Stratigraphy of the Central Platte River Sand Body Near Grand Island, NE Using Surface and Subsurface Geological and Geochronological Techniques

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This paper summarizes the first comprehensive stratigraphic investigation of the central Platte River sand body combining internal architecture, real-time morphological changes, and an understanding of its context within the ~ 50m thick Platte River incised valley fill. During the Holocene, the Platte River incised ~10m into the Pleistocene fill in a succession of migrating braided channel belts. The most recent of these belts has undergone changes in morphology due to variations in flow and vegetation cover. Channel morphology within the channel belts has been quantified using aerial photography, Soil-Survey data, and 7½ minute topographic maps. Ground-Penetrating Radar (GPR) data were used in conjunction with sequential aerial photographs to determine the internal architecture of the abundant, partially vegetated macroform bars. The chronology of these surfaces was determined using cross-cutting relationships and Optically Stimulated Luminescence dating techniques. The Holocene incised valley fill comprises two surfaces, labeled Qap2 and Qap1. The Qap2 channel belt is ~4 ka and somewhat reworked by the lower, late Holocene Qap1 surface comprising inactive and active systems divided into several anabranches. The relationships among the Qap1 and Qap2 channel belts may be useful in understanding the reservoir potential of similar incised valley fill deposits. Anthropogenic modification upstream of the central Platte River has led to a decrease in sediment load and discharge. This decrease, coupled with encroachment by the invasive reed Phragmites, has led to the establishment of mid-channel islands. Mid-channel islands, which fix secondary channels in place, give the stream an anastomosing character. Analysis of sequential aerial photographs associates the reflectors seen in the GPR transects of the islands with both barforms and channel bedforms. Therefore, the mid-channel islands comprise sections of abandoned and vegetated channel bedforms and barforms, rather than, as assumed by previous models, simply merged unit bars with laterally accreted surfaces. Vegetated mid-channel islands in the Central Platte River may be similar to macroforms found in other braided stream systems that have been affected by the encroachment of vegetation, thereby providing a valuable model to determine the nature of a potential reservoir.