

Constructed Wetlands

for Stormwater Management

Dear Clients and Friends:

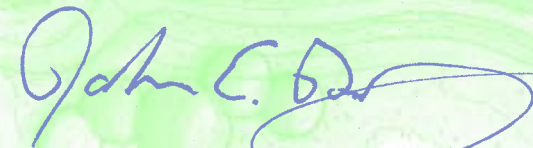
The use of constructed wetlands for stormwater management and water quality control continues to gain increased attention as members of the development community become fully aware of the requirements for and benefits of this ecological Best Management Practice. Properly designed, constructed wetlands provide flood control, reduce runoff velocities and remove pollutants while providing an aesthetically pleasing and environmentally friendly alternative to typical methods of stormwater control.

Through the work of our engineers, landscape architects and wetland scientists, Beals and Thomas, Inc. has accumulated valuable experience in the design, permitting and development of constructed wetlands for commercial, retail and residential projects. As a result we are able to provide comprehensive consulting services concerning all issues related to the construction, replication and/or restoration of wetland habitat.

In March, Beals and Thomas, Inc. presented a larger version of the accompanying exhibit to participants at the annual meeting of the Massachusetts Association of Conservation Commissions. Throughout the year, our staff is given many opportunities to lecture on wetlands and stormwater management, providing information on current industry trends, innovations and regulations to a variety of professional organizations. Recent forums in which we have participated have been sponsored by the Massachusetts Association of Land Surveyors and Civil Engineers, the National Association of Industrial and Office Properties, Massachusetts Association of Planning Directors and the Massachusetts Department of Environmental Protection. We hope you find the information contained herein valuable and encourage you to contact us at our Westborough offices for assistance with any questions you may have pertaining to wetlands and stormwater management related issues.

Sincerely,

BEALS AND THOMAS, INC.



John E. Bensley, PE
Principal



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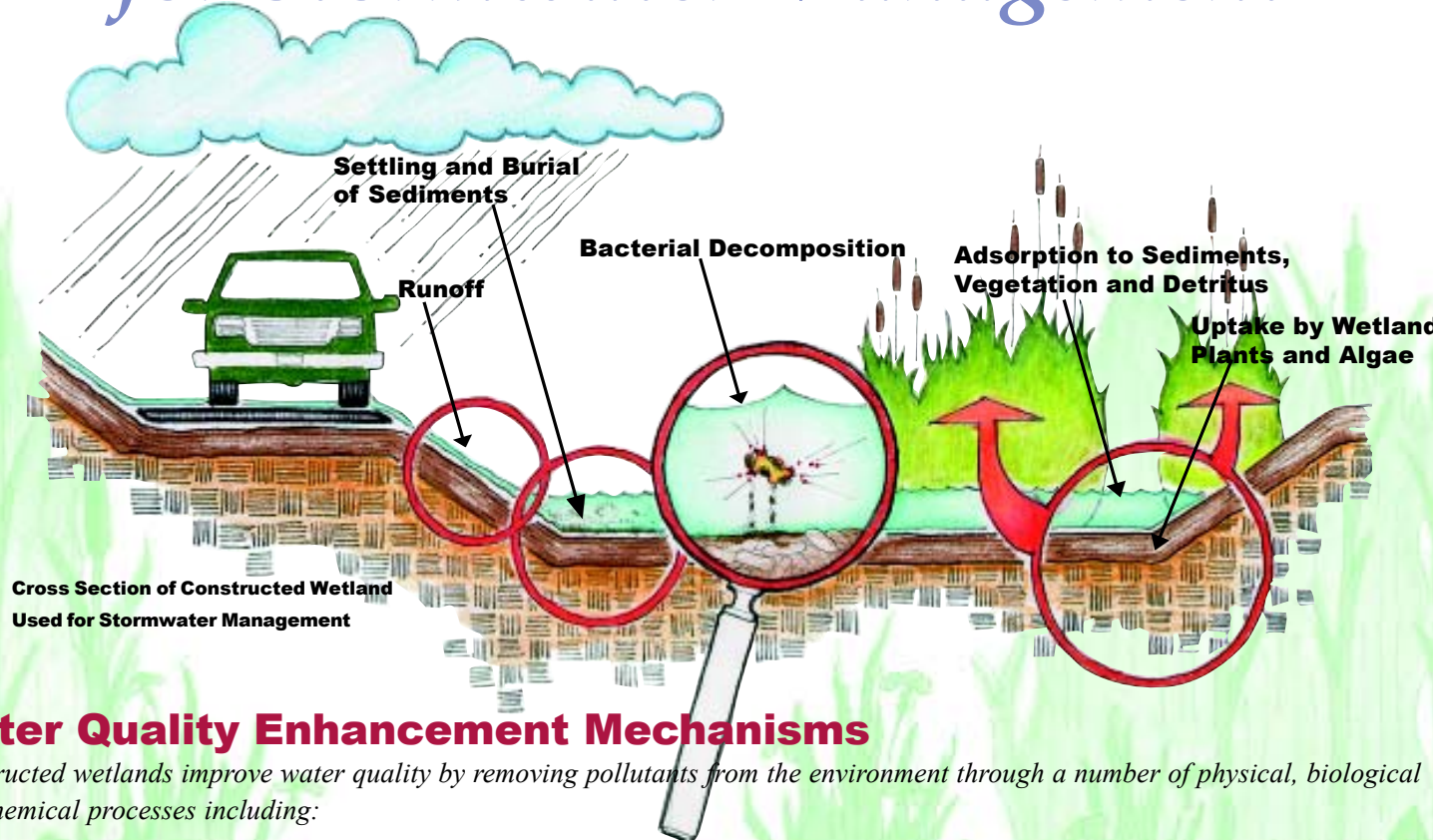
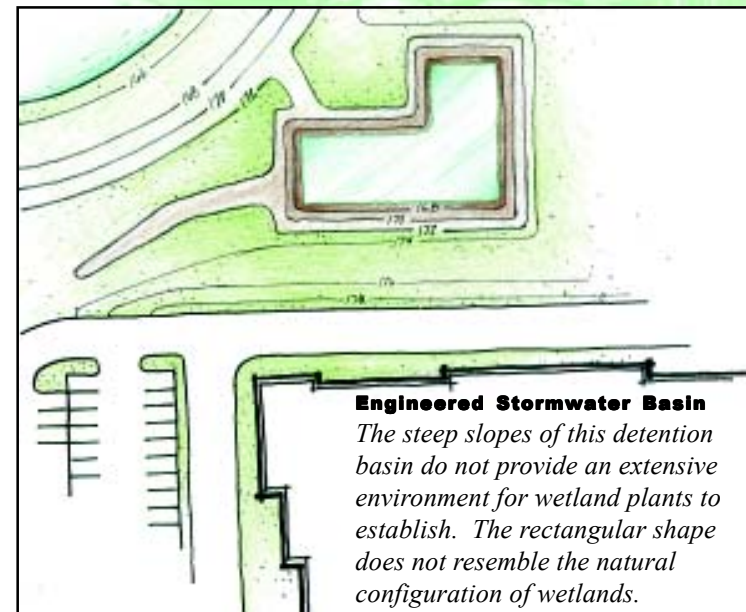


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Prior to the mid 1980s, stormwater management basins, typically dry, dull, detention structures, were the primary method of stormwater control, solely ensuring that post-development discharge rates stayed in line with those of predevelopment levels. Through time and evolution many of these barren, lifeless structures developed into self sustaining wetlands, natural stormwater control systems which were found to perform their physical function just as well for the designs of man as they did for those of Mother Nature. Today constructed wetlands are an authorized Best Management Practice (BMP), approved under the Department of Environmental Protection's (DEP) Stormwater Management Policy.

Specifically designed and created to mitigate the impacts of development on stormwater quality and quantity, constructed wetlands provide multiple functions, including the storage of runoff and the removal of pollutants through their simple yet effective ecosystem. Time tested, durable and adaptable to many development scenarios, constructed wetlands, which do require some space, additionally provide wildlife habitat, enhance existing wetland systems and serve as a recreational amenity.



Water Quality Enhancement Mechanisms

Constructed wetlands improve water quality by removing pollutants from the environment through a number of physical, biological and chemical processes including:

Settling and Burial of Sediments

Pollutants, such as phosphorous and metals, bind to sediments in the water, which when slowed by vegetation settle to the bottom of the wetland and are buried within the soil.

Bacterial Decomposition

Vegetation, decaying plant matter and organic sediments come together within the wetland to create an environment in which microbes, whose activity promote the removal and transformation of nitrogen and various metals, can thrive.

Adsorption to Sediments, Vegetation and Detritus

Dissolved pollutants are removed from the water through adsorption, the attraction of ions or compounds to the surface of a solid, an activity promoted within wetlands by the high amount of organic matter and detritus (living and decaying plant matter). The higher the vegetative cover within the wetland, the higher the production of organic matter and the greater the adsorption process.

Uptake by Wetland Plants and Algae

Plants facilitate the removal of pollutants through their roots and the water column. Although storage of pollutants in wetland plants is seasonal and temporary, ending with their decomposition, trees and shrubs provide a long term solution, storing nutrients for their entire life cycle. In addition, those metals and nutrients absorbed through the growing season by the emergent plants are stored and buried in the soil during their dieback in the fall. Uptake during the growing season can also mitigate the adverse effects of excessive nutrients, which can be present on surface waters during the summer months causing algae blooms and reduced available oxygen. A healthy amount of algae though serves to remove soluble pollutants by converting these substances to biomass, which in turn settles into the wetland sediments.



Typical Design Features of Constructed Wetlands

Effective wetland design requires creating a microtopography within the wetland system in order to encourage the establishment of a diversity of vegetation and treatment areas, including - for example - deep water pools, low marsh areas and high marsh zones.

Forebays reduce incoming runoff velocities, allow for the initial settlement of particulate pollutants and provide an accessible area from which to remove accumulated sediments during maintenance operations.

Long Flow Paths increase contact time between contaminants and the surface area of the wetland.

Micropools prevent clogging of the outlet structure with debris and allow for the final settlement of particulate pollutants prior to discharge from the constructed wetland.

Low and High Marshes provide varying elevations suitable for the vital growth of wetland plants and increased vegetative diversity.