

**INVESTIGATION 5****WHERE IS RADON FOUND IN NEW JERSEY?****INTRODUCTION**

Maps are made for many different purposes, and provide an excellent tool for showing information that relates to distance and space. If the question you are asking includes the word “where”, then a map might be a good tool to use in attempting to answer your question. An important aspect of a map is its *scale*, in other words how much of the earth is reported on the map. A model airplane built at a scale of 1 to 100 will be one one-hundredth the size of the actual airplane. A map scale of 1 to 10,000 can be expressed as 1:10,000, or 1/10,000, or 1 cm = 1 km. In each case, the scale tells you how the distances on the map correspond with the real distances. It is not very satisfying to be told by your co-pilot in the car “drive two centimeters to the left and then turn right and go another centimeter!”

Maps can be used in our investigations regarding radon issues locally, in New Jersey, or nationwide. The scales will be different and the amount of information that can be represented on the map will be different depending on the size of the area to be mapped.

It is difficult to predict where radon is apt to accumulate to high concentrations in indoor air and thus constitute a potential health problem. However, scientists at the U.S. Environmental Protection Agency (EPA) have attempted to do just that, by constructing a map of the United States that shows areas with “potentially high radon levels” (Figure 1). The map was based on geologic data and indicates those areas where there are known deposits of granite, phosphate, shale, and uranium - all likely sources of radon. EPA scientists caution that the map should not be used for predicting high radon levels in individual homes. This is because the map only shows what areas are *most likely* to have high radon, based on available information. If you live in one of the darkened areas, you don’t necessarily have a radon problem. Similarly, if you live outside the darkened areas, you could still have high radon levels in your home.

Geographers and geologists have divided the State of New Jersey into a number of sections, called physiographic provinces, based on the processes responsible for the formation of rocks and land features in the region (Figure 2). Rocks in the Highlands area, also called the Reading Prong, are mostly granites, are very old (almost one billion years), and contain high concentrations of uranium. Rocks in the Piedmont area are younger (less than 1/4 billion years) and include many sedimentary rock types, including some shales that are high in uranium. The Valley and Ridge Province also contains rock with high-uranium content. Glacial debris from the last ice age tends to be very thick in this area, which can prevent radon gas from escaping to the surface prior to its breakdown into another radioactive element.

Because of the uncertainties in identifying areas of high radon and the difficulties in predicting the location of individual homes with elevated levels of radon, the New Jersey Department of Environmental Protection (DEP) recommends that *all* homes in the state be tested for radon.

Radon is a geologic phenomenon and houses that accumulate very high concentrations of radon tend to occur in clusters. If a house is identified with high radon concentrations, there is a good chance that other houses nearby may also have elevated radon concentrations. The DEP has found that when a house has radon levels of 200 pCi/L or more, 75% of the surrounding homes

(within a one mile radius) will have radon levels at or above 4 pCi/L. **In this exercise you will explore the geographic aspects of radon in New Jersey.**

In the last ten years both the US Environmental Protection Agency (EPA) and the New Jersey Dept. of Environmental Protection (NJ-DEP) have developed other radon potential maps based upon the results of radon tests done in actual homes. The EPA divides the country into three "zones" based upon the potential for indoor radon levels exceeding the action level of 4 pCiAL (Figure 3).

In 1988, NJ-DEP conducted a state-wide radon survey to map out areas of potential for elevated radon levels by municipality. The resulting "tier" map (figure 4) shows the potential for indoor radon levels in excess of 4 pCi/L. Since 1988 this map has been updated several times. Part of the reporting requirements for NJ-DEP certified radon service providers is to provide NJ-DEP with measurement data. These test results are used to periodically update the tier designations when additional data moves municipalities from one tier to another.

## Areas with Potentially High Radon Levels

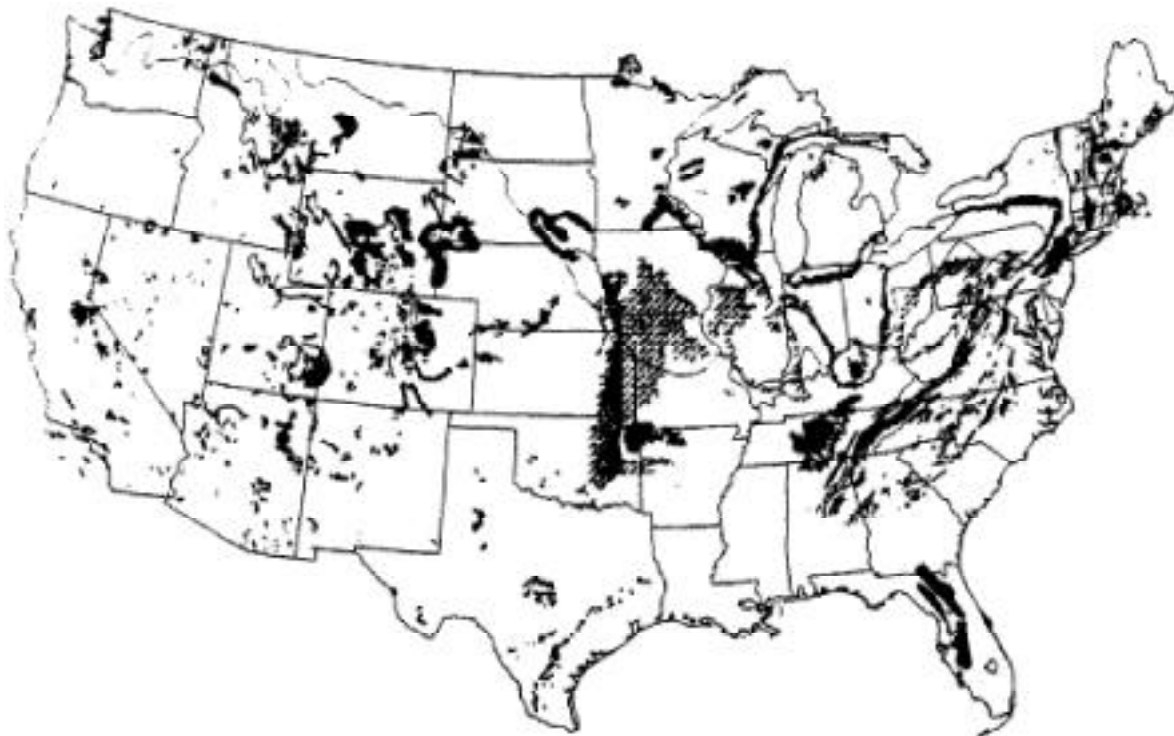


Figure 1. Major areas of the United States that have "potentially high concentrations of radon" in indoor air. This map was constructed from geologic information on the distribution of certain rock types known to be associated with radon release.

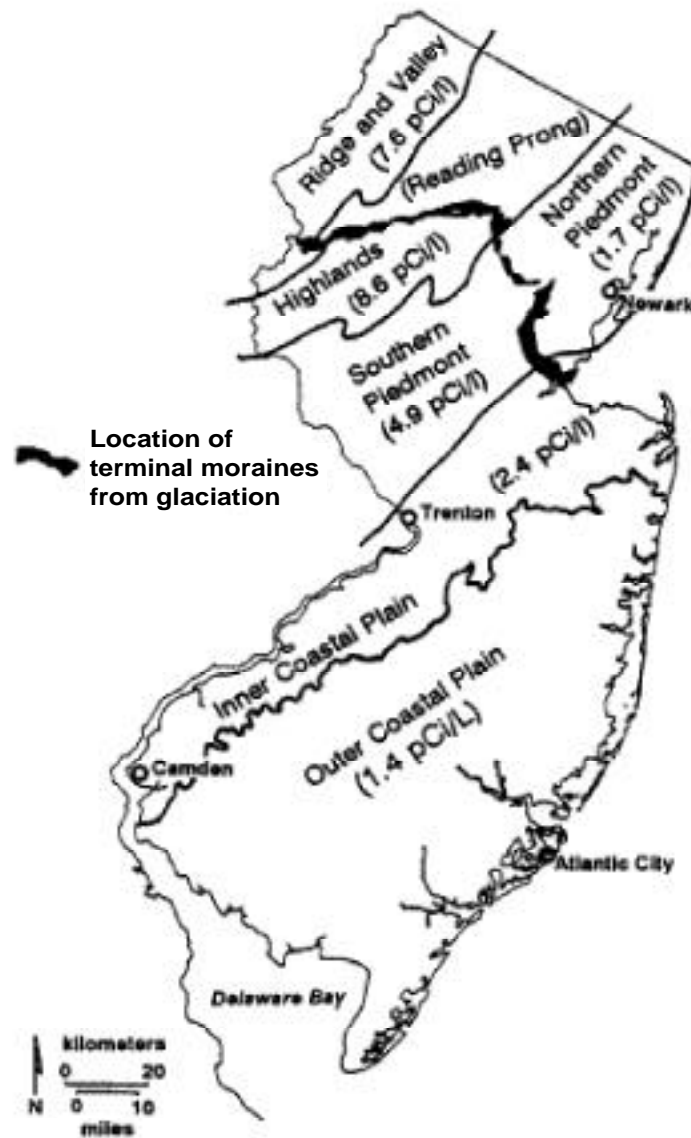


Figure 2. Physiographic provinces of New Jersey. The highest concentrations of radon in the state have been found in homes located in the Highlands and Piedmont areas. The numbers in parentheses are the average pCi/L of radon found in the homes.

## OBJECTIVE

To explore mapping as a tool and the geographical aspects of the radon issue in New Jersey.

## PROCEDURE

1. Review the maps in Figures 1 and 2.

**ANALYSIS**

2. You have recently been appointed the new acting director of the New Jersey Radon Program. Your highest immediate priority is to identify as many homes as possible that contain more than 20 pCi/L of radon. Your budget for this task is \$200,000, and you estimate that it will cost about \$500 per house, including personnel and data analysis costs, to obtain the desired radon measurements. Design and describe your strategy for tackling this problem.



*Hint: You have access to all existing data on radon measurements taken so far, and soils and geology maps for New Jersey.*

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3. Describe the uses and limitations of mapping as a tool to help in the study of an environmental issue such as radon.

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4. What kinds of data would you like to have mapped in order to help you design your strategy for Question 1?

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