Preparedness Alert

Colorado Division of Homeland Security and Emergency Management
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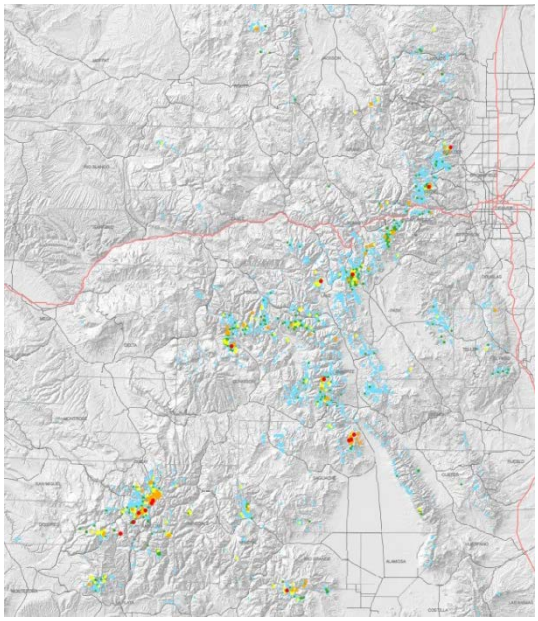
Land subsidence can cause major damage

Many communities in Colorado were built around mining activity. While some of these mines have long since closed, their imprint remains. When it comes to underground mines, particularly coal mines, subsidence can be a major concern. Subsidence is the action of sinking or settling; a common occurance when materials have been removed below the ground's surface. This becomes a problem when structures are built in subsidence zones. Sinking ground can cause foundations to move or crack, causing leaks or structural instability.



Abandoned mines in Colorado – Colorado Geological Survey

Hazard area identification

A home or structure may be subject to subsidence if it is located close to or over an undermined area. A map of inactive coal mines in Colorado is available at http://bit.ly/abandoned_mines. In addition to showing the location of inactive coal mines, these maps show features such as mine openings and existing surface subsidence features.

Damage identification

Subsidence damage may vary depending on the type and extent of the subsidence. Common signs are below.

Residential buildings

- Sudden cracks in brick or stone facing
- Sags in roofline
- Separation of steps or chimneys from buildings

Mission
Provide leadership and support to Colorado communities to prevent, protect, mitigate, respond and recover from all-hazard events including acts of terrorism.

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- Sudden appearance or widening of cracks in drywall or plaster
- Pits or sags around the building or regular pattern of cracks in ground that lead to cracks in building
- Distorted window and door frames and sticking of windows and doors
- Basement or foundation pulling away from building or superstructure
- Sudden pits or sags around the home or other building and popping or cracking noises

Roads

- Cracked, sagging or tilting concrete or asphalt

Utilities

- Sudden breaks in brittle water and sewer pipes
- Saturated ground
- Dirty tap water
- Gas leaks
- Gravity flow systems such as water and sewer lines may drain improperly

Damage minimization

While it is impossible to know if or when subsidence damage will occur, there are some things that can be done to minimize damage.

Existing structures

- Install flexible couplings for gas lines. This reduces the risk of broken gas lines and the potential for explosions.
- Vent outside gas lines to the surface to prevent gas from compromised lines from entering the building.
- Dig a trench around buildings at risk for subsidence damage and backfill with compressible material. The trench, rather than the structure, will then absorb ground compression.
- Add additional support to bearing walls and reinforce foundations.

New construction

- Make sure a subsidence investigation has been completed and that the site is appropriate for construction.
- Have an engineer evaluate the best type of construction for the site. Consider using a reinforced concrete slab foundation and/or flexible construction techniques utilizing technology such as leveling devices.

Major abandoned mine danger maps

- **Cragmoor** – Colorado Springs area http://bit.ly/cragmoor
- **Rockrimmon** – Colorado Springs area http://bit.ly/rockrimmon
- **Louisville** – Louisville area http://bit.ly/louisvillemine
- **Laffayette** – Laffayette area http://bit.ly/lafayettemine
- **Tri-Towns – Boulder-Weld Coal Field** – Boulder area http://bit.ly/tri-towns

- Make sure that utilities are constructed with flexible joints and that special fill is used around utilities to absorb compression and tension.
- Explore the possibility of mine backfilling or drilling piers to support construction. This can be expensive and works best for shallow mines.

If you detect subsidence issues

Following are tips from the Colorado Division of Reclamation Mining and Safety on what to do if you notice subsidence-related problems around your home:

- Determine if your building is served by natural gas and if so contact your utility provider. If gas lines are cracked or broken, there is a potential for fire or explosion.
- Contact your city or county safety or fire department and the Office of Surface Mining (OSM), Federal Reclamation projects Branch in Denver. OSM controls Federal abandoned mine reclamation emergency funds.
- Contact your water and sewer department so that these lines can be checked for damage.
- If the subsidence feature is near the house, large windows should be taped to help prevent flying glass if distorted windows shatter.
- Start a written log. This log will help investigators to determine if the damage is caused by subsidence. The log should include when signs of damage appear as well as where and what kind of damage is taking place. Cracks should be measured daily and in the same spot.
- Permanent marks on cracks and by windows and doors will make it easier to see if progressive movement is taking place. Photographs can also help document ongoing damage.

For more information

- General preparedness information – www.readycolorado.com
- Colorado Division of Reclamation and Mining Safety (DRMS) - http://bit.ly/CODRMS
- DRMS subsidence overview - http://bit.ly/DRMS_subs
- Subsidence Above Inactive Coal Mines: Information for the Homeowner (DRMS) - http://bit.ly/DRMScoal
- Mine Subsidence Protection Program - http://bit.ly/DRMS_protect

Subsidence terms

- **Abandoned Workings** – Excavations that are deserted and in which further mining is not intended.
- **Backfill** – In general refers to material placed to refill voids left after mining.
- **Barrier pillar** – A solid block or rib of coal left unworked between two mines.
- **Compression** – The stress that tends to compress material, or shorten its length.
- **Potholes**– A circular or funnel-shaped depression at the surface, caused by subsidence.
- **Tilt** - The change in surface slope of a part of a subsidence trough.