

Gravel Wetland Soil Specifications – Updated 9-21-2021

1. Wetland soil be a uniform low-phosphorus mix of compost, sand, and fine soil and have a minimum thickness of 8 inches.
2. The Mehlich-3 Phosphorus Saturation Ratio (PSR) for the Wetland Soil shall be no more than 10%.
3. Wetland soil shall have a pH of 6.0-7.0.
4. Wetland soil shall have a low hydraulic conductivity between 0.1-0.01 ft/day.
5. The organic portion of the Wetland Soil shall constitute 10-15% of the Total Wetland soil mixture. The organic portion shall be comprised of well pulverized and composted leaf mulch. Animal or poultry manure shall not be accepted.
 - a. The organic portion of the Wetland Soil shall be adjusted if soil testing demonstrates a PSR greater than 10%.
6. Granular soil shall constitute 80-85% of total Wetland Soil mixture and meet the following gradation:

US Standard Sieve Size in/mm	% Passing by Weight
0.5/12.5	90-100%
#10/2.00	70-95%
#100/0.15	35-55%
#200/0.075	20-55%

7. No materials or substances shall be mixed or dumped within the gravel wetland media harmful to plant growth or impede maintenance. Wetland soil that is stockpiled on site shall be stored away from potential sources of contamination and protected from precipitation.
8. Wetland soil shall be free of noxious weeds.
9. Contractor shall submit the following:
 - a. An analytical test showing compliance with the above requirements. A minimum of (1) Mehlich-3 test and a subsequent PSR test of the Mehlich-3 extraction for soil phosphorus (See testing requirements on Page 2). All tests shall be performed by the same testing facility.
 - b. Hydraulic conductivity test showing compliance with the above requirements.
10. Onsite native soils may be utilized to formulate the wetland muck mix with some deviation from the specifications above subject to Engineer approval.

Recommendation for the P testing requirement to be used for the upper media layer of bioretention systems and gravel wetland soil layers in Vermont

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Final mixes must have a Phosphorus Saturation Ratio (PSR) less than or equal to 0.1. PSR is to be determined using the following protocol:

1. Samples are to be air dried and sieved through 2 mm prior to testing
2. Air-dry, sieved soil samples are to then be extracted with the Mehlich-3 solution (0.2 M CH₃COOH + 0.25 M NH₄NO₃ + 0.015 M NH₄F + 0.013 M HNO₃ + 0.001 M EDTA) by shaking a soil-solution suspension for 5 minutes at a 1:10 (soil mass : solution) ratio, followed by filtering to remove particles above 2 μm in size (0.45 μm pore size is also acceptable).
3. Extracts from the Mehlich-3 procedure are to be analyzed for P, Fe, and Al by ICP-OES.
4. The Phosphorus Saturation Ratio (PSR) is then calculated as follows:

$$PSR = \frac{\left(\frac{P_{M3}}{31}\right)}{\left(\frac{Fe_{M3}}{56}\right) + \left(\frac{Al_{M3}}{27}\right)}$$

where,

P_{M3} = Mehlich-3 P in mg P per kg dry soil

Fe_{M3} = Mehlich-3 Fe in mg Fe per kg dry soil

Al_{M3} = Mehlich-3 Al in mg Al per kg dry soil

Mehlich-3 extractions must be used following the above protocol. Other soil test extractions, including Modified Morgan tests, oxalate extractions, water extractions, or extractions used to quantify total elements, are **not** acceptable.