

INTRODUCTION

On the basis of fieldwork and drilling completed in the fall of 1980, several zones of intertonguing between the Star Point Sandstone and the overlying Blackhawk Formation have been identified in the northern part of the Wasatch Plateau, Carbon County, Utah (sheet 1). As a result of this work, correlations of important coal beds have been revised.

The U.S. Geological Survey drilled a total of 12 holes in the area, from the west side of Pleasant Valley, near Slaughterhouse Canyon, to the eastern part of the Beaver Creek drainage (sheet 1) (Blanchard and others, 1976; U.S. Geological Survey, 1980). In addition, several detailed sections were measured from Spring Canyon near Price, Utah (sheet 1), to Slaughterhouse Canyon.

STRATIGRAPHY

The Star Point Sandstone is a regressive coastal sandstone complex that shows a transition upward from offshore subfacies muds through shoreface subfacies sands. The uppermost sandstone units have evolved an upper foreshore subfacies with rooted and bleached zones from subaerial exposure. These sandstone units probably represent accretion-ridge barrier sands formed of longshore drift from distributary mouth bar and channel point sources that were reworked by waves. The uppermost sandstone units are frequently cut by concave-upward, scour-and-fill sandstone lenses that are commonly vertically stacked at a single channel site (Marley and others, 1979, p. 33). The uppermost sandstone units are planar laminated, very fine grained to fine grained at the base, grading upward into coarser sand, with more massive bedding, gently dipping cross-laminations, and bidirectional crossbedding. Trace fossils are common near the bases of these units but are sparse near the top. The intervals separating the sandstone units contain interbedded shales and siltstones and very thin, fine-grained, burrowed sandstone except where the Blackhawk Formation intertongues with upper sandstone units of the Star Point Sandstone. The lowermost sandstone units are very fine grained to fine grained and planar laminated; they contain abundant *Ophiomorpha* and other trace fossils. The intervals separating the sandstones are very similar to those intervals of the upper part of the Star Point.

The Blackhawk Formation consists primarily of fine- to medium-grained sandstone, siltstone, mudstone, shale, and coal. Coal beds occur throughout the formation but thick, laterally continuous beds occur only in the lower 300 feet. According to Marley, Flores, and Cavaroc (1979, p. 30), the Blackhawk represents

the deltaic facies of an easterly prograding alluvial deltaic detrital wedge.

DESCRIPTION OF INTERTONGUING

The contact between the Star Point Sandstone and the Blackhawk Formation is marked by an abrupt change from the shoreline facies sandstones of the uppermost Star Point into the dark, carbonaceous siltstones, mudstones, and sandstones of the lower part of the Blackhawk (Marley and others, 1979, p. 35). Spieker (1931) considered this boundary to be a reliable, mappable surface over the entire Wasatch Plateau. However, others (Clark, 1928; and Flores and others, 1980) have shown that it is not a subplanar surface but is represented by zones of intertonguing between the two formations.

Clark (1928, p. 14-19) first recognized the intertonguing between the Star Point Sandstone and the underlying Mancos Shale and between the Star Point Sandstone and the overlying Blackhawk Formation in the western part of the Book Cliffs coal field, which abuts the Wasatch Plateau west of the town of Price, Utah.

According to Clark (1928, p. 17 and 18), there are three sandstone tongues of the Star Point Sandstone in the western Book Cliffs coal field: in ascending order, the Panther, Storrs, and Spring Canyon Tongues. The Aberdeen Sandstone, though not identified by Clark (1928) as a tongue of the Star Point, does rest upon and is joined with the Spring Canyon Member at Price. The Panther Tongue thins to the east and is eventually replaced by Mancos Shale; to the west, it is separated from the overlying Storrs Tongue by a tongue of Mancos Shale. Farther west, the Panther Tongue thickens and unites with the Storrs Tongue, which also thins and disappears to the east and thickens to the west. The Storrs Tongue is separated from the overlying Spring Canyon by a tongue of Mancos Shale. The Spring Canyon Tongue follows the same pattern as the Storrs and Panther Tongues. At Price, the Spring Canyon is directly overlain by the Aberdeen Member of the Blackhawk as defined by Spieker (1931). Present work suggests that Aberdeen Sandstone is actually a tongue of the Starpoint Sandstone. To the east, where the Spring Canyon thins and disappears, the Aberdeen Member rests on Mancos Shale. West of Price, the Spring Canyon is separated from the Aberdeen by a tongue of the Blackhawk Formation containing coal-bearing sediments. The Aberdeen Member, much like the Spring Canyon Tongue, also eventually intertongues with the Mancos Shale, and pinches out to the east and thickens to the west to a point where it joins the Spring Canyon Tongue. From there, it thins to a featheredge to the west where it eventually disappears in the Blackhawk Formation. Inspection of the Aberdeen has shown it to be identical in nature to the Spring Canyon Tongue of the Star Point Sandstone and probably deposited in

the same environment. Young (1955) recognized 13 littoral marine sandstone units in the Book Cliffs. The Kenilworth, Sunnyside, and other members behave much like the Aberdeen Member and the other members that lie below. Sheets 1-3 illustrate the relationships of the sandstone tongues with the Mancos Shale and the Blackhawk Formation.

Flores and others (1980) recognized similar intertonguing between the Star Point and the Blackhawk in the southern part of the Wasatch Plateau. South of the area of Flores and others (1980) I have identified three additional zones of intertonguing (unpublished data).

In the area between the west side of Pleasant Valley and North Gordon, at least four tongues of the Blackhawk Formation (and related tongues of the Star Point Sandstone) have been identified on the outcrop and on geophysical logs. Spieker (1931) assumed that the Aberdeen Member was continuous throughout the area and that it extended at least as far west as Pleasant Valley. Fieldwork in 1980 demonstrated that the Aberdeen thins to a featheredge and pinches out in the North Gordon area northwest of the old town of National, in the NW sec. 17, T. 13 S., R. 8 E. This has had a great effect on coal-bed correlation between Pleasant Valley, Gordon Creek, and Bob Wright Canyon.

The Spring Canyon Tongue appears to be continuous throughout the area. Several more tongues of the Star Point below the Spring Canyon Tongue were identified from characteristic geophysical log signatures and in outcrops in Bob Wright, Slaughterhouse, and Bordinghouse Canyons. Cross sections A-A' and E-E' illustrate these relationships.

COAL STRATIGRAPHY

Three widespread, economically important coal beds occur in this area; each is associated with and directly overlies a sandstone tongue of the Star Point Sandstone. In ascending order, they are the Lower O'Connor (local name), Hiawatha (Upper O'Connor - local name), and Castlegate A beds.

The Castlegate A bed directly overlies the Aberdeen Member except where the Aberdeen is missing. This bed has been traced from near Price to west of the old town of National (Spieker, 1931; and Clark, 1928) into the subsurface where it pinches out, about 2 mi. west of where the Aberdeen Member pinches out (cross section A-A').

From the Spring Canyon area, where it is probably part of the Spring Canyon coal group (Clark, 1928), the Hiawatha bed can be traced westward to the west

side of Pleasant Valley and appears to be continuous throughout the area. The Hiawatha bed everywhere lies directly on top of the Spring Canyon Tongue. In the Pleasant Valley area, the bed is known as the Upper O'Connor by local coal companies and is probably correlative with the Castlegate A bed of Spieker (1931) in the Pleasant Valley area (cross section A-A'). Spieker (1931) did not recognize the pinchout of the Aberdeen Member in the North Gordon area and because he had no subsurface information he continued the Castlegate A bed to Pleasant Valley, associating it with the stratigraphically highest bed underlain by a white, massive sandstone similar to the Aberdeen Member. The sandstone underlying Spieker's (1931) Castlegate A bed in Pleasant Valley is probably the Spring Canyon Tongue unless the Spring Canyon Tongue pinches out between the east and west sides of Pleasant Valley. The Spring Canyon Tongue probably thins to a featheredge and pinches out west of Pleasant Valley, but this could not be verified in the field.

The Lower O'Connor bed lies 85-135 ft below the top of the Spring Canyon Tongue, in a tongue of the Blackhawk Formation and directly above the third tongue (from the top) of the Star Point Sandstone (cross sections A-A' and E-E'). This bed is well developed on the west side of Pleasant Valley but thins rapidly in the direction of Beaver Creek, toward Bob Wright Canyon, and disappears where the Blackhawk tongue pinches out in the Star Point. A thin, local bed (Columbine) lies in a tongue of the Blackhawk Formation between the first and second tongues of the Star Point.

A lower bed is locally present below the Lower O'Connor bed, directly on top of the fifth (from the top) tongue of the Star Point and is locally known as the Flat Canyon bed (cross sections A-A' and B-B'). There may be additional beds present below the Flat Canyon bed in other tongues of the Blackhawk Formation but none of the holes were drilled deep enough to penetrate them.

Other locally thick beds are present in the area. In the North Gordon area, the Gordon bed (cross section C-C') is present between the Hiawatha and the Castlegate A beds. Above the Castlegate A bed are several local beds which Spieker (1931) assigned to the Bob Wright coal group.

Correlation of coal beds from the Bob Wright Canyon area to the North Gordon area was more difficult owing to lack of drill-hole and continuous outcrop data; however, several of Spieker's (1931) locations were revisited and recorelated (cross section C-C'). In the Bob Wright Canyon area, Spieker's Hiawatha bed is now correlated with the Lower O'Connor bed of the Pleasant Valley area and his

Castlegate A bed is probably correlative with the Hiawatha (Upper O'Connor) bed in the Gordon Creek area. The Bob Wright coal group in Bob Wright Canyon lies in the approximate stratigraphic position of the Castlegate A bed of the North Gordon area but is probably not continuous with that bed.

REFERENCES

Blanchard, L. F., Ellis, E. G., and Roberts, J. V., 1977, Lithologic and geophysical logs of holes drilled in the Wasatch Plateau Known Recoverable Coal Resource Area, Carbon, Emery, and Sevier Counties, Utah: U.S. Geological Survey Open-File Report 77-133, 324 p.

Clark, F. R., 1928, Economic geology of the Castlegate, Wellington, and Sunnyside quadrangles, Carbon County, Utah: U.S. Geological Survey Bulletin 793, 105 p.

Flores, R. M., Hayes, P. T., Marley, W. E., 3d, and Sanchez, J. D., 1980, Intertonguing between the Star Point Sandstone and the coal-bearing Blackhawk Formation requires revision of some coal-bed correlations in the southern Wasatch Plateau, Utah, in Shorter contributions to stratigraphy and structural geology, 1979: U.S. Geological Survey Professional Paper 1126-C, p. G1-G6.

Marley, W. E., 3d, Flores, R. M., and Cavaroc, V. V., 1979, Coal accumulation in Upper Cretaceous marginal deltaic environments of the Blackhawk Formation and Star Point Sandstone, Emery County, Utah: Utah Geology, v. 6, no. 2, p. 25-40.

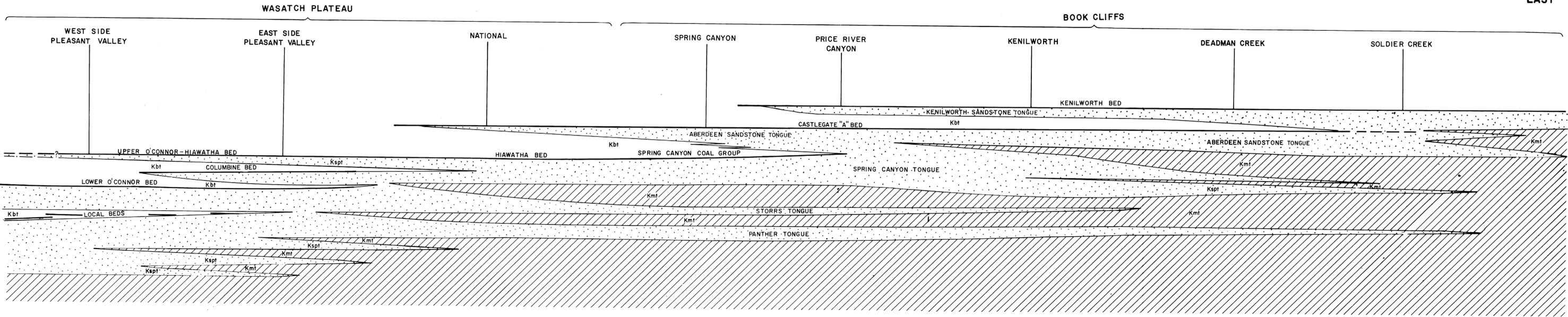
Spieker, E. M., 1931, The Wasatch Plateau coal field, Utah: U.S. Geological Survey Bulletin 819, 210 p.

U.S. Geological Survey, 1980, Drill holes UGC-1 through UGC-6 and SHC-1 and -2, T. 13 S., R. 7 E., SLM, Carbon County, Utah: Available only through Petroleum Information, Denver, Colorado.

Young, R. G., 1955, Sedimentary facies and intertonguing in the Upper Cretaceous of the Book Cliffs, Utah-Colorado: Geological Society of America Bulletin, v. 66, p. 177-201.

WEST

EAST



No vertical or horizontal scale

DIAGRAMMATIC CROSS SECTION

EXPLANATION

- Blackhawk Formation
- Star Point Sandstone
- Mancos Shale

- CASTLEGATE "A" MAJOR COAL BED**
- Kbt Tongue of Blackhawk Formation
- Kmt Tongue of Mancos Shale
- Kspt Tongue of Star Point Sandstone

Note: East half of cross section adapted from Clark (1928)

This report has not been edited for conformity with Geological Survey editorial standards or stratigraphic nomenclature.

NEWLY IDENTIFIED INTERTONGUING BETWEEN THE STAR POINT SANDSTONE AND THE BLACKHAWK FORMATION AND THE CORRELATION OF COAL BEDS
IN THE NORTHERN PART OF THE WASATCH PLATEAU, CARBON COUNTY, UTAH

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