2.97 A freshly cut log floats with one fourth of its volume protruding above the water surface. Determine the specific weight of the log.

$\mathcal{V} = log \; volume$

$\mathcal{V}_{H_2O} = \frac{3}{4} \mathcal{V}$

$F_B = W \quad or$

$\gamma_{H_2O} \, \mathcal{V}_{H_2O} = \gamma_{log} \, \mathcal{V}$

Thus,

$\gamma_{log} = \gamma_{H_2O} \dfrac{\mathcal{V}_{H_2O}}{\mathcal{V}} = \gamma_{H_2O} \dfrac{\frac{3}{4}\mathcal{V}}{\mathcal{V}}$

or

$\gamma_{log} = \frac{3}{4} \gamma_{H_2O} = \frac{3}{4}\left(62.4 \frac{lb}{ft^3}\right) = \underline{\underline{46.8 \; \frac{lb}{ft^3}}}$