STORMWATER 201

REASONS TO CONSIDER GREEN INFRASTRUCTURE THAT DON'T HAVE ANYTHING TO DO WITH STREET FLOODING

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Illinois Extension
Sustainable Communities Initiative

Sustainable Communities connects Illinois communities to University of Illinois scholars and students, bringing the latest research findings to communities, and helping researchers know and address Illinois's most pressing sustainability challenges.

Stormwater is…

Surface water in abnormal quantity resulting from heavy falls of rain or snow.

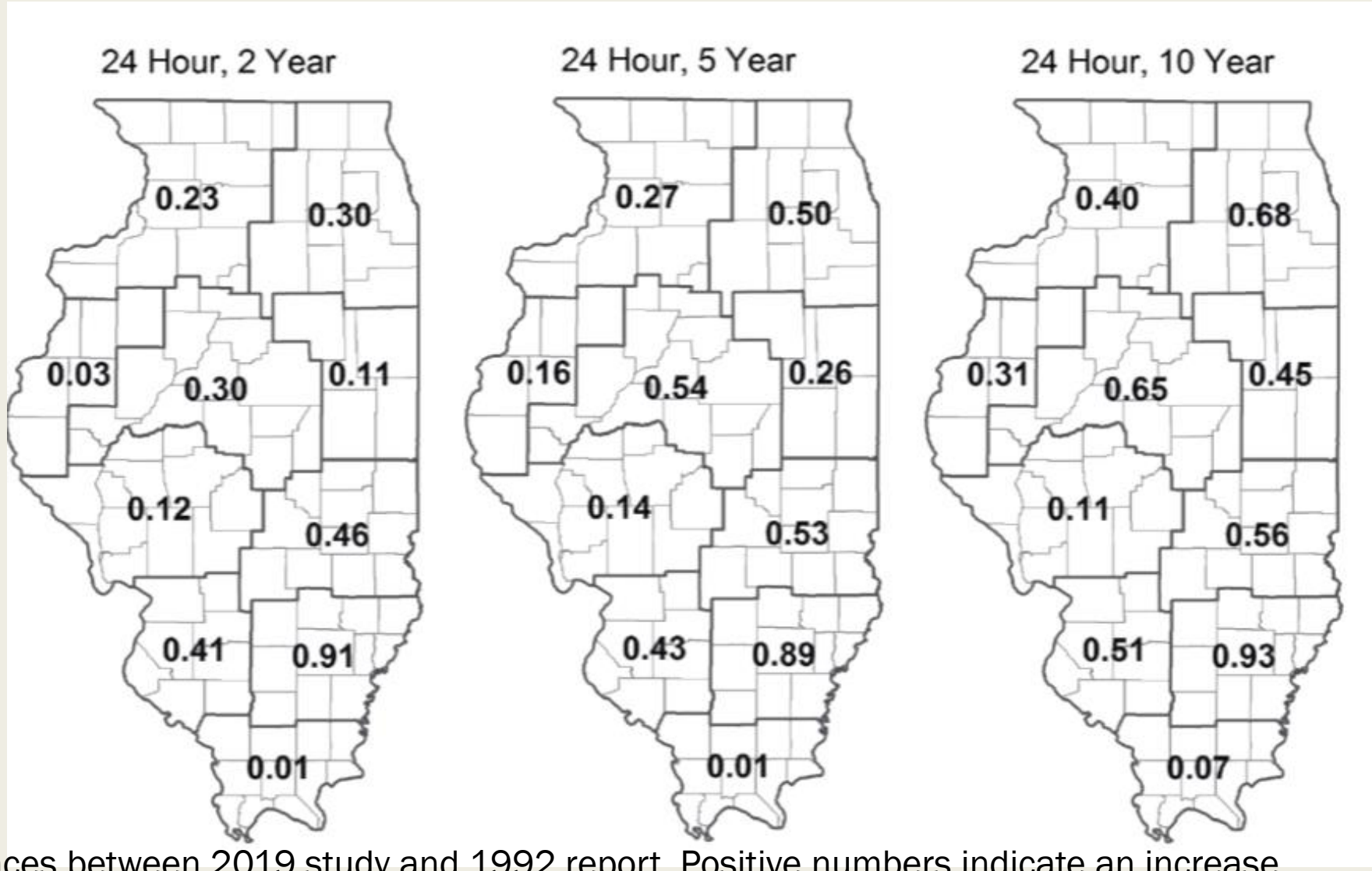
(Thanks Google Dictionary)

Gray Infrastructure

- Engineered by people to manage stormwater
  - Pipes
  - Pumps
  - Ditches
  - Detention ponds

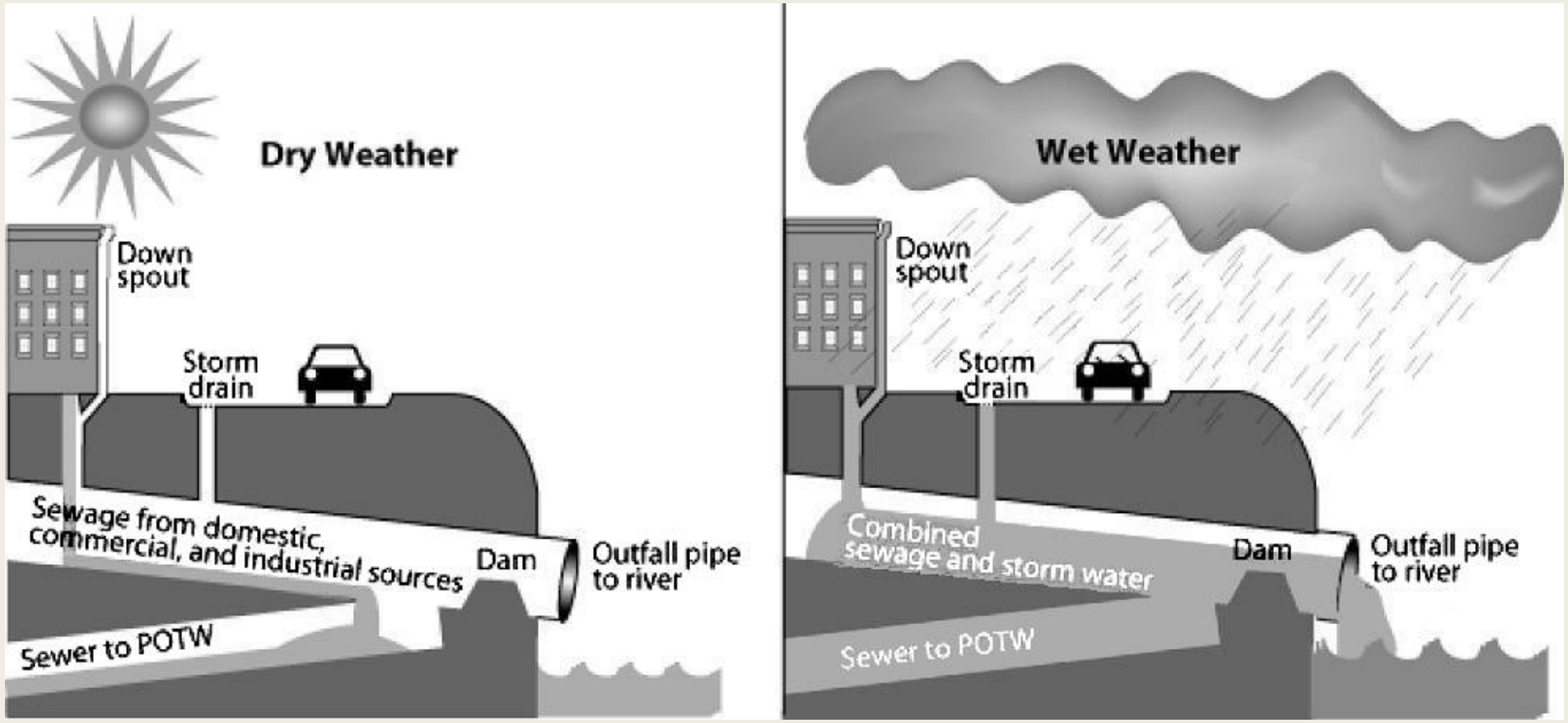
We need gray infrastructure.

Why gray infrastructure isn't enough

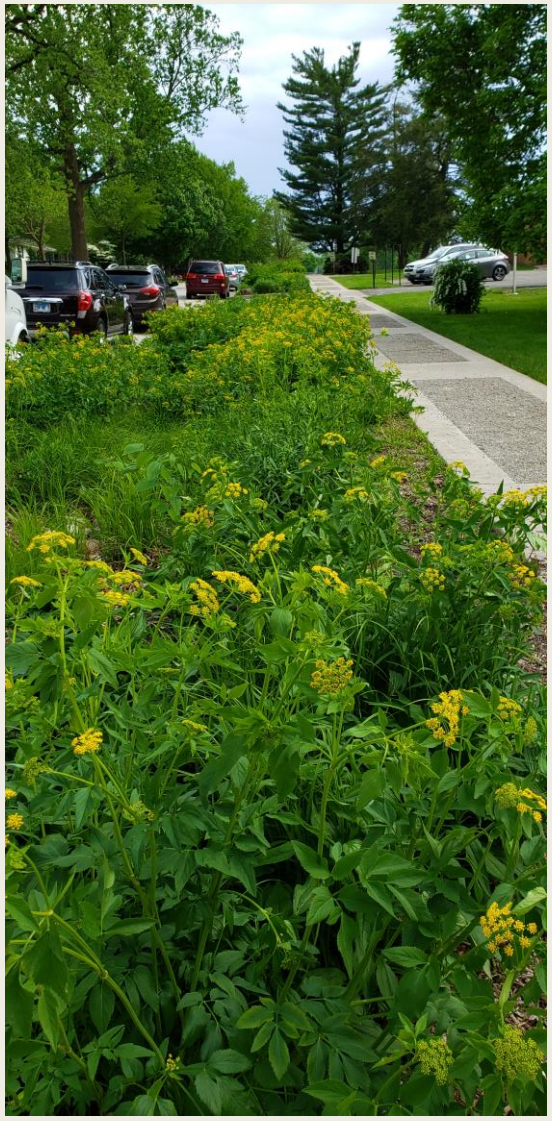


Differences between 2019 study and 1992 report. Positive numbers indicate an increase.
Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70 (http://hdl.handle.net/2142/103172)

Why gray infrastructure isn't enough



What is green infrastructure?



"a variety of practices that restore or mimic natural hydrological processes" (USEPA)

Benefits of green infrastructure

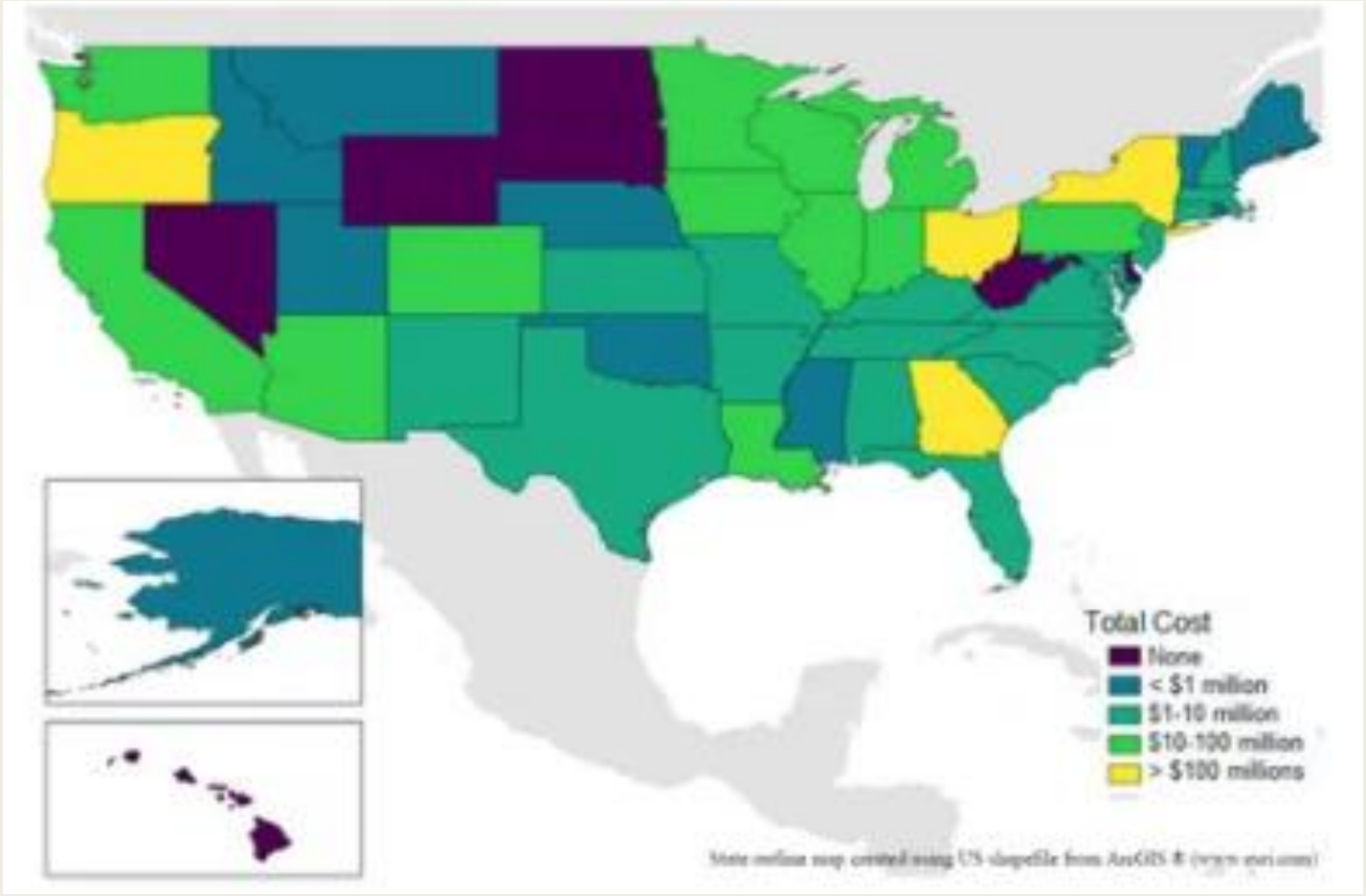
Benefit	Reduces Stormwater Runoff				Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO_2	Reduces Urban Heat Island	Improves Community Livability					Improves Habitat	Cultivates Public Education Opportunities
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding								Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture		
Practice										CO_2								
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◒	●	◒	◒	●	●
Tree Planting	●	●	●	●	○	◒	○	●	●	●	●	●	●	●	●	◒	●	●
Bioretention & Infiltration	●	●	●	●	◒	◒	○	○	●	●	●	●	●	◒	◒	○	●	●
Permeable Pavement	●	●	●	●	○	◒	●	◒	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◒	○	◒	◒	◒	○	○	○	○	○	○	○	●

Where is green infrastructure?

Practices used:

- 55% bioswales
- 50% rain gardens
- 45% bioretention ponds
- 44% porous pavement

Most projects used an average of three practices.

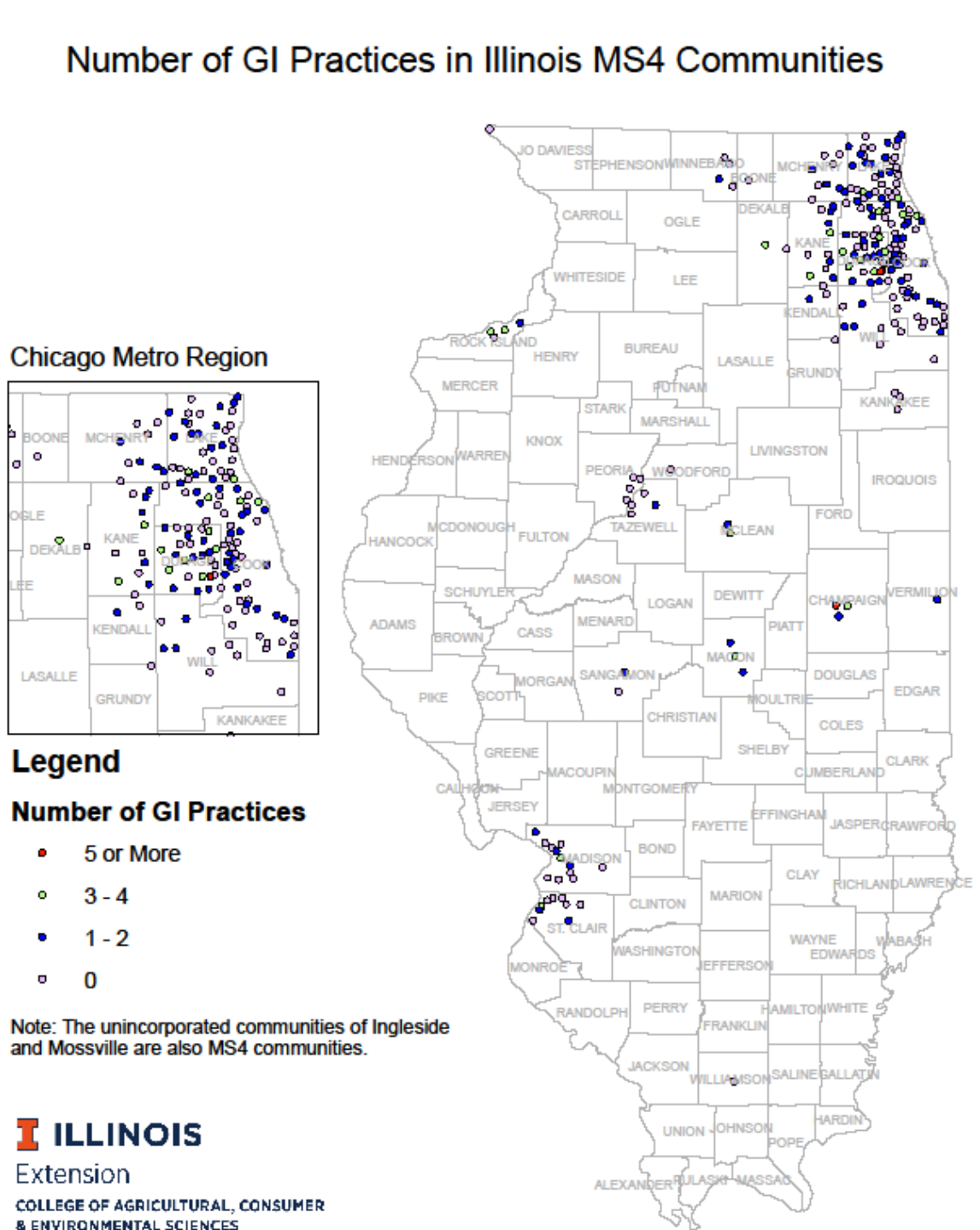


Zimmerman, R.; Brenner, R.; Llopis Abella, J. Green Infrastructure Financing as an Imperative to Achieve Green Goals. *Climate* **2019**, *7*, 39.

Where is green infrastructure?

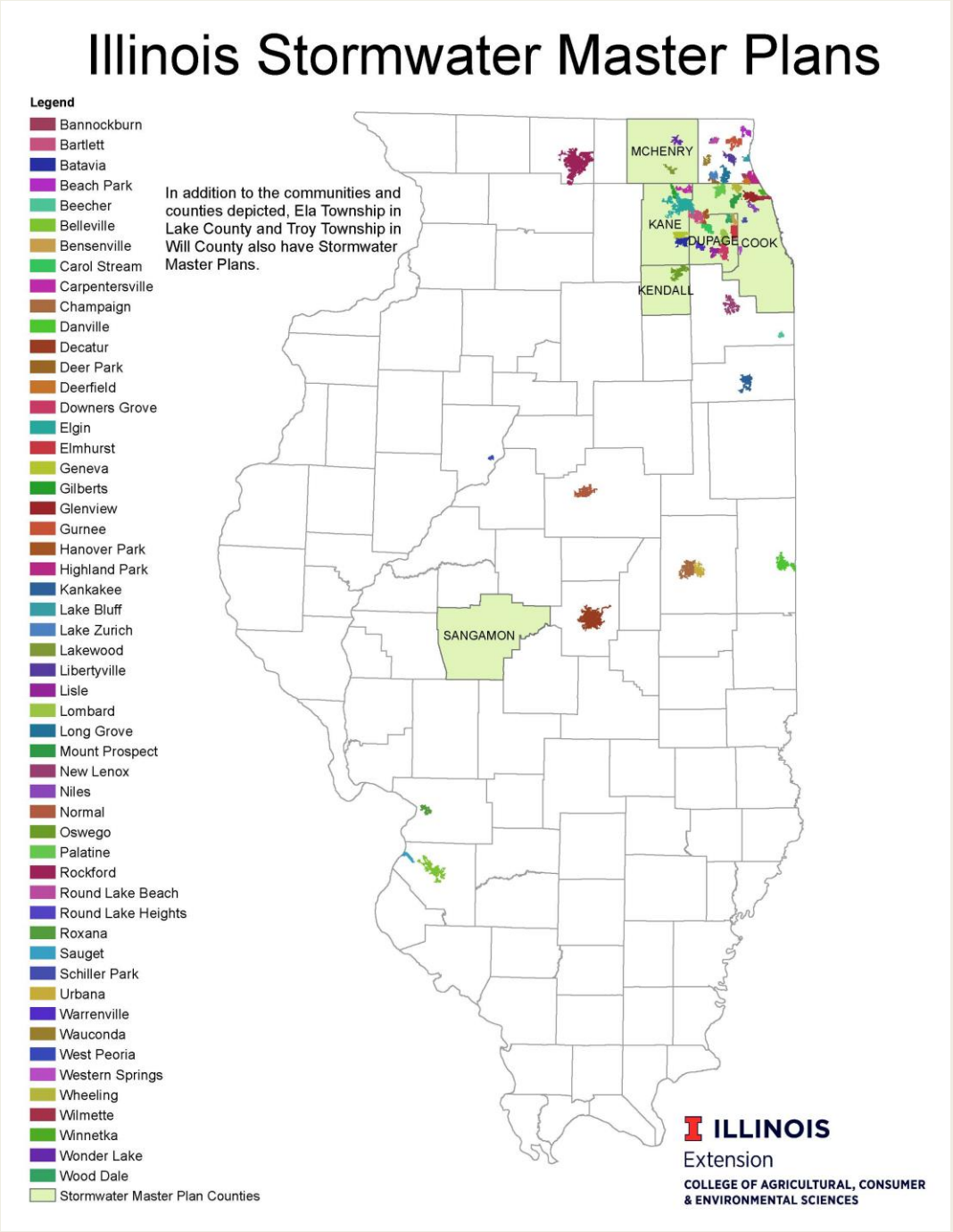
- Review of 212 communities with IEPA Municipal Separate Storm Sewer Permits

- 67% of communities had at least one GI practice
- 36 communities had over 3 practices
- Street sweeping programs were the most common, followed by
  - *rain barrel programs,*
  - *raingardens,*
  - *green infrastructure grants,*
  - *stormwater utility fees,*
  - *bioswales*



Stormwater Master Plans

- Municipal planning process to
  - *Collect community input into stormwater practices*
  - *Plan for infrastructure needs*
  - *Identify areas that need infrastructure*
  - *Address water quality concerns in impacted water bodies*
  - *Begin to seek funding for future projects*



Reason #1: People Want it

- 1972 Water Quality Act: regulates discharge of pollutants into water
- National Pollutant Discharge Elimination System: Requires cities, towns, and counties over 50,000 to obtain state permits to discharge into waters
- Municipal Separate Storm Sewer System Permits/Combined Sewer Overflow Permits: Many states incorporate GSI guidelines
- Sustainability goals (community level)
- Increasing severe storm events

Survey says:

- 80% of respondents would consider putting a rain garden in their right of way
- 90% would have one if their neighbor did
- People want rain gardens to
  - *Beautify the neighborhood*
  - *Increase pollinator and bird habitat*
  - *Reduce the need for mowing and fertilizer*
- Barrier: 62% of people said they would need training

Reason #2: Green Infrastructure Saves Money

- Reduction in stormwater runoff
  - Reduced water treatment needs
  - Reduced grey infrastructure needs
  - Improved water quality
  - Reduced flooding
- Reduction in energy used
  - Cooling buildings
  - Reducing energy needs for water treatment
- Air quality improvements
  - Reduced nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2) and some particulate matter
  - Related health benefits
  - Indirect energy reduction

Annual Rainfall Interception in Gallons from 1 tree, 40-year average, Midwest Region

	Small tree: Crabapple (22 ft tall, 21 ft spread)	Medium tree: Red Oak (40 ft tall, 27 ft spread)	Large tree: Hackberry (47 ft tall, 37 ft spread)
Rainfall Interception	292 gallons	1,129 gallons	2,162 gallons

Source: McPherson, E. et al. (2006).

- **NO_2 = $3.34/lb**
- **O_3 = $3.34/lb**
- **SO_2 = $2.06/lb**
- **PM-10 = $2.84/lb**

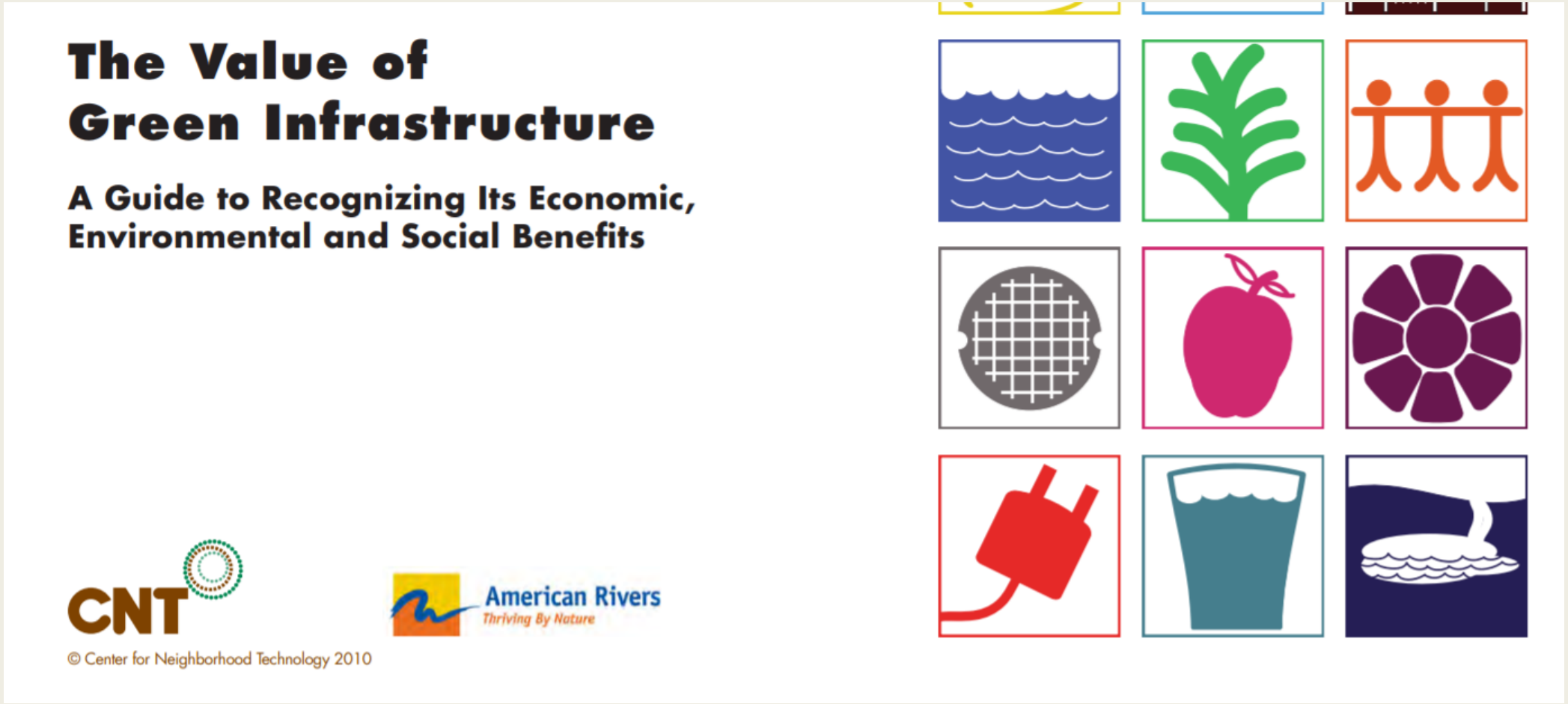
US Forest Service

Reason #3: Green Infrastructure Makes Money

- *Well designed landscaping boost rental rates by 7%.*
- *Retail customers are willing to pay 8-12% more when shopping in a place with a mature tree canopy.*
- *Proximity to green infrastructure increases property value ~2-26.6%.*
- *Flood mitigation increases property value by 2-8%.*

https://www.nrdc.org/sites/default/files/commercial-value-green-infrastructure-report.pdf

Figuring out economic benefits



https://www.cnt.org/sites/default/files/publications/CNT_Value-of-Green-Infrastructure.pdf

Reason #4: Green infrastructure can achieve social justice goals

- Community cohesion
  - *Chance for community conversation about needs and wants*
  - *Safe, beautiful public spaces for walking, picnics, birthday parties*
- Reduced crime rates?
  - *Mature trees on public lands, especially those not in the ROW, give the impression of "eyes on the ground" and community cohesion, which decrease actual and perceived crime rates*
- Green space is good for kids
  - *Kids who have more access to green spaces do better in school*
- Overall health benefits
  - *More walking, biking, sports, etc…*

Unintended Consequences

Unintended Consequences

- Property value increases between 17.9% and 26.6% within a ½ mile (Immergluck 2018).
- Disproportionally affected minority and low income neighborhoods, despite efforts to maintain affordable housing.

https://beltline.org/about/the-atlanta-beltline-project/atlanta-beltline-overview/

Social Justice Solutions(?)

- General Guidelines
  - *Function and location matter*
    - Transportation corridors
    - Proximity to downtown or business districts
  - *Park size seems less connected to increases in prices.*

    (Rigolon, 2019)

- Just Green Enough

Winifred Curran, an associate professor of geography at DePaul University

The Newtown Creek Nature Walk in Greenpoint, Brooklyn *Flickr/Garrett Ziegler*

Reason #5: Green infrastructure employs people

- To meet the current and currently anticipated demand, more than 200,000 trained green infrastructure professionals will be needed across the country (*Jobs for the Future*, 2017).
  - Green infrastructure maintenance is a challenge and barrier for community implementation.
  - People currently employed in water jobs are predominantly white and predominantly male.

Maintenance and Workforce Solution(s)

- Think about infrastructure maintenance differently
  - *People, not pipes*
- Green infrastructure maintenance can't be deferred
- Green infrastructure maintenance requires a specific skill set
  - *National Green Infrastructure Certification Program*

Green Infrastructure Certification

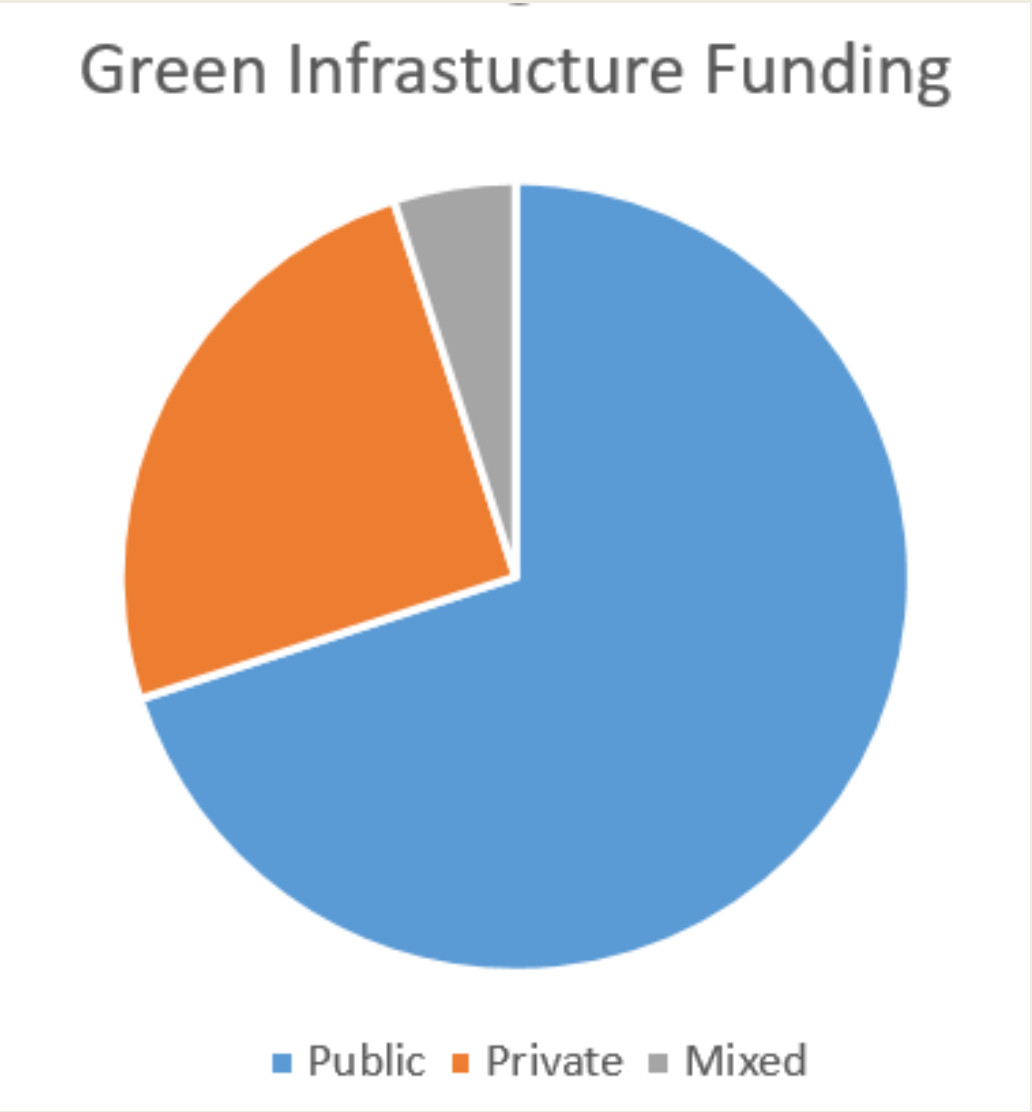
- Provides:
  - Core set of skills and knowledge
  - Standardization of techniques.
  - More consistent outcomes

PURDUE EXTENSION
rainscaping
PURDUE RAINSCAPING EDUCATION PROGRAM

Reason #6: Funding is available

- 80% of projects used only one funding source
- 66% used grant sources
- 51% used only grants

(Zimmerman, 2019)



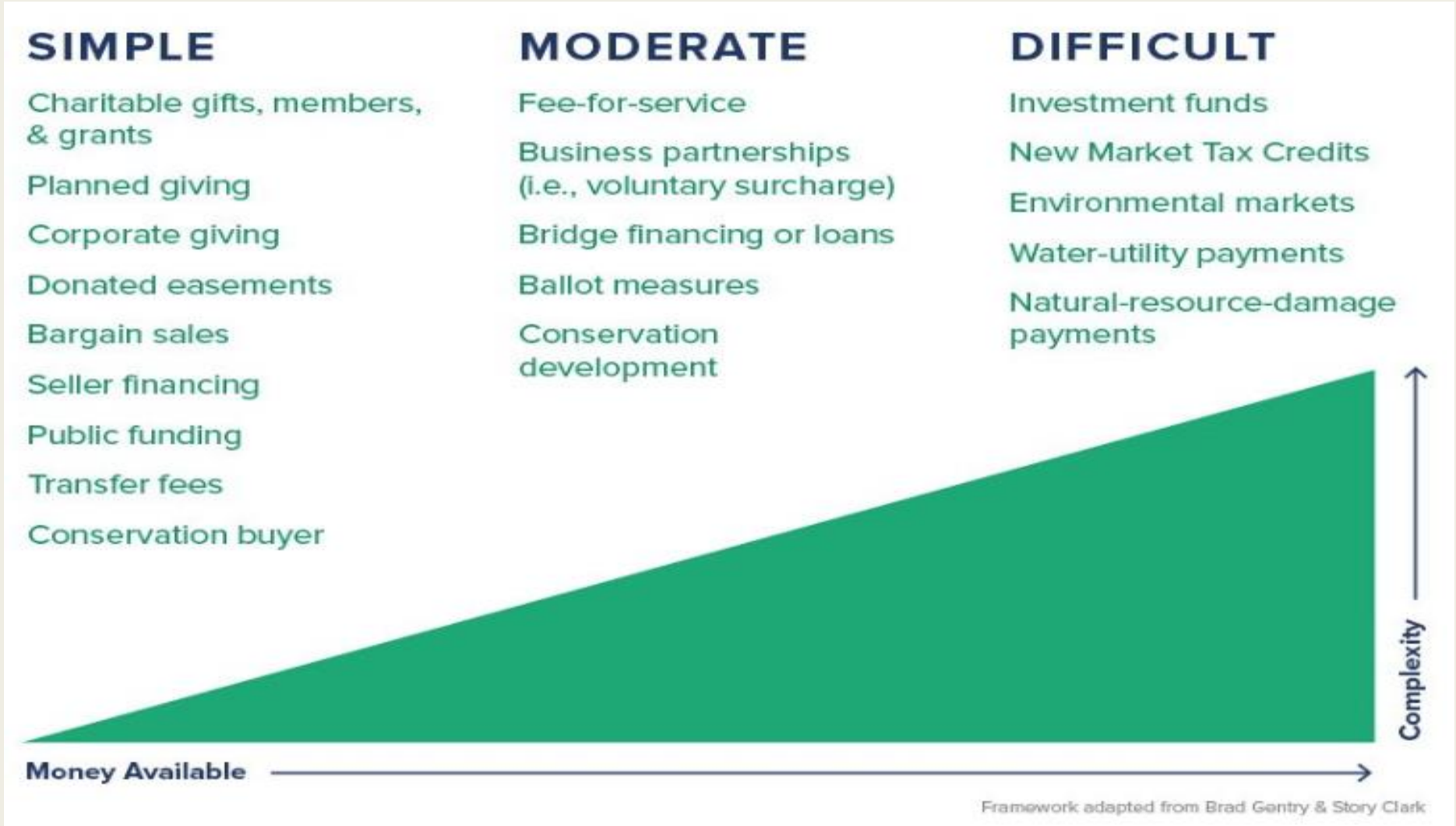
How we pay for green infrastructure now

Table 2. Distribution of financial tools by financial source.

	Grant	Bond	Loan	Tax	User Fee	Donation	Developer
Public	61	8	3	20	2	0	0
Private	0	0	0	0	0	8	1
Mixed	7	0	1	0	0	13	0
	Grant	Bond	Loan	Tax	User Fee	Donation	Developer
Public	64.9%	8.5%	3.2%	21.3%	2.1%	0.0%	0.0%
Private	0.0%	0.0%	0.0%	0.0%	0.0%	88.9%	11.1%
Mixed	33.3%	0.0%	4.8%	0.0%	0.0%	61.9%	0.0%

Zimmerman, R.; Brenner, R.; Llopis Abella, J. Green Infrastructure Financing as an Imperative to Achieve Green Goals. *Climate* **2019**, *7*, 39.

Conservation Finance Network tools



Impact Bonds

Atlanta Environmental Impact Bond Breaks Into Public Market

- Return depends on results of the project.
  - 3.55% return
  - After 6 years, if returning 6.52M gallons of stormwater capacity, investors get a performance pay out.

- First public sector impact bond
  - Established with grant funds from the Rockefeller Foundation

Impact Investing

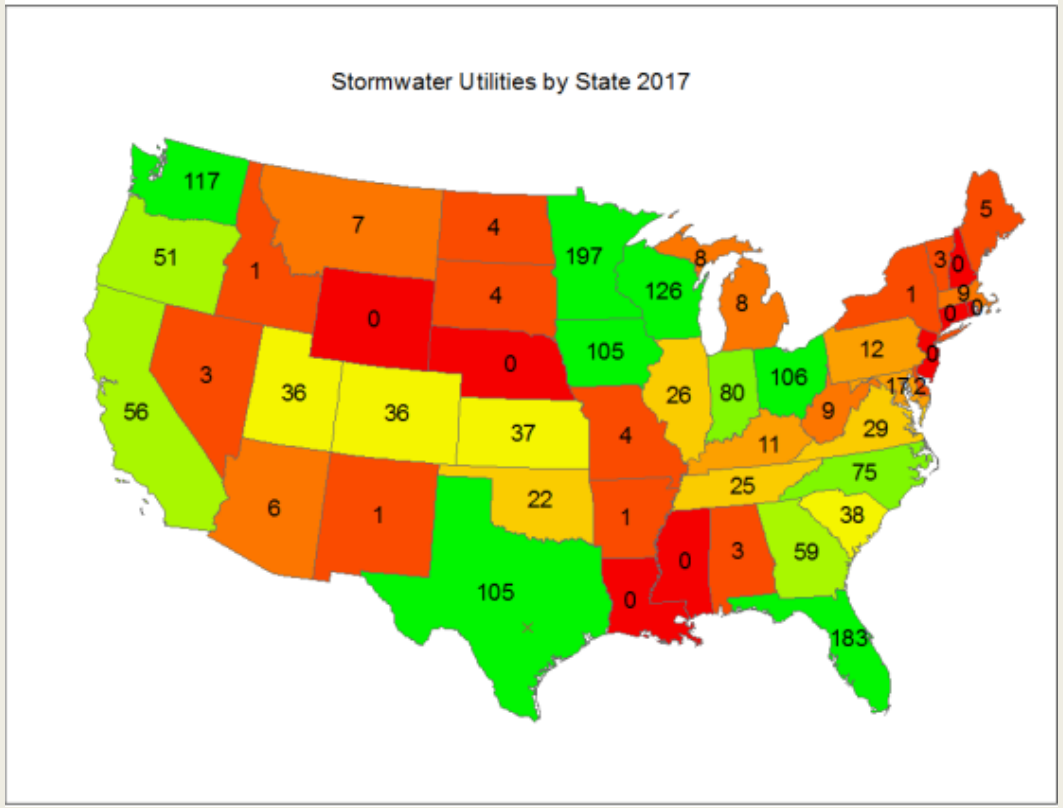
- "Impact investments are investments made with the intention to generate positive, measurable social and environmental impact alongside a financial return," according to Global Impact Investing Network (GLIIN).
  - *Market is growing at 18%/year*
  - *$12.0 trillion or more of professionally managed investments is currently invested in socially responsible investment strategies.*
  - *What does it mean for communities?*
    - Community Development Financial Institutions seek community projects.
    - Community foundations leverage donations to support socially responsible.

Ag-Urban Partnerships/Water Quality Permit Trading

Improved water quality/pollutant load relief at treatment plant downstream

$ for ag practices that improve water quality upstream

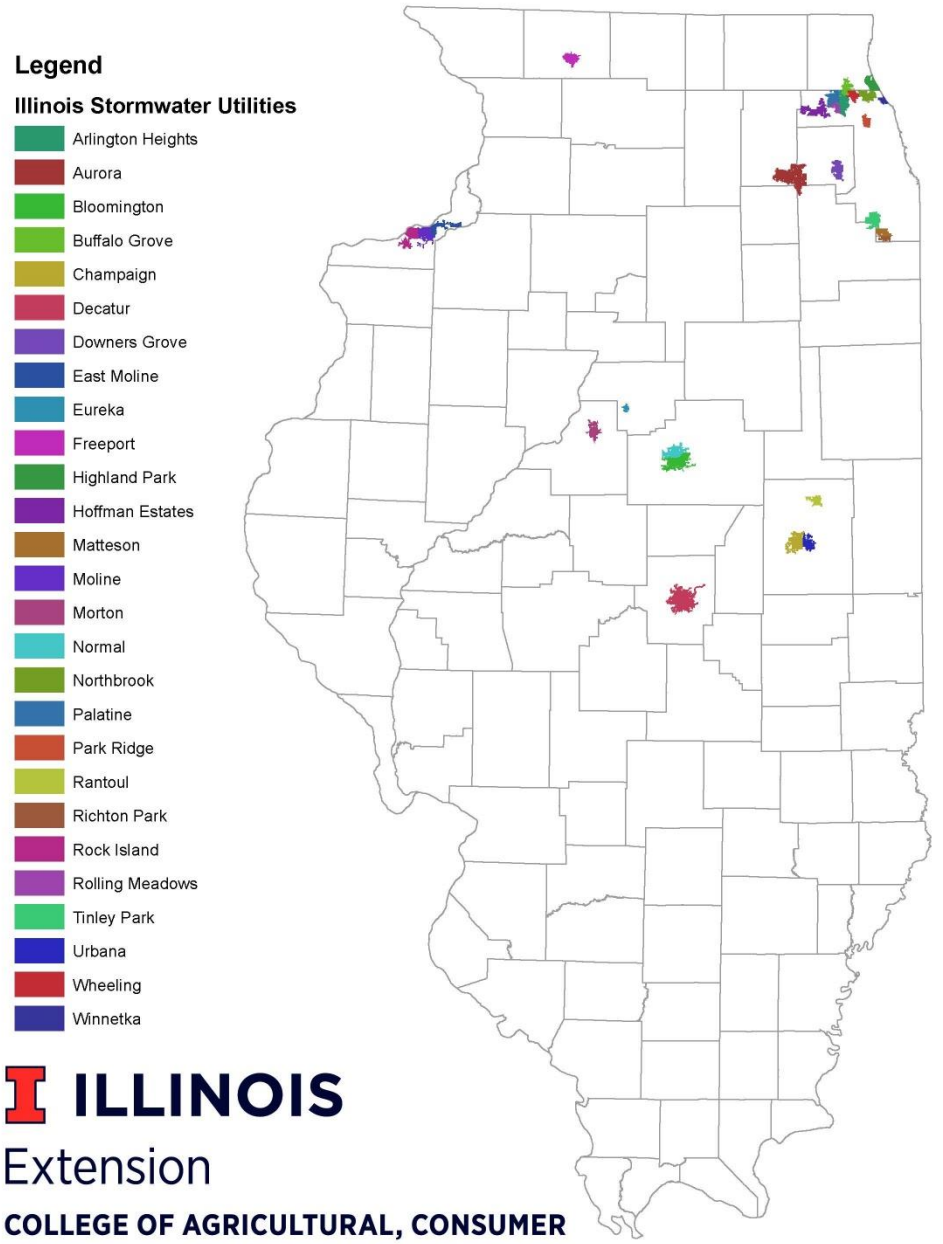
Stormwater Utility Fees



https://www.wku.edu/seas/documents/swusurvey2017b.pdf

- 1639 programs 40 states and DC
  - 6 states have over 100
- Smallest community: Creek Village, FL (pop 88)
- Average fee: $5.18/single family household
  - Fees range from $0-$69.25/month
  - Most set fees based on impervious area

Illinois Stormwater Utilities



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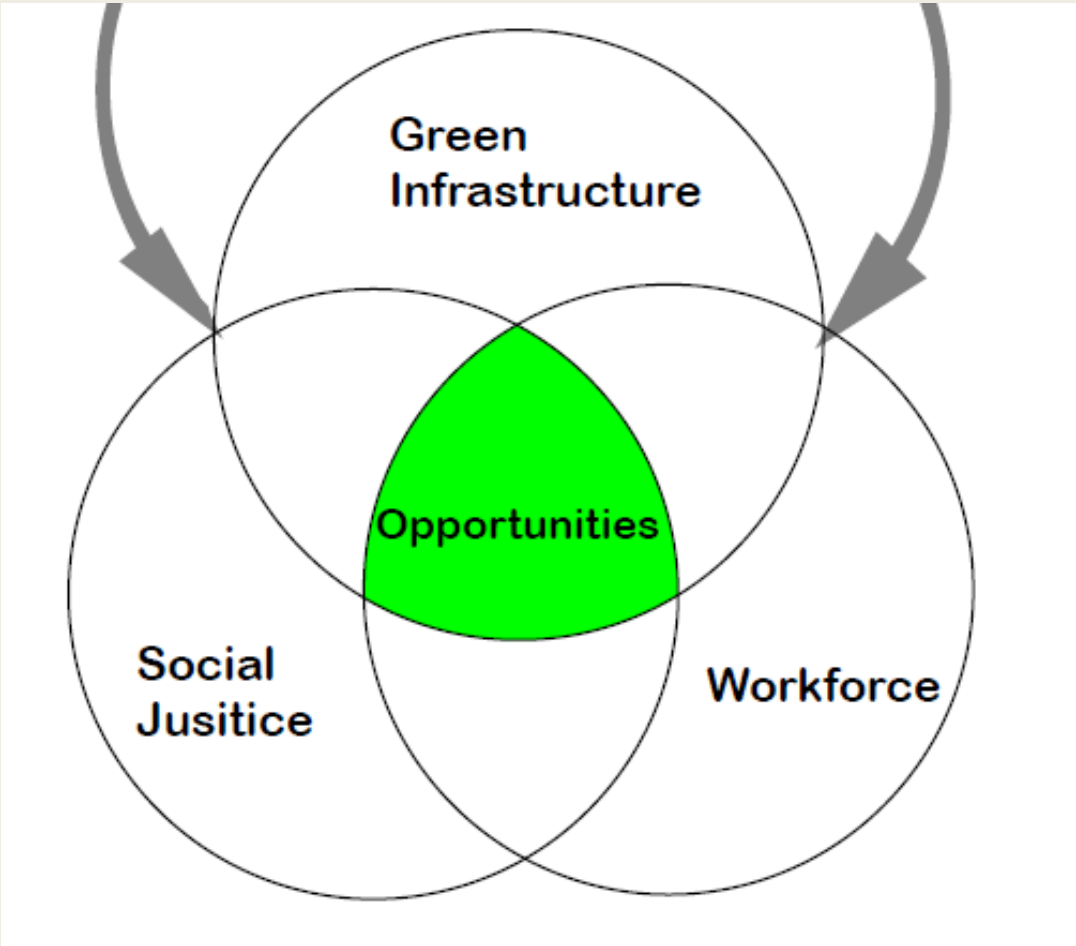
Sources for Green Infrastructure Funding

- NLRS Urban Stormwater Working Group Resource Repository https://www.illinoisfloods.org/publications-resources
- USEPA's Water Finance Clearinghouse https://www.epa.gov/waterfinancecenter/water-finance-clearinghouse
- Conservation Finance Network https://www.conservationfinancenetwork.org
- Illinois EPA
  - *319 grants*
  - *Revolving loan funds*
  - *Illinois Green Infrastructure Grants?*

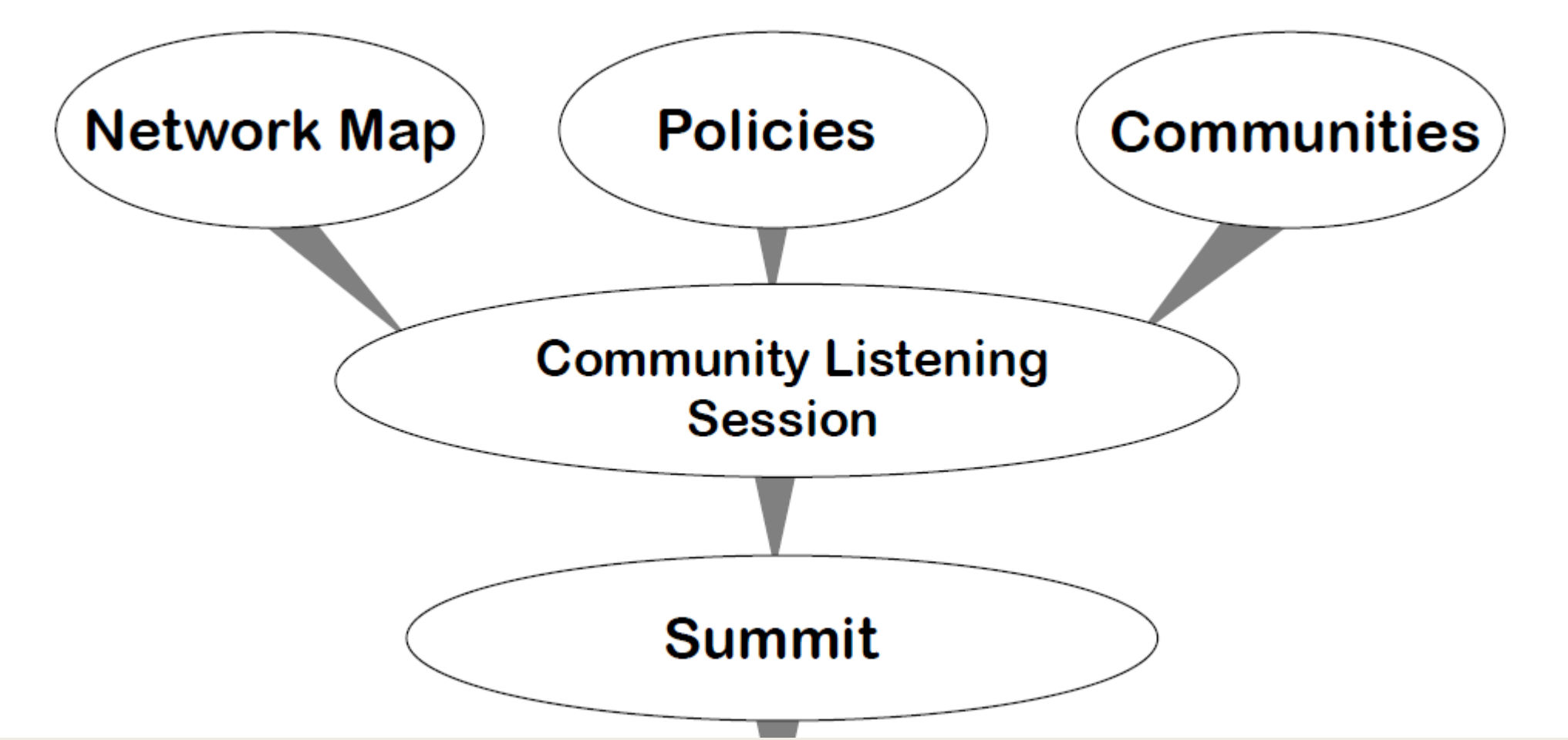
What's next?

- Partnership started at the 2019 One Water Network Meeting
  - *Social justice and water*
- Planning grant funded by the North Central Regional Water Network
- Project period: Spring 2019-Summer 2020



Current Partners

Process


Network Map
Policies
Communities
Community Listening Session
Summit

If you would like to be part of the conversation:

http://northcentralwater.org/greeninfrastructure

Or contact Lisa Merrifield, lmorrisn@Illinois.edu

Flood Resilience Needs Assessment RFP

- Documents current extension responses to long-term flood planning and preparedness across the North Central Region,
- Assesses long-term flood planning and preparedness needs for agriculture and communities that extension is best suited to address,
- Documents gaps in extension programs and the research foundations of extension programs, related to long-term flood planning and preparedness.
- **In collaboration with Network leadership, NCRCRD leadership, Extension Program Leaders for Agriculture, and Extension Program Leaders for Community Development develops recommendations for strengthening extension support for long-term flood** planning and preparedness and reducing flood vulnerability in the North Central Region.

NORTH CENTRAL REGION WATER NETWORK

Upcoming Webinars

University of Illinois Extension
Local Government Education

- October 17, 2019 – Counting for Dollars: Census 2020
- November 14, 2019 – Raising the Minimum Wage in Illinois
- November 21, 2019 -- “Ready to Diversify: Lessons Learned from Coal Communities Across the Country”
- December 12, 2019 – The US Energy Transition and its Impact on Illinois
- Spring 2020 – Illinois’ Climate – What to expect this spring

https://web.extension.illinois.edu/lge/

Thank you!

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