Agroforestry in the Urban Environment: Water Quality

ATLANTIC STATES LEGAL FOUNDATION

Agroforestry Improves Water Quality

The planting of food producing trees and shrubs can play a critical part in protecting water quality in urban landscapes. Their canopies intercept rainfall, and root systems stabilize soil, slow down stormwater runoff and filter out harmful contaminants. Established urban food forests can significantly reduce runoff and improve the water quality of urban waterways while providing a valuable food resource for communities.

Water Resource Issues in Urban Landscapes

Urbanization and development continue to stress water resources in urban areas. Added roofs and impervious pavement increase surface runoff, which has become the leading cause of urban water pollution. Runoff washes fertilizers, pesticides, dirt, bacteria, and other pollutants into nearby waterbodies. The resulting water pollutions, such as harmful algal blooms (HABs), which are caused by nutrient-loaded runoff, can affect not only the health of people and the ecosystem, but also regional and local economies. In cities like Syracuse where old sewer systems convey both sewage and stormwater, excessive runoff during heavy precipitation events may cause combined sewer overflows (CSOs). This results in contaminated runoff, mixed with untreated raw sewage that contains harmful bacteria, polluting surrounding waterbodies, such as Onondaga Lake and its tributaries. Additionally, rainwater runoff flowing across hot, paved urban surfaces raises the water temperature in streams, rivers, and lakes, affecting the living environment of aquatic creatures. All of these sources of pollution result in poor and possibly even dangerous water quality. As a result, urban populations lose out on access to the valuable benefits healthy waterbodies can provide.

Climate Change Adds New Challenge

Climate change will increase the chance of extreme precipitation events that tend to be more brief, highly unpredictable and intense. Such meteorological events pose serious challenges to cities' drainage systems, potentially causing more CSOs in communities with combined sewer systems, and creating damaging flash floods in urban environments. Cities need to add and incorporate green infrastructure to the landscape in order to build community resilience to extreme weather and to mitigate other climate impacts.

How Agroforestry Helps

Just like other trees and shrubs in urban forests, fruit trees and berry bushes, as part of agroforestry plantings, can increase the amount of rain that is absorbed into the ground and reduce runoff through slowing and intercepting rainfall.

Leaves and branches can intercept a large amount of precipitation before it hits the ground, thus significantly reducing the volume of runoff generated. This is especially true when tree canopies are over paved surfaces. Their roots help to prevent soil from compaction and maintain the soil porosity around trees so more rainwater is absorbed. Additionally, the amount of stormwater that flows over roadways and other impervious surfaces is reduced. This in turn lessens the burden on storm drain systems and reduces flooding in urban landscapes. Also, both the leaves and roots protect against soil erosion, by either reducing the impact from rainfall or holding the soil in place. This is particularly important on steep slopes and on urban stream banks, where bare soil is highly prone to erosion. Additionally, root systems help to catch displaced soil and sediments carried by runoff, which can otherwise cause the water to become cloudy. Cloudy water hinders aquatic animals' feeding and reduces sunlight from reaching aquatic plants. These trees and shrubs also reduce water pollution by filtering out contaminants. Nutrients and chemicals are removed through plant uptake and bacterial degradation, reducing the nutrient loads of nitrogen and phosphorous in the runoff, which could subsequently cause harmful algal bloom in the receiving water. Either through being planted as part of a backyard orchard or incorporated in an urban stream buffer, agroforestry plants can provide one of the most important ecosystem services to urban communities - managing stormwater runoff.

Planting for Water Quality

Every individual tree or shrub, large and small, contributes to a cleaner waterbody and healthier ecosystem. This is more true in highly-developed urban environments where nature has become scarce. Proper design and application of agroforestry planting can better help with water quality improvement. Things to consider:

1. Always use the right plant at the right place. There is a wide range of edible species to select from for an urban agroforestry project. Select the plants based on the site's conditions to limit the need for irrigation, maximize rainwater interception and uptake, or stabilize a steep slope, while still maintaining healthy and productive

Did You Know?

- Through their canopies, deciduous trees usually intercept 20% of rainfall
- 180 million Americans receive quality drinking water from forested watersheds
- The Environmental Protection Agency lists sediment as the most common pollutant in rivers, streams, lakes and reservoirs.

plants. Plantings along roadways, in parking lots, and along streambanks are usually more effective in managing runoff.

2. Incorporate proper edible plants in green infrastructure stormwater projects to augment the project benefits. Many popular agroforestry species, such as pawpaw, elderberry, blueberry, and serviceberry, are well suited for being used in rain gardens, bioswales, etc.

3. Where space allows, group your trees and shrubs following agroforestry practices such as windbreaks and alley cropping to limit flooding and soil erosion. Keep and create large, contiguous forest patches as possible.

4. Keep maintenance in mind from the start of project planning to avoid any conflict with stormwater management facilities and operations.

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