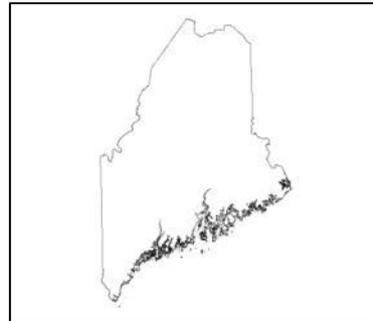


Geologic Site of the Month  
June, 2004

***Historical Bedrock Maps of Maine  
Part I: The Hitchcock (1885) Map***



Text by  
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## Introduction

Since William Smith presented the [first modern geologic map](#) in 1815, of England and Wales with part of Scotland, geologic maps have become the standard way of portraying geologic information. There have been four significant maps showing Maine's bedrock geology, published in 1885, 1933, 1967, and 1985. Each map is a product of its time, reflecting the current status of knowledge and understanding of geologic principles by the author. So it is best to view each one as a progress report, representing an interpretation of myriad bits of information.

In using a geologic map, or any map for that matter, it is important for the reader to appreciate the purpose for which the map was made. Certain things are shown and many things are not shown. Coloration and labeling emphasize things of perceived importance. In preparing a geologic map, hundreds of decisions are made by the geologist, and scrutiny of the finished map gives insight into that thought process.

In other fact sheets we look at [Arthur Keith's 1933 map](#), the [1967 Preliminary Geologic Map of Maine](#) and the [1985 Bedrock Geologic Map of Maine](#). This fact sheet presents the 1885 Maine bedrock map. In each case we review the context in which the map was made (**History**), point out the way in which different rocks are portrayed (**Lithology**), discuss the geologic ages assigned to the various rocks of Maine (**Age**), and look at major geological relationships that can be deduced from reading the map (**Regional Relationships**). Selected close-up areas from the map are presented as figures to illustrate these points.



## Images of the Map and Explanatory Text

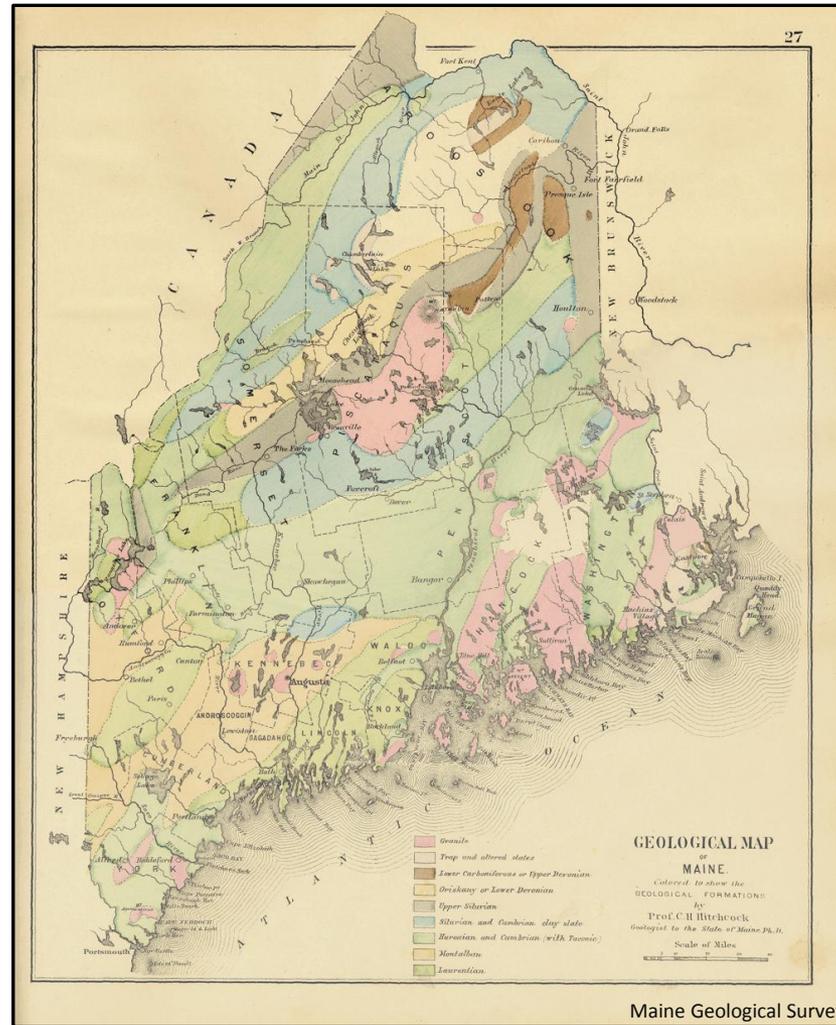


Figure by Marc Loisel

**Figure 1.** Bedrock geologic map of Maine by Hitchcock (1885).



Images of the Map and Explanatory Text

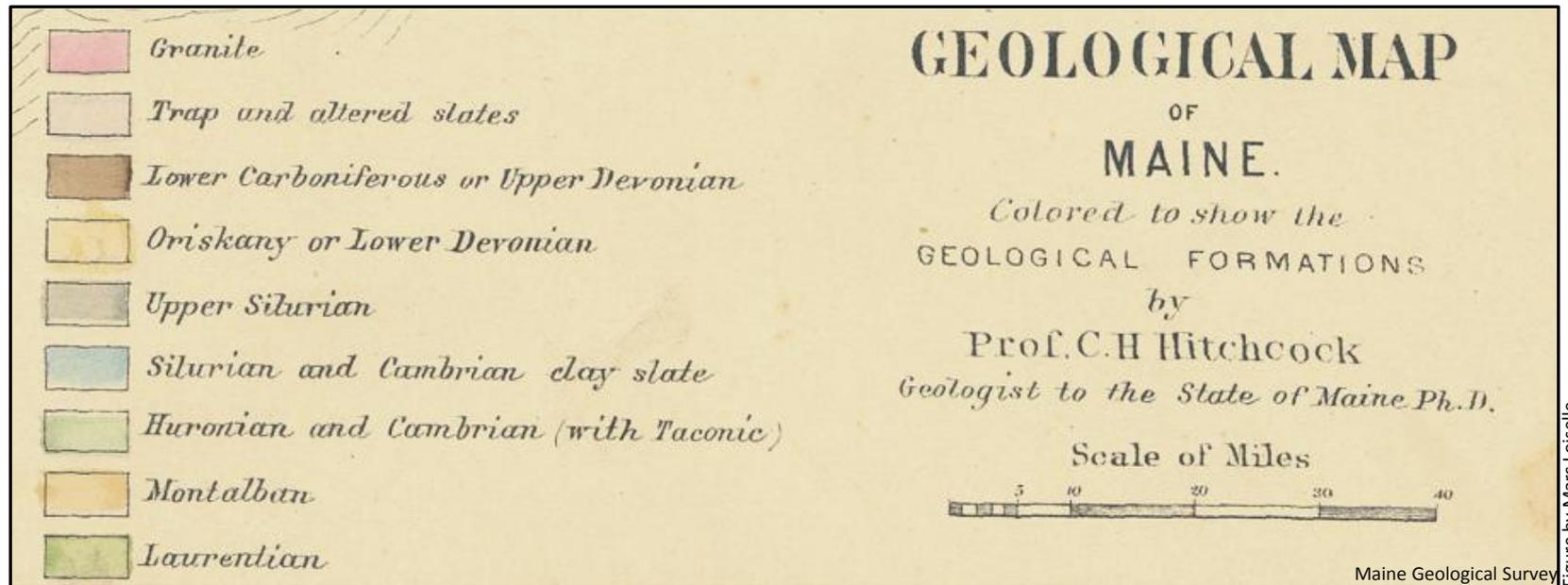


Figure by Marc Loisele

**Figure 2.** Map legend and title.



Images of the Map and Explanatory Text

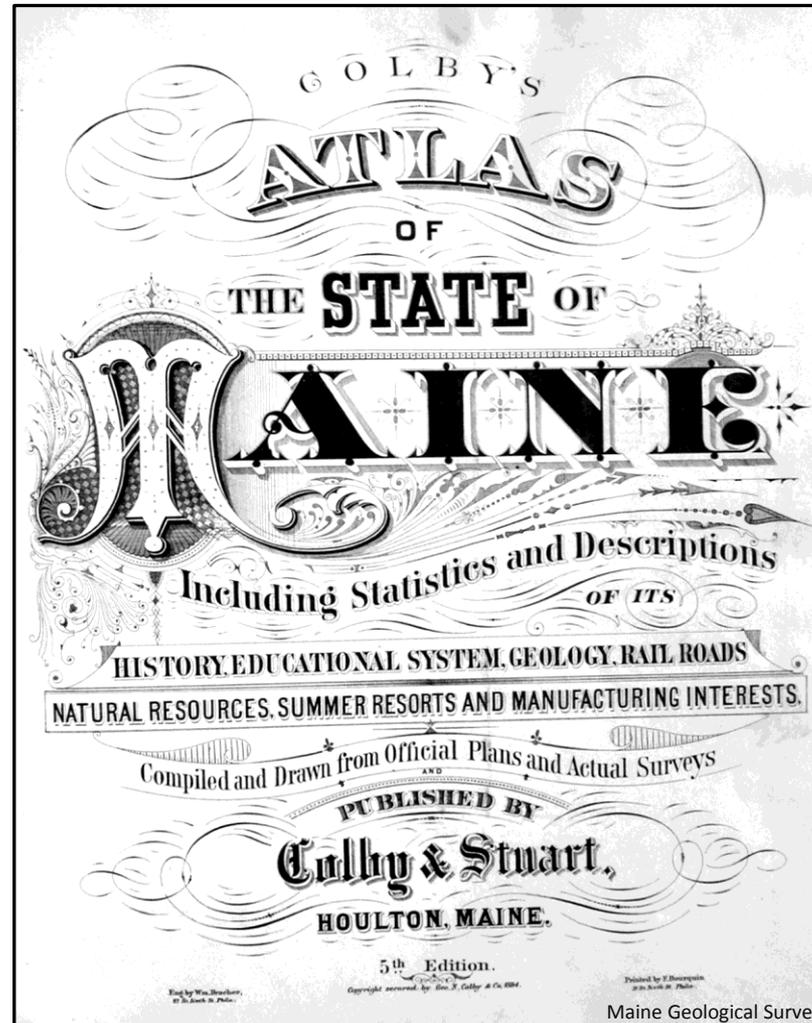


Figure by Marc Loiseau

**Figure 3.** Atlas title page. The full explanatory text for the map is provided in [pdf format \(7.7Mb\)](#).



### History

Results of the Maine Scientific Survey of 1861 and 1862 were described in two lengthy reports and embodied in a large Geological Map of Maine presented by C. H. Hitchcock to the State Legislature. The map was exhibited by special permission to the American Association for the Advancement of Science in about 1868 and an abstract of the explanation was published in the AAAS proceedings. Unfortunately, the whereabouts of the original map is not known. Hitchcock produced a smaller, page-sized map that was published in 1885 as part of Colby's Atlas of the State of Maine. It is based largely on his original 1868 map, though his accompanying text indicates some amount of modification. The Colby Atlas was widely circulated in several printings. Each map was colored by hand. This is one of the finer copies that has survived.

Hitchcock considered this to be a preliminary geologic map. In 1861 he wrote that his original map did not warrant publication since it was so imperfect, but he presented a manuscript copy so that "the total results of all previous explorations will not be lost." Considering the complexity of Maine's bedrock geology and the brief time of study available the 1885 map is remarkable, a testament to Hitchcock's knowledge of geologic principles and his skill at synthesizing an insufficient amount of data into a reasonable interpretation.



### Abstract

Hitchcock, Charles H., 1868, Explanation of a geological map of Maine: American Association for the Advancement of Science, Proceedings, vol. 16, p. 123.

Explanation of a Geological Map of Maine.  
by C. H. Hitchcock, of New York, N. Y.

*The results obtained during the progress of the Maine Scientific Survey in 1861, 1862, have been embodied in a large map, the property of the Legislature. By the permission of the executive officers of that State, the map was exhibited to the Association. Gneissic rocks with granite and patches of schist and limestones, occupy the hilly parts of York, Cumberland, and Oxford Counties. This is the remotest extension of the White Mountain series. The same appear in great amount along the coast, including the area twenty miles back, between Portland and the Penobscot River. Between those gneissic masses commences a mica schist, extending north-easterly into New Brunswick. Where it crosses the Penobscot River, it occupies the area between Medway and Bucksport. At the eastern State line it is narrower, including Orient, Amity, and part of Hodgdon. In Hancock County, a range of granite commences at Mount Desert Island and extends north-easterly, entering New Brunswick with the entire width of the Eastern Schoodic Lakes. Another development of mica schist appears on the south of the granite, followed in the south-east part of Washington County by smaller deposits of flinty slates, the Lower Helderberg, Upper Devonian, and by great masses of trappean rocks.*

*The northern part of the State is sparsely settled, and it is not everywhere easy to trace out the strata. But it is in this section that the greatest number of fossils are found. A wide formation of clay slate succeeds to the great central belt of mica schist. One like it reappears on the Lower Allequash waters and the St. John River above the Great Falls. This is also underlaid by the Quebec group along the Canadian border. The northern part of the State, from the distribution of these two groups, would appear to form a great synclinal basin, holding at various parts of its surface a long area of Oriskany sandstone, Cauda-Galli grit, and various fossiliferous Upper Silurian and Devonian strata. The clay slates about Waterville contain fine examples of Nereites and Myrianites. The Port Daniel limestone of Lake Sedgwick has afforded a fine series of trilobites and brachiopods. The surface geology of Maine is remarkably interesting. Examples of local glaciers, and thirty-four "eskers," or "horsebacks," have been described. The chief exports of mineral wealth are granite and lime.*



## Graphic Index to the Figures

The map below displays the areas with Geological Inset Maps from Hitchcock's 1885 Geological Map of Maine. The figure numbers correspond to those used in this text.

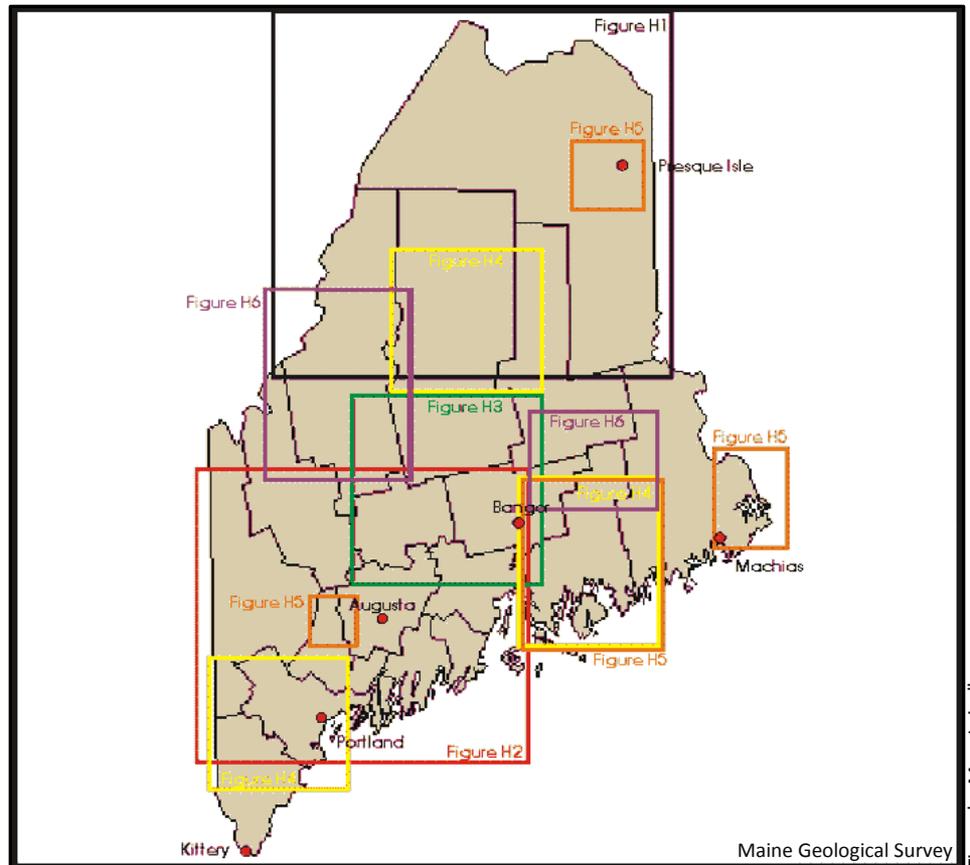


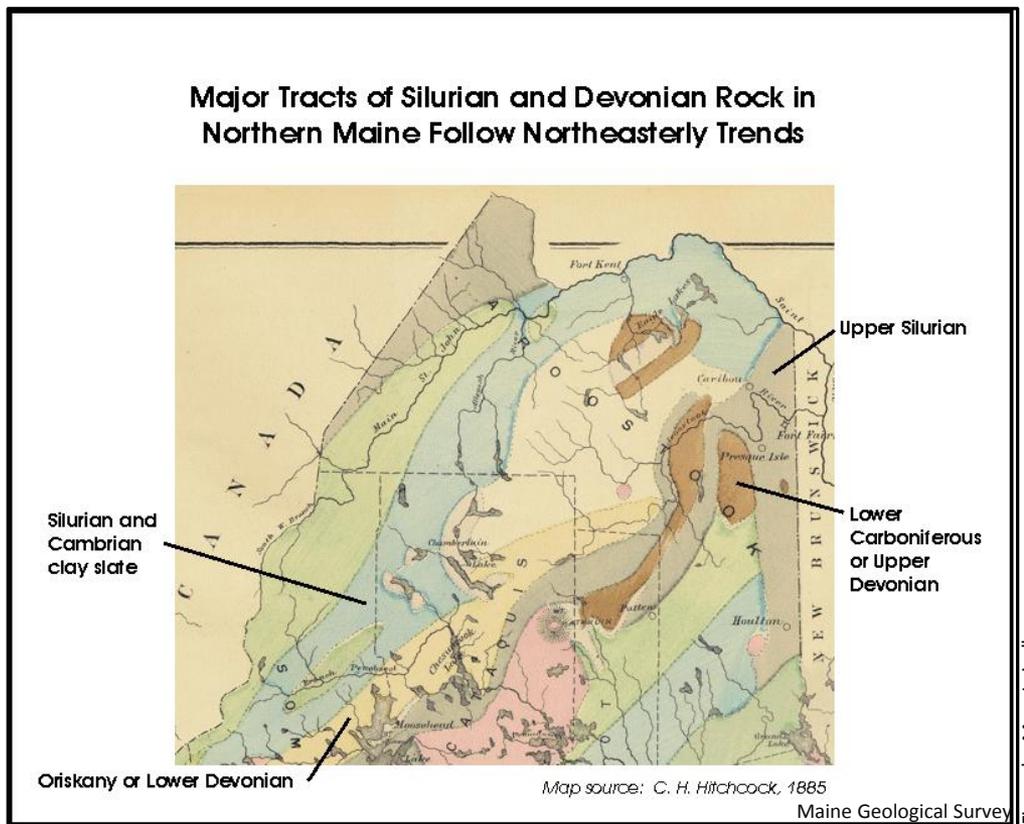
Figure by Marc Loiseille

**Figure 4.** Index map.



## Lithology (rock descriptions)

The broad aspects of Maine's bedrock geology are essentially correct. The Silurian and Devonian formations of northern Maine are shown to occupy continuous, northeast-trending tracts (Figure H1). Calcareous slates, indicated as "Upper Silurian", are mapped from Houlton to Fort Fairfield (Figure H1).

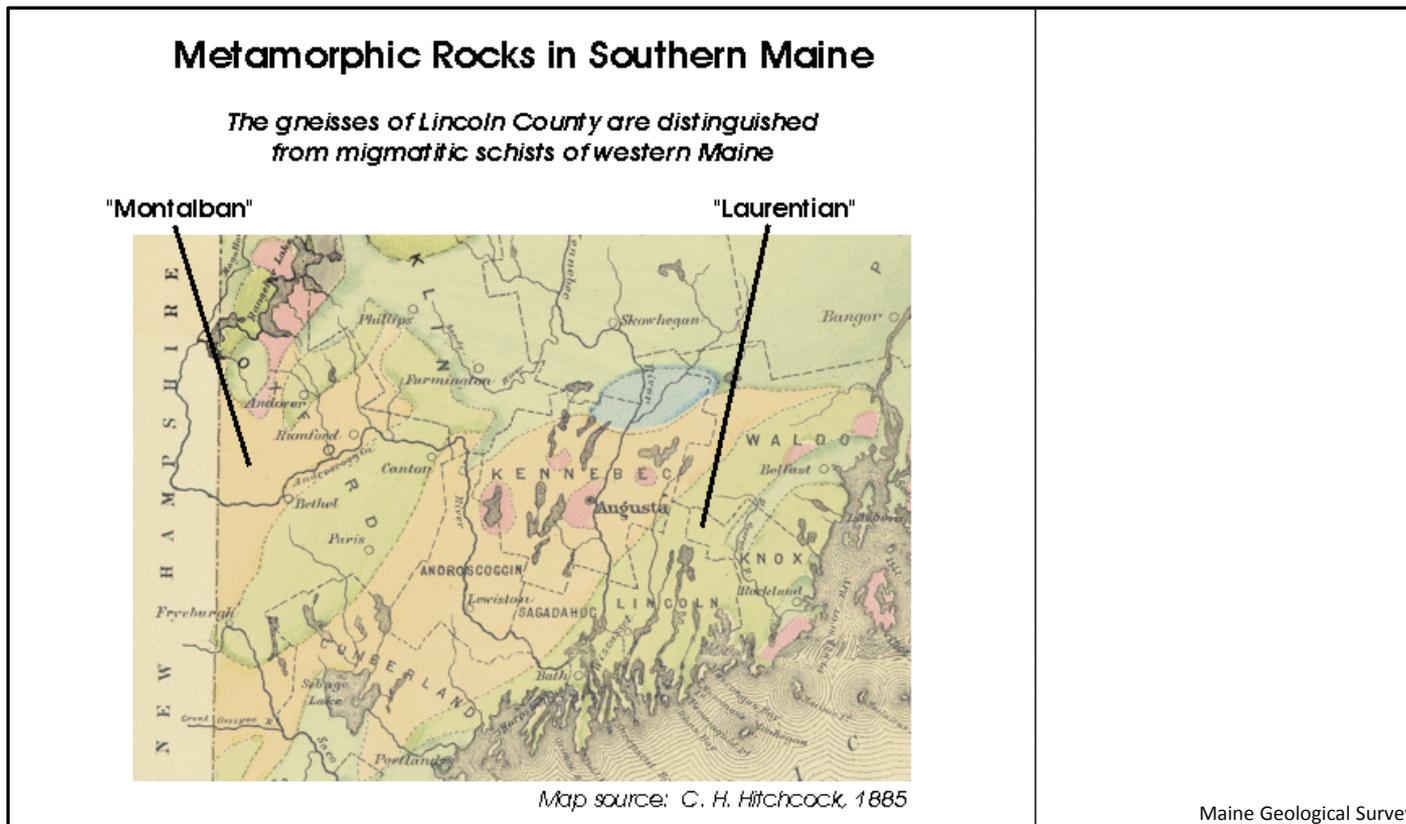


**Figure H1.** Early interpretation of lithology in northern Maine.



## Lithology (rock descriptions)

The complex metamorphic and migmatitic rocks of western and southwestern Maine are set apart, as are the metamorphic rocks extending from Harpswell through Waldo County, although the names "Montalban" and "Laurentian" mean little to modern geologists (Figure H2).



**Figure H2.** Early interpretation of lithology in southern Maine.



## Lithology (rock descriptions)

The broad lowland area of the central Maine slate belt is delineated, with a patch of Silurian "clay slate" around the controversial Waterville fossils (Figure H3).

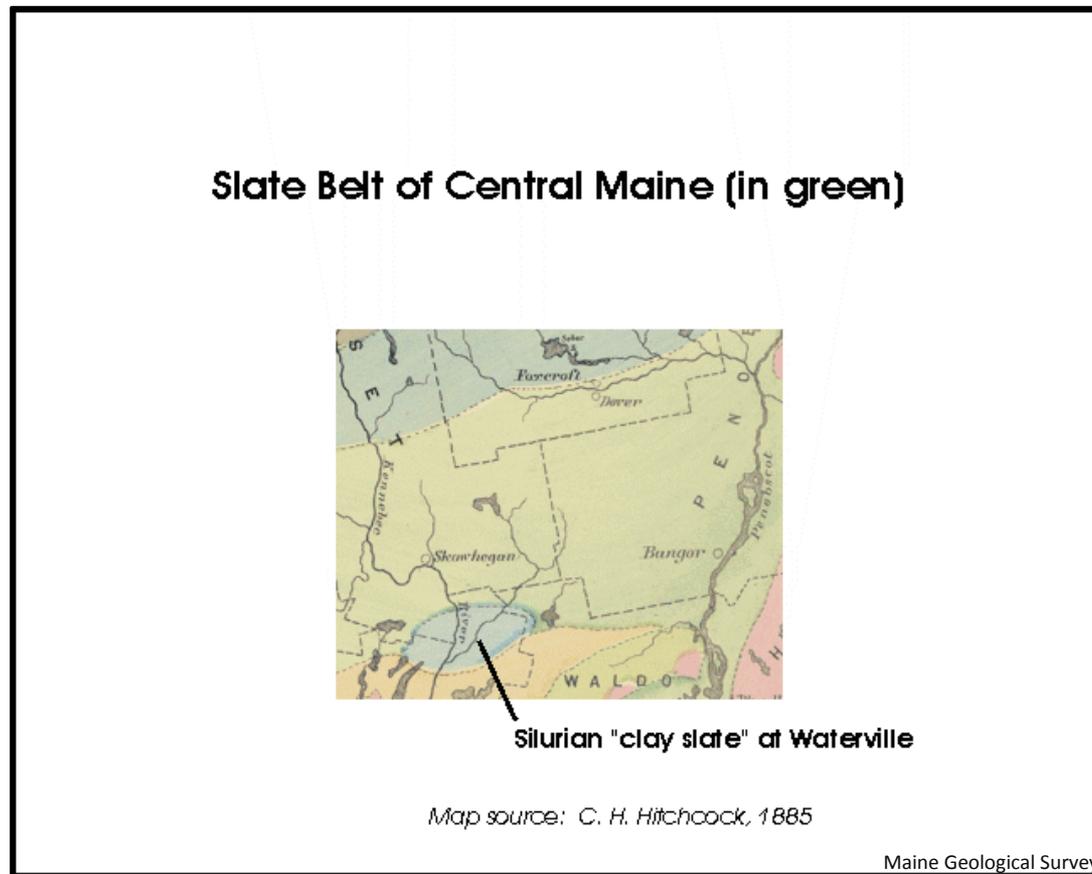


Figure by Marc Loiseille

**Figure H3.** Early interpretation of lithology in central Maine.



## Lithology (rock descriptions)

Large areas of granite had been discovered in Hancock and Washington Counties, at Katahdin, and to the south of Sebago Lake (Figure H4), even though scholars of the day did not agree as to how such masses of granite had formed.

### Granite Bodies (shown in pink)

**A: In Hancock and Washington Counties**



**B: On Mt. Katahdin and to the south**



**C: South of Sebago Lake**



Map source: C. H. Hitchcock, 1885

Maine Geological Survey

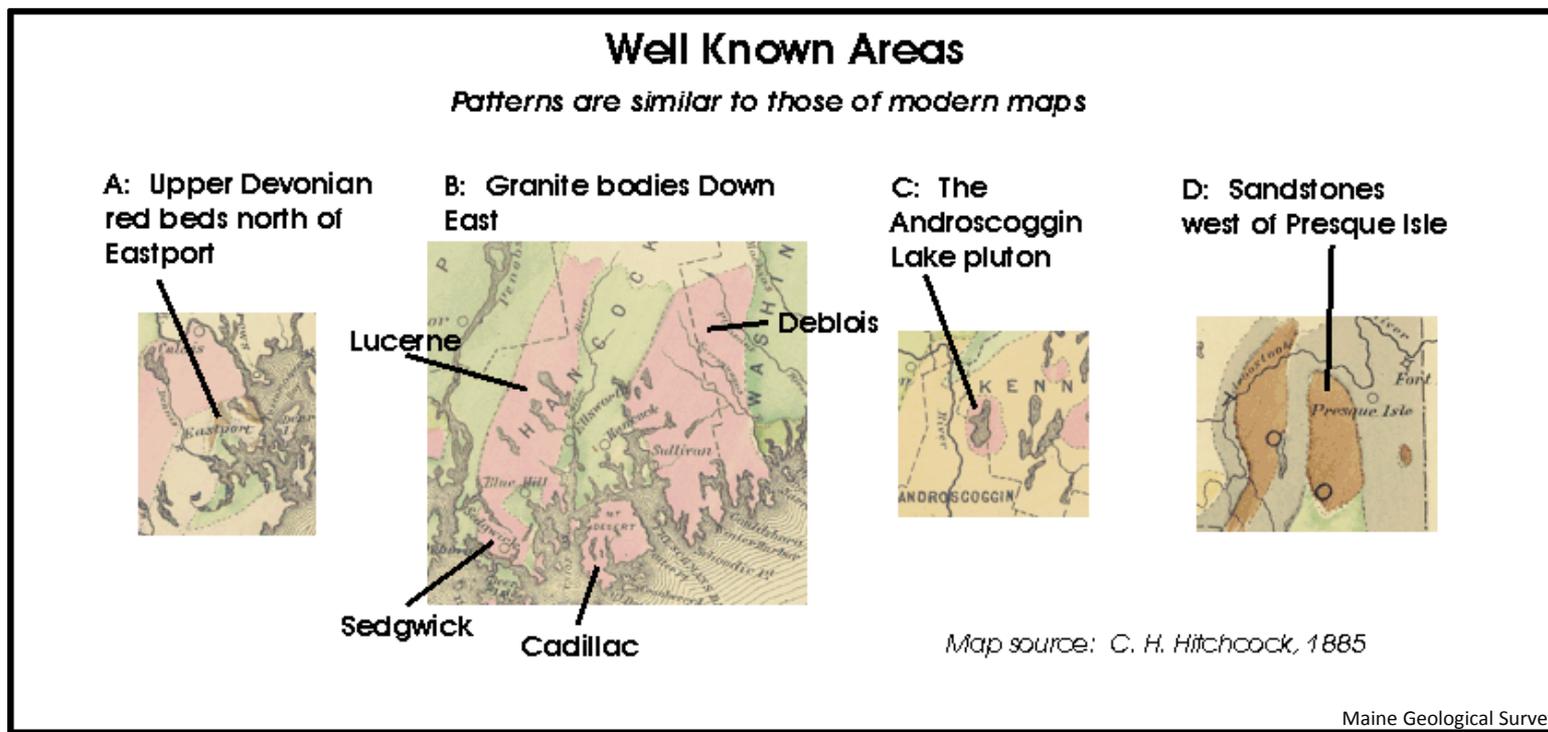
Figure by Marc Loisel

**Figure H4.** Early interpretation of lithology of granite bodies.



## Lithology (rock descriptions)

Where more detailed mapping had been done, mainly in the populated regions, comparison with subsequent bedrock maps shows the enduring quality of the work. Notice, for example, the Upper Devonian red beds near Eastport (Figure H5A), the accurate contacts of the Lucerne, Deblois, and Sedgwick granites near Blue Hill (Figure H5B), the Androscoggin Lake pluton west of Augusta (Figure H5C), and the oval outlier of "Upper Devonian" sandstone west of Presque Isle (Figure H5D).



**Figure H5.** Early interpretation of lithology in well known localities.



## Lithology (rock descriptions)

By contrast, the geology of the "Wild Lands" of northern Maine was known only in reconnaissance from bateau and canoe expeditions up the major rivers. It is obvious from the blank area in northern Hancock County, and the sweeping shapes of the contacts in northern Franklin and Somerset Counties that the geology was poorly known in those areas (Figure H6).

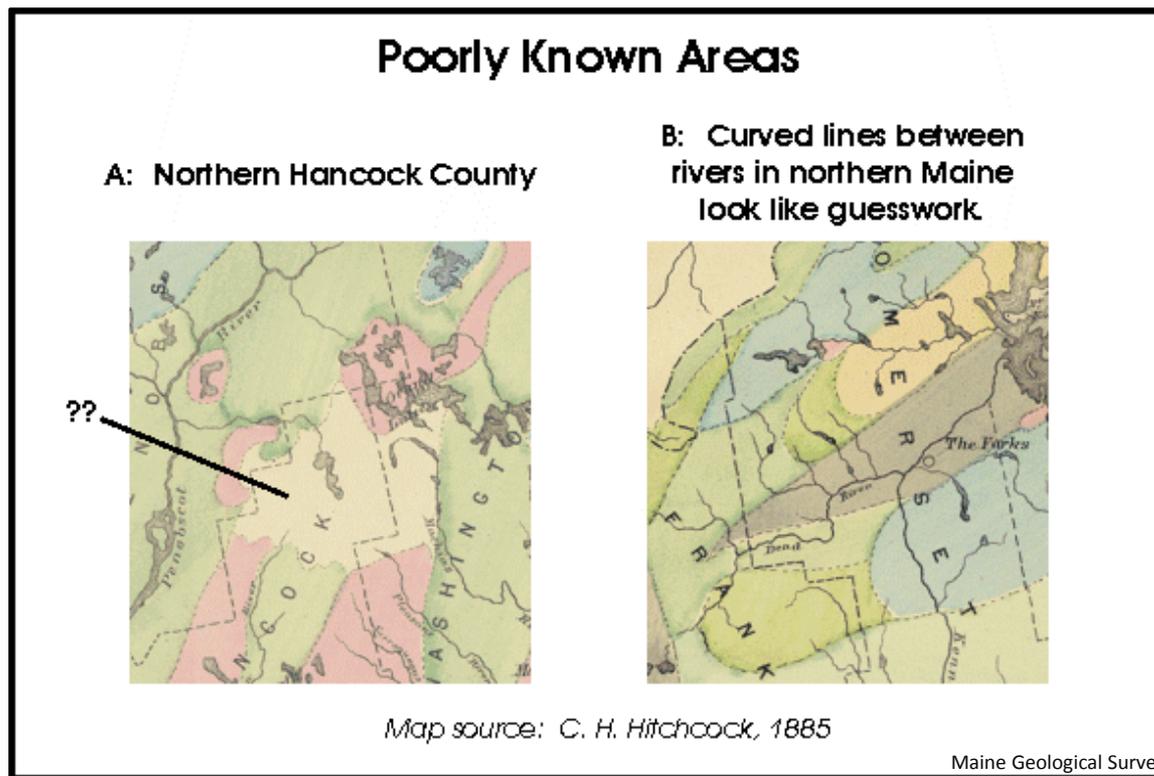


Figure by Marc Loisele

**Figure H6.** Early interpretation of lithology in poorly known localities.



### Age

By 1861, paleontologists had correctly established the ages of the Upper Devonian Old Red Sandstone at Perry, certain Lower Devonian sandstones and Upper Silurian rocks of northern Maine, and fossil-rich Upper Silurian rocks at Pembroke. Incomplete or problematic fossil collections from Flint Island in Narraguagus Bay and from Waterville suggested Lower Silurian ages for those places also.

Despite the circumstance that "fossils are wanting" elsewhere, Hitchcock assigned most of the remaining rocks to the Lower Paleozoic, relying on the principles of stratigraphic continuity and superposition combined with a knowledge of western New England geology to deduce the ages of Azoic rocks from the ages of fossiliferous ones. A significant conclusion presented on this map is that all of the bedrock in Maine is older than Carboniferous. Therefore, the Carboniferous coal measures being mined at the time in Massachusetts and in New Brunswick do not occur in Maine. "We did not desire to arrive at this conclusion, but the inference must be drawn." (Hitchcock, 1861, p. 255)

Metamorphic rocks of southwest Maine are shown as Montalban and Laurentian (Precambrian), even though Hitchcock allows that "It is difficult as yet to say whether any of these Azoic rocks belong to the Laurentian series or the Paleozoic system." No Ordovician rocks are shown because it was not yet an accepted geologic time period. Rocks we would now call Ordovician were included in the Lower Silurian of Hitchcock's time.



## Regional Relationships

Belts of rock of the same age are repeated across the map, especially in northern Maine, due to large anticlinal and synclinal folds (Figure H7a).

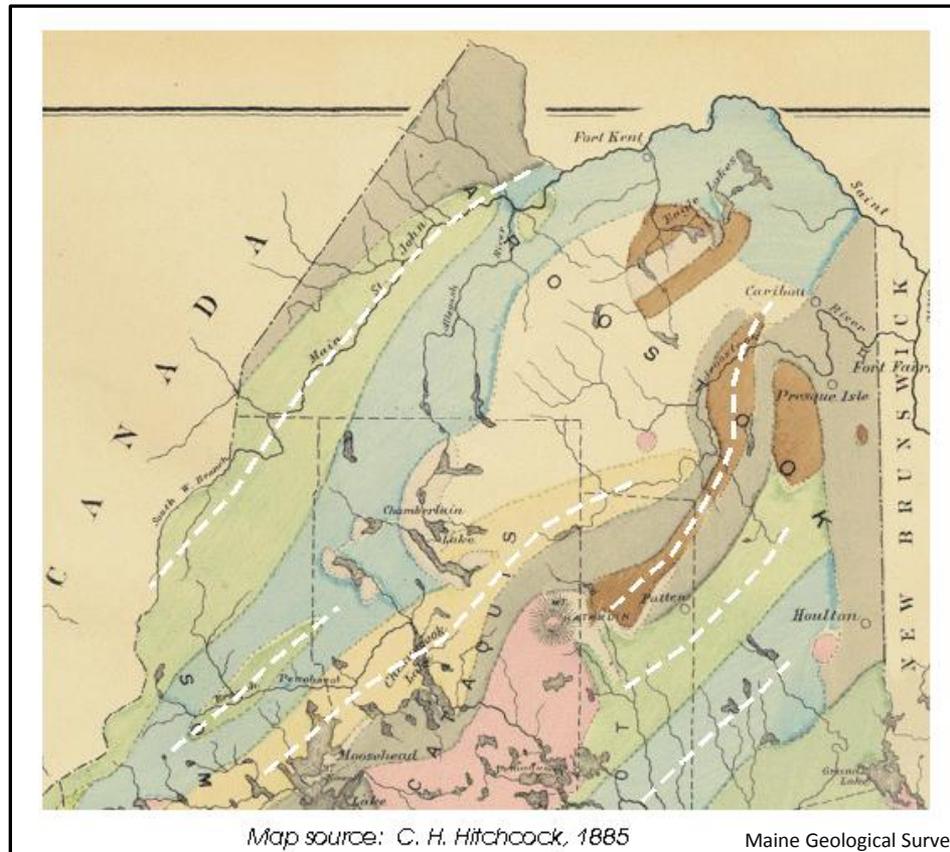
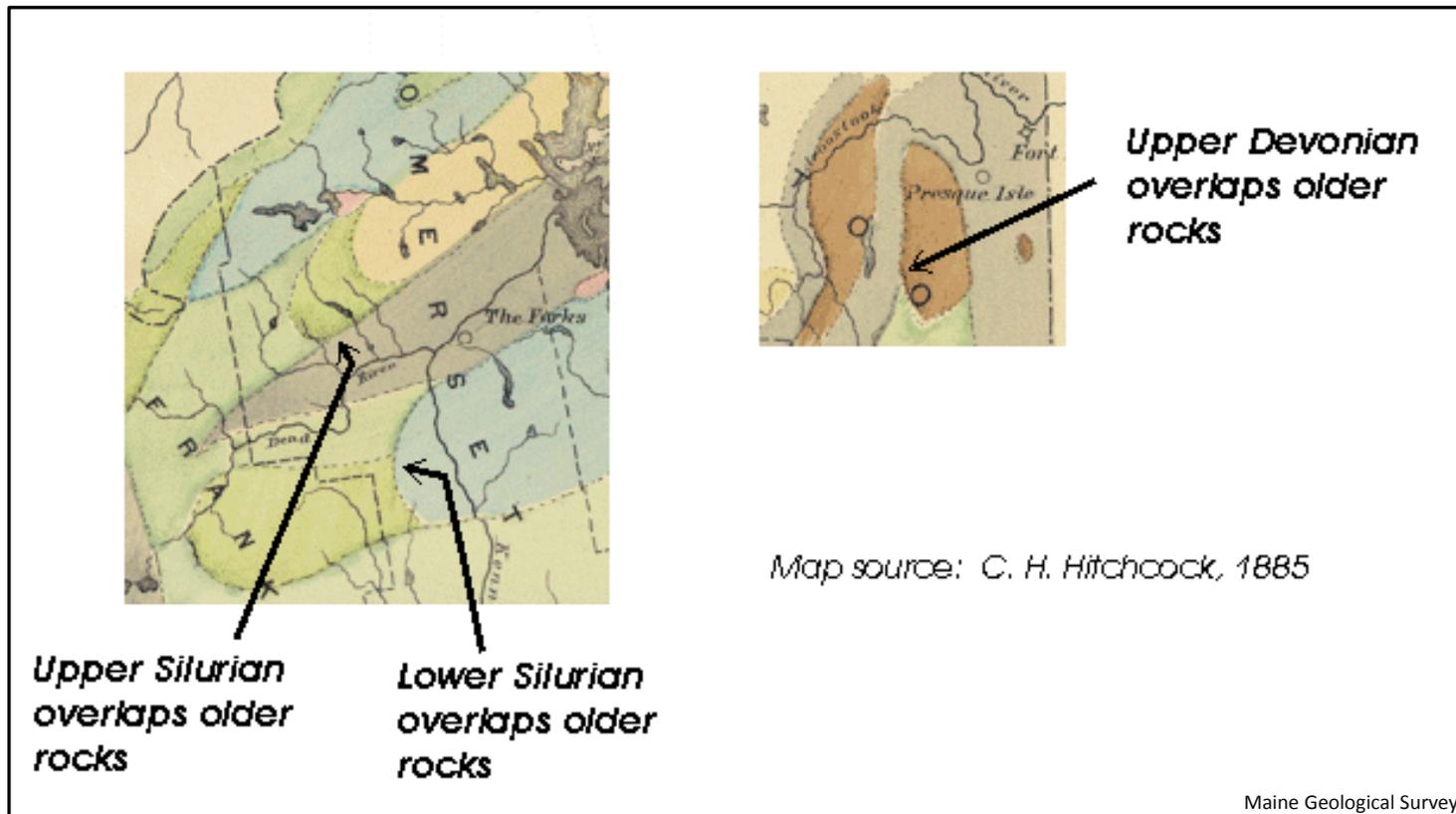


Figure by Marc Loisel

**Figure H7a.** Repetition of units is due to large anticline and syncline folds (trace of axial surfaces added in white).

## Regional Relationships

The overlapping pattern of units on the map indicates major unconformities beneath the Middle Devonian, beneath the Upper Silurian, and beneath the Lower Silurian (Figure H7b). Relationships among Huronian rocks, Laurentian rocks, and granites are ambiguous.



**Figure H7b.** Overlapping units indicate unconformities.

### Conclusions

Differences between the various bedrock maps of Maine derive partly from the amount of information available at the time of publication, but depend more importantly on the perspective of the author. Charles Hitchcock was one of the preeminent geologic scholars of his day, with a vast knowledge of New England geology. His 1885 map is clearly an attempt to generalize the major geologic features of Maine into a stratigraphic or historical perspective. In his explanatory text, Hitchcock mentions many geologic details that demonstrate his command of the facts. But this map is not intended to show all those details. Rather, it gives a larger view of the systematic nature of Maine's geology, related to the geology of neighboring areas and explained by the workings of geologic processes through time.



References and Additional Information

Hitchcock, Charles H., 1861a, General report upon the geology of Maine: in Preliminary report on natural history and geology: Maine Board of Agriculture, 6th Annual Report, p. 146-328.

Hitchcock, Charles H., 1861b, Geology of the wild lands: in Preliminary report on natural history and geology: Maine Board of Agriculture, 6th Annual Report, p. 377-419, map.

Hitchcock, Charles H., 1862, Geology of Maine [includes contributions by G. L. Goodale, O. White, and E. Holmes]: Maine Board of Agriculture, 7th Annual Report, p. 223-430, map.

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Hitchcock, Charles H., 1885, Geological map of Maine: in Colby's Atlas of the State of Maine: George N. Colby & Co., Houlton, Maine, p. 27 (scale approximately 1:1,267,200).

