

# **2020 Fact Sheets Products of New York State Mines**

**New York State  
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Division of Mineral Resources  
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**Remember: If it can't be  
grown, it has to be mined!**

## BLUESTONE MINES IN NEW YORK



View of a bluestone mine in New York State.



Using a hand chisel to split the rock into landscaping and building material.

## FAST FACTS

Bluestone can be found in many colors including bluish-gray, green, red, purple, pink, and brown.

In the U.S., bluestone is only commercially produced in south-central New York and northeast Pennsylvania.

The term "bluestone" refers to a type of sandstone that is easily split into thin slabs.

Bluestone is very durable, naturally skid-resistant, maintains its color, and can withstand fluctuations in temperature and pressure without cracking.

## WHAT IS IT USED FOR?

Bluestone is primarily used as an architectural/decorative stone in sidewalks, patios, building veneer, stair treads, countertops, etc. Notable structures that utilize bluestone in their construction:

- \* Fenimore Art Museum – Cooperstown, NY
- \* NY logo at Yankee Stadium – Bronx, NY
- \* Cornell University – Ithaca, NY
- \* Princeton University – Princeton, NJ
- \* Bellevue Hospital – New York, NY
- \* Bethel Center for the Arts – Bethel, NY
- \* Opus 40 – Saugerties, NY
- \* Grant's Tomb Restoration – New York, NY
- \* Starrucca Viaduct (a National Civil Engineering Landmark) – Lanesboro, PA
- \* The White House Rose Garden terrace – Washington D.C.
- \* Sidewalks and curbing throughout NYC and many other metropolitan areas.

**Properties**

*Composition: Feldspathic greywacke (quartz, feldspar, mica, iron)*

*Color: Varies (blue, bluish-gray, green, red, purple, brown, green, etc.)*

*Hardness: 7 on Mohs scale*

*Structure: Layered*



## Bluestone

Bluestone is a specific type of evenly layered sandstone that can be split into thin, smooth slabs. The term "bluestone" was coined back in the mid-1800s when the majority of the stone appeared blue or bluish-gray. Despite the name, bluestone can also be found in a range of colors including shades of green, brown, purple, dusty gray, pink, or red. New York and Pennsylvania are the only sources of commercially-produced bluestone in the United States. It is very durable, maintains its color, and is resistant to cracking under atmospheric changes, such as temperature and pressure fluctuations. Bluestone mining in New York State began in Ulster County in the mid-19<sup>th</sup> century and it has been mined ever since for use in sidewalks, building veneer, stair treads and other construction applications.

New York's bluestone was deposited during a time when an ancient sea covered the majority of present-day New York. Streams transported the sand-size grains that make up the stone and deposited them in a shallow sea/deltaic environment, known as the Catskill Delta. Even though the bluestone was formed in

this low-lying, shallow sea environment, much of the material in the rock originated from erosion of the former Acadian Mountains, which were located in what is now the modern-day mountain ranges of the Northeast.

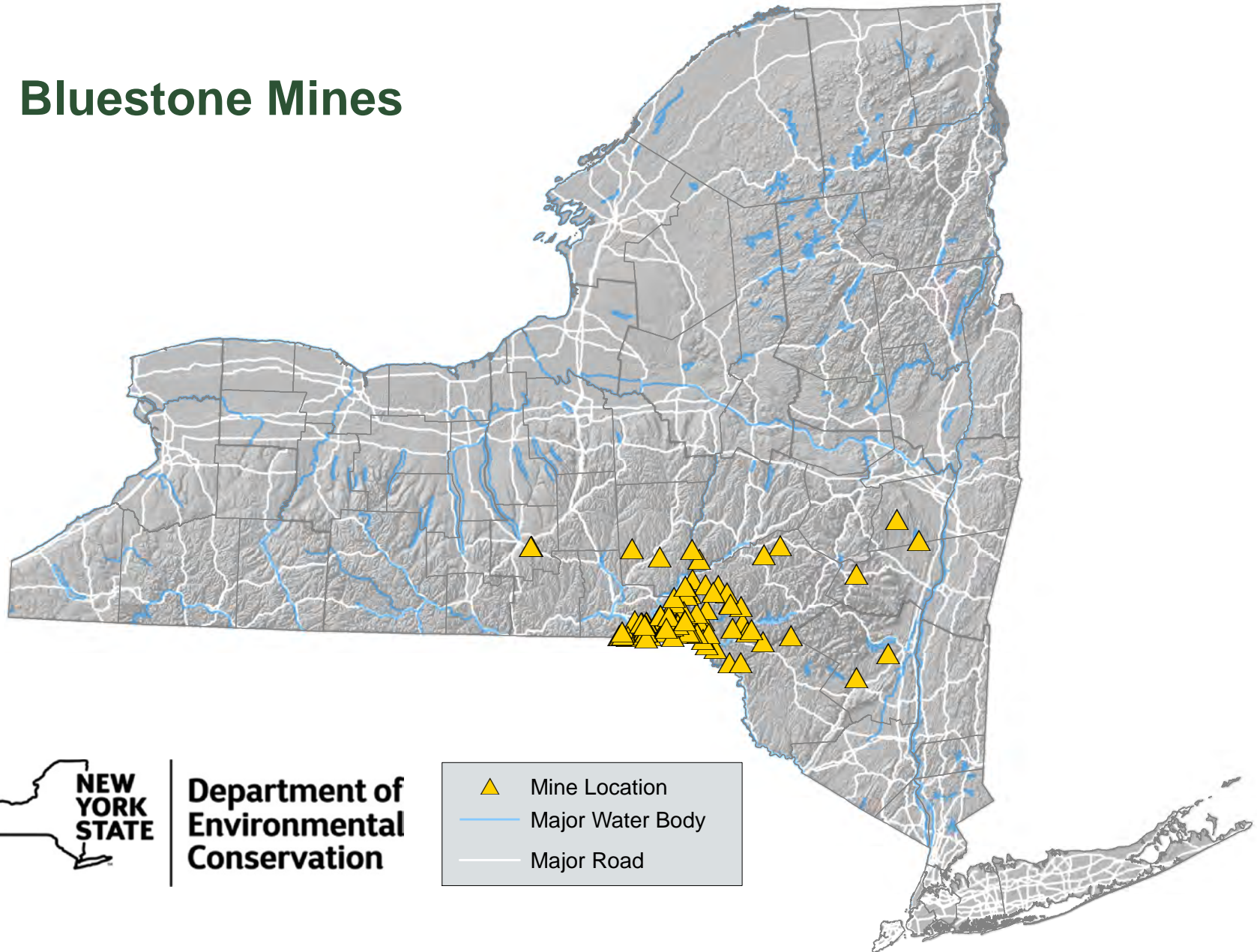
Exploring for bluestone is more difficult than for many types of rock where a few well-placed core holes will yield useful information. High quality bluestone deposits tend to be limited in extent and discontinuous in nature, so it is not always cost-effective to use core holes to locate new deposits. In addition, bluestone mining typically involves removing eight times more overburden (overlying material) than the quantity of useable bluestone.

In 2020, there were 97 permitted bluestone mines in New York, with the majority located in Delaware and Broome Counties. Bluestone mining is, by nature, a relatively small-scale operation (approximately 54% are 10 acres or less in size). ⚒



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Bluestone Mines



Department of  
Environmental  
Conservation

- ▲ Mine Location
- Major Water Body
- Major Road

## GARNET MINES IN NEW YORK



View of a garnet mine in New York State with piles of garnet separated from the source rock.



Closer view of a large garnet and some of the processed grade sizes for use in abrasives.

## FAST FACTS

NY garnets are primarily red to very dark red but can also be found as purple, green, orange, yellow, and brown. In fact, garnet varieties can be found throughout the world in every color except blue!

Garnet is the official New York State Gem.

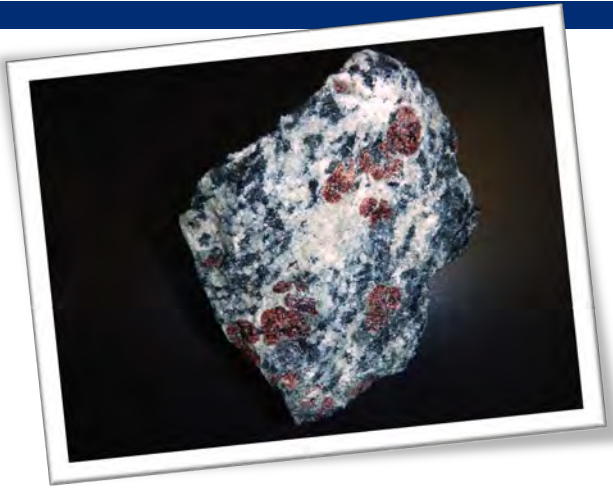
NY garnet mines are among the top producers in the country with products sold worldwide.

NY garnets always break with a sharp edge even at the smallest sizes, making them an ideal abrasive!

Garnet products have an advantage over similar products because they are non-toxic, non-reactive, and reusable/recyclable. They also produce less dust than other abrasive materials.

## WHAT IS IT USED FOR?

- \* Sandpaper and sand blasting
- \* Waterjet abrasives and cutting
- \* Polishing television/computer screens and other high quality glass; such as the glass sights on American aircraft during WWII, the windows on the space shuttle, and the Hubble telescope lenses!
- \* Water filtration media
- \* A non-skid additive for paint
- \* Removing peanut hulls
- \* Eyeglasses and dental grinding wheels
- \* Cleaning petroleum drill pipes/well casings
- \* Landscaping and decorative tile/countertop

**Properties**

*Composition: Iron aluminum silicate  
 $Fe_3Al_2(SiO_4)_3$  or  $(Fe, Mg, Mn)_3Al_2(SiO_4)_3$*

*Color: Dark red, reddish-brown, black*

*Hardness: 7 – 7.5 on Mohs scale*

*Structure: Dodecahedral (12-sided)*

## Garnet

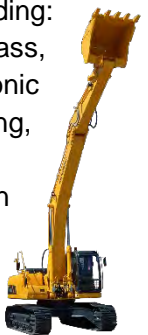
As a member of the silicates group, garnet is actually a generalized term for a group having similar properties but varying chemical compositions. The garnets mined in New York are almandine garnets, the most common type, which are an iron aluminum silicate, and pyrope which are a magnesium aluminum silicate. Garnets can be found in a multitude of colors due to their differing chemical makeup, however, they are most commonly associated with a deep red color. Garnet is New York State's official gem, even though the majority of garnets found here have too many imperfections for use in jewelry and are better suited for industrial purposes.

Garnets have been mined in the Adirondack Mountains of New York since 1878 by the Barton Mines Corporation, which is the first industrial garnet mining operation in the world, as well as the oldest continuous garnet mining operation in the world (second oldest in the U.S. mining the same product throughout its history and still under the same management). Prior to Barton moving its active mining operations to the nearby Ruby Mountain Mine in 1982, the Gore

Mountain Mine was the largest garnet mine...IN THE WORLD! NYCO Minerals in Essex County and R.T. Vanderbilt in Lewis County also produce garnets in small amounts at their wollastonite mines.

The garnet crystals found in the Gore/Ruby Mountain Mines are unique and highly-valued for their abrasive properties. These garnets always break with a chiseled edge, even at the smallest sizes, which gives them a “self-sharpening” trait that is ideal for use as an abrasive.

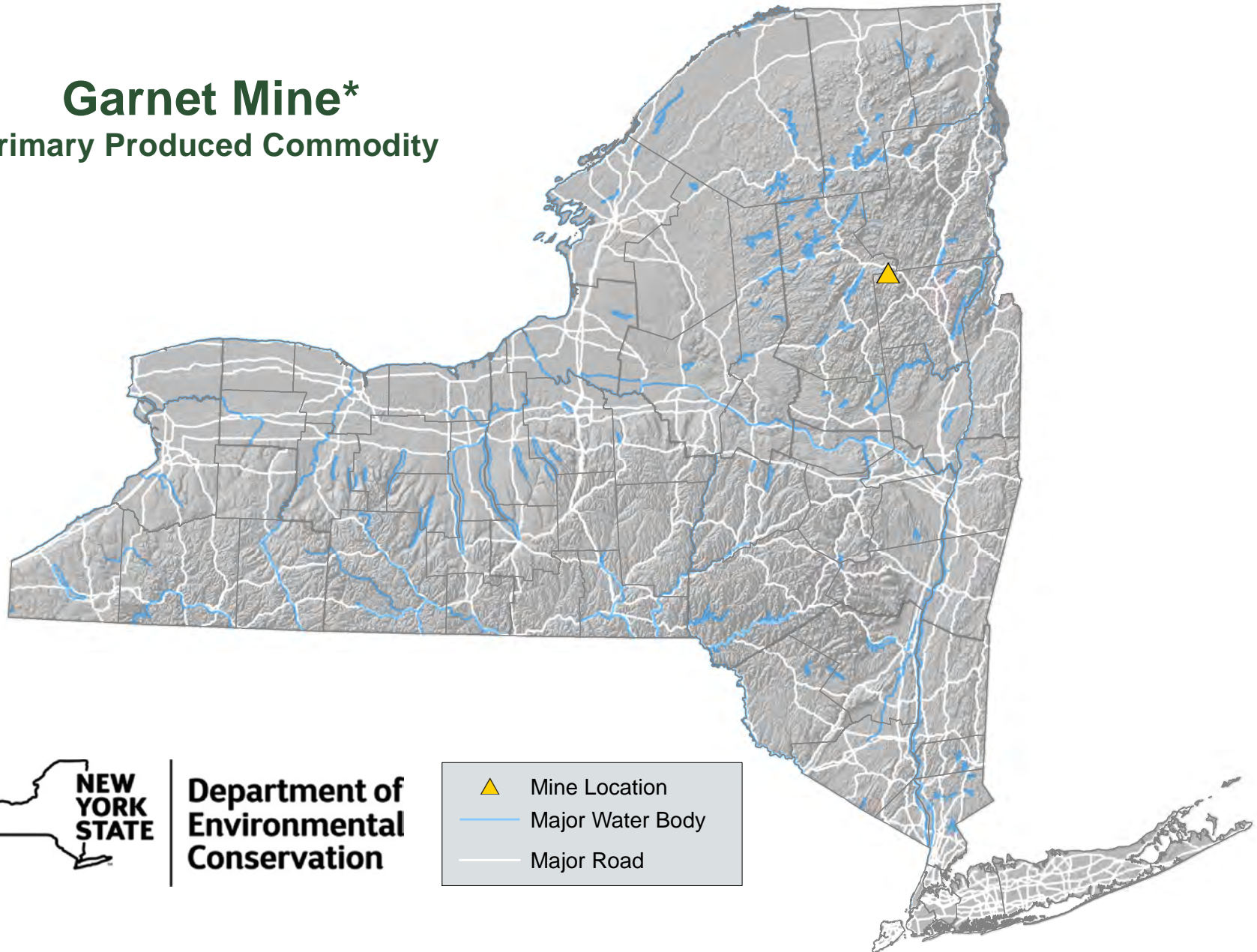
Garnets are primarily used as abrasives and cutting media (sandpaper, waterjet blasting/ cutting) in many industries including: woodworking, ceramic/glass, petroleum, electronic component manufacturing, aircraft/shipbuilder/ automotive, etc. It's even used for cutting armor plating on military Humvees! It is also used as a paint additive for non-skid surfaces, water filtration media, countertops, tile, and landscape boulders. ⚒



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Garnet Mine\*

\*Primary Produced Commodity



Department of  
Environmental  
Conservation

- ▲ Mine Location
- Major Water Body
- Major Road

## GRANITE MINE IN NEW YORK



View of a granite quarry in New York State.



View of a granite quarry in New York State.

## FAST FACTS

Granite is considered the most abundant rock in the continental crust, whereas the much denser basalt is the main component of oceanic crust.

Commercially sold “granite” is often any rock that is harder than marble and has visible grains such as gabbro, pegmatite, gneiss, syenite, anorthosite, granodiorite, diabase, labradorite, etc.

Granite is very hard, highly resistant to abrasion, able to support significant weight loads, resistant to weathering, and attractive in both its natural and polished forms making it a worthwhile and sought-after stone.

The first commercial railroad in the U.S. transported granite approximately three miles in Massachusetts and was nicknamed the “Granite Railway”.

Many rocks are radioactive and some granites can contain radioactive elements many times higher than normal.

## WHAT IS IT USED FOR?

- \* Countertops
- \* Floor tile
- \* Building veneer
- \* Paving stone
- \* Curbing
- \* Cemetery monuments
- \* Statues
- \* Stair treads
- \* Dimension stone
- \* Curling stones (used in the sport of curling)
- \* Crushed stone/aggregate
  - roads
  - railroad ballast
  - foundations



## Granite

In general, granite is a light-colored, coarse-grained rock of igneous origin that is comprised primarily of interlocking quartz and feldspar crystals with minor amounts of mica and amphibole minerals. It is formed when molten rock material, or magma, beneath the Earth’s surface slowly cools, with the rate of cooling determining the crystal size (slower cooling equals larger crystals). Granite is considered the most abundant rock in the continental crust and makes up the core of many mountain ranges. Granite, and similar igneous granitic rocks, are known as “basement rocks” and lie deep below many of the sedimentary rocks exposed at the Earth’s surface.

In New York, granite is mined mostly in the Adirondack and Taconic regions, with Washington County having the most granite mines in the state.

Due to its hardness, strength, weather-resistance, and attractive appearance, granite is often used as interior and exterior decorative stone. Its resistance to acid rain also makes granite favorable over marble for outdoor monuments. Some well-

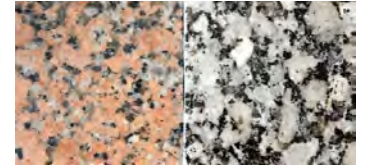
**Properties**

*Composition: Varies – primarily quartz (~70%) and feldspars (~20%) with minor amounts of mica and amphibole*

*Color: White, gray, pink, or red color with varying amounts of darker minerals distributed throughout the rock*

*Hardness: 6 - 7 on Moh’s scale*

*Structure: Phaneritic (grains visible by the naked eye)*



known granite monuments include: Mount Rushmore in South Dakota, the pedestal for the Statue of Liberty, and parts of the Great Pyramids in Egypt. In 2004, an over 20-ton piece of granite that originated in the Adirondacks was placed as a cornerstone for the Freedom Tower in New York City. Unfortunately, the rock was removed due to a redesign.

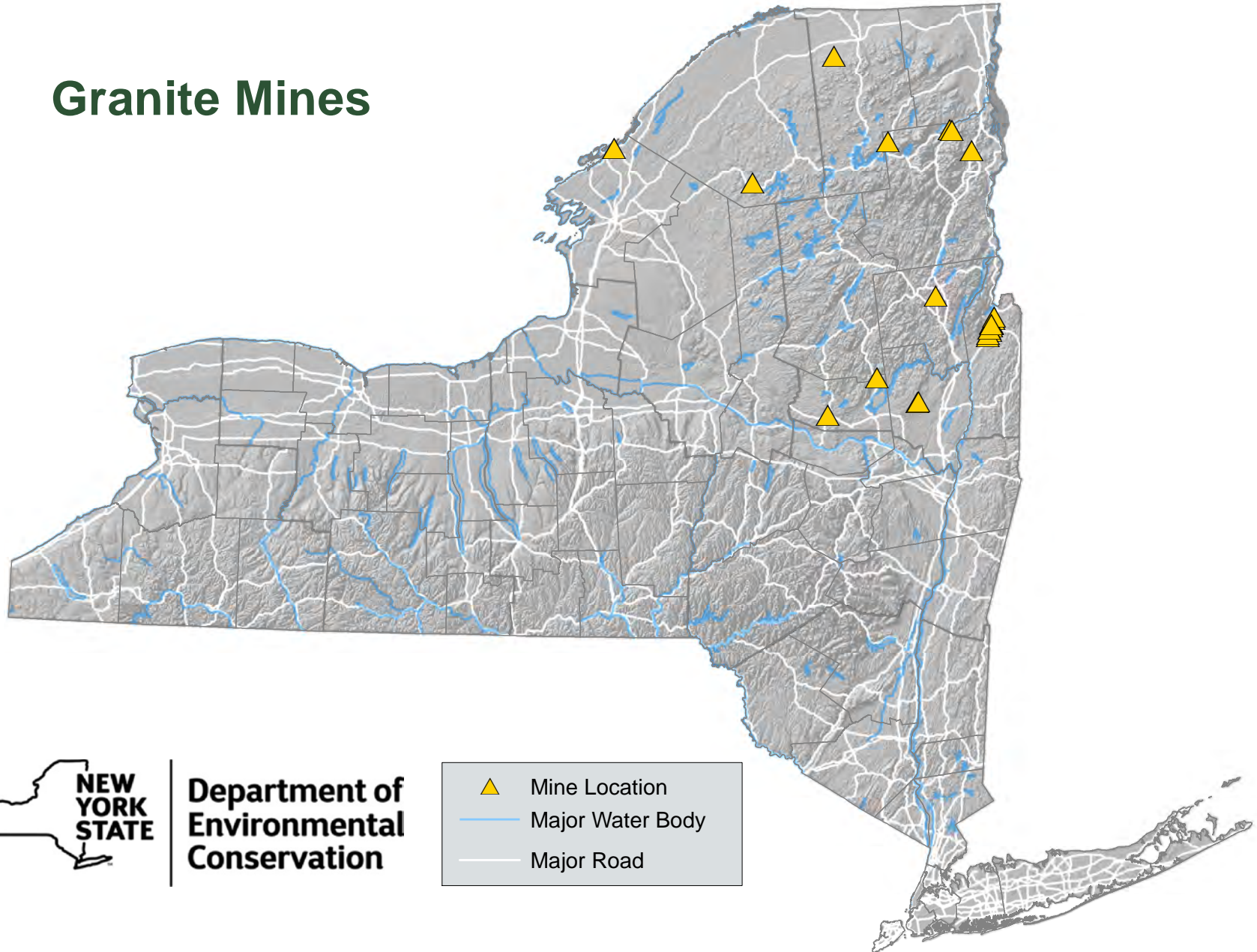
Granite is also used in the construction industry as crushed stone or aggregate for roads, railroad ballast, foundations, etc.

As with many rocks, some granite contains trace amounts of radioactive elements. Radon gas is a byproduct of these elements and is considered the second leading cause of lung cancer, after smoking. The EPA has stated, though, that radon gas originating from in situ bedrock beneath buildings is a greater health risk than building materials made from granite. ⚡



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Granite Mines



**Department of  
Environmental  
Conservation**



## LIMESTONE QUARRY IN NEW YORK



View of a limestone quarry in New York State.



Closer view of an active face showing angled bedding.

## FAST FACTS

Limestone and dolostone comprise the third largest number of New York mines.

Cement manufacturing is mostly focused in the upper Hudson Valley area where a relatively pure limestone is mined from the Coeymans Formation.

Marble is metamorphosed limestone.

Karst topography (many caves, gorges, sinkholes, etc.) is formed as a result of acidic water dissolving the calcium carbonate in limestone.

Often a "reservoir rock" and a target of oil and gas drilling.

## WHAT IS IT USED FOR?

In addition to the items mentioned in the text of this Fact Sheet, limestone and dolostone are used in a variety of every day products including: toothpaste, cosmetics, vitamins, pharmaceuticals, breakfast cereal, baking soda, swimming pools, roofing shingles, paint, caulking, crayons, glue, vinyl siding, PVC pipe, paper, detergent, fertilizer, etc.

Many famous landmarks are constructed of limestone including: the NYS Capitol building, the Brooklyn Bridge, the Empire State Building, Yankee Stadium, the Great Pyramid of Giza, the Sphinx, the [leaning] Tower of Pisa, the Pentagon, the Lincoln Memorial, and so many more! Kingston, Canada is even nicknamed the "Limestone City" because so many of its buildings are constructed of limestone.

Howe Caverns (and most other caves, including the well-known Carlsbad Caverns), as well as the Niagara Falls escarpment are formed in limestone and dolostone.

**Properties**

*Composition: Limestone  $\text{CaCO}_3$ ;  
Dolostone  $\text{CaMg}(\text{CO}_3)_2$*

*Color: White to gray; white to light brown (green, black, red also possible)*

*Hardness: Limestone 3 on Moh's scale;  
Dolostone 3.5 - 4 on Moh's scale*

*Structure: N/A*



## Limestone/Dolostone

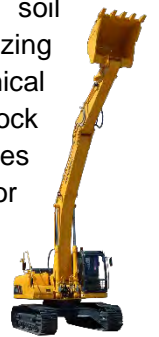
Limestone is a sedimentary rock with at least 50% of its composition being calcium carbonate, or calcite ( $\text{CaCO}_3$ ). It most commonly forms in a calm, shallow, warm marine environment and is essentially the accumulation of shells, skeletal fragments, and other organic debris which can be microscopic, as is the case with chalk, or larger shell fragments/ fossils, as is the case with coquina and fossiliferous limestones. A less common type forms by the direct precipitation of calcium carbonate in lake and marine environments. Travertine is a type of limestone that forms by the evaporation of calcium-rich water and is often found in caves and near springs (stalactites, stalagmites, flowstone). Dolostone is similar to limestone but the material is altered by magnesium-rich groundwater post deposition to form  $\text{CaMg}(\text{CO}_3)_2$ .

Both limestone and dolostone will effervesce in a cold solution of 5% hydrochloric acid but dolostone reacts much less vigorously. Due to their solubility in weak acidic waters (i.e. "acid rain" – commonly comprised of hydrochloric, nitric, and sulfuric acids; and carbonic acid – formed when carbon dioxide and

water react in the atmosphere), limestone and dolostone often form various erosional features, known as karst, which include caves, gorges, sinkholes, etc.

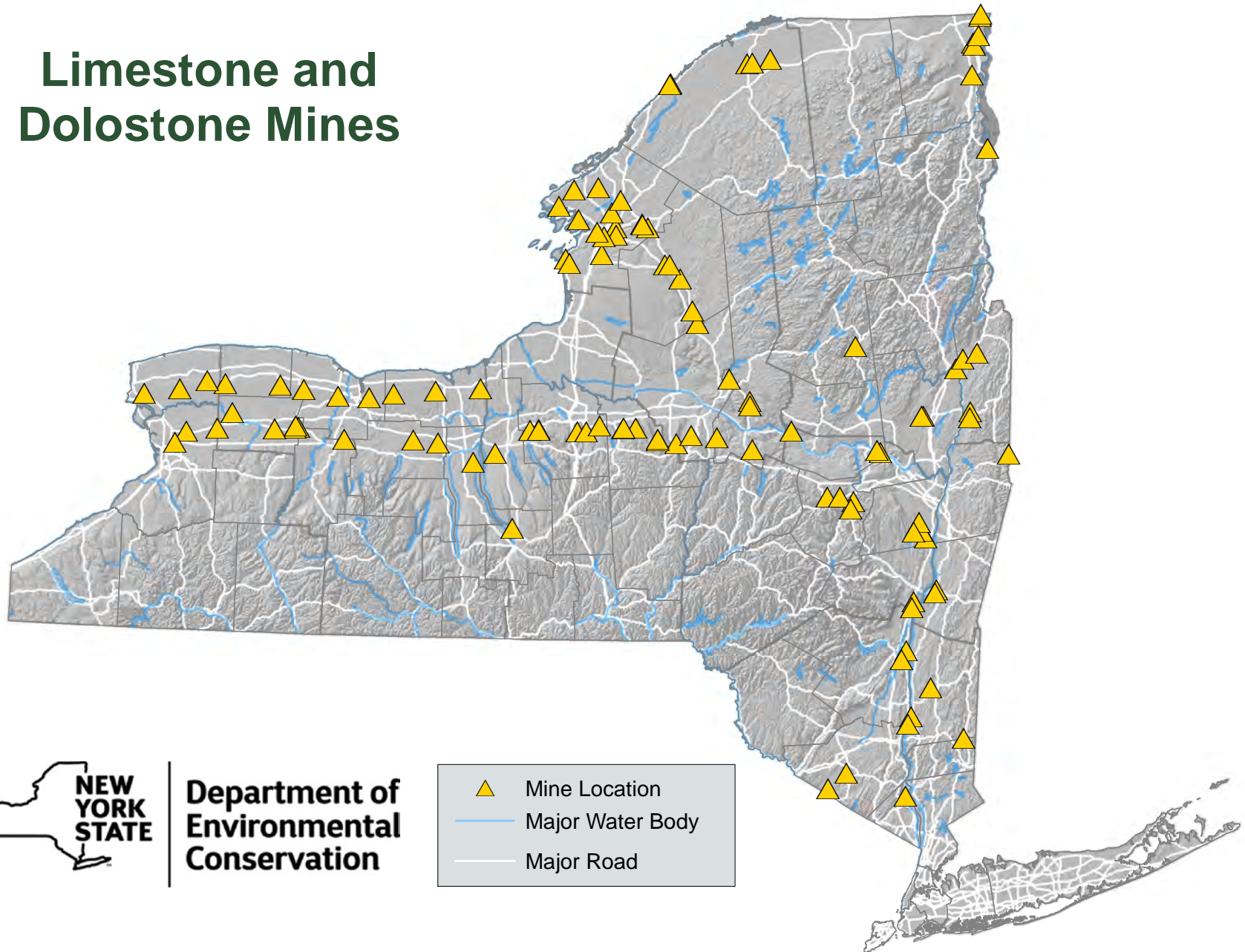
Limestone and dolostone are primarily used in the construction industry as crushed stone for road base, railroad ballast, aggregate in concrete and blacktop, a key component of Portland cement, rip-rap, dimension stone, roofing granules, flux stone in metal refining processes, glass/ceramics/bricks, agricultural lime soil conditioner, acid-neutralizing agent in the chemical industry, and a livestock feed additive (provides calcium needed for production of egg shells and milk). Limestone is also used to reduce sulfur dioxide air emissions in power plants, as well as to control coal mine dust when applied to the walls as a powder.

Limestone and dolostone quarries are New York's third and seventh most common types of mines, respectively. ⚒



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Limestone and Dolostone Mines



## PEAT MINE IN NEW YORK



View of a peat mine in New York State.



View of a peat mine in New York State.

## FAST FACTS

Peat is essentially the accumulation of decaying plant matter that is formed in a saturated, anaerobic, and nutrient-deficient environment.

Peat has been used for at least 2,000 years as a fuel source.

Peatlands are the most efficient carbon sinks in the world.

Peat fires can burn for a very long time, even underground!

Peat accumulates at roughly 1 millimeter per year.

Peat absorbs and retains a lot of water, allowing for its associated marshy area to broaden.

## WHAT IS IT USED FOR?

- \* Horticulture (as a soil amendment to improve plant growth by absorbing moisture, aerating roots, adding bulk to sandy soils, and improving drainage in clayey soils)
- \* Growing mushrooms
- \* Raising earthworms
- \* Fuel source for electricity, heating, and cooking in some countries
- \* Water filtration medium
- \* Absorbent material for fuel and oil spills
- \* Insulation material
- \* Used to manufacture activated carbon, resins and waxes, medicinal products, etc.
- \* Drying malted barley used in some whisky distilleries

**Properties**

*Composition: Partially decomposed organic material*

*Color: Light brown to dark brown to black*

*Hardness: N/A*

*Structure: N/A*

## Peat

Peat is the buildup of partially decomposed organic material (which comprises at least 30% of its dry composition) formed in a saturated, low oxygen, and nutrient-poor environment. These environments go by many names including: bogs, fens, wetlands, peatlands, mires, muskegs, etc. Peat is found worldwide but is predominantly located in the Northern Hemisphere. It is found at all elevations and climates, in conditions that vary from alkaline to acidic. Historically, peat has been mined in almost every region of New York State but today only a few permitted peat mines exist with limited production.

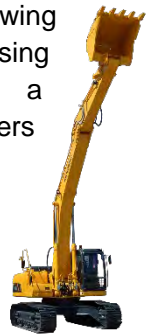
Peat environments are among the most efficient carbon sinks in the world, as they capture CO<sub>2</sub> and store carbon. Analyzing the pollen and plant remnants in peat also allows scientists to learn more about past surroundings and climates.

Peat is used for a variety of purposes around the world. In some places (especially those lacking trees), such as areas of Ireland, England, Russia, Germany, Sweden, Finland, and the Netherlands, peat is used as a

source of fuel for generating electricity, heating and cooking. Some whiskies are produced with malted barley that is dried by fires fueled with peat. This gives them a distinct smoky flavor, referred to as peatiness. Burning peat releases the stored-up carbon as CO<sub>2</sub> at a rate higher than that of coal emissions.

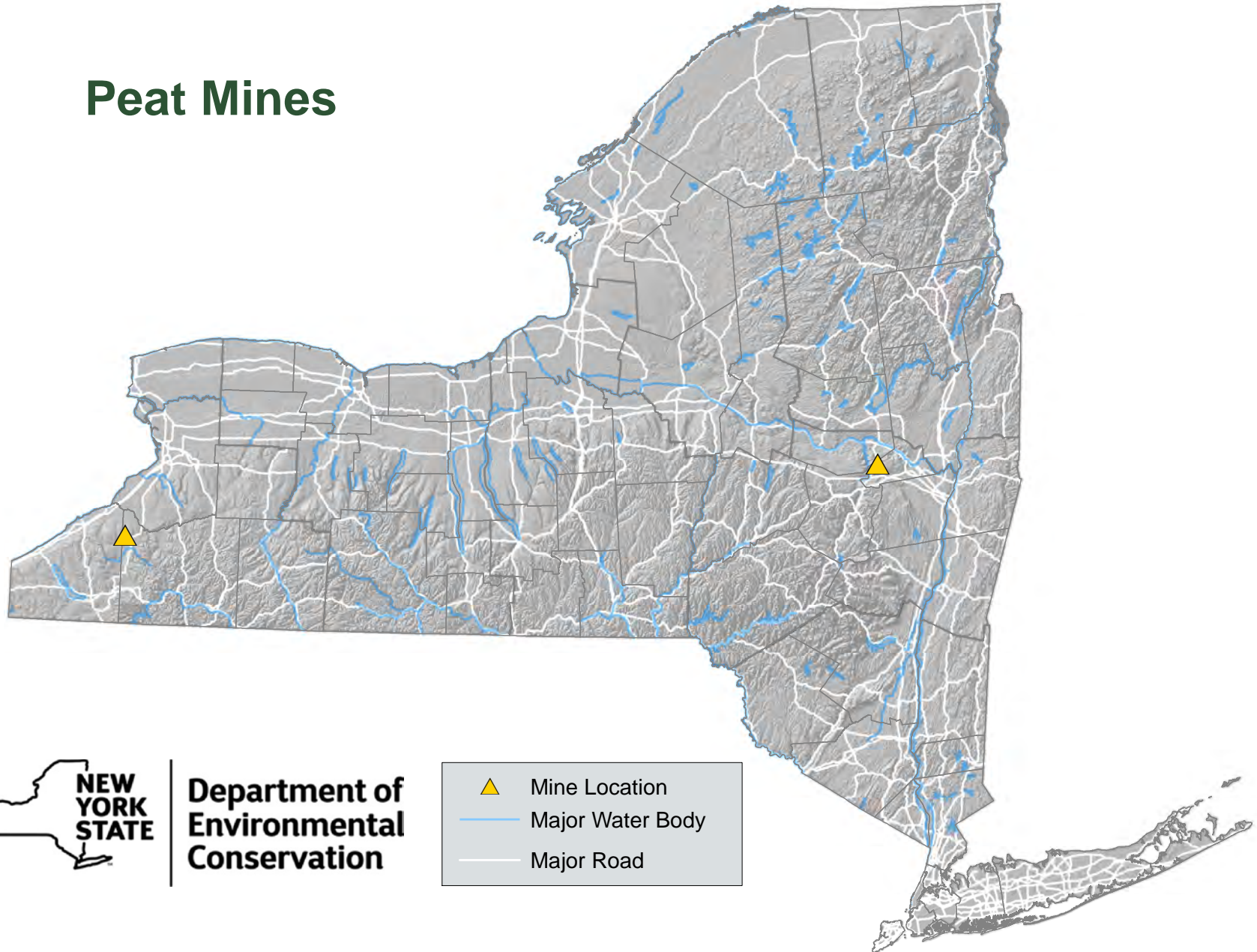
In the U.S., peat is primarily used as a soil conditioner and is often sold as sphagnum peat (contains sphagnum moss), or humus, a peat variety that has experienced further decay than the more fibrous sphagnum variety. Peat is also used for growing mushrooms, raising earthworms, and as a packing material for flowers and shrubs.

Peat is an effective water filtration medium to remove toxic substances from wastewater, pathogens from sewage effluent, and suspended materials from storm water. It can be used to absorb petroleum spills, as well as in the manufacturing of a variety of products. ⚡



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Peat Mines



**Department of  
Environmental  
Conservation**

Yellow Triangle	Mine Location
Blue Line	Major Water Body
White Line	Major Road

## SALT MINES IN NEW YORK



View of a salt stockpile in New York State.



Closer view of an underground salt mine in operation.

## FAST FACTS

The 2020 USGS Mineral Commodity Summaries reports New York as is the fourth largest salt-producing state in the country.

Commercial production of salt began in Syracuse due to the difficulty in getting salt during the War of 1812.

In 1825, money from the taxes on salt was used to build the remaining leg of the Erie Canal, allowing salt to be transported to the Great Lakes. As such, the canal was nicknamed “the ditch that salt built”.

In the 1800s, Irish salt workers in central New York used the boiling salt vats to cook their potatoes at lunch, thus introducing salt potatoes.

The U.S. government requires that any food-grade salt be a minimum of 97.5% pure. The remainder is usually an anti-clumping agent and iodine.

## WHAT IS IT USED FOR?

- \* Food seasoning and flavor enhancer
- \* Curing meat
- \* Lotions and soaps
- \* De-icing roadways
- \* Dyes
- \* Paper
- \* Electronic circuits
- \* Salt licks for cattle
- \* Softening hard water
- \* Chemicals
- \* Aspirin
- \* Leather shoes
- \* Removing water from aviation fuel
- \* Stain remover (even wine!)
- \* Warding off evil spirits (many cultures believe that salt has supernatural properties)
- \* Rust remover
- \* Cleaning products
- \* Making ice cream (mixed with ice to lower freezing point)



## Salt

Halite (NaCl) is the source mineral for salt and is also the primary ore for the elements sodium and chlorine. Ocean and saline lake waters contain dissolved salt which precipitates and is left behind as the water evaporates. About 400 million years ago, much of central and western New York was under a large sea. As it dried up, salt was deposited on the sea floor and eventually buried deep below the surface. Most salt mines, including those in New York, work these underground deposits.

There are currently two active underground salt mines and five solution salt facilities in New York. The underground salt mines operate similarly to other underground hard rock mines using pillars left in place to support the ceiling. The salt is processed underground prior to being conveyed to the surface. In solution mining, water is pumped down a well to dissolve the salt, the “brine” is retrieved, and the water is then evaporated off to recrystallize the salt. This process leaves a relatively pure salt, often used as table salt. The United States is the second largest salt producer in the world, with New York being the third largest salt-producing state.

Properties

*Composition: Halite NaCl*

*Color: Colorless to white when pure; can be yellow, gray, black, brown, red, orange, pink, blue, violet, green, and multicolored.*

*Hardness: 2 – 2.5 on Moh's scale*

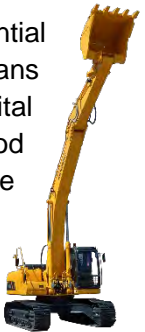
*Structure: Isometric w/ cubic cleavage*



Surface deposits of salt are typically only found in arid environments where evaporation rates exceed precipitation rates, leaving behind salt along the shorelines.

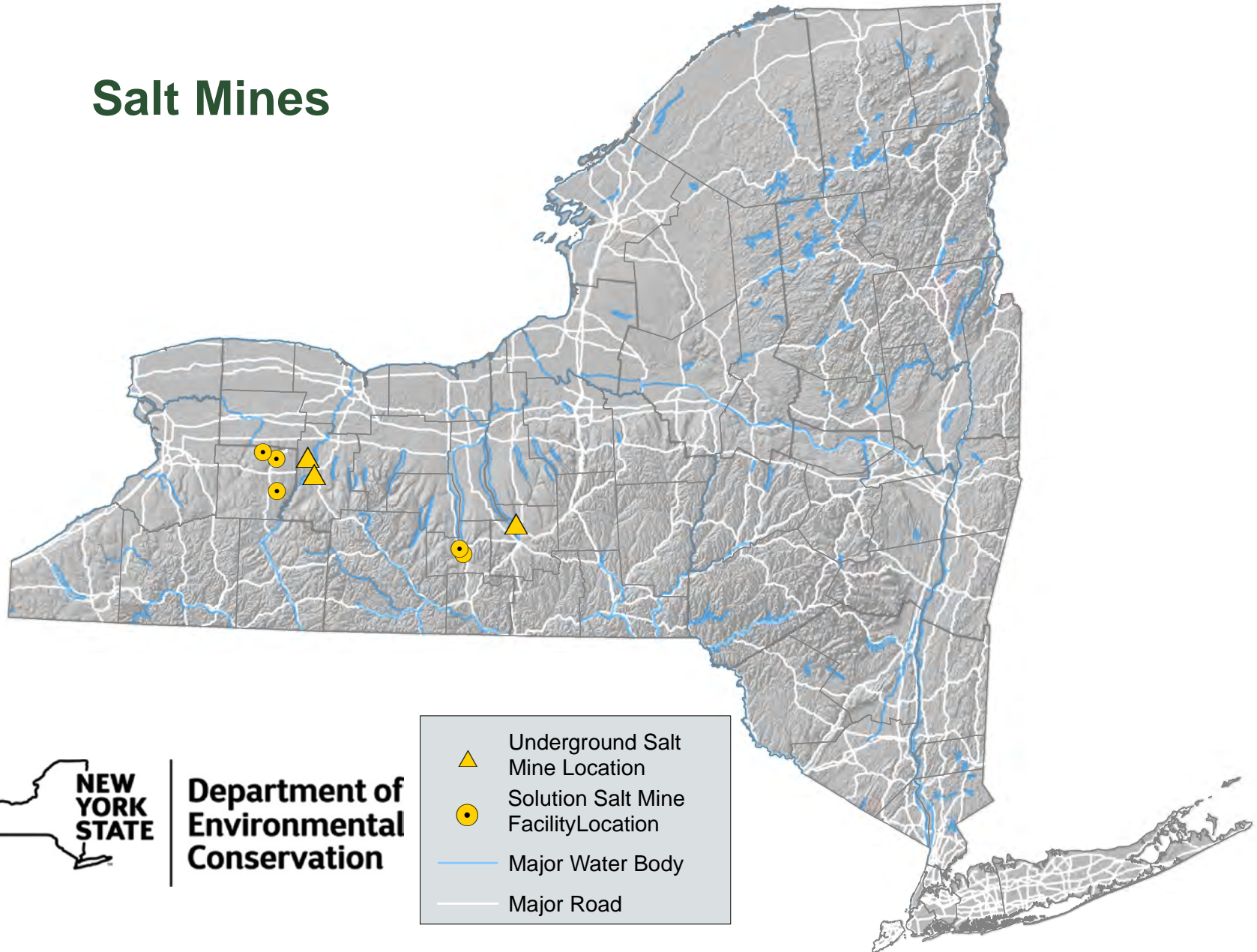
Salt is actually one of the most extensively utilized minerals in the world and has more than 14,000 uses! In addition to its well-known uses as a seasoning for food and a road de-icing treatment (both of which only account for a small percentage of our salt consumption), a considerable amount of salt is used by the chemical industry. The list on the left describes some of salt's uses.

Salt is also an essential mineral in the diet of humans and animals, playing a vital role in managing blood pressure and volume, nerve impulses to and from the brain, and heart and muscle contractions. In 1924, Morton began selling iodized salt to address iodine deficiencies which were prevalent at the time. Overconsumption of salt is also a concern as it contributes to heart disease and other issues. ⚒



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Salt Mines



**Department of  
Environmental  
Conservation**

## SAND &amp; GRAVEL MINES IN NEW YORK



View of a sand & gravel mine in New York State.



Closer view of an active face showing depositional structure.

## FAST FACTS

Sand and gravel is New York's third most economically important non-fuel mineral.

Sand and gravel mines are New York's most common type of mine.

Sand and gravel is produced in all 50 states.

## WHAT IS IT USED FOR?

The construction aggregate industry is the largest consumer of sand and gravel in New York, where it is primarily used in concrete and blacktop products. The roads that you drive on and the buildings that you live, work, and play in all contain sand and gravel. Additionally, sand and gravel is used in the manufacture of:

- \* Traction control in snow and ice.
- \* Block, brick, and decorative stone.
- \* Glass, ceramics, and related materials – this includes the glass on your smart phone, oven-safe cookware, and even the windows for the space shuttle!
- \* Foundry sand – molds and casts are created from the foundry sand for the production of iron, steel, copper, and aluminum products.
- \* Paint – used as a flattening agent and improves durability, scrubability, and resistance to weathering.
- \* Plastics – improves flexural strength.
- \* Abrasives – used in the sand blasting of metal.
- \* Water filtration – used in pools and waste water treatment facilities to filter out unwanted material.
- \* Sports – baseball infields, golf courses, and football fields.

**Properties**

*Composition: Varies (main constituents include quartz, limestone, feldspar, etc.)*

*Color: Varies*

*Hardness: N/A*

*Structure: N/A*



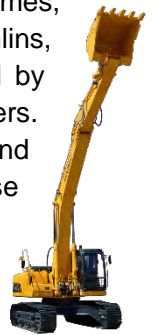
## Sand & Gravel

Sand and gravel is a high volume, low value product derived from the breakdown of many rock types and is most commonly comprised of quartz, limestone, and feldspar but can also include garnet, magnetite, zircon, shale, etc. Almost all sand and gravel produced in New York is used in construction products such as concrete (roads, buildings, blocks/bricks, etc.) and blacktop (roads, parking lots, etc.) but other uses can include glass (Corning, Inc. headquartered in NY manufactures many products that you also use in your everyday life and they have a museum where you can even make your own glass artwork!), abrasives, traction (icy roads, railroad tracks, etc.), fiberglass insulation, play sand for sandboxes, foundry sand, water filtration media, and sports fields (golf, football, baseball, etc.), as well as many other uses.

Sand and gravel mines are New York's most common type of mine, with active mines spread across the state. Transporting long distances is not economically feasible, thus, the mines must be located near the consumer. The map on the next page shows how the sand and gravel mines in New York are located

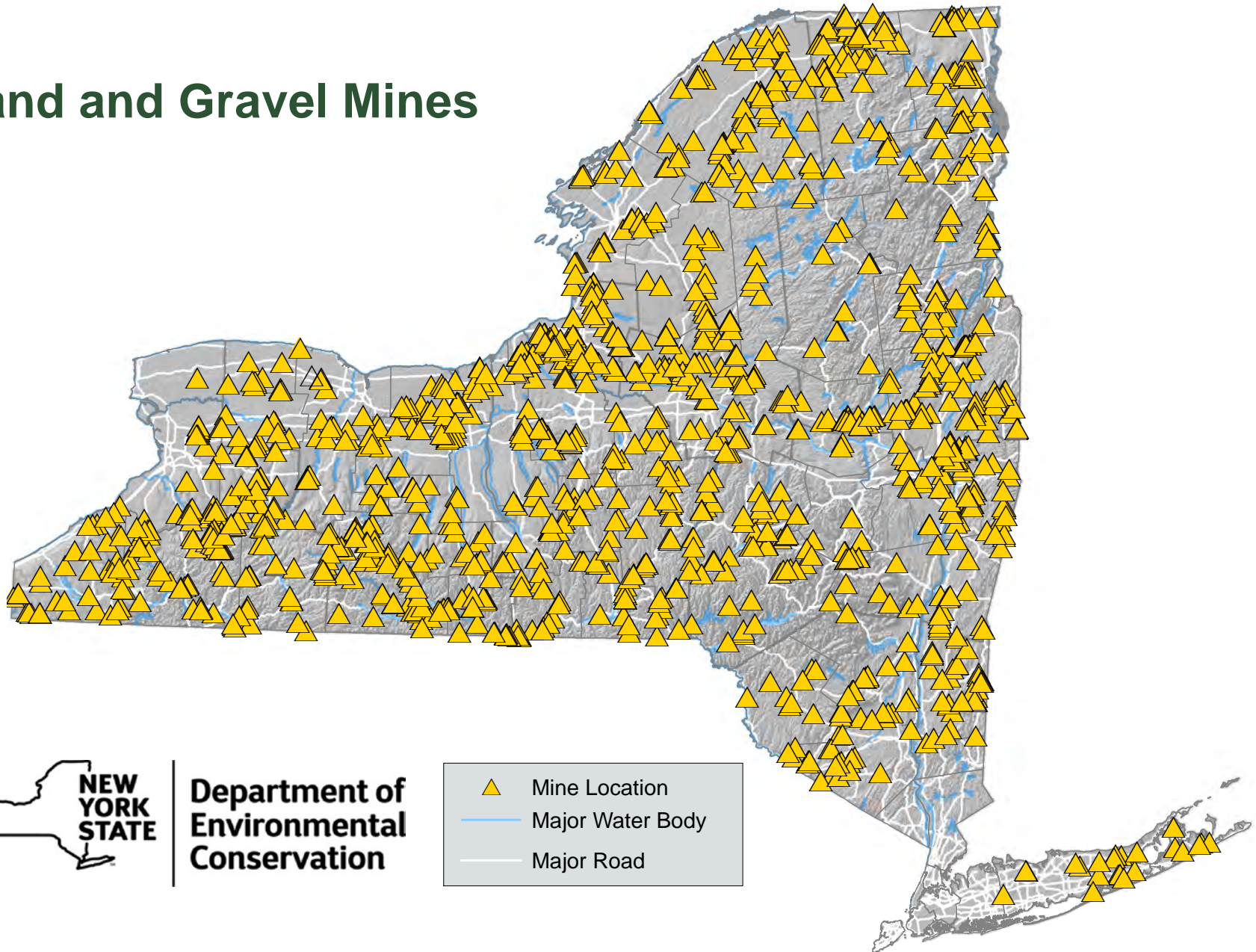
across the entire state. Cattaraugus, Dutchess, Suffolk, and Rensselaer counties are among the leading producers of sand and gravel due to high quality glacial deposits in those counties and their proximity to large populations that require these materials for roads, buildings, and other infrastructures.

Sand and gravel mines in New York are typically located where glacial deposits (eskers, kames, outwash plains, drumlins, etc.) were left behind by the melting glaciers. Much of the finer silt and clay material in these deposits was carried away by the glacial meltwater, leaving behind the heavier sand and gravel. Sand and gravel deposits are also found in former lake/river beds, shore-lines, and deltaic deposits. ⚡



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Sand and Gravel Mines



Department of  
Environmental  
Conservation

- ▲ Mine Location
- Major Water Body
- Major Road



## SANDSTONE MINES IN NEW YORK



View of a sandstone mine in New York State.



View of a sandstone mine in New York State.

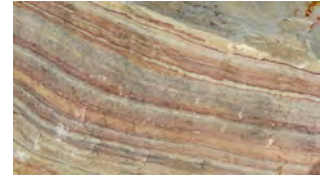
**Properties**

*Composition: Varies (typically high quartz content with siliceous or calcareous cement)*

*Color: Varies (can be any color depending on its composition)*

*Hardness: Varies*

*Structure: Layered*



## Sandstone

Sandstone is a sedimentary rock typically formed by the deposition of eroded sediments in near-shore coastal environments. Of particular popularity in New York State is the Potsdam Sandstone, composed of sand-sized quartz grains held together by a siliceous cement making it almost entirely silica. It is very durable, has a high compressive strength, maintains its color, and is resistant to freezing and thawing processes, acid rain and atmospheric conditions. Distinctively, its fire-resistant properties made it preferentially suitable over granite (less cracking and spalling) for use as a refractory lining in iron furnaces. Potsdam Sandstone ranges in color from red to pink, white, yellow, and gray to tan depending on the associated minerals. In general, though, sandstone can be found in most every color possible. Fossils are scarce in the Potsdam Sandstone as quartz sand is not well-suited for preserving organisms, however, ripple marks, mudcracks, and trace fossils (ie. burrows, tracks, trails, etc.) are locally abundant.

Due to its durability and attractive appearance, many buildings, sidewalks, gravestones, etc. are

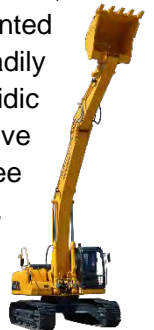
constructed of sandstone. The photo below shows St. Mary's Church in Potsdam, NY which is constructed of Potsdam Sandstone. Bluestone is also a popular type of sandstone



mined in New York State (see its Fact Sheet). Many of the row houses, or "brownstones", in New York City are faced with sandstone primarily quarried from nearby Connecticut and New Jersey, but the Medina Sandstone from western New York was also used.

Not all sandstones are suitable for use as a building material, though. Lime-cemented sandstones are readily decomposed by weak acidic conditions and erosive weathering processes (see Limestone Fact Sheet).

Some sandstones are also not very attractive for use as a building's façade. ✂



## FAST FACTS

Sandstone can be found in many colors including red, white, brown, yellow, green, blue, etc.

Potsdam Sandstone is very durable and virtually unaffected by freeze-thaw processes, weathering, acidic environments (acid rain and atmospheric conditions), fire, and parasitical plants.

Bluestone is a type of sandstone also mined in NY.

Many sandstones in western and central NY are "reservoir rocks" and are often targeted for oil and gas drilling.

Many highly recognizable geologic features throughout the United States are formed in sandstone including:

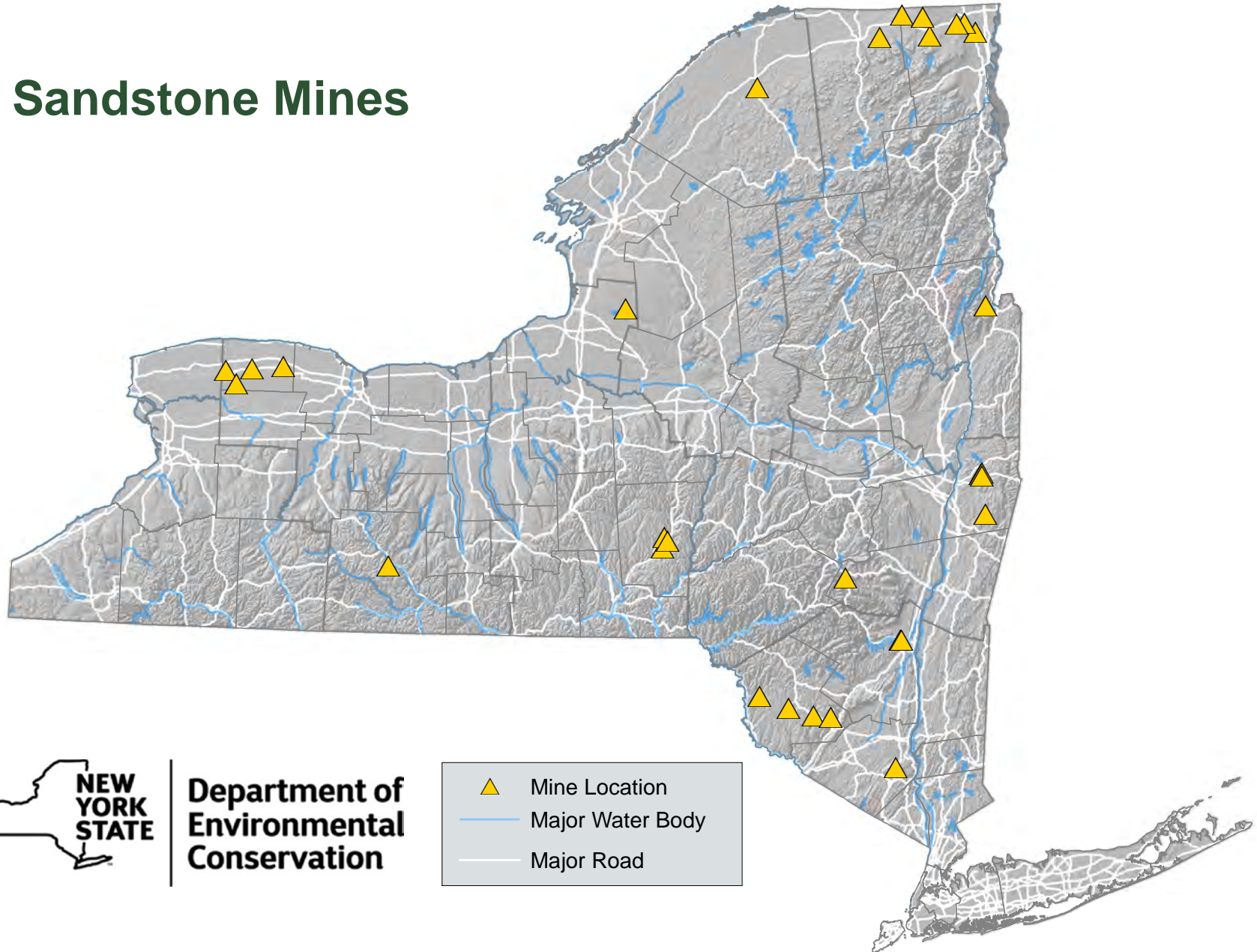
- \* The Delicate Arch (Arches Nat'l Park in Utah which has over 2,000 natural sandstone arches)
- \* The Wave (Coyote Buttes, Arizona)
- \* The Valley of Fire State Park in Nevada
- \* The Mittens (Monument Valley Navajo Tribal Park in Utah)
- \* Zion National Park in Utah
- \* Sandstone is also prominently featured in the Grand Canyon; along with limestone, shale, dolomite, schist, gneiss, quartzite, siltstone, mudstone, basalt, gypsum, and chert.

## WHAT IS IT USED FOR?

Sandstone is primarily used as an architectural/decorative/building stone in sidewalks, patios, building veneer, stair treads, countertops, gravestones, etc. and can be seen in countless buildings and structures throughout the world. It is also used as rip-rap for lining waterways and stabilizing embankments from erosion. Much of the sandstone in NY is crushed for use as aggregate. Some sandstone is also used as a refractory lining in iron furnaces due to its high-heat resistance.

# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Sandstone Mines



WOLLASTONITE MINES IN NEW YORK



View of a wollastonite quarry in New York State.



Closer view of the quarry face.

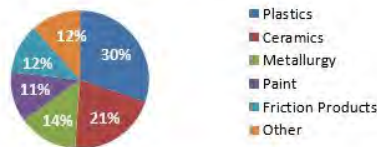
FAST FACTS

100%

New York supplies nearly all of the wollastonite used in the U.S. On a global scale, New York is the third largest producer behind China and India.

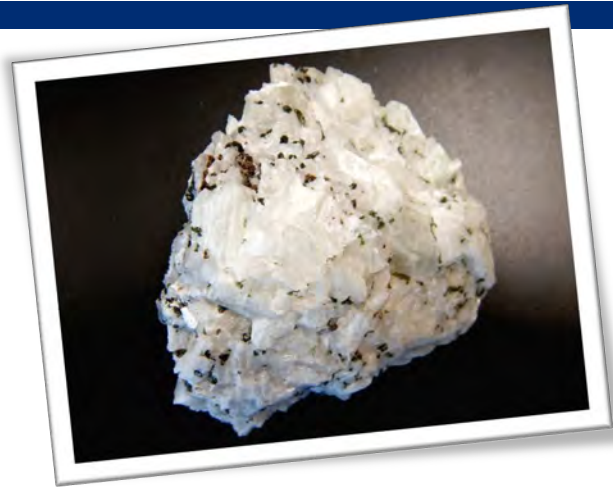
WHAT IS IT USED FOR?

U.S. End-Uses of Wollastonite 2013



Wollastonite has been used as a replacement for asbestos since the early 1980's. It is inert and stable at high temperatures, improves flexural and tensile strength of products, and is chemically resistant.

- \* Ceramics – reduces warping & cracking during firing, increases strength, reduces glaze defects.
- \* Metallurgy – used as a flux in welding, a slag conditioner, and protects the surface of molten metal during the steel casting process.
- \* Paint – improves durability and resistance to weathering, pH buffer, and reduces pigment.
- \* Plastics – improves tensile and flexural strength, reduces resin consumption, and improves stability at high temperatures.



**Properties**

Composition: CaSiO<sub>3</sub>

Color: Bright white (can be gray, cream, brown, pale green, or red)

Hardness: 4.5 – 5.5 on Mohs scale

Structure: Acicular (needle-like)

# Wollastonite

Wollastonite is a calcium metasilicate that is typically formed when impure limestones are metamorphosed or when silica-rich fluids encounter calcareous sediments during metamorphism. In either case, the calcium carbonate reacts with silicon dioxide and creates calcium metasilicate (wollastonite) and carbon dioxide as shown here:  $CaCO_3 + SiO_2 = CaSiO_3 + CO_2$ . Wollastonite can also form directly from a high carbon content magma but this is less common.

The only commercially-produced wollastonite in the U.S. is mined in New York State in the Adirondack Mountains. Since only a relatively small quantity of wollastonite is imported into the U.S, New York supplies almost all of the wollastonite used in the country. On a global scale, New York is the third largest producer behind China and India. A significant portion of New York's wollastonite is specially milled and/or surface treated to achieve specific industrial properties. To protect proprietary data, USGS does not publish detailed statistics on wollastonite. However, for 2020, USGS reports that the country's production was estimated to have

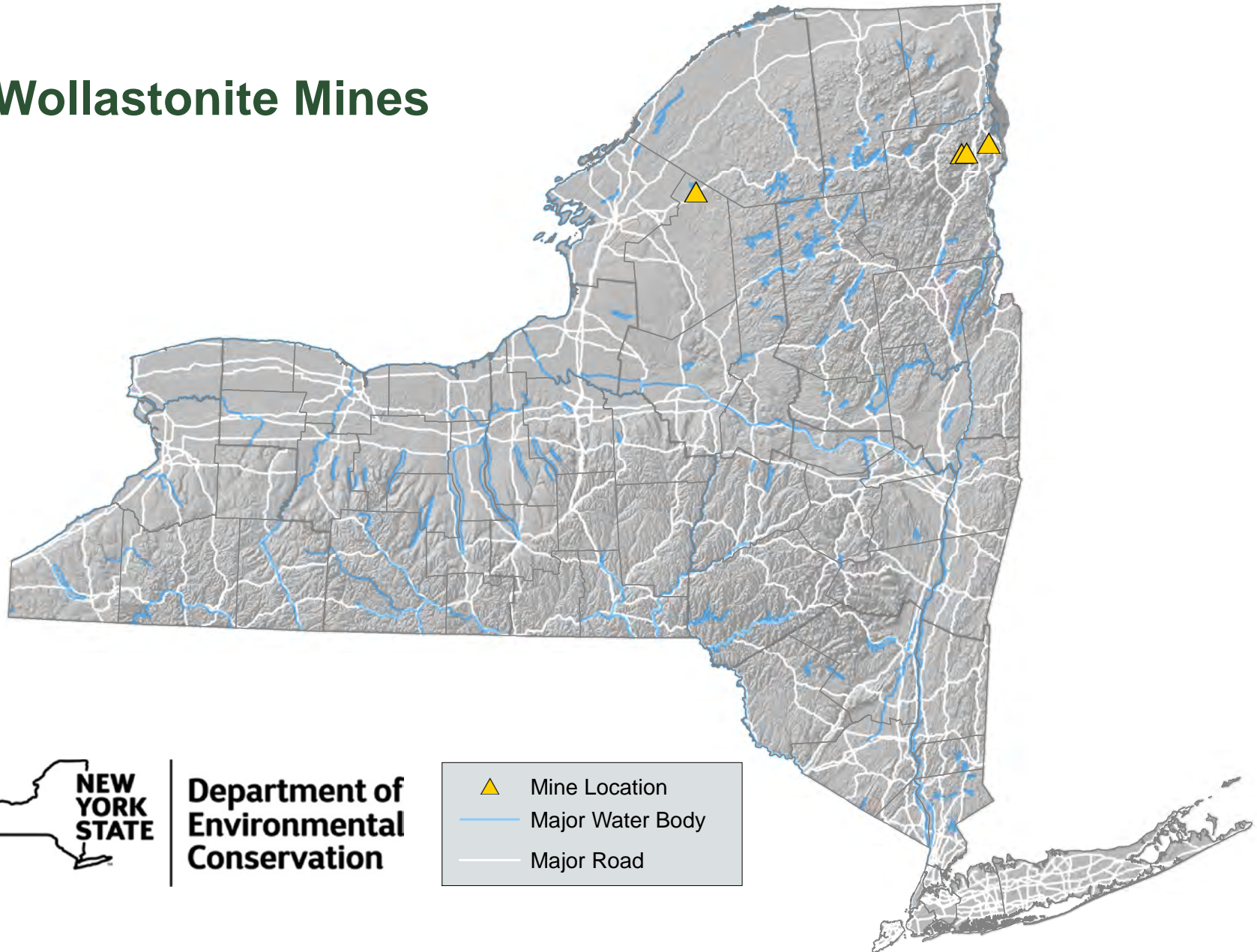
remained essentially unchanged from that of 2019 and the apparent consumption was estimated to have decreased as compared to 2019.

One of wollastonite's most unusual characteristics is its ability to cleave into needle-like (acicular) crystals. These fibrous particles make it useful both as an asbestos replacement and as reinforcement material in products ranging from plastics, ceramics and brake pads, to paint, coatings and sealants. Plastics and rubber are the major end-uses of wollastonite in the U.S. for 2016, followed by ceramics. The automotive industry is a main consumer of wollastonite. Plastics for interior, exterior, and underhood components utilize wollastonite as a strengthening agent and for its heat-resistant properties. ⚒



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Wollastonite Mines



**Department of  
Environmental  
Conservation**

## ZINC QUARRY IN NEW YORK



View of the entrance to the underground sphalerite (zinc) quarry in New York State.



Commonly associated rocks found at the Balmat mine - blue calcite (l); hexagonite (r).

## FAST FACTS

After iron, aluminum, and copper, the fourth most consumed metal in the world is zinc.

New York was once considered a major zinc producer with one of the top ten zinc mines in the country.

There is currently one operating zinc mine in NY.

The largest zinc mine in the world is the Red Dog mine in Alaska.

Sphalerite is too soft for most jewelry use, however, high quality specimens can produce a "fire", or flash of color, many times higher than diamond.

## WHAT IS IT USED FOR?

- \* Galvanizing iron or steel for corrosion-resistance (i.e. automobile bodies, highway guide rails, chain-link fence, culverts, metal roofs, suspension bridges, nuts/bolts, etc.).
- \* Combined with other metals to make alloys such as brass and bronze.
- \* Batteries
- \* Dietary supplements
- \* Deodorants
- \* Anti-dandruff shampoo
- \* Luminescent paint
- \* Sunscreen/Protective Skin Ointment
- \* Rubber manufacturing
- \* Electrical components
- \* Cathodic protection of buried pipelines and metals exposed to seawater (i.e. many boats and ships use zinc to protect rudders and propellers)
- \* Primary metal in pennies since 1982 and coated with a thin layer of copper
- \* Fire retardant and wood preservative
- \* Denture cream



## Zinc

The primary ore mineral for zinc is sphalerite (Zn,Fe)S which can be found in igneous, metamorphic, and sedimentary environments. In the case of most zinc mines, including those in New York, deposits were formed by ore-bearing hydrothermal fluid contacting a carbonate-rich, marine environment. The sulfides were deposited and then later remobilized during metamorphism. Sphalerite has been mined in the Balmat-Edwards Zinc District of St. Lawrence County, New York since the early 1900s. New York was once a major zinc producer with one of the top ten zinc mines in the country! The Balmat mine is the only remaining permitted zinc mine in the state.

Zinc is primarily used as a corrosion or rust deterrent. It can be applied to iron or steel by several methods with the most common being hot-dip galvanizing, where thin layers of zinc are added by dipping items into a bath of molten zinc. Freshly exposed zinc is actually highly reactive to atmospheric conditions but once the patina forms, the corrosion rate drastically decreases. The patina is an insoluble carbonate film that gives it its dull appearance but is highly

Properties

*Composition: Sphalerite (Zn,Fe)S*

*Color: Brown, yellow, gray/black, red, green*

*Hardness: 3.5 - 4 on Moh's scale*

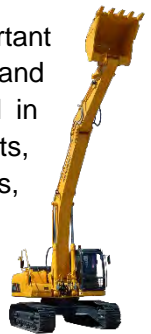
*Structure: Isometric w/ dodecahedral cleavage*



resistant to further corrosive action. Interestingly, if the zinc coating is damaged, the patina will eventually spread to cover the underlying exposed steel and protect it from further corrosion. Since zinc is more reactive than iron or steel, it is often used as cathodic protection of buried pipelines and metals exposed to sea water.

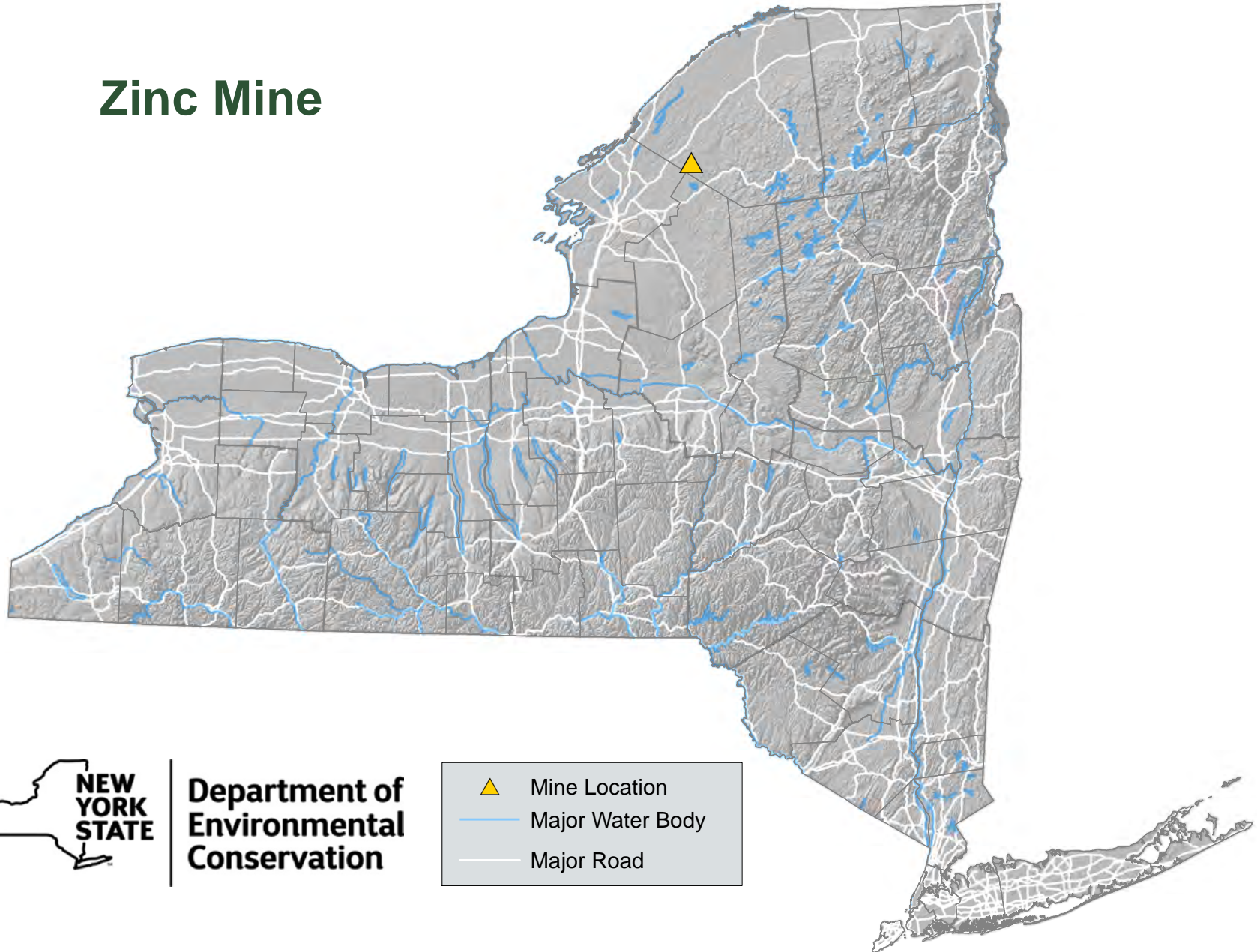
It is too brittle to use on its own for manufacturing, but zinc is often used as an alloy with other metals (i.e., brass is an alloy of zinc and copper). The resulting alloy is stronger and more ductile than copper and has the corrosion resistant properties of zinc.

Zinc is also an important nutrient for our health and development. It is used in dietary supplements, prenatal vitamins, cereals, protective skin ointments, shampoo, etc. It can also be found naturally in foods such as seafood, beef, nuts/seeds, and wheat germ. Caution should be taken, though, as digesting too much zinc can also be toxic. ⚠



# NEW YORK STATE OIL, GAS AND MINERAL RESOURCES | 2020

## Zinc Mine



Department of  
Environmental  
Conservation