Non-marine Deposition in the Cordillera

Devonian to present
(but mostly Cenozoic)
Jerry Smith lecture - November 15, 2002

Non-marine Depositional Systems

• Previously we have focused on marine and marine/non-marine interface environments with regard to sequence stratigraphy.

• Prior to the Cenozoic, non-marine environments tend to be located east of the orogenic zones close to the North American craton.

Depositional Environments

• Eolian
  – Generally not close to the source area
• Alluvial
• Fluvial
• Lacustrine
  – The three environments above all grade into one another depending on the climate, drainage and stream equilibrium.

Eolian

• Wind transported clastic sediments – generally produce sand to silt size particles.

• Typically quartz grains as the mechanical working is too harsh for other minerals

• 2nd generation or higher sediments

• Colors are typically white-yellow: iron staining only on cements.
Navajo Fm. -- archetypal eolian dunes

Alluvial-Fluvial-Lacustrine

- Examine the transport of clastic sediments from the source (highlands) to the basin.
- Non-clastic deposition (typically stromatolites and evaporites) occur in lacustrine depositional environments.

Alluvial-Fluvial (Cordillera)

- These comprise the red-beds
- Generally arid environment allows oxidation of iron in the clay matrix and preserves plagioclases.
- Clastic sediments derived from felsic plutons will generate arkosic sandstones and conglomerates.
Example of Alluvial to Lacustrine Depositional Systems

Green River Basin of Utah–Colorado–Wyoming

Fig. 46—Red-beded lacustrine deposits of the Triassic Moenkopi Formation of Arizona. The red-beded lacustrine deposits and light-red sandstones at the top are crevasses splay deposits. Many red-beded lacustrine beds can be seen. A large scarp or scar is present at the base. About 60 m of section is present.

Fig. 12—Large outcrop of meandering stream deposits in the Seepie Formation (Cenomanian) of California which shows light colored sandstones and red shales. The large sandstone bed in the center of the photograph flanks and splits laterally. The more continuous bed above this is about 3 m thick. (Photo courtesy J. L. Bohren.)
Basins of the Rocky Mountain region

Figure 34. Cross section through the Wyoming-Idaho thrust belt, the Green River Basin, and the Wind River uplift. Line of section is located on Figure 33. The section is from Bally and Seidov (1985). Drill holes 6 and 15 are identified in Table 2.

Figure 35. Map showing the distribution of lithologic and structural information derived from drilling in the basin area and the surrounding region. The map was compiled by the U.S. Geological Survey and the U.S. Forest Service.

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Fig. 61—Douglas Creek Member of the Green River Formation, Three-Mile Canyon, Utah. Formed sandstone, shalestone, and claystone of a fluvial and shallow lacustrine origin. Terrigenous units are overlain by sinterolithic algal biostromes. This depositional complex was formed both in a river-lacustrine plain and on a carbonate flat during a saline phase of Late Uinta (Fouch et al., 1976).

Fig. 62—Douglas Creek Member of the Green River Formation, East Temple Plateau, Utah. Sinterolithic algal biostromes (A) overlain by an oysteroid, calapian, and calcaric sandstone (B). The sandstone is overlain by a laterally continuous, small-scale, crass-terminating, intercrustacean, gypseous, aragonite, and dolomite rock. The dolomite overlain by an unnamed carbonate rock. This depositional complex was formed both in a river-lacustrine plain and on a carbonate flat during a saline phase of Late Uinta (Fouch et al., 1976).

Fig. 64—Green River Formation (Eocene), East Temple Plateau, Utah. Wavy bedding in the Parachute Creek Member (Tdp). This member is characterized by thinning, coarsening, and thinning again. The Parachute Creek Member (Tdp) contains several oil shale zones, the principal one being the Mahogany Zone (Tdp). This member contains over 400 m of layered continuous shale that contains abundant lipid-rich organic matter. These thin, discontinuous beds grade laterally and downdip into marginal lake-sedimentary rocks of the Douglas Creek Member (Tdd).

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Figure 5. Cross section of the Mid-Valley, Nevada, showing the formation and separation of the Eagle Spring and Trippe Spring fields from the Idaho Springs oil field. Oil is produced from the Idaho Springs Formation and the shallow, east-dipping Granite Peak Fault. Oil from the Idaho Springs Formation is separated from the oil from the Eagle Spring Formation by the shallow, east-dipping Granite Peak Fault. Oil from the Idaho Springs Formation is separated from the oil from the Trippe Spring Formation by the east-dipping Granite Peak Fault. Oil from the Idaho Springs Formation is separated from the oil from the Trippe Spring Formation by the east-dipping Granite Peak Fault. Oil from the Idaho Springs Formation is separated from the oil from the Trippe Spring Formation by the east-dipping Granite Peak Fault.