

# LOOKING AT YOUR CEC

**I am trying** to find out more info on CEC's in the soil. What is the ideal CEC when reading a soil analysis report? What is a bad or good CEC reading on a soil sample? What can be done to correct the CEC?

Glynn County Sports Field Manager

**A** simplistic description of CEC is the ability of that soil to retain and provide nutrients (positively charged nutrients) or its ability to exchange nutrients. A low CEC increases the chances for nutrient deficiencies in nitrogen, potassium, magnesium, manganese, iron, and calcium. It also increases the leaching potential of these important nutrients, making nutrient monitoring more important. CEC also indirectly influence pH of the soil in that a low CEC soil is not as buffered from pH change and a soil with higher CEC.

CEC comes from several sources. Most of it comes from the smallest particles of the soil (i.e. clay particle); the contribution may vary on type (of clay)



and from organic materials. CEC is expressed in units of centimoles (cmol) per kg or milliequivalents (meq.) per 100 grams of dry soil. There is a 1 to 1 relationship between these units. In soil test reports, CEC is normally reported as CEC, Cation Exchange Capacity, or Total Cation Exchange (TEC). Each of these terms has the same meaning and uses the same units.

So, what kind of soil test values can you expect? I am not sure you can really label a CEC value as ideal. The CEC values of sands tend to be low. If the sand (soil) does not have clay or organic matter in it then the CEC can be very low. Sand with 1-2 percent organic matter typically has a CEC in the 1 to 3 range; whereas a sand with 2-4 percent organic matter may have a CEC in the 3 to 5 range. A sandy loam soil may have a CEC of 3 to 10 and a high CEC clay up to about 50. As the percent clay or organic matter in your soil increases, CEC also increases. But just because a CEC is high does not necessarily mean it is good. It takes more than CEC to make a good soil. Clay and organic matter content also have significant influence on water retention and infiltration. Construction of sand-based fields has become popular in the past 20 years due to reduced compaction and rapid infiltration, making high-use fields easier to manage and reducing surface water that could delay play.

Generally, practices to enhance CEC are considered only when turfgrass soils have a CEC of less than 4. I would not use the word "correct" with CEC. You may adjust CEC . . . but even that is not easy to do. Working through the calculations, one will find that adding 1 percent (by weight) organic matter with a CEC of 150 to a sand with a CEC of 2 would increase the CEC to 3.5. That is a 75 percent increase but 1 percent by weight organic matter is a large volume (8 to 10 percent) of material. This is reasonable to accomplish during construction, but more difficult to incorporate into the soil profile on an established turf.

I mentioned clay contributes to CEC earlier, but I would normally not suggest adding clay to a sports field due to drainage and compaction issues. There are some calcined clay products that would not be bad amendments since they are heated and do not negatively impact drainage. They may also increase plant available water in some sand soils. There are other minerals (e.g. zeolites) used as amendments that may have a CEC around 200. Research the material before purchasing since some zeolites may contain high sodium levels (not good) and they seem to have a minor impact on soil moisture. Not all heated clay products are the same either.

Though not part of your question, the last points I would like to make concern management of low CEC soil. Start by adjusting soil pH if warranted. The CEC in many soils is pH-dependent. An increase in pH from 5.0 to 7.0 may result in a 10-50 percent increase in CEC. Use slow release nitrogen fertilizers or spoon-feed with quick release nitrogen. You may also see enhanced results with organic fertilizer sources. Maintain adequate potassium in your fertilizer program since potassium ions are easily leached in low CEC soils. I would suggest yearly soil tests to watch your magnesium, calcium, and manganese levels. Iron deficiencies may also occur under low CEC conditions, so foliar iron applications may be beneficial. Low CEC should not be a significant concern since many of the normal cultural programs will compensate. **ST**

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