LAKE LAFAYETTE DRAINAGE BASIN: TRIBUTARY & WATERBODY BUFFER STUDY
THE OVERLAND FLOW METHOD FOR DETERMINING BUFFER WIDTHS

The overland flow method for computing buffer width was developed for situations where the buffer area has poor infiltration potential. Poor infiltration rates are generally characteristic of soils classified in the "C" and "D" hydrologic soil groups, in sites with a high groundwater table, and in other situations. Hydrologic soil Group C soils have low infiltration rates when wetted and consist mainly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. Hydrologic soil Group D soils have a high runoff potential and very low infiltration rates. They consist primarily of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. Where infiltration rates are not as limited, an alternative methodology for computing buffer widths may be employed. This method is referred to as the "infiltration method", which involves many other variables not used in the overland flow method and more complex calculations.

The overland flow methodology for determining buffer width is designed to provide a specified travel time (T) of sheetflow through the buffer. For systems discharging to Class III receiving water bodies, the vegetated natural buffer should be designed to provide at least 200 seconds (0.056 hour) of travel time by overland flow through the buffer for the 2-year, 24-hour storm event. For systems discharging to receiving water bodies designated as Class I, Class II, or Outstanding Florida Waters (OFWs), the buffer should be designed to provide at least 300 seconds (0.083 hour) of travel time by overland flow through the buffer during this storm event.

The standard overland flow formula is as follows:

$$W_1 = [(T^{1.25})(P^{0.625})(S^{0.4})] / [(0.002)(n)]$$

where:

W_1 = buffer width in feet (calculated without applying a safety factor)

T = Travel time of overland flow through buffer, expressed in hours
= 0.056 for Class III waters or 0.083 for Class I, Class II, OFWs

P = Rainfall (in inches) for the 2-year, 24-hour storm event
= 5.64 inches for Leon County area

S = Average grade (slope) of land surface in the buffer area, expressed in feet/feet

n = Manning's roughness coefficient (a measure of surface retardance of overland flow based on soil surface conditions such as the vegetation present on the surface or the lack thereof)

Some sources recommend applying a "safety factor" to the standard overland flow formula when determining the necessary buffer width. This safety factor helps guard against the negative effects of various factors not accounted for in the standard formula; factors that tend to short-circuit the time of travel. A safety factor of 2 seems appropriate, although any safety factor could be employed.

When using a safety factor, the final buffer width required is computed as follows:

$$W_2 = (W_1)(F)$$

where:

W_2 = Final buffer width in feet
W_1 = Buffer width in feet as calculated using the standard overland flow formula
F = Safety factor

In the overland flow equation, P (rainfall) is a constant value. T (travel time) is a constant value but this value can be assigned as either 0.056 or 0.083. Use of the higher T value increases the buffer width assuming all other values in the equation remain the same. If a safety factor is used, the value for this factor (F) is also constant. Obviously, the buffer width increases as the value of F increases assuming all other equation values remain the same.

Given the above, there are really only two variables in the equation: the surface slope (S) and Manning's roughness coefficient (n). When all other values in the equation are held constant, the necessary buffer width increases as the slope increases. The required buffer width decreases as the roughness coefficient increases (e.g., buffer width increases as the surface roughness decreases).