ES322 Geomorphology – Western Cascade Erosion Problem

The Western Cascades of Oregon are typically composed of basaltic andesite bedrock. Watersheds draining from the W. Cascades at H.J. Andrews Experimental Forest (Blue River – McKenzie River area) have been monitored historically for sediment production and discharge. The average values for watershed sediment production has been calculated at 40 $t/km^2/yr$ (i.e. for every square km of watershed area, the river removes 40 metric tons of rock-equivalent material per year, on average). The goal of this exercise is to calculate the long-term vertical rock erosion rates by W. Cascades rivers in meters of vertical rock erosion per millions of years.

The following are the critical parameters to consider for solving the problem.

Density of Basaltic Andesite = 2.8 g/cm^3

Density = mass / volume

Watershed-Scale Erosion Volume = drainage area x thickness of rock eroded

t = metric tons = 1000 kg

1 kg = 1000 g

1 m = 100 cm

Historic Watershed Erosion Rate = 40 $t/km^2/yr$

1 m.y. = 1,000,000 years

      Key Questions to Consider:

            What is the density of basaltic andesite in t/m^3 ?_____ (show work)

            Given density; how does thickness of eroded rock relate to volume and drainage area?

            What is the vertical rock erosion rate in m/m.y.? _____

            Draw a sketch, show all math work below.