

GREEN INFRASTRUCTURE STRATEGIES FOR COMMUNITY RESILIENCE: Planning, Maintenance & Workforce Development

By: Phillip Rodbell, Sara Lamback, Sandra Albro, Jenifer Kaminsky,
Eve Pytel



DEFINING GREEN INFRASTRUCTURE

Green infrastructure encompasses the naturally occurring and human-built features that manage stormwater, remove pollutants, conserve energy, reduce erosion and provide other ecological, psychological, cost-effective and environmentally sustainable services.



TODAY'S SESSION

- **Phillip Rodbell**, U.S. Forest Service
- **Sara Lamback**, Jobs for the Future
- **Sandra Albro**, Cleveland Botanical Garden
- **Jenifer Kaminsky**, PUSH Buffalo
- **Eve Pytel**, Delta Institute
- Q/A and interactive exercise

* Questions for moderator should be written on notecards and will be collected.





JOBS FOR THE FUTURE

NEW PARTNERS FOR SMART GROWTH GREEN INFRASTRUCTURE STRATEGIES FOR COMMUNITY RESILIENCE: PLANNING, MAINTENANCE, & WORKFORCE DEVELOPMENT

Emerging Lessons from NatureWORKS: A National Urban Green
Infrastructure Workforce Study
Sara Lamback | February 11, 2016



- > Introduction to JFF
- > Overview of NatureWORKS
 - The NatureWORKS Definition of Green Infrastructure
 - Goals and Actions to Date
- > Characteristics of the “GI” Workforce
- > City Deep Dive: Lincoln, NE
- > Discussion and Questions



JOBS FOR THE FUTURE

ABOUT JOBS FOR THE FUTURE & THE NATUREWORKS STUDY

HOW JFF WORKS: SCALING SOLUTIONS



JOBS FOR THE FUTURE



Develop Evidence-Based Innovations



Build Systems and Field Capacity



Advocate and Influence Policy

← ALIGNMENT ACROSS SECONDARY—POSTSECONDARY—WORKFORCE →



This study aims to:

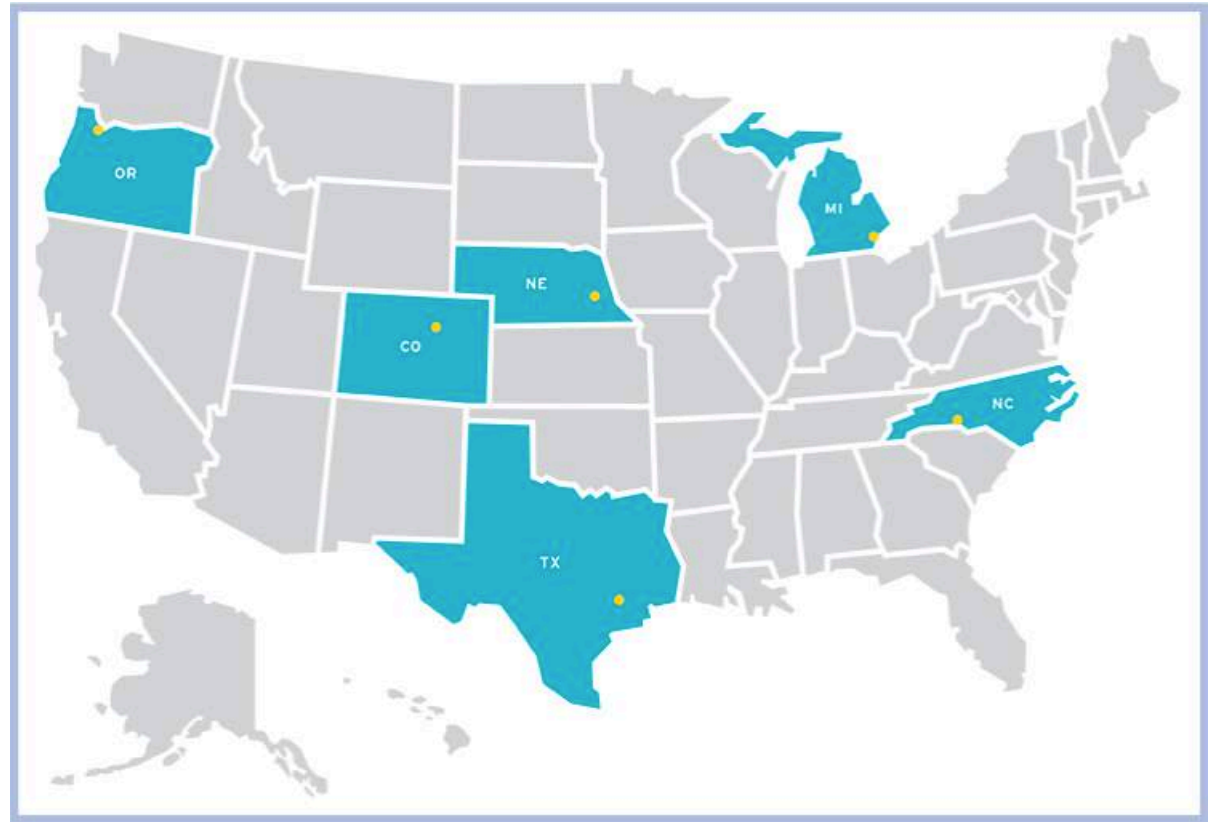
- > Analyze green infrastructure (GI) activities and related public and private employment in select cities.
- > Analyze traditional and real-time labor market data to understand employment trends in GI industries.
- > Identify wages of GI jobs and compare to related industries.
- > Identify promising strategies for expanding GI employment in both the public and private sector.

NATUREWORKS “DEEP DIVE” CITIES



JOBS FOR THE FUTURE

- > Ann Arbor, MI
- > Austin, TX
- > Charlotte, NC
- > Denver, CO
- > Lincoln, NE
- > Portland, OR





JOBS FOR THE FUTURE

GREEN INFRASTRUCTURE OCCUPATIONS

FOCUS ON GI OPERATIONS AND MAINTENANCE

> Top GI Hiring Regions (MSA)

- Washington, DC
- New York City
- Los Angeles
- Seattle
- Chicago
- San Francisco
- Denver
- Philadelphia
- Portland
- Houston



Source: Burning Glass Labor/Insight. Results are based upon 50,429 total job postings in the last 12 months. Analysis conducted using GI keywords.

SELECTED GI OPERATIONS & MAINTENANCE OCCUPATIONS (DENVER)



JOBS FOR THE FUTURE

Title	Wage Range
Arborist Technician I	\$17.69 - \$25.82
Arborist Technician II	\$19.33 - \$28.23
Arborist	\$25.03 - \$40.05
Arboreal Inspector	\$22.40 - \$32.71
Park Horticulturist	\$16.92 - \$24.70
Horticultural Worker	\$16.18 - \$23.63
Gardening Technician	\$14.80 - \$21.61
Park Seasonal Laborer	\$10.99 - \$12.31
Utility Worker	\$14.80 - \$21.61
Senior Utility Worker	\$16.18 - \$23.63
Crew Supervisor	\$23.10 - \$33.73
Equipment Operator	\$16.92 - \$24.70
Equipment Operator Specialist	\$17.69 - \$25.82
Heavy Equip. Operator	\$19.33 - \$28.23
Building/Grounds Supervisor	\$17.69 - \$28.30
Facility Maintenance Technician	\$19.33 - \$28.23
Cement Finisher	\$20.21 - \$29.51



JOBS FOR THE FUTURE

CHARACTERISTICS OF THE GREEN INFRASTRUCTURE WORKFORCE

HIGHLIGHTS FROM RESEARCH IN LINCOLN, NE



- > Consulting Engineers
- > Landscape Architects
- > Existing Contractors
(Landscaping, Tree care,
Excavation, Nurseries,
Pavement, Horticulture,
Construction, Water and Sewer)
- > City Staff
 - Inspectors
 - Maintenance
 - Arborist
 - Engineers
 - Naturalists
 - Environmental Specialists
 - Planners



WORKFORCE NEEDS AND RECOMMENDATIONS: LINCOLN



JOBS FOR THE FUTURE

- > Design of GI projects has generally been effective.
- > Local contractor bids are rising.
- > Lincoln is considering a certification for the construction and maintenance of GI projects.
- > Currently, the maintenance of GI projects is the biggest concern
 - A need exists for construction and maintenance training.



STORMWATER REGULATORY DRIVERS: LINCOLN



JOBS FOR THE FUTURE

- > Floodplain and detention requirements.
- > New growth area standards
 - No net increase in flow/elevations
 - Minimum corridor standards
 - Compensatory storage requirements.
- > Stormwater Quality Requirements
 - Effective February 1, 2016
 - Maintenance plan required.





JOBS FOR THE FUTURE

KEY TAKEAWAYS & CLOSING



- > The GI workforce includes public, private, and volunteer workers.
- > Education, certification, and training:
 - GI installation and maintenance jobs require little education beyond high school.
 - Many contractors and public employees need training in GI installation and maintenance.
 - Some GI occupations have certifications of increasing value (e.g., green roofs).
 - National and local efforts are underway to establish GI workforce and site certifications.
- > Tracking development of Asset Management Plans and Best Management Practice (BMP) manuals can help track changing workforce needs.
- > A healthy market niche for specialty GI contractors, including community-based social enterprises, and volunteer/service corps organizations already exists.



- > See the NatureWORKS Website:
 - <http://www.jff.org/initiatives/natureworks>
- > Find interviews, guest blogs, and other information on the GI workforce at:
 - <http://www.jff.org/blog>
- > Email Sara Lamback if you would like to receive emails and other updates on NatureWORKS!
 - slamback@jff.org

We look forward to your involvement in this exciting project!

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JOBS FOR THE FUTURE

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*SESSION: Green infrastructure strategies for community resilience:
planning, maintenance & workforce development*

VACANT to **VIBRANT**

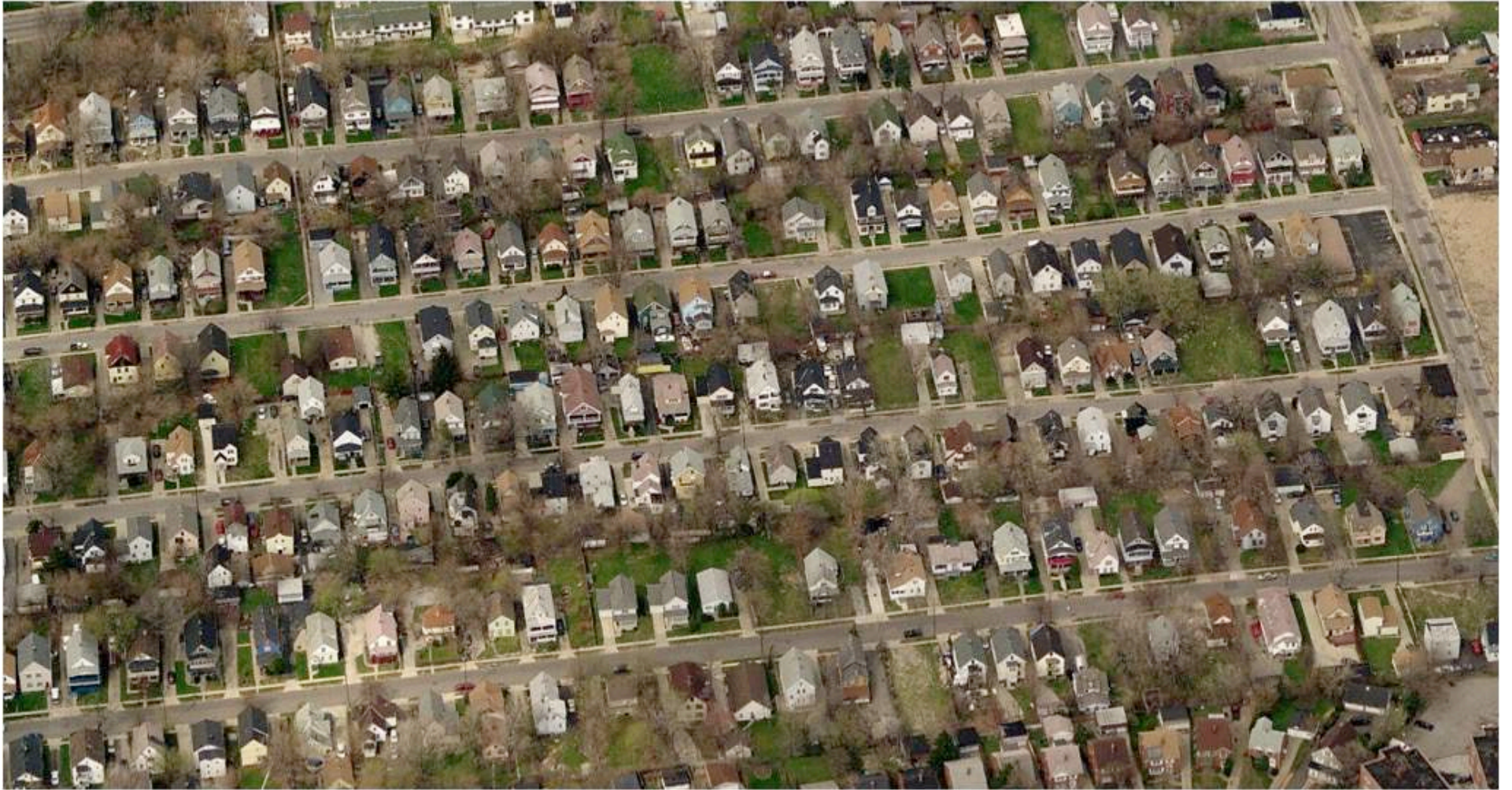
stormwater management & neighborhood stabilization
on vacant urban land

Sandra Albro, Research Associate, Applied Urban Ecology





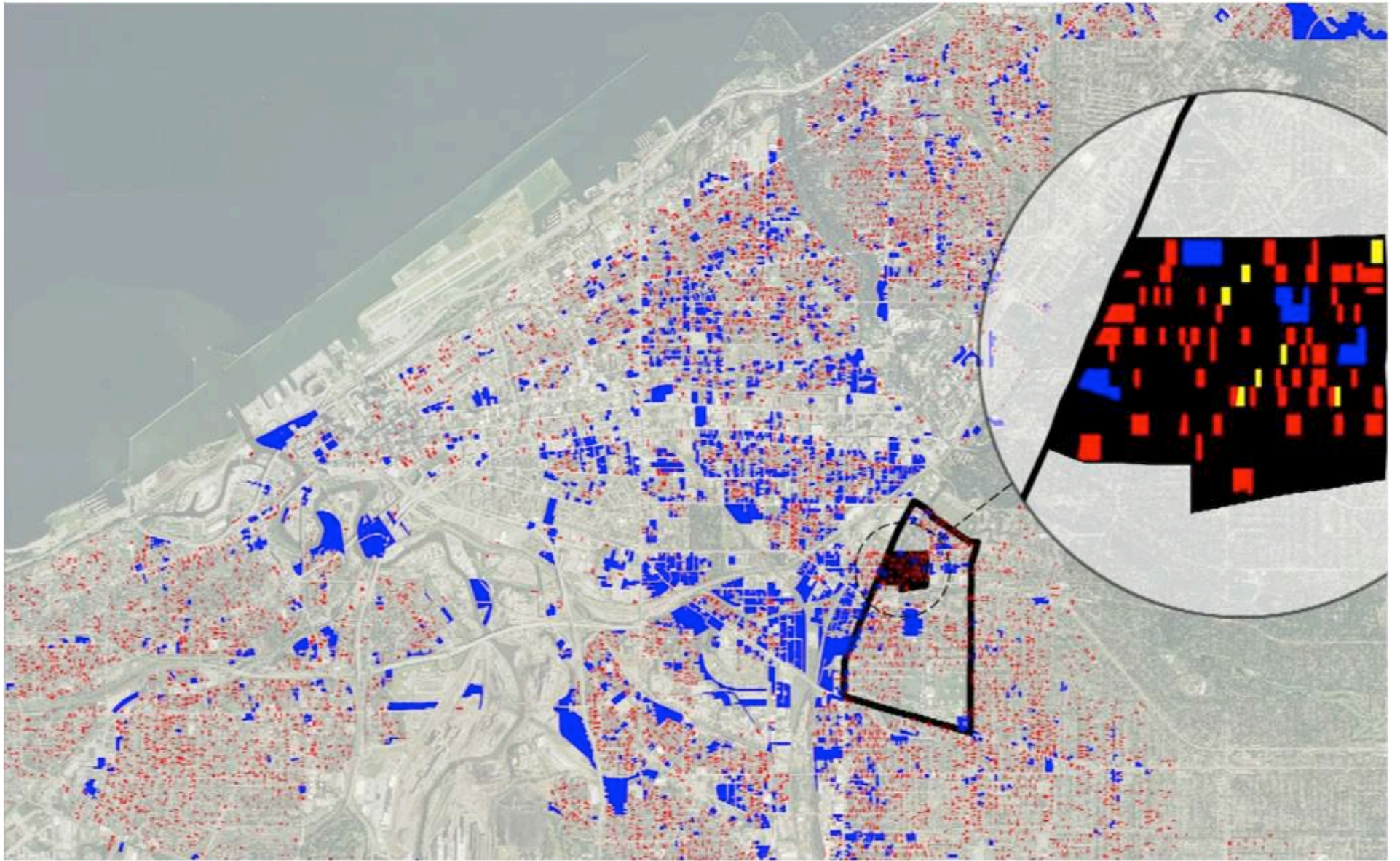
Cleveland vacant land – extreme example



Cleveland vacant land – typical example



Cleveland vacant land – typical example



Cleveland vacant land – 85% - 95% is <0.5 acres &/or <3 parcels



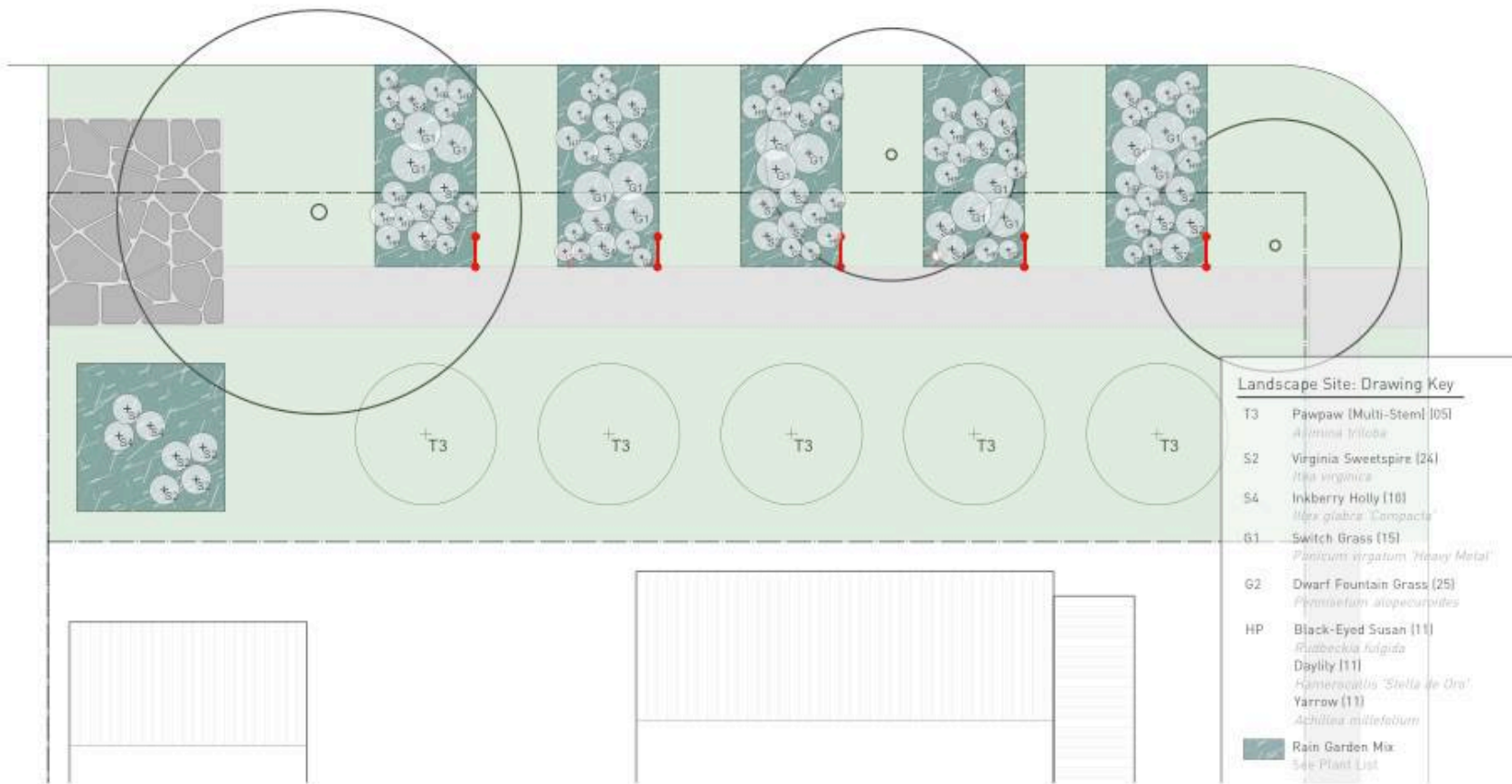
Vacant to Vibrant – Cleveland, OH



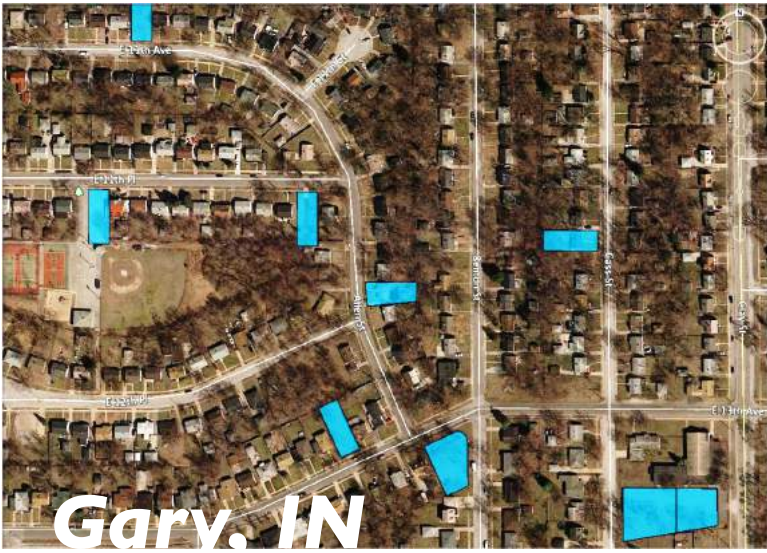
Vacant to Vibrant – Gary, IN



Vacant to Vibrant – Buffalo, NY



Vacant to Vibrant – stormwater management + recreational use



Vacant to Vibrant: 2013-2017

VACANT *to* VIBRANT

- Utilizes small, discontinuous vacant parcels
- Stormwater management + neighborhood stabilization
- Replicable

LOWER MAINTENANCE

- Planting: Trees/Shrubs/Grasses
- T1 Honey Locust (7)
Gleditsia triacanthos
 - G1 Heavy Metal Blue Switch Grass (12)
Panicum virgatum 'Heavy Metal'
 - G2 Dwarf Fountain Grass (5)
Pennisetum alopecuroides 'Hameln'
 - S1 Red-Osier Dogwood (03)
Cornus stolonifera
 - S2 Virginia Sweetspire (4)
Itea virginica



L
03



Lawrence Place
Planting Plan

IMPLEMENT
DESIGN / GRAPHICS / LANDSCAPE

Lawrence Place

Simple design, fewer elements



fewer species

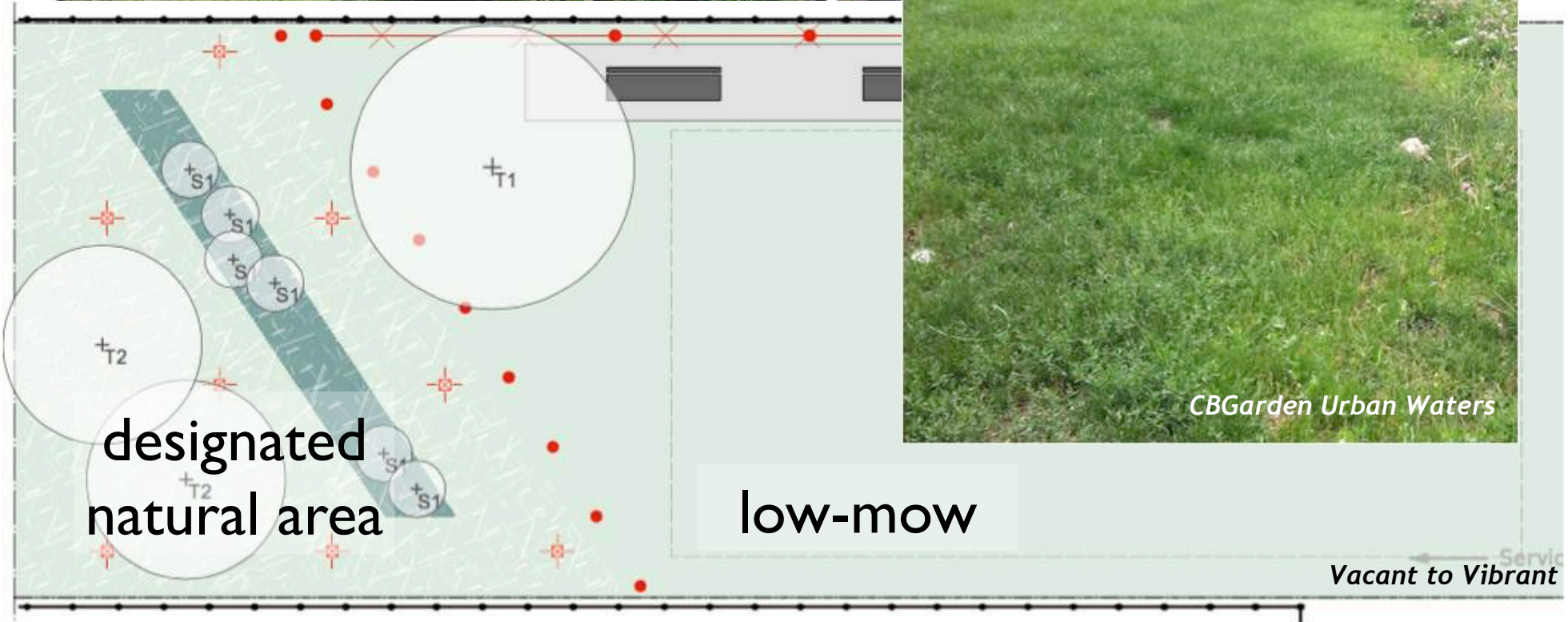
Quarterly maintenance, monthly mowing



Re-Imagining Cleveland



CBGarden Urban Waters



Monthly mowing, (bi)annual clean-up



fewer species

less mulch

perennials

low-mow

natives

Quarterly maintenance, monthly mowing

LOWER MAINTENANCE

- Design and build to maintenance capacity & constraints
- Simplify design as much as possible
- Involve maintenance contractor in design process

WORKFORCE DEVELOPMENT



Buffalo plant nursery

V2V Buffalo maintenance – PUSH Buffalo



V2V Cleveland maintenance – CBGarden Green Corps



V2V Gary maintenance – City of Gary Urban Conservation Team

WORKFORCE DEVELOPMENT

- Certification & specialized training:
 - Native/low-maintenance landscaping
 - Stormwater engineering
 - Plant/soil production
- Require community-based procurement/training

COMMUNICATE SUSTAINABILITY



“Triple bottom line”



<\$0.75 / gallon CSO



\$2.00–\$4.00 / gallon CSO

Northeast Ohio Regional Sewer District

“Cost per gallon”

COMMUNICATE SUSTAINABILITY

- Emphasize economic bottom line
- Ensure financial sustainability
- Close loop between who pays & who profits



cbgarden.org/v2v

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Cleveland Botanical Garden

Ryan Mackin
Joseph Koonce
Patti Barz

PUSH Buffalo

Jenifer Kaminsky
Joshua Smith

City of Gary

Brenda Scott Henry

Image NOAA

Google earth

Imagery Date: 5/18/2012 41°29'40.33" N 81°39'11.16" W elev 662 ft eye alt 31.87 mi



PUSH

BLUE 

JOBS • COMMUNITIES • CLEAN WATER



PUSH Buffalo

- ▶ PUSH began in 2005 as a community-based organization dedicated to building a base of resident leaders capable of leading public campaigns to address the lack of jobs and rapidly declining neighborhood conditions, including widespread housing abandonment.
- ▶ All work starts with community organizing and leadership development
- ▶ PUSH pursues this work through a variety of program areas:
 - ▶ Green affordable housing development
 - ▶ Green infrastructure
 - ▶ Creation of pathways to green jobs and training
 - ▶ Assist families and businesses to access weatherization resources



PUSH Blue

- ▶ Address Buffalo's Combined Sewer Overflow problem
- ▶ Add an environmental justice and community focused lens to the conversation about CSO's
- ▶ Create a social enterprise landscaping business to ensure that multiple benefits of this work are felt in impacted communities
- ▶ Leverage the job creating power of the local drivers of green infrastructure including:
 - ▶ The Buffalo Sewer Authority's commitment to green infrastructure and Long Term Control plan with the EPA
 - ▶ The changes to Buffalo's zoning code – the Green Code



The Impact of CSO's on the West Side



The Impact of CSO's on the West Side



The Impact of CSO's on the West Side



129-135 Chenango rain garden



527 W. Utica Green Roof



37 19th Stormwater Planter



BSA Post-Demo Green Infrastructure



PUSH Blue Green Jobs

- ▶ In 2013 PUSH Blue hired four new employees to be part of a six person crew working on storm water and green infrastructure projects.
- ▶ Two of those employees have since gone on to assume more involved and challenging roles with PUSH.
- ▶ The 2015 crew includes 5 individuals plus members of the PUSH Hiring Hall as needed
- ▶ All crew members live and were recruited from Buffalo's West Side
- ▶ Training has included OSHA 10 and on the ground training



Creating green jobs



PUSH Blue social enterprise landscaping business

- ▶ Hire and train local individuals for green infrastructure work as well as other positions within green jobs lattice, including energy efficiency retrofit work
- ▶ Expand work to include green infrastructure, street tree planting, bioremediation, habitat restoration, and green infrastructure maintenance
- ▶ Currently negotiating contract with Buffalo Sewer Authority to do green infrastructure treatments on 232 demolition sites in 2015-2016 season
- ▶ Testing a value proposition that we can provide clients with expertise, experience, and the social benefits of high road job creation



PUSH Blue Successes

- ▶ 20 rain gardens, 3 bioswales, 5 rainwater harvesting projects, 3 living roofs, 2 permeable parking pads, 1 vegetable garden for a local charter school.
- ▶ Partnership with the Buffalo Sewer Authority and other local groups on a city-wide downspout disconnection program
- ▶ Establishment of a strong brand identity for PUSH Blue that is currently and will continue to leverage contract work



PUSH Blue Challenges

- ▶ **Assessing what job training should look like.**
 - ▶ Finding appropriate certification programs, balancing with on the ground training
- ▶ **Staff choices**
 - ▶ How to balance job creation mission with real needs, like having a drivers license



PUSH Blue lessons learned and learning

- ▶ **Maintenance**
 - ▶ How to budget for and pay for maintenance of sites?
- ▶ **Right-sizing of work**
 - ▶ Balance between initial site design and long term maintenance
 - ▶ Finding best choice of species for individual conditions and microclimates, while also surviving high traffic environments, sudden inundation of rain, and drought.



Building a Community Anchor Institution



www.pushbuffalo.org

www.greendevlopmentzone.org

Jenifer Kaminsky – jen@bnsbuffalo.org, 716-882-2672





GREEN INFRASTRUCTURE TOOLS FOR WEAK-MARKET COMMUNITIES

DISRUPT

CATALYZE

TRANSFORM

ABOUT DELTA INSTITUTE

Founded in 1998 to work at the nexus of environmental sustainability and economic development.

Our staff: Multidisciplinary team of 17 FTE, including urban planners, civil engineers, foresters, economists, scientists, architects, LEED APs, GIS.

What we do:

- Develop innovative programs and market-driven solutions
- Build sustainable markets
- Convene diverse stakeholders
- Inform better policy



**SUSTAINABLE
ENVIRONMENT.**

**SUSTAINABLE
ECONOMY.**

ON THE AGENDA:

Presentation Themes

Challenge Summary

Tools and Resources



DISRUPT

CATALYZE

TRANSFORM

LAND

Most productive land may not be available

Public vs Private

Sourcing plant materials

Land condition

CAPITAL

Not enough \$
Too many types
Maintenance
Installation



LABOR

Expertise
Workforce
Seasonality

There is a lack of technical expertise and understanding.



**CITY MANAGER/
VILLAGE MANAGER**

**MAYOR
ELECTED OFFICIAL**

*LOCAL
GOVERNMENT*

**COMMUNITY
PLANNER**

PUBLIC WORKS DIRECTOR



*GREEN INFRASTRUCTURE
DESIGNS
SCALABLE SOLUTIONS TO LOCAL
CHALLENGES*

JULY 2015

delta institute 

GUIDON 
ARCHITECTURE + DESIGN

delta institute 

Toolkit features

1. Decision support tree, basic information on green infrastructure
2. Templates, plan sets, cross sections, and material specifications
3. Estimation tools for installation and maintenance costs

For general public

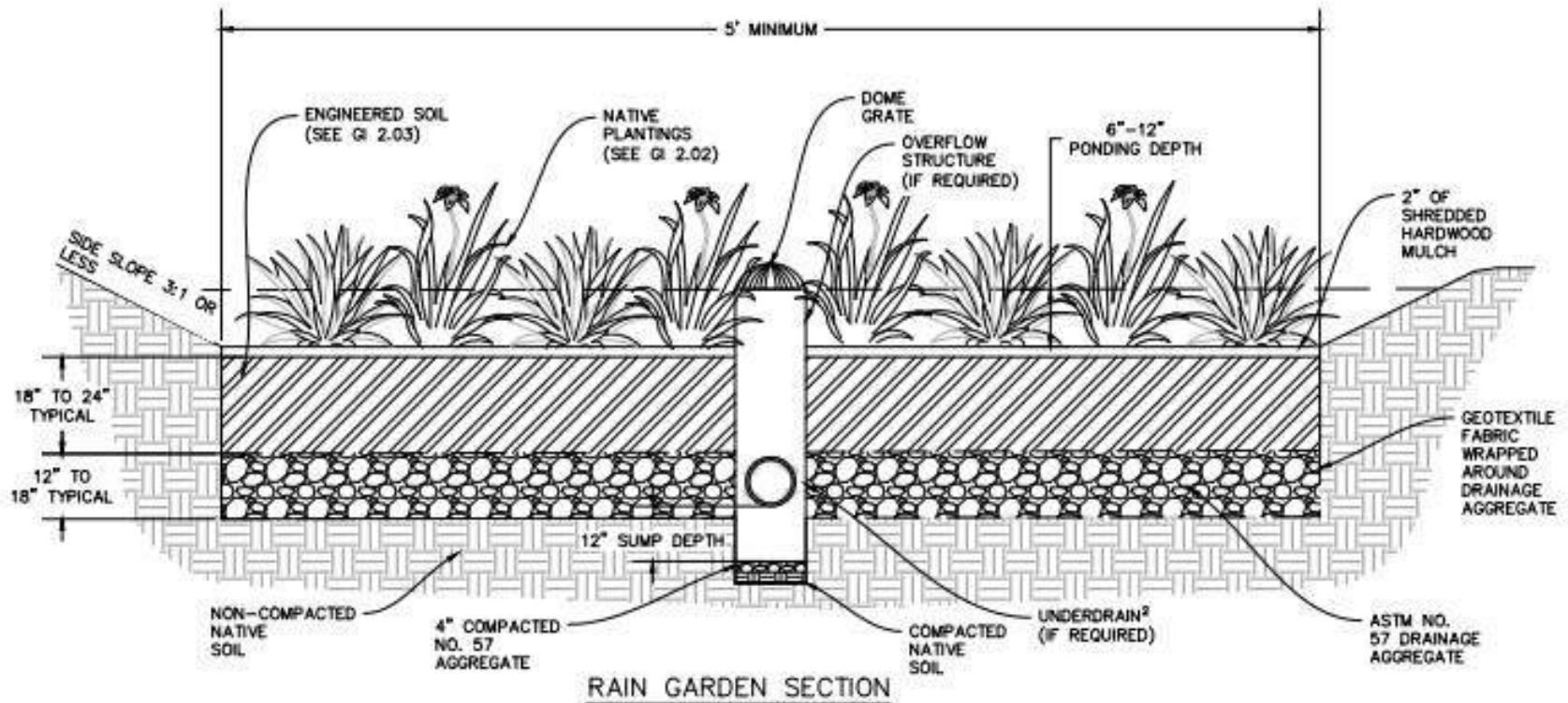
- 📍 Location: Right-of-way
- ↔ Width: At least 5'
- ⌈ Length: Scalable
- 🏠 Drainage Area: <5 acres



source: http://water.epa.gov/infrastructure/greeninfrastructure/gi_what.cfm

Excerpt from Bioswale/Hybrid Ditch section

For engineers



Excerpt from Rain Garden section

For municipal managers

	Item	Description	Installed Cost ¹	Unit
<i>GI Technique</i>	<i>Permeable pavement</i>	<i>Pavers, stone layers (bedding, base, and subbase), geotextile and excavation</i>	<i>\$ 15.00</i>	<i>SF²</i>
<i>Required component</i>	<i>Bedding layer</i>	<i>2" ASTM No. 8 Stone</i>	<i>\$ 45.00</i>	<i>TON</i>
	<i>Base layer</i>	<i>4" ASTM No. 57 Stone</i>	<i>\$ 30.00</i>	<i>TON</i>
	<i>Subbase layer³</i>	<i>6" ASTM No. 2 Stone</i>	<i>\$ 35.00</i>	<i>TON</i>
	<i>Geotextile</i>	<i>Non-woven geotextile fabric</i>	<i>\$ 5.00</i>	<i>SY</i>
	<i>Curb</i>	<i>Containment curb</i>	<i>\$ 35.00</i>	<i>LF⁴</i>
<i>Custom options</i>	<i>Underdrain</i>	<i>12" HDPE perforated storm pipe</i>	<i>\$ 32.00</i>	<i>LF</i>
	<i>Connect to existing storm structure</i>	<i>Core drill existing structure, connect overflow pipe</i>	<i>\$ 1,500</i>	<i>EA</i>

GI design templates for:

- Bioswale/Hybrid Ditch
- Rain Garden
- Stormwater Planters
- Permeable Pavement
- Underground Storage

THE IMPACT & NEXT STEPS...

- Reverse barriers to scalable green infrastructure implementation
- Improve stormwater management
- Distribute the toolkit
- Measure impacts

View Toolkit: bit.ly/greeninfrastructuretools

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- **Q/A and interactive exercise**



FOR DISCUSSION AT YOUR TABLE

Community resilience involves building ownership and equity in local project planning and implementation

1. Engaging residents
2. Using locally sourced materials
3. Training and employing residents. So here's the trigger question for discussion at your table:

Q: What have you done to build equity in your green infrastructure projects, and what did you find were the greatest barriers?

