

Understanding the Linkages Between Land Cover and Income in Baltimore City

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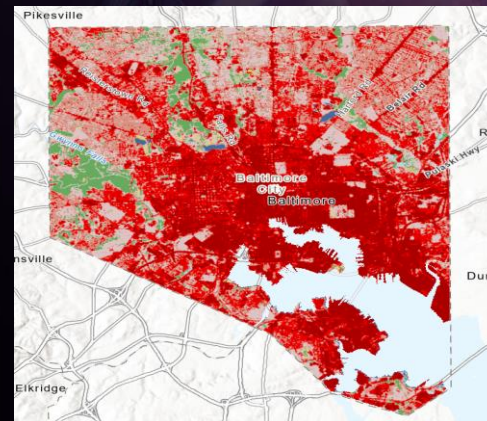
Background

Baltimore City has a significant amount of developed land cover (depicted in red)

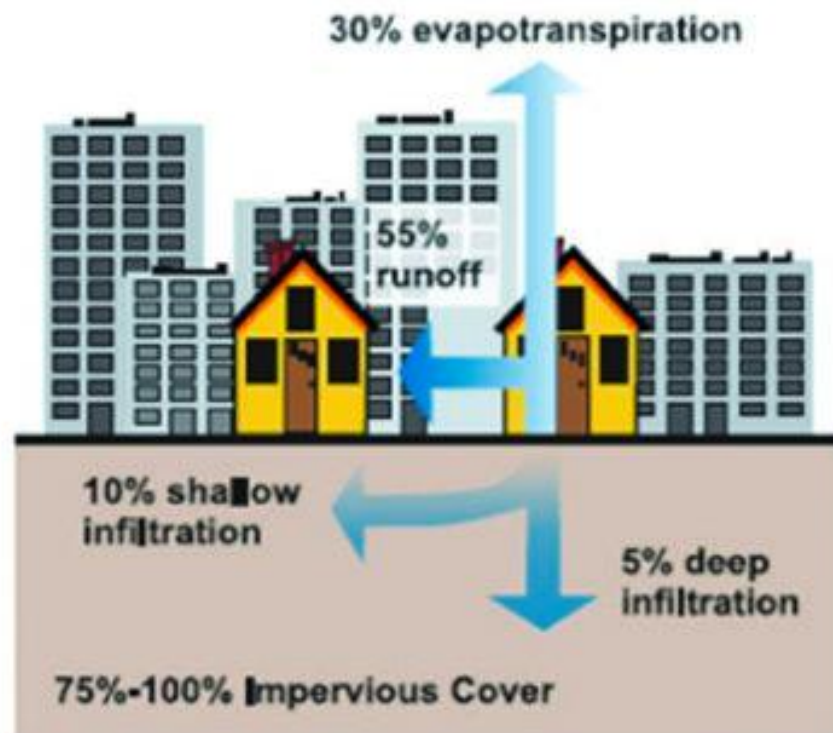
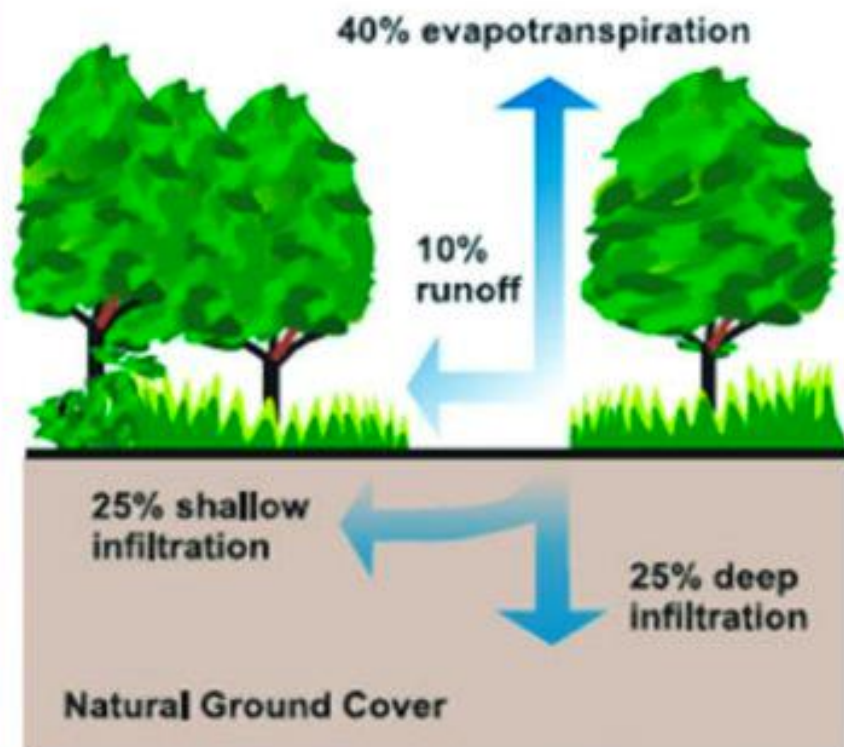
Stormwater runoff is one of the leading causes of pollution into the Chesapeake Bay

Stormwater runoff, caused by excess impervious surface cover, tends to have much more pronounced effects downstream of the area of concentrated land cover

These effects include destruction of local stream beds, aquatic ecosystem habitat loss, and transport of local contaminants to sensitive ecosystems







Motivation

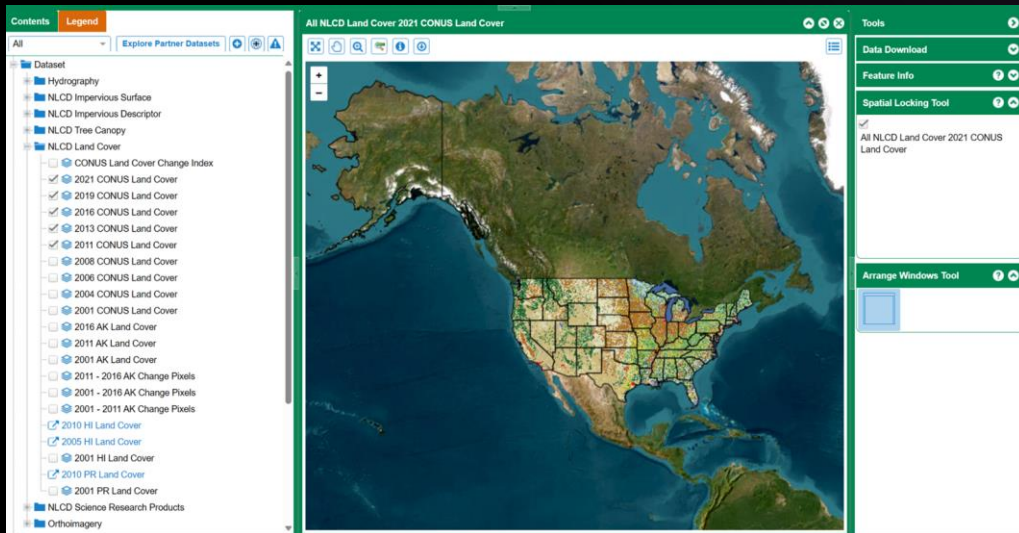
Low income households and businesses don't have the financial means to start and maintain green stormwater infrastructure projects, which are more expensive to implement than other forms of green infrastructure

Since the consequences of stormwater mismanagement tend to take effect downstream of the area that is causing the excess stormwater runoff, it is not possible to thoroughly clean and protect the Chesapeake Bay without implementing green stormwater infrastructure in all communities

There is a need for policy that pushes for equitable infrastructure in all parts of the city



Methodology



Use National Land Cover Database (NLCD) developed land cover data from 2011, 2013, 2016, 2019, and 2021 and Baltimore Neighborhood Indicator Alliance Data (BNIA) on Median Household Income to examine the relationship between developed land cover and income

Use GIS to calculate the % of land cover change over time in correlation with the income

Use zonal statistics to calculate other summary statistics for the Community Statistical Areas (CSA) provided in the BNIA dataset

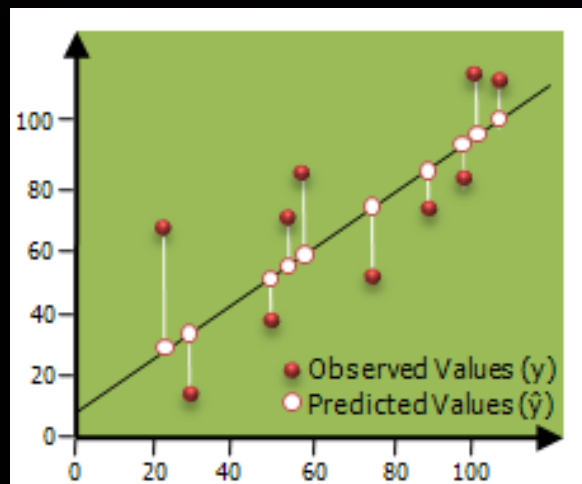
Application

- Updated/New Policies can be established to more adequately address stormwater mismanagement
- Stormwater runoff resulting from low-income neighborhoods can be reduced
- Local ecosystems and habitats, as well as larger ecosystems like the Chesapeake Bay, have the potential to be restored



Machine Learning Application

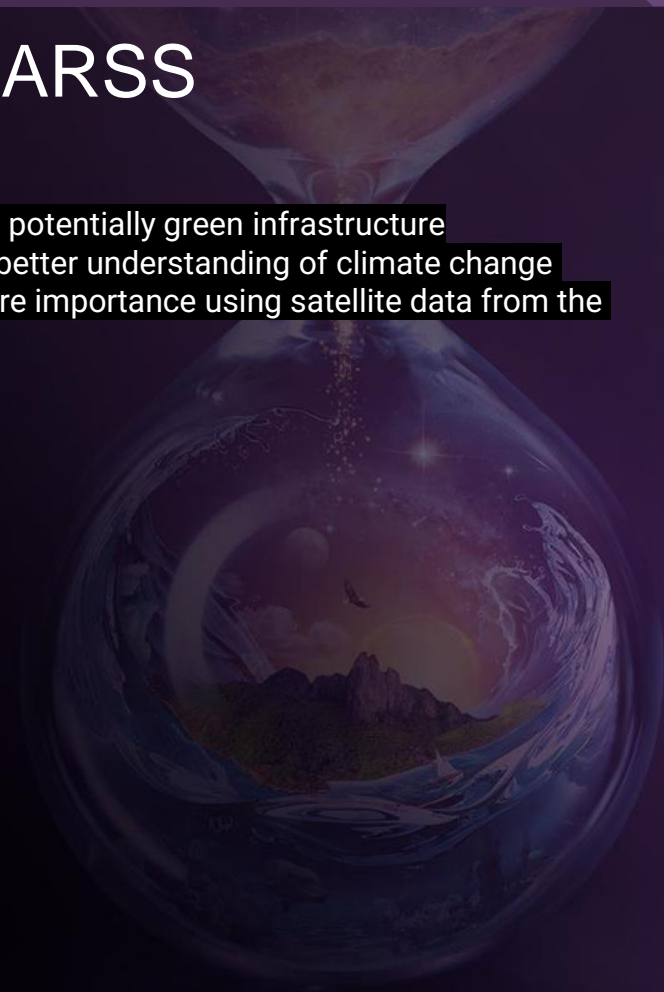
- We will use the statistical method Ordinary Least Squares (OLS) to predict the Median Household Income for a given year using our data.
- We will further understand the relationship between the Median Household Income per neighborhood and land cover data for a specific areas in Baltimore City as well as the entire city



(OLS) is a common technique for **estimating coefficients of linear regression** equations which describe the relationship between one or more independent quantitative variables and a dependent variable (simple or multiple linear regression).

Machine Learning Application to IGARSS

- We hope to incorporate time series forecasting for future land cover and potentially green infrastructure
- We also hope to incorporate regression algorithms that work towards a better understanding of climate change effects of developed land cover through parameter estimation and feature importance using satellite data from the NLCD



What is Baltimore City doing to address this problem?

Baltimore Green Network Plan

Green Pattern Book

Baltimore Green Space

NGOs such as Blue Water Baltimore, Civic Works, the Neighborhood Design Center, Parks & People, and the Chesapeake Bay Trust provide pro-bono assistance to communities looking to develop vacant lots into stormwater management sites or improve existing green infrastructure

Baltimore City provides limited assistance to low-income individuals and businesses to develop green infrastructure, instead focusing efforts on making it easier for residents to implement green infrastructure projects in their communities

While these are steps in the right direction, Baltimore City can take more steps to provide low-income residents with opportunities to develop green infrastructure in their neighborhoods, such as by offering subsidies to low-income residents for developing vacant lots into stormwater management infrastructure, creating jobs for low-income residents to manage the growing green infrastructure across the city, and developing educational opportunities for low-income residents to learn low-cost green infrastructure management techniques that reduce maintenance time as well