Mar 6th, 12:00 AM

08. Environmental Science

Southwestern Oklahoma State University

Effects of Fertilizer on Cow Pasture

Alexandra Lopez

Abstract

One of the biggest contributors to greenhouse gases is livestock, and cows make up most of that percentage. To try to reduce emissions, Low Carbon Beef LLC (LCB) has developed protocols to contribute to a more sustainable beef industry. By conducting their own research, LCB can improve their low-carbon methods. Because soil carbon sequestration has a big impact on the overall lifecycle emissions from cattle, the objective of this experiment was to record the effects of fertilizer on the soil. Two similar 10' x 10' plots of land were chosen. One plot was fertilized, while the other was left untouched. After a month, one cow and one calf were placed in the fertilized plot for four hours; which is a grazing period equivalent to that in a typical pasture (5 acres per cow per year). Soil samples were collected four times: 1) before the experiment, 2) 7 days after fertilizing, 3) 7 weeks after fertilizing, and 4) 12 weeks after fertilizing. All samples were analyzed by the Oklahoma State University Extension Office for pH, nitrate, phosphorus, potassium, organic matter percentage, and total nitrogen percentage. The fertilized plot showed an 18% increase in organic carbon, a 12% increase in total nitrogen, a 51% increase in phosphorus, a 23% increase in potassium, and a 3% increase on pH after the 12 weeks. The control had no increase in organic carbon, total nitrogen, or in phosphorus after 12 weeks, but there was a 13% increase in potassium and a 3% increase in pH. As

Health Impacts of Air Pollutants: Particulate Matter

Brandon Blankenship

Abstract

The purpose of this study was to look at the connection of particulate matter (2.5 and 10 ppm) and how it affects the human body. Also, I looked at what adverse effects and complications could arise. Particulate matter is a mixture of the solid particles and liquid droplets found suspended in the air. Once our body is exposed and inhaled, if the PM is 2.5 or 10 ppm in size this is when it could be dangerous if inhaled, once inhaled it has the potential to enter the bloodstream. The elevated ozone levels have been closely related to an increase in hospitalizations, emergency room visits, and premature death. In the research, I have also found that some of the particulate matter is carcinogenic and can pose a huge threat to immunocompromised patients. The Ambient air pollution posed greater threats and was linked to the presence of PM. The elderly and the children were the focus of the community. This is where I saw most of the adverse health effects.

A Look at Water Use and Agriculture in Oklahoma: Toward a Sustainable Future

Hanna Vranesevich

Abstract

While landlocked states such as Oklahoma appear to be far removed from national and global water systems tied to rivers, lakes, and oceans, runoff from commercial agricultural practices can have detrimental effects on the ecosystems of groundwater and river systems which can ultimately disrupt larger bodies of water such as the Gulf of Mexico (Smits 2019). The continuous struggle to find an equilibrium between the potentially damaging effects of mismanaged agriculturally based commercial operations and the need for such operations have resulted in lawsuits that have reached the U.S. Supreme Court. The decision reached in Arkansas v. Oklahoma of 1992, upstream states were ordered to adhere to the water quality standards of downstream states, yet regulatory bodies like the Environmental Protection Agency are still evaluating this monumental case (Seitzinger 2017). While this presentation emphasizes the economic impairments that arise from this issue, it also focuses on the ecological damage that occurs. When common organic agricultural outputs such as nitrogen and phosphorus enter water sources, oxygen is depleted through a process called eutrophication which makes it almost impossible for life to survive (Monteagudo 2012). The development of sustainable measures to maintain clean and healthy waters is vital for the continued protection of this invaluable resource.

Impact of Stream Unit Type and Upstream/Downstream Location on Litter Accumulation in Small Urban Waterways

Breanne Thomas, Dr. Emily Hendryx, Dr. Matthew Parks, & Kim Hwa Lee

Abstract

Litter is recognized as the improper disposal of trash, leading to impacts on the environment and public health. The main goal of this research is to inform litter remediation efforts for urban waterways in the Oklahoma City metropolitan area. We collected litter accumulation data from multiple transects within riffle, run and pool stream units along four urban creek sites. Litter counts and surface area coverage along streams were recorded from digital point-transect images taken on-site; litter counts were also recorded through visual-transect counts. Field data was summarized using ANOVA statistical methods, contrasting the effects of stream unit type and upstream/downstream locations on litter distributions. These results will enable more efficient litter mitigation efforts, including placement of litter funnel traps and community stream cleanup events.

Correlating Litter Accumulation and Development in Small Oklahoma City Urban Waterways

Breanne Thomas, Kim Hwa Lee, Dr. Andrew Taylor, Dr. Matthew Parks, & Dr. Emily Hendryx

Abstract

Accumulation of litter in local and regional watersheds has global consequences, including contributing to decreased quality of freshwater resources and oceanic 'garbage patches'. In this study, we surveyed several streams in Oklahoma City in different types of urban areas to determine the correlation between litter amounts and level and type of adjacent development. We predict that areas that are more commercialized will have more litter than areas that are not as developed. We surveyed four stream sites: heavily commercialized, medium commercialized, light commercialized, and residential. At each site, we determined run, riffle, and pool stream units and took litter count and surface area measurements along three point-transects within each unit type. Along each transect, we took digital images of 1 m diameter, regularly-spaced points spanning the stream channel and adjacent floodplain. Point-transect measurements were supplemented with visual counts along one transect per stream unit type. Data was summarized using ANOVA-based statistical methods, contrasting levels of development with litter accumulation, and accounting for differences in stream unit type. Correlation between the level of development and litter accumulation could inform remediation efforts, identify critical litter point sources and help establish more effective regulatory measures for future development.

Concentration of Trash Along Small Streams at a Fixed Point in Time

Noah Holt, Dr. Matthew Parks, Ashton Johnson, & Dr. Emily Hendryx

Abstract

Accumulation of trash in small watersheds can negatively impact both terrestrial and aquatic ecosystems. The inappropriate disposal of consumables is a longstanding issue with significant influence on environments all around the world. The goal of this study is to mathematically model how trash deposited into small streams collects and spreads along the body of water. We collected litter accumulation data using point-transect methods along four sites in small urban streams in the Oklahoma City metropolitan area. By employing a steady-state convection-diffusion equation, we model trash distribution with respect to stream properties over a distance. Our model demonstrates the relationship between the most common types of segments in small waterways and the concentration and rates of diffusion of trash. Project results leverage underlying processes driving litter accumulation in small waterways, and will inform future modeling efforts for both urban and rural watersheds.

A Differential Equations Model of Litter Movement Along a Stream Over Time

Dr. Andrew Taylor, Noah Holt, Ashton Johnson, Dr. Emily Hendryx, & Dr. Matthew Parks

Abstract

Litter accumulation in urban waterways in central Oklahoma negatively affects our local ecosystems. We collected data by the use of point-transect sampling at multiple stream sites in the Oklahoma City metropolitan area consisting of the standard riffle, run, and pool stream units. The goal of our research is to model the amount of trash on both land and water in a given stream unit with respect to time through the use of a system of first order linear differential equations. The specific parameters of our mathematical model are derived from statistical analysis of our data for each unit, describing trash movement between land and water as well as from unit to unit. Our research provides preliminary results for predicting litter collection in similar streams based on our general mathematical framework and coupled with specific parameters derived from stream data. Such models allow us to study litter dynamics under different stream properties and varying litter inputs over time.

Evaluating Methods of Quantifying Stream Litter Accumulation in Urban Streams

Brock Archer & Alfonzo Cole

Abstract

Litter accumulation in stream systems is a local problem with global significance, as local sources contribute to the growing mass of litter contaminating our waterways and oceans. The objective of this research was to evaluate three different strategies of quantifying litter accumulation in streams. We visited four sites along streams within the Oklahoma City metropolitan area and recorded three different measurements of litter accumulation: point-transect count, point-transect surface area, and rapid visual-transect count. For each site, we delineated three-stream unit types (riffle, run, and pool) and ran three point-transects perpendiculars to streamflow within each unit type. Each point-transect included five proportionally-spaced 1-m-diameter plots within the stream channel, as well as one plot on the floodplain of each bank. This was different from the rapid visual-transect count conducted once per stream unit type, in which individuals were timed and counted litter visually along a straight transect. We hypothesized that each method would capture elements of litter accumulation in streams effectively, but that each method may have unique biases. Therefore, we compared the three measures across our sampling sites by graphing and correlation analyses. The differences between these methods can provide insight regarding the appropriateness of each measure for quantifying litter accumulation in streams, informing future clean-up efforts in urban watersheds.