

LOUISIANA HOME LAWN SERIES

A guide to maintaining a healthy Louisiana lawn



Soil pH

Soil pH is the measurement of the acidity or alkalinity of soil. Soil pH is the negative log of the concentration of H⁺ (hydrogen ions) in the soil solution. The more H⁺ ions in the soil solution, the more acidic the soil. Soil pH is measured on a 1 to 14 scale with a pH 7 being neutral, a pH less than 7 acidic, and a pH greater than 7 alkaline or basic. The pH of soil affects nutrient availability, microbial activity and, consequently, turfgrass growth. It is important to monitor soil pH through routine soil testing so that proper adjustments can be made. Soil pH, while important, is only one of many variables that affect turfgrass health. High-quality turfgrass can be managed within a wide range of soil pH.

Common issues with acidic soil pH

- Plant uptake of some essential nutrients like nitrogen may be reduced.
- When pH approaches 4.0, increased aluminum solubility may limit turfgrass rooting and, therefore, overall plant growth.
- Aluminum and manganese can become toxic to the plant at a very low soil pH less than 4.0.
- Affects some microbial populations to reduce thatch decomposition and necessary nutrient conversions.

Common issues with alkaline soil pH

- Plant uptake of essential nutrients, including phosphorus, iron, manganese, boron and zinc, may be reduced.
- Some pesticides can be less efficacious at a higher soil pH.
- Although many species can grow in more alkaline soils, centipedegrass prefers a soil pH of 5.5.
- Increased disease incidence can occur with some pathogens, such as take-all root rot (also known as take-all patch).

Raising Soil pH

Soil pH can be increased through the addition of lime. Additions of any amendment to raise pH should be based on the recommendations of a soil test. If soil pH is extremely acidic (a pH lower than 4.5), it is best to consult with your local extension service for assistance before applying any amendments. Soil tests often report the amount of lime needed to raise soil pH by giving a calcium carbonate equivalent (CCE). Because sources of lime can differ in the amount required to achieve a suitable pH range, a CCE sets a standard that allows you to calculate the amount of a specific lime source needed to achieve the desired soil pH. For example, if you chose to use hydrated lime instead of calcitic limestone, then you would have to apply 0.74 pounds of hydrated lime for every 1 pound of calcitic limestone.

Lime sources: There are several sources of lime. Listed in the table are some of the more common sources of lime. Calcium oxide, or quick lime, is not recommended for turfgrasses because it is extremely caustic. Other liming sources, such as pulverized shells, slags and wood ash, can be used to raise pH but need to be evaluated for purity and suitable particle size.

A few things to keep in mind when selecting a lime source:

- Source
- Purity and presence of other constituents
- The CCE
- Particle size

Common Lime Sources
Calcitic limestone - CaCO_3 - Calcium carbonate
Dolomitic limestone - $\text{CaMg}(\text{CO}_3)_2$
Calcium hydroxide — $\text{Ca}(\text{OH})_2$ + $\text{Mg}(\text{OH})_2$ - hydrate lime
Calcium oxide — CaO - quick lime

Lime application rates, frequency and timing: Soil pH should be routinely monitored through soil tests every two to three years. Soil tests may be analyzed more frequently for soils that have more extreme pH or soils that are more susceptible to changes in pH, such as soils with high sand content, areas with high rainfall and soils with low organic matter. Consider applying lime following aerification (see publication 3624-LLL) so that materials are more accessible to plant roots. Remember, it takes time for lime applied at the soil surface to change the soil pH within the soil profile. Never take a soil sample soon after applying lime, as it may affect soil fertility analyses.

Source	Rate (product per 1000 ft ²)
Calcitic limestone — CaCO ₃	Up to 25 lbs
Calcium hydroxide — Ca(OH) ₂	5 to 10 lbs
Calcium oxide — CaO	Not recommended

Lime can be applied throughout the year, but one of the best times to adjust soil pH is during cooler temperatures when the warm-season turfgrass is dormant. Depending on the lime source, some sources are more caustic than other sources. The more caustic a lime, the greater the potential for injuring plants, particularly during warm, dry temperatures. It is always advisable to irrigate after lime is applied to wash it from the leaves and into the soil. Following the application rates suggested in the table can also help minimize turfgrass injury. Application at higher rates can lead to increased turfgrass injury. If the soil test requires more lime to achieve the desired pH, then apply additional lime every few months until the recommended amount has been applied. Higher application rates of lime can be applied prior to turfgrass establishment if it is incorporated. Be careful when applying lime, and wear the correct personal protective equipment.

Remember some fertilizers can affect soil pH. The ability of a fertilizer to alter soil pH should be taken into account when developing a fertilizer and liming plan. Lime should never be applied with ammonium-based fertilizers. Lime can be applied a minimum of two weeks after an ammonium-based fertilizer has been applied, depending on environmental conditions.

Lowering soil pH

Soil pH can be decreased by using amendments that result in the addition of hydrogen to the soil (e.g., elemental sulfur, urea, ammonium sulfate). Additions of any amendment to lower pH should be based on the recommendations of a soil test. If soil pH is excessively alkaline (a pH greater than 8.2) it is best to consult with your local extension service for assistance before applying any amendments. Other issues related to soil salinity may be affecting soil pH. Further tests may be required to properly characterize soil conditions to determine the necessary steps to reduce soil pH concerning free CaCO₃. However, unlike acidic soils, there may be no reason to adjust soil pH if the soil pH is lower than 8.2. Many turfgrass species can grow in more alkaline soils. The exception is centipedegrass, which prefers slightly acidic soils around pH 5.5.

Sulfur sources: Amendments to reduce soil pH typically contain sulfur. The most commonly applied amendment is elemental sulfur. When elemental sulfur reacts with water, sulfuric acid is the resulting product. Elemental sulfur is very reactive; therefore, proper personal protective equipment should be worn when applying. Incorrect application rates and timing can lead to turfgrass injury.

Elemental sulfur application rates, frequency and timing: Soil pH should be routinely monitored through soil tests every two to three years. Soil tests may be analyzed more frequently for soils that have more extreme pH or soils that are more susceptible to changes in pH, such as soils with high sand content, areas with high rainfall and soils with low organic matter. Consider applying elemental sulfur following aerification (see publication 3624-DDD) so that materials are more accessible to plant roots. Remember, it takes time for elemental sulfur applied at the soil surface to change the soil pH within the soil profile.

Elemental sulfur can be applied during cooler temperatures or when warm-season turfgrasses are dormant. Soil temperature affects sulfur oxidation in the soil; therefore, application during warmer periods can lead to low acidity at the soil surface or thatch. Elemental sulfur should be applied at a rate of 2 to 5 pounds per 1,000 square feet per application, never exceeding a total of 10 pounds per year. Application during warm periods can lead to turfgrass injury. Application at higher rates can lead to increased turfgrass injury. It is always advisable to irrigate after elemental sulfur is applied to wash it from the leaves and into the soil. If the soil test requires more elemental sulfur to achieve the desired pH, then apply additional elemental sulfur every few months, depending on weather conditions, until the recommended amount has been applied.

Remember some fertilizers can affect soil pH. The ability of a fertilizer to alter soil pH should be taken into account when developing a fertilizer plan. Be careful when applying elemental sulfur and wear the correct personal protective equipment.

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