



2021 Cooperative Summer Internship Program

USGS Project Scientist	Matthew Conlon
Project start date	5/3/2021
Duration	3-5 months
Location	Southeastern Pennsylvania
Type of Intern	Any
Title of Project	Assessment of Pesticides and Characterization of Groundwaters in Pennsylvania's Triassic Lowland Hydrogeologic Setting
Background	<p>Pesticide compounds are widely used in agricultural applications and can lead to contamination of vulnerable aquifers in Pennsylvania. Sampling in various settings is needed to determine if trends or other temporal changes in pesticide occurrence or concentration are observed in the numerous different hydrogeologic settings around the state. To meet this need, the USGS has partnered with the Pennsylvania Department of Agriculture (PDA) since 2003 to conduct assessments of pesticides in groundwater through sampling domestic-supply wells. In 2021, the program will continue with work focused on monitoring for pesticide occurrence in groundwater in siliciclastic aquifers of the Triassic Lowland hydrogeologic setting in south-central and south-east Pennsylvania, which was previously sampled in 1993 and 2003. Sampling for major ions, trace metals, nutrients, radon-222, chemical isotopes, and bacteria also will be conducted at 30 domestic-supply wells. In addition, a subset of wells for per- and polyfluoroalkyl substances (PFAS) will be sampled. This project is in cooperation with the PDA as part of the Pennsylvania Pesticides and Ground Water Strategy.</p>
Objectives	<p>This project seeks to further the understanding of groundwater quality within siliciclastic aquifers of the Triassic Lowland hydrogeologic setting in south-central and south-east Pennsylvania through (1) maintaining a monitoring network to detect pesticide occurrence, (2) collecting nutrient data to assess the relationship between elevated concentrations of nitrate with detectable concentrations of pesticides, (3) obtaining radon-222 data in an area where little or no radon-222 data have been previously collected, and (4) collecting a broad range of analytes including major ions, trace metals, chemical isotopes, and bacteria to establish general trends and processes occurring in groundwater in areas where a lack of historical data exists.</p>
Intern Tasks	<p>(1) Well Reconnaissance – Domestic wells previously sampled for this project will be prioritized for sampling. Letters of interest and “permission to sample” forms will be mailed to homeowners who previously had their wells sampled. Site visits may be necessary to make contact with homeowners who do not respond or to initiate contact with new homeowners who now own the property where the well is located. Geographic Information Systems (GIS) may be used to compile geologic, water-quality, and geospatial data from existing published reports, databases, and other sources into</p>

relational geospatial databases to select additional candidate domestic wells for sampling. Addresses for these wells will need to be acquired, and letters of interest and “permission to sample” forms will be mailed. Site visits may be necessary to locate candidate wells and to verify that sample collection prior to any water treatment systems is possible. The incumbent can expect to spend approximately 15 percent of their time on well reconnaissance efforts. (2) Preparation for Groundwater Sampling – Once reconnaissance is completed and wells are selected for sampling, the homeowner will be contacted to schedule a date and time for sample collection. Digital and physical field folders, consisting of all site inventory, well reconnaissance, and existing water-quality information, will be created for each well. Prior to scheduled sampling events, the sampling trip will be planned, bottle sets will be assembled, and sampling paperwork (Analytical Services Request and Groundwater Quality Field Notes forms) and shipping labels will be generated. Sampling equipment will also be cleaned and checked to ensure there are no issues prior to sampling. The incumbent can expect to spend approximately 15 percent of their time preparing for groundwater sampling. (3) Groundwater Sampling and Post-Sampling Tasks – Wells selected through the reconnaissance process will be sampled for selected pesticides, major ions, trace metals, nutrients, radon-222, chemical isotopes, and bacteria using standard USGS field-sampling protocols. A subset of wells will also be sampled for per- and polyfluoroalkyl substances (PFAS). If possible, a water-level measurement will be obtained from the well before sampling. Samples will be collected prior to any treatment (untreated water), typically at a pressure tank or outside tap and before any filtration, water softening, or bacteriological treatment systems. The existing submersible well pump will be turned on to purge the well and ensure sampled water is representative of the aquifer. Field measurements of the well water will be analyzed with a multi-parameter water-quality meter for temperature, specific conductance, pH, and dissolved oxygen concentration and with a turbidimeter for turbidity. After the values of the water-quality field parameters stabilize, sample bottles will be filled and shipped to the appropriate analyzing laboratories. Field data will be documented throughout this process using Groundwater Quality Field Notes forms. Sampling equipment will be cleaned and stored according to USGS standard protocols. Groundwater field forms will be scanned, and digital and hardcopy information for each well will be filled and organized to ensure proper records management. Digital versions of Analytical Services Request forms will be downloaded and stored in both digital and physical site files. Field parameters will be compiled into an Excel workbook. The incumbent can expect to spend approximately 70 percent of their time conducting groundwater sampling and post-sampling tasks.

Expected Results and Benefits to the Intern

The intern will be exposed to and develop skills in water-quality monitoring in vulnerable groundwater aquifers, gaining valuable field experience with equipment and techniques used to collect field measurements (water temperature, turbidity, pH, dissolved oxygen, and specific conductance) and a wide range of water-quality samples. The work will involve detail-oriented data collection and compilation and groundwater sampling and post-sampling tasks. Due to the extensive nature of the sampling protocol, the intern will work with a hydrologist for the duration of the sampling; however, the intern will have various tasks assigned to allow them to work in an independent manner following an initial training period. The intern will also be exposed to the various tasks that are involved with sampling a diverse set of locations for a wide variety of parameters, including public outreach, sample scheduling,

equipment preparation, and proper cleaning of equipment. In addition, the intern will also gain a working knowledge of groundwater chemical interactions as it relates to project work to be able to inform the owners of the wells being sampled about the purpose of the sampling effort.

Skills and Interests of Candidates

The Pennsylvania Water Science Center seeks candidates with interests in geology, hydrology, human health, and statistics. Field data collection will require a detail-oriented individual who is capable of working independently after an initial training period. Familiarity with set-up, calibration, and use of water-quality instruments for collection of environmental data in field settings is preferred but not required. Candidates need to be comfortable working with Microsoft Word, Publisher, and Excel and Adobe Acrobat. A working knowledge of ArcGIS to create simple shapefiles and map documents would be beneficial but is not required.

Project Type

Field Work;Office Work;

Project Discipline

Water Quality;Groundwater;