Evaluation and Enhancement of Carbon Sequestration Potential, Bioenergy Production and Ecosystem Services of Existing Vegetation Along Roadsides

Evaluating the potential of roadside vegetation for carbon sequestration along roadsides in San Antonio, TX

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There is a growing realization that anthropogenic greenhouse gases (GHG) emissions are contributing to global climate change. Therefore, it is critical to identify and leverage appropriate avenues to mitigate this problem. According to the Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2015, the transportation sector in the U.S. was estimated to emit 1,807 million metric tons of carbon dioxide (CO_2) equivalents in 2015, over half of which is from road transport alone. Therefore, road transport contribution to GHG emissions should be mitigated to reduce atmospheric CO_2 concentrations thereby alleviating the harmful effects of changing climate and global warming. Interest has recently been increasing in the potential for roadside vegetation and soils to capture and store carbon to reduce GHG emissions as well as to use this approach to generate revenue by pursuing market-based strategies for trading carbon credits or carbon offsets. This study aims to conduct a baseline assessment of carbon sequestration potential of existing vegetation along a Texas highway and evaluate different management techniques to take remedial measures for improving carbon sequestration capability along existing roadside infrastructure.

Background

There has been a growing interest in the potential for roadside vegetation and soils to capture and store carbon. There have been few recent studies of the existing annual carbon sequestration occurring along U.S. roadsides. The Carbon Sequestration Pilot Program by FHWA and the preliminary investigation report on Roadside Management Strategies to Reduce Greenhouse Gases provide the overall context of the feasibility and measurability of a roadside carbon sequestration effort using sustainable forestry practices or alternative management of grasslands in the highway ROW, in addition to investigating the various related aspects of a carbon sequestration program. Recently, the FDOT estimated its roadside carbon sequestration contribution as part of a larger study on ecological services provided by rights-of-way. FDOT study valued the ROW carbon being captured and stored at $157-363 million using a conservative price for carbon. All these studies were estimates based solely on the passive management of existing soils and vegetation, estimated carbon storage rates, and acreage along roads. Collectively these studies demonstrate the great potential for easily accessible roadsides to be more focused on active carbon management.

Project Summary

The main objective of this project is to evaluate and enhance the carbon sequestration potential and other ecosystem service provided by roadside vegetation. This study is especially important for roadsides in highly polluted zones such as those affected by heavy vehicular traffic and industries. Therefore, due to heavy traffic and close proximity to UTSA, we will evaluate carbon sequestration along Interstate-35 (I-35) within Bexar County for this study.

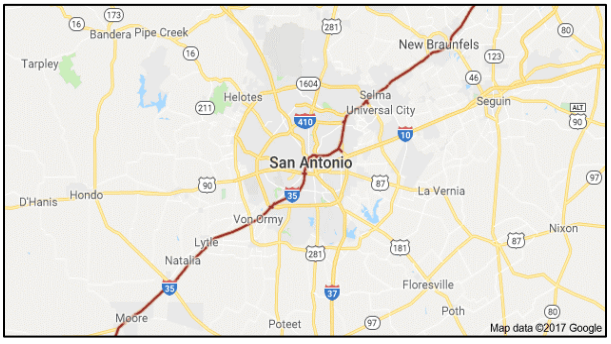

Figure 1. Map of I-35 in Bexar County, TX.

Status Update

We completed vegetation and carbon sampling of 8 locations in San Antonio, TX during May to August of 2018. Seven of the roadway sites were along the I-35 and one site along SR-1604 in San Antonio. At each site, we measured the vegetation cover by species along 3 x 20 m line transects. Within each transect, we collected 2 soil cores, organic leaf litter, and above ground biomass. Plant material was sorted and bagged by

species. All samples were oven-dried in the lab. During September, we have begun to analyze the carbon content of the soil, leaf litter, and plant species by loss-on-ignition method. While the sample of native plants, especially grasses, was limited, we plan to statically compare the carbon content between native and non-native plants to determine future research needs. For example, if several species of native plants are more efficient at sequestering carbon, we will request permission to plant monoculture and polyculture plots of native and non-native species along roadways to determine if native plants can compete with non-native plants and are better at sequestering carbon. We are currently in the process of analyzing the carbon content of soil and vegetation with an expected completion date of December 2018.

Impacts

This study will produce a baseline assessment for the carbon captured and stored along a roadside in an arid state in the South-Central region (Texas). This study will result in refinements of additional steps towards establishing simple, reliable, and replicable methodology for assessing the carbon stocks in vegetation along federal highways of the US and eventually developing strategies for registering carbon credits. The information gained in this study will also assist transportation engineers in taking remedial measures for improving carbon sequestration along roadside, thereby contributing significantly towards the reduction of GHG emissions. In addition to preserving the environment, this study will also provide information on the ecosystem services provided by roadside vegetation. This study will also assess how the transportation sector can effectively reduce pollution in highly polluted zones of Texas like chemical/refinery plants by the use of active management practices related to roadside plantations in these areas. Roadside vegetation also provide important ecosystem services such as prevent soil erosion and water pollution during flooding, which is particularly important during natural disasters in the area as witnessed during Hurricane Harvey.

Tran-SET

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