Geometric Trends for Floodplain Lakes in High Accommodation Floodplains and Architecture of Floodplain Lake Partitioning, Elongate Splay Delta Channels

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Fluvial systems are prolific hydrocarbon reservoirs. Accordingly, numerous studies have addressed architectural styles and aspect ratios aimed at the “net” channel-belt reservoirs. Floodplain lake deposits are known to typically constitute the majority of the “gross” sections of fluvial systems in high-accommodation settings. Virtually no comparable studies have been done to quantify lake geometry and evolution. We make a first attempt to measure trends in floodplain lakes by examining four lake-rich fluvial sites where lakes were in early developmental stages.

The lakes in the study areas ranged widely in shape and area. Much of the variability stemmed from the tendency of large lakes to undergo partitioning into multiple smaller lakes as they became partitioned by avulsive small channels during filling, creating complex relationships between the lakes and small partitioning channels. Consequently the relationship between trunk channel/channel belt size and lake size was weak. These channels appear to be elongate (up to several kilometers) crevasse splay deltas - very few lobate splay deltas were observed, although they are described as such in the majority of ancient sediment studies.

Elongate splay delta channels appear to be the norm for the floodplains in this study and other modern high accommodation settings. It appears that the formation of elongate splay delta channels is largely dependent on a combination of hyperpycnal flow, relatively low energy lake setting, easily eroded lake bottom, seasonal changes in water level (climate) and vegetation. Modern examples from man-made reservoir lakes in North Texas illustrate this process. A geomorphic comparison is made between proposed end members of splay architecture, which range from crevasse splays to elongate splay delta channels as water level adjacent to the trunk channel increases.

These partitioning channels may form good conduits for petroleum between reservoir channel belts through floodplain lake complexes and would play an important role if the reservoir is self sourced. Interfluve lake areas may not thus model well as continuous seals.