CHAUTAUQUA COUNTY, NEW YORK

The Geology of the Lake Plain

I. Location and Boundaries

The 1,069 square miles of Chautauqua County is located in the southwestern corner of New York State. It is bordered by Erie Co., N.Y. and Cattaraugus Co., N.Y. in the east and by Warren and Erie counties, Pa. in the south and west. Lake Erie forms the northern border of the county.(figure 1).

II. Physiographic Divisions

Chautauqua County is located within two different physiographic provinces, the Central Lowlands and the Appalachian Plateaus. The Central Lowlands section is located along the plains of Lake Erie in the northernmost part of the county. The Portage Escarpment serves as the border between this area and the Appalachian Plateaus. The Appalachian Plateau section can be further divided into the Southern New York section and the Kanawha section. The Kanawha section occupies a triangular area in the southeastern corner of the county(figure 3).

III. Elevation and Relief

Central Lowlands	Appalachian Plateaus	Kanawha secti
Lake Erie ----------	Portage Escarpment----------	Oak Hill
580 ft.(avg.)----------	1000 ft.----------	2160 ft.
Max. relief 420 ft.	Max. relief 1160 ft.	

Max. relief of Chautauqua County 1580 ft.

Relief-
The lake plain section of the county has very minimal relief and the plateau section exhibits moderate relief with rolling landscapes.

IV. Structural Controls

The Lake escarpment morainal deposits influenced stream drainage in the county. North of the moraine,streams flow to the north into Lake Erie and the St. Lawrence River Basin. Streams south of the moraine flow into the Allegheny River Basin. Another moraine located in the southeastern corner of the county, between Jamestown and Salamanca,diverted a northward flow of the Allegheny River to it's present course. Stream gradients vary dramatically due to the influence of the Portage escarpment and the Lake moraine. Streams that are forced to flow down the Portage escarpment by the Lake moraine are generally short and steep with high gradients(20-300ft./mile). Streams that flow to the south have a gradient of only 1-2 ft./mile.

V. Geomorphic Processes

Two past geomorphic processes are the major influences on the geology of Chautauqua County. The first occured 300 m.y. ago when sediments were deposited in the county which would later form the bedrock of the county. Most bedrock in the county are identified with the Upper Devonian period, with the Knapp formation being associated with the Lower Mississipian period. The order of deposition suggests an approaching shoreline with association with the Catskill delta. The other process was the advance and retreat of glaciers between 350 thousand and 10 thousand years ago. These glaciers are responsible for the sculptedlandscapes and the deposition of glacial debris throughout the county. Some deposits in river valleys are 500ft. thick.

Geomorphic processes(cont'd).

Present day processes include fluvial erosion, lake erosion, creep, and mass wasting.

VI. Landforms

Landforms in the county include the Portage escarpment, streamlined glacial deposits, kettle hole lakes(Cassadaga Lakes, Mud Lakes Bear Lake, Findley Lake) and Chautauqua Lake. Chautauqua Lake is situated in a glaciated valley. It is thought by some people to have been two separate valleys and lakes. It became one lake valley as the last glacier retreated and scoured out a small ridge between Bemus Pt. and Stow.

VII. Climate

Chautauqua County's climate shows all Four Seasons. On the lake plain, Lake Erie is responsible for a cooler Spring and an extension of the growing season in the Fall.

VIII. Economic Geology

The geology of Chautauqua County is responsible for the gas and oil industry, farming, and the presence of gravel pits throughout the county.

IV. Bibliography

Muller, Ernest H. Geology of Chautauqua County, Part II, Pleistocene Geology of Chautauqua County. New York State Museum and Science Service.,Albany, 1963.

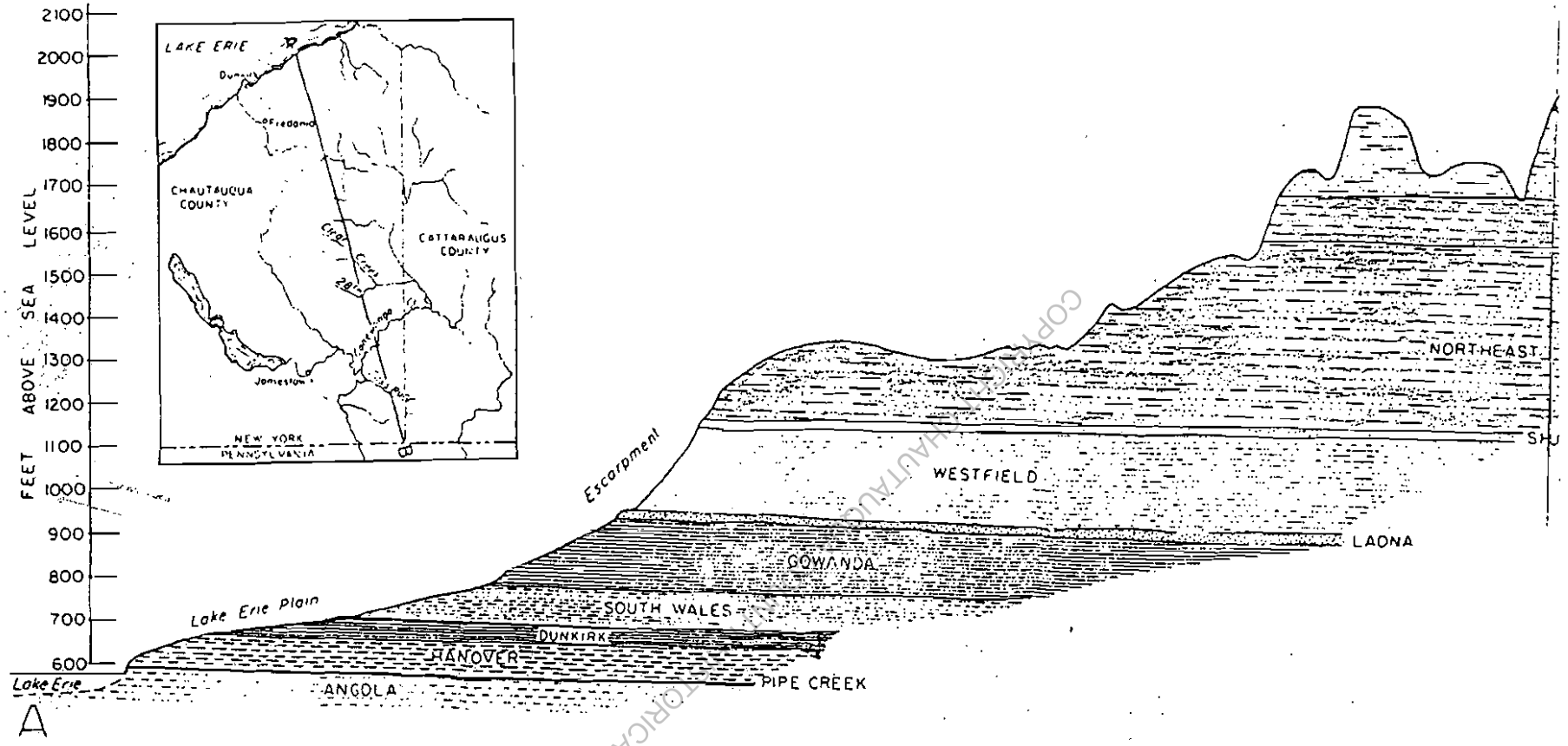
Jamestown Post-Journal; "Panama Rocks: Far Older Than the Glaciers", October 8, 1983.

Roseberry, C.R.; Niagara to Montauk, "Scenic Pleasures of New York State."

Tesmer, Irving H.; The Geology of Chautauqua County, New York. Buffalo Museum of Science, Vol. 35, No. 2, 1954.

Tesmer, The Geology of Chautauqua County, Part I, Stratigraphy and Paleontology(Upper Devonian). Albany 1963.

Van Tyne, Arthur M., "Oil and Gas Developments in New York" AAPG Bulletin, Vol. 67, No. 10.



Series	Group / Formation / Member	Thickness	Lithologies	Subsurface Units in NY and PA
	Stratigraphic Units in Outcrop			
Lower Penna.	Olean	80	Conglomerate	
Lower Miss.	Knapp	80	Sandstone, Shale, Cong.	
UPPER DEVONIAN	Oswayo	150	Sandy Shale	
	Cattaraugus	350	Sandstones, Siltstones	Panama Rocks Cong/.
	Ellicott	150	Shale and Siltstone	Southwestern Br mayville Hakwum Road
	Dexterville	100	Siltstone and Shale	Jamestown (Ashen St. Brickyard)
	Northeast	470	Shale and Siltstone	Bradford First Chipmunk Bradford Second Harrisburg Run
	Shumla	30	Siltstone	
	Westfield	150	Shale and Siltstone	escarpment
	Laona	30	Siltstone	Bradford Third
Upper Devonian	Gowanda	100+	Shale w/siltstone	
	South Wales	70	Shale	
	Dunkirk	40	Black Shale	
	Hanover	90	Shale	
	Angola	220	Shale	
	Rhinestreet	170	Black Shale	
	Cashaqua	65	Shale	
	Middlesex	10	Black Shale	
iddle evonian	Genesee	25	Shale	
	Hamilton	270	Shale, some linestone	Abundantly fossiliferous
	Onondaga	100	Limestone w/chert nodules Reef known at Base	Driller's "Flint"
. Dev.	Oriskany	0-20?	Sandstone	Generally absent in the West
pper ilurian	Bertie	75	Dolomite, Waterlime	Euripterids
	Camillus	80	Shale	
	Syracuse	100	Shale, salt, Gypsum	Evaporites absent under Chautauqua Co.
	Vernon	200	Shale	
Middle Silurian	Lockport Gp. Oak Orchard Eramosa Goat Island Gasport Decew	200	Dolomite Reefs	Driller's "Big Lime"
	Rochester	30	Shale	
	Irondequoit	35	Limestone	
ower ilurian	Thorold	20	Sandstone	
	Grimsby	110	Sandstone, Red	Driller's "Red Medina"

Figure 8.1. Outcrop map of the Lower, Middle, and Upper Devonian rock units in New York State. Notice that the Lower Devonian formations do not extend into the western part of the State. An unconformity cuts across these formations, as you can see on Plate 3. Erosion removed the Lower Devonian units from western New York before sediment was deposited there in Middle Devonian time.

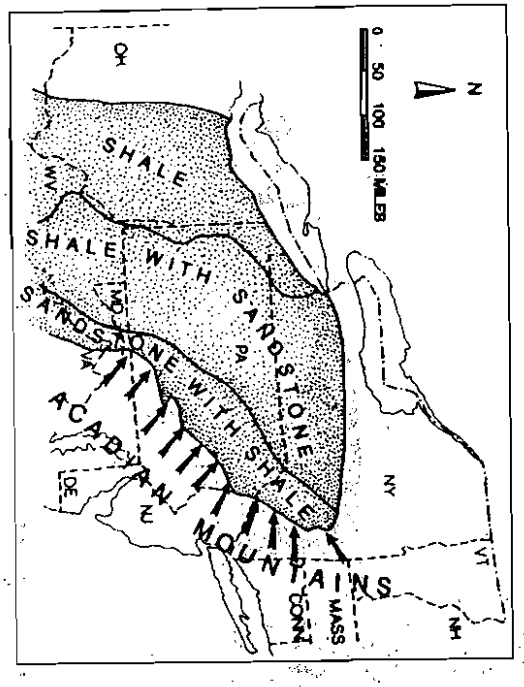


Figure 8.14. Map of the area where "Catskill Delta" deposits exist today. They originally extended farther north across New York, but erosion has removed them from that area. The Acadian Mountains of Middle and Late Devonian time were the source of the sediments of the "delta." The arrows represent a system of large rivers that carried sediment from the mountains to build the "delta." (Modified after W.D. Sevon, Fig. 3 and 6, Guidebook, 53rd Annual Meeting of New York State Geological Association, 1981.)

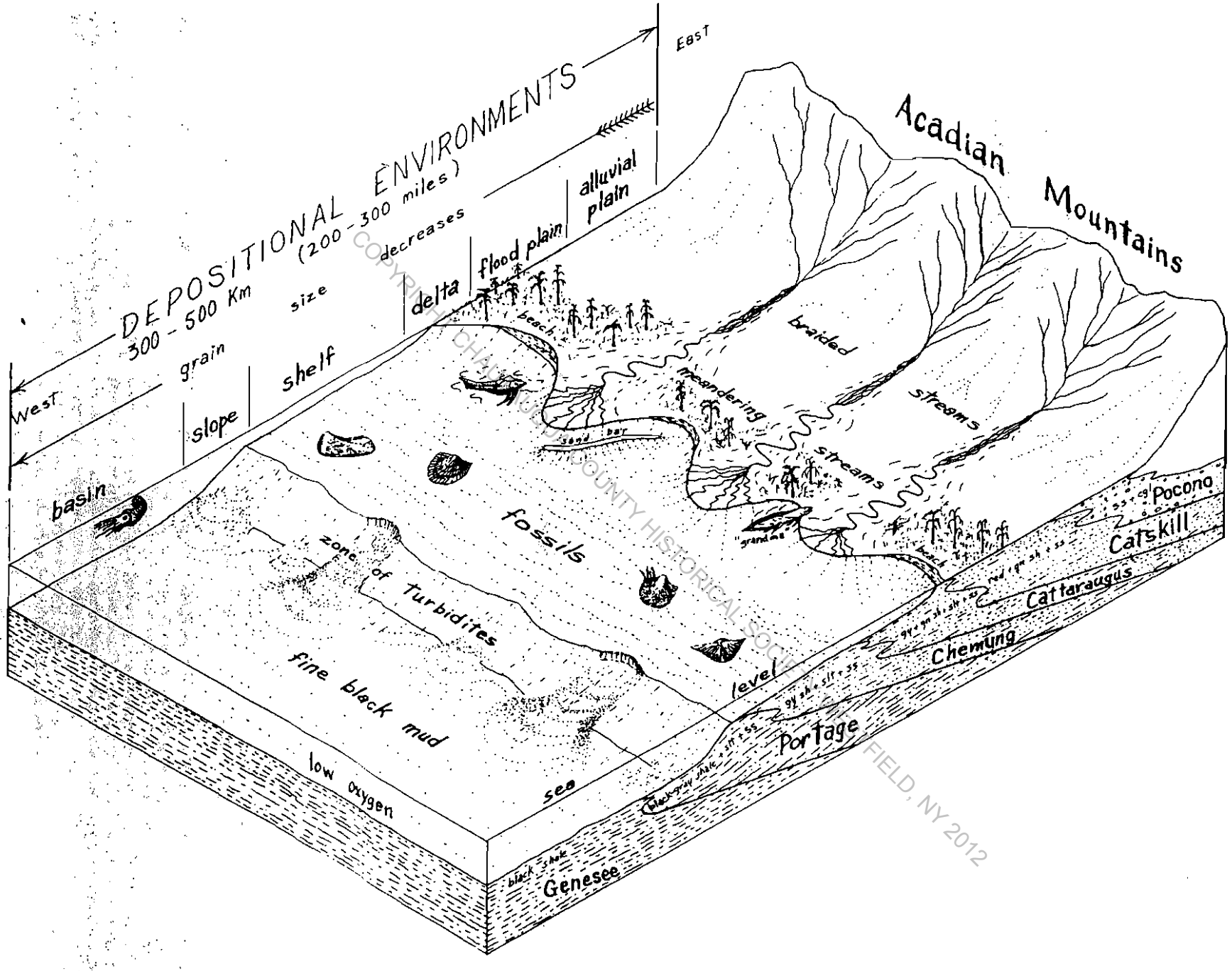
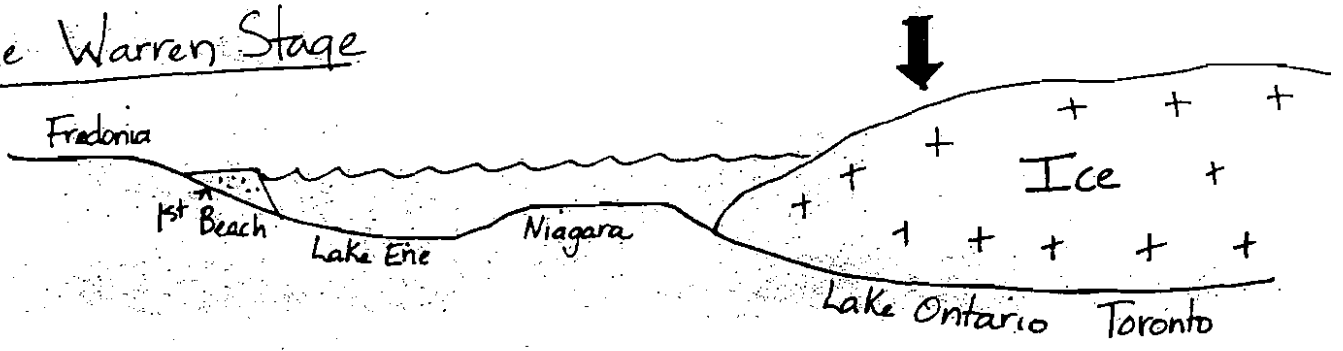


Figure 8.15. Diagram of the depositional environments of the "Catskill Delta" and the facies that were deposited in them. The arrangement of the facies (Genesee-Pocono) shows that the environments have moved from right to left through time as the sediment has filled in the edge of the sea. This process could be reversed by a rise in sea level, which would move the shore zone toward the right. (In this oversimplified diagram, the Pocono facies looks as if it were underneath the Acadian Mountains. It was actually deposited at the foot of the mountains.)

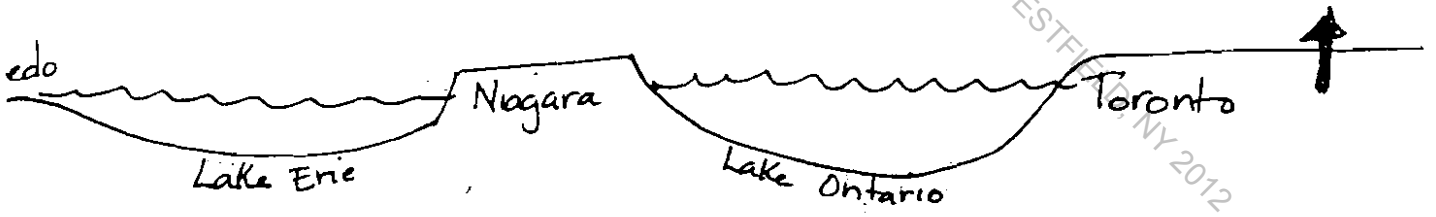
Great Lakes History (Gordon Baird)

ake Warren Stage



ake Algonquin Stage

Lake Payette Stage



Present Day