



Scenario B: Turning Gray to Green Scientific and Historical Background for the Teacher



The following information is excerpted from The Executive Summary, Green Infrastructure Plan, Lancaster, PA. The document guides the city in making decisions using a data-driven process combined with input from the community's various stakeholders.

“The City of Lancaster is one of about 770 cities nationwide with a combined sewer system (EPA)... during intense rainstorms and other wet weather events, the system becomes overwhelmed. . .

“At the time that combined sewer systems were being built across the country 100 – 200 years ago, they were considered a highly efficient method of treating all forms of waste from urbanized areas. . . But as urbanized areas grew and eventually overwhelmed these systems, the methods used did not change or keep up with development. . .

“The Environmental Protection Agency. . . has begun enforcing limits on nitrogen, phosphorus and sediment pollution, referred to as Total Maximum Daily Load (TMDL). . . The costs to comply with these new regulations are going to be felt by every community.

“... Lancaster City has been working proactively to reduce combined sewer system overflows. . . most of the strategies under consideration have been limited to “gray infrastructure” options, such as increasing the capacity of the City’s wastewater conveyance and treatment infrastructure; adding storage or holding tanks to detain wastewater flows until treatment capacity returns; or providing some form of wastewater treatment to the overflow discharges.

“... there remains a significant amount of untreated combined sewage overflowing into the Conestoga River. . . . Given the expense of gray infrastructure modifications, the City has instead opted for a two-prong strategy for reducing the volume of stormwater entering the combined sewer system:

1. Increase the efficiency and capacity of the City’s existing gray infrastructure; and
2. Employ “green infrastructure” methods of stormwater management.





. . . Green infrastructure generally includes stormwater management methods that:” allow water to infiltrate through porous pavements and gutters, rain gardens and bioretention; evaporate and transpire from vegetated roofs and trees; and be reused through rain barrels, cisterns and gray water systems.

“The impervious cover analysis revealed that 41 percent of the city’s impervious surface is attributable to buildings, 32 percent to parking lots, 25 percent to roadways and 2 percent to railroads. . .” (1)

“Thanks for contacting us about the use of technology. GIS / technology was critically important to various planning efforts . . . Here are some specific examples of how GIS data was (is!) used in the planning/design process:

For the GI (green infrastructure) Plan, GIS was a critical tool . . . it helped us perform the land use analysis, as well as all of the input for our calculator and GI build-out analysis. LiDAR data (publically available on our GIS Data Clearinghouse PASDA) was used to create a land cover layer, including tree canopy, which was used to develop a tree canopy baseline, as well as help the City set a goal for future canopy growth. Results from a GPS survey of the existing trees in the City is used along with the canopy layer to perform gap analysis, and the results help with planning and design for future GI projects. A digital survey of the road and right-of-way (ROW) features was undertaken and integrated into the City’s asset management system, Lucity. The ROW data is used in GIS basemapping in order to determine conflicts during GI design phase. (2)

1. Gray, J. R. The City of Lancaster, PA, (2011). Executive summary, green infrastructure plan. Lancaster, PA.
2. Katzenmoyer, C., Dir. of Public Works, City of Lancaster, PA (2013, March 13). Interview by M Burton [Personal Interview].

(Son of Citation didn’t have an e-mail category, so I used the personal interview format under social media, since that seemed to be the closest thing to an answer to a question asked by e-mail)

The City of Lancaster, PA and its Green Infrastructure Plan

“Each year the City of Lancaster is responsible for about one billion gallons of polluted water flowing into the Conestoga River and eventually into the Chesapeake Bay. This is common in historic cities like Lancaster that rely on a combined sewer system. . . (that) collects and transports both domestic sewage and rainwater flowing. . . over impervious surfaces into the City’s storm drains. . . This Green Infrastructure (GI) Plan provides a strategy that addresses the problem of stormwater runoff with techniques that are both cost-effective and responsible.” (1)





Geographic Information Systems (GIS) have revolutionized the planning of green infrastructure networks. (2)

(1) Gray, J. R. The City of Lancaster, PA, (2011). Executive summary, green infrastructure plan. Lancaster, PA.

(2) Sustainable cities institute: geographic information systems (gis). (n.d.). Retrieved from http://www.sustainablecitiesinstitute.org/view/page.basic/class/feature.class/Lesson_Geogr.