Developing an Interactive Online Water Quality Interpretation Program

Hailin Zhang

Regents Professor and Director, Soil, Water and Forage Analytical Laboratory
Hailin.zhang@okstate.edu
Department of Plant and Soil Sciences
Oklahoma State University

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Descriptors: water test interpretations, computer program, extension.

Publications: It is an interactive online computer program. The url is https://erams.com/wqtool/. The program is widely used by farmers and homeowners to understand their water test reports from any laboratories. Several presentations have been made by the principle investigator to disseminate the information:

1. Oct. 22, 2014. An on-line interactive water quality interpretation program. Water Research Symposium.
2. Dec. 10, 2014. Highlight of agricultural testing and animal waste management extension. New Educator Orientation.
3. Feb. 17, 2015. Water test and interpretation. OCES In-service Training.
4. Mar. 5, 2015. Irrigation water quality. Panhandle Crop Clinic.

Problem and Research Objectives: Farmers, homeowners and consultants rely on water tests to make sound decisions. The OCES Soil, Water and Forage Analytical Laboratory (SWFAL) analyzes over 7,000 Irrigation, Livestock and Household water samples annually with limited interpretations. Typically, more questions on water tests come from Extension Educators and other clients than from other tests. The shortage of extension specialists has resulted in serious gaps in providing urgently needed services to lab users and the general public on water related issues. Therefore, the objective of this project was to enhance our outreach capacity on water quality related issues by developing a web-based tool to evaluate household, irrigation and livestock water quality and provide further guidance on water use and treatments.

Methodology:

1. The Water Quality Interpretation Tool developed by the Northern Plains and Mountains Region States (http://www.erams.com/erams_beta/wqtool/) provides comprehensive evaluations for drinking, livestock and irrigation water quality based on water test data by state. It is informative because it includes interpretive information from several states and EPA. It is also user friendly since it is interactive and online. This is exactly what we needed in Oklahoma. Therefore, I first evaluated and then revised our existing irrigation and household water test interpretations to serve as the basis for the online interpretation program; EPA guidelines were used for household water interpretation.

2. I worked with water quality specialists from the Mountain Region and the web programmer from Colorado State University to modify the online interactive program to include all Oklahoma specific information.
3. After the new program was developed, I promoted the program at several meetings.

Principal Findings and Significance:

A user friendly and comprehensive water test interpretation system was developed using the fund. This program will enhance the ability of county educators and area specialists to address water quality related questions from laboratory users and the general public. This program can also be used by individuals and government agencies. I believe this program is a good supplement to our existing software, and will improve OCES's ability to address water quality issues greatly. The feedbacks from users are all positive thus far.

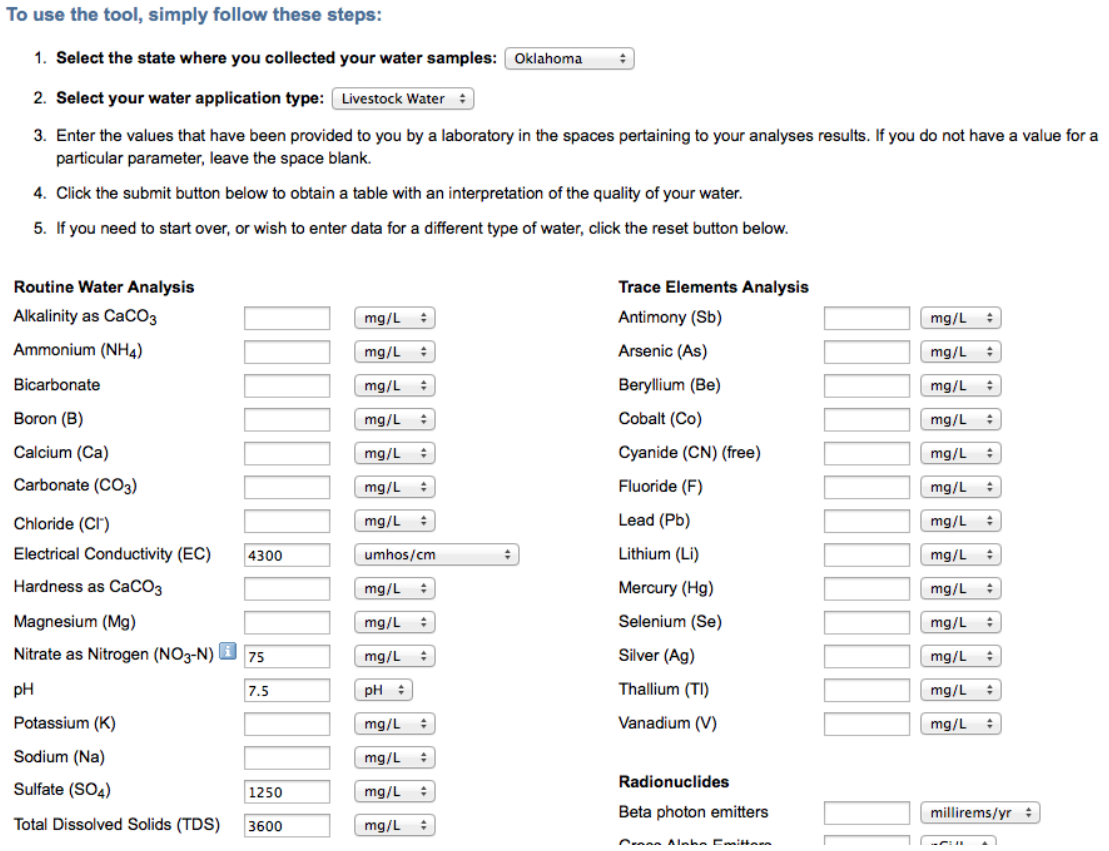

Figure 1. Screen for providing water test data. The user needs to select a state (Oklahoma) and water test type. It does not need to fill in all boxes in order for this program to work.

Interpretations of Livestock Water Quality for Oklahoma

Test Name	Lab Result	Interpretation	Acceptable	Additional Comments
1) Routine Water Analysis				
pH	7.5 pH	**Acceptable**	<= 9.0 and >= 5.5 pH	This water is satisfactory for some livestock because it falls between the guideline of 5.5 to 9.0. Water with a pH below 7 is considered acidic, while water with a pH above 7 is alkaline. If pH is lower than 5.5, a reduction in feeding and acidosis may occur in cattle. A low pH may also accelerate certain antibacterial agents being delivered through the water system (i.e. sulphonamides). The efficiency of chlorination is diminished when pH is high. The commonly touted acceptable ranges (a low of 5.5 – 6.5 and a high of 7.5 – 9.0) are excessively conservative from a strictly animal health standpoint, at least on the acid side. However, there are not sufficient experimental and/or clinical data to offer a specific alternative. For more information on livestock drinking water, please visit the following websites: • Water Quality for Wyoming Livestock & Wildlife • Water Quality for Livestock and Poultry • NDSU Extension - Livestock and Water Quality • Well Educated - Suitability of Water for Livestock
Sulfate (SO_4)	1250 mg/L	**Objectionable**	<= 1000.001 mg/L ***	This water may be objectionable for some livestock because it exceeds the guideline of 1,000 mg/L. High sulfate levels have a laxative effect on livestock. In many animals, sulfate affects how copper is metabolized. High sulfate water consumption usually requires that animals receive an increase in copper and a decrease of other minerals. Assuming normal feedstuff S concentrations, keeping water SO42- concentrations less than 1800 mg/L should minimize the possibility of acute death in cattle. Concentrations less than 1000 mg/L (chronic exposure criteria) should not result in any easily measured loss in performance. Long-term consumption result in poor performance. Short-term exposure (day - weeks) should not exceed 1800 mg SO42-/L. For more information on livestock drinking water, please visit the following websites: • Water Quality for Wyoming Livestock & Wildlife • Water Quality for Livestock and Poultry • NDSU Extension - Livestock and Water Quality • Well Educated - Suitability of Water for Livestock
Total Dissolved Solids (TDS)	3600 mg/L	**Objectionable**	<= 3000.0 mg/L ***	This water is considered unacceptable because it exceeds the guideline of 3000 mg/L. The following are guidelines for total dissolved solids (TDS) for livestock water use. Concentration units listed below are ppm or mg/L. Less than 3,000 - Usually satisfactory for most livestock. 3,000 - 5,000 - May not cause adverse effects to adult livestock. Growing/young livestock could be affected by looseness or poor feed conversion. At levels near 5,000 - The water is unacceptable for poultry. 5,000 - 7,000 - Should not be used for pregnant or lactating females. Usually a laxative and may result in reduced water intake. 7,000 - 10,000 - Do not use for swine. Do not use for pregnant or lactating ruminants or horses. 10,000 or more - May cause brain damage or death. For more information on livestock drinking water, please visit the following websites: • Water Quality for Wyoming Livestock & Wildlife • Water Quality for Livestock and Poultry • NDSU Extension - Livestock and Water Quality • Well Educated - Suitability of Water for Livestock

Figure 2. Once the data in Fig. 1 is submitted, the above interpretation page will appear. It is self-explanatory and the user can click the links to obtain more information. Such as related factsheets from Oklahoma or other states.