Management Strategy: Water Quality Improvement

Water quality improvement is a management strategy that can be used to remediate impaired waters in a wetland. Some contaminants that are commonly found in impaired waters in the Chesapeake Bay region include excess nutrients (such as nitrogen and phosphorus), pesticides, hydrocarbons, and sediments.[1] Among other things, excess nutrients can cause an overgrowth of algae. Significant amounts of algae in the water can deplete available oxygen that marine plants and animals need to survive. Similarly, sediment pollution can increase the turbidity in the water, leading to limited photosynthesis of aquatic plants and reduced oxygen availability.[2] The water quality improvement management strategy focuses on techniques such as stormwater management and nutrient availability alterations which aim to reduce runoff into a watershed. By incorporating these techniques, a land manager can improve the water quality and health of their marsh.

- **Stormwater Management**

Stormwater management refers to the practice of managing the flow of precipitation that falls on developed or urban areas. [3] Hard surfaces such as roads and roofs prevent water from being absorbed into the ground. Instead, the water accumulates and runs off into a local stream, river, or a storm drain. As the water runs across developed areas, it picks up pollutants such as oil, sediment, and nutrients that can be harmful to the aquatic ecosystems where they end up, including marshes. Implementing a form of stormwater management can indirectly help to protect a marsh by reducing the amount of harmful runoff that reaches the habitat. Some stormwater management strategies include infiltration trenches, storage tanks, rain gardens, and bioretention ponds.

Infiltration trench: An infiltration trench is a 3-12-foot-deep trench that is lined and filled with a combination of small stones/gravel.[4] The trench collects and holds stormwater to give the water time to infiltrate into the ground. This system is appropriate for most sites but will require an assessment of the site's soil type, water table, drainage area and slope to ensure the conditions are suitable for this treatment type.[5] The construction and design costs for an infiltration trench can range from $60,000-$70,000 per acre of surface treated.

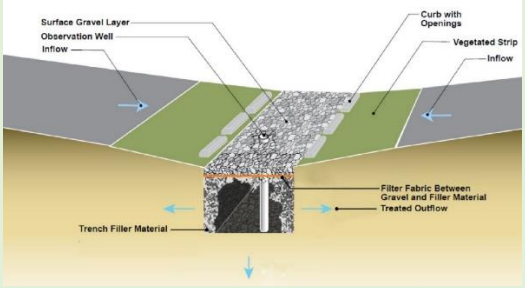

Figure 1. A cross section diagram of an infiltration trench. [6]

Storage tanks: Rainwater storage tanks capture and store stormwater from surrounding impervious areas to reduce surging runoff. The water in the tanks can be used for greywater purposes or can be released into the ground more slowly in drier conditions. Storage tanks include rain barrels, cisterns, and underground tanks. The cost of a storage tank will depend on the volume, site location and materials. For reference, a 50-gallon rain barrel will typically range from $50-$250, whereas a 200-gallon cistern can cost around $600 (depending on materials). [7, 8] Typically, underground storage is more expensive than surface level stormwater storage. [9]

Figure 2. Steel cistern captures rainwater from adjacent roof. [10]

Rain garden: A rain garden is a planted shallow depression that uses water tolerant plants and landscaping to soak up stormwater runoff that flows from impervious surfaces. Rain gardens capture stormwater and allow it to infiltrate slowly into the ground to reduce the surge of water into a storm drain or a neighboring body of water. [11] A rain garden is suited for most properties, so long as the site gets sufficient sun exposure, and the water table is at least two feet below the surface. In some cases, the soil at a site may have to be amended to facilitate drainage. The costs of a rain garden can range from $4 to $35 per square foot depending on the site conditions and the source of materials.

Figure 3. Example of an established rain garden. [12]

Stormwater Retention Pond: A stormwater retention pond is a system that captures and filters stormwater runoff from developed areas. [13] Retention ponds improve water quality by allowing sediments and pollutants to settle out as the water moves slowly form one side of the pond to the other before it is discharged into a local stream. Retention ponds often have plant or wetland areas to add an extra layer of filtration as the plants will absorb excess nutrients in the water. Retention ponds are suitable for most sites that have a large enough drainage area (generally 10-20 acres) to maintain the permanent pool of water. [14] Construction costs for a retention pond can range from $35,000-$75,000 per acre of surface treated.

Figure 4. Stormwater retention pond in Montgomery County, MD. [15]

- **Alter Nutrient Availability (*i.e.*, nutrient management in agricultural applications)**

This technique focuses on regulating the amount of nutrients that a land manager uses or produces on a property in order to reduce the nutrient pollution that could run off into a body of water. This technique is particularly relevant to farmers or other property owners who regularly apply fertilizers to their crops, gardens, or lawns or to farmers that produce and use livestock manure as fertilizers. Landowners may apply more chemical or manure fertilizer with more nutrients than a crop can absorb. [16] The remaining nutrients that are not used by plants can be picked up and run off into rivers or streams. One way a land manager can prevent runoff from excessive nutrient use is by developing a nutrient management plan. This is a site-specific plan that recommends the amount, form, source, rate, placement, and timing of manure and/or fertilizer to maximize a crop's nutrient. Similarly, a land manager or farmer can reduce the amount of nutrients available on their property by properly managing livestock manure and poultry liter. Proper poultry and manure management involves appropriate application of manure to a cropland, the development of animal waste storage systems, transportation of excess manure to areas in need, and restriction/exclusion of animals from streams.

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