Avalon Terrane Field Trip!

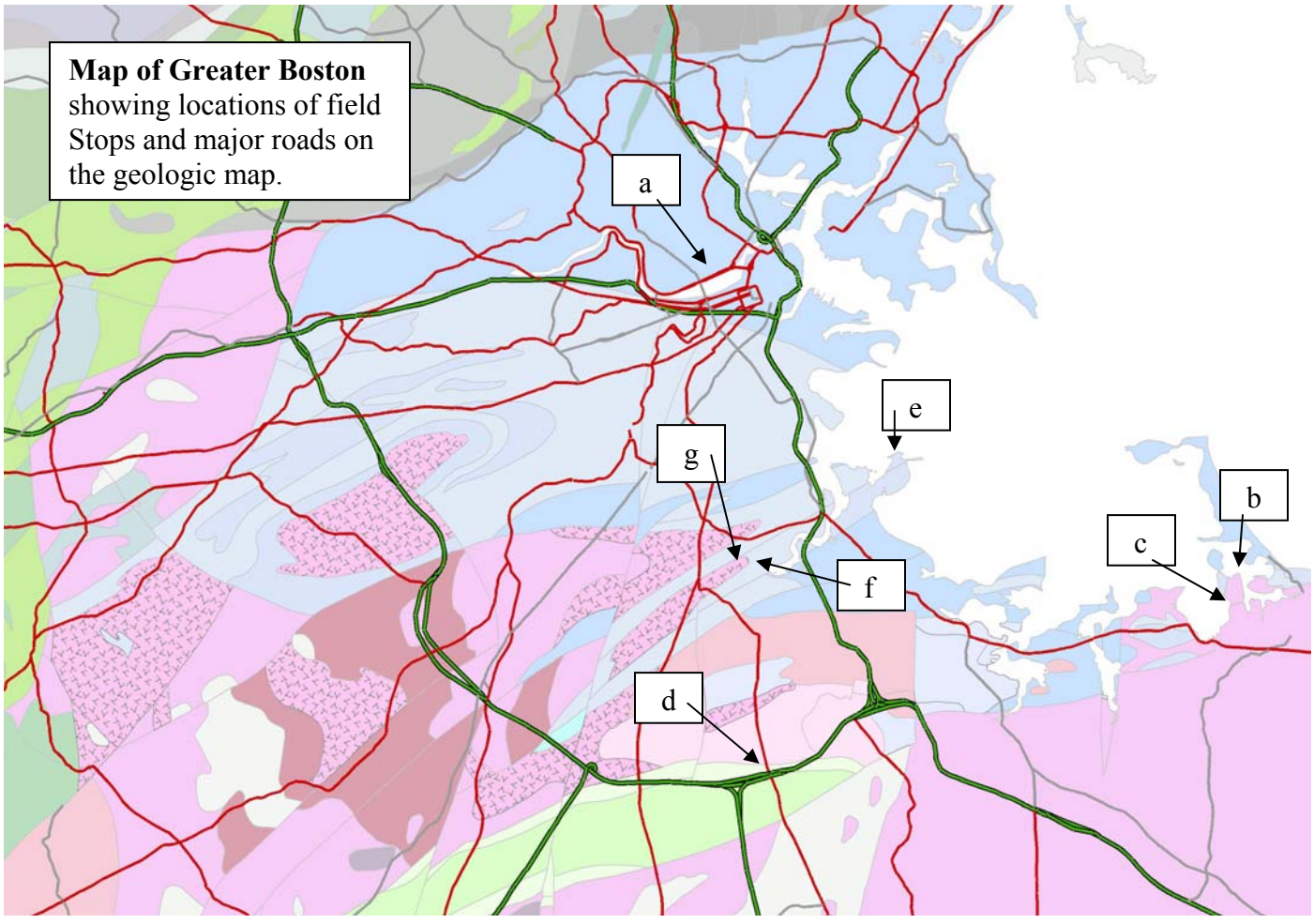
11 – X – 2005
9am – 5pm
Dinner at Ben's:

We will focus on the following goals:

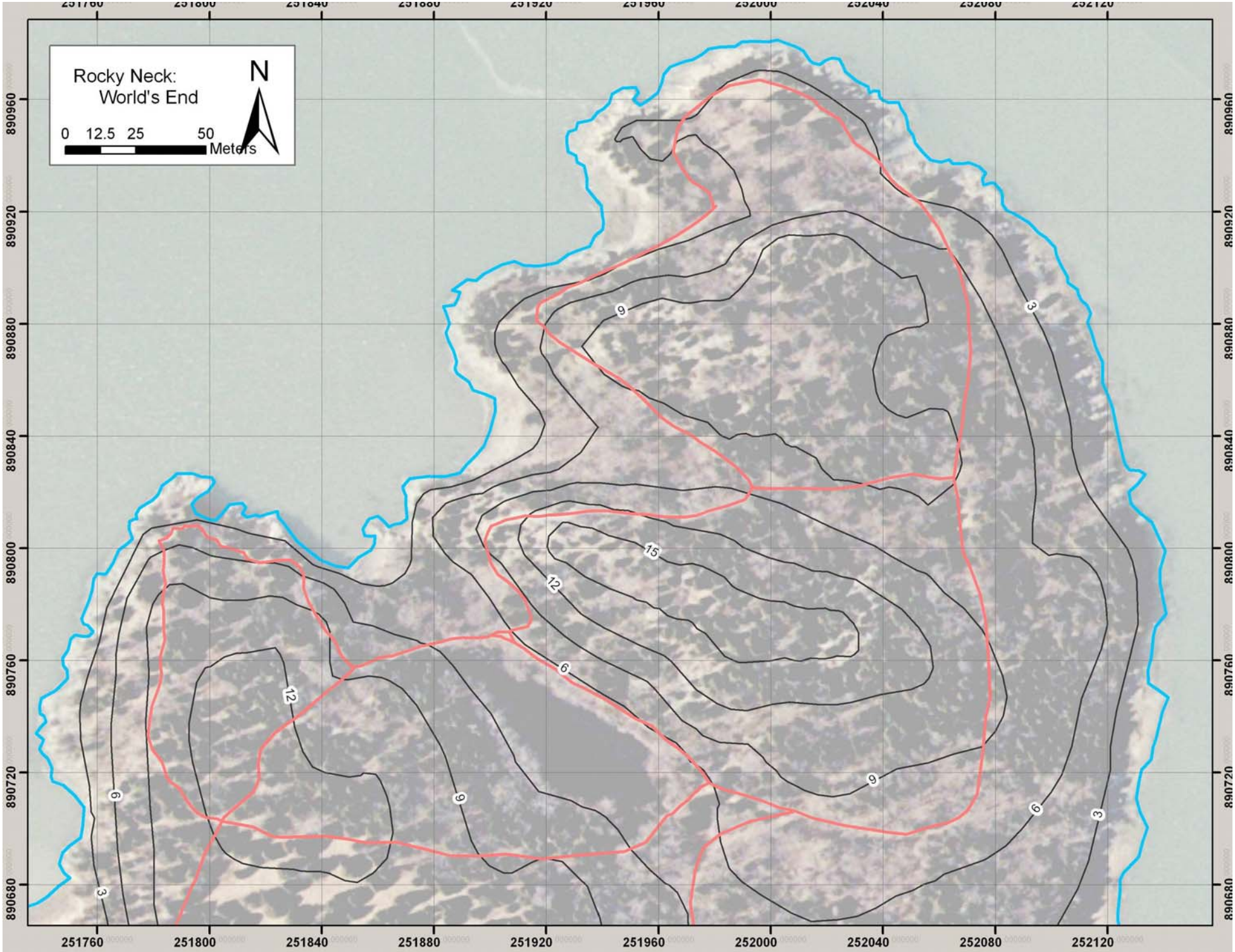
- Improving map reading skills (triangulation, reading topography, scale, etc)
- Improving lithologic and structural observation skills in the field
- Collecting and plotting geologic data on a map
- Staying positive in adverse weather conditions

The schedule of stops will go something like:

(a) 9:00 – Meet at MIT, distribute gear, load up, head out.
(b) 9:40 – Arrive at World's End, begin geologic mapping of Rocky Neck
(c) 12:30 – Lunch Break. Discuss local geologic setting.
(d) 1:30 – Leave for Pondville/Blue Hills Porphry Contact
(e) 2:30 – Leave for Squantum Head (if time and weather permits, otherwise…)
(f) 3:30 – Leave for Chocolate factory
(g) 5:00 - 5:30: Go to Grocery store, get food, start cookin'



Map of Greater Boston showing locations of field Stops and major roads on the geologic map.


Rocky Neck:
World's End
N
0 12.5 25 50
Meters
251760
251800
251840
251880
251920
251960
252000
252040
252080
252120
890960
890920
890880
890840
890800
890760
890720
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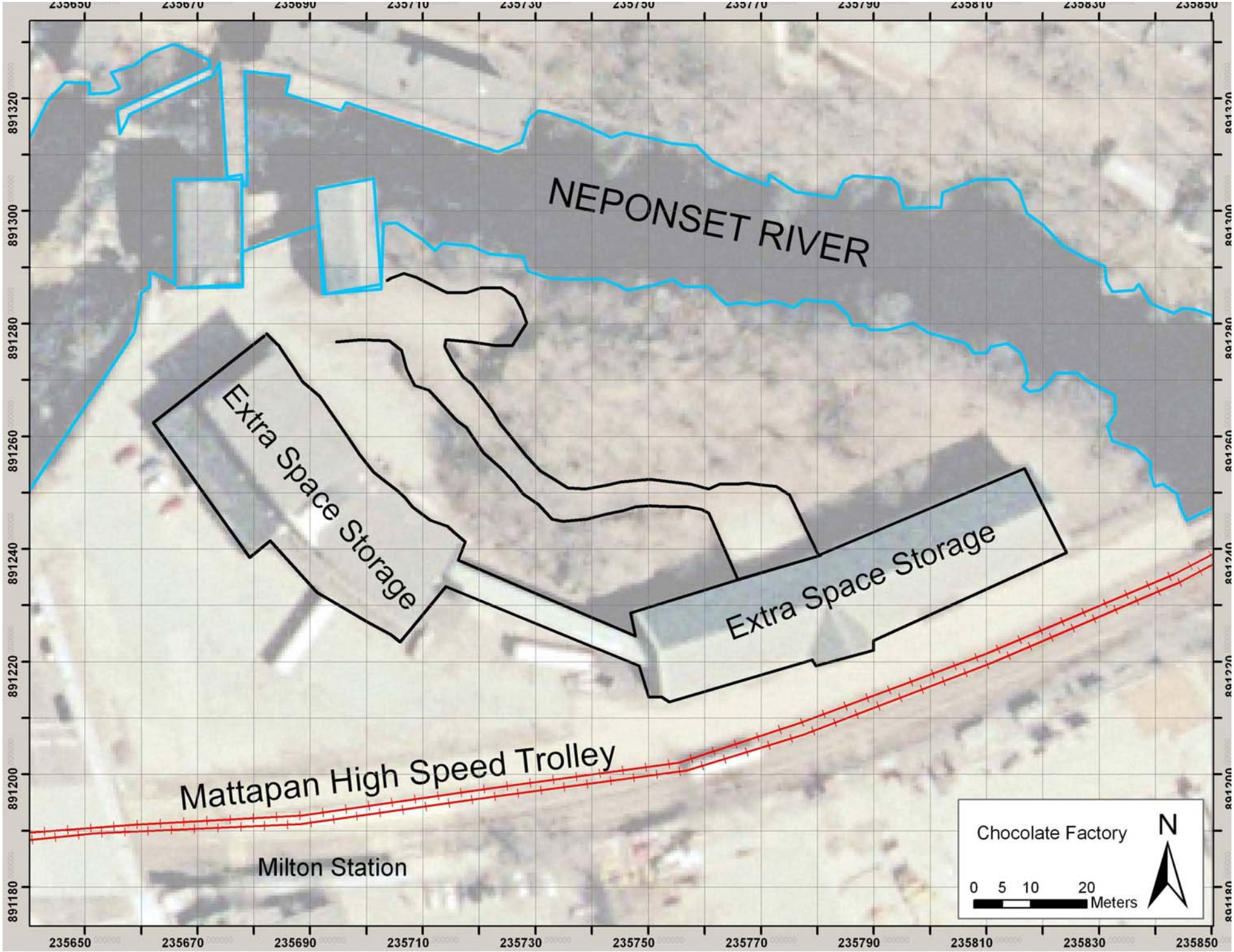
3
6
9
12
15


NEPONSET RIVER
Extra Space Storage
Extra Space Storage
Mattapan High Speed Trolley
Milton Station
Chocolate Factory
N
0 5 10 20
Meters
235650
235670
235690
235710
235730
235750
235770
235790
235810
235830
235850
891320
891300
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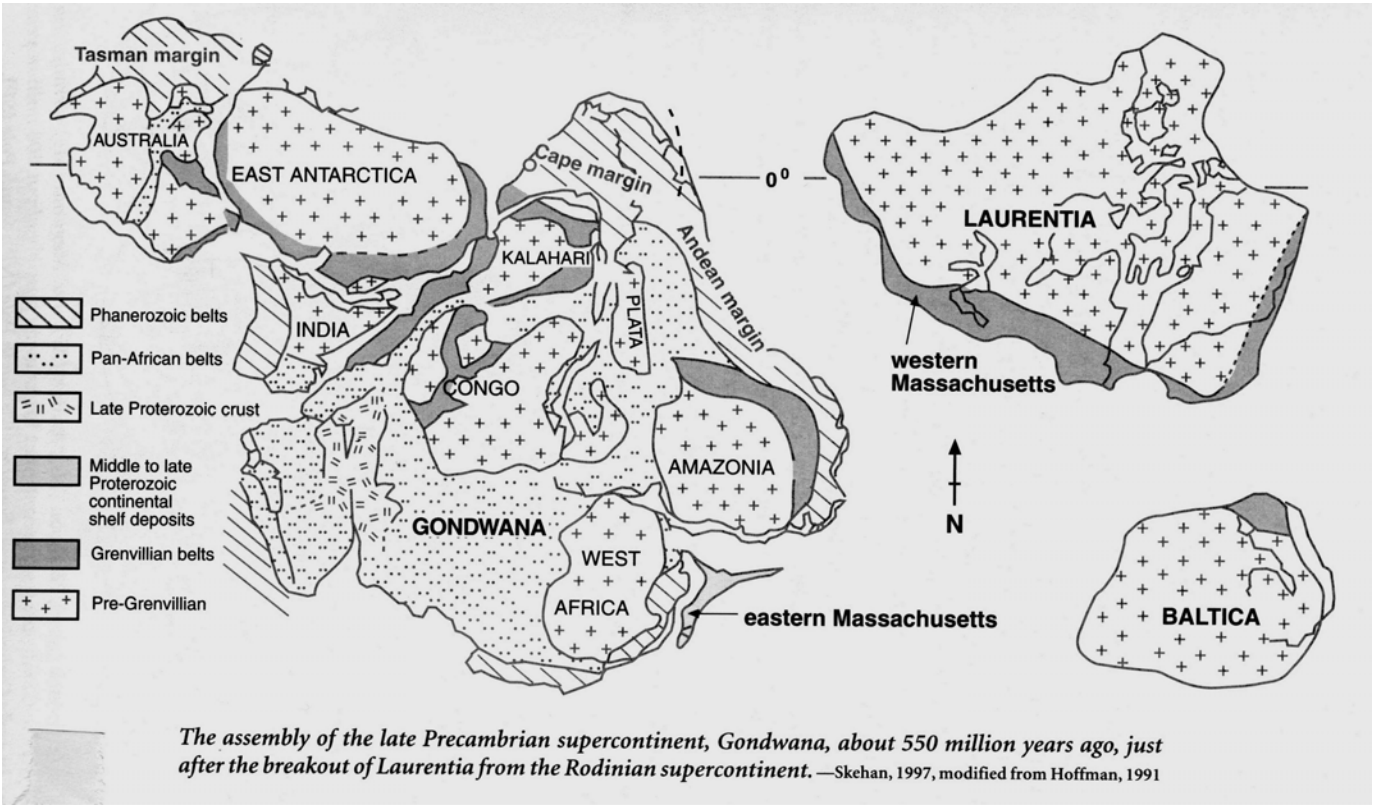
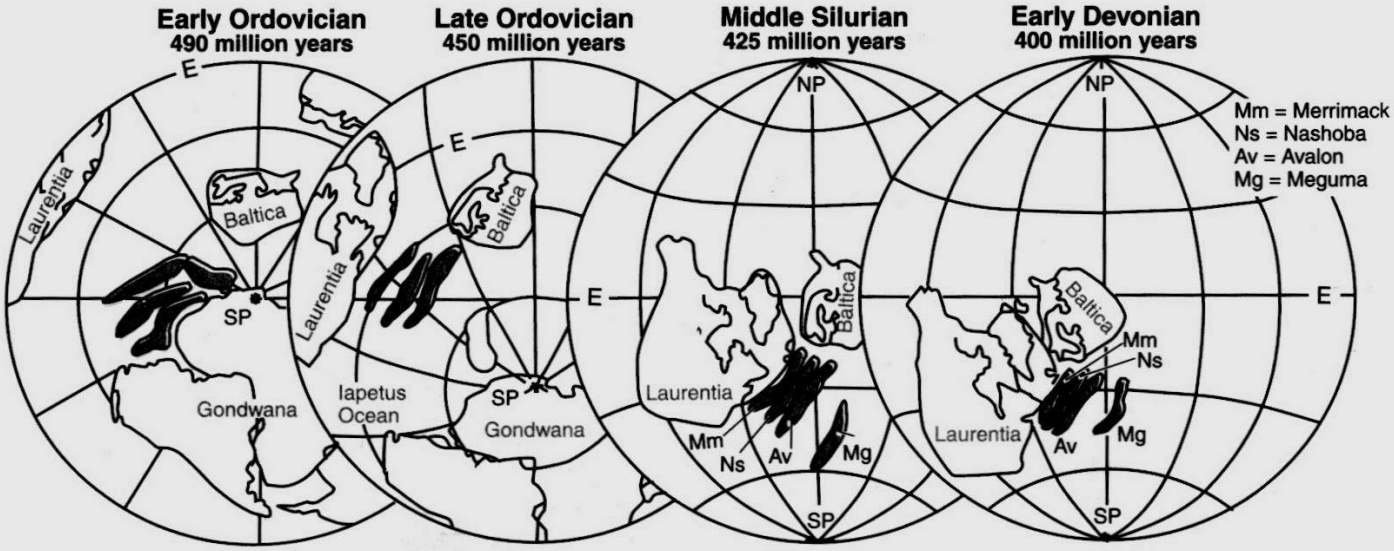
MOST IMAGES IN THIS GUIDE COME FROM
THE ROADSIDE GEOLOGY OF MASSACHUSETTS, (SKEHAN, 2001?)

The assembly of the late Precambrian supercontinent, Rodinia, by about 750 million years ago. —Skehan, 1997, modified from Hoffman, 1991

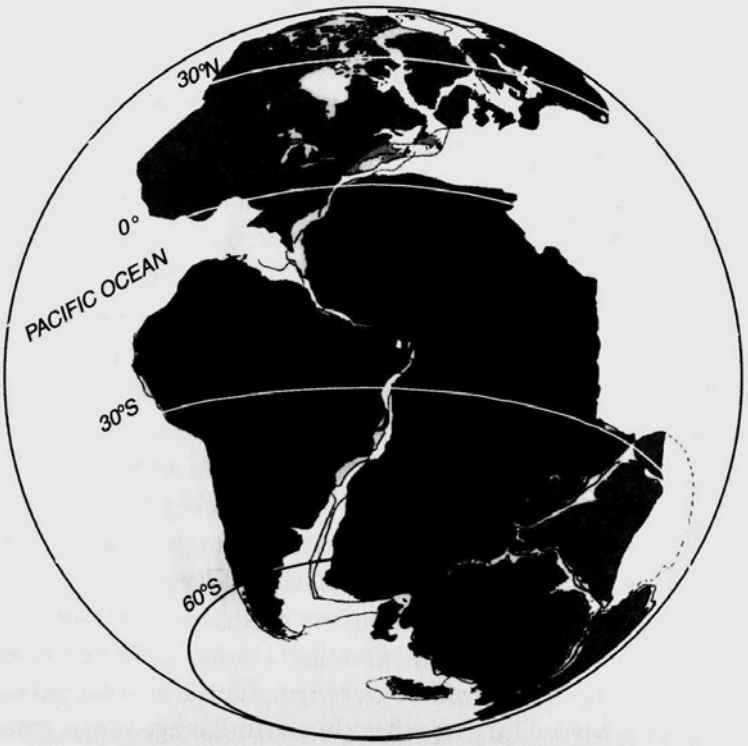


The assembly of the late Precambrian supercontinent, Gondwana, about 550 million years ago, just after the breakout of Laurentia from the Rodinian supercontinent. —Skehan, 1997, modified from Hoffman, 1991

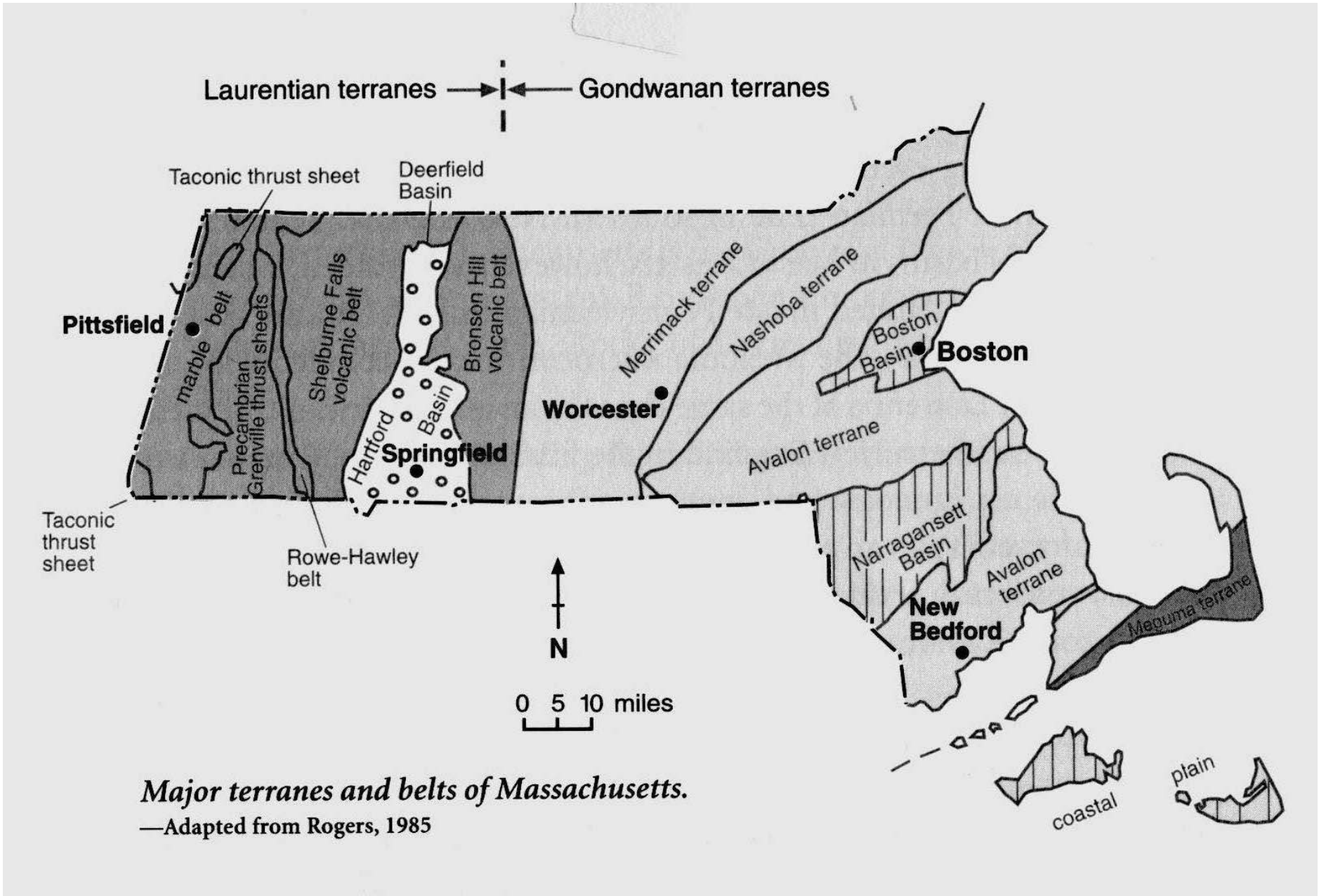


The Merrimack (Mm), Nashoba (Ns), Avalon (Av), and Meguma (Mg) terranes that fringed the Gondwanan supercontinent broke away possibly about 500 million years ago, in early Ordovician time. Equator (E); North Pole (NP); South Pole (SP).

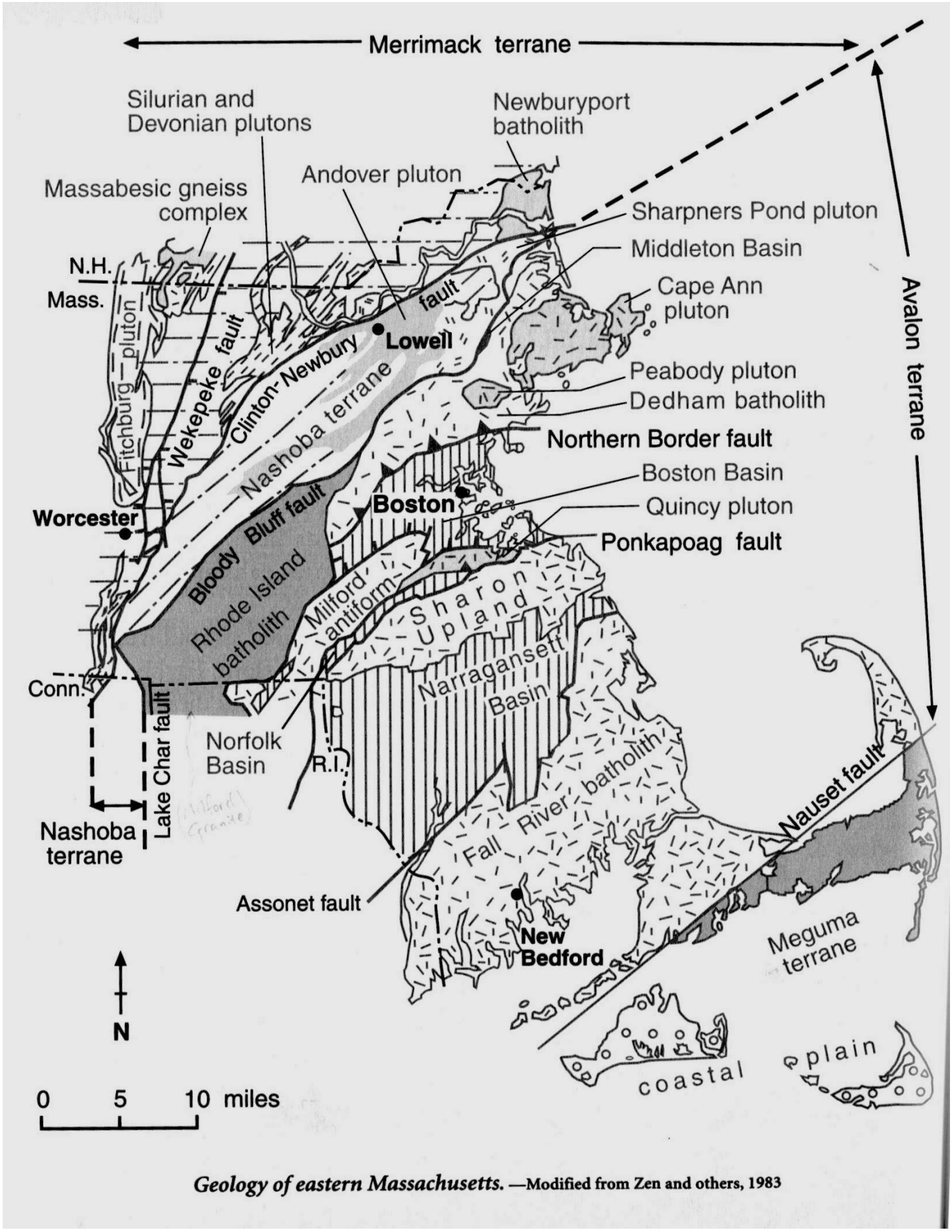
—Modified from Torsvik and others, 1992; Meissner and others, 1994



Gondwana docks with Laurentia, forming the Pangaean supercontinent. **—Modified from Dalziel, 1997**



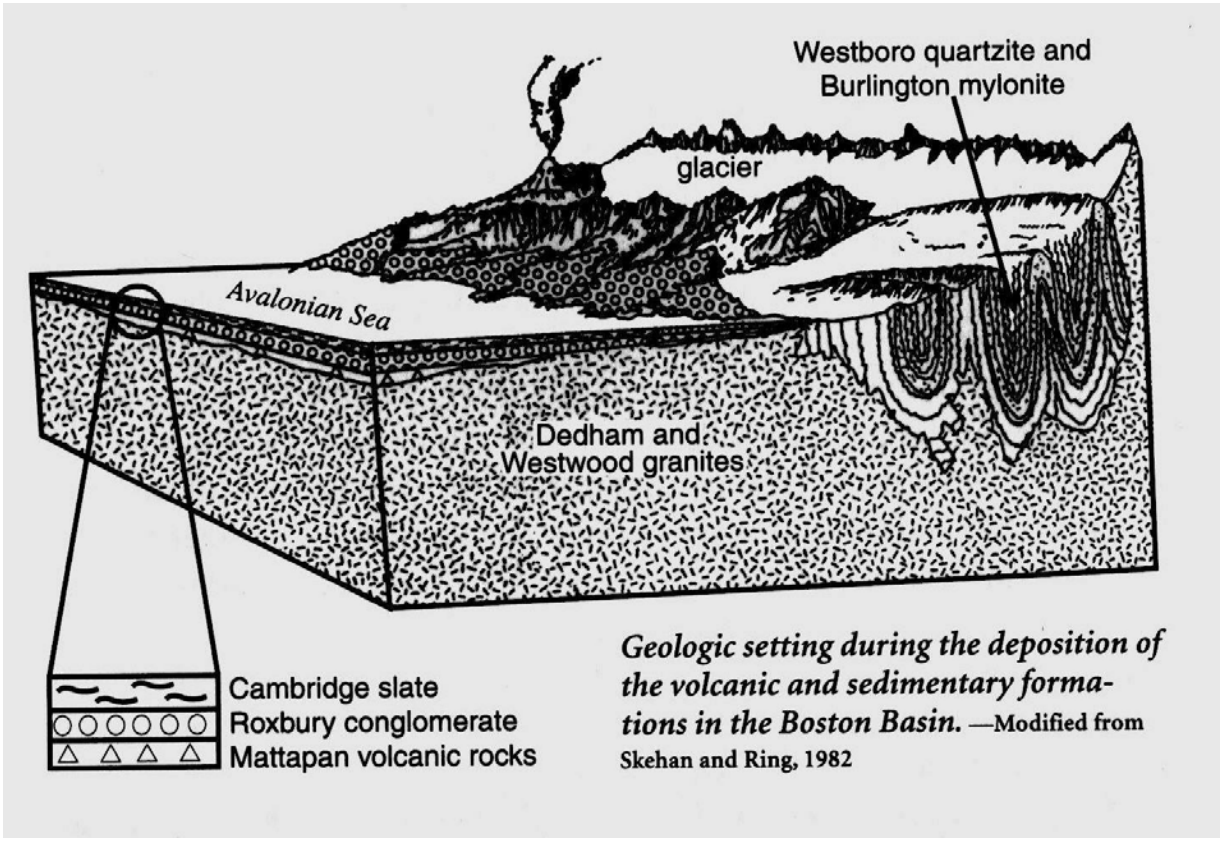
Major terranes and belts of Massachusetts.
—Adapted from Rogers, 1985



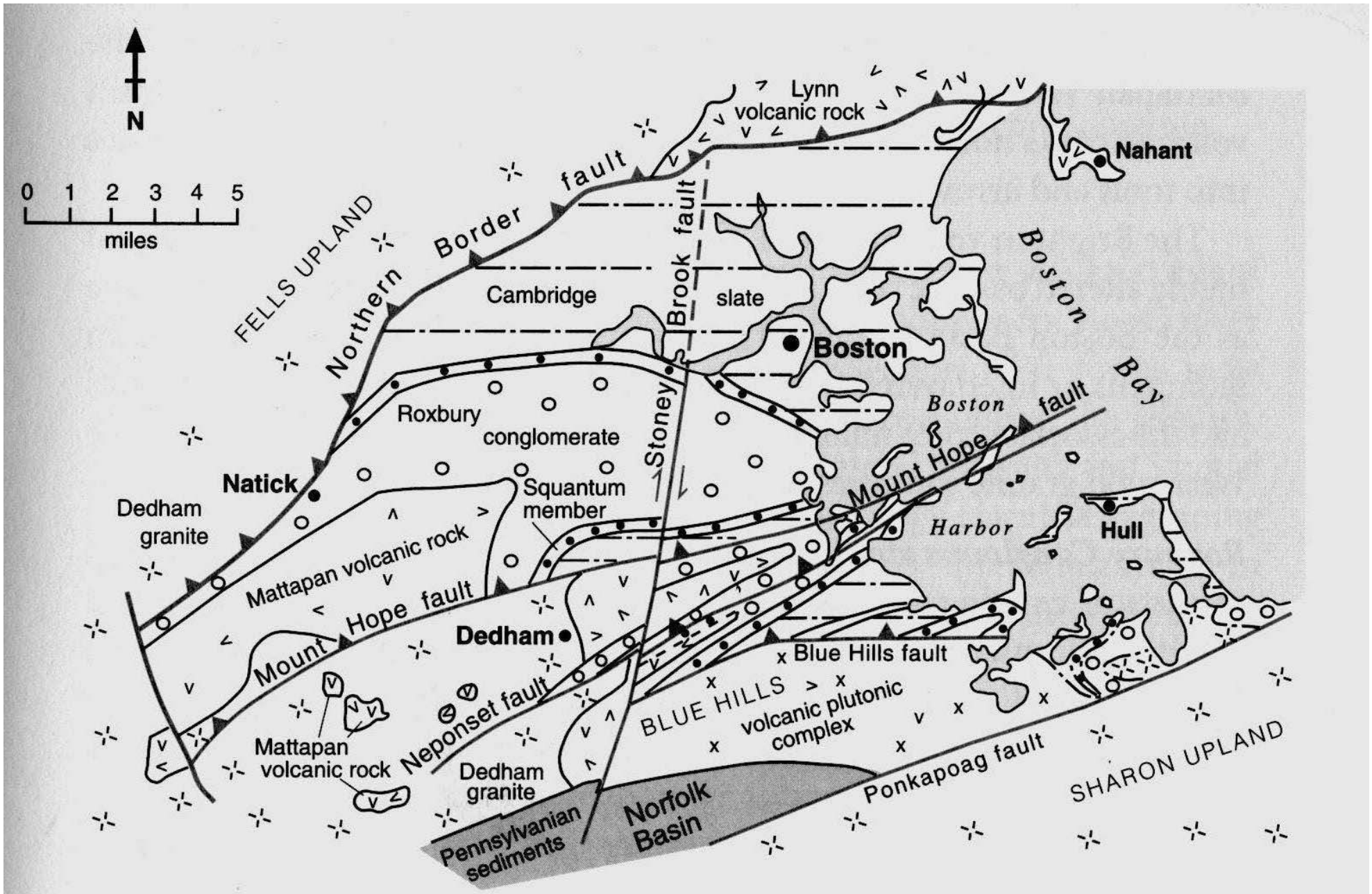
Geology of eastern Massachusetts. —Modified from Zen and others, 1983

Geologic events in the Avalon terrane.

AGE (millions of years ago)	GEOLOGIC EVENTS	MAJOR ROCK UNITS
Triassic	Middleton Basin: rift basin along Bloody Bluff fault zone	
—245—		
Permian		
—286—		
Pennsylvanian Mississippian	Coal basin formation	Dighton conglomerate Rhode Island fm. Sachuest conglomerate Pondville conglomerate Wamsutta formation
—360—	Bloody Bluff fault zone	
Devonian	Alkalic plutonism	Peabody granite Franklin granite Quincy granite Cape Ann granite
—417—		
Silurian	Burlington mylonite zone: shearing between Avalon and Nashoba terranes	
—443—		
Ordovician		
—495—		
Cambrian	Sedimentation	Braintree slate Weymouth formation
—545—	Boston Basin: rifting, volcanism, and sedimentation	Cambridge slate Roxbury conglomerate Mattapan, Lynn, and Brighton volcanic rocks
Late Proterozoic	Calc-alkaline plutonism	Westwood granite 599 Milford granite 610 Dedham granite 610 Fall River granite
	Burlington mylonite zone forms from shearing on margin of Gondwana; formation of Avalon island chain	
	Continental shelf sedimentation	Westboro formation



Geologic setting during the deposition of the volcanic and sedimentary formations in the Boston Basin. **—Modified from Skehan and Ring, 1982**



Major formations and structures of the Boston Basin. —Modified from Billings, 1979

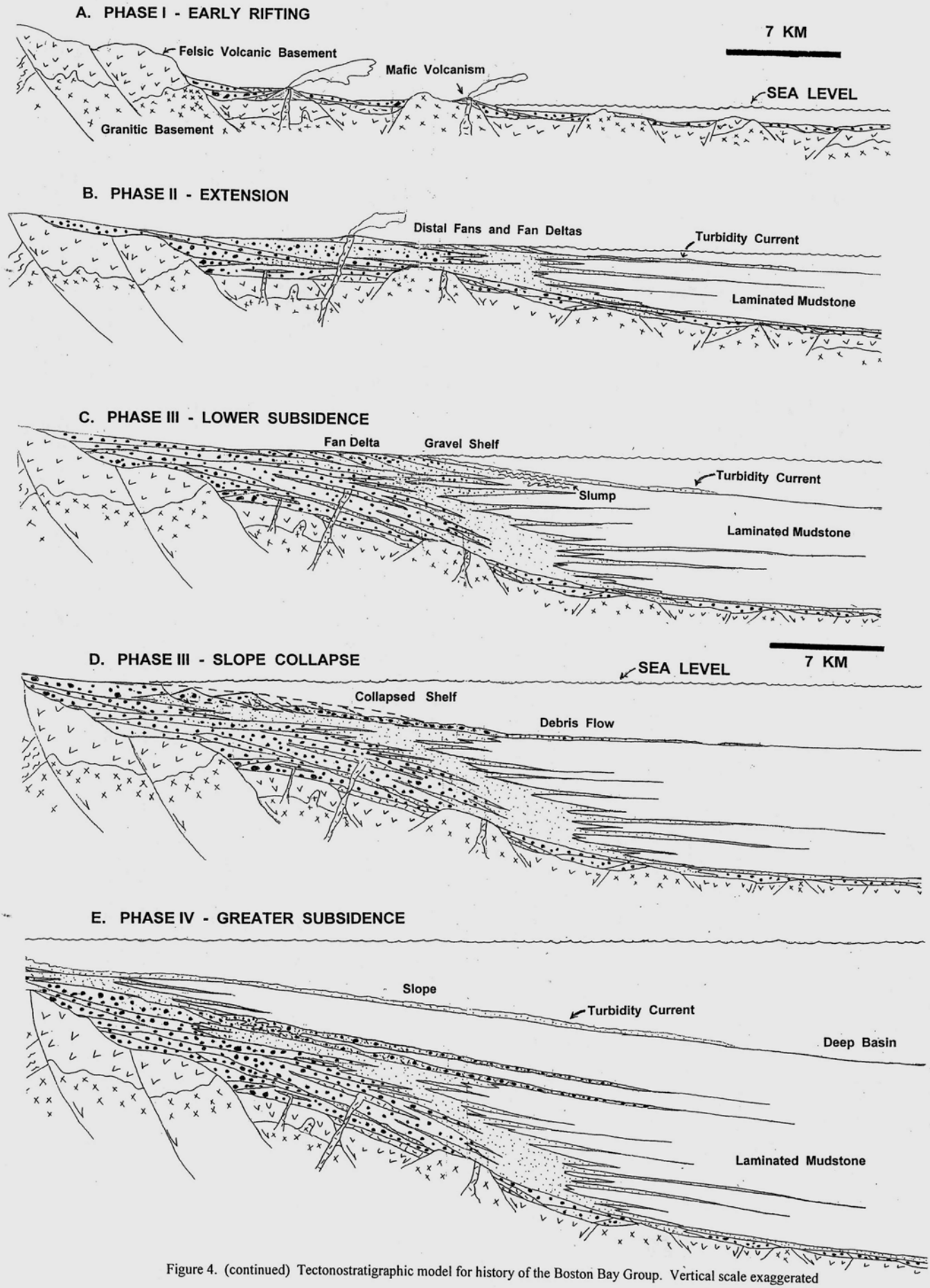


Figure 4. (continued) Tectonostratigraphic model for history of the Boston Bay Group. Vertical scale exaggerated

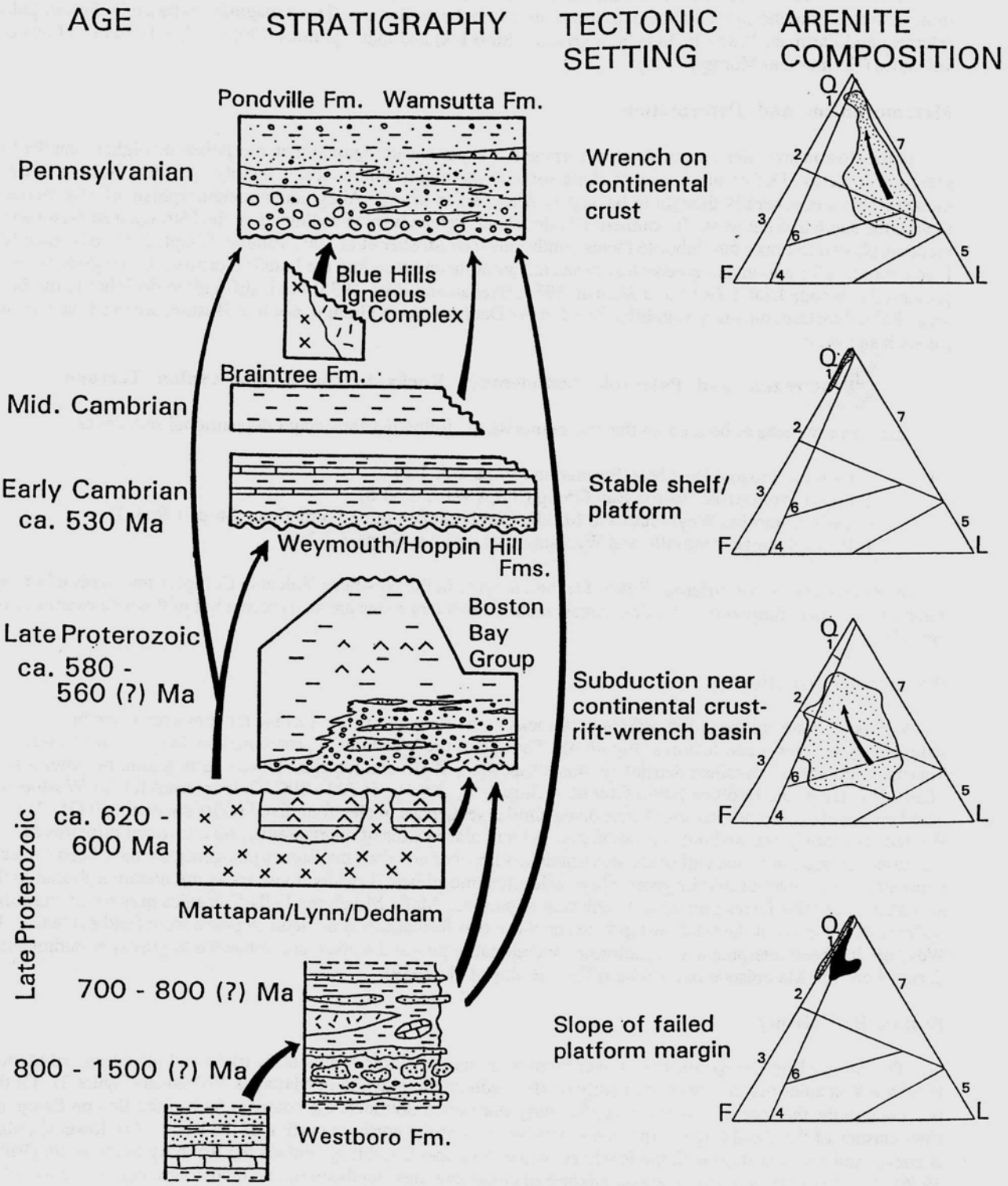
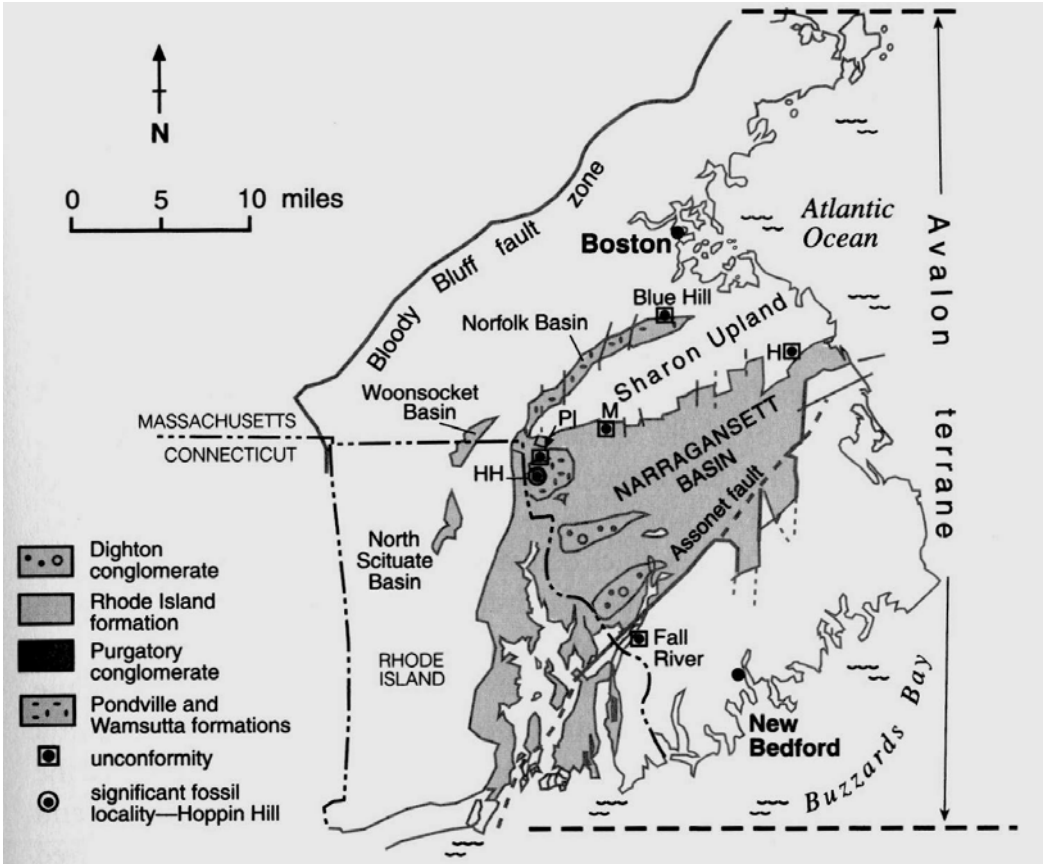
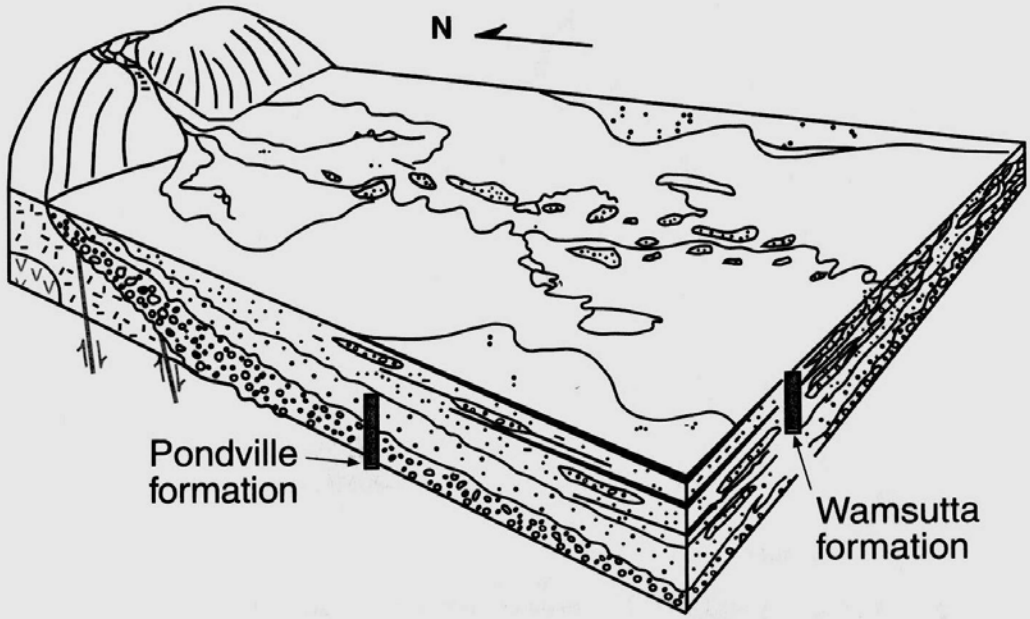


Figure 3. Summary of stratigraphy, tectonic setting, and sandstone composition of four sedimentary sequences in the northern part of the Boston-Avalon Terrane: Arrows link sedimentary sequences with primary source rocks. Q-F-L plots with tectonic discrimination fields, 1) craton interior, 2) transitional continental, 3) basement uplift, 4) transitional arc, 5) undissected arc, 6) dissected uplift, 7) recycled orogenic; black area in Westboro plot encloses Boston Bay Group quartzite cobbles; arrows show change in composition upsection.

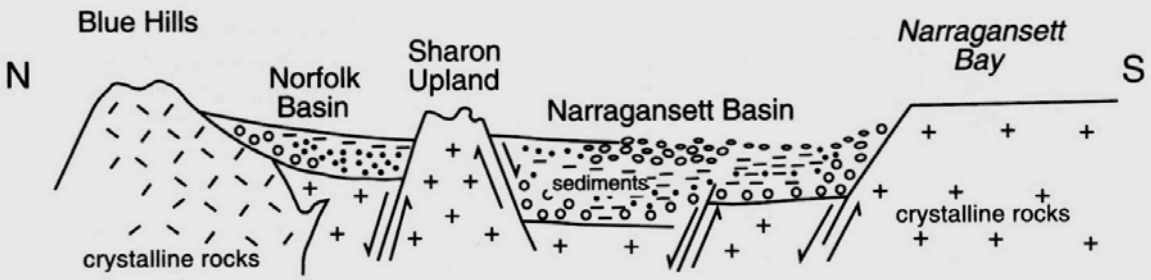


***Narragansett, Norfolk, Woonsocket, and North Scituate Basins in the Avalon terrane. Significant floral locations and unconformities between Pennsylvanian and late Precambrian rocks are noted. Hanover* (H); *Hoppin Hill* (HH); *Foolish Hill, Mansfield* (M); *Masslite Plainville Quarry* (Pl).** —Modified from Skehan and others, 1986

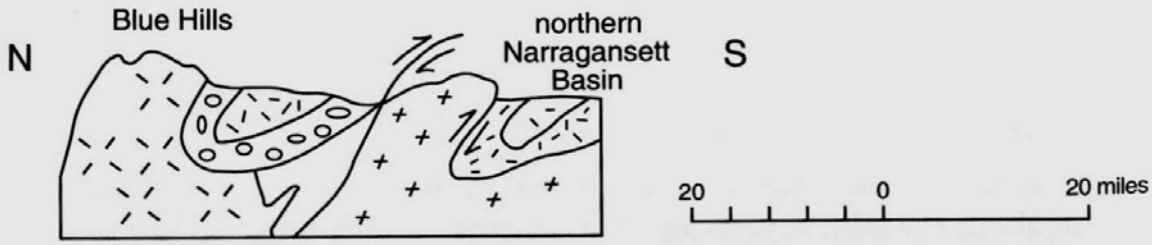


The probable environment of deposition of the Pondville (Giant) conglomerate of the Pennsylvanian Norfolk Basin south of the Blue Hills. —Modified from Hepburn and others, 1993

Before the Alleghanian mountain building event

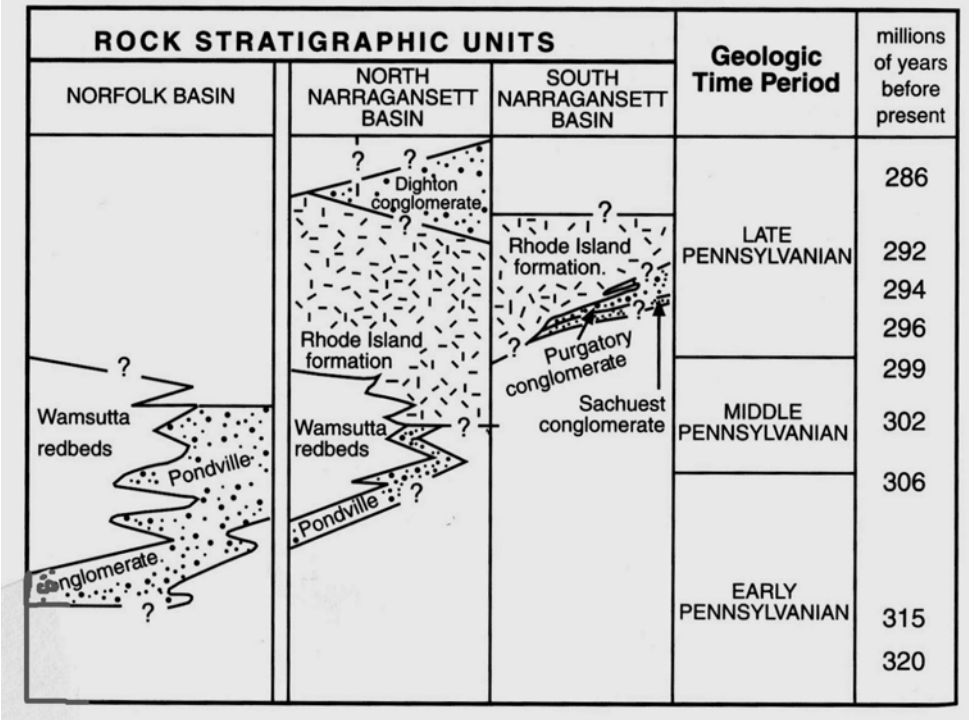


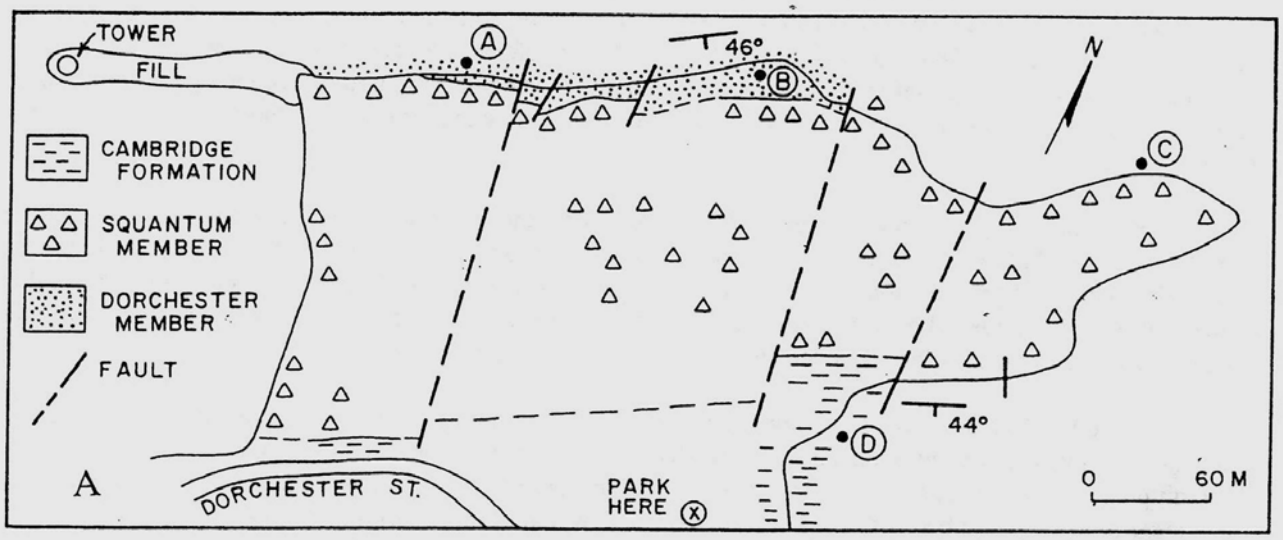
After the Alleghanian mountain building event



Fault-block basins in Precambrian granites. The basins filled with sediments before the tectonic collision that caused the Alleghanian mountain building event. **—Modified from Skehan and others, 1986; Skehan, 1983**

Stratigraphic relationships for the Norfolk Basin and the northern and southern parts of the Narragansett Basin. **—Modified from Skehan and others, 1986**





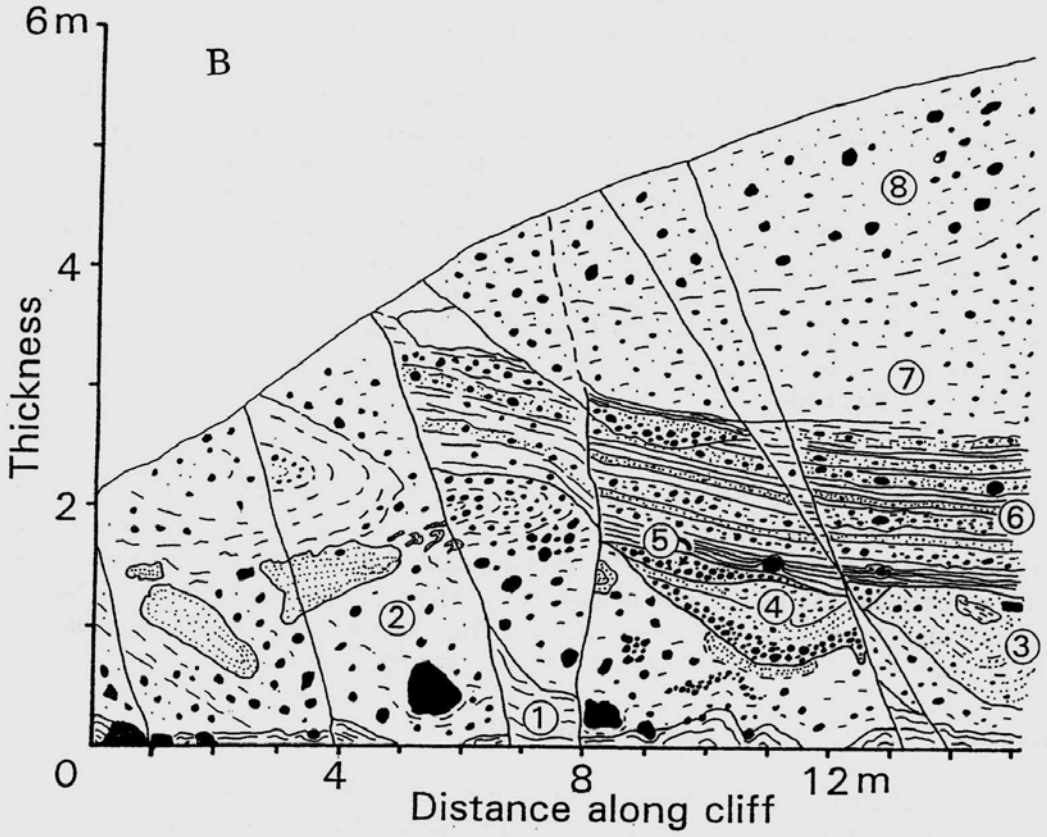


Figure 5. A. Geologic map of Stop 3, Squaw Rock Park, Quincy, MA; B. Detailed stratigraphic section along cliff at locality A. Note 2X vertical exaggeration. Plane of section oriented NE-SW, view is to south. Unit 1. thinly laminated deformed and loaded sandstone, Unit 2. diamictite with intraclasts and soft sediment folds, Unit 3. deformed pebbly/granule sandstone, Unit 4. clast supported conglomerate and diamictite, Unit 5. clast supported conglomerate, Unit 6. interbedded graded sandstones and diamictites, both with outsized clasts or lonestones, Unit 7. pebbly diamictite, Unit 8. pebble and cobble diamictite.

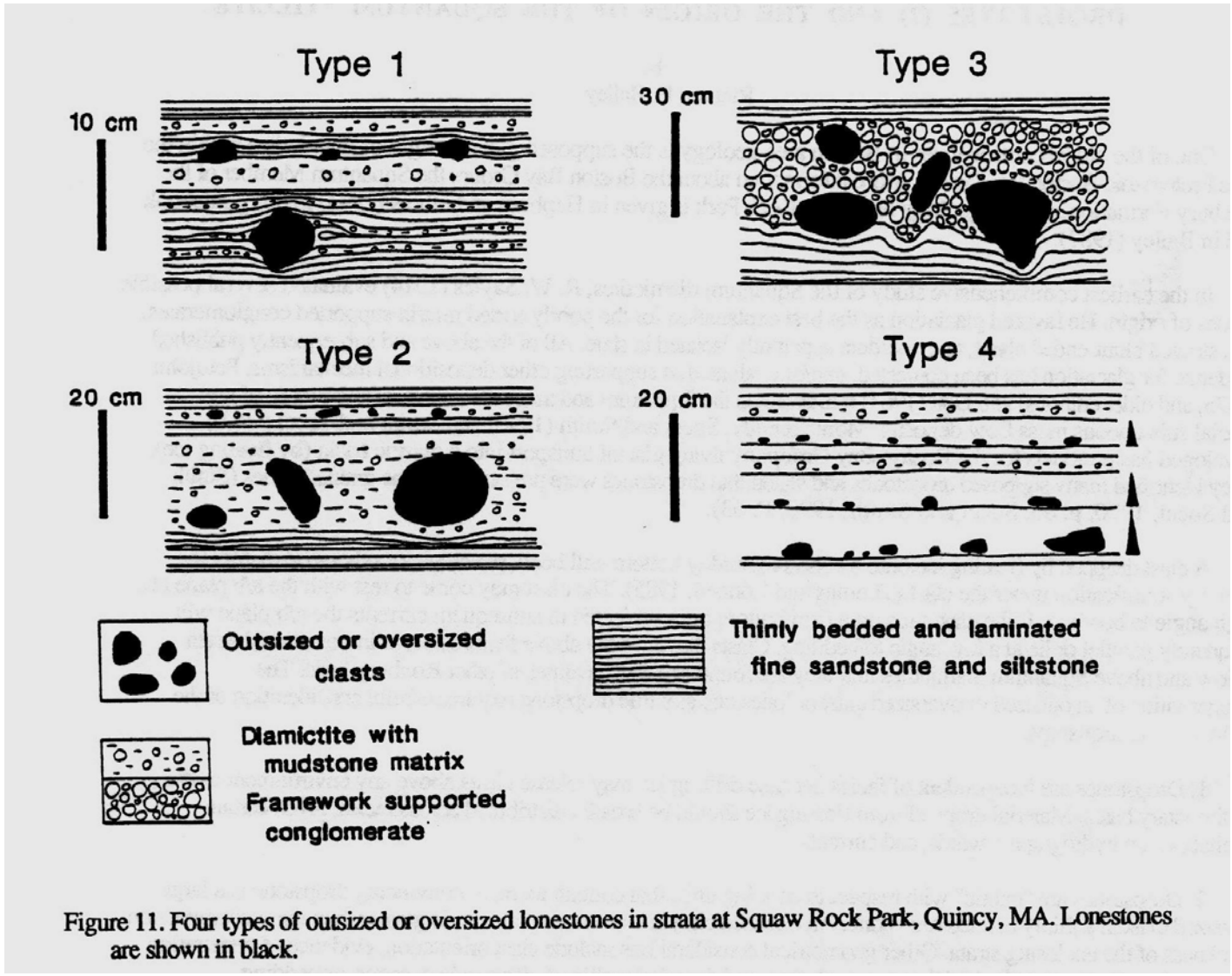


Figure 11. Four types of outsized or oversized lonestones in strata at Squaw Rock Park, Quincy, MA. Lonestones are shown in black.

That's It!