

Recommended Revisions to Mid-Carboniferous Stratigraphy of the Big Snowy Trough, Central Montana, USA

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ABSTRACT

The Heath and Tyler Formations of central Montana have been the subject of much study and debate since the Tyler Formation was named in 1922 by Freeman and the Heath was named as the uppermost formation in the Big Snowy Group by Scott in 1935. Numerous workers in the 1950s and 1960s debated whether strata assigned to the Tyler are a mappable unit, the existence of an unconformity between beds assigned to the Tyler and the Heath, and the age of the Tyler. Paleontological studies of the Bear Gulch Limestone began in 1968 and clearly document that it is latest Mississippian in age, and therefore the underlying units, including the Lower Tyler (or Stonehouse Canyon Member of the Tyler), must also be late Mississippian in age. Studies that have focused on outcrops in the Big Snowy uplift typically regard strata known to most workers as Lower Tyler and Bear Gulch Limestone as the uppermost beds of the Heath Formation. However, regional stratigraphic correlations document a sequence boundary with more than 400 feet of relief between clastic-rich sedimentary strata of the Lower Tyler and marine strata of the Heath. The Lower Tyler is largely confined to incised valleys cut into the underlying Heath, so this erosional relief and much of the Lower Tyler are only locally present. This study proposes modifications to existing stratigraphic correlation charts for the Carboniferous in central Montana. The base of the Heath Formation/top of the Otter Formation should be re-defined as the top of a laterally persistent oolitic limestone bed that is regionally correlative in the subsurface and is mappable at the surface (Scott, 1935). The current definition of the top of the Otter as the “first green shale” is neither consistent nor mappable. The top of the Heath Formation and the top of the Big Snowy Group should be defined as the sequence boundary above which fine to coarse-grained sandstones are present. The clastic-bearing unit above the Heath, largely present in incised valleys, and the Bear Gulch Limestone are late Mississippian in age and should be included in the Tyler Formation. Further paleontological studies should be undertaken to better define the ages of strata between the lower Heath and the Bear Gulch Limestone. The overlying Cameron Creek Member (upper Tyler) is separated from the Bear Gulch by at least one sequence boundary. These strata are Morrowan (Pennsylvanian) in age and are most closely affiliated with the overlying Alaska Bench. Paleontological data from the dark gray shales and sandstones within the Upper Tyler incised valley fills is lacking, and these could be either latest Mississippian or early Pennsylvanian. If these strata are included in the Tyler Formation, the Mississippian-Pennsylvanian Boundary is within the Tyler. Additional studies are needed to determine the true stratigraphic affiliations of the “Becket Beds” and the “Surenough Beds”. New core data help subdivide internal strata within the Heath Formation. Past attempts at internal subdivision of the Heath have suffered from poor outcrops and limited core (lithological) control. Core to log calibrations and ensuing regional correlations allow informal definition, in ascending order, of the lower Heath, Van Dusen zone, Cox Ranch Oil Shale Interval (expanded from the original definition), Heath Carbonate unit (which has the Loco Ridge Gypsum bed at the top), a lowstand basin fill shale, carbonate, and gypsum unit, and the upper Heath. The Heath and Tyler Formations of central Montana have been the subject of much study and debate since the Tyler Formation was named in 1922 by Freeman and the Heath was named as the uppermost formation in the Big Snowy Group by Scott in 1935. Numerous workers in the 1950s and 1960s debated whether strata assigned to the Tyler are a mappable unit, the existence of an unconformity between beds assigned to the Tyler and the Heath, and the age of the Tyler. Paleontological studies of the Bear Gulch Limestone began in 1968 and

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