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Volume XIV

Number 3

The Mechanical Composition of  
Sediments in Graphic Form

by

CHESTER K. WENTWORTH

Iowa  
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I 09  
v. 14, no. 3

Published by the University, Iowa City, Iowa

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UNIVERSITY OF IOWA STUDIES  
IN NATURAL HISTORY

HENRY FREDERICK WICKHAM, Editor

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The Mechanical Composition of  
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investigators who have used the Bureau of Soils scale or the Tyler Standard scale, usually because of slightly greater ease in securing sieves. Still more unfortunate is the occasional publication of papers in which the sieves are designated by the number of meshes to the inch and in which no data as to size of opening are given.

In view of these facts continued advocacy and wider discussion appear to be needed and the following compilation of analyses in graphic form is presented to that end. It was intended originally to collect 1000 analyses and there is little doubt that more than that number of analyses of sediments of known origin have been made. However, the pressure of other projects, and the considerable delay already incurred, which it seems unwise to prolong, lead the writer to present the collection as it stands with the hope that others will supplement it as additional studies are made.

The principal utility of a collection such as this is to enable students to see the various types of mechanical composition more vividly than is possible in numerical tables and to offer a somewhat comprehensive guide for the interpretation of origin of sediments in which the mechanical composition appears to be distinctive. As the writer has pointed out elsewhere<sup>2</sup> a very large amount of critical study is needed before the mechanical composition of sediments can be used in a broadly diagnostic way in the solution of genetic problems. It is thought that the most effective means to progress in this field consists of extended statistical analyses of the mechanical composition data considered as frequency distributions and in the paper cited a comparatively simple computing procedure has been described. It is sufficient to state here that in this procedure values for the *Mean Size*, *Standard Size Ratio Deviation* (a measure of degree of sorting), and *Skewness* (Asymmetry) are derived which indicate in numerical form the chief characteristics of the curve of frequency distribution and which greatly facilitate averaging, plotting and other manipulations of these data.

It is believed that the present compilation will enable stu-

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<sup>2</sup>Wentworth, C. K., A Method of Computing Mechanical Composition Types in Sediments, Geol. Soc. Amer. Bull. 40, pp. 771-790, 1929.



dents to select sediments showing mechanical composition of certain general required characteristics or due to a particular agent or set of conditions to which the computing procedure mentioned above may be applied for detailed comparison and study. It is thought that in this way only will accurate data be obtained on the grade distance between the mean values for the two maxima of certain double maximum sediments like river gravels or between the mean sizes of grains of different densities in a complex sand. It is thought, moreover, that within these characteristics of sorting by the two fluids, air and water, with their variations in velocities and other conditions of transport, are contained some very fundamental facts, which a sufficiently searching study will bring out to the great furtherance of interpretive studies.

#### SOURCE AND ARRANGEMENT OF DATA

For the most part analyses portrayed here were made to the 1-2-4-8 millimeter scale. In a few instances, as indicated in the references below, analyses made to another scale have been converted to the standard scale by the writer. The converted portions commonly have an unavoidable smoothness in the region not so completely covered by the data of the analysis.

In the interest of brevity and economy of space the source information for each pyramid or histogram representing an analysis has been conventionalized. For example, in (Figure 46 (I—235) Dune sand, Nebraska), the serial number for this publication is 46, the Roman numeral I refers to the list below and indicates the paper by J. A. Udden and the number 235 is the original one used by Udden. The name following the parenthesis in most cases is that given by the author or analyst, though in a few instances it has been changed by the present writer to better describe the material. Only in a few instances has the most important data concerning the situation of collection been given and the locality has been simplified to the name of the state or other such general region.

Graphic presentation is naturally of limited accuracy. There are those who will object that significant computations can



only be made from data in which the fractions of percentages are given. The writer has discussed this question elsewhere<sup>3</sup> and believes that at the present stage of studies in this field and with the uncertainty attending the collecting of samples the graphic data here presented are as accurate as can readily be utilized and that computations made from them with readings to the nearest 1% will yield frequency constants quite as precise as are justified by the original conditions of collecting and analysis.

In the figures which follow the sediments have been arranged under the main genetic headings and under lesser headings in as logical manner as seemed practicable. In a few instances groups of sediments analyzed by one person in a series have been kept together though not strictly of the same sort. An effort has been made to arrange the material in the way most likely to prove useful. Somewhat arbitrary classifications have been made by the writer in places and in case of doubt or desire to make selections for a special purpose the reader is referred to the original published data.

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- I—Udden, J. A., Mechanical Composition of Clastic Sediments, Geol. Soc. Amer. Bull. 25, pp. 655-744, 1914.
- II—Wentworth, C. K., Petrology and Origin of the Post-Miocene Terraces and Gravels of the Middle Atlantic Slope. Unpublished thesis, U. of Iowa, 1923.
- III—Wentworth, C. K., Pyroclastic Geology of Oahu. Bishop Museum Bulletin 30, Honolulu, 1926.
- IV—Wentworth, C. K., Miscellaneous unpublished analyses.
- V—Dake, C. L., The Problem of the St. Peter Sandstone, Missouri School of Mines Bulletin, Vol. 6, No. 1, 1921. (Converted from Tyler Standard scale.)
- VI—Dake, C. L., The Sand and Gravel Resources of Missouri, Missouri Bureau of Geology and Mines, Volume 15, 2nd Series, 1918. (Converted from Tyler Standard scale.)

<sup>3</sup>Wentworth, C. K., Methods of Mechanical Analysis of Sediments, Univ. of Iowa Studies in Nat. History, Vol. XI, No. 11, pp. 32-35, 1926. The Accuracy of Mechanical Analysis, Amer. Jour. Science, Fifth Series, Vol. XIII, pp. 399-408, 1927.



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- VIII—Teas, L. P., Sand and Gravel Resources of Georgia, Geological Survey of Georgia, Bull. 37, 1921.  
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- X—Trowbridge, A. C., Unpublished analyses.
- XI—Wentworth, C. K., Geology and Sand and Gravel Resources of the Virginia Coastal Plain, Va. Geol. Survey, Bull. 32, 1930.
- XII—Lugn, A. L., Sedimentation in the Mississippi River, Augustana Library Publications, Number 11, 1927.
- XIII—Bramlette, M. N., Some Marine Bottom Samples from Pago Pago Harbor, Samoa, Carnegie Institution of Washington, Pub. No. 344, pp. 1-35, 1926.  
 (Converted from Bureau of Soils scale.)

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## PLATE I

## EOLIAN SEDIMENTS

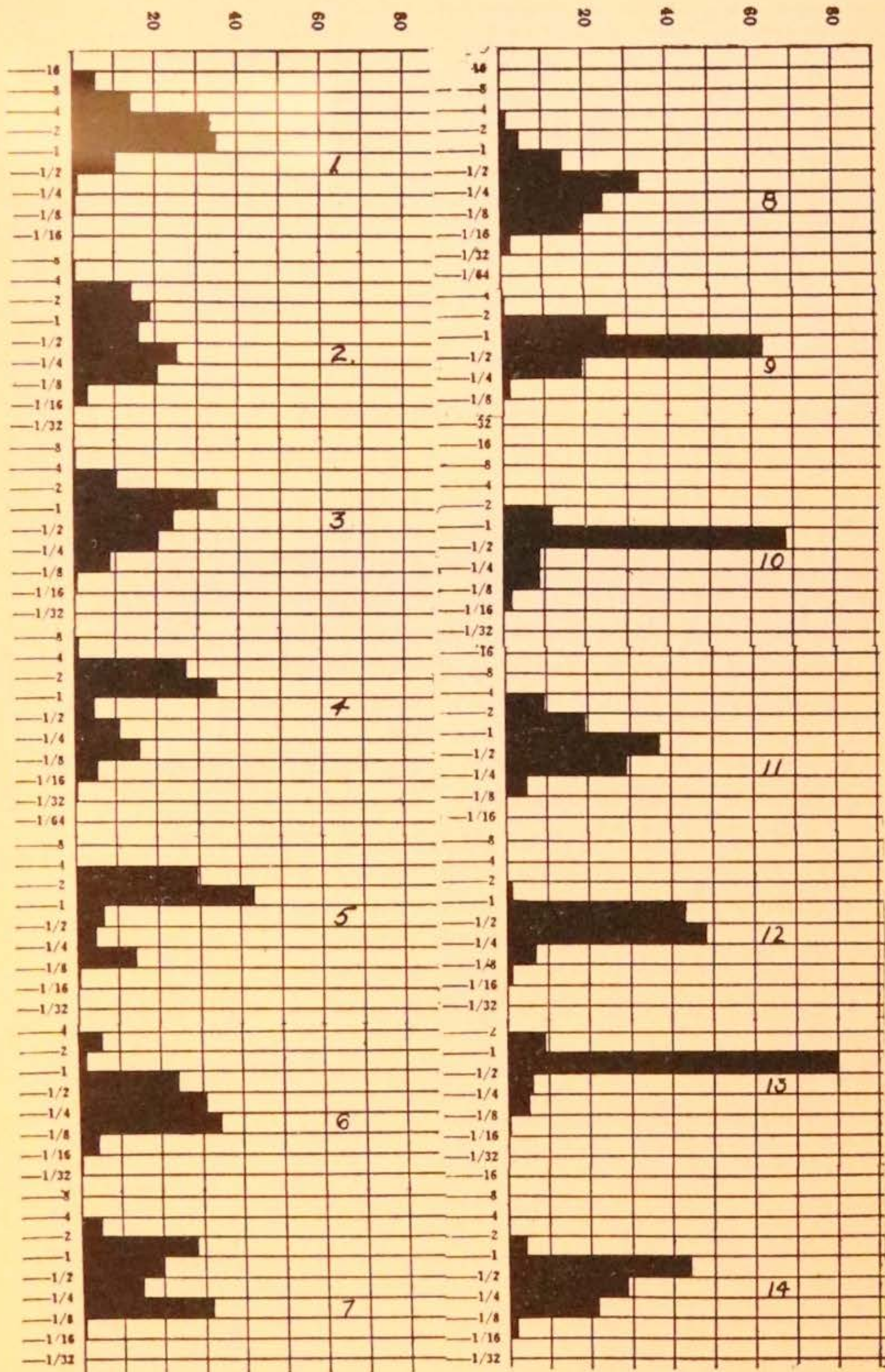
## Lag Gravel

- Figure 1 (I—191) Lag gravel, chips of shale, South Dakota.  
Figure 2 (I—192) Lag gravel, from "blowout," Illinois.  
Figure 3 (I—193) Lag gravel, from "blowout," Illinois.  
Figure 4 (I—194) Lag gravel, Illinois.  
Figure 5 (I—195) Lag gravel, rear of dune, Indiana.  
Figure 6 (I—196) Lag gravel, "blowout," Nebraska.  
Figure 7 (I—197) Lag gravel, rear of dune, Indiana.  
Figure 8 (I—198) Lag gravel, wind-blown ground, South  
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Figure 9 (I—199) Lag gravel, rear of dune, Illinois.  
Figure 10 (I—200) Lag gravel, "blowout," Nebraska.  
Figure 11 (XI—2065) Eolian lag sand, Virginia.  
Figure 12 (XI—2074C) Eolian lag sand, Virginia.

## Coarse Drifting Sand

- Figure 13 (I—201) Drift sand, rear dune slope, Nebraska.  
Figure 14 (I—202) Drift sand, rear dune slope, Illinois.





Figures 1-14



## PLATE II

## EOLIAN SEDIMENTS

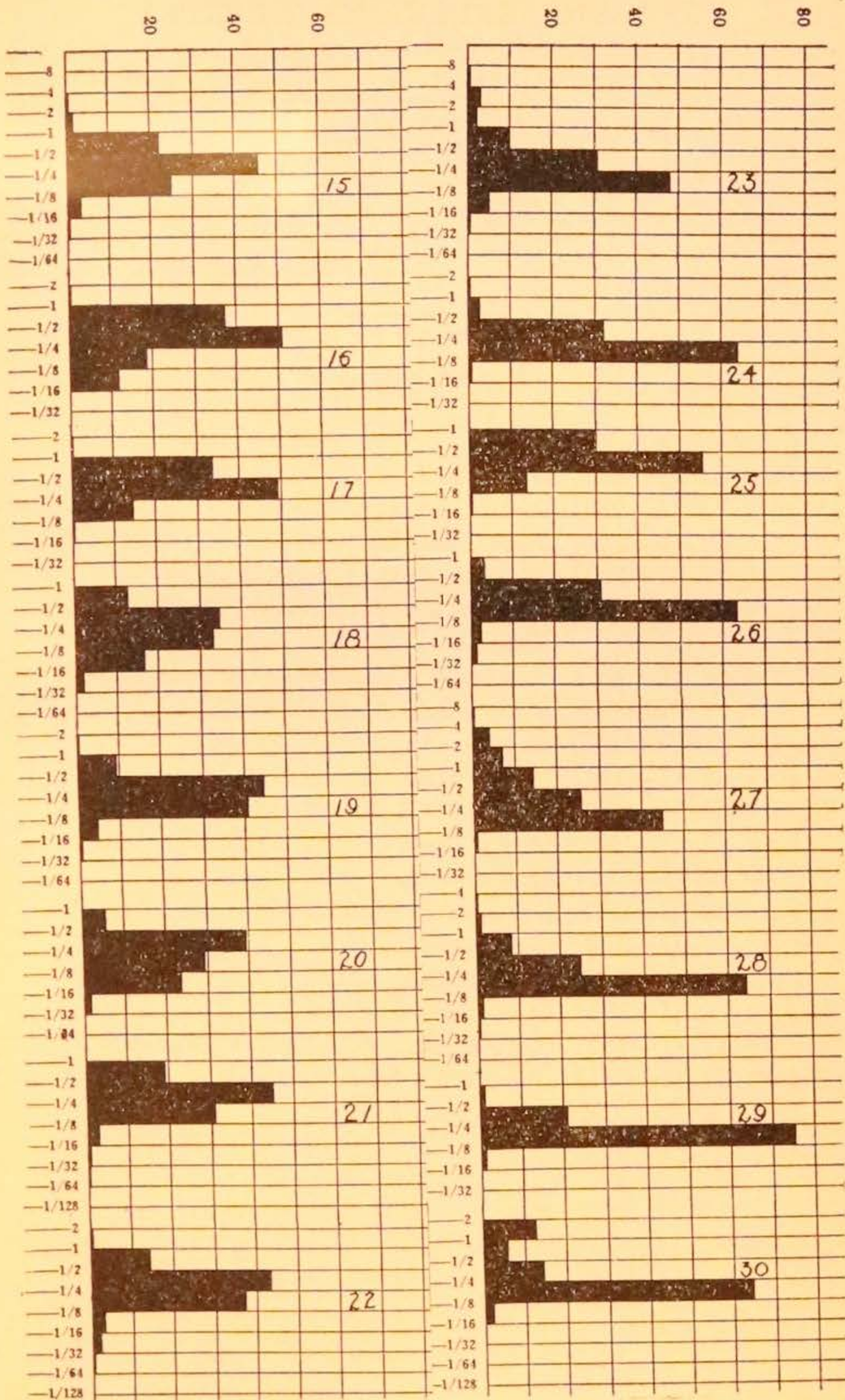
## Coarse Drifting Sand

- Figure 15 (I—203) Drift sand, rear dune slope, Illinois.  
Figure 16 (I—204) Drift sand, rear dune slope, Nebraska.  
Figure 17 (I—205) Drift sand, rear dune slope, Nebraska.  
Figure 18 (I—206) Drift sand, rear dune slope, Illinois.  
Figure 19 (I—207) Drift sand, rear dune slope, Illinois.  
Figure 20 (I—208) Drift sand, rear dune slope, Illinois.  
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## Dune Sand

- Figure 23 (I—211) Dune sand, rear slope of ripples, Illinois.  
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Figure 28 (I—216) Dune sand, Indiana.  
Figure 29 (I—217) Dune sand, Indiana.  
Figure 30 (I—218) Dune sand, near crest, Indiana.





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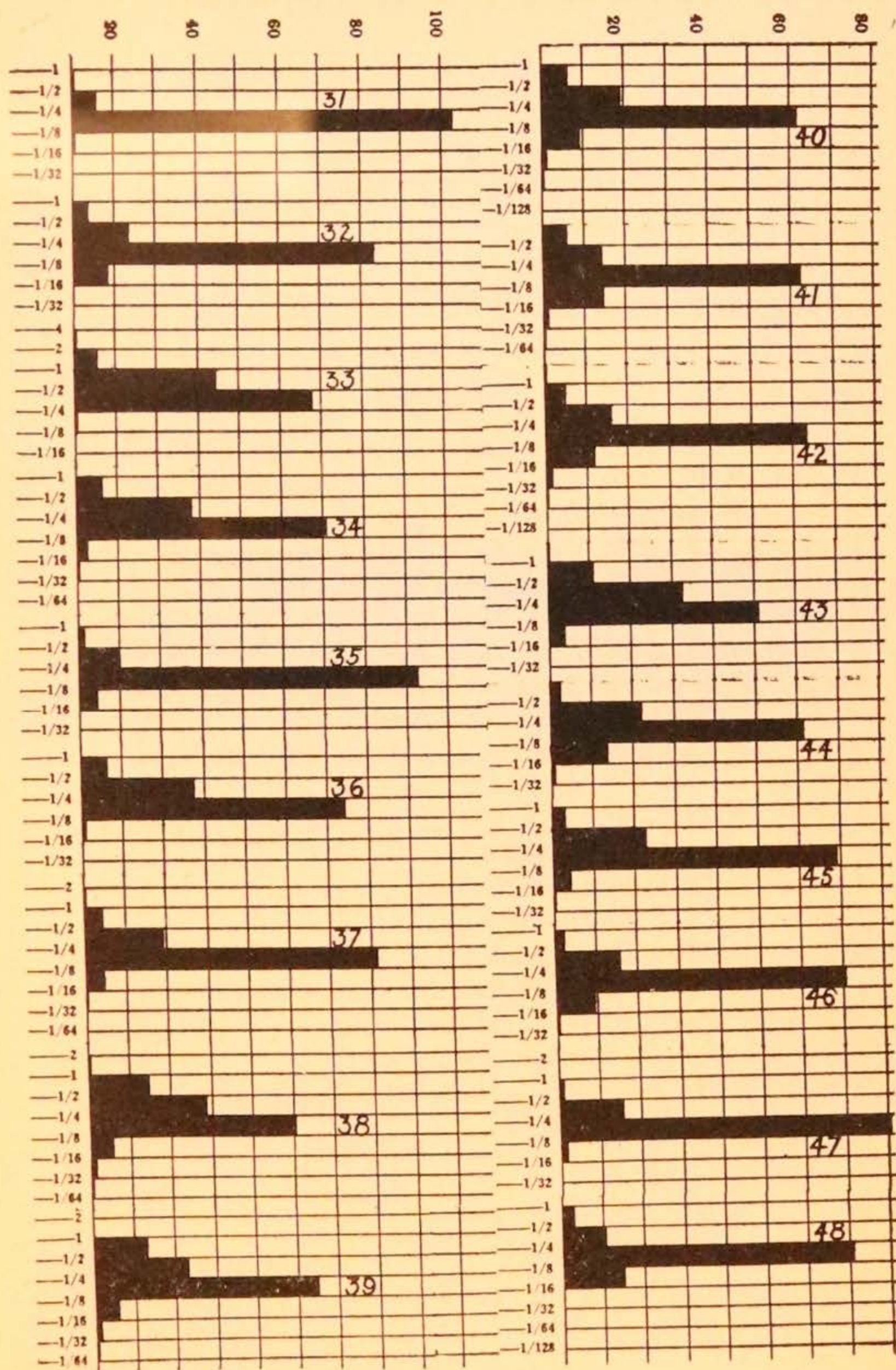
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## EOLIAN SEDIMENTS

## Dune Sand

- Figure 31 (I—219) Dune sand, crest, Indiana.  
Figure 32 (I—220) Dune sand, top, Indiana.  
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Figure 34 (I—223) Dune sand, rear slope, Kansas.  
Figure 35 (I—224) Dune sand, single layer in front slope,  
Kansas.  
Figure 36 (I—225) Dune sand, Massachusetts.  
Figure 37 (I—226) Dune sand, Massachusetts.  
Figure 38 (I—227) Blown sand, North Dakota.  
Figure 39 (I—228) Blown sand, North Dakota.  
Figure 40 (I—229) Blown sand, North Dakota.  
Figure 41 (I—230) Blown sand, North Dakota.  
Figure 42 (I—231) Blown sand, North Dakota.  
Figure 43 (I—232) Dune sand, Illinois.  
Figure 44 (I—233) Dune sand, Illinois.  
Figure 45 (I—234) Blown sand, Kansas.  
Figure 46 (I—235) Dune sand, Nebraska.  
Figure 47 (I—236) Dune sand, front slope, Nebraska.  
Figure 48 (I—237) Dune sand, from coarse layer, Nebraska.





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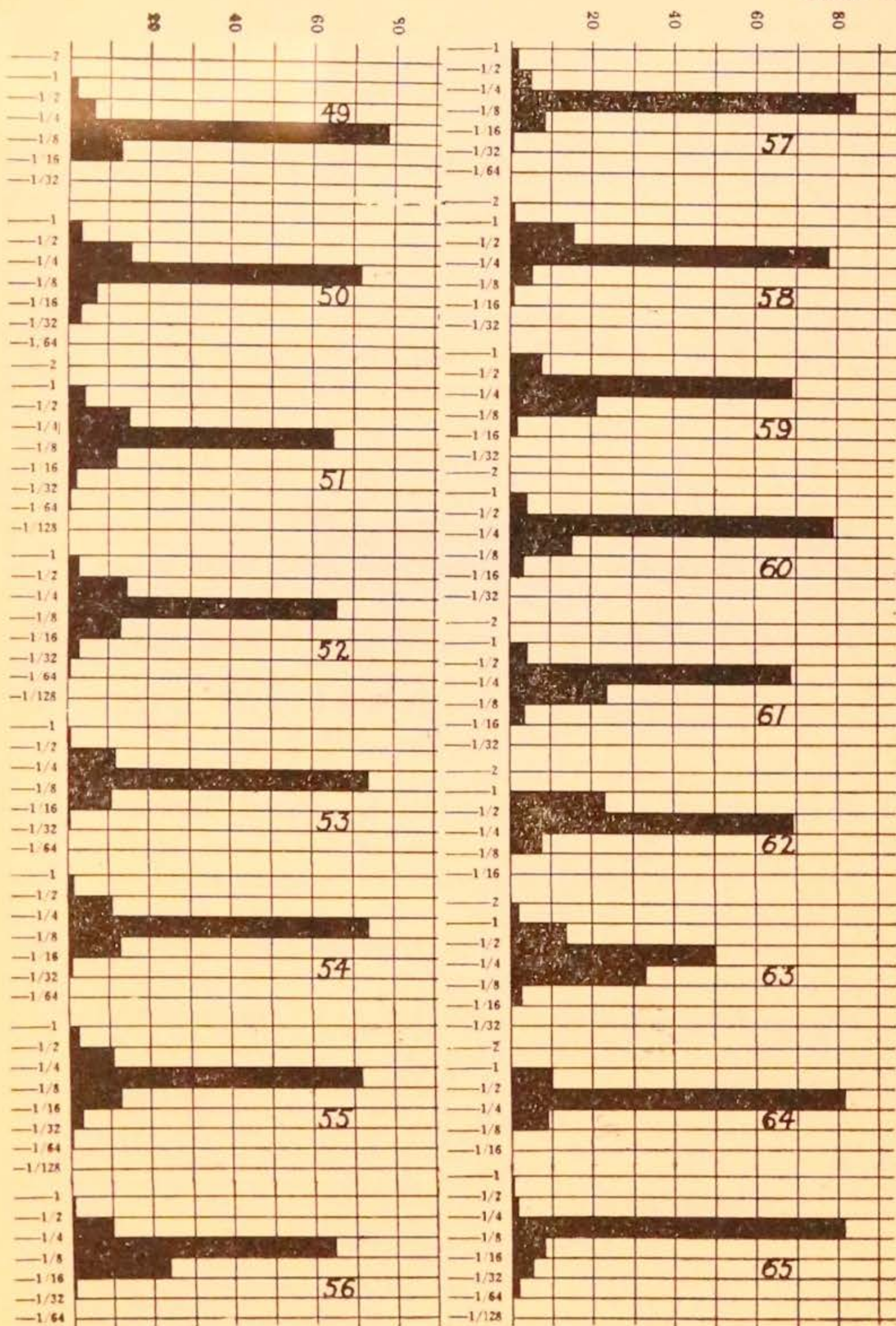
## PLATE IV

## EOLIAN SEDIMENTS

## Dune Sand

- Figure 49 (I—238) Dune sand, from fine layer, Nebraska.  
 Figure 50 (I—240) Dune sand, top, Illinois.  
 Figure 51 (I—241) Dune sand, top, Illinois.  
 Figure 52 (I—242) Dune sand, lower front slope, Illinois.  
 Figure 53 (I—243) Dune sand, top, Illinois.  
 Figure 54 (I—244) Dune sand, upper front slope, Illinois.  
 Figure 55 (I—245) Dune sand, top, Illinois.  
 Figure 56 (I—246) Dune sand, lower front slope, Illinois.  
 Figure 57 (I—247) Dune sand, Illinois.  
 Figure 58 (II—741B) Dune sand, from shore dunes on beach  
 (See beach sand II—741A) New Jersey.  
 Figure 59 (XI—2072B) Dune sand, Virginia (See beach sand  
 XI—2072A).  
 Figure 60 (XI—2074A) Dune sand, Virginia.  
 Figure 61 (XI—2074B) Dune sand, Virginia.  
 Figure 62 (XI—2076) Dune sand, Virginia.  
 Figure 63 (VIII—216) River dune sand, Georgia.  
 Figure 64 (XI—2063) Dune sand, Virginia.
- Incipiently Blown Sand
- Figure 65 (I—248) Blown sand, field, Illinois.





Figures 49-65



## PLATE V

## EOLIAN SEDIMENTS

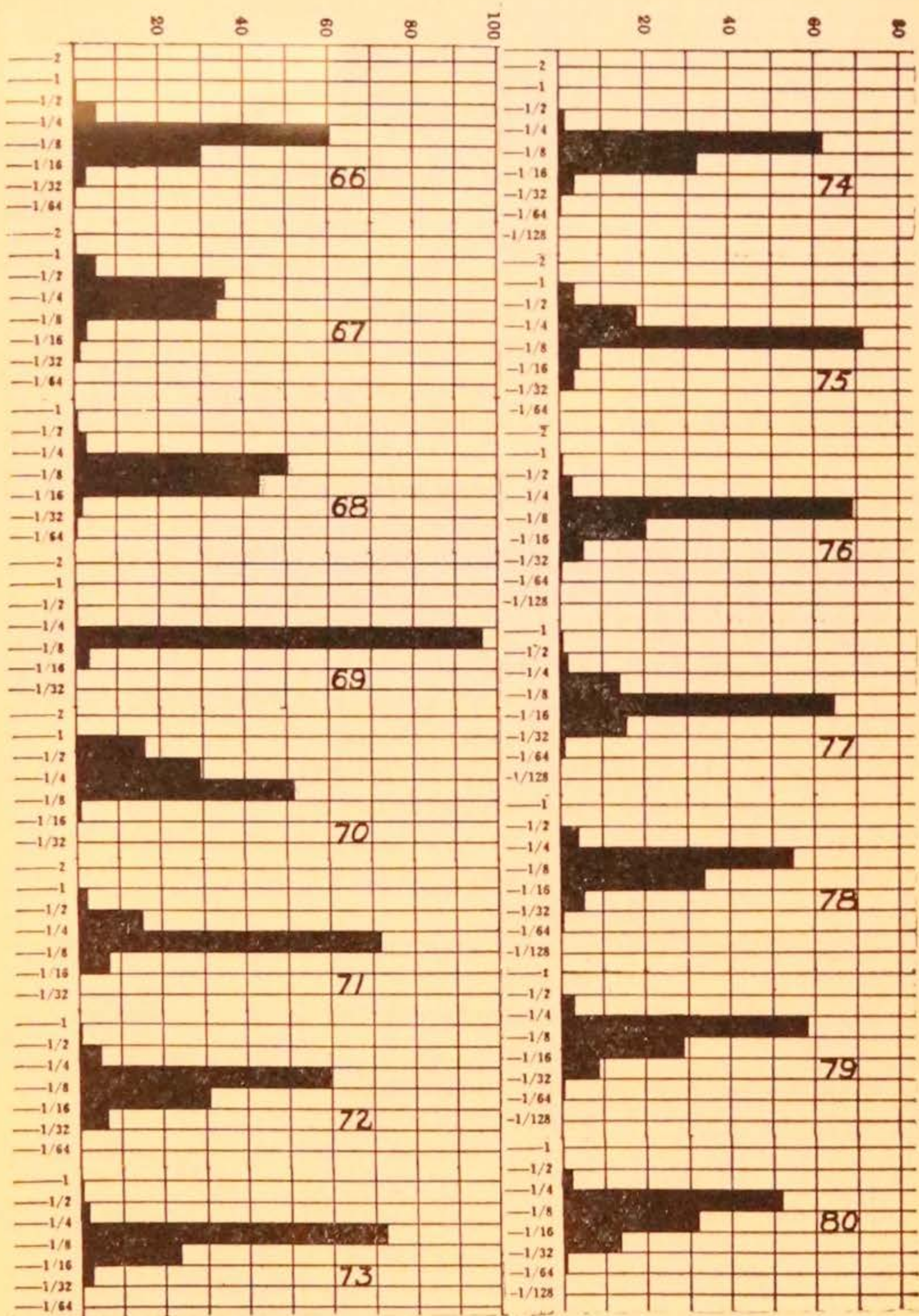
## Incipiently Blown Sand

- Figure 66 (I—249) Blown sand, Kansas.  
Figure 67 (I—250) Blown sand, snow drift, Maryland.  
Figure 68 (I—251) Blown sand, gutter, Maryland.  
Figure 69 (I—252) Blown sand, beach, Florida.  
Figure 70 (I—253) Blown sand, railroad bed, Illinois.

## Lee Sand

- Figure 71 (I—254) Lee sand, Kansas.  
Figure 72 (I—255) Lee sand, six feet in front of lee drift, Kansas.  
Figure 73 (I—256) Lee sand, fifteen feet in front of lee drift, Kansas.  
Figure 74 (I—257) Lee sand, twenty-four feet in front of lee drift, Kansas.  
Figure 75 (I—258) Lee sand, from lee drift, Kansas.  
Figure 76 (I—259) Lee sand, ten feet ahead of lee drift, Kansas.  
Figure 77 (I—260) Lee sand, fifty feet ahead of lee drift, Kansas.  
Figure 78 (I—261) Lee sand, ten feet ahead of small dune, Illinois.  
Figure 79 (I—262) Lee sand, 100 feet ahead of small dune, Illinois.  
Figure 80 (I—263) Lee sand, 160 feet ahead of small dune, Illinois.





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## PLATE VI

## EOLIAN SEDIMENTS

## Miscellaneous Types of Dust

- Figure 81 (I—264) Dust, in house four miles from blown field, North Dakota.
- Figure 82 (I—265) Dust, in house four miles from blown field, North Dakota.
- Figure 83 (I—266) Dust, from running railway coach, Arizona.
- Figure 84 (I—267) Dust, from running railway coach, Minnesota.
- Figure 85 (I—268) Dust, from running railway coach, Nebraska and Kansas.
- Figure 86 (I—269) Dust, from running railway coach, New England.
- Figure 87 (I—270) Dust, from running railway coach, North Dakota and Montana.
- Figure 88 (I—271) Dust, from running railway coach, Northwest United States.
- Figure 89 (I—272) Dust, from running railway coach, Utah.
- Figure 90 (I—273) Dust, from running railway coach, North Dakota.
- Figure 91 (I—274) Dust, from running railway coach, North Dakota.
- Figure 92 (I—275) Dust, from running railway coach, Minnesota.
- Figure 93 (I—276) Dust, from running railway coach, Colorado.







## PLATE VII

## EOLIAN SEDIMENTS

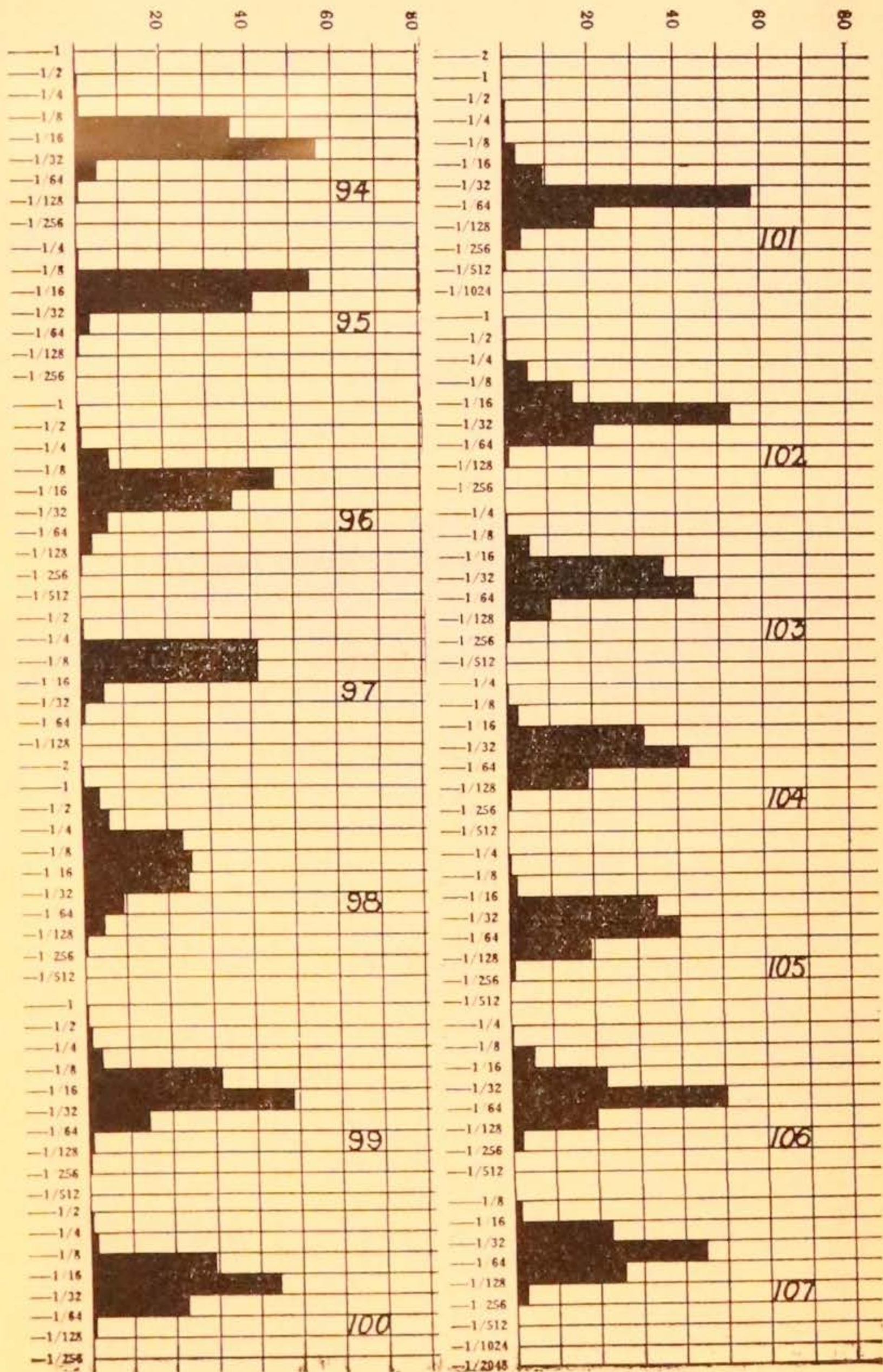
## Miscellaneous Types of Dust

- Figure 94 (I—277) Dust, from running railway coach, Kansas.
- Figure 95 (I—278) Dust, from running railway coach, Northwest United States.
- Figure 96 (I—279) Dust, window sill, Arizona.
- Figure 97 (I—280) Dust, volcanic, from snow, Norway.
- Figure 98 (I—281) Dust, five feet from road, Maryland.
- Figure 99 (I—282) Dust, fifteen feet from road, Maryland.
- Figure 100 (I—283) Dust, twenty-five feet from road, Illinois.
- Figure 101 (I—284) Dust, twenty-five feet from road, Maryland.
- Figure 102 (I—285) Dust, from ice, Minnesota.

## Dust from Known Winds

- Figure 103 (I—286) Dust, wind under nine miles per hour.
- Figure 104 (I—287) Dust, wind under ten miles per hour.
- Figure 105 (I—289) Dust, wind under 13 miles per hour.
- Figure 106 (I—290) Dust, wind under 19 miles per hour.
- Figure 107 (I—291) Dust, wind under 22 miles per hour.





Figures 94-107



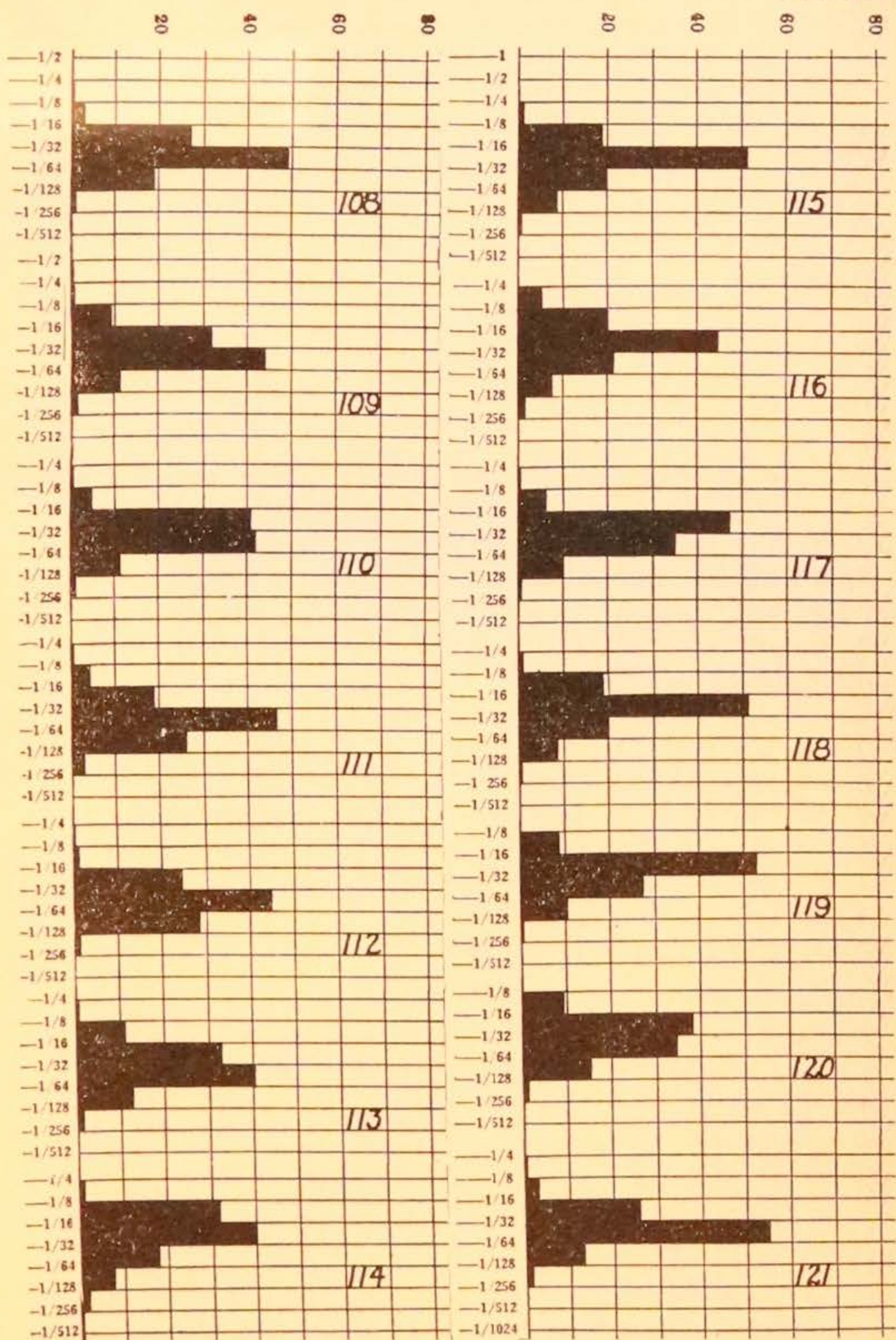
## PLATE VIII

## EOLIAN SEDIMENTS

## Dust from Known Winds

- Figure 108 (I—292) Dust, wind under 22 miles per hour.  
Figure 109 (I—293) Dust, from air ninety feet above ground.  
Figure 110 (I—294) Dust, from air ten feet above ground.  
Figure 111 (I—295) Dust, top flagpole.  
Figure 112 (I—296) Dust, near ground.  
Figure 113 (I—297) Dust, wind under 14 miles per hour.  
Figure 114 (I—298) Dust, wind under 18 miles per hour.  
Figure 115 (I—299) Dust, wind under 18 miles per hour.  
Figure 116 (I—300) Dust, wind under 19 miles per hour.  
Figure 117 (I—301) Dust, wind under 20 miles per hour.  
Figure 118 (I—302) Dust, wind under 21 miles per hour.  
Figure 119 (I—303) Dust, wind under 23 miles per hour.  
Figure 120 (I—304) Dust, wind under 24 miles per hour.  
Figure 121 (I—305) Dust, from air ten feet above ground.





Figures 108-121



## PLATE IX

## EOLIAN SEDIMENTS

Dust from Surfaces Above the Ground (Taken chiefly from  
the leaves and branches of trees in Illinois)

Figure 122 (I—306) Dust.

Figure 123 (I—307) Dust.

Figure 124 (I—308) Dust.

Figure 125 (I—309) Dust.

Figure 126 (I—310) Dust.

Figure 127 (I—311) Dust.

Figure 128 (I—312) Dust.

Figure 129 (I—313) Dust.

Figure 130 (I—314) Dust.

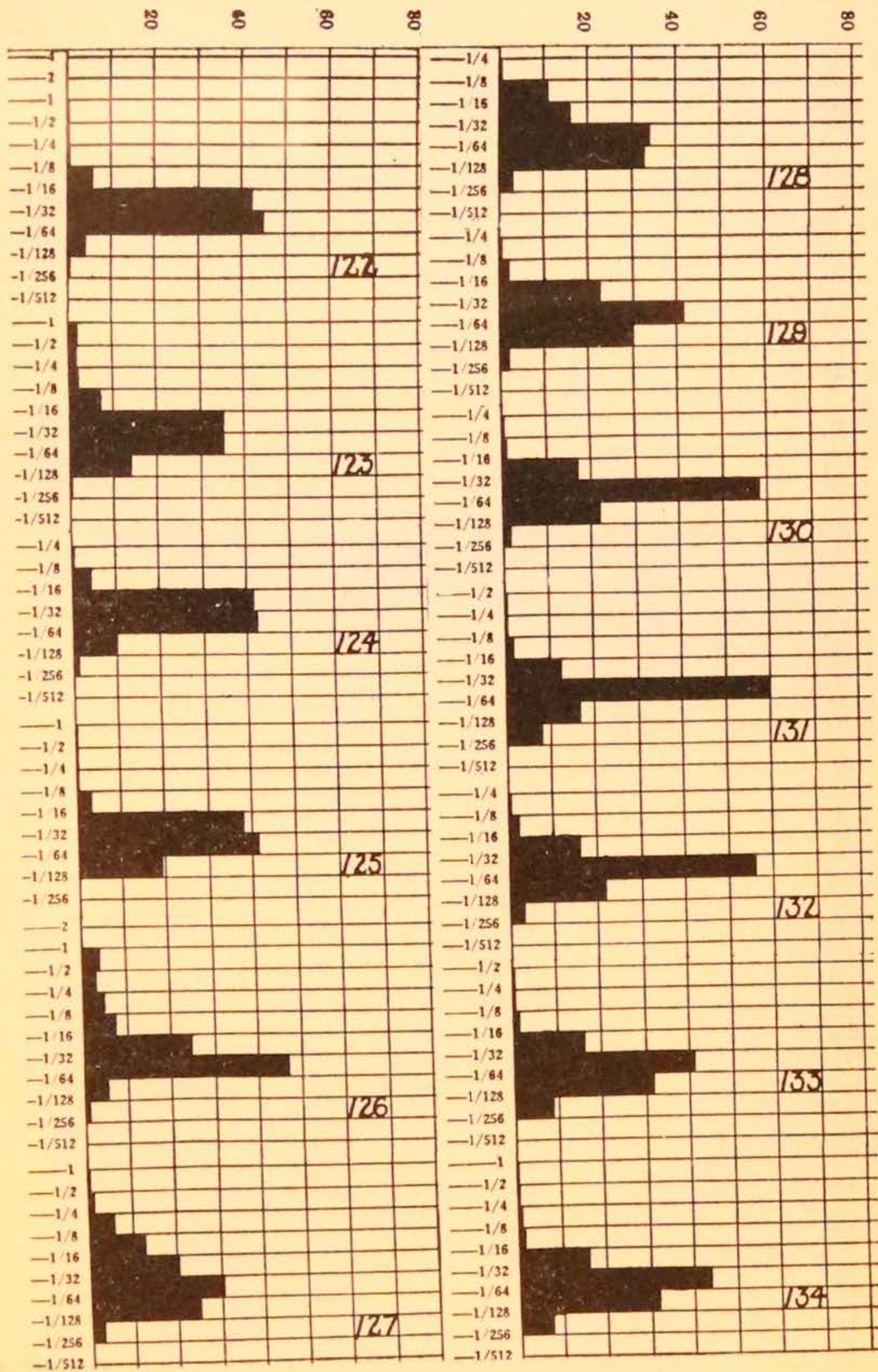
Figure 131 (I—315) Dust.

Figure 132 (I—316) Dust.

Figure 133 (I—317) Dust.

Figure 134 (I—318) Dust.





Figures 122-134



## PLATE X

## EOLIAN SEDIMENTS

Dust from Surfaces Above the Ground (Taken chiefly from  
the leaves and branches of trees in Illinois)

Figure 135 (I—319) Dust.

## Shower Dust

Figure 136 (I—320) Shower dust, Missouri.

Figure 137 (I—321) Shower dust, Iowa.

Figure 138 (I—322) Shower dust, Iowa.

Figure 139 (I—323) Shower dust, Illinois.

Figure 140 (I—324) Shower dust, Illinois.

Figure 141 (I—325) Shower dust, Illinois.

Figure 142 (I—326) Shower dust, Illinois.

Figure 143 (I—327) Shower dust, Illinois.

Figure 144 (I—328) Shower dust, Illinois.

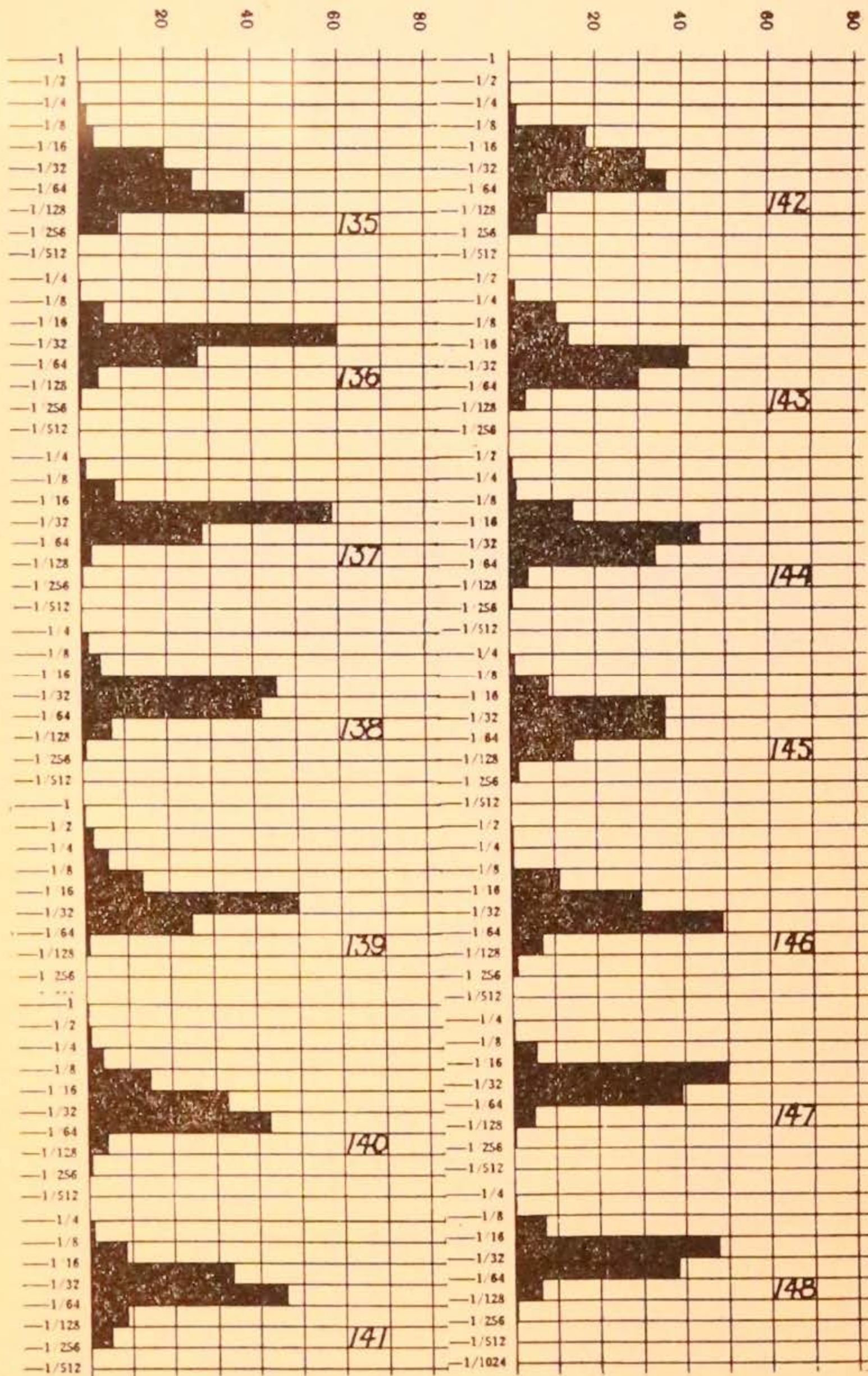
Figure 145 (I—329) Shower dust, Illinois.

Figure 146 (I—330) Shower dust, Illinois.

Figure 147 (I—331) Shower dust, Illinois.

Figure 148 (I—332) Shower dust, Illinois.





Figures 135-148



## PLATE XI

## EOLIAN SEDIMENTS

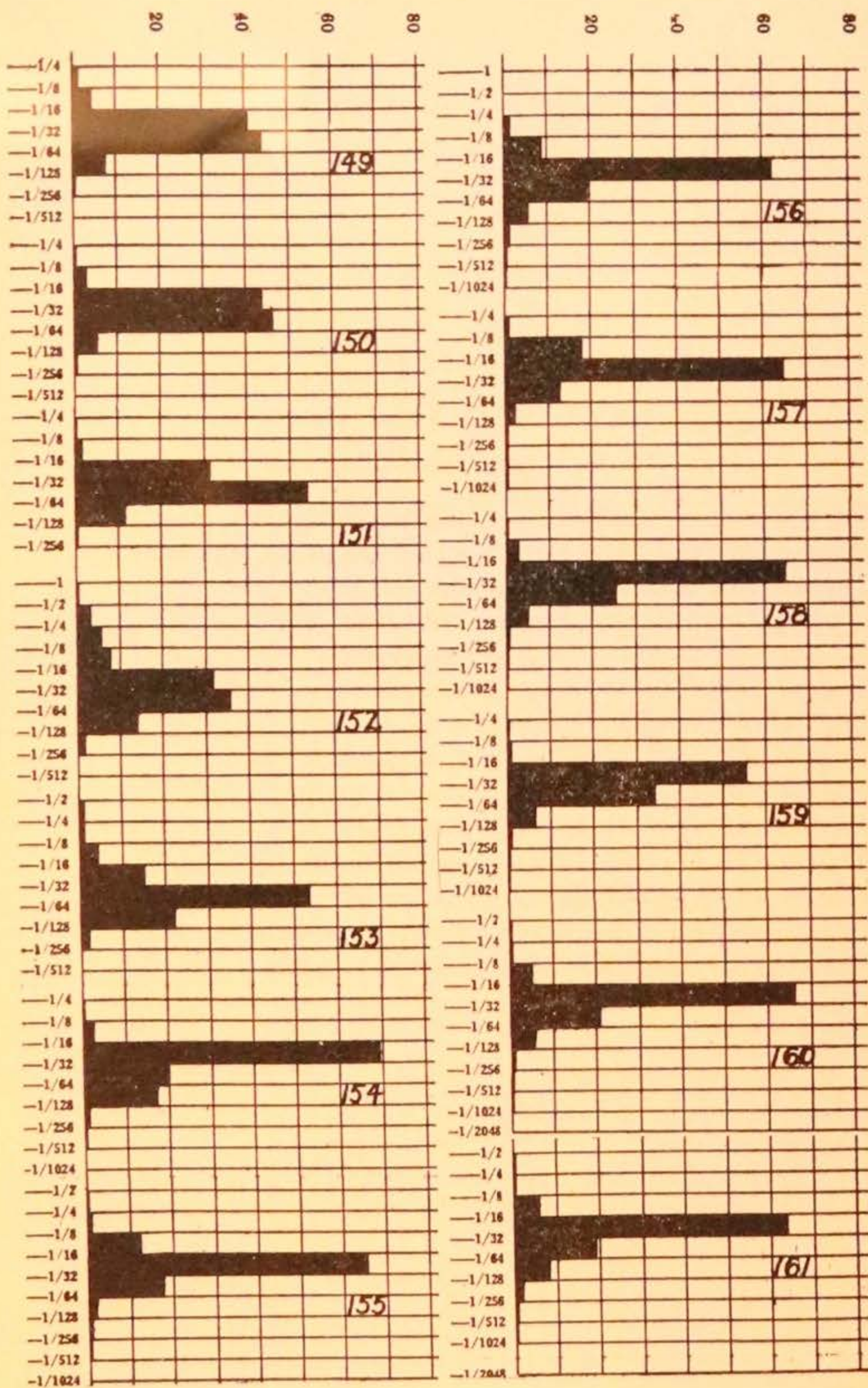
## Shower Dust

- Figure 149 (I—333) Shower dust, Illinois.  
Figure 150 (I—334) Shower dust, Illinois.  
Figure 151 (I—335) Shower dust, Illinois.  
Figure 152 (I—336) Shower dust, Illinois.  
Figure 153 (I—337) Shower dust, New York.

## Loess

- Figure 154 (I—352) Loess, Iowa.  
Figure 155 (I—353) Loess, near base, Iowa.  
Figure 156 (I—354) Loess, twenty feet above base, Iowa.  
Figure 157 (I—355) Loess, forty feet above base, Iowa.  
Figure 158 (I—356) Loess, sixty feet above base, Iowa.  
Figure 159 (I—357) Loess, twenty feet below top, Iowa.  
Figure 160 (I—358) Loess, fifteen feet below top, Iowa.  
Figure 161 (I—359) Loess, eight feet below top, Iowa.





Figures 149-161



## PLATE XIII

## FLUVIAL SEDIMENTS

## River Gravel

Figure 174 (VII—31-954A) Stream gravel, California.

## Creek Gravel

Figure 175 (I—56) Creek gravel, Texas.

Figure 176 (I—57) Creek gravel, Texas.

Figure 177 (I—58) Creek gravel, Iowa.

Figure 178 (I—60) Creek gravel, Iowa.

Figure 179 (VIII—145) Creek gravel, Georgia.

Figure 180 (VIII—146) Creek gravel, Georgia.

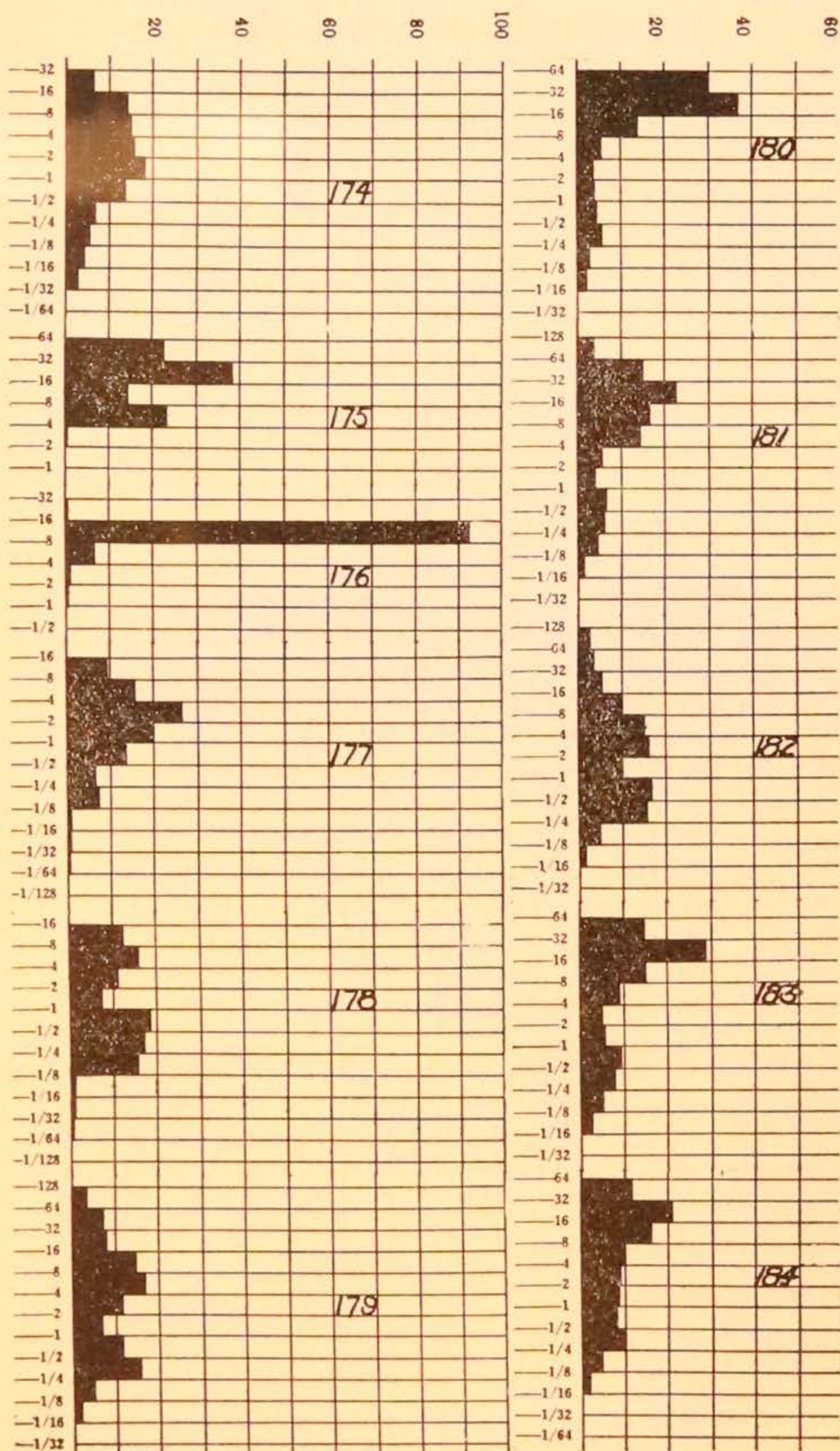
Figure 181 (VIII—155) Creek gravel, Georgia.

Figure 182 (VIII—167) Creek gravel, Georgia.

Figure 183 (VIII—224) Creek gravel, Georgia.

Figure 184 (VIII—225) Creek gravel, Georgia.





Figures 174-184



## PLATE XIV

## FLUVIAL SEDIMENTS

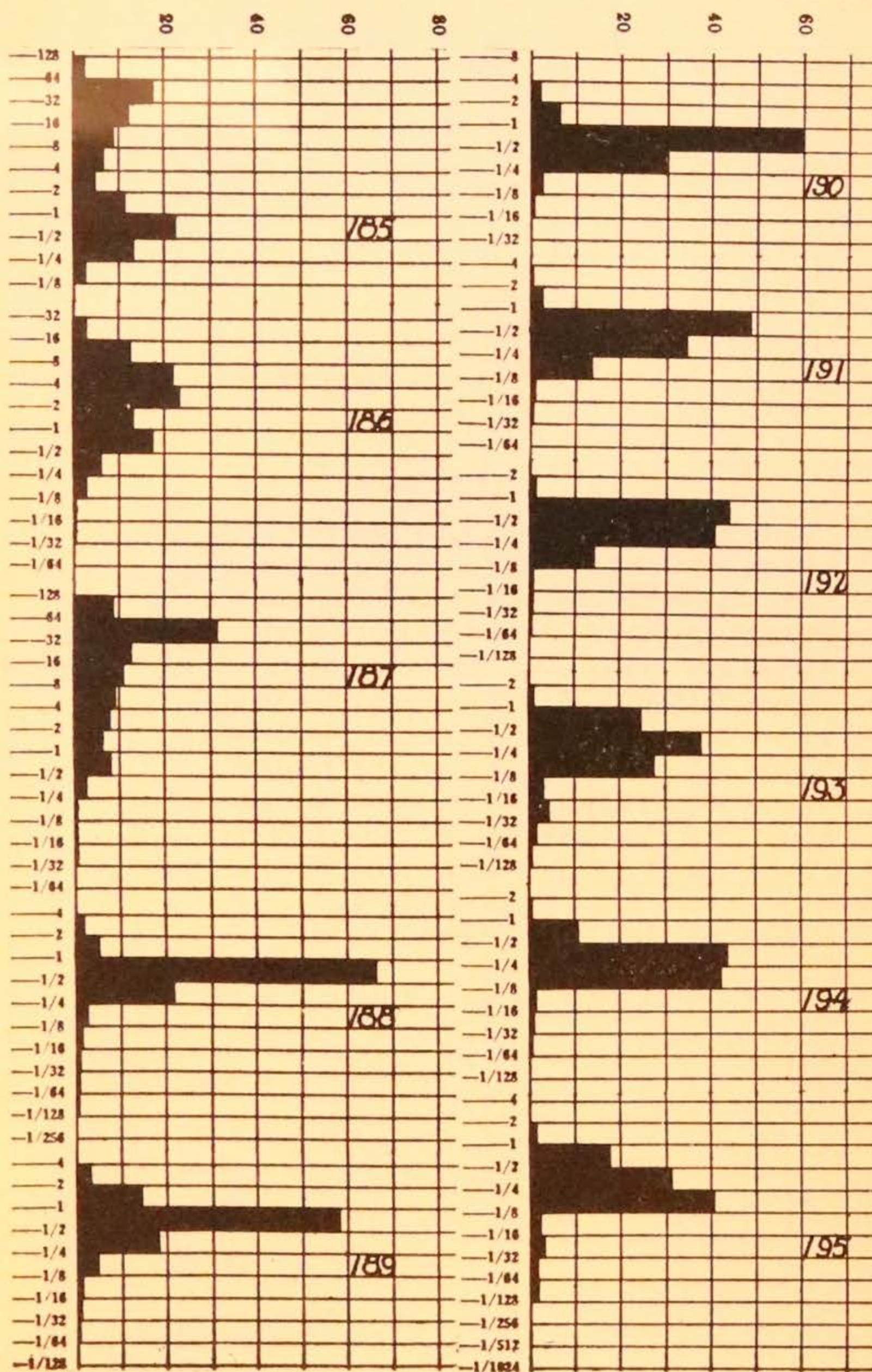
## Creek Gravel

- Figure 185 (VIII—230) Creek gravel, Georgia.  
Figure 186 (II—496) Creek gravel, Maryland.  
Figure 187 (II—698) Creek gravel, Pennsylvania.

## Creek Sand

- Figure 188 (I—59) Creek sand, South Dakota.  
Figure 189 (I—61) Creek sand, Iowa.  
Figure 190 (I—62) Creek sand, Wisconsin.  
Figure 191 (I—63) Creek sand, Iowa.  
Figure 192 (I—64) Creek sand, Iowa.  
Figure 193 (I—65) Creek sand, Iowa.  
Figure 194 (I—66) Creek sand, Iowa.  
Figure 195 (I—67) Creek sand, Iowa.





Figures 185-195



## PLATE XV

## FLUVIAL SEDIMENTS

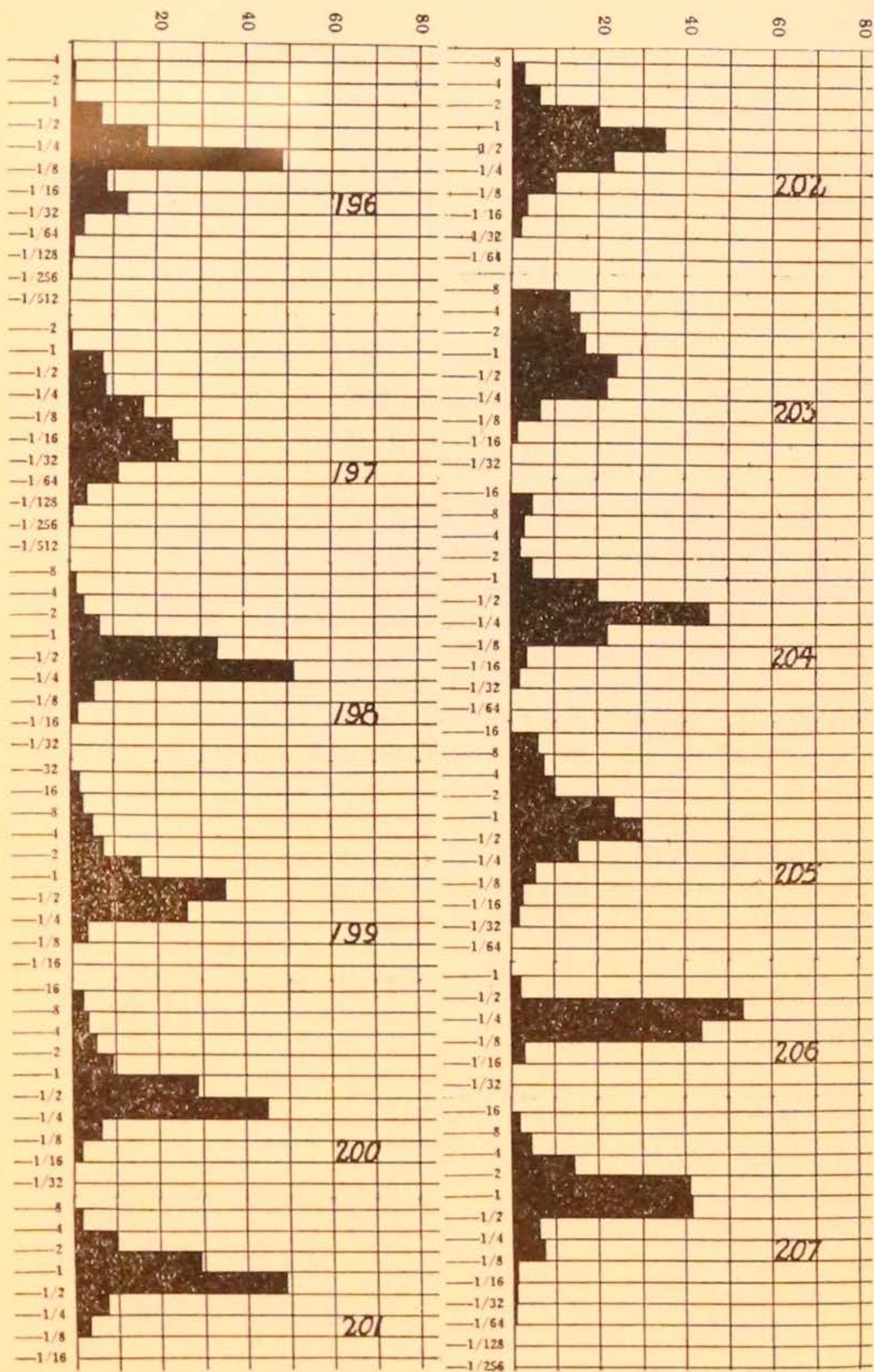
## Creek Sand

- Figure 196 (I—68) Creek sand, South Dakota.  
Figure 197 (I—69) Creek sand, South Dakota.  
Figure 198 (VIII—5) Creek sand, Georgia.  
Figure 199 (VIII—93) Creek sand, Georgia.  
Figure 200 (VIII—109) Creek sand Georgia.  
Figure 201 (VIII—111) Creek sand, Georgia.  
Figure 202 (VIII—115) Creek sand, Georgia.  
Figure 203 (VIII—126) Creek sand, Georgia.  
Figure 204 (VIII—129) Creek sand, Georgia.  
Figure 205 (VIII—181) Creek sand, Georgia.  
Figure 206 (VIII—222) Creek sand, Georgia.

## River Sand

- Figure 207 (I—81) River gravel, Iowa.





Figures 196-207



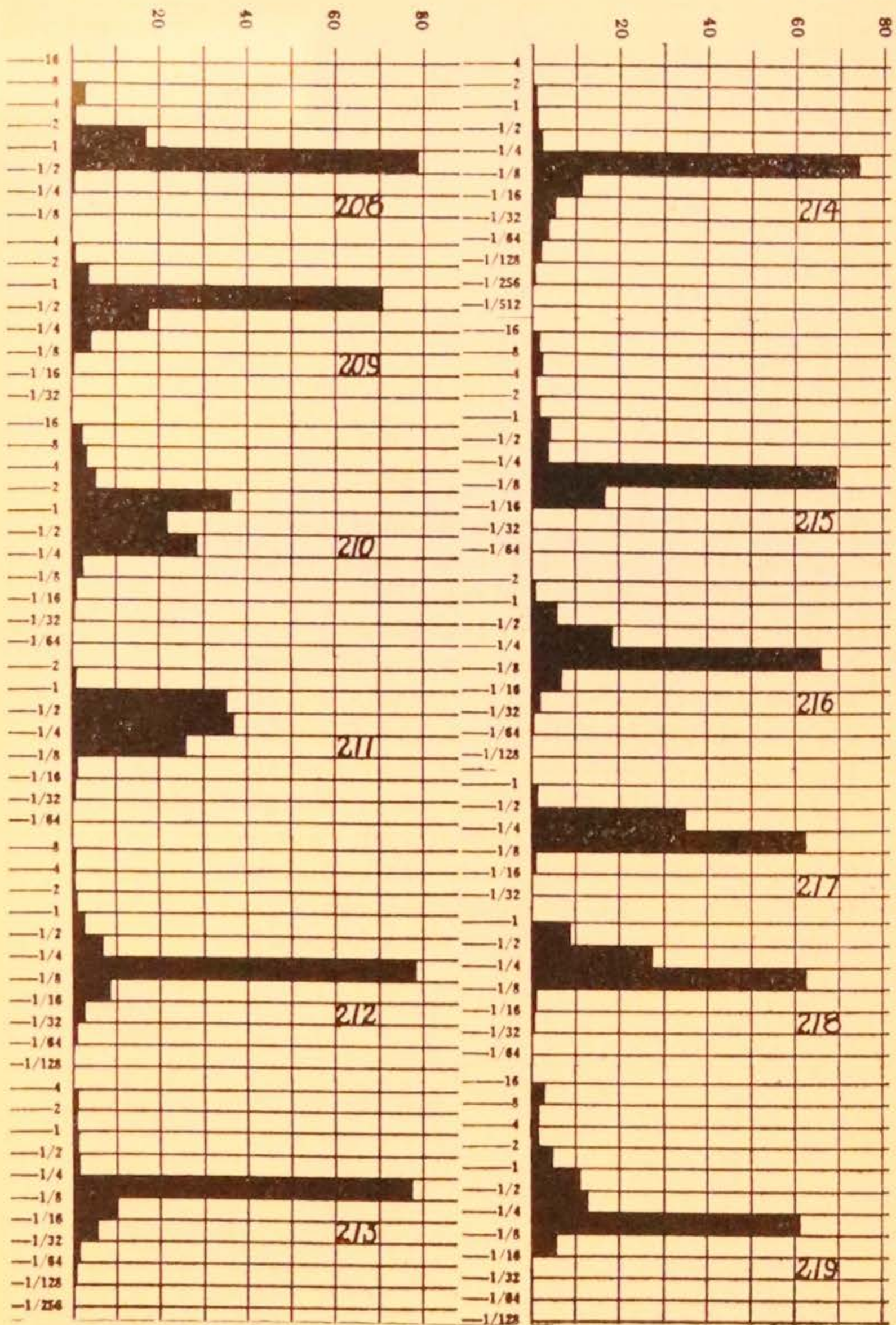
## PLATE XVI

## FLUVIAL SEDIMENTS

## River Sand

- Figure 208 (I—82) River sand, Illinois.  
Figure 209 (I—83) River sand, Illinois.  
Figure 210 (I—84) River sand, Iowa.  
Figure 211 (I—85) River sand, Iowa.  
Figure 212 (I—86) River sand, Illinois.  
Figure 213 (I—87) River sand, Iowa.  
Figure 214 (I—88) River sand, from floods, Iowa.  
Figure 215 (I—89) River sand, Alaska.  
Figure 216 (I—90) River beach sand, Illinois.  
Figure 217 (I—91) River beach sand, Iowa.  
Figure 218 (I—92) River beach sand, Iowa.  
Figure 219 (I—93) River sand, Alaska.





Figures 208-219



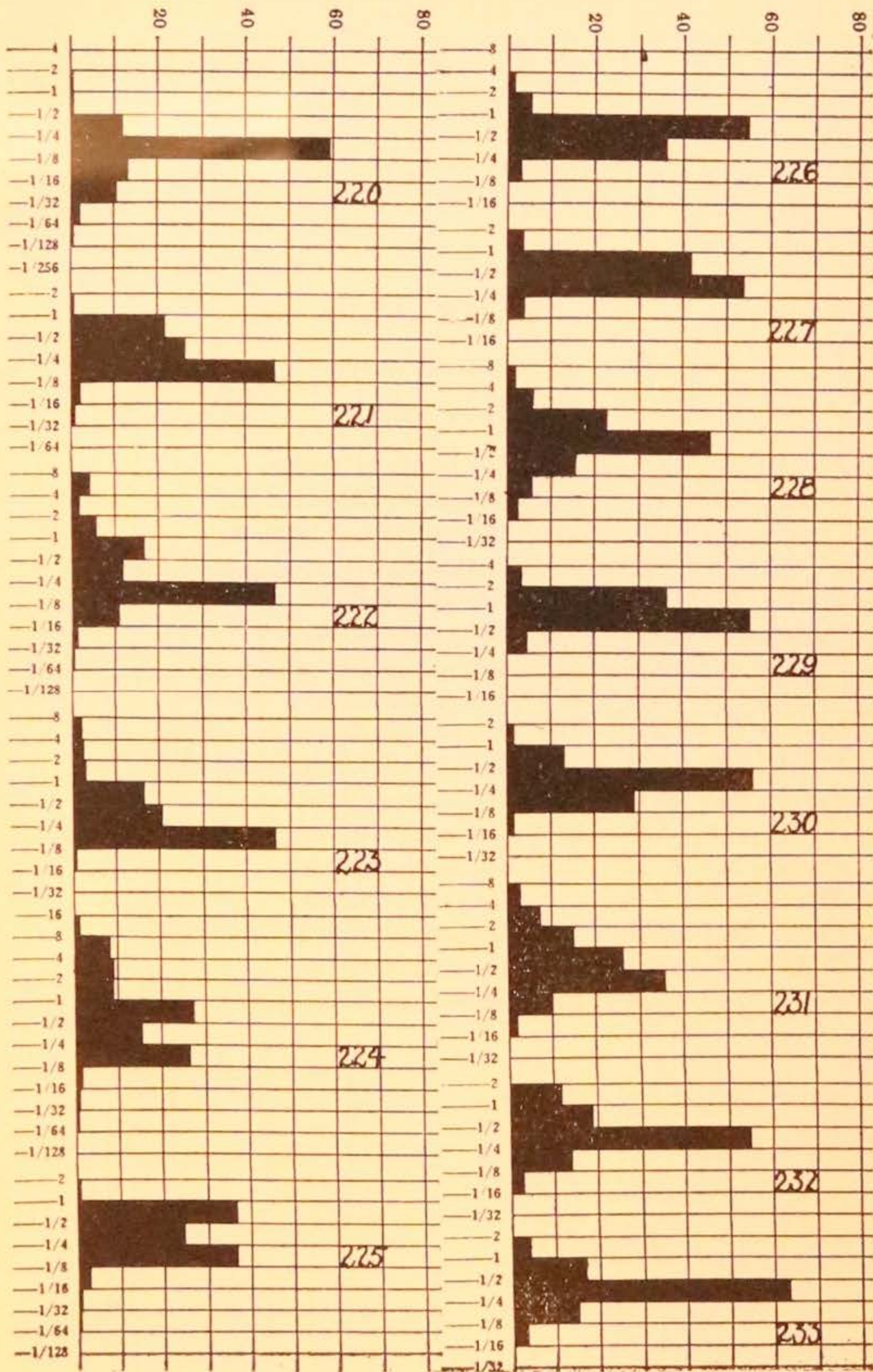
## PLATE XVII

## FLUVIAL SEDIMENTS

## River Sand

- Figure 220 (I—94) River sand, Iowa.  
Figure 221 (I—95) River bank sand, Iowa.  
Figure 222 (I—96) River beach sand, Iowa.  
Figure 223 (I—97) River sand, Illinois.  
Figure 224 (I—98) River gravel, Iowa.  
Figure 225 (I—99) River beach sand, Iowa.  
Figure 226 (VIII—13) River sand, Georgia.  
Figure 227 (VIII—35) River sand, Georgia.  
Figure 228 (VIII—130) River sand, Georgia.  
Figure 229 (VIII—207) River sand, Georgia.  
Figure 230 (VIII—220) River sand, Georgia.  
Figure 231 (VI—154B) River sand, Missouri.  
Figure 232 (VI—178) River sand, Missouri.  
Figure 233 (VI—180) River sand, Missouri.





Figures 220-233



## PLATE XVIII

## FLUVIAL SEDIMENTS

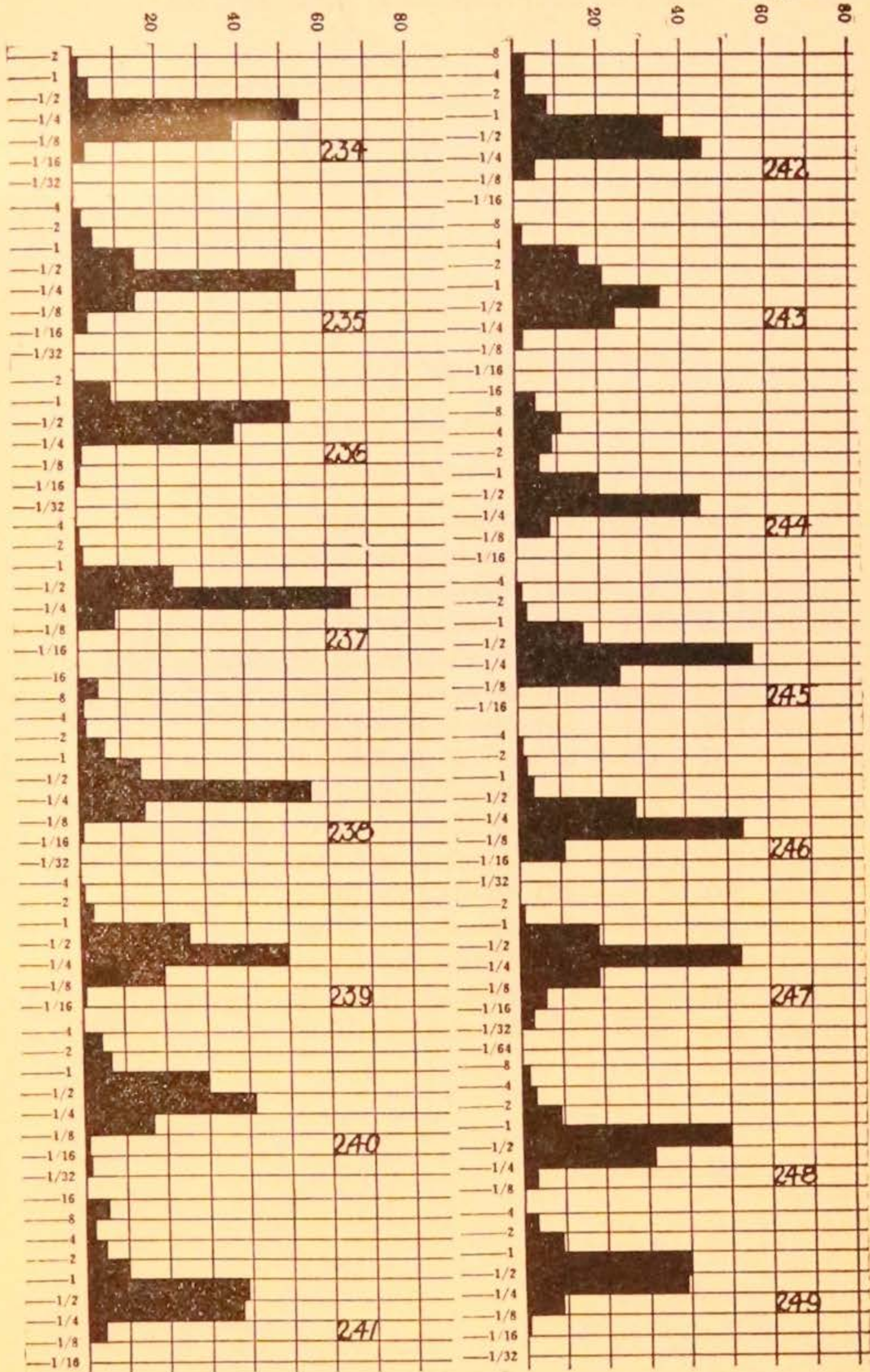
## River Sand

- Figure 234 (VI—193) River sand, Missouri.  
Figure 235 (VI—198) Creek sand, Missouri.  
Figure 236 (XI—1729A) River sand, Virginia.

## Channel Sand

- Figure 237 (XII— 4) Mississippi River.  
Figure 238 (XII— 9) Mississippi River.  
Figure 239 (XII— 10) Mississippi River.  
Figure 240 (XII— 15) Mississippi River.  
Figure 241 (XII— 16) Mississippi River.  
Figure 242 (XII— 17) Mississippi River.  
Figure 243 (XII— 18) Mississippi River.  
Figure 244 (XII— 19) Mississippi River.  
Figure 245 (XII— 20) Mississippi River.  
Figure 246 (XII— 21) Mississippi River.  
Figure 247 (XII— 22) Mississippi River.  
Figure 248 (XII— 26) Mississippi River.  
Figure 249 (XII— 27) Mississippi River.





Figures 234-249



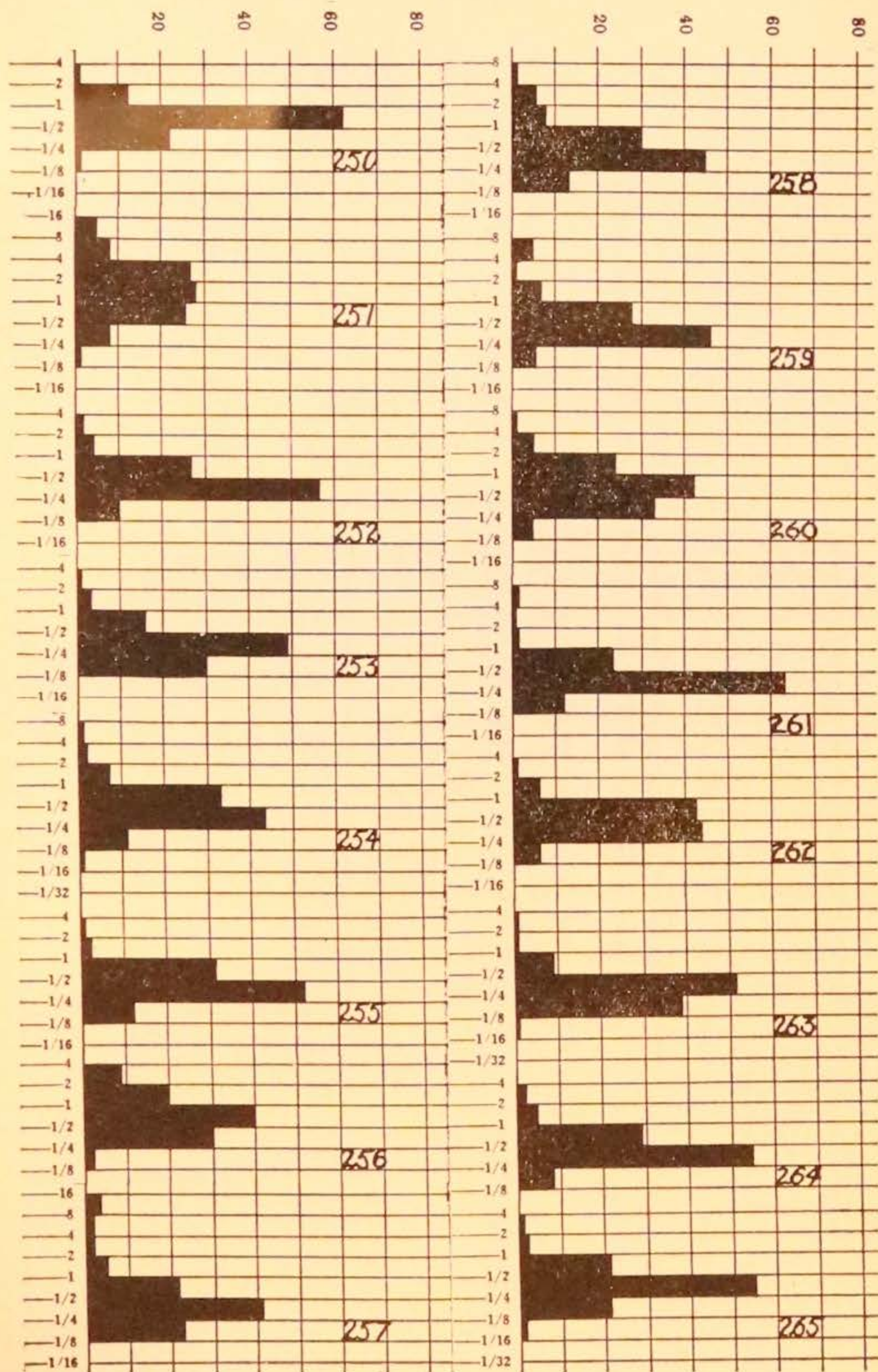
## PLATE XIX

## FLUVIAL SEDIMENTS

## Channel Sand

- Figure 250 (XII— 36) Mississippi River.  
Figure 251 (XII— 51) Mississippi River.  
Figure 252 (XII— 52) Mississippi River.  
Figure 253 (XII— 53) Mississippi River.  
Figure 254 (XII— 54) Mississippi River.  
Figure 255 (XII— 55) Mississippi River.  
Figure 256 (XII— 56) Mississippi River.  
Figure 257 (XII— 57) Mississippi River.  
Figure 258 (XII— 58) Mississippi River.  
Figure 259 (XII— 59) Mississippi River.  
Figure 260 (XII— 65) Mississippi River.  
Figure 261 (XII— 67) Mississippi River.  
Figure 262 (XII— 68) Mississippi River.  
Figure 263 (XII— 69) Mississippi River.  
Figure 264 (XII— 74) Mississippi River.  
Figure 265 (XII— 78) Mississippi River.





Figures 250-265



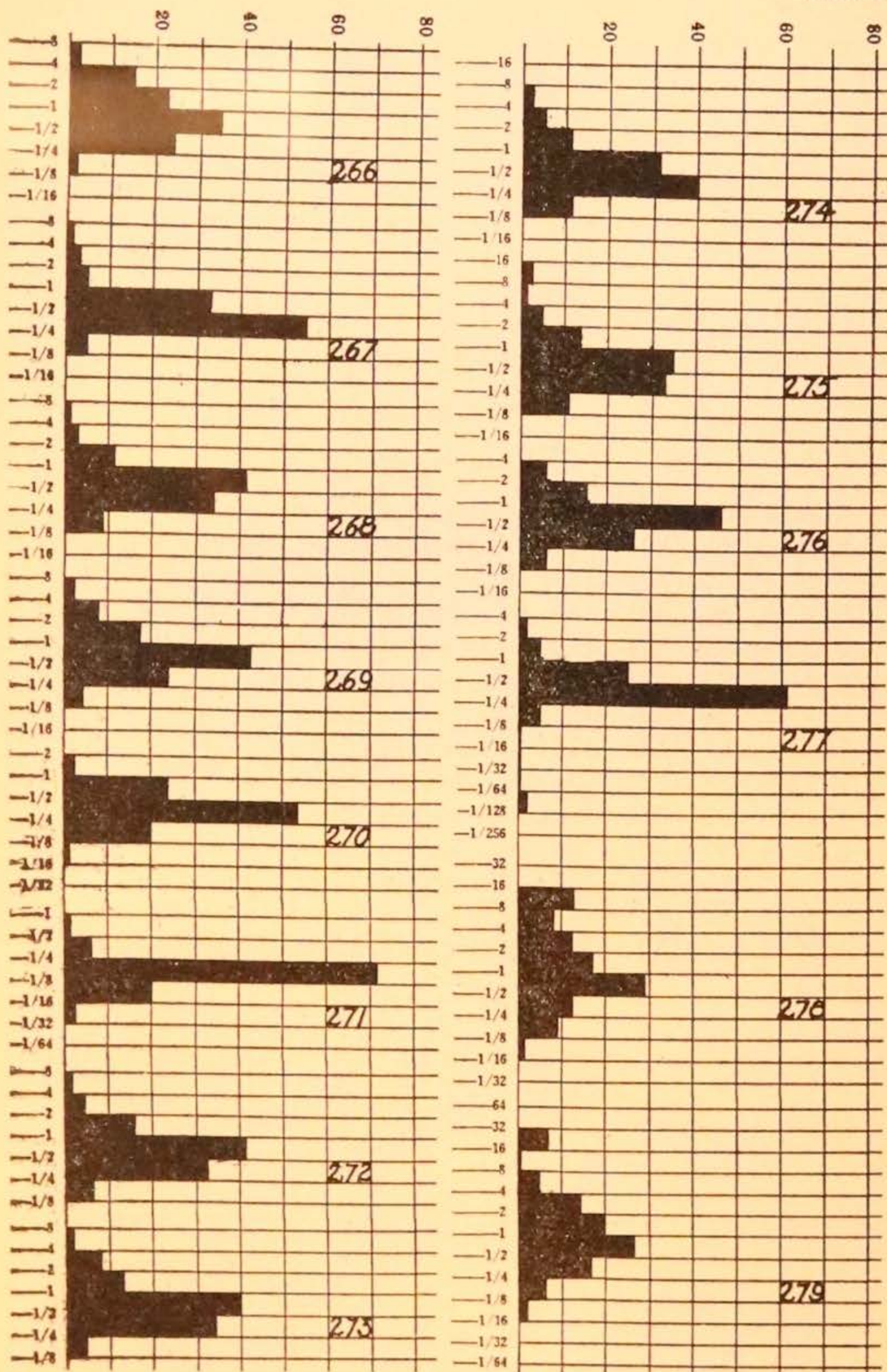
## PLATE XX

## FLUVIAL SEDIMENTS

## Channel Sand

- Figure 266 (XII— 79) Mississippi River.  
Figure 267 (XII— 81) Mississippi River.  
Figure 268 (XII— 90) Mississippi River.  
Figure 269 (XII— 91) Mississippi River.  
Figure 270 (XII— 92) Mississippi River.  
Figure 271 (XII— 93) Mississippi River.  
Figure 272 (XII— 94) Mississippi River.  
Figure 273 (XII—100) Mississippi River.  
Figure 274 (XII—109) Mississippi River.  
Figure 275 (XII—114) Mississippi River.  
Figure 276 (XII—117) Mississippi River.  
Figure 277 (XII—120) Mississippi River.  
Figure 278 (XII—138) Mississippi River.  
Figure 279 (XII—143) Mississippi River.





Figures 266-279



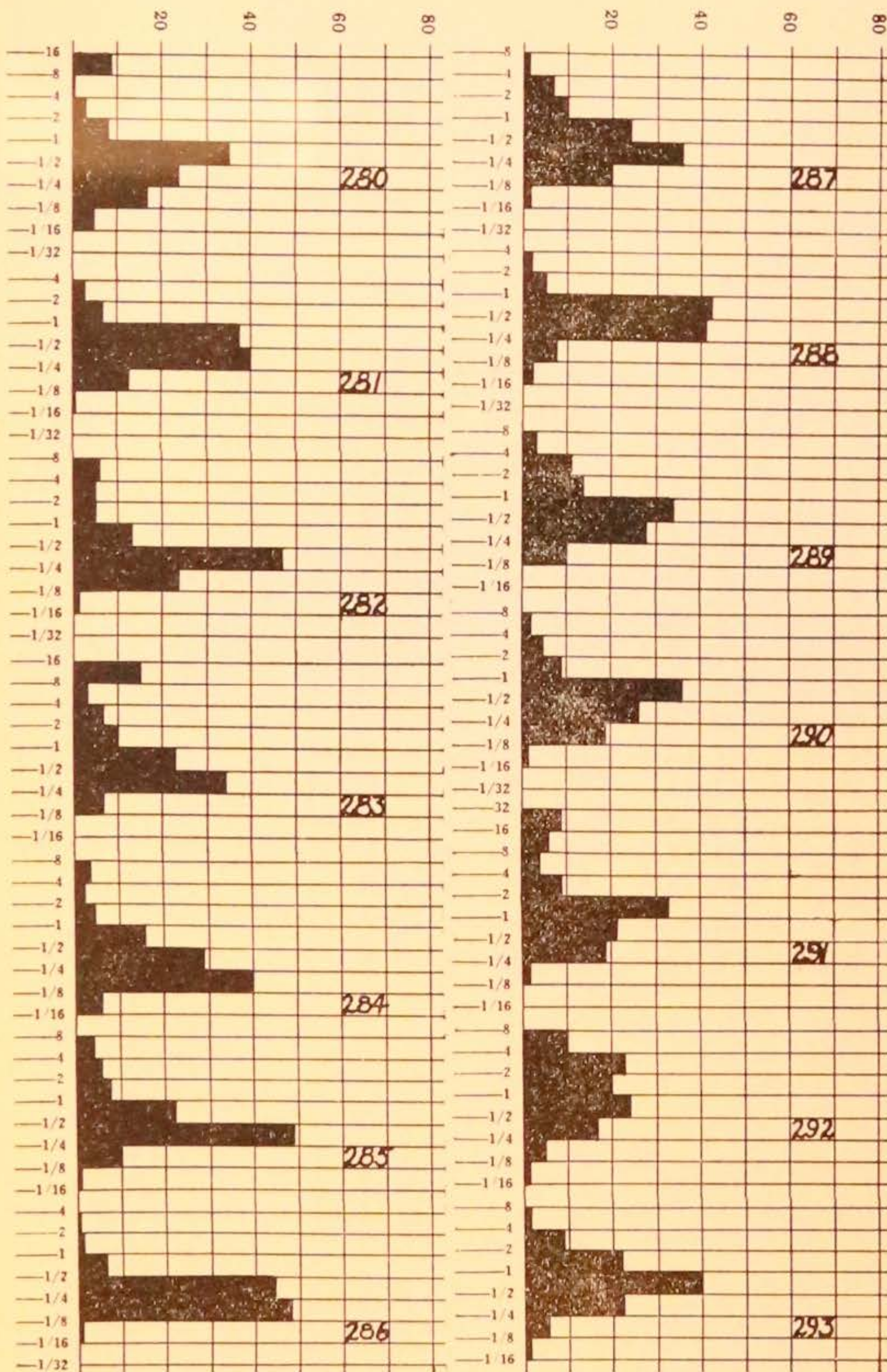
## PLATE XXI

## FLUVIAL SEDIMENTS

## Channel Sand

- Figure 280 (XII—144) Mississippi River.  
Figure 281 (XII—147) Mississippi River.  
Figure 282 (XII—148) Mississippi River.  
Figure 283 (XII—149) Mississippi River.  
Figure 284 (XII—153) Mississippi River.  
Figure 285 (XII—155) Mississippi River.  
Figure 286 (XII—163) Mississippi River.  
Figure 287 (XII—172) Mississippi River.  
Figure 288 (XII—173) Mississippi River.  
Figure 289 (XII—185) Mississippi River.  
Figure 290 (XII—186) Mississippi River.  
Figure 291 (XII—187) Mississippi River.  
Figure 292 (XII—189) Mississippi River.  
Figure 293 (XII—196) Mississippi River.





Figures 280-293



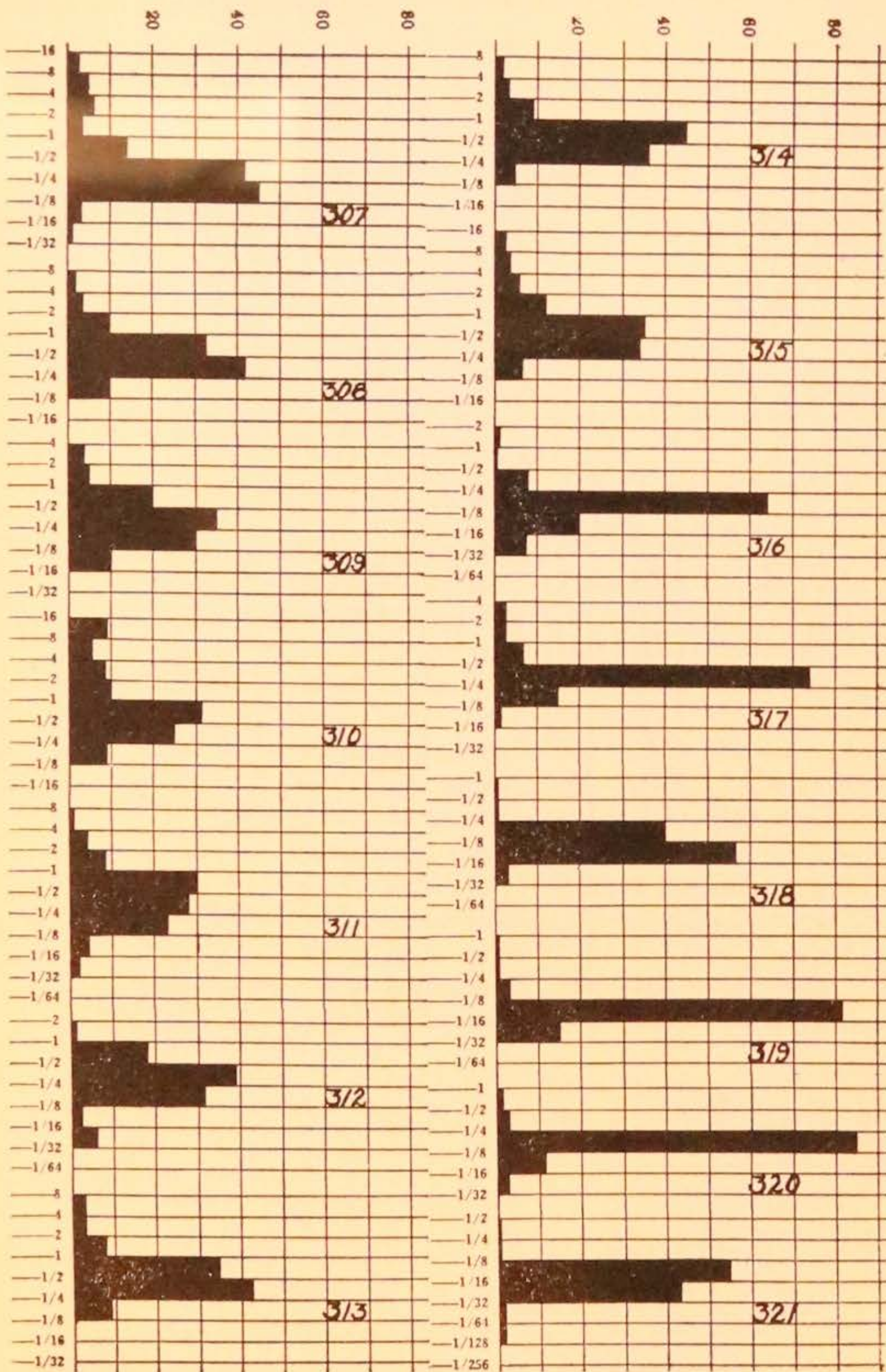
## PLATE XXIII

## FLUVIAL SEDIMENTS

## Sediments from Positions Slightly Off Channels

- Figure 307 (XII— 11) Mississippi River.  
Figure 308 (XII— 23) Mississippi River.  
Figure 309 (XII— 24) Mississippi River.  
Figure 310 (XII— 25) Mississippi River.  
Figure 311 (XII— 47) Mississippi River.  
Figure 312 (XII— 71) Mississippi River.  
Figure 313 (XII— 75) Mississippi River.  
Figure 314 (XII— 76) Mississippi River.  
Figure 315 (XII— 77) Mississippi River.  
Figure 316 (XII—137) Mississippi River.  
Figure 317 (XII—142) Mississippi River.  
Figure 318 (XII—145) Mississippi River.  
Figure 319 (XII—151) Mississippi River.  
Figure 320 (XII—152) Mississippi River.  
Figure 321 (XII—156) Mississippi River.





Figures 307-321



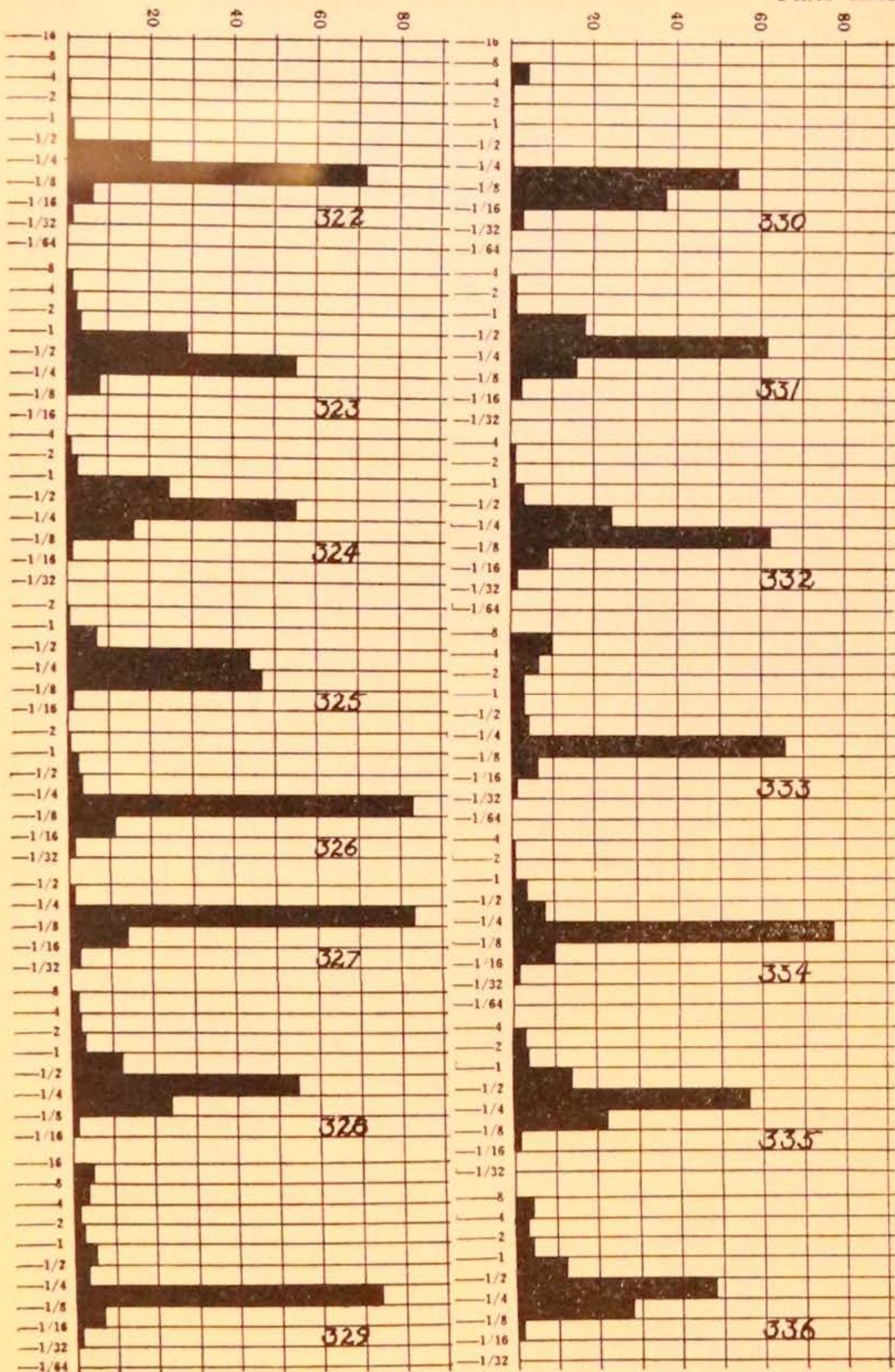
## PLATE XXIV

## FLUVIAL SEDIMENTS

## Sediments from Positions Slightly Off Channels

- Figure 322 (XII—158) Mississippi River.  
Figure 323 (XII—162) Mississippi River.  
Figure 324 (XII—164) Mississippi River.  
Figure 325 (XII—171) Mississippi River.  
Figure 326 (XII—175) Mississippi River.  
Figure 327 (XII—177) Mississippi River.  
Figure 328 (XII—188) Mississippi River.  
Figure 329 (XII—190) Mississippi River.  
Figure 330 (XII—191) Mississippi River.  
Figure 331 (XII—202) Mississippi River.  
Figure 332 (XII—204) Mississippi River.  
Figure 333 (XII—209) Mississippi River.  
Figure 334 (XII—212) Mississippi River.  
Figure 335 (XII—222) Mississippi River.  
Figure 336 (XII—223) Mississippi River.





Figures 322-336



## PLATE XXV

## FLUVIAL SEDIMENTS

## Sediments from Positions Slightly Off Channels

Figure 337 (XII—226) Mississippi River.

Figure 338 (XII—227) Mississippi River.

Figure 339 (XII—234) Mississippi River.

Slack Water Sediments, Considerably Away from Main  
Channels

Figure 340 (XII— 33) Mississippi River.

Figure 341 (XII— 82) Mississippi River.

Figure 342 (XII— 83) Mississippi River.

Figure 343 (XII— 85) Mississippi River.

Figure 344 (XII— 86) Mississippi River.

Figure 345 (XII— 87) Mississippi River.

Figure 346 (XII— 88) Mississippi River.

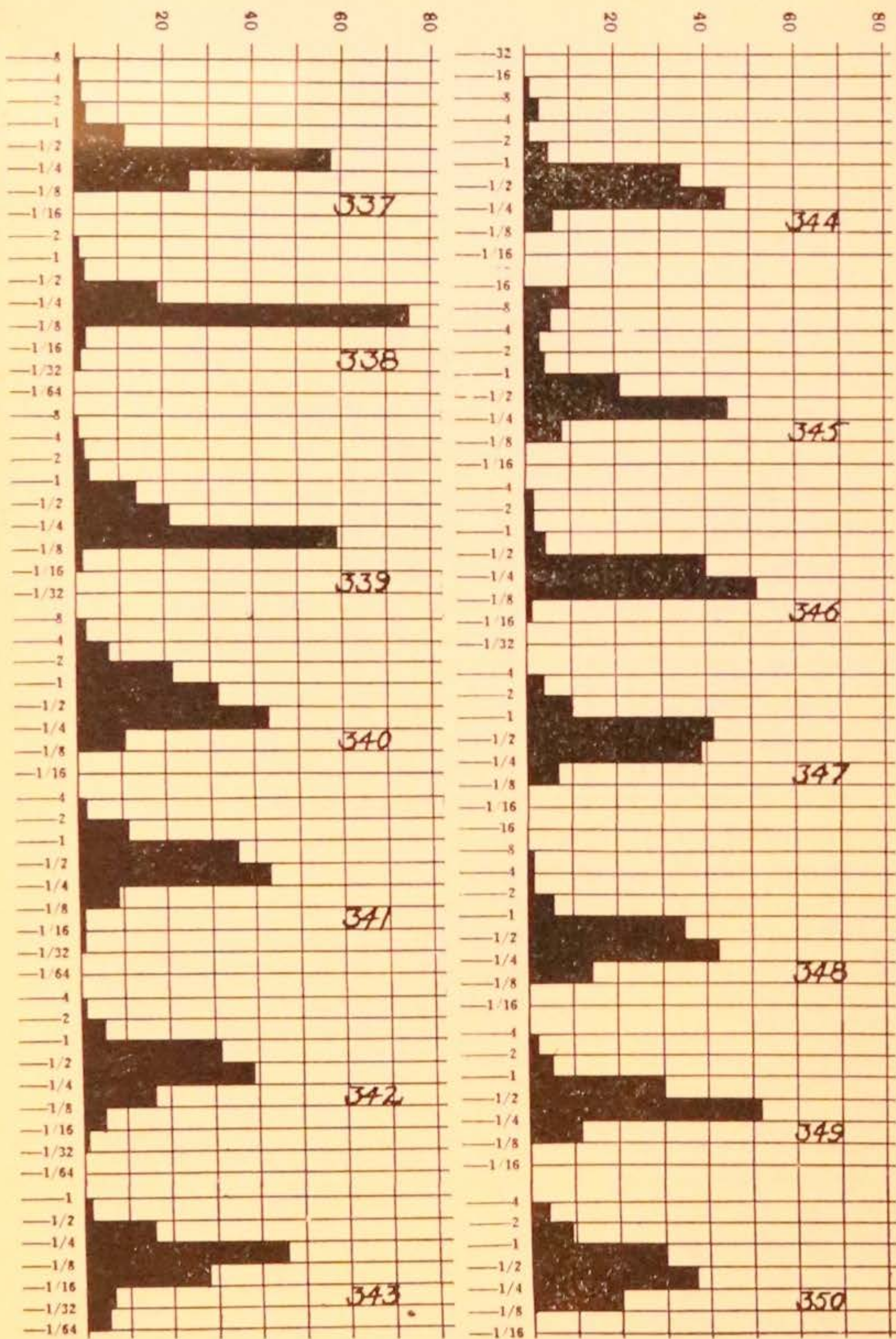
Figure 347 (XII— 95) Mississippi River.

Figure 348 (XII— 96) Mississippi River.

Figure 349 (XII— 97) Mississippi River.

Figure 350 (XII— 98) Mississippi River.





Figures 337-350



## PLATE XXVI

## FLUVIAL SEDIMENTS

Slack Water Sediments, Considerably Away from Main  
Channels

- Figure 351 (XII—101) Mississippi River.  
Figure 352 (XII—102) Mississippi River.  
Figure 353 (XII—103) Mississippi River.  
Figure 354 (XII—104) Mississippi River.  
Figure 355 (XII—106) Mississippi River.  
Figure 356 (XII—107) Mississippi River.  
Figure 357 (XII—108) Mississippi River.  
Figure 358 (XII—110) Mississippi River.  
Figure 359 (XII—112) Mississippi River.  
Figure 360 (XII—115) Mississippi River.  
Figure 361 (XII—116) Mississippi River.  
Figure 362 (XII—122) Mississippi River.  
Figure 363 (XII—123) Mississippi River.  
Figure 364 (XII—124) Mississippi River.  
Figure 365 (XII—126) Mississippi River.  
Figure 366 (XII—127) Mississippi River.







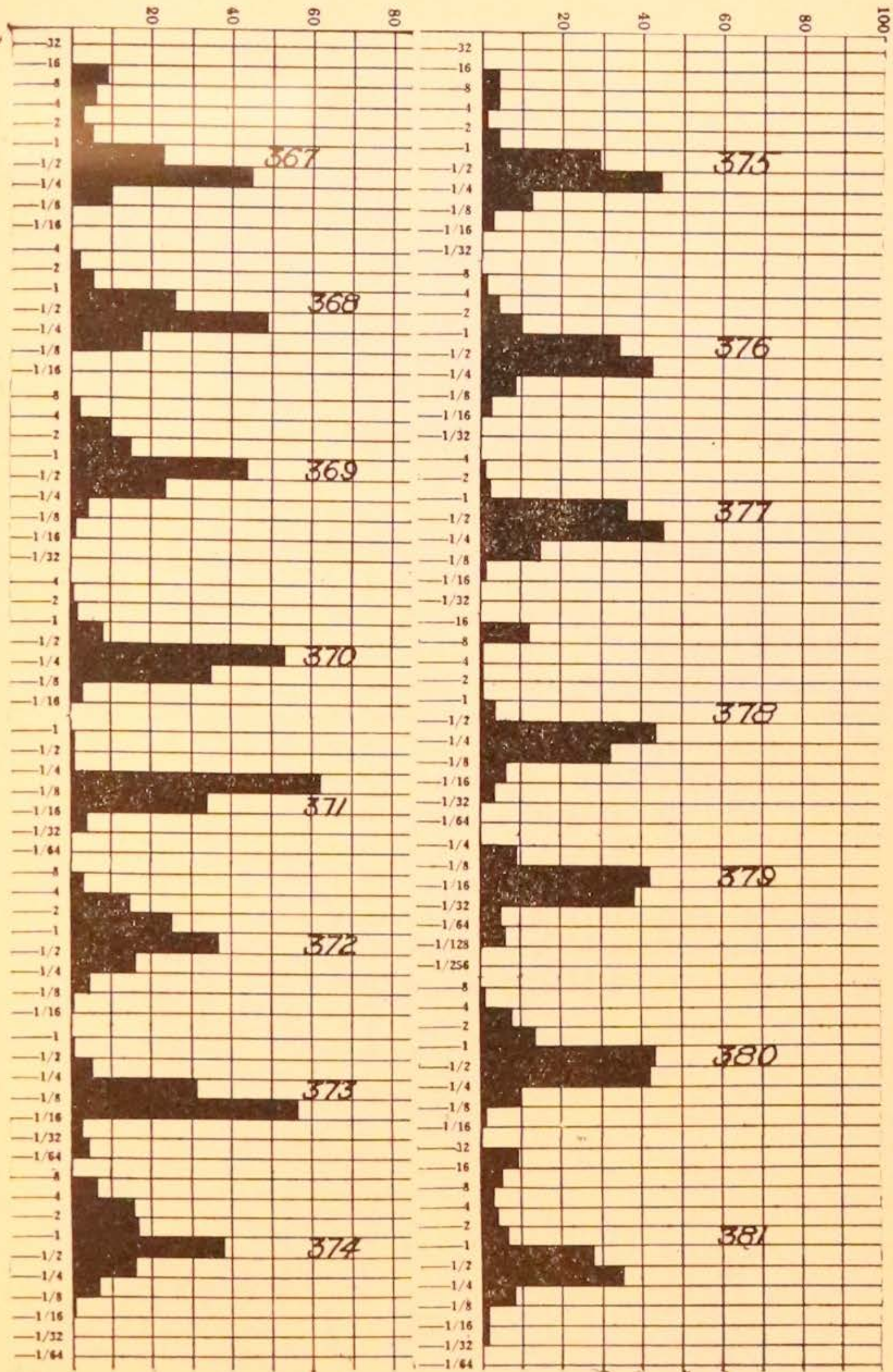
## PLATE XXVII

## FLUVIAL SEDIMENTS

Slack Water Sediments, Considerably Away from Main  
Channels

- Figure 367 (XII—128) Mississippi River.  
Figure 368 (XII—131) Mississippi River.  
Figure 369 (XII—139) Mississippi River.  
Figure 370 (XII—140) Mississippi River.  
Figure 371 (XII—141) Mississippi River.  
Figure 372 (XII—174) Mississippi River.  
Figure 373 (XII—176) Mississippi River.  
Figure 374 (XII—178) Mississippi River.  
Figure 375 (XII—201) Mississippi River.  
Figure 376 (XII—203) Mississippi River.  
Figure 377 (XII—211) Mississippi River.  
Figure 378 (XII—213) Mississippi River.  
Figure 379 (XII—214) Mississippi River.  
Figure 380 (XII—215) Mississippi River.  
Figure 381 (XII—231) Mississippi River.





Figures 367-381



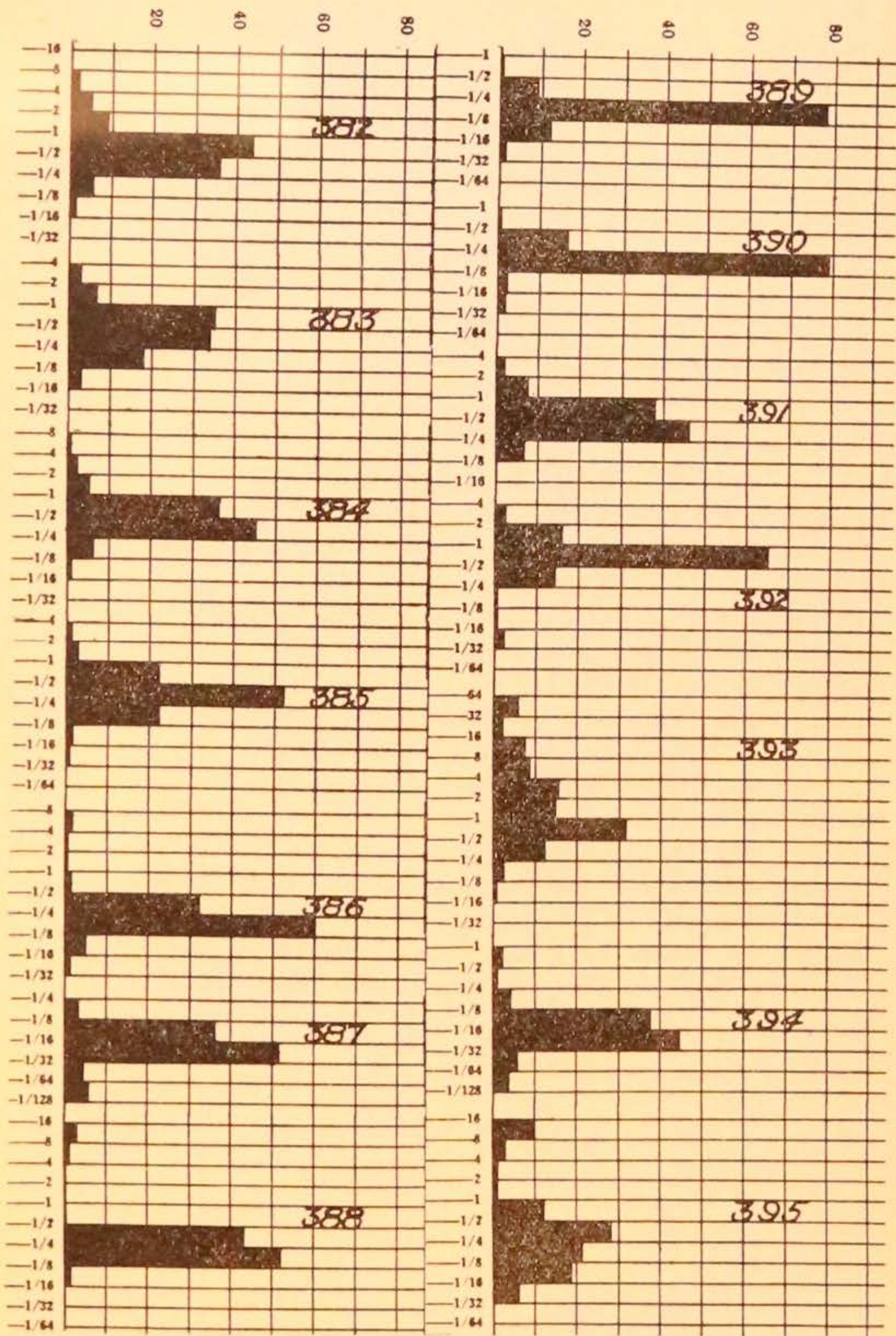
## PLATE XXVIII

## FLUVIAL SEDIMENTS

Slack Water Sediments, Considerably Away from Main  
Channels

- Figure 382 (XII—232) Mississippi River.  
Figure 383 (XII—233) Mississippi River.  
River Bar Sand  
Figure 384 (XII— 3) Mississippi River.  
Figure 385 (XII— 5) Mississippi River.  
Figure 386 (XII—154) Mississippi River.  
Figure 387 (XII—160) Mississippi River.  
Figure 388 (XII—167) Mississippi River.  
Figure 389 (XII—168) Mississippi River.  
Figure 390 (XII—169) Mississippi River.  
Figure 391 (XII—170) Mississippi River.  
Figure 392 (XII—180) Mississippi River.  
Figure 393 (XII—181) Mississippi River.  
Figure 394 (XII—183) Mississippi River.  
Figure 395 (XII—218) Mississippi River.





Figures 382-395



## PLATE XXIX

## FLUVIAL SEDIMENTS

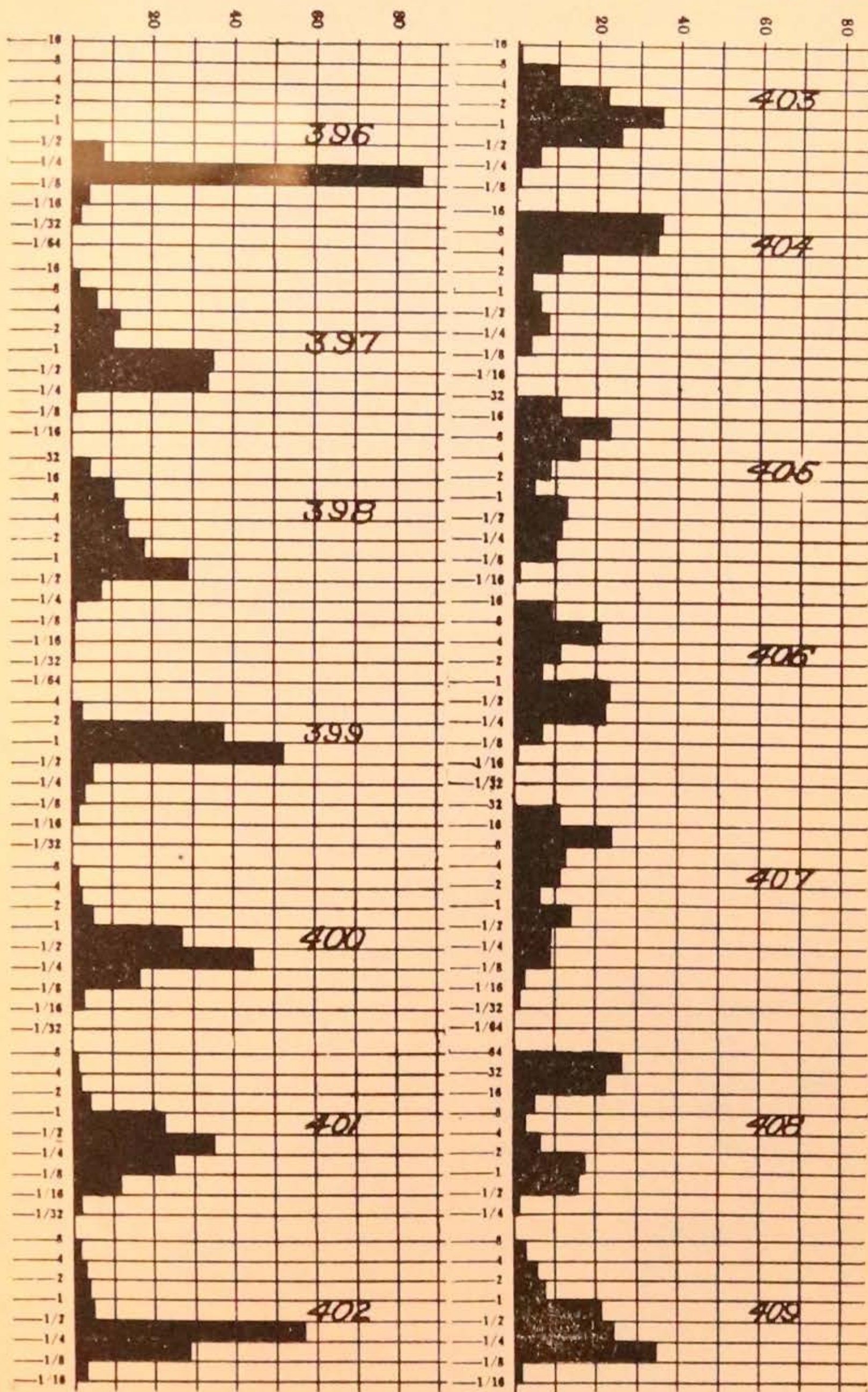
## River Bar Sand

- Figure 396 (XII—229) Mississippi River.  
Figure 397 (XI—1729B) River bar sand, Virginia.  
Figure 398 (XI—1729C) River bar sand and pebbles, Virginia.  
Figure 399 (VIII—110) River bar sand, Georgia.  
Figure 400 (VIII—214) River bar sand, Georgia.  
Figure 401 (VIII—241) River bar sand, Georgia.  
Figure 402 (VI—211) River bar sand, Missouri.

## River Lag Sand and Gravel

- Figure 403 (XI—1729D) River lag sand, Virginia.  
Figure 404 (XII— 46) Lag gravel, Mississippi River.  
Figure 405 (XII— 60) Lag gravel, Mississippi River.  
Figure 406 (XII—132) Lag gravel, Mississippi River.  
Figure 407 (XII—179) Lag gravel, Mississippi River.  
Figure 408 (XII—193) Lag gravel, Mississippi River.  
Figure 409 (XII—194) Lag sand, Mississippi River.





Figures 396-409



## PLATE XXX

## FLUVIAL SEDIMENTS

## River Lag Sand and Gravel

Figure 410 (XII—220) Lag sand, Mississippi River.

## Sand from Small Dry Channels

Figure 411 (III— 81) Medium sand from dry channel, Island of Oahu.

Figure 412 (III—664B) Medium sand from dry channel, Island of Oahu.

Figure 413 (III— 841) Medium sand from dry channel, Island of Oahu.

Figure 414 (III—1821) Medium sand from dry channel, Island of Oahu.

Figure 415 (III—1859) Medium sand from dry channel, Island of Oahu.

Figure 416 (III—1860) Medium sand from dry channel, Island of Oahu.

## Fluvial Terrace Materials

Figure 417 (I—24) Terrace gravel, Illinois.

Figure 418 (I—25) Terrace gravel, Illinois.

Figure 419 (I—26) Terrace gravel, Illinois.

Figure 420 (I—27) Terrace gravel, Illinois.

Figure 421 (I—28) Terrace gravel, Illinois.

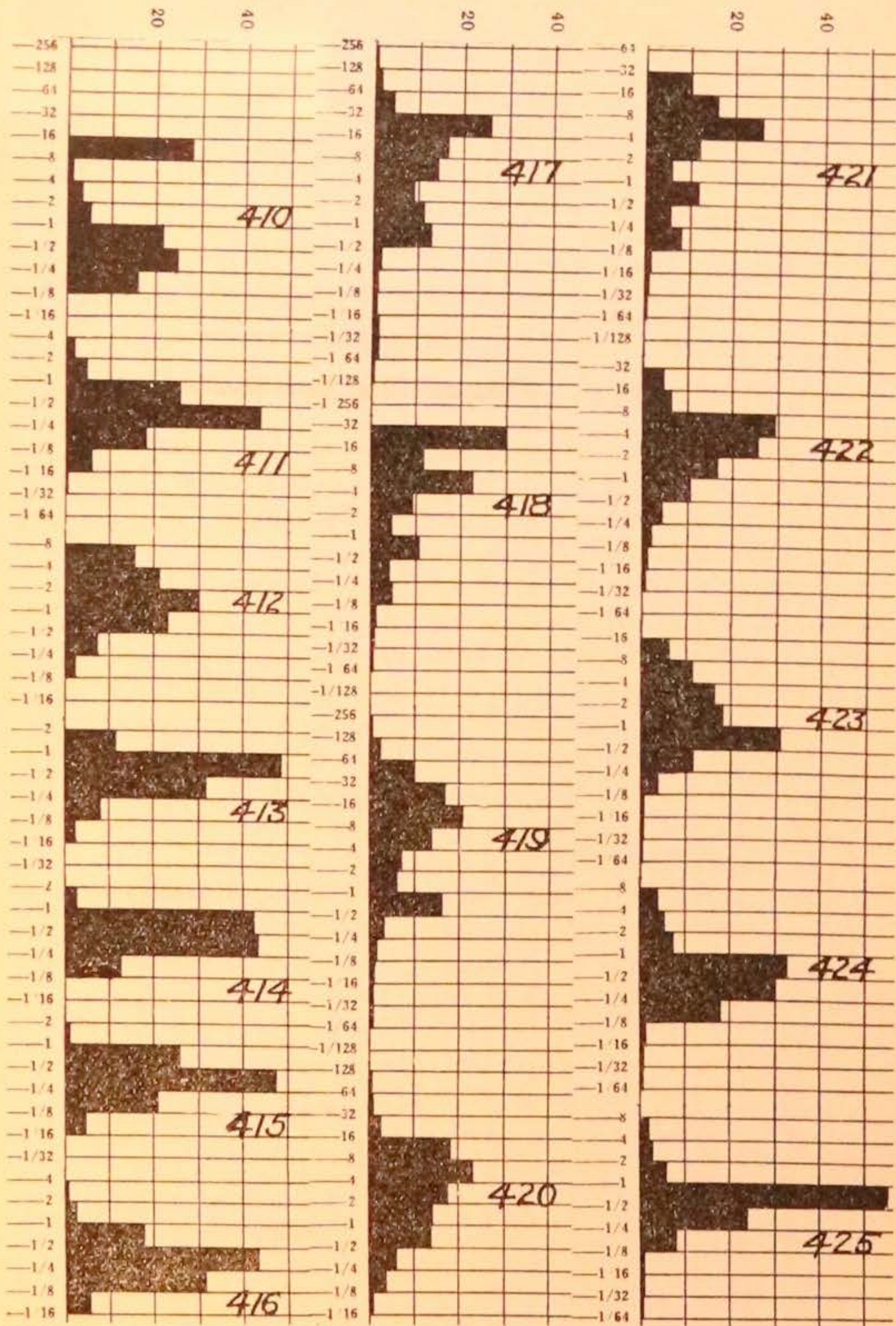
Figure 422 (I—29) Terrace gravel, Illinois.

Figure 423 (I—30) Terrace gravel, Illinois.

Figure 424 (I—31) Terrace sand, Illinois.

Figure 425 (I—32) Terrace sand, Illinois.





Figures 410-425



## PLATE XXXI

## FLUVIAL SEDIMENTS

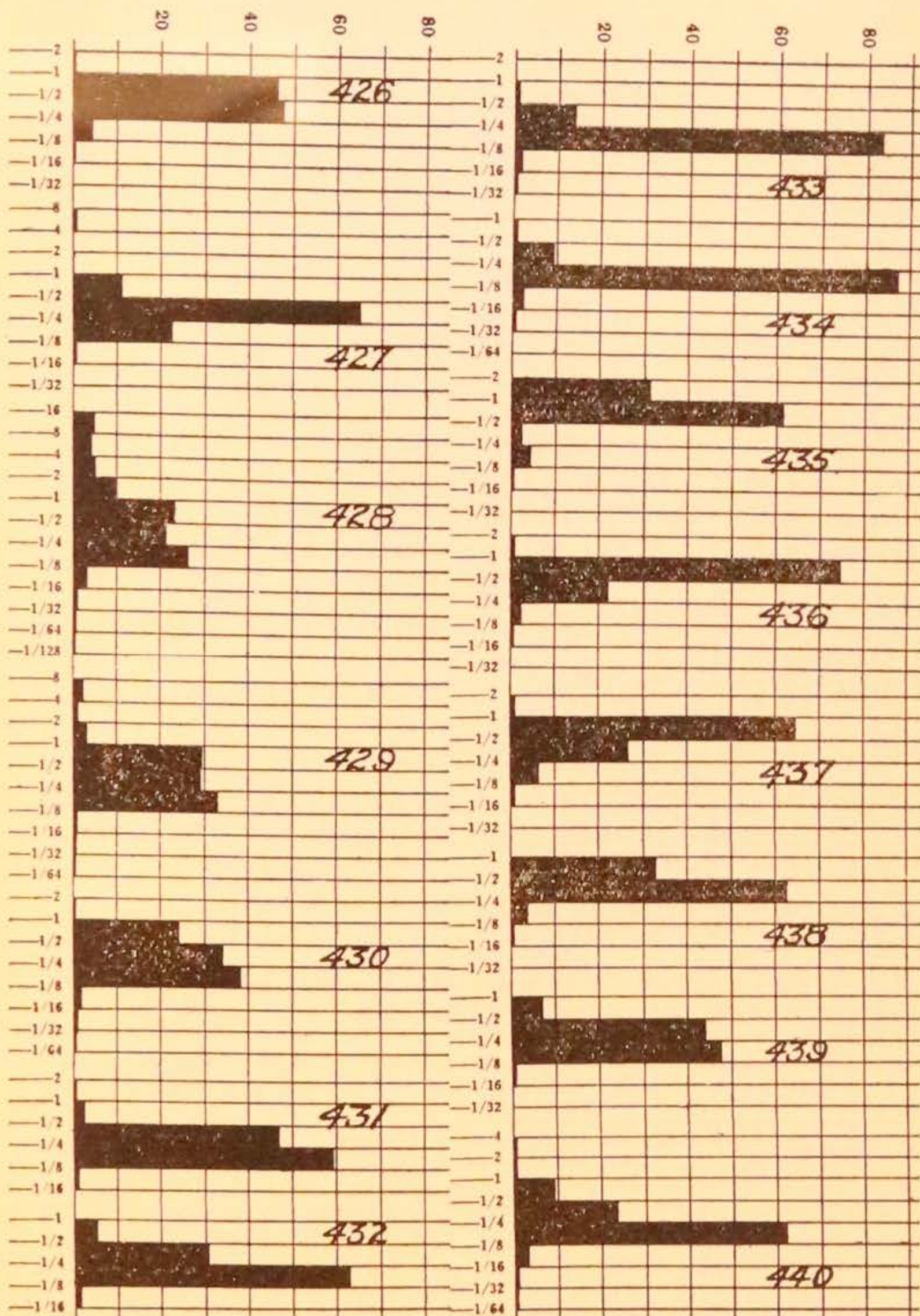
## Fluvial Terrace Materials

- Figure 426 (I—33) Terrace sand, cross-bedded, Illinois.  
Figure 427 (I—34) Sand from single oblique layer, Illinois.  
Figure 428 (I—35) Terrace gravel, Illinois.  
Figure 429 (I—36) Terrace sand, Illinois.

## Terrace Materials, Single Layers

- Figure 430 (I—19) Glacial sand, Illinois.  
Figure 431 (I—20) Glacial sand, Illinois.  
Figure 432 (I—21) Glacial sand, from single oblique layer, Illinois.  
Figure 433 (I—22) Glacial sand, Illinois.  
Figure 434 (I—23) Glacial sand, Illinois.  
Figure 435 (I—37) Terrace sand, Illinois.  
Figure 436 (I—39) Terrace sand, Illinois.  
Figure 437 (I—40) Sand from oblique layer, Illinois.  
Figure 438 (I—41) Sand from oblique layer, Illinois.  
Figure 439 (I—42) Sand from oblique layer, Illinois.  
Figure 440 (I—43) Terrace sand, Iowa.





Figures 426-440



## PLATE XXXII

## FLUVIAL SEDIMENTS

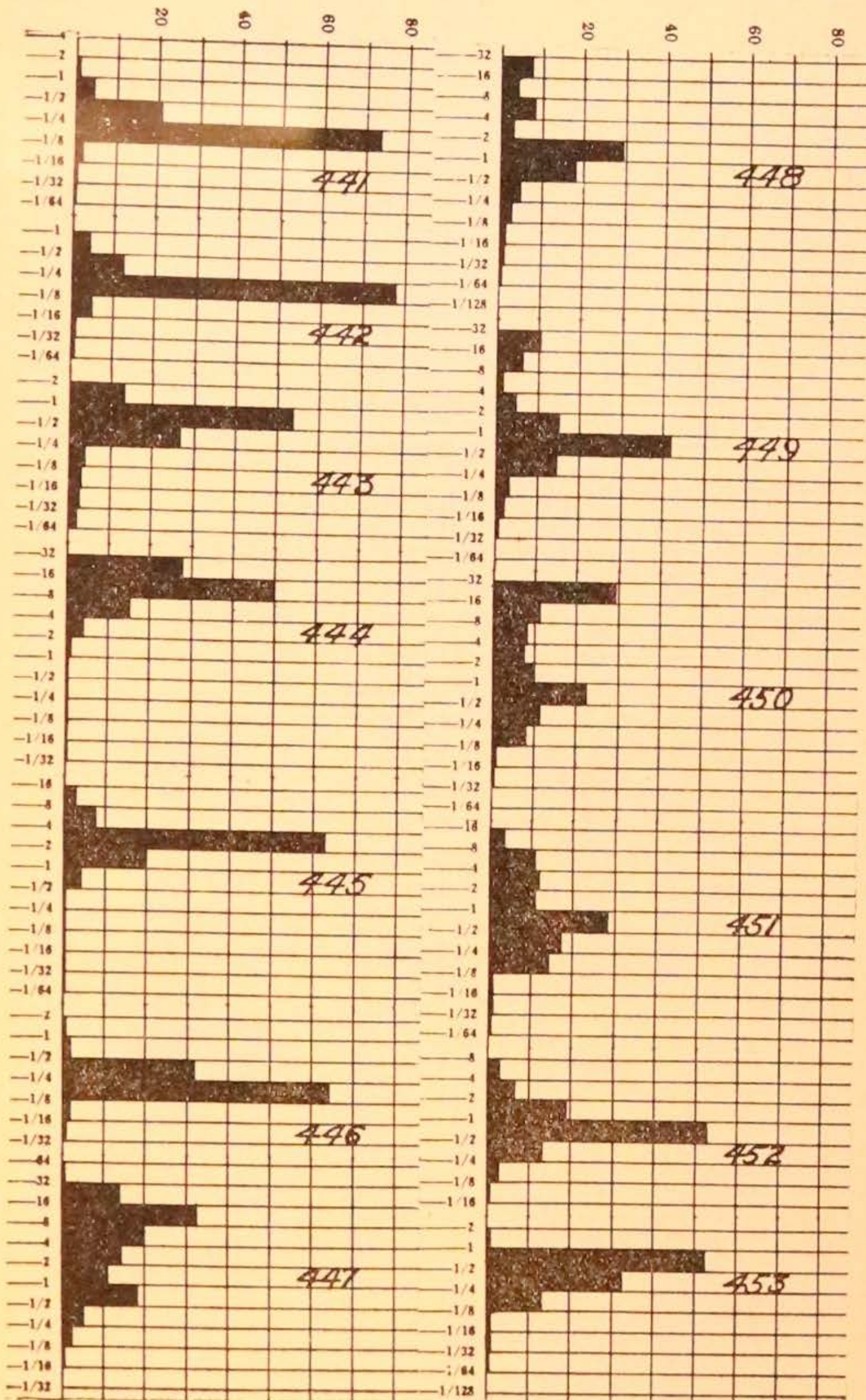
## Terrace Materials, Single Layers

- Figure 441 (I—44) Sand from oblique layer, Illinois.  
Figure 442 (I—45) Sand from single layer, Illinois.  
Figure 443 (VI—175) Glacial sand, Missouri.  
Figure 444 (II—334A) Terrace gravel from single layer,  
Maryland.  
Figure 445 (II—334D) Terrace gravel from single layer,  
Maryland.  
Figure 446 (II—334E) Terrace sand from single layer, Mary-  
land.

## Fluvio-glacial Sediments

- Figure 447 (I— 9) Glacial terrace gravel, Illinois.  
Figure 448 (I—10) Glacial gravel from pocket in till, Illinois.  
Figure 449 (I—11) Glacial terrace gravel, Illinois.  
Figure 450 (I—12) Glacial terrace gravel, Illinois.  
Figure 451 (I—13) Glacial gravel, South Dakota.  
Figure 452 (I—14) Glacial terrace gravel, Illinois.  
Figure 453 (I—15) Glacial sand, Iowa.





Figures 441-453



## PLATE XXXIII

## FLUVIAL SEDIMENTS

## Fluvio-glacial Sediments

- Figure 454 (I—16) Glacial terrace sand, Illinois  
Figure 455 (I—17) Glacial terrace sand, Illinois.  
Figure 456 (I—18) Glacial terrace sand, Illinois.

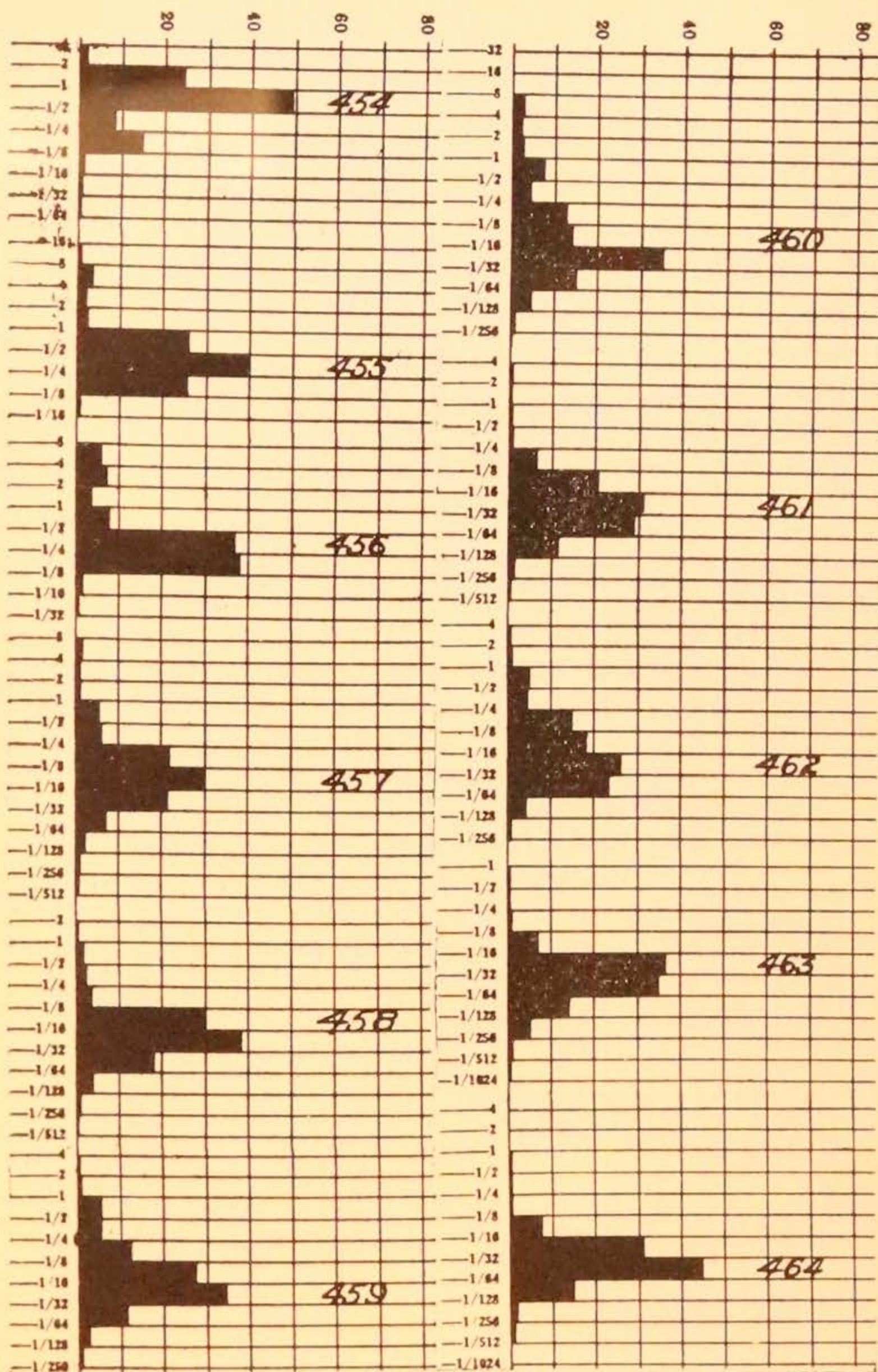
## Silt from Large Streams

- Figure 457 (I—100) Alluvium, Iowa.  
Figure 458 (I—101) Alluvium, Iowa.  
Figure 459 (I—102) Alluvium, Iowa.  
Figure 460 (I—103) Alluvium, Illinois.  
Figure 461 (I—104) Alluvium, Iowa.

## Silt from Mississippi Terraces

- Figure 462 (I—37) Terrace material, Iowa.  
Figure 463 (I—46) Glacial silt, single layer, Iowa.  
Figure 464 (I—47) Glacial silt, single layer, Iowa.





Figures 454-464



## PLATE XXXIV

## FLUVIAL SEDIMENTS

## Silt from Mississippi Terraces

- Figure 465 (I—48) Glacial silt, Iowa.  
Figure 466 (I—49) Glacial silt, single layer, Iowa.  
Figure 467 (I—50) Glacial silt, single layer, Iowa.  
Figure 468 (I—51) Glacial silt, single layer, Iowa.  
Figure 469 (I—52) Glacial silt, single layer, Iowa.  
Figure 470 (I—53) Glacial silt, single layer, Iowa.  
Figure 471 (I—54) Glacial silt, single layer, Iowa.  
Figure 472 (I—55) Glacial silt, single layer, Iowa.

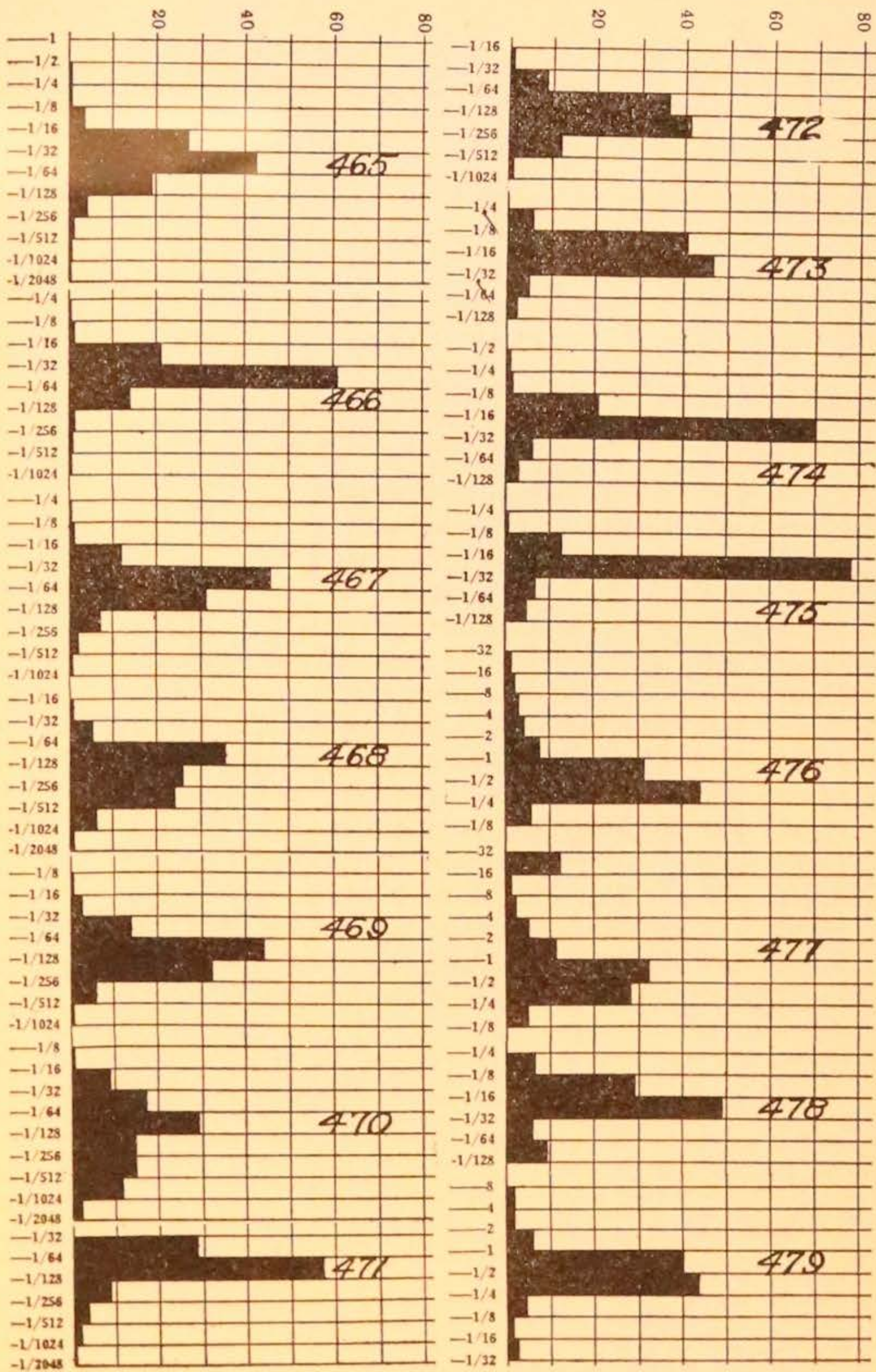
## Bankland Silt, Mississippi Delta

- Figure 473 (I—45) Silt, Louisiana.  
Figure 474 (I—46) Silt, Louisiana.  
Figure 475 (I—78) Silt, Louisiana.

## Natural Levee Sediments

- Figure 476 (XII— 13) Mississippi River.  
Figure 477 (XII— 89) Mississippi River.  
Figure 478 (XII—159) Mississippi River.  
Figure 479 (XII—230) Mississippi River.





Figures 465-479



## PLATE XXXV

## FLUVIAL SEDIMENTS

## Silt from Small Streams

Figure 480 (I—70) Alluvium, Maryland.

Figure 481 (I—71) Silt, South Dakota.

Figure 482 (I—72) Alluvium, Maryland.

Figure 483 (I—73) Silt, Maryland.

## Heavy Concentrates

Figure 484 (III—120) Olivine sand, rill channel, Oahu.

Figure 485 (III—523) Magnetite sand, rill channel, Oahu.

Figure 486 (XI—1543) Black sand, rill channel, Virginia.

Figure 487 (XI—1578) Black sand, rill channel, Virginia.

Figure 488 (I—338) Magnetite-Quartz sand, Texas.

Figure 489 (I—340) Magnetite-Quartz sand, Texas.

Figure 490 (I—343) Magnetite-Quartz sand, Texas.

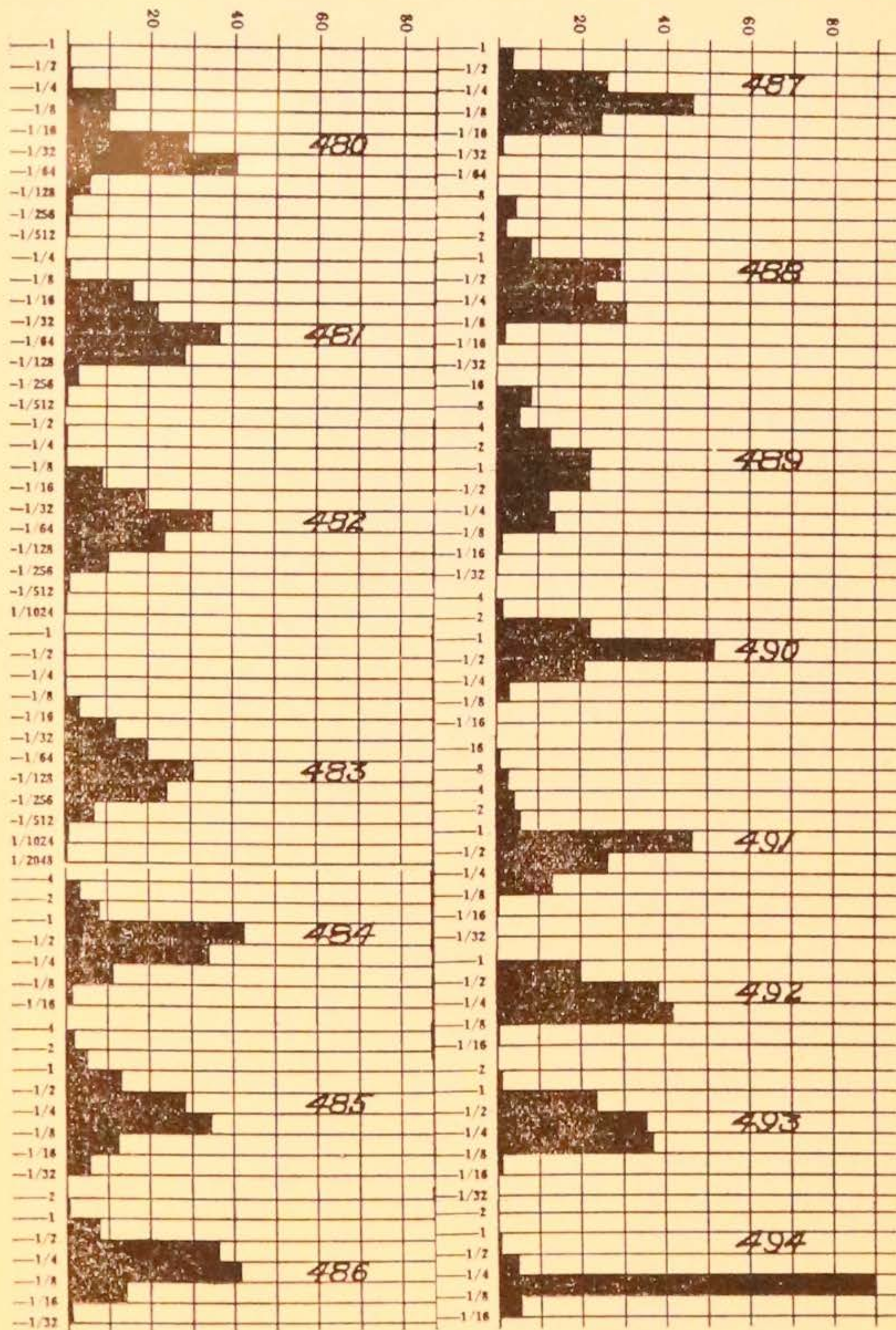
Figure 491 (I—344) Magnetite-Quartz sand, Texas.

Figure 492 (I—345) Magnetite portion, No. 338, Texas.

Figure 493 (I—347) Magnetite portion, No. 340, Texas.

Figure 494 (I—350) Magnetite portion, No. 343, Texas.





Figures 480-494



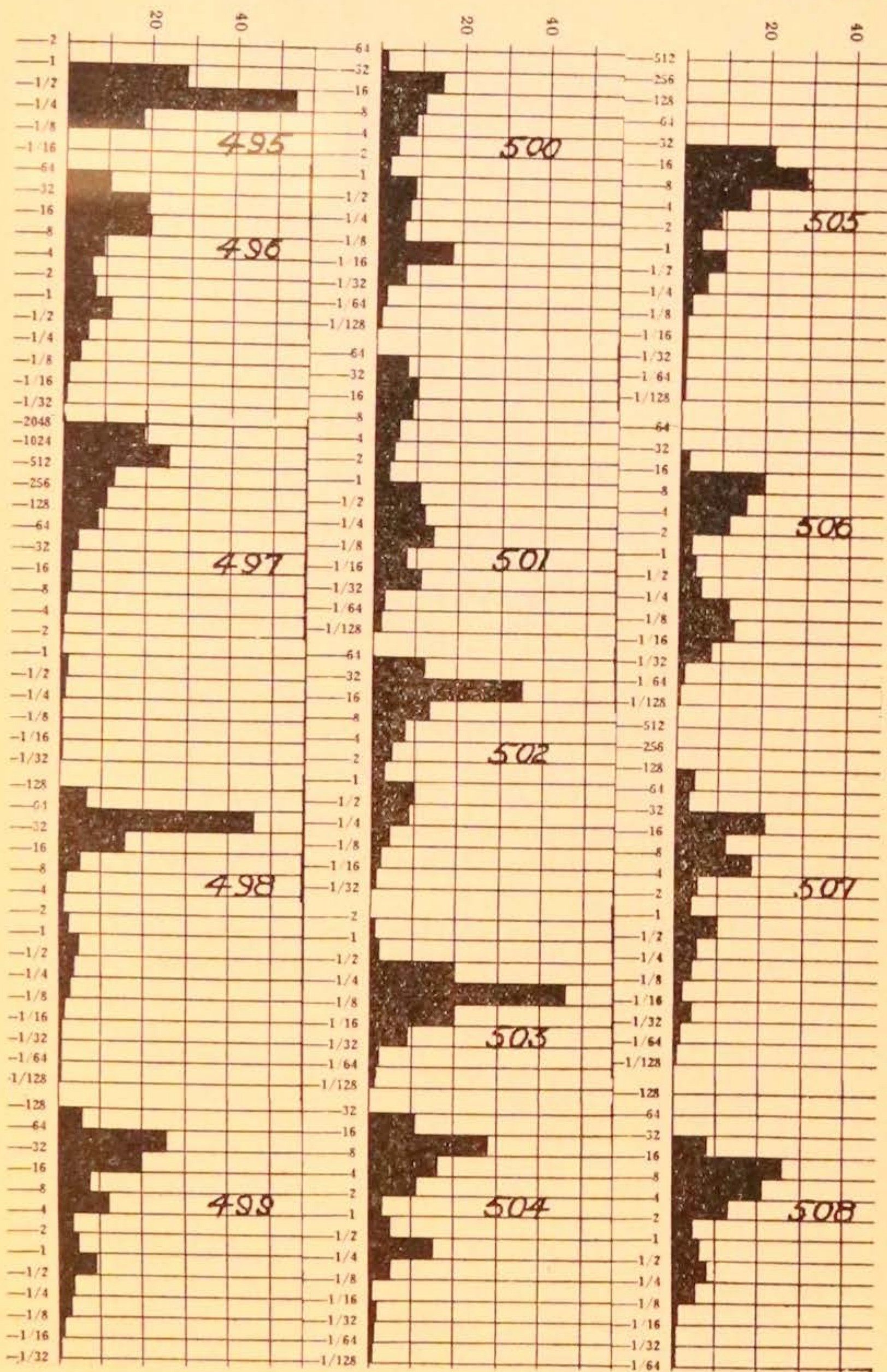
## PLATE XXXVI

## FLUVIAL SEDIMENTS

## Heavy Concentrates

- Figure 495 (I—351) Magnetite portion, No. 344, Texas.  
Ancient Fluvial Sediments
- Figure 496 (II—74A) Gravel, Pleistocene terrace, Maryland.  
Figure 497 (II—116M) Gravel, Wicomico terrace, D. C.  
Figure 498 (II—133) Gravel, Brandywine terrace, D. C.  
Figure 499 (II—138) Gravel, Sunderland terrace, D. C.  
Figure 500 (II—146) Gravel, Tenley terrace, D. C.  
Figure 501 (II—165T) Gravel, Tenley terrace, D. C.  
Figure 502 (II—323) Gravel, Brandywine terrace, Maryland.  
Figure 503 (II—329) Sand, Brandywine terrace, Maryland.  
Figure 504 (II—330) Gravel, Brandywine terrace, Maryland.  
Figure 505 (II—334F) Gravel, Brandywine terrace, Maryland.  
land.
- Figure 506 (II—345) Gravel, Brandywine terrace, Maryland.  
Figure 507 (II—379M) Gravel, Sunderland terrace, D. C.  
Figure 508 (II—440B) Gravel, Sunderland terrace, D. C.





Figures 495-508



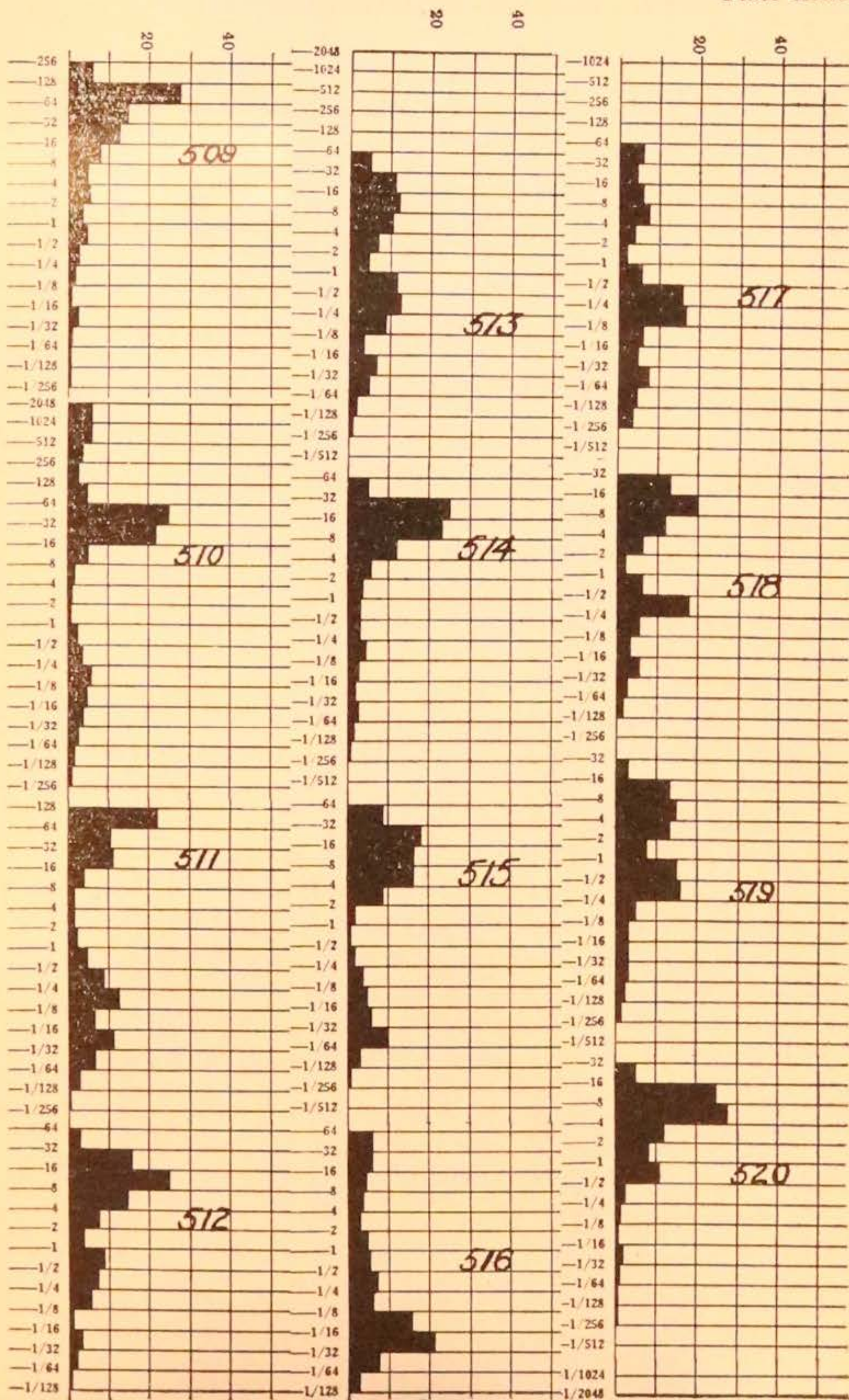
## PLATE XXXVII

## FLUVIAL SEDIMENTS

## Ancient Fluvial Sediments

- Figure 509 (II—480A) Gravel, Sunderland terrace, Virginia.  
Figure 510 (II—546) Gravel, Sunderland terrace, Maryland.  
Figure 511 (II—571) Gravel, Pleistocene terrace, Virginia.  
Figure 512 (II—579) Gravel, Sunderland terrace, Virginia.  
Figure 513 (II—588) Gravel, Tenley terrace, Virginia.  
Figure 514 (II—591) Gravel, Tenley terrace, Virginia.  
Figure 515 (II—619) Gravel, Brandywine terrace, West Virginia.  
Figure 516 (II—693) Gravel, Tenley terrace, Pennsylvania.  
Figure 517 (II—702) Gravel, Tenley terrace, Pennsylvania.  
Figure 518 (II—726) Gravel, Brandywine terrace, Pennsylvania.  
Figure 519 (II—814) Gravel, Pleistocene terrace, Maryland.  
Figure 520 (II—823) Gravel, Sunderland terrace, Maryland.





Figures 509-520



## PLATE XXXVIII

## FLUVIAL SEDIMENTS

## Ancient Fluvial Sediments

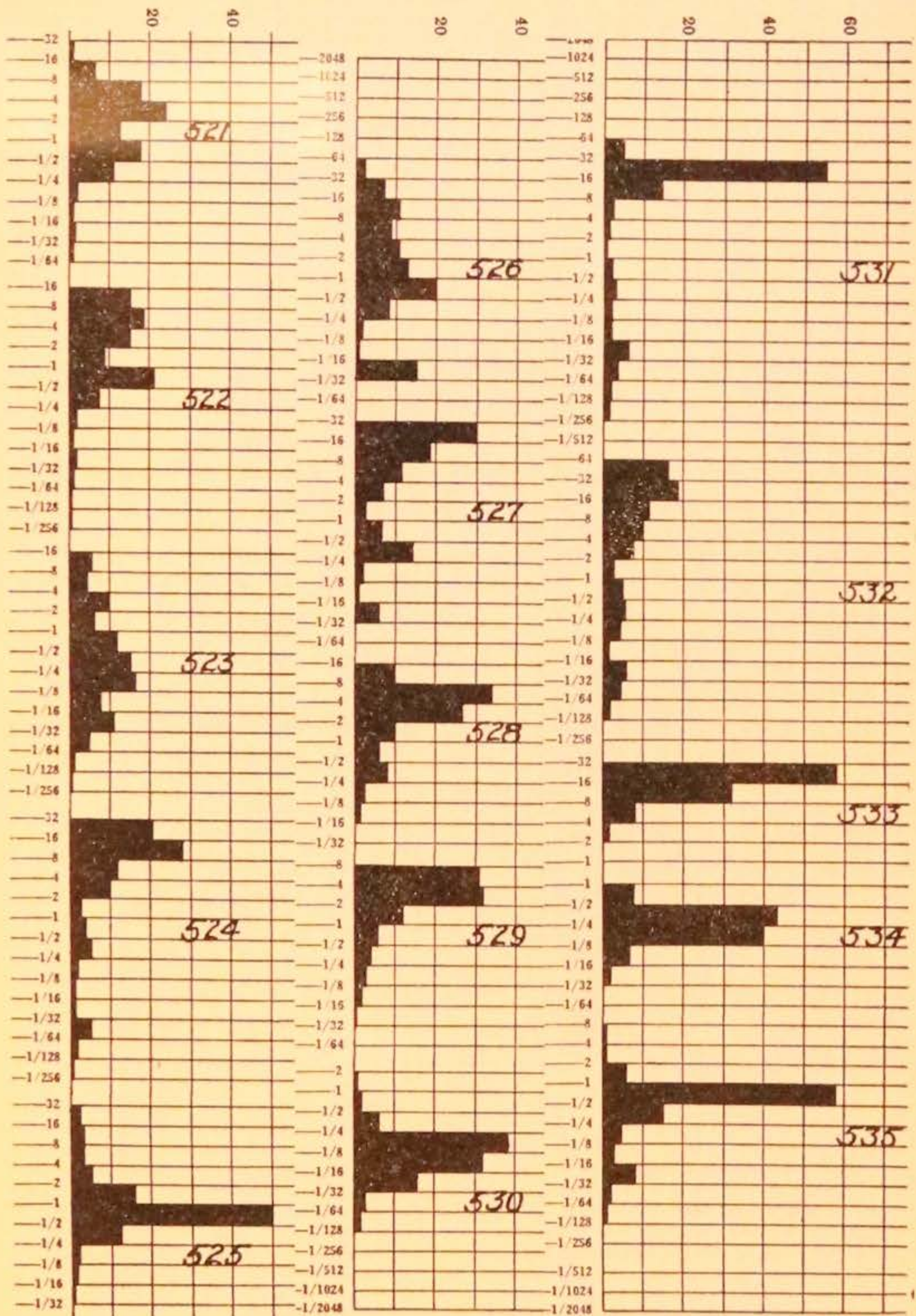
- Figure 521 (II—828) Gravel, Sunderland terrace, Maryland.  
 Figure 522 (II—848) Gravel, Sunderland terrace, Maryland.  
 Figure 523 (II—896) Gravel, Sunderland terrace, Virginia.  
 Figure 524 (II—983) Gravel, Sunderland terrace, Virginia.  
 Figure 525 (XI—1364) Gravel, Sunderland terrace, Virginia.  
 Figure 526 (XI—1387C) Gravel, Brandywine terrace, Virginia.

- Figure 527 (XI—1444) Gravel, Brandywine terrace, Virginia.  
 Figure 528 (XI—1686) Gravel, Sunderland terrace, Virginia.  
 Figure 529 (XI—1999) Gravel, Pleistocene terrace, Virginia.

Ancient Sediments, Probably Mostly Fluvial but in Part  
 Possibly Deltaic or Littoral Marine

- Figure 530 (II—130A) Sand, Patuxent formation, Maryland.  
 Figure 531 (II—164) Gravel, Patuxent formation, D. C.  
 Figure 532 (II—165) Gravel, Patuxent formation, D. C.  
 Figure 533 (II—167) Gravel, Patuxent formation, D. C.  
 Figure 534 (II—234) Sand, Patuxent formation, D. C.  
 Figure 535 (II—377C) Sand, Patuxent formation, D. C.





Figures 521-535



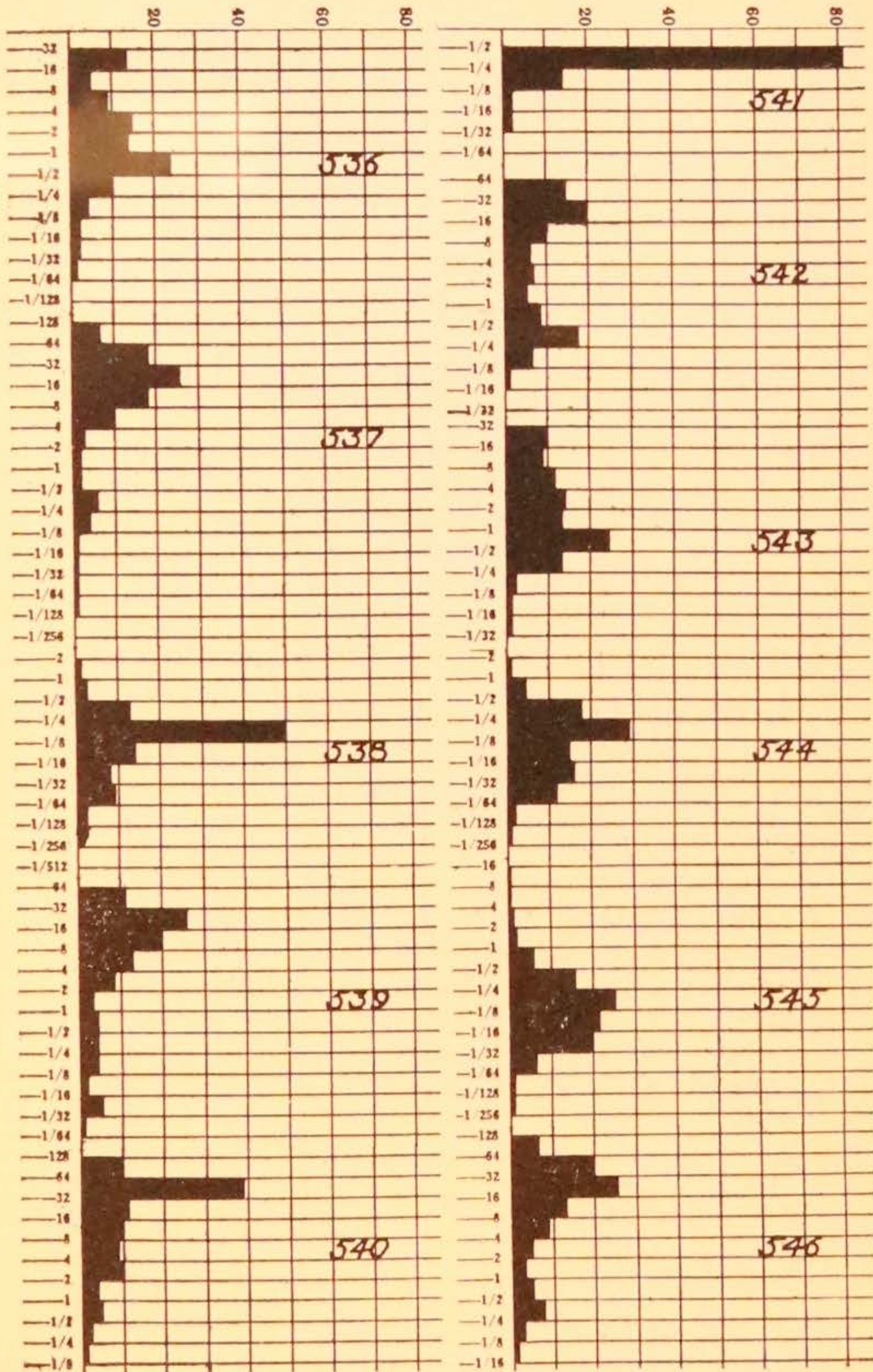
## PLATE XXXIX

## FLUVIAL SEDIMENTS

Ancient Sediments, Probably Mostly Fluvial but in Part  
Possibly Deltaic or Littoral Marine

- Figure 536 (II—377E) Gravel, Patuxent formation, D. C.  
Figure 537 (II—383) Gravel, Patuxent formation, D. C.  
Figure 538 (II—977E) Sand, Patuxent formation, D. C.  
Figure 539 (II—977K) Gravel, Patuxent formation, D. C.  
Figure 540 (II—977X) Gravel, Patuxent formation, D. C.  
Figure 541 (XI—1387A) Sand, Patuxent formation, Virginia.  
Figure 542 (XI—1387B) Gravel, Patuxent formation, Virginia.  
Figure 543 (XI—1434) Gravel, Patuxent formation, Virginia.  
Figure 544 (II—984) Sand, Sunderland terrace, Virginia.  
Figure 545 (II—1009) Sand, Sunderland terrace, Virginia.  
Figure 546 (II—45) Gravel, Pleistocene terrace, Maryland.





Figures 536-546



## PLATE XL

## FLUVIAL SEDIMENTS

Ancient Sediments, Probably Mostly Fluvial but in Part  
Possibly Deltaic or Littoral Marine

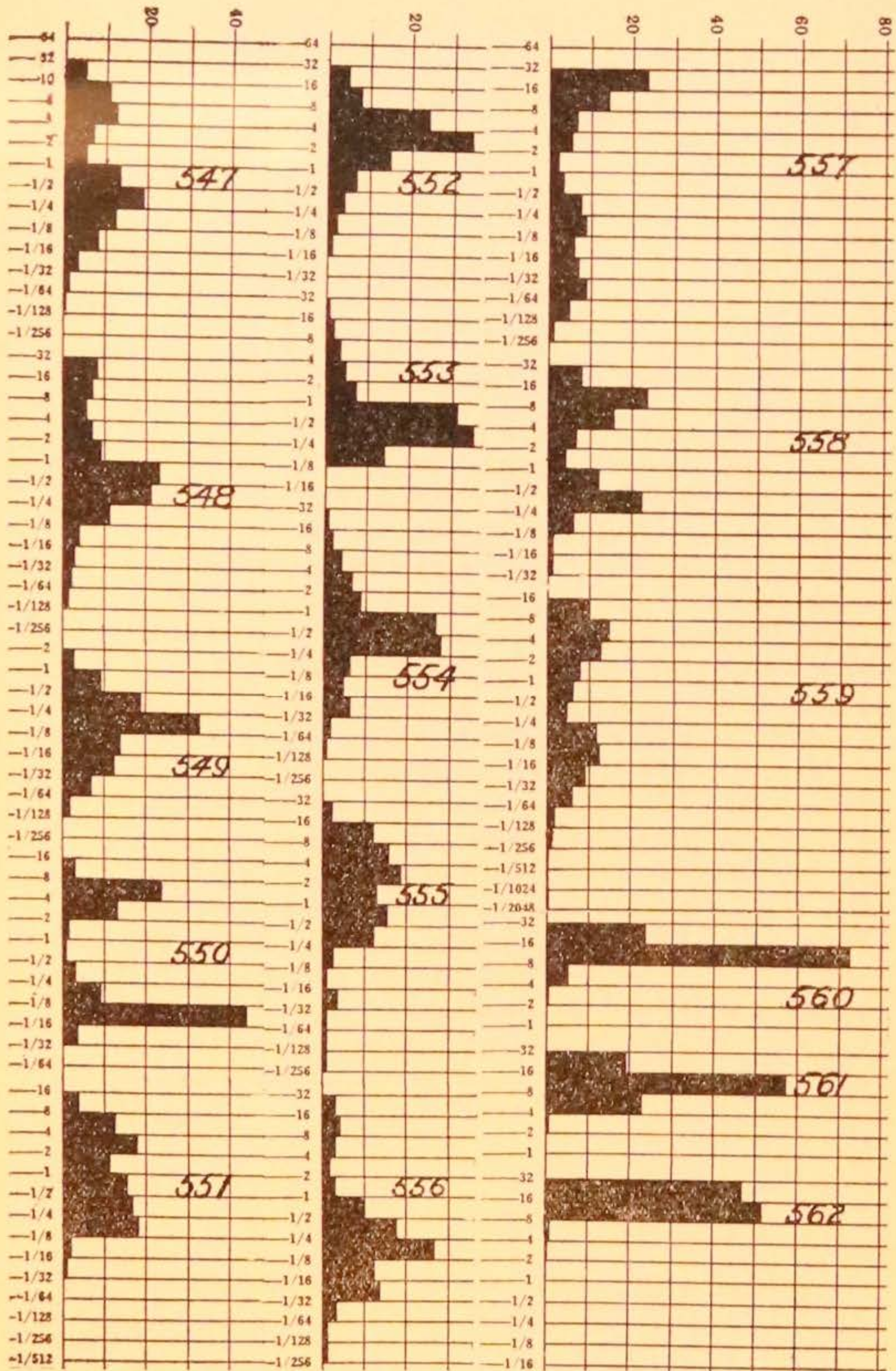
- Figure 547 (II—735A) Gravel, Pleistocene terrace, New Jersey.
- Figure 548 (II—735B) Gravel, Pleistocene terrace, New Jersey.
- Figure 549 (II—735C) Sand, Pleistocene terrace, New Jersey.
- Figure 550 (II—736) Gravel, Pleistocene terrace, New Jersey.
- Figure 551 (II—830) Gravel, Pleistocene terrace, Maryland.
- Figure 552 (II—838) Gravel, Pleistocene terrace, Maryland.
- Figure 553 (II—841) Sand, Pleistocene terrace, Maryland.
- Figure 554 (II—995A) Sand, Pleistocene terrace, Virginia.
- Figure 555 (II—995B) Gravel, Pleistocene terrace, Virginia.
- Figure 556 (II—1000) Gravel, Pleistocene terrace, Virginia.
- Figure 557 (II—1022) Gravel, Pleistocene terrace, Maryland.
- Figure 558 (II—1042) Gravel, Pleistocene terrace, Maryland.
- Figure 559 (II—1043) Gravel, Pleistocene terrace, Maryland.

## MARINE SEDIMENTS

## Beach Gravel

- Figure 560 (I—114) Beach gravel, Texas.
- Figure 561 (I—115) Beach gravel, Massachusetts.
- Figure 562 (I—116) Beach gravel, Texas.





Figures 547-562



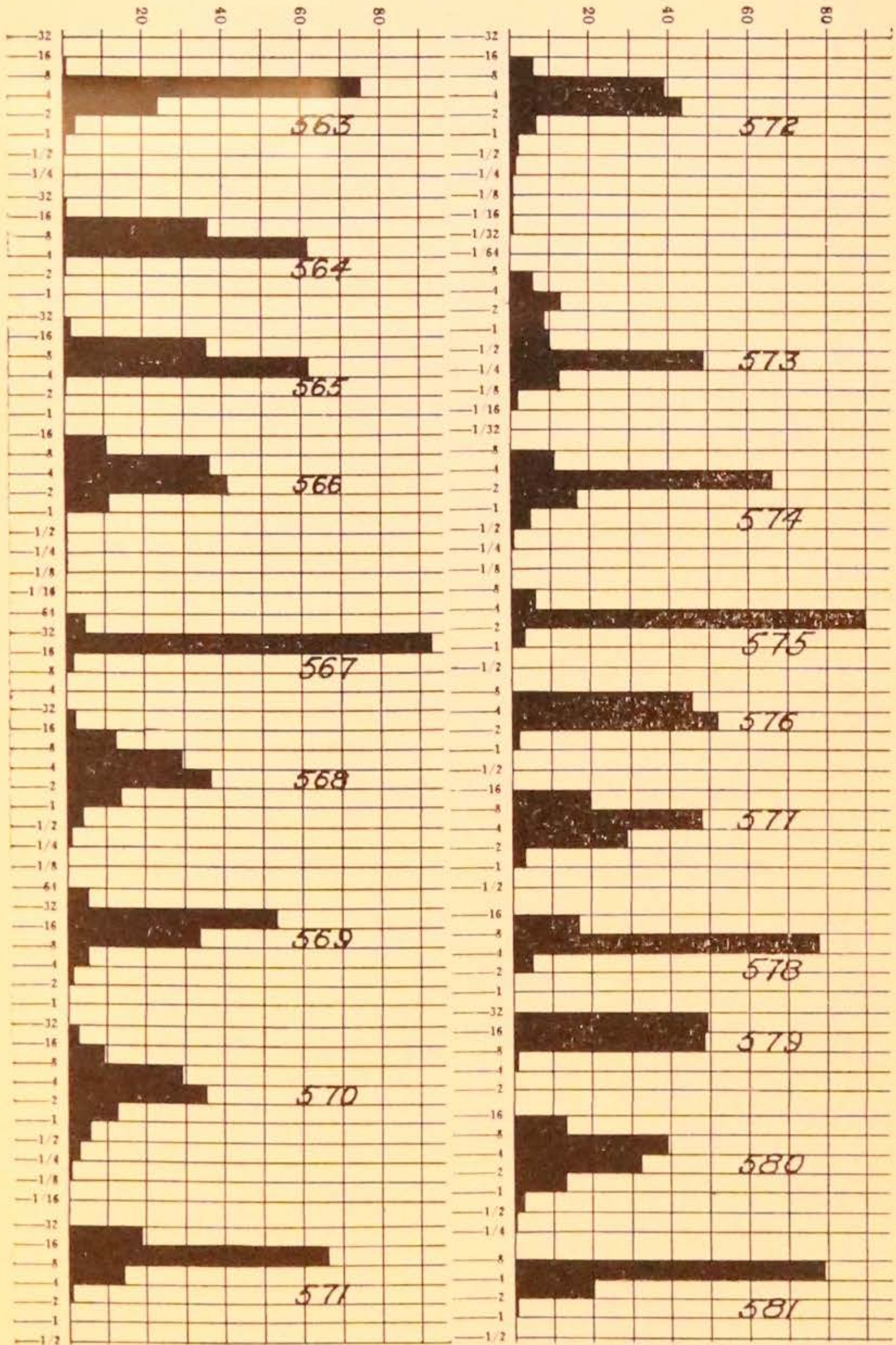
## PLATE XLI

## MARINE SEDIMENTS

## Beach Gravel

- Figure 563 (I—117) Beach gravel, Alaska.  
Figure 564 (I—118) Beach gravel, Texas.  
Figure 565 (I—119) Beach gravel, Texas.  
Figure 566 (I—120) Beach gravel, Alaska.  
Figure 567 (II—731) Beach gravel, Massachusetts.  
Figure 568 (II—733R) Beach gravel, Massachusetts.  
Figure 569 (II—733R2) Beach gravel, Massachusetts.  
Figure 570 (II—820) Beach gravel, Virginia.  
Figure 571 (II—843) Beach gravel, Maryland.  
Figure 572 (II—1055C) Beach gravel, Maryland  
Figure 573 (XI—1747A) Beach gravel, Virginia.  
Figure 574 (XI—1930E) Beach gravel, Virginia.  
Figure 575 (III—1887) Beach gravel, Island of Oahu.  
Figure 576 (III—1933) Beach gravel, Island of Oahu.  
Figure 577 (IV—2505C) Beach gravel, Fanning Island.  
Figure 578 (IV—2511) Beach gravel, composed of whole gas-  
tropod shells, Xmas Island.  
Figure 579 (IV—2530) Beach gravel, Xmas Island.  
Figure 580 (IV—2555H) Beach gravel, Xmas Island.  
Figure 581 (IV—2556I) Beach gravel, Jarvis Island.





Figures 563-581



## PLATE XLII

## MARINE SEDIMENTS

## Beach Gravel

- Figure 582 (IV—2556L) Beach gravel, Jarvis Island.  
 Figure 583 (IV—2571C) Beach gravel, Washington Island.  
 Figure 584 (IV—2574D) Beach gravel, Washington Island.  
 Figure 585 (IV—2574H) Beach gravel, Washington Island.

## Beach Lag Materials

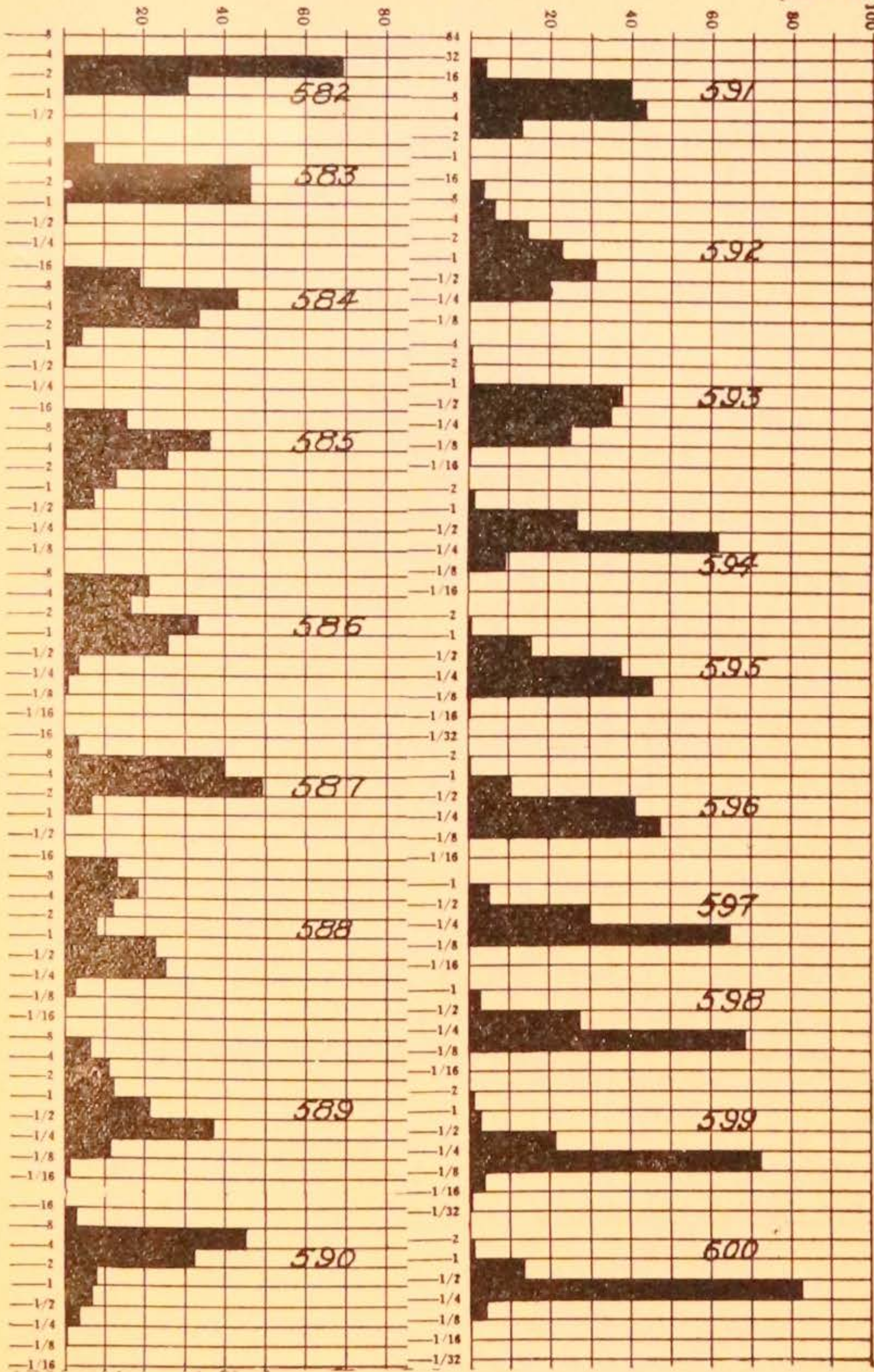
- Figure 586 (IV—2527) Lag gravel on beach, sorted partly by wind, partly by crabs, Xmas Island.  
 Figure 587 (IV—2528) Lag gravel from wave wash, Xmas Island.  
 Figure 588 (IV—2536) Lag gravel from wave wash, Xmas Island.

- Figure 589 (XI—1874A) Sand, Virginia.  
 Figure 590 (XI—1951B) Gravel, Virginia.  
 Figure 591 (XI—2061A) Gravel, Virginia.  
 Figure 592 (XI—2286B) Gravel, Virginia.

## Beach Sand

- Figure 593 (I—105) Sand, lake beach, Lake Michigan.  
 Figure 594 (I—106) Sand, lake beach, Lake Michigan.  
 Figure 595 (I—107) Sand, lake beach, Lake Michigan.  
 Figure 596 (I—108) Sand, lake beach, Lake Michigan.  
 Figure 597 (I—109) Sand, lake beach, Lake Michigan.  
 Figure 598 (I—110) Sand, lake beach, Lake Michigan.  
 Figure 599 (II—732B) Beach sand, Massachusetts.  
 Figure 600 (II—741A) Beach sand (see Dune Sand II—741B) New Jersey.





Figures 582-600



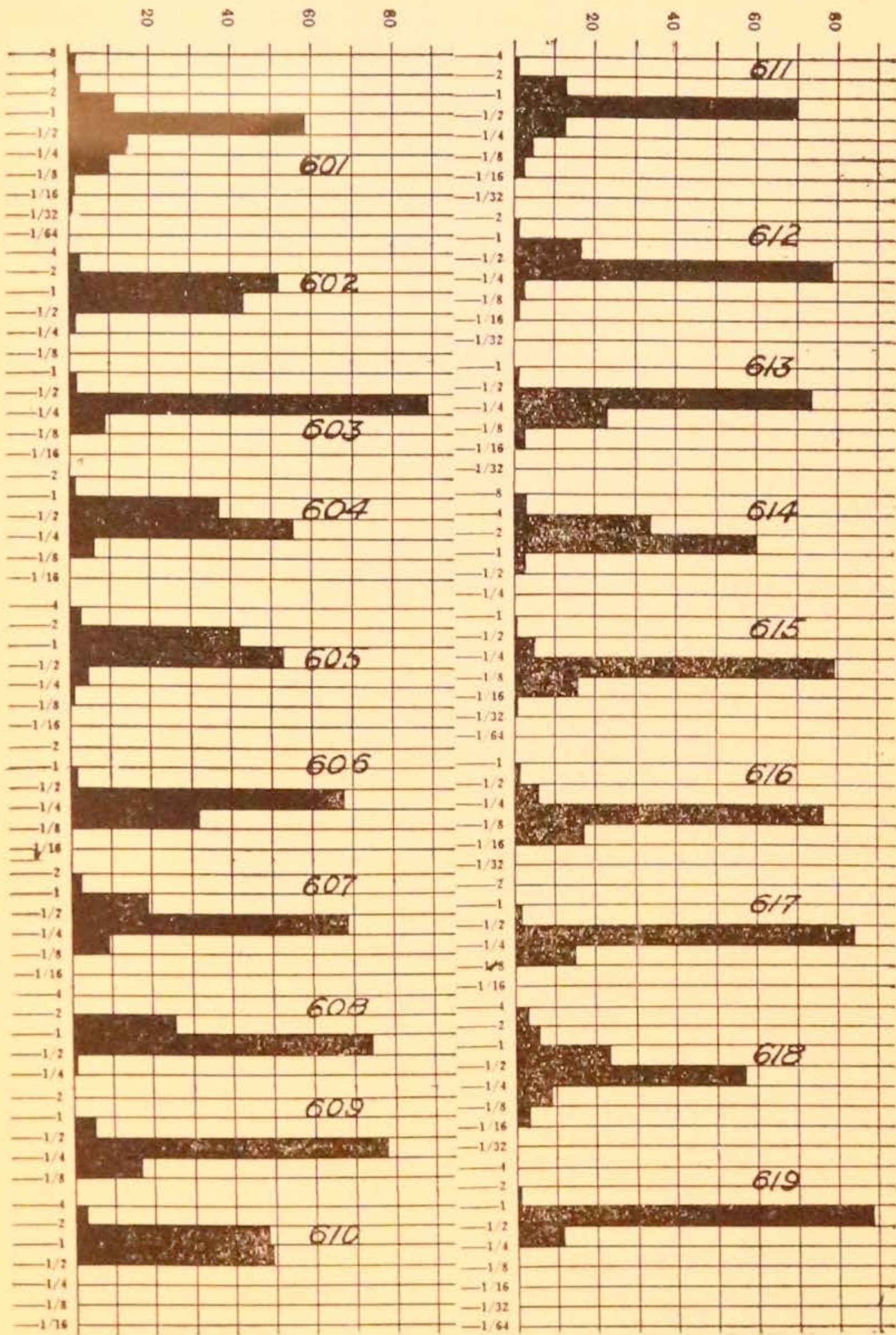
## PLATE XLIII

## MARINE SEDIMENTS

## Beach Sand

- Figure 601 (II—1002) Beach sand, Maryland.  
Figure 602 (III—12) Beach sand, Island of Oahu.  
Figure 603 (III—21B) Beach sand, Island of Oahu.  
Figure 604 (III—130) Beach sand, Island of Oahu.  
Figure 605 (III—610) Beach sand, Island of Oahu.  
Figure 606 (III—611) Beach sand, Island of Oahu.  
Figure 607 (III—1302) Beach sand, Island of Oahu.  
Figure 608 (III—1885) Beach sand, Island of Oahu.  
Figure 609 (III—1886) Beach sand, Island of Oahu.  
Figure 610 (III—2027) Beach sand, Island of Oahu.  
Figure 611 (VII—30) Beach sand, California.  
Figure 612 (XI—1738) Beach sand, Virginia.  
Figure 613 (XI—1747C) Beach sand, Virginia.  
Figure 614 (XI—1749) Beach sand, Virginia.  
Figure 615 (XI—1799) Beach sand, Virginia.  
Figure 616 (XI—1874B) Beach sand, Virginia.  
Figure 617 (XI—1874C) Beach sand, Virginia.  
Figure 618 (XI—1950) Beach sand, Virginia.  
Figure 619 (XI—2061B) Beach sand, Virginia.





Figures 601-619



## PLATE XLIV

## MARINE SEDIMENTS

## Beach Sand

- Figure 620 (XI—2071A) Beach sand, Virginia.  
Figure 621 (XI—2071B) Beach sand, Virginia.  
Figure 622 (XI—2071C) Beach sand, Virginia.  
Figure 623 (XI—2072A) Beach sand (see Dune sand, XI—  
2072B), Virginia.  
Figure 624 (XI—2073) Beach sand, Virginia.  
Figure 625 (XI—2075) Beach sand, Virginia.  
Figure 626 (XI—2254B) Beach sand, Virginia.  
Figure 627 (XI—2277B) Beach sand, Virginia.  
Figure 628 (XI—2286A) Beach sand, Virginia.  
Figure 629 (XI—2288) Beach sand, Virginia.  
Figure 630 (IV—X) Beach sand, Xmas Island.  
Figure 631 (IV—2501) Beach sand, Fanning Island.  
Figure 632 (IV—2517B) Beach sand, Xmas Island.  
Figure 633 (IV—2529) Beach sand, Xmas Island.  
Figure 634 (IV—2537) Beach sand, Xmas Island.  
Figure 635 (IV—2538) Beach sand, Xmas Island.  
Figure 636 (IV—2546A) Beach sand, Xmas Island.  
Figure 637 (IV—2551) Beach sand, Xmas Island.  
Figure 638 (IV—2556F) Beach sand, Jarvis Island.







## PLATE XLV

## MARINE SEDIMENTS

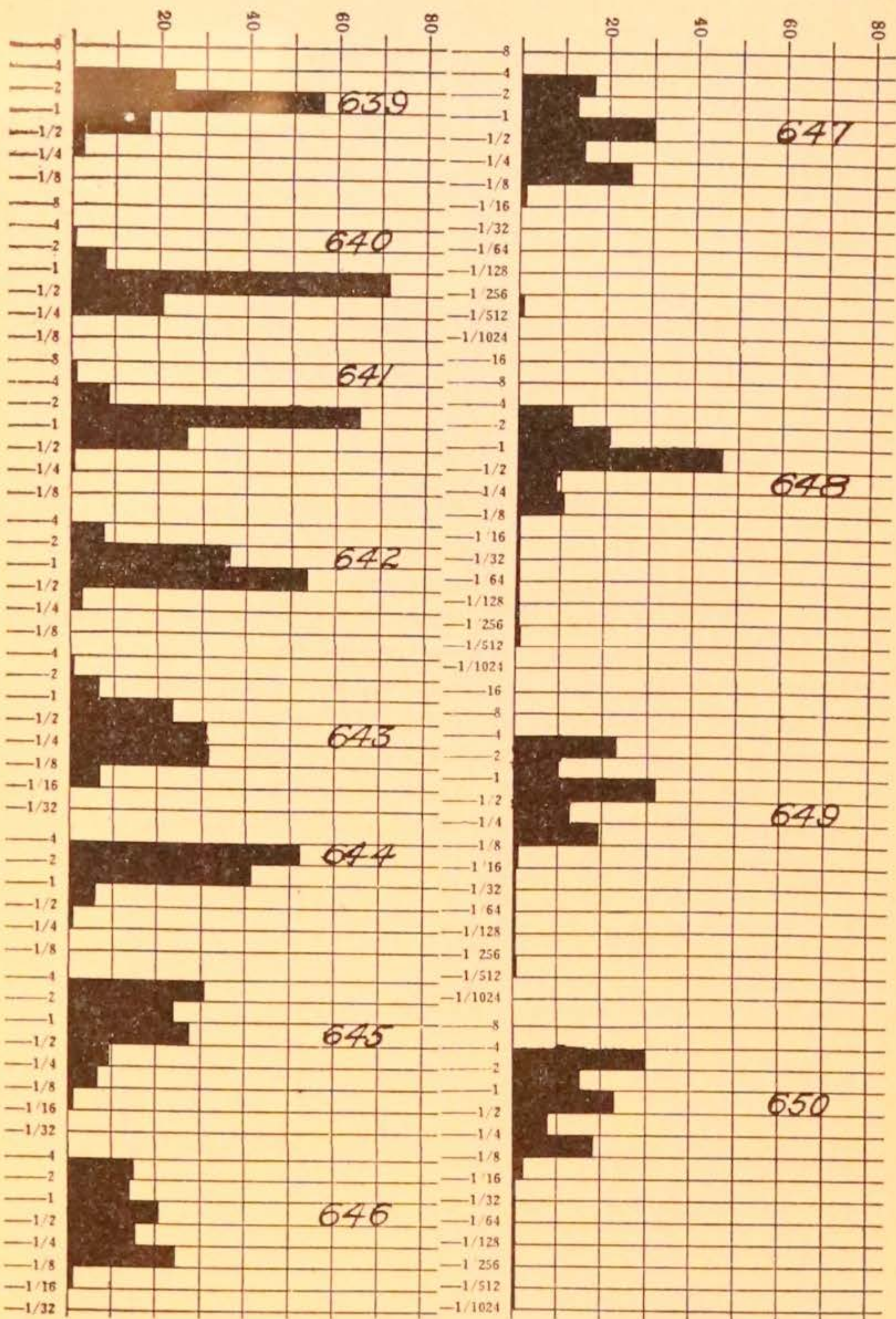
## Beach Sand

- Figure 639 (IV—2556J) Beach sand, Jarvis Island.  
Figure 640 (IV—2572A) Beach sand, Washington Island.  
Figure 641 (IV—2572F) Beach sand, Washington Island.  
Figure 642 (IV—2573A) Beach sand, Washington Island.

## Shallow Water Sediments

- Figure 643 (XIII—Aua 1) Beach sand, Samoa.  
Figure 644 (XIII—Aua 2) Beach gravel, Samoa.  
Figure 645 (XIII—Aua 3) Sand, 10 ft. from shore, Samoa.  
Figure 646 (XIII—Aua 4) Sand, 50 ft. from shore, Samoa.  
Figure 647 (XIII—Aua 5) Sand, 100 ft. from shore, Samoa.  
Figure 648 (XIII—Aua 6) Sand, 200 ft. from shore, Samoa.  
Figure 649 (XIII—Aua 7) Sand, 300 ft. from shore, Samoa.  
Figure 650 (XIII—Aua 8) Sand, 400 ft. from shore, Samoa.





Figures 639-650



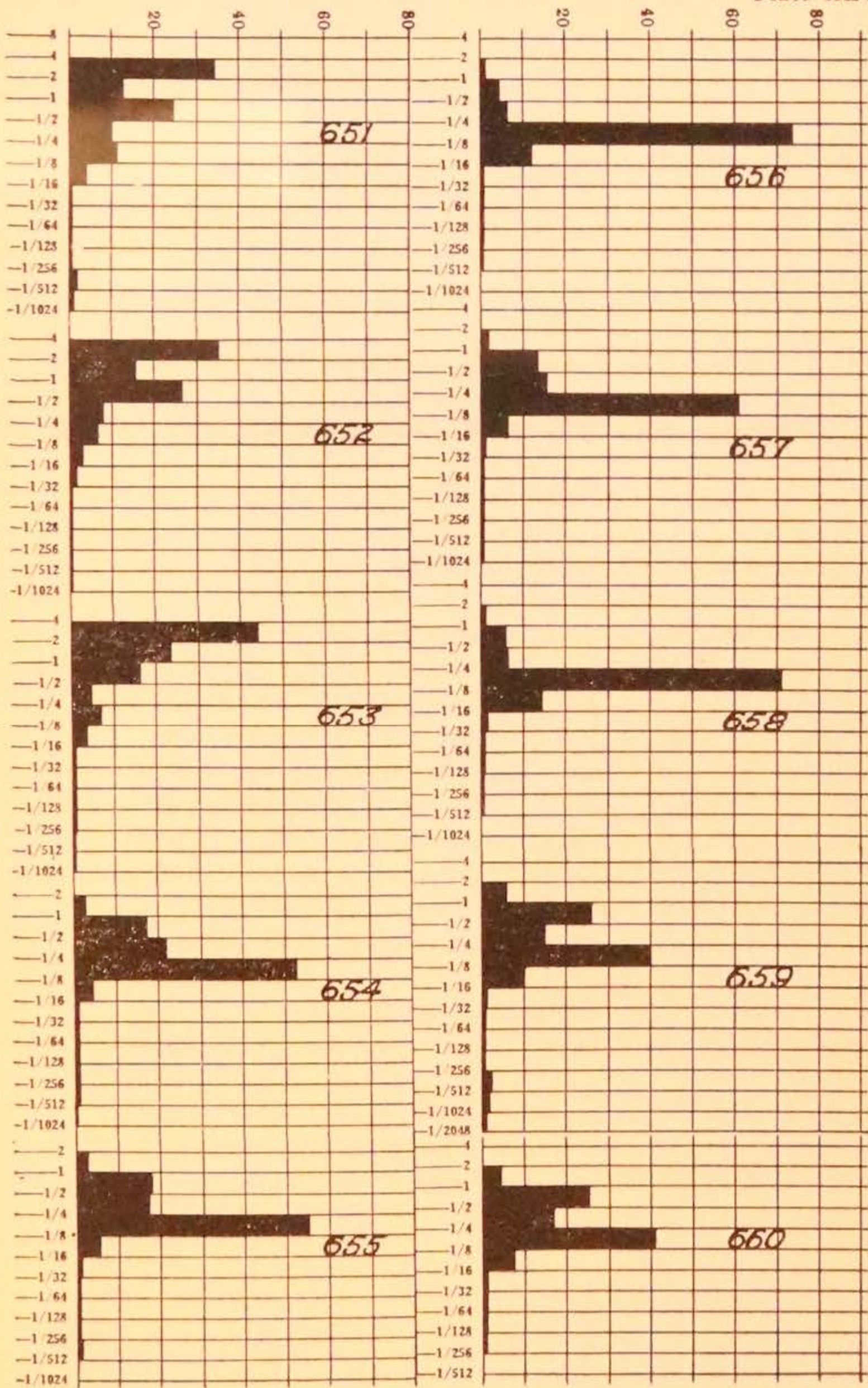
## PLATE XLVI

## MARINE SEDIMENTS

## Shallow Water Sediments

- Figure 651 (XIII—Aua 9) Sand, 500 ft. from shore, Samoa.  
Figure 652 (XIII—Aua 10) Sand, 600 ft. from shore, Samoa.  
Figure 653 (XIII—Aua 11) Sand, 700 ft. from shore, Samoa.  
Figure 654 (XIII—Aua 20) Sand, off reef front, Samoa.  
Figure 655 (XIII—Aua 21) Sand, off reef front, Samoa.  
Figure 656 (XIII—Aua 22) Sand, off reef front, Samoa.  
Figure 657 (XIII—Aua 23) Sand, off reef front, Samoa.  
Figure 658 (XIII—Aua 24) Sand, off reef front, Samoa.  
Figure 659 (XIII—Nuuli A) Sand, center of lagoon, Samoa.  
Figure 660 (XIII—Nuuli B) Sand, center of lagoon, Samoa.





Figures 651-660



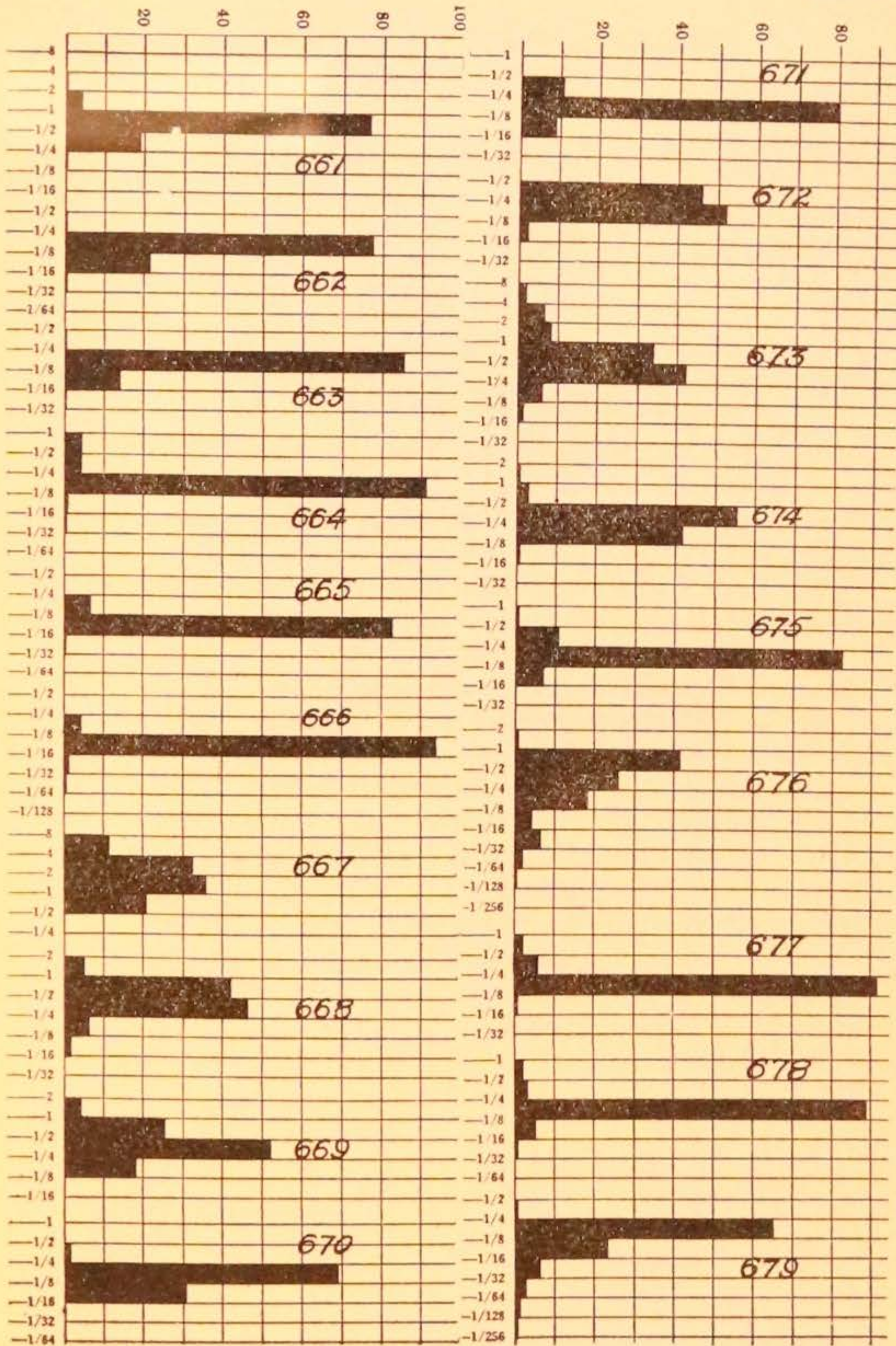
## PLATE XLVII

## MARINE SEDIMENTS

## Heavy Concentrates

- Figure 661 (I—339) Magnetite-quartz sand, Lake Michigan beach.
- Figure 662 (I—341) Magnetite-quartz sand, Ocean beach, Texas.
- Figure 663 (I—342) Magnetite-quartz sand, Ocean beach, Texas.
- Figure 664 (I—346) Magnetite portion of 339.
- Figure 665 (I—348) Magnetite portion of 341.
- Figure 666 (I—349) Magnetite portion of 342.
- Figure 667 (III—740D) Olivine-augite sand, Island of Oahu.
- Figure 668 (III—796) Heavy sand, Island of Oahu.
- Figure 669 (III—1021) Heavy sand, Island of Oahu.
- Figure 670 (II—1018) Black beach sand, Maryland.
- Figure 671 (XI—1579A) Black beach sand, Virginia.
- Figure 672 (XI—1579B) Black beach sand, Virginia.
- Figure 673 (XI—1874D) Black beach sand, Virginia (contains light shell fragments also).
- Figure 674 (XI—1951C) Black beach sand, Virginia.
- Figure 675 (XI—2012) Black beach sand, Virginia.
- Continental Shelf Sands
- Figure 676 (I—134) Sand and mud, inner shelf, North Atlantic.
- Figure 677 (I—135) Sand, inner shelf, Cuba.
- Figure 678 (I—136) Sand, inner shelf, Florida.
- Figure 679 (I—137) Sand, inner shelf, Labrador.





Figures 661-679



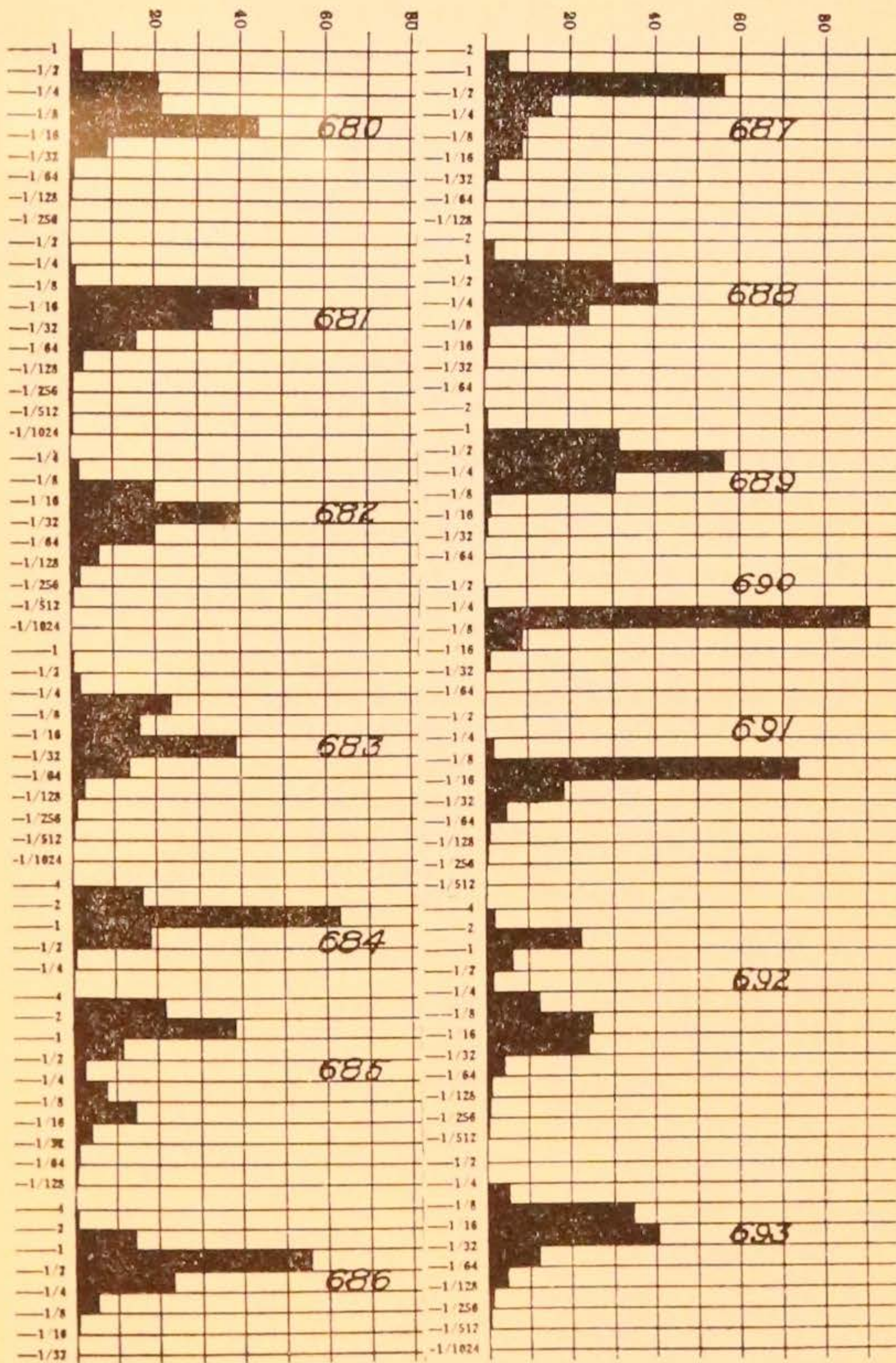
## PLATE XLVIII

## MARINE SEDIMENTS

## Continental Shelf Sands

- Figure 680 (I—138) Sand and mud, inner shelf, North Atlantic.
- Figure 681 (I—139) Mud, inner shelf, Massachusetts.
- Figure 682 (I—140) Sand and mud, inner shelf, Cuba.
- Figure 683 (I—141) Sand and mud, inner shelf, Patagonia.
- Figure 684 (I—142) Sand, outer shelf, North Atlantic.
- Figure 685 (I—143) Sand, outer shelf, North Atlantic.
- Figure 686 (I—144) Sand, outer shelf, North Atlantic.
- Figure 687 (I—145) Sand, outer shelf, North Atlantic.
- Figure 688 (I—146) Sand, outer shelf, Yucatan.
- Figure 689 (I—147) Sand, outer shelf, North Atlantic.
- Figure 690 (I—148) Sand, outer shelf, North Atlantic.
- Figure 691 (I—149) Sand and mud, outer shelf, North Atlantic.
- Figure 692 (I—150) Sand and mud, outer shelf, North Atlantic.
- Figure 693 (I—151) Sand and mud, outer shelf, North Atlantic.





Figures 680-693



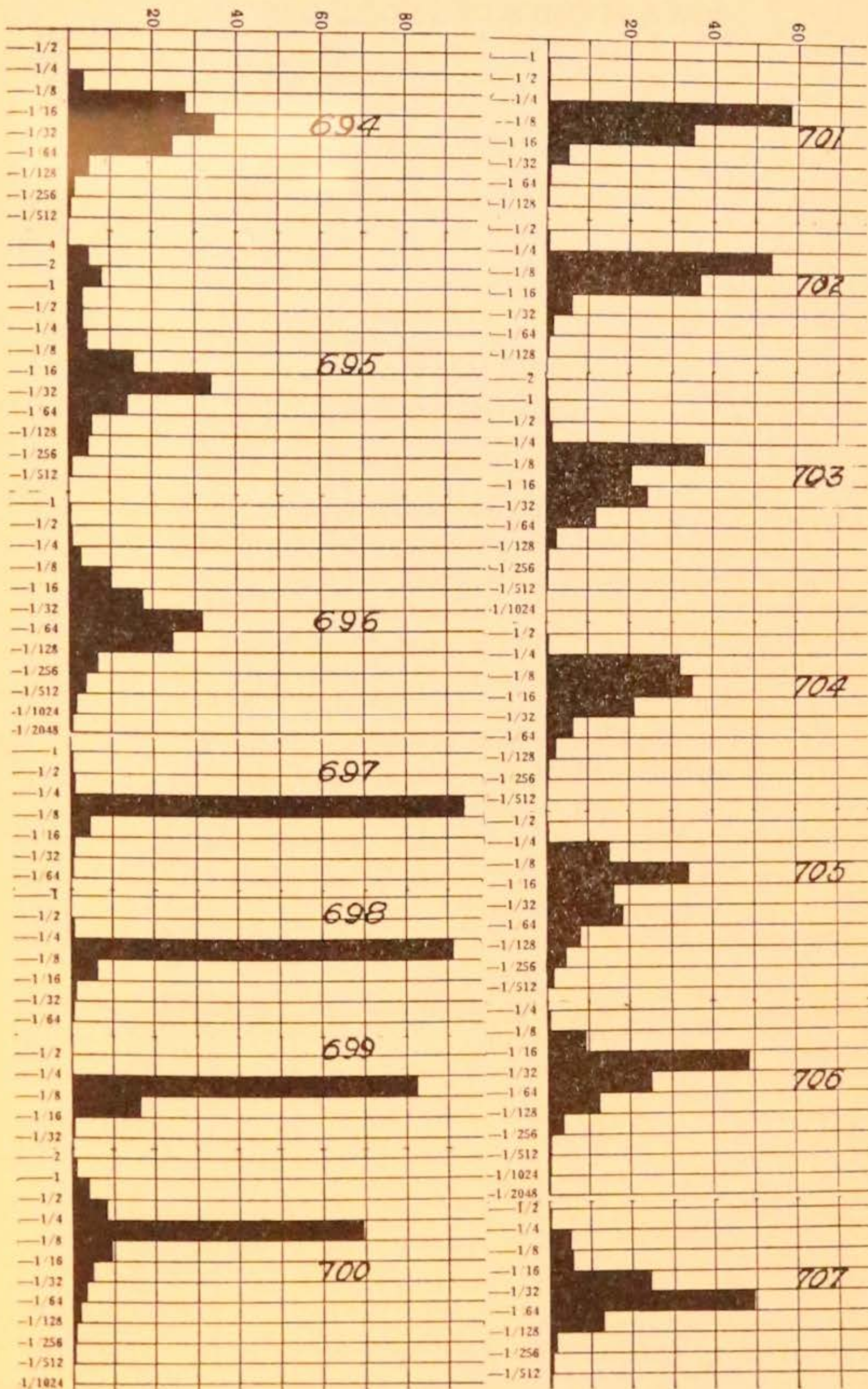
## PLATE XLIX

## MARINE SEDIMENTS

## Continental Shelf Sands

- Figure 694 (I—152) Sand and mud, outer shelf, North Atlantic.
- Figure 695 (I—153) Sand and mud, outer shelf, North Atlantic.
- Figure 696 (I—154) Mud, outer shelf, North Atlantic.
- Figure 697 (I—165) Sand, marine shelf, Bering Sea.
- Figure 698 (I—166) Sand, marine shelf, Bering Sea.
- Figure 699 (I—167) Sand, marine shelf, Bering Sea.
- Figure 700 (I—168) Sand, marine shelf, Bering Sea.
- Figure 701 (I—169) Sand, marine shelf, Bering Sea.
- Figure 702 (I—170) Sand and mud, marine shelf, Bering Sea.
- Figure 703 (I—171) Sand and mud, marine shelf, Bering Sea.
- Figure 704 (I—172) Sand and mud, marine shelf, Bering Sea.
- Figure 705 (I—173) Sand and mud, marine shelf, Bering Sea.
- Figure 706 (I—174) Sand and mud, marine shelf, Alaskan Coast.
- Figure 707 (I—175) Sand and mud, marine shelf, Alaskan Coast.





Figures 694-707



## PLATE L

## MARINE SEDIMENTS

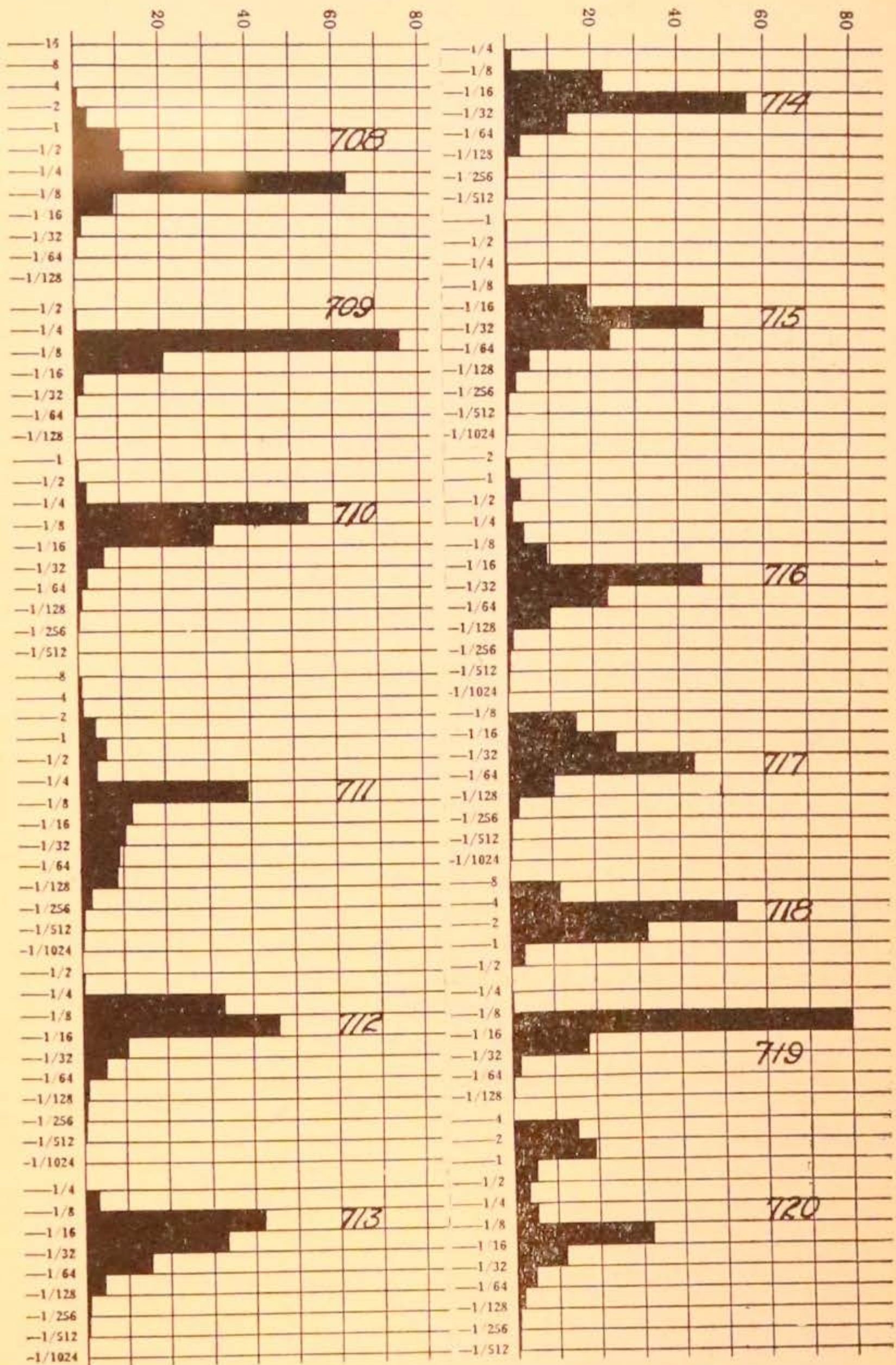
## Steep Submerged Continental Slope Sediments

- Figure 708 (I—155) Marine sand and mud, California.  
Figure 709 (I—156) Marine sand, Washington.  
Figure 710 (I—157) Marine sand and mud, California.  
Figure 711 (I—158) Marine sand and mud, California.  
Figure 712 (I—159) Marine sand, Washington.  
Figure 713 (I—160) Marine mud, California.  
Figure 714 (I—161) Marine green mud, California.  
Figure 715 (I—162) Marine green mud, Lower California.  
Figure 716 (I—163) Marine green mud, California.  
Figure 717 (I—164) Marine offshore brown ooze, Washington.

## Sediments from Margins of Ocean Basins

- Figure 718 (I—182) Coral sand, 634 fathoms, Galapagos Islands.  
Figure 719 (I—183) Brown ooze, 1753 fathoms (see reference).  
Figure 720 (I—184) Soft green mud, 841 fathoms (see reference).





Figures 708-720



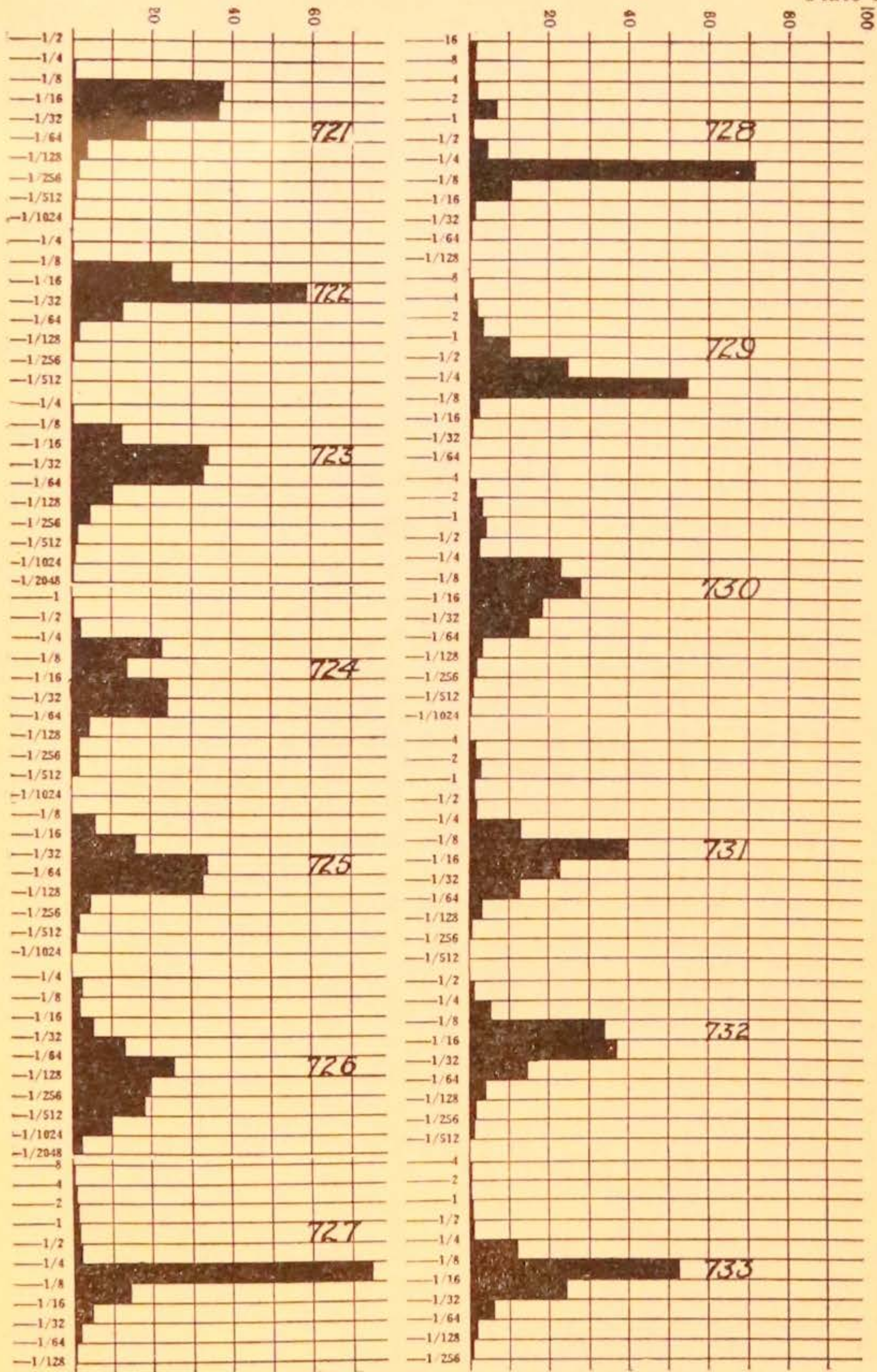
## PLATE LI

## MARINE SEDIMENTS

## Sediments from Margins of Ocean Basins

- Figure 721 (I—185) Green mud, 876 fathoms, off British Columbia.
- Figure 722 (I—186) Gray ooze, 1525 fathoms, West Atlantic.
- Figure 723 (I—187) Brown ooze, 1867 fathoms (see reference).
- Figure 724 (I—188) Gray ooze, 2257 fathoms, Aleutian Islands.
- Figure 725 (I—189) Gray mud-sand, 776 fathoms, California.
- Figure 726 (I—190) Gray mud, 1255 fathoms, Gulf of Mexico.  
Marine Sediments near Volcanoes
- Figure 727 (I—176) Brown mud, 905 fathoms, Gulf of California.
- Figure 728 (I—177) Inorganic sand, 56 fathoms (see reference).
- Figure 729 (I—178) Fine gray sand, 142 fathoms, Alaska Peninsula.
- Figure 730 (I—179) Black sand, 109 fathoms, Unimak Island.
- Figure 731 (I—180) Green mud, 284 fathoms (see reference)
- Figure 732 (I—181) Gray sand, 328 fathoms, Azores.
- Harbor Silt
- Figure 733 (I—121) Harbor silt, Massachusetts.





Figures 721-733



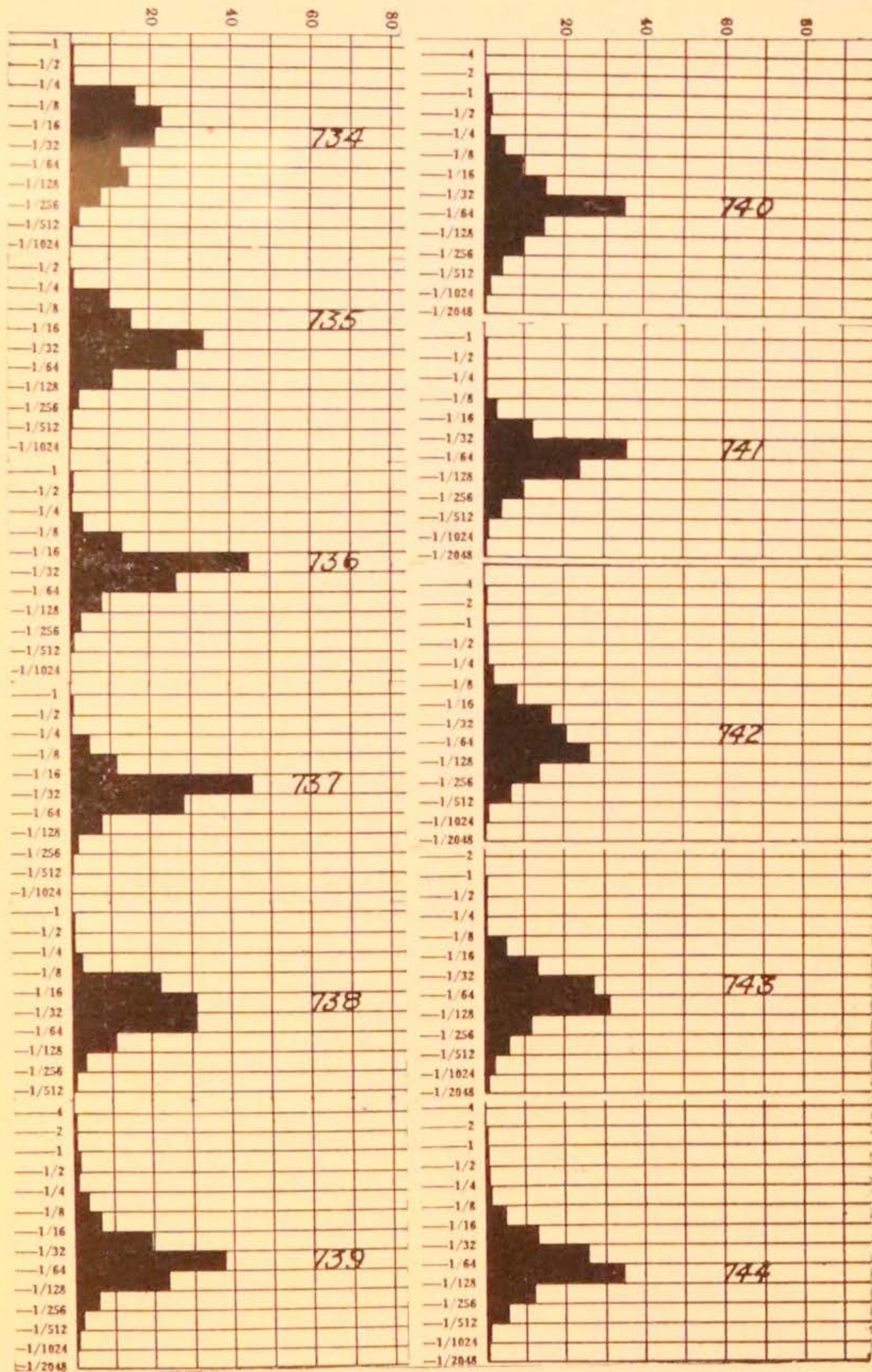
## PLATE LII

## MARINE SEDIMENTS

## Harbor Silt

- Figure 734 (I—122) Harbor silt, Virginia.  
Figure 735 (I—123) Harbor silt, Virginia.  
Figure 736 (I—124) Harbor silt, West Indies.  
Figure 737 (I—125) Harbor silt, Chesapeake Bay.  
Figure 738 (I—126) Harbor silt, Virginia.  
Figure 739 (I—127) Harbor silt, Massachusetts.  
Figure 740 (I—128) Harbor silt, Rio de Janeiro.  
Figure 741 (I—129) Harbor silt, Maryland.  
Figure 742 (I—130) Harbor silt, Rhode Island.  
Figure 743 (I—131) Harbor silt, Chesapeake Bay.  
Figure 744 (I—132) Harbor silt, Maryland.





Figures 734-744



## PLATE LIII

## MARINE SEDIMENTS

## Harbor Silt

Figure 745 (I—133) Harbor silt, Sea Wall, Atlantic Coast.

## Delta Sands

Figure 746 (X—174) Delta sand, Pass mouth, Mississippi Delta.

Figure 747 (X—176) Delta sand, Pass mouth, Mississippi Delta.

## Ancient Marine Sands

Figure 748 (II—70A) Marine sand, Patapsco formation, Maryland.

Figure 749 (II—70B) Marine sand, Patapsco formation, Maryland.

Figure 750 (II—988A) Marine terrace sand, Virginia.

Figure 751 (II—988B) Marine terrace sand, Virginia.

Figure 752 (II—1014) Marine terrace sand, Virginia.

Figure 753 (XI—1736A) Marine terrace sand, Virginia.

Figure 754 (XI—1736B) Marine terrace sand, Virginia.

## LACUSTRINE SEDIMENTS

## Lake Clay

Figure 755 (I—111) Lake clay, Wisconsin.

Figure 756 (I—112) Lake clay, Wisconsin.

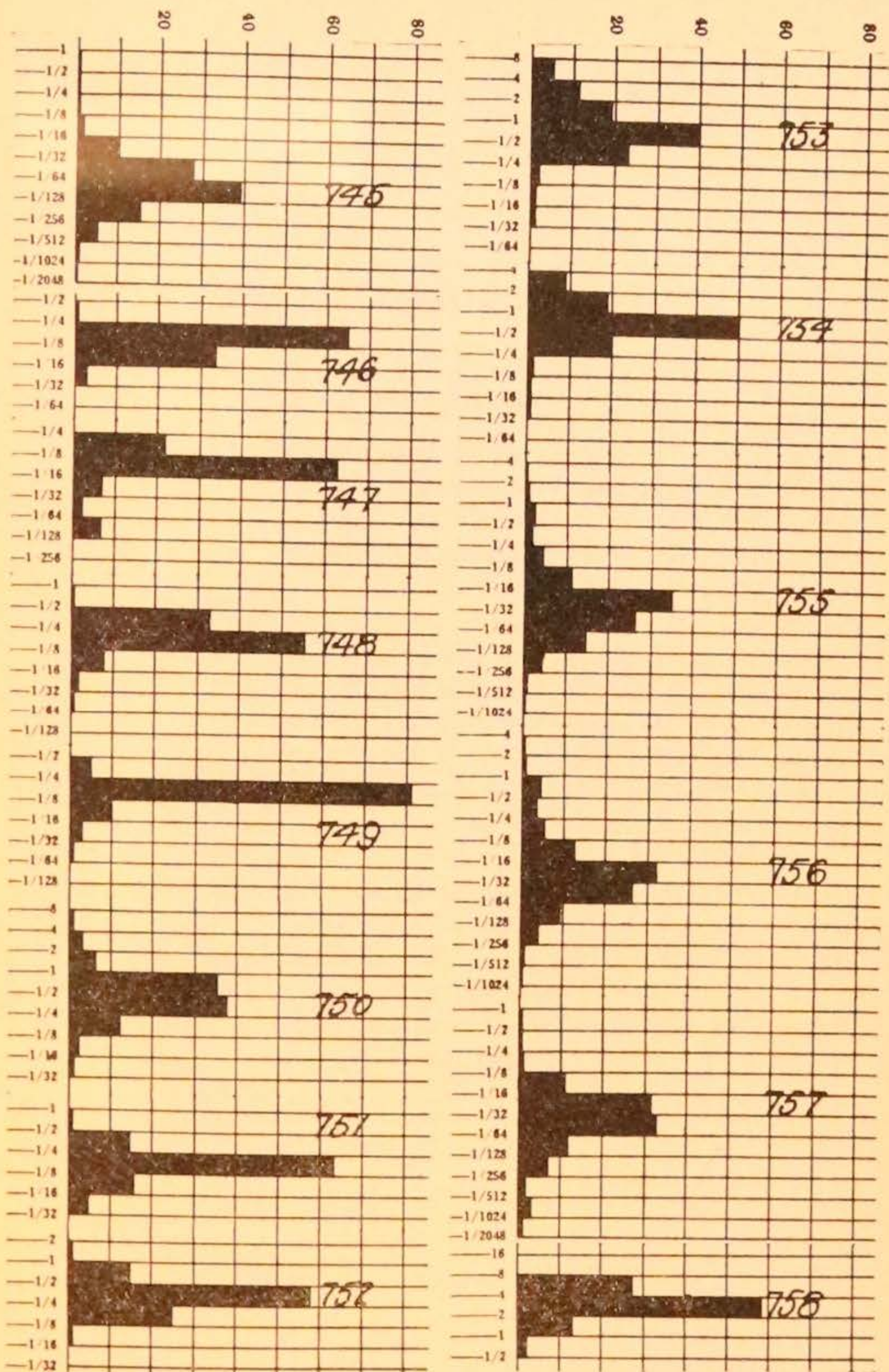
Figure 757 (I—113) Lake clay, Wisconsin.

## PYROCLASTIC SEDIMENTS

## Volcanic Ash

Figure 758 (III—14) Volcanic ash, Hawaii.





Figures 745-758



## PLATE LIV

## PYROCLASTIC SEDIMENTS

## Volcanic Ash

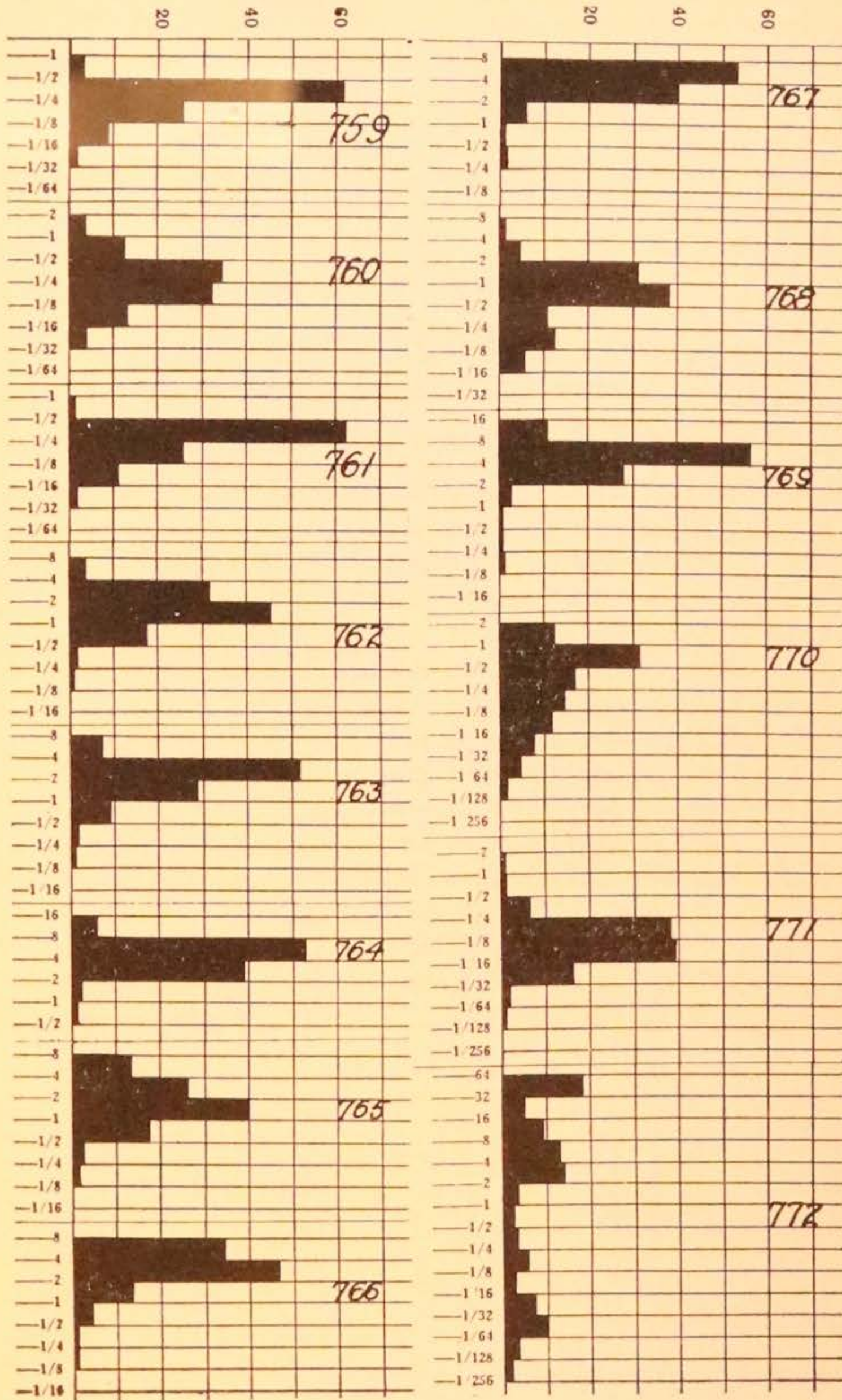
- Figure 759 (III—50) Volcanic ash, Hawaii.  
Figure 760 (III—84) Volcanic ash, Hawaii.  
Figure 761 (III—85) Volcanic ash, Hawaii.  
Figure 762 (III—161) Volcanic ash, Hawaii.  
Figure 763 (III—515B) Volcanic ash, Hawaii.  
Figure 764 (III—535) Volcanic ash, Hawaii.  
Figure 765 (III—549) Volcanic ash, Hawaii.  
Figure 766 (III—559) Volcanic ash, Hawaii.  
Figure 767 (III—588) Volcanic ash, Hawaii.  
Figure 768 (III—841) Volcanic ash, Hawaii.  
Figure 769 (III—1854) Volcanic ash, Hawaii.

## GRAVITY AND COLLUVIAL SEDIMENTS

## Weathering Products and Slope Washed Material

- Figure 770 (II—357A) Weathered detritus from gneiss, District of Columbia.  
Figure 771 (II—357B) Sand, slightly transported from site of 357A, District of Columbia.  
Figure 772 (II—760) Slope washed detritus from gneiss, Maryland.





Figures 759-772



## PLATE LV

## GRAVITY AND COLLUVIAL SEDIMENTS

## Weathering Products and Slope Washed Material

Figure 773 (II—1057) Slope washed detritus from gneiss,  
Virginia.

## Gumbo (Probably Gumbotil)

Figure 774 (I—363) Gumbo, Iowa.

Figure 775 (I—364) Gumbo, Iowa.

Figure 776 (I—365) Gumbo, Iowa.

Figure 777 (I—366) Gumbo, Iowa.

Figure 778 (I—367) Gumbo, Iowa.

Figure 779 (I—368) Gumbo, Iowa.

Figure 780 (I—369) Gumbo, Iowa.

Figure 781 (I—370) Gumbo, Iowa.

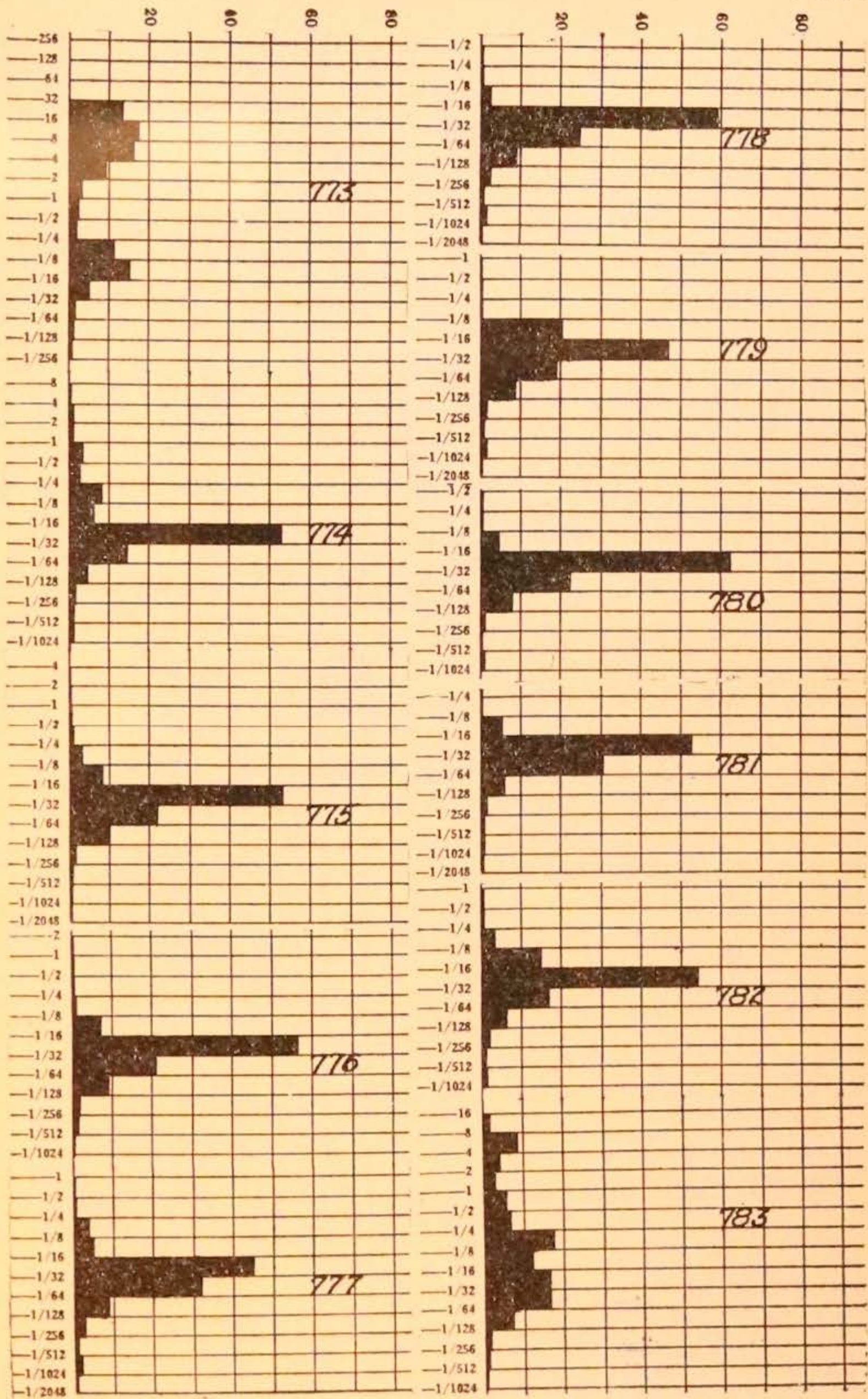
Figure 782 (I—371) Gumbo, Iowa.

## GLACIAL SEDIMENTS

## Till

Figure 783 (I—1) Boulder clay, Illinois.





Figures 773-783



## PLATE LVI

## GLACIAL SEDIMENTS

## Till

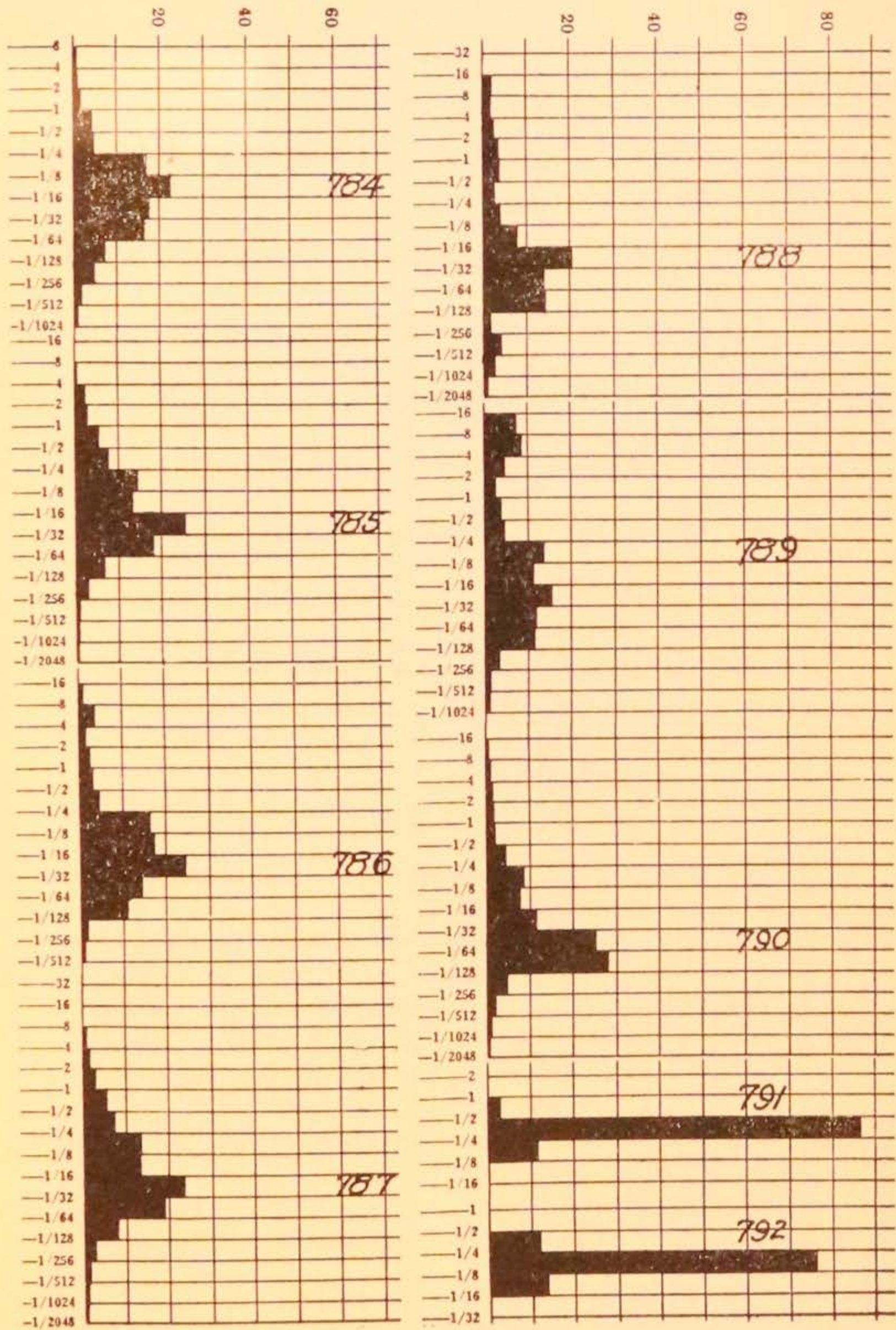
- Figure 784 (I—2) Boulder clay, unweathered Kansan drift, Illinois.
- Figure 785 (I—3) Boulder clay, Iowa.
- Figure 786 (I—4) Boulder clay, Illinois.
- Figure 787 (I—5) Clay, "like the Kansan," Iowa.
- Figure 788 (I—6) Boulder clay, Illinois.
- Figure 789 (I—7) Boulder clay, Illinois.
- Figure 790 (I—8) Boulder clay, Illinois.

## MISCELLANEOUS ANCIENT FORMATIONS

## Sandstone, Breccia, etc.

- Figure 791 (V—S 33) Sandstone, St. Peter formation, Missouri.
- Figure 792 (V—S 82) Sandstone, St. Peter formation, Missouri.





Figures 784-792



## PLATE LVII

## MISCELLANEOUS ANCIENT FORMATIONS

## Sandstone, Breccia, etc.

- Figure 793 (V—S 220) Sandstone, St. Peter formation, Missouri.
- Figure 794 (V—S 243) Sandstone, St. Peter formation, Missouri.
- Figure 795 (V—S 244) Sandstone, St. Peter formation, Missouri.
- Figure 796 (V—S 246) Sandstone, Potsdam formation, Missouri.
- Figure 797 (V—S 247) Sandstone, Potsdam formation, Missouri.
- Figure 798 (XII—W 7) Oil sand, Wilcox formation, Oklahoma.
- Figure 799 (XII—W 25) Oil sand, Wilcox formation, Oklahoma.
- Figure 800 (XII—H 8) Oil sand, Hominy formation, Oklahoma.
- Figure 801 (XII—H 18) Oil sand, Hominy formation, Oklahoma.
- Figure 802 (XII—B 17) Oil sand, Bartlesville formation, Oklahoma.
- Figure 803 (XII—B 3) Oil sand, Bartlesville formation, Oklahoma.
- Figure 804 (XII—E 10) Oil sand, Elgin formation, Oklahoma.
- Figure 805 (XII—E 16) Oil sand, Elgin formation, Oklahoma.
- Figure 806 (VII—13) Breccia, San Onofre formation, California.
- Figure 807 (VII—14) Breccia, San Onofre formation, California.







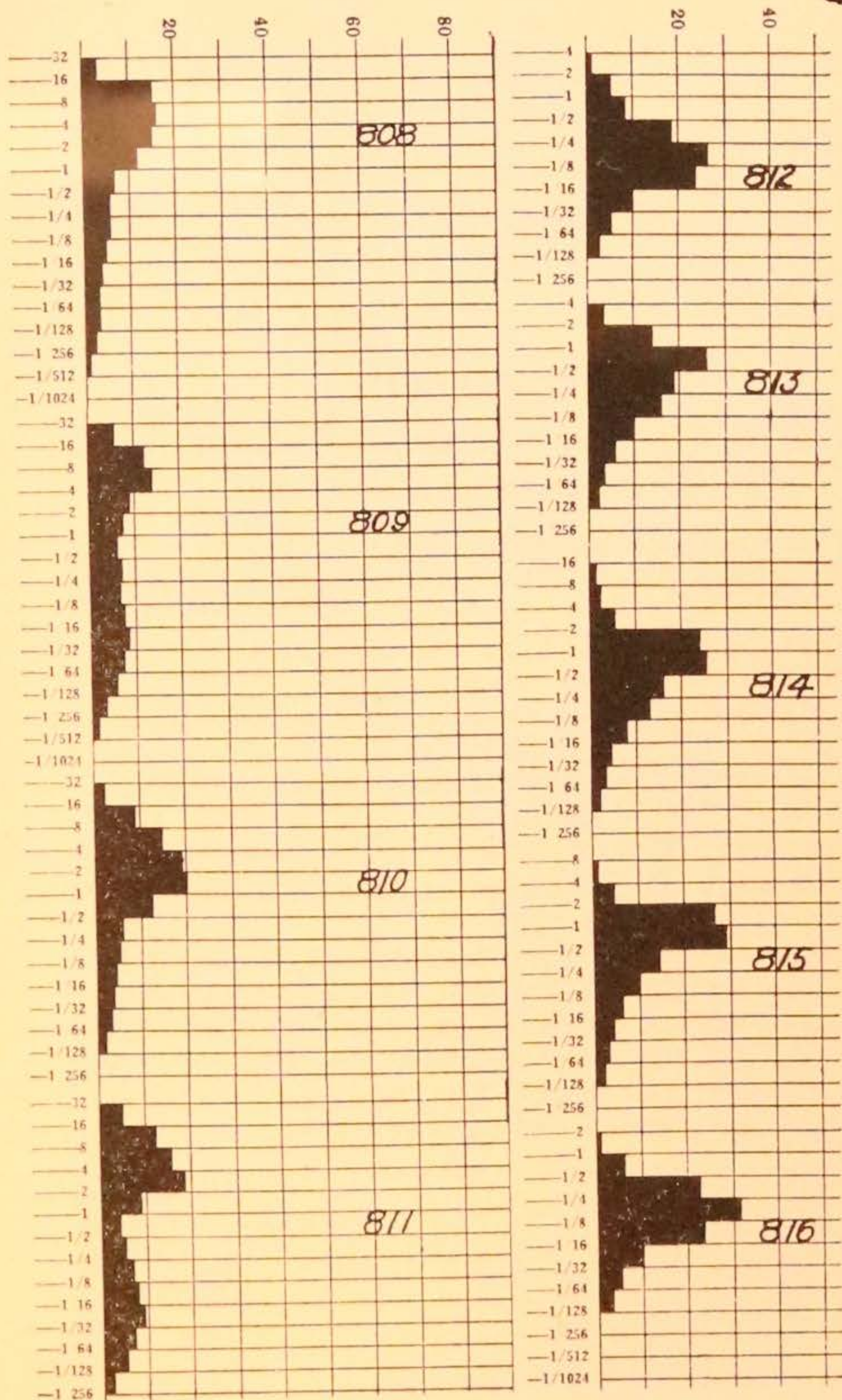
## PLATE LVIII

## MISCELLANEOUS ANCIENT FORMATIONS

## Sandstone, Breccia, etc.

- Figure 808 (VII—15) Breccia, San Onofre formation, California.
- Figure 809 (VII—16) Breccia, San Onofre formation, California.
- Figure 810 (VII—17) Conglomerate, San Onofre formation, California.
- Figure 811 (VII—18) Conglomerate, San Onofre formation, California.
- Figure 812 (VII— 5) Sandstone, Tejon formation, California.
- Figure 813 (VII— 7) Sandstone, Tejon formation, California.
- Figure 814 (VII— 8) Sandstone, Tejon formation, California.
- Figure 815 (VII— 9) Sandstone, Tejon formation, California.
- Figure 816 (VII—10) Sandstone, Tejon formation, California.





Figures 808-816



## PLATE LIX

## MISCELLANEOUS ANCIENT FORMATIONS

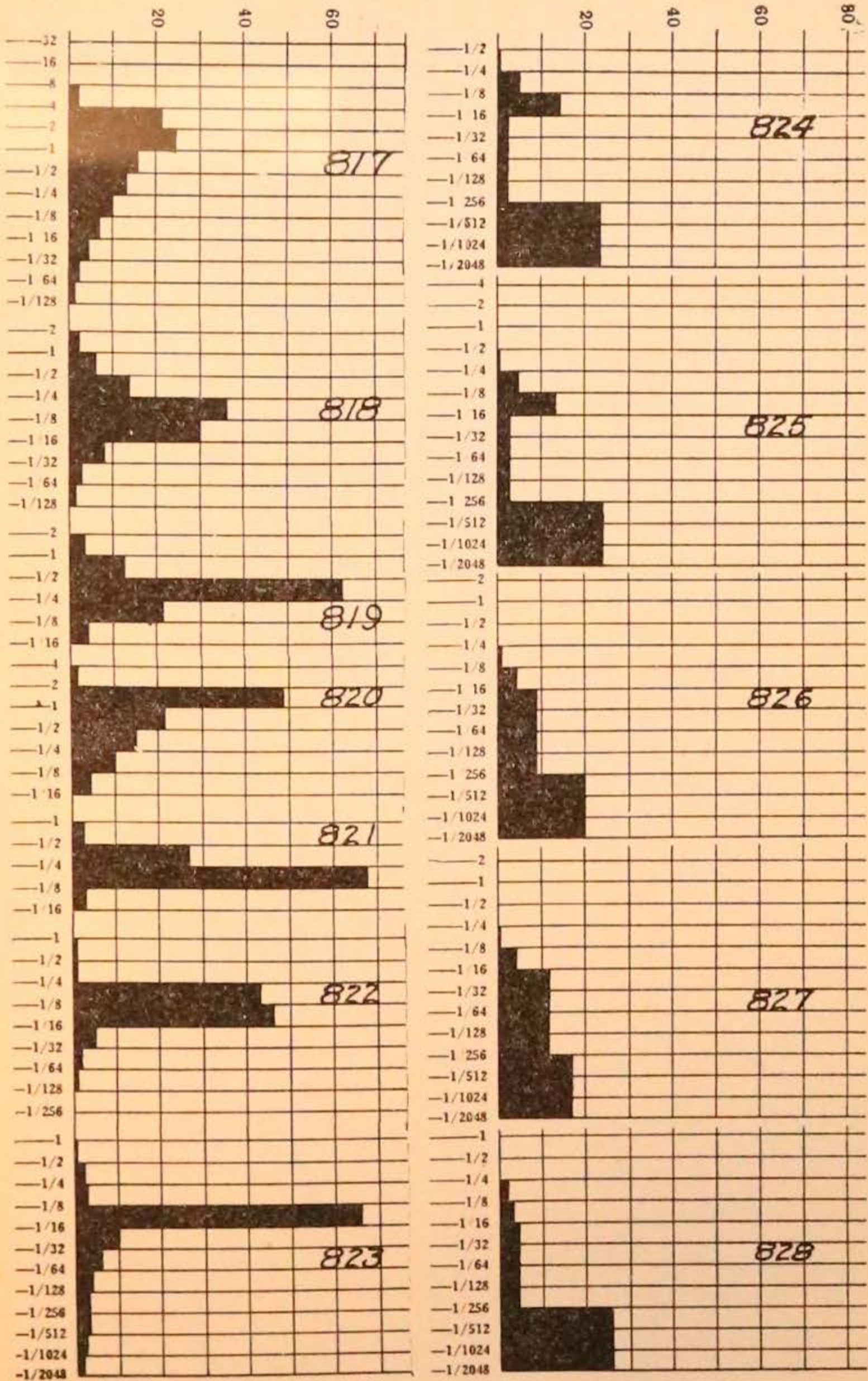
## Sandstone, Breccia, etc.

- Figure 817 (VII—4) Sandstone, Chico formation, California.  
Figure 818 (VII—11) Sandstone, Vaqueros formation, California.  
Figure 819 (VI—141) Sandstone, Commerce formation, Missouri.  
Figure 820 (VI—142) Sandstone, Commerce formation, Missouri.  
Figure 821 (VI—146) Sandstone, Commerce formation, Missouri.  
Figure 822 (IX—6) Sandstone, Cody formation, Wyoming.  
Figure 823 (IX—7) Sandstone, Mesaverde formation, Wyoming.

## Bentonite

- Figure 824 (IX—1) Bentonite, Thermopolis shale, Wyoming.  
Figure 825 (IX—2) Bentonite, Thermopolis shale, Wyoming.  
Figure 826 (IX—3) Bentonite, Thermopolis shale, Wyoming.  
Figure 827 (IX—4) Bentonite, Thermopolis shale, Wyoming.  
Figure 828 (IX—5) Bentonite, Frontier formation, Wyoming.





Figures 817-828



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