REGIONAL CORRELATION OF THE CARBONACEOUS SHALE AND LIGNITE COAL DEPOSITS, LOWER LEBO MEMBER, FORT UNION FORMATION (PALEOCENE), SOUTHEASTERN MONTANA

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The Fort Union Formation is widespread in Montana, Wyoming, and North Dakota and is composed of only three members: the Tullock, the Lebo, and the Tongue River (Figure 1.). The 1988 study area was on the northeast side of the intersection where Montana Route # 12 crosses the Powder River, about 35 miles east of Miles City in southeastern Montana (Figures 2 and 3). Within the study area, all three members are exposed, although the base of the Tullock, which coincides roughly the Cretaceous-Tertiary boundary, is missing, as is the top of the Tongue River member.

The Lebo member is composed primarily of unconsolidated terrigenous fine-grained clastic sediments in a variety of alluvial depositional modes. The strata include gray, tan and yellow very-fine to fine-grained sands, silts, muds, carbonaceous shales, and lignite coals. The Tullock-Lebo contact is gradational; the base of the Lebo is usually taken at the base of the C coal (Luft et al., 1984). The upper Lebo contact with the Tongue River marks a transition from the Lebo smectite muds and thicker coals (1-3 meters), to a dominantly sandy sequence with thinner, discontinuous coals (0.1-1 meter), and sheet-like crevasse-splay lobe deposits (Belt, Sakimoto, and Rockwell, in press). The majority of the coals and carbonaceous shales in the Lebo member occur in the lower portion, in the C and D coal zones.

The object of this study is to determine: 1) the extent and characteristics of the coal and carbonaceous shale deposits, 2) if the deposits can be correlated regionally, and 3) the lateral relationships--if any--of the coals to the carbonaceous shales and other floodbasin deposits.

The badlands and butte topography of the field area combined with the unconsolidated (trenchable) nature of the sediments ensure nearly continuous vertical stratigraphic sections and good exposures for lateral tracing of beds. This greatly facilitates the correlational work.

The correlation of the coals and carbonaceous shales in the Lebo is a multi-step process: First, stratigraphic sections in the 1988 field area are correlated within their creek drainage basins by walking along the coal seams or zones from one section to another. The sections from different basins are correlated using distinctive marker beds, characteristic coal stratigraphic patterns, the Tullock-Lebo contact, and best-educated-guess methods (Figure 4). Next, the correlation is pushed south with data from the 1987 KECK field season, and tentatively east across the Powder River with data from both the 1987 KECK project and earlier studies (Figure 3).

The correlation of the creek drainage basins reveals the small scale variation and patterns in the coals and shales that seem to be echoed on a larger scale regionally. The D coal in the middle Lebo, and the C coal at the base (Collier and Smith, 1909) are actually coal zones composed of one to five coals and numerous carbonaceous shale beds. The D coals tend to be lenticular, and can usually be traced laterally to carbonaceous shales. In places, they are difficult to distinguish from the C coals, as the stratigraphic separation between the C and D coals approaches the separation between different benches in the C and D coals. The C coals are also lenticular and sometimes laterally traceable to carbonaceous shales, but the C coal zone is more continuous as a whole and at least one bench can be tentatively traced throughout the study area and beyond (Belt, Sakimoto, and Rockwell, in press) even though most individual seams within the zone may thin and disappear. The D coals are more likely to make a lateral transition to carbonaceous shale as a group. The larger scale correlations confirm the lenticular tendencies of the D coals zone and most of the C coal benches while reaffirming the probable presence of the C coal zone over the entire area correlated, and confirming the presence of the D coal zone either as a coal zone or a carbonaceous shale zone.

The observed lenticularity of some of the individual coal seams suggests smaller coal swamps than the continuous coal seams would. However, some of the longer correlations are questionable, and it is impossible to tell if any particular bench is continuous over the entire area or not until better coverage is obtained. My best-guess correlations indicate at least one continuous bench in the C coal zone for the entire field area. The abundance of the coals and carbonaceous shales in the C and D coal zones also suggests that coal swamps were very

widespread during deposition of the Lower Lebo, and more common in this area during deposition of the C and D coal zones than during deposition of the remainder of the Lebo Member.

References:

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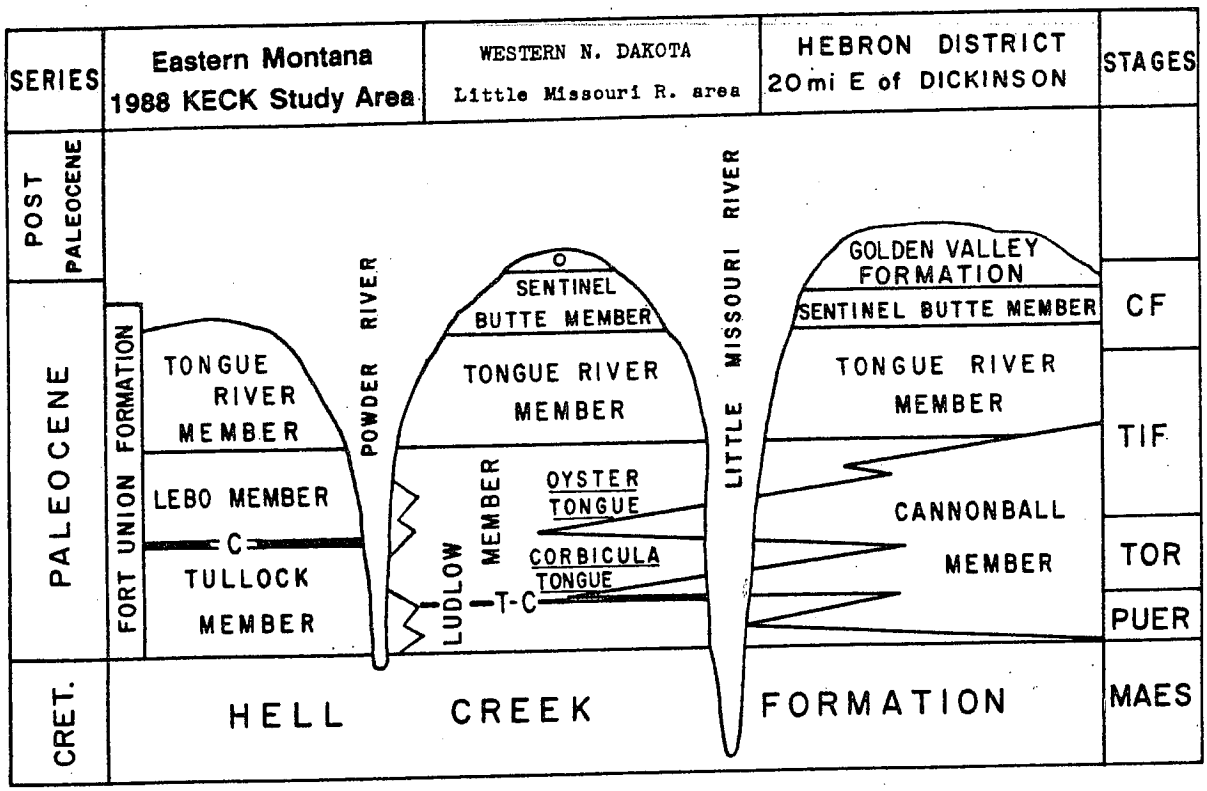

Figure 1 **Stratigraphic Placement of the Fort Union Formation**

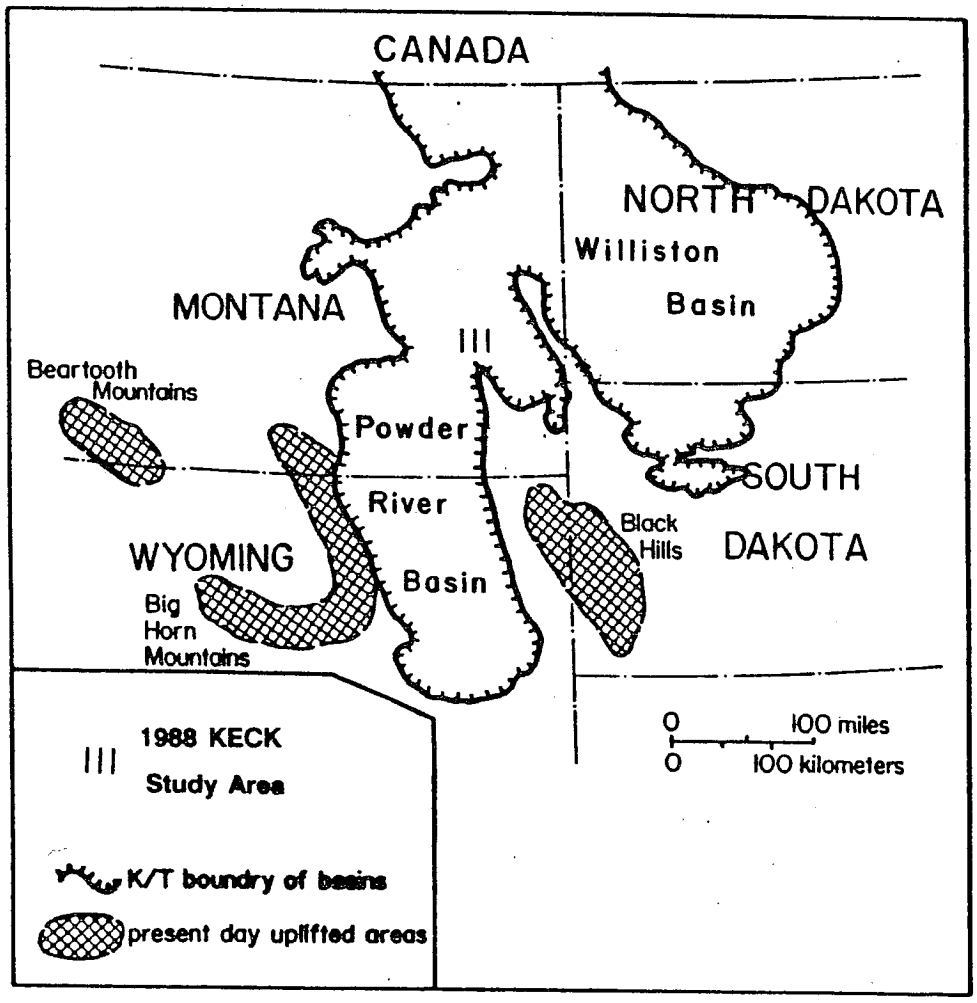

Figure 2

Location of the Study Area

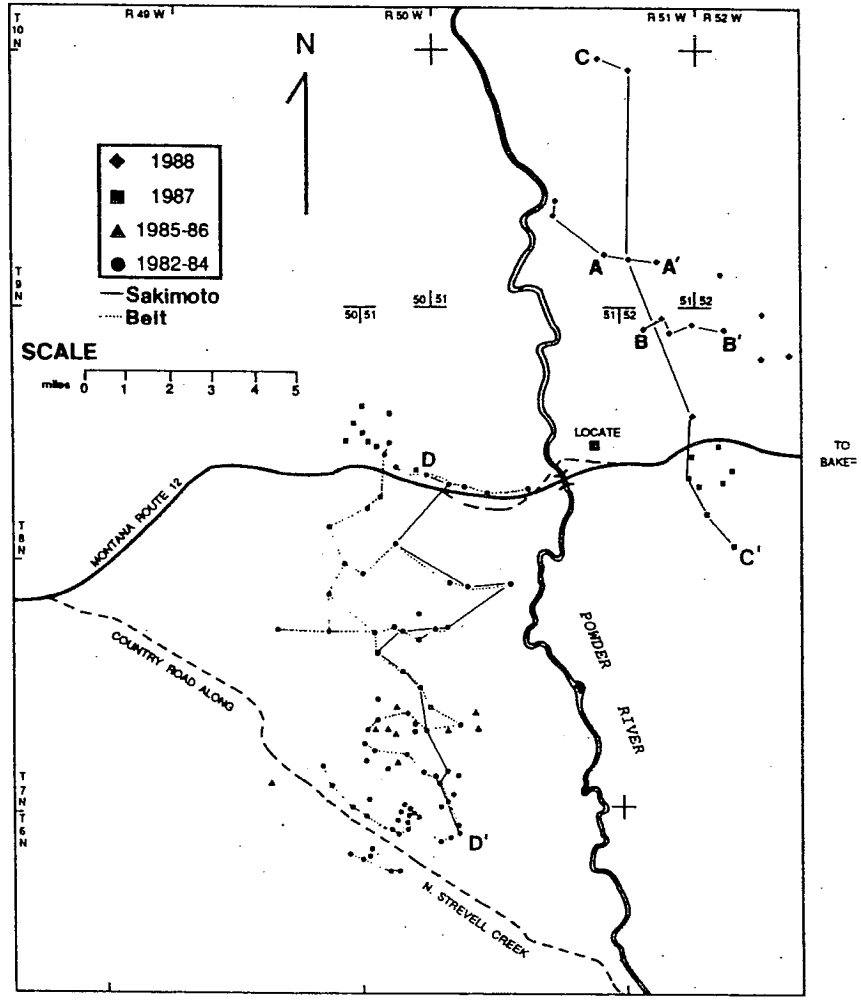

Figure 3

Location of Measured Sections and Cross Sections

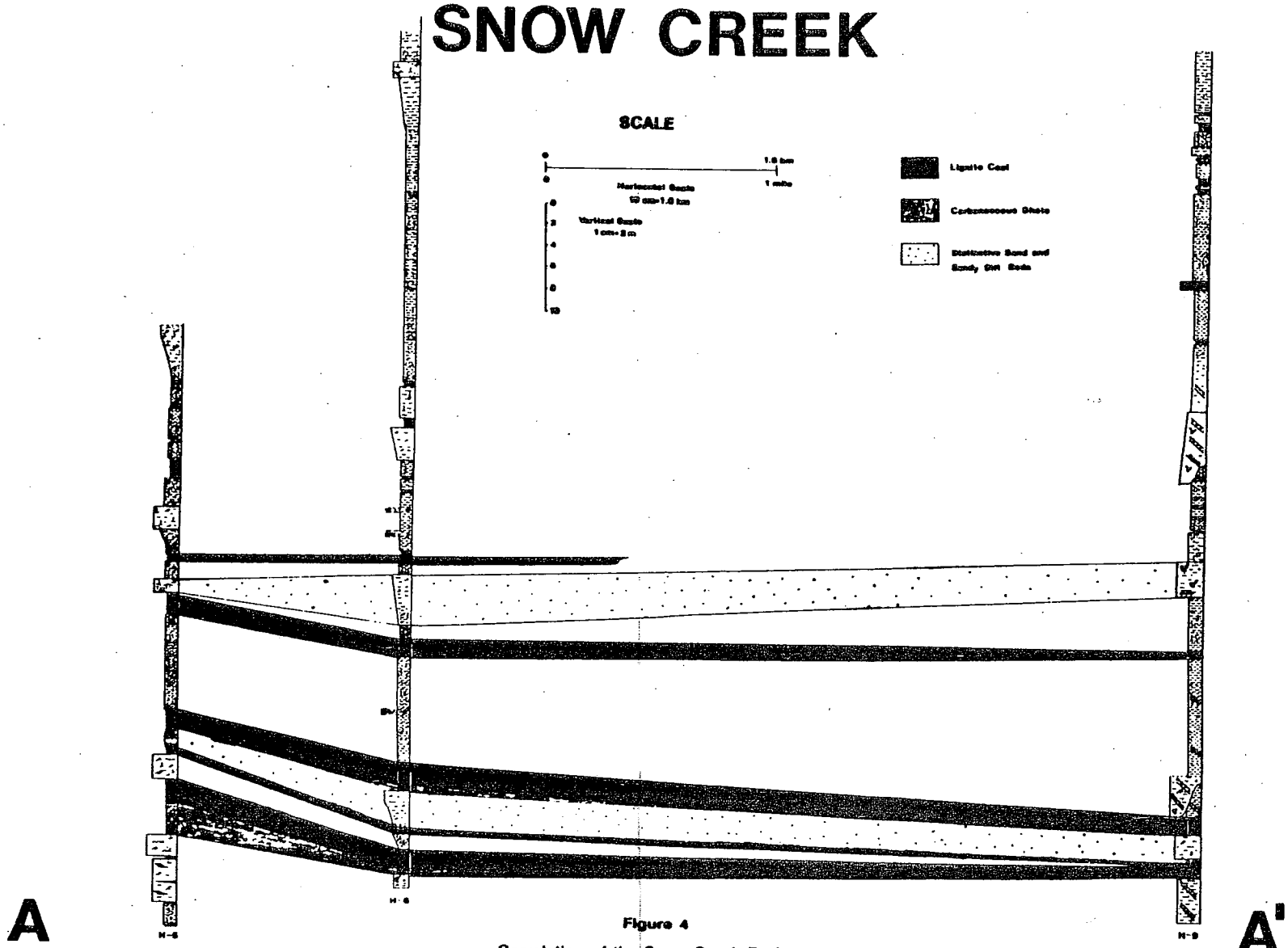

Figure 4

Correlation of the Snow Creek Drainage