Follo, M. F., Conglomerates as clues to the sedimentary and tectonic evolution of a suspect terrane

APPENDIX: SEDIMENTARY AND STRATIGRAPHIC DESCRIPTIONS

Doyle Creek Conglomerates

The conglomerates usually occur in massive, tabular or lenticular beds ranging in thickness from 30 cm to 5 meters or more. Individual beds typically have sharp, erosional bases and are laterally continuous for 10 to 100 meters. They may be amalgamated to form conglomeratic intervals up to 40 meters thick, or occur as isolated beds within thick sequences of finer grained strata. Normal grading is locally present in the conglomerates, but stratification and clast imbrication are rare. Sorting is moderate to good, and clast supported fabrics are the most common. Interbedded fine grained units include sandstones, siltstones, and laminated mudstones. The sandstones and siltstones exhibit small-scale cross bedding, normal grading, and erosional bases marked by load casts, channel cut and fill, and flame structures. Doyle Creek lithofacies are arranged in several thinning-upward vertical sequences in the southern Wallowa Mountains. In contrast, an overall coarsening upward sequence is observed in the northern Wallowas.

Individual clasts within the Doyle Creek conglomerates are typically angular to sub-rounded and range from 2-20 cm in diameter. Isolated clasts as large as 1.5 meters are common. There is a general westward and southward decrease in grain size and bed thickness within conglomerates of the Doyle Creek Formation. Measurements of rare cross-bedding in Doyle Creek sandstones from the Wallowa Mountains suggest transport dominantly from the north and east (Follo, 1986). Prostka (1963) recognized a southward decrease in the thickness of the entire "Lower Sedimentary Series" in the Sparta quadrangle (southern Wallowas), but such a pattern could not be documented for the Doyle Creek Formation as a whole in other areas.

Eagle Creek Conglomerates

The conglomerates occur as poorly sorted, massive units which are either clast- or matrix-supported. Individual beds range from less than 0.5 meters to as much as 10 meters in thickness. Most appear to be laterally continuous, but the thickest beds are typically lens-shaped and discontinuous, suggesting erosional channeling. The Eagle Creek conglomerates are interbedded with very fine-grained limestones, calcareous shales, and carbonate grainstones. These finer grained sediments typically exhibit normal grading on scales from 1 cm to 1 meter and contain small slump folds which are consistently overturned to the south.

Limestone clasts in the Eagle Creek conglomerates are sub-rounded to rounded, and range from 1 cm to over 1 meter in diameter. Sutured pressure solution contacts between individual clasts are very common. Lithologic contrasts among clasts are best seen on weathered surfaces (Figure 7). On fresher surfaces, diagenetic and low-grade metamorphic recrystallization of carbonate clasts and matrix often obscures the textural differences between them. The clasts are almost exclusively derived from shallow water carbonate platform environments. Bioclastic and oolitic grainstones and packstones, typical of platform margin high-energy shoal facies, are the most abundant clast varieties (see Figure 5). Post-depositional silicification is common in the more permeable oolitic clasts. Plastically deformed rip-up clasts of fine-grained slope deposits are typically present in zones of inverse grading which characterize the lower parts of many of the conglomerate beds. Fragmental reefal material, including corals, calcareous sponges, tabulozoans, spongiomorphs, bivalves, echinoids, and crinoids, is locally abundant in the Eagle Creek conglomerates and suggests derivation from isolated patch reefs on the slope and/or shelf edge. One such buildup has been described from the Martin Bridge Limestone by Stanley and Senowbari-Daryan (1986).

Deadman Lake Breccia

The Deadman Lake unit is up to 100 meters thick and thins toward the south, where it is truncated by the Wallowa Batholith. The unit occurs approximately 300 meters above the top of the Martin Bridge Limestone, interbedded within an otherwise continuous sequence of argillites and calcareous shales of the Hurwal Formation. The megabreccia is predominantly massive, with an irregular base characterized by as much as 10 meters of erosional relief. Plastically deformed rip-up clasts up to several meters in diameter are randomly dispersed throughout the unit. Although no fossils have been identified from the matrix of the Deadman Lake breccia, Nolf (1966) described Norian fossils from the Hurwal beds conformably above and below the Deadman Lake unit, as well as from argillite blocks within the breccia.

Clasts as large as 40 meters thick by 200 meters long have been described from the Deadman Lake breccia (Nolf, 1966). Most of the larger blocks, however, are on the order of 10-25 meters in maximum dimension. Limestone clasts are bimodally distributed between small (<20 cm) well-rounded cobbles and larger, more angular blocks ranging from 1 meter to tens of meters in length. Intimately intermixed with the limestone clasts are argillite blocks of Norian age which are identical to underlying Hurwal lithologies. These are 20 cm to 10 meters in length and typically broken parallel to bedding. Some blocks, especially the smaller ones, have been subjected to intense plastic deformation and have wispy, indented, or diffuse margins, suggestive of erosion and transport in a semi-consolidated state. Others clasts are more massive, have well-defined planar boundaries, and appear to have acted as rigid blocks within a semifluid matrix.

Excelsior Gulch Conglomerates

Where exposed, it is typically the uppermost stratigraphic unit of the Hurwal Formation in the southern Wallowas. In the most complete stratigraphic section, the Excelsior Gulch unit overlies a 300 meter-thick sequence of fine-grained basinal Hurwal strata containing pelagic fossils and the trace fossil *Chondrites*. The conglomerate interval itself is approximately 80 meters thick and unconformably overlain by rocks of the Columbia River Basalt Group. Well-preserved bivalve and belemnoid fossils from calcareous siltstones interbedded with the conglomerate indicate an early Norian age for the unit (Follo, 1986).

The Excelsior Gulch unit is composed primarily of coarse, clast-supported conglomerates interbedded with very minor sandstones and siltstones. Conglomerate beds may be lenticular or laterally continuous, and range from 10 cm to several meters in thickness. The more massive conglomerate intervals are up to 10 meters thick and probably represent several amalgamated beds. Clasts within the conglomerate are subrounded to well-rounded, and range in size from 1 cm to over 1 meter in maximum diameter. There is an overall decrease in average clast size and bed thickness from south to north across the outcrop area in the southern Wallowas. This trend is accompanied by a northward increase in the degree of conglomerate organization (sorting, stratification, and imbrication) across the same area.

Coon Hollow Conglomerates

Individual conglomerate beds range from 25 cm up to 5 meters in thickness, and typically exhibit erosional basal contacts with the underlying shales and siltstones. Normal grading is characteristic of most beds, but clast stratification is uncommon. Paleocurrent indicators such as clast imbrication and cross-bedding are also extremely rare. Apart from the abrupt upward change from basal conglomerates and coarse sandstones to shales and siltstones in the lower part of the Coon Hollow Formation, no well-defined vertical stratigraphic sequences, such as large-scale coarsening- or thickening-upward cycles, could be discerned in the formation.

The conglomerates are moderately well sorted and may be either clast- or matrix-supported. The more common clast-supported fabric has minimal interstitial matrix and abundant pressure solution contacts between adjacent clasts. Individual clasts are very well rounded and range in size from less than 1 cm to as large as 30 cm. Clasts are predominantly radiolarian cherts (40-85%) with subordinate amounts of metasedimentary and felsic volcanic rocks, and rare vein quartz (Figure 5).

Fine-grained strata make up 80-90% of the total Coon Hollow stratigraphic sequence. Highly fractured mudstones and shales are interbedded with thin (1mm to 5cm) layers of siltstone and fine sandstone exhibiting erosional bases, graded bedding, and small-scale cross lamination.