Correlation of Permian and Pennsylvanian Sections Between Egan Range and Spring Mountains Nevada

By PATRICK J. BAROSH

CONTRIBUTIONS TO STRATIGRAPHY

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By PATRICK J. BAROSH

ABSTRACT

The Permian and Pennsylvanian parts of the Bird Spring Formation near Lee Canyon in the northern Spring Mountains, northwest of Las Vegas, can be correlated with the Ely Limestone, lower and coralline members of the Riepe Spring Limestone of Steele (1960), the Rib Hill Sandstone, and the lower member of the Arcturus Formation of the central Egan Range, near Ely, on the basis of similarities in lithology, sequence, and assigned age.

The thick Lee Canyon sequence is a key section in the correlation of the Permian and Pennsylvanian strata of east-central and southern Nevada.

INTRODUCTION

Thick and widespread Permian and Pennsylvanian strata occur in east-central and southern Nevada but are present only as small thin remnants in the intervening area. The Permian rocks undergo considerable facies change along an east-west trend in east-central Nevada and adjacent Utah (Barosh, 1964, 1965) and, at places, are difficult to correlate between adjacent ranges. Facies changes within the Pennsylvanian rocks are less severe. Facies changes occur along an east-west trend in southern Nevada also.

The lack of significant intervening Permian and Pennsylvanian strata between east-central and southern Nevada and the facies changes within these regions rendered correlations between these regions tenuous at best. The striking similarities between the Permian and Pennsylvanian section near Lee Canyon in the northern part of the Spring Mountains, northwest of Las Vegas, and the section in the central part of the Egan Range, near Ely, provide an opportunity to place the regional correlation on a much firmer basis (fig. 1).

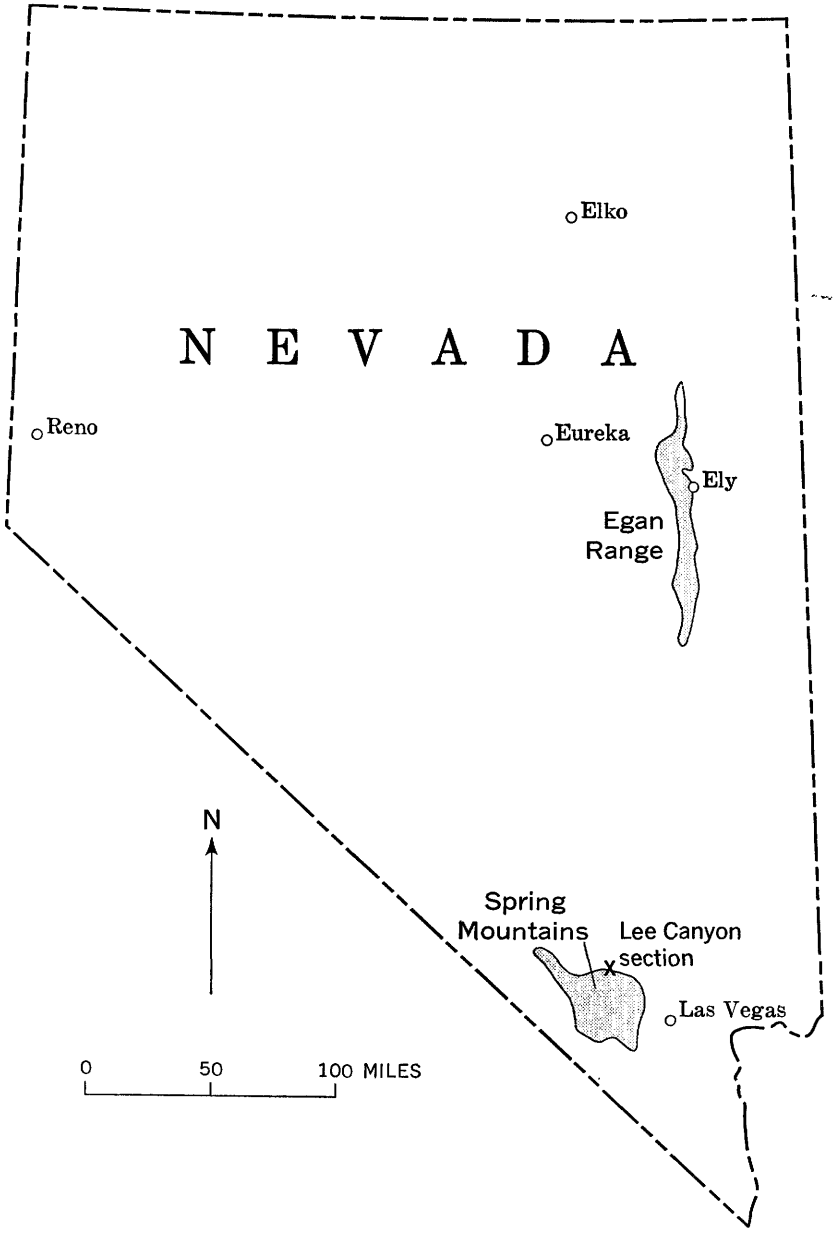

FIGURE 1.—Index map showing location of Egan Range and Spring Mountains, Nev.

EGAN RANGE

The Permian and Pennsylvanian section in the Egan Range begins with the Pennsylvanian Ely Limestone, a cherty limestone sequence. Permian strata overlie the Ely along a disconformity marked by a very thin chert-pebble conglomerate. The basal Permian formation is the Riepe Spring Limestone of Steele (1960). The Riepe Spring Limestone of the Egan Range is composed of (1) a lower member of limestone, limy dolomite, and a thin basal chert breccia that marks the Pennsylvanian-Permian unconformity; (2) a coralline member, which characterizes the formation; and (3) an upper member of cherty limestone (Barosh, 1964). The lower member thickens southward through the central Egan Range, whereas the upper member thins southward. The Riepe Spring is overlain by the Rib Hill Sandstone (Riepetown Sandstone of Steele, 1960), a buff to red calcareous siltstone with subordinate carbonate rocks. It underlies the Arcturus Formation, divisible into a lower member composed of alternating medium-bedded limestone and buff siltstone, and an upper member composed of alternating thin-bedded limestone and buff to red siltstone and minor gypsum. The Arcturus is succeeded by the Kaibab Limestone, a massive bioclastic limestone (Langenheim and others, 1960; Barosh, 1964).

SPRING MOUNTAINS

In the northern Spring Mountains, Permian and Pennsylvanian strata, in addition to some Mississippian rocks, form the Bird Spring Formation. Hewett (1931) briefly described the formation from exposures in the Bird Spring Range, south of the Spring Mountains, and Longwell and Dunbar (1936) later divided it into five members. The most complete and continuous section occurs near Lee Canyon and is more than 7,000 feet thick (Rich, 1959, 1961, 1963; Longwell and others, 1965). The formation consists of limestone and subordinate siltstone and some shale and sandstone at the base.

CORRELATION

The Bird Spring Formation was traversed near Lee Canyon along the line of section measured by Rich (1959, 1961, 1963), and the strata are here discussed in terms of units of his measured section. Rich apparently measured the section in pieces as his unit numbers are not in sequence. Rich's (1959, 1961) correlation of the Lee Canyon section with the unit numbers of Longwell and Dunbar (1936) is given as a reference.

The basal sequence of sandstone, limestone, and shale, units 2–9 (fig. 2), is Mississippian in age and correlates with the thicker Chainman Shale, which underlies the Pennsylvanian Ely Limestone in the

Egan Range (MacKenzie Gordon, Jr., and F. G. Poole, written commun., 1966; Webster and Lane, 1967; fig. 2). This sequence forms the lower part of the Indian Springs Member of Longwell and Dunbar (1936) or the Indian Springs Formation as restricted by Webster and Lane (1967).

The overlying limestone sequence, units 10–298, is similar to and correlates with the Ely Limestone in the Egan Range. The sequence contains the same types of cherty limestone and megafossils. *Chaetetes* and *Syringopora* biostromes occur sporadically in both sections, although *Syringopora* is more abundant in the Spring Mountains. This sequence corresponds to the upper part of the Indian Springs Member and all of member 2 of Longwell and Dunbar (Rich, 1959, p. 9, 12).

The cherty limestone sequence is succeeded by a less cherty sequence, units 136A–13A, which is capped by a coralline limestone unit, units 12A–2A. The coralline limestone is the same in appearance as the coralline member of the Riepe Spring Limestone in the Egan Range. Both this unit and the coralline member contain numerous *Lithostrotion*-type corals, commonly recrystallized. These two sequences correspond to member 3 of Longwell and Dunbar (Rich, 1959, p. 9, 12).

The thickness of the lower member equivalent represented in the Lee Canyon section is not precisely known; a sequence of cherty and noncherty limestone and silty limestone lies between the coralline member and the definite Ely-like lithology, but no distinct lithologic break was seen in the interval. No chert breccia such as is present along the contact in the Egan Range was found. The chert content of the limestone gradually decreases upward. The ledge-forming nature of several of the limestone units in the middle of the slope is more characteristic of the Ely than of the lower member, but below the ledges are some light- to medium-gray-weathering silty dolomitic limestone units, which are similar to some in the lower member.

Apparently strata in the lower part of the interval between the definite Ely-like rocks and the coralline member in the Spring Mountains are absent from the central Egan Range but are present, in part, in the southern Egan Range. Rich (1959, 1961) found Upper Pennsylvanian rocks and a transitional Pennsylvanian-Permian boundary in the Lee Canyon section. In the southern Egan Range, R. C. Douglass (in U.S. Geol. Survey, 1962, p. A42) studied Upper Pennsylvanian rocks below an unconformity, unlike the relations in the central Egan Range, where Wolfcamp rocks of the Riepe Spring disconformably overlie Middle Pennsylvanian strata of the Ely Limestone (fig. 2). The Upper Pennsylvanian rocks near Lee Canyon apparently form a transitional sequence between rocks equivalent to the Ely and the lower member of the Riepe Spring of the Egan

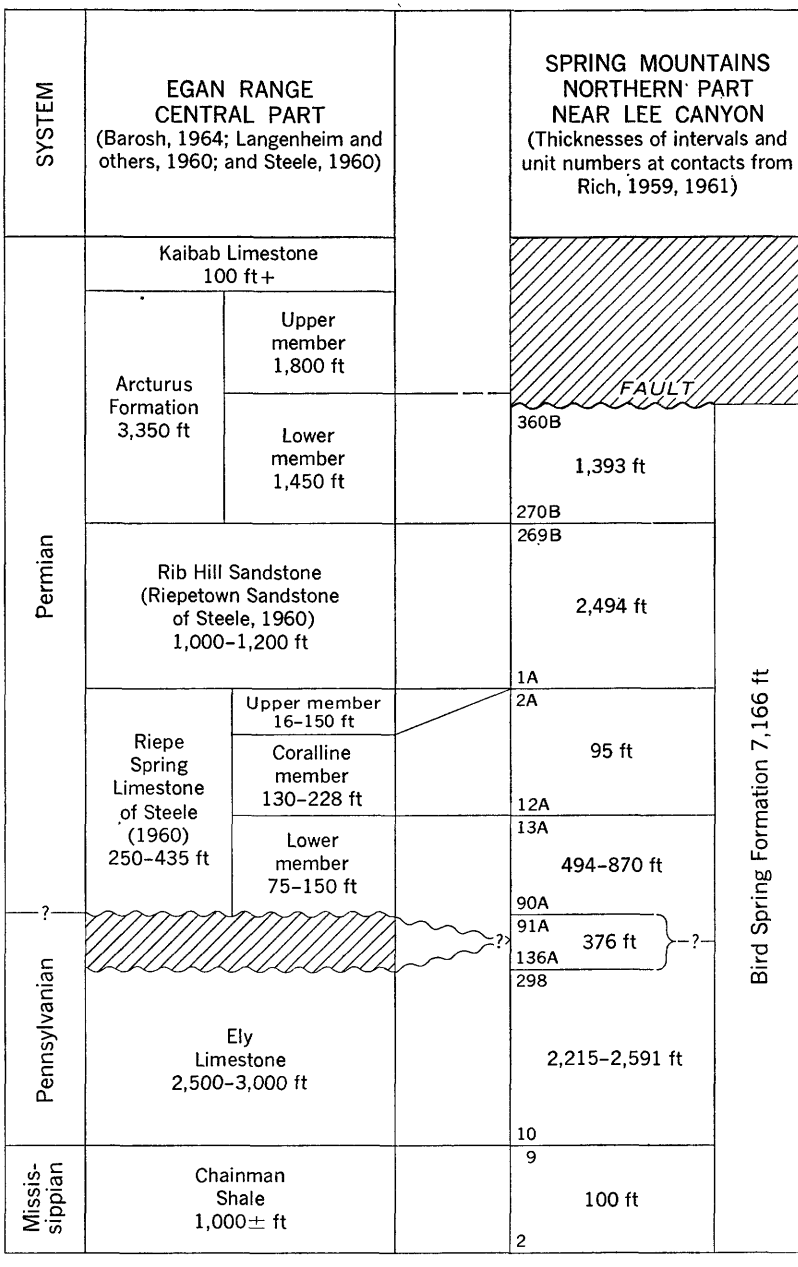

FIGURE 2.—Correlation of Permian and Pennsylvanian strata in the Egan Range and the Spring Mountains, Nev.

Range. The equivalent stratigraphic position of the unconformity would probably lie within the Upper Pennsylvanian rocks above the Ely-like lithology, that is, within the 376 feet of strata between units 298 and 90A. This makes the equivalent of the lower member of the Riepe Spring between 494 and 870 feet thick at Lee Canyon, which is much thicker than in the Egan Range. Correspondingly, the Ely equivalent would be between 2,215 and 2,591 feet thick (fig. 2). The equivalent of the upper member of the Riepe Spring was not seen near Lee Canyon and must be very thin or missing there.

Overlying the Riepe Spring equivalent at Lee Canyon is a thick sequence of buff calcareous siltstone, silty limestone and limestone, units 1A–269B, similar to the equivalent Rib Hill Sandstone in the Egan Range. This sequence corresponds approximately to member 4 of Longwell and Dunbar (Rich, 1959, p. 9, 12). The base of the sequence is buff rather than red, as it generally is in the Egan Range and the sequence as a whole has a greater lime content. The Rib Hill thickens southward through the central Egan Range (Barosh, 1964) and is considerably thicker in the Spring Mountains than in the Egan Range. Rich (1963, p. 1679) recognized the equivalency of the stratigraphic position of this part of the section to the Rib Hill (Riepetown Sandstone of Steele, 1960).

The Rib Hill equivalent is succeeded by a limestone sequence that continues to the top of the measured section, units 270B–360B, which is very similar to the lower member of the Arcturus Formation in the Egan Range. Unit 270B at the base of the Arcturus equivalent in the Lee Canyon section, forms a bluff capped by a zone of abundant fasciculate corals as it does in the central Egan Range. The lower member corresponds approximately to member 5 of Longwell and Dunbar (Rich, 1959, p. 12). The section is terminated at the top by faults and erosion (Rich, 1959, 1961, 1963) and apparently does not extend as high as the upper member of the Arcturus Formation.

COMPARATIVE AGES

A comparison of the indicated ages of the strata in the Spring Mountains (Rich, 1959, 1961; Christy, 1958) and the central Egan Range (Barosh, 1964; Langenheim and others, 1960; Wilson and Langenheim, 1962) agrees well with the lithologic correlations.

The Mississippian-Pennsylvanian boundary is approximately at the base of the Ely in both areas. The Pennsylvanian-Permian boundary differs in the two areas due to the lack of Upper Pennsylvanian rocks in the central Egan Range, but is consistent with the lithologic correlations. The Wolfcamp-Leonard boundary lies in the same general position in both areas. Near Lee Canyon it is considered to fall within 242 feet below and 237 feet above the base of

the Arcturus equivalent, between units 243B and 292B (Christy, 1958; Rich, 1959, 1961). In the Egan Range the boundary is considered to be within the lower member of the Arcturus, possibly as low as 130 feet above the base (Wilson and Langenheim, 1962; Barosh, 1964).

CONCLUSIONS

The Permian and Pennsylvanian strata of the Bird Spring Formation near Lee Canyon in the northern Spring Mountains can be correlated with the Ely Limestone, lower and coralline members of the Riepe Spring Limestone, the Rib Hill Sandstone and the lower member of the Arcturus Formation of the central Egan Range on the basis of similarities in lithology, sequence, and assigned age. The main differences in the stratigraphic units at Lee Canyon, the absence of the upper member, greatly increased thickness of lower member of the Riepe Spring Limestone, and probable absence of the disconformity are predictable from trends of changes in the Egan Range.

The well-studied Lee Canyon section could serve as a standard section in the correlation of the Permian and Pennsylvanian strata of east-central and southern Nevada if the other Permian and Pennsylvanian sections in southern Nevada are keyed to the Lee Canyon section.

Pennsylvanian and especially Permian sedimentation was apparently more uniform along the strike of facies in east-central and southern Nevada than has been previously described.

The Bird Spring Formation has been elevated to group status farther east by Langenheim, Carss, Kennerly, McCutcheon, and Waines (1962). If the Bird Spring is raised to group rank in the Spring Mountains, the stratigraphic terminology from the central Egan Range can be considered for the Permian and Pennsylvanian strata, and proliferation of formational names thus be avoided.

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