Puerto Rico Water Resources and Environmental Research Institute

University of Puerto Rico at Mayagüez (UPRM)

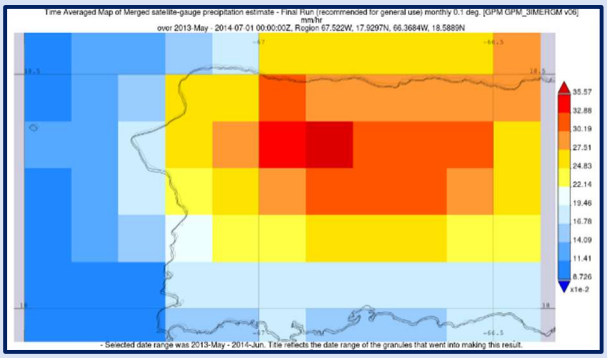
About Us

We are one of the 54 Water Resources Research Centers in the United States and its territories. Established in 1964 by the Water Resources Act (1964), the Institute conducts basic and applied research to solve water and environmental problems unique to Puerto Rico, the Caribbean and Latin America. We **conduct research** to find innovative solutions to problems related to water resources and the environment. To do so, we **support students and scientists** with our projects, and provide them with knowledge as an integral part of UPRM education programs. We **publish research** results on our website, in local, national, and international journals and magazines. Our applied research contributes to the development of the next generation of water and natural resources professionals and supports young scientists and engineers.

Awards to PRWRERI students during poster competition, ASABE **conference, Jan. 2023.**

Evaluation of Satellite Rainfall Products in the Caribbean Region

Precipitation data in remote areas and mountainous river basins in many countries around the world is only accessible using satellites. Usually there are not in-situ gaging stations nor radar information. This situation is common in several islands in the Caribbean. This project evaluates high spatial resolution satellite precipitation products. Rainfall-runoff conversion is done using the Hydrological Modeling System (HEC-HMS). A comparison of ground-based estimates from pluviometry data available in Puerto Rico is used to verify the satellite-based estimates. Satellite rainfall data products will be selected from a list of the latest satellite precipitation technology models for implementation, such as PERSIANN-CDR, the Climate Hazards Group Infra-Red Precipitation with Stations (CHIRPS), and Tropical Rainfall Measuring Mission Multi-satellite (TMPA) for later streamflow simulation. The objective is to identify which of these different satellite precipitation products provide better estimates of rainfall for hydrological applications in different regions of the Caribbean. The first phase is identifying the study area in Puerto Rico for the creation of the calibration and validation hydrological model. The experience obtained with the calibrated model will be transferred to the Republic of Haiti attempting to develop flood-prone area maps on the north side of the country.



Precipitation satellite image (Giovanni Nasa) used for the East part of PR

Experiments on Vegetative Flow Resistance for Erosion Control Using Grass Species from the Caribbean Region

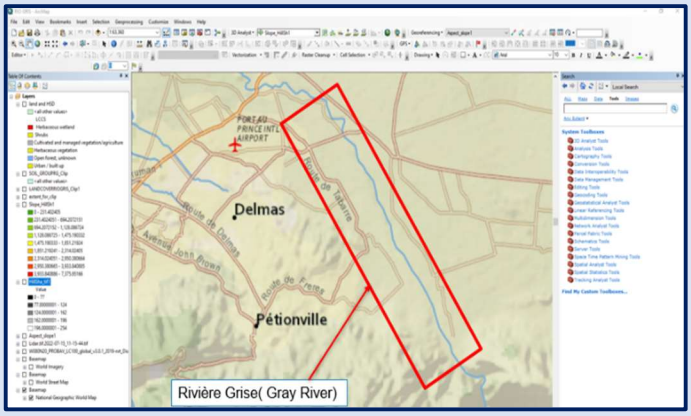
The objective of this project was to validate Manning's resistance coefficient and determine the Retardance Index for grass species cultivated in the Caribbean Area. Hydraulics of vegetative channels is a complex problem due to the dynamic nature of submerged vegetation and several possible plants configuration affected by flow velocity, flow depth, vegetation density, and plant morphology and structure.

Four grass species were studied: Bermuda, Bahia, Pangola, and Zoysia. The methodology included measurement of particle velocities using ADV to obtain velocity profiles over the grass, fit the data to a modified logarithmic profile which provided the shear stress over the deflected vegetation, a gradually varied flow profile to obtain the energy grade line, and solution of momentum and Manning's equation to solve for the Manning's coefficients. The interval of Manning's coefficients obtained in the experiments was between 0.115 and 0.282. The results also were in the limit of Manning's n values for channel flow and overland flow. Results showed that retardance degrees published in the Puerto Rico Erosion and Sedimentation Control Handbook for Developing Areas (USDA-NRCS, 2005) apply to the species tested in this project.

Experimental Flume at UPRM **Flume with Bermuda grass**

Erosion and Sedimentation of the Rivière Grise (Gray River) of Haiti

Fluvial erosion in Haiti, especially in the Rivière Grise, is a serious natural phenomenon aggravated by human activities. Its effects include loss of riparian protection, degradation of agricultural land and increase vulnerability of infrastructure. According to a World Bank study on natural resource management in Haiti, in 1990 the estimates of soil loss in watersheds varies from 7.5 MT/ha/year to 750 MT/ha/year. The Rivière Grise has been impacted severely, threatening the productivity of agricultural land and the biodiversity, which are often located along the riverbanks. This research focuses on the analysis of the main factors causing the soil water erosion in the Cul de Sac Plain basin, particularly the Rivière Grise. It focuses on the identification of downstream and upstream erosion risks and associated problems by estimating soil erosion and sediment transport. Expected results aim at making proposals on soil conservation measures in the basin to reduce the quantity of sediments. The methodology is based on digital mapping techniques including the acquisition and processing of satellite images combined with other geographic data in a Geographic Information System tool and the Universal Soil Loss Equation (RUSLE) formula for calculating annual erosion. A profile analysis along the Rivière Grise will be performed by following the distribution of sub-basins, helping to determine sediment accumulation sites that are potential sites of water overflow into neighboring areas.



Rivière Grise Study Area in GIS.

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P.O. BOX 9040, Mayagüez. P.R.
URL: http://prwreri.uprm.edu/
e-mail: prwreri@uprm.edu