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# Catalyzing Green Infrastructure on Private Property



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# Background

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- An increasing number of cities and municipalities are committed to “green” approaches to keeping polluted runoff out of waterways.
- Green infrastructure (GI) mimics natural hydrologic processes to capture, infiltrate, and evapo-transpire rainwater at or near the site where it falls.
- These approaches work in many soil conditions – highly infiltrative soils are not required for adequate functioning of the majority of GI with proper design and installation.
- Green stormwater strategies are attractive because they provide a range of public benefits that traditional “gray” solutions lack, including:
  - improved air quality
  - regulation of urban temperatures
  - reduce flood risk (in some cases)
  - opportunities to improve property values in underserved communities
  - improved urban resiliency overall
- In many cities, low-cost GI opportunities exist on private property
- However, accessing these low-cost GI opportunities is a challenge

# Philadelphia's 'Green City Clean Waters' plan

Philadelphia is required by both state and federal law to manage stormwater from approx. 10,000 impervious acres within the combined sewershed by 2036.

Three key sources of Philadelphia's "greened acres":

- **Retrofits on public land/public right-of-way (ROW)**

*Managing stormwater from streets, sidewalks, parks, and other publicly-owned impervious areas*

- **On-site capture standards for re-development**

*Local rule requiring new and re-development projects above a threshold size to manage first inch of stormwater as a condition of permit approval*

- **Incentives for private property owners (focus on commercial) to voluntarily retrofit**

*Stormwater billing system that enables stormwater fees to be reduced if owners retrofit AND new program created to provide direct grants to subsidize upfront retrofit costs*



**What is a "Greened Acre"?**  
A Greened Acre manages at least the first inch of rainfall over an acre of hard surfaces.   
In other words, a single rain garden that can absorb an inch of rain from a one-acre parking lot would equal one (1) GA; a rain garden that can absorb one inch of rain from a three-acre parking lot equals three (3) GA.

# GI retrofits need to be economically attractive for private property owners

- Philly offered an 80% discount on monthly stormwater fees for property owners who installed GI.
- If a Philly property owner wanted to re-coup expenses for their retrofit within four years based on their stormwater fee discount, it would mean that a project would need to cost less than **~\$0.40/sf**. If they could wait ten years to get re-paid, a project would need to cost less than **~\$0.80/sf**.
- Stormwater fee savings are better seen as O&M “pay for performance” contract rather than way to re-pay owner for upfront cost

GI practice	Retrofit cost ranges (\$/ft <sup>2</sup> )*
<b>Downspout disconnections</b>	<b>\$0.33-0.38</b>
<b>Vegetated swales</b>	<b>\$0.64- 2.13</b>
<b>Infiltration trenches</b>	<b>\$1.38-\$1.58</b>
<b>Rainwater harvesting</b>	<b>\$1.28- 5.33</b>
<b>Rain gardens</b>	<b>\$3.88-4.43</b>
<b>Porous pavement</b>	<b>\$4.88-5.58</b>
<b>Green roof</b>	<b>\$30.70-63.97</b>

*\*Costs estimated in 2012 dollars. Cost ranges represent Philadelphia capital cost estimates and do not include O&M. Costs vary greatly by city and on a case-by case basis; these ranges are therefore most useful as points of comparison across practice types.*

# City programs can help improve GI retrofit economics for private land owners

## GI practices

## Example programs

	Off-site Mitigation	Aggregation	\$0.50/ft <sup>2</sup> Subsidy	\$1.00/ft <sup>2</sup> Subsidy	\$3.00/ft <sup>2</sup> Subsidy	\$3.50/ft <sup>2</sup> Subsidy
Downspout Disconnection						
Swales						
Infiltration Trenches						
Rainwater Harvest & Reuse						
Rain Gardens						
Reducing Impervious (Hard) Surfaces						
Flow-Through Planters						
Porous Pavements						
Green Roofs						
<b>New Potential Greened Acres</b>	<b>658</b>	<b>215</b>	<b>2,532</b>	<b>2,252</b>	<b>1,015</b>	<b>344</b>
Total Potential Greened Acres	658	873	3,405	5,656	6,671	7,015
Progress to 9,564 Greened Acres Goal	7%	9%	36%	59%	70%	73%

The City can get substantial amount of stormwater management for **\$3.50/ft<sup>2</sup>** through private property retrofits whereas capital cost estimates for right-of-way retrofits cost approximately \$250,000/acre, or **\$5.74/ft<sup>2</sup>**

Source: *Creating Clean Water Cash Flows* (NRDC, TNC, & EKO, 2013)

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# Concluding thoughts

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- Likely that in many cities, a hybrid gray/green approach to runoff management that utilizes both private and public land is most cost-effective
- Strategic policies can play an important role in helping cities leverage the most economic GI projects across all property types:
  - On-site capture requirements for new and re-development
  - Impervious-area based stormwater fees can help encourage voluntary retrofits
    - ✓ Fee discount unlikely on it's own to motivate voluntary retrofits
    - ✓ Fees can be leveraged to help pay for long-term GI maintenance
  - Direct subsidies likely required to achieve voluntary GI retrofits on private property