

Sediment Characterization

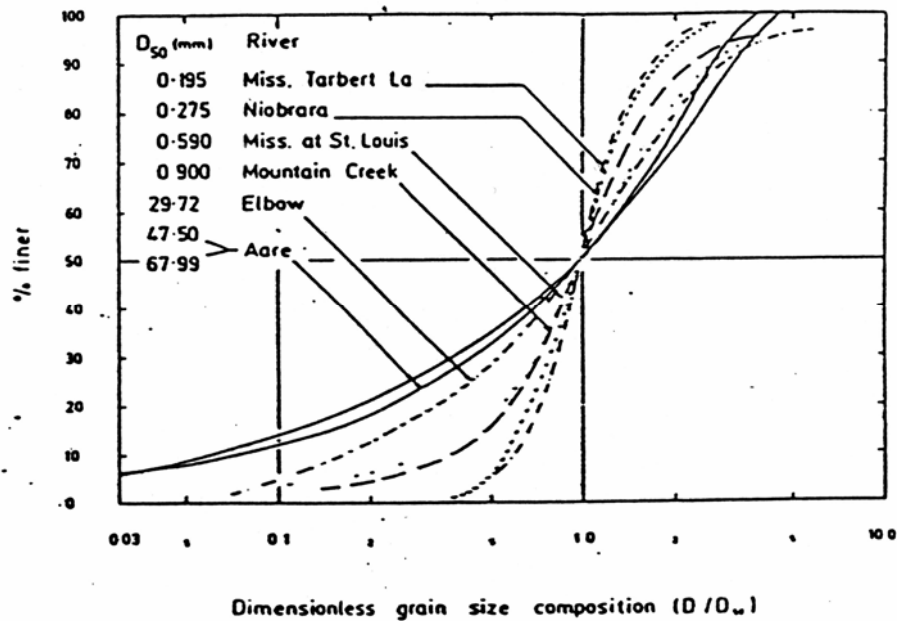
Grain size

There are number of ways to describe the size of sediment. One of the most popular is the Φ scale.

Φ	D (mm) *(μm)	Type of material
-8	256	Boulders
-7	128	Cobbles
-6	64	Cobbles
-5	32	Coarse Gravel
-4	16.0	Gravel
-3	8.0	Gravel
-2	4.0	Pea Gravel
-1	2.0	Coarse Sand
0	1.00	Coarse Sand
1	0.50	Medium Sand
2	0.25	Fine Sand
3	125*	Fine Sand
4	63*	Coarse Silt
5	32*	Coarse Silt
6	16*	Medium Silt
7	8*	Fine Silt
8	4*	Fine Silt
9	2*	Clay

Boundaries vary, but the table is relatively consistent with both engineering and geological interpretations.

However, most material does not have a uniform size (or well-sorted, or poorly graded). Therefore, one usually uses a 'grain-size distribution'. These are typically done in the fashion shown below, where the % of mass finer than a certain size is plotted against that size.



Submerged specific gravity

The submerged specific gravity of a particle

$$R = (\rho_{particle} - \rho_{fluid}) / \rho_{fluid} \tag{1}$$

strongly affects the settling rate of the particle (as will be shown below). Quartz and other minerals, when solid,

typically have a submerged specific gravity of $\sim 1.7 \pm 0.2$. SiC and few other compounds (magnetite) have $R > 2$. Laboratory materials, to improve scaling properties, will often have $R < 0.5$ or even < 0.1 . Coal, vinyl, polystyrene, and walnut shells are examples. Floccs also have low R due to high porosities.

Shape and natural particles (Dietrich, 1982)

Shape is an extremely difficult parameter to measure and account for. Shape varies dramatically from clay, which is plate-like, to aeolian-derived sand, which is almost perfectly spherical. It represents the dominant variable that cannot be easily accounted for. There are two schools of thought –

Engineering – The Zingg diagram and those like it use abstract shapes fit to equations of motion for particle behavior.

Geological (Dietrich, 1982) – His approach was to use natural sediment and dimensional analysis to identify the proper model and generate empirical data to constrain it.