



# What Soil, Forage or Water Test Do You Need?

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The Oklahoma State University Soil, Water, and Forage Analytical Laboratory (SWFAL) offers many tests that benefit all of the agricultural community (Table 1). These tests can help the homeowner with lawn and garden needs, the farmer with fertilizer needs, and the land owner with reclamation problems. With such a diversity of tests available, knowing the test(s) that may be right for your needs is sometimes difficult. This fact sheet has been prepared to help you choose the right test(s) for your situation. Each test is composed of one or more analyses. These analyses are listed at the back of the fact sheet.

To use this fact sheet, use the diagrams to make an initial choice. The text will provide more information about the choices available for help in making the final decision about the test(s) that needed.

## Soil Testing

### Routine

Use of soil testing as an index of the fertility status of the soil is one of the most economical investments a producer can make. For most producers, the routine soil test is all that is required. Results will reveal any pH problems, predict the amount of lime to correct such problems and measure the status of the macronutrients: nitrogen, phosphorus and potassium.

Normally, the routine test is all that is required whether it is for forage production, cultivated field crops or a home garden and lawn.

### Subsoil Nitrate

Deep-rooted crops, such as wheat, cotton and bermudagrass, can use nitrates from the subsoil. This extra source can only be accurately measured by submitting a subsoil sample plus the surface sample (see Extension Facts PSS-2207).

### Secondary and Micronutrients

There are some areas and crops in Oklahoma where the soil-supplied secondary and micronutrients may not be available to plants in sufficient quantity to achieve top yields. However, these tests are not required in the majority of cases. If there are conditions or crops not indicated in the diagram but still have doubts, discuss the suspected problem with the local county Extension Educator or area agronomist.

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## Salinity Testing

### Salinity Management

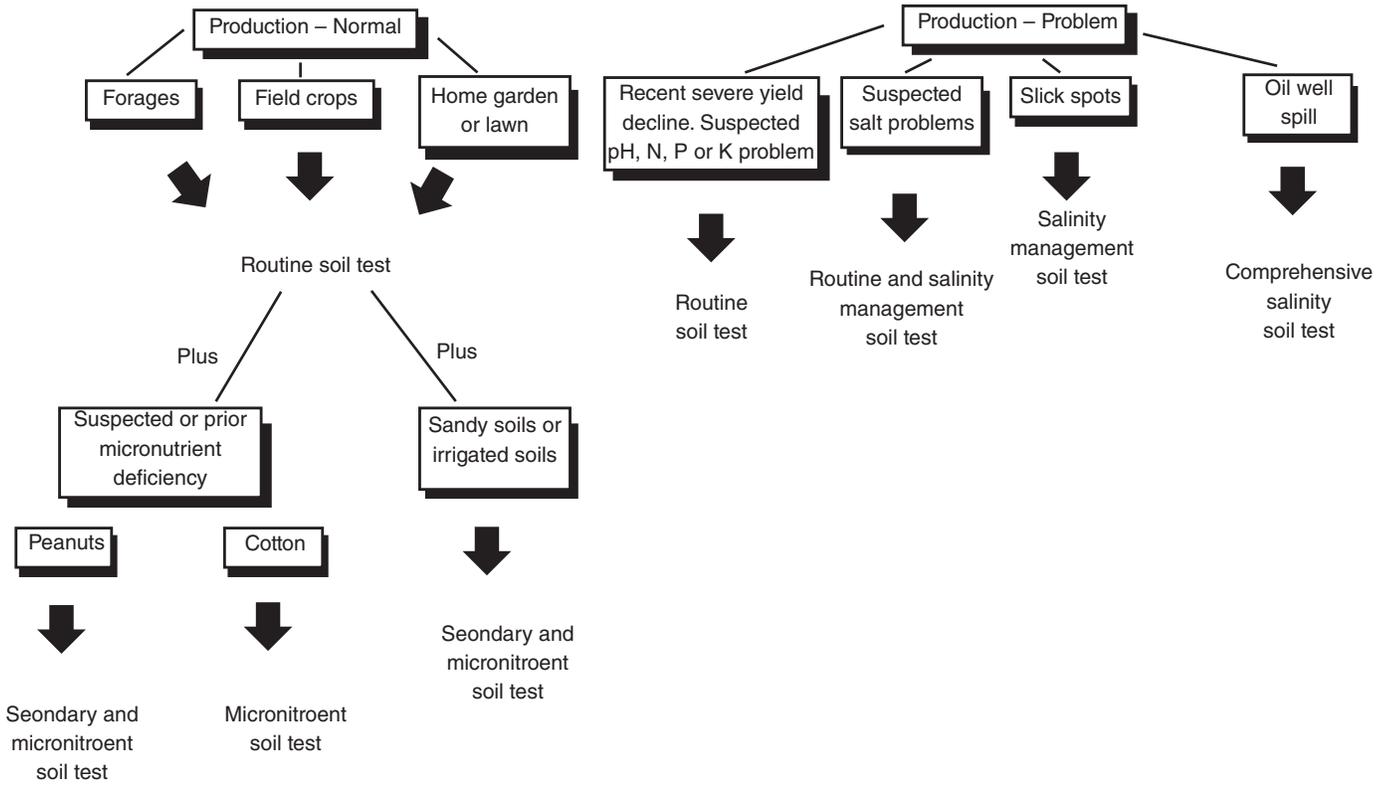
In some cases, an accumulation of salts may limit or even prevent plant growth. These salts can reach excessive levels by either man-made or natural events. Regardless of the cause, it is important to diagnose the condition correctly. If you suspect such a problem may exist in your field or lawn, the routine and salinity management tests will be the best choices. The routine test will show any pH or nutrient deficiencies while, the salinity management test will quantify the amount and kind of salts present. Effective treatment can only begin if the information is known and the resulting recommendations followed. Improved management techniques may also be necessary at this time to change the conditions which led to the salt buildup in the first place.

The presence of slick spots in an otherwise productive field should not be ignored. If these areas, usually small at first, are managed in the same manner as the remainder of the field, they will tend to become more extensive with resultant production losses. Slick spots are usually high in fertility, but due to excessive sodium and salts, do not permit normal plant growth. Because such spots result from natural conditions, reclamation of the entire area may not be feasible. Proper management will minimize the effect of slick spots on crop production. For more information on slick spots and soil salinity see OSU Extension Fact Sheet PSS-2226.

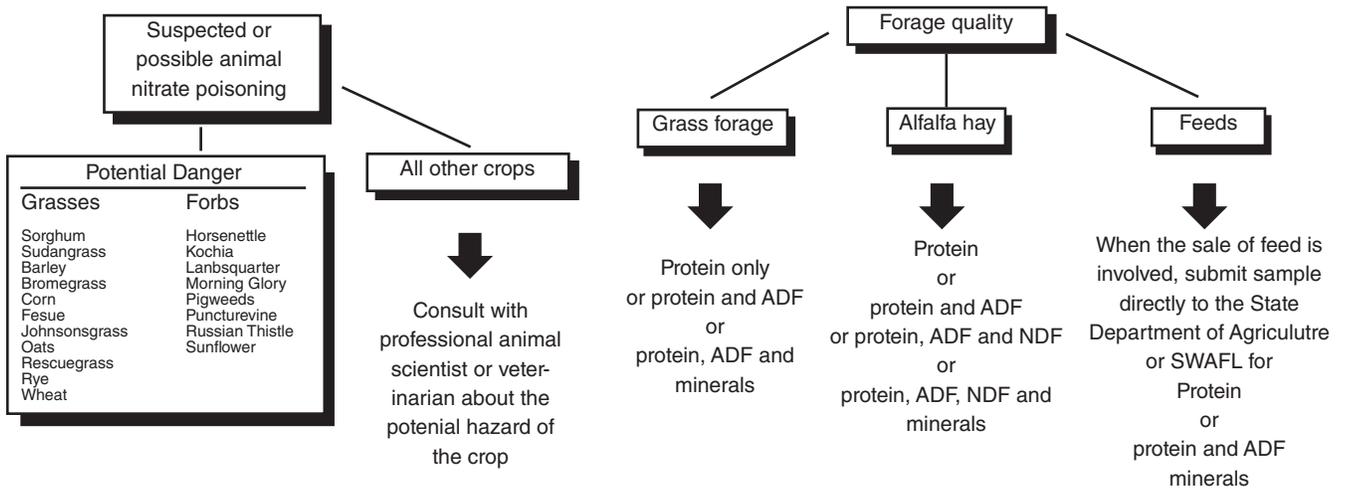
### Comprehensive Salinity

Increased oil and gas drilling in Oklahoma has increased the frequency of spill of oily/saline solutions on agricultural lands. The nature of such fluids is very site specific, but in general, most fluids contain appreciable amounts of salts, oil and/or other potentially toxic substances. At present, SWFAL can only be of assistance with the salt aspect of such spills. In such cases, the Comprehensive Salinity test will provide information on the quantity and ratio of both cations and anions in the soil. If the buildup of oily material is not extremely heavy, natural degradation will occur with enough time. Proper management of oil-affected areas can greatly speed this recovery time. Litigation is often involved in such spills and hence proper sampling methods and documentation should be given consideration before testing begins.

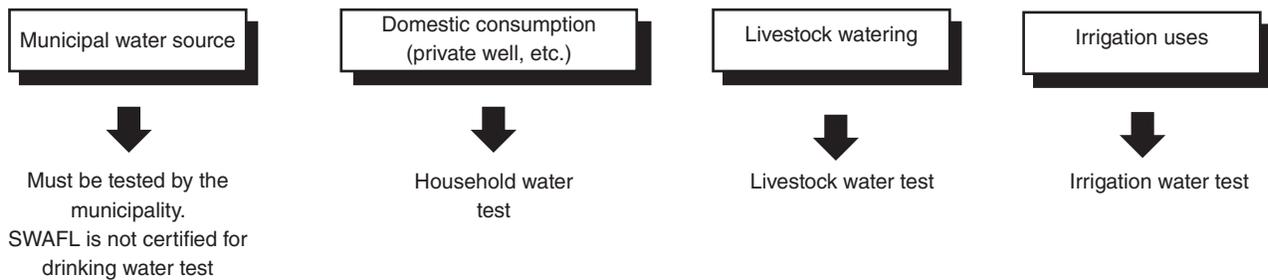
# SOIL



# FORAGE



# WATER



## Water Testing

### Domestic Consumption (household)

Water in Oklahoma is a valuable, renewable resource which can aid in both crop and animal production if the water quality is suitable. To help in this determination, SWFAL offers three different tests. Municipalities are responsible for the water quality and its safety within their jurisdiction. Samples of municipal waters should not be submitted to this lab. The final authority for all water used for human consumption, rests with the Oklahoma State Department of Environmental Quality.

SWFAL provides a Household Water test for non-municipal sources to assist in deciding if the mineral content is suitable for human use. No bacteriological tests are offered.

### Livestock Drinking

Stock ponds and other livestock water sources can be evaluated in terms of total salts, nitrate levels and other compounds by requesting the Livestock Water test. For most situations, this test will be adequate to determine suitability for animals. If contamination of the water source is suspected, such as by herbicide/insecticide or salt spills, this test may not be adequate. Consult a veterinarian or professional animal scientist for assistance in these situations.

### Irrigation

The mineral content of irrigation water is very important, both to the crop growth and to the future productivity of the soil. If salts are present in excessive amounts and/or the ratio of these salts is incorrect, crop yields will be depressed and the physical and chemical characteristics of the soil will be adversely affected. The classification of irrigation water will aid in determining the suitability of water for irrigation, while maintaining soil productivity. The irrigation water test may also help quantify the presence of high salt problems in water contaminated by oil well-related spills. The test cannot be run on oil or drilling fluids with large amounts of drilling mud present.

## Forage Testing

The quality of a forage is very important to the health and weight gain of Oklahoma livestock. SWFAL offers several tests of forage quality.

Many forages, weeds and forbs differ in the manner in which nitrates, a soil-supplied nutrient, are utilized for growth. With normal growing conditions, most plants use nitrates to make protein. However, under drought conditions or temperature stress, growth of some plant types stops or slows down and nitrates may accumulate in the stems. This natural condition is not harmful to the plant itself but it may kill rumen livestock that eat the plant. Unlike prussic acid, another poisonous compound in some plants, nitrate levels do not decrease appreciably after cutting. The danger to livestock still exists after harvest. Additional information about both nitrates and prussic acid and the plants which accumulate nitrates can be found in OSU Extension Fact Sheet PSS-2903 and PSS-2904.

### Nitrates

Because of the potential hazard of high levels of plant nitrates, SWFAL offers a one day turnaround on this test. The nitrate value will be reported, via telephone or Internet, to the county Extension Office to reduce any delay due to the mail.

Most county Extension offices have a nitrate quick test that is a reliable indicator of possible nitrate poisoning. If this test is positive, the forage should be tested to quantify the nitrate level. In some cases, the nitrate concentration may be low enough that the forage can be fed under careful management or after blending with another low-nitrate forage. If the nitrate level is very high, the forage should not be fed to livestock.

### Protein

Another measure of forage quality is crude protein. SWFAL provides this test which includes a report of the following results: percent moisture and crude protein on an as-fed basis and dry weight basis.

These values can be valuable tools when determining rations or other feeding parameters for livestock.

### Fiber

Acid detergent fiber (ADF) and neutral detergent fiber (NDF) are also offered. The net energy and total digestible nutrients (TDN) of forage is calculated when ADF is tested. Relative feed value (RFV) is also calculated for alfalfa sample when both ADF and NDF are ordered.

### Minerals

Concentrations of important minerals such as Ca, P, Mg, K, S, Zn, Fe and Cu can also be tested by SWFAL.

**Table 1. Laboratory analyses for soil, water and forage samples.**

<b>Tests</b>	<b>Analyses*</b>
<b>SOIL</b>	
Routine	pH, buffer index (lime requirement), nitrate-nitrogen, phosphorus and potassium
Sub-soil nitrate	nitrate-nitrogen from sub-soil samples (6 to 18 inches)
Secondary nutrients	calcium, magnesium and sulfur
Micronutrients	iron, zinc, manganese and boron
Salinity Management	Electrical conductivity (soluble salts), pH, sodium, calcium, magnesium, (SAR, ESP, texture)
Comprehensive Salinity	Same as for Salinity Management above, plus: nitrate, chloride, sulfate, bicarbonate and carbonate.
<b>WATER</b>	
Livestock Drinking	Electrical Conductivity (soluble salts), pH, nitrate, Cl <sup>-</sup> , SO <sub>4</sub> <sup>2-</sup> , Na, Ca, Mg, K, Fe, Zn, Cu, Mn
Household	Electrical Conductivity (soluble salts), pH, sodium, calcium, magnesium, nitrate, chloride, sulfate, Cu, Fe, Mn, Zn and hardness.
Irrigation Use	Same as for household above, plus: bicarbonate, carbonate, boron and sodium percentage.
<b>FORAGE</b>	
Nitrate Toxicity	Nitrate
Protein only	Percentage moisture, percentage crude protein – dry, “as is” and fed basis.
Basic Analysis	Protein, ADF, TDN and Energy
Basic Plus RFV	Protein, ADF, TDN, Energy, NDF and RFV
Relative feed value	RFV calculated from ADF and NDF
Minerals	Calcium (Ca), Phosphorus (P), Mg, K, S, Zn, Fe and Cu

\* Items shown parenthesis are calculate or estimated from items actually/analyzed.

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