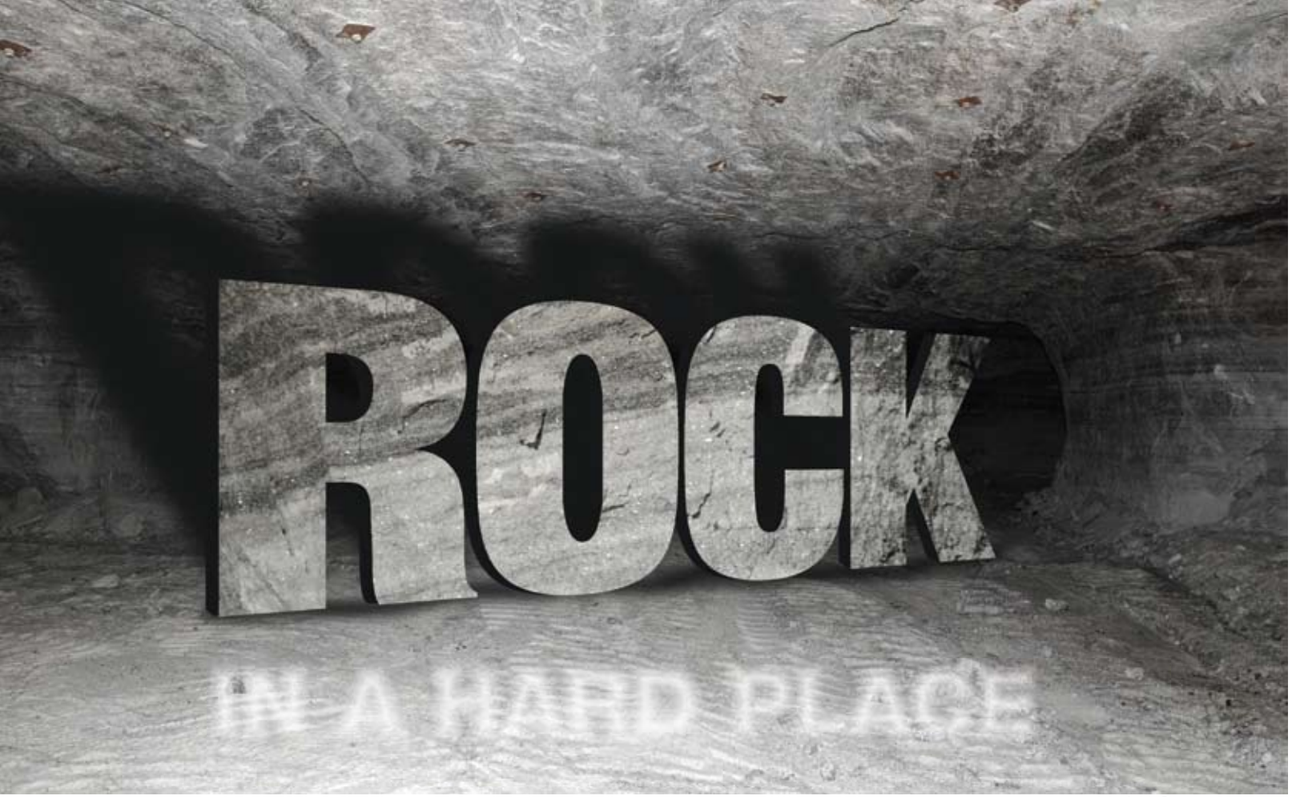

James Clayton

3.9 trillion metric tons of salt
lie under New York State. Getting to it can be a challenge.

By Jenna DuChene and Christine Reed

When you think of salt, you probably think of the stuff in the shaker on your dining room table, or what's used to deice the roads in winter. But do you know how much effort it takes to get this ancient mineral from the ground to our roads and tables?

Deep, deep underground lays a hidden world of glistening rooms and tunnels. Light is absent, but it's the middle of the day. It's quiet and, what's that smell? It's like an ocean breeze; maybe it's…yes, it's salt!

At least three different processes produce this important resource that is found in everything from soap to batteries, and is a vital component of every animal's life processes, including humans.

The United States is the second largest producer of salt in the world, with New York producing the third most salt of any state in the country. In New York, salt (a.k.a. the mineral halite) occurs in formations deep underground. These formations are remnants of a vast sea that covered what is today's western and central New York during the Silurian period, some 400 million years ago. Over time, the water dried, leaving behind thick salt deposits. Today, more than 10,000 square miles (about 3.9 trillion metric tons) of salt lie under New York at depths ranging from 500 feet near Syracuse to 4,000 feet near the Pennsylvania/New York border. With salt deposits so deep and expansive, collecting it can be a challenge.

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One method for mining salt is known as solution salt mining. It works basically as it sounds: water is pumped down a well and dissolves the salt. The resulting solution, called brine, is pumped back up and sold, or is dried to leave the salt behind. This is how we get our table salt. In New York, there are three sites in Wyoming County and two sites in Schuyler County where this method is used.

One of the oldest forms of salt production is the solar evaporation method. Like its name suggests, salt water from the ocean or another saline body is evaporated by sunlight, leaving the salt behind. To accomplish this, water is gathered in a concentrating pond and then in a crystallizing pond where it undergoes the solar evaporation process. While this method was prevalent in Syracuse in the late 1800s, today's demand for large scale commercial production of salt, combined with a rainy and cold climate, make it nearly nonexistent in New York today.

Since the early 1900s, conventional hard rock salt mining is the primary process used for mining salt for deicing and snow removal. Employing the "room-and-pillar" method during mining, solid salt pillars are carved in the underground cavern to provide roof support and the walls of salt are excavated through the use of small, controlled blasts. Front-end loaders scoop the pile of fallen salt, which is then processed in a crusher to make the salt uniform. Next, the salt is hoisted to the surface and taken away by trucks and trains.

> While modern highway departments are making strides to reduce the amount of salt they use, it's still a concern.

In New York there are two active conventional salt mines—Cargill's Cayuga Mine in Tompkins County, and American Rock Salt's Hampton Corners Mine in Livingston County. The Cayuga mine is a large operation that encompasses approximately 18,000 acres under portions of Cayuga Lake and adjacent lands. In addition, the mine is 2,300 feet deep, making it the deepest salt mine in the western hemisphere.

In New York, rock salt production averages about 4.3 million metric tons annually. Last year, demand was high for salt to combat the above average snowfall that occurred in the Northeast and Midwest. This has caused a salt shortage this year, which has many communities feeling the crunch and reassessing their salt usage for the remainder of this winter and in the future. Some towns have decided to use other less expensive means to treat their roads, like sand or sand-salt blends. But while these may cost less, depending on conditions, they may also be less effective.

In seeking alternative methods for deicing roads, researchers have uncovered a new, unconventional method that uses beets. It seems far-fetched, but the sugar beet's byproduct, a desugared liquid, can withstand cold temperatures down to -30°F before freezing. Some states' transportation departments have already been testing a salt-beet combination on roads. The unique mixture has a lower freezing point than salt alone, which means it can stay on roads longer, requiring fewer applications.

This new deicer may also be easier on the environment—an option worth studying further. You see, traditional rock salt can damage trees and vegetation along roads and can increase the amount of chloride in water bodies. While modern highway departments are making strides

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Equipment necessary for rock salt mining, is disassembled above ground and reassembled after being lowered into the cave piece by piece.

NOT JUST ANY ROCK

Salt is used to cure meat, it's part of our oceans, and is an essential component of our bodies, so it's no small wonder it repeatedly finds a place in our society. Here are just a few ways salt has influenced the environment, our diet, our work and even our language.

- **Salt is in lotions, soaps, dyes, paper, electronic circuits and rubber.**
- **The phrase "not worth his salt" comes from the days when Greeks traded slaves for salt.**
- **Salt potatoes originated in central New York, particularly Syracuse, when Irish salt workers of the 1800s threw potatoes into the boiling salt vats for their lunches.**
- **The final leg of the Erie Canal, from the Hudson River to the Great Lakes, was built in 1825 with money citizens paid in accordance with the day's tax on salt.**
- **"Salting the earth" was an ancient military practice where soldiers salted fields so crops could not grow.**

James Clayton

Protecting a Natural Resource

In coordination with the federal Underground Injection Control (UIC) Program administered by the Environmental Protection Agency, DEC's Division of Mineral Resources oversees all aspects of solution salt mining in New York, including well drilling, plugging and operational activities. The entire process is subject to the same rules placed on oil and gas well drilling, but with some additional requirements such as monitoring the amount of fluids injected and removed to detect any leaks in the system. The Division also oversees hard rock salt mining under the Mined Land Reclamation Program.

Once a cavern is no longer actively mined for salt, it may be used for other purposes. For example, old caverns are sometimes used to store natural gas. Gas is pumped in during months where demand is low and pumped out when demand is high, like in winter.

Susan L. Shafer

To decrease possible damage to the environment, DOT has limited the amount of salt used on our roads, and is continuously looking for more environmentally friendly deicing alternatives.

to reduce the amount of salt they use, it's still a concern. Scientists worry that if current land development and road salting practices continue, chloride levels in some water bodies, such as streams by long sections of road, could slowly rise to the point that the chloride becomes toxic to freshwater life.

But all road deicers have pros and cons, and beet juice is no exception. While it is true that adding beet juice to form innovative concoctions reduces salt levels, more study is needed. Experience and tests will show whether it is beneficial, of little consequence, or if it has unintended impacts, like reducing dissolved oxygen levels in nearby water bodies.

The New York State Department of Transportation (NYSDOT) is continually looking for new ways to reduce the impacts deicing has on the environment while still keeping our roads safe. Twice a year, experts from every region gather to form the Snow & Ice Community of Practice to exchange ideas about snow and ice removal in our state.

In last winter's issue of NYSDOT's electronic magazine, the department highlighted some advances being made in deicing New York's roads. One improvement, for example, is that the department no longer uses sand to treat roads. Snow/ice program engineer Mike Lashmet explains that sand gets into drainage ditches, clogs culverts and isn't ecologically safe. The department has adopted the practice of "pre-treating" roads ahead of a storm with salt brine or magnesium chloride (a more expensive type of deicer). The solutions prevent ice and snow from compacting, allowing for easier removal. In turn, this allows the department to cut back on the amount of initial rock salt applications. So far, says Lashmet, it's working.

NYSDOT is continually looking for new ways to reduce the impacts deicing has on the environment while still keeping our roadways safe.

Whether we realize it or not, salt is a large part of our lives. Through advances like these, we can better control our impact on the environment and help safeguard New York's communities.

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