Modeling the Effects of Land Use Change on Flooding in Pacific Northwest Streams to Promote Green Practices

Nayak, Adam (School: Webber Academy)

Due to population growth, urban areas in Oregon have been expanding, leading to increases in impervious surfaces and net losses in wetlands, riparian vegetation, and forestation in the Northwest. Utilizing ArcGIS and NOAA's C-CAP imagery, this study classifies and analyzes urban land use changes between 1996 and 2010. Developmental trends were first analyzed alongside historical flood records to validate the relationship between flood severity and land use. Through regression analysis, predictions of annual impervious change were then calculated using NOAA's Impervious Surface Analysis Tool within four urban stream basins (Johnson Creek, Tualatin River, Pudding River, and Clackamas River). Based upon these predictions, changes in flood severity were determined through a novel application of NOAA's CHPS Streamflow Modeling System. Significant discharge change predictions due to development were calculated, and represented visually in flood inundation maps using USGS's GIS Flood Tool. With this information, projected necessary rates of wetland and green infrastructure implementation were able to be formulated, quantifying the necessary changes needed to counteract urban development within the Willamette River Basin. These findings shed light on the importance of land use management in urban settings and are being used by local watershed councils to advocate for changes within their stream basins.

Awards Won:

Intel ISEF Best of Category Award of $5,000

United States Environmental Protection Agency: The Patrick Hurd Sustainability Award winner will travel to EPA's National Sustainable Design Expo in Washington, DC