GREENPRINT PARTNERS

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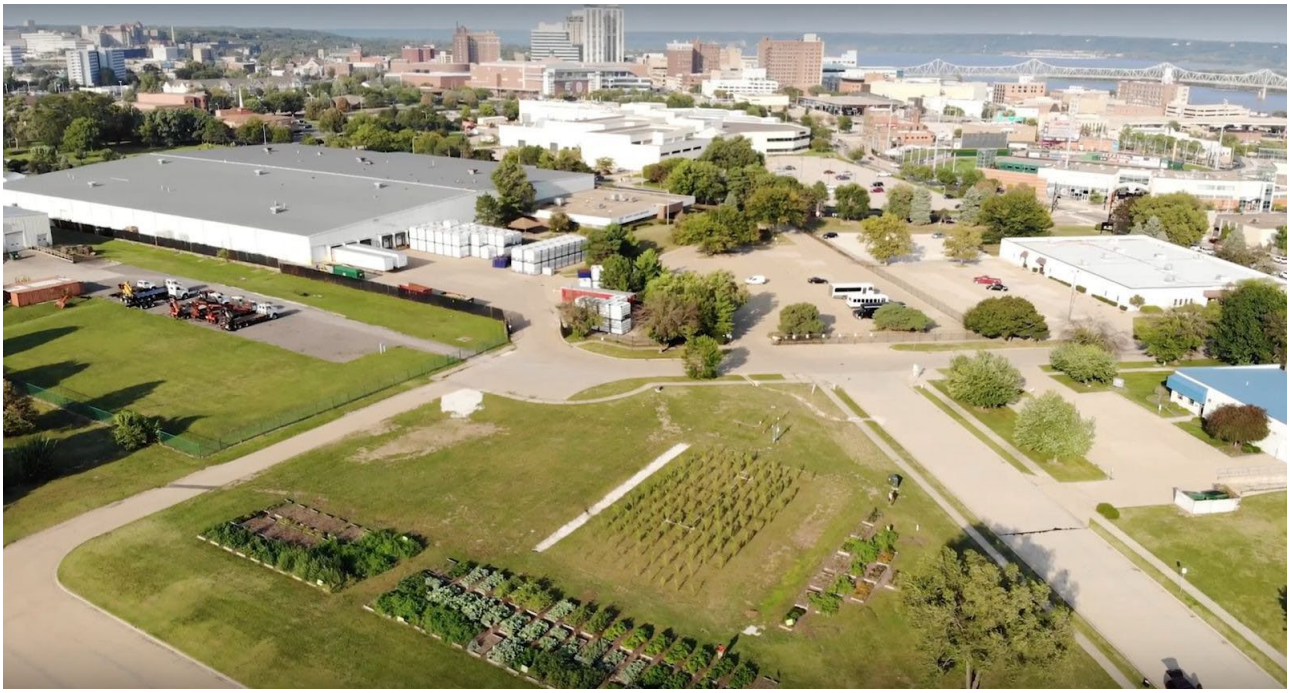
# Creating Working Landscapes from Former Urban Lands in Legacy Cities:

## *Applications and Scale with Revenue Generating Stormwater Infrastructure and Impact Investing*



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## Executive Summary

Greenprint Partners, a national green infrastructure delivery partner, designed the Well Farm and its associated programming in partnership with engineering firm AKRF, the City of Peoria, The gitm Foundation, and a 20-member stakeholder advisory group representing residents of Peoria's First District. The project team worked since 2016 to bring the vision of a working "stormwater farm" to life. The Well Farm at Voris Field is among the country's first 'stormwater farms'.

This USDA CIG-funded demonstration project represents Peoria, Illinois' innovative spirit, and their goal to become the first city to solve stormwater challenges with 100% green infrastructure. Called the 'most inclusive public works process to date' in Peoria, this award-winning project transformed a vacant parcel in one of America's 100 poorest zip-codes to into a tapestry of multi-functional, community-driven stormwater SMPs, from a hybrid poplar stand, to a bioswale, to 100 raised beds that hosted an agricultural apprenticeship program. Together, these features capture runoff from a 1.55 acre area, preventing an estimated 1.3 million gallons of stormwater from entering Peoria's combined sewer system each year. To date, the Well Farm has won three awards, the prestigious national US Water Prize, the Illinois Green Alliance Emerald Award, and the Peoria-based Sun Foundation's Making Waves award.

## Introduction

Peoria, Illinois is a mid-sized city of 116,000 people on the banks of the Illinois River. Peoria's aging sewer system does not have the capacity to manage all of the runoff from 4,000+ football fields worth of impervious surfaces. While Peoria is among hundreds of U.S. cities investing in solutions to reduce flooding and water pollution caused by outdated wastewater management infrastructure, it is currently on track to be the first city to use 100% green stormwater infrastructure (GSI) to do so. The Well Farm, a community-driven pilot, demonstrates how GSI can be used to manage stormwater and achieve community goals in a lower income, underinvested community.

## Background

As one of the 100 poorest zip codes in the nation, Peoria's south side is home to the city's most concentrated minority and low-income population. It is Peoria's largest food desert, as well as the neighborhood most impacted by flooding and combined sewer overflows.

The idea to pursue an urban farm concept began with Greenprint Partners' goal to pioneer GSI solutions that maximize benefits to the local community, and engage residents in design, construction, and maintenance to ensure the long-term success of installations. Our Community Benefits-Driven Design process uncovered first district residents' desires to increase access to fresh produce and create new jobs. This made the urban farm concept an ideal fit for the community. Greenprint Partners secured a USDA NRCS Conservation Innovation Grant to meet several integrated goals: to demonstrate how urban agriculture projects can effectively manage stormwater, to research how our Benefits-Driven Design approach impacts the surrounding community, and to install monitoring equipment on experiment and control plots to measure stormwater management impacts.

## Methods

The Well Farm and its associated programming was designed by Greenprint Partners, a certified WBE/WOSB and B-Corp green infrastructure development partner, in partnership the City of Peoria, engineering firm AKRF, The Gifts in the Moment (gitm) Foundation, and a 20-member stakeholder advisory group representing residents of Peoria's First District. The project team worked from 2016-2018 to bring the vision of a working "stormwater farm" to life.

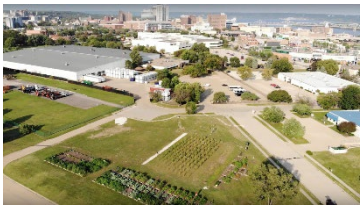
**Benefits-Driven Design**



Greenprint Partners' 'Benefits-Driven Design' process puts community at the center of the green stormwater infrastructure design process. We work with community stakeholders to identify community assets, needs, and opportunities and respond with green infrastructure solutions. Our design principles are based on peer-reviewed research about the co-benefits (e.g., beautification, crime reduction, increased physical activity, reduced energy use etc., realized by a wide range of green infrastructure (e.g., rain gardens, bioswales, tree plantings, permeable pavers, etc.). The Well Farm Benefits-Driven Design process was led by Greenprint with ongoing input from a stakeholder advisory group who was involved from beginning to end. The final design was the result of analysis of:

- **Assets:** large, vacant city-owned property, access to a local urban agriculture nonprofit.
- **Needs:** food desert, high unemployment, high crime.
- **Opportunities:** repurpose a vacant urban lot into a multi-benefit community asset; partner with a local nonprofit to implement an urban agricultural apprenticeship program that provides job training and brings fresh produce into a food desert.

**Stormwater Management**



The Well Farm site captures 1.3 million gallons of stormwater per year, which could save nearly $200,000 in stormwater treatment costs over the next 30 years. If scaled across the city, these sites could capture more than 65 million gallons of stormwater annually and save nearly $10 million dollars in stormwater treatment costs over the next 30 years.

**Stormwater Forest**

The stormwater forest includes two stands of hybrid poplar trees, a fast-growing hybrid that absorbs three times as much water as the average tree. An experimental plot is irrigated with stormwater collected from surrounding rights of way, and a control plot receives no irrigation. Monitoring equipment installed on the plots measures the inflow of stormwater into the plots and the outflow from the plots as it enters the sewer system. Three months on monitoring show that the stormwater forest is absorbing more than 97% of stormwater.

**Raised Beds**

The Well Farm design features 100 raised beds, which were used as the growing site for an urban agriculture training program. The beds overflowed with thriving crops of kale, collard greens, and okra.

**Urban Agriculture Training Program**

The working urban farm was designed to produce locally grown timber and food. During the first two

growing seasons, The gitm Foundation, a local nonprofit, and Intangible Mindz Urban Agriculture, a social enterprise, took up to 20 participants to cultivate produce and learn how to sell their products at local farmers markets and through a Community Supported Agriculture (CSA) program.

**Community Engagement and Communication**

Core stakeholders and the broader community were kept informed of the project through public events (groundbreaking and ribbon cutting), public relations, an active social media presence, an email listserv, project videos, and more. These touchpoints across a variety of platforms helped keep the community informed of progress and positive impacts.

## Findings

The Well Farm, one of the first "stormwater farms" in the country, demonstrates how urban agriculture can reduce runoff that pollutes the Illinois River, and showcases many community benefits of GSI. Construction launched with a public Groundbreaking, was completed on time and on budget in the summer of 2018, and was celebrated with a joyful Ribbon Cutting ceremony. At the Ribbon Cutting ceremony, which included the mayor, city council members, city staff, and nearly 100 community members, Kari Cohen, Director of the Conservation Innovation Team at USDA NRCS said, "This project here today ticks a lot of boxes for us; we have agroforestry, we have urban agriculture, we have innovative financing solutions to natural resource challenges, and we've got community development. There are many people around the country watching this project who are interested in using it as a model." He added, "There's a lot of excitement about green infrastructure in urban areas…but no one's doing it quite like this."

The Well Farm delivers many of the documented benefits of GSI, including cost effectiveness, long term job growth, and urban livability improvements to Peoria's 1st District. It also transforms a long-vacant property into a vibrant community gathering space that supports an urban agricultural training program and protects Peoria's natural waterways. According to a report released by Earth Economics, The Well Farm also provides the following benefits:

- **Public Health.** The Well Farm project will sequester more than 3000 lbs of harmful air pollutants over the next 30 years, and save more than $8,000 in public health expenses. This is especially crucial because the Well Farm site is located in a neighborhood with some of the highest air pollution levels in the city. **If green infrastructure installations like Well Farm were developed in every neighborhood in the city, the installed trees could sequester more than 150,000 lbs. of pollutants and generate nearly half a million dollars in avoided health costs over the next 30 years.**
- **Economic Growth.** The Well Farm project generated $2.8 million dollars in economic output in the county, 29 full-time equivalent jobs, and $1.5 dollars in economic activity in the county for every $1 invested. **Scaled across the city, these green infrastructure installations could generate $140 million dollars in economic output in the county and create 1,450 jobs**.
- **Carbon Sequestration.** The poplar trees on site will sequester more than 840 metric tons of CO2 over the next 30 years. **Scaled across the city, these types of installations could sequester 42,000 metric tons of CO2.**
- **Stormwater Management.** The site will capture 1.3 million gallons of stormwater per year, saving at least $197,340 in stormwater costs over the next 30 years. **Scaled across the city these sites could capture more than 65 million gallons of stormwater annually and save nearly $10 million dollars in stormwater costs over the next 30 years.**

## Conclusions and Recommendations


The Well Farm concept has received broad support from community members, politicians, local organizations, and national water leaders. There are strong intersections between stormwater management and urban agriculture that cities should consider as they are considering land-use decisions, particularly for vacant properties.

**Recommendations**

1. City managers and developers should consider using vacant or underutilized properties for urban agriculture and stormwater management. Repurposing such vacant properties can come with significant environmental, economic, and community benefits. However, it is important to understand the constraints on the use of grey water for irrigating edible products. The Well Farm team needed to install a water line to provide irrigation for the raised beds whereas the street runoff was suitable for the tree stand.
2. City managers and developers should consider locating green infrastructure and urban agriculture projects in low-to-moderate income communities. Such communities tend to be in low-lying areas most prone to flooding and water pollution and they have the most to gain from the co-benefits of

green infrastructure.

3. Project leaders should involve local community in all phases of green infrastructure projects by forming and shepherding a stakeholder advisory group. Place meaningful decision-making power into the hands of the community; this both increases buy-in and generates community pride in the project which contributes to its long-term sustainability.
4. When setting up an urban agriculture program, program managers should work with highly stable organizations with diverse funding sources to safe-guard the long-term sustainability of the program.
5. Project leaders should dedicate a portion of the project budget for project communications (e.g., social media, public events, videos, and more) to keep interested community members informed of progress and opportunities to be involved.

## Appendices

**Site Statistics**

- The final site is located at: 1013 SW Reed Ave, Peoria, IL 61605
- Site size: 1.6 Acres
- Volume of stormwater managed: 1.3M gallons/year
- Stormwater management features on site:
    - stormwater forest test and control plots totaling 126 hybrid poplars
    - bioswale
    - 100 raised beds
- Video intro to site: http://bit.ly/GreenprintVideo

**Metrics & Analysis**

- **Economic and Air Quality Analysis:** With grant support from The Kresge Foundation, Earth Economics performed a third-party evaluation of the co-benefits associated with The Well Farm at Voris Field.
- **Sample Public Engagement Metrics:**
    - Stakeholder Advisory Group: 34 Members, many of whom represent influential organizations.
    - Groundbreaking: 67 Attendees
    - Ribbon Cutting: 100 Attendees
    - Well Farm Facebook Page: 220 Followers, many of whom took action when prompted and 105,344 impressions
    - Earned Media: Total estimated impressions: 20,595
        - Urban Agriculture Could Be the Next Solution for Alleviating Peoria's CSO Problem (Peoria NPR)
        - Stormwater farm to break ground Thursday in Downtown Peoria (Peoria Journal Star)
        - Sat., June 30 Ribbon Cutting for The Well Farm at Voris Field (Peoria Standard)
        - Stormwater farm benefits to be celebrated Saturday Downtown (Peoria Journal

Star)

- Grand opening of Well Farm sparks hope for Peoria's environment (WMBD)
- Peoria's 'Well Farm At Voris Field', A National Model For Community-Driven Green Stormwater Infrastructure, Opens To Public (My Social Good News)
- US Water Alliance announces US Water Prize 2019 winners (WaterWorld)
- In Peoria, Green Infrastructure As a Path to Social Equity (NextCity)

- **Public Communications Samples:** Above and beyond direct the community engagement efforts undertaken through the Stakeholder Working and Advisory Group and community events like the Groundbreaking, Ribbon Cutting, and community volunteer days. Greenprint Partners publicized the Farm's successes through a video, photos, case studies, press releases, awards, authored articles, and a Facebook page.
- **Flow Monitoring and Modeling:** In order to monitor the effectiveness of the stormwater forest, the team modeled the site hydrologic water balance as a series of flows entering and leaving the system. To quantify each of these flows, sensors were installed on-site and used to measure right-of-way (ROW) stormwater inflow, direct precipitation, sap flow (a proxy for evapotranspiration), soil moisture content, and surface runoff overflow. Interception and ground evaporation were considered negligible and were not measured. By quantifying and summing the inflow and outflow rates at 15-minute intervals, the team was able to gain insight into changes in stormwater forest performance over time and net stormwater performance.
    - While the 2019 site-monitoring period began in late March 2019, repeated instances of animal damage throughout the site impaired equipment function and narrowed the available time interval of usable data. Data from 4/23/19 to 7/19/19 were used to calculate the hydrologic water balance. Because of these unforeseen challenges, the team used modeled right-of-way (ROW) inflow data instead of the ROW inflow sensor data.
    - Approximately 70,000 cf (~525,000 gallons) of combined precipitation and stormwater runoff flowed into the site from 4/23/19 to 7/19/19. Of this total inflow volume, 94% was managed either via infiltration, soil moisture storage, or sap flow. The remaining 6% of the total inflow volume was transmitted to downstream areas via surface runoff overflow.
    - Results of the study showed that management of inflow was due primarily to infiltration and change in soil moisture (i.e. storage) rather than via evapotranspiration. The importance of evapotranspiration would be expected to substantially increase as trees continue to grow and mature in future years.
    - The final objective of the Well Farm stormwater forest project was to calibrate "slug flow" constants in an iTree/SWMM stormwater forest performance calculator. Within the calculator, the SWMM component of the stormwater calculator models right-of-way inflow into stormwater forests, while the iTree Eco and iTree Hydro components model tree growth to estimate leaf area index, evapotranspiration rates, and canopy interception. The "slug flow" parameter models the flow of water through the soil profile in a series of vertical storage units.