CLASIC

CASE STUDY

Community Life-Cycle Analysis for Stormwater Infrastructure Costs

Middle Blue River
Kansas City Metro

CLASIC Case Studies showcase the variety of ways that the online tool can assist communities with stormwater project planning and decision-making.

CASE STUDY HIGHLIGHTS

- The case for including trees in rain garden or bioretention projects in the Kansas City metro area
- Economic, environmental and social benefits of including trees in green stormwater infrastructure projects
- Cost savings may also be a benefit to including trees in green stormwater infrastructure projects

Background and Project Purpose

The upper watershed of the Middle Blue River contains valuable natural cover such as marsh/wetlands, lowland hardwoods, deciduous forest and grasslands.

While the watershed's upper portions are healthy enough to support diverse biological life, aquatic life has declined in the lower watershed areas due to urbanization, declining vegetations, increased impervious surface runoff, increases in nutrient loading and wastewater inputs.

Two thirds of the water in the Kansas City metropolitan area drains into the Blue River. The middle segment of the river corridor is affected by issues such as poor infill development, sedimentation, nutrient overload, invasive species, combined sewer overflows and lack of public awareness.

The Challenge

Kansas City metro's Middle Blue River Watershed is experiencing an increase in vacant properties. One proposed solution is to build rain gardens in strategic locations to help improve the value of existing inhabited properties, ease the land bank's maintenance burden for vacant properties and improve overall watershed health.

The purpose of this case study is to determine whether including trees in rain garden projects improves economic, social and environmental outcomes.

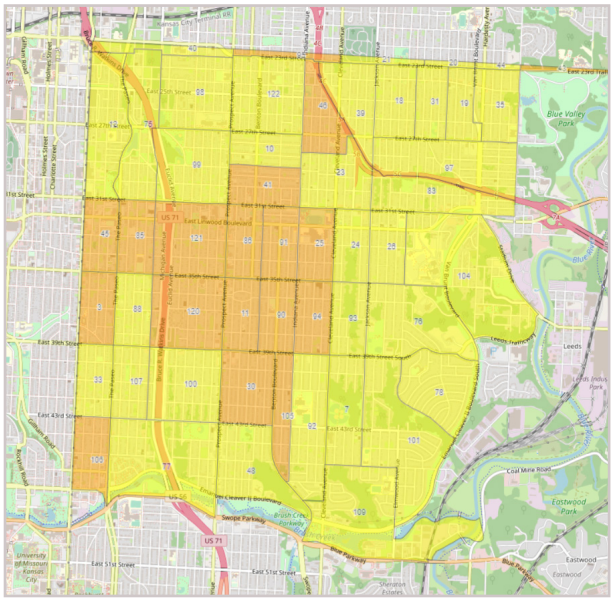


Figure 1 Kansas City – Middle Blue River Study Area

BASELINE SCENARIOS

Scenario 1

- 62 medium rain gardens (1,000 ft^2) with diverse vegetation that capture 15% runoff from impervious surface in the study area

Scenario 2

- 62 medium rain gardens (1,000 ft^2) with diverse vegetation that capture 15% runoff from impervious surface in the study area
- Two trees included in each rain garden

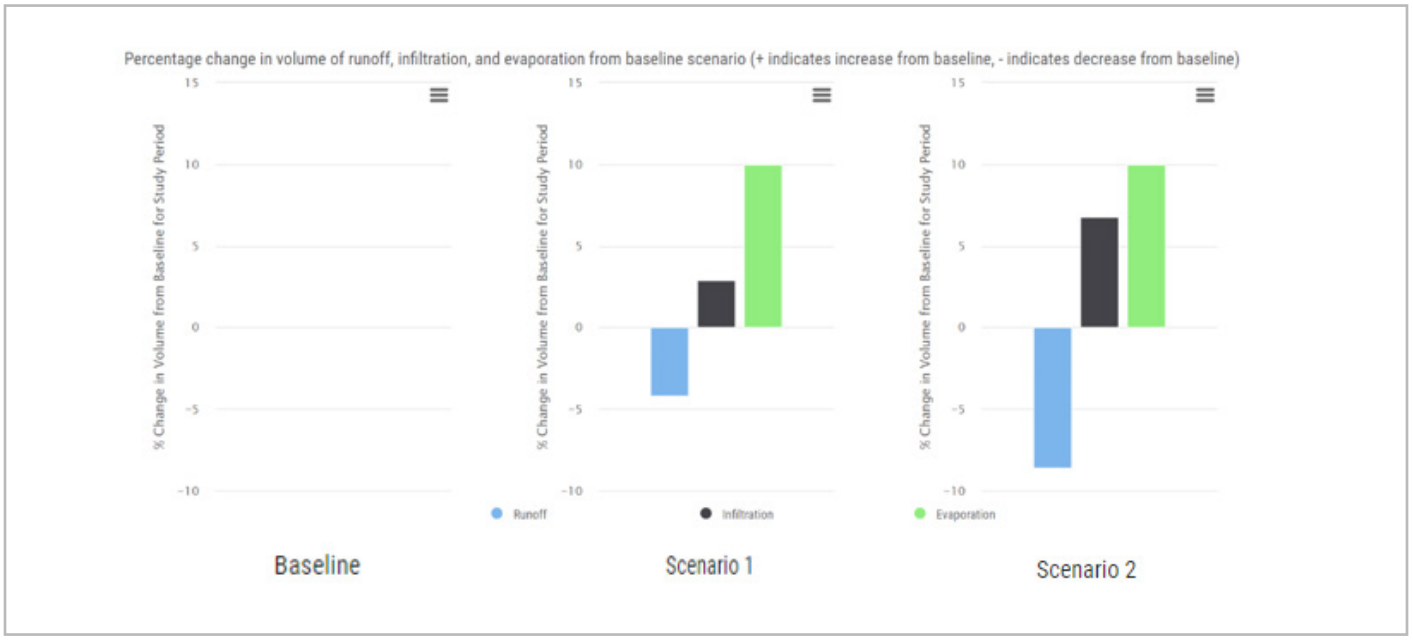
PERFORMANCE – HYDROLOGY AND WATER QUALITY

Scenario 1 (Rain Gardens without Trees)

- Estimates a 4.2% reduction in runoff, 2.9% increase in infiltration and 10% increase in evaporation from the baseline scenario.

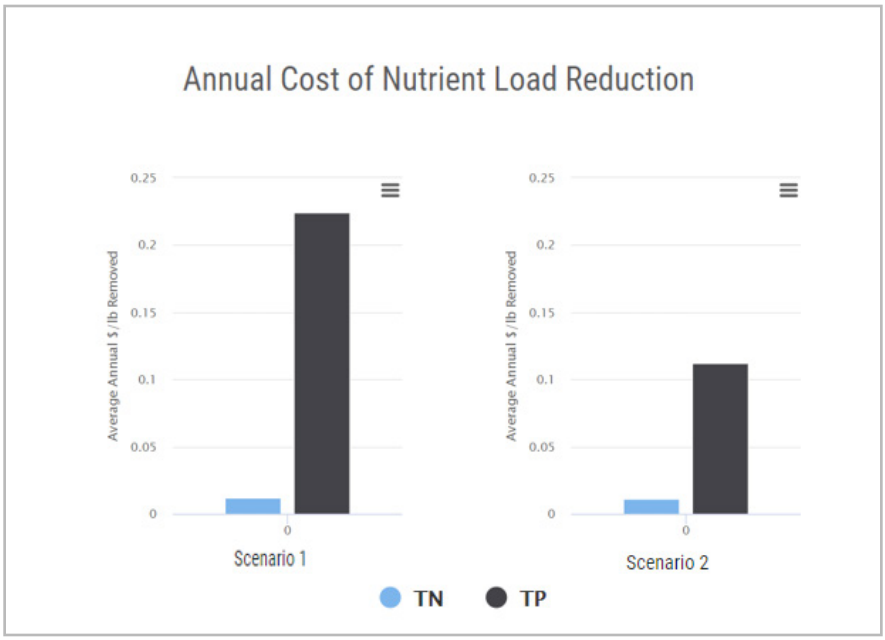
Scenario 2 (Rain Gardens with Tress)

- Calculates an 8.6% reduction in runoff and 6.8% increase in infiltration from the baseline scenario. These are marked increases from Scenario 1.
- Evaporation increase from the baseline is 10% in both Scenario 1 and Scenario 2.



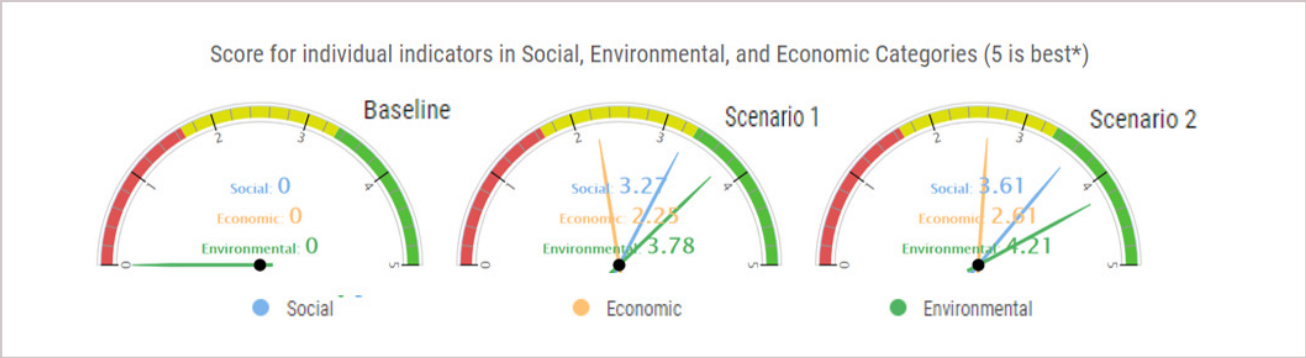
As the Middle Blue River watershed tackles nutrient loading, CLASIC identifies the average annual cost of reducing nutrients in the "Hydrology and Water Quality" result tab. In this analysis, both Scenario 1 and 2 show that the cost per pound of nitrogen reduction is only $0.01.

The cost per pound of phosphorous reduced is cut in half when trees are included in the rain garden projects, from $0.22 in Scenario 1 to $0.11 in Scenario 2.



CO-BENEFITS

- When rain gardens are added to the baseline stormwater system, there is a significant jump in the social, economic and environmental benefits.
- When trees are added to the rain gardens, there is a further increase in each co-benefit area.



SUMMARY

These scenarios are very costly, but the case study can still be useful to show the added benefits of including trees into stormwater management practices.

At this time most local governments are facing cutbacks due to the lasting impacts of the COVID-19 Pandemic. This will unfortunately impact stormwater management programs in cities that do not have a stormwater fee in place but rather pull from their general funds.

In the future when moving forward with repairing and replacing infrastructure, that will most likely be kicked even further down the road, the CLASIC tool will be immensely useful for showing the benefits of green infrastructure options for addressing healthy watersheds and stormwater management programs

This case study is based on a hypothetical project in a real-world location. The project and results do not represent any actual construction or spending in the city listed.