Psst! Pay attention to soil pH

Wyoming has a lot of great things to offer, but nutrient-rich soil isn't typically one of them. The state's alkaline (high pH) soils restrict plant-available nutrients and can have soil layers that impede the reach of roots, ultimately limiting plant success.

The pH scale

Measuring soil pH indicates whether the soil is acidic or basic. The pH scale ranges from 0 (acidic) to 14 (basic or alkaline), with 7 being neutral. Soils vary in pH based on their geographic location, parent material, and stage of development. Almost all soils in Wyoming are alkaline, ranging from 7.5 to 10 on the pH scale, and are relatively undeveloped.

Plant preferences for pH

One of the most important factors for successful plant cultivation is to ensure the soil pH is suited to the plants you are trying to grow. The ideal soil pH is between 6 and 7.5 for a majority of crops. Most vegetable and fruit crops prefer relatively neutral soils and can tolerate some deviation from neutral. However, some plants, such as prickly pear cactus, saltbush, and halogeton, prefer alkaline soils. Coniferous trees, potatoes, rhododendrons, azaleas, hydrangeas, and blueberries prefer acidic soils.

Growing blueberries

Blueberries are relatively cold hardy and may initially appear well suited for many of the hardiness zones found in Wyoming. They are often sold at big box stores, sometimes resulting in misconceptions about growing fruit in Wyoming. Blueberries prefer soils with a pH around 4.5, which makes them very difficult to grow in many of Wyoming's native soils. If you're interested in growing blueberries, container gardening offers an alternative (and often more successful) approach that doesn't require extensive application of soil amendments. To learn more, visit https://bit.ly/bb-blueberry-container.

Measuring soil pH

Laboratory testing of a soil sample is one of the most accurate ways to determine the pH of your soil. A comprehensive soil test performed in a laboratory typically includes a pH test, along with an analysis of other nutrient levels and soil properties. Typically, a soil sample is gathered and shipped to the lab, and you receive a report once the analysis is complete. Here are a few soil labs near Wyoming:

- Ward Labs – Kearney, Nebraska
- Colorado State University – Denver, Colorado
- Utah State University – Logan, Utah
- B & C Ag Consulting – Billings, Montana

Soil tests can range in cost from around $17 to $66. Using pH test strips is a less expensive alternative to laboratory testing, but is also less accurate. Test strips can be purchased at local lawn and garden stores and provide an easy general rating of pH. As long as the minerals and other nutrients are well balanced in the soil (as determined by an initial soil test), you should be able to monitor and maintain soil pH without extensive laboratory analysis. The upper layer of the soil (0–6 inches) is where pH matters most to plants, since this is where most roots actively take in water and nutrients.

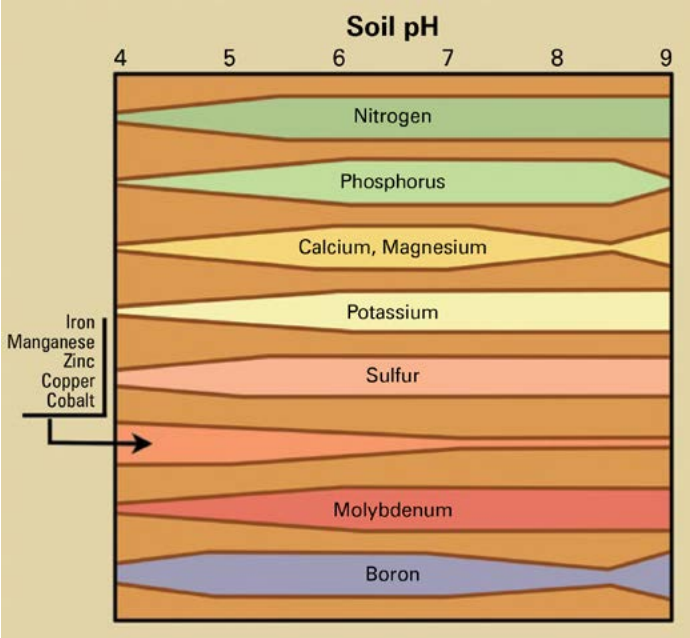
It is recommended to test your soil before making amendments. Soil pH and nutrients, especially in the garden, can change depending on what was grown (e.g., nitrogen-fixing legumes versus "nutrient hogs" like tomatoes) and biological activity.

Note that raising soil pH is very rarely needed in Wyoming. For assistance interpreting the results of a soil test, contact a local extension office.

Collecting a soil sample

To collect a good soil sample, use a shovel or trowel to dig straight down to a depth of 6–8 inches. Use the shovel or trowel to shave off a 1-inch-thick portion from the length of the sidewall of the hole. Discard any surface litter and place the middle 1-inch-wide section from the sample in a bucket. For a better representation of the area, multiple samples can be gathered and aggregated.

Alternatively, you can use a soil probe to gather soil cores. Probes are often available for checkout at county extension offices. For more tips on collecting soil samples, visit https://bit.ly/how-to-sample-soil.



Nutrient availability at different pH levels. A wider bar indicates the nutrient is more soluble at that pH value and therefore more available to plants. (Source: eXtension.)

Changing soil pH

It takes a lot of effort and the correct amendments to adjust soil pH. Most attempts require a good dose of patience, since the process can take some time. The scale of the project will determine how quickly the pH might be adjusted. Note that adjustments are usually only successful in growing systems like raised beds, container gardens, and small-scale gardens, not large landscape-scale production areas like orchards and large gardens.

Keep in mind that pH values are distributed on a base-10 logarithmic scale. For example, a soil with a pH of 6 is 10 times more acidic than a soil with a pH of 7, and 100 times more acidic than soil with a pH of 8. This means that even a small adjustment on the pH scale has large implications in the soil.

Great care should be exercised if significant adjustments of soil pH occur near waterways or drainages. Aquatic plants, fish, and other organisms that depend on a relatively neutral (pH = 7) environment may be negatively impacted by soil amendments leaching into the water.

Common amendments

Elemental sulfur and aluminum sulfate are two of the most common soil amendments used to lower soil pH. Both can be found at local lawn and garden stores or purchased online. Depending on the starting pH of your soil, and the desired pH, you will need to adjust how much you apply. Aluminum sulfate acts faster in the soil than elemental sulfur, but more aluminum sulfate must be applied to achieve a similar change in pH.

When using aluminum sulfate, keep in mind that this amendment can cause aluminum toxicity, a condition that primarily affects the plants' roots by restricting the growth and metabolism of certain nutrients.

Regardless of which soil amendment you apply, it is best to incorporate it into the soil prior to planting. Planting should be delayed at least 30 days following the last application to allow acidic "hotspots" to dissipate and avoid harming plant roots. Attempting to modify soil pH after plants have become established is more difficult.

Organic materials like pine needles or peat moss can be incorporated into the soil, but will likely not bring about a substantial reduction in pH. Applications of certain nitrogen fertilizers containing ammonium can be used to help maintain acidic conditions, but likely will not cause a noticeable drop in pH.

After the soil has reached the desired pH, it's best to test your soil annually to make sure it remains in the desired range. Soil amendments may need to be reapplied over time.

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