

## Associated Thematic Data for the Geologic Map of Puerto Rico

By

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The geologic map of Puerto Rico for this study consists of a main island and the three largest surrounding islands of Isla de Vieques, Isla de Culebra, and Isla Mona.

The geologic map of the Commonwealth of Puerto Rico ( west; central; east ) is based upon a compilation by R.D. Krushensky at 1:100,000 scale of sixty-seven geologic quadrangles, sixty-two of which were mapped at a scale of 1:20,000 (fig. 1). Compilation of the geologic map for the main island of Puerto Rico was initiated in order to produce a more recent and useful geologic map to be used by both government and industry. Because of the length of time over which these geologic quadrangles were mapped and the large number of individuals involved in the mapping, reinterpretation of the original data for some quadrangles was necessary to resolve map-edge inconsistencies, which became apparent in this compilation. Table 1 lists the quadrangle name, mapper, scale, and date of publication for each of the quadrangles. The geologic maps for the above-mentioned three surrounding islands are not included in the 1:100,000 scale compilation, but reflect the general geologic features as presented in Cox and Briggs, 1973.

The geologic map used in this study of the mineral resources of Puerto Rico is presented at a scale of 1:100,000. This geologic map (west; central; east ) consists of 151 map units for the main island, descriptions of which can be found on in Appendix A. These map units descriptions are listed in alphabetical order by map unit mnemonic.

The geologic legend is presented in several different formats. The basic legend has map units grouped into twelve terranes based upon lithologic rock type, depositional environment, and(or) age of deposition. These terranes were designed with consideration of how the mineral resource assessment would be conducted and what logical groupings made the most sense in Puerto Rico. Colors and patterns are combined to have each map unit

unique, with patterns used to distinguish discrete columns of map units in the legend, and colors are used to differentiate map units within columns. For example, all nonvolcaniclastic map units of Pliocene through Oligocene age are overprinted with black vertical lines, and all nonvolcaniclastic map units which are Eocene through Cretaceous in age have blue vertical lines. The Stratigraphic Correlation Chart is another format of the map units. The correlation chart is designed to show which map units are in contact and which map units in different parts of the island were forming at the same time. The basic legend is displayed with terrane colors to show what map units are included in each terrane. The stratigraphic correlation chart is displayed with terrane colors to show how each terrane is distributed through time.

The 1:100,000 scale geologic map as represented in this study was optically scanned on a drum scanner and transformed into a digital map coverage. Each closed map area (polygon) was identified and tagged with the appropriate map unit attributes of mnemonic (which includes formation name and age), polygon color, polygon pattern and geologic terrane. The purpose in creating this digital map was to enable the combination, analysis and manipulation of other digital thematic data (geochemistry, geophysics) relevant to the mineral resource assessment, and to provide a useful product to an ever-growing Geographic Information System (GIS) community.

The digital geologic map of Puerto Rico allows for the analysis and manipulation of information which is impossible with hard copy (paper). Maps can be reproduced at varying scales and at different projections without a great deal of difficulty. Derivative maps can also be produced by combining map units (i.e., all intrusive map units), or selecting only combinations of map units for which there is an interest. An example of the statistics which can be generated from digital maps can be found in table 1 of the geologic terrane section, this report.

Table 1. List of 1:20,000 scale geologic maps.

Quadrangle name	Reference
Adjuntas	Mattson, P.H., 1968, Geologic map of the Adjuntas Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-519, scale 1:20,000.
Aguadilla	Monroe, W.H., 1969a, Geologic map of the Aguadilla Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigation Map I-569, scale 1:20,000.
Aguas Buenas	Pease, M.H., Jr., 1968b, Geologic map of the Aguas Buenas Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-479, scale 1:20,000.
Arecibo	Briggs, R.P., 1968c, Geologic map of the Arecibo Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-551, Scale 1:20,000.
Barceloneta	Briggs, R.P., 1965, Geologic map of the Barceloneta Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-421, scale 1:20,000.
Barranquitas	Briggs, R.P., and Gelabert, P.A., 1962, Preliminary report of the geology of the Barranquitas Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-336, scale 1:20,000, 2 sheets.
Bayamon	Monroe, W.H., and Pease, M.H., 1962, Preliminary geologic map of the Bayamon Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-347, scale 1:20,000.

- Monroe, W.H., 1973, Geologic map of the Bayamon Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-751, scale 1:20,000.
- Bayaney Nelson, A.E., and Tobisch, Q.T., 1968, Geologic map of the Bayaney quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-525, scale 1:20,000.
- Cabo Rojo Volckmann, R.P., 1984a, Geologic map of the Cabo Rojo-Parguera Quadrangle, southwest Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1557, scale 1:20,000.
- Caguas Rogers, C.L., 1979, Geologic map of the Caguas Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1152, scale 1:20,000.
- Camuy Monroe, W.H., 1963b, Geology of the Camuy Quadrangle, Puerto Rico: U.S. Geological Survey Geologic Quadrangle GQ-197, scale 1:20,000.
- Carolina Monroe, W.H., 1977, Geologic map of the Carolina quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1054, scale 1:20,000.
- Cayey Berryhill, H.L., and Glover, Lynn, 1960, Geology of the Cayey Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-319, scale 1:20,000.
- Cayo Icacos Briggs, R.P., and Aguilar-Cortes, E., 1980, Geologic map of the Fajardo and Cayo Icacos Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1153, scale 1:20,000.

- Central Aguirre Berryhill, H.L., Jr., 1960, Geology of the Central Aguirre Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-318, scale 1:20,000.
- Central La Plata McIntyre, D.H., 1971, Geologic map of the Central La Plata Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-660, scale 1:20,000.
- Ciales Berryhill, H.L., Jr., 1965, Geology of the Ciales quadrangle, Puerto Rico: U.S. Geological Survey Bulletin 1184, scale 1:20,000.
- Coamo Glover, III, Lynn, 1961a, Preliminary report on the geology of the Coamo Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-335, scale 1:20,000.
- Comerio Pease, M.H., and Briggs, R.P., 1960, Geology of the Comerio Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-320, scale 1:20,000.
- Corozal Nelson, A.E., 1967a, Geologic Map of the Corozal Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-473, scale 1:20,000.
- El Yunque Seiders, V.M., 1971a, Geologic map of the El Yunque quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-658.
- Fajardo Briggs, R.P., and Aguilar-Cortes, E., 1980, Geologic map of the Fajardo and Cayo Icacos Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1153, scale 1:20,000.
- Guanica Monroe, W.H., 1972, Geology of the middle Tertiary rock in the Ponce-Guanica area, Puerto Rico: U.S. Geological Survey Open-File Report Series no. 1712.

- Florida Nelson, A.E., and Monroe, W.H., 1966, Geology of the Florida quadrangle, Puerto Rico: U.S. Geological Survey Bulletin 1221-C, scale 1:20,000.
- Guayama Glover, Lynn, 1982, Preliminary geologic map of the Patillas and Guayama Quadrangles, Puerto Rico: U.S. Geological Survey Open-File Report 82-1097, scale 1:20,000.
- Gurabo Seiders, V.M., 1971c, Geologic map of the Gurabo Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-657, scale 1:20,000.
- Humacao M'Gonigle, J.W., 1978a, Geologic map of the Humacao Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1070, scale 1:20,000.
- Isabela Monroe, W.H., 1969b, Geologic map of the Moca and Isabela Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-565, scale 1:20,000.
- Isla de Mona Briggs, R.P., and Seiders, V.M., 1972, Geologic map of the Isla de Mona Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-718, 1 sheet, scale 1:20,000.
- Isla Descheo Seiders, V.M., Briggs, R.P., and Gover, L., III, 1972, Geology of Isla Descheo, Puerto Rico, with notes on the great southern Puerto Rico fault zone and quaternary stillstands of the sea: U.S. Geological Survey Professional Paper 739, Washington, D.C., scale 1:9,500.
- Jayaya Mattson, P.H., 1986b, Geologic map of the Jayaya quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-520.

- Juncos Broedal, C.H., 1961, Preliminary geologic map showing iron and copper prospects in the Juncos Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-326, scale 1:20,000.
- Manati Monroe, W.H., 1971, Geology of the Manati Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-671, scale 1:20,000.
- Maricao McIntyre, D.H., 1976, Geologic map of the Maricao quadrangle, western Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-918, scale 1:20,000.
- Mayaguez Curet, A.F., 1986, Geologic map of the Mayaguez and Rosario Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1657, scale 1:20,000.
- Moca Monroe, W.H., 1969b, Geologic map of the Moca and Isabela Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-565, scale 1:20,000.
- Monte Guilarte Krushensky, R.D., and Curet, A.F., 1984, Geologic map of the Monte Guilarte quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1556, scale 1:20,000.
- Naguabo M'Gonigle, J.W., 1979, Geologic map of the Naguabo and part of the Punta Puerca Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1099, scale 1:20,000.
- Naranjito Pease, M.H., 1968c, Geologic map of the Naranjito Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-508, scale 1:20,000.
- Orocovis Briggs, R.P., 1971a, Geologic map of the Orocovis Quadrangle, Puerto Rico: U.S. Geological Survey

- Miscellaneous Investigations Map I-615, 1 sheet, scale 1:20,000.
- Parguera Volckman, R.P., 1984a, Geologic map of the Cabo Rojo-Paguera quadrangles, southwest Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1557, scale 1:20,000.
- Patillas Glover, Lynn, 1982, Preliminary geologic map of the Patillas and Guayama Quadrangles, Puerto Rico: U.S. Geological Survey Open-File Report 82-1097, scale 1:20,000.
- Peñuelas Krushensky, R.D., and Monroe, W.H., 1978, Geologic map of the Peñuelas and Punta Cuchara Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1042, scale 1:20,000.
- Playa de Ponce Glover, L., Pease, M.H., and Arnow, T., 1977, Surficial geologic map of the Playa de Ponce and Santa Isabel Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Field Studies Map MF-886, scale 1:20,000.
- Ponce Krushensky, R.D., and Monroe, W.H., 1975, Geologic map of the Ponce Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-863, scale 1:20,000.
- Puerto Real Volckmann, R.P., 1984b, Geologic map of the Puerto Real Quadrangle, southwest Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-559, scale 1:20,000.
- Punta Cuchara Krushensky, R.D., and Monroe, W.H., 1978, Geologic map of the Peñuelas and Punta Cuchara Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1042, scale 1:20,000.



- Punta Guayanes Rogers, C.L., 1977, Geologic map of the Punta Guayanes Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-998, scale 1:20,000.
- Punta Puerca M'Gonigle, J.W., 1979, Geologic map of the Naguabo and part of the Punta Puerca Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1099, scale 1:20,000.
- Punta Tuna Rogers, C.L., Cram, C.M., Pease, M.H., and Tischler, M.S., 1979, Geologic map of the Yabucoa and Punta Tuna Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1086, scale 1:20,000.
- Punta Verraco Krushensky, R.D., and Monroe, W.H., 1979, Geologic map of the Yauco and Punta Verraco Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1147, scale 1:20,000.
- Quebradillas Monroe, W.H., 1967a, Geologic map of the Quebradillas Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-498, scale 1:20,000.
- Rio Descalabrado Glover, Lynn, III, and Matson, P.H., 1973, Geologic map of the Rio Descalabrado Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-735, scale 1:20,000.
- Rincon Aaron, J.M., 1968, Geology of the Rincon Quadrangle, a preliminary report: Washington, D.C., U.S. Geological Survey
- Rio Grande Pease, M.H., 1972, Geologic map of the Rio Grande quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-733, scale 1:20,000.
- Rosario Curet, A.F., 1986, Geologic map of the Mayaguez and Rosario Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1657, scale 1:20,000.

Salinas Glover, Lynn, III, 1961b, Preliminary geologic map of the Salinas Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-337, scale 1:20,000.

Sabana Grande Krushensky, R.D., Unpublished data

San German Volckmann, R.P., 1984c, Geologic map of the San German Quadrangle, southwest Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-558, scale 1:20,000.

San Juan Pease, M.H., and Monroe, W.H., 1977, Geologic map of the San Juan Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1010, scale 1:20,000.

San Sebastian Tobisch, Q.T., and Turner, M.D., 1971, Geologic map of the San Sebastian quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-661, scale 1:20,000.

Santa Isabel Glover, L., Pease, M.H., and Arnow, T., 1977, Surficial geologic map of the Playa de Ponce and Santa Isabel Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Field Studies Map MF-886, scale 1:20,000.

Utua do Nelson, A.E., 1967b, Geologic map of the Utua do Quadrangle, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-480, scale 1:20,000.

Vega Alta Monroe, W.H., 1963a, Geology of the Vega Alta Quadrangle, Puerto Rico: U.S. Geological Survey Geologic Quadrangle Map GQ-191, scale 1:20,000.

Yabucoa Rogers, C.L., Cram, C.M., Pease, M.H., and Tischler, M.S., 1979, Geologic map of the Yabucoa and Punta Tuna Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1086, scale 1:20,000.

Yauco

Krushensky, R.D., and Monroe, W.H., 1979, Geologic map of the Yauco and Punta Verraco Quadrangles, Puerto Rico: U.S. Geological Survey Miscellaneous Investigations Map I-1147, scale 1:20,000.