



Florida Department of Transportation Research

Examination of Lower Slopes and Rainfall Intensities Taking into Account Overland Flow

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Healthy roadside vegetation beautifies Florida highways, but it is also an essential engineering component of the roadway, reducing erosion and helping maintain the integrity of the roadway. The Florida Department of Transportation (FDOT) maintains roadside vegetation with a program of mowing and fertilization. And while fertilizer benefits the roadside, Florida's intensive summer rainfall can wash fertilizer out of the roadside, eventually sending it to nearby waterbodies, where it can promote overgrowth of algae and severely damage the waterbody.

FDOT recently changed its highway fertilization practices to reduce the downstream discharge of nutrients and to meet designated targets for water quality restoration called Total Maximum Daily Loads (TMDLs). To assist in this effort, University of Central Florida researchers began a project in 2008 to provide a scientific basis for quantifying the reduction in nutrient losses from highway slopes due to the changed fertilization practices. Their research focused on simulating the factors that result in loss of nutrients from fertilized highway slopes, factors such as rainfall intensity, slope, soil type, sod type, and roadway overland flow.

The researchers conducted extensive testing using a custom designed field-scale test bed and rainfall simulator at the Stormwater Management Academy Research and Testing Laboratory (SMARTL) at the University of Central Florida. The test bed has an area of 240 square feet and a depth of 1 foot. Its inclination is adjustable. Soil and turf types tested matched those most commonly used in north and south Florida roadway construction, A-2-4 and A-3 soil and Pensacola Bahia and Argentine Bahia turf, respectively, yielding four soil-turf combinations.

Rainfall intensities and slopes used in this study closely simulated conditions on Florida's highways. The test bed was filled with soil, which was then compacted to simulate highway embankment



Runoff from highways can carry fertilizer applied to the roadside vegetation to local rivers and lakes.

construction. Sod was laid on the compacted soil and allowed to establish roots before testing began. Tests were conducted on slopes of 25%, 33%, and 50% with one hour of rainfall at intensities of 0.5, 1, and 3 inches per hour. Each soil-turf combination was first tested without any fertilizer to establish baseline conditions. Tests were then conducted for the same series of slopes and rainfall intensities after treatment with fertilizer at rates of 1 pound or 0.5 pound of nitrogen per 1,000 square feet. Two fertilizer formulations were tested: 10-10-10, as used by FDOT before the changes in fertilization practice; and slow release 16-0-8, as used in current practice. Additional tests were conducted to simulate multiday storms. For each test in this comprehensive matrix, the researchers measured run-off volumes, total nitrogen, and total phosphorus. Total dissolved solids and turbidity were measured as indicators of soil erosion.

The extensive testing conducted by the researchers yielded many insights into the interaction of the many variables that affect fertilizer wash-out. The information gained in this project helped confirm the appropriate environmental stewardship of FDOT's revised practices and pointed the way to refinements that will further protect Florida water resources.