THE EFFECTS OF PRESCRIBED BURNING ON SOIL INFILTRATION RATES AND OTHER SELECT SOIL PHYSICAL AND CHEMICAL PROPERTIES IN EAST TEXAS

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ABSTRACT
The study focuses on whether or not prescribed burning affects the soil physical properties, especially water infiltration. Soil infiltration rates will be measured using tubes (three months after the fire) and in October (three months after the fire). Soil samples will also be collected to determine the effects of prescribed burning on soil pH, bulk density, particle density, pore space, soil strength, O-horizon weight and depth (organic matter), water stable aggregates, and soil fertility. This project is ongoing and in the early stages of sampling and data collection. The research is being conducted on several types of burned regimes. The National Forests and Grasslands of Texas (NFGT) of the United States Forest Service have been regimes, which occur every two to three years predominately during the dormant season, The Nature Conservancy’s (TNC) Roy E. Larson Sandhills Sanctuary, been both during the dormant and growing season, and Wesley Land and Cattle Ltd. True Farm, often burned similarly, are all being studied. Samples are being taken in the Deep East Texas Prairie, Weeds on the Angeline, Sbina, Dryy Crockett, and San Houston National Forests, along with The Nature Conservancy’s Roy E. Larson Sandhills Sanctuary, and the Wesley Land and Cattle Ltd. True Farm. These areas were chosen to showcase a diversity of burned regimes within the same ecological region of Texas with the same vegetation types and a variety of soil types. The study is aimed at developing an understanding of any correlation between the soil physical and chemical properties among the soil types and the ecological region and the effects prescribed burning has on them.

GOALS AND OBJECTIVES
The overall goal is to determine if prescribed burning impacts soil infiltration rates and soil physical and chemical properties of forest soils in deep East Texas.

Objectives:
- Test the effects of soil infiltration rates as influenced by prescribed fire in Deep East Texas.
- Evaluate the effects of various soil physical properties influenced by prescribed fire in Deep East Texas.

SITE DESCRIPTIONS
All of the sites were chosen based on availability and the likelihood of them being burned. NFGT and TNC plots were previously burned. The Wesley plots were not pre-existing and therefore were randomly selected within the projected burn area in a plotted Longitude/Pine area.

SOIL TEXTURE DETERMINATION

FIELD SAMPLING METHODS

GPS COORDINATES: GPS coordinates will be taken at the site of sampling within the established plot. Another waypoint will be taken at the second plot.

RANDONM DIRECTION AND DISTANCE: A random number generator will be used to determine the direction and the distance from plot center and then again for the secondary plot.

SOIL SERIES CONFIRMATION: The Web Soil App (CC District and Natural Resources Conservation Service), will be used to determine soil type at each plot. A soil auger will be used to go to a minimum depth of 1.5 meters to confirm the soil type.

SOIL BULK DENSITY: The Excavation Method will be used in the field. A small hole will be dug to the depth not exceeding 15cm, all the soil will be collected from the hole. The hole will then be filled with fine loose sand. Known quantity of water will then be poured into the hole filling it to the top.

MINERAL SOIL SAMPLES: Two bags of mineral soil samples will be collected from each plot, not to exceed 15cm in depth. One bag will be sent off to an external lab to determine soil fertility. The other bag will be used in determining the wet soil pH, the soil texture, and percentage of water stable aggregates.

HORIZONTAL DEPTH AND WEIGHT: A 25cm X 25cm square will be utilized to collect the organic.

SOIL STRENGTH: A cone penetrometer of 19.05 mm (% bulk) will be used to determine the soil strength in PSI up to a depth of 127 mm (5 inches).

SOIL INFILTRATION: A double-ended cylindrical infiltrometer will be used and measurements will occur until a steady rate is reached in the inner ring.

LAB SAMPLING METHODS

SOIL TEXTURE: 100 grams of dry soil is put into a milled 2-mesh cup with 100 ml of Sodium Metaphosphate and fill halfway with water and stirred for 10 minutes. The sample is then poured into a cylinder and a burette is placed into the mixture and water is added. Measurements will be taken in the 45-second and 2-minute time frame, another measurement will be taken after 12 hours to determine the % Sand, Silt, and Clay.

PARTICLE DENSITY: Water displacement of the soil bulk density sample will be taken by filling a graduated cylinder with 100ml of water and soil added. The density will be calculated by the volumetric difference.

SOIL pH: 2g of soil will be measured out and put into an Erlenmeyer Flask and 40ml of deionized water will be added. The pH will be put on a shaker for 15 minutes and measured using a combination pH probe.

WATER STABLE AGGREGATES: The percentage of water stable aggregates will be determined using 200g of soil. The test soil will be put through a test of size. The water size will be as follows: 0.25 mm, 0.5 mm, 5mm, and 0.125 mm. Aggregates on each size will be weighed and then placed in an oven at 105 degrees Celsius until a constant weight is reached. Percentages of water stable aggregates on each size will then be calculated.

SOIL BULK DENSITY: Soil will be weighed wet and then after reaching a constant dry weight at a temperature of 105 degrees Celsius.

WATER CONTENT OF SOIL: The water content will be measured from the soil bulk density sample in %W/C and %MC.

WATER CONTENT OF ORGANIC MATTER: The organic matter will be measured wet and then dried at 60 degrees Celsius for at least 48 hours or until the weight remains constant.

SOIL FERTILITY: A separate bag of soil mineral sample will be sent to an external lab to measure the total organic carbon content, total Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, and Sulphur.