

Open-File Report 96-49

**Correlation Chart showing Suggested Revisions of
Uppermost Devonian through Permian Stratigraphy,
Pennsylvania**

by William E. Edmunds, P.G., Consulting Geologist

PENNSYLVANIA GEOLOGICAL SURVEY

FOURTH SERIES

HARRISBURG

1996

Material from this report may be published if credit is given to the
Pennsylvania Geological Survey

THIS REPORT HAS NOT BEEN REVIEWED
FOR CONFORMITY WITH THE EDITORIAL STANDARDS
OF THE PENNSYLVANIA GEOLOGICAL SURVEY

This is a preliminary report that reflects the geological ideas of the author, who has spent many years studying the uppermost Devonian to Permian rock sequence in Pennsylvania and nearby states. *The correlations and stratigraphic names of the chart do not necessarily conform to currently approved usage of the Pennsylvania Geological Survey.*

ADDITIONAL COPIES OF THIS REPORT MAY BE OBTAINED FROM
PENNSYLVANIA GEOLOGICAL SURVEY
3240 SCHOOLHOUSE ROAD
MIDDLETOWN, PA 17057-3534
717-702-2017

TABLE OF CONTENTS

General comments1

Specific comments2

 Pennsylvanian and Permian units2

 Mauch Chunk Formation3

 Pocono Formation and Waverly Group3

References6

CORRELATION CHART SHOWING SUGGESTED REVISIONS OF UPPERMOST DEVONIAN THROUGH PERMIAN STRATIGRAPHY, PENNSYLVANIA

WILLIAM E. EDMUNDS, P.G.
Consulting Geologist,
Harrisburg, PA 17102

General Comments

1. These suggested revisions of the correlations and nomenclature depicted on the *Stratigraphic Correlation Chart of Pennsylvania* (G 75) (Berg and others, 1993) deal only with the uppermost Devonian (upper Conowangoan) through Permian units. This includes the Pocono Formation and its marine equivalents, Mauch Chunk Formation, Pottsville Formation, Llewellyn Formation, Allegheny Formation, Conemaugh Group, Monongahela Formation, and Dunkard Group. The underlying Catskill, Venango, and Chagrin-Brallier Formations are revised only to the extent that they interface with the overlying units.
2. The columns and reference areas are the same as employed in G 75, except that the upper Paleozoic rocks of eastern Perry County (Area 8) are included in adjacent Area 9 rather than with the remote Broad Top sequence. The order of the columns has been rearranged as being more informative when dealing with just the upper Paleozoic. The width of the columns has been increased to accommodate more detail.
3. The absolute time scale has been altered to employ the dating of Hess and Lippolt (1986) for the Pennsylvanian and Roberts and others (1995) for the Mississippian and upper part of the Devonian. It is uniform throughout at 1 inch equals 4 million years. Using a uniform scale consumes more paper, but has the advantage of showing the various units in their true relative time proportions and tends to avoid the more improbable stratigraphic interpretations. A particularly egregious example of stratigraphic distortion in G 75 is the great relative compression of the Meramecian Stage, making it appear reasonable that the 300-foot Burgoon Sandstone Member and the 30- to 100-foot Loyalhanna Member can span most of the Osagean and all of the Meramecian. Expanding the Meramecian to its true proportion of almost twice the Osagean make it immediately doubtful that 400 feet of section is going to require 16 million years of continuous deposition.
4. Russian stage names and the letter-denominated subdivisions of the central European stages have been added.
5. The Devonian-Mississippian boundary has been raised as indicated in Harper (1993).
6. Area 10 is divided into subareas 10A and 10B corresponding to the area of the Southern and Middle Anthracite fields and the area of the Northern Anthracite field respectively. This reflects

the fact that, as far as the upper Paleozoic is concerned, the two areas are physically separate and geologically rather distinctive.

SPECIFIC COMMENTS

Pennsylvanian and Permian Units

1. There is no change in the Permian Dunkard Group. The indicated possibility that the uppermost Llewellyn Formation is Permian is questioned as there is no specific information as to that fact.
2. The Monongahela Group and Pittsburgh and Uniontown Formations are reduced to Monongahela Formation and Pittsburgh and Uniontown Members. The Uniontown coal which separates the Pittsburgh and Uniontown units is often obscure or missing and correlation between the Uniontown Basin and elsewhere is unclear. Further subdivisions of the Pittsburgh or Uniontown units can be dealt with as “beds” or other informal mechanisms.
3. The Conemaugh Group is unchanged.
4. The Pottsville Group of western Pennsylvania and the Allegheny Group are reduced to formations. Further subdivisions of the Allegheny and Pottsville, some of which have been treated as formations are reduced to members or “beds.” The reason for the reduction in rank is that the Pottsville and Allegheny as well as most subdivisions are based upon key beds which for the most part do not have regional continuity resulting in frequent forcing of boundaries by use of phantom horizons. The problem of separating the Pottsville and Allegheny at the Brookville coal is barely manageable, but carrying subordinate units as formations (the fundamental unit) produces many more unnecessary difficulties. Reducing subordinate units to members or beds allows flexibility according to the situation.
5. A number of prominent Pennsylvanian and Permian beds have been included, but others could be added as well.
6. The base of the Pottsville Formation in western and north-central Pennsylvania (Areas 1-7) has been generally raised somewhat. Using White (1904, p. 272, and 1912, p. 447) and some roundabout correlations from the West Virginia standard section, it appears that the Sharon coal and shales are probably late Morrowan age (see Edmunds, 1992, p. 229, for a more lengthy discussion of the problem). The Sharon-Olean coarse clastics are mostly somewhat older, and the Sharon-Olean fluvial system probably existed well back into middle Morrowan time if this was the channelway through which passed the middle Morrowan coarse clastics of the Lee and Crab Orchard Mountain Formations of Kentucky, West Virginia, and Tennessee. Where Connoquenessing sandstones form the base of the Pottsville, the oldest date is raised to latest Morrowan and early Atokan, although little is known about the age of the Connoquenessing except that it falls between Sharon and Mercer.
7. In north-central Pennsylvania (Areas 5 and 6) the Bloss coal bed is indicated to be equivalent to the Mercer coal complex and the Seymour coal to be equivalent to the Lower Kittanning coal

complex as indicated by Dodge (1995, Figure 11). The “unnamed” coal in Dodge’s figure is interpreted to be the Seymour. The Pottsville-Allegheny contact follows from Dodge’s conclusions.

8. A lateral stratigraphic break is shown across Area 6 consisting of a western Allegheny and western Pottsville sequence and an eastern Northern Anthracite field Pottsville (Sharp Mountain Member) sequence. The intention is to show the unresolved problem of how these two end members correlate across this interconnecting area.

9. In the Broad Top synclinorium (Area 8), the general positioning of the Conemaugh Group, Allegheny Formation, and Ames (?) marine zone is based mainly upon the Pennsylvania Geological Survey drill hole given in Edmunds and Glover (1986, p. 99). The position of the base of the Pottsville and the Roaring Run marine zone is from Edmunds (1992).

10. In Areas 9 and 10, the unconformity below the Sharp Mountain Member is based upon conclusions in Edmunds (1988). The strongly time-transgressive contact between the Tumbling Run and Schuylkill Members and the underlying Mauch Chunk of G75 is reduced to what I consider a more realistic level. The Campbells Ledge shale beds are added as part of the Sharp Mountain Member. The correlation of the Red Ash-Dunmore No. 3 coalbed with the Buck Mountain coal bed at the base of the Llewellyn is questioned, based upon White (1912, p. 441) who doubted the equivalency.

Mauch Chunk Formation

1. All aspects of the Mauch Chunk Formation, which includes the entire Meramecian and Chesterian Stages, about half of the Osagean Stage, and a small part of the Morrowan Stage, are extensively revised. The revisions are discussed in Edmunds (1993a), in greater length in Edmunds (1993b), and have been considerably corrected, expanded, and referenced in an unpublished revision of Edmunds (1993b).

2. The Mauch Chunk in Area 5 is so thin and poorly exposed that it is not certain that it is actually there. Fuller (1903) claims it is there and I have seen faint traces of reddish soil that suggest that it is.

Pocono Formation and Waverly Group

1. Allowing the progressive fragmentation and restriction of the Pocono Formation has been a mistake. The Pocono was originally and, regardless of numerous squabbles about details, remained until relatively recently a primary stratigraphic subdivision which included the dominantly non-red, nonmarine clastic sequence spanning the interval between the red Catskill and the red Mauch Chunk Formations. As such, it had wide applicability throughout eastern and central Pennsylvania and westward from there to its interface with its marine lateral equivalents. It was also used extensively in northern West Virginia. The Pocono continued to serve well until the lower part was broken out as the Spechty Kopf Member of the Catskill Formation (Trexler and others, 1962). This error was corrected by transferring the Spechty Kopf Member to the Pocono Formation in Dyson (1962), Faill and Wells (1974), and Hoskins (1976). A new

problem was created in Epstein and others (1974), followed by Sevon (1975) and Inners (1978), when the Spechty Kopf was broken out as a separate formation and the Pocono relegated to only the upper part of its original interval. Unfortunately, the stratigraphic and geographic restriction of the Pocono was widely extended when Berg and Edmunds (1979) created the Huntley Mountain Formation, introduced the Rockwell Formation from Maryland as a formation (both, more-or-less, laterally equivalent to each other and the Spechty Kopf) and raised the Burgoon Sandstone Member to formation rank. The changes were also introduced on the 1980 State Geologic Map. Thus, in one swoop, the term Pocono was eliminated from all but the eastern anthracite areas and the Broad Top synclinorium. The Pocono was reduced to only one of several formations making up the Pocono's original domain. The original, widely recognizable Pocono Formation was reduced to a Chinese puzzle, the parts of which an experienced specialist can usually separate, but which are not that strikingly different, especially along their vertical and lateral interfaces. Although the various units are fairly reasonable when considered individually and locally, they need to be incorporated under a single unit of superior rank in order to achieve collective cohesion and to reestablish the widespread unity of the original Pocono interval. For these reasons, I recommend that the Pocono be reinstated as a formation representing the dominantly non-red, non-marine clastic sequence between the Catskill and Mauch Chunk Formations. The Spechty Kopf, Rockwell, Huntley Mountain, and Burgoon should be reduced to members of the Pocono Formation along with the Beckville and Mt. Carbon. Alternately, it would be possible to raise the Pocono to group status although this would be less desirable since the fundamental definitions reside at the formation level and any unit raised to group level tends to be pushed into semi-retirement. It would also be preferable to have the Pocono established at the same level as the underlying Catskill and overlying Mauch Chunk. Although the Stratigraphic Code is clear in declaring that the formation is the "basic lithostratigraphic unit used in describing the geology of a region" and tends to leave the impression that the group is a sort of neutral stratigraphic bracket with no characteristics of its own except for those imparted by the included formations, the point is not unambiguous. The code does say that the group has a definition to the extent that it expresses the "natural relationships of associated formations." Perhaps more importantly, the group does not have to be completely filled out by formations, which implicitly seems to suggest that the group must have its own overriding characteristics. Since all of the sub-units of the Pocono do meet the general definition as being "dominantly non-red, nonmarine clastics," it is probably just barely tolerable to have the Pocono as a group.

2. I also think that is strongly desirable to have a collective term for the dominantly marine lateral equivalents of the non-marine Pocono in western Pennsylvania. Fortunately, the Ohio term "Waverly" fits the requirement almost exactly. The Waverly Group of Ohio (see Hyde, 1953) includes the section from the top of the Cleveland Shale to the unconformity below the Pottsville Formation, or the unconformity below the Maxville Limestone where that unit is present. This Ohio sequence is closely equivalent to the Pennsylvania section from the base of the Cussewago Sandstone through the marine facies of the Burgoon Member. Once the Venango and Catskill Formations appear to the east, the lower boundary of the Waverly Group can be dropped to include the Riceville and Oswayo as well. In addition to providing a useful collective term, the use of the term Waverly would distinctly aid in clearly delimiting the general marine-nonmarine lateral interface which is the western termination of the equivalent Pocono. The Waverly has been established as a group and its subdivisions as formations for so long that it is

probably futile to plan to have them otherwise (although it would really be better as a formation and members). Suggested usage and interface with the Pocono is shown in columns for Areas 1-7. As is always the case in transitional situations, problems will be encountered in separating the Waverly and Pocono, but none that we don't have already. Where appropriate, Waverly subdivisions can be carried across into the Pocono or its subdivisions .

3. The Cuyahoga Group is reduced to Cuyahoga Formation and its Orangeville, Sharpsville, and Meadville Formations reduced to members. This is a striking example of classification congestion.

4. The Shellhammer Hollow Formation as shown in Area 1 of G 75 is incorrect. The SHF is defined as extending from the top of the Cussewago Sandstone to the Bartholomew siltstone bed in the Orangeville Member of the Cuyahoga in the area(s) where the Berea and Corry Sandstones are absent. DeWitt and McGrew (1979, Plate 15A) also seem to extend the SHF to the top of the Riceville Shale if the Cussewago is also missing (if it can be separated from the Riceville without the Cussewago). The SHF is an artificial stratigraphic contrivance with elastic boundaries used to fill out the sequence when the conventional series of formations based upon alternating sandstones and shales breaks down where one of the sandstones pinches out. I didn't include it because it's too hard to include all the possibilities in the space available. (The SHF is also an example of the rule that the most minuscule units must have the most interminable names.)

5. Revisions of Area 3 are largely from Dodge (1995).

6. Areas 2, 4, and the western part of Area 7 are based upon correlations of Harper and Laughrey (1986 and 1989) and Harper (1989) and follows their stratigraphic nomenclature, except for the Venango-Catskill interface. The Catskill Formation is retained as far westward as it remains a persistent unified unit and maintains a reasonable thickness relative to the Venango Formation. The tongue of the upper part of the Venango which overrides the Catskill eastward can be incorporated into Oswayo-Riceville as the "upper tongue of the Venango Formation" with member status. Similarly, the tongue of the upper part of the Venango which underlies the Catskill to the east can be incorporated into the Chadakoin Formation as the "lower tongue of the Venango Formation" with member status. Once the Catskill Formation deteriorates into a tongue or tongues, clearly subordinate to the overall Venango Formation, it should be incorporated into the Venango Formation as "Catskill tongue(s)" with member status.

7. I'm not sure where the "unnamed marine sandstones and shales" facies of the Burgoon comes from in Areas 2 and 4. I recall that Tom Berg thought he had something of the sort along the Allegheny River in Armstrong County. To the extent these marine beds are real lateral equivalents, it can no longer be called Burgoon which is nonmarine. I expect that it would also be difficult to separate from the underlying Shenango Formation. This interval coupled with the underlying Shenango is about equivalent to Logan Formation of Ohio.

8. In Area 8, on the west side of the Broad Top synclinerium, the Pocono is clearly divisible into Burgoon and Rockwell. On the east side the situation seems less clear, possibly from lack of

Careful study, but possibly because Burgoon type sandstones are appearing lower in the section laterally equivalent to the Rockwell.

9. The Pocono sequence in Areas 9 and 10 is changed only slightly from G 75, except for reincorporation of the Spechty Kopf as a member.

10. The terminal age of the Pocono throughout the chart has been lowered from the end of the Osagean Stage to the middle. This makes it the same age as the terminal date established for the laterally equivalent marginal marine Price Formation in southern West Virginia.

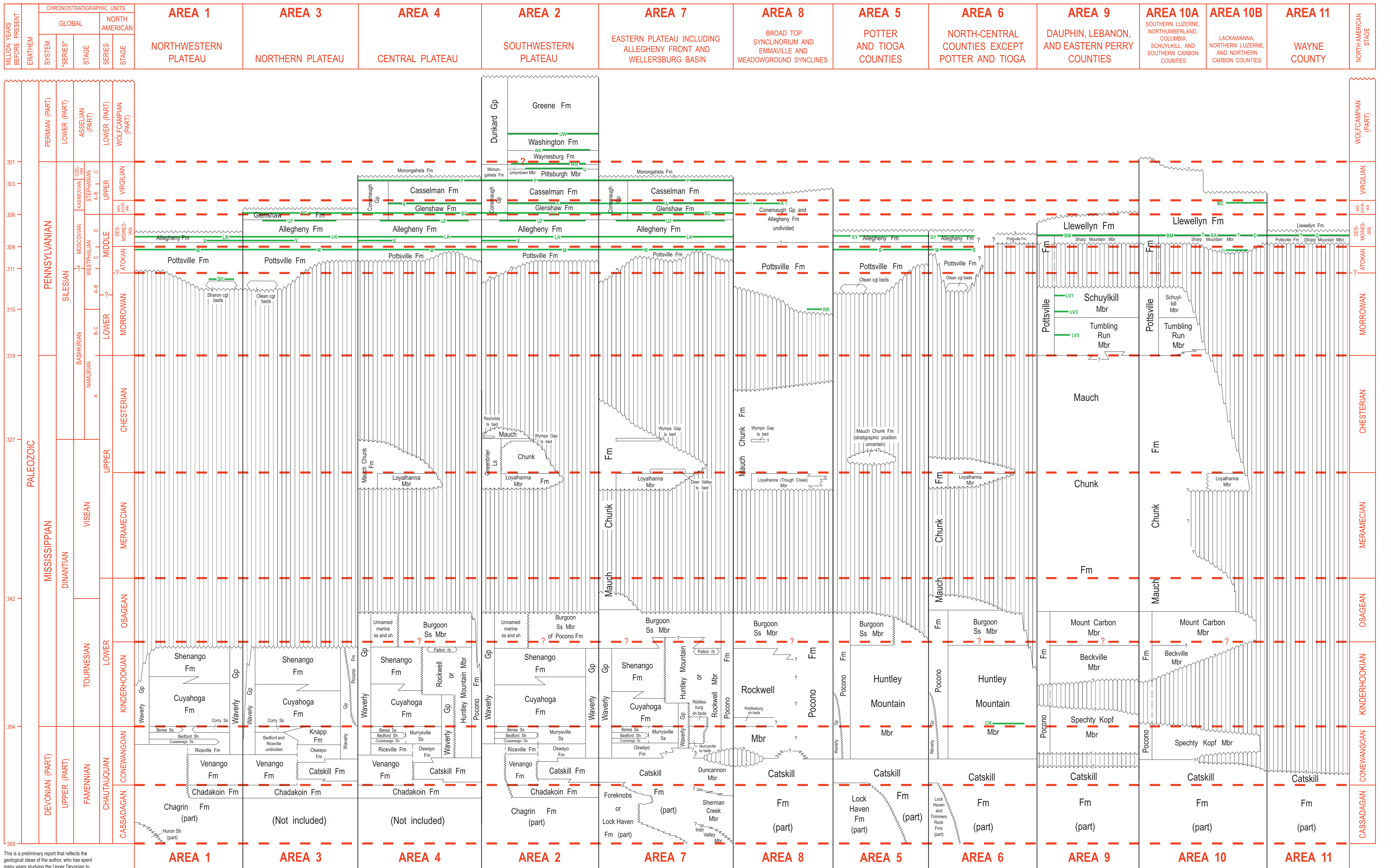
REFERENCES

- Berg, T. M. and Edmunds, W. E., 1979, The Huntley Mountain Formation: Catskill to Burgoon transition in north-central Pennsylvania: Pennsylvania Geological Survey, 4th ser., Information Circular 83, 80 p.
- Berg, T. M., McInerney, M. K., Way, J. H., and MacLachlan, D. B., 1993, Stratigraphic correlation chart of Pennsylvania (slightly revised): Pennsylvania Geological Survey, 4th ser., General Geology Report 75, 1 plate + addendum.
- DeWitt, Wallace, Jr., and McGrew, L. W., 1979, Appalachian basin region in Craig, L. C., and Conner, C. W., coordinator, Paleotectonic investigations of the Mississippian System in the United States: U.S. Geological Survey, Professional Paper 1010-C, p. C13-C48.
- Dodge, C. H., 1992, Bedrock lithostratigraphy of Warren County, Pennsylvania in Sevon, W. D., ed., Geology of the upper Allegheny River region in Warren County, northwestern Pennsylvania: Field Conference of Pennsylvania Geologists, 57th annual meeting, Guidebook, p. 1-20.
- Dodge, C. H., 1995, Little Pine Creek coal field, northwestern Lycoming County, Pennsylvania in Carnein, C. R., and Way, J. H., eds., Applied geology in the Lock Haven and Williamsport region, Clinton and Lycoming Counties, Pennsylvania: Field Conference of Pennsylvania Geologists, 60th annual meeting, Guidebook, p. 27-36.
- Dyson, J. L., 1967, Geology and mineral resources of the northern half of the New Bloomfield quadrangle: Pennsylvania Geological Survey, 4th ser., Atlas 137ab, 63 p. + plates.
- Edmunds, W. E., 1988, The Pottsville Formation of the anthracite area in Inners, J. D., ed., Bedrock and glacial geology of the North Branch Susquehanna lowland and the Eastern Middle Anthracite field, northeastern Pennsylvania: Field Conference of Pennsylvania Geologists, 53rd annual meeting, Guidebook, p. 40-50.
-, 1992, Early Pennsylvanian (middle Morrowan) marine transgression in south-central Pennsylvania: *Northeastern Geology*, v. 14, no. 2, p. 225-231.
-, 1993a, Regional aspects of the Mauch Chunk Formation: the hard luck delta revisited in Shaulis, J. R., and others, Geology of the southern Somerset County region, southwestern Pennsylvania, Field Conference of Pennsylvania Geologists, 58th annual meeting, Guidebook, p. 11-19.

-, 1993b, Stratigraphy—Mauch Chunk Formation and Depositional history and environments—The Mississippian Mauch Chunk delta in the central Appalachians in Eggleston, J. R. and others, Carboniferous geology of the Anthracite Fields of eastern Pennsylvania and New England: Geological Society of America, Field Trip No. 11, Guidebook, p. 3-10 and 21-27.
- Edmunds, W. E., and Glover, A. G., 1986, Broad Top coal field in Sevon, W. D., ed., Selected geology of Bedford and Huntingdon Counties: Field Conference of Pennsylvania Geologists, 51st annual meeting, Guidebook, p. 93-102.
- Epstein, J. B., Sevon, W. D., and Glaeser, J. D., 1974, Geology and mineral resources of the Lehigh and Palmyra quadrangles, Carbon and Northampton Counties, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Atlas 195cd, 460 p. + plates.
- Fail, R. T., and Wells, R. B., 1974, Geology and mineral resources of the Millerstown quadrangle, Perry, Juniata, and Snyder Counties: Pennsylvania Geological Survey, 4th ser., Atlas 136, 276 p. + plates.
- Fuller, M. L., 1903, Description of the Elkland and Tioga quadrangles, Pennsylvania: U.S. Geological Survey Folio No. 93, 9 p. + plates.
- Harland, W. B., Armstrong, R. L., Cox, A. V., Craig, L. E., Smith, A. G., and Smith, D. G., 1990, A geologic time scale, 1989: Cambridge University Press, Cambridge, 263 p.
- Harper, J. A., 1989, Subsurface stratigraphy in Harper, J. A., ed., Geology of the Laurel Highlands of southwestern Pennsylvania: Field Conference of Pennsylvania Geologists, 54th annual meeting, Guidebook, p. 23-34.
-, 1993, Giving the Mississippian/Devonian boundary a facelift: Pennsylvania Geology, v. 24, no. 3, p. 9-14.
- Harper, J. A., and Laughrey, C. D., 1987, Geology of the oil and gas fields of southwestern Pennsylvania: Pennsylvania Geological Survey, 4th ser., Mineral Resources Report 87, 166 p.
-, 1989, Upper Devonian and Lower Mississippian stratigraphy and depositional systems in Harper, J. A., ed., Geology of the Laurel Highlands of southwestern Pennsylvania: Field Conference of Pennsylvania Geologists, 54th annual meeting, guidebook, p. 35-62.
- Hess, J. C., and Lippolt, H. J., 1986, $^{40}\text{Ar}/^{39}\text{Ar}$ ages of tonstein and tuff sanidines: new calibration points for the improvement of upper Carboniferous time scales: Chemical Geology (Isotope Geoscience Section), v. 59, p. 143-154.
- Hoskins, D. M., 1976, Geology and mineral resources of the Millersburg 15-minute quadrangle, Dauphin, Juniata, Northumberland, and Snyder Counties, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Atlas 146, 38 p. + plates.
- Hyde, J. E., 1953, The Mississippian formations of central and southern Ohio: Ohio Geological Survey, Bulletin 51, 355 p.
- Inners, J. D., 1978, Geology and mineral resources of the Berwick quadrangle, Luzerne and Columbia Counties, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Atlas 174c, 34 p. + plates.

- Palmer, A. R., compiler, 1983, The Decade of North American Geology 1983 geologic time scale: *Geology*, v. 11, p. 503-504.
- Roberts, John, Claoue²-Long, J. C., and Jones, P. J., 1995, Australian Early Carboniferous time in *Geochronology, time scales, and global stratigraphic correlation*: SEPM (Society for Sedimentary Geology) Special Publication No. 54, p. 24-40.
- Sevon, W. D., 1969, The Pocono Formation in northeastern Pennsylvania: Field Conference of Pennsylvania Geologists, 34th annual meeting, Guidebook, 127 p.
- Sevon, W. D., 1975, Geology and mineral resources of the Hickory Run and Blakeslee quadrangles, Carbon and Northampton Counties, Pennsylvania: Pennsylvania Geological Survey, 4th ser., Atlas 194cd, 2 plates.
- Trexler, J. P., Wood, G. H., Jr., and Arndt, H. H., 1962, Uppermost Devonian and Lower Mississippian rocks of the western part of the Anthracite Region of eastern Pennsylvania: U.S. Geological Survey, Professional Paper 450-C, p. C36-C39.
- White, C. D., 1904, Deposition of the Appalachian Pottsville: *Geological Society of America Bulletin*, v. 15, p. 267-282.
- White, C. D., 1912, General features of the Pennsylvanian in the Appalachian province in Willis, Index to the stratigraphy of North America: U.S. Geological Survey, Professional Paper 71, p. 430-455.

CORRELATION CHART SHOWING SUGGESTED REVISIONS OF
UPPERMOST DEVONIAN THROUGH PERMIAN STRATIGRAPHY, PENNSYLVANIA
WILLIAM E. EDMUNDS, P. G.
1996



This is a preliminary report that reflects the geological ideas of the author, who has spent many years studying the Upper Devonian to Permian rock sequence in Pennsylvania and nearby states. The correlations and stratigraphic names of the chart do not necessarily conform to currently approved usage of the Pennsylvania Geological Survey.

This chart has not been reviewed for conformity with the editorial standards of the Pennsylvania Geological Survey.

Digital work by J. H. Dolopio.

UNIT ABBREVIATIONS

- Gp Group
- Fm Formation
- Mbr Member
- Cgl Conglomerate
- Ss Sandstone
- Sh Shale
- Ls Limestone
- Rb Red bed

ABBREVIATIONS FOR MISCELLANEOUS BEDS

- UW Upper Washington limestone
- WA Washington coal
- WB Waynesburg coal
- U Uniontown coal
- P Pittsburgh coal
- A Ames marine zone
- BC Brush Creek marine zone
- UF Upper Freeport coal
- LK Lower Kittanning coal complex
- SY Seymore coal
- V Vanport Limestone
- M Mercer coal complex
- B Bloss coal complex
- SH Sharon coal
- RR Roaring Run marine zone
- CR Cedar Run marine zone

SYMBOLS

- Unconformity
- Lateral facies boundary
- Boundary indicating variable vertical and lateral relationships
- Section missing by nondeposition and erosion