LSU Blight to Bioswale: NOLA Lower 9th Ward Engineered Nature Park

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Background

After Hurricane Katrina in 2005, approximately 2,000 properties were left vacant in the Lower 9th Ward, New Orleans. Many community members relocated after the flood, those remained in the community faced great strife for the last 13 years due to the demographics of their class and race.

Objective

The objective is to turn the abandoned properties into an engineered nature park that addresses storm water and air quality. The park would feature a bioswale that would allow the storm water to filtrate through and remove the pollutants. There would also be added vegetation and a living wall that would decrease air pollution in the Lower 9th Ward.

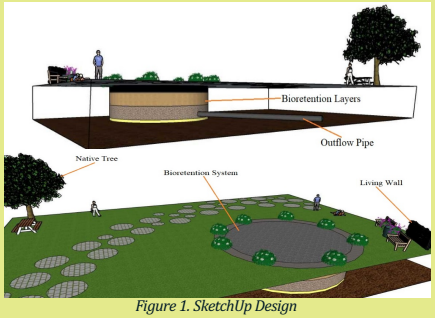


Figure 1. SketchUp Design

Methodology

Bioretention Sizing Model for Surface Area Analysis NCRS Method

- Block analysis of the total area of the property
  - Pervious and impervious areas
- 1 hour storm
  - Excess rainfall entering pervious and impervious areas
  - Total runoff entering the lot

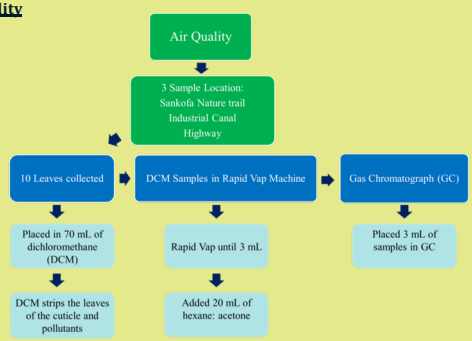
Bioretention analysis

- Total runoff volume from NCRS Method
- Stormwater Control Measures (SCM)
- Storage depth, summation of depth of each bioretention layer multiplied by its associated void ratio.

$$Surface\ Area = \frac{Total\ runoff\ volume\ -Volume\ reduced\ by\ an\ upstream\ SCM}{Storage\ Depth}$$

Equation 1. Calculation bioretention surface area

Air Quality



Water Quality

1. 2 L synthetic stormwater was poured in 4 columns with different percentages of pecan biochar, oyster shell char, and sand.
2. Storm water samples were collected after retention time of 24 hours.

Methodology Continued

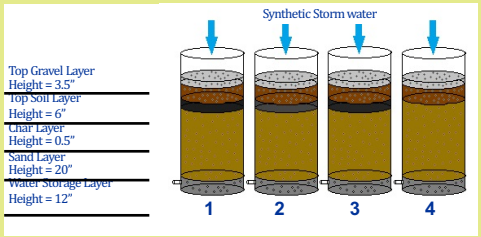


Figure 2. Bioretention columns used to test effectiveness of filtration materials. (1) Pecan Biochar (2) Oyster Shell Char (3) Pecan Biochar and Oyster Shell Char (4) Sand only

Results

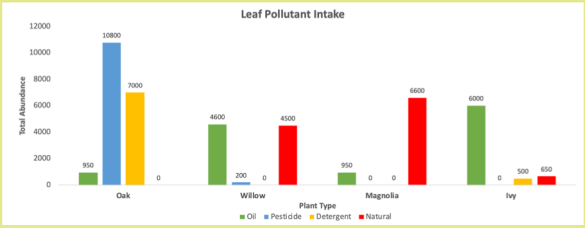


Figure 3. Total abundance of oil, pesticide, detergent, natural air pollutants

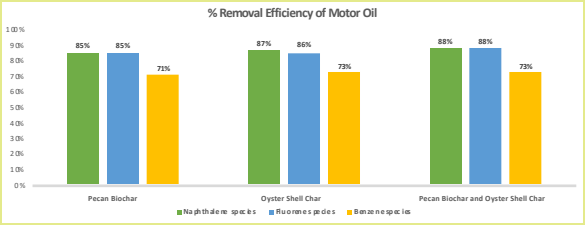


Figure 4. Motor oil removal efficiency based on the type of filter media used

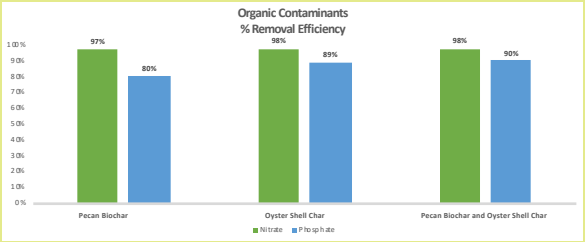


Figure 5. Organic contaminants removal efficiency based on the type of filter media used

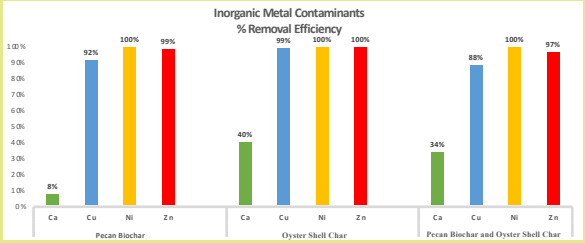


Figure 6. Metal contaminants removal efficiency based on the type of filter media used

Conclusion

Air Quality

- Plants (ivy, black willow, and oak tree) near high traffic areas showed high concentrations of oil based air pollutants.
- Plants (magnolia tree) in an area with thick vegetation showed very low amounts of pollutants.
- SO_2 is known to be a critical pollutant in the area, traces of SO_2 were not detected on the sampled leaves.
- ❖ Planting native vegetations, such as magnolias, oak trees, and star jasmines, around the bioswale and constructing a living wall will improve the air quality of the community.

Water Quality

- For motor oil, pecan biochar and oyster shell char mix treated the highest concentration of naphthalene, fluorene, and benzene species.
- Nitrate removal efficiency was consistent due to denitrification in IWS.
- Pecan biochar and oyster shell char mix removed the most phosphate concentrations due to both medias activate sorption properties and ability to create calcium oxide (adsorption properties).
- Oyster shell char had the highest removal efficiency of metal concentrations (calcium, copper, nickel, and zinc).
- ❖ The water treatment system will have a layer of pecan biochar and oyster shell char together, the mixture proved most efficient in removal of metal contaminants, organic contaminants and motor oil.

Recommendations

- Green infrastructure is a cost effective, low impact development technology that can be used to treat storm water and pollution runoff while improving human health and the environment.
- The water treatment system will have a layer of pecan biochar and oyster shell char because overall, the mixture proved most efficient in removal of metal contaminants, organic contaminants, and motor oil.
- Planting native vegetation, such as magnolias, an oak tree, and star jasmine, around the bioswale and constructing a living wall will improve the air quality of the Lower 9th Ward.
- Constructing a series of beautiful parks in the Lower 9th Ward will help bring a sense of community into the area and will help to draw in new, as well as old, residents.

Acknowledgements

We would like to thank our community partner, Beth Butler, and our project advisor, Dr. John Pardue. Additionally, we would like to thank the Department of Civil & Environmental Engineering at LSU.

Figure 7. Team members with Beth Butler (Executive Director of A Community Voice)