



# Intersection of geology, public safety, and public health

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## Alaska DNR/Division of Geological & Geophysical Surveys (DGGS)

### DGGS' Fairbanks Office



### Geologic Materials Center - Anchorage



DGGS is a science-focused agency within the Department of Natural Resources. Its mission is to "determine the potential of Alaskan land for production of metals, minerals, fuels, and geothermal resources, the locations and supplies of groundwater and construction material, and the potential geologic hazards to buildings, roads, bridges, and other installations and structures" (AS 41.08.020).

DGGS' goal is to provide unbiased scientific data and interpretations to answer important questions about the geology of the state, to benefit the health and welfare of all Alaskans. We partner with emergency coordinators, communities, and other science agencies to provide timely information on imminent and long-term threats to the public and infrastructure. Below are examples of DGGS programs that may be of interest to public health professionals.

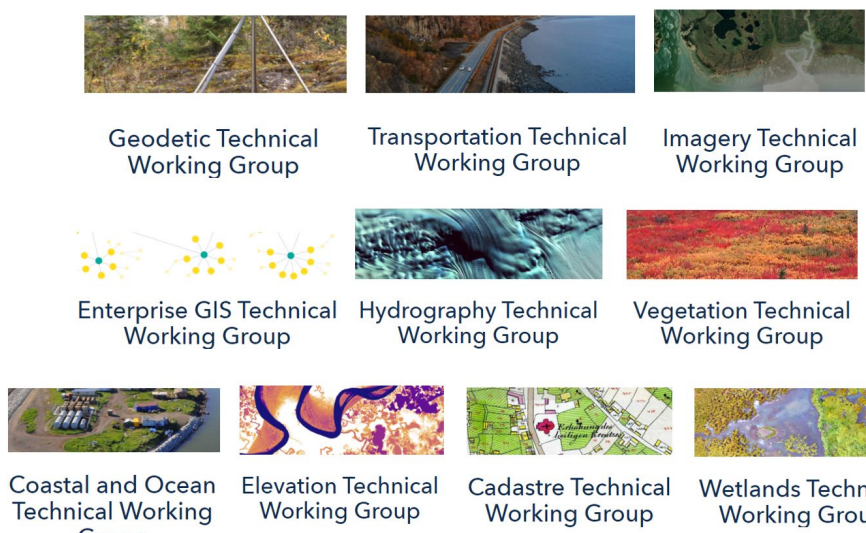
For example, Alaska spatial data coordinated through the Alaska Geospatial Council (see left) and applied-science investigations by DGGS programs (see lower right) provide baseline and pertinent information for emergency operations, land management, and many other issues that affect Alaskans' quality of life.

### Spatial Information

#### Alaska Geospatial Council

Coordinating across agencies to provide public access to geospatial data and maps critical to decision-making

Supporting economic development and the public safety and well-being of Alaskans



<https://agc.dnr.alaska.gov/>

### Radon case study: Collaboration with healthcare professionals is critical

Radon is a naturally occurring radioactive gas that can concentrate in buildings. In the United States, radon is the #2 cause of lung cancer, after smoking, and it is estimated to cause over 21,000 deaths each year.

According to the Alaska Division of Public Health, radon is an under-recognized health risk in the state. In fact, many homes tested throughout Alaska have radon levels above the Environmental Protection Agency's (EPA) limit of 4 picocuries per liter of air (pCi/L). Despite new available data, many people in Alaska are unaware that radon is a hazard in the state.

Even in North Dakota, a high radon state, a recent study by [Schmitz and others \(2021\)](#) showed that "most North Dakota family physicians are knowledgeable about radon, and more than one third have tested their own homes. However, only a minority transmit this knowledge to their patients."

The Centers for Disease Control and Prevention encourage healthcare providers to incorporate radon awareness in their practice.

<https://www.cdc.gov/radon/radon-healthcareproviders.html>

Environmental Geology

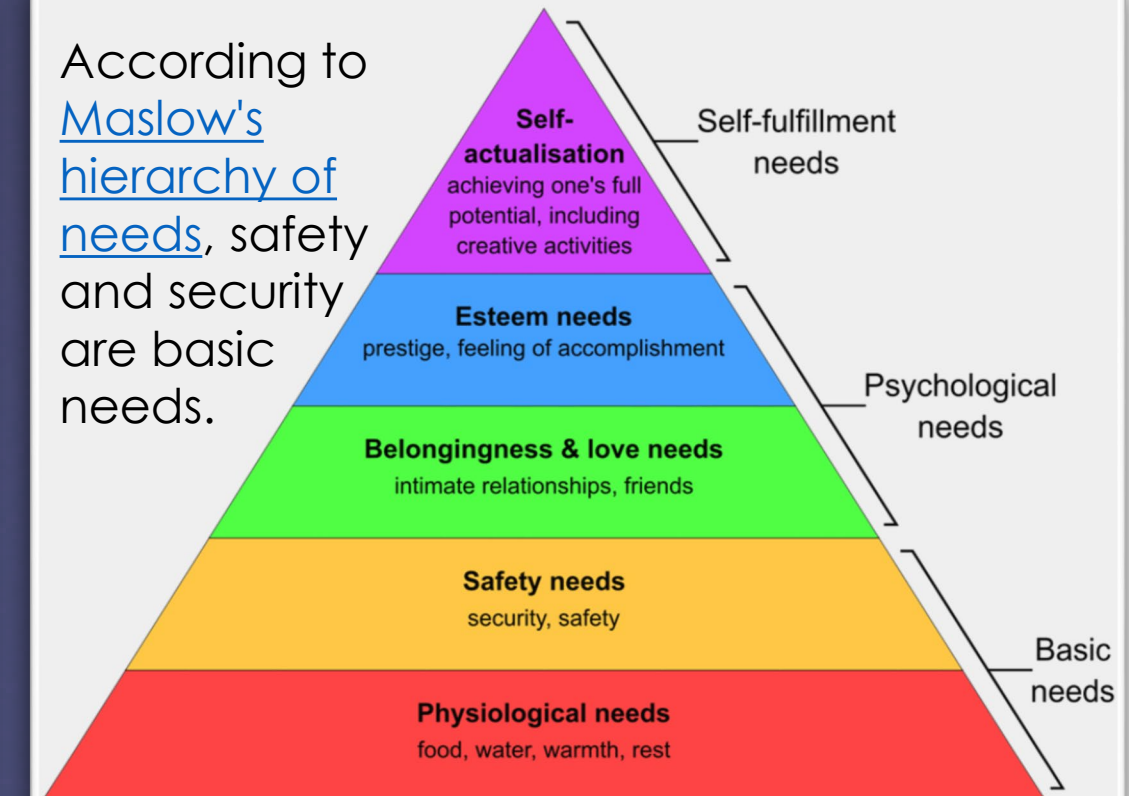


Public safety is often thought of as the protection of the public from dangers and threats such as crimes and disasters. Delving more deeply into the definitions of safety and security reveals that these concepts are complex, and safety can be broadened into an umbrella term covering a wide range of quality of life issues.

According to a [City of Austin, Texas website](#): Psychologist Abraham Maslow used a much broader definition of safety in his famous "Hierarchy of Human Needs" model. He said that one of the most fundamental needs that we have is safety. This includes not only physical safety but also security of our health, money, belongings, jobs, and families.

Category	Safety	Security
Definition	Feeling of being protected against emotional or physical threats	Protection against external threats
State of wellbeing	Emotional aspect	Physical aspect
Breadth of term	Broad coverage – to feel safe one must also be secure	Narrow coverage
Type of threat	Deliberate and unintended threats (accidents)	Deliberate threats
Agent creating the threat	Internal agent – one's own perceptions	External agent – acts of another
Type of mitigating action	Proactive measures	Proactive and reactive actions relative to situation
Mitigation	One who has control of risk factors feels safe	One who is prepared to respond to a threat can feel secure
Mitigation examples	Minimizing hazards with equipment and actions: PPE, seat belts, physical fitness, planning, etc.; emotional support; self-assuredness	Maintaining borders; having people ready to respond; rule enforcement; disaster recovery; availability of resources

According to [Maslow's hierarchy of needs](#), safety and security are basic needs.



### Applied science and collaboration benefits public safety, security, and health

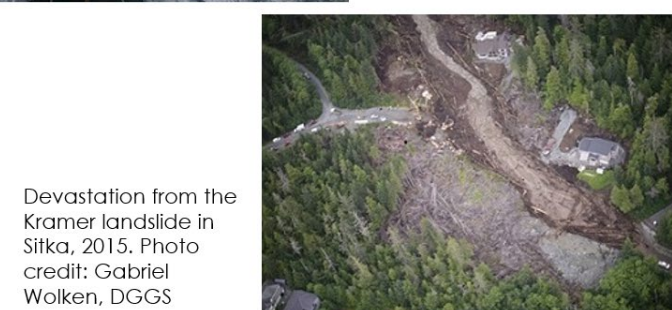
#### Climate and cryosphere hazards – Snow avalanches, glacial change, and unstable slopes

Identify, assess, and monitor climate and cryosphere hazards like avalanches, landslides, and other climate-related change

Collaboration and partnerships with Alaska Railroad Corporation, DOT&PF, Alaska Electric Light & Power, National Tsunami Warning Center, etc.



Avalanche that released in Keystone Canyon in January of 2014 blocked the Richardson Highway, the only road access to Valdez, for over a week and dammed the Lowe River. Photo credit: Alaska DOT&PF



<https://dggs.alaska.gov/hazards/climate/>

#### Coastal hazards – 144 communities in Alaska are threatened

Studies, tool development, and community outreach on coastal hazards, e.g., flooding, erosion, and permafrost degradation

- Forecasted site erosion of wastewater facilities, materials sites, abandoned fuel tanks, and landfills
- Height-based flood models support resilience of infrastructure systems
- Studies of saltwater intrusion of drinking water sources
- Data collection, mapping, and monitoring hazards can help reduce some of the uncertainties climate change brings



<https://dggs.alaska.gov/hazards/coastal/>

#### Alaska Volcano Observatory (AVO) – A joint program of the USGS, UAF GI, and DGGS

AVO has three primary objectives: To conduct monitoring and other scientific investigations in order to assess the nature, timing, and likelihood of volcanic activity;

To assess volcanic hazards associated with anticipated activity, including kinds of events, their effects, and areas at risk; and To provide timely and accurate information on volcanic hazards, and warnings of impending dangerous activity, to local, state, and federal officials and the public.



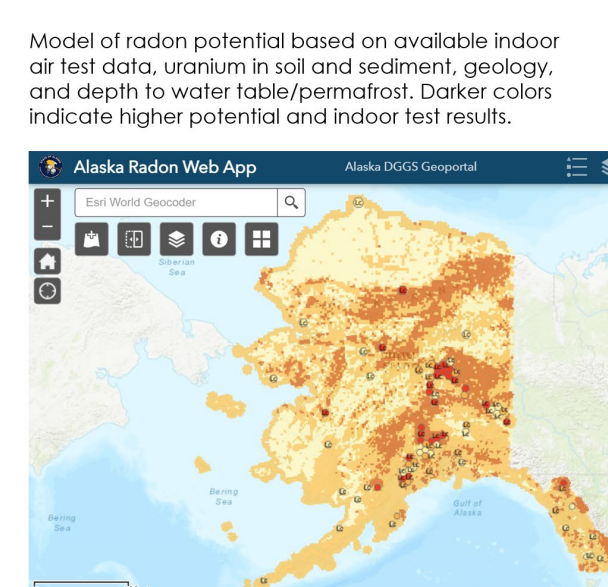
Eruption plume of Great Sitkin volcano captured by Lauren Flynn (USFWS) from the R/V Tiglax on the evening of May 25, 2021 at 2106 HADT.

<https://avo.alaska.edu/>

#### Radon in Alaska – Crowdsourcing data for mapping radon potential

Radon is the second leading cause of lung cancer. In the entire U.S., one in 15 homes have high radon levels. Alaska also has radon in some areas of the state. Alaskans are invited to [obtain a free test kit](#) and contribute radon test results to the database.

This [online map](#) serves as a guide to where radon may occur; however, indoor radon concentrations can vary greatly from building to building. The only way to know if a home contains radon is to test.



<https://dggs.alaska.gov/hazards/radon.html>

#### Earthquakes & tsunamis – Part of the National Tsunami Hazard Mitigation Program (NTHMP)

Focused on reducing the impact of tsunamis. Under NTHMP, DGGS collaborates closely with the UAF GI and the AK Dept. of Homeland Security & Emergency Management. We produce hazard reports for at-risk coastal communities and interact directly with residents of all ages, city planners, emergency responders, fire/police, harbor masters, and other stakeholders through published reports on various Tsunami Operations and Rural Resilience Workshops.

Our main goals are potential inundation assessment, evacuation planning, and public education/awareness so that Alaskans know what to do before, during, and after the next major earthquake and tsunami.

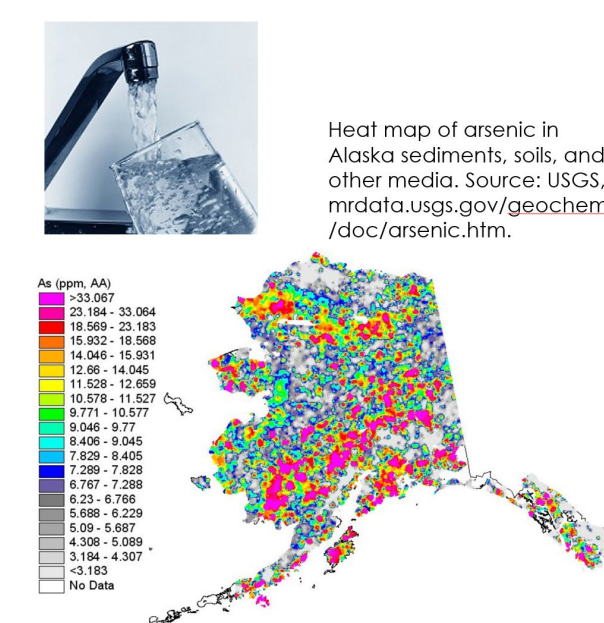


<https://dggs.alaska.gov/hazards/earthquakes.html>

#### Groundwater quality mapping in Alaska – A multi-agency collaboration

DGGS mapping of natural groundwater contaminants in Alaska has four goals:

- Build a network of Alaska groundwater data creators and users among stakeholders
- Provide education and support to homeowners about testing private well water
- Compile a database of Alaska groundwater quality data for natural contaminants
- Make groundwater quality maps available online to the public and agencies



<https://dggs.alaska.gov/hazards/arsenic.html>