(2) If water is dispersed as a fog of droplets all of the same diameter, and if that diameter can be chosen to achieve the greatest capacity for a given amount of water, estimate the amount of water, in g per m^3, required to reduce the range of visibility through the fog to about 10 m.

For drops of radius $a \gg \lambda$ the extinction cross section is geometrical, or strictly speaking twice geometrical if the diffracted energy is counted as extinction, as it should be in this case, so we get more extinction cross section per gram of water with smaller drops. On the other hand, for $a \ll \lambda$ we have Rayleigh scattering with cross section proportional to a^6. For given λ we expect the cross section per gram of water to peak somewhere around $a \approx \lambda$, with the cross section per drop πa^2 in order of magnitude. Before looking it up I expected to find the peak close to $a \approx \bar{\lambda}$ rather than $a \approx \lambda$. But in fact it falls very close to $a = \lambda$, where the cross section rises to nearly $4\pi a^2$. (I looked it up in *Absorption and Scattering of Light by Small Particles*, Bohren and Huffman, Wiley-Interscience, 1983.) At $\lambda = 500$ nm we get $3/\lambda$ or $6 \times 10^6\ m^2/m^3$, equivalent to 6 m^2 of extinction cross section per g of water. To make the limit of visibility 10 m it seems reasonable to set the extinction distance at 5 m. For that we need 0.2 m^2 of extinction cross section per m^3 of air, which requires 0.03 g of water per m^3 of air. If I'd stuck with my poor guess $a \approx \bar{\lambda}$ and $\sigma \approx 2\pi a^2$, my answer would have been an order of magnitude larger.