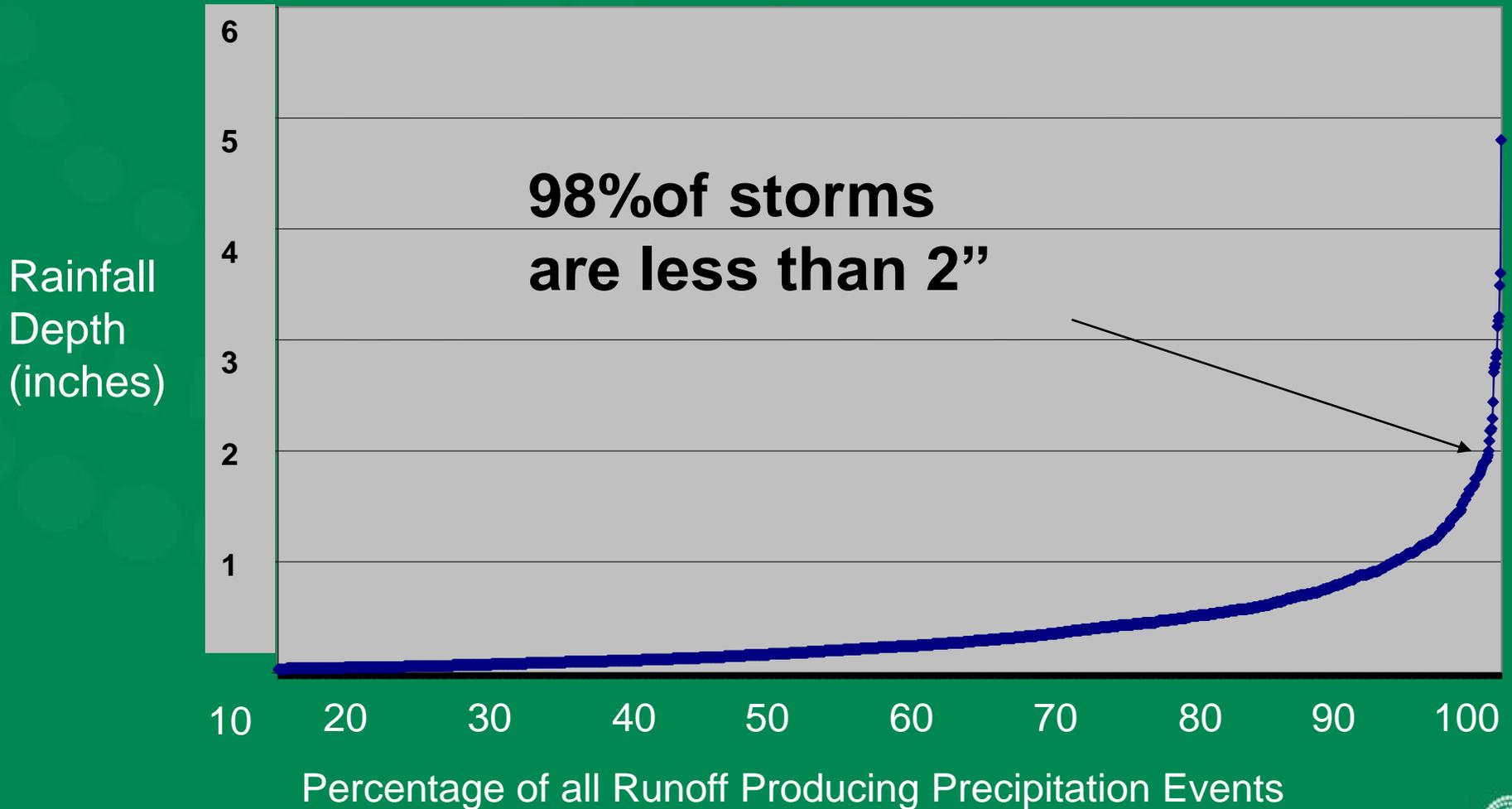
October 2008 Evaluation of USEPA Stormwater Regulatory Program

“...the regulation of stormwater is hampered by its association with a statute that focuses primarily on specific pollutants and ignores the volume of discharges.”

National Research Council Report

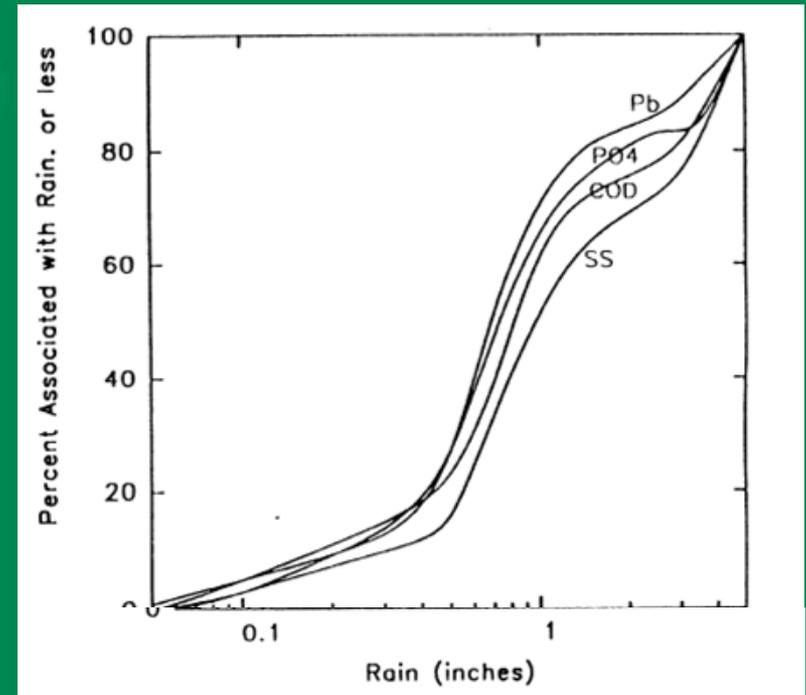
“Radical changes to the current regulatory program appear necessary to provide meaningful regulation of stormwater dischargers in the future.”

Chicago Rainfall Statistics



Potential Impact of “First-Inch Capture” Requirement

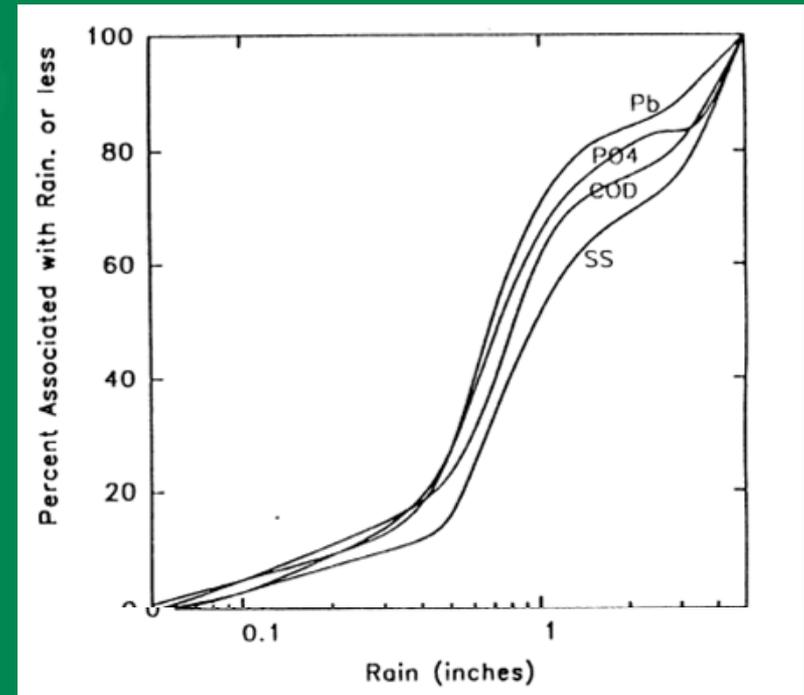
Infiltration Standard	% of Events	% of Volume	% of TP/TSS
1.5”	96	79	75/65
1.0”	90	65	70/55
0.8”	82	54	58/42
0.5”	64	32	38/18
0.34”	45	16	15/10



Pitt *et al.*, 1999 for Milwaukee, WI, data collected (early 1980s) by Bannerman for medium density residential area

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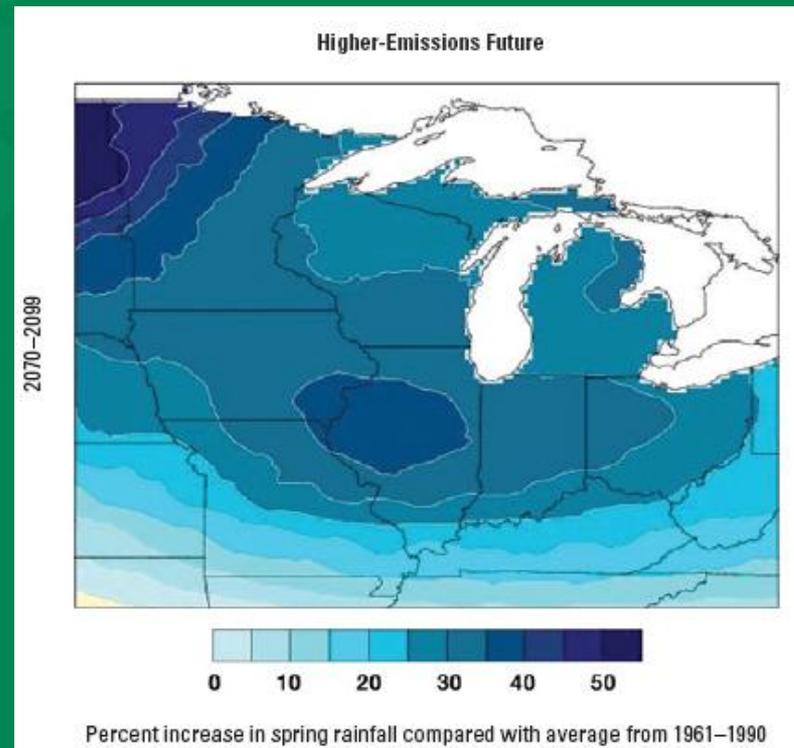
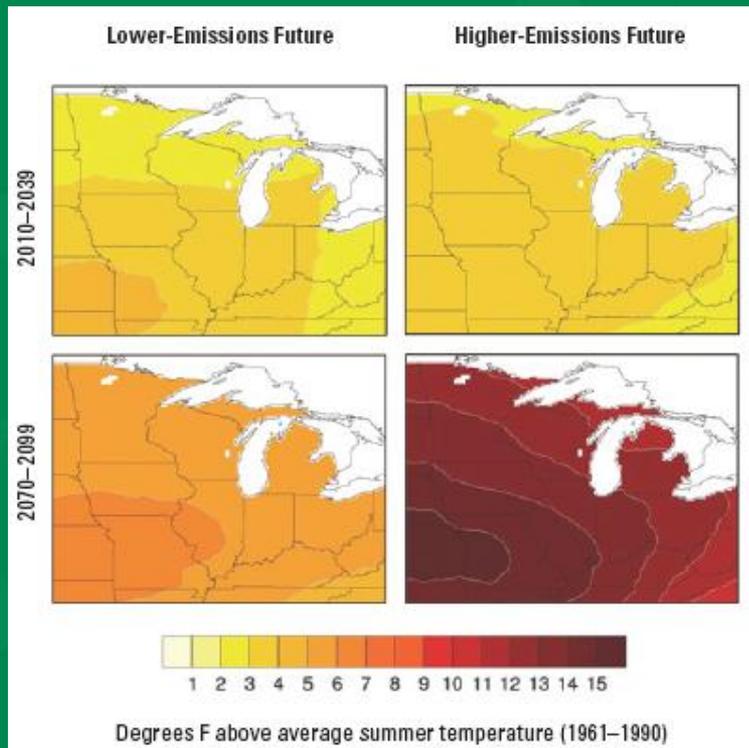
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Climate Change and Stormwater

“ The frequency of heavy precipitation events (or proportion of total rainfall from heavy falls) will *very likely* increase over most areas during the 21st century, with consequences to the risk of rain-generated floods.”

*Intergovernmental Panel on Climate Change
Technical Paper on Climate Change
and Water, April '08*

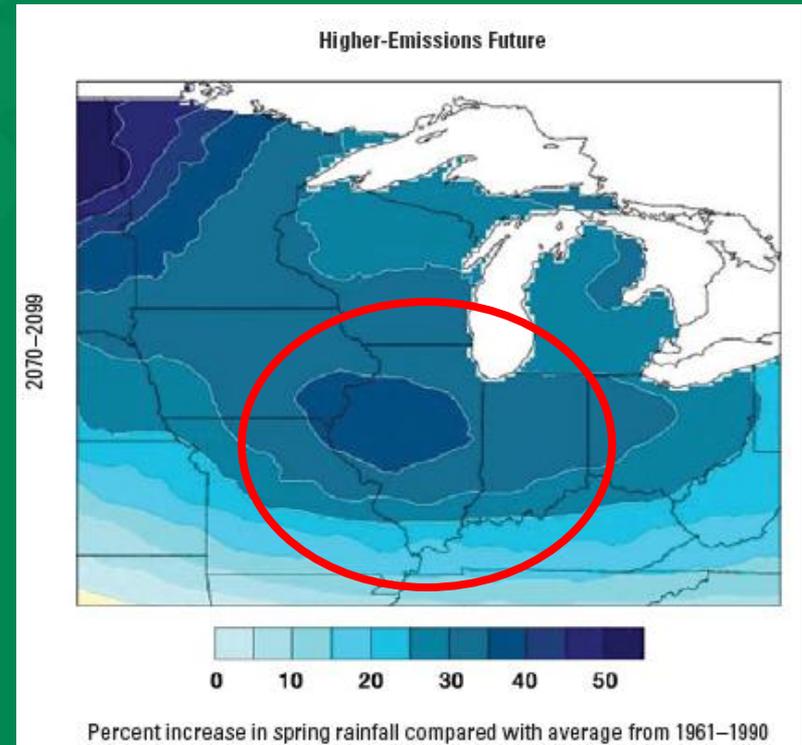
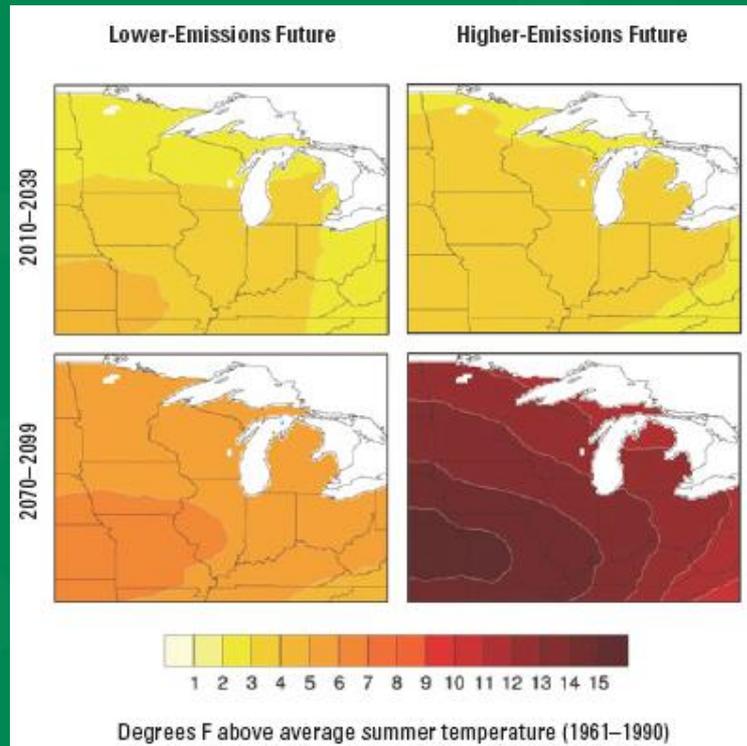
Regional Climate Future: More Intense Heat, Storms, Floods



Projected: In Illinois, a 30% to 40% increase in spring rainfall toward the end of the century.

Source: Union of Concerned Scientists, 2009

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Think About That

Many of Chicago's storm sewers were constructed over 100 years ago.

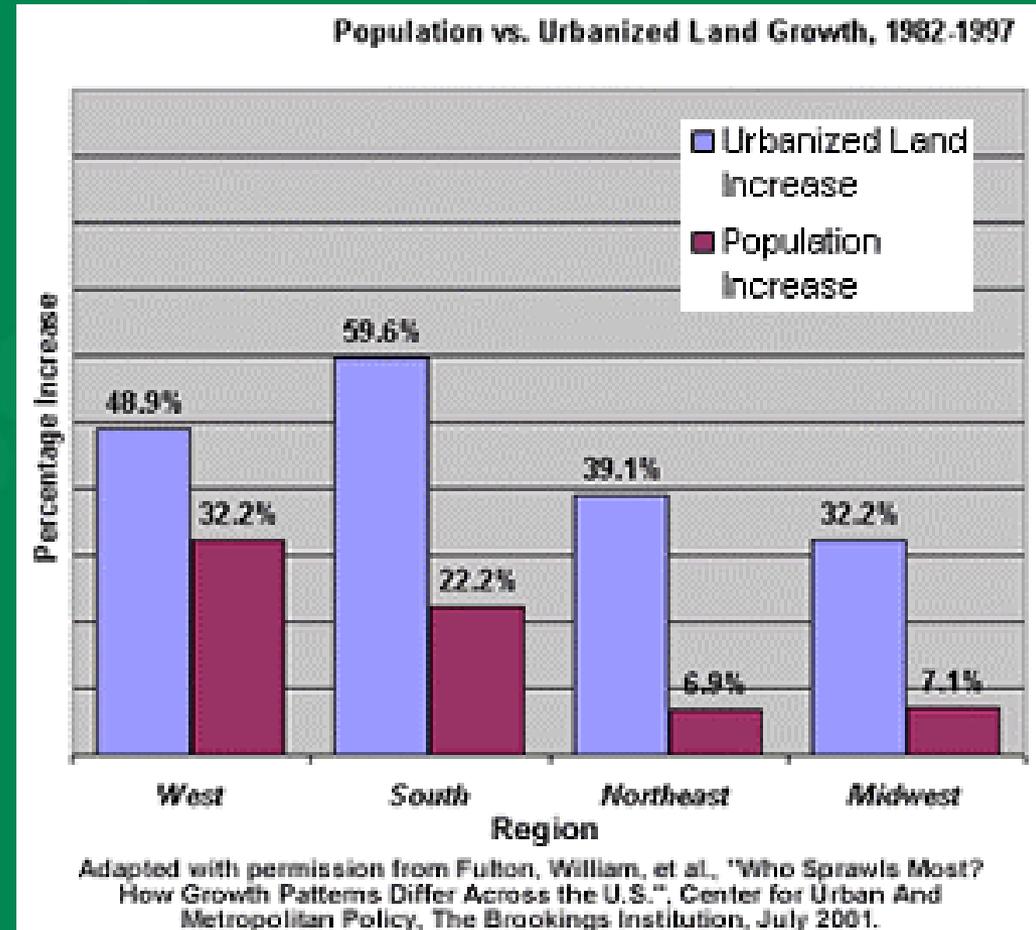
They were designed using the then current meteorological data.

Dealing with Increased Storm Intensity

“To maintain the same design and service standards, **the diameter of every sewer pipe in the Chicago region would have been increased by up to 17%** if rainfall IDF relationships were updated properly in time.” (Guo, 2006)

Increasing Development Intensity

- Between 1982 and 1997 Chicago Population grew 12%
 - Land Developed increased 25%
 - 10-24 Billion Gallon loss in infiltration
- Paving our Way to Water Shortages (2002)



Thinking Outside the Pipe: Redefining Performance with “Green Infrastructure”

Measured in “anti-gallons”

- Infiltration
- Evapotranspiration
- Reuse in natural drainage

1. Rain gardens
2. Green roofs
3. Porous pavement
4. Constructed wetlands
5. Trees
6. Rain water harvesting

Redefining Performance with Green Infrastructure

Cost effective
solutions that
deliver multiple
benefits→

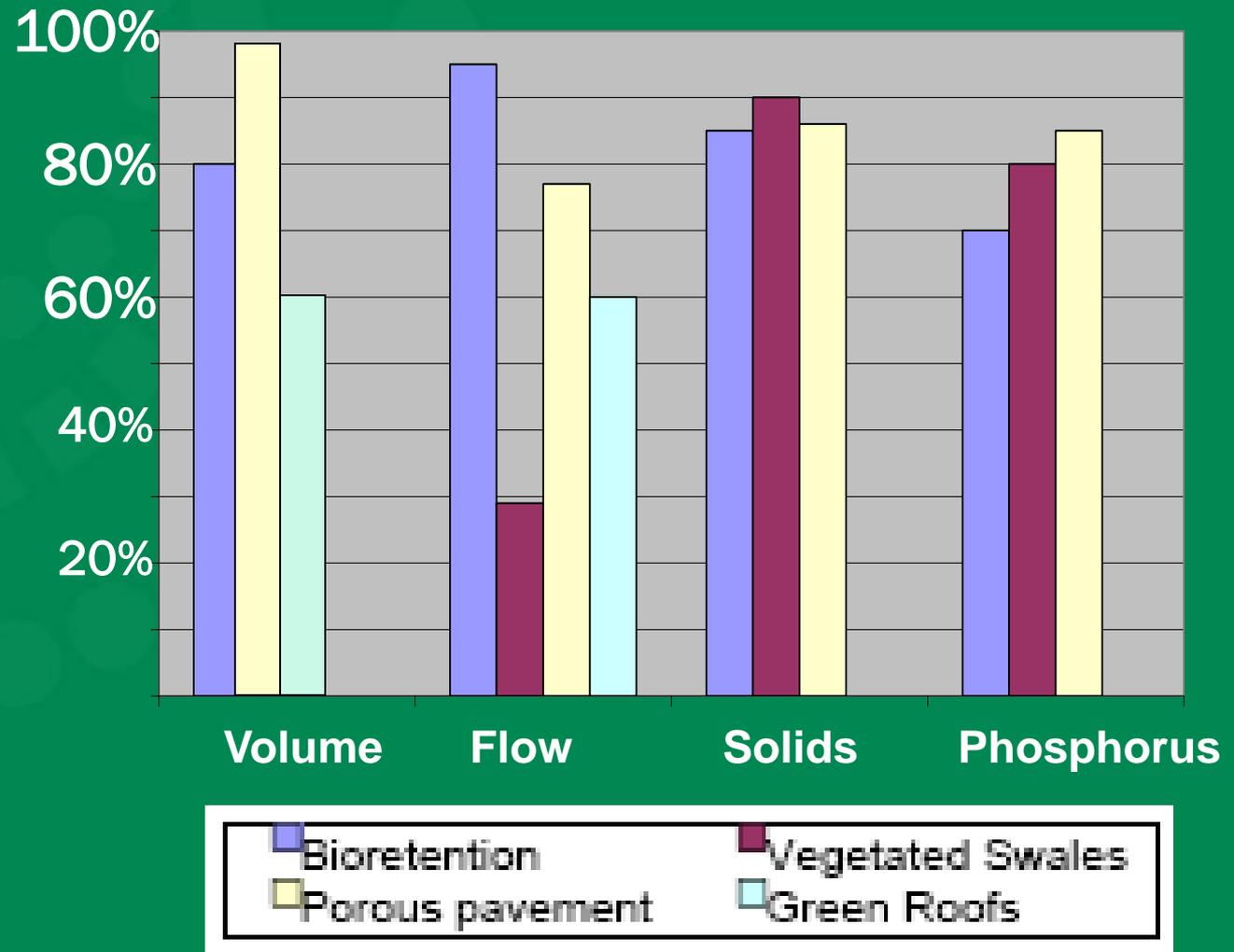
1. Reduced and delayed volume
2. Reduced CSOs
3. Reduced pollutant loading
4. Enhanced groundwater recharge
5. Increased carbon sequestration
6. Mitigation of heat island effect and energy savings
7. Improved air quality
8. Additional habitat and recreational space
9. Improved aesthetics
10. Increased land values

Green Infrastructure

- **Highly effective** for stormwater runoff reduction and pollutant removal
- **Restores, recycles, extends** natural and built regional stormwater management infrastructure
- **Saves money** compared to conventional infrastructure
- **Delivers multiple community benefits** in addition to stormwater management

High Performance Standard

*Stormwater runoff;
sewer overflow;
pollutant reductions*



U.S. EPA: GI/LID Saves Money

Table 2. Summary of Cost Comparisons Between Conventional and LID Approaches^a

Project	Conventional Development Cost	LID Cost	Cost Difference ^b	Percent Difference ^b
2 nd Avenue SEA Street	\$868,803	\$651,548	\$217,255	25%
Auburn Hills	\$2,360,385	\$1,598,989	\$761,396	32%
Bellingham City Hall	\$27,600	\$5,600	\$22,000	80%
Bellingham Bloedel Donovan Park	\$52,800	\$12,800	\$40,000	76%
Gap Creek	\$4,620,600	\$3,942,100	\$678,500	15%
Garden Valley	\$324,400	\$260,700	\$63,700	20%
Kensington Estates	\$765,700	\$1,502,900	-\$737,200	-96%
Laurel Springs	\$1,654,021	\$1,149,552	\$504,469	30%
Mill Creek ^c	\$12,510	\$9,099	\$3,411	27%
Prairie Glen	\$1,004,848	\$599,536	\$405,312	40%
Somerset	\$2,456,843	\$1,671,461	\$785,382	32%
Tellabs Corporate Campus	\$3,162,160	\$2,700,650	\$461,510	15%

EPA Reducing Stormwater Costs through LID Strategies and Practices

Seattle 2nd Avenue SEA Street Project

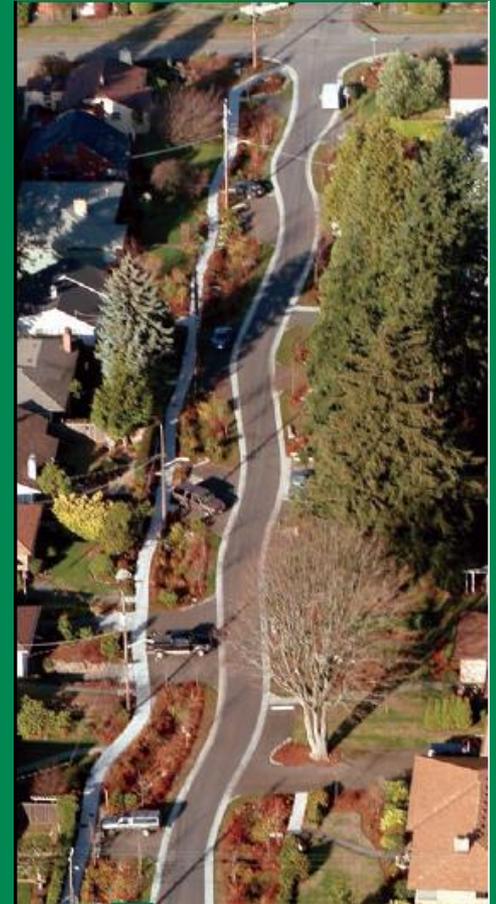
Conventional Development Cost	Low Impact Development Cost	Cost Difference	Percent Difference
\$868,803	\$651,548	\$217,255	25%

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Unpaving the Way : Seattle SEA Streets



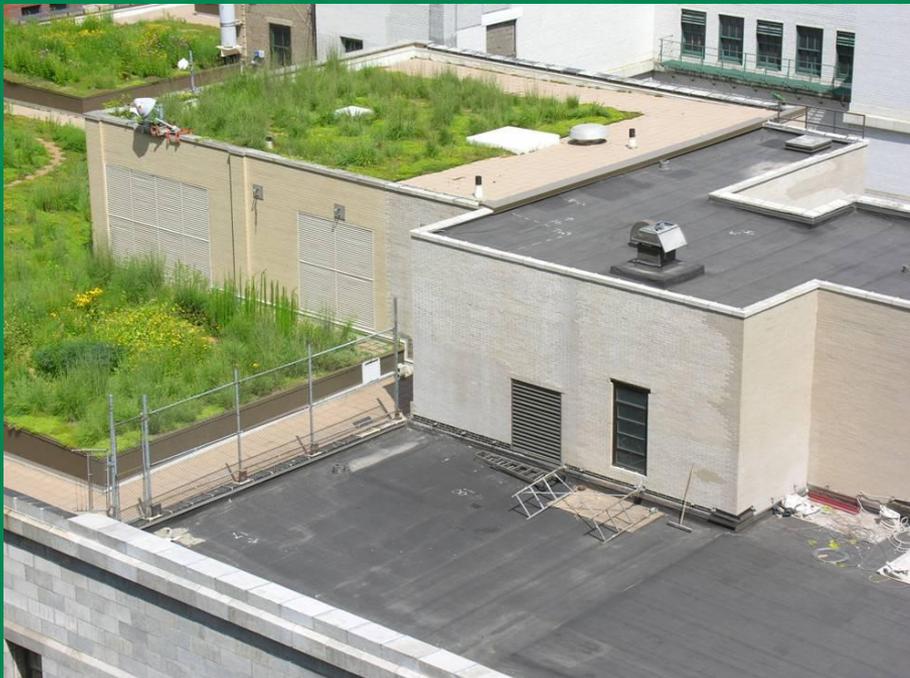
- vegetated strips, no curbs = 11% reduction in impermeable surface
- **90+% runoff reduction**
- **25% cost savings** compared to conventional design



Green Roof Energy Potential

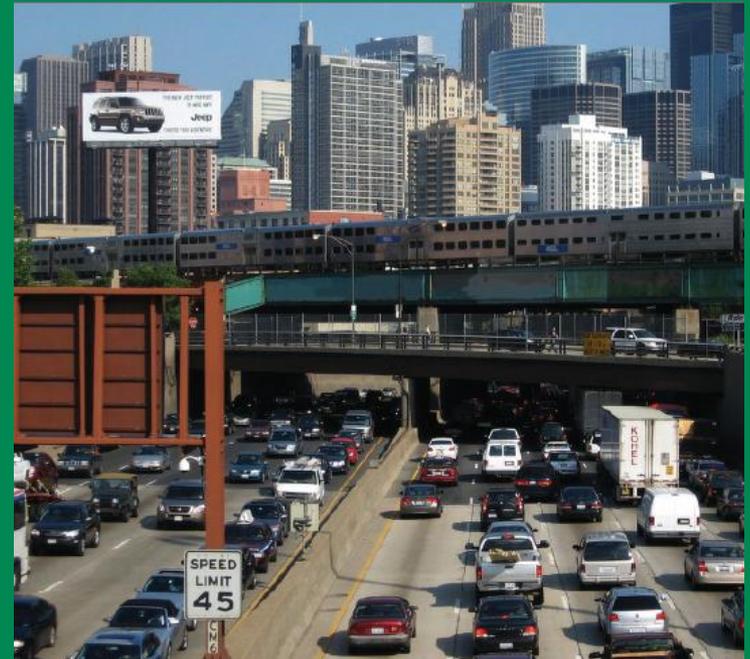
- Chicago citywide projection: \$100 million energy savings and 720 megawatts (= 3 coal fired power plants)

-- Weston Design Consultants



Chicago Green Roofs

2 million square feet
built, 7 million
planned/permitted



~ annual particulate
capture from
130,000 cars

Heat Island Damper: LA

- 15% Green Roof Coverage
- 5-9 degree heat island reduction
- .5 - 1 **Gigawatt** peak power savings

Lawrence Berkeley Labs Heat Island Group, 2000



Urban Forest Cooling

- 10% canopy increase → 5-10% energy savings from shading, wind blocking



Integrated Site Practices – Chicago Center for Green Technology

- Redeveloped brownfield
- Partial green roof, permeable surfaces, constructed wetland, water harvest
- **81% annual volume capture**



Green Employment Intensity

PlaNYC Impacts				
	Construction \$	Direct Jobs	O&M \$	O&M Jobs
Green Infrastructure	\$1 Billion	4,035	\$13 Million	3,629
Conventional	\$32 Billion	135,586	\$33 Million	3,902

*-- Analysis of Jobs Creation in PlaNYC, Final Report, March 2008
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Questions?