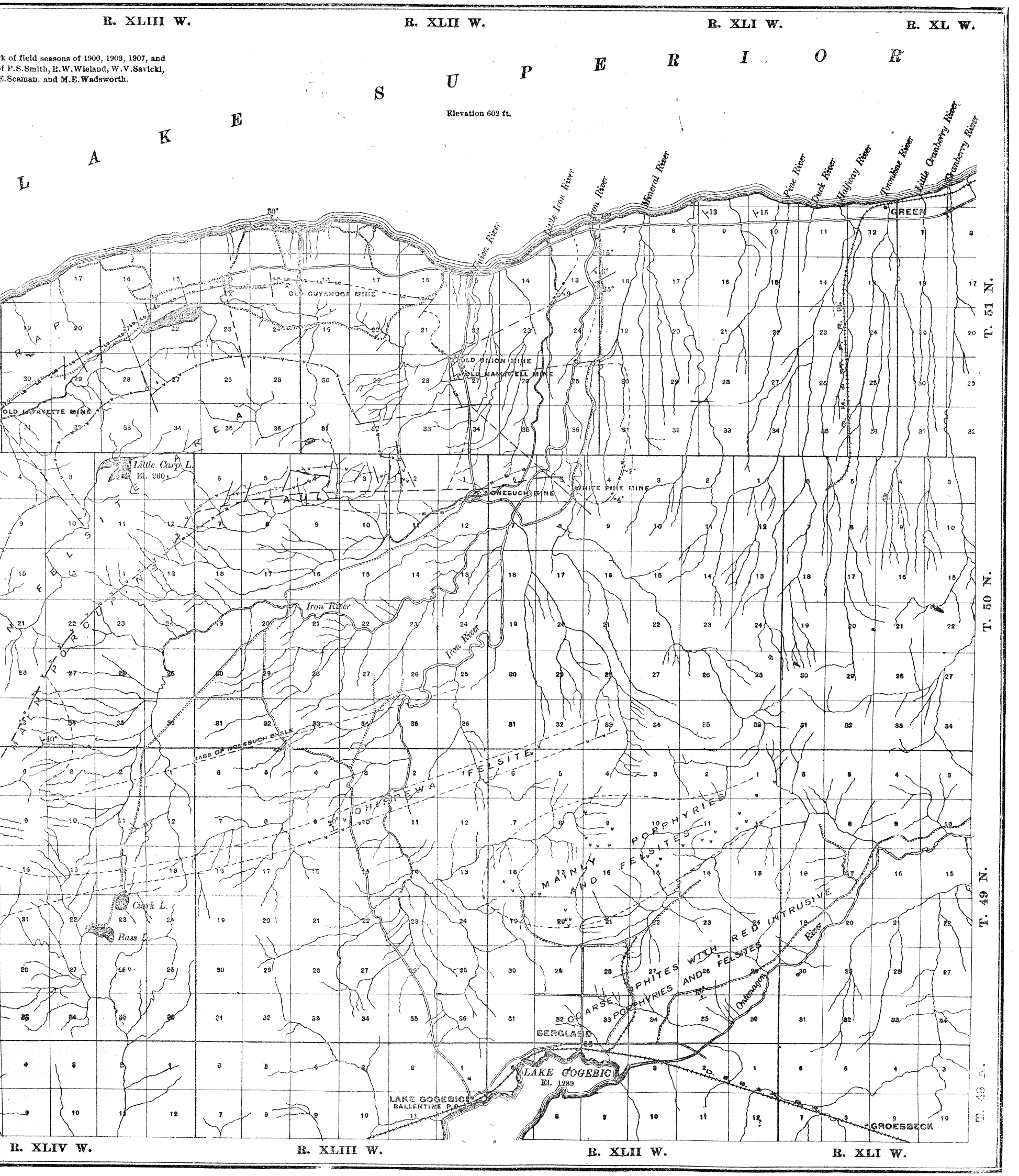

R. XLIII W.
R. XLII W.
R. XLI W.
R. XL W.
k of field seasons of 1900, 1903, 1907, and
f P.S.Smith, R.W.Wieland, W.V.Savicki,
E.Seaman. and M.E.Wadsworth.
LAKE SUPERIOR
Elevation 602 ft.
Union River
Little Iron River
Iron River
Mineral River
Pine River
Duck River
Halfway River
Townline River
Little Cranberry River
Cranberry River
GREEN
OLD CUYAHOGA MINE
OLD UNION MINE
OLD HALLIWELL MINE
OLD LAFAYETTE MINE
Little Carp L.
El. 960
WONESUCH MINE
WHITE PINE MINE
Iron River
BASE OF WONESUCH SHALE
OHIPPEWA FELSITE
MAINLY PORPHYRIES AND FELSITES
COARSE PHITES WITH RED INTRUSIVE PORPHYRIES AND FELSITES
Ontonagon River
Clark L.
Bass L.
BERGLAND
LAKE GOGEBIC
El. 1289
LAKE GOGEBIC
BALLENTINE P.O.
GROESBECK
T. 51 N.
T. 50 N.
T. 49 N.
T. 48 N.
R. XLIV W.
R. XLIII W.
R. XLII W.
R. XLI W.

Preliminary Geological Map of the

PORCUPINE MOUNTAINS AND VICINITY

by F. E. Wright and A. C. Lane.

1909

Including work of field seasons of 1900, 1903, 1907, and 1908 and notes of P.S.Smith, R.W.Wieland, W.V.Savicki, A.F.Benson, A.E.Scaman. and M.E.Wadsworth.

Base of Nonesuch Shale Series.....

Black and grey micaceous shales and grits of about 500 to 600 feet thick; at base, a thin stratum of greenish conglomerate containing an occasional red pebble. Overlain by the Freda Sandstone Series.

Base of Lake Shore Trap Series.....

Fine grained traps with coarse quartzose amygdaloids from 300 to 500 feet thick; overlain by the Outer Copper Harbor Conglomerate and underlain by a red sandstone broken with epidote and calcite seams.

Chippewa Felsite and Porphyry.....

Above the Chippewa Felsite are a few hundred feet of traps, then about 2000 feet of the Great Copper Harbor Conglomerate and Sandstone.

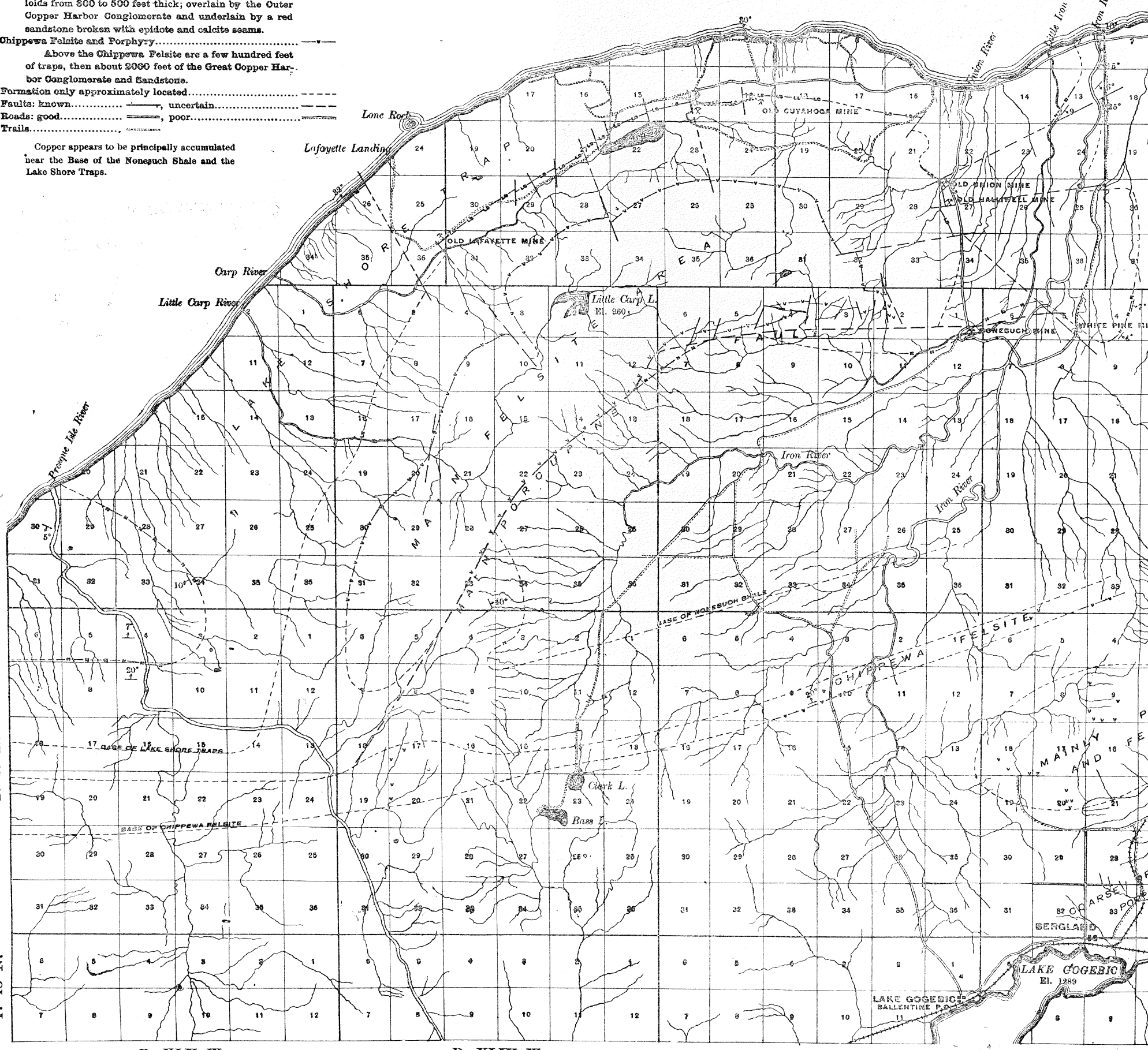
Formation only approximately located.....

Faults: known....., **uncertain**.....

Roads: good....., **poor**.....

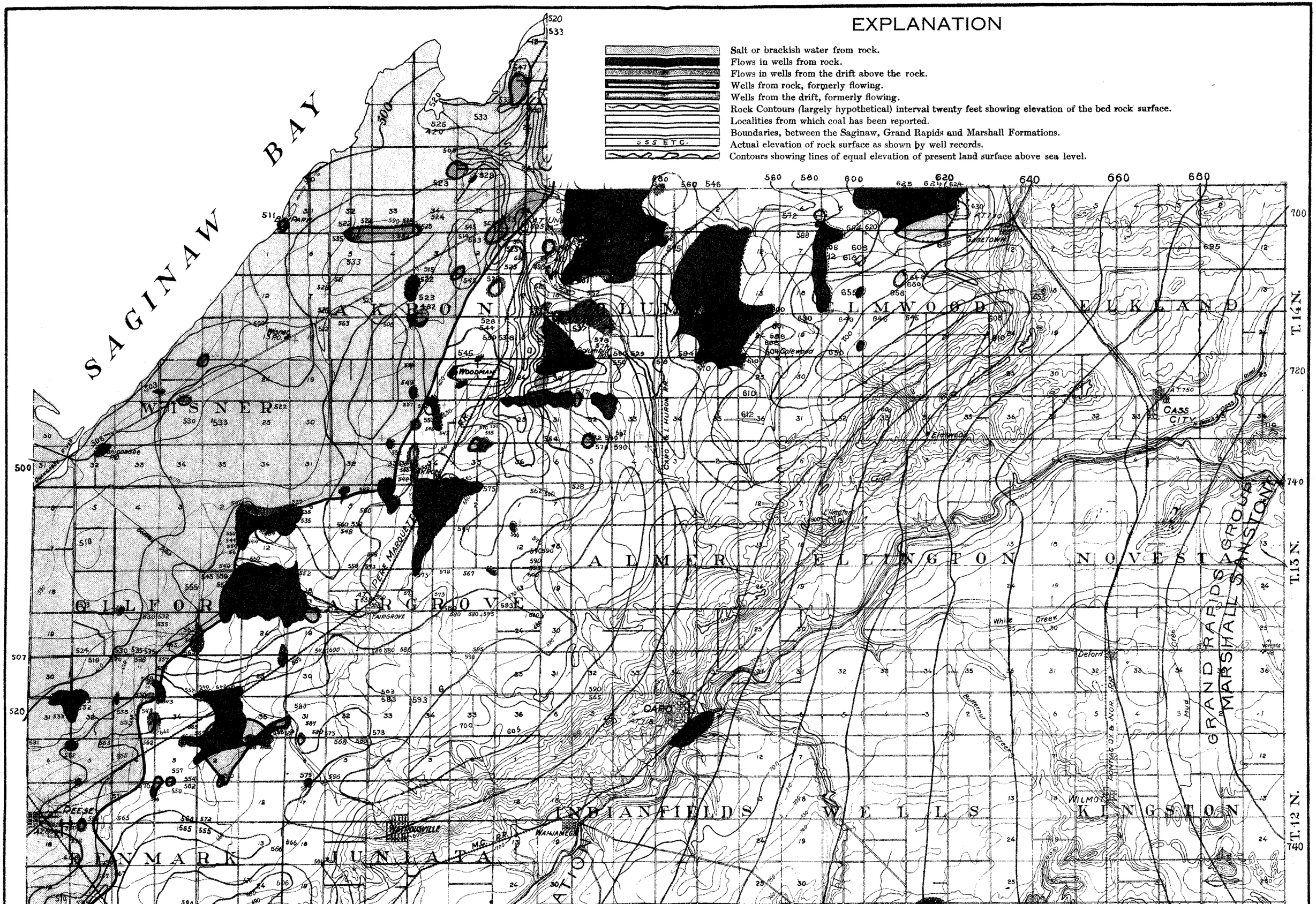
Trails.....

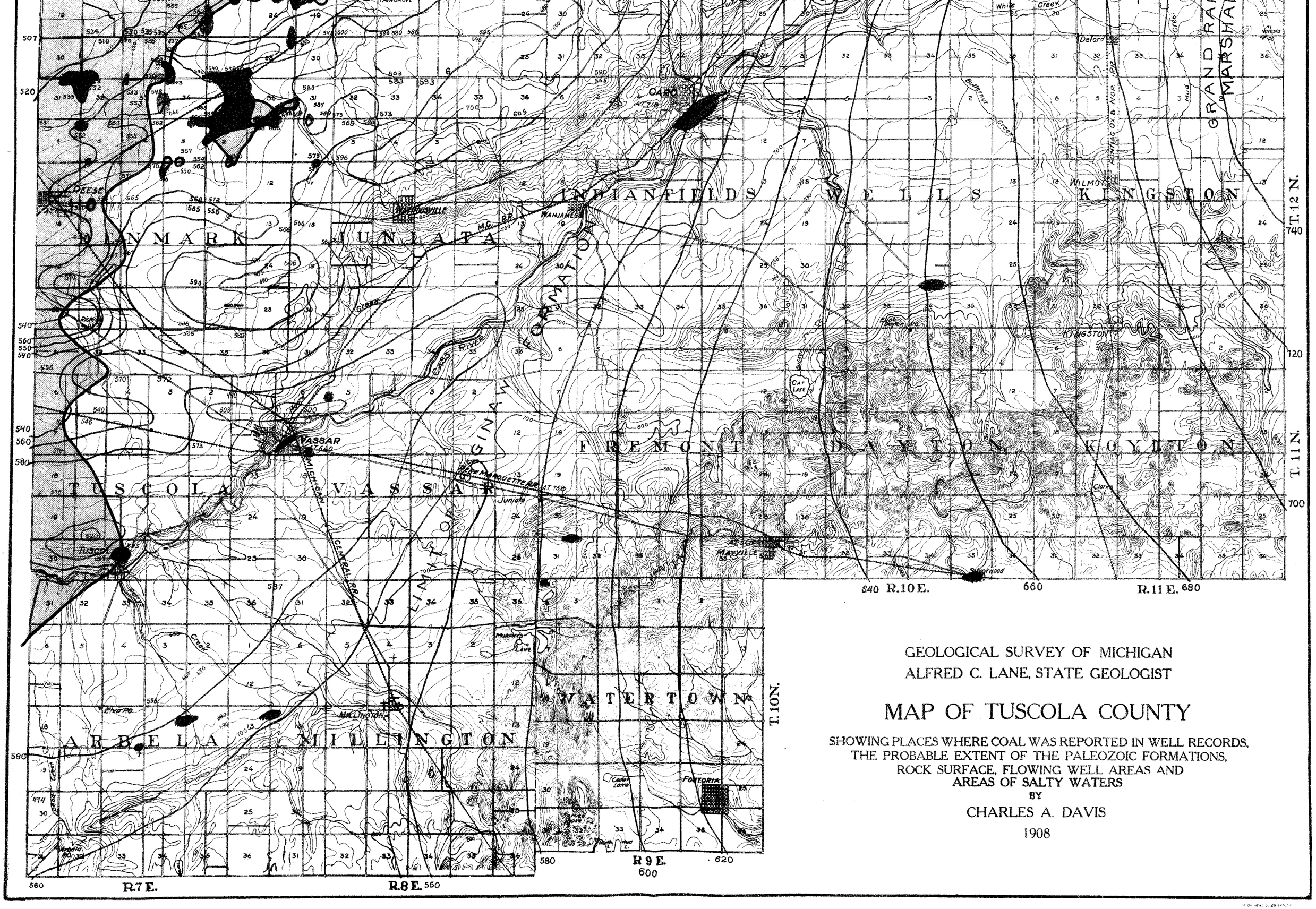
Copper appears to be principally accumulated near the Base of the Nonesuch Shale and the Lake Shore Traps.



System	Series Name	Formation Name	Columnar Section	Thickness	Character of Rock
QUATERNARY	Pleistocene	Recent Champlain Wisconsin and earlier drift sheets		1110 — 0	Sand, gravel, boulder clay. Lake Superior pink clay. Till = boulder clay, sometimes very sandy, again clayey and dark. A gray and red till may in some places be distinguished, an older and a younger.
POSSIBLY LATER	Conemaugh	Woodville		110 — 0	Light reddish sandstone and sandy shales.
CARBONIFEROUS	Pennsylvanian (Upper Pottsville)	Saginaw		400	White sandstone, coal seams, black and white shales; then bands of limestone and of siderite rare, rarely broken up and found in fragments of the sandstone.
		Parma		170 — 0	White sandstone and conglomerates, of small white quartz pebbles; brine and sulphates.
	Mississippian	Bayport or Maxville Upper Grand Rapids Upper St. Louis		235 — 50	Limestones: light and bluish, cherty; also calcareous sandstones.
		Michigan Lower Gd. Rapids Lower St. Louis Osage or Augusta		300 — 0	Dark or bluish limestones and dolomites with gypsum and blue or black shales: rarely reddish or greenish shales and dark or red sandstones.
		Napoleon Upper Marshall		560 — to	White sandstone: often pyritic, brine or fresh water, sulphates low.
		Lower Marshall		260	White and red sandstones: peanut conglomerates, sandy shales, whetstones, and blue shales, much carbonate of iron, and mica in the formation; generally a red shale at the top and bottom.
		Coldwater Buena Vista		1000 — 800	Blue shale: with nodules of carbonate of iron especially at the top; sandstone; very subordinate streaks of fine grained limestone, especially on the west side; black shales at the base.
		Sunbury or Berea			
		Berea			White sandstone; brine and salt even near the surface.
DEVONIAN	Neo-Devonian	Bedford Antrim (Senecan)		480 — 140+	Shale: mainly black and always at the base, with huge round balls of calcite; towards the top, blue and black shales.
	Meso-Devonian	Naples gonialite fauna Traverse Petosky limestone Hamilton (Erian) Acervularia beds		660 to	Bluish limestones, dolomites and shales: base a blue or black shale; top generally limestone and rarely reddish.
		Bell and (Marcellus shale)		50 60	
		Dundee (Ulsterian)		255 to 65 –	Limestone: buff and light brown, fiercely effervescent, somewhat cherty.
	Latest Ontarian possibly Eo-Devonian	MONROE: Upper Monroe or Detroit River — Lucas, Amherstburg, Anderdon, Flat Rock		275 to 0 — a 200, b 20, c 50, d 47	Dolomites; mainly; the Anderdon formation is limestone; gypsum or anhydrite also occurs, with celestite and sulphur.
		Middle Monroe, Sylvania		440 ? to 30	White sandstone: very pure, passing towards the north into calcareous sand-limestone.
UPPER SILURIAN OR ONTARIAN	Upper Ontarian	Lower Monroe or Bass Island — Raisin River, Put-in-Bay, Tymochtee, Greenfield		200 ? 100 + 100 – 100 –	Dolomites: at some levels sandy, at others oölitic, often cherty. At the Tymochtee and other levels shaly; anhydrite abundant in the lower parts of the salt basin; Celestite.
	Middle Ontarian	SALINA ? 3, 2, 1		960 to 0	Salt, anhydrite, dolomites, calcareous marls: red and green, more rarely blue and black, shales.
	Lower Ontarian (Niagaran or Manitoulin)	Guelph and Niagara		600 to 270	White dolomites: peculiar whiteness characteristic, often cherty, and with a little quartz sand which sometimes occurs in beds; pure limestone rare.
		Rochester Shale		85 to 0	Blue shale.
		Clinton		130 to 0	Reddish limestones and shales or iron ore.
		Medina and		100 to 0	Red shales; sometimes sandy or green shales.
LOWER SILURIAN OR ORDOVICIAN	Upper Ordovician (Cincinnatian) (Hudson River)	Richmond		150 to 0 ?	Shales; red and blue and sandy; gradual transition at base.
		Lorraine		343 t 215	Shales: blue, sometimes in streaks black, especially towards base.
		Utica		80 to 50	Black shales.
	Middle Ordovician	Trenton Gelena Platteville ?		271 to 100 ?	Limestone and dolomite; blue and shaly, or solid shale at base.
OZARKIAN ?	Lower Ordovician	St. Peter Calciferous		18 to 0	White friable sandstone; or represented by red clay, residual top of underlying formation.

FIG. 5. GEOLOGICAL COLUMN OF MICHIGAN, FROM TRENTON UP.


EXPLANATION
Salt or brackish water from rock.
Flows in wells from rock.
Flows in wells from the drift above the rock.
Wells from rock, formerly flowing.
Wells from the drift, formerly flowing.
Rock Contours (largely hypothetical) interval twenty feet showing elevation of the bed rock surface.
Localities from which coal has been reported.
Boundaries, between the Saginaw, Grand Rapids and Marshall Formations.
Actual elevation of rock surface as shown by well records.
Contours showing lines of equal elevation of present land surface above sea level.
SAGINAW BAY
AKRON
ELMWOOD
ELKLAND
WISNER
ALMER
ELLINGTON
NOVESTA
GILFORD
FAIRGROVE
INDIANFIELDS
WELLS
KINGSTON
DENMARK
JUNIATA
CASS CITY
CARO
WOODMAN
WAHJAMEGA
WILMOT
GRAND RAPIDS GROUP
MARSHALL SANDSTONE
T. 14 N.
T. 13 N.
T. 12 N.



GEOLOGICAL SURVEY OF MICHIGAN
ALFRED C. LANE, STATE GEOLOGIST

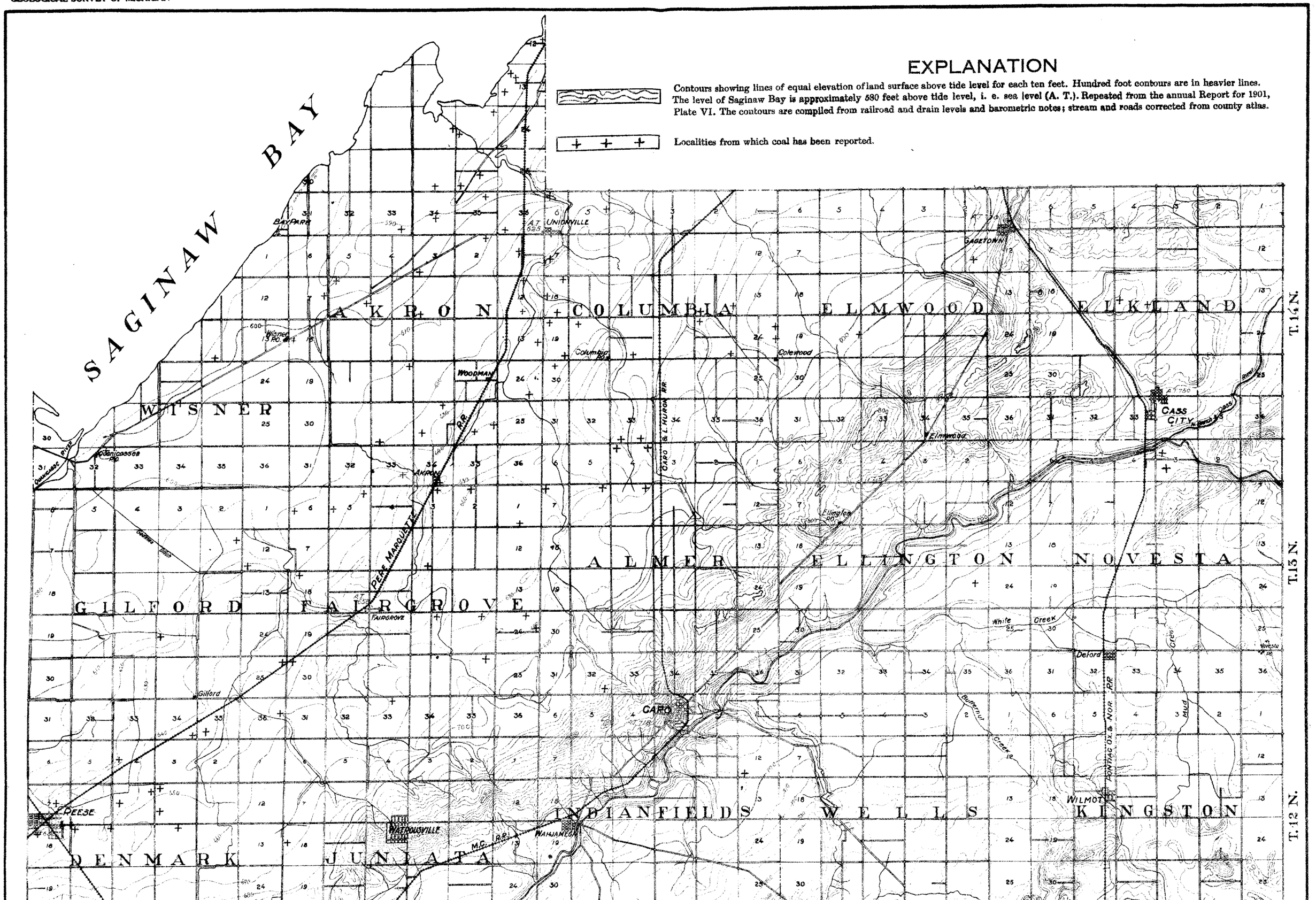
MAP OF TUSCOLA COUNTY

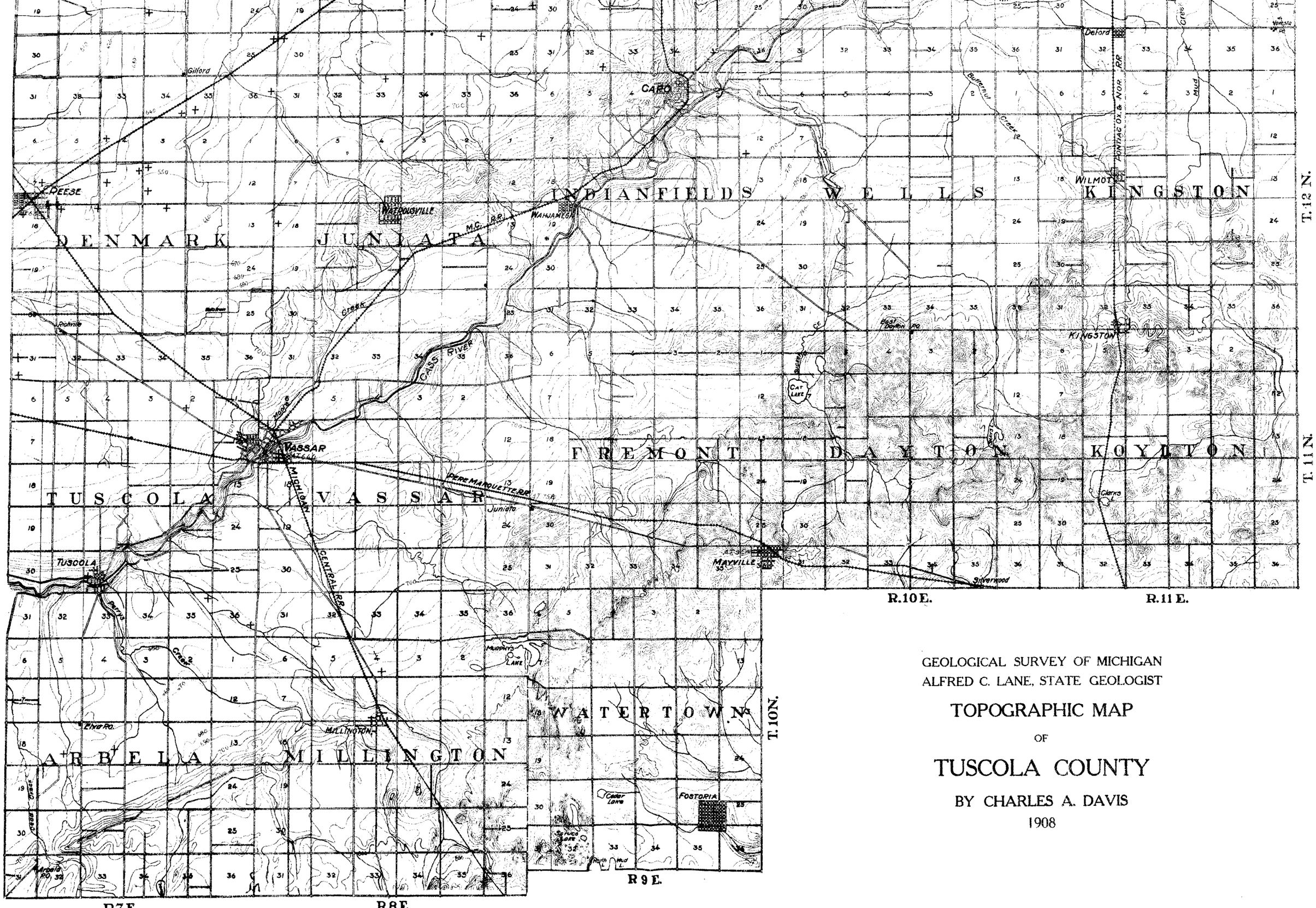
SHOWING PLACES WHERE COAL WAS REPORTED IN WELL RECORDS, THE PROBABLE EXTENT OF THE PALEOZOIC FORMATIONS, ROCK SURFACE, FLOWING WELL AREAS AND AREAS OF SALTY WATERS

BY

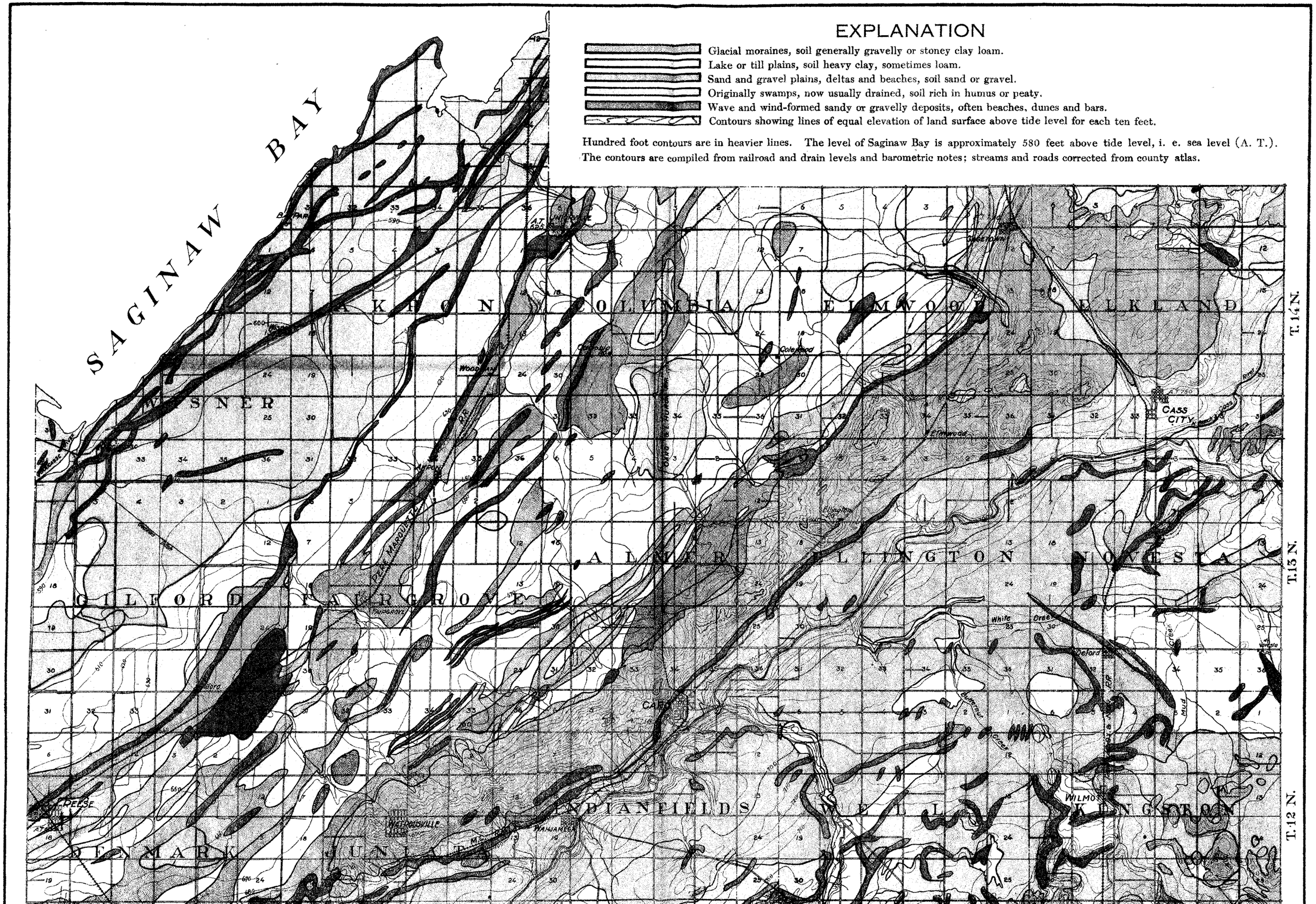
CHARLES A. DAVIS

1908


EXPLANATION
Contours showing lines of equal elevation of land surface above tide level for each ten feet. Hundred foot contours are in heavier lines. The level of Saginaw Bay is approximately 580 feet above tide level, i. e. sea level (A. T.). Repeated from the annual Report for 1901, Plate VI. The contours are compiled from railroad and drain levels and barometric notes; stream and roads corrected from county atlas.
Localities from which coal has been reported.
SAGINAW BAY
AKRON
COLUMBIA
ELMWOOD
ELKLAND
WISNER
ALMER
ELLINGTON
NOVESTA
GILFORD
FAIRGROVE
INDIANFIELDS
WELLS
KINGSTON
DENMARK
JUNIATA
T. 14 N.
T. 13 N.
T. 12 N.
BAYPARK
UNIONVILLE
GAGETOWN
WOODMAN
Columbia
Colewood
Elmwood
CASS CITY
AKRON
Ellington
FAIRGROVE
Gilford
CARO
Deford
WILMOT
REESE
WATROUSVILLE
WAHJAMEGA
PERE MARQUETTE R.R.
CARO & L. HURON R.R.
PONTIAC OX. & NOR. R.R.
M.C. R.R.
White Creek
Butternut Creek
Mud Creek
Cass River
Quanicassee River
Wisner P.O.
Quanicassee P.O.
Goodhues Ditch



GEOLOGICAL SURVEY OF MICHIGAN
ALFRED C. LANE, STATE GEOLOGIST
TOPOGRAPHIC MAP
OF
TUSCOLA COUNTY
BY CHARLES A. DAVIS
1908
DENMARK
JUNIATA
INDIANFIELDS
WELLS
KINGSTON
FREMONT
DAYTON
KOYLTON
TUSCOLA
VASSAR
ARBELA
MILLINGTON
WATERTOWN
REESE
WATROUSVILLE
WAHJAMEGA
CARO
WILMOT
KINGSTON
VASSAR
TUSCOLA
MAYVILLE
MILLINGTON
FOSTORIA
CASS RIVER
MICHIGAN CENTRAL R.R.
PERE MARQUETTE R.R.
PONTIAC OX. & NOR. R.R.
M.C. R.R.
Gilford
Richville
Juniata
Silverwood
Clarks
Elva Po.
Arbela Po.
Cedar Lake
Spruce Lake
Murphys Lake
Cat Lake
Deford
Butternut Creek
Mud Creek
Moore Creek
Perrys Creek
Cedar Creek
T. 12 N.
T. 11 N.
T. 10 N.
R. 7 E.
R. 8 E.
R. 9 E.
R. 10 E.
R. 11 E.


EXPLANATION
Glacial moraines, soil generally gravelly or stoney clay loam.
Lake or till plains, soil heavy clay, sometimes loam.
Sand and gravel plains, deltas and beaches, soil sand or gravel.
Originally swamps, now usually drained, soil rich in humus or peaty.
Wave and wind-formed sandy or gravelly deposits, often beaches, dunes and bars.
Contours showing lines of equal elevation of land surface above tide level for each ten feet.
Hundred foot contours are in heavier lines. The level of Saginaw Bay is approximately 580 feet above tide level, i. e. sea level (A. T.).
The contours are compiled from railroad and drain levels and barometric notes; streams and roads corrected from county atlas.
SAGINAW BAY
AKRON
COLUMBIA
ELMWOOD
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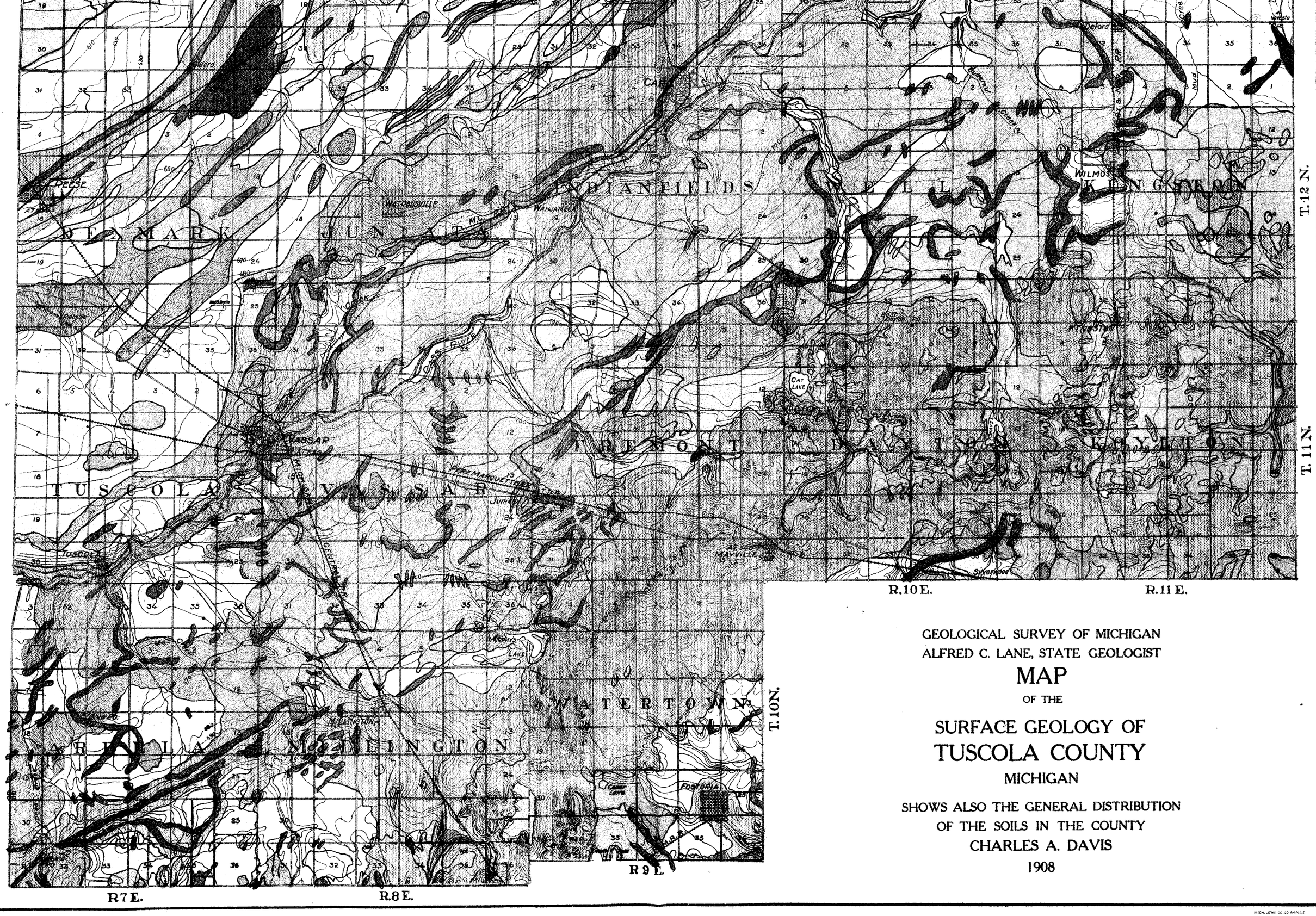

GEOLOGICAL SURVEY OF MICHIGAN
ALFRED C. LANE, STATE GEOLOGIST

MAP

OF THE

SURFACE GEOLOGY OF TUSCOLA COUNTY

MICHIGAN

SHOWS ALSO THE GENERAL DISTRIBUTION
OF THE SOILS IN THE COUNTY

CHARLES A. DAVIS

1908

MICH. LITHO CO. GR. RAPIDS