



# SOIL

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## Selecting an Analytical Laboratory    no. 0.520

by R.M. Waskom, J.G. Davis and J.R. Self <sup>1</sup>

### Quick Facts...

Yearly sampling of each crop field is recommended to make accurate nutrient management recommendations.

Lawn and garden management also can be improved by soil sampling. About a dozen soil cores are adequate for a typical urban lawn or garden sample.

Manure testing is the best way to determine the fertilizer value of manure spread on fields or gardens.

Annual water testing is suggested to help monitor the quality of your private water supply.

Soil and manure testing are the foundation of an economically and environmentally sound crop management program. Plant tissue analysis can be a useful method to assess crop nutrient status. In addition, rural homeowners should periodically test their well water to ensure it is safe for drinking.

There are a number of qualified laboratories in Colorado that provide these services. There also are commercially available quick test kits that are less accurate but can be used at home for testing both soil and water. Without an analysis, you may be buying unnecessary fertilizer or applying too much manure to your fields. Neither practice is sound. In some cases, a \$35 soil analysis can save a crop producer thousands of dollars in unnecessary fertilizer costs.

### Soil Testing

Yearly sampling of each crop field is recommended to make accurate nutrient management recommendations. Routine soil sampling also provides valuable information about soil salinity, pH and organic matter content. Obtaining a representative sample is the key to getting accurate results. For proper sampling steps, contact the analytical laboratory that will analyze your samples or see fact sheet 0.500, *Soil Sampling*, available from your Colorado State University Cooperative Extension county office.

To get a representative sample, use clean tools to collect soil cores from a variety of locations in the field. Combine 20 to 30 individual samples and mix thoroughly before transferring the soil to the sample bag. Avoid (or sample separately) any unusual areas that will bias your results. Break large fields into smaller sampling units based on crop, yield and fertilizer histories. Typically, soil is collected from the top 8 to 12 inches (plow layer) for routine analysis for fertilizer recommendations. Separate subsoil samples for nitrate analysis are suggested to determine accurate N recommendations for irrigated crops, such as corn, sugar beets and wheat.

Lawns and gardens also can be improved by soil analysis. Usually about a dozen soil cores to a depth of 4 to 6 inches are adequate for a typical urban lawn or garden sample.

Soils also can be analyzed for less common elements such as selenium or lead, as well as for organic compounds such as pesticides or hydrocarbons. Pesticide tests are expensive and not routinely recommended unless serious contamination problems are suspected. Check with an analytical laboratory concerning the submission of samples for pesticide testing. Sampling for organic compounds requires special handling.

Air dry soil samples as soon as possible by spreading them over a clean paper grocery sack (for boron analysis use plastic sheets) prior to mailing to the laboratory. Be sure to keep all samples cool until they can be air dried. For best

results, deliver samples to the laboratory as soon as possible. The chemical composition of samples kept in warm, moist conditions may change substantially within just a few days and significantly alter fertilizer recommendations.

## Water Testing

Public supplies have strict federal and state regulations governing water quality and testing. However, if you have a private water system, it is your responsibility to make sure your family's water is safe. Contaminated water may taste, look or smell the same as safe drinking water. Laboratory analysis is the only reliable method to determine the quality of drinking water.

If you are buying a new property or if you cannot remember when your well was last tested, have your water analyzed by a reputable laboratory for bacteria, nitrate, sulfate, chloride, pH, total dissolved solids (TDS), hardness and conductivity to get baseline information on your well. Bacterial analysis is strongly recommended for all private water supplies, especially for a well close to septic systems or animal confinement facilities. Tests for pesticides, other organic contaminants and radon are expensive and usually not recommended unless you have reason to suspect contamination.

Annual water testing is suggested to help monitor the quality of your private water supply. If you see a decline in quality, more thorough investigation is warranted. These records will provide valuable information on the history of your well if your water is ever contaminated.

Follow your laboratory's sampling procedure when collecting water samples. Many laboratories provide clean containers with detailed instructions on sample collection. If one is not provided, use a clean plastic container. Rinse it three times with the well water before you collect the actual sample. Wash your hands prior to sampling and do not touch the inside of the container or lid. Let the water flow for about five minutes before sampling. Do not draw from an aerated faucet or a swing arm faucet. For best results, immediately refrigerate water samples and analyze within 30 hours of the initial collection.

## Manure Testing

Analyze manure for nitrogen, phosphorus, potassium and salt content. There are a number of qualified laboratories in Colorado that can provide these services.

Obtaining a representative manure sample can be challenging. For proper manure sampling, you need a clean bucket and sample jar. If you spread manure daily, take many small samples over a representative period. For periodic spreading from a manure pack or pile, use a clean shovel or fork to collect samples from a variety of locations in the pack or pile. Be sure to collect both manure and bedding if they are applied together. Agitate liquid manure handling systems before sampling and collect several separate samples.

Combine the individual spot samples from a particular lot or lagoon in the bucket and mix thoroughly before filling the sample jar. Keep the sample refrigerated and deliver it to the laboratory within 24 hours if possible. If a food refrigerator is used to store it, wrap the sample in several layers of clean plastic and put it in a tightly-sealed plastic container.

Collect the samples well in advance of your spreading date so you have time to obtain test results and calculate the correct application rate for the crop to be grown. If this isn't possible, it is still helpful to analyze a representative sample so you know how much to credit in the future. An accurate manure test is an excellent investment of time and money. It can help you save fertilizer costs and avoid water contamination problems.

### References

Mortvedt, J.J., and J.R. Self. 1994. Plant Analysis. *Colorado State University Cooperative Extension fact sheet 0.116. Fort Collins, Colorado.*

Self, J.R., and P.N. Soltanpour. 1997. Soil Sampling. *Colorado State University Cooperative Extension fact sheet 0.500. Fort Collins, Colorado.*

## Questions to Ask

Call the laboratory manager prior to sample collection to determine the laboratory's suitability and to get more detailed information. You may want to ask some of the following questions:

1. What analyses does your laboratory offer?
2. What do they cost?
3. How long will it take to get my results?
4. Do you participate in the North American Laboratory Proficiency Program? If so, how has your performance been?
5. Are your analytical methods EPA-approved or described in the North American Laboratory Proficiency Program lab manual?
6. Is the lab associated with a co-op or fertilizer company?
7. What is your lab history? How long have you been running analyses similar to what I need?
8. What is your philosophy in making fertilizer recommendations? Are your recommendations research-based?

## Plant Analysis

Plant analysis during the growing season can help assess nutrient sufficiency in the growing plant. While nutrient deficiencies may be apparent, excess nutrient levels can be determined only by plant tissue analysis. Plant analysis allows producers to apply lower rates of fertilizer before planting, and to adjust plant nutrient status during the growing season. Plant analysis, when properly used, offers producers insurance that careful nutrient management will not negatively affect the bottom line. (See 0.116, *Plant Analysis*.)

## Choosing a Laboratory

Individual laboratories vary in services offered, prices and the time they require for analysis. The following list of laboratories is not all-inclusive, and the list of services may change over time. To select a lab, consider convenience, services offered and quality.

There is a North American Laboratory Proficiency Program administered by Utah State University (1-801-797-2217). This program provides a manual with detailed descriptions of recommended analytical methods and also runs a Quality Assurance/Quality Control (QA/QC) program. Participating labs are sent samples to analyze throughout the year and their results are compared to other laboratories. These comparisons are sent back to the labs to help them improve techniques and methods.

Laboratories usually have a QA/QC program within their laboratory. By running duplicate samples and comparing results, or by periodically analyzing standards (samples with known values) during sample runs, a lab can determine if its results are reproducible and accurate.

Fertilizer recommendations are based on soil test results. However, there are differing nutrient management philosophies that will impact recommendations. Be sure your laboratory's philosophy is consistent with your objectives. One approach is to build up soil fertility levels, another approach is to replace the amount of nutrients taken up by a crop, and a third approach is to base fertilizer recommendations on crop requirements to maximize yield. The first two approaches result in higher fertilizer recommendations that can lead to a buildup of nitrogen and phosphorus in the soil and potential pollution of water sources.

## Recordkeeping and Interpretation

Keep a record of your lab results as a reference for future testing. If you need help interpreting the results of your sample, the lab manager where the sample was analyzed or your Colorado State Cooperative Extension county office can assist you. Different labs may vary in analytical tests used, reported concentration values, and in actual fertilizer recommendations. Ask your lab manager about their nutrient management philosophy to be sure it is consistent with your objectives.

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**Table 1: Commonly used laboratories and analysis summary.**

	<b>Soil Test</b>	<b>Water Analysis</b>	<b>Manure Analysis</b>	<b>Nitrate Analysis</b>	<b>Pesticide Analysis in Soil or Water</b>	<b>Bacteria Analysis</b>
<b>Price Range</b>	<b>\$15-80</b>	<b>\$13-74.50</b>	<b>\$28-80</b>	<b>\$6-20</b>	<b>*</b>	<b>\$10-50</b>
<b>Most Quoted Price</b>	<b>\$20</b>	<b>\$40</b>	<b>\$45</b>	<b>\$10</b>		<b>\$20</b>
<b>A &amp; L Laboratories, Inc.</b> P.O. Box 1590 302 34 <sup>th</sup> St. Lubbock, TX 79408-1590 (806) 763-4278 E-mail: allabs@al-labs-plains.com Web: www.al-labs-plains.com	X	X	X	X		X
<b>Accu-Labs Research, Inc.</b> 4663 Table Mountain Dr. Golden, CO 80403-1650 (303) 277-9514 Web: acculabs.com	X	X		X	X	X
<b>ACZ Laboratories, Inc.</b> 2773 Downhill Drive Steamboat Springs, CO 80487 (970) 879-6590, (800) 334-5493 E-mail: christyv@acz.com	X	X		X	X	X
<b>Agri-Test, Inc.</b> 2043 Kimberly Road P.O. Box 4 Twin Falls, ID 83301-0004 (208) 734-2303, (800) 632-0842	X	X	X	X	X	
<b>Analytica Environmental Laboratories, Inc.</b> 325 Interlocken Pkwy, Suite 200 Broomfield, CO 80021 (303) 469-8868, (800) 873-8707 Web: www.analyticagroup.com	X	X		X	X	
<b>Aspen Analytical</b> 1110 Elkton Dr., Suite A Colorado Springs, CO 80907 (719) 593-9595 (800) 866-9594	X	X		X	X	X
<b>Colorado Analytical Laboratory</b> 240 S. Main St P.O. Drawer 507 Brighton, CO 80601 (303) 659-2313 E-mail: sgnca@aol.com	X	X	X	X		X
<b>Colorado Dept. Public Health Lab &amp; Radiation Services Division</b> 8100 Lowry Blvd. Denver, CO 80230-6928 (303) 692-3054		X		X	X	X
<b>Colorado State Soil, Water and Plant Testing Laboratory</b> Room A319 NESB Fort Collins, CO 80523-1120 (970) 491-5061 E-mail: jself@agsci.colostate.edu	X	X	X	X		

**Table 1: continued.**

	<b>Soil Test</b>	<b>Water Analysis</b>	<b>Manure Analysis</b>	<b>Nitrate Analysis</b>	<b>Pesticide Analysis in Soil or Water</b>	<b>Bacteria Analysis</b>
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<b>El Paso County Dept. Public Health Env. Laboratory</b> 301 South Union Blvd. Colorado Springs, CO 80910 (719) 578-3120		X				X
<b>Energy Laboratories, Inc.</b> 2393 Salt Creek Highway P.O. Box 3258 Casper, WY 82602 (888) 235-0515 Web: www.energylab.com	X	X	X	X	X	X
<b>Evergreen Analytical Inc.</b> 4036 Youngfield St. Wheat Ridge, CO 80033-3862 (303) 425-6021, (800) 845-7400 Web: www.evergreenanalytical.com		X		X	X	X
<b>Grand Junction Laboratories</b> 435 North Ave. Grand Junction, CO 81501 (970) 242-7618	X	X	X	X	X	X
<b>Inter-American Laboratories Inc.</b> P.O. Box 94 Cozad, NE 69103 (308) 784-4011, (800) 658-3146	X		X	X		
<b>Kansas State Research and Extension Soil Testing Laboratory</b> Dept. of Agronomy 2004 Throckmorton Manhattan, KS 66506-5501 (785) 532-7897 E-mail: tester@bear.agron.ksu.edu	X	X		X		
<b>MDS Harris</b> 621 Rose St. P.O. Box 80837 Lincoln, NE 68501 (402) 476-2811 Web: www.mdsharris.com	X	X	X	X	X	
<b>Midwest Laboratories, Inc.</b> 13611 B St. Omaha, NE 68144-3693 (402) 334-7770 E-mail: jking@midwestlabs.com Web: www.midwestlabs.com	X	X	X	X	X	X
<b>Northeast Colorado Dept. of Public Health</b> 700 Columbine Sterling CO, 80751-0316 (970) 522-3741						X

**Table 1: continued.**

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<b>Olsen's Agricultural Laboratory, Inc.</b> P.O. Box 370 210 East First McCook, NE 69001 (308) 345-3670 E-mail: bobolsen@olsenlab.com Web: www.olsenlab.com	X	X	X	X		X
<b>Quality-Water Bio-Lab</b> 9999 Olde Wadsworth Blvd. Broomfield, CO 80021 (303) 466-7055		X				X
<b>Root &amp; Norton Laboratories</b> P.O. Box 316 576 Spring Creek Rd. Montrose ,CO 81402 (800) 595-1977, (970) 249-5366	X	X		X		
<b>SDC Laboratory, Inc.</b> Tierra del Sol Industrial Park 2329 Lava Ln. Alamosa, CO 81101 (719) 589-1024 FAX (719) 589-3697 E-mail: evelyn@sangrelabs.com	X	X	X	X	X	X
<b>Severn Trent Laboratories</b> 10703 E. Bethany Dr. Aurora, CO 80014 (303) 751-1780 Web: www.stl-inc.com	X	X	X	X	X	X
<b>Servi-Tech Laboratories</b> P.O. Box 1397 1816 E. Wyatt Earp Dodge City, KS 67801 (316) 227-7509, (800) 557-7509 Web: www.servi-techinc.com	X	X	X	X		X
<b>Servi-Tech Laboratories</b> P.O. Box 167, 1602 Park West Dr. Hastings, NE 68901 (402) 463-3522 (800) 468-5411 E-mail: edu1617@tcgcs.com Web: www.servi-techinc.com	X	X	X	X		X
<b>Stewart Environmental</b> 3801 Automation Way, Suite 200 Fort Collins, CO 80525 (970) 226-5500, (800) 373-1348 E-mail: stewart@webaccess.net	X	X	X	X		X

**Table 1: continued.**

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<b>Stukenholtz Laboratory</b> Addison Ave. East Box 353, Twin Falls, ID 83303 (208) 734-3050, (800) 759-3050 E-mail: stuklab@micron.net	X	X	X	X		X
<b>Trace Minerals International</b> 6545 Gunpark Dr. Suite 240 Boulder CO 80301 (303)530-5135, (800) 530-5228 E-mail: info@tracemin.com		X		X	X	X
<b>UNL Soil and Plant Analytical Laboratory</b> 139 Keim Hall Lincoln, NE 68583-0916 (402) 472-1571 FAX: (402) 472-1396 E-mail: spal@unl.edu	X	X	X	X		
<b>Ward Laboratories, Inc.</b> 4007 Cherry Ave. P.O. Box 788 Kearney, NE 68848 (308) 234-2418, (800) 887-7645 E-mail: rayward@wardlab.com Web: www.wardlab.com	X	X	X	X	X	X
<b>Warren Analytical</b> P.O. Box G , 650 "O" St. Greeley, CO 80632-0350 (970) 351-6344, (800) 945-6669 Web: www.warrenlab.com		X		X	X	X
<b>Weld County Dept. Public Health and Environment Laboratory</b> 1555 N. 17th Ave. Greeley, CO 80631 (970) 304-6415 Ext. 2271		X		X		X
<b>Weld Laboratories, Inc.</b> 1527 1st Ave. Greeley, CO 80631 (970) 353-8118 E-mail: weldlab@aol.com	X	X	X	X		X
<b>Western Laboratories</b> P.O. Box 1020 Parma, ID 83660 (208) 722-6564, (800) 658-3858 E-mail: westernl@cyberhighway.net	X	X	X	X	X	X

**X** - indicates service provided

\*Cost of analyzing soil or water for pesticides will vary depending on how many and which pesticides.

Laboratory services, prices and addresses may change. Contact the lab you intend to use prior to sample collection to get the most up-to-date information and specific sample collection information. Lab quality and turn-around may vary, so ask the lab manager about areas of expertise or seek references. The list of labs herein does not constitute endorsement nor does omission imply criticism. The lab information was verified in late 1999 and early 2000.