

NHANRS Fact Sheet: Soils for Constructed Wetlands

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Manufactured soils are a creative source of topsoil for use in constructed wetlands or in wetland restoration projects. These soils are normally produced by mixing on-site or off-site mineral material, with compost from various sources. Industry experts recommend the following soil characteristics for most constructed wetlands in New Hampshire.

The ideal manufactured soil will provide adequate plant nutrients, healthy microbial activity, unrestricted infiltration and physical stability. These qualities will help insure rapid plant establishment, high plant survivability, improved floodwater retention, resistance to erosion and absorption of pollutants. Experience has shown that wetland formation is accelerated by application of a high quality wetland soil substrate.

There are three key components that the compost industry experts focus on when making wetland soil are: are organic matter content (or organic carbon), soil texture, and the likely seed bank. Other soil characteristics are important for assessment of the soils long-term capability to store and release nutrients and to provide adequate rooting. Careful sampling followed by chemical and physical laboratory analyses are necessary to assess these characteristics. In addition it is recommended to sample and test for background levels of important nutrients or contaminants such as metals in order to determine management objectives such as the regulation of pH.

- Organic Matter Content

Leaf compost is generally used to increase organic matter and make wetland soil. Leaf compost can vary from 25% to 40% organic matter depending on the source. Typically, leaf compost is incorporated in a ratio of 1:1 with loamy topsoil that has an organic matter content of about 5% or it is blended in a ratio of 2:1 (two parts compost) with loamy subsoil that has negligible organic matter content. Since regulatory guidelines suggest organic matter content for constructed wetland soil as high as 20%, it is important to select compost that is high in organic matter content. Although 20% organic matter content in the final soil mix is the regulatory standard, many consider 12% organic matter to be adequate for constructed wetlands.

- Soil Texture

The texture of the mineral soil portion in the final soil mix is critical for proper permeability, moisture holding capacity, and resistance to compaction or subsidence. The most commonly recommended USDA textural classes include: sandy loam (SL), fine sandy loam (FSL), silt loam (SiL) or loam (L).

- Likely Seed Bank

Determining seed bank can best be achieved by knowing your material sources. Visiting the compost facility will reveal factors that contribute to likely seed content. For example, the thoroughness of the composting operation such as turning frequency, method of turning, and feedstock sources can easily be determined from a site visit.

- Cation Exchange Capacity (CEC)

CEC is a measurement of the soils ability to absorb and release many of the primary plant nutrients that occur as cations (Ca, Mg, K, NH₄, etc.). A CEC of 20 or more is recommended for best results. A general rule of thumb is that a soil manufactured from compost, having 15-20% organic matter will have an adequate CEC.

- Bulk Density
Bulk density is the mass per unit volume of the whole soil, including pore space, so it is a reflection of porosity. Bulk density impacts the resistance to plant roots and the ability of air and water to move within and through the soil. For constructed soils the recommended range of bulk density is 1.05 to 1.17 g/cc or 1600 to 1800 lbs./cubic yards as a delivered.
- Soil pH
Soil pH is a measurement of the hydrogen ion concentration in the soil solution. It is commonly referred to as “acidity” or “alkalinity”. The soil pH determines the availability of nutrients and other chemical constituents. A soil pH of 6.5 to 7.5 is recommended for manufactured wetland soils. The specific needs of the selected plant material must be determined and the pH adjusted as needed for optimum growth of plants.
- Application Depth
An application depth of 8-12” (manufactured soil) is recommended for best results in constructed wetlands.

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