NOVA SCOTIA

Minerals and Gems

Identify, collect, and learn more about minerals and gems found in Nova Scotia

White porcelanite with amethyst

Atlantic Geoscience Society

How to Use this Guide

Minerals are fascinating to all of us. They are often attractive colours, their crystals can have intriguing shapes, and we may, if lucky, occasionally find a gemstone. Minerals are the chapters in telling the story of rock formation and Earth history. Many minerals are important beyond their natural beauty. Some are essential to our way of life. The fibre of fibre optic cables is silica from quartz. The wires moving electricity are made of copper from chalcopyrite. Barite is an important mineral for medical purposes and for drilling mud used in drilling for oil and natural gas. Some minerals are gemstones, such as diamond, chalcedony, and amethyst and are cut and faceted for jewellery.

Each mineral description has the same structure so you can always find important information quickly. The headings indicate whether a mineral has a metallic or non-metallic lustre. Minerals are listed on the panels from softest (H=1) to hardest (H=10) on the Moh's Scale. Colour is described first and then other properties that may help to identify the mineral. If an area has particularly good collecting, the location is mentioned. In addition, minerals are labeled for their relative abundance:

C = common
O = occasional
R = rare
G = semi-precious gem

This brochure will provide you with a basic information of how to identify minerals and where to find them. Take some time to become familiar with the on-line and published mineral identification resources as well as maps, books, and brochures that explore and explain Nova Scotia geology. Knowing more about the geology of Nova Scotia will enhance your experience with minerals. The brochure *Nova Scotia Pebbles* is a companion to this publication. Where you find nice pebbles, you may find interesting mineral specimens. Please see the resources section for further information sites and publications. Be sure to read the section, Mineral Collection Rules and Safety, at the end of the brochure.

GEAR FOR MINERAL COLLECTING

PURPOSE	DETAILS of GEAR
Finding Your Way	Topographic maps Geological maps Compass GPS unit
Staying Safe and Comfortable	Eye protection Work gloves Hard hat Appropriate footwear Smartphone Water and food Hat, rain protection First aid kit Trip plan
Collecting Specimens	Backpack Geologist's hammer Various chisels 10x hand lens Streak plate Knife Magnet Weak acid (5 to 10% hydrochloric acid) Mineral reference book
Keeping Organized	Notebook Pen, pencils Newspaper for protecting specimens Plastic or cloth bags Camera and scale Markers (permanent)

Getting Started

Typical field gear.

Mineral collecting does not require a lot of expensive equipment. The accompanying photo and table show the gear you will need and its purpose. The four categories will help you pack the gear and know its use. Many smart phones can take images of the location, provide GPS coordinates, as well as being a communication tool. Wrap specimens in paper, place in collecting bags, and mark with date and location. Keep notes about your observations and specimens in your notebook. Record the location and specimens in photos. Be sure to use a scale when you take photos of the specimens.

Knowing a Mineral from a Rock

A mineral is a naturally occurring, inorganic solid with a definite chemical composition and a specific atomic arrangement. A rock is an aggregate of minerals. Rocks are divided into three categories, depending on how they formed: igneous, sedimentary, and metamorphic. Mineral reference books and *Nova Scotia Pebbles* provide useful information.

Copper from Cap d'Or

A mineral may be one element such as copper (Cu) or a compound with many elements such as potassium feldspar ($KAlSi_3O_8$). Each mineral has certain characteristics that collectors can use to identify it. With more than 4000 naturally occurring minerals, must you know the characteristics of each one? Luckily for geoscientists and amateur collectors, the answer is "No." Work on knowing the physical properties of the minerals you expect to find.

Orthoclase (potassium feldspar) from Port Joli area

Everyone who looks at rocks or collects minerals, realizes that they see the same mineral quite often. Minerals such as quartz, potassium feldspar, pyrite, and calcite are extremely common and are found almost everywhere. These minerals are part of the 30 or so common minerals that most collectors know. Other minerals, such as the zeolite group are common only in the Bay of Fundy region. If you are collecting them, you will need to know their details.

Granite (L) is a rock composed of the minerals (L to R) feldspar, quartz, and biotite.

Identifying Minerals

Every mineral has **physical properties**—these are the general characteristics defined by the mineral's structure and composition. The common physical properties that mineral collectors use to identify a specific mineral are **lustre, hardness, colour, streak, specific gravity, crystal shape, reaction with weak acid, magnetism**, and **cleavage**. Many minerals such as quartz and pyrite, have diagnostic properties that define them with only a few physical properties. For example, quartz has a non-metallic lustre, white or clear colour, a conchoidal fracture, and a hardness of seven. Pyrite has two diagnostic characteristics: cubic shape and metallic lustre. Begin an identification with lustre and hardness, then move on to other properties.

Moh's Hardness Scale

1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Orthoclase
7	Quartz
8	Topaz
9	Corundum
10	Diamond

The list of common minerals in Moh's Hardness Scale.

Using the properties of lustre and hardness, you will easily start the process of identification. Where a specimen has several minerals present, they are usually separated by colour. Make sure you work on identifying one mineral at a time.

LUSTRE is the way light interacts with the surface of a mineral and is seen by your eyes. A mineral that looks like metal has a metallic lustre. An example is the pyrite in the left-hand photo. Minerals that do not have a metallic look have a non-metallic lustre. Non-metallic lustre ranges from vitreous or glass-like (diamond and quartz) to dull and earthy (some hematite and goethite). The right-hand photo shows the non-metallic lustre of quartz with gold. By determining lustre, you begin the mineral ID process.

Metallic lustre in pyrite.

Non-metallic lustre in quartz.

HARDNESS is related to the composition and molecular bonding in a mineral. In 1822 German mineralogist, Friedrich Mohs, devised a simple way of describing hardness of minerals by creating a hardness scale based on common minerals.

You can determine relative hardness by using common items such as your fingernail (about 2.5), a copper penny (about 3), a knife blade or nail (5.5), or a piece of glass (6).

Knife (5.5) scratches calcite (3).

Typical colours of common minerals: From left to right, grey-white muscovite mica, milky quartz, black biotite mica, and pale-orange orthoclase feldspar.

COLOUR is the natural colour of a mineral. Be careful with colour because some minerals can be more than one colour depending on the small amounts of impurities. **Streak** is the colour of the powder left on a white, unglazed porcelain surface by a mineral. With a hardness of about 7, a streak plate allows many minerals to produce a powder. The powder colour is an excellent indicator for minerals such as sphalerite (ore of zinc; black streak) and hematite (iron ore; red-brown streak).

Red-brown streak of hematite is diagnostic.

OTHER PHYSICAL PROPERTIES. Mineral reference books provide a large amount of information about other physical properties. **Specific gravity** refers to the density of a mineral, or simply put, how heavy it is. **Magnetism** is simple. Does a mineral draw a magnet on a string towards it? The photo of magnetite (specimen 43) shows a magnet attached to the specimen. Colour is useful but some minerals exhibit several colours. **Reaction with acid** indicates that the mineral is calcite or dolomite. Calcite is soft (about 3) and reacts quickly with weak HCl. Dolomite reacts slowly with the acid. **Crystal shape** may be very useful. Quartz is often found in six-sided crystals. Finally, many minerals exhibit **cleavage**, which is a plane of preferred breakage in a mineral. Cleavage surfaces may be flat or stepped but all reflect light like a mirror. Mica (both biotite and muscovite) has one direction of cleavage while potassium feldspar has two directions at 90º to each other.

Weak hydrochloric acid reacting with calcite.

Check the reference books or go online for detailed information about a particular mineral. Mineral collecting is both exciting and satisfying. The collector uses simple tools and investigative techniques to determine identity. Geological maps, reports, identification books, and information from local clubs can help you find and identify minerals.

Partridge Island near Parrsboro – great collecting!

Non-Metallic, Light-Coloured Minerals

1 Orthoclase (potassium feldspar), H=6, C

Pale white to orange; two directions of cleavage at 90°; crystals in pegmatites exposed along shore from White Point to Thomas Raddall Provincial Park, Queens County; Bayers Lake Business Park, Halifax.

2 Amazonite, H=6, R

Green-coloured feldspar; same properties as orthoclase; found in granite pegmatites near Georgeville, Antigonish County.

3 Plagioclase Feldspar, H=6, C

Off-white to grey; commonly found in pegmatites and dark-coloured igneous rocks; Bayers Lake Business Park, Halifax.

4 Quartz, H=7, C, G

Transparent to milky; conchoidal fracture; six-sided crystals in pegmatites from Queens County; Boylston area, Guysborough County; and Bayers Lake Business Park, Halifax; occurs in fault zones.

5 Smoky Quartz, H=7, R, G

Grey to dark grey, black; often occurs as six-sided crystals; a variety of quartz; found in pegmatites; Bayers Lake Business Park, Halifax.

6 Amethyst on Magnetite, H=7, O, G

Mauve to pale purple; often found in thin bands in geodes and cavities with or without zeolites and varieties of chalcedony; a variety of quartz; occurs in basalts of the Minas Basin and Bay of Fundy. See also specimen 21.

7 Gypsum, H=2, C

White to greyish; found in large deposits; may form underground cavities and sinkholes; varieties are selenite and fibrous gypsum; good exposures in Hants, Inverness, and Victoria counties.

8 Selenite, H=2, R

Generally clear; crystalline form of gypsum; variety Satin Spar: pink with needle-like crystals.

9 Muscovite Mica, H=2½, C

Shiny grey-white; known as eisenglass; platy with one cleavage; granites and pegmatites of Queens County coast and Bayers Lake Business Park, Halifax.

10 Calcite, H=3, C

White to greyish off-white; found in various types of crystals (dog-toothed and rhombohedrons); reacts with weak hydrochloric acid.

11 Anhydrite (with white Howlite), H=3 to 3½, O

White to grey, found with gypsum deposits.

12 Spodumene, H=6½ to 7½, R

White, off-white; lithium bearing pyroxene; two cleavages at right angles; found in pegmatites; Brazil Lake area, Yarmouth County.

13 Halite, H=2½, R

White, grey, rarely blue; common name is rock salt; cubic crystals; not found on surface, soluble in water; mined underground at Pugwash and by solution mining at Nappan; important chemical 'feedstock' for sodium and chlorine.

14 Barite, H=3 to 3½, O

Yellow, brown, white, blue, gray, or even colourless; noticeably heavy; found at Lake Ainslie, Cape Breton; scattered occurrences in Cumberland and Colchester counties.

15 Celestite, H=3 to 3½, R

White to bluish-white, blue; noticeably heavy; formerly mined at Lake Enon, Cape Breton County; scattered occurrences in Cumberland County.

16 Probertite (white) on Gypsum, H=3½, R

White sometimes colourless; commonly associated with evaporite minerals such as gypsum that form from the evaporation of sea water; found at Cheverie, Hants County.

17 Howlite (white) on anhydrite, H= 3½, R

White, colourless, or brown; found in some gypsum deposits. Howlite was first described by Dr. Henry How of Kings College, Windsor, Nova Scotia in 1879. Howlite in anhydrite, near Iona, Cape Breton.

Non-Metallic, Light-Coloured Minerals

Specimens 18 to 29 are found in cavities in basalt exposed along the shores of the Minas Basin and Bay of Fundy. They are associated with other zeolites, amethyst, agate/chalcedony, and silica-rich minerals.

18 Agate and Chalcedony, H=7, C, G

Agate is Nova Scotia's Provincial Gem. White, almost colourless, red, green, brown, black; a banded variety of very fine-grained quartz; found in geodes in basalts; non-banded is variety chalcedony.

19 Fortification Agate, H=7, C, G

Multiple colours possible; depends on impurities; known for concentric banding; important mineral for jewellery making.

20 Jasper in Agate, H=7, C, G

Red-coloured agate; may be banded or dendritic (branching) patterns.

21 Porcelanite with Amethyst, H=7, O, G

Usually white to light grey; very fine-grained; looks like porcelain. Photo on front cover.

22 Siliceous Sinter, H=7, O

White, grey; porous material composed of opal or chalcedony.

Zeolites – *found in cavities in basalt, Minas Basin and Bay of Fundy. Associated w*

23 Stilbite on Heulandite, H=3½ to 4, C

Stilbite is Nova Scotia's Provincial Mineral. White, light grey, pale yellow; found as flat, blade-like, and radiating crystals.

24 Heulandite, H=3½ to 4, C

Usually orange, may be white, grey, red; massive with no crystals visible and fibrous and thick needle-like crystals.

25 Chabazite, H=4 to 5, C

Usually orange, also white, yellowish, pinkish; found as pseudo-cubic and rhombohedral crystals.

26 Apophyllite, H=4½ to 5, C

Colourless, white, greenish, or colourless; found as large, glassy, cube-like crystals.

27 Mordenite, H=5, R

White, grey, yellowish; found in oval-shaped aggregates of fibrous crystals; Named after the locality where first identified at Morden, Kings County, NS.

with other zeolites, amethyst, agate/chalcedony, and silica-rich minerals. Zeolite minerals s

28 Natrolite,
H=5 to 5½, C

White, grey, yellowish, or colourless; found as fibrous radiating crystals.

Geological Map of Nova Scotia
Showing Mineral and Gem Locations

Location of minerals are shown by colour-coded specimen numbers.

Faults ————

These minerals are found along the shoreline of these four highlighted areas.

6 18 19 20 21 22
23 24 25 26 28 29

39

14

4

27

38 Gold is found throughout Nova Scotia.
Black dots indicate gold – ●

34 12

34

Yarmouth

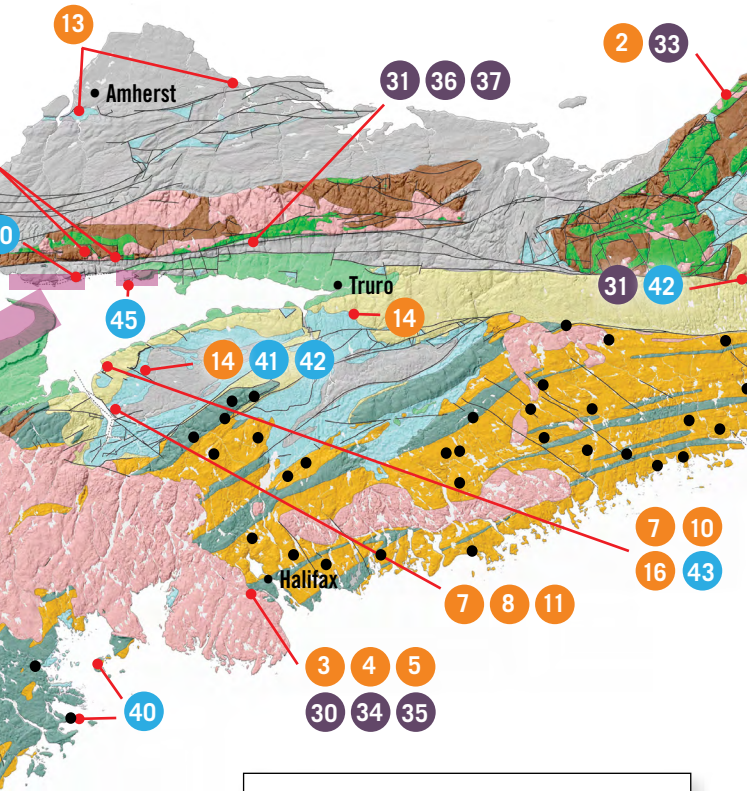
1 4 34

20 km

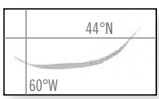
hown here are specimens 23, 24, 25, 27, 28, and 29.

29 Analcime,
H=5 to 5½, C

White colourless, grey; found as large crystals and massive to granular.

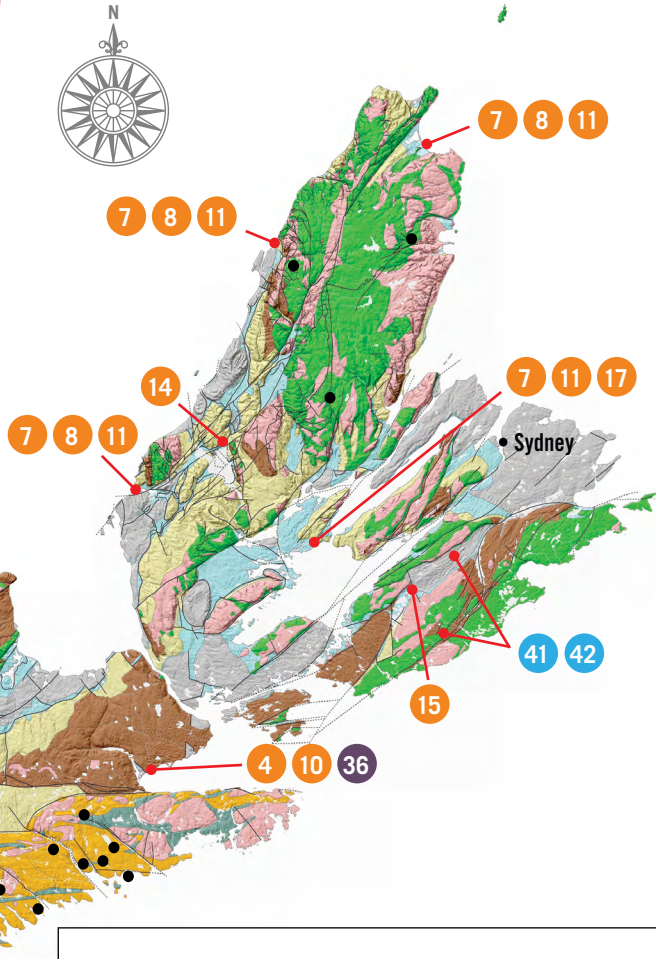


Sable Island – a remnant of Nova Scotia's glacial heritage.



Legend for Mineral Categories

- Metallic Minerals
- Non-Metallic, Light-coloured Minerals
- Non-Metallic, Light-coloured Minerals
- Non-Metallic, Dark-coloured Minerals



Legend for Geological Map

The geological period is shown in **bold**, the age in millions of years (my = million years), and the rock types are in *Italics*.

- **Triassic to Jurassic** (230 to 190 my). *Sandstone, shale, basalt*
- **Late Carboniferous** (325 to 280 my). *Sandstone, shale, coal*
- **Middle Carboniferous** (340 to 325 my). *Gypsum, limestone, salt, shale*
- **Early Carboniferous** (375 to 340 my). *Sandstone, shale*
- **Cambrian to Early Ordovician** (485 to 505 my). *Shale, slate*
- **Cambrian** (543 to 505 my). *Grey sandstone and quartzite*
- **Cambrian to Early Carboniferous** (543 to 340 my). *Sandstone, shale, volcanic rocks, limestone*
- **Precambrian** (1020 to 543 my). *Gneiss, schist, marble, quartzite, slate, and meta-volcanic rocks*
- **Precambrian to Permian** (1020 to 295 my). *Igneous rocks includes granite, gabbro, anorthosite*

Non-Metallic, Dark-Coloured Minerals

30 Biotite Mica, H=2½ to 3, C

Shiny black; thin sheets, one cleavage; found in granite and pegmatites; Bayers Lake Area of Halifax.

31 Siderite, H=3, O

Usually reddish; occurs as rhombs; three directions of cleavage; found in the Londonderry region associated with hematite and goethite and Copper Lake, Pictou County with chalcopyrite.

32 Fluorite, H=4, O

Usually purple or blue, may be other colours; four directions of cleavage; found in fault zones and some pegmatites; Bayers lake Business Park, Halifax.

33 Hornblende, H=6, C

Usually black; two cleavages at 60°; found in gabbro (Georgeville, Antigonish County) and granite (Cobequid Highlands); common in igneous rocks.

34 Garnet (shown in granite), H=6½ to 7½, C, G

Red; often in crystal forms similar in shape to soccer balls called dodecahedrons; occurs in metamorphic rocks in Cape Breton and shoreline in Shelburne and Queens counties; pegmatites and granites in Bayers Lake Business Park, Halifax.

35 Tourmaline (shown in pegmatite), H=7 to 7½, O, G

Usually black to midnight blue (variety schorl); long needle-like crystals, triangular cross-sections; occurs in pegmatites in the Bayers Lake Business Park, Halifax, and Peggys Cove.

36 Hematite (earthy lustre), H=5 to 6, C

Red brown to dark brown; streak always brown; former mines at Torbrook, Annapolis County; Londonderry, Colchester County; and Ferrona, Pictou County.

Metallic Minerals

38 Gold, H=2 to 3½, R

Distinctive deep golden-yellow colour; can be cut by a knife blade; occurs in quartz veins and waste rock in former mine dumps. Gold was discovered in 1858 at Mooseland, NS.

39 Copper, H=2 to 3½, R

Copper-red to pale rose-red; soft; often seen with tarnish of green malachite; found in basalt flows along the Bay of Fundy and Minas Basin. Cap d'Or hosted several copper mines.

40 Pyrite, (Fool's Gold), H=6 to 6½, C

Pale-yellow; often occurs in cubes but also occurs without crystal shape called massive; found in abundance at Blue Rocks and on Tancook Island in the Cambrian to Ordovician rock unit. Known as fool's gold; distinguished from gold by its distinctive black streak and cubic structure.

41 Galena with sphalerite, H=2½ (galena), H=3½ (sphalerite), O

Galena: lead-grey; noticeably heavy; often seen as cubes; ore of lead; sphalerite: brown -yellow to black; ore of zinc; often found together; former mines at Gays River, Halifax County; Walton area, Hants County; and Yava and Sterling mines in south-east Cape Breton.

37 Goethite and Limonite, H=5 to 5½, O

Brown to yellow brown; limonite has more yellow; both found associated with hematite; found at Torbrook, Annapolis County; Londonderry, Colchester County; and Ferrona, Pictou County.

42 Chalcopyrite, H=3½ to 4, R

Brassy yellow with an iridescent tarnish; ore of copper; occurs at Coxheath, Cape Breton County; Walton area, Hants County; Yava and Sterling mines in south-east Cape Breton; and Copper Lake, Antigonish County.

43 Manganite, H=4, C

Black to dark grey; ore of manganese; commonly found along the Minas Basin shore (Cheverie); also occurs at Loch Lomond, Richmond County and New Ross, Lunenburg County.

44 Arsenopyrite, H=5½ to 6, O

Silvery white to grey; may be iridescent; often found in pencil-like crystal form; strong garlic smell when hit by a hammer. Wash hands after handling. Common in most of the former gold districts.

45 Magnetite with amethyst and a magnet, H=5½ to 6½, O

Grey-black to black; magnets stick to mineral; occurs in basalts of the Minas Basin and Bay of Fundy region including Economy Mountain area.

Mineral Collecting and Safety

Provincial Guidelines on Mineral Collecting

Mineral collecting is for personal interest, recreation, or pleasure. Specimens are collected with hand tools only with no ground disturbance. The collector can only remove the amount of material she or he can carry unassisted and can collect at a specific site or location one day per year. Public lands extend seaward from the high tide mark. Use public access to beaches or obtain permission from the land owner to access coastal or inland exposures.

Collecting cannot take place in locations where it is not permitted such as provincial wilderness areas, provincial parks and park reserves, nature reserves, protected beaches, national parks, national wildlife areas, and aboriginal lands. Some provincial parks may allow limited collecting; check with park staff before collecting. For additional information refer to the NS Department of Natural Resources brochure *A Guide to Rock and Mineral Collecting in Nova Scotia.*

All fossils in Nova Scotia are protected by the *Special Places Protection Act*. It is against the law to collect fossils without a valid Heritage Research Permit. If you find an unusual fossil, leave it in place, and take detailed information (location, photo, date). Contact the Nova Scotia Museum of Natural History or the Fundy Geological Museum.

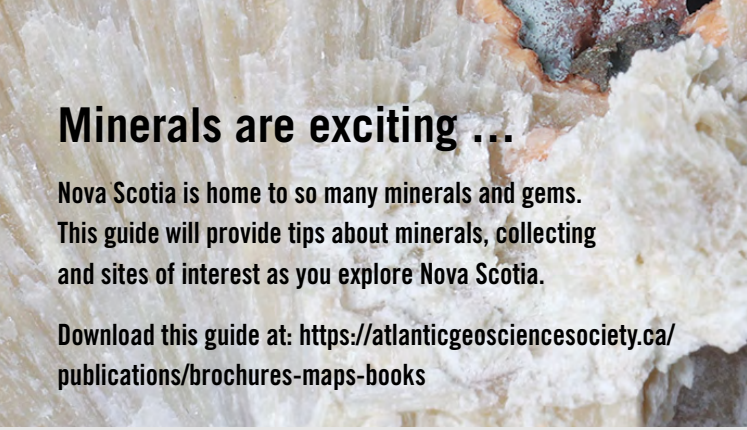
Collection of minerals and rocks must be done in a manner that respects the environment and does not conflict with other land users or businesses.

Safety

You are responsible for your own safety. Always use caution and be aware of potential hazards. Prepare a trip plan—let someone know where you are going and when you plan to return. Dress appropriately for the weather including sturdy footwear. Be prepared! Take appropriate gear for the location. Cliffs can be high with loose material and can have overhangs. Bring and use personal protective equipment: hard hat, eye protection, gloves, and sturdy footwear. Collecting with a friend is safer and more fun.

In coastal areas, tidal changes are a concern. Along the Bay of Fundy, the Minas Basin, and rivers that flow into them, tidal ranges are extreme. Check the tide tables in advance (tides.gc.ca) and collect from locations on a falling tide. Choose safe access locations and allow enough time to safely leave the shore. Rocks that are loose, wet, or covered in seaweed can be very slippery. Use care when collecting along rivers and lakeshores.

We acknowledge that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People.



Minerals are exciting …

Nova Scotia is home to so many minerals and gems. This guide will provide tips about minerals, collecting and sites of interest as you explore Nova Scotia.

Download this guide at: https://atlanticgeosciencesociety.ca/publications/brochures-maps-books

The **Atlantic Geoscience Society** (AGS) brings together earth science professionals, students, and enthusiasts in the Atlantic Provinces. AGS is a volunteer, non-profit association with a small membership fee. One of the AGS's main goals is to encourage an interest in the earth sciences, especially in the Atlantic Provinces. As part of this effort, the Society has developed a series of educational resources for students and the general public.

Related AGS Publications:

- *Nova Scotia Pebbles*
- *Nova Scotia Rocks* (2nd edition)
- *Geological Journey Map of Nova Scotia* (4th Edition)
- *The Last Billion Years: A Geological History of the Maritime Provinces of Canada* (2nd edition)

Additional Resources:

- *Four Billion Years and Counting: Canada's Geological Heritage*
- *Geology of Nova Scotia: Touring through time at 48 scenic sites*
- Mineral information on the web: https://www.mindat.org
- The Mineralogy of Nova Scotia: http://nsminerals.atspace.com/

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