GUIDEBOOK SERIES
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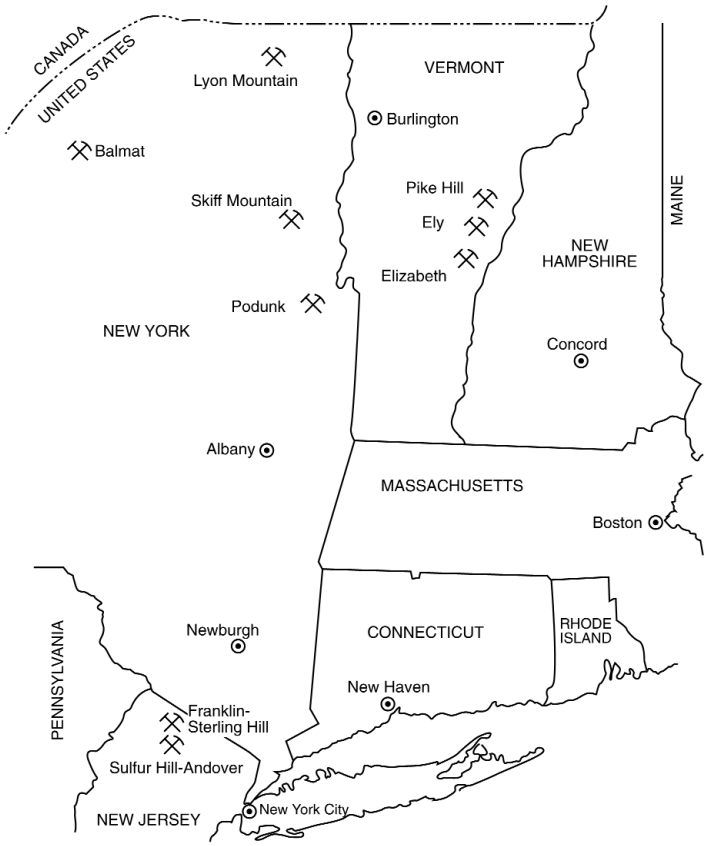
Part I. PROTEROZOIC IRON AND ZINC DEPOSITS OF THE ADIRONDACK MOUNTAINS OF NEW YORK AND THE NEW JERSEY HIGHLANDS

Edited by John F. Slack

Part II. ENVIRONMENTAL GEOCHEMISTRY AND MINING HISTORY OF MASSIVE SULFIDE DEPOSITS IN THE VERMONT COPPER BELT

Edited by Jane M. Hammarstrom and Robert R. Seal II



Guidebook prepared for the Society of Economic Geologists
I. Premeeting field conference—30 October–3 November 2001
II. Postmeeting field conference—8–10 November 2001

SOCIETY OF ECONOMIC GEOLOGISTS, INC.

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Preface

This Society of Economic Geologists (SEG) guidebook covers two field trips held in association with the annual meetings of the Geological Society of America in Boston, Massachusetts, November 5–8, 2001. The premeeting trip, from October 30 through November 3, is focused on Proterozoic iron and zinc deposits of the Adirondack Mountains in New York and the New Jersey Highlands. The postmeeting trip, from November 8 through November 10, is devoted to geoenvironmental and historical aspects of mining in the Vermont copper belt. Included in the guidebook are road logs for each of the trips and separate chapters that describe the geology, ore deposits, and geochemistry and of individual mines.

The regional geologic setting of the mines is shown on Figure 1. During the premeeting trip we will visit four different types of Proterozoic iron deposits and two different types of Proterozoic zinc deposits. The iron deposits are all of the low Ti variety. One type featured is associated with Mesoproterozoic granitic intrusions in the eastern and northern Adirondack massif, as described in the chapter by McLelland et al. Examples of this deposit type will be seen at the Podunk, Skiff Mountain, and Lyon Mountain iron mines, on the first and second days of the trip. Farther west, in the Adirondack lowlands, is the Balmat zinc sulfide deposit within Grenvillian marbles, which will be examined during an underground tour on the third day; the related deposit description is by deLorraine. The other ore deposits to be visited are in the northern part of the New Jersey Highlands, within both Mesoproterozoic and younger Neoproterozoic rocks. The chapter by Volkert presents a summary of the geological settings of various iron, zinc, and also graphite deposits in Grenvillian rocks of the Highlands, and iron deposits in younger Neoproterozoic rocks. The world-famous zinc silicate and zinc oxide deposits of the Franklin and Sterling Hill mines, within Grenvillian marbles, will be visited on the fourth day, together with a stop at marble-hosted magnetite iron formation (Furnace magnetite bed) at the Franklin mine; descriptions of these deposits and models for their origin are presented in separate chapters by Metsger and Johnson. The last day of the field trip features visits to the Sulfur Hill iron deposit, within Mesoproterozoic rocks of the Highlands, and the Andover iron deposit, within Neoproterozoic rocks. Models for the origin of these and other types of iron deposits in the Highlands are presented in the chapter by Puffer.

The postmeeting trip visits two Besshi-type massive sulfide deposits in the Vermont copper belt. The focus of this trip is the environmental legacy and historical significance of mining at the Elizabeth mine on the first day, and at the Ely mine on the second day. The Elizabeth mine was the site of a major 19th century copperas (hydrated ferrous iron sulfate) works, and was among the top U.S. copper producers during the 1950s. The Ely mine made Vermont a leading copper-producing state in the 1870s, and was the site of a mining "boom town" and labor conflict. Acid mine drainage associated with both mine sites degrades water quality in the Connecticut River watershed. The Elizabeth mine is the first metal mine in the northeastern United States designated for site cleanup under the U.S. Environmental Protection Agency's Superfund Program. The Ely mine is a proposed Superfund site. Slack et al. describe the geologic setting and geochemical signature of the copper deposits of the region. Kierstead summarizes the history of mining and the historical resources associated with Elizabeth and Ely mines. Hammarstrom et al. examine the geochemistry and mineralogy of solid mine waste materials at Elizabeth and Ely as sources of metals and acidity, and their relation to the mining history. Crowley et al. applies airborne and field spectral reflectance techniques to map mineralogy of the Elizabeth mine waste piles. Seal et al. document geochemical settings of mine drainage in the Vermont copper belt, and describe the processes that develop acid mine drainage. In the last chapter, Hathaway et al. provide an overview of the Superfund program, and summarize the nature of the environmental impact at the Elizabeth mine and reclamation options for the site. The detailed studies at the Elizabeth mine provide a template that may facilitate reclamation planning for the Ely mine and for other abandoned mine sites associated with Besshi-type massive sulfide deposits in temperate climates.

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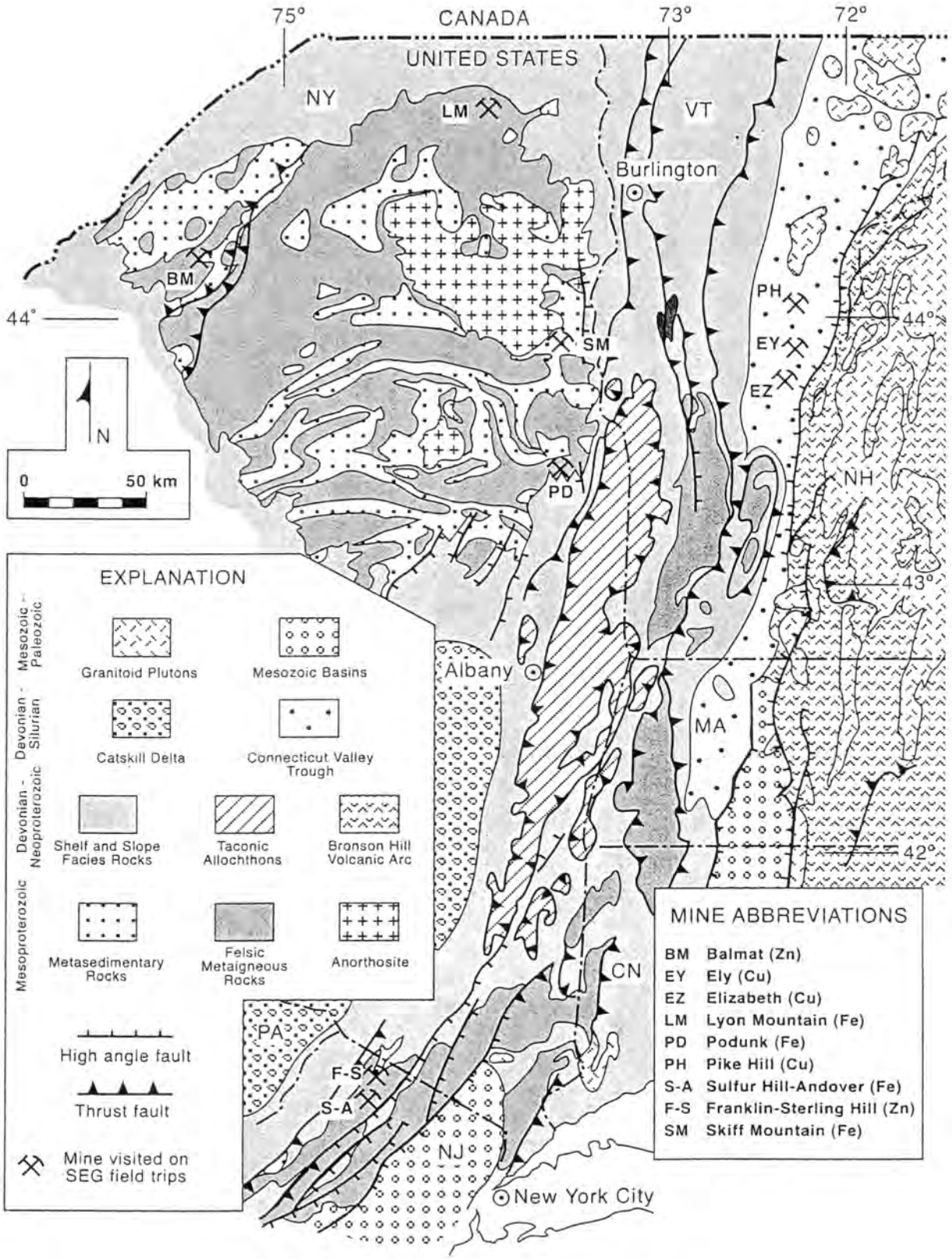

FIG. 1. Simplified geologic map showing the locations of mines to be visited on SEG field trips associated with the Boston GSA meetings. Geologic base modified from Rankin et al. (1993, Map A).

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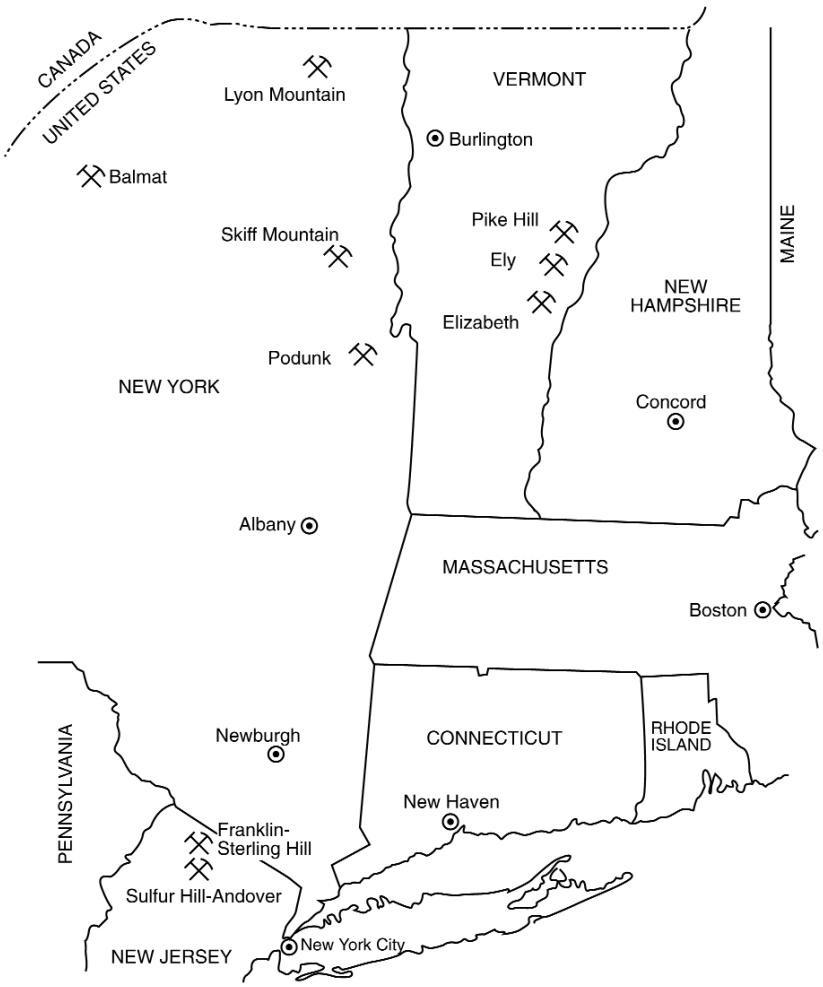

Guidebook prepared for the Society of Economic Geologists II. Postmeeting field conference—8–10 November 2001

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