

ROCKS AND MINERALS OF IOWA

Rocks are the materials composing the crust of the earth. They may be exposed at the surface, or if not, they underlie the covering of soil, vegetation or water. They may be consolidated or unconsolidated. Unconsolidated materials, such as clay, silt, sand, gravel, and boulders are just as truly rocks as their consolidated forms called shale, siltstone, sandstone, and conglomerate. Most rocks are an aggregate of one or more minerals. For example, limestone consists chiefly of calcium carbonate (CaCO_3), hornblende, and other accessory minerals.

Rocks have been classified into three groups according to their mode of origin and their relation to one another. In a simple classification, these three groups of rocks are as follows:

1. Igneous rocks – made by the solidification of molten or partially molten masses that come from within the earth.
2. Sedimentary or stratified rocks – formed by the transportation and deposition of sediments by water, wind, ice, by chemical precipitation, and by accumulations of shells and other hard parts of animals.
3. Metamorphic rocks – formed by alteration of igneous or sedimentary rocks, usually by pressure or heat or both.

Igneous rocks lie beneath the sedimentary rocks and the glacial deposits in Iowa and are encountered only in drilled wells that extend to great depths. However, a buried structure, that is believed to be of volcanic origin, occurs within 100 feet of the surface near the town of Manson in southeastern Pocahontas County. The igneous boulder and pebbles scattered at the surface are not native to our state, but were brought in by glaciers which covered this region during the Great Ice Age. Most of the igneous rocks that we find here come from the country north of Iowa. Large boulders of granite, gabbro and basalt are very common on our farms and in the beds of creeks and rivers.

Examples of sedimentary rocks are limestone, sandstone, shale, and chert. These are the most widespread and common types of rocks in Iowa. In most places the consolidated sedimentary rocks are covered by a thick layer of unconsolidated glacial drift. The first solid rock in place beneath the soil, glacial clay, and gravel is called bedrock. Natural exposures of bedrock occur at the surface in cliffs or in streambeds of many river and creek valleys. Man-made quarries and road cuts are good places to study these rocks. The total thickness of the sedimentary layers varies in different parts of the state. They are thickest (5000+ feet) in southwestern Iowa and thin toward the north and northeast. They are underlain by igneous and metamorphic rocks of the basement complex.

Animal and plant remains, known as fossils, are found in the sedimentary rocks. The fossils generally consist of parts or impressions of shells, skeletons or leaves and wood that were buried in the lime or mud at the time of deposition of the sediments. In many cases the fossils later turned into stone as the sediments hardened or were cemented into layers of rocks. Well preserved bones, teeth, and tusks of mastodons and mammoths, animals that roamed this region in recent geological time, occasionally are uncovered in stream beds and sand and gravel pits. Fossils provide a record of earlier life.

When the glaciers that covered Iowa melted, they dropped huge loads of clay, sand, gravel, and boulders that had been trapped in the ice. This unconsolidated and unsorted debris is known as glacial drift. In some places, particularly in the western part of the state, the glacial drift may be as much as 500 to 600 feet thick; but generally it is less than 200 feet thick. In other places, as in the "Driftless Area" of northeastern Iowa, it may be entirely absent where erosion has removed it. Large amounts of sand and gravel were spread across the state by streams that flowed beneath or out from the glacier borders.

The only exposed metamorphic rock native to Iowa is the Sioux quartzite found at the extreme northwestern corner of the state in Lyon County. Quartzite is one of the hardest types of rock. It was formerly a sand or sandstone. The sand was cemented by silica or was recrystallized so that the rock is practically a solid quartz mass.

Some igneous rocks found in Iowa –

1. Granite – consists mostly of glassy or milky quartz and white or pink feldspar, and this is generally light colored; includes biotite mica and other minerals.

Gabbro – darker and heavier than granite because it contains little or no quartz and has a large proportion of iron-bearing minerals.

Basalt – originally a molten lava which flowed out of volcanoes or cracks in the earth; a very fine-grained dark gray or black rock.

Some sedimentary rocks found in Iowa –

2. Conglomerate – consists of rounded or subrounded pebbles, cobbles, and boulders cemented together, generally in a matrix of sand or silt.
3. Sandstone – cemented sand grains, predominantly quartz, having a size range of 1/16 to 2 mm in diameter. The cementing materials may be silica, calcium carbonate, or iron oxide.

4. Siltstone – cemented silt that is more fine-grained than sandstone, but coarser than shale (clay).
5. Shale – a consolidated clay or mud; often splits into thin sheets like slate. Claystone or mudstone are more correct terms for those shales that do not have thin laminations.
- 6a. Limestone – consolidated lime mud or cemented fossil shells made chiefly of calcium carbonate. Effervesces freely on application of diluted hydrochloric acid.
- 6b. Oolitic limestone – an unusual variety of limestone resembling fish roe.
- 6c. Chalk – a fine-grained variety of limestone usually soft enough to soil the fingers.
7. Dolomite – similar to limestone but with less calcium and more magnesium. Commonly porous from removal of fossil shells by solution. Does not effervesce as freely as limestone on application of hydrochloric acid.
8. Coal – plant material that accumulated in marshy areas and later was buried under other sediments and finally compressed to coal.

Some metamorphic rocks found in Iowa –

9. Quartzite – a quartz rock transformed from sandstone by cementation with silica; it is very hard and breaks through the original sand grains rather than around them.

Gneiss – foliated rock in which the layers are of different mineral composition; generally the mineral particles are coarse enough to be seen with the naked eye.

Schist – differs from gneiss in having closely spaced foliated planes; it splits readily into thin flaky slabs or plates.

Some minerals found in Iowa –

10. Limonite – hydrous iron oxide mineral found north of Waukon, south of Guthrie Center, near Coburg, and at a few other places in Iowa.
11. Pyrite and Marcasite – iron sulfide minerals, very common in the rocks of Iowa; commonly called “fool’s gold” from the resemblance to the precious metal.

12. Galena – a lead sulfide mineral and the chief source of lead; found in the vicinity of Dubuque.

Sphalerite – a zinc sulfide mineral associated with Galena in the Dubuque vicinity. Common names are Zinc Blende, Black-Jack, and Mock-Lead.

13. Calcite – a very common mineral made of lime and carbon dioxide (Calcium carbonate); limestone consists of tiny calcite crystals.

14. Gypsum – a hydrous calcium sulfate mineral mined near Fort Dodge and Burlington; also found with deeply buried sedimentary rocks over a wide area in southern and southeastern Iowa.

Quartz – the most common mineral; has a composition of silicon dioxide; found in many forms, e.g., sand, sandstone, chert, flint, agate, jasper, and amethyst; is the chief component of Iowa sands and sandstone.

15. Chert – a variety of quartz in which the crystal structure cannot be seen; used by Indians for arrowheads and tools; very common in Iowa.

Some fossils found in Iowa –

16. Invertebrate fossils – corals, brachiopods, bryozoans, gastropods, cephalopods, trilobites, crinoids, graptolites, sponges, and conodonts.

Vertebrate fossils – fish teeth, mastodon and mammoth teeth and tusks, bison, skulls, and horns; and more rarely teeth or bones of ground sloths, early horse, musk ox, peccary, caribou, elk, bear, and few other mammals.