

TECHNICAL REPORT

NGMDB Cooperative Agreement G21AC10696

BUILDING A MODERN STRATIGRAPHIC FRAMEWORK FOR PENNSYLVANIA 2022-2023

Submitted by

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PROJECT: BUILDING A MODERN STRATIGRAPHIC FRAMEWORK FOR PENNSYLVANIA

Abstract

The U.S. National Cooperative Geologic Mapping Program awarded \$102,717.28 to the Pennsylvania Geological Survey under NGMDB Cooperative Agreement G21AC10696 for the purpose of developing a comprehensive stratigraphic framework for Pennsylvania. Modernizing the State's stratigraphic framework standardizes the usage of geologic names across the state and facilitates regional geologic mapping and compilation. It also provides a basis for opening dialogue with neighboring states over stratigraphic reconciliation.

The most recent comprehensive stratigraphic framework produced by the Pennsylvania Geological Survey was released 40 years ago with the publication of the Stratigraphic Correlation Chart of Pennsylvania (Berg and others, 1983). Since then, understanding of the stratigraphic framework of Pennsylvania has evolved and has been documented in a variety of maps and reports, but has not yet been consolidated into a cohesive document. This wide dispersal of information, at best, can hinder regional map compilation. At worst, it confuses our understanding of the geologic history and character of natural resource systems important to Pennsylvania's human and economic health. Through the use of Pennsylvania Geological Survey publications, U.S. Geologic Names Lexicon ("Geolex"), survey staff interviews, and input from subject matter experts via six stratigraphic forums, the initial stage of stratigraphic reconciliation and compilation for the state of Pennsylvania was completed.

The first step of this project involved an extensive literature review on all geologic units believed to exist within Pennsylvania state lines. Prior to the onset of this project, between 2013 and 2021, staff within the Pennsylvania Geological Survey compiled a list of these geologic units. See [PA_G21AC10696_PUBGUT.xlsx](#). This list was used throughout the literature review as a guide. The review was completed using Pennsylvania Geological Survey publications and Geolex. It revealed previous inconsistencies that had yet to be resolved and new inconsistencies that had not yet been discovered. Following an internal review of these discrepancies, feedback from the geologic community was sought. Through this continuous open discussion with professionals throughout the community, fostered by the survey's stratigraphic forum series, the inconsistencies in nomenclature and correlation across Pennsylvania were addressed. Questions with quick resolutions were recorded, and solutions for more challenging stratigraphic conflicts were obtained. Many questions require further investigation through field work and/or collaboration and research. As a result, the data obtained from this project may help guide future research at the survey and within the scientific community.

Summary of Activities

- The literature review and subsequent discussions on the inconsistencies uncovered occurred between March 2022 and March 2023.
- A list of all historic and modern geologic units within Pennsylvania was compiled prior to the beginning of this project by survey staff. This list totaled 1,399 units and was used as a guide during all stages of the process.

- Spreadsheets for all formal units within the initial list provided were created by staff geoscientist Hailey Filippelli. The sheets host information discovered during the literature review relating to each formal unit. See **PA_G21AC10696_ModStrat.zip**.
- Filippelli conducted an extensive literature review on all scanned Pennsylvania Geological Survey publications spanning back to the early 1900s. The list of PDFs totaled 2,399 publications. The documents were scanned by an optical character reader (OCR) by Filippelli, then populated into a search index in Adobe Acrobat Pro.
- Throughout the literature review, information on each unit was documented by Filippelli in the unit's corresponding spreadsheet. Conflicting information and inconsistencies were identified.
- After the completion of the literature review for a set of units, inconsistencies found were circulated by Filippelli throughout survey staff for possible answers and solutions. Remaining unanswered questions were condensed into a single spreadsheet.
- Geoscience manager, Alfred Guiseppe, and geoscience supervisor, Kristen Hand, along with the assistance of Filippelli, organized and hosted the Pennsylvania Geological Survey's stratigraphic forum series. This open series posed the questions remaining after the internal review to other professionals throughout the scientific community. The series consisted of six total forums, each centered around a different geologic age/group of ages. Structure of the forums included a review of the questions followed by open discussion.
- Filippelli noted comments made throughout each forum. Post forum summaries were compiled (Appendix 1). These summaries contain the questions and inconsistencies discussed and the resolutions agreed upon by the professional community and survey staff for each. Attendance records were kept for each forum (Appendix 2).

Summary of Results

- One result of this project was the creation of the forum summary sheets. These sheets contain detailed notes on the discussions held throughout the forum series, as well as the final consensus for each of the different geologic issues tackled. The consensus of the scientific community on these geologic issues typically fell within one of three different categories, although some fell into multiple.
 - Category 1: The first type of resolution was the "quick resolution". The types of questions that lend itself to this resolution were typically less complicated and tended to lie within better understood areas. These were questions that could be answered within the forum itself and did not require any additional work.
 - Category 2: The second type of consensus was "additional collaboration or research necessary." This category was generally associated with more complex questions. These were questions that could not be answered within the confines of the forum and would necessitate future collaboration. This future collaboration could include collaboration within the Pennsylvania Geological Survey, between the Pennsylvania Geological Survey and the USGS, between both private and public sectors, or between different agencies across state lines.

- Category 3: The final type of resolution was the “additional mapping required” category. Questions that fell into this resolution category were those that could potentially be answered through additional field work or mapping.
- Another byproduct of the extensive literature review was the creation of the unit spreadsheets. See **PA_G21AC10696_ModStrat.zip**. These spreadsheets contain all pertinent information found within the indexed resources for each geologic unit. The information found within these spreadsheets may include the following: publication name, year of publication, general location referenced, geologic unit name (as stated in the literature), geologic unit age, geologic unit description, and other significant information regarding the unit of interest, including inconsistencies, chronostratigraphic correlations, lithostratigraphic correlations, etc. The spreadsheets also contain reference information from the list of geologic units previously compiled by staff at the Pennsylvania Geological Survey. Finally, a summary section is included where, when possible, both a general description of the unit and its probable age or age range can be found. These sheets will continue to serve as important reference documents for future research.
- This project provided the opportunity to identify areas, both geographically and stratigraphically, in which knowledge is generally lacking. While quick resolutions were sometimes possible, many questions were more complex and will ultimately require additional research or field work. The ability to pinpoint the areas in which understanding is lacking will help to guide future research at the survey. The continuation of the modernization of Pennsylvania’s stratigraphic framework include pinpointing the area of the State, or the general location, in which each unit can be found (geographic extent) and continuing to work through the stratigraphic column into younger units, including unconsolidated deposits.
- The results of this project will provide the foundation on which to build a series of updated stratigraphic columns for regions of the state. The results of this study also provides a framework for the Pennsylvania Geological Survey plans to build an inventory of outcrop and subsurface core sections that will allow geologists to examine representative examples the formations in different regions.
- The nomenclature changes recommended as a result of this investigation will be formalized through publication of geological reports or documentation through Stratigraphic Notes. All nomenclature updates will be delivered to NGMDB for inclusion in Geolex.
- The information that comprises the new stratigraphic framework will be released to the public through Pennsylvania Geologic Data Exploration (PaGEODE) website.

References

Berg, T. M., McInerney, M. K., Way, J. H., and MacLachlan, D. B., 1983, Stratigraphic Correlation Chart of Pennsylvania: Pennsylvania Geological Survey, 4th ser., General Geology Report 75