Geologic Hazards

General

Earthquake

Earthquakes are very rare in Pennsylvania and have caused very little damage and no reported injuries or casualties. Since the Commonwealth is not on an active fault, the earthquakes that do occur are from deep within the earth's crust. In most cases, these are non-measurable events. However, earthquake standards are still a valuable consideration when determining building codes. The Richter Scale describes the magnitude of an earthquake and can be seen below.

The Richter Scale

Descriptor	Richter Magnitude	Earthquake Effects	Worldwide Annual Average
Micro	Less than 2.0	Microearthquakes, not felt.	About 8,000/day
Very Minor	2.0-2.9	Generally not felt, but recorded.	About 1,000/day
Minor	3.0-3.9	Often felt, but rarely cause damage	49,000 (estimated)
Light	4.0-4.9	Noticeable shaking of indoor items, rattling noises. Significant damage unlikely.	6,200 (estimated)
Moderate	5.0-5.9	Can cause major damage to poorly constructed buildings over small regions. At most slight damage to well-designed buildings.	800
Strong	6.0-6.9	Can be destructive in areas up to about 100 miles across in populated areas.	120
Major	7.0-7.9	Can cause serious damage over larger areas.	18
Great	8.0 or greater	Can cause serious damage in areas several hundred miles across	1

Source: U.S. Geological Survey (USGS)

Landslides

Landslides are a natural movement of earth down a slope. Deaths and injuries from landslides have not been a problem in the past, however, this does not mean that they will not occur. The worst damage by a landslide is usually done to utilities (pipelines, power lines/poles), roadways, and buildings.

Radon

Radon is a naturally occurring, colorless, odorless, inert, radioactive gas. It forms as a product of the natural decay of uranium. Radon and its radioactive products are dangerous to health.

Alpha particles are a probable cause of lung cancer. Studies done in Pennsylvania since 1984 show that indoor radon levels are controlled by the radon-emanation properties of soil and rock on which homes are built.

Subsidence and Sinkholes

Subsidence is caused by the removal of ground water or other resources from the ground. The difference between subsidence and sinkholes is that subsidence is a manmade hazard, while sinkholes are natural hazards caused by erosion underground. The United States Geological Survey explains that sinkholes are a characteristic of karst topography, that results from dissolution and collapse of carbonate rocks, such as limestone and dolomite, and is characterized by closed depressions or sinkholes, caves, and underground drainage.

History

Earthquake

No significant earthquakes have occurred in Snyder County. Neighboring Centre and Lebanon Counties have experienced minor earthquakes with minimal damage.

Landslides

Landslide history is not documented as well as other hazards, primarily because landslides are not always seen. Landslides have occurred all over Pennsylvania and have caused minor to major damage. The Pennsylvania Department of Transportation estimates it spends $10 million annually on repair contracts for roadways damaged by landslides throughout the Commonwealth. No significant landslides have been documented in Snyder County.

Radon

Pennsylvania has a serious radon problem. While individual instances of radon detection are not well documented, Pennsylvania has seen numerous cases of radon in homes. It is estimated 40 percent of homes in Pennsylvania have radon levels above EPA's action guideline of 4 pCi/l. One pCi is equal to the decay of about two radioactive atoms per minute.

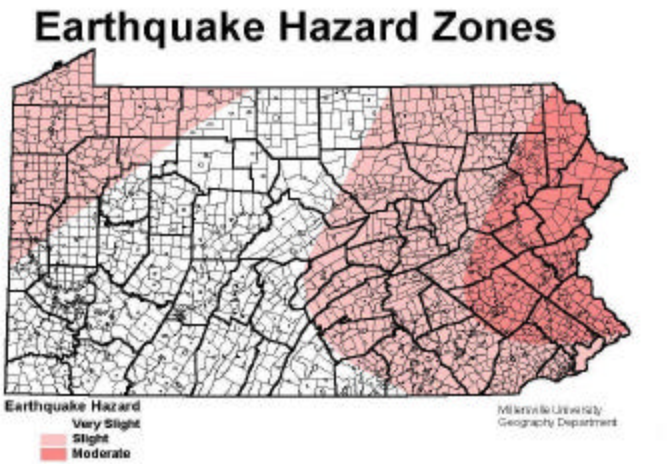
Subsidence and Sinkholes

Sinkholes are a problem throughout Pennsylvania, however, Snyder County is an exception. As stated by the United States Geological Survey, sinkholes have been most dangerous and frequent in Florida, Texas, Alabama, Missouri, Kentucky, Tennessee, and Pennsylvania. Yet, according to the Pennsylvania Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, no sinkholes exist in Snyder County.

Vulnerability

Earthquake

As seen in the "Earthquake Hazard Zones" map at right, Snyder County is slightly at risk to experience an earthquake. However, no earthquakes featured here have been documented in County history. If an earthquake of significant magnitude strikes Snyder County, some secondary effects could include utilities failures, dam failures, fire, landslides, subsidence, and transportation accidents (especially pipeline breaks).



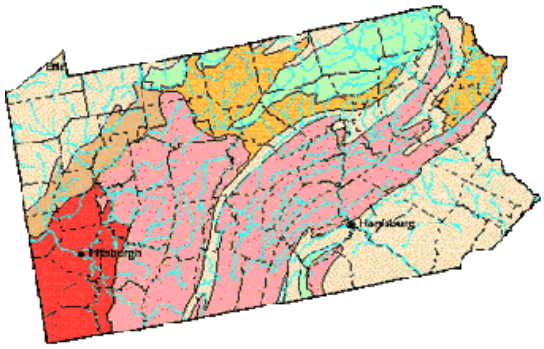
Source: Millersville University Geography Dept.

Landslides

The total number of landslides and their damage in Pennsylvania is unknown. Reporting varies widely from county to county. Landslides are seen mostly in Allegheny, Armstrong, Beaver, Tioga, and Washington Counties; Snyder County is not prone to landslides. Most landslides are a result of heavy precipitation. Also contributing to this is the removal of vegetation, changing the slope of a hillside, and earthquakes. As seen in the Landslide Overview Map included here and provided by the United States Geological Survey Snyder County's vulnerability to a landslide is high, with a moderate rate of incidence.

The most vulnerable and dangerous places for landslides are along transportation routes and pipeline pathways. Roadways are often blocked with soil and rocks from recent landslides. The most likely time an injury or death from a landslide will be reported is when it happens on a roadway. Pipelines are dangerous places for landslides, because of the materials in the pipeline. Often carrying hazardous materials through rural areas, pipeline breaks from landslides can contaminate soils, waterways, and other natural habitats. Some of the secondary effects of a landslide include utilities failures, dam failures, hazardous materials spills, and transportation accidents/roadway damage. Much like earthquakes, landslides occur several times a year and may go unnoticed.

Pennsylvania Landslide Overview



LANDSLIDE INCIDENCE

Low (less than 1.5% of area involved)

Moderate (1.5%-15% of area involved)

High (greater than 15% of area involved)

LANDSLIDE SUSCEPTIBILITY/INCIDENCE

Moderate susceptibility/low incidence

High susceptibility/low incidence

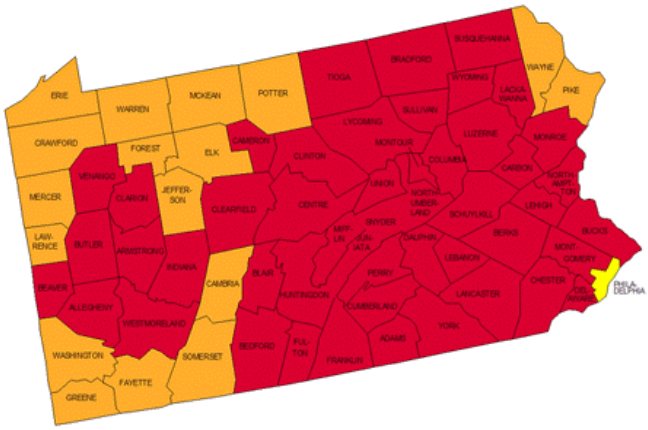
High susceptibility/moderate incidence

Source: U.S. Geological Survey

Radon

According to the U.S. Environmental Protection Agency, Snyder County is among Pennsylvania counties with the highest potential for dangerous radon emission. It is important to remember that no individual location can be assumed safe unless proven so by testing.

Pennsylvania Radon Zones



	Zone 1 Highest Potential (greater than 4 pCi/L)
	Zone 2 Moderate Potential (from 2 to 4 pCi/L)
	Zone 3 Low Potential (less than 2 pCi/L)

Source: U.S. Environmental Protection Agency

Subsidence and Sinkholes

Subsidence and sinkholes strongly correlate to the distribution of carbonic rock. However, not all areas underlain by carbonate bedrock, such as limestone, are at risk. According to the Pennsylvania Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, no sinkholes exist in Snyder County.

Probability

Earthquake

The probability of an earthquake occurring in Snyder County is low, occurring every 30 years or less. This is because Snyder County does not lay on a major fault line. No significant earthquakes have occurred in Snyder County to date.

Landslides

There is only a moderate probability that Snyder County will experience a landslide, likely occurring every 30 years or less. However, no significant landslides have been recorded in the County to date.

Radon

Radon gas is emitted from decaying uranium underground. Snyder County is located in an area with the highest potential for radon emission in Pennsylvania. Therefore, there is great potential for radon emission in Snyder County.

Subsidence and Sinkholes

The potential for subsidence and sinkholes occurring in Snyder County is high. Although these events occur annually, impact is minimal. Severe events occur at a much lower potential, occurring around every 30 years or less.

Maximum Threat

Earthquake

Because no major fault lines run through Snyder County, no one area is presented with a maximum threat.

Landslides

The threat of landslides is greatest along high volume traffic areas. Therefore, municipalities along U.S. Route 11/15 face the maximum threat of this hazard. This is because landslides and block roadways cause traffic congestion, delays, and severe accidents.

Radon

All Snyder County municipalities face the highest potential for radon gas emissions. Only areas that have not been tested and found safe are not susceptible to radon gas emissions.

Subsidence and Sinkholes

No sinkholes have been recorded in Snyder County. However, because the County is still susceptible to subsidence and sinkholes, there is still a threat. Maximum threat would occur in the areas underlain with carbonic rock. Carbonic rock is found throughout the central part of the County with limestone and dolomite rock found in the areas near Perry and West Perry Townships, as well as Beaver and Franklin Townships.

Secondary Effect

Earthquake

Secondary effects from earthquakes can be a major concern. Even minor earthquakes can cause power outages that may threaten the continuity of government. Also, hazardous materials may be leaked, due to traffic accidents, overturned oil tanks, and other hazardous material containers.

Landslides

Similar to earthquakes, the secondary effects of landslides can cause traffic disruption and accidents. These accidents can lead to power outages or the spilling of hazardous materials.

Radon

The secondary effects of radon are more difficult to identify. Often, radon's effects go unnoticed. Radon is a probable cause of lung cancer.

Subsidence and Sinkholes

Hazardous material spills can also be a secondary effect of subsidence and sinkholes. Such hazards often occur without warning, causing disruption of traffic or accidents. However, subsidence and sinkholes can also occur in very rural areas with little hazardous effects.