Fluvial (River) Environments

- **Alluvial fans:** Cone- or fan-shaped accumulations of coarse sediment at the base of mountains, where confined streams spread out into unconfined valleys [1] [2]. These form in areas of high relief and consist of poorly sorted gravels/sands from episodic debris flows or sheetfloods.
- **Braided rivers:** Multi-channel rivers with an interwoven network of channels separated by transient bars. They carry abundant bedload (sand/gravel) and have unstable, bank-eroding channels [3] [4]. Braided systems lack extensive floodplains; instead, coarse channel deposits and frequent erosion surfaces dominate.
- **Meandering rivers:** Single-channel, highly sinuous rivers with well-developed **point bars** and broad muddy floodplains. Lateral migration and helicoidal flow cause point-bar deposition on inner bends and cut-bank erosion on outer bends [5] [4]. Deposits show characteristic fining-upward sequences from basal channel sands to overlying muds.
- **Anastomosing (multi-channel) rivers:** Networks of multiple **stable** channels separated by floodplain islands. Channels are relatively fixed in position (limited lateral migration) and often flow over low gradients [6] [4]. In the stratigraphic record, anastomosed rivers appear as isolated ribbon-like channel sand bodies encased in overbank muds, reflecting high overbank deposition in subsiding basins.

Aeolian (Desert) Environments

- **Dune fields (ergs):** Vast areas of wind-formed sand dunes of various morphologies – e.g. **barchan dunes** (crescent-shaped), **transverse dunes** (ridge perpendicular to wind), **linear/longitudinal dunes**, and **star dunes** [7]. Dune sands are typically well-sorted, well-rounded quartzose sand with large-scale cross-bedding. Small wind ripples often ornament the dune surfaces, and grainflow avalanches on dune slipfaces create steep cross-strata.
- **Interdune areas:** Flats or low areas between dunes, which can be **dry** or **wet**. Dry interdunes are often sites of deflation (wind erosion) leaving coarse lag deposits or small ripples, and show thin, discontinuous laminations or windswept surfaces [8]. Wet interdunes occur where water ponds temporarily (playas or evaporite pans), depositing fine silts/clays with mud cracks, evaporite minerals (e.g. gypsum/halite), and possible freshwater fossils [9]. These interdunal playas can leave laminated mud or evaporite layers, overprinted by desiccation features.
- **Sand sheets:** Broad, flat sandy areas surrounding dune fields, characterized by low-relief, gently undulating sand deposits [10]. Sand sheets typically have lower-angle stratification than dunes (commonly <10–20°) and consist of well-sorted sands with thin layers. They may show bioturbation by insects or plants and local high-energy wind ripples, but lack the large cross-beds of dune deposits. *(Additionally, deserts can have wind-blown silt loess blankets and desert pavement lag deposits, though these are more uniform and less visually distinct than dune/interdune structures [11].)*

Estuarine Environments

- **Wave-dominated estuaries:** Estuaries where wave action at the coast is the primary influence on sedimentation and morphology. These often feature a **bay-mouth barrier** (sand bar or barrier island) partially enclosing a lagoon or central basin [12]. Marine sand is delivered by longshore drift

to build spits or barriers across the estuary mouth, limiting tidal influence. Inside, one finds quiet-water muddy lagoons or bays, flanked by tidal flats or marsh. The stratigraphy shows a tripartite division: marine sand at the mouth (barrier/inlet deposits), central bay muds, and fluvial sands/muds near the head [13] [12].

- **Tide-dominated estuaries:** Estuaries in macrotidal settings where tidal currents and range dominate over wave energy [14]. They tend to be funnel-shaped embayments with multiple tidal channels and sand bars stretching inland. Strong bidirectional tidal currents produce sand-rich tidal bars, **flaser** and **wavy bedding**, and extensive mud drapes on tidal flats. Brackish-water fauna (e.g. mollusks) are common in these deposits [15]. The estuary mouth may lack a distinct barrier; instead, tidal sand shoals and channels characterize the seaward transition.
- **Mixed-energy estuaries:** Estuarine systems with a substantial influence of both wave and tidal processes, falling between the end-member wave-dominated and tide-dominated types [16]. They might display a combination of features – for example, a partial barrier at the mouth and significant tidal channel development inside. Many modern estuaries actually exhibit mixed characteristics, with waves shaping the outer estuary and tides governing the inner parts. (One cited example is the St. Lawrence estuary in Canada [16].)

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[1] [3] [5] [6] 10.1: Alluvial Systems - Geosciences LibreTexts
https://geo.libretexts.org/Courses/SUNY_Potsdam/Sedimentary_Geology%3A_Rocks_Environments_and_Stratigraphy/10%3A_Depositional_Environments/10.01%3A_Alluvial_Systems

[2] [4] [7] [8] [9] [10] [11] [12] [13] [14] [15] [16] Depositional environments - AAPG Wiki
http://wiki.aapg.org/Depositional_environments